# CHRYSLER CORPORATION

## SERVICE MANUAL and SUPPLEMENT

## 1996 JEEP®
## GRAND CHEROKEE

To order the special service tools used and illustrated, please refer to the instructions on inside back cover.

CHRYSLER CORPORATION



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GENERAL INFORMATION (Continued)


9400-9

*Fig. 2 API Symbol*

*ENGINE OIL*

**SAE GRADE RATING INDICATES ENGINE OIL VISCOSITY**

An SAE viscosity grade is used to specify the viscosity of engine oil. SAE 30 specifies a single viscosity engine oil. Engine oils also have multiple viscosities. These are specified with a dual SAE viscosity grade which indicates the cold-to-hot temperature viscosity range.

- SAE 30 = single grade engine oil.
- SAE 10W-30 = multiple grade engine oil.

**API QUALITY CLASSIFICATION**

The API Service Grade specifies the type of performance the engine oil is intended to provide. The API Service Grade specifications also apply to energy conserving engine oils.

Use engine oil that is API Service Grade Certified or an oil that conforms to the API Service Grade SH or SH/CD. MOPAR engine oils conform to all of these service grades.

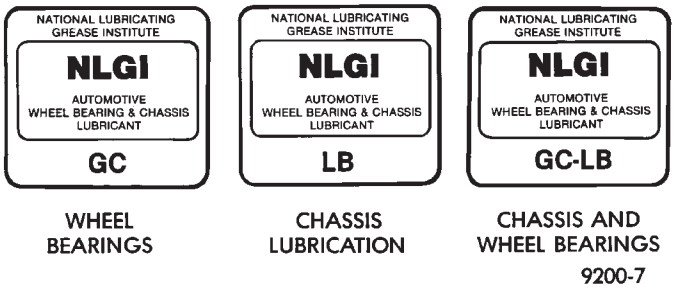
Refer to Group 9, Engine for engine oil specification.

**GEAR LUBRICANTS**

SAE ratings also apply to multiple grade gear lubricants. In addition, API classification defines the lubricants usage.

**LUBRICANTS AND GREASES**

Lubricating grease is rated for quality and usage by the NLGI. All approved products have the NLGI symbol (Fig. 3) on the label. At the bottom NLGI symbol is the usage and quality identification letters. Wheel bearing lubricant is identified by the letter “G”. Chassis lubricant is identified by the latter “L”. The letter following the usage letter indicates the quality of the lubricant. The following symbols indicate the highest quality.




9200-7

*Fig. 3 NLGI Symbol*

## FLUID CAPACITIES

*FUEL TANK*

All. . . . . .87.4 L (23 gal.)

*ENGINE OIL W/FILTER CHANGE*

4.0L . . . . . .5.7 L (6.0 qts.)
5.2L . . . . . .4.7 L (5.0 qts.)

*COOLING SYSTEM*

4.0L . . . . . .11.4 L (12.0 qts.)*
5.2L . . . . . .14.1 L (14.9 qts.)*

*Includes 2.2 L (2.3 qts.) for coolant recovery bottle.

*AUTOMATIC TRANSMISSION*

Dry fill capacity.*

42RE . . . . . .8.0-10.4 L (17-22 pts.)
44RE . . . . . .8.0-10.4 L (17-22 pts.)

*Depending on type and size of internal cooler, length and inside diameter of cooler lines, or use of an auxiliary cooler, these figures may vary. Refer to Group 21, Transmission for proper fluid fill procedure.

*FRONT AXLE*

Model 30 . . . . . .1.48 L (3.13 pts.)

*REAR AXLE*

Model 44* . . . . . .2.24 L (4.75 pts.)

*If the vehicle is equipped with TRAC-LOK, include 0.11 L (0.25 pts.) of friction modifier.

**NOTE: Vehicles with trailer tow, must use a synthetic lubricant. Refer to Group 3, Differential and Driveline for service procedures.**

SERVICE PROCEDURES (Continued)

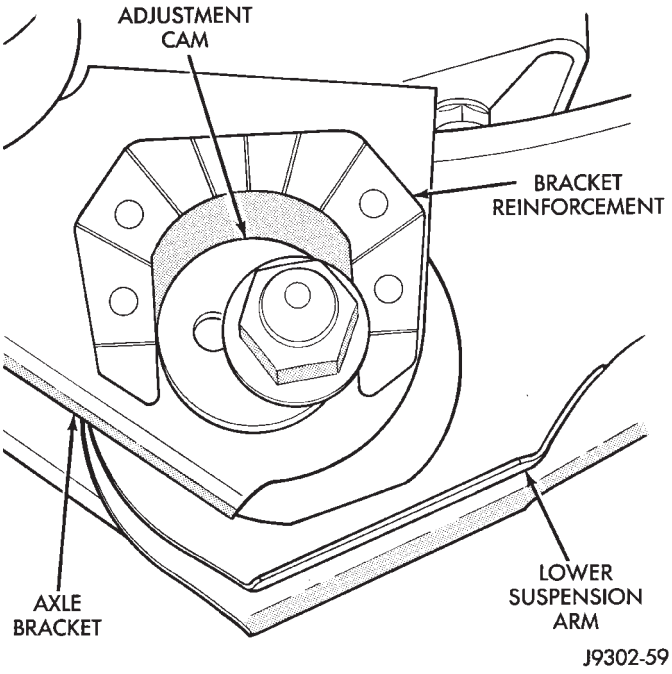



*Fig. 1 Cam Adjuster*

*TOE POSITION*

The toe position adjustment should be the last adjustment made.

**NOTE: The engine must remain running during the entire toe position adjustment.**

(1) Apply parking brakes.

(2) Start the engine and turn wheels both ways before straightening the steering wheel. Center and secure the steering wheel.

(3) Loosen the adjustment sleeve clamp bolts (Fig. 2).

(4) Adjust the right wheel toe position with the drag link (Fig. 3) and (Fig. 4). Turn the sleeve until the right wheel is at the correct positive TOE-IN position. Position the clamp bolts as shown (Fig. 2) and tighten to 49N·m (36 ft. lbs.).

**NOTE: Tighten clamp bolt nearest the pitman arm first. Make sure the toe setting does not change during clamp tightening.**

(5) Adjust the left wheel toe position with the tie rod. Turn the sleeve until the left wheel is within .05° TOE-IN position as the right wheel. Position the clamp bolts as shown (Fig. 2) and tighten to:

- Vehicles with 6 cyl engine: 27 N·m (20 ft. lbs.)
- Vehicles with 8 cyl engine: 49 N·m (36 ft. lbs.)

1996 Grand Cherokee
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TSB 26-04-96 April, 1996

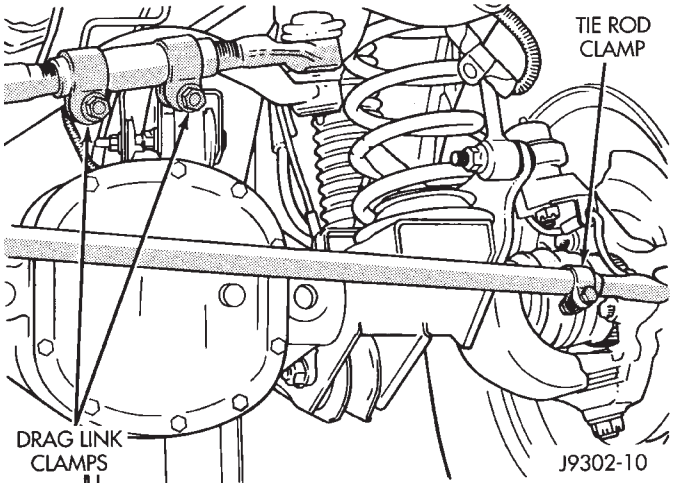



*Fig. 2 Drag Link and Tie Rod Clamp*

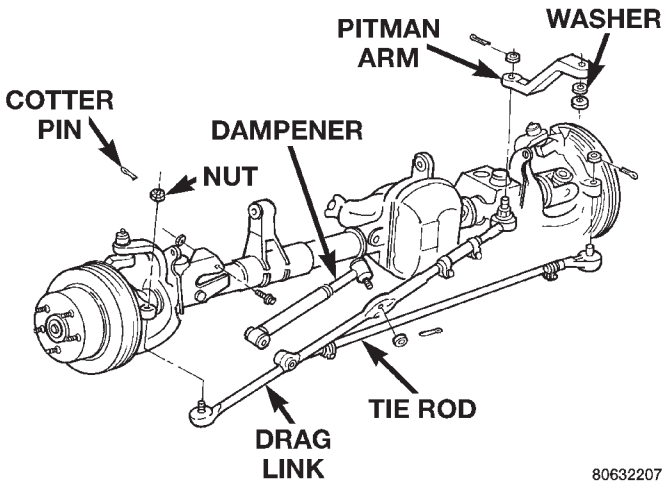



*Fig. 3 Steering Linkage—6 Cylinder Engine*

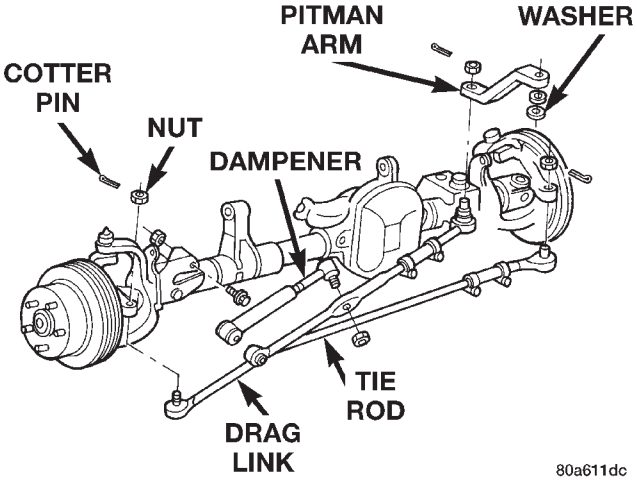



*Fig. 4 Steering Linkage—8 Cylinder Engine*

GENERAL INFORMATION (Continued)

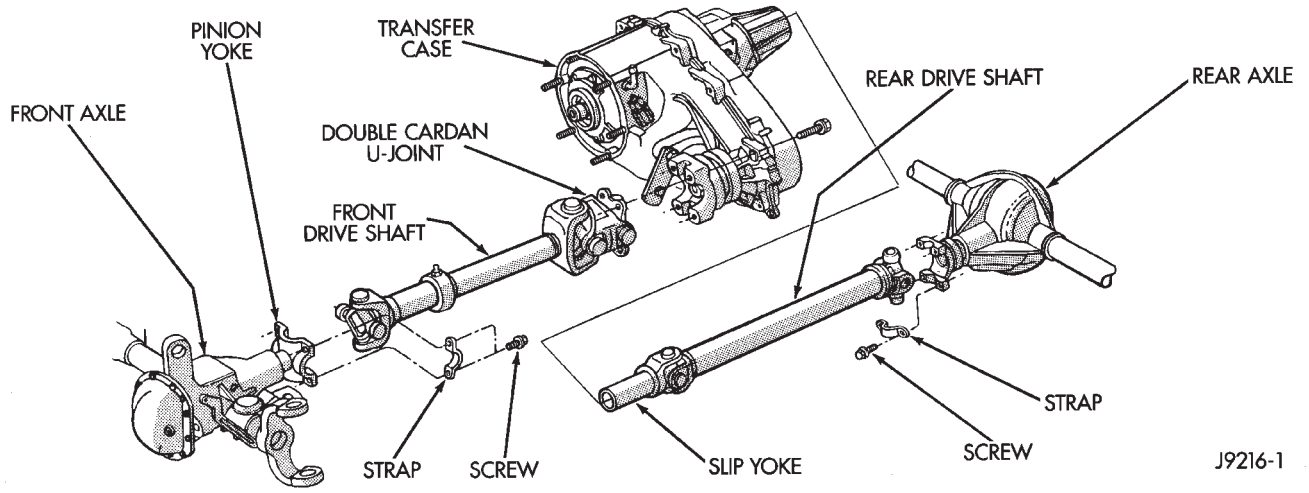



*Fig. 1 Front & Rear Propeller Shafts—Typical 4WD*

which eliminates the need for a slip yoke. The CV joint has a splined shaft which allows the overall shaft length to be adjusted for optimum joint travel. This spline shaft is locked in place with a nut. **Never attempt to adjust the shaft length. The overall shaft length is preset during manufacturing.**

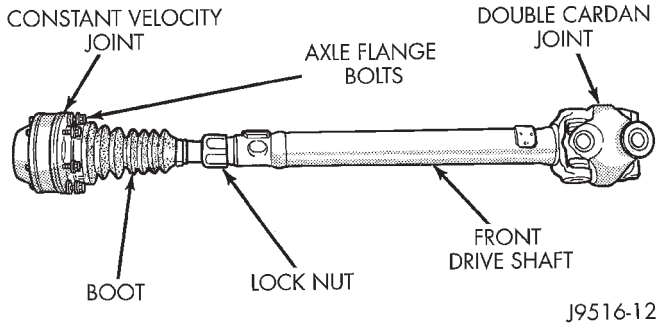



*Fig. 2 Front Propeller Shaft*

## UNIVERSAL JOINTS

Three different types of universal joints are used (Fig. 3), (Fig. 4) and (Fig. 5). These joints are not repairable if worn or damaged they must be replaced. If a vehicle has a damaged constant velocity joint or boot (Fig. 5), the propeller shaft must be replaced.

## LUBRICATION

The slip yoke on the Type 1 front shaft is equipped with a lubrication fitting. Use a multi-purpose NLGI Grade 2 EP lubricant.The factory installed U-joints are lubricated for the life of the vehicle and do not need lubrication. All U-joints should be inspected for leakage and damage each time the vehicle is serviced. If seal leakage or damage exists, the U–joint should be replaced.

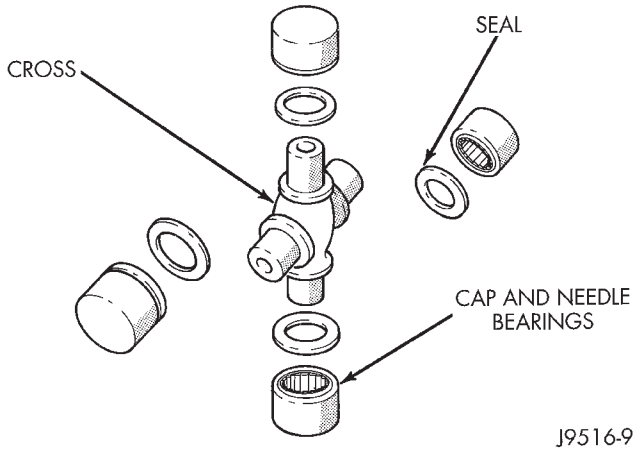



*Fig. 3 Single Cardan U-Joint —Rear*

## PRECAUTIONS

Use exact replacement hardware for attaching the propeller shafts. Exact replacement will ensure safe operation. The specified torque must always be applied when tightening the fasteners.

Put reference marks on the propshaft yoke and axle or transmission yoke before service (Fig. 6). This will assure correct phasing and eliminate possible vibration.

**CAUTION: Do not allow the propeller shaft to drop or hang from either universal joint during removal. Attach it to the vehicle underside with wire to prevent damage to the universal joints.**

**CAUTION: It is very important to protect the machined, external surface of the slip yoke from damage after propeller shaft removal. If damaged, the transmission extension seal could be damaged and cause a leak.**

GENERAL INFORMATION (Continued)

- The factory installed lubricant quantity for the non–disconnect type axle is 1.48 L (3.13 pts.).
- The factory installed lubricant quantity for the vacuum–disconnect type axle is 1.65 L (3.76 pts.).

Refer to Group 0, Lubrication and Maintenance for additional information regarding temperature range, viscosity and fluid level.

**CAUTION: If axle is submerged in water, lubricant must be replaced immediately to avoid possible premature axle failure.**

## PINION GEAR DEPTH INFORMATION

Ring and pinion gears are supplied as matched sets only. The identifying numbers for the ring and pinion gear are etched into the face of each gear (Fig. 1). A plus (+) number, minus (–) number or zero (0) is etched into the face of the pinion gear. This number is the amount (in thousandths of an inch) the depth varies from the standard depth setting of a pinion etched with a (0). The standard setting from the centerline of the ring gear to the back face of the pinion is 92.1 mm (3.625 inches) for Model 30 axles (Fig. 2). The standard depth provides the best teeth contact pattern.

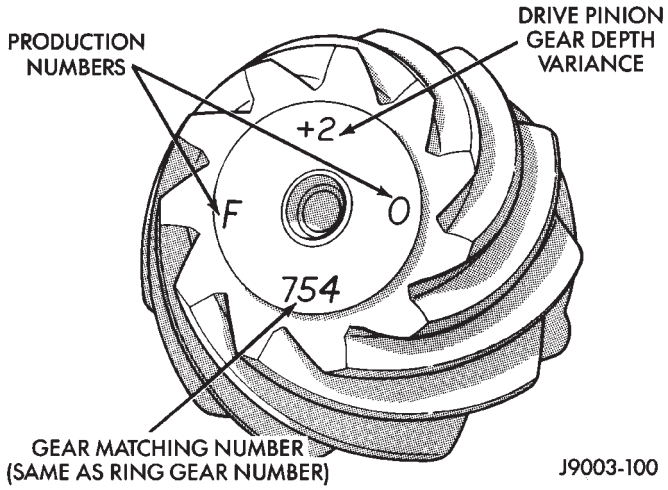



*Fig. 1 Pinion Gear ID Numbers*

THE BUTTON END ON THE PINION GEAR HEAD IS NO LONGER A MACHINED–TO– SPECIFICATIONS SURFACE. DO NOT USE THIS SURFACE FOR PINION DEPTH SET–UP OR CHECKING (Fig. 2).

Compensation for depth variance is achieved by a selected thickness oil slinger (production) or shims (service). The slinger is placed between the inner pinion bearing cone and gear head (Fig. 3). The shim pack is placed under the inner (rear) bearing cup for service. To change the pinion adjustment, shims are available in thicknesses of 0.003, 0.005, and 0.010 inch. **The oil slinger or baffle must be measured and the thickness included with the total shim pack.**

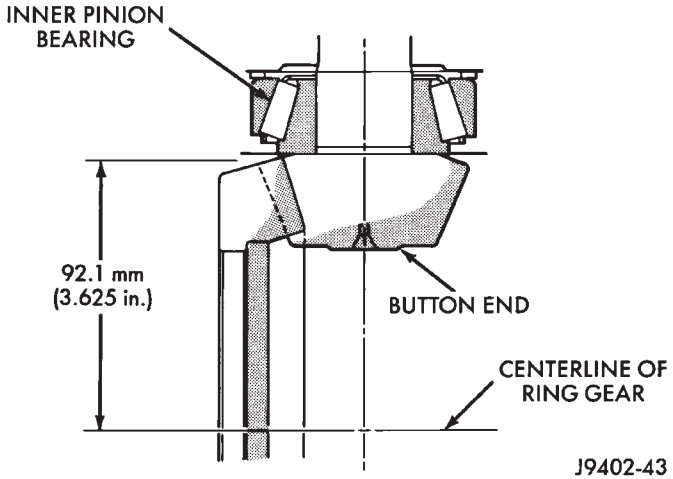



*Fig. 2 Pinion Gear Head*

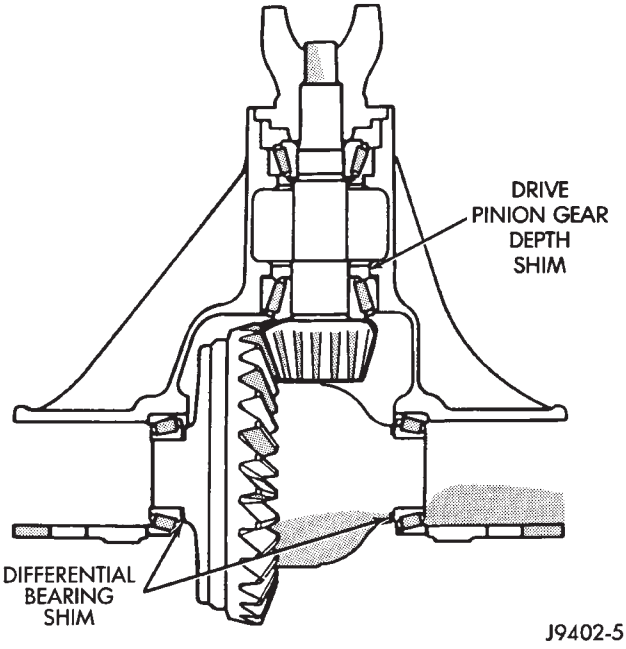



*Fig. 3 Shim Locations*

**New gear set: note the depth variance etched into both the original and the replacement pinion gear. Add or subtract the thickness of the original depth shims to compensate for the difference in the depth variances. Refer to the Depth Variance charts.**

Note where Old and New Pinion Marking columns intersect. Intersecting figure represents plus or minus amount needed.

For example, if old pinion is plus (+) 1 and the new pinion is minus (–) 3, intersecting figure is (+) 0.004 in. (0.10 mm). Add this amount to the original shim. Or if the old pinion is (–) 3 and the new pinion is (–)

REMOVAL AND INSTALLATION (Continued)

(8) Install the yoke washer and **old nut** on the pinion gear. Use Holder 6958 to retain the yoke (Fig. 28). Tighten nut to 216– 352 N·m (160–260 ft. lbs.) torque.

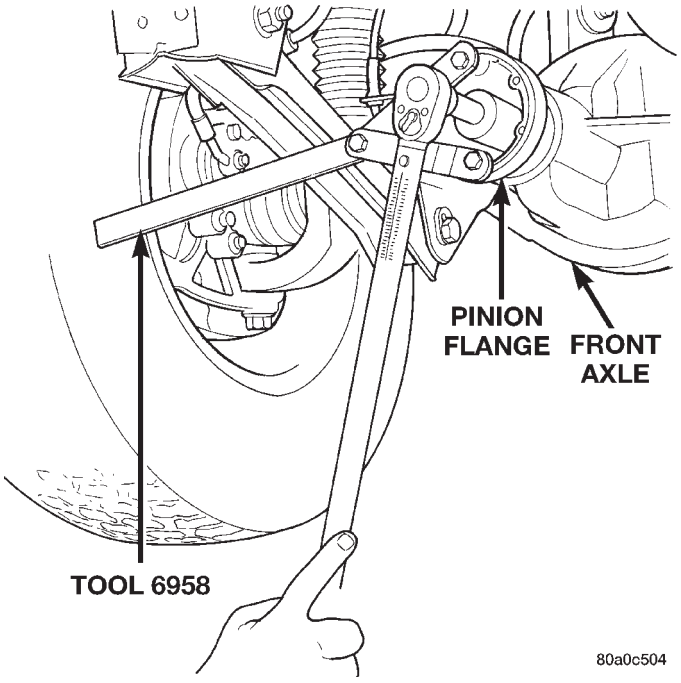



*Fig. 28 Tightening Pinion Nut*

(9) Check bearing rotating torque with an inch pound torque wrench (Fig. 29). If torque to rotate is within specification, remove old nut and install new nut. The torque necessary to rotate the pinion gear should be;

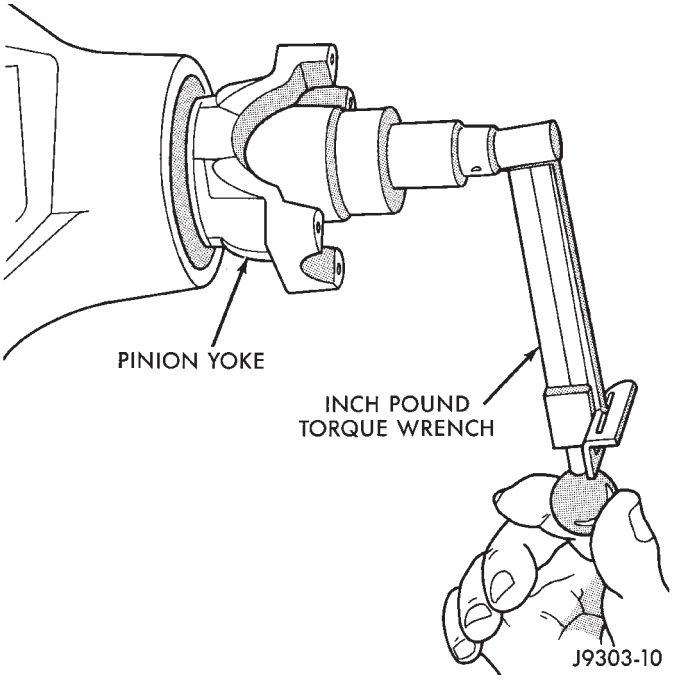



*Fig. 29 Check Pinion Gear Torque*

- Original Bearings: 1 to 3 N·m (10 to 20 in. lbs.).
- New Bearings: 2 to 5 N·m (15 to 35 in. lbs.).

(10) If rotating torque is high, add shims to decrease torque. If rotating torque is low, remove shims to increase torque.

## DISASSEMBLY AND ASSEMBLY

### 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. 30).

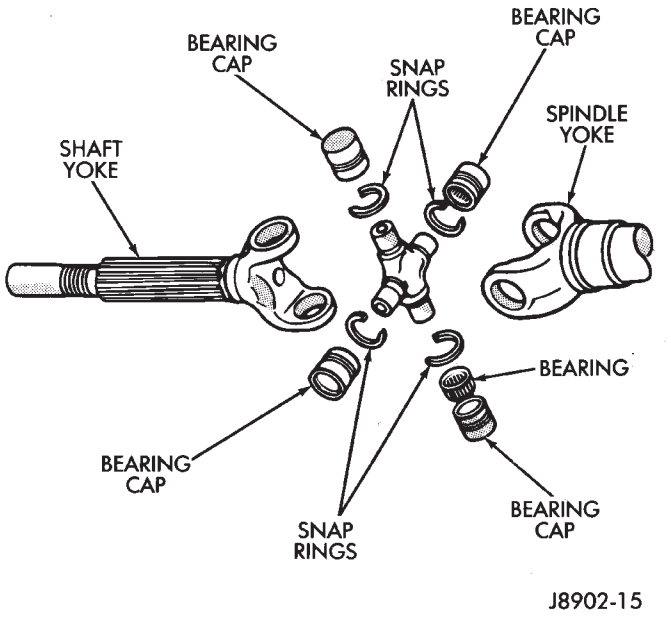



*Fig. 30 Axle Shaft Outer U–Joint*

**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. 31).

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

GENERAL INFORMATION (Continued)

**CAUTION: If axle is submerged in water, lubricant must be replaced immediately to avoid possible premature axle failure.**

## DESCRIPTION AND OPERATION

### AXLES

The Model 35 axle is standard for XJ vehicles. The 8 1/4 axle is available in XJ vehicles without ABS brakes.

The Model 35 and 8 1/4 axle housings has a cast iron center section. Two steel axle shaft tubes are pressed into the differential housing and welded.

It is not necessary to remove the axle from the vehicle for service. A removable differential cover is provided for routine vehicle service. If the differential housing is damaged, the complete axle assembly can be removed.

For complete drive axle assembly removal and installation refer to Drive Axle Assembly Replacement in this Group.

#### *IDENTIFICATION*

Model 35 axle has the assembly part number and gear ratio listed on a tag. The tag is attached to the left side of the housing cover (Fig. 1). Build date identification codes on axles are stamped on the axle shaft tube cover side. The Model 35 axle has a flat housing cover gasket flange at the outer edge (Fig. 1).

The 8 1/4 axle has the build date code and gear ratio tags attached to the housing cover (Fig. 2). The housing cover gasket has a rolled gasket flange at the outer edge (Fig. 2).

- The Model 35 axle has shaft tubes that are 2.625 inch (66.67 mm) in diameter.
- The 8 1/4 axle has axle shaft tubes that are 3.0–inch (76.2 mm) in diameter.

#### *STANDARD DIFFERENTIAL OPERATION*

The differential gear system divides the torque between the axle shafts. It allows the axle shafts to rotate at different speeds when turning corners.

Each differential side gear is splined to an axle shaft. The pinion gears are mounted on a pinion mate shaft and are free to rotate on the shaft. The pinion gear is fitted in a bore in the differential case and is positioned at a right angle to the axle shafts.

In operation, power flow occurs as follows:

- The pinion gear rotates the ring gear
- The ring gear (bolted to the differential case) rotates the case
- The differential pinion gears (mounted on the pinion mate shaft in the case) rotate the side gears

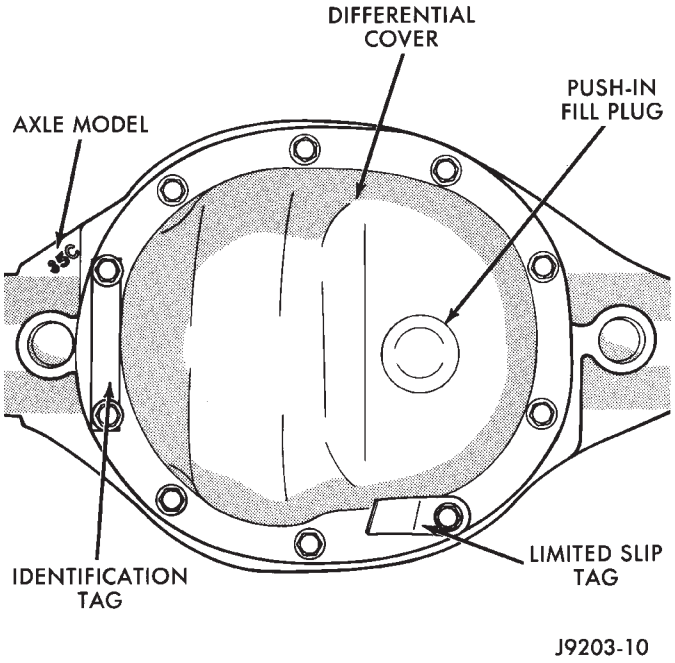



*Fig. 1 Model 35 Differential Cover*

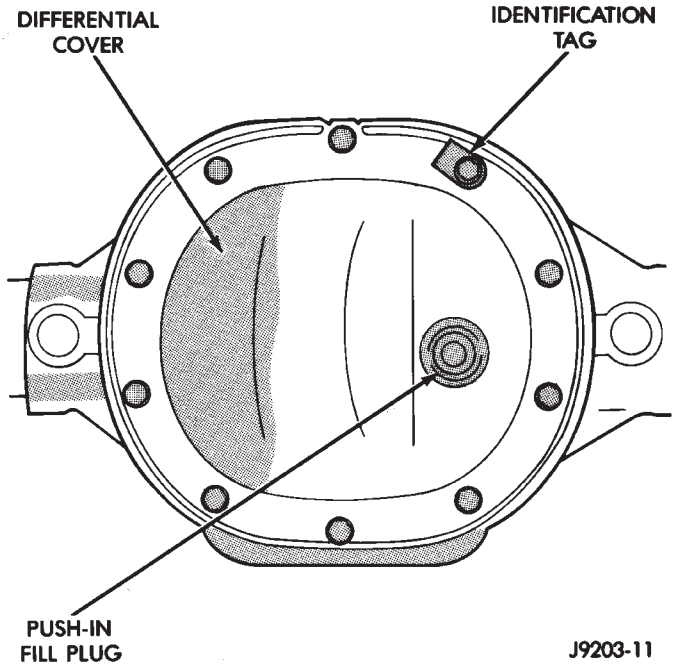



*Fig. 2 Differential Cover–8 1/4*

- The side gears (splined to the axle shafts) rotate the shafts

During straight- ahead driving, the differential pinion gears do not rotate on the pinion mate shaft. This occurs because input torque applied to the gears is divided and distributed equally between the two side gears. As a result, the pinion gears revolve with the pinion mate shaft but do not rotate around it (Fig. 3).

REMOVAL AND INSTALLATION (Continued)

(8) Remove the collapsible preload spacer (Fig. 29).

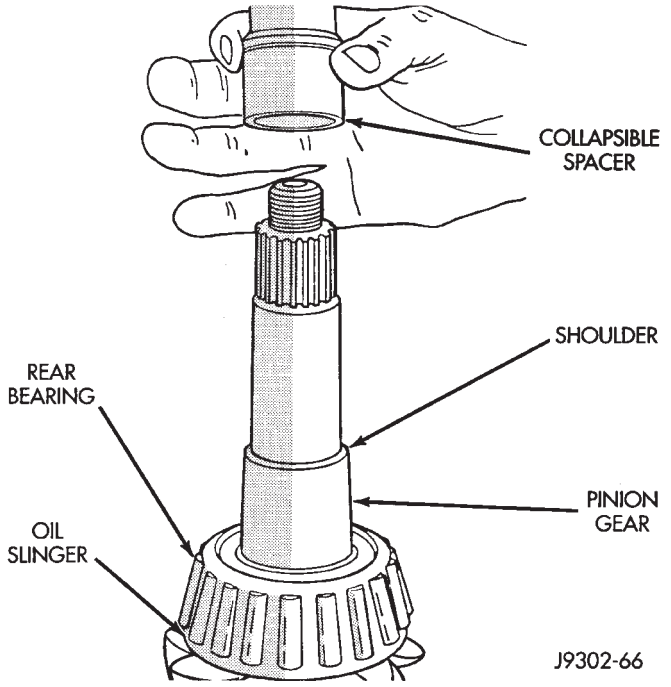



*Fig. 29 Collapsible Spacer*

(9) Remove the inner bearing from the pinion with Puller C–293PA and Adapter C–293–39 (Fig. 30).

**Place adapter rings so they do not damage the bearing cage.**

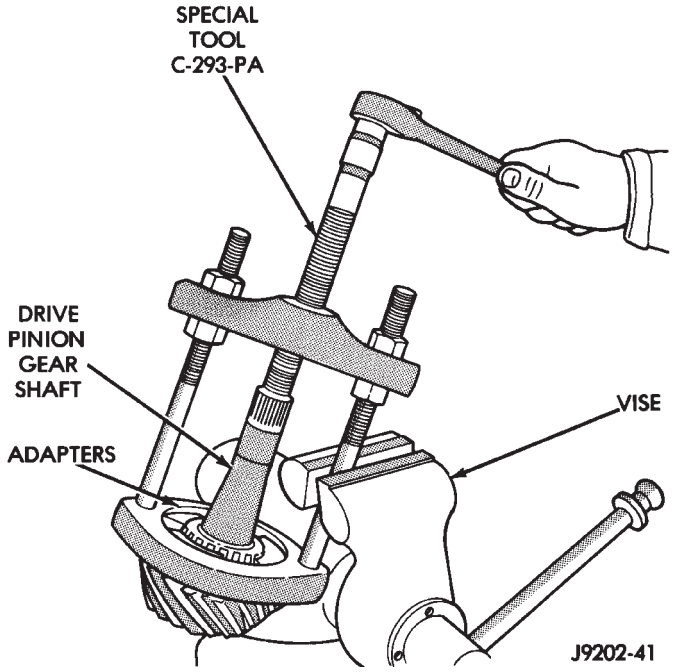



*Fig. 30 Inner Bearing Removal*

(10) Remove the depth shims from the pinion gear shaft. Record the thickness of the depth shims.

*PINION GEAR INSTALLATION*

(1) Install the pinion rear bearing cup with Installer C—4308 and Driver Handle C–4171 (Fig. 31). Ensure cup is correctly seated.

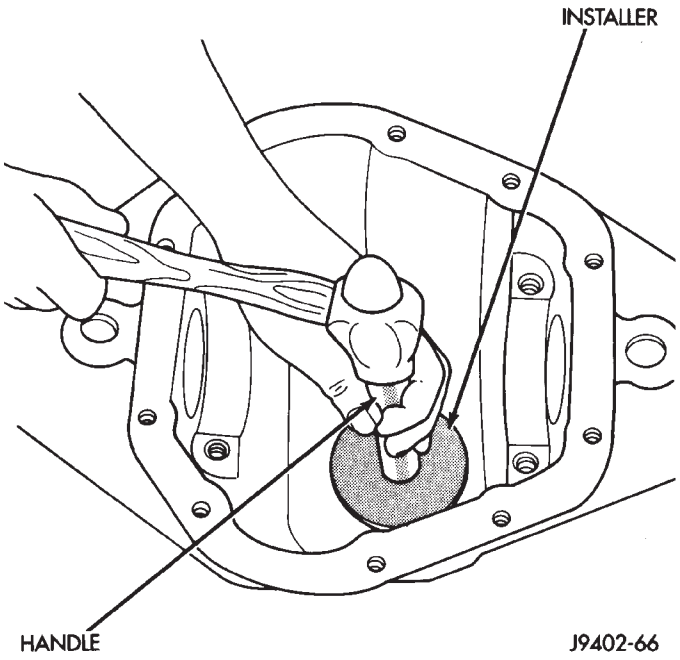



*Fig. 31 Pinion Rear Bearing Cup Installation*

(2) Install the pinion front bearing cup with Installer D–129 and Handle C–4171 (Fig. 32).

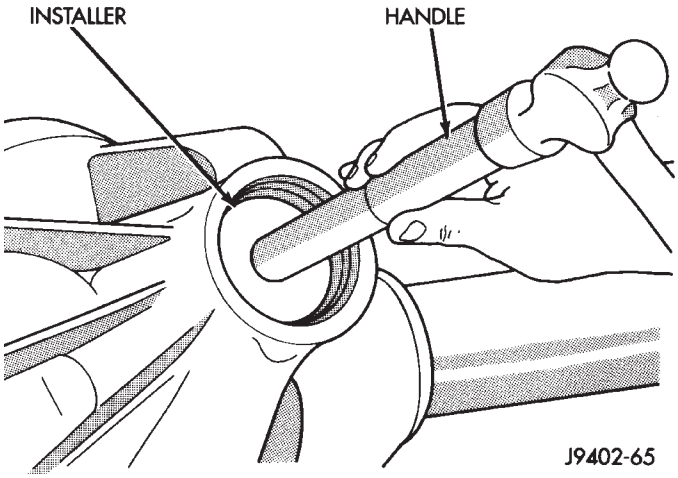
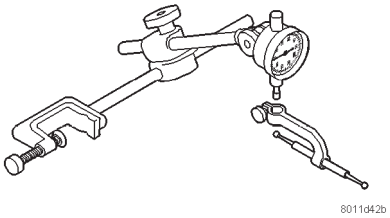
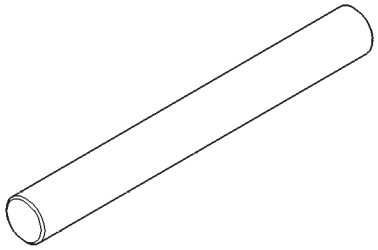



*Fig. 32 Pinion Front Bearing Cup Installation*

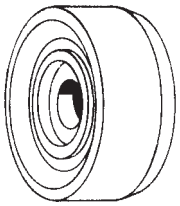
SPECIAL TOOLS (Continued)



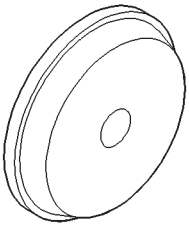

***Dial Indicator—C-3339***



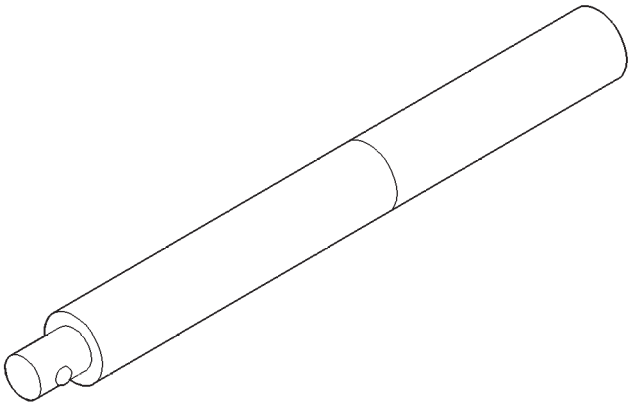
***Arbor, Pinion—W-115-3***



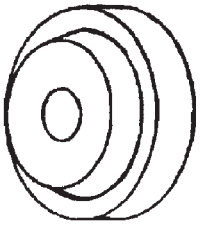
***Driver—C-3716-A***



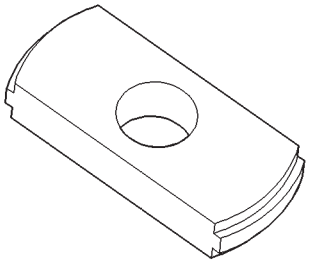
***Installer—D-130***



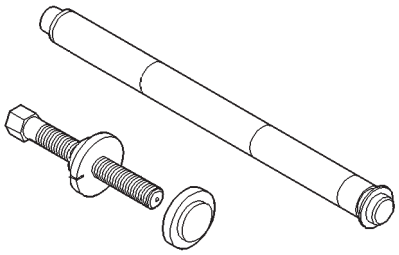
***Handle—C-4171***



***Installer—D-146***



***Remover—D-147***



***Trac-lok Tool—C-4487***

REMOVAL AND INSTALLATION (Continued)

(5) Separate the housing enough to remove the case from the housing. Measure the distance with the dial indicator (Fig. 16).

(6) Remove the dial indicator.

(7) Pry the differential case loose from the housing. To prevent damage, pivot on housing with the end of the pry bar against spreader (Fig. 17).

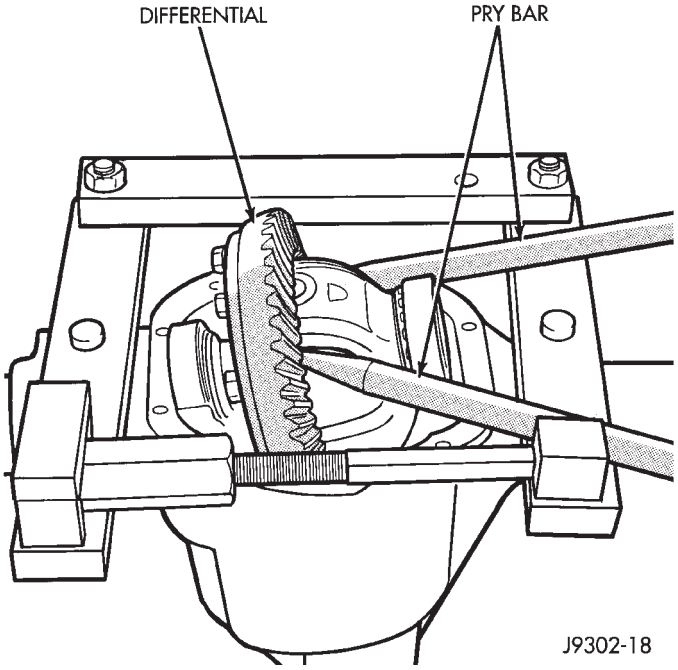



***Fig. 17 Differential Removal***

(8) Remove the case from housing. Mark or tag bearing cups and outboard shim/spacer (selected thickness) indicating which side they were removed.

*DIFFERENTIAL INSTALLATION*

(1) Position Spreader W–129–B with the tool dowel pins seated in the locating holes (Fig. 16). Install the hold down clamps and tighten the tool turnbuckle finger–tight.

(2) Install a pilot stud at the left side of the differential housing. Attach Dial Indicator to housing pilot stud. Load the indicator plunger against the opposite side of the housing (Fig. 16) and zero the indicator.

**CAUTION: Do not spread over 0.38 mm (0.015 in). If the housing is over–separated, it could be distorted or damaged.**

(3) Separate the housing enough to install the case in the housing. Measure the distance with the dial indicator (Fig. 16).

(4) Remove the dial indicator.

(5) Install differential and outboard shim/spacer (selected thickness) in housing.

(6) Install case in the housing. Tap the differential case to ensure the bearings are fully seated (Fig. 18). Remove the spreader.

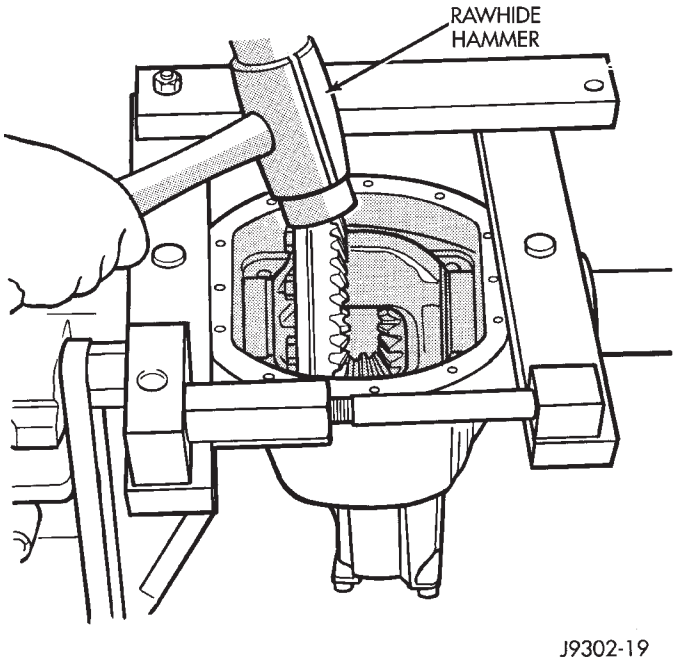



***Fig. 18 Differential Installation***

(7) Install the bearing caps at their original locations (Fig. 19). Tighten the bearing cap bolts to 77 N·m (57 ft. lbs.) torque.

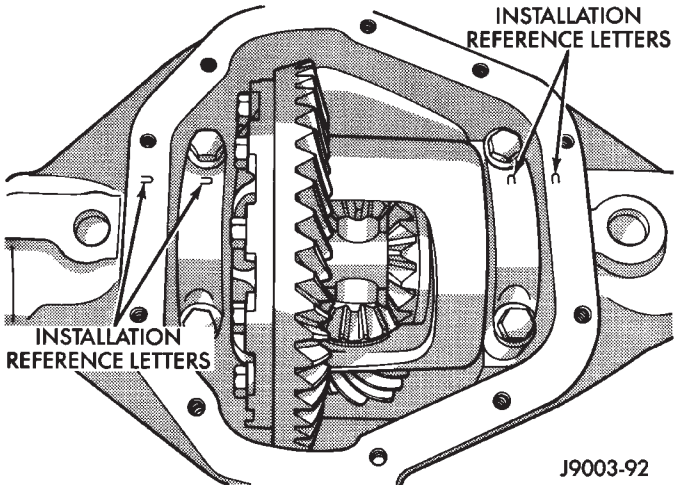



***Fig. 19 Differential Bearing Cap Reference Letters***

ADJUSTMENTS (Continued)

**The differential bearings must be preloaded to compensate for heat and load during operation.**

(9) Add an additional 0.004–in. (0.1 mm) to each outboard shim/spacer for bearing preload.

(10) Remove differential from axle housing.

(11) Remove dummy bearings.

(12) Install new side bearing cones and cups.

(13) Install ring gear.

(14) Install differential and verify gear lash and contact pattern.

(15) Proceed to Final Assembly paragraph in this section.

### *GEAR BACKLASH AND CONTACT PATTERN ANALYSIS*

After installing new side bearings or ring and pinion set adjusting the bearing perload and gear mash backlash will be necessary.

(1) Rotate assembly several revolutions to seat bearings. Measure backlash at three equally spaced locations around the perimeter of the ring gear with a dial indicator (Fig. 63).

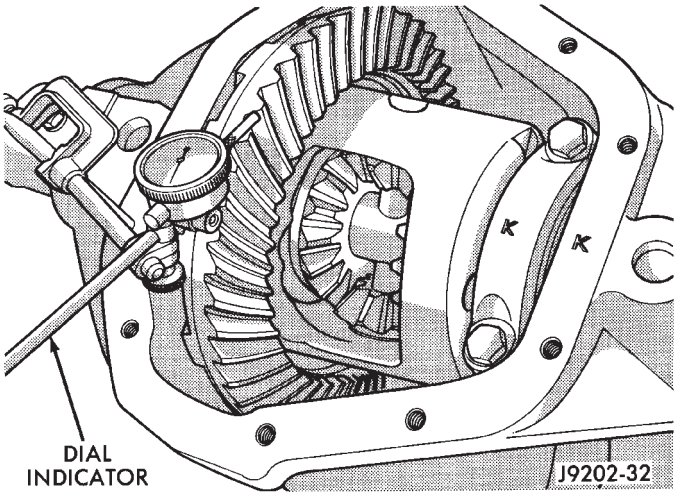



***Fig. 63 Ring Gear Backlash Measurement***

**The ring gear backlash must be within 0.12 – 0.20 mm (0.005 – 0.008 in.). It cannot vary more than 0.05 mm (0.002 in.) between the points checked.**

If backlash must be adjusted, spacers are available in various thicknesses. Adjust the backlash accordingly (Fig. 64). **Do not increase the total shim pack thickness, excessive bearing preload and damage will occur.**

The ring gear teeth contact patterns will show if the pinion gear depth shim(s) have the correct thickness. It will also show if the ring gear backlash has been adjusted correctly. The backlash must be maintained within the specified limits until the correct tooth contact patterns are obtained.

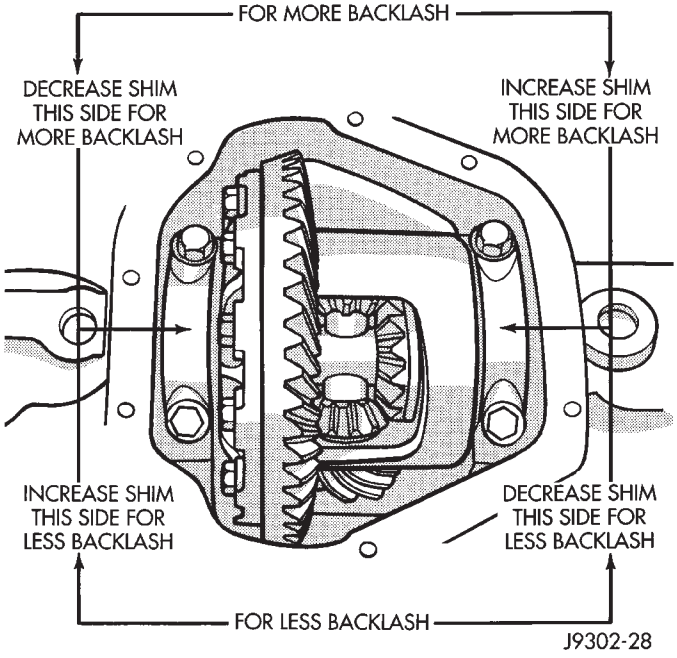



***Fig. 64 Backlash Shim Adjustment***

(2) Apply a thin coat of hydrated ferric oxide, or equivalent, to the drive and coast side of the ring gear teeth.

(3) Rotate the ring gear one complete revolution in both directions while a load is being applied. Insert a pry bar between the differential housing and the case flange. This will produce distinct contact patterns on both the drive side and coast side of the ring gear teeth.

(4) Note patterns in compound. Refer to (Fig. 65) for interpretation of contact patterns and adjust accordingly.

## SPECIFICATIONS

### MODEL 44 AXLE

| DESCRIPTION | SPEC. |
|---|---|
| **Type** | Semi-floating Hypoid |
| **Axle Ratios** | 3.55/3.73 |
| **Ring Gear Diameter** | 216 mm (8.5 in.) |
| **Gear Backlash** | 0.13–0.20 mm (0.005–0.008 in.) |
| **Pinion Depth** | 109.52 mm (4.312 in.) |
| **Brg. Perload, Pinion (New)** | 2.26–4.52 N·m (20–40 in. lbs.) |
| **Maximum Carrier Spread** | 0.51 mm (0.020 in. |

REMOVAL AND INSTALLATION (Continued)

## COLLAPSIBLE SPACER

*REMOVAL W/PINION INSTALLED*

(1) Raise and support the vehicle.

(2) Remove wheel and tire assemblies.

(3) Remove rear brake rotors and calipers. Refer to Group 5, Brakes, for proper procedures.

(4) Mark the propeller shaft and pinion yoke for installation reference.

(5) Remove the propeller shaft from the yoke.

(6) Rotate the pinion gear three or four times.

(7) Measure the amount of torque necessary to rotate the pinion gear with an in. lbs. dial-type torque wrench. Record the torque reading for installation reference.

(8) Using a short piece of pipe and Holder 6958 to hold the pinion yoke, remove the pinion nut and washer (Fig. 13).

(9) Use Remover C-452 and Wrench C-3281 to remove the pinion yoke (Fig. 14).

(10) Use Remover 7794-A and slide hammer to remove the pinion shaft seal (Fig. 15).

(11) Remove the front pinion bearing using a pair of suitable pick tools to pull the bearing straight off the pinion gear shaft. It may be necessary to lightly tap the end of the pinion gear with a rawhide or rubber mallet if the bearing becomes bound on the pinion shaft.

(12) Remove the collapsible spacer.

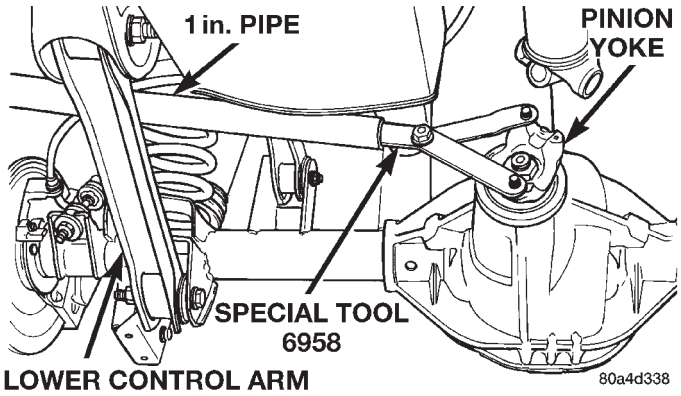



***Fig. 13 Pinion Yoke Holder***

*REMOVAL W/PINION REMOVAL*

(1) Raise and support the vehicle.

(2) Remove wheel and tire assemblies.

(3) Remove rear brake rotors and calipers. Refer to Group 5, Brakes, for proper procedures.

(4) Mark the propeller shaft and pinion yoke for installation reference.

(5) Remove the propeller shaft from the yoke.

(6) Rotate the pinion gear three or four times.

(7) Measure the amount of torque necessary to rotate the pinion gear with an in. lbs. dial-type torque wrench. Record the torque reading for installation reference.

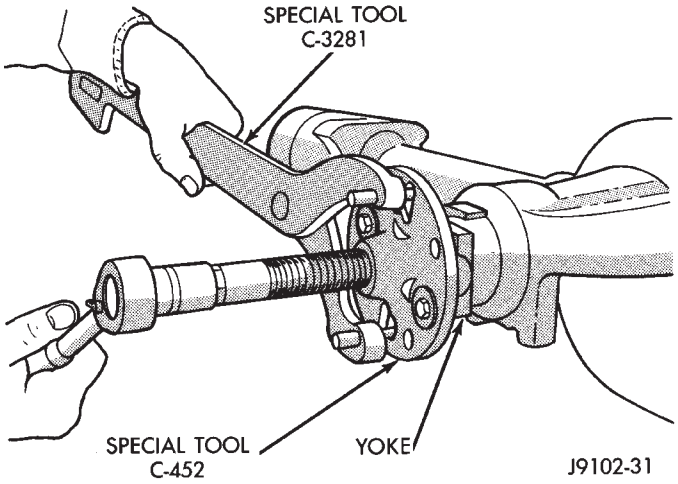



***Fig. 14 Pinion Yoke Removal***

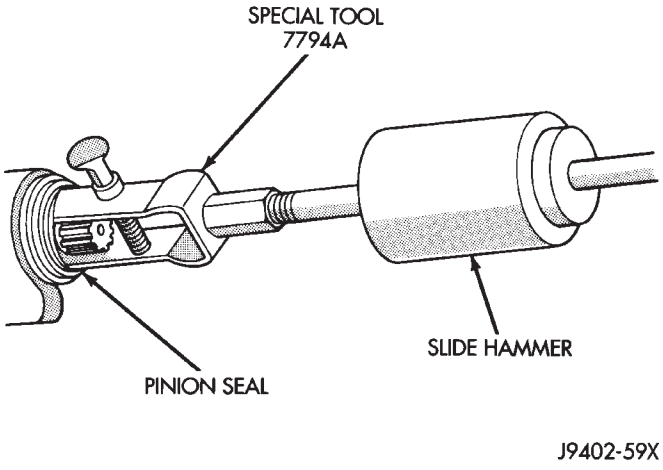



***Fig. 15 Seal Removal***

(8) Remove differential assembly from axle housing.

(9) Using Holder 6958 to hold yoke and a short length of 1 in. pipe, remove the pinion yoke nut and washer (Fig. 13).

(10) Using Remover C–452 and Wrench C–3281, remove the pinion yoke from pinion shaft (Fig. 14).

(11) Remove the pinion gear from housing (Fig. 16). Catch the pinion with your hand to prevent it from falling and being damaged.

(12) Remove collapsible spacer from pinion shaft.

*INSTALLATION*

(1) Install a new collapsible preload spacer on pinion shaft (Fig. 17).

(2) If pinion gear was removed, install pinion gear in housing.

(3) Install pinion front bearing. Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer D–163 and Handle C–4171 (Fig. 18).

DISASSEMBLY AND ASSEMBLY (Continued)

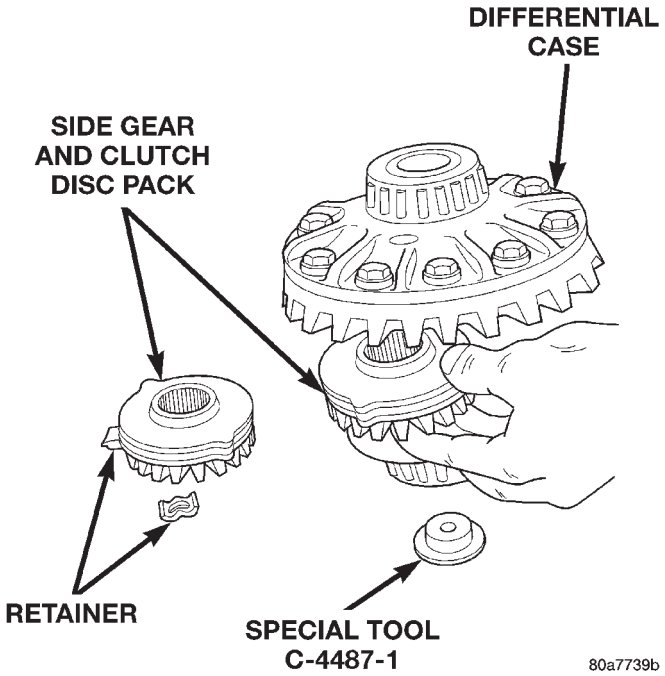



*Fig. 62 Side Gear & Clutch Disc Removal*

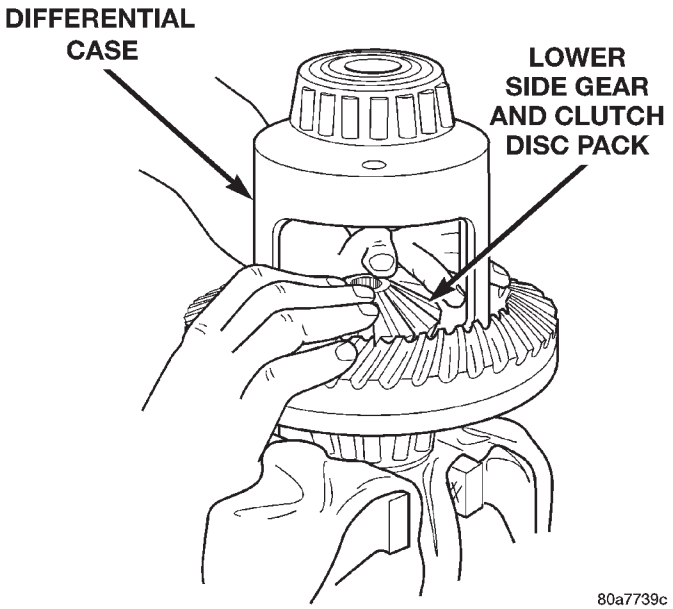



*Fig. 64 Clutch Discs & Lower Side Gear Installation*

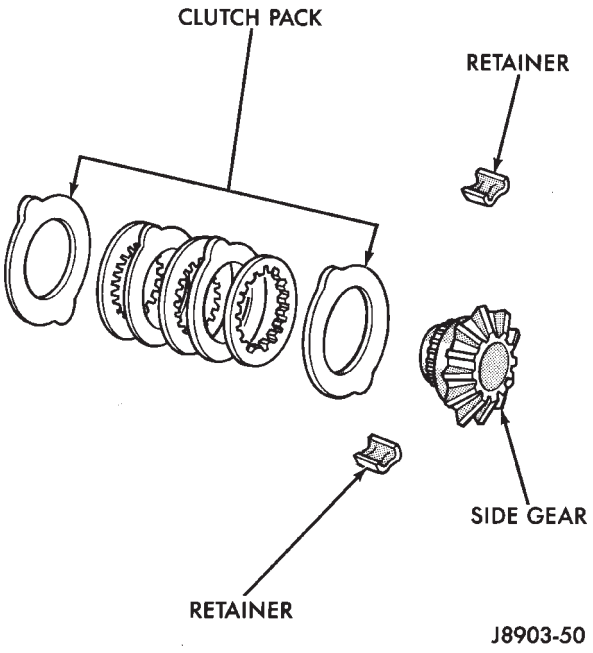



*Fig. 63 Clutch Disc Pack*

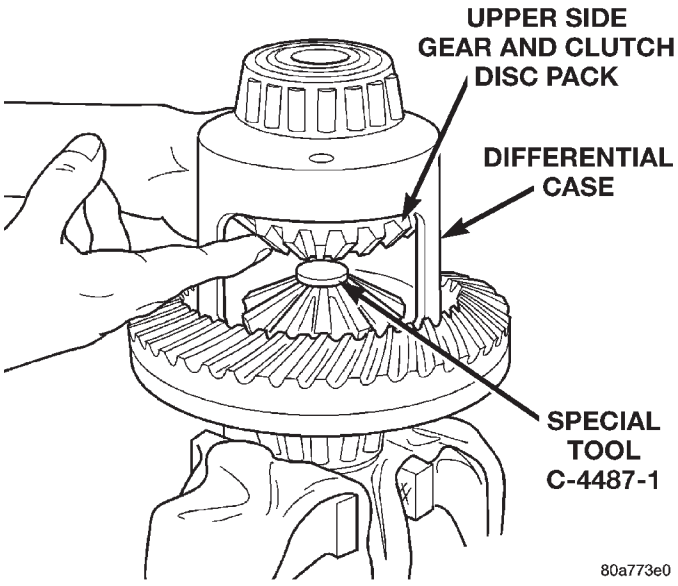



*Fig. 65 Upper Side Gear & Clutch Disc Pack Installation*

(7) Hold assembly in position. Insert Threaded Adapter C–4487–3 into top side gear.

(8) Insert Forcing Screw C–4487–2.

(9) Tighten forcing screw tool to slightly compress clutch discs.

(10) Place pinion gears in position in side gears and verify that the pinion mate shaft hole is aligned.

(11) Rotate case with Turning Bar C–4487–4 until the pinion mate shaft holes in pinion gears align with holes in case. It may be necessary to slightly tighten the forcing screw in order to install the pinion gears.

(12) Tighten forcing screw to 122 N·m (90 ft. lbs.) to compress the Belleville springs.

(13) Lubricate and install thrust washers behind pinion gears and align washers with a small screw driver. Insert mate shaft into each pinion gear to verify alignment.

(14) Remove forcing screw, threaded adapter, and step plate.

(15) Install pinion gear mate shaft and align holes in shaft and case.

DESCRIPTION AND OPERATION (Continued)

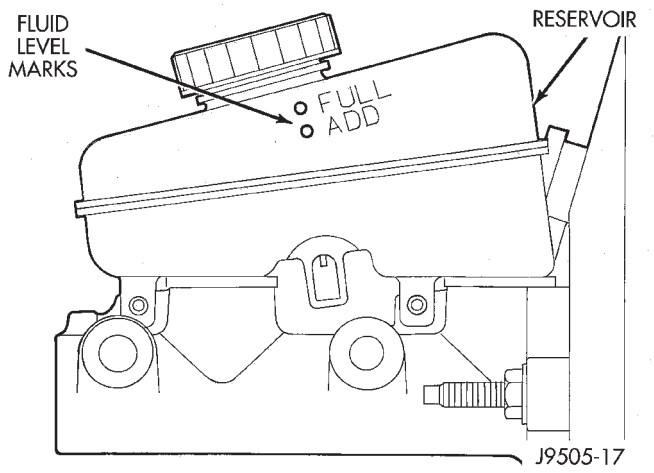



*Fig. 2 Master Cylinder*

pressure in the separate front/rear brake hydraulic circuits.

A decrease or loss of fluid pressure in either hydraulic circuit will cause the switch valve to shuttle to the low pressure side. Movement of the valve pushes the switch plunger upward. This action closes the switch internal contacts completing the electrical circuit to the red warning light. The switch valve will remain in an actuated position until repairs are made.

The rear proportioning valve is used to balance front-rear brake action. The valve allows normal fluid flow during moderate effort brake stops. The valve only controls (meters) fluid flow during high effort brake stops.

## FRONT DISC BRAKES

The calipers are a single piston type. The calipers are free to slide laterally, this allows continuous compensation for lining wear.

When the brake are applied fluid pressure is exerted against the caliper piston. The fluid pressure is exerted equally and in all directions. This means pressure exerted against the caliper piston and within the caliper bore will be equal (Fig. 3).

Fluid pressure applied to the piston is transmitted directly to the inboard brakeshoe. This forces the shoe lining against the inner surface of the disc brake rotor. At the same time, fluid pressure within the piston bore forces the caliper to slide inward on the mounting bolts. This action brings the outboard brakeshoe lining into contact with the outer surface of the disc brake rotor.

In summary, fluid pressure acting simultaneously on both piston and caliper, produces a strong clamping action. When sufficient force is applied, friction will stop the rotors from turning and bring the vehicle to a stop.

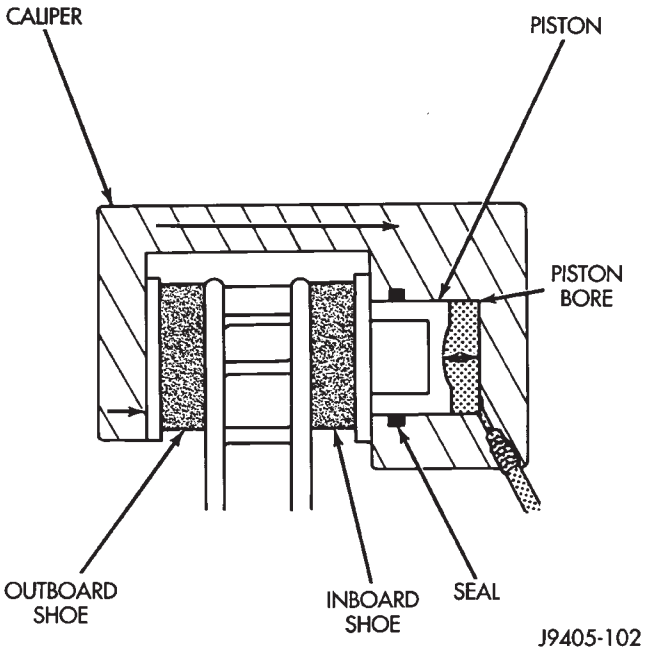



*Fig. 3 Brake Caliper Operation*

Application and release of the brake pedal generates only a very slight movement of the caliper and piston. Upon release of the pedal, the caliper and piston return to a rest position. The brakeshoes do not retract an appreciable distance from the rotor. In fact, clearance is usually at, or close to zero. The reasons for this are to keep road debris from getting between the rotor and lining and in wiping the rotor surface clear each revolution.

The caliper piston seal controls the amount of piston extension needed to compensate for normal lining wear.

During brake application, the seal is deflected outward by fluid pressure and piston movement (Fig. 4). When the brakes (and fluid pressure) are released, the seal relaxes and retracts the piston.

The amount of piston retraction is determined by brakelining wear. Generally the amount is just enough to maintain contact between the piston and inboard brakeshoe.

## REAR DISC BRAKES

Rear disc brake components consist of single piston, floating-type, rear disc brake calipers and solid rotors.

The rear calipers are mounted in a bracket attached to the rear axle tube flange (Fig. 5). The calipers are secured to the bracket with mounting bolts. The bracket also secures the rear disc brake rotor splash shield to the tube flange.

The rotor and splash shield used for rear disc brake applications are unique. The parking brake-

REMOVAL AND INSTALLATION (Continued)

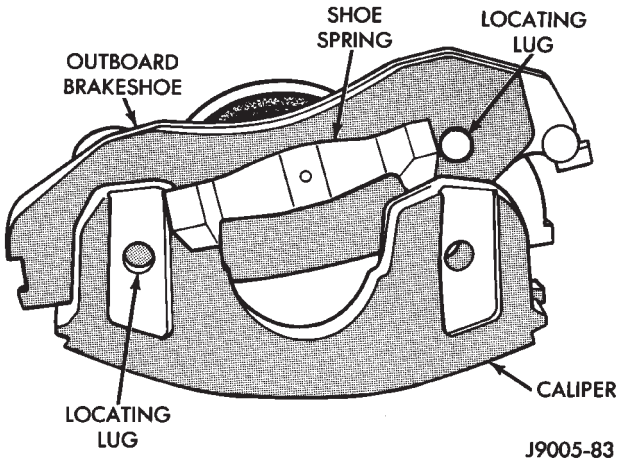



*Fig. 29 Outboard Brakeshoe Removal*

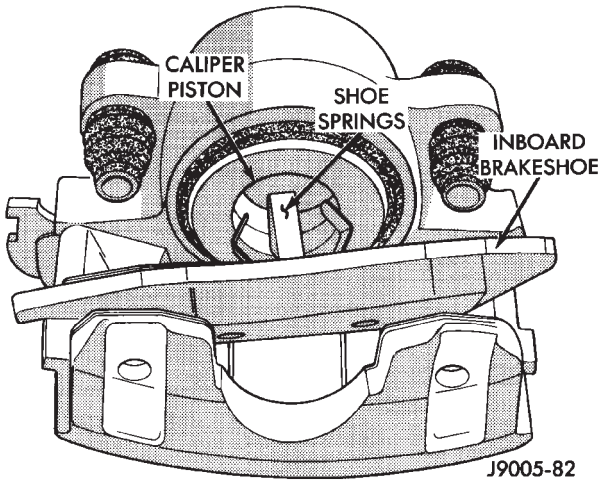



*Fig. 30 Inboard Brakeshoe Removal*

**unseat dust boot and force dirt into piston bore.**

*INSTALLATION*

(1) Clean brakeshoe mounting ledge slide surfaces of steering knuckle with wire brush. Then apply light coat of Mopar multi-mileage grease to slide surfaces. Lubricate mounting bolts and bushings with GE 661 or Dow 111 silicone grease (Fig. 31).

(2) Install inboard shoe in caliper and verify shoe retaining springs are fully seated into the piston.

(3) Install outboard shoe in caliper by starting one end of shoe in caliper and rotating shoe downward into place. Verify shoe locating lugs and shoe spring are seated.

(4) Install caliper by position notches at lower end of brakeshoes on bottom mounting ledge. Then install caliper over rotor and seat upper ends of brakeshoes on top mounting ledge (Fig. 32).

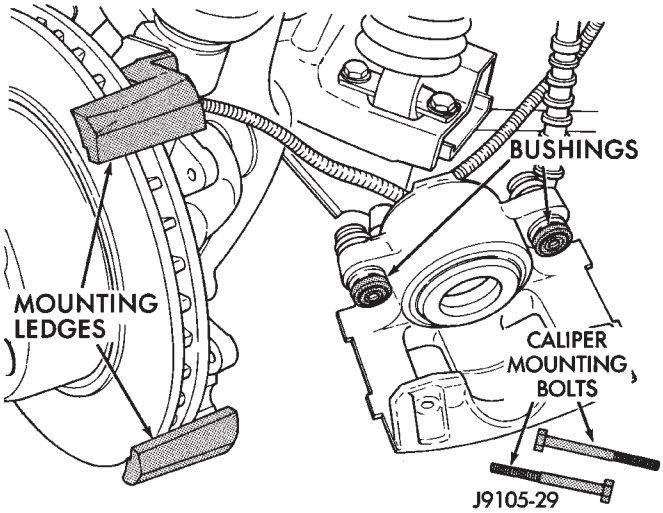



*Fig. 31 Caliper Lubrication Points*

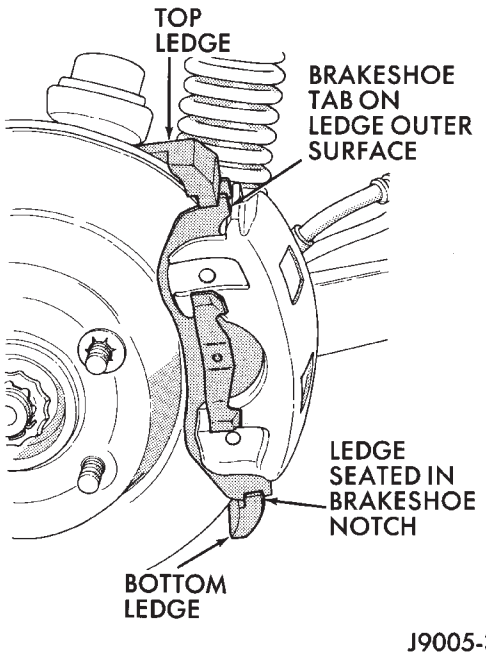



*Fig. 32 Caliper Installation*

**CAUTION: Before securing the caliper, be sure the caliper brake hose is not twisted, kinked or touching any chassis components.**

(5) Install and tighten caliper mounting bolts to 10-20 N·m (7-15 ft. lbs.).

**CAUTION: If new caliper bolts are being installed, or if reason for repair was a drag/pull condition, check caliper bolt length. If the bolts have a shank length greater than 67.6 mm (2.66 in.), they will contact the inboard brakeshoe causing a partial apply condition. Refer to (Fig. 33) for correct caliper bolt length.**

(6) Install wheel and tire assemblies.

CLEANING AND INSPECTION (Continued)

corroded, rusted, scored, or if polishing would increase bore diameter more than 0.025 mm (0.001 inch).

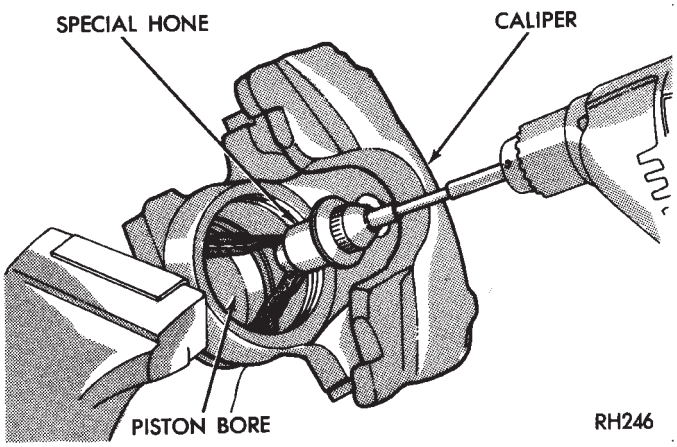



*Fig. 82 Lightly Polishing Piston Bore With Tool*

## ADJUSTMENTS

### STOP LAMP SWITCH

(1) Press and hold brake pedal in applied position.
(2) Pull switch plunger all the way out to fully extended position.
(3) Release brake pedal. Then pull pedal fully rearward. Pedal will set plunger to correct position as pedal pushes plunger into switch body. Switch will make racheting sound as it self adjusts.

### PARKING BRAKE CABLE TENSIONER

**NOTE: Parking brake adjustment is only necessary when the tensioner, or a cable has been replaced or disconnected for service. When adjustment is necessary, perform the following procedure for proper parking brake operation.**

*ADJUSTMENT*

(1) Raise vehicle.
(2) Back off tensioner adjusting nut to create slack in cables.
(3) Remove rear wheel/tire assemblies and remove brake drums.
(4) Check rear brakeshoe adjustment with standard brake gauge. **Excessive shoe-to-drum clearance, or worn brake components will result in faulty parking brake adjustment and operation.**
(5) Verify that parking brake cables operate freely and are not binding, or seized. Replace faulty cables, before proceeding.
(6) Reinstall brake drums and wheel/tire assemblies after brakeshoe adjustment is complete.
(7) Lower vehicle enough for access to parking brake lever. Then **fully** apply parking brakes. Leave brakes applied until adjustment is complete.
(8) Raise vehicle and mark tensioner rod 6.5 mm (1/4 in.) from tensioner bracket (Fig. 83).
(9) Tighten adjusting nut at equalizer until mark on tensioner rod moves into alignment with tensioner bracket.
(10) Lower vehicle until rear wheels are 15-20 cm (6-8 in.) off shop floor.
(11) Release parking brake lever and verify that rear wheels rotate freely without drag.
(12) Lower vehicle.

**NOTE: Do not loosen/tighten equalizer adjusting nut for any reason after completing adjustment.**

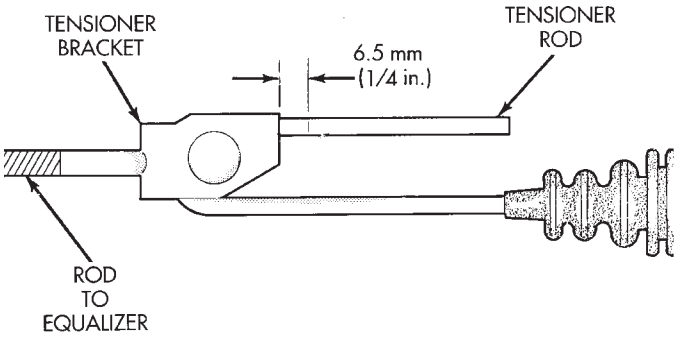



*Fig. 83 Tensioner Rod Measurement*

### PARKING BRAKESHOE

(1) Remove wheel and tire assemblies.
(2) Secure rotor with two wheel nuts.
(3) Remove rubber access plug from back of splash shield.
(4) Insert brake tool through access hole in splash shield (Fig. 84). Position tool at bottom of star wheel.
(5) Rotate star wheel upward in counterclockwise direction to expand shoes (while facing front of vehicle).
(6) Expand shoes until light drag is experienced. Then back off adjuster screw only enough to eliminate drag.
(7) Install plug in splash shield access hole.
(8) Install wheel and tire assemblies.

## SPECIFICATIONS

### BRAKE FLUID

The brake fluid used in this vehicle must conform to DOT 3 specifications and SAE J1703 standards. No other type of brake fluid is recommended or

GENERAL INFORMATION (Continued)

## COOLING SYSTEM

The cooling system regulates engine operating temperature. It allows the engine to reach normal operating temperature as quickly as possible. It also maintains normal operating temperature and prevents overheating.

The cooling system also provides a means of heating the passenger compartment and cooling the automatic transmission fluid (if equipped). The cooling system is pressurized and uses a centrifugal water pump to circulate coolant throughout the system.

An optional factory installed maximum duty cooling package is available on most models. This package will provide additional cooling capacity for vehicles used under extreme conditions such as trailer towing in high ambient temperatures.

## COOLING SYSTEM COMPONENTS

The cooling system consists of:

- A radiator
- Cooling fan
- Thermal viscous fan drive
- Fan shroud
- Radiator pressure cap
- Thermostat
- Coolant reserve/overflow system
- Transmission oil cooler (if equipped with an automatic transmission)
- Coolant
- Water pump
- Hoses and hose clamps

## SYSTEM COOLANT ROUTING

For cooling system routings refer to (Fig. 1) (Fig. 2).

## WATER PUMP BYPASS HOSE—5.2L V-8 ENGINE

A water pump bypass hose (Fig. 3) is used between the intake manifold and water pump on all 5.2L V-8 engines.

## COOLANT

The cooling system is designed around the coolant. Coolant flows through the engine water jackets absorbing heat produced during engine operation. The coolant carries heat to the radiator and heater core. Here it is transferred to ambient air passing through the radiator and heater core fins. The coolant also removes heat from the automatic transmission fluid in vehicles equipped with an automatic transmission.

## RADIATOR

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

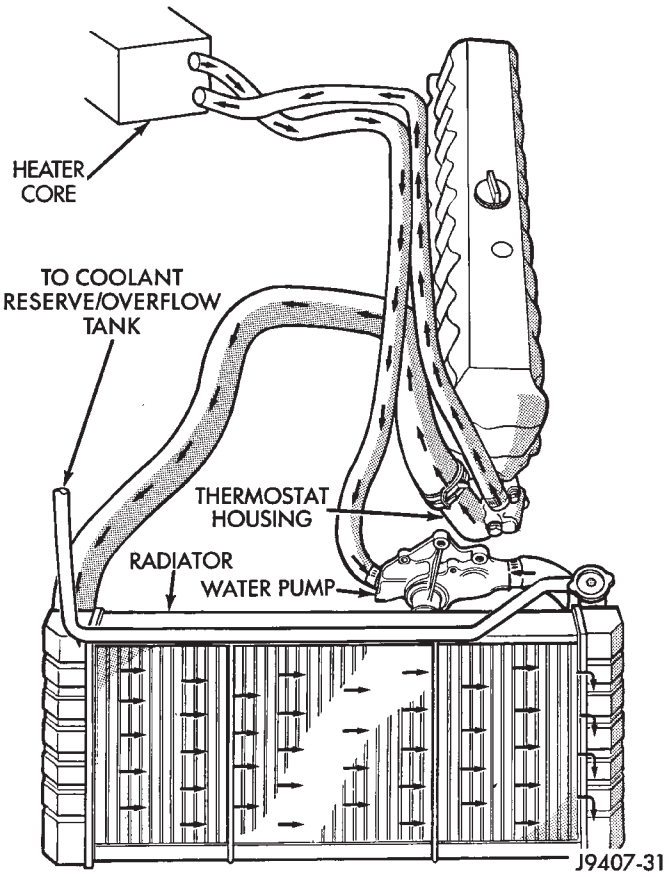



***Fig. 1 Engine Cooling System—4.0L Engine—Typical***

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

DESCRIPTION AND OPERATION

## AUTOMATIC TRANSMISSION OIL COOLERS

There are two types of automatic transmission oil coolers:

- An oil-to-coolant type. This is supplied as standard equipment on vehicles with an automatic transmission. It is mounted in the radiator outlet tank.
- An external auxiliary oil-to-air cooler. This is supplied as optional equipment. It is mounted in front of the radiator and air conditioning condenser and behind the grille.

## COOLANT RESERVE/OVERFLOW SYSTEM

This system works along with the radiator pressure cap. This is done by using thermal expansion and contraction of the coolant to keep the coolant free of trapped air. It provides:

- A volume for coolant expansion and contraction.

DIAGNOSIS AND TESTING (Continued)

| CONDITION | POSSIBLE CAUSES | CORRECTION |
|---|---|---|
| TEMPERATURE GAUGE READS HIGH OR ENGINE COOLANT WARNING LAMP ILLUMINATES. COOLANT MAY OR MAY NOT BE LOST OR LEAKING FROM COOLING SYSTEM - CONT. | 7. Coolant level low in radiator but not in coolant reserve/overflow tank. This means the radiator is not drawing coolant from the coolant reserve/overflow tank as the engine cools. As the engine cools, a vacuum is formed in the cooling system of the engine and radiator. If radiator cap seals are defective, or cooling system has leaks, a vacuum can not be formed. | 7. (a) Check condition of radiator cap and cap seals. Refer to Radiator Cap in this group. Replace cap if necessary.<br>(b) Check condition of radiator filler neck. If neck is bent or damaged, replace radiator.<br>(c) Check the condition of the hose from the radiator to the coolant tank. It should fit tight at both ends without any kinks or tears. Replace hose if necessary.<br>(d) Check coolant reserve/overflow tank and tank hoses for blockage. Repair as necessary. |
| | 8. Freeze point of antifreeze not correct. Mixture may be too rich. | 8. Check antifreeze. Refer to Coolant section of this group. Adjust antifreeze-to-water ratio as required. |
| | 9. Coolant not flowing through system. | 9. Check for coolant flow at radiator filler neck with some coolant removed, engine warm and thermostat open. Coolant should be observed flowing through radiator. If flow is not observed, determine reason for lack of flow and repair as necessary. |
| | 10. Radiator or A/C condenser fins are dirty or clogged. | 10. Clean insects or debris. Refer to Radiator Cleaning in this group. |
| | 11. Radiator core is corroded or plugged. | 11. Have radiator re-cored or replaced. |
| | 12. Aftermarket A/C installed without proper radiator. | 12. Install proper radiator. |
| | 13. Fuel or ignition system problems. | 13. Refer to Fuel and Ignition System groups for diagnosis. Also refer to the appropriate Powertrain Diagnostic Procedures service manual for operation of the DRB scan tool. |
| | 14. Dragging brakes. | 14. Check and correct as necessary. Refer to Group 5, Brakes in the manual text. |
| | 15. Bug screen is being used reducing airflow. | 15. Remove bug screen. |
| | 16. Thermostat partially or completely shut. This is more prevalent on high mileage vehicles. | 16. Check thermostat operation and replace as necessary. Refer to Thermostats in this group. |
| | 17. Thermal viscous fan drive not operating properly. | 17. Check fan drive operation and replace if necessary. Refer to Viscous Fan Drive in this group. |
| | 18. Cylinder head gasket leaking. | 18. Check for cylinder head gasket leaks. Refer to Testing Cooling System For Leaks in this group. For repair, refer to Group 9, Engines. |
| | 19. Heater core leaking. | 19. Check heater core for leaks. Refer to Group 24, Heating and Air Conditioning. Repair as necessary. |

REMOVAL AND INSTALLATION (Continued)

any of these conditions are found. Also check condition of the thermal viscous fan drive. Refer to Viscous Fan Drive in this group.

The water pump can be removed without discharging the air conditioning system (if equipped).

*REMOVAL*

(1) Disconnect negative battery cable from battery.

(2) Drain cooling system. Refer to Draining Cooling System in this group.

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

(3) The thermal viscous fan drive is attached (threaded) to the water pump hub shaft (Fig. 32). Remove fan/viscous fan drive assembly from water pump by turning mounting nut counterclockwise as viewed from front. Threads on viscous fan drive are **RIGHT HAND.** A Snap-On 36 MM Fan Wrench (number SP346 from Snap-On Cummins Diesel Tool Set number 2017DSP) can be used. Place a bar or screwdriver between water pump pulley bolts (Fig. 32) to prevent pulley from rotating. Do not attempt to remove fan/viscous fan drive assembly from vehicle at this time.

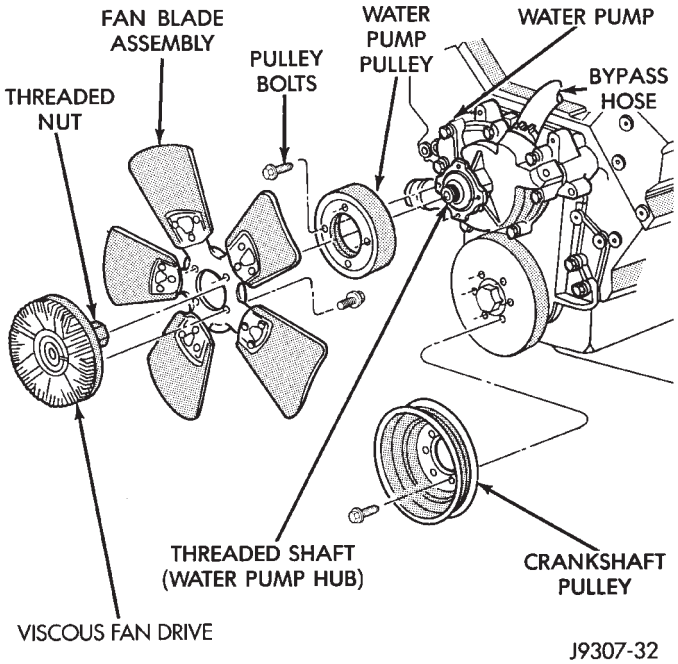



***Fig. 32 Fan Blade and Viscous Fan Drive—5.2L Engine***

**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. 29). 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. 30). If replacement is necessary, use only an original equipment clamp with matching number or letter.**

(4) If water pump is being replaced, do not unbolt fan blade assembly (Fig. 32) from thermal viscous fan drive.

(5) Remove two fan shroud-to-radiator nuts (Fig. 33). Do not attempt to remove fan shroud at this time.

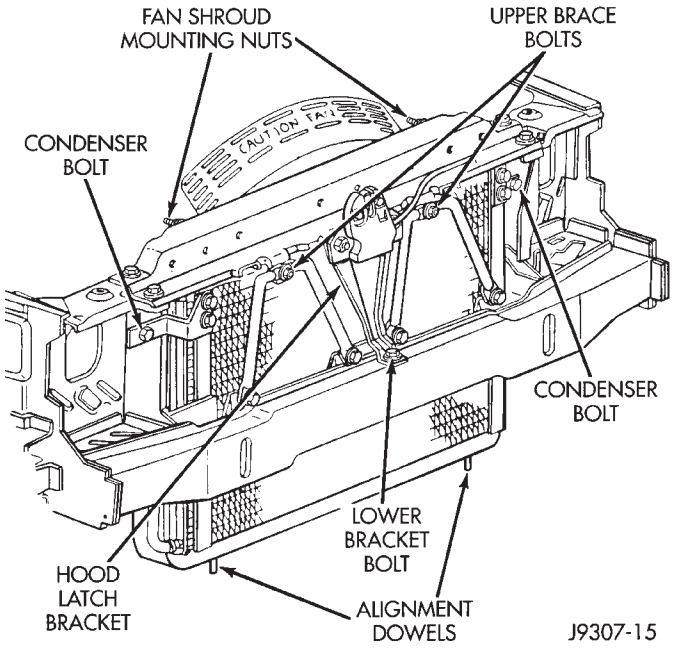



***Fig. 33 Fan Shroud Nuts***

(6) Remove fan shroud and fan blade/viscous fan drive assembly from vehicle as a complete unit.

(7) After removing fan blade/viscous fan drive assembly, **do not** place thermal viscous fan drive in horizontal position. If stored horizontally, silicone fluid in viscous fan drive could drain into its bearing assembly and contaminate lubricant.

(8) **Do not** remove water pump pulley bolts at this time.

(9) Remove accessory drive belt as follows: The drive belt is equipped with a spring loaded automatic belt tensioner (Fig. 34). Relax tension from belt by rotating tensioner clockwise (as viewed from front) (Fig. 34). When all belt tension has been relaxed, remove accessory drive belt.

(10) Remove four water pump pulley-to-water pump hub bolts (Fig. 32) and remove pulley from vehicle.

REMOVAL AND INSTALLATION (Continued)

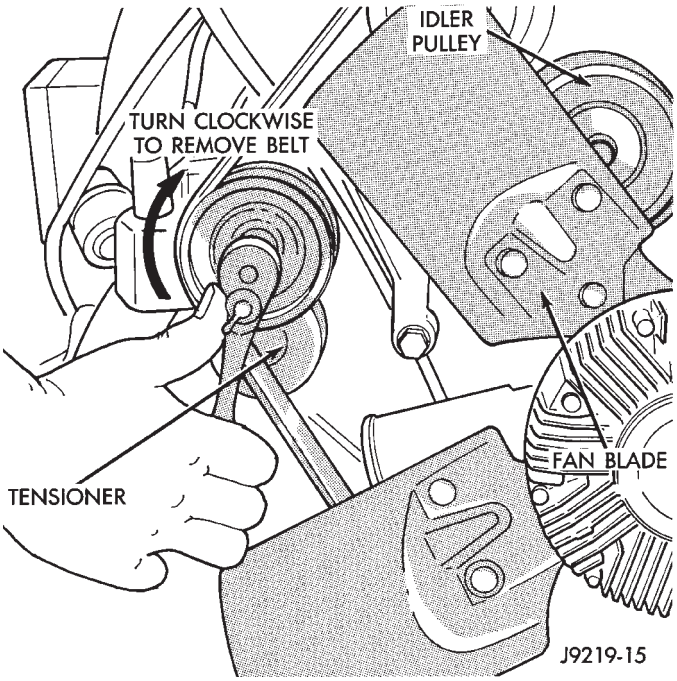



*Fig. 65 Belt Tensioner—5.2L Engine*

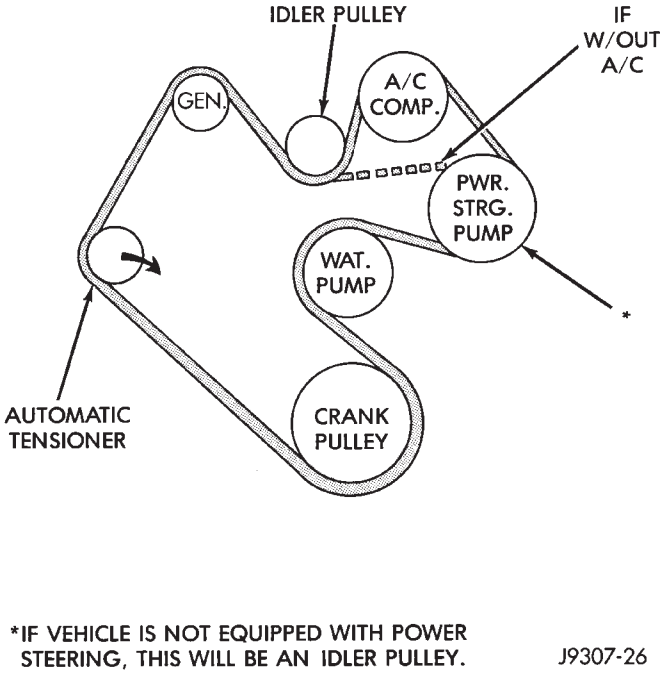



*Fig. 66 Belt Routing—5.2L Engine*

(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 vehicle.

**INSTALLATION**

**CAUTION: When installing serpentine accessory drive belt, the belt must be routed correctly. If not, engine may overheat due to water pump rotating in wrong direction. Refer to (Fig. 66) for correct engine belt routing. 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 tensioner (Fig. 65).
(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 Automatic Belt Tensioner.

## AUTOMATIC BELT TENSIONER

**NOTE: On 5.2 engines, the tensioner is equipped with an indexing arrow (Fig. 67) 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-) (Fig. 67). 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.**

**A used belt should be replaced if tensioner indexing arrow has moved to point-A (Fig. 67). Tensioner travel stops at point-A.**

*REMOVAL*

(1) Remove accessory drive belt. Refer to Belt Removal/Installation in this group.
(2) Disconnect wiring and secondary cable from ignition coil.
(3) Remove ignition coil from coil mounting bracket (two bolts). Do not remove coil mounting bracket from cylinder head.
(4) Remove tensioner assembly from mounting bracket (one nut) (Fig. 67).

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

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

SERVICE PROCEDURES (Continued)

**WARNING:**

**IF THE BATTERY SHOWS SIGNS OF FREEZING, LEAKING, LOOSE POSTS, OR LOW ELECTROLYTE LEVEL, DO NOT TEST, ASSIST-BOOST, OR CHARGE. THE BATTERY MAY ARC INTERNALLY AND EXPLODE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.**

**EXPLOSIVE HYDROGEN GAS FORMS IN AND AROUND THE BATTERY. DO NOT SMOKE, USE FLAME, OR CREATE SPARKS NEAR THE BATTERY. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.**

**THE BATTERY CONTAINS SULFURIC ACID, WHICH IS POISONOUS AND CAUSTIC. AVOID CONTACT WITH THE SKIN, EYES, OR CLOTHING. IN THE EVENT OF CONTACT, FLUSH WITH WATER AND CALL A PHYSICIAN IMMEDIATELY. KEEP OUT OF THE REACH OF CHILDREN.**

**IF THE BATTERY IS EQUIPPED WITH REMOVABLE CELL CAPS, BE CERTAIN THAT EACH OF THE CELL CAPS IS IN PLACE AND TIGHT BEFORE THE BATTERY IS RETURNED TO SERVICE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT FROM LOOSE OR MISSING CELL CAPS.**

**CAUTION:**

**Always disconnect and isolate the battery negative cable before charging a battery. Do not exceed 16.0 volts while charging a battery. Damage to the vehicle electrical system components may result.**

**Battery electrolyte will bubble inside the battery case during normal battery charging. Electrolyte boiling or being discharged from the battery vents indicates a battery over-charging condition. Immediately reduce the charging rate or turn off the charger to evaluate the battery condition. Damage to the battery may result from over-charging.**

**The battery should not be hot to the touch. If the battery feels hot to the touch, turn off the charger and let the battery cool before continuing the charging operation. Damage to the battery may result.**

Some battery chargers are equipped with polarity-sensing circuitry. This circuitry protects the charger and/or battery from being damaged if they are improperly connected. If the battery state-of-charge is too low for the polarity-sensing circuitry to detect, the charger will not operate. This makes it appear that the battery will not accept charging current. Refer to the instructions provided with the battery charger to bypass the polarity-sensing circuitry.

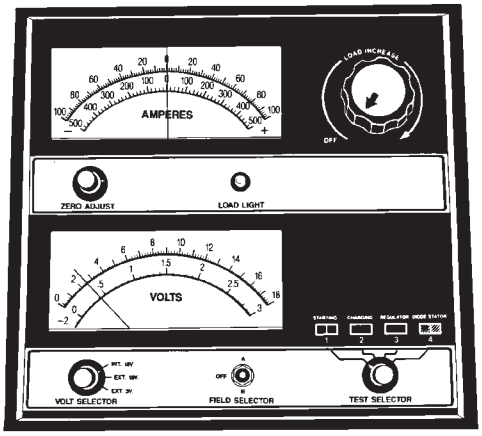
After the battery has been charged to 12.4 volts or greater, perform a load test to determine the battery cranking capacity. If the battery will endure a load test, return the battery to use. If the battery will not endure a load test, it is faulty and must be replaced.

Clean and inspect the battery holddowns, tray, terminals, posts, and top before completing service. See the Battery Removal and Installation procedures in this group for more information.

### *CHARGING A COMPLETELY DISCHARGED BATTERY*

The following procedure should be used to recharge a completely discharged battery. Unless this procedure is properly followed, a good battery may be needlessly replaced.

(1) Measure the voltage at the battery posts with a voltmeter, accurate to 1/10 (0.10) volt (Fig. 9). If the reading is below 10 volts, the charge current will be low. It could take some time before the battery accepts a current greater than a few milliamperes. Such low current may not be detectable on the ammeters built into many chargers.




898A-12

***Fig. 9 Voltmeter Accurate to 1/10 Volt Connected***

(2) Disconnect and isolate the battery negative cable. Connect the battery charger leads. Some battery chargers are equipped with polarity-sensing circuitry. This circuitry protects the charger and/or battery from being damaged if they are improperly connected. If the battery state-of-charge is too low for the polarity-sensing circuitry to detect, the charger will not operate. This makes it appear that the battery will not accept charging current. Refer to the instructions provided with the battery charger to bypass the polarity-sensing circuitry.

(3) Battery chargers vary in the amount of voltage and current they provide. The amount of time required for a battery to accept measurable charger current at various voltages is shown in the Charge Rate chart. If the charge current is still not measurable at the end of the charging time, the battery is faulty and must be replaced. If the charge current is measurable during the charging time, the battery

DIAGNOSIS AND TESTING (Continued)

receptacles. They should be properly installed and tight. Repair or replace as required.

(3) Inspect the electrolyte level in the battery. Replace battery if electrolyte level is low.

(4) Inspect generator mounting bolts for tightness. Replace or tighten bolts if required. Refer to the Generator Removal/Installation section of this group for torque specifications.

(5) Inspect generator drive belt condition and tension. Tighten or replace belt as required. Refer to Belt Tension Specifications in Group 7, Cooling System.

(6) Inspect automatic belt tensioner (if equipped). Refer to Group 7, Cooling System for information.

(7) Inspect connections at generator field, battery output, and ground terminals. Also check ground connection at engine. They should all be clean and tight. Repair as required.

## CHARGING SYSTEM RESISTANCE TESTS

These tests will show the amount of voltage drop across the generator output wire, from the generator output (B+) terminal (Fig. 2) to the battery positive post. They will also show the amount of voltage drop from the ground (-) terminal on the generator (Fig. 2) to the battery negative post.

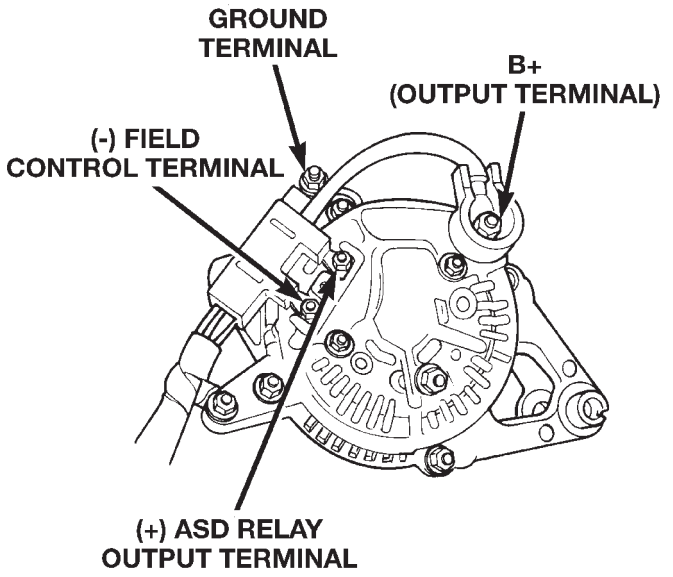



***Fig. 2 Generator Terminals***

A voltmeter with a 0–18 volt DC scale should be used for these tests. By repositioning the voltmeter test leads, the point of high resistance (voltage drop) can easily be found.

*PREPARATION*

(1) Before starting test, make sure battery is in good condition and is fully-charged. See Group 8A, Battery for more information.

(2) Check condition of battery cables at battery. Clean if necessary.

(3) Start the engine and allow it to reach normal operating temperature.

(4) Shut engine off.

(5) Connect an engine tachometer.

(6) Fully engage the parking brake.

*TEST*

(1) Start engine.

(2) Place heater blower in high position.

(3) Turn on headlamps and place in high-beam position.

(4) Turn vehicle interior lamps on.

(5) Start engine. Bring engine speed up to 2400 rpm and hold.

(6) Testing (+) circuitry:

(a) Touch the negative lead of voltmeter directly to battery positive post.

(b) Touch the positive lead of voltmeter to the B+ output terminal stud on the generator (not the terminal mounting nut). Voltage should be no higher than 0.6 volts. If voltage is higher than 0.6 volts, touch test lead to terminal mounting stud nut and then to the wiring connector. If voltage is now below 0.6 volts, look for dirty, loose or poor connection at this point. Also check condition of the generator output wire-to-battery bullet connector. Refer to Group 8, Wiring for connector location. A voltage drop test may be performed at each (+) connection in this circuit to locate the excessive resistance.

(7) Testing (-) circuitry:

(a) Touch the negative lead of voltmeter directly to battery negative post.

(b) Touch the positive lead of voltmeter to the ground terminal stud on the generator case (not the terminal mounting nut). Voltage should be no higher than 0.3 volts. If voltage is higher than 0.3 volts, touch test lead to terminal mounting stud nut and then to the wiring connector. If voltage is now below 0.3 volts, look for dirty, loose or poor connection at this point. A voltage drop test may be performed at each (-) connection in this circuit to locate the excessive resistance. This test can also be performed between the generator case and the engine. If test voltage is higher than 0.3 volts, check for corrosion at generator mounting points or loose generator mounting.

DIAGNOSIS AND TESTING (Continued)

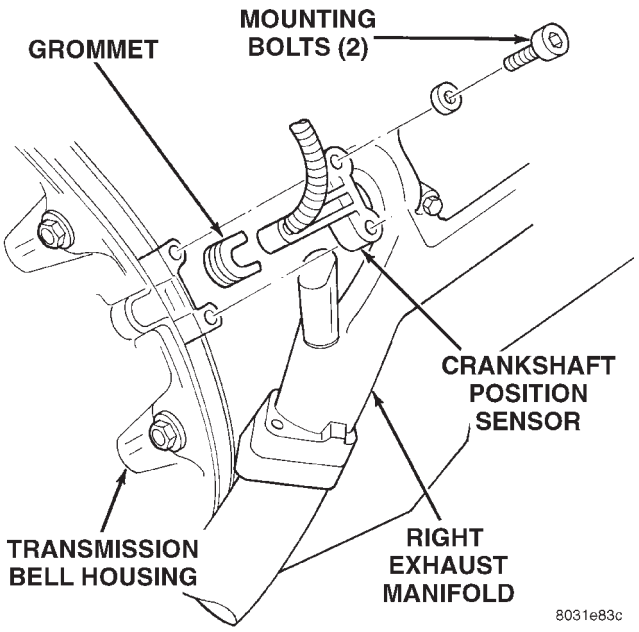



*Fig. 16 Crankshaft Position Sensor—5.2L Engines*

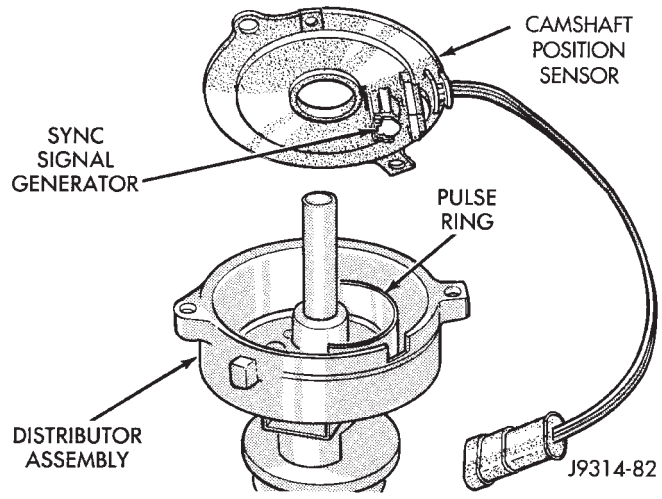



*Fig. 17 Camshaft Position Sensor—Typical (5.2L Distributor Shown)*

when inserting the paper clips. Attach voltmeter leads to these paper clips.

(1) Connect the positive (+) voltmeter lead into the sensor output wire. This is at done the distributor wire harness connector. For wire identification, refer to Group 8W, Wiring Diagrams.

(2) Connect the negative (-) voltmeter lead into the ground wire. For wire identification, refer to Group 8W, Wiring Diagrams.

(3) Set the voltmeter to the 15 Volt DC scale.

(4) **5.2L Engines:** Remove distributor cap from distributor (two screws). Rotate (crank) the engine until the distributor rotor is pointed towards the rear of vehicle. The movable pulse ring should now be within the sensor pickup.

(5) **4.0L Engine:** Remove distributor cap from distributor (two screws). Rotate (crank) the engine until the distributor rotor is pointed to approximately the 11 o'clock position. The movable pulse ring should now be within the sensor pickup.

(6) Turn ignition key to ON position. Voltmeter should read approximately 5.0 volts.

(7) If voltage is not present, check the voltmeter leads for a good connection.

(8) If voltage is still not present, check for voltage at the supply wire. For wire identification, refer to Group 8W, Wiring Diagrams.

(9) If 5 volts is not present at supply wire, check for voltage at PCM 32-way connector (cavity A-17). Refer to Group 8W, Wiring for location of connector/terminal. Leave the PCM connector connected for this test.

(10) If voltage is still not present, perform vehicle test using the DRB scan tool.

(11) If voltage is present at cavity A-17, but not at the supply wire:

(a) Check continuity between the supply wire. This is checked between the distributor connector and cavity A-17 at the PCM. If continuity is not present, repair the harness as necessary.

(b) Check for continuity between the camshaft position sensor output wire and cavity A-18 at the PCM. If continuity is not present, repair the harness as necessary.

(c) Check for continuity between the ground circuit wire at the distributor connector and ground. If continuity is not present, repair the harness as necessary.

(12) While observing the voltmeter, crank the engine with ignition switch. The voltmeter needle should fluctuate between 0 and 5 volts while the engine is cranking. This verifies that the camshaft position sensor in the distributor is operating properly and a sync pulse signal is being generated.

If sync pulse signal is not present, replacement of the camshaft position sensor is necessary

## ENGINE COOLANT TEMPERATURE SENSOR

For an operational description, diagnosis and removal/installation procedures, refer to Group 14, Fuel System.

## INTAKE MANIFOLD AIR TEMPERATURE SENSOR

For an operational description, diagnosis and removal/installation procedures, refer to Group 14, Fuel System.

## SPARK PLUG CABLES

Check the spark plug cable connections for good contact at the coil(s), distributor cap towers, and spark plugs. Terminals should be fully seated. The

REMOVAL AND INSTALLATION (Continued)

(d) With key cylinder in unseated position, rotate key counterclockwise to the lock position and remove key.

(e) Remove key cylinder from ignition switch (Fig. 54).

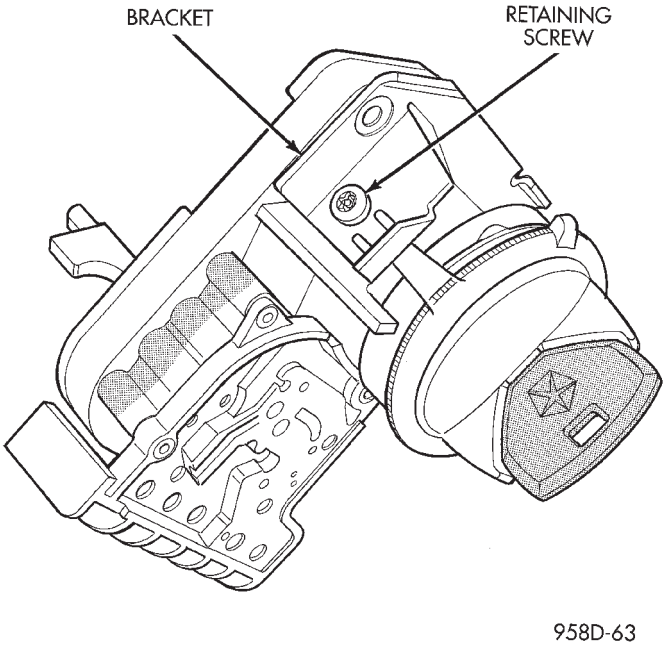



*Fig. 52 Key Cylinder Retaining Screw*

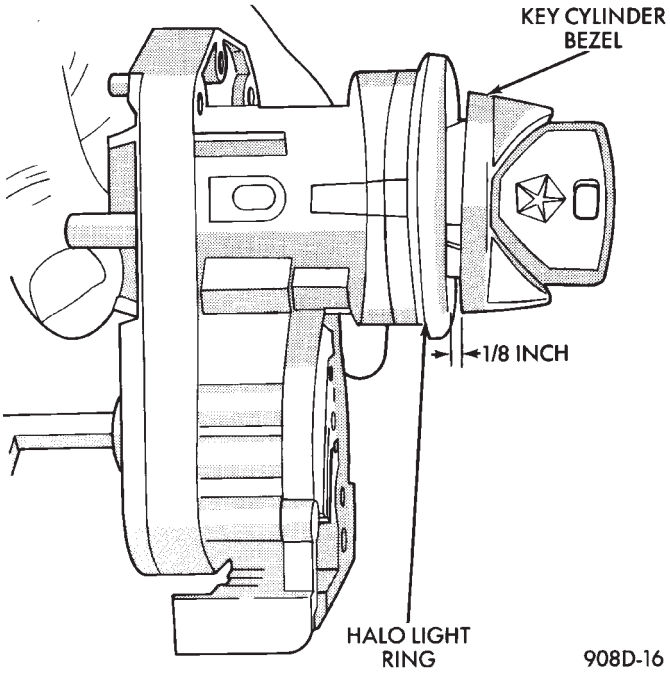



*Fig. 53 Unseated Key Cylinder*

INSTALLATION

(1) Connect electrical connectors to ignition switch. Make sure that switch locking tabs are fully seated in wiring connectors.

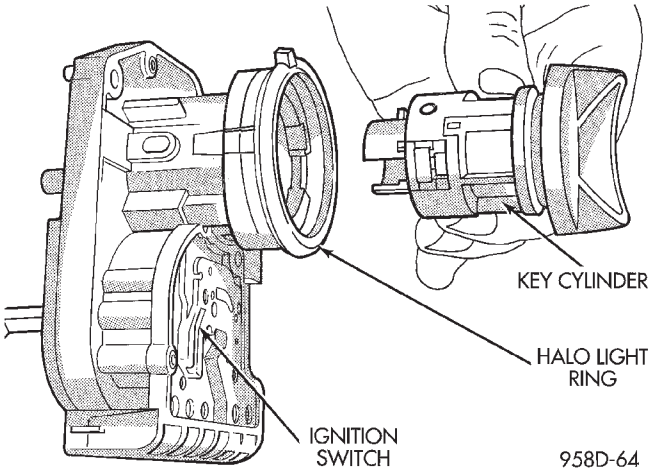



*Fig. 54 Key Cylinder Removal*

(2) Before attaching ignition switch to a tilt steering column, the transmission shifter must be in Park position. The park lock dowel pin and column lock flag must also be properly indexed before installing switch (Fig. 55).

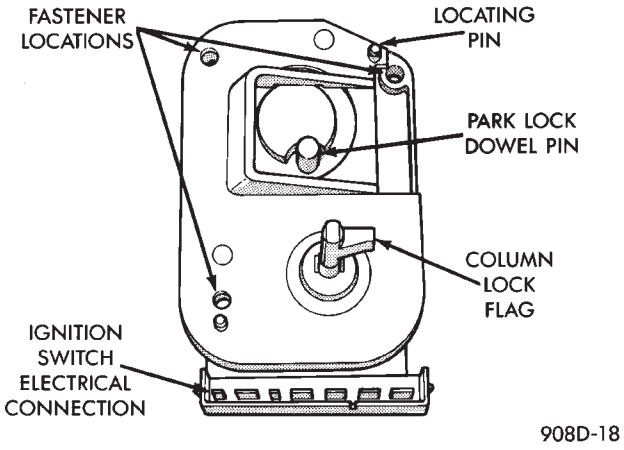



*Fig. 55 Ignition Switch View From Column*

(a) Place transmission shifter in PARK position.

(b) Place ignition switch in lock position. The switch is in the lock position when column lock flag is parallel to ignition switch terminals (Fig. 55).

(c) Position ignition switch park lock dowel pin so it will engage steering column park lock slider linkage (Fig. 56).

(d) Apply a light coating of grease to column lock flag and park lock dowel pin.

(3) Place ignition switch against lock housing opening on steering column. Ensure that ignition switch park lock dowel pin enters slot in park lock slider linkage in steering column.

(4) Install retaining bracket and ignition switch mounting screws. Tighten screws to 3±.5 N·m (26±4 in. lbs.) torque.

(5) Install ignition lock cylinder:

DIAGNOSIS AND TESTING (Continued)

Diagnosis of the oil pressure gauge, the instrument cluster circuitry, and/or the CCD data bus should be performed with the DRB scan tool as described in the proper Body Diagnostic Procedures Manual.

### SPEEDOMETER

If the problem being diagnosed is related to gauge accuracy, be certain to confirm that the problem is with the gauge and not with an incorrect speedometer pinion, axle ratio, or tire size. Refer to Group 21 - Transmission for more information. Refer to Group 8W - Wiring Diagrams for circuit descriptions and diagrams.

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

Diagnosis of the vehicle speed sensor and circuit, and/or the powertrain control module should be performed with the DRB scan tool as described in the proper Powertrain Diagnostic Procedures Manual. Diagnosis of the speedometer, the gauge cluster circuitry, and/or the CCD data bus should be performed with the DRB scan tool as described in the proper Body Diagnostic Procedures Manual.

### TACHOMETER

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

Refer to Group 8W - Wiring Diagrams for circuit descriptions and diagrams. Diagnosis of the crankshaft position sensor and circuit, and/or the powertrain control module should be performed with the DRB scan tool as described in the proper Powertrain Diagnostic Procedures Manual. Diagnosis of the tachometer, the gauge cluster circuitry, and/or the CCD data bus should be performed with the DRB scan tool as described in the proper Body Diagnostic Procedures Manual.

### VOLTMETER

If the problem being diagnosed is related to gauge accuracy, be certain to confirm proper charging system operation before considering gauge replacement. Refer to Group 8C - Charging System for more information. Refer to Group 8W - Wiring Diagrams for circuit descriptions and diagrams.

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

Diagnosis of the system voltage input circuit, and/or the powertrain control module should be performed with the DRB scan tool as described in the proper Powertrain Diagnostic Procedures Manual. Diagnosis of the voltmeter gauge, the instrument cluster circuitry, and/or the CCD data bus should be performed with the DRB scan tool as described in the proper Body Diagnostic Procedures Manual.

### AIRBAG INDICATOR LAMP

The diagnosis found here addresses an inoperative lamp condition. If the airbag indicator lamp stays on with the ignition switch in the On position, or comes on while driving, refer to Group 8M - Passive Restraint Systems for diagnosis. For circuit descriptions and diagrams, refer to 8W-40 - Instrument Cluster, 8W-43 - Airbag System, and 8W-45 - Body Control Module in Group 8W - Wiring Diagrams.

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

The airbag indicator lamp has a lamp backup feature. Following the seat belt reminder lamp display function, if the instrument cluster circuitry has detected an inoperative airbag warning lamp circuit it will flash the seat belt reminder lamp on and off for twenty seconds. Once the instrument cluster circuitry has detected an inoperative airbag warning lamp circuit, if a lamp-on message is received from the airbag control module on the CCD data bus, the seatbelt reminder lamp will flash for twelve seconds or the duration of the airbag system malfunction, whichever is longer.

If the airbag indicator lamp fails to light when the ignition switch is turned to the On position, and the seat belt reminder lamp flashes following its normal

REMOVAL AND INSTALLATION (Continued)

(1) Remove the knee blocker/steering column cover as described in this group.

(2) Remove the four screws securing the body control module to the instrument panel armature (Fig. 11).

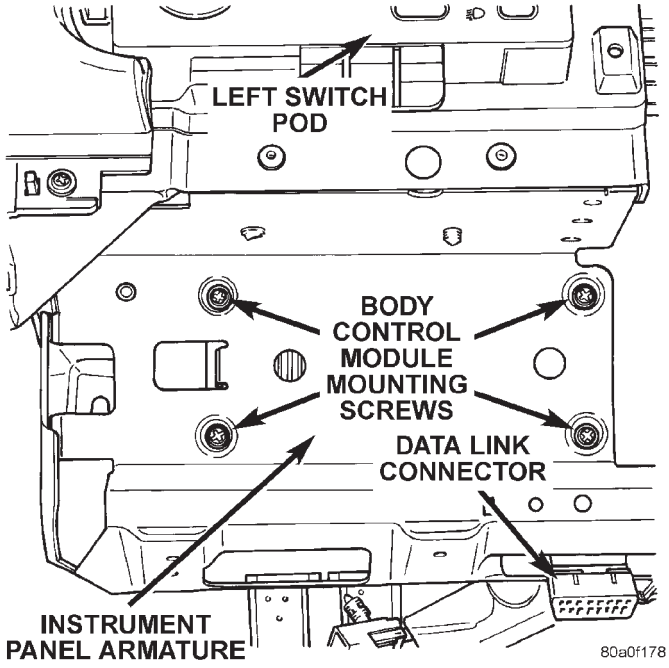



*Fig. 11 Body Control Module Remove/Install*

(3) Move the body control module towards the steering column far enough to unplug the three wiring connectors.

(4) Remove the body control module.

(5) Reverse the removal procedures to install.

## LOWER RIGHT INSTRUMENT PANEL MODULE

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

(1) Remove the knee blocker/steering column cover as described in this group.

(2) Remove the two screws securing the top of the instrument panel center bezel above the graphic display module/vehicle information center.

(3) Remove the ash receiver and remove the two screws in the back of the ash receiver opening of the center bezel.

(4) Remove the courtesy lamp under the right end of the instrument panel.

(5) Open the right front door and remove the screw in the right end of the instrument panel.

(6) Remove the four screws in the glove box hinge on the bottom edge of the lower right instrument panel module.

(7) Open the glove box door and remove the four screws on the upper edge of the glove box opening in the lower right instrument panel module.

(8) Lower the lower right instrument panel far enough to unplug the wiring connectors for the glove box lamp/switch, the cigar lighter/lamp, and the power outlet. Also remove the bulb and socket as a unit from the ash receiver lamp hood.

(9) Remove the lower right instrument panel module from the vehicle.

(10) Reverse the removal procedures to install.

## GRAPHIC DISPLAY MODULE/VEHICLE INFORMATION CENTER

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

(1) Remove the lower right instrument panel module as described in this group.

(2) Remove the three screws securing the graphic display module/vehicle information center to the instrument panel (Fig. 12).

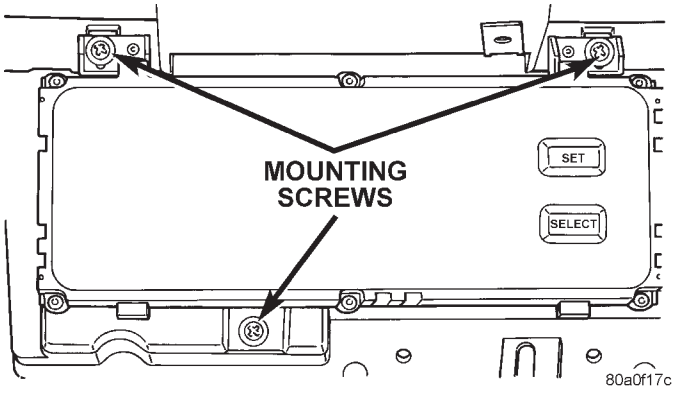



*Fig. 12 Graphic Display Module/Vehicle Information Center Remove/Install*

(3) Pull the unit out from the instrument panel far enough to unplug the wiring connector.

(4) Remove the graphic display module/vehicle information center from the instrument panel.

(5) Reverse the removal procedures to install.

DESCRIPTION AND OPERATION (Continued)

to light the airbag indicator lamp in the instrument cluster when a monitored airbag system fault occurs.

The ACM also contains an energy-storage capacitor. This capacitor stores enough electrical energy to deploy the airbags for up to one second following a battery disconnect or failure during an impact. The purpose of the capacitor is to provide airbag system protection in a severe secondary impact, if the initial impact has damaged or disconnected the battery, but was not severe enough to deploy the airbags.

The ACM cannot be repaired and, if damaged or faulty, it must be replaced.

## DIAGNOSIS AND TESTING

### AIRBAG SYSTEM

A DRB scan tool is required for diagnosis of the airbag system. Refer to the proper Body Diagnostic Procedures Manual for more information.

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

(2) Connect the DRB scan tool to the 16-way data link connector. The connector is located under the lower left corner of the instrument panel behind the steering column cover/knee blocker (Fig. 1).

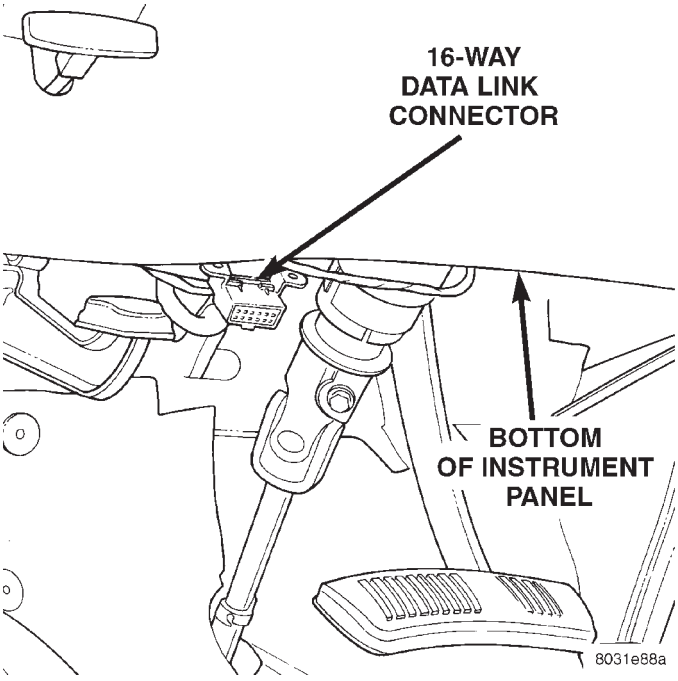



***Fig. 1 16-Way Data Link Connector - Typical***

(3) Turn the ignition switch to the On position. Exit the vehicle with the DRB. Use the latest version of the proper DRB cartridge.

(4) After checking that nobody is inside the vehicle, reconnect the battery negative cable.

(5) Using the DRB, read and record the active Diagnostic Trouble Code (DTC) data.

(6) Read and record any stored DTC data.

(7) Refer to the proper Body Diagnostic Procedures Manual, if any DTC is found in Step 5 or Step 6.

(8) Erase the stored DTC data, if there are no active fault codes. If any problems remain, the stored DTC data will not erase.

(9) With the ignition switch still in the On position, make sure nobody is in the vehicle.

(10) From outside of the vehicle (away from the airbag modules in case of an accidental deployment) turn the ignition switch to the Off position, and then back to the On position. Observe the airbag indicator lamp in the instrument cluster. It should light for six to eight seconds - then go out. This indicates that the airbag system is functioning normally.

**NOTE: If the airbag warning lamp fails to light, or lights and stays on, there is a system malfunction. Refer to the proper Body Diagnostic Procedures Manual to diagnose the problem.**

## SERVICE PROCEDURES

### AIRBAG SYSTEM

*UNDEPLOYED*

At no time should any source of electricity be permitted near the inflator on the back of an airbag module. When carrying an undeployed airbag module, the trim cover or airbag side should be pointed away from the body to minimize injury in the event of accidental deployment. If the module is placed on a bench or any other surface, the trim cover or airbag side should be face up to minimize movement in the event of an accidental deployment.

In addition, the airbag system should be disarmed whenever steering wheel, steering column, or instrument panel components require diagnosis or service. Failure to observe this warning could result in accidental airbag deployment and possible personal injury. Refer to Group 8E - Instrument Panel Systems for additional service procedures on the instrument panel. Refer to Group 19 - Steering for additional service procedures on the steering wheel and steering column.

*DEPLOYED*

Any vehicle which is to be returned to use after an airbag system deployment, must have the airbag modules, clockspring, instrument panel top pad, and the passenger's side airbag rear mounting bracket replaced. These are one-time components and cannot

# HEATED SEATS

## INDEX



## GENERAL INFORMATION

### INTRODUCTION

Individually controlled electrically heated front seats are available factory-installed optional equipment on this model. The seat heaters will only operate when the ignition switch is in the On position, and the surface temperature at the front seat heating element sensors is below the system's designed temperature set points. The heated seat system will not operate in ambient temperatures greater than about 32°C (90°F).

There are separate three-position switches for each front seat located in the right instrument panel switch pod, just right of the steering column. An Off, Low, or High position can be selected with each switch, and Light-Emitting Diodes (LED) for each switch illuminate to give a visual indication that the system is turned on. The Low heat position set point is about 32°C (90°F), and the High heat position set point is about 38°C (100°F). Each switch controls a Heated Seat Control Module (HSCM) mounted to the seat cushion frame under each front seat.

When a seat heater is turned on, a sensor located near the seat cushion electric heater element provides the HSCM with an input indicating the surface temperature of the seat cushion. If the surface temperature input is below the temperature set point for the selected Low or High switch position, a relay in the HSCM energizes the heating elements in the seat cushion and back. When the sensor input indicates the correct temperature set point has been achieved, the HSCM de-energizes the relay. The HSCM will continue to cycle the relay as needed to maintain the temperature set point.

The HSCM will automatically disconnect power from the heating elements if it detects an open in the sensor circuit, or a short in the heating element circuit causing an excessive current draw. The system is also turned off automatically when the ignition switch is turned to the Off position. The control circuit operates on ignition switched power from a fuse in the junction block. The heating elements operate on power supplied through the power seat circuit breaker in the junction block.

Following are general descriptions of the major components in the heated seat system. Refer to 8W-63 - Power Seat With Heated Seats in Group 8W - Wiring Diagrams for complete circuit descriptions and diagrams.

## DESCRIPTION AND OPERATION

### HEATED SEAT SWITCH

The heated seat switch is integral to the right switch pod, which is mounted in the instrument panel just right of the steering column. The two three-position sliding-type switches, one switch for each front seat, provide a resistor multiplexed signal to their respective Heated Seat Control Module (HSCM). Each switch has an Off, Low, and High position so that both the driver and the front seat passenger can select a preferred seat heating mode.

Each switch has a Light-Emitting Diode (LED), which lights to indicate that the heated seat that the switch controls is turned on. The heated seat switches and their LED cannot be repaired. If faulty, the right switch pod unit must be replaced.

### HEATED SEAT CONTROL MODULE

The Heated Seat Control Module (HSCM) is an electronic thermostatic module designed to operate the electric seat heater elements. Two modules are used in the vehicle, one for each front seat. The HSCM for each seat is mounted to a bracket under the seat cushion spring. The bracket is fastened to the inside surface of the outboard seat cushion frame with a single screw driven through the frame from the outside.

DESCRIPTION AND OPERATION (Continued)

The liftgate lock cylinder switch cannot be repaired and, if faulty or damaged, it must be replaced.

### LIFTGLASS AJAR SWITCH

The liftglass ajar switch is integral to the liftglass latch assembly on the liftgate. It is a momentary-type switch that is open when the liftglass is closed, and closed when the liftglass is open.

The liftglass ajar switch cannot be repaired and, if faulty or damaged, the liftglass latch assembly must be replaced.

### AUTO HEADLAMP RELAY

The auto headlamp relay is a International Standards Organization (ISO) micro-relay. The terminal designations and functions are the same as a conventional ISO relay. However, the micro-relay terminal orientation (or footprint) is different, current capacity is lower, and the relay case dimensions are smaller than on the conventional ISO relay.

The auto headlamp relay is a electro-mechanical device that switches current to the headlamps when the body control module grounds the relay coil. The auto headlamp relay is located in the junction block, on the right cowl side panel below the instrument panel in the passenger compartment.

### HORN RELAY

The horn relay is a International Standards Organization (ISO) micro-relay. The terminal designations and functions are the same as a conventional ISO relay. However, the micro-relay terminal orientation (or footprint) is different, current capacity is lower, and the relay case dimensions are smaller than on the conventional ISO relay.

The horn relay is a electro-mechanical device that switches current to the horns when the horn switch or the body control module grounds the relay coil. The horn relay is located in the power distribution center, in the engine compartment.

### PARK LAMP RELAY

The park lamp relay is a International Standards Organization (ISO) micro-relay. The terminal designations and functions are the same as a conventional ISO relay. However, the micro-relay terminal orientation (or footprint) is different, current capacity is lower, and the relay case dimensions are smaller than on the conventional ISO relay.

The park lamp relay is a electro-mechanical device that switches current to the park lamps when the body control module grounds the relay coil. The park lamp relay is located in the junction block, on the right cowl side panel below the instrument panel in the passenger compartment.

### SET LAMP

The VTSS set lamp is a red light-emitting diode mounted with the auto headlamp ambient light sensor on top of the instrument panel near the left defroster outlet. The set lamp receives fused battery feed at all times and is grounded by the body control module to give a visible indication of the VTSS status.

The set lamp cannot be repaired and, if damaged or faulty, the set lamp/auto headlamp ambient light sensor must be replaced as a unit.

## DIAGNOSIS AND TESTING

### VEHICLE THEFT SECURITY SYSTEM

The vehicle theft security system should be diagnosed using the DRB scan tool and the proper Body Diagnostic Procedures Manual. Refer to 8W-39 - Vehicle Theft Security System in Group 8W - Wiring Diagrams for complete circuit descriptions and diagrams.

#### *Self-Diagnostics*

The vehicle theft security system has a self-diagnostic mode that can be entered using the DRB scan tool. Refer to the proper Body Diagnostic Procedures Manual for more information on this feature.

### RELAYS

The horn relay is located in the Power Distribution Center (PDC) in the engine compartment. The auto headlamp and park lamp relays are located in the junction block in the passenger compartment. Each of these relays can be tested as described in the following procedure, however the circuits they are used in vary. To test the relay circuits, refer to the circuit descriptions and diagrams in 8W-39 - Vehicle Theft Security System in Group 8W - Wiring Diagrams.

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

Remove the relay from the PDC or junction block as described in this group to perform the following tests:

(1) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 2. If not OK, replace the faulty relay.

DESCRIPTION AND OPERATION (Continued)

The DDM circuitry controls the output to the left front and rear door power window motors, and supplies battery feed for the power window switch on the left rear door. The PDM circuitry controls the output to the right front and rear power window motors, and supplies battery feed for the power window switch on the right rear door. When a DDM-integrated power window switch for a passenger's side window is actuated, the DDM circuitry sends a message to the PDM on the Chrysler Collision Detection (CCD) data bus to activate the output to that power window motor(s).

The front door power window switches and their lamps cannot be repaired so, if faulty, the entire door module must be replaced. The rear door power window switches and their lamps cannot be repaired but, if faulty, only the switch unit must be replaced.

### DOOR MODULE

A Driver Door Module (DDM) and a Passenger Door Module (PDM) are used on this model to control and integrate many of the vehicle's electrical features and functions. The DDM and PDM communicate with each other, and with other vehicle modules on the Chrysler Collision Detection (CCD) data bus network.

The CCD data bus network allows the sharing of sensor information. This helps to reduce wiring harness complexity, internal controller hardware, and component sensor current loads. At the same time, this system provides increased reliability, enhanced diagnostics, and allows the addition of many new feature capabilities.

For diagnosis of the DDM, PDM, or the CCD data bus network, refer to the proper Body Diagnostic Procedures Manual.

### BODY CONTROL MODULE

A Body Control Module (BCM) is used on this model to control and integrate many of the vehicle's electrical functions and features. The BCM contains a central processing unit and interfaces with other modules in the vehicle on the Chrysler Collision Detection (CCD) data bus network.

The CCD data bus network allows the sharing of sensor information. This helps to reduce wiring harness complexity, reduce internal controller hardware, and reduce component sensor current loads. At the same time, this system provides increased reliability, enhanced diagnostics, and allows the addition of many new feature capabilities.

One of the functions and features that the BCM supports and controls, is the Power Window System. The BCM receives inputs from the ignition switch and the door ajar switches. The programming in the BCM allows it to process the information from these inputs and send ignition switch and door ajar status messages to the DDM and PDM on the CCD data bus. The DDM and PDM use this information to control the lighting of the switch lamps, and to control the power window operation after ignition off feature.

The BCM is mounted under the left end of the instrument panel, behind the instrument panel support armature and below the left switch pod. Refer to Group 8E - Instrument Panel Systems for removal and installation procedures. For diagnosis of the BCM or the CCD data bus, refer to the proper Body Diagnostic Procedures Manual. The BCM can only be serviced by an authorized repair station. Refer to the Warranty Policies and Procedures Manual for a listing of authorized repair stations.

### POWER WINDOW MOTOR

A permanent magnet reversible motor moves the window regulator through an integral gearbox mechanism. A positive and negative battery connection to the two motor terminals will cause the motor to rotate in one direction. Reversing current through these same two connections will cause the motor to rotate in the opposite direction. In addition, each power window motor is equipped with an integral self-resetting circuit breaker to protect the motor from overloads. The power window motor and gearbox assembly cannot be repaired. If faulty, the entire motor assembly must be replaced.

### CIRCUIT BREAKER

An automatic resetting circuit breaker in the junction block is used to protect the power window system circuit. The circuit breaker can protect the system from a short circuit, or from an overload condition caused by an obstructed or stuck window glass or regulator. The circuit breaker cannot be repaired. If faulty, the circuit breaker must be replaced.

## DIAGNOSIS AND TESTING

### POWER WINDOW SYSTEM

For circuit descriptions and diagrams, refer to 8W-60 - Power Windows in Group 8W - Wiring Diagrams.

#### *ALL WINDOWS INOPERATIVE*

(1) Check the circuit breaker in the junction block, as described in this group. If OK, go to Step 2. If not OK, replace the faulty circuit breaker.

(2) Remove the left and right front door trim panels. Check the 12-way door module wiring connectors to see that they are fully seated in the door module receptacles. If OK, go to Step 3. If not OK, install the connectors properly.

(3) Unplug the 12-way door module connectors. Check for continuity between the ground circuit cav-

# OVERHEAD CONSOLE SYSTEMS

CONTENTS



## GENERAL INFORMATION

### INTRODUCTION

Two overhead consoles featuring a mini trip computer, an electronic compass, and a thermometer are available factory-installed options on this model. A long version of the overhead console is used on models without a power sunroof option. A short version of the overhead console is used on models with a power sunroof option.

The long overhead console includes two front-mounted and two rear-mounted reading/courtesy lamps, a garage door opener storage bin, and a sunglasses storage bin. The short overhead console includes two reading courtesy lamps and houses the power sunroof switch.

Following are general descriptions of the major components used in the overhead console. Refer to 8W-49 Overhead Console in Group 8W - Wiring Diagrams for complete circuit descriptions and diagrams.

## DESCRIPTION AND OPERATION

### TRIP COMPUTER

A mini trip computer is available on this model to provide several electrical functions and features. The trip computer contains a central processing unit and interfaces with other modules in the vehicle on the Chrysler Collision Detection (CCD) data bus network.

The CCD data bus network allows the sharing of sensor information. This helps to reduce wiring harness complexity, reduce internal controller hardware, and reduce component sensor current loads. At the same time, this system provides increased reliability, enhanced diagnostics, and allows the addition of many new feature capabilities.

Some of the functions and features that the trip computer supports and/or controls, include the following displays:

- Compass/temperature
- Trip odometer (ODO)
- Average miles per gallon (AVG ECO)
- Instant miles per gallon (ECO)
- Distance to empty (DTE)
- Elapsed time (ET)
- Blank display.

Momentarily depressing and releasing the Step button when the ignition switch is in the On position will cause the overhead console display to step sequentially through the listed display options. Momentarily depressing and releasing the U.S/Metric button toggles the display between U.S. and Metric measurements. For more information on the trip computer features refer to the owner's manual in the vehicle glove box.

The push button module is hard-wired to the trip computer. The compass flux-gate unit is integral to the trip computer, compass, thermometer, display module unit. Data input for all other trip computer functions is received through CCD data bus network messages. The trip computer uses its internal programming and all of these inputs to calculate and display the requested data. If the data displayed is incorrect, perform the self-diagnostic tests as described in this group. If these tests prove inconclusive, the use of a DRB scan tool and the proper Body Diagnostic Procedures Manual is recommended for

DIAGNOSIS AND TESTING (Continued)

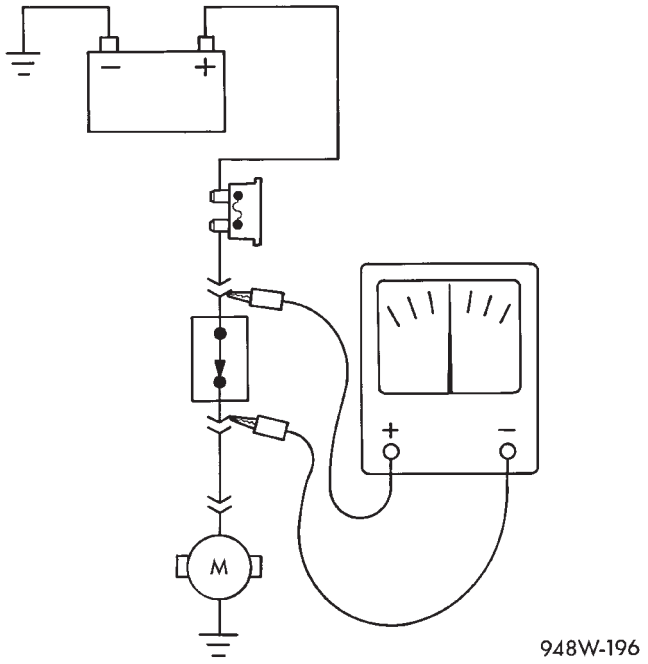



*Fig. 10 Testing for Voltage Drop*

(3) Analyze the symptoms. Use the wiring diagrams to determine what the circuit is doing, where the problem most likely is occurring and where the diagnosis will continue.

(4) Isolate the problem area.

(5) Repair the problem.

(6) Verify proper operation. For this step check for proper operation of all items on the repaired circuit. Refer to the wiring diagrams.

## SERVICE PROCEDURES

### WIRING REPAIR

When replacing or repairing a wire, it is important that the correct gauge be used as shown in the wiring diagrams. The wires must also be held securely in place to prevent damage to the insulation.

(1) Disconnect battery negative cable

(2) Remove 1 inch of insulation from each end of the wire.

(3) 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.

(4) Spread the strands of the wire apart on each part of the exposed wire (example 1). (Fig. 11)

(5) Push the two ends of wire together until the strands of wire are close to the insulation (example 2) (Fig. 11)

(6) Twist the wires together (example 3) (Fig. 11)

(7) Solder the connection together using rosin core type solder only. **Do not use acid core solder.**

(8) 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.

(9) Secure the wire to the existing ones to prevent chafing or damage to the insulation

(10) Connect battery and test all affected systems.

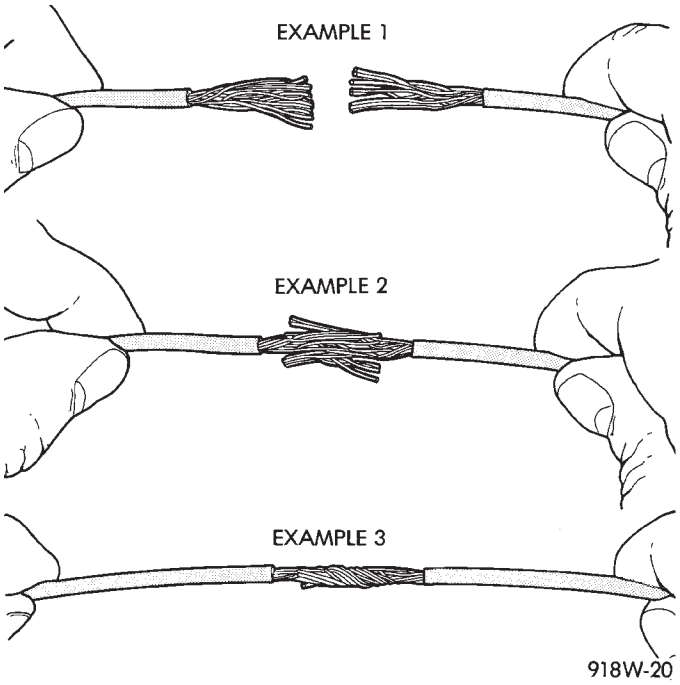



*Fig. 11 Wire Repair*

### TERMINAL/CONNECTOR REPAIR-MOLEX CONNECTORS

(1) Disconnect battery.

(2) Disconnect the connector from its mating half/component.

(3) Insert the terminal releasing special tool 6742 into the terminal end of the connector (Fig. 12).

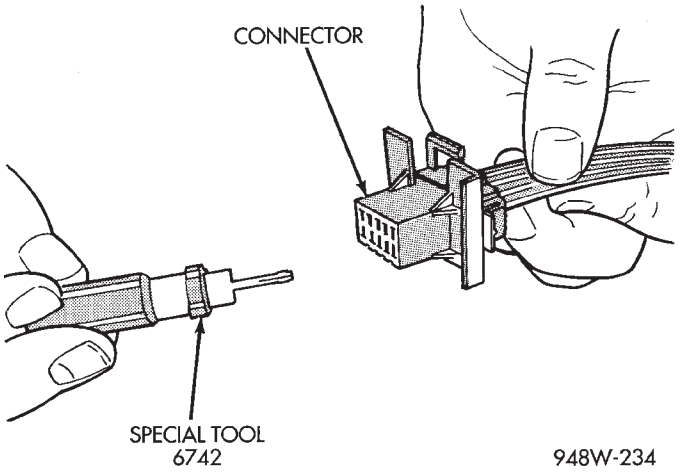



*Fig. 12 Molex Connector Repair*

## RELAYS

**HORN RELAY**

| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| A1 | F31 16VT | FUSED B(+) |
| A2 | X2 16DG/YL | HORN RELAY OUTPUT |
| A3 | F31 16VT | FUSED B(+) |
| | F31 16VT | FUSED B(+) |
| A4 | – | – |
| A5 | X4 20GY/OR | HORN RELAY CONTROL |

**TRANSMISSION CONTROL RELAY**

| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| A6 | F92 18LG | FUSED B(+) |
| A7 | T20 18LB | TRANSMISSION RELAY OUTPUT |
| A8 | F99 20OR | FUSED IGNITION SWITCH OUTPUT (START/RUN) |
| A9 | – | – |
| A10 | T66 20BR/OR | TRANSMISSION RELAY CONTROL |

**A/C COMPRESSOR CLUTCH RELAY**

| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| B1 | F250 18RD/GY | FUSED B(+) |
| B2 | C2 18DB/YL | A/C COMPRESSOR CLUTCH RELAY OUTPUT |
| B3 | F99 20OR | FUSED IGNITION SWITCH OUTPUT (START/RUN) |
| B4 | – | – |
| B5 | C13 20DB/RD | A/C COMPRESSOR CLUTCH RELAY CONTROL |

**ABS MAIN RELAY**

| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| B6 | B47 16RD/LB | ABS SYSTEM RELAY OUTPUT |
| B7 | A20 16RD/LG | FUSED B(+) |
| B8 | F12 20DB/WT | FUSED IGNITION SWITCH OUTPUT (RUN) |
| B9 | Z4 20BK | GROUND |
| B10 | B58 20GY/LB | ABS SYSTEM RELAY CONTROL |

**AUTOMATIC SHUT DOWN RELAY**

| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| B16 | F5 18RD/YL | FUSED B(+) |
| B17 | A142 18DG/OR | AUTOMATIC SHUT DOWN RELAY OUTPUT |
| B18 | F99 20OR | FUSED IGNITION SWITCH OUTPUT (START/RUN) |
| B19 | – | – |
| B20 | K900 20PK/WT | AUTOMATIC SHUT DOWN RELAY CONTROL |

**INTERMITTENT WIPER RELAY**

| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| C1 | V6 16DB | WIPER PARK SWITCH SENSE |
| C2 | F86 16LG/RD | FUSED B(+) |
| | F86 16LG/RD | FUSED B(+) |
| C3 | F86 16LG/RD | FUSED B(+) |
| C4 | V66 18VT/WT | WIPER PARK SWITCH SENSE |
| C5 | V18 20YL/LG | INTERMITTENT WIPER RELAY CONTROL |

## CIRCUIT BREAKERS

| CIRCUIT BREAKER NO. | SIZE | FEED CIRCUIT | FUSED CIRCUIT |
|---|---|---|---|
| 1 | 20A | A31 12RD/BK | F86 16LG/BK |
| | | | F86 16LG/BK |
| | | | F86 16LG/RD* |
| 2 | 30A | A250 10RD | F81 10TN |
| | | | F81 12TN |
| 3 | 20A | A7 12YL/RD | F35 16RD |
| | | | F35 16RD |

## RELAYS

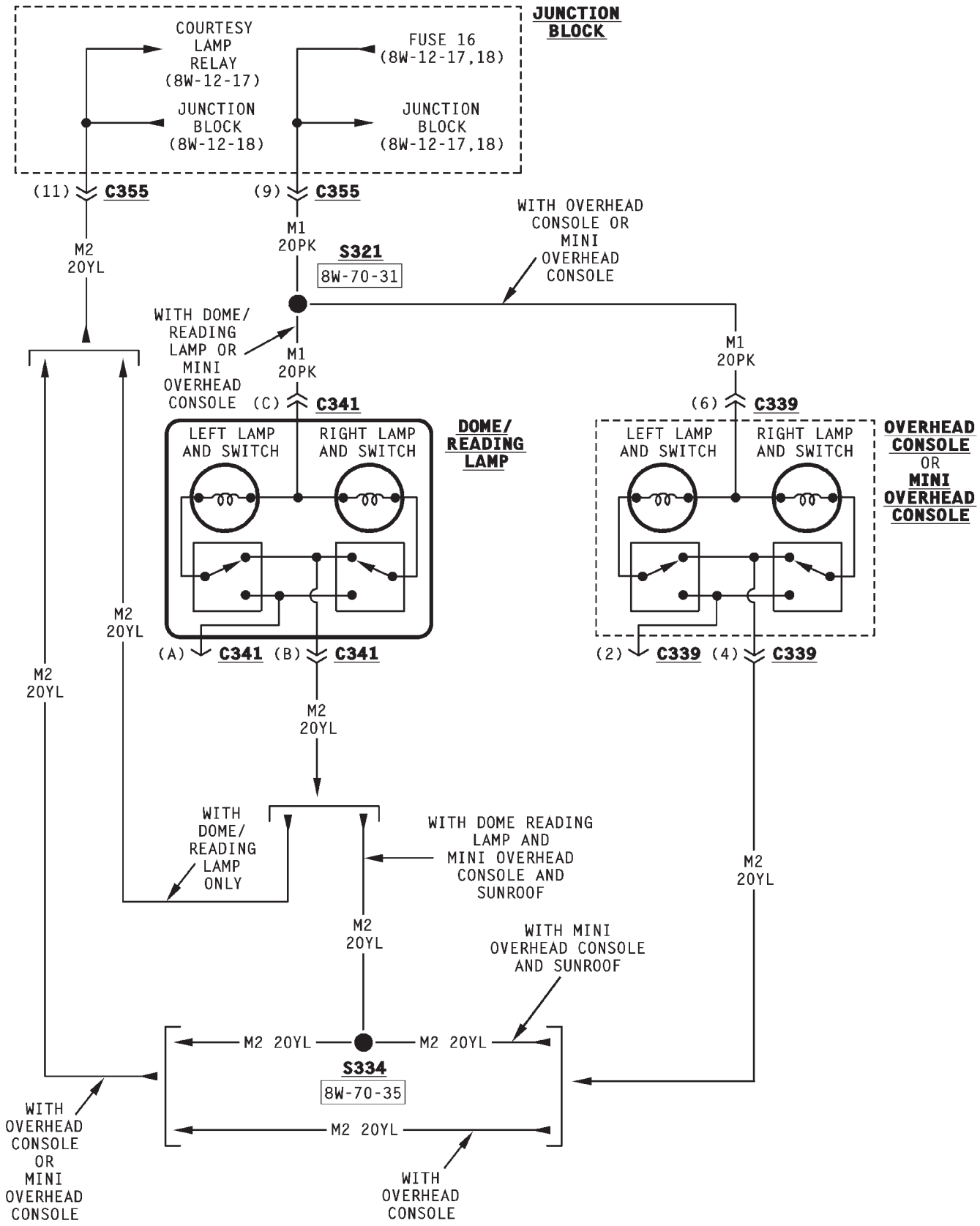
**NOT USED (A)**

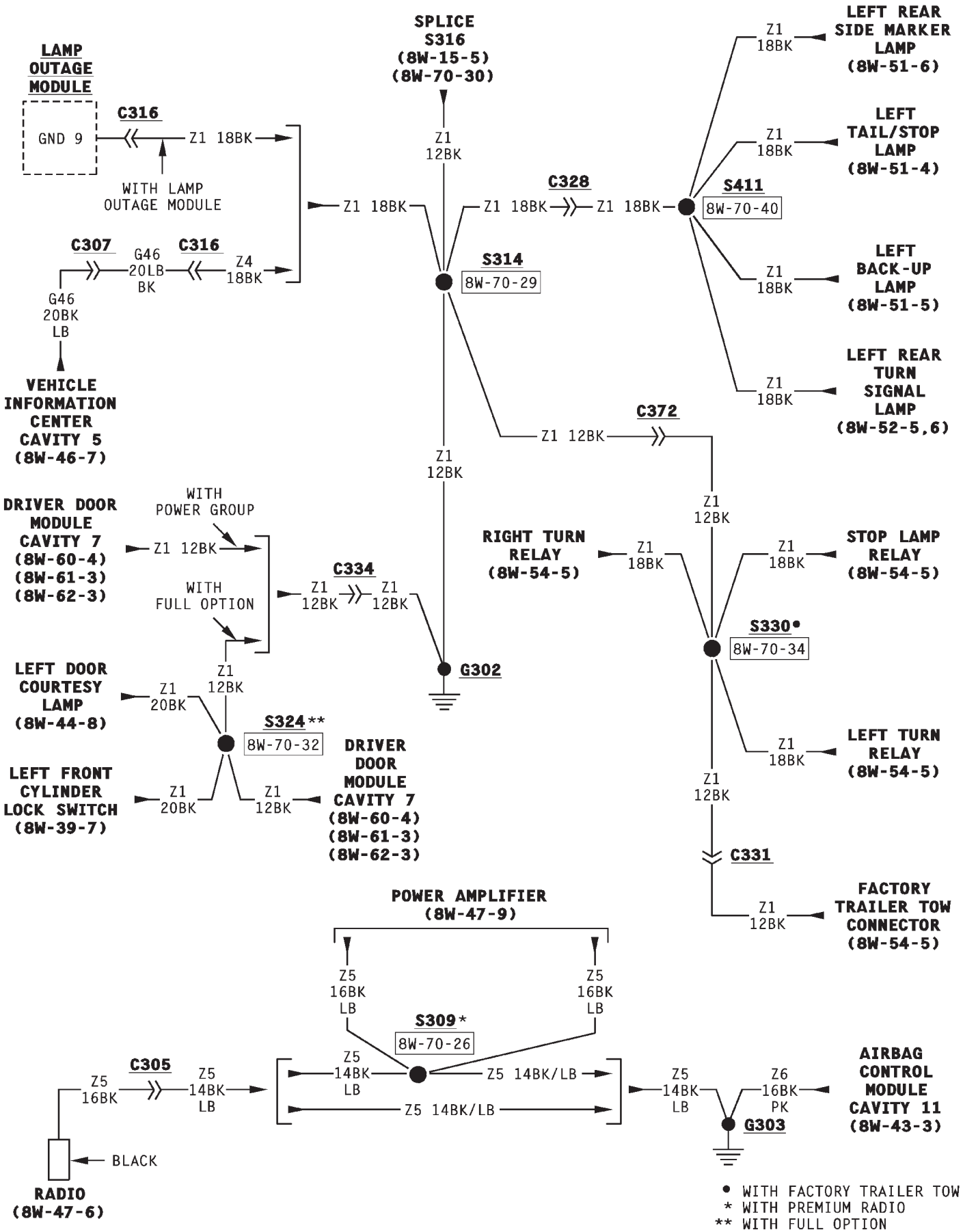
| CAVITY | CIRCUIT | FUNCTION |
|---|---|---|
| 30 | -- | -- |
| 85 | – | – |
| 86 | – | – |
| 87 | – | – |
| 87A | – | – |

**CIGAR LIGHTER RELAY (B)**

| CAVITY | CIRCUIT | FUNCTION |
|---|---|---|
| 30 | INTERNAL | FUSED B(+) |
| 85 | Z1 BK | GROUND |
| 86 | A31 RD/BK | FUSED IGNITION SWITCH OUTPUT (ACC/RUN) |
| 87 | F30 RD/DB | FUSED IGNITION SWITCH OUTPUT (ACC/RUN) |
| 87A | – | – |

* WITH POWER SUNROOF


JUNCTION BLOCK
COURTESY LAMP RELAY (8W-12-17)
FUSE 16 (8W-12-17,18)
JUNCTION BLOCK (8W-12-18)
JUNCTION BLOCK (8W-12-17,18)
(11) C355
(9) C355
M2 20YL
M1 20PK
S321
8W-70-31
WITH OVERHEAD CONSOLE OR MINI OVERHEAD CONSOLE
WITH DOME/ READING LAMP OR MINI OVERHEAD CONSOLE
M1 20PK
(C) C341
DOME/ READING LAMP
LEFT LAMP AND SWITCH
RIGHT LAMP AND SWITCH
M1 20PK
(6) C339
OVERHEAD CONSOLE OR MINI OVERHEAD CONSOLE
LEFT LAMP AND SWITCH
RIGHT LAMP AND SWITCH
M2 20YL
M2 20YL
(A) C341 (B) C341
(2) C339 (4) C339
M2 20YL
WITH DOME/ READING LAMP ONLY
WITH DOME READING LAMP AND MINI OVERHEAD CONSOLE AND SUNROOF
M2 20YL
M2 20YL
WITH MINI OVERHEAD CONSOLE AND SUNROOF
M2 20YL
M2 20YL
S334
8W-70-35
M2 20YL
WITH OVERHEAD CONSOLE OR MINI OVERHEAD CONSOLE
WITH OVERHEAD CONSOLE


LAMP OUTAGE MODULE
GND 9
C316
Z1 18BK
WITH LAMP OUTAGE MODULE
C307
G46 20LB BK
C316
Z4 18BK
G46 20BK LB
VEHICLE INFORMATION CENTER CAVITY 5 (8W-46-7)
SPLICE S316 (8W-15-5) (8W-70-30)
Z1 12BK
Z1 18BK
Z1 18BK
C328
Z1 18BK
S411
8W-70-40
S314
8W-70-29
Z1 18BK
LEFT REAR SIDE MARKER LAMP (8W-51-6)
Z1 18BK
LEFT TAIL/STOP LAMP (8W-51-4)
Z1 18BK
LEFT BACK-UP LAMP (8W-51-5)
Z1 18BK
LEFT REAR TURN SIGNAL LAMP (8W-52-5,6)
Z1 12BK
C372
Z1 12BK
DRIVER DOOR MODULE CAVITY 7 (8W-60-4) (8W-61-3) (8W-62-3)
WITH POWER GROUP
Z1 12BK
WITH FULL OPTION
C334
Z1 12BK
Z1 12BK
G302
Z1 12BK
RIGHT TURN RELAY (8W-54-5)
Z1 18BK
Z1 18BK
STOP LAMP RELAY (8W-54-5)
S330•
8W-70-34
LEFT DOOR COURTESY LAMP (8W-44-8)
Z1 20BK
S324**
8W-70-32
LEFT FRONT CYLINDER LOCK SWITCH (8W-39-7)
Z1 20BK
Z1 12BK
DRIVER DOOR MODULE CAVITY 7 (8W-60-4) (8W-61-3) (8W-62-3)
Z1 18BK
LEFT TURN RELAY (8W-54-5)
Z1 12BK
C331
Z1 12BK
FACTORY TRAILER TOW CONNECTOR (8W-54-5)
POWER AMPLIFIER (8W-47-9)
Z5 16BK LB
Z5 16BK LB
S309*
8W-70-26
C305
Z5 16BK
Z5 14BK LB
Z5 14BK LB
Z5 14BK/LB
Z5 14BK/LB
Z5 14BK LB
Z6 16BK PK
G303
AIRBAG CONTROL MODULE CAVITY 11 (8W-43-3)
BLACK
RADIO (8W-47-6)
• WITH FACTORY TRAILER TOW
* WITH PREMIUM RADIO
** WITH FULL OPTION

DESCRIPTION AND OPERATION (Continued)

## CRANKSHAFT POSITION SENSOR

The Powertrain Control Module (PCM) supplies 5 volts to the crankshaft position sensor on circuit K25. Circuit K25 connects to cavity A17 of the PCM.

The PCM receives the crankshaft position sensor signal on circuit K27. Circuit K27 connects to cavity A8 of the PCM.

The PCM provides a ground for the crankshaft position sensor (circuit K27) through circuit K4. Circuit K4 connects to cavity A4 of the PCM.

*HELPFUL INFORMATION*

- Circuit K25 splices to supply 5 volts to the camshaft position sensor, manifold absolute pressure sensor and throttle position sensor.

Circuit K4 splices to supply ground for the signals from the following:

- Upstream and downstream heated oxygen sensor
- Camshaft position sensor
- Intake air temperature sensor
- Throttle position sensor
- Manifold absolute pressure sensor
- Engine coolant temperature sensor
- Vehicle speed sensor

## CAMSHAFT POSITION SENSOR

The Powertrain Control Module (PCM) supplies 5 volts to the camshaft position sensor (in distributor) on circuit K25. Circuit K25 connects to cavity A17 of the PCM.

The PCM receives the camshaft position sensor signal on circuit K24. Circuit K24 connects to cavity A18 of the PCM.

The PCM provides a ground for the camshaft position sensor signal (circuit K24) through circuit K4. Circuit K4 connects to cavity A4 of the PCM.

*HELPFUL INFORMATION*

- Circuit K25 splices to supply 5 volts to the crankshaft position sensor, manifold absolute pressure sensor, and throttle position sensor.

Circuit K4 splices to supply ground for the signals from the following:

- Upstream and downstream heated oxygen sensors
- Crankshaft position sensor
- Intake air temperature sensor
- Throttle position sensor
- Manifold absolute pressure sensor
- Engine coolant temperature sensor
- Vehicle speed sensor

## ENGINE COOLANT TEMPERATURE SENSOR

The engine coolant temperature sensor provides an input to the Powertrain Control Module (PCM) on circuit K2. From circuit K2, the engine coolant temperature sensor draws up to 5 volts from the PCM. The sensor is a variable resistor. As coolant temperature changes, the resistance in the sensor changes, causing a change in current draw. The K2 circuit connects to cavity A16 of the PCM.

The PCM provides a ground for the engine coolant temperature sensor signal (circuit K2) through circuit K4. Circuit K4 connects to cavity A4 of the PCM connector.

*HELPFUL INFORMATION*

Circuit K4 splices to supply ground for the signals from the following:

- Battery temperature sensor
- Camshaft position sensor
- Crankshaft position sensor
- Intake air temperature sensor
- Throttle position sensor
- Manifold absolute pressure sensor
- Upstream and downstream heated oxygen sensor
- Vehicle speed sensor

## EVAPORATIVE SYSTEM LEAK DETECTION PUMP

Vehicle built for sale in the State of California are equipped with an evaporative system leak detection pump.

When the ignition switch is in the START or RUN position, it connects circuit A1 from fuse 8 in the Power Distribution Center (PDC) to circuit A21. Circuit A21 powers circuit F99 through PDC fuse 18. Circuit F99 feeds the leak detection pump.

On circuits J96 and J95, the PCM operates the leak detection pump. Circuit J96 connects to cavity C14 of the PCM. Circuit J95 connects to PCM cavity C10.

## THROTTLE POSITION SENSOR

From the Powertrain Control Module (PCM), circuit K25 supplies 5 volts to the throttle position sensor (TPS). Circuit K25 connects to cavity A17 of the PCM.

Circuit K22 delivers the TPS signal to the PCM. Circuit K22 connects to cavity A23 of the PCM.

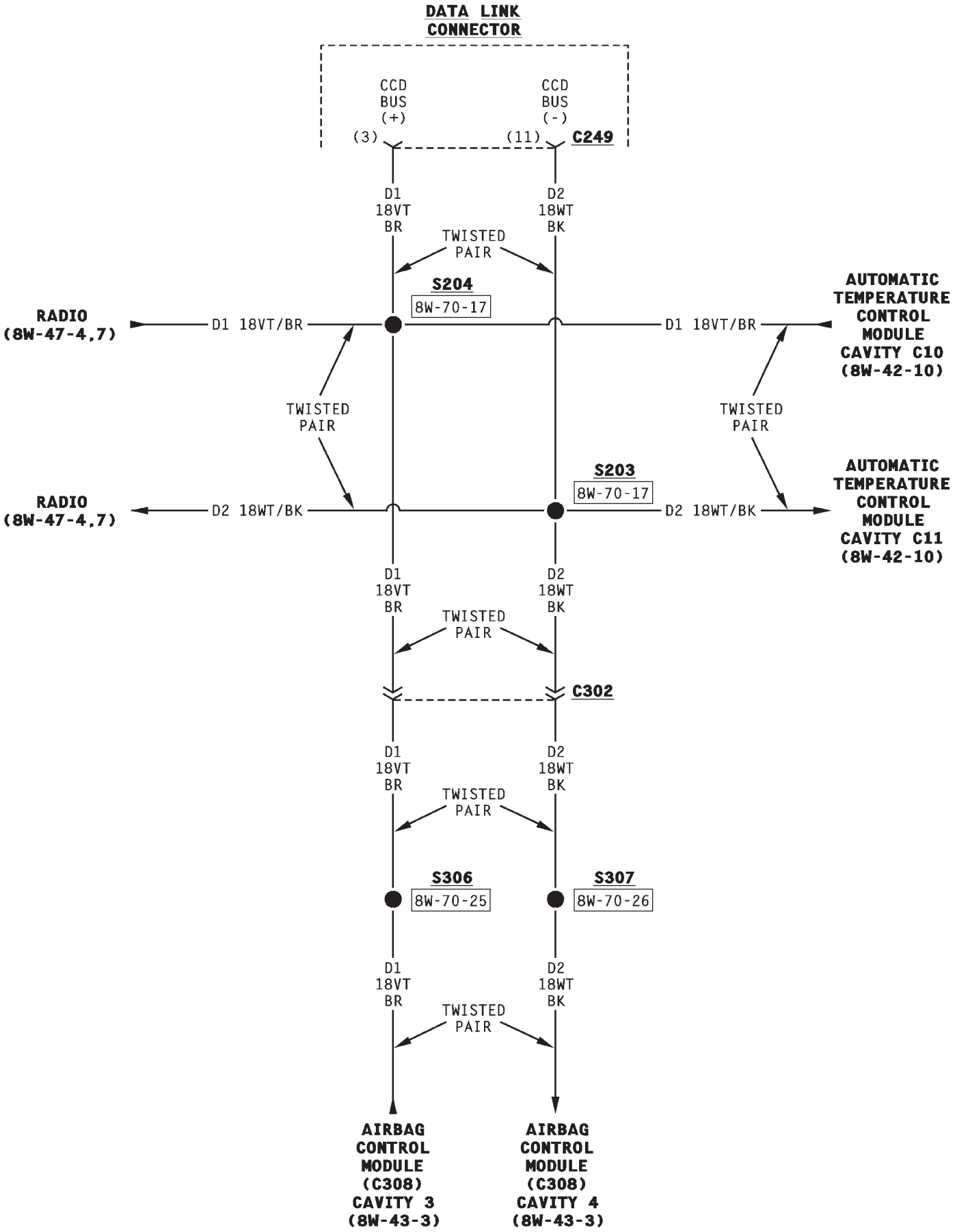
The PCM provides a ground for the throttle position sensor signal (circuit K22) through circuit K4. Circuit K4 connects to cavity A4 of the PCM.

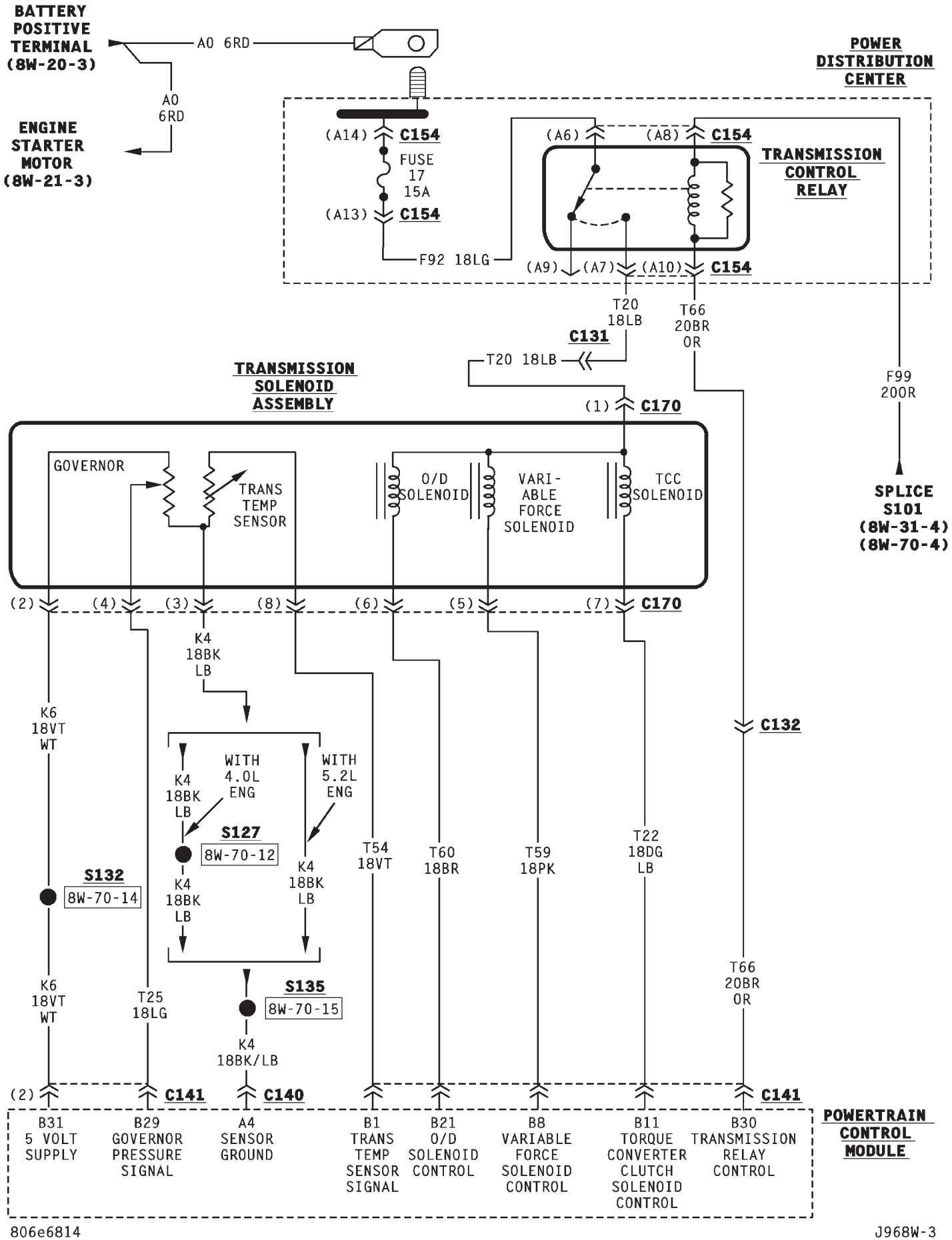
*HELPFUL INFORMATION*

Refer to Group 14 for throttle position sensor operation.

Circuit K25 splices to supply 5 volts to the manifold absolute pressure sensor, camshaft position sensor, and crankshaft position sensor.

Circuit K4 splices to supply ground for the signals from the following:


DATA LINK CONNECTOR
CCD BUS (+)
CCD BUS (-)
(3)
(11)
C249
D1 18VT BR
D2 18WT BK
TWISTED PAIR
S204
8W-70-17
RADIO (8W-47-4,7)
D1 18VT/BR
D1 18VT/BR
AUTOMATIC TEMPERATURE CONTROL MODULE CAVITY C10 (8W-42-10)
TWISTED PAIR
TWISTED PAIR
S203
8W-70-17
RADIO (8W-47-4,7)
D2 18WT/BK
D2 18WT/BK
AUTOMATIC TEMPERATURE CONTROL MODULE CAVITY C11 (8W-42-10)
D1 18VT BR
D2 18WT BK
TWISTED PAIR
C302
D1 18VT BR
D2 18WT BK
TWISTED PAIR
S306
8W-70-25
S307
8W-70-26
D1 18VT BR
D2 18WT BK
TWISTED PAIR
AIRBAG CONTROL MODULE (C308) CAVITY 3 (8W-43-3)
AIRBAG CONTROL MODULE (C308) CAVITY 4 (8W-43-3)

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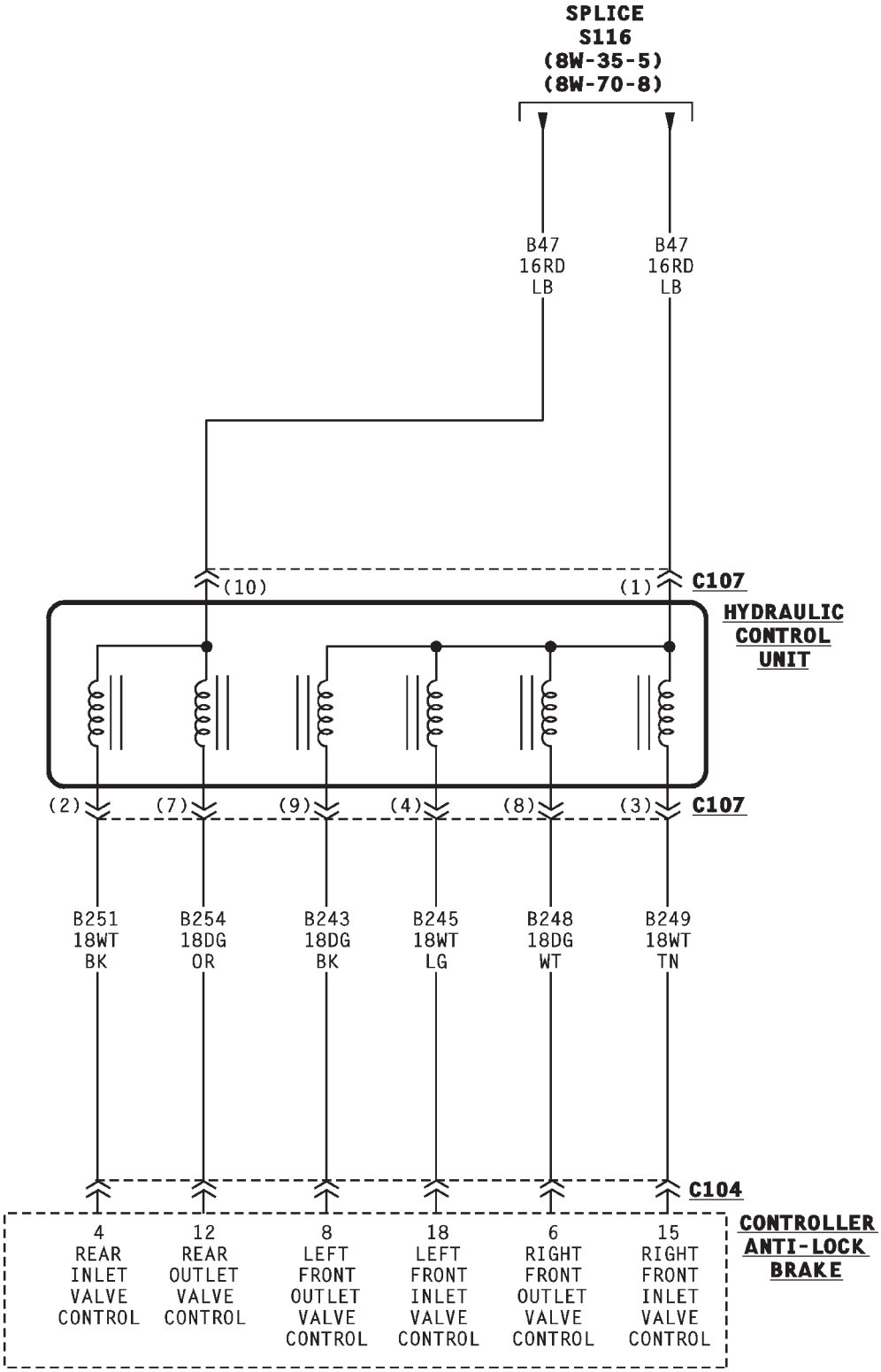

SPLICE
S116
(8W-35-5)
(8W-70-8)
B47
16RD
LB
B47
16RD
LB
(10)
(1)
C107
HYDRAULIC
CONTROL
UNIT
(2)
(7)
(9)
(4)
(8)
(3)
C107
B251
18WT
BK
B254
18DG
OR
B243
18DG
BK
B245
18WT
LG
B248
18DG
WT
B249
18WT
TN
C104
4
REAR
INLET
VALVE
CONTROL
12
REAR
OUTLET
VALVE
CONTROL
8
LEFT
FRONT
OUTLET
VALVE
CONTROL
18
LEFT
FRONT
INLET
VALVE
CONTROL
6
RIGHT
FRONT
OUTLET
VALVE
CONTROL
15
RIGHT
FRONT
INLET
VALVE
CONTROL
CONTROLLER
ANTI-LOCK
BRAKE

## DIAGRAM INDEX

DESCRIPTION AND OPERATION (Continued)

Z1. Circuit C3 from the PCM connects to the low pressure switch. Circuit C21 connects the low pressure switch to the high pressure switch. The high pressure switch connects circuit C21 to ground circuit Z1. If the A/C low pressure and high pressure switches are closed, the PCM senses the A/C request signal on circuit C3.

After sensing the A/C request signal, the PCM supplies ground for the coil side of A/C compressor clutch relay on circuit C13. Circuit F99 from fuse 18 in the PDC powers the coil side of the relay.

When the PCM grounds the A/C compressor clutch relay, the contacts close and connects circuit F250 from fuse 21 in the PDC to circuit C2. Circuit C2 supplies power to the case grounded A/C compressor clutch.

The A/C compressor clutch has a built-in diode. The diode controls the induced voltage that results from the magnetic field collapsing when the clutch disengages. The diode provides a current path to protect other components and systems.

*HELPFUL INFORMATION*

Circuit A900 from fuse 3 in the PDC powers circuit F250 through PDC fuse 21.

### RECIRCULATION DOOR MOTOR—AUTOMATIC TEMPERATURE CONTROL

When the ignition switch is in the RUN position, it connects circuit A1 from fuse 8 in the Power Distribution Center (PDC) to circuit A22. Circuit A22 powers circuit F71 through fuse 12 in the junction block. Circuit F71 feeds the recirculation door motor. Circuit F71 also connects to the Automatic Temperature Control (ATC) module.

Circuits C32 and C33 from the ATC module connect to the recirculation door motor. Circuits C32 and C33 provide ground for the motor.

### MODE DOOR MOTOR—AUTOMATIC TEMPERATURE CONTROL

Circuit C40 from the Automatic Temperature Control (ATC) module supplies 5 volts to the position switch in the mode door motor. The ATC module receives the sensor signal from the mode door motor on circuit C39. Circuit D41 provides ground for the mode door position sensor. Circuit D41 connects to the ATC module.

The ATC module operates the mode door motor on circuits C37 and C38.

### BLEND DOOR MOTOR—AUTOMATIC TEMPERATURE CONTROL

Circuit C40 from the Automatic Temperature Control (ATC) module supplies 5 volts to the position switch in the blend door motor. The ATC module receives the sensor signal from the blend door motor on circuit C36. Circuit D41 provides ground for the mode door position sensor. Circuit D41 connects to the ATC module.

The ATC module operates the mode door motor on circuits C35 and C34.

### BLOWER MOTOR—AUTOMATIC TEMPERATURE CONTROL

When the operator selects blower motor HIGH speed operation, the Automatic Temperature Control (ATC) module grounds high speed blower motor relay. For any speed other than HIGH, the blower power module supplies battery voltage for the blower motor.

*BLOWER MOTOR POWER MODULE*

When the operator selects any blower motor speed other than HIGH, the blower motor power module supplies voltage for the blower motor. Circuit A19 from fuse 7 in the Power Distribution Center (PDC) supplies battery voltage to the blower motor power module.

The voltage level fed to the blower motor depends on the blower speed selected by the operator. Slower speed selections provide lower voltage to the motor. The blower motor power module feeds the blower motor on circuit C42. Circuit Z4 provides ground for the blower motor and the blower motor power module.

Circuit C43 from the power module connects to the ATC module. The ATC module controls feedback on circuit C43.

*HIGH SPEED BLOWER MOTOR RELAY*

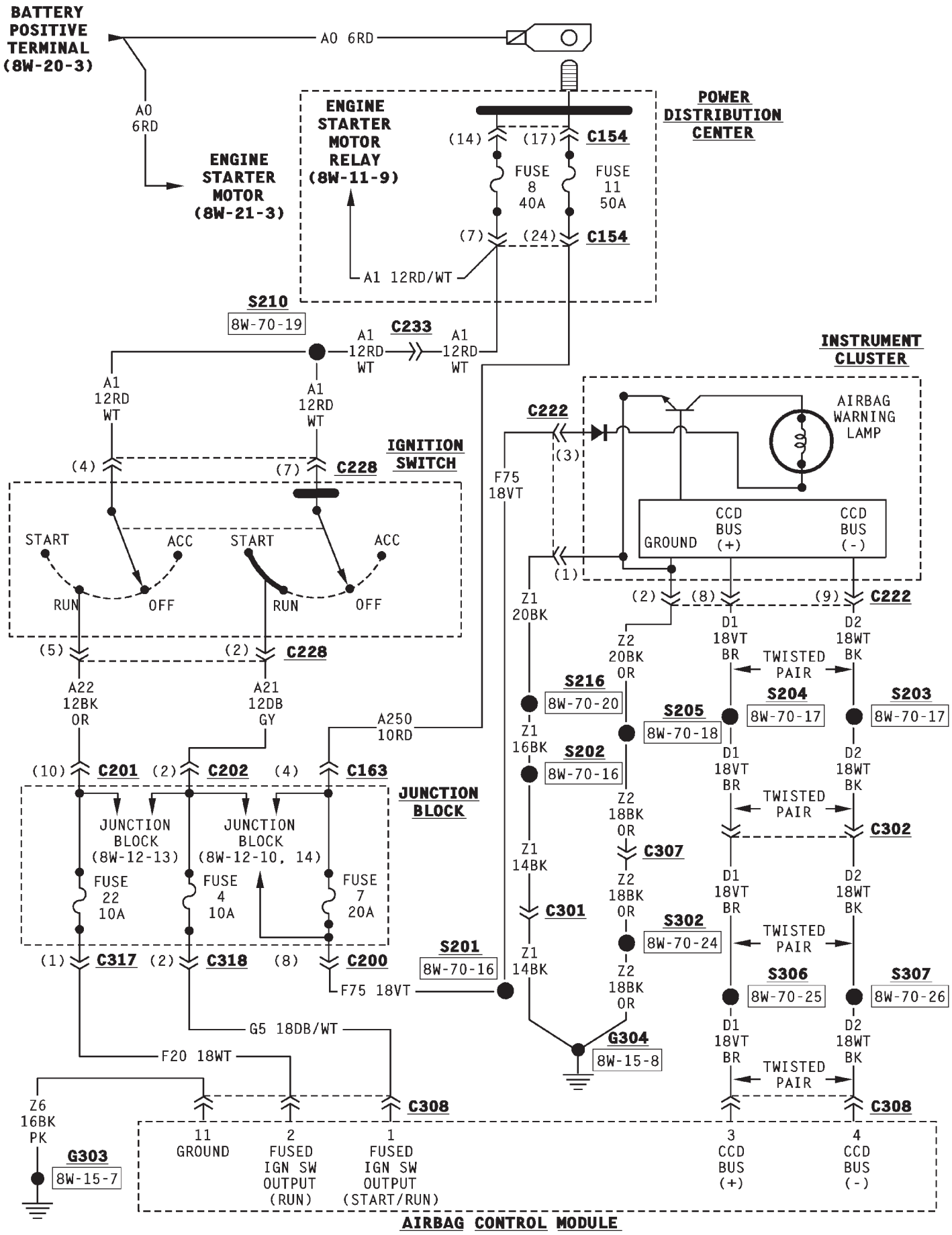
Circuit A19 from fuse 7 in the Power Distribution Center supplies battery voltage to the coil and contacts sides of the high speed blower motor relay. The ATC module provides ground for the coil side of the relay on circuit C41.

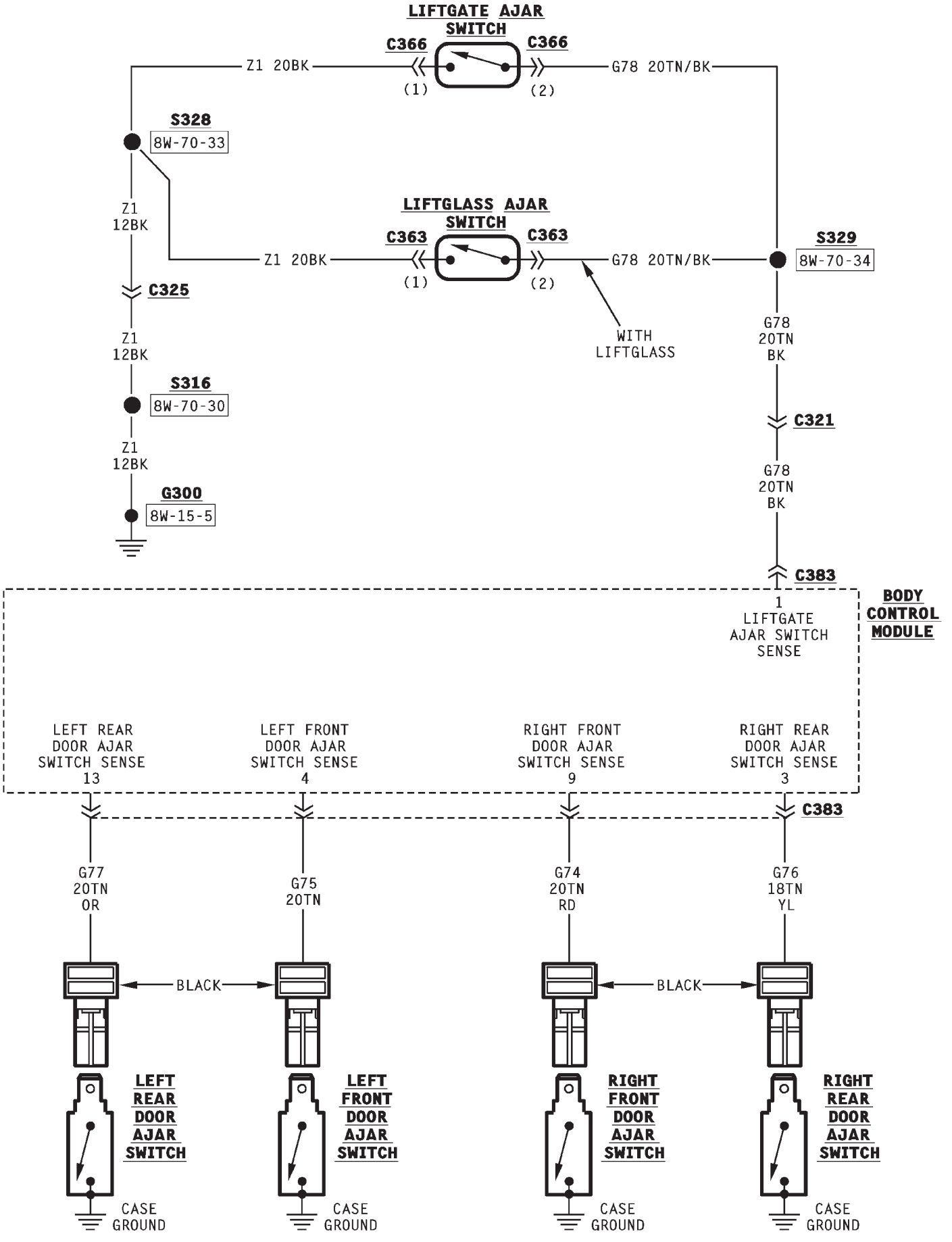
When the ATC module grounds the high speed blower motor relay, the relay contacts close and connect circuit A19 to circuit C42. Circuit C42 connects to the blower motor and the ATC module. Circuit Z4 provides ground for the blower motor.

## SCHEMATICS AND DIAGRAMS

### WIRING DIAGRAM INDEX

The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
ENGINE STARTER MOTOR RELAY (8W-11-9)
POWER DISTRIBUTION CENTER
(14)
(17)
C154
FUSE 8 40A
FUSE 11 50A
(7)
(24)
C154
A1 12RD/WT
S210
8W-70-19
A1 12RD WT
C233
A1 12RD WT
A1 12RD WT
A1 12RD WT
INSTRUMENT CLUSTER
C222
AIRBAG WARNING LAMP
(3)
F75 18VT
IGNITION SWITCH
(4)
(7)
C228
GROUND
CCD BUS (+)
CCD BUS (-)
(1)
START
ACC
START
ACC
RUN
OFF
RUN
OFF
(2)
(8)
(9)
C222
Z1 20BK
D1 18VT BR
D2 18WT BK
Z2 20BK OR
TWISTED PAIR
(5)
(2)
C228
S216
8W-70-20
S205
8W-70-18
S204
8W-70-17
S203
8W-70-17
A22 12BK OR
A21 12DB GY
A250 10RD
Z1 16BK
S202
8W-70-16
Z2 18BK OR
C307
Z1 14BK
C301
Z1 14BK
S201
8W-70-16
F75 18VT
JUNCTION BLOCK
(10)
C201
(2)
C202
(4)
C163
JUNCTION BLOCK (8W-12-13)
JUNCTION BLOCK (8W-12-10, 14)
FUSE 22 10A
FUSE 4 10A
FUSE 7 20A
(1)
C317
(2)
C318
(8)
C200
G5 18DB/WT
F20 18WT
G304
8W-15-8
S302
8W-70-24
S306
8W-70-25
S307
8W-70-26
C302
C308
C308
Z6 16BK PK
G303
8W-15-7
11 GROUND
2 FUSED IGN SW OUTPUT (RUN)
1 FUSED IGN SW OUTPUT (START/RUN)
3 CCD BUS (+)
4 CCD BUS (-)
AIRBAG CONTROL MODULE

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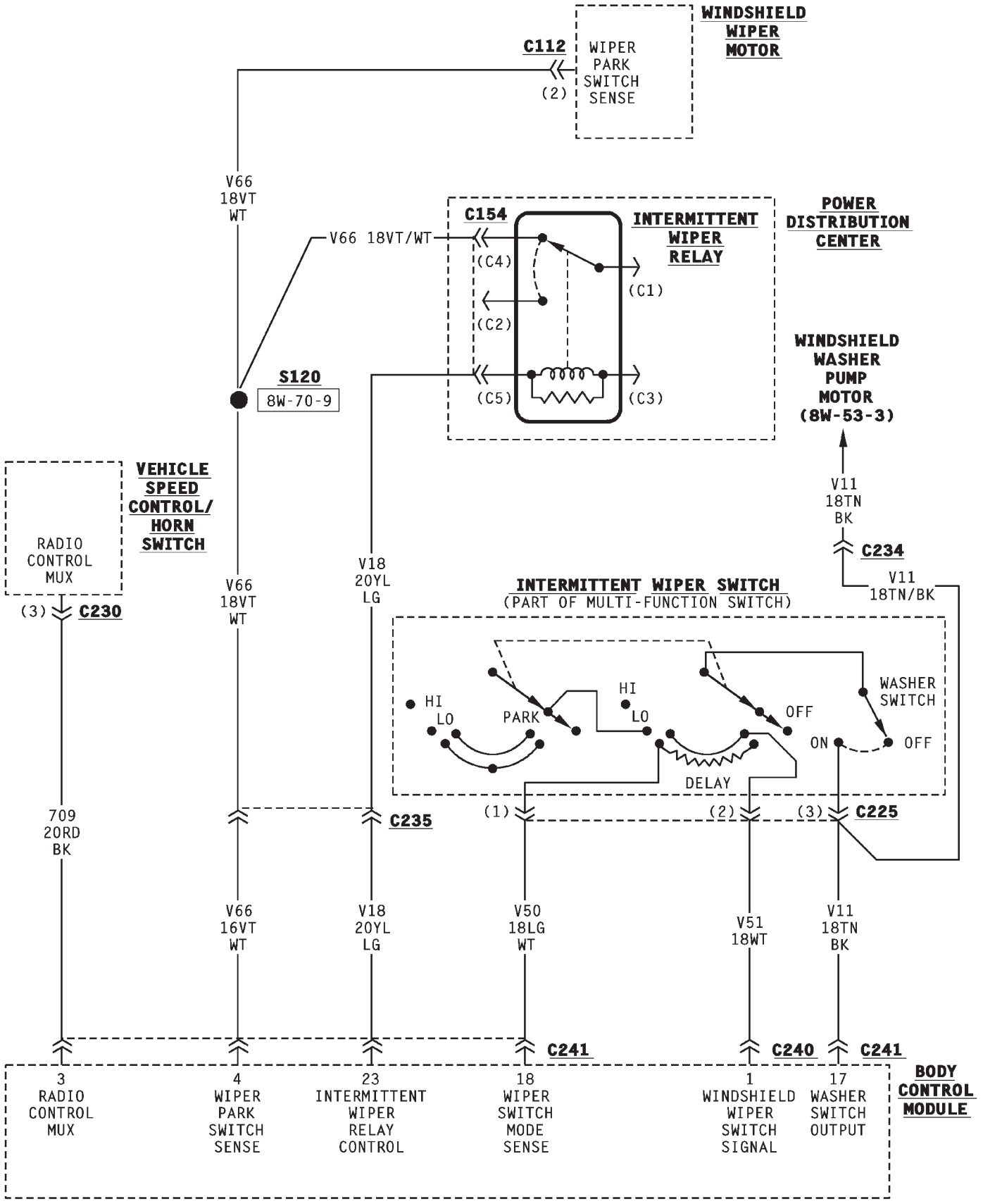
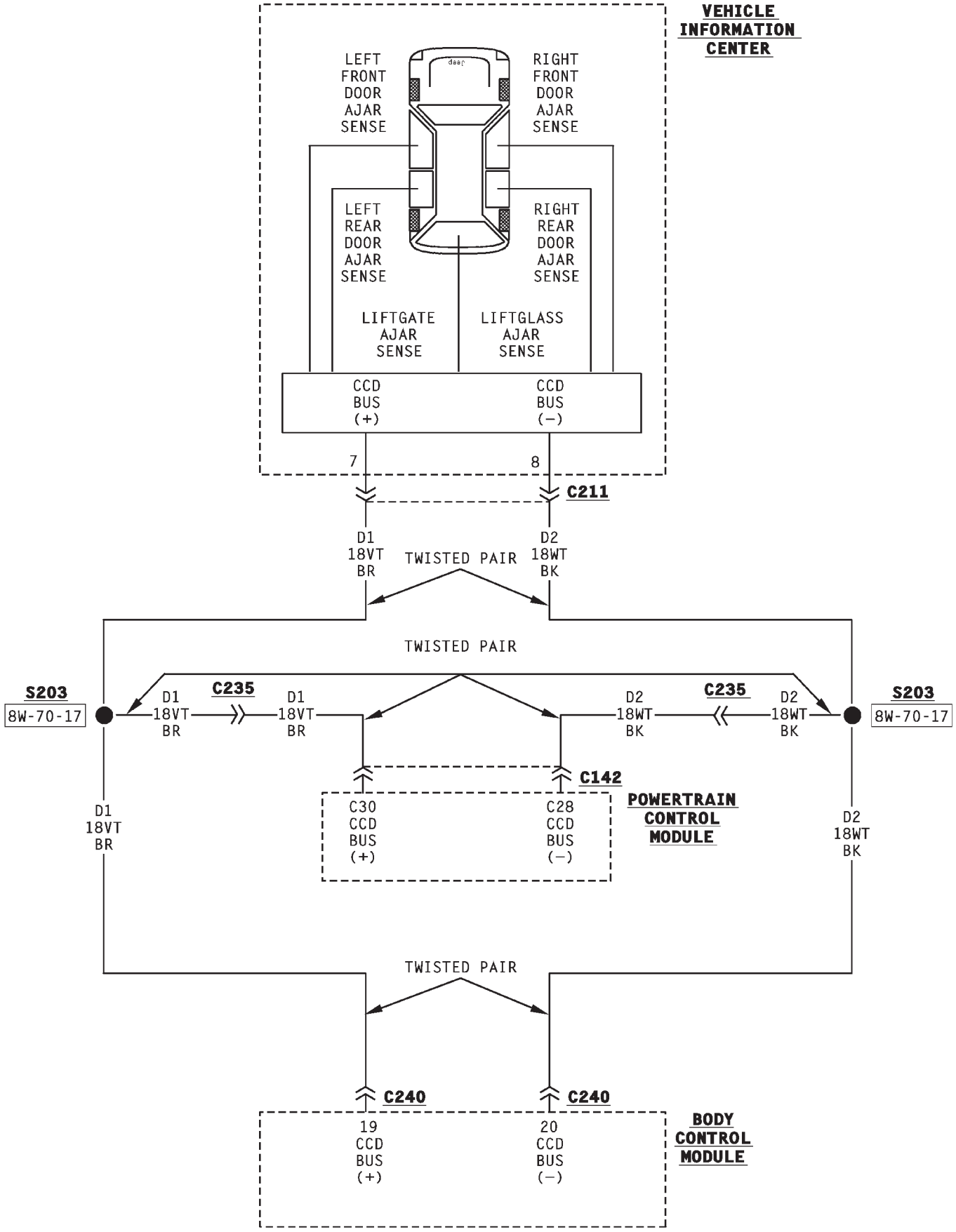

WINDSHIELD WIPER MOTOR
C112
WIPER PARK SWITCH SENSE
(2)
V66 18VT WT
V66 18VT/WT
C154
INTERMITTENT WIPER RELAY
(C4)
(C1)
(C2)
(C5)
(C3)
POWER DISTRIBUTION CENTER
S120
8W-70-9
WINDSHIELD WASHER PUMP MOTOR (8W-53-3)
V11 18TN BK
C234
V11 18TN/BK
VEHICLE SPEED CONTROL/ HORN SWITCH
RADIO CONTROL MUX
(3)
C230
V18 20YL LG
INTERMITTENT WIPER SWITCH
(PART OF MULTI-FUNCTION SWITCH)
HI
LO
PARK
HI
LO
OFF
WASHER SWITCH
ON
OFF
DELAY
709 20RD BK
C235
(1)
(2)
(3)
C225
V66 16VT WT
V18 20YL LG
V50 18LG WT
V51 18WT
V11 18TN BK
C241
C240
C241
3 RADIO CONTROL MUX
4 WIPER PARK SWITCH SENSE
23 INTERMITTENT WIPER RELAY CONTROL
18 WIPER SWITCH MODE SENSE
1 WINDSHIELD WIPER SWITCH SIGNAL
17 WASHER SWITCH OUTPUT
BODY CONTROL MODULE


VEHICLE INFORMATION CENTER
LEFT FRONT DOOR AJAR SENSE
RIGHT FRONT DOOR AJAR SENSE
LEFT REAR DOOR AJAR SENSE
RIGHT REAR DOOR AJAR SENSE
LIFTGATE AJAR SENSE
LIFTGLASS AJAR SENSE
CCD BUS (+)
CCD BUS (−)
7
8
C211
D1 18VT BR
D2 18WT BK
TWISTED PAIR
TWISTED PAIR
S203
8W-70-17
C235
D1 18VT BR
D1 18VT BR
D2 18WT BK
C235
D2 18WT BK
S203
8W-70-17
C142
C30 CCD BUS (+)
C28 CCD BUS (−)
POWERTRAIN CONTROL MODULE
D1 18VT BR
D2 18WT BK
TWISTED PAIR
C240
C240
19 CCD BUS (+)
20 CCD BUS (−)
BODY CONTROL MODULE

# 8W-48 REAR WINDOW DEFOGGER

## DESCRIPTION AND OPERATION

### REAR WINDOW DEFOGGER

The Body Control Module (BCM) operates the rear window defogger system through a relay located in the junction block. When the operator presses the rear window defogger switch, the switch connects circuit C80 from the BCM to ground circuit Z1. In response, the BCM grounds the coil side of the rear window defogger relay on circuit C14.

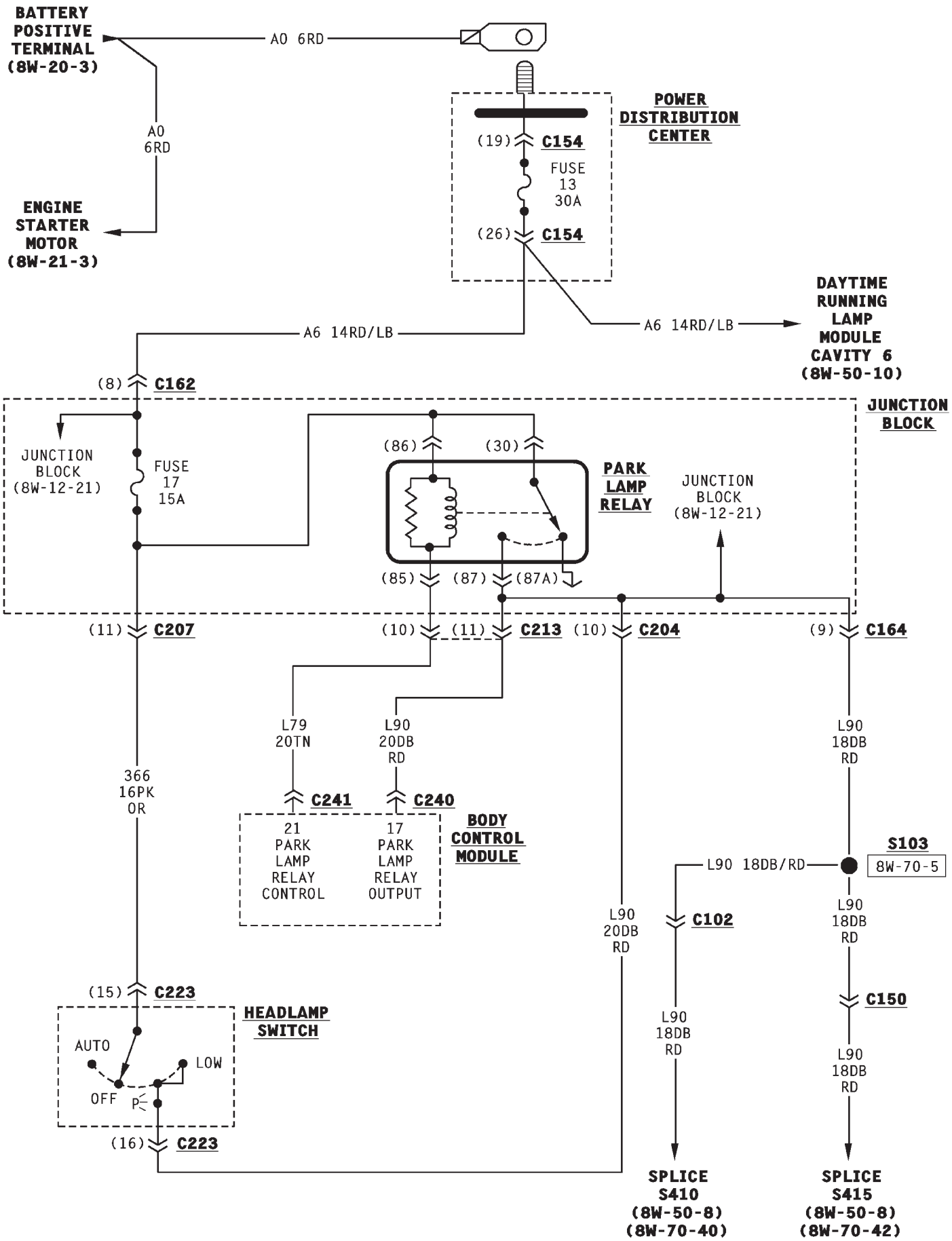
When the BCM grounds the rear window defogger relay coil, the contacts close and connect circuit A900 from fuse 3 in the Power Distribution Center (PDC) to circuit C15. Circuit C15 supplies power to the rear window defogger grid. Circuit A900 also powers the coil side of the relay. Circuit Z1 grounds the rear window defogger grid.

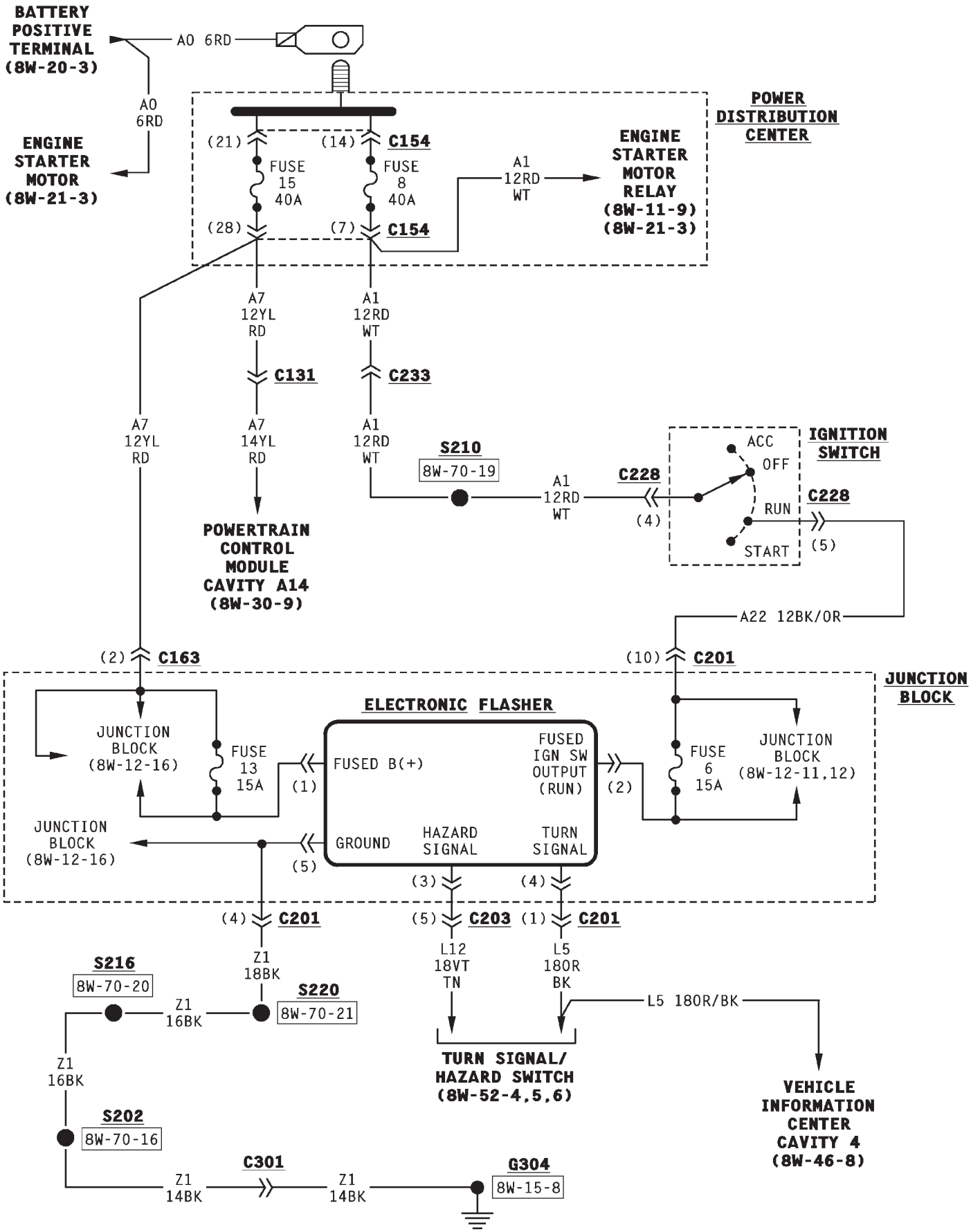
Internal to the junction block, circuit C15 splices to feed circuit C16 through fuse 10. Circuit C16 feeds the Light Emitting Diode (LED) in the rear window defogger switch.

## SCHEMATICS AND DIAGRAMS

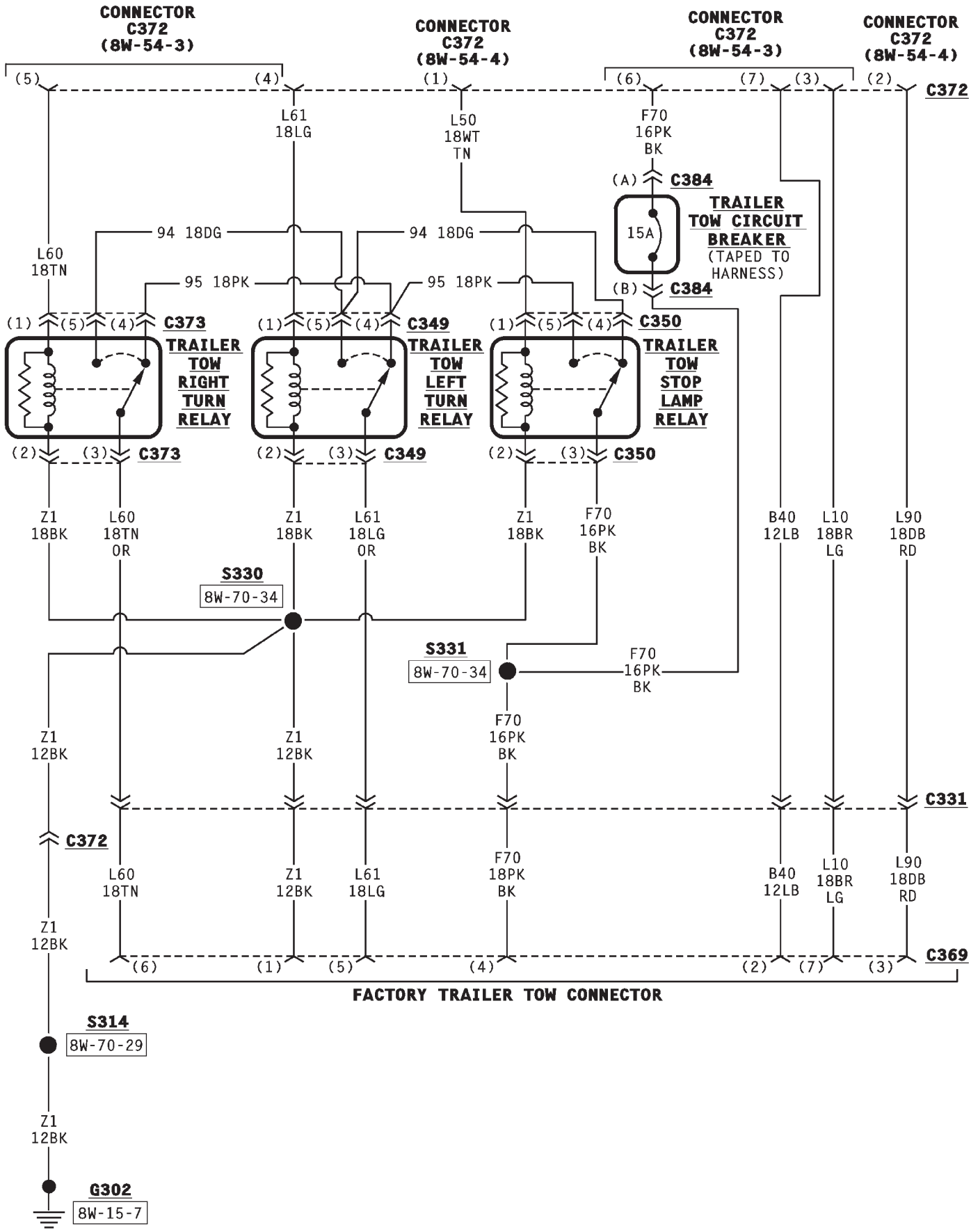
### WIRING DIAGRAM INDEX

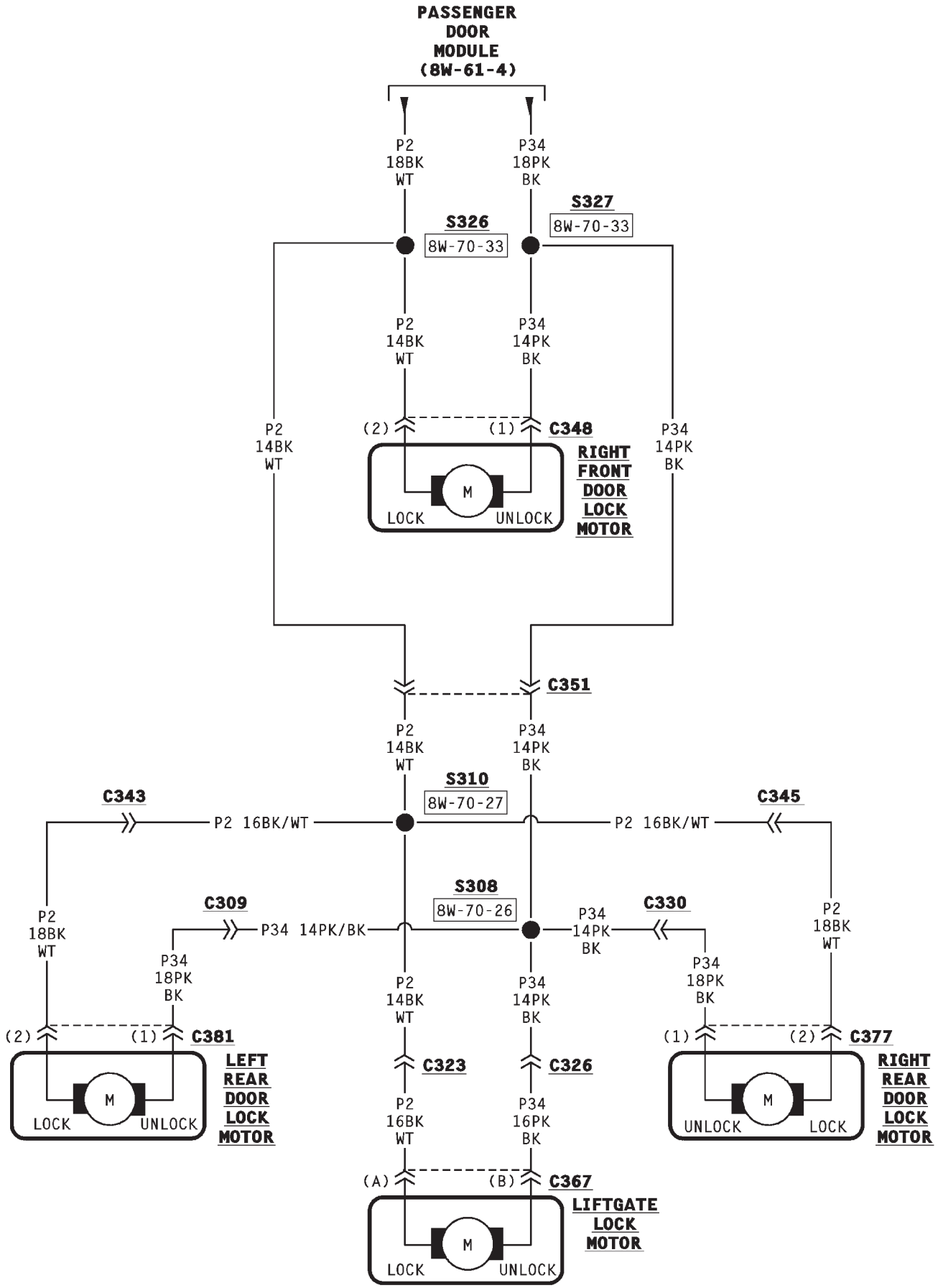
The following index covers all components found in this section of the wiring diagrams. If the component you are looking for is not found here, refer to section 8W-02 for a complete list of all components shown in the wiring diagrams.

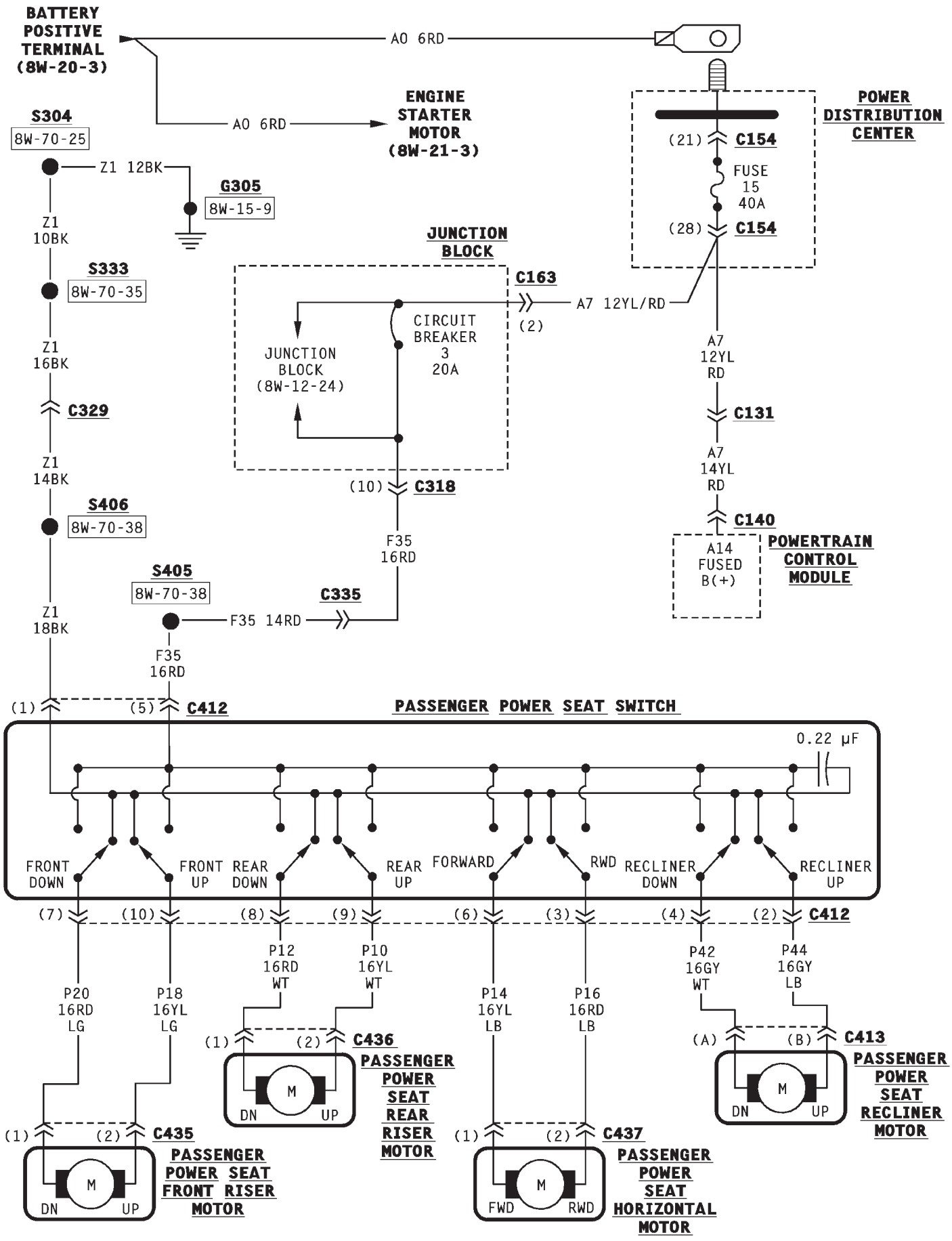

BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
POWER DISTRIBUTION CENTER
(19) C154
FUSE 13 30A
(26) C154
A6 14RD/LB
A6 14RD/LB
DAYTIME RUNNING LAMP MODULE CAVITY 6 (8W-50-10)
(8) C162
JUNCTION BLOCK
JUNCTION BLOCK (8W-12-21)
FUSE 17 15A
(86)
(30)
PARK LAMP RELAY
JUNCTION BLOCK (8W-12-21)
(85)
(87)
(87A)
(11) C207
(10) (11) C213
(10) C204
(9) C164
L79 20TN
L90 20DB RD
L90 18DB RD
366 16PK OR
C241
C240
21 PARK LAMP RELAY CONTROL
17 PARK LAMP RELAY OUTPUT
BODY CONTROL MODULE
S103
8W-70-5
L90 18DB/RD
C102
L90 20DB RD
L90 18DB RD
C150
(15) C223
HEADLAMP SWITCH
AUTO
LOW
OFF
P
L90 18DB RD
L90 18DB RD
(16) C223
SPLICE S410 (8W-50-8) (8W-70-40)
SPLICE S415 (8W-50-8) (8W-70-42)


BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
POWER DISTRIBUTION CENTER
(21)
(14)
C154
FUSE 15 40A
FUSE 8 40A
(28)
(7)
C154
A1 12RD WT
ENGINE STARTER MOTOR RELAY (8W-11-9) (8W-21-3)
A7 12YL RD
A1 12RD WT
C131
C233
A7 12YL RD
A7 14YL RD
A1 12RD WT
S210
8W-70-19
A1 12RD WT
C228
(4)
ACC
OFF
RUN
START
IGNITION SWITCH
C228
(5)
POWERTRAIN CONTROL MODULE CAVITY A14 (8W-30-9)
A22 12BK/OR
(2)
C163
(10)
C201
JUNCTION BLOCK
ELECTRONIC FLASHER
JUNCTION BLOCK (8W-12-16)
FUSE 13 15A
(1)
FUSED B(+)
FUSED IGN SW OUTPUT (RUN)
(2)
FUSE 6 15A
JUNCTION BLOCK (8W-12-11,12)
JUNCTION BLOCK (8W-12-16)
(5)
GROUND
HAZARD SIGNAL
TURN SIGNAL
(3)
(4)
(4)
C201
(5)
C203
(1)
C201
Z1 18BK
L12 18VT TN
L5 18OR BK
L5 18OR/BK
S216
8W-70-20
Z1 16BK
S220
8W-70-21
Z1 16BK
S202
8W-70-16
TURN SIGNAL/ HAZARD SWITCH (8W-52-4,5,6)
VEHICLE INFORMATION CENTER CAVITY 4 (8W-46-8)
C301
Z1 14BK
Z1 14BK
G304
8W-15-8

## WITH FACTORY TRAILER TOW




PASSENGER DOOR MODULE (8W-61-4)
P2 18BK WT
P34 18PK BK
S326
8W-70-33
S327
8W-70-33
P2 14BK WT
P34 14PK BK
P2 14BK WT
(2)
(1)
C348
RIGHT FRONT DOOR LOCK MOTOR
M
LOCK
UNLOCK
P34 14PK BK
C351
P2 14BK WT
P34 14PK BK
S310
8W-70-27
C343
P2 16BK/WT
C345
P2 16BK/WT
P2 18BK WT
C309
P34 14PK/BK
S308
8W-70-26
P34 14PK BK
C330
P2 18BK WT
P34 18PK BK
P34 18PK BK
P2 14BK WT
P34 14PK BK
(2)
(1)
C381
LEFT REAR DOOR LOCK MOTOR
(1)
(2)
C377
RIGHT REAR DOOR LOCK MOTOR
C323
C326
P2 16BK WT
P34 16PK BK
(A)
(B)
C367
LIFTGATE LOCK MOTOR

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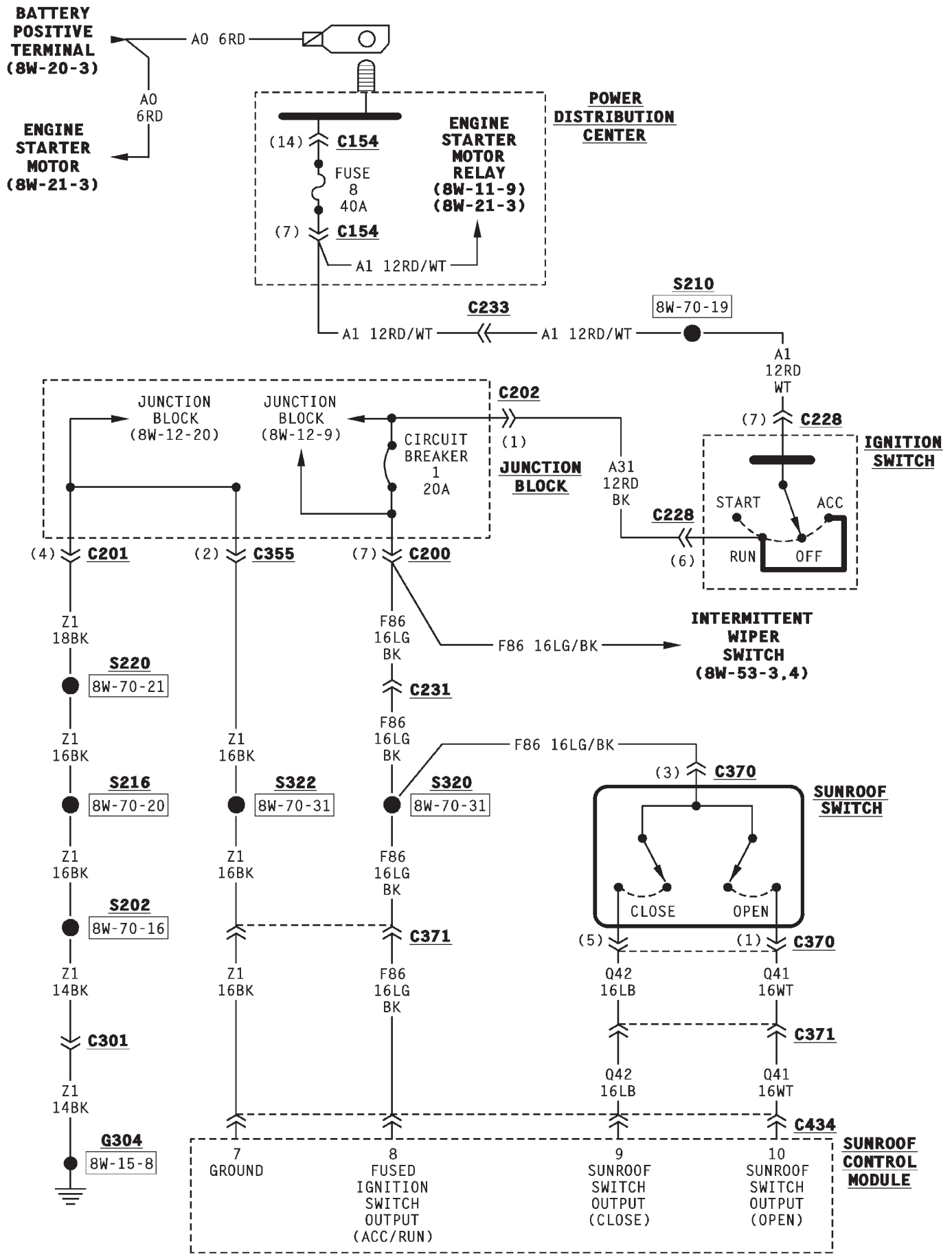
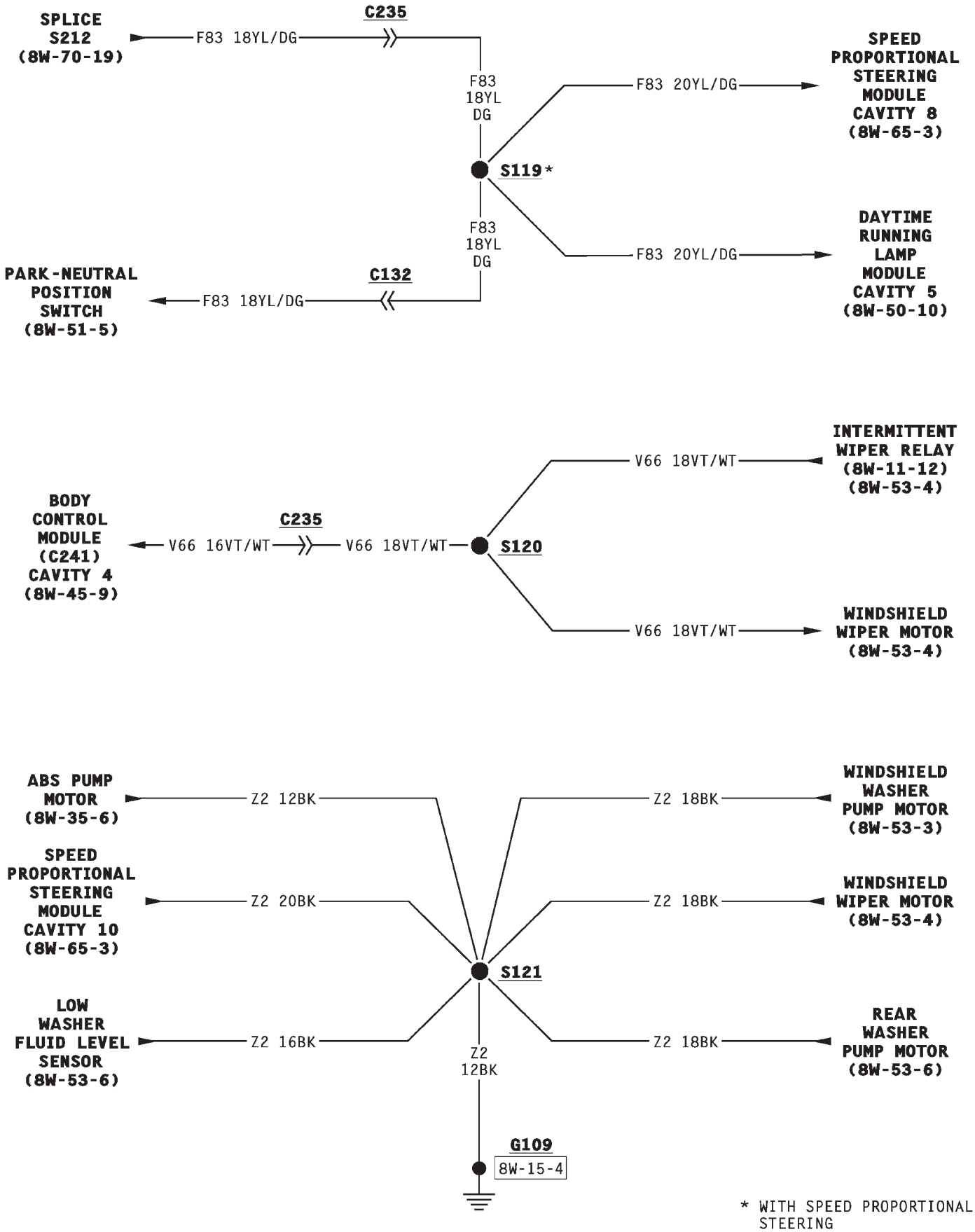
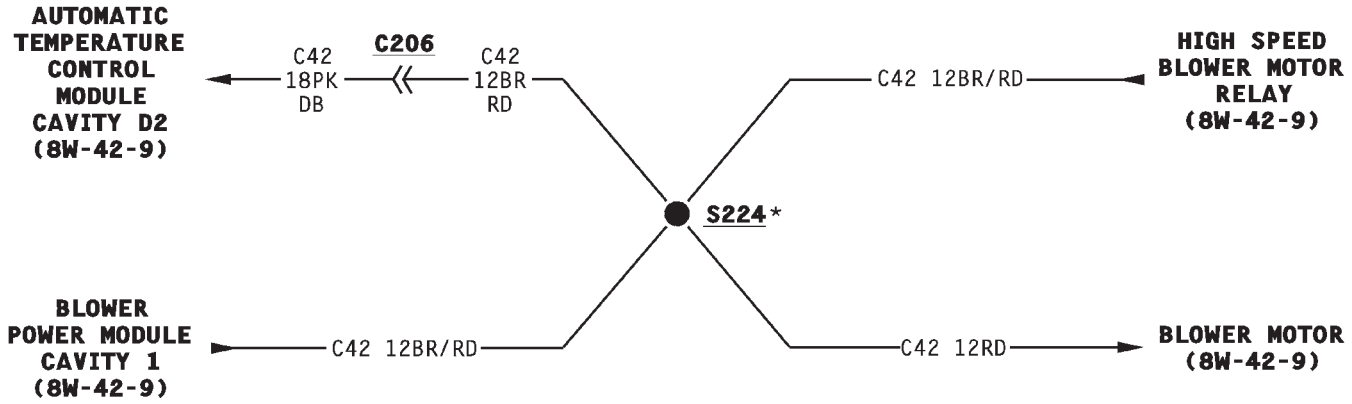
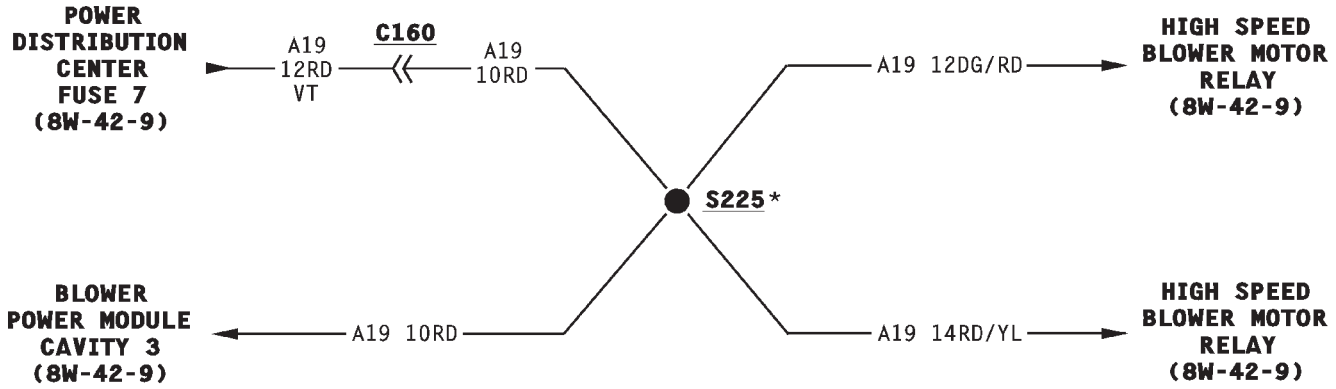
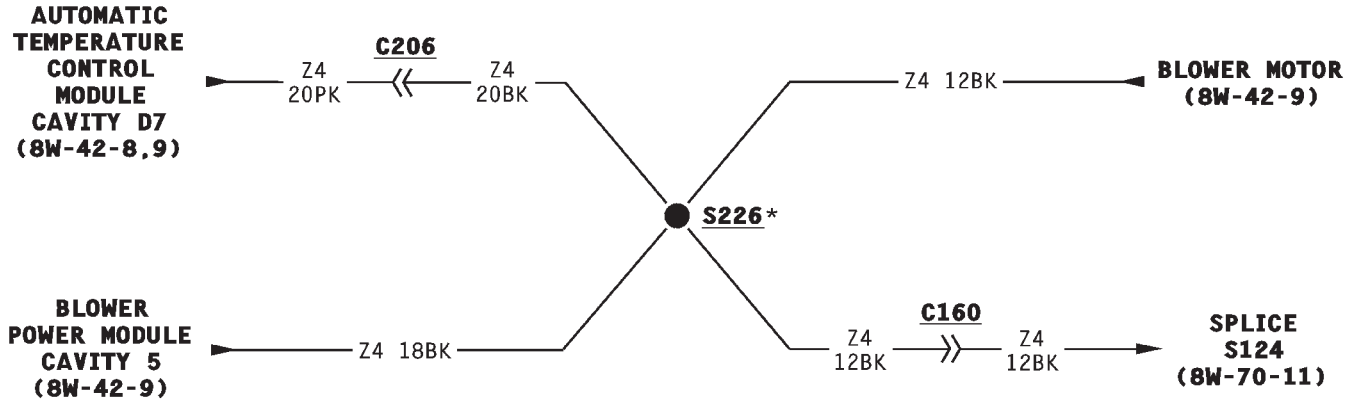

BATTERY POSITIVE TERMINAL (8W-20-3)
A0 6RD
A0 6RD
ENGINE STARTER MOTOR (8W-21-3)
POWER DISTRIBUTION CENTER
(14) C154
FUSE 8 40A
(7) C154
ENGINE STARTER MOTOR RELAY (8W-11-9) (8W-21-3)
A1 12RD/WT
C233
S210
8W-70-19
A1 12RD/WT
A1 12RD/WT
A1 12RD WT
(7) C228
IGNITION SWITCH
START
ACC
RUN
OFF
C228
(6)
JUNCTION BLOCK (8W-12-20)
JUNCTION BLOCK (8W-12-9)
CIRCUIT BREAKER 1 20A
C202
(1)
JUNCTION BLOCK
A31 12RD BK
(4) C201
(2) C355
(7) C200
Z1 18BK
S220
8W-70-21
Z1 16BK
S216
8W-70-20
Z1 16BK
S202
8W-70-16
Z1 14BK
C301
Z1 14BK
G304
8W-15-8
Z1 16BK
Z1 16BK
Z1 16BK
F86 16LG BK
C231
F86 16LG BK
S322
8W-70-31
S320
8W-70-31
F86 16LG BK
F86 16LG BK
C371
Z1 16BK
F86 16LG BK
F86 16LG/BK
INTERMITTENT WIPER SWITCH (8W-53-3,4)
(3) C370
SUNROOF SWITCH
CLOSE
OPEN
(5)
(1) C370
Q42 16LB
Q41 16WT
C371
Q42 16LB
Q41 16WT
C434
SUNROOF CONTROL MODULE
7 GROUND
8 FUSED IGNITION SWITCH OUTPUT (ACC/RUN)
9 SUNROOF SWITCH OUTPUT (CLOSE)
10 SUNROOF SWITCH OUTPUT (OPEN)

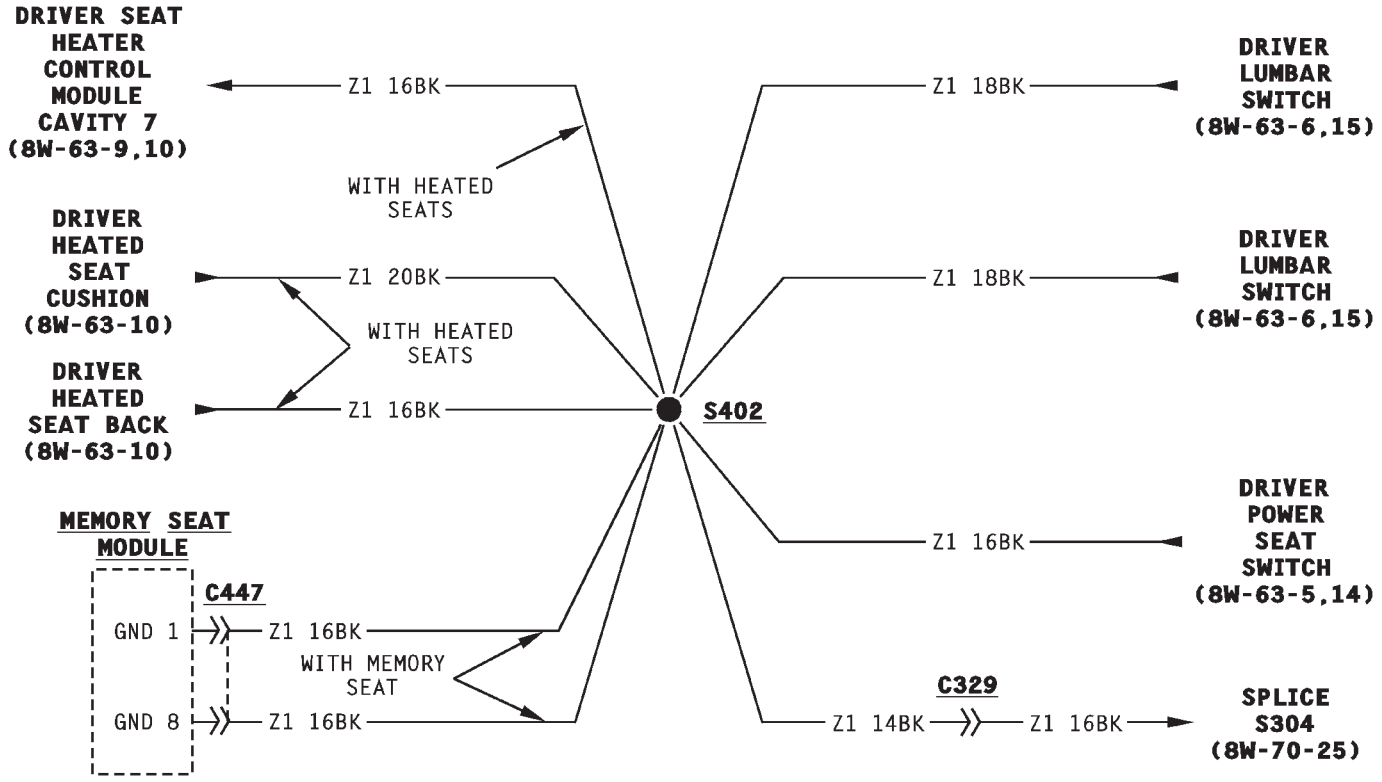

SPLICE S212 (8W-70-19)
F83 18YL/DG
C235
F83 18YL DG
S119*
F83 20YL/DG
SPEED PROPORTIONAL STEERING MODULE CAVITY 8 (8W-65-3)
F83 20YL/DG
DAYTIME RUNNING LAMP MODULE CAVITY 5 (8W-50-10)
F83 18YL DG
C132
F83 18YL/DG
PARK-NEUTRAL POSITION SWITCH (8W-51-5)
V66 18VT/WT
INTERMITTENT WIPER RELAY (8W-11-12) (8W-53-4)
BODY CONTROL MODULE (C241) CAVITY 4 (8W-45-9)
C235
V66 16VT/WT
V66 18VT/WT
S120
V66 18VT/WT
WINDSHIELD WIPER MOTOR (8W-53-4)
ABS PUMP MOTOR (8W-35-6)
Z2 12BK
Z2 18BK
WINDSHIELD WASHER PUMP MOTOR (8W-53-3)
SPEED PROPORTIONAL STEERING MODULE CAVITY 10 (8W-65-3)
Z2 20BK
Z2 18BK
WINDSHIELD WIPER MOTOR (8W-53-4)
S121
LOW WASHER FLUID LEVEL SENSOR (8W-53-6)
Z2 16BK
Z2 18BK
REAR WASHER PUMP MOTOR (8W-53-6)
Z2 12BK
G109
8W-15-4
* WITH SPEED PROPORTIONAL STEERING

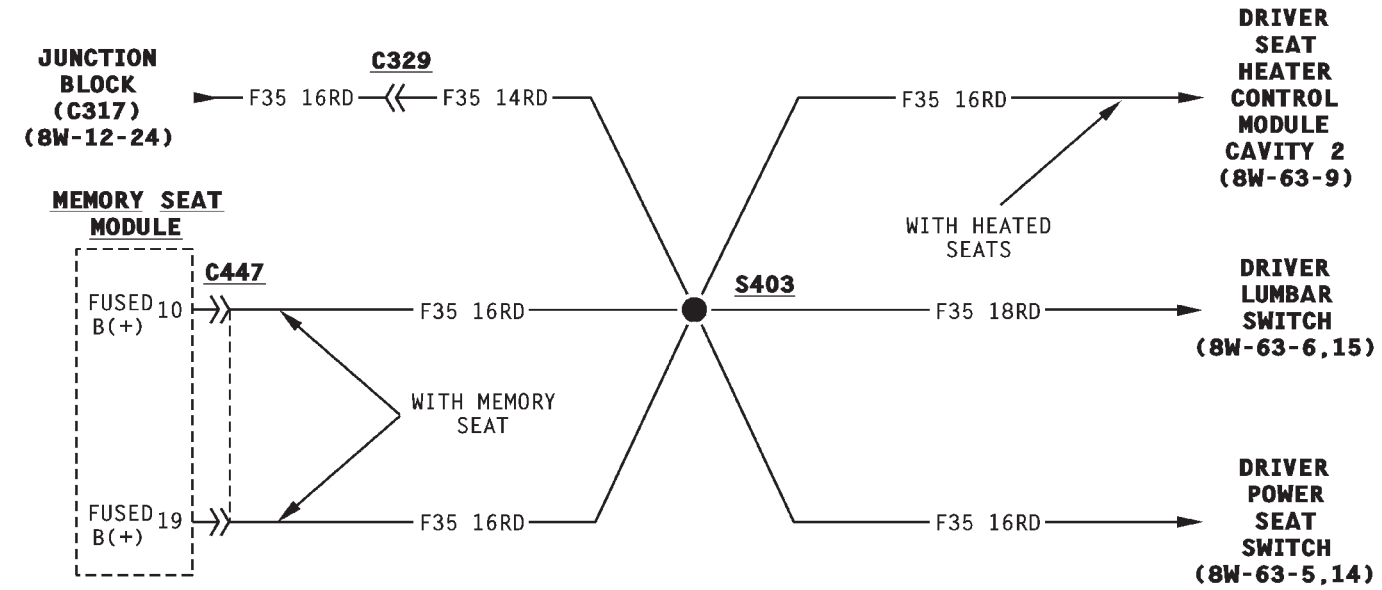

AUTOMATIC TEMPERATURE CONTROL MODULE CAVITY D2 (8W-42-9)
C42 18PK DB
C206
C42 12BR RD
HIGH SPEED BLOWER MOTOR RELAY (8W-42-9)
C42 12BR/RD
S224*
BLOWER POWER MODULE CAVITY 1 (8W-42-9)
C42 12BR/RD
C42 12RD
BLOWER MOTOR (8W-42-9)

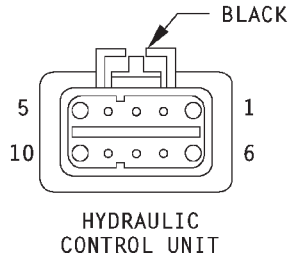

POWER DISTRIBUTION CENTER FUSE 7 (8W-42-9)
A19 12RD VT
C160
A19 10RD
HIGH SPEED BLOWER MOTOR RELAY (8W-42-9)
A19 12DG/RD
S225*
BLOWER POWER MODULE CAVITY 3 (8W-42-9)
A19 10RD
A19 14RD/YL
HIGH SPEED BLOWER MOTOR RELAY (8W-42-9)


AUTOMATIC TEMPERATURE CONTROL MODULE CAVITY D7 (8W-42-8,9)
Z4 20PK
C206
Z4 20BK
BLOWER MOTOR (8W-42-9)
Z4 12BK
S226*
BLOWER POWER MODULE CAVITY 5 (8W-42-9)
Z4 18BK
C160
Z4 12BK
Z4 12BK
SPLICE S124 (8W-70-11)

* WITH ATC


DRIVER SEAT HEATER CONTROL MODULE CAVITY 7 (8W-63-9,10)
Z1 16BK
WITH HEATED SEATS
DRIVER HEATED SEAT CUSHION (8W-63-10)
Z1 20BK
WITH HEATED SEATS
DRIVER HEATED SEAT BACK (8W-63-10)
Z1 16BK
S402
Z1 18BK
DRIVER LUMBAR SWITCH (8W-63-6,15)
Z1 18BK
DRIVER LUMBAR SWITCH (8W-63-6,15)
Z1 16BK
DRIVER POWER SEAT SWITCH (8W-63-5,14)
MEMORY SEAT MODULE
C447
GND 1
Z1 16BK
WITH MEMORY SEAT
GND 8
Z1 16BK
C329
Z1 14BK
Z1 16BK
SPLICE S304 (8W-70-25)

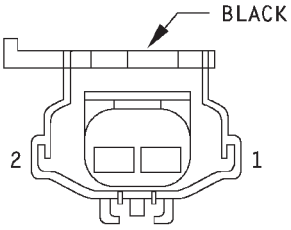

JUNCTION BLOCK (C317) (8W-12-24)
C329
F35 16RD
F35 14RD
MEMORY SEAT MODULE
C447
FUSED B(+) 10
F35 16RD
WITH MEMORY SEAT
FUSED B(+) 19
F35 16RD
S403
F35 16RD
WITH HEATED SEATS
DRIVER SEAT HEATER CONTROL MODULE CAVITY 2 (8W-63-9)
F35 18RD
DRIVER LUMBAR SWITCH (8W-63-6,15)
F35 16RD
DRIVER POWER SEAT SWITCH (8W-63-5,14)




HYDRAULIC
CONTROL UNIT

**C107**

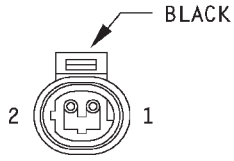
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | B47 16RD/LB | ABS WARNING LAMP RELAY CONTROL |
| 2 | B251 18WT/BK | REAR INLET VALVE CONTROL |
| 3 | B249 18WT/TN | RIGHT FRONT INLET VALVE CONTROL |
| 4 | B245 18WT/LG | LEFT FRONT INLET VALVE CONTROL |
| 5 | – | – |
| 6 | – | – |
| 7 | B254 18DG/OR | REAR OUTLET VALVE CONTROL |
| 8 | B248 18DG/WT | RIGHT FRONT OUTLET VALVE CONTROL |
| 9 | B243 18DG/BK | LEFT FRONT OUTLET VALVE CONTROL |
| 10 | B47 16RD/LB | ABS WARNING LAMP RELAY CONTROL |




ABS PUMP MOTOR

**C108**

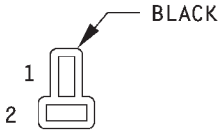
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | B82 12BR/WT | ABS MAIN RELAY OUTPUT |
| 2 | Z2 12BK | GROUND |




LEFT FRONT
WHEEL SPEED SENSOR

**C109**

| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | B8 20RD/DB | LEFT FRONT WHEEL SPEED SENSOR (-) |
| 2 | B9 20RD | LEFT FRONT WHEEL SPEED SENSOR (+) |



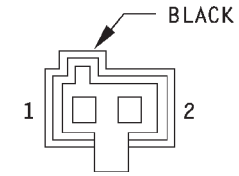

REAR WASHER
PUMP MOTOR

**C110**

| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | V20 18WT/BK | REAR WASHER MOTOR CONTROL |
| 2 | Z2 18BK | GROUND |

## C154

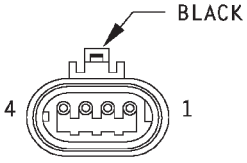
**POWER DISTRIBUTION CENTER**
**(SEE 8W-11-2)**




A/C LOW PRESSURE SWITCH

## C155

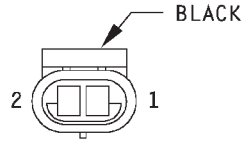
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | C3 18DB/BK | A/C PRESSURE SWITCH SENSE |
| 2 | C21 18DB/OR | A/C PRESSURE SWITCH SENSE |




VEHICLE SPEED CONTROL SERVO

## C156

| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | V36 20TN/RD | SPEED CONTROL VACUUM SOLENOID CONTROL |
| 2 | V35 20LG/RD | SPEED CONTROL VENT SOLENOID CONTROL |
| 3 | V30 20DB/LG | SPEED CONTROL STOP LAMP SWITCH OUTPUT |
| 4 | Z4 20BK | GROUND |

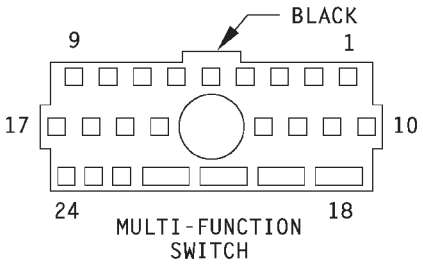



ENGINE COOLANT LEVEL SENSOR

## C157

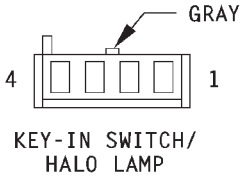
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | G18 16PK/BK | ENGINE COOLANT LEVEL SENSE |
| 2 | Z1 16BK | GROUND |

## C225

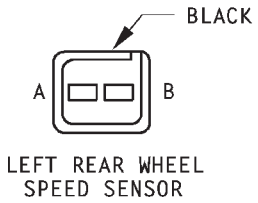



| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | V50 18LG/WT | WIPER SWITCH MODE SENSE |
| 2 | V51 18WT | WINDSHIELD WIPER SWITCH SIGNAL |
| 3 | V11 18TN/BK | WASHER SWITCH OUTPUT |
| | V11 18TN/BK | WASHER SWITCH OUTPUT |
| 4 | F86 16LG/BK | FUSED IGNITION SWITCH OUTPUT (ACC/RUN) |
| 5 | V4 18RD/YL | WIPER SWITCH HIGH SPEED OUTPUT |
| 6 | V3 18BR/WT | WIPER SWITCH LOW SPEED OUTPUT |
| | V3 18BR/WT | WIPER SWITCH LOW SPEED OUTPUT |
| 7 | V6 16DB | FUSED IGNITION SWITCH OUTPUT (ACC/RUN) |
| 8 | V6 16DB | FUSED IGNITION SWITCH OUTPUT (ACC/RUN) |
| 9 | V3 18BR/WT | WIPER SWITCH LOW SPEED OUTPUT |
| 10 | – | – |
| 11 | L64 18TN/DB | RIGHT TURN SIGNAL INDICATOR LAMP |
| 12 | L60 18TN | LEFT TURN SIGNAL INDICATOR LAMP |
| 13 | L12 18VT/TN | HAZARD SIGNAL |
| 14 | – | – |
| 15 | L61 18DG | TURN SIGNAL SWITCH OUTPUT |
| 16 | L65 18LG/DB | TURN SIGNAL SWITCH OUTPUT |
| | L65 18LG/DB | TURN SIGNAL SWITCH OUTPUT |
| 17 | L5 18OR/BK | TURN SIGNAL |
| | L5 18OR/BK | TURN SIGNAL |
| 18 | L4 16VT/OR | DIMMER SWITCH LOW BEAM OUTPUT |
| | L4 16VT/OR | DIMMER SWITCH LOW BEAM OUTPUT |
| 19 | F34 16TN/BK | LOW HEADLAMP SWITCH SENSE |
| | F34 16TN/BK | LOW HEADLAMP SWITCH SENSE |
| 20 | L3 16RD/OR | DIMMER SWITCH HIGH BEAM OUTPUT |
| 21 | L11 16LG/BK | FLASH TO PASS |
| 22 | – | – |
| 23 | – | – |
| 24 | – | – |

## C226



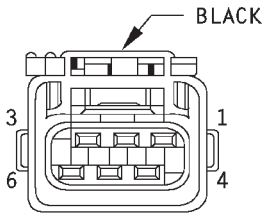

| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | Z1 20BK | GROUND |
| 2 | G26 20LB | KEY-IN IGNITION SWITCH SENSE |
| 3 | M2 20YL | COURTESY LAMP RELAY OUTPUT |
| 4 | M1 20PK | FUSED B(+) |



LEFT REAR WHEEL SPEED SENSOR

**C314**

| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| A | B3 20LG/DB | LEFT REAR WHEEL SPEED SENSOR (-) |
| B | B4 20LG | LEFT REAR WHEEL SPEED SENSOR (+) |

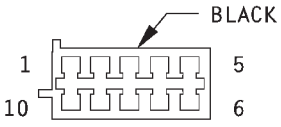


FUEL PUMP MODULE

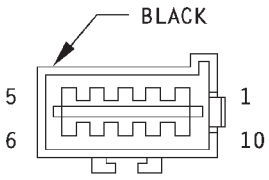
**C315**

| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | A64 16DG/WT | FUEL PUMP RELAY OUTPUT |
| 2 | – | – |
| 3 | G40 20LB/BK | LOW FUEL SENSE |
| 4 | K4 20BK/LB | SENSOR GROUND |
| 5 | – | – |
| 6 | Z1 16BK | GROUND |

**C316** (WITHOUT LAMP OUTAGE MODULE)

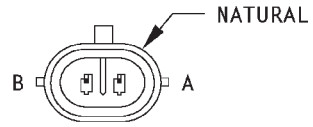



| CAV | CIRCUIT |
|---|---|
| 1 | L36 18LG/OR |
| 2 | L50 18WT/TN |
| 3 | L90 18DB/RD |
| | L90 18DB/RD |
| 4 | L90 18DB/RD |
| | L90 18DB/RD |
| 5 | L90 18DB/RD |
| 6 | L50 18WT/TN |
| 7 | L50 18WT/TN |
| 8 | L50 18WT/TN |
| 9 | G46 20LB/BK |
| 10 | F87 18WT/PK |




| CAV | CIRCUIT |
|---|---|
| 1 | L36 18LG/OR |
| | L36 18LG/OR |
| 2 | L50 18WT/TN |
| 3 | L90 18DB/RD* |
| | L90 20DB/RD |
| 4 | L22 18LB |
| 5 | L21 18LB/WT |
| 6 | L74 18PK/BK |
| 7 | L73 18PK/WT |
| 8 | L87 18DG/WT |
| 9 | Z1 18BK |
| 10 | – |

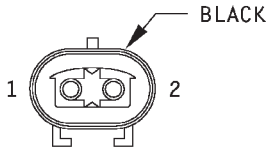
* WITH FACTORY TRAILER TOW OR AFTERMARKET TRAILER TOW




LIFTGLASS LIMIT SWITCH

**C361**

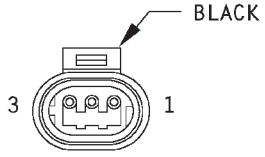
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| A | F70 16PK/BK | FUSED B(+) |
| B | P101 16OR/PK | LIFTGLASS LIMIT SWITCH OUTPUT |




LIFTGLASS RELEASE SOLENOID

**C362**

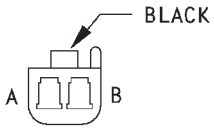
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | P100 14OR/BR | LIFTGLASS PUSH BUTTON OUTPUT |
| 2 | Z1 14BK | GROUND |




LIFTGLASS AJAR SWITCH

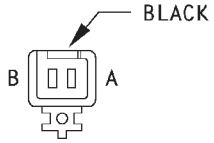
**C363**

| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | Z1 20BK | GROUND |
| 2 | G78 20TN/BK | LIFTGLASS AJAR SWITCH SENSE |
| 3 | – | – |

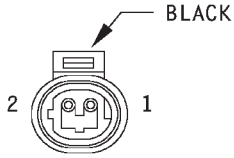



**C364**

| CAV | CIRCUIT |
|---|---|
| A | Z1 20BK |
| B | L90 20DB/RD |



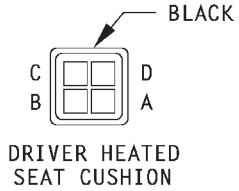

| CAV | CIRCUIT |
|---|---|
| A | Z1 20BK |
| B | L90 20DB/RD |




LIFTGLASS PUSH BUTTON

**C365**

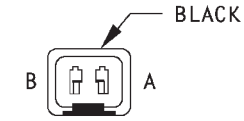
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | P100 14OR/BR | LIFTGLASS PUSH BUTTON OUTPUT |
| 2 | P101 16OR/PK | LIFTGLASS LIMIT SWITCH OUTPUT |




DRIVER HEATED
SEAT CUSHION

**C444**

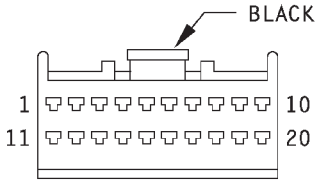
| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| A | P87 16BK/OR | HEATED SEAT DRIVER |
| B | P88 16BR/BK | HEATED SEAT DRIVER |
| C | P7 18LB/BK | DRIVER HEATED SEAT SWITCH OUTPUT |
| D | Z1 20BK | GROUND |




DRIVER HEATED
SEAT BACK

**C445**

| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| A | Z1 16BK | GROUND |
| B | P88 16BR/BK | HEATED SEAT DRIVER |




MEMORY SEAT
MODULE B

**C446**

| CAV | CIRCUIT | FUNCTION |
|---|---|---|
| 1 | P29 20BR/WT | 6 VOLT SENSOR SUPPLY |
| 2 | P28 20BR/RD | SENSOR GROUND |
| 3 | P25 20VT/RD | HORIZONTAL POSITION SENSE |
| 4 | P26 20BR | FRONT RISER POSITION SENSE |
| 5 | P27 20LB/RD | REAR RISER POSITION SENSE |
| 6 | P47 20LB | RECLINER POSITION SENSE |
| 7 | P103 20DB/WT | LUMBAR POSITION SENSE |
| 8 | P21 18RD/LG | FRONT RISER DOWN SWITCH SENSE |
| 9 | P19 18YL/LG | FRONT RISER UP SWITCH SENSE |
| 10 | P13 18RD/WT | REAR RISER DOWN SWITCH SENSE |
| 11 | P11 18YL/WT | REAR RISER UP SWITCH SENSE |
| 12 | P15 18YL/LB | HORIZONTAL FORWARD SWITCH SENSE |
| 13 | P17 18RD/LB | HORIZONTAL REARWARD SWITCH SENSE |
| 14 | P40 18GY/LB | RECLINER UP SWITCH SENSE |
| 15 | P48 18GY/WT | RECLINER DOWN SWITCH SENSE |
| 16 | P105 20LG/DB | LUMBAR FORWARD SWITCH SENSE |
| 17 | P104 20YL/RD | LUMBAR REARWARD SWITCH SENSE |
| 18 | D1 20VT/BR | CCD BUS (+) |
| 19 | D2 20WT/BK | CCD BUS (-) |
| 20 | – | – |

SCHEMATICS AND DIAGRAMS (Continued)

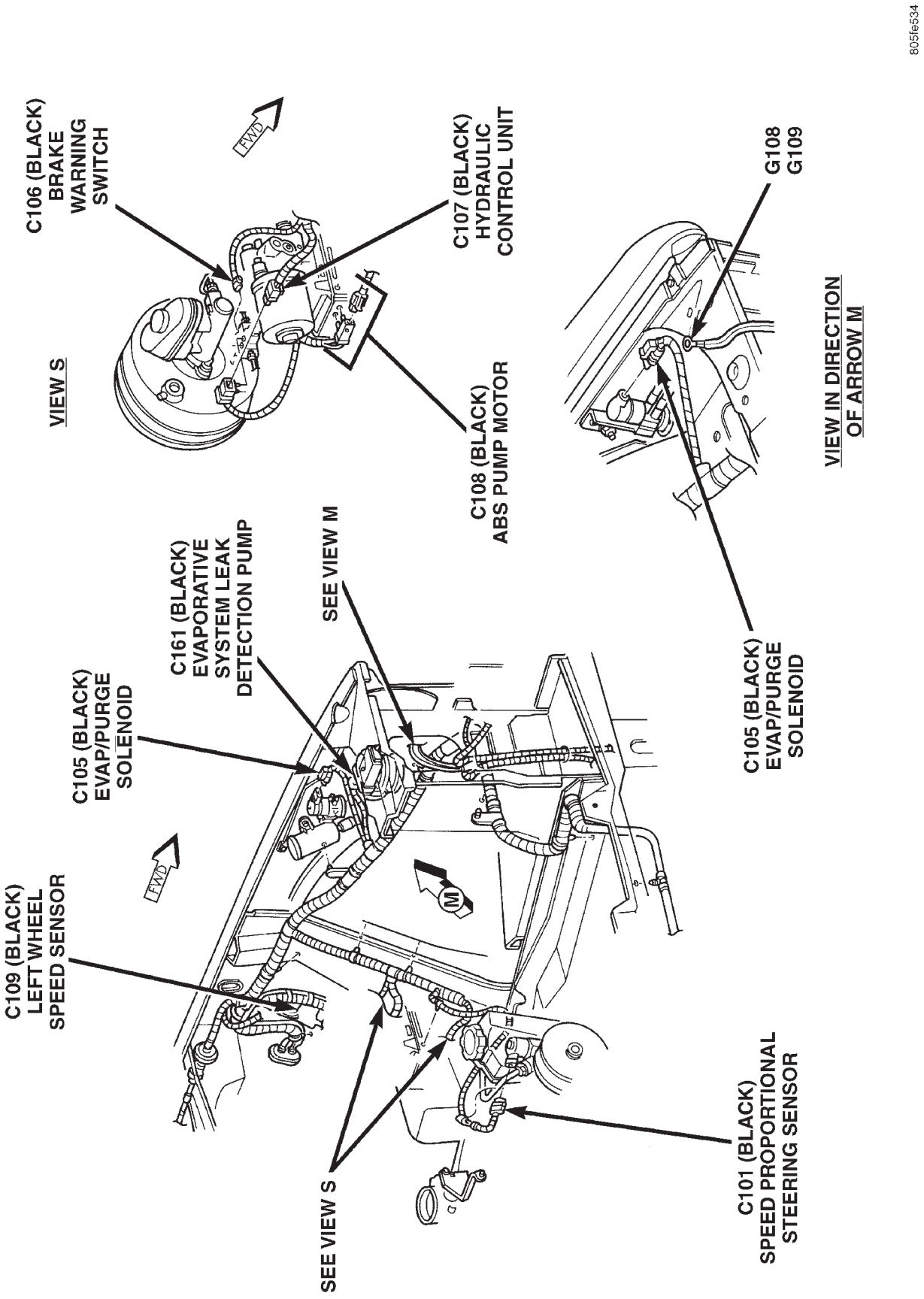



*Fig. 3 Engine Compartment—Right Side*

SCHEMATICS AND DIAGRAMS (Continued)

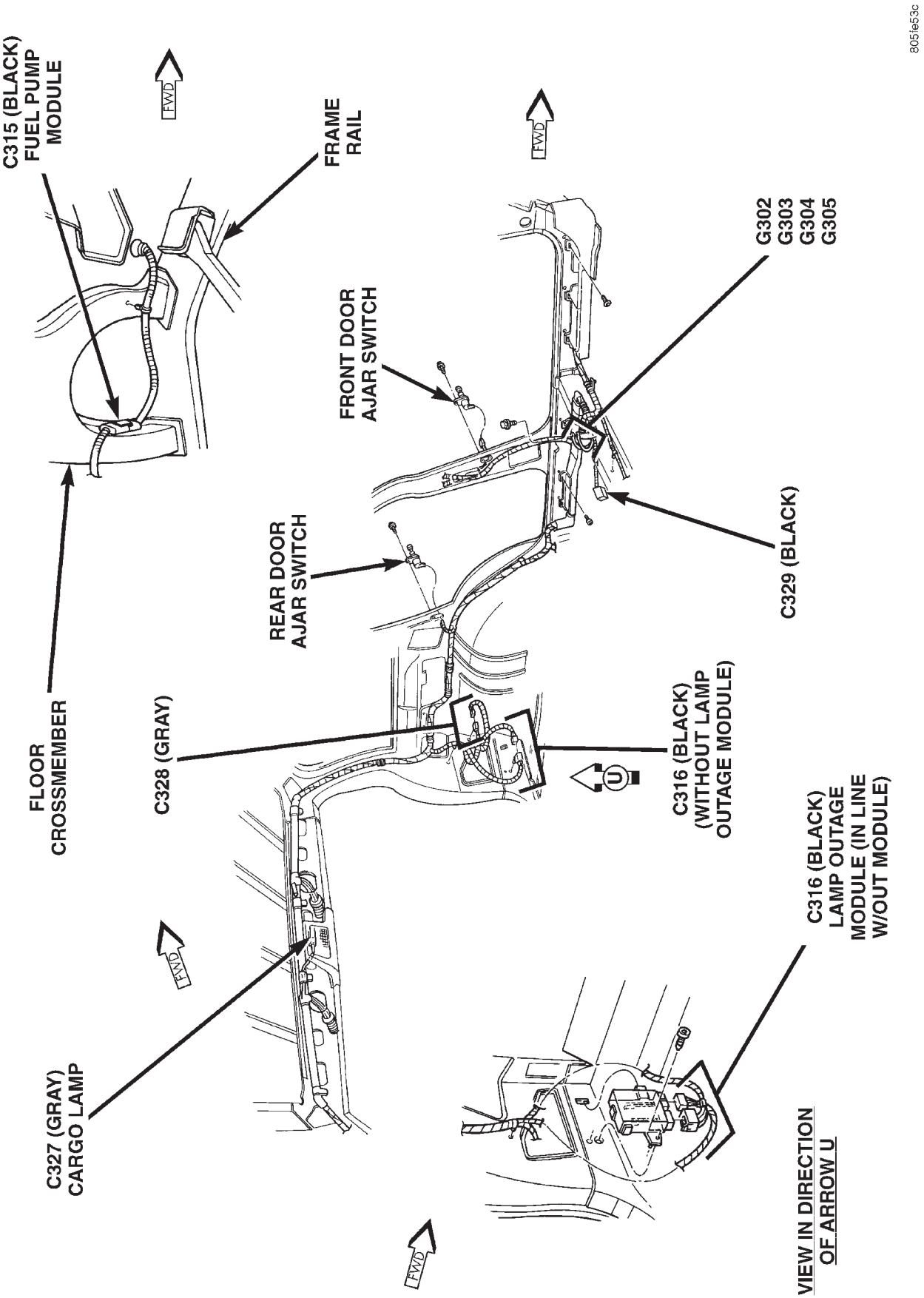



*Fig. 17 Body Connectors—Left Side*

SCHEMATICS AND DIAGRAMS (Continued)

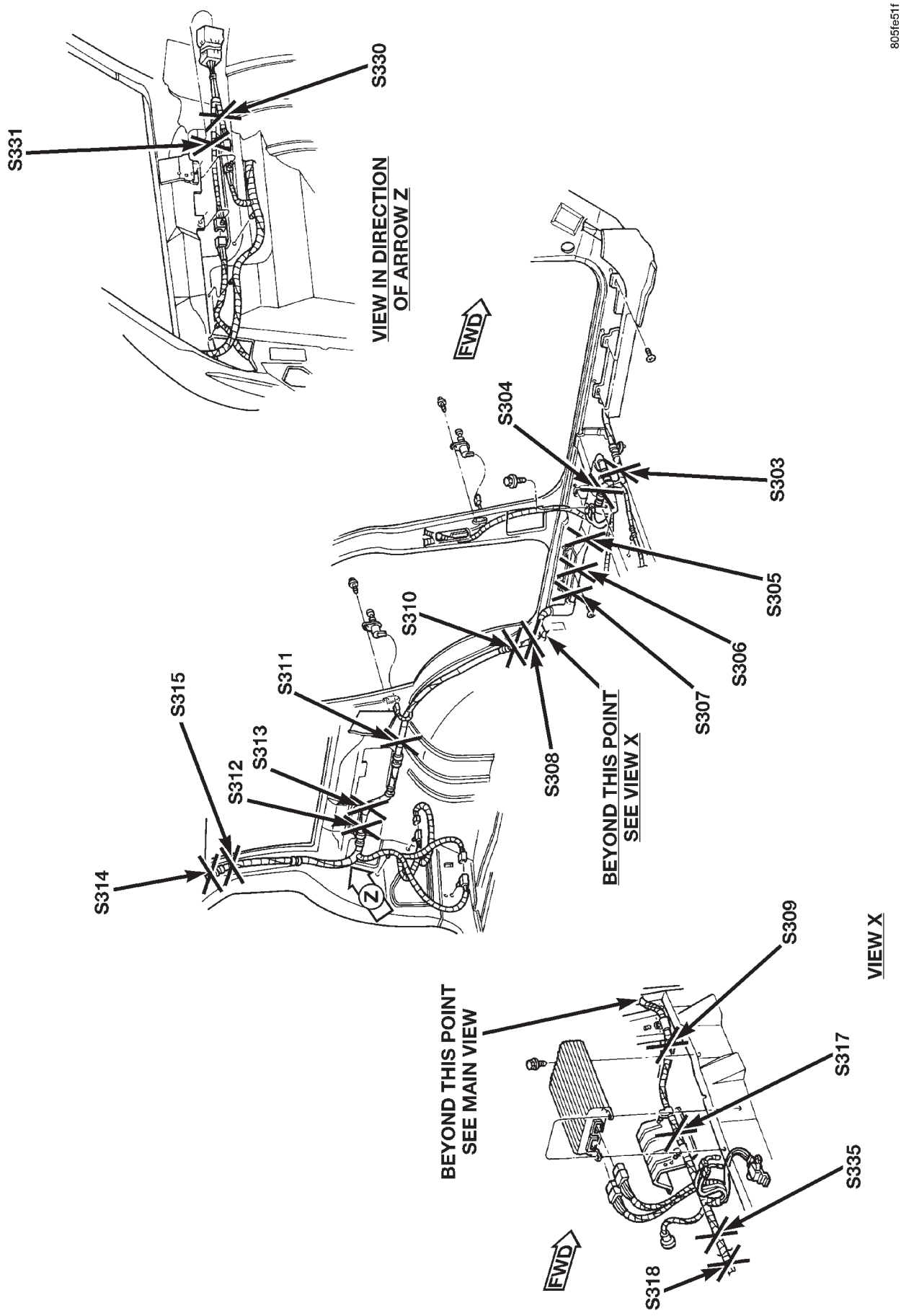



*Fig. 7 Left Body Side Wiring Splices*

DIAGNOSIS AND TESTING (Continued)

hydraulic tappets by the oil pump causing them to lose length and allow valves to seat noisily.

**LOW**

Low oil level may allow oil pump to take in air. When air is fed to the tappets, they lose length, which allows valves to seat noisily. Any leaks on intake side of oil pump through which air can be drawn will create the same tappet action. Check the lubrication system from the intake strainer to the pump cover, including the relief valve retainer cap. When tappet noise is due to aeration, it may be intermittent or constant, and usually more than one tappet will be noisy. When oil level and leaks have been corrected, operate the engine at fast idle. Run engine for a sufficient time to allow all of the air inside the tappets to be bled out.

*TAPPET NOISE DIAGNOSIS*

(1) To determine source of tappet noise, operate engine at idle with cylinder head covers removed.

(2) Feel each valve spring or rocker arm to detect noisy tappet. The noisy tappet will cause the affected spring and/or rocker arm to vibrate or feel rough in operation.

**NOTE: Worn valve guides or cocked springs are sometimes mistaken for noisy tappets. If such is the case, noise may be dampened by applying side thrust on the valve spring. If noise is not appreciably reduced, it can be assumed the noise is in the tappet. Inspect the rocker arm push rod sockets and push rod ends for wear.**

(3) Valve tappet noise ranges from light noise to a heavy click. A light noise is usually caused by excessive leak-down around the unit plunger, or by the plunger partially sticking in the tappet body cylinder. The tappet should be replaced. A heavy click is caused by a tappet check valve not seating, or by foreign particles wedged between the plunger and the tappet body. This will cause the plunger to stick in the down position. This heavy click will be accompanied by excessive clearance between the valve stem and rocker arm as valve closes. In either case, tappet assembly should be removed for inspection and cleaning.

(4) The valve train generates a noise very much like a light tappet noise during normal operation. Care must be taken to ensure that tappets are making the noise. If more than one tappet seems to be noisy, it's probably not the tappets.

## ENGINE OIL PRESSURE

(1) Remove oil pressure sending unit.

(2) Install Oil Pressure Line and Gauge Tool C-3292. Start engine and record pressure. Refer to Oil Pressure in Engine Specifications for the proper pressures.

SERVICE PROCEDURES (Continued)

*MAIN BEARING FITTING CHART*

| Crankshaft Journals #1 - #6 | | Corresponding Crankshaft Bearing Insert | |
|---|---|---|---|
| Color Code | Diameter | Upper Insert Size | Lower Insert Size |
| Yellow | 63.5025-63.4898 mm (2.5001-2.4996 in.) | Yellow - Standard | Yellow - Standard |
| Orange | 63.4898-63.4771 mm (2.4996-2.4991 in.) 0.0127 mm (0.0005 in.) Undersize | Blue - Undersize 0.025 mm (0.001 in.) | Yellow - Standard |
| Blue | 63.4771-63.4644 mm (2.4991-2.4986 in.) 0.0254 mm (0.001 in.) Undersize | Blue - Undersize 0.025 mm (0.001 in.) | Blue - Undersize 0.025 mm (0.001 in.) |
| Green | 63.4644-63.4517 mm (2.4986-2.4981 in.) 0.0381 mm (0.0015 in.) Undersize | Blue - Undersize 0.025 mm (0.001 in.) | Green - Undersize 0.051 mm (0.002 in.) |
| Red | 63.2485-63.2358 mm (2.4901-2.4896 in.) 0.254 mm (0.010 in.) Undersize | Red - Undersize 0.254 mm (0.010 in.) | Red - Undersize 0.254 mm (0.010 in.) |

| Crankshaft Journals #7 Only | | Corresponding Crankshaft Bearing Insert | |
|---|---|---|---|
| Color Code | Diameter | Upper Insert Size | Lower Insert Size |
| Yellow | 63.4873-63.4746 mm (2.4995-2.4990 in.) | Yellow - Standard | Yellow - Standard |
| Orange | 63.4746-63.4619 mm (2.4990-2.4985 in.) 0.0127 mm (0.0005 in.) Undersize | Blue - Undersize 0.025 mm (0.001 in.) | Yellow - Standard |
| Blue | 63.4619-63.4492 mm (2.4985-2.4980 in.) 0.0254 mm (0.001 in.) Undersize | Blue - Undersize 0.025 mm (0.001 in.) | Blue - Undersize 0.025 mm (0.001 in.) |
| Green | 63.4492-63.4365 mm (2.4980-2.4975 in.) 0.0381 mm (0.0015 in.) Undersize | Blue - Undersize 0.025 mm (0.001 in.) | Green - Undersize 0.051 mm (0.002 in.) |
| Red | 63.2333-63.2206 mm (2.4895-2.4890 in.) 0.254 mm (0.010 in.) Undersize | Red - Undersize 0.254 mm (0.010 in.) | Red - Undersize 0.254 mm (0.010 in.) |

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REMOVAL AND INSTALLATION (Continued)

the number of chain pins between the timing marks of both sprockets. There must be 15 pins.

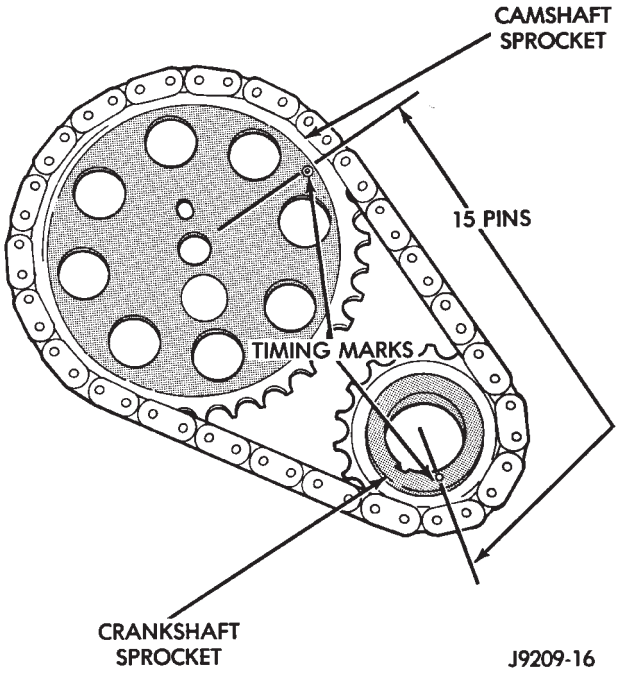


***Fig. 44 Verify Crankshaft—Camshaft Installation—Typical***

(6) Install the crankshaft oil slinger.

(7) Tighten the camshaft sprocket preload bolt to 108 N·m (80 ft. lbs.) torque.

(8) Check the valve timing.

(9) Lubricate the tension spring, the thrust pin and the pin bore in the preload bolt with Mopar Engine Oil Supplement, or equivalent. Install the spring and thrust pin in the preload bolt head.

(10) Coat both sides of the replacement timing case cover gasket with gasket sealer. Apply a 3 mm (1/8 inch) bead of Mopar Silicone Rubber Adhesive Sealant, or equivalent to the joint formed at the oil pan and cylinder block.

(11) Position the timing case cover on the oil pan gasket and the cylinder block.

(12) Place Timing Case Cover Alignment and Seal Installation Tool 6139 in the crankshaft opening in the cover (Fig. 45).

(13) Install the timing case cover-to-cylinder block bolts. Install the oil pan-to-timing case cover bolts.

(14) Tighten the 1/4 inch cover-to-block bolts to 7 N·m (60 in. lbs.) torque. Tighten the 5/16 inch front cover-to-block bolts to 22 N·m (192 in. lbs.) torque. Tighten the oil pan-to-cover 1/4 inch bolts to 14 N·m (120 in. lbs.) torque. Tighten the oil pan-to-cover 5/16 inch bolts to 18 N·m (156 in. lbs.) torque.

(15) Remove the cover alignment tool and install a replacement oil seal into the cover.

(16) Install the vibration damper on the crankshaft.

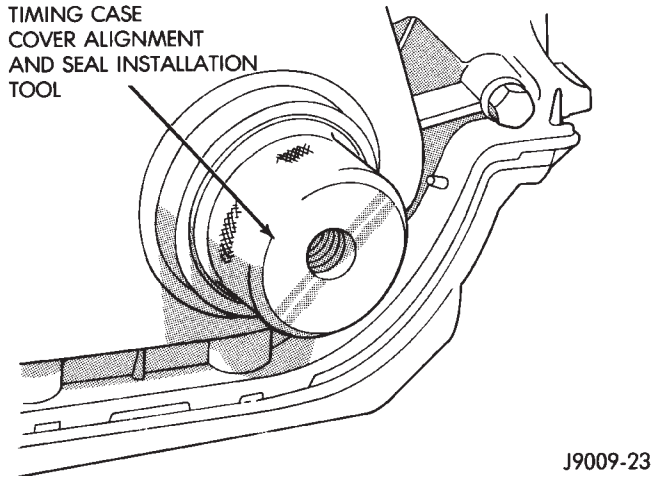


***Fig. 45 Timing Case Cover Alignment and Seal Installation Tool 6139***

(17) Lubricate and tighten the damper bolt to 108 N·m (80 ft. lbs.) torque.

(18) If equipped with air conditioning:

(a) Install the A/C compressor serpentine drive belt idler pulley.

(b) Install the generator.

(c) Install the A/C condenser and receiver/drier assembly.

(19) Install the serpentine drive belt on the pulleys and tighten (refer to Group 7, Cooling System for the specifications and procedures).

(20) Install the radiator. Connect the radiator hoses and automatic transmission fluid cooler pipes, if equipped. Fill the cooling system.

(21) Install the fan and shroud.

(22) Connect negative cable to battery.

## CRANKSHAFT MAIN BEARINGS

*REMOVAL*

(1) Disconnect negative cable from battery.

(2) Remove the spark plugs.

(3) Raise the vehicle.

(4) Remove the oil pan and oil pump.

(5) Remove only one main bearing cap and lower insert at a time (Fig. 46).

(6) Remove the lower insert from the bearing cap.

(7) Remove the upper insert by LOOSENING (DO NOT REMOVE) all of the other bearing caps. Now insert a small cotter pin tool in the crankshaft journal oil hole. Bend the cotter pin as illustrated to fabricate the tool (Fig. 47). With the cotter pin tool in place, rotate the crankshaft so that the upper bearing insert will rotate in the direction of its locking tab. Because there is no hole in the No.3 main journal, use a tongue depressor or similar soft-faced tool to remove the bearing insert (Fig. 47). After moving

# 5.2L ENGINE

## INDEX



## GENERAL INFORMATION

### 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.

### OIL PUMP PRESSURE

The MINIMUM oil pump pressure is 41.4 kPa (6 psi) at curb idle. The MAXIMUM oil pump pressure is 207-552 kPa (30-80 psi) at 3,000 RPM or more.

**CAUTION: If oil pressure is ZERO at curb idle, DO NOT run engine at 3,000 RPM.**

### PISTON AND CONNECTING ROD ASSEMBLY

The pistons are elliptically turned so that the diameter at the pin boss is less than its diameter across the thrust face. This allows for expansion under normal operating conditions. Under operating temperatures, expansion forces the pin bosses away from each other, causing the piston to assume a more nearly round shape.

All pistons are machined to the same weight, regardless of size, to maintain piston balance.

The piston pin rotates in the piston only and is retained by the press interference fit of the piston pin in the connecting rod.

## DESCRIPTION AND OPERATION

### ENGINE DESCRIPTION

The 5.2 Liter (318 CID) eight-cylinder engine is a V-Type lightweight, single cam, overhead valve engine with hydraulic roller tappets (Fig. 1).

This engine is designed for unleaded fuel.

REMOVAL AND INSTALLATION (Continued)

**NOTE: Whenever an engine has been rebuilt, a new camshaft and/or new tappets installed, add 1 pint of Mopar Crankcase Conditioner, or equivalent. The oil mixture should be left in engine for a minimum of 805 km (500 miles). Drain at the next normal oil change.**

(2) Install Camshaft Gear Installer Tool C-3509 with tongue back of distributor drive gear (Fig. 30).

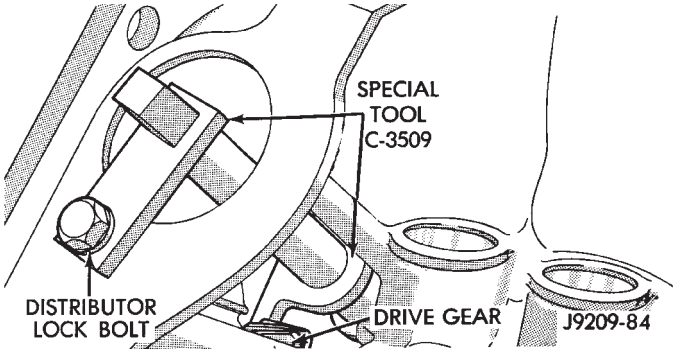


***Fig. 30 Camshaft Holding Tool C-3509 (Installed Position)***

(3) Hold tool in position with a distributor lockplate bolt. This tool will restrict camshaft from being pushed in too far and prevent knocking out the welch plug in rear of cylinder block. **Tool should remain installed until the camshaft and crankshaft sprockets and timing chain have been installed.**

(4) Install camshaft thrust plate and chain oil tab. **Make sure tang enters lower right hole in thrust plate.** Tighten bolts to 24 N·m (210 in. lbs.) torque. Top edge of tab should be flat against thrust plate in order to catch oil for chain lubrication.

(5) Place both camshaft sprocket and crankshaft sprocket on the bench with timing marks on exact imaginary center line through both camshaft and crankshaft bores.

(6) Place timing chain around both sprockets.

(7) Turn crankshaft and camshaft to line up with keyway location in crankshaft sprocket and in camshaft sprocket.

(8) Lift sprockets and chain (keep sprockets tight against the chain in position as described).

(9) Slide both sprockets evenly over their respective shafts and use a straightedge to check alignment of timing marks (Fig. 31).

(10) Install the camshaft bolt/cup washer. Tighten bolt to 68 N·m (50 ft. lbs.) torque.

(11) Measure camshaft end play. Refer to Specifications for proper clearance. If not within limits install a new thrust plate.

(12) Each tappet reused must be installed in the same position from which it was removed. **When camshaft is replaced, all of the tappets must be replaced.**

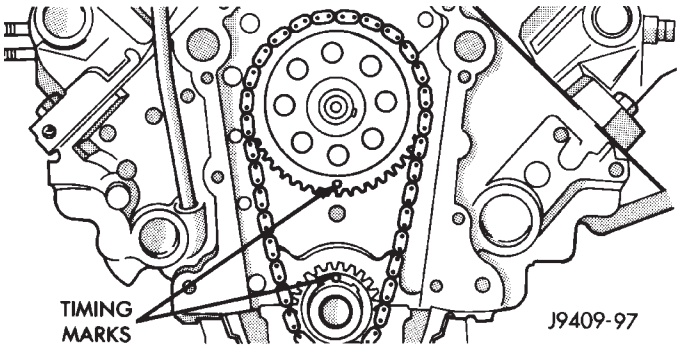


***Fig. 31 Alignment of Timing Marks***

## CAMSHAFT BEARINGS

*REMOVAL*

**NOTE: This procedure requires that the engine is removed from the vehicle.**

(1) With engine completely disassembled, drive out rear cam bearing core hole plug.

(2) Install proper size adapters and horseshoe washers (part of Camshaft Bearing Remover/Installer Tool C-3132-A) at back of each bearing shell. Drive out bearing shells (Fig. 32).

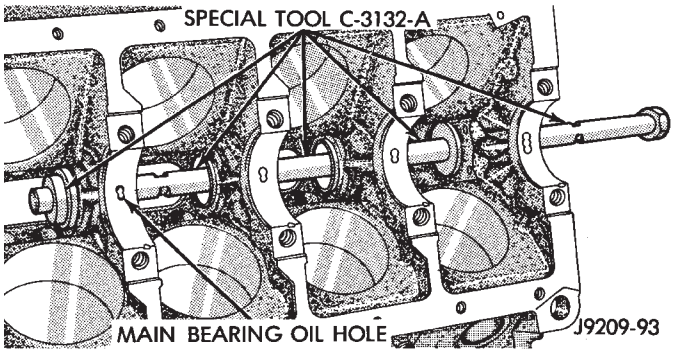


***Fig. 32 Camshaft Bearings Removal/Installation with Tool C-3132-A***

*INSTALLATION*

(1) Install new camshaft bearings with Camshaft Bearing Remover/Installer Tool C-3132-A by sliding the new camshaft bearing shell over proper adapter.

(2) Position rear bearing in the tool. Install horseshoe lock and by reversing removal procedure, carefully drive bearing shell into place.

(3) Install remaining bearings in the same manner. Bearings must be carefully aligned to bring oil holes into full register with oil passages from the main bearing. If the camshaft bearing shell oil holes are not in exact alignment, remove and install them correctly. Install a new core hole plug at the rear of camshaft. **Be sure this plug does not leak.**

## SPECIFICATIONS

### 5.2L ENGINE

#### Camshaft

| | |
|---|---|
| Bearing Diameter | |
| No. 1 | 50.800-50.825 mm (2.000-2.001 in) |
| No. 2 | 50.394-50.419 mm (1.984-1.985 in) |
| No. 3 | 50.013-50.038 mm (1.969-1.970 in) |
| No. 4 | 49.606-49.632 mm (1.953-1.954 in) |
| No. 5 | 39.688-39.713 mm (1.5625-1.5635 in) |
| Diametrical Clearance | 0.0254-0.0762 mm (0.001-0.003 in) |
| Max. Allowable | 0.127 mm (0.005 in) |
| End Play | 0.051-0.254 mm (0.002-0.010 in) |
| Bearing Journal Diameter | |
| No. 1 | 50.749-50.775 mm (1.998-1.999 in) |
| No. 2 | 50.343-50.368 mm (1.982-1.983 in) |
| No. 3 | 49.962-49.987 mm (1.967-1.968 in) |
| No. 4 | 49.555-49.581 mm (1.951-1.952 in) |
| No. 5 | 39.637-39.662 mm (1.5605-1.5615 in) |

#### Connecting Rods

| | |
|---|---|
| Bearing Clearance | 0.013-0.056 mm (0.0005-0.0022 in) |
| Max. Allowable | 0.08 mm (0.003 in) |
| Piston Pin Bore Diameter | 24.966-24.978 mm (0.9829-0.9834 in) |
| Side Clearance (Two Rods) | 0.152-0.356 mm (0.006-0.014 in) |
| Total Weight (Less Bearing) | 726 grams (25.61 oz) |

#### Crankshaft

| | |
|---|---|
| Connect Rod Journal | |
| Diameter | 53.950-53.975 mm (2.124-2.125 in) |
| Out-of-Round (Max.) | 0.0254 mm (0.001 in) |
| Taper (Max.) | 0.0254 mm (0.001 in) |
| Diametrical Clearance | |
| No. 1 | 0.013-0.038 mm (0.0005-0.0015 in) |
| Nos. 2, 3, 4 and 5 | 0.013-0.051 mm (0.005-0.0020 in) |
| Max. Allowable (Nos. 2, 3, 4 & 5) | 0.064 mm (0.0025 in) |
| End Play | 0.051-0.178 mm (0.002-0.007 in) |
| Max. Allowable | 0.254 mm (0.010 in) |
| Main Bearing Journals | |
| Diameter | 63.487-63.513 mm (2.4995-2.5005 in) |
| Out-of-Round (Max.) | 0.0254 mm (0.001 in) |
| Taper (Max.) | 0.0254 mm (0.001 in) |

#### Cylinder Block

| | |
|---|---|
| Cylinder Bore | |
| Diameter | 99.314-99.365 mm (3.910-3.912 in) |
| Out-of-Round (Max.) | 0.127 mm (0.005 in) |
| Taper (Max.) | 0.254 mm (0.010 in) |
| Oversize (Max.) | 1.016 mm (0.040 in) |
| Distributor Lower Drive Shaft | |
| Bushing (Press Fit in Block) | 0.0127-0.3556 mm (0.0005-0.0140 in) |
| Shaft-to-Bushing Clearance | 0.0178-0.0686 mm (0.0007-0.0027 in) |
| Tappet Bore Diameter | 22.99-23.01 mm (0.9051-0.9059 in) |

#### Cylinder Head

| | |
|---|---|
| Compression Pressure | 689 kPa (100 psi) |
| Gasket Thickness (Compressed) | 1.2065 mm (0.0475 in) |
| Valve Seat | |
| Angle | 44.25° - 44.75° |
| Runout (Max.) | 0.0762 mm (0.003 in) |
| Width (Finish) – Intake | 1.016-1.524 mm (0.040-0.060 in) |
| Width (Finish) – Exhaust | 1.524-2.032 mm (0.060-0.080 in) |

#### Hydraulic Tappets

| | |
|---|---|
| Body Diameter | 22.949-22.962 mm (0.9035-0.9040 in) |
| Clearance in Block | 0.0279-0.0610 mm (0.0011-0.0024 in) |
| Dry Lash | 1.524-5.334 mm (0.060-0.210 in) |
| Push Rod Length | 175.64–176.15 mm (6.915–6.935 in) |

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REMOVAL AND INSTALLATION (Continued)

(12) Connect the heater hoses and bypass hose.
(13) Install distributor cap and wires.
(14) Hook up the return spring.
(15) Connect the accelerator linkage and, if so equipped, the speed control and transmission kick-down cables.
(16) Install the fuel lines and fuel rail (refer to Group 14, Fuel System).
(17) Install the support bracket to the intake manifold and the mounting bracket.
(18) 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 the proper adjusting of belt tension.
(19) Install the A/C compressor on the mounting bracket (refer to Group 24, Heating and Air Conditioning).
(20) Install the air cleaner.
(21) Fill cooling system (refer to Group 7, Cooling System for the proper procedure).
(22) Connect the negative cable to the battery.

## EXHAUST MANIFOLD—5.2L ENGINE

*REMOVAL*

Exhaust manifolds are LOG type with balanced flow.

(1) Disconnect the negative cable from the battery.
(2) Remove the exhaust manifold heat shields (Fig. 16).

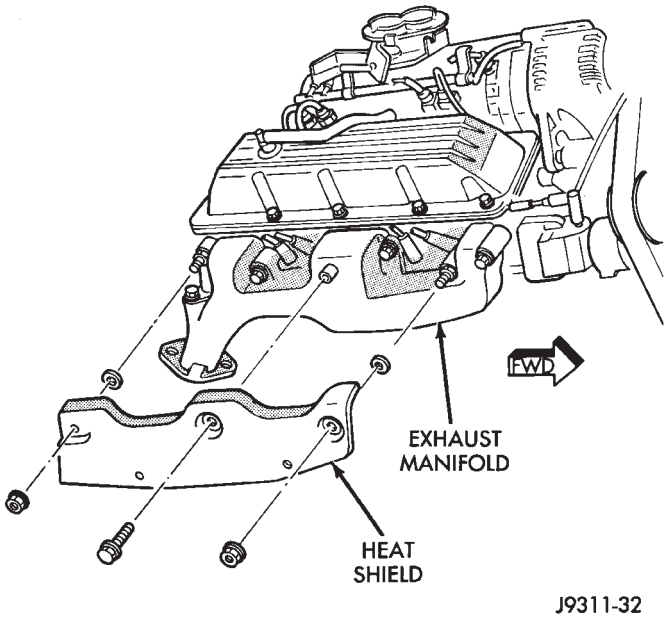



***Fig. 16 Exhaust Manifold Heat Shields (Left Shield Shown)***

(3) Remove the ERG tube (refer to Group 25, Emission Control Systems).
(4) Raise the vehicle.
(5) Remove the bolts and nuts attaching the exhaust pipe to the exhaust manifold.
(6) Lower the vehicle.
(7) Remove bolts, nuts and washers attaching manifold to cylinder head.
(8) Remove manifold from the cylinder head.

*INSTALLATION*

**CAUTION: If the studs came out with the nuts when removing the exhaust manifold, install new studs.**

(1) Position the exhaust manifolds on the two studs located on the cylinder head. Install conical washers and nuts on these studs (Fig. 17).
(2) Install new bolt and washer assemblies in the remaining holes (Fig. 17). Start at the center arm and work outward. Tighten the bolts and nuts to 27 N·m (20 ft. lbs.) torque.

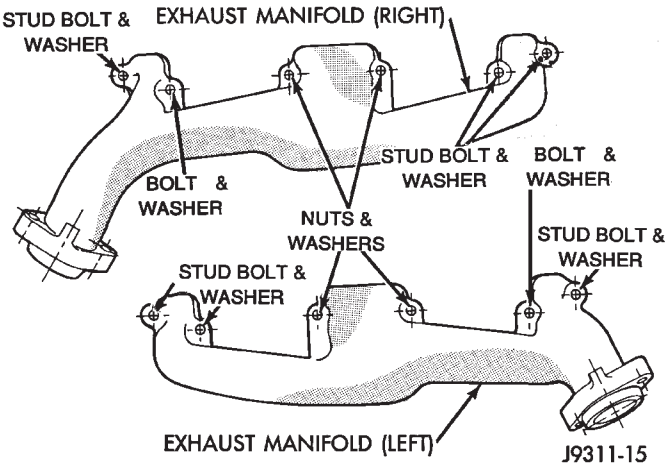



***Fig. 17 Exhaust Manifold***

(3) Raise the vehicle.
(4) Assemble the exhaust pipe to the exhaust manifold and secure with bolts, nuts and washers. Tighten these nuts to 31 N·m (23 ft. lbs.) torque.
(5) Lower the vehicle.
(6) Install the EGR tube (refer to Group 25, Emission Control Systems).

**CAUTION: The exhaust manifold heat shields MUST be installed to protect the underhood components.**

(7) Install the exhaust manifold heat shields. Tighten the nuts to 27 N·m (20 ft. lbs.) torque.
(8) Connect the negative cable to the battery.

GENERAL INFORMATION (Continued)

line and ETBE (Ethyl Tertiary Butly Ether) are blends of gasoline and up to 17 percent ETBE. Gasoline blended with MTBE or ETBE may be used in your vehicle.

Many gasolines are now being blended that contribute to cleaner air, especially in those areas of the country where pollution levels are high. These new blends provide a cleaner burning fuel and some are referred to as reformulated gasoline.

**Reformulated Gasoline**

Many areas of the country are requiring the use of cleaner-burning fuel referred to as **Reformulated Gasoline**. Reformulated gasolines are specially blended to reduce vehicle emissions and improve air quality.

Chrysler Corporation strongly supports the use of reformulated gasolines whenever available. Although your vehicle was designed to provide optimum performance and lowest emissions operating on high quality unleaded gasoline, it will perform equally well and produce even lower emissions when operating on reformulated gasoline.

**Materials Added to Fuel**

Indiscriminate use of fuel system cleaning agents should be avoided. Many of these materials intended for gum and varnish removal may contain active solvents of similar ingredients that can be harmful to fuel system gasket and diaphragm materials.

SERVICE PROCEDURES (Continued)

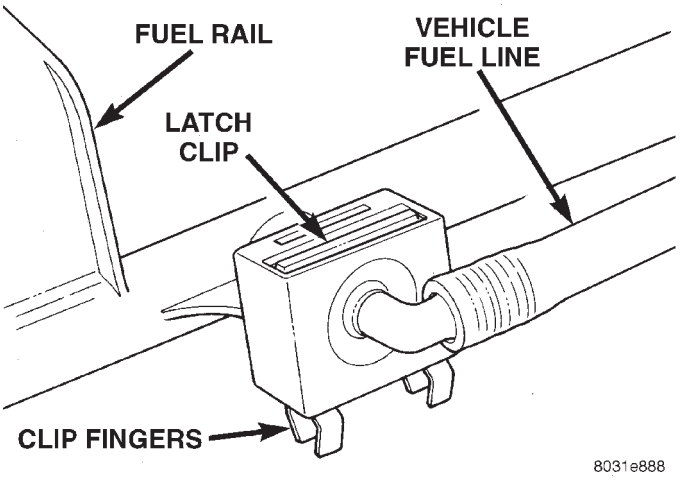



*Fig. 24 Latch Clip Installation*

(11) Verify a locked condition by firmly pulling on fuel line and fitting (15-30 lbs.).
(12) Connect negative battery cable to battery.
(13) Start engine and check for leaks.

## REMOVAL AND INSTALLATION

### FUEL FILTER

The filter is located under the vehicle near the front of fuel tank (Fig. 25). Replace fuel filter at intervals specified in the Lubrication and Maintenance Schedule chart found in Group 0, Lubrication and Maintenance.

*REMOVAL*

**WARNING: THE FUEL SYSTEM IS UNDER CONSTANT FUEL PRESSURE EVEN WITH THE ENGINE OFF. THIS PRESSURE MUST BE RELEASED BEFORE SERVICING THE FUEL FILTER.**

(1) Disconnect negative battery cable. Remove fuel filler cap.
(2) Release fuel system pressure. Refer to the previous Fuel System Pressure Release Procedure in this section.
(3) Raise and support vehicle.
(4) Place shop towels under fuel filter.
(5) Disconnect fuel lines at filter. Refer to Quick-Connect Fittings in this group for procedures.
(6) Remove retaining strap mounting bolt.
(7) Remove filter retaining strap.
(8) Remove filter from mounting bracket.

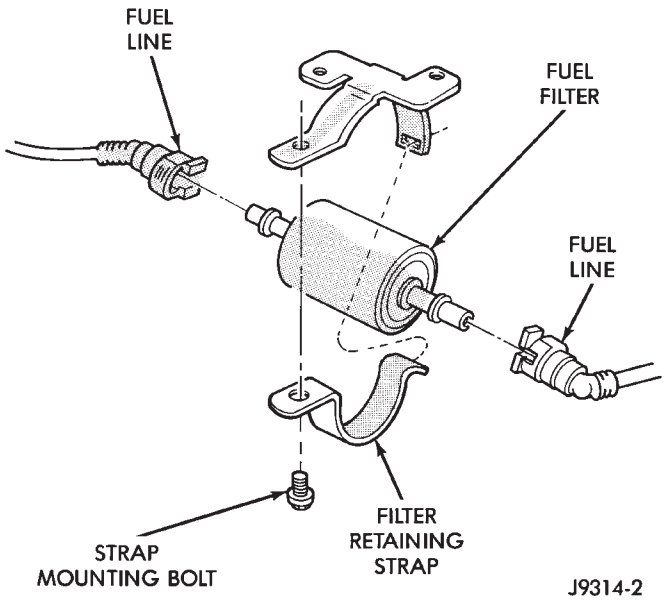



*Fig. 25 Fuel Filter*

*INSTALLATION*

**CAUTION: The ends of the fuel filter are marked for correct installation. Install filter with the end marked IN towards fuel tank and the end marked OUT towards engine.**

(1) Place fuel filter in retaining strap with the marked ends in the correct position.
(2) Install retaining strap bolt. Tighten to 7 N·m (66 in. lbs.) torque.
(3) Install fuel lines to filter. Refer to Fuel Tubes/Lines/Hoses and Clamps in this group. Also refer to Quick-Connect Fittings in this group for procedures.
(4) Lower vehicle.
(5) Connect negative battery cable.
(6) Start engine and check for leaks.

### FUEL PRESSURE REGULATOR

The pressure regulator is not serviced separately. If it needs servicing, the entire fuel pump module must be replaced. Refer to Fuel Pump Module for procedures.

### FUEL PUMP RELAY

The fuel pump and automatic shutdown (ASD) relays are located in the Power Distribution Center (PDC). The PDC is located in the engine compartment. (Fig. 26). Refer to label on PDC cover for relay location. Check the terminals in the PDC relay connector for corrosion or damage before installation.

DESCRIPTION AND OPERATION (Continued)

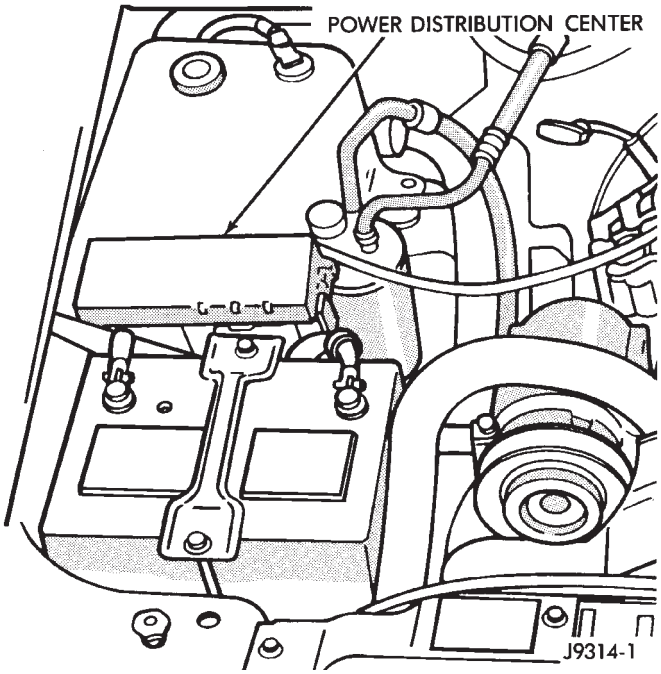



*Fig. 2 Power Distribution Center (PDC)*

## BATTERY VOLTAGE—PCM INPUT

The battery voltage input provides power to the powertrain control module (PCM). It also informs the PCM what voltage level is supplied to the ignition coil and fuel injectors.

If battery voltage is low, the PCM will increase injector pulse width (period of time that the injector is energized). This is done to compensate for the reduced flow through injector caused by the lowered voltage.

## FIVE VOLT SENSOR SUPPLY—PRIMARY

Supplies the required 5 volt power source to the crankshaft position sensor, camshaft position sensor, MAP sensor and throttle position sensor.

## FIVE VOLT SENSOR SUPPLY—SECONDARY

Supplies the required 5 volt power source to the transmission pressure sensor and the vehicle speed sensor.

## FUEL LEVEL SENSOR—PCM INPUT

The fuel level sensor sends a signal to the PCM to indicate fuel level. The purpose of this feature is to prevent a false setting of misfire and fuel system monitor trouble codes if the fuel level is either less than 15 percent, or more than 85 percent of its rated capacity.

## BRAKE SWITCH—PCM INPUT

When the brake light switch is activated, the powertrain control module (PCM) receives an input indicating that the brakes are being applied. After receiving this input, the PCM maintains idle speed to a scheduled rpm through control of the idle air control (IAC) motor. The brake switch input is also used to operate the speed control system.

## CAMSHAFT POSITION SENSOR—PCM INPUT

A sync signal is provide by the camshaft position sensor. The sensor located in the distributor on all 4.0L/5.2L engines (Fig. 3). The sync signal from this sensor works in conjunction with the crankshaft position sensor to provide the powertrain control module (PCM) with inputs. This is done to establish and maintain correct injector firing order.

Refer to Camshaft Position Sensor in Group 8D, Ignition System for more information.

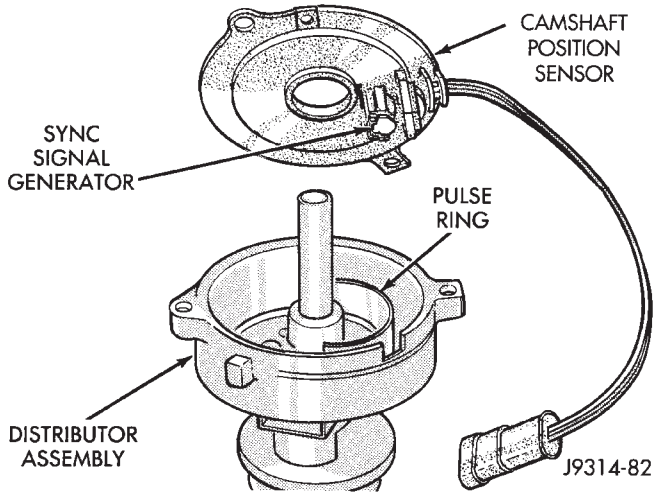



*Fig. 3 Camshaft Position Sensor—Typical (5.2L Distributor Shown)*

## CRANKSHAFT POSITION SENSOR—5.2L ENGINES—PCM INPUT

This sensor is a hall effect device that detects notches in the flywheel (manual transmission) or flexplate (automatic transmission).

This sensor is used to indicate to the powertrain control module (PCM) that a spark and or fuel injection event is to be required. The output from this sensor, in conjunction with the camshaft position sensor signal, is used to differentiate between fuel injection and spark events. It is also used to synchronize the fuel injectors with their respective cylinders.

The sensor is bolted to the cylinder block near the rear of the right cylinder head (Fig. 4).

Refer to Group 8D, Ignition System for more crankshaft position sensor information.

The engine will not operate if the PCM does not receive a crankshaft position sensor input.

DIAGNOSIS AND TESTING (Continued)

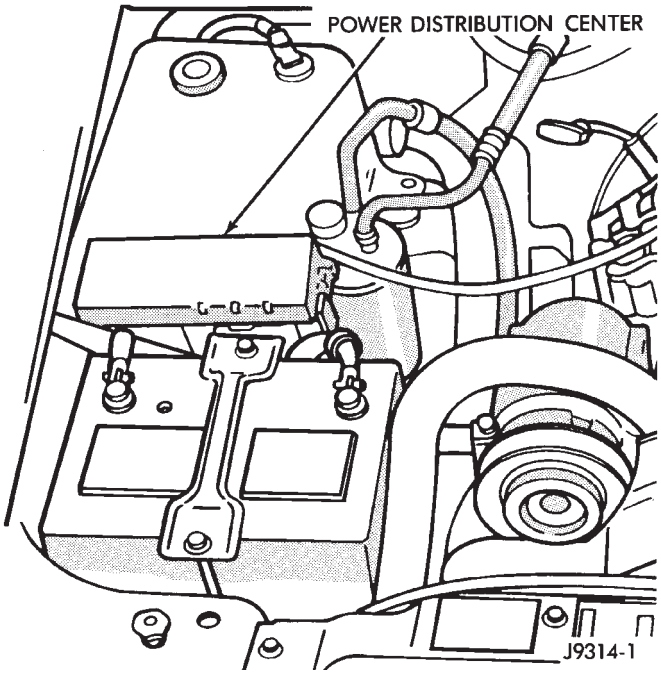



*Fig. 34 Power Distribution Center (PDC)*

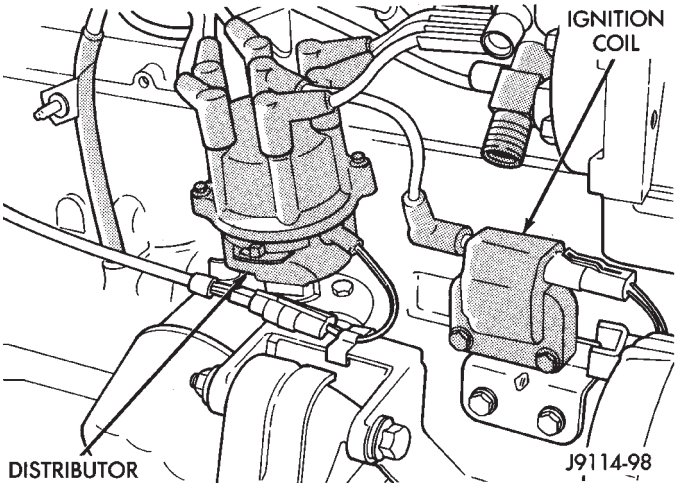



*Fig. 35 Ignition Coil—4.0L Engine*

(8) Verify crankcase ventilation (CCV) operation. Refer to Group 25, Emission Control System for additional information.

(9) Inspect fuel tube quick-connect fitting-to-fuel rail connections.

(10) Verify that hose connections to all ports of vacuum fittings on intake manifold are tight and not leaking.

(11) Inspect accelerator cable, transmission throttle cable (if equipped) and cruise control cable connections (if equipped). Check their connections to the throttle arm of throttle body for any binding or restrictions.

(12) If equipped with vacuum brake booster, verify that vacuum booster hose is firmly connected to fitting on intake manifold. Also check connection to brake vacuum booster.

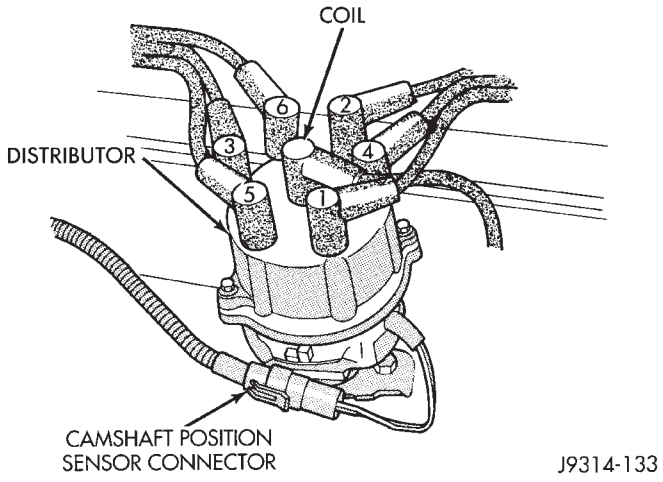



*Fig. 36 Distributor and Wiring—4.0L Engine*

(13) Inspect the air cleaner inlet and air cleaner element for dirt or restrictions.

(14) Inspect radiator grille area, radiator fins and air conditioning condenser for restrictions.

(15) Verify that the intake manifold air temperature sensor wire connector is firmly connected to harness connector (Fig. 37).

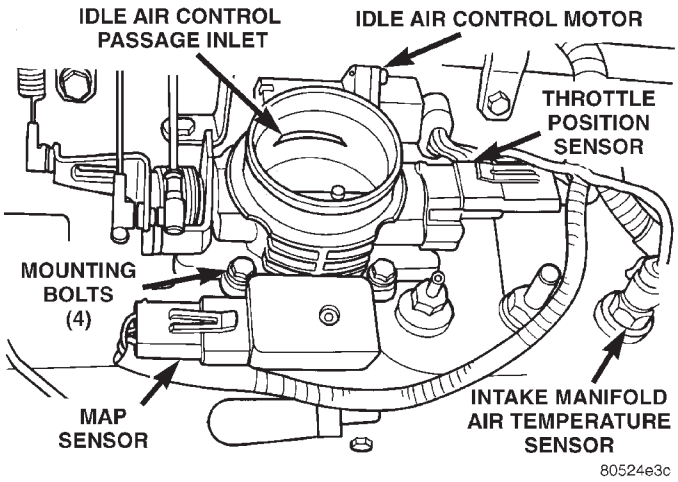



*Fig. 37 Sensor Locations—4.0L Engine*

(16) Verify that MAP sensor electrical connector is firmly connected to MAP sensor (Fig. 37). Also verify that rubber L-shaped fitting from MAP sensor to the throttle body is firmly connected (Fig. 38).

(17) Verify that fuel injector wire harness connectors are firmly connected to injectors in the correct order. Each harness connector is numerically tagged with the injector number (INJ 1, INJ 2 etc.) of its corresponding fuel injector and cylinder number.

(18) Verify harness connectors are firmly connected to idle air control (IAC) motor and throttle position sensor (TPS) (Fig. 37).

REMOVAL AND INSTALLATION (Continued)

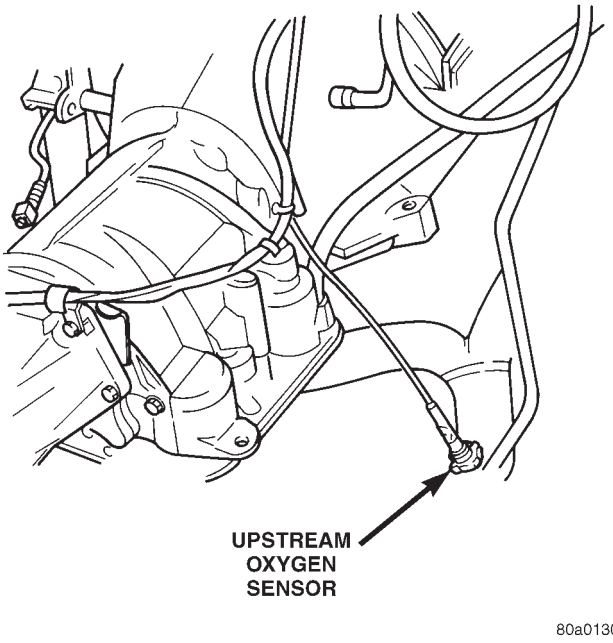



*Fig. 76 Upstream Oxygen Sensor Location—5.2L Engine*

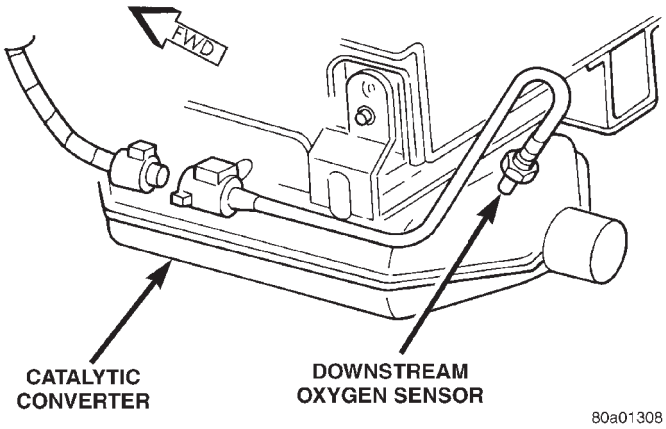



*Fig. 77 Downstream Oxygen Sensor Location*

*INSTALLATION*

Threads of new oxygen sensors are factory coated with anti-seize compound to aid in removal. **DO NOT add any additional anti-seize compound to the threads of a new oxygen sensor.**

(1) Install the O2S sensor. Tighten to 30 N·m (22 ft. lbs.) torque.

(2) Connect the O2S sensor wire connector.

(3) Lower the vehicle.

## OXYGEN SENSOR—4.0L ENGINE

The upstream O2S sensor is located in the exhaust downpipe. The downstream sensor is located near outlet end of catalytic converter. Refer to (Fig. 78) or (Fig. 77).

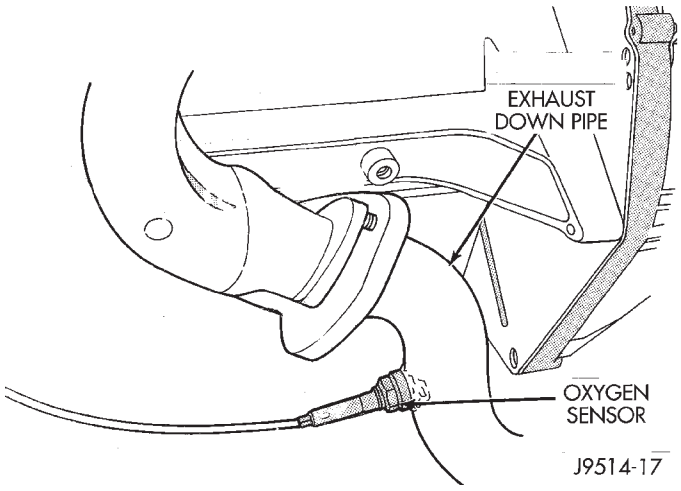



*Fig. 78 Upstream Oxygen Sensor Location—4.0L Engine*

*REMOVAL*

**WARNING: THE EXHAUST MANIFOLD, EXHAUST PIPES AND CATALYTIC CONVERTER BECOME VERY HOT DURING ENGINE OPERATION. ALLOW ENGINE TO COOL BEFORE REMOVING OXYGEN SENSOR.**

(1) Raise and support the vehicle.

(2) Disconnect the wire connector from the O2S sensor.

**CAUTION: When disconnecting the sensor electrical connector, do not pull directly on wire going into sensor.**

(3) Remove the O2S sensor. Snap-On oxygen sensor wrench (number YA 8875) may be used for removal and installation.

*INSTALLATION*

Threads of new oxygen sensors are factory coated with anti-seize compound to aid in removal. **DO NOT add any additional anti-seize compound to the threads of a new oxygen sensor.**

(1) Install the O2S sensor. Tighten to 30 N·m (22 ft. lbs.) torque.

(2) Connect the O2S sensor wire connector.

(3) Lower the vehicle.

## AIR CLEANER HOUSING

*REMOVAL*

(1) Unlock clean air hose clamp (Fig. 79) at air cleaner cover. To unlock the clamp, attach adjustable pliers to clamp and rotate pliers as shown in (Fig. 80). Remove clean air hose at cover.

(2) Remove crankcase breather/filter hose at air cleaner cover.

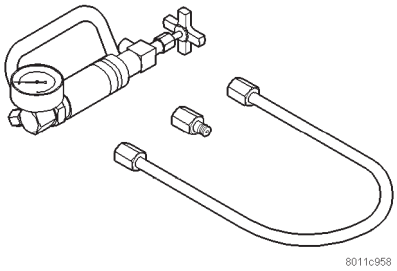
## SPECIFICATIONS

### TORQUE CHART

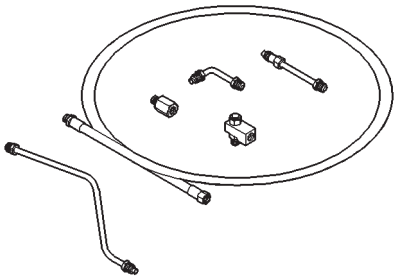
| DESCRIPTION | TORQUE |
|---|---|
| Power Steering Pump | |
| Bracket Bolts | 41 N·m (30 ft. lbs.) |
| Pump Bolts | 27 N·m (20 ft. lbs.) |
| Flow Control Valve | 75 N·m (55 ft. lbs.) |
| Pressure Line | 28 N·m (21 ft. lbs.) |

## SPECIAL TOOLS

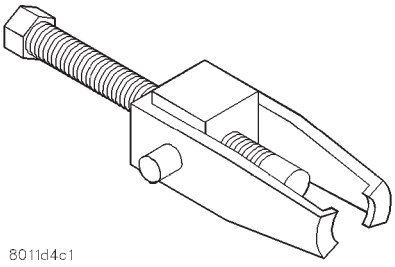
### POWER STEERING PUMP



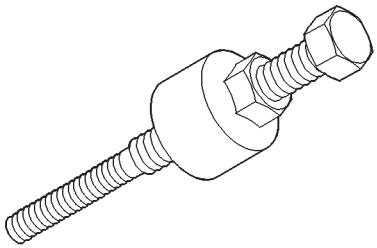

***Analyzer Set, Power Steering Flow/Pressure 6815***



***Adapters, Power Steering Flow/Pressure Tester 6893***




***Puller C-4333***



***Installer, Power Steering Pulley C-4063–B***

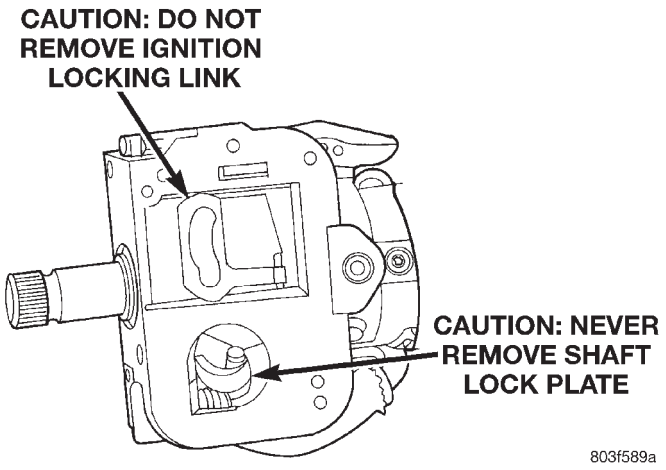



*Fig. 2 Observe Cautions*

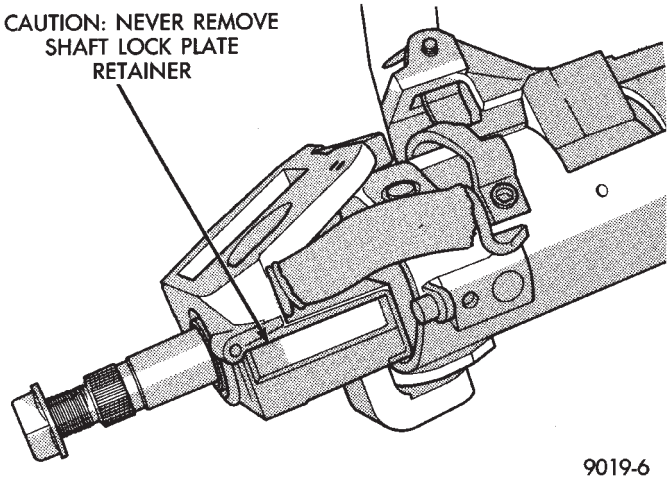



*Fig. 3 Observe Cautions*

## DIAGNOSIS AND TESTING

### IGNITION SWITCH

*TEST AND REPAIR*

If the ignition switch effort is excessive, remove the ignition switch from the steering column. Refer to Group 8D Ignition System. Using a key cylinder, check the turning effort of the switch. If the ignition switch binds look for the following conditions.

(1) Look for rough areas or flash in the casting and if found remove with a file (Fig. 4).

(2) Remove the link and slider and check the link to see if it is bent. If so replace with a new part.

(3) Put the slider in its slot in the sleeve and verify a loose fit over the length of the slot. If the slider binds in the slot at any point lightly file the slider until clearance is achieved.

(4) If no binding is found, lightly file the ramp on the ignition switch, (The ramp fits into the casting) until binding no longer occurs.

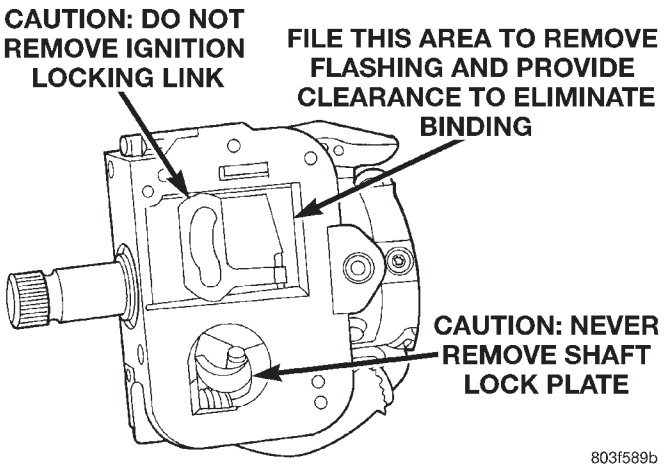



*Fig. 4 Steering Column Flash Removal And Non-Serviceable Components*

## REMOVAL AND INSTALLATION

### STEERING COLUMN

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

*REMOVAL*

(1) Position front wheels straight ahead.

(2) Disconnect the negative (ground) cable from the battery.

(3) Remove airbag, refer to Group 8M Electrical for procedure.

(4) Remove steering wheel with appropriate puller (Fig. 5).

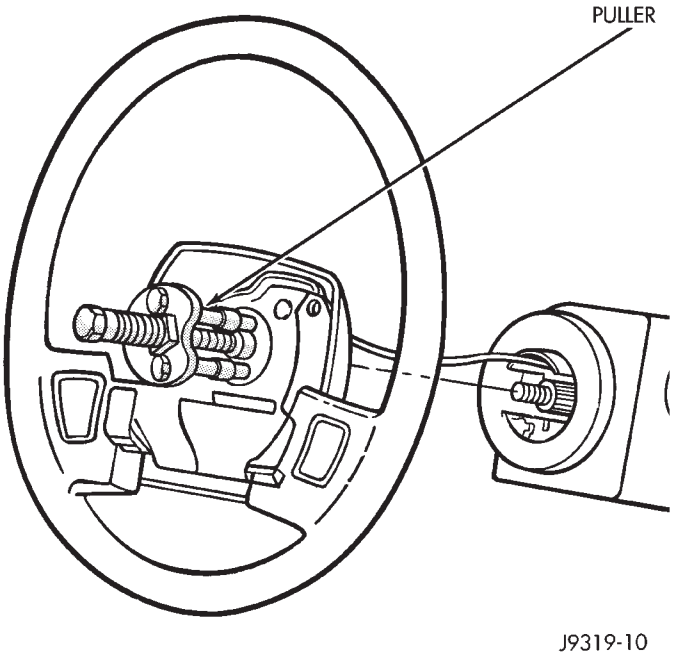



*Fig. 5 Steering Wheel Removal*

DESCRIPTION AND OPERATION (Continued)

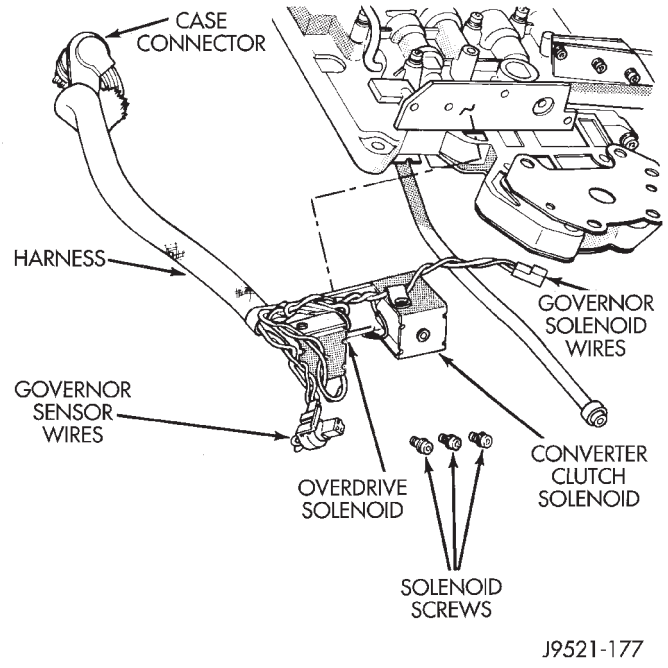



***Fig. 5 Thermistor Location***

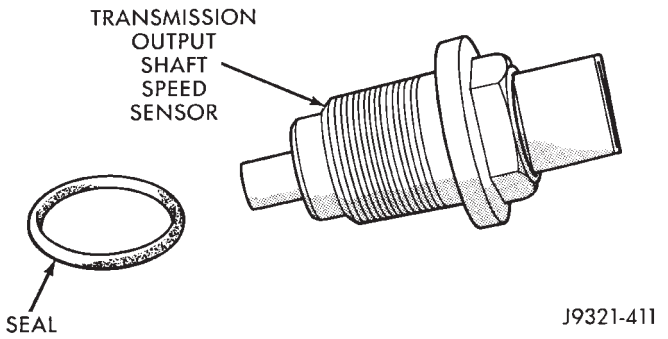



***Fig. 6 Transmission Speed Sensor***

*POWERTRAIN CONTROL MODULE (PCM)*

The PCM controls operation of the converter clutch, overdrive clutch, and governor pressure solenoid.

The control module determines transmission shift points based on input signals from the transmission thermistor, transmission output shaft speed sensor, crankshaft position sensor, vehicle speed sensor, and throttle position sensor.

Operating voltage is supplied through the battery terminal on the control module. The ignition voltage signal is supplied through a terminal on the ABS control module.

The DRB scan tool can be used to check operation of the control module and transmission electrical components. The diagnostic connector (for the scan tool) is located under the instrument panel near the steering column. The connector has a 6-way terminal and is blue in color.

## GOVERNOR PRESSURE CURVES

There are four governor pressure curves programmed into the transmission control module. The different curves allow the control module to adjust governor pressure for varying conditions. One curve is used for operation when fluid temperature is at, or below, 1°C (30°F). A second curve is used when fluid temperature is at, or above, 10°C (50°F) during normal city or highway driving. A third curve is used during wide-open throttle operation. The fourth curve is used when driving with the transfer case in low range.

## SHIFT VALVE OPERATION

The shift valves are moved by a combination of throttle and governor pressure. The governor pressure is generated by electrical components.

The conditions under which a shift to fourth will not occur when:

- Overdrive switch is Off
- Transmission fluid temperature is below 10° C (50° F) or above 121° C (250° F)
- Shift to third not yet completed
- Vehicle speed too low for 3-4 shift to occur

## HYDRAULIC CONTROL SYSTEM

The hydraulic control system provides fully automatic operation. The system performs five basic functions which are: pressure supply, pressure regulation, flow control, clutch/band application, and lubrication.

*PRESSURE REGULATION*

The pressure regulator valve maintains line pressure. The amount of pressure developed is controlled by throttle pressure which is dependent on the degree of throttle opening. The regulator valve is located in the valve body.

The throttle valve determines line pressure and shift speed. Governor pressure increases in proportion to vehicle speed. The throttle valve controls upshift and downshift speeds by regulating pressure according to throttle position.

*Shift Valve Flow Control*

The manual valve is operated by the gearshift linkage and provides the operating range selected by the driver.

The 1-2 shift valve provides 1-2 or 2-1 shifts and the 2-3 shift valve provides 2-3 or 3-2 shifts.

The kickdown valve provides forced 3-2 or 3-1 downshifts depending on vehicle speed. Downshifts occur when the throttle is opened beyond downshift detent position. Detent is reached just before wide open throttle position.

The 2-3 valve throttle pressure plug provides 3-2 downshifts at varying throttle openings depending on vehicle speed.

DIAGNOSIS AND TESTING (Continued)

| CONDITION | POSSIBLE CAUSES | CORRECTION |
|---|---|---|
| | 2. Filter Clogged. | 2. Change filter. |
| | 3. Gearshift Linkage Misadjusted. | 3. Adjust linkage and repair linkage if worn or damaged. |
| | 4. Torque Converter Drain Back (Oil drains from torque converter into transmission sump) | 4. If vehicle moves normally after 5 seconds after shifting into gear, no repair is necessary. If longer, inspect pump bushing for wear. Replace pump house. |
| | 5. Rear Band Misadjusted. | 5. Adjust band. |
| | 6. Valve Body Filter Plugged. | 6. Replace fluid and filter. If oil pan and old fluid were full of clutch disc material and/or metal particles, overhaul will be necessary. |
| | 7. Oil Pump Gears Worn/Damaged. | 7. Remove transmission and replace oil pump. |
| | 8. Governor Circuit and Solenoid Valve (RE Only) Electrical Fault. | 8. Test with DRB and repair as required. |
| | 9. Hydraulic Pressure Incorrect. | 9. Perform pressure test, remove transmission and repair as needed. |
| | 10. Reaction Shaft Seal Rings Worn/Broken. | 10. Remove transmission, remove oil pump and replace seal rings. |
| | 11. Rear Clutch/Input Shaft, Rear Clutch Seal Rings Damaged. | 11. Remove and disassemble transmission and repair as necessary. |
| | 12. Governor Valve Stuck. | 12. Remove and inspect governor components. Replace worn or damaged parts. |
| | 13. Regulator Valve Stuck. | 13. Clean. |
| | 14. Cooler Plugged. | 14. Transfer case failure can plug cooler. |
| NO DRIVE RANGE (REVERSE OK) | 1. Fluid Level Low. | 1. Add fluid and check for leaks if drive is restored. |
| | 2. Gearshift Linkage/Cable Loose/ Misadjusted. | 2. Repair or replace linkage components. |
| | 3. Rear Clutch Burnt. | 3. Remove and disassemble transmission and rear clutch and seals. Repair/replace worn or damaged parts as needed. |
| | 4. Valve Body Malfunction. | 4. Remove and disassemble valve body. Replace assembly if any valves or bores are damaged. |
| | 5. Transmission Overrunning Clutch Broken. | 5. Remove and disassemble transmission. Replace overrunning clutch. |
| | 6. Input Shaft Seal Rings Worn/ Damaged. | 6. Remove and disassemble transmission. Replace seal rings and any other worn or damaged parts. |
| | 7. Front Planetary Failed Broken. | 7. Remove and repair. |
| NO DRIVE OR REVERSE (VEHICLE WILL NOT MOVE) | 1. Fluid Level Low. | 1. Add fluid and check for leaks if drive is restored. |

REMOVAL AND INSTALLATION (Continued)

(3) Disconnect and remove propeller shaft.
(4) Remove old seal with Seal Remover C-3985-B (Fig. 31) from overdrive housing.

*INSTALLATION*

(1) Place seal in position on overdrive housing.
(2) Drive seal into overdrive housing with Seal Installer C-3995-A or C-3972 (Fig. 32).
(3) Carefully guide propeller shaft slip yoke into housing and onto output shaft splines. Align marks made at removal and connect propeller shaft to rear axle pinion yoke.

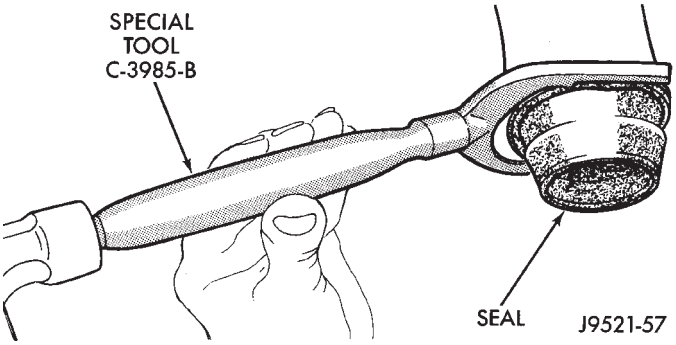



***Fig. 31 Removing Overdrive Housing Yoke Seal***

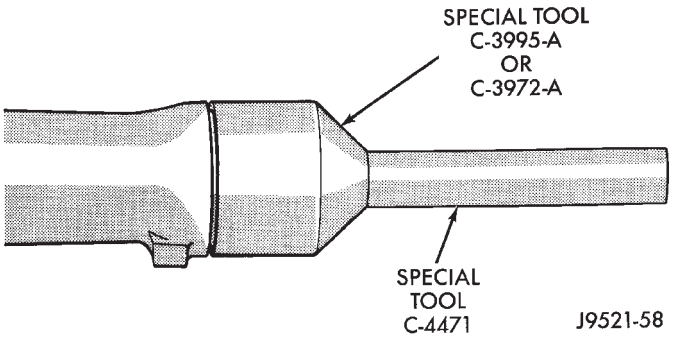



***Fig. 32 Installing Overdrive Housing Yoke Seal***

## OVERDRIVE HOUSING BUSHING

*REMOVAL*

(1) Remove overdrive housing yoke seal.
(2) Remove housing bushing as follows:
(a) If overdrive housing was not removed, drive tapered, round pointed tool between bushing and housing to upset and collapse bushing. Then remove bushing with pry tool or vise grip pliers.
(b) If overdrive housing has been removed and disassembled, drive old bushing out with Driver Handle C-4171 and Removal Tool C-4470.

*INSTALLATION*

(1) Align bushing oil hole with oil slot in overdrive housing.
(2) Tap bushing into place with driver handle and Tool C-4171 and C-4469 (Fig. 33).
(3) Install new oil seal in housing using Seal Installer C-3972–A.

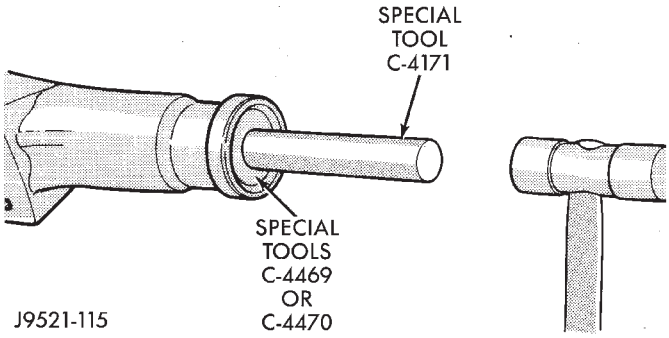



***Fig. 33 Overdrive Housing Bushing Installation***

## OUTPUT SHAFT REAR BEARING

*REMOVAL*

(1) Remove overdrive unit from the vehicle.
(2) Remove overdrive geartrain from housing.
(3) Remove snap ring holding output shaft rear bearing into overdrive housing (Fig. 34).
(4) Using a suitable driver inserted through the rear end of housing, drive bearing from housing.

*INSTALLATION*

(1) Place replacement bearing in position in housing.
(2) Using a suitable driver, drive bearing into housing until the snap ring groove is visible.
(3) Install snap ring to hold bearing into housing (Fig. 34).
(4) Install overdrive geartrain into housing.
(5) Install overdrive unit in vehicle.

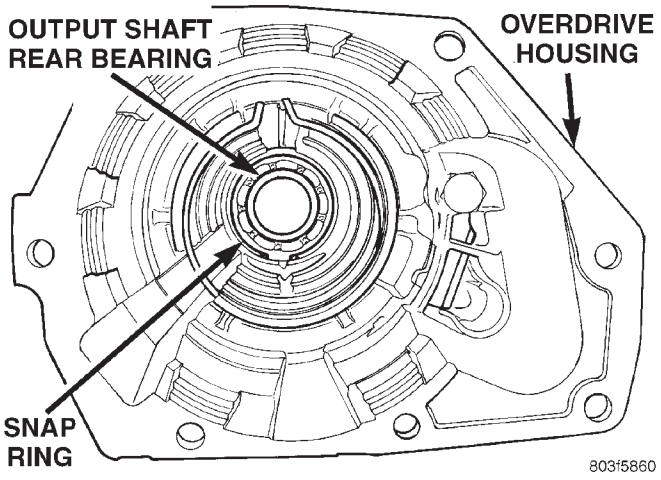



***Fig. 34 Output Shaft Rear Bearing***

DISASSEMBLY AND ASSEMBLY (Continued)

(14) Remove E-clip and washer that retains throttle lever shaft in manual lever (Fig. 73).

(15) Remove manual lever and throttle lever (Fig. 74). Rotate and lift manual lever off valve body and throttle lever shaft. Then slide throttle lever out of valve body.

(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. 75).

(17) Remove park rod E-clip and separate rod from manual lever (Fig. 76).

(18) Remove screws attaching pressure adjusting screw bracket to valve body and transfer plate (Fig. 77). Hold bracket firmly against spring tension while removing last screw.

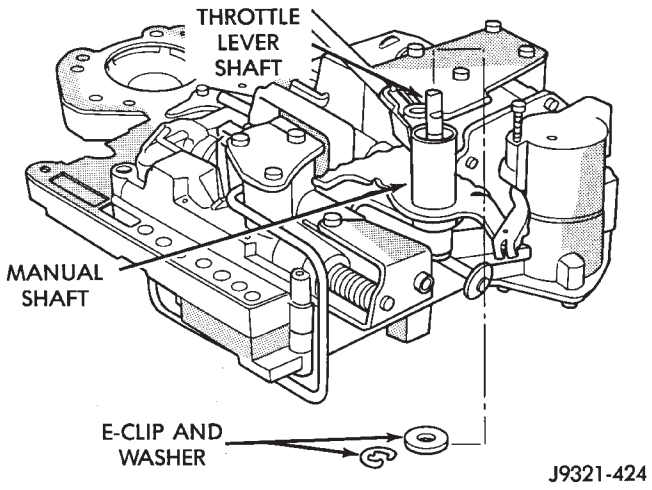



*Fig. 73 Throttle Lever E-Clip And Washer*

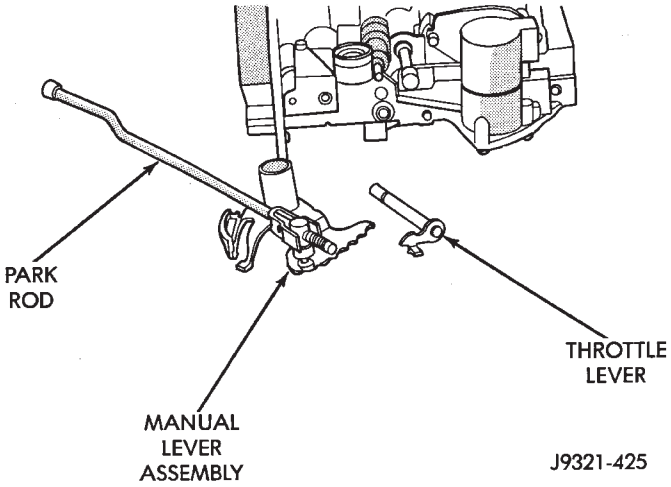



*Fig. 74 Manual And Throttle Lever*

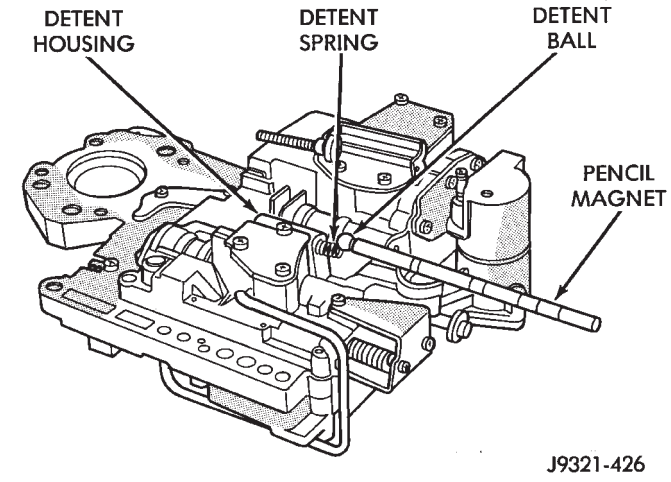



*Fig. 75 Detent Ball And Spring*

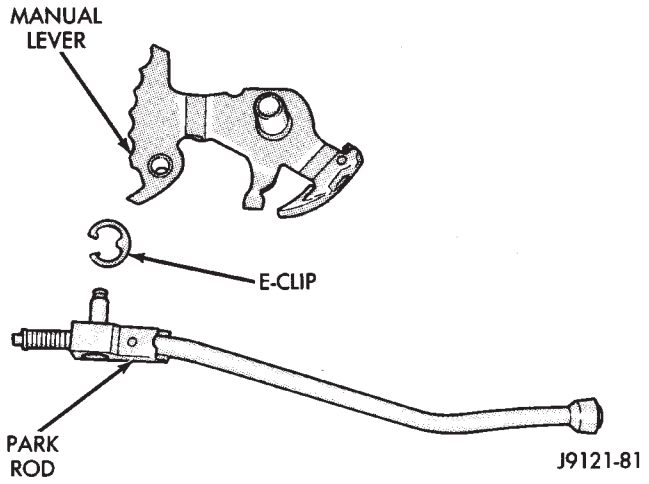



*Fig. 76 Park Rod*

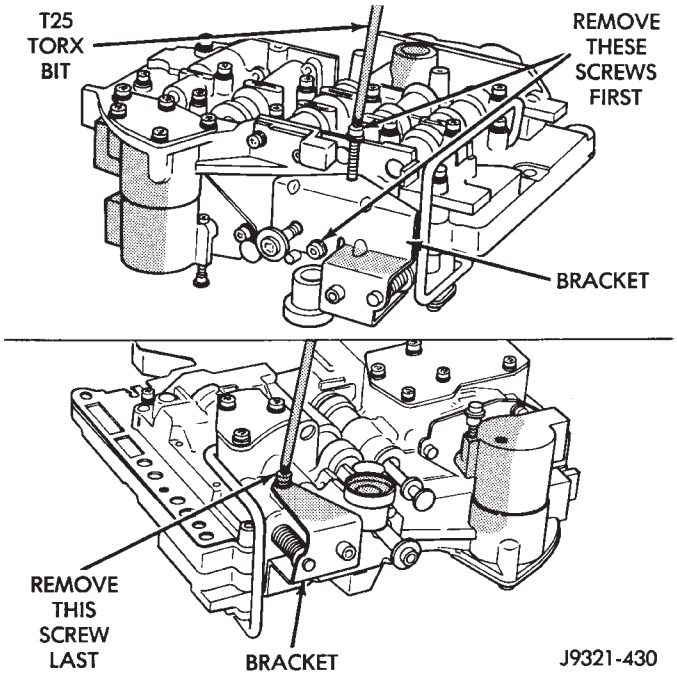



*Fig. 77 Adjusting Screw Bracket Fastener*

DISASSEMBLY AND ASSEMBLY (Continued)

(6) Place transmission in upright position (Fig. 123).

(7) Remove bolts attaching overdrive unit to transmission case (Fig. 123). An 11 mm socket is required. Note position of all wiring clips and bolts for installation reference.

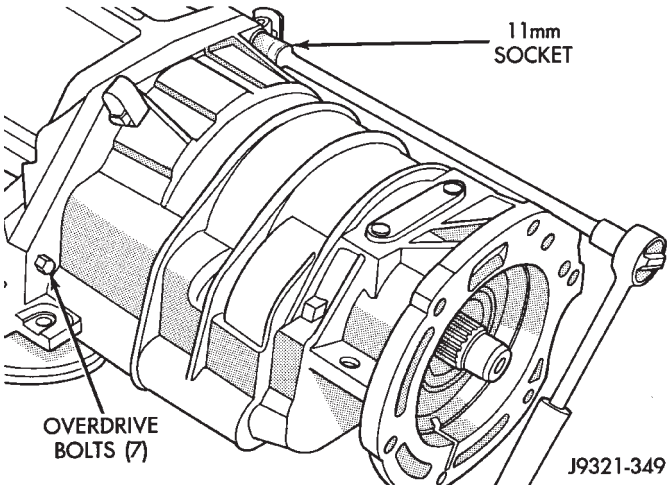



***Fig. 123 Removing/Installing Overdrive Unit Attaching Bolts***

(8) Lift overdrive unit up and off transmission intermediate shaft (Fig. 124).

(a) If overdrive unit does not require service, insert Alignment Tool 6227-2 in overrunning clutch and planetary gear splines to maintain alignment (Fig. 125). **If clutch and gear splines rotate out of alignment, overdrive unit may have to be disassembled in order to realign splines.**

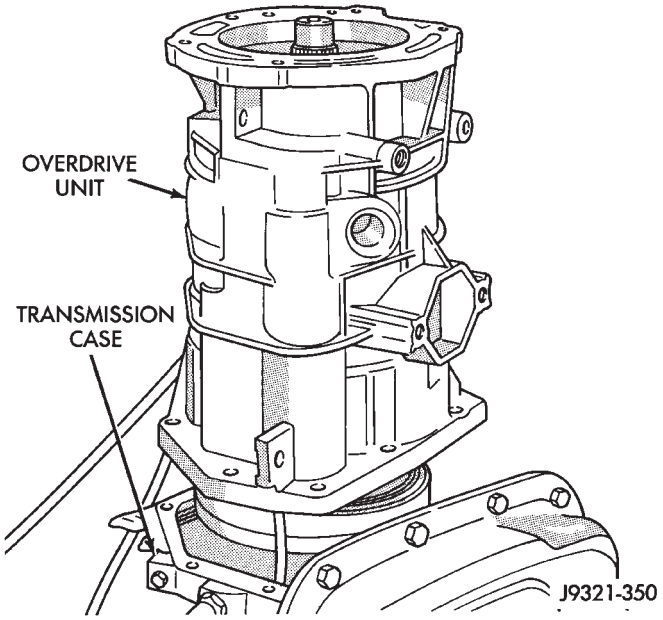



***Fig. 124 Overdrive Unit Removal***

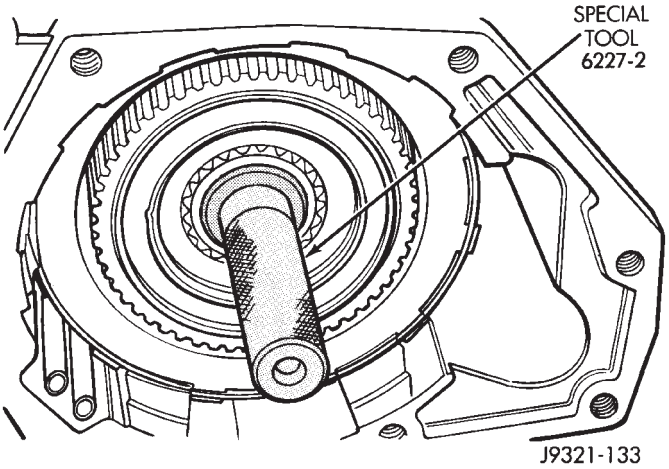



***Fig. 125 Overdrive Spline Alignment Tool Installation***

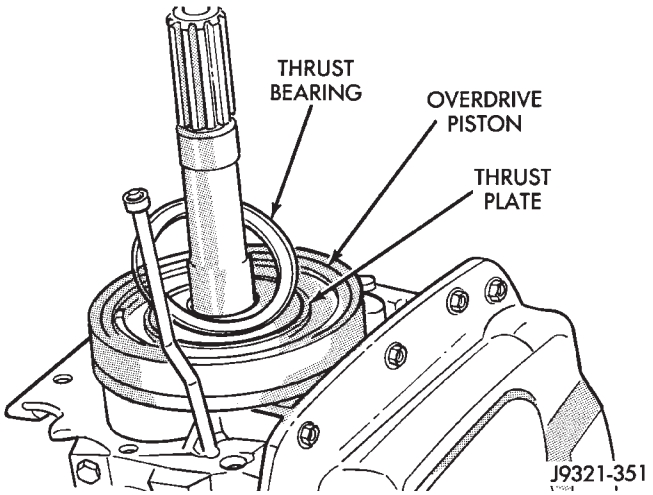



***Fig. 126 Thrust Bearing And Plate Removal***

(b) If overdrive unit **does** requires service, refer to Overdrive Unit Overhaul section.

(9) Remove thrust bearing and thrust plate from overdrive piston (Fig. 126).

(10) Place transmission in horizontal position.

(11) Remove transmission oil pan and gasket.

(12) Remove oil filter from valve body (Fig. 127). Keep filter screws separate from other valve body screws. Filter screws are longer and should be kept with filter.

(13) Remove overdrive piston from retainer (Fig. 128).

(14) Remove pump oil seal with Special Tool C-3981B (Fig. 129). Be sure to tighten tool threads completely into seal before using puller bolt to withdraw seal.

(15) Remove park/neutral position switch (Fig. 130).

(16) Remove hex head bolts attaching valve body to transmission case (Fig. 131). A total of 10 bolts are

DISASSEMBLY AND ASSEMBLY (Continued)

(45) Carefully withdraw alignment tool from overdrive unit.

(46) Lubricate intermediate shaft splines and bushing surfaces with transmission fluid or petroleum jelly.

(47) Install overdrive unit. Note that intermediate shaft is snug fit in overdrive planetary gear and overrunning clutch. If overdrive unit will not seat, gear and clutch splines are probably misaligned.

(48) Apply 1-2 drops of Mopar thread adhesive (or Loctite 242) to overdrive unit attaching bolts. Then install and tighten bolts to 34 N·m (25 ft. lbs.) torque. **Be sure wire harness clips are placed on appropriate overdrive bolts beforehand.**

(49) Measure and if necessary, correct input shaft end play as follows (Fig. 183):

(a) Be sure overdrive unit is installed on transmission. **End play cannot be properly checked with overdrive unit off transmission.**

(b) Attach dial indicator to converter housing.

(c) Position indicator plunger against input shaft and zero indicator.

(d) Move input shaft in and out and record reading. End play should be 0.56 - 2.31 mm (0.022 - 0.091 in.). Proceed to next step if end play is not within specified limits.

(e) Intermediate shaft thrust washer (in hub of rear clutch retainer) controls end play. Washer is a select fit part and can be changed to adjust end play. If end play turns out to be incorrect, remove oil pump, and clutches. Then install thinner/ thicker thrust washer as necessary.

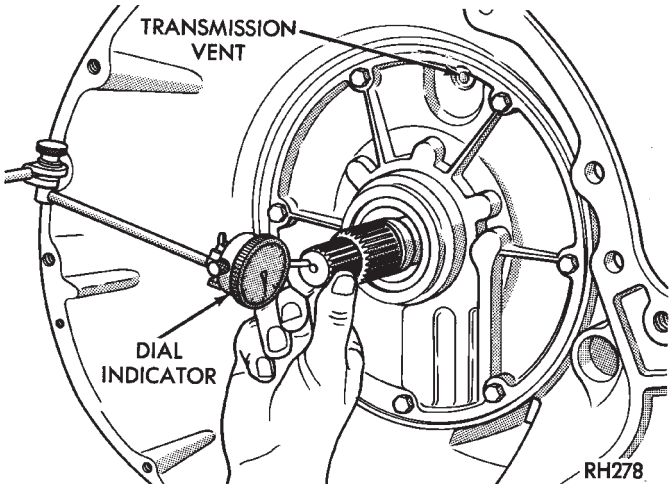



*Fig. 183 Measuring Input Shaft End Play*

(50) Install accumulator piston and inner and outer springs (Fig. 184).

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

(52) Verify that valve body solenoid harness is secured in 3-4 accumulator housing cover plate.

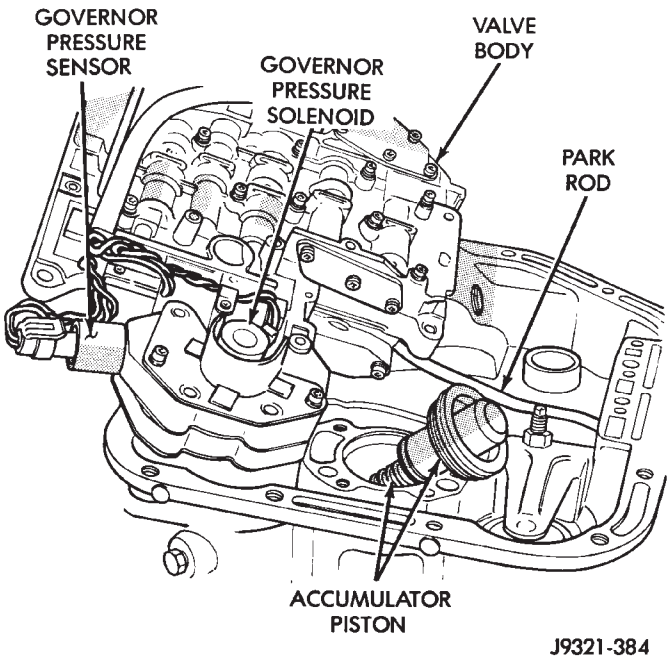



*Fig. 184 Accumulator Piston And Springs*

(53) Install valve body as follows:

(a) Align and carefully insert park rod into pawl. Rod will make click noise as it enters pawl. Move rod slightly to check engagement.

(b) Align and seat valve body on case. Be sure manual lever shaft and overdrive connector are fully seated in case. Also be sure valve body wiring is not pinched or kinked.

(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.**.

**CAUTION: It is possible for the park rod to displace into a cavity just above the pawl sprag during installation. Make sure the rod is actually engaged in the pawl and has not displaced into the cavity. If the rod enters the cavity during installation, it will become bent when the overdrive bolts are tightened. If this occurs, the rod will have to be removed and replaced.**

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

(55) Adjust front and rear bands as follows:

(a) Loosen band adjusting screw locknuts.

(b) Tighten each band adjusting screw to 5 N·m (72 in. lbs.) with torque wrench.

(c) **Back off front band adjusting screw 3-5/8 turns.**

(d) Back off rear band screw 4 turns.

DISASSEMBLY AND ASSEMBLY (Continued)

(8) Install thrust plate on sun gear (Fig. 232). Note that driving shell thrust plates are interchangeable. Use either plate on sun gear and at front/rear of shell.

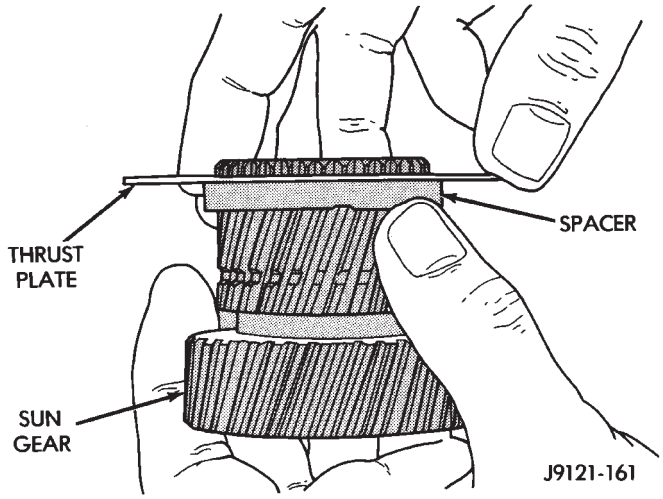



*Fig. 232 Installing Driving Shell Front Thrust Plate On Sun Gear*

(9) Hold sun gear in place and install thrust plate over sun gear at rear of driving shell (Fig. 233).

(10) Position wood block on bench and support sun gear on block (Fig. 234). This makes it easier to align and install sun gear lock ring. Keep wood block handy as it will also be used for geartrain end play check.

(11) Align rear thrust plate on driving shell and install sun gear lock ring. Be sure ring is fully seated in sun gear ring groove (Fig. 235).

(12) Install assembled driving shell and sun gear on output shaft (Fig. 236)..

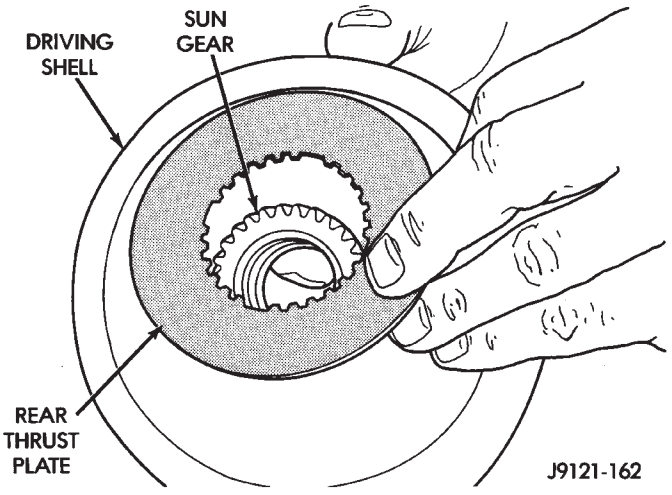



*Fig. 233 Installing Driving Shell Rear Thrust Plate*

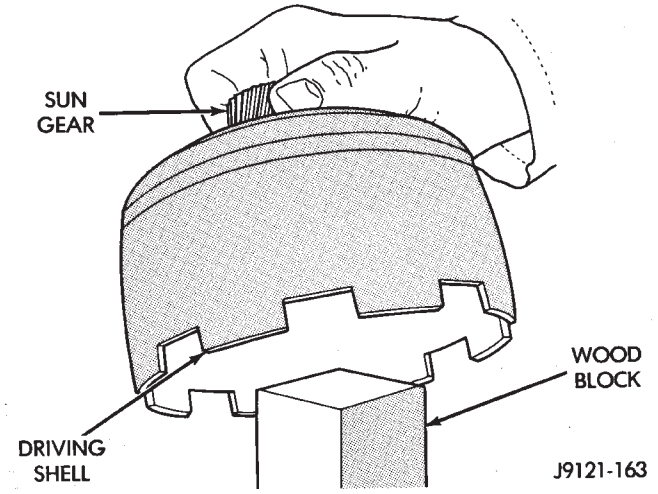



*Fig. 234 Supporting Sun Gear On Wood Block*

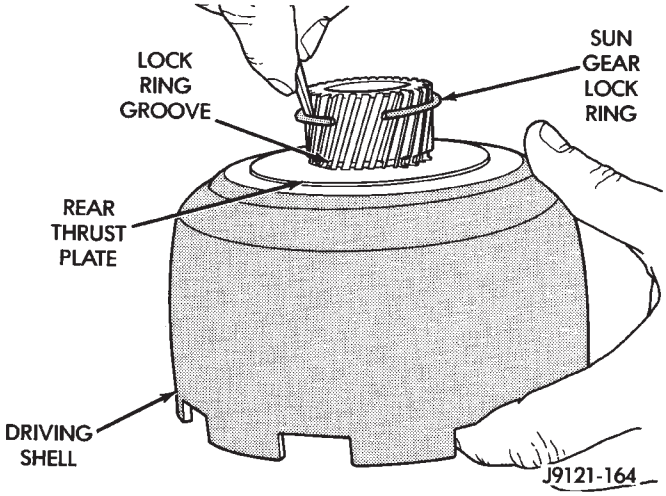



*Fig. 235 Installing Sun Gear Lock Ring*

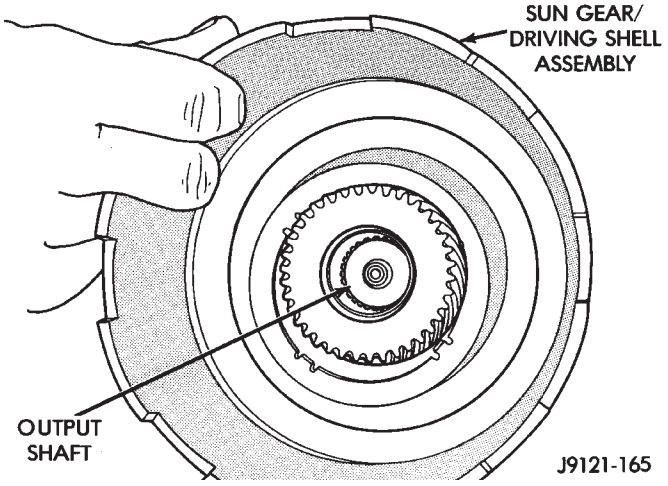



*Fig. 236 Installing Assembled Sun Gear And Driving Shell On Output Shaft*

DISASSEMBLY AND ASSEMBLY (Continued)

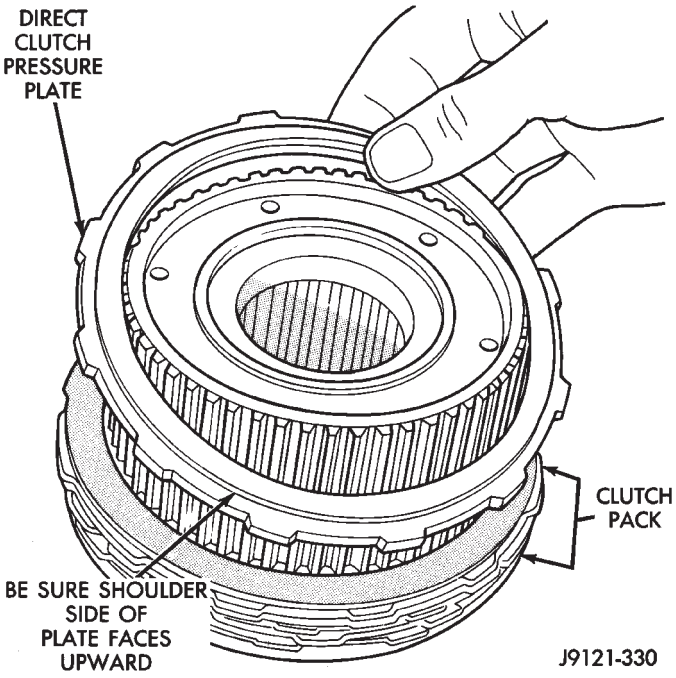



***Fig. 292 Correct Position Of Direct Clutch Pressure Plate***

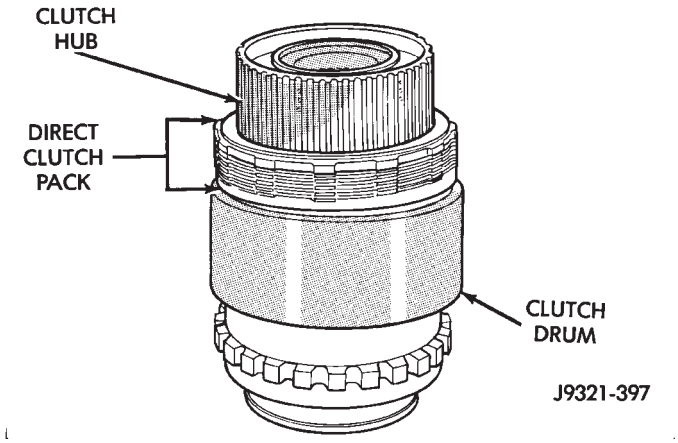



***Fig. 293 Direct Clutch Pack And Clutch Hub Installation***

spline misalignment. Tool must be removed at this point to provide room for compressor tool movement.

(22) Position Compressor Tool 6227-1 on clutch hub (Fig. 294).

(23) Position Tool C-3995-A or similar type tool on top of Tool 6227-1 (Fig. 295).

(24) Compress clutch hub and spring just enough to place tension on hub and hold it in place.

(25) Slide direct clutch pack upwards on hub (Fig. 294). Then set clutch pack on edge of clutch hub and compressor tool as shown.

(26) Slowly compress clutch hub and spring (Fig. 294). Compress spring and hub only enough to expose ring grooves for clutch pack snap ring and clutch hub retaining ring.

(27) Realign clutch pack on hub and seat clutch discs and plates in clutch drum (Fig. 294).

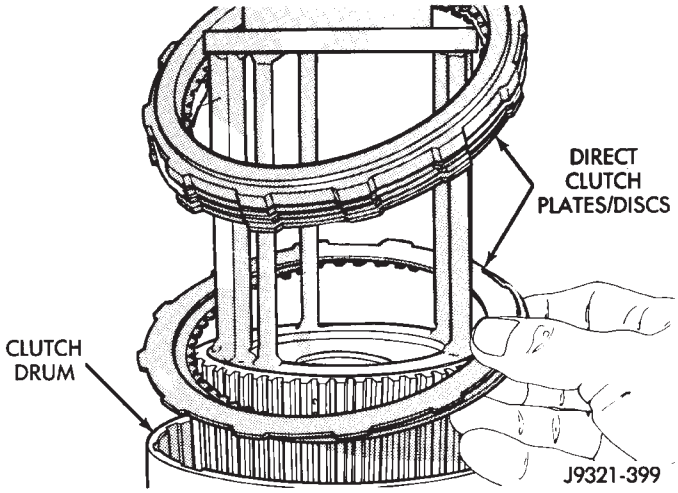



***Fig. 294 Seating Clutch Pack In Drum***

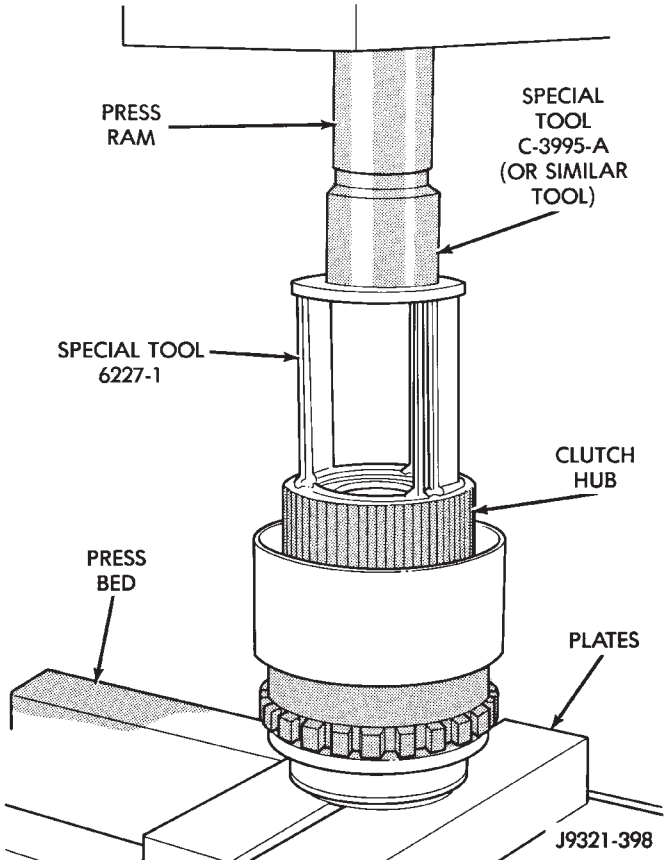



***Fig. 295 Geartrain Mounted In Press***

CLEANING AND INSPECTION (Continued)

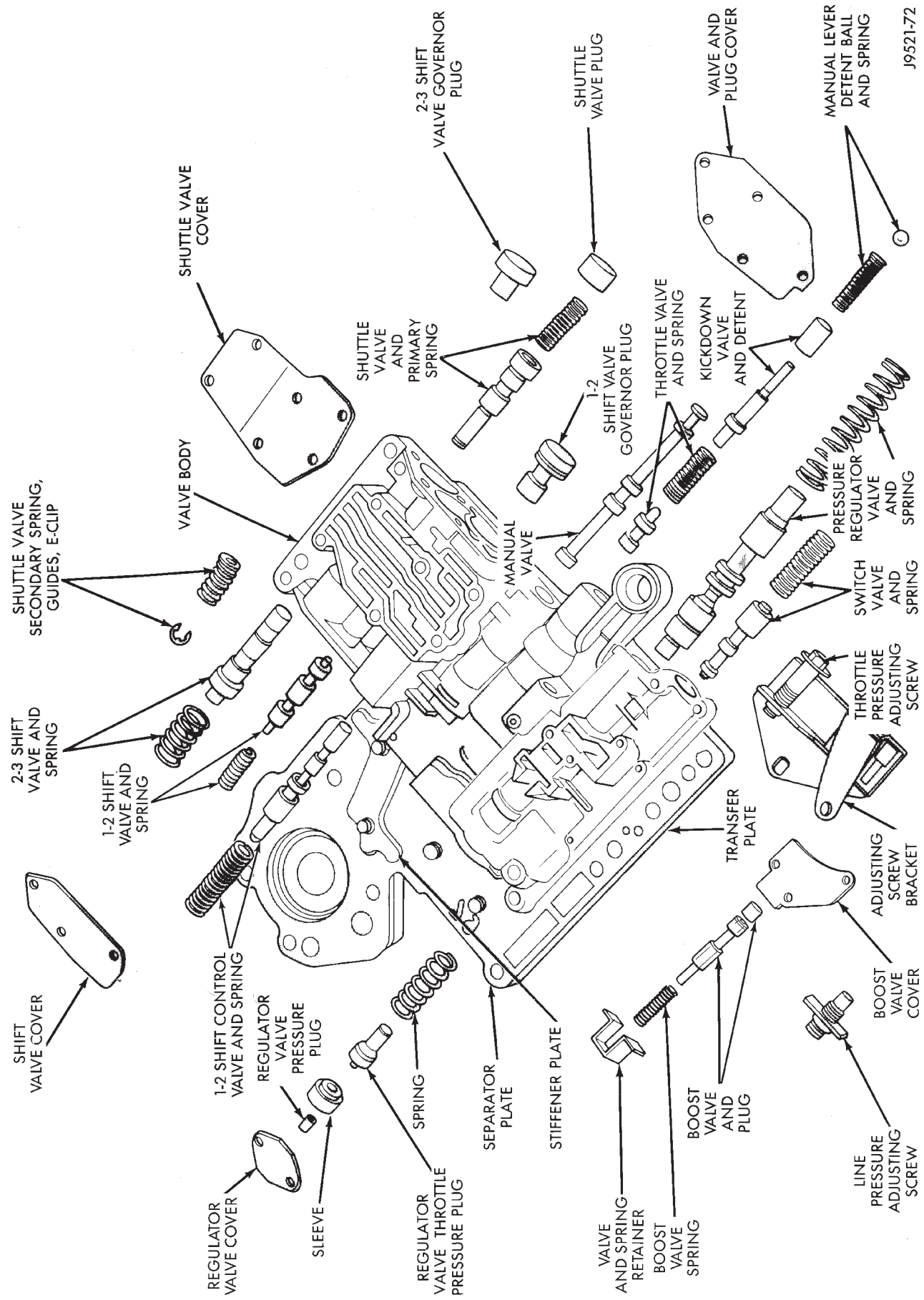
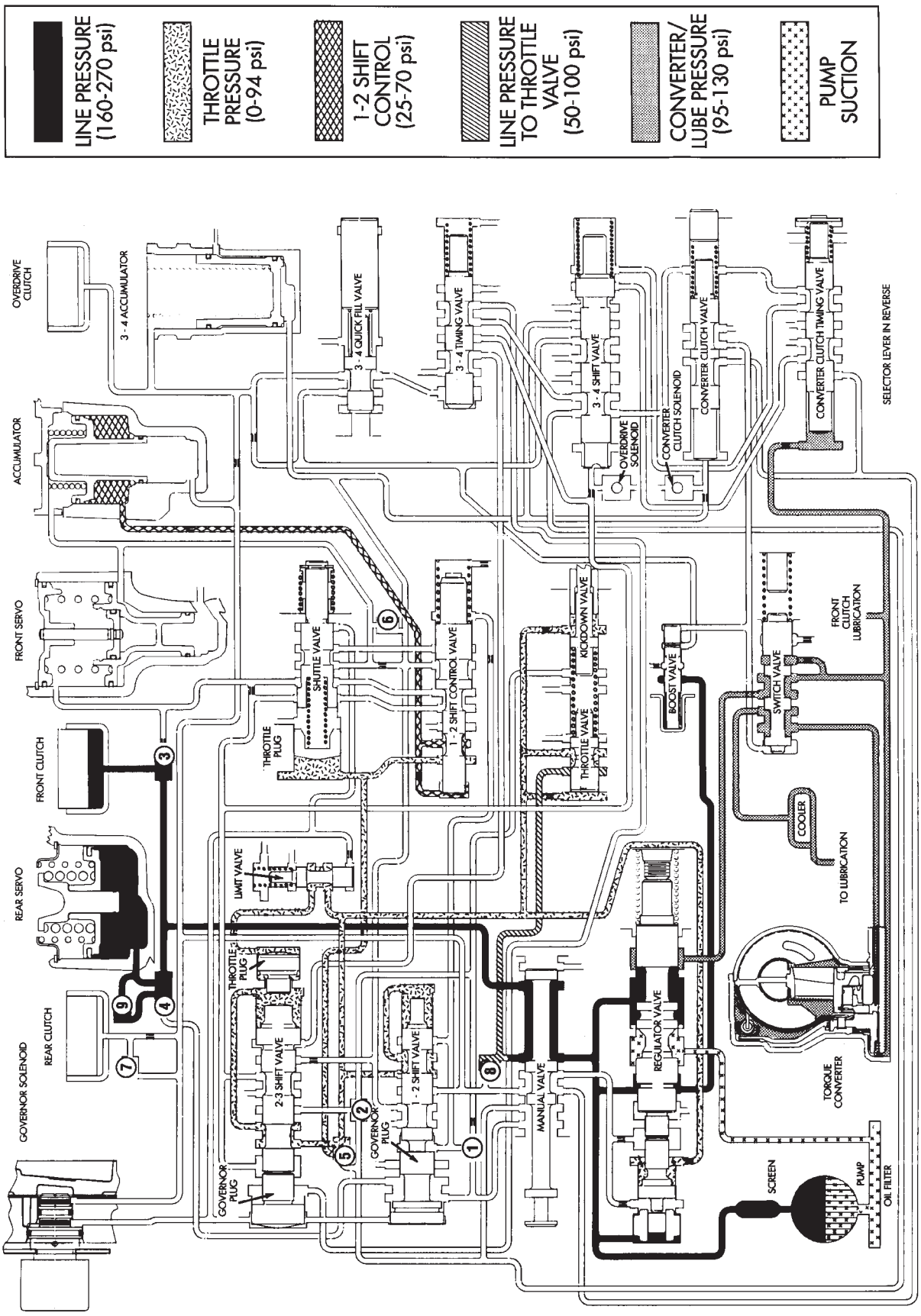


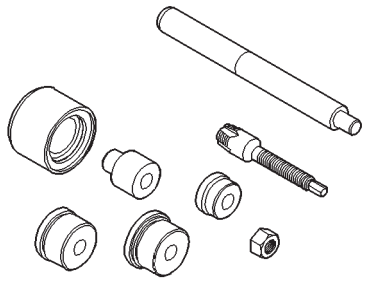

*Fig. 346 Upper Housing Valves, Plug, Springs And Brackets*

SCHEMATICS AND DIAGRAMS (Continued)

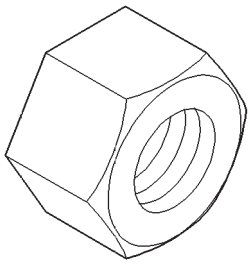



***HYDRAULIC FLOW IN REVERSE***

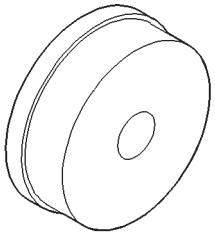
SPECIAL TOOLS (Continued)



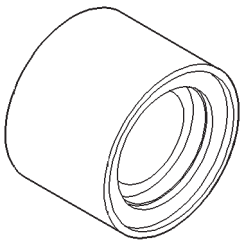
***Bushing Remover/Intsaller Set—C-3887-B***



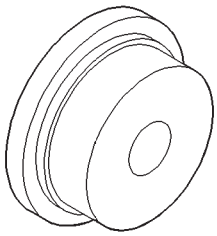
***Nut, Bushing Remover—SP-1191, From kit C-3887-B***



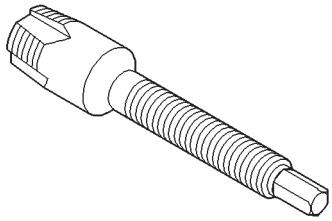
***Remover, Front Clutch Bushing—SP-3629, From kit C-3887-B***



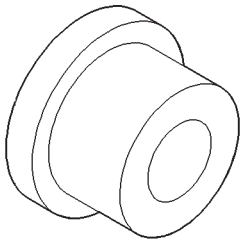
***Cup, Bushing Remover—SP-3633, From kit C-3887-B***



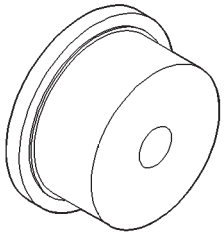
***Installer, Oil Pump Bushing—SP-5118, From kit C-3887-B***



***Remover, Reaction Shaft Bushing—SP-5301, From kit C-3887-B***



***Installer, Reaction Shaft Bushing—SP-5302, From kit C-3887-B***



***Installer, Front Clutch Bushing—SP-5511, From kit C-3887-B***

DISASSEMBLY AND ASSEMBLY (Continued)

(10) Install new seal in input retainer with Tools C-4171 and 7884 (Fig. 54).

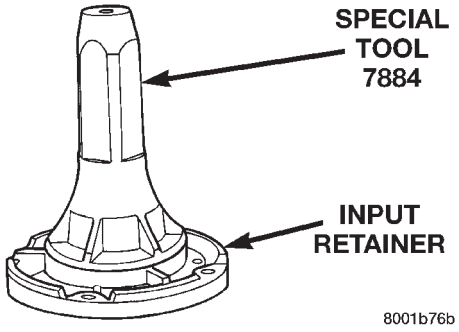



***Fig. 54 Input Retainer Seal Installation***

(11) Apply 3 mm bead of Mopar Sealer P/N 82300234, or Loctite Ultra Gray to front bearing retainer seal surface (Fig. 55).

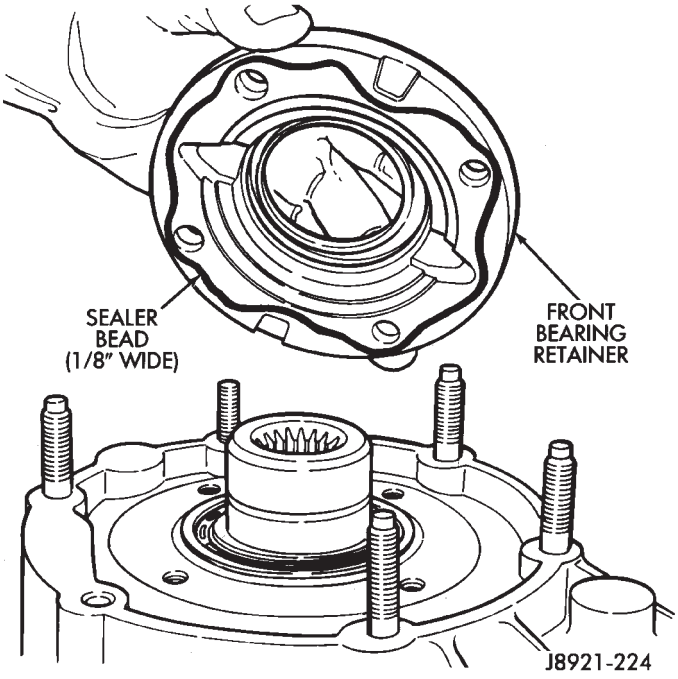



***Fig. 55 Applying Sealer Bead To Input Bearing Retainer***

(12) Align oil channel in retainer with oil feed hole in front case (Fig. 56).

(13) Align and install input retainer on front case (Fig. 57).

(14) Install and tighten input retainer bolts to 16–24 N.m (12–18 ft. lbs.) torque.

**SHIFT SECTOR/POPPET/RANGE FORK/RANGE HUB INSTALLATION**

(1) Install shift sector O-ring and nylon retainer in case bore. Note that one side of retainer is slightly rounded and that the opposite side has a shallow groove. Groove side goes toward seal and rounded side faces out.

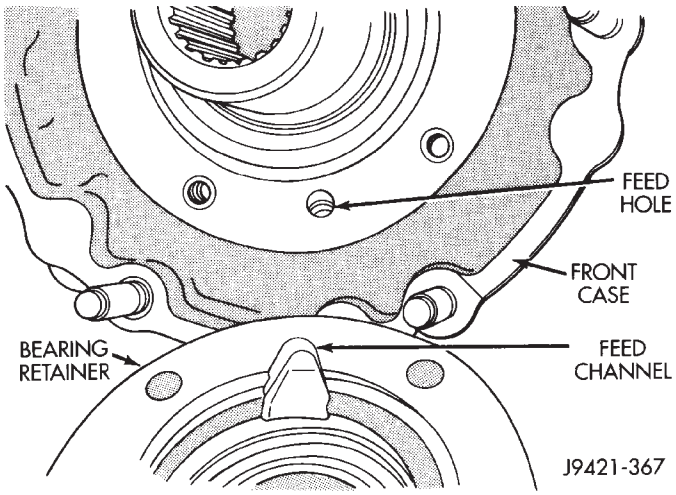



***Fig. 56 Aligning Retainer Oil Channel With Feed Hole In Front Case***

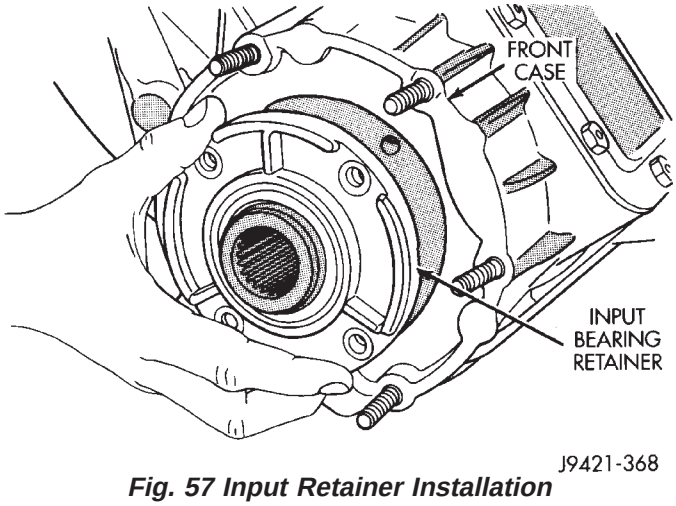



***Fig. 57 Input Retainer Installation***

(2) Install shift sector in case (Fig. 58). Lubricate sector shaft with transmission fluid before installation.

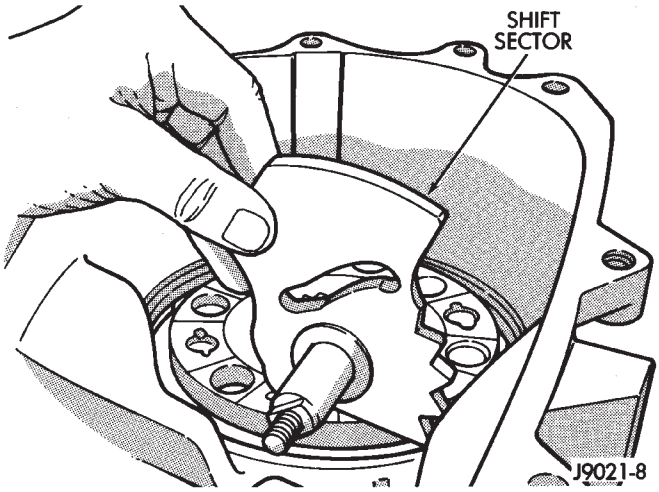



***Fig. 58 Shift Sector Installation***

REMOVAL AND INSTALLATION (Continued)

(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 BEARINGS AND SEALS

### OUTPUT SHAFT FRONT SEAL

(1) Hoist vehicle and support on safety stands.
(2) Remove front propeller shaft, refer to Group 3, Differential and Driveline for proper procedure.
(3) Remove front output shaft yoke.
(4) Remove seal from front case with pry tool (Fig. 6).

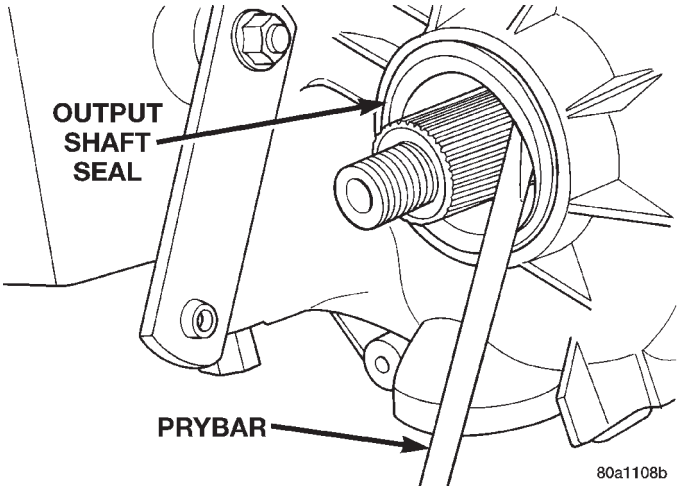



*Fig. 6 Remove Front Output Shaft Seal*

(5) Install new front output seal in front case with Installer Tool 6952 and Tool Handle C-4171 as follows:
(a) Place new seal on tool. **Garter spring on seal goes toward interior of case.**
(b) Start seal in bore with light taps from hammer (Fig. 7). Once seal is started, continue tapping seal into bore until installer tool bottoms against case.

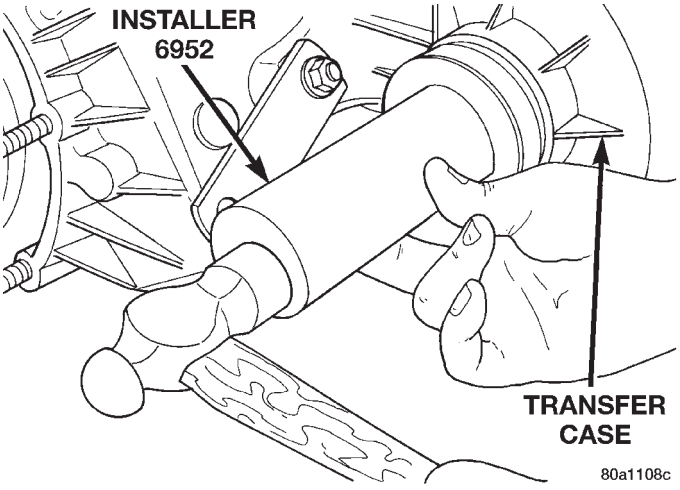



*Fig. 7 Front Output Seal Installation*

### OUTPUT SHAFT FRONT BEARING

The transfer case housing must be disassembled to replace to output shaft front bearing (Fig. 8).
(1) Remove snap ring that retains front bearing in front case (Fig. 9).

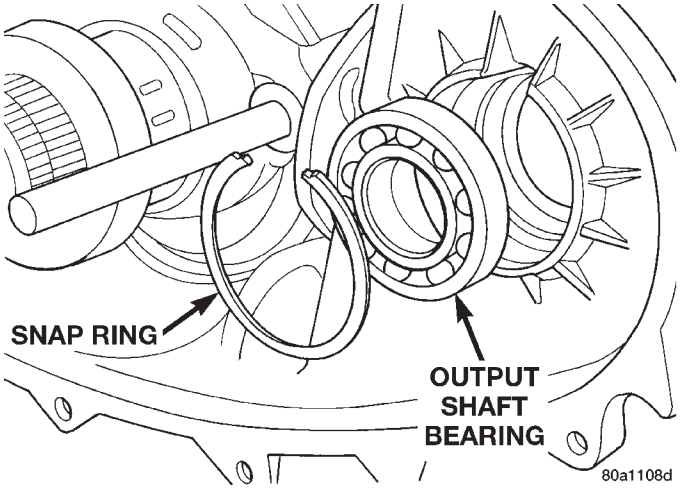



*Fig. 8 Output Shaft Front Bearing*

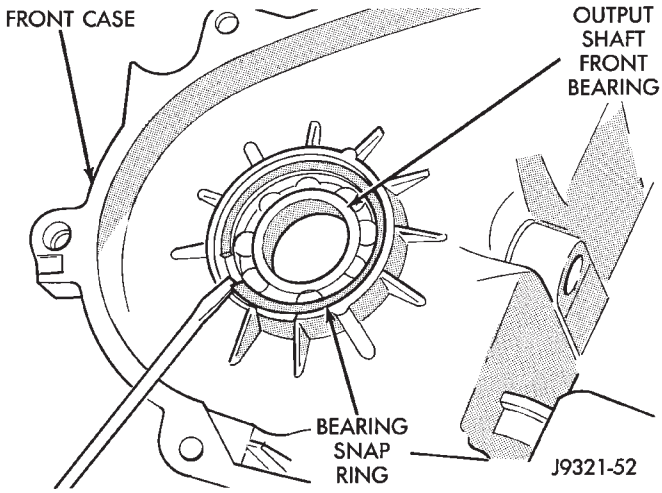



*Fig. 9 Output Shaft Front Bearing Snap Ring Removal*

(2) Using tool 6953, remove bearing from front case (Fig. 10).
(3) Using tool 6953, install new bearing.
(4) Install snap-ring to hold bearing into case.
(5) Assemble transfer case.

### REPLACING FRONT OUTPUT SHAFT REAR BEARING

The transfer case must be disassembled to replace the front output shaft rear bearing.

Using Puller 7794A and Slide Hammer C-637 with Adapter 7420-8, pull the output shaft rear bearing from the rear case (Fig. 12).

Using Tool Handle C-4171 and Installer 5066, install the new bearing with (Fig. 13). **The bearing**

DISASSEMBLY AND ASSEMBLY (Continued)

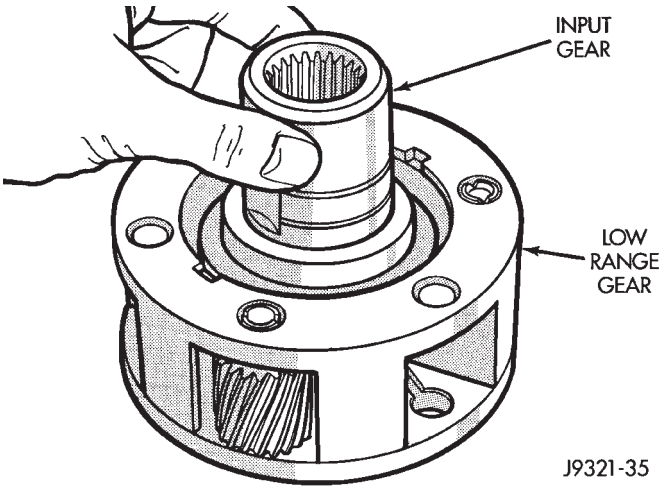



*Fig. 74 Input Gear Removal*

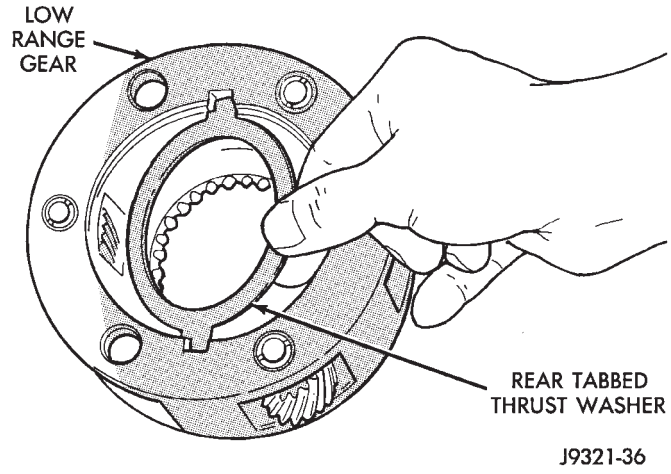



*Fig. 75 Rear Tabbed Thrust Washer Removal*

*INPUT AND LOW RANGE GEAR ASSEMBLE*

(1) Lubricate gears and thrust washers (Fig. 76) with recommended transmission fluid.

(2) Install first thrust washer in low range gear (Fig. 76). Be sure washer tabs are properly aligned in gear notches.

(3) Install input gear in low range gear. Be sure input gear is fully seated.

(4) Install remaining thrust washer in low range gear and on top of input gear. Be sure washer tabs are properly aligned in gear notches.

(5) Install retainer on input gear and install snap ring.

## CLEANING AND INSPECTION

### NV249 COMPONENTS

Clean the transfer case components with parts cleaning solvent. Flush the oil passages in the cases and drivetrain components with solvent. This will help remove dirt and particles from these passages.

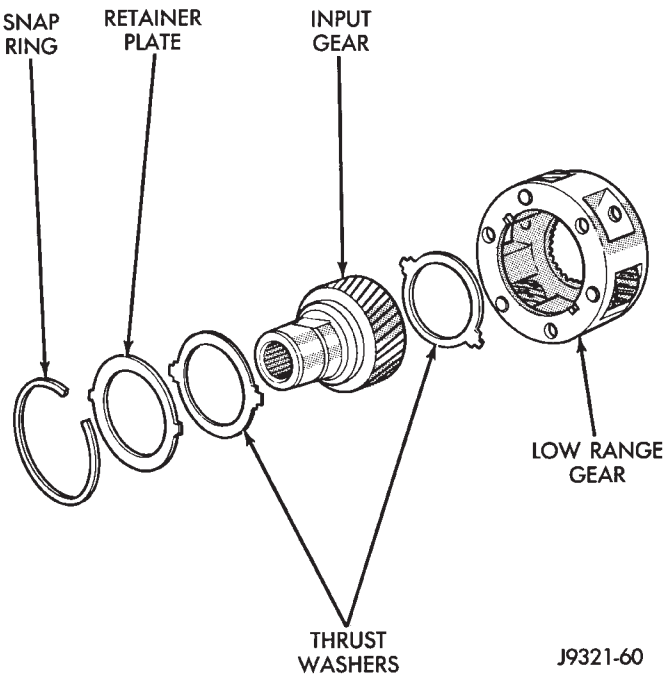



*Fig. 76 Input/Low Range Gear Components*

Dry the transfer case components with compressed air or allow them to air dry on clean shop towels.

Apply compressed air through all oil passages in the cases and gear components to clear them of any residue.

*MAINSHAFT*

Examine the mainshaft components carefully for evidence of wear or damage.

Replace the thrust washers if worn or damaged.

Replace the mainshaft and sprocket gears if the teeth or gear bores are worn or damaged.

Replace the mainshaft bearings if worn, flat spotted, brinelled, or damaged in any way.

Replace the mainshaft if it exhibits wear or damage to the bearing surfaces, splines or gear teeth.

*INPUT AND LOW RANGE GEARS*

Inspect the low range gear pinions and pinion pins. Replace the low range gear if any of the pins or pinions are worn or damaged.

Inspect the thrust washers, retainer and snap ring. Replace the snap ring if bent, or distorted. Replace the thrust washers and retainer if worn, cracked or damaged in any way.

Examine the input gear carefully. Be sure the gear teeth and bearing surfaces are in good condition. Replace the gear if wear or damage is evident.

Check the input gear pilot bearing. Rotate the bearing and check for roughness or noise. Also check bearing position in the bore. The bearing should be recessed approximately 2.5 mm (0.100 in.) below the top edge of the bore. The bearing should not be

DISASSEMBLY AND ASSEMBLY (Continued)

(7) Remove intermediate clutch shaft snap ring (Fig. 27).
(8) Remove clutch shaft thrust ring (Fig. 28).
(9) Remove intermediate clutch shaft (Fig. 29).

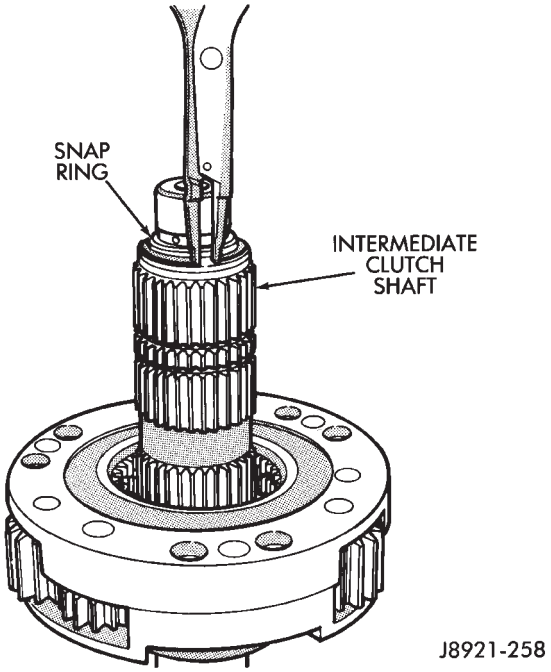



*Fig. 27 Intermediate Clutch Shaft Snap Ring Removal*

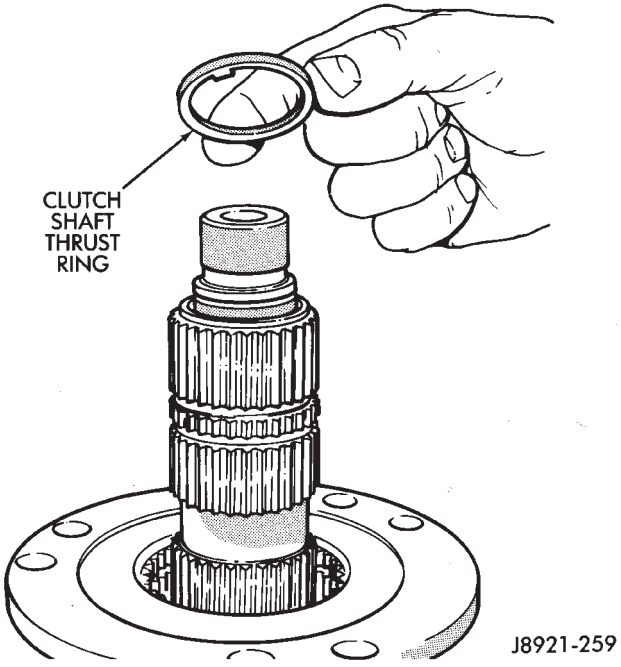



*Fig. 28 Clutch Shaft Thrust Ring Removal*

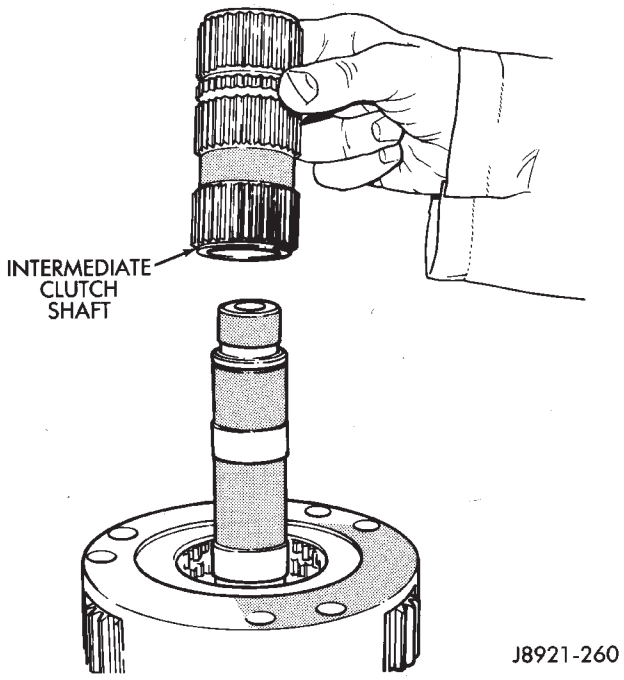



*Fig. 29 Intermediate Clutch Shaft Removal*

(10) Remove differential snap ring (Fig. 30).
(11) Remove differential (Fig. 31).
(12) Remove differential needle bearings and both needle bearing thrust washers from mainshaft.

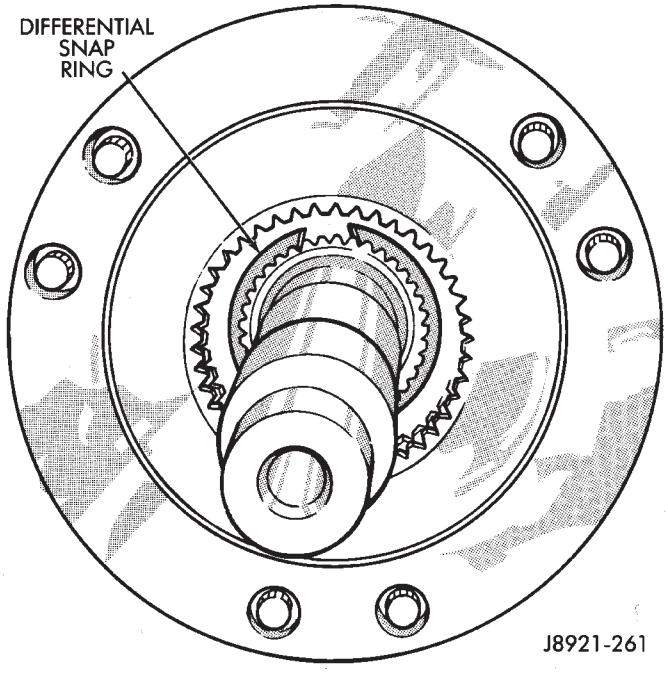



*Fig. 30 Differential Snap Ring Removal*

DISASSEMBLY AND ASSEMBLY (Continued)

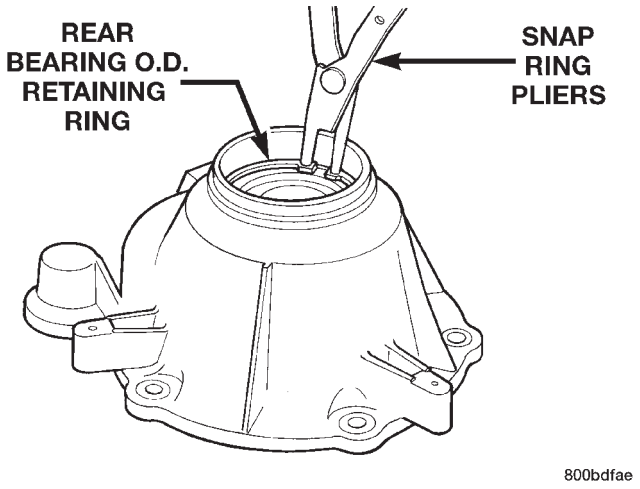



*Fig. 83 Rear Bearing Retaining Ring Installation*

retainer. Sealer bead should be a maximum of 3/16 in.

(5) Install rear retainer on rear case. Tighten retainer bolts to 20–27 N·m (15–20 ft. lbs.) torque.

(6) Install rear bearing I.D. retaining ring and spacer on output shaft.

(7) Apply liberal quantity of petroleum jelly to new rear seal and to output shaft. Petroleum jelly is needed to protect seal lips during installation.

(8) Slide seal onto Seal Protector 6992 (Fig. 84). Slide seal protector and seal onto output shaft.

(9) Slide Installer C-4076-A onto seal protector with the recessed side of the tool toward the seal. Drive seal into rear bearing retainer with installer C-4076-A and handle MD-998323 (Fig. 85).

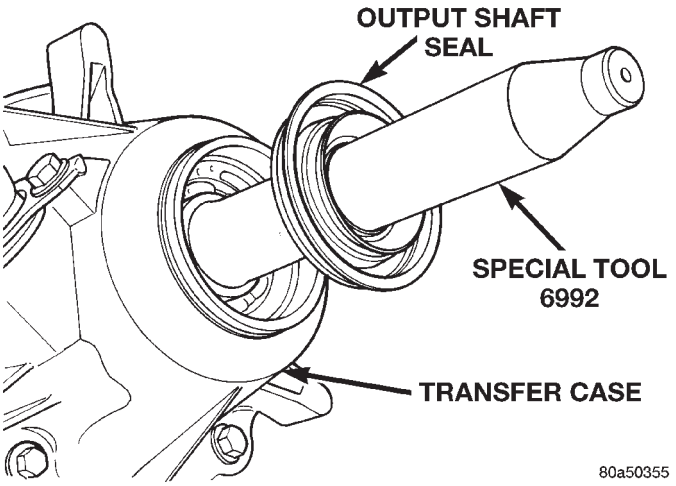



*Fig. 84 Output Shaft Seal and Protector*

(10) Install rear slinger with installer C-4076-A and handle MD-998323 (Fig. 85).

(11) Install boot on output shaft slinger and crimp retaining clamp with tool C-4975-A (Fig. 86).

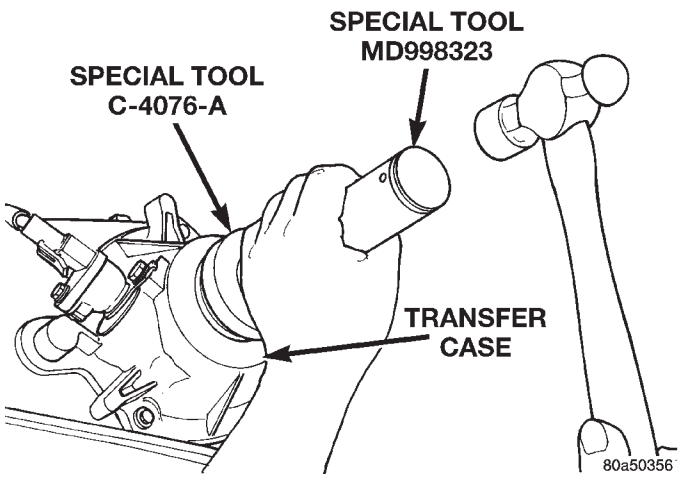



*Fig. 85 Rear Seal Installation*

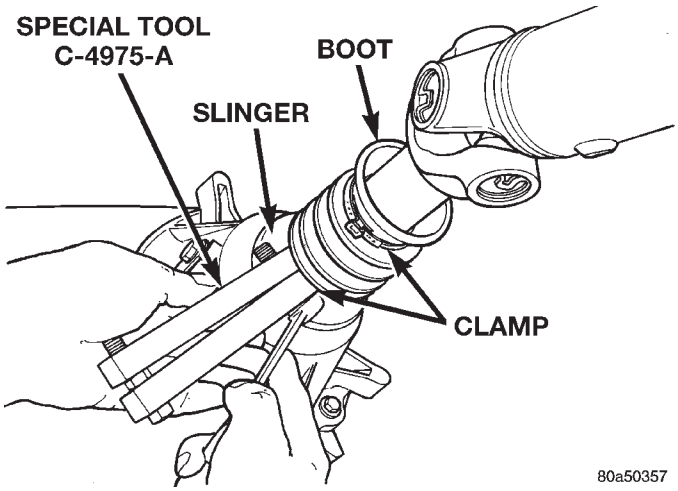



*Fig. 86 Slinger Boot Installation*

**FRONT YOKE AND SWITCH INSTALLATION**

(1) Install indicator switch in front case. Tighten switch to 20–34 N·m (15–25 ft. lbs.) torque.

(2) Lubricate yoke hub with transmission fluid and install yoke on front shaft.

(3) Install new seal washer on front shaft.

(4) Install yoke on front shaft. Secure yoke with new nut.

## CLEANING AND INSPECTION

### NV242 TRANSFER CASE

Clean the transfer case parts with a standard parts cleaning solvent. Remove all traces of sealer from the cases and retainers with a scraper and all purpose cleaner. Use compressed air to remove solvent residue from oil feed passages in the case halves, retainers, gears, and shafts.

The oil pickup screen can be cleaned with solvent. Shake excess solvent from the screen after cleaning and allow it to air dry. Do not use compressed air.

DIAGNOSIS AND TESTING (Continued)

## TIRE AND WHEEL RUNOUT

Radial runout is the difference between the high and low points on the tire or wheel (Fig. 2).

Lateral runout is the **wobble** of the tire or wheel.

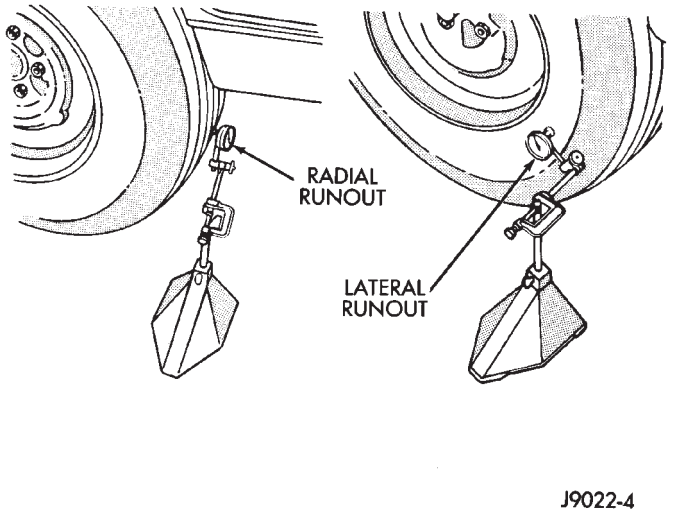



*Fig. 2 Checking Tire Runout*

Radial runout of more than 1.5 mm (.060 inch) measured at the center line of the tread may cause the vehicle to shake.

Lateral runout of more than 2.0 mm (.080 inch) measured near the shoulder of the tire may cause the vehicle to shake.

Sometimes radial runout can be reduced. Relocate the wheel and tire assembly on the mounting studs (See Method 1). If this does not reduce runout to an acceptable level, the tire can be rotated on the wheel. (See Method 2).

### *METHOD 1 (RELOCATE WHEEL ON HUB)*

Check accuracy of the wheel mounting surface; adjust wheel bearings.

Drive vehicle a short distance to eliminate tire flat spotting from a parked position.

Make sure all wheel nuts are properly torqued.

Relocate wheel on the mounting, two studs over from the original position.

Re-tighten wheel nuts until all are properly torqued, to eliminate brake distortion.

Check radial runout. If still excessive, mark tire sidewall, wheel, and stud at point of maximum runout and proceed to Method 2.

### *METHOD 2 (RELOCATE TIRE ON WHEEL)*

Rotating tire on wheel is particularly effective when there is runout in both tire and wheel.

Remove tire from wheel and re-mount wheel on hub in former position.

Check wheel radial runout (Fig. 3).

**NOTE: If the vehicle is equipped with aluminum or full faced wheels the tire must be removed to check radial runout.**

- STEEL WHEELS: Radial runout 0.040 in., Lateral runout 0.045 in.
- ALUMINUM WHEELS: Radial runout 0.030 in., Lateral runout 0.035 in.

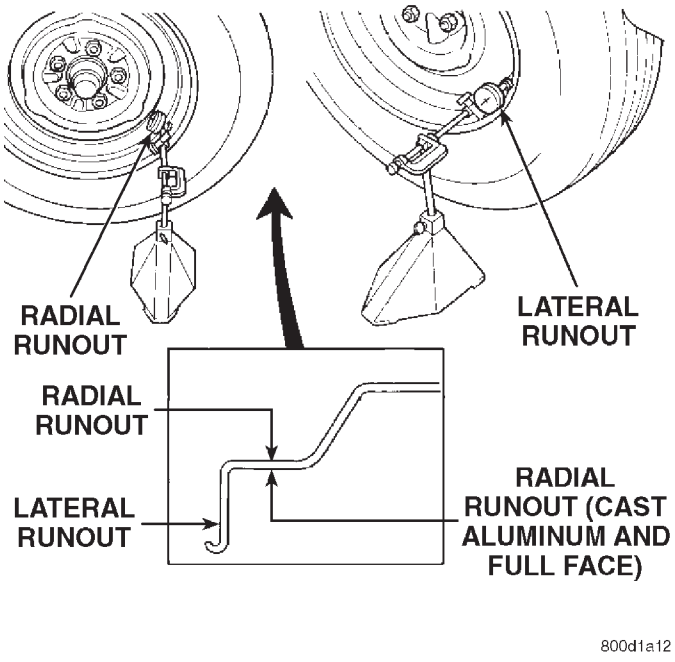



*Fig. 3 Checking Wheel Runout*

If point of greatest runout is near original chalk mark, remount tire 180 degrees. Recheck runout.

# SERVICE PROCEDURES

## WHEEL INSTALLATION

The wheel studs and nuts are designed for specific applications. They must be replaced with equivalent parts. Do not use replacement parts of lesser quality or a substitute design. All aluminum and some steel wheels have wheel stud nuts which feature an enlarged nose. This enlarged nose is necessary to ensure proper retention of the aluminum wheels.

**NOTE: Do not use chrome plated lug nuts with chrome plated wheels.**

Before installing the wheel, be sure to remove any build up of corrosion on the wheel mounting surfaces. Ensure wheels are installed with good metal-to-metal contact. Improper installation could cause loosening of wheel nuts. This could affect the safety and handling of your vehicle.

To install the wheel, first position it properly on the mounting surface. All wheel nuts should then be tightened just snug. Gradually tighten them in sequence to the

# SEATS

## INDEX



## REMOVAL AND INSTALLATION

### BUCKET SEAT BACK

*REMOVAL*

(1) Position seat back into full recline.
(2) Remove seat cushion outboard trim cover.
(3) Remove bolts attaching recliner to seat cushion frame.
(4) Remove inboard pivot bolt.
(5) Disengage electrical connectors for power lumbar, power recliner and seat heater element, if equipped.
(6) Separate seat back from vehicle.

*INSTALLATION*

(1) Position seat back in vehicle.
(2) Engage electrical connectors for power lumbar, power recliner and seat heater element, if equipped.
(3) Install inboard pivot bolt. Tighten bolt to 40 N·m (29 ft. lbs.) torque.
(4) Install bolts attaching recliner to seat cushion frame. Tighten bolts to 28 N·m (20 ft. lbs.) torque.
(5) Install seat cushion outboard trim cover.

### BUCKET SEAT BACK COVER

*REMOVAL*

(1) Remove head restraint.
(2) Remove seat back.
(3) Unfasten seat back cover zipper.
(4) Route zipper over power recliner motor, if equipped.
(5) Slide hand between the face of the seat back cushion and the cushion cover and carefully separate hook and loop fastener (Fig. 1).
(6) Roll cover upward to top of seat back.
(7) Carefully slide cover over head restraint guide sleeves.
(8) Separate cover from seat back.

*INSTALLATION*

(1) Position cover at the top of seat back.

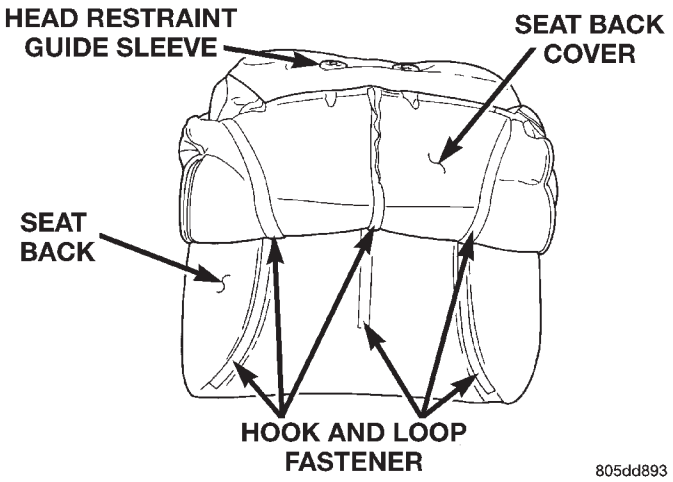



***Fig. 1 Seat Back Cover***

(2) Carefully slide cover over head restraint guide sleeves.
(3) Roll cover downward.
(4) Route zipper over power recliner motor, if equipped.
(5) Fasten seat back cover zipper.
(6) Install seat back.
(7) Install head restraint.

### LUMBAR SUPPORT

*REMOVAL*

(1) Remove seat back.
(2) Remove seat back cover.
(3) Slide Duon® cover upward to access bolts attaching recliner to seat back frame (Fig. 2) and remove recliner.
(4) Disengage hog rings at base of seat back.
(5) Slide seat back frame out of seat back foam cushion.
(6) Remove Duon cover.

*INSTALLATION*

(1) Transfer components (Fig. 3):
- Back panel.
- Head restraint sleeves.
- U-nut on inboard pivot location.

REMOVAL AND INSTALLATION (Continued)

(2) Remove screw from inner door panel attaching seal to outer door panel (Fig. 22).

(3) Grasp seal and pull rearward to release it from side view mirror bezel.

(4) Lift seal upward and separate from door.

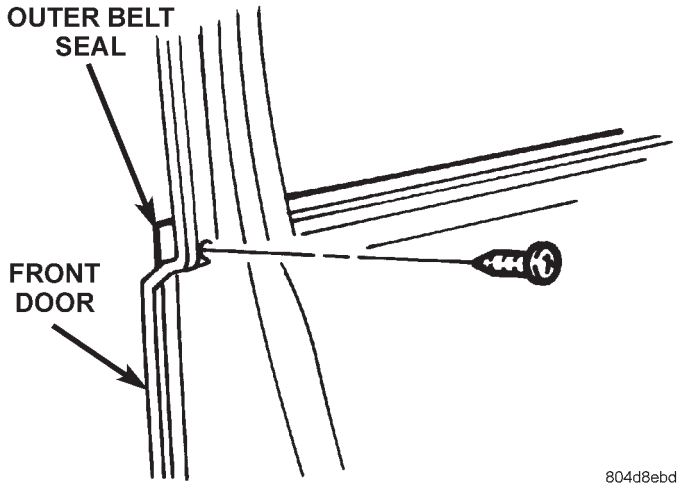



***Fig. 22 Front Door Outer Belt Seal***

*INSTALLATION*

(1) Lightly lubricate the front of the seal

(2) Position the seal onto the door flange.

(3) Slide the front of the seal behind the side view mirror bezel. Force the seal onto door flange. Continue rearward until it is seated on flange.

(4) Install the screw securing the seal to the outer door panel.

## FRONT DOOR RUN CHANNEL WEATHERSTRIP

*REMOVAL*

(1) Lower window glass.

(2) Grasp seal from upper run channel corner and firmly separate weatherstrip from flange (Fig. 23).

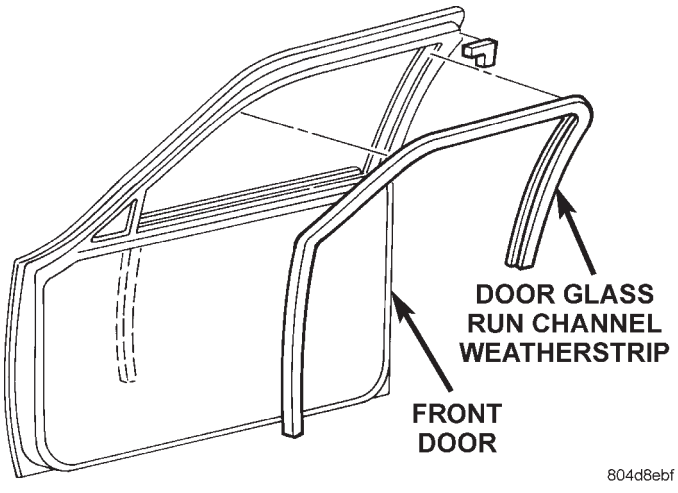



***Fig. 23 Front Door Glass Run Channel Weatherstrip***

*INSTALLATION*

**NOTE: Soapy water may be used to aid in installation.**

(1) Position weatherstrip on flange aligning notches in each corner.

(2) Press weatherstrip into position.

## FRONT DOOR OPENING WEATHERSTRIP

*REMOVAL*

(1) Remove A-pillar trim panel.

(2) Remove B-pillar upper trim panel.

(3) Remove B-pillar lower trim panel.

(4) Grasp seal and separate from door opening.

*INSTALLATION*

(1) Position weatherstrip at corners using paint dots as alignment points.

(2) Move upward and around edge of door opening. Seat seal on flange (Fig. 24).

(3) Engage connector plug with each end of weatherstrip at bottom of door opening.

(4) Install B-pillar lower trim panel.

(5) Install B-pillar upper trim panel.

(6) Install A-pillar trim panel.

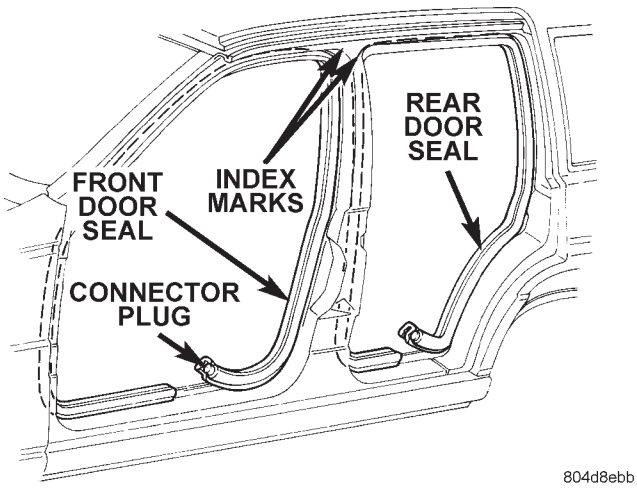



***Fig. 24***

## FRONT DOOR WINDOW REGULATOR

*REMOVAL*

(1) Remove door trim panel and waterdam. If necessary, refer to removal procedure.

(2) Position window glass to access window track nuts (Fig. 25).

(3) Loosen window track nuts and slide track off of the window.

(4) Remove window regulator retaining screws (Fig. 26).

REMOVAL AND INSTALLATION (Continued)

(4) Remove sunvisors from front of roof panel. Disconnect vanity lamp wiring (if applicable)
(5) Remove assist handles from side of roof rails.
(6) Remove push plugs from roof support (Fig. 60).
(7) Remove dome/reading lamp or overhead console from center of roof panel.
(8) Remove sunroof pinch welt holding headliner, if equipped (Fig. 61).
(9) With aid of an assistant, remove headliner through liftgate opening.

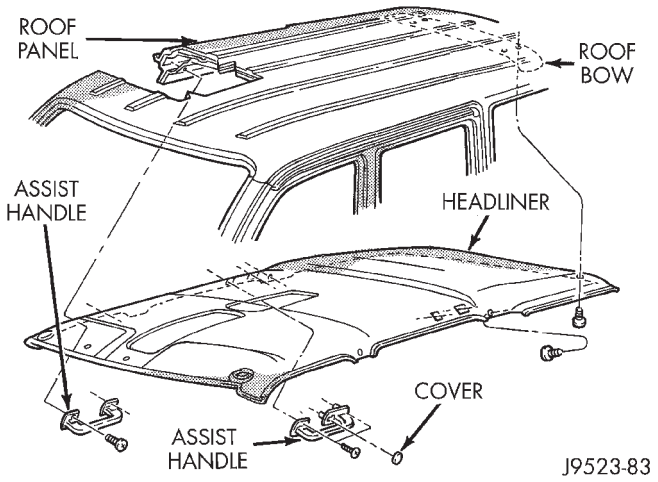



***Fig. 60 Headliner***

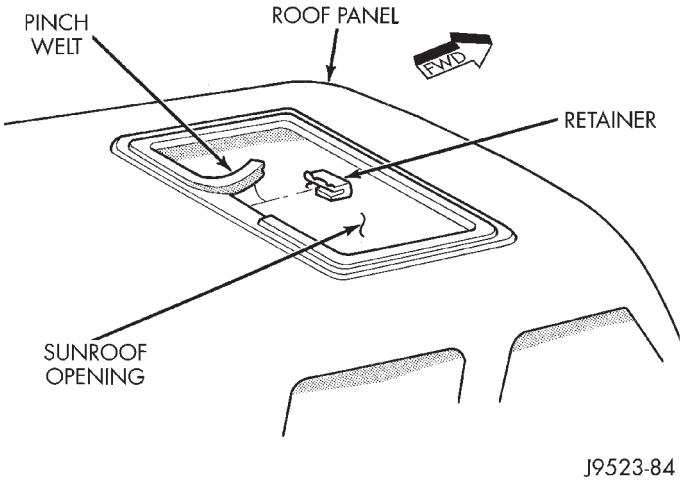



***Fig. 61 Sunroof Opening***

*INSTALLATION*

(1) With the aid of an assistant, position headliner in vehicle.
(2) Install sunroof pinch welt.
(3) Install dome/reading lamp.
(4) Install push plugs in roof support.
(5) Install sunvisors.
(6) Install assist handles.
(7) Install A, B, C and D-pillar trim panels.
(8) Install liftgate upper trim panel.

## LIFTGATE TRIM PANEL

**NOTE:**
**When removing both trim panels from liftgate, remove lower trim panel first. When installing both trim panels, install the upper trim panel first.**

*UPPER TRIM PANEL REMOVAL*

(1) Remove screws attaching upper trim panel to liftgate (Fig. 62).
(2) Remove screws at upper and lower trim panel overlap.
(3) Gently, pull trim panel downward. If necessary rotate trim panel away from glass panel to release push-in fasteners.
(4) Use a trim panel removal tool to detach push-in fasteners from liftgate.

*UPPER TRIM PANEL INSTALLATION*

(1) Position trim panel at liftgate and slide overlapping portions of trim panel under liftgate lower trim panel.
(2) Align trim panel push-in fasteners with holes in liftgate inner panel. Press trim panel upward to seat fasteners.
(3) Install screws at upper and lower trim panel overlap.
(4) Install screws attaching upper trim panel to liftgate.

*LOWER TRIM PANEL REMOVAL*

(1) Remove screws attaching lower trim panel to liftgate (Fig. 62).
(2) Use a trim panel removal tool to detach push-in fasteners from liftgate.

*LOWER TRIM PANEL INSTALLATION*

(1) Position trim panel on liftgate.
(2) Align trim panel push-in fasteners with holes in liftgate inner panel. Press trim panel inward to seat fasteners.
(3) Install screws attaching lower trim panel to liftgate.

## LIFTGATE

*REMOVAL*

**WARNING: DO NOT DISCONNECT THE SUPPORT ROD CYLINDERS WITH THE LIFTGATE CLOSED. THE SUPPORT ROD PISTONS ARE OPERATED BY HIGH PRESSURE GAS. THIS PRESSURE COULD CAUSE DAMAGE AND/OR PERSONAL INJURY IF THEY ARE REMOVED WHILE THE PISTONS ARE COMPRESSED.**

DESCRIPTION AND OPERATION (Continued)

## BLOWER MOTOR SWITCH

The heater-A/C blower motor is controlled by a rotary switch, mounted in the heater-A/C control panel. On vehicles with manual temperature control systems, the switch allows the selection of four blower motor speeds, but will only operate with the ignition switch in the On position, and the heater-A/C mode control switch in any position except Off. On vehicles with ATC systems, the switch allows the selection of Lo Auto, Hi Auto, and an infinite number of manual speed settings between Lo and Hi.

On manual temperature control systems, the blower motor switch is connected in series with the blower motor ground circuit through the heater-A/C mode control switch. The blower motor switch directs this ground path to the blower motor through the blower motor resistor wires, or directly to the blower motor, as required to achieve the selected blower motor speed.

On ATC systems, the blower motor switch is just one of many inputs to the ATC controller. In the manual blower modes, the ATC controller adjusts the blower motor speed through the power module or the high speed blower motor relay as required by the blower switch position. In the auto blower modes, the ATC controller it is selected with the blower adjusts the blower motor speed through the power module or the high speed blower motor relay as required to achieve and maintain the selected comfort level.

The blower motor switch cannot be repaired and, if faulty, must be replaced. The switch is serviced only as a part of the heater-A/C control assembly.

## COMPRESSOR

The air conditioning system uses a Nippon Denso 10PA17 fixed displacement compressor on all models. A label identifying the use of R-134a refrigerant is located on the compressor. The purpose of the compressor is to compress the low-pressure refrigerant vapor from the evaporator into a high-pressure, high-temperature vapor. The compressor is serviced only as an assembly.

## COMPRESSOR CLUTCH

The compressor clutch assembly consists of a stationary electromagnetic coil, a hub bearing and pulley assembly, and a clutch plate (Fig. 4). The electromagnetic coil and pulley are retained on the compressor with snap rings. The clutch plate is mounted on the compressor shaft and secured with a bolt.

These components provide the means to engage and disengage the compressor from the engine serpentine accessory drive belt. When the clutch coil is energized, it magnetically draws the clutch into contact with the pulley and drives the compressor shaft.

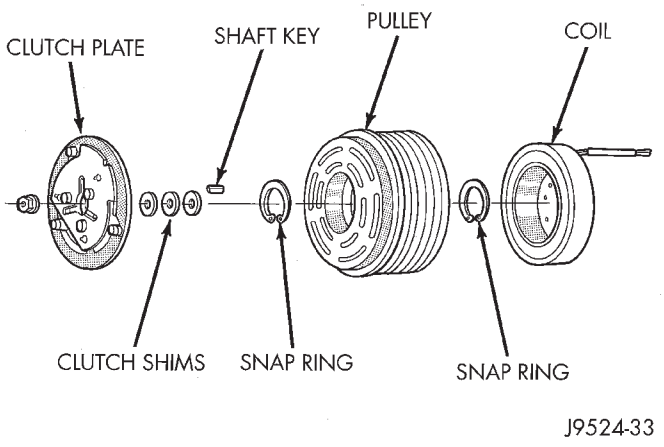



***Fig. 4 Compressor Clutch - Typical***

When the coil is not energized, the pulley free-wheels on the clutch hub bearing, which is part of the pulley. The compressor clutch and coil are the only serviced parts on the compressor.

The compressor clutch is controlled by several components: the A/C switch on the heater-A/C control panel, the ATC controller, the low pressure cycling clutch switch, the high pressure cut-off switch, the compressor clutch relay, and the Powertrain Control Module (PCM). The PCM may delay compressor clutch engagement for up to 30 seconds. Refer to Group 14 - Fuel System for more information on the PCM controls.

## COMPRESSOR CLUTCH RELAY

The compressor clutch relay is a International Standards Organization (ISO) micro-relay. The terminal designations and functions are the same as a conventional ISO relay. However, the micro-relay terminal orientation (footprint) is different, current capacity is lower, and the relay case dimensions are smaller than on the conventional ISO relay.

The compressor clutch relay is a electro-mechanical device that switches current to the compressor clutch coil when the Powertrain Control Module (PCM) grounds the coil side of the relay. The PCM responds to inputs from the A/C switch on the heater-A/C control panel, the ATC controller, the low pressure cycling clutch switch, and the high pressure cut-off switches.

The compressor clutch relay is located in the Power Distribution Center (PDC) in the engine compartment. Refer to the PDC label for relay identification and location.

## CONDENSER

The condenser is located in front of the engine cooling radiator. It is a heat exchanger that allows the high-pressure refrigerant gas to give up its heat to the air passing over the condenser fins. This causes