JEEP®

SERVICE MANUAL

2004
WRANGLER

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

NEXT PAGE ▶

MAINTENANCE SCHEDULES (Continued)

Schedule "B"

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

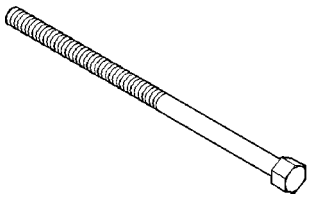
- Day or night temperatures are below 0°C (32°F)
- Stop and go driving
- Excessive engine idling
- Driving in dusty conditions
- Short trips of less than 16.2 km (10 miles)
- More than 50% of your driving is at sustained high speeds during hot weather, above 32°C (90°F)
- Trailer towing
- Taxi, police,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

Miles (Kilometers)	**3,000 (5 000)**	**6,000 (10 000)**	**9,000 (14 000)**	**12,000 (19 000)**	**15,000 (24 000)**
Change the engine oil and engine oil filter.	X	X	X	X	X
Inspect the engine air filter element, replace if necessary.					X
Lubricate the steering linkage tie rod ends.	X	X	X	X	X
Lubricate the steering and suspension ball joints.		X		X	
Inspect the brake linings.				X	
Drain and refill the front and rear axle fluid‡				X	

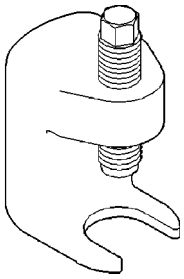
Miles (Kilometers)	**18,000 (29 000)**	**21,000 (34 000)**	**24,000 (38 000)**	**27,000 (43 000)**	**30,000 (48 000)**
Change the engine oil and engine oil filter.	X	X	X	X	X
Inspect the engine air filter element, replace if necessary.					X
Inspect the PCV Valve, and replace if necessary. ◇					X
Replace the spark plugs.					X
Lubricate the steering linkage tie rod ends.	X	X	X	X	X
Lubricate the steering and suspension ball joints.	X		X		X
Inspect the brake linings.			X		
Drain and refill the front and rear axle fluid‡			X		
Inspect the transfer case fluid, add if necessary.					X

Miles (Kilometers)	**33,000 (53 000)**	**36,000 (58 000)**	**39,000 (62 000)**	**42,000 (67 000)**	**45,000 (72 000)**
Change the engine oil and engine oil filter.	X	X	X	X	X
Inspect the engine air filter element, replace if necessary.					X
Lubricate the steering linkage tie rod ends.	X	X	X	X	X
Lubricate the steering and suspension ball joints.		X		X	
Inspect the brake linings.		X			
Drain and refill the front and rear axle fluid‡		X			

FRONT (Continued)



Bolt, Special 7604



Remover C-4150A

BUSHINGS

REMOVAL

(1) Remove the upper suspension arm from axle.

(2) Position Spacer 7932-3 over the axle bushing on a 4x2 vehicle and right side on a 4x4 vehicle.

(3) Place Receiver 7932-1 over flanged end of the bushing. (Fig. 1).

(4) Place small end of Remover/Install 7932-2 against other side of the bushing.

(5) Install bolt 7604 through remover, bushing and receiver.

(6) Install Long Nut 7603 and tighten nut too pull bushing out of the axle bracket.

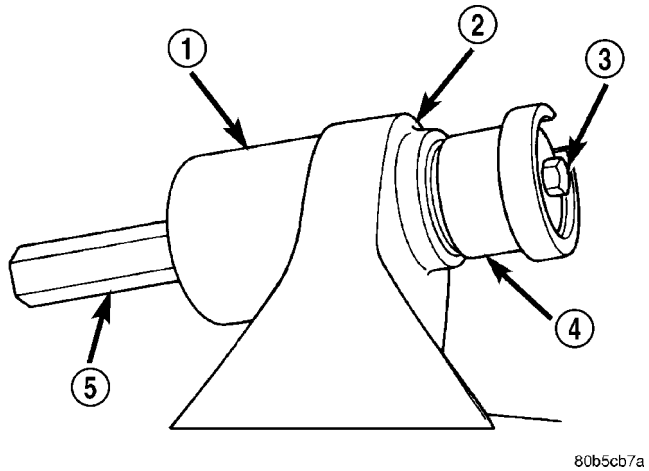


Fig. 1 Bushing Removal

1 - RECEIVER
2 - AXLE BRACKET
3 - BOLT
4 - REMOVER/INSTALLER
5 - LONG NUT

(7) Remove nut, bolt, receiver, remover and bushing.

NOTE: On 4x2 vehicle and right side of 4x4 vehicle, leave Spacer 7932-3 in position for bushing installation.

INSTALLATION

(1) Place Receiver 7932-1 on the other side of the axle bracket.

(2) Position new bushing up to the axle bracket., and large end of Remover/Install 7932-2 against the bushing (Fig. 2).

(3) Install bolt 7604 through receiver, bushing and installer.

(4) Install Long Nut 7603 and tighten nut to draw the bushing into the axle bracket.

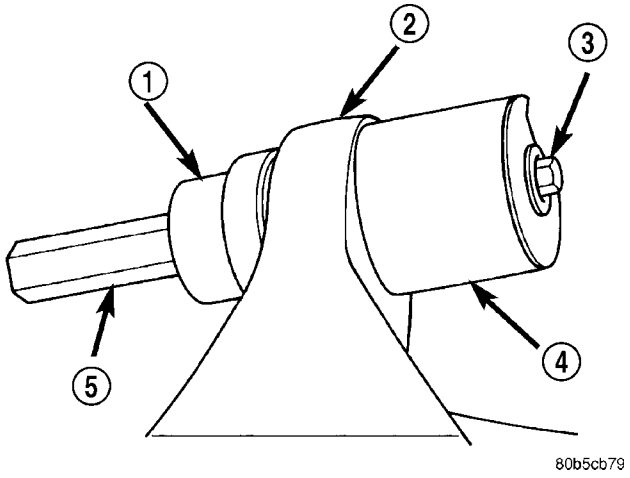


Fig. 2 Bushing Installation

1 - REMOVER/INSTALLER
2 - AXLE BRACKET
3 - BOLT
4 - RECEIVER
5 - LONG NUT

(5) Remove tools and install the upper suspension arm.

HUB / BEARING

DESCRIPTION

The bearing used on the front hub of this vehicle is the combined hub and bearing unit type assembly. This unit assembly combines the front wheel mounting hub (flange) and the front wheel bearing into a one piece unit. The wheel mounting studs are the only replaceable component of the hub/bearing assembly.

DOUBLE CARDAN UNIVERSAL JOINTS (Continued)

(9) Flip assembly and repeat Step 5, Step 6, Step 7 and Step 8 to remove the opposite bearing cap.

(10) Remove cross centering kit assembly and spring (Fig. 24).

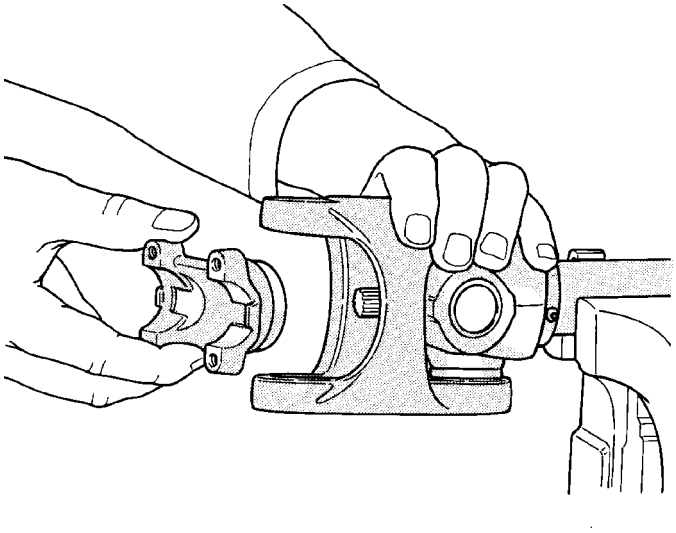


Fig. 24 CENTERING KIT

(11) Press remaining bearing caps out the other end of the link yoke, as described above to complete the disassembly.

ASSEMBLY

CAUTION: Alignment marks on link yoke and propeller shaft yoke must be aligned during assembled. Keep needle bearings upright in the bearing cap. Failure to heed caution may result in damage.

(1) Apply extreme pressure (EP) N.L.G.I. Grade 1 or 2 grease to inside of yoke bores.

(2) Fit a cross into propeller shaft yoke (Fig. 25).

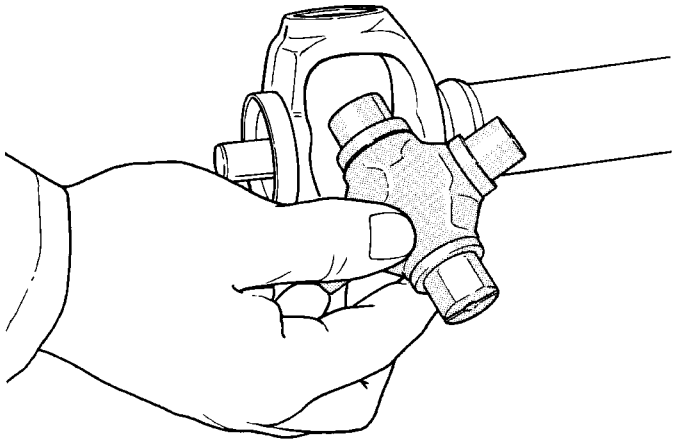


Fig. 25 INSTALL CROSS IN YOKE

(3) Place a bearing cap over the trunnion and align cap with the yoke bore (Fig. 26).

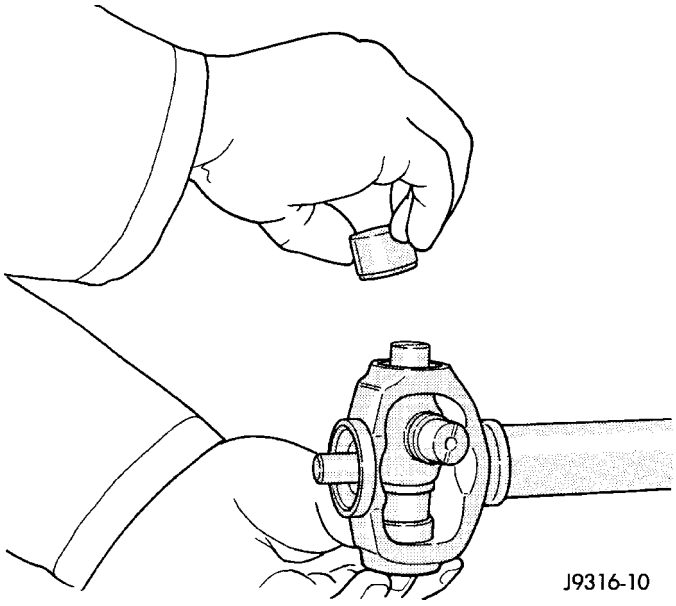


Fig. 26 INSTALL BEARING CAP

(4) Press bearing cap into the yoke bore enough to clear snap ring groove (Fig. 27).

(5) Install a snap ring.

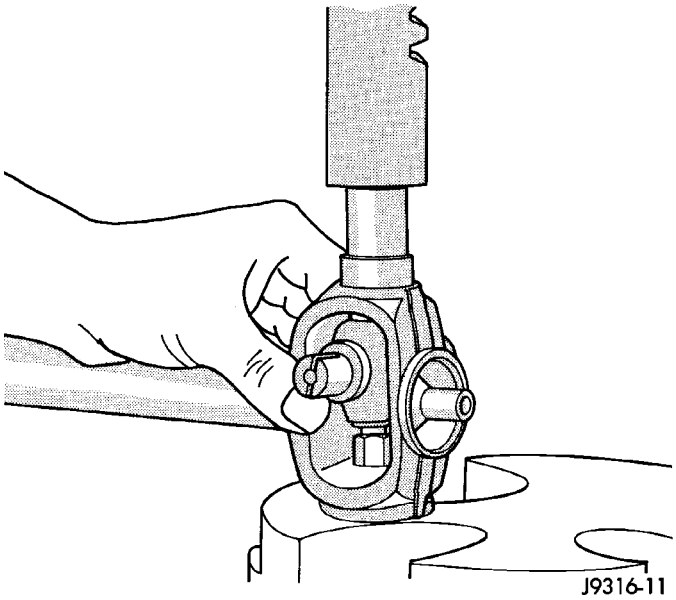


Fig. 27 PRESS BEARING CAP

PINION SEAL (Continued)

(2) Install yoke on pinion gear with Installer W-162-D, Cup 8109 and Holder 6958 (Fig. 39).

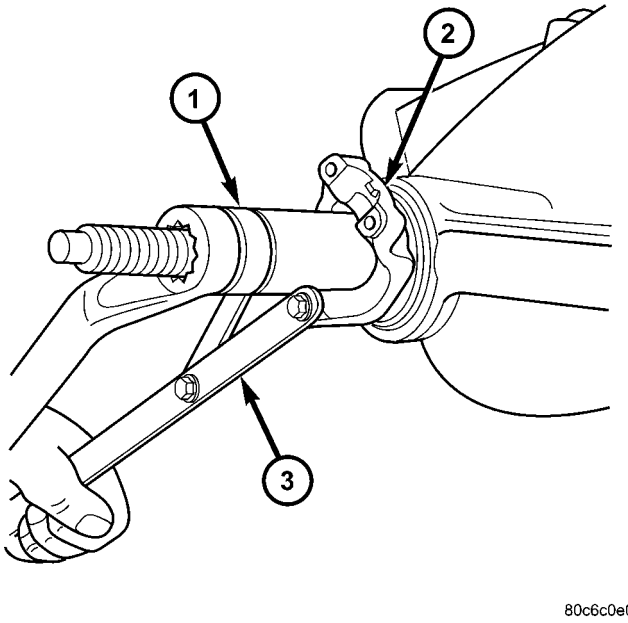


Fig. 39 PINION YOKE INSTALLER

1 - INSTALLER
2 - PINION YOKE
3 - SPANNER WRENCH

CAUTION: Do not exceed the minimum tightening torque when installing the pinion yoke retaining nut at this point. Failure to heed caution may result in damage

(3) Install pinion washer and a **new** nut on the pinion gear shaft.

NOTE: Tighten nut only enough to remove the shaft end play.

(4) Tighten pinion nut to 217 N·m (160 ft. lbs.).

(5) Rotate pinion shaft using an inch pound torque wrench. Rotating torque should be equal to the reading recorded during removal, plus an additional 0.56 N·m (5 in. lbs.) (Fig. 40).

(6) If rotating torque is low, use Spanner 6958 (Fig. 41) to hold the pinion yoke and tighten pinion shaft nut in 6.8 N·m (5 ft. lbs.) increments until proper rotating torque is achieved.

(7) Install propeller shaft with reference marks aligned.

(8) Install brake rotors and calipers.

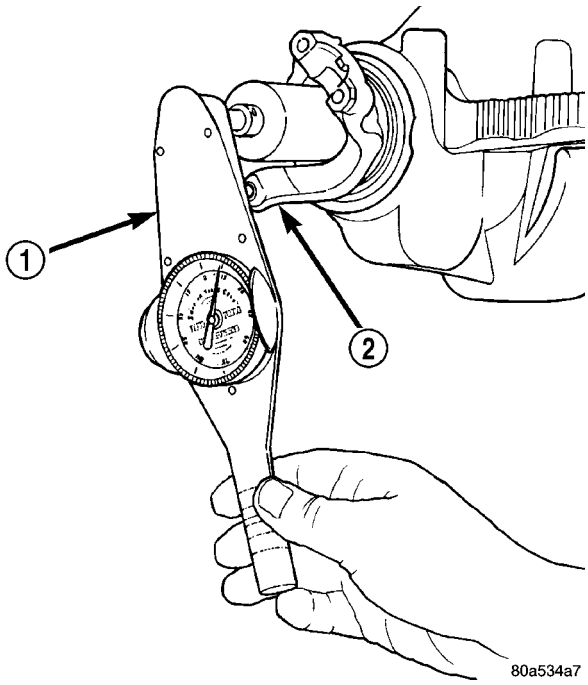


Fig. 40 PINION ROTATING TORQUE

1 - TORQUE WRENCH
2 - PINION YOKE

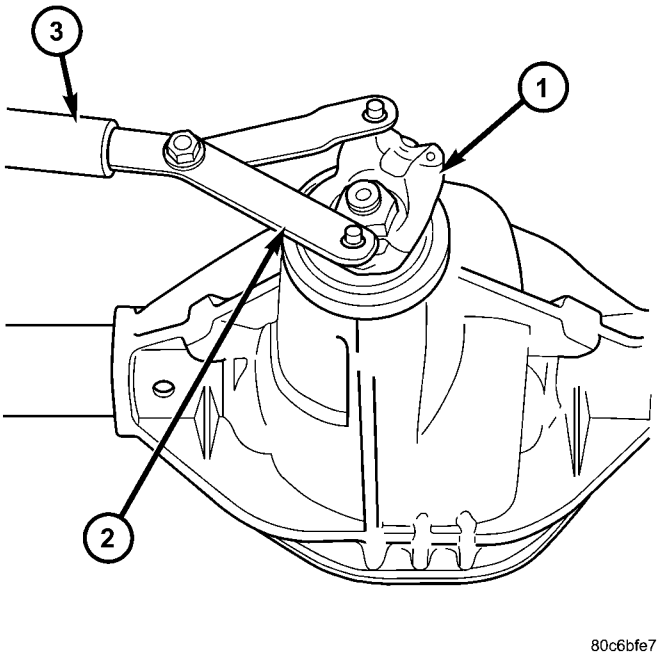


Fig. 41 YOKE HOLDER

1 - PINION YOKE
2 - SPANNER WRENCH
3 - PIPE

(19) Push and hold differential case toward pinion gear and zero dial indicator (Fig. 21).

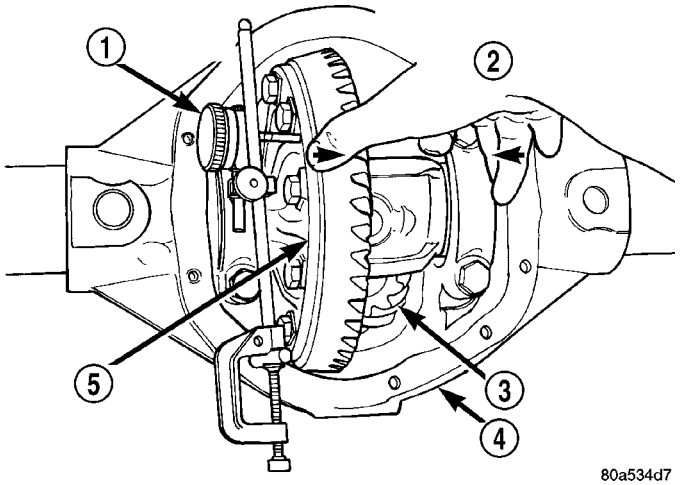


Fig. 21 ZERO DIAL INDICATOR

1 - DIAL INDICATOR FACE
2 - DIFFERENTIAL CASE TO PINION GEAR SIDE
3 - PINION GEAR
4 - DIFFERENTIAL HOUSING
5 - DIFFERENTIAL CASE

(20) Push and hold differential case to ring gear side of the housing and record dial indicator reading (Fig. 22). Subtract 0.05 mm (0.002 in.) from this reading. This is the shim thickness for the ring gear side.

NOTE: This is the shim needed on the ring gear side for proper backlash.

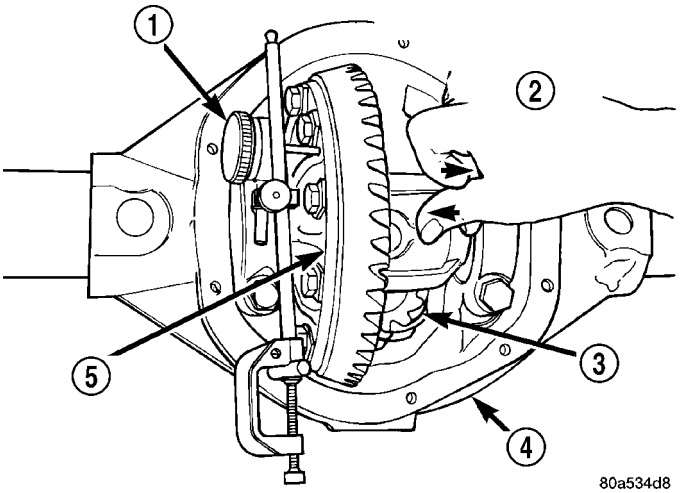


Fig. 22 RECORD DIAL INDICATOR READING

1 - DIAL INDICATOR
2 - DIFFERENTIAL CASE TO RING GEAR SIDE
3 - PINION GEAR
4 - DIFFERENTIAL HOUSING
5 - DIFFERENTIAL CASE

(21) Subtract the backlash shim thickness from the total preload shim thickness. The remainder is the shim thickness required on the pinion side of the housing.

(22) Rotate dial indicator out of the way on pilot stud.

(23) Remove differential case and dummy bearings from the housing.

(24) Install the selected shims onto the differential case hubs.

(25) Install side bearings on differential case hubs with Install C-3716-A and Handle C-4171.

(26) Install bearing cups on differential.

(27) Install Spreader W-129-B and some items from Adapter Set 6987 on the housing and spread open enough to receive differential case.

CAUTION: Do not spread housing over 0.38 mm (0.015 in.). Failure to heed caution may result in damage.

(28) Install differential case into the housing.

(29) Remove spreader from the housing.

(30) Rotate the differential case several times to seat the side bearings.

(31) Position the indicator plunger against a ring gear tooth (Fig. 23).

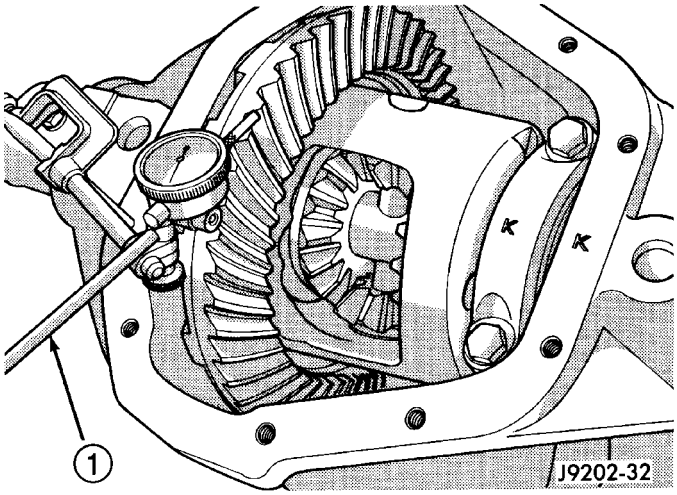


Fig. 23 RING GEAR BACKLASH MEASUREMENT

1 - DIAL INDICATOR

(32) Push and hold ring gear upward while not allowing the pinion gear to rotate.

(33) Zero dial indicator face to pointer.

(34) Push and hold ring gear downward while not allowing the pinion gear to rotate. Dial indicator reading should be between 0.12 mm - 0.20 mm (0.005 in. - 0.008 in.). If backlash is not within specifications transfer the necessary amount of shim thickness from one side of the housing to the other (Fig. 24).

REAR AXLE - 194RBI

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REAR AXLE - 194RBI

DIAGNOSIS AND TESTING

GEAR NOISE

Axle gear noise can be caused by insufficient lubricant, incorrect backlash, incorrect pinion depth, tooth contact, worn/damaged gears, or the carrier housing not having the proper offset and squareness.

Gear noise usually happens at a specific speed range. The noise can also occur during a specific type of driving condition. These conditions are acceleration, deceleration, coast, or constant load.

When road testing, first warm-up the axle fluid by driving the vehicle at least 5 miles and then accelerate the vehicle to the speed range where the noise is the greatest. Shift out-of-gear and coast through the peak-noise range. If the noise stops or changes greatly:

- Check for insufficient lubricant.
- Incorrect ring gear backlash.
- Gear damage.

Differential side gears and pinions can be checked by turning the vehicle. They usually do not cause noise during straight-ahead driving when the gears are unloaded. The side gears are loaded during vehicle turns. A worn pinion shaft can also cause a snapping or a knocking noise.

BEARING NOISE

The axle shaft, differential and pinion bearings can all produce noise when worn or damaged. Bearing noise can be either a whining, or a growling sound.

Pinion bearings have a constant-pitch noise. This noise changes only with vehicle speed. Pinion bearing noise will be higher pitched because it rotates at a faster rate. Drive the vehicle and load the differential. If bearing noise occurs, the rear pinion bearing is the source of the noise. If the bearing noise is heard during a coast, the front pinion bearing is the source.

Worn or damaged differential bearings usually produce a low pitch noise. Differential bearing noise is similar to pinion bearing noise. The pitch of differential bearing noise is also constant and varies only with vehicle speed.

Axle shaft bearings produce noise and vibration when worn or damaged. The noise generally changes when the bearings are loaded. Road test the vehicle. Turn the vehicle sharply to the left and to the right. This will load the bearings and change the noise

DIFFERENTIAL - TRAC-LOK

DESCRIPTION

The Trac-Lok® differential has a one-piece differential case, and similar internal components as a standard differential, plus two clutch disc packs. Differential bearing preload and ring gear backlash are adjusted with shims located between the differential case bearing cups and housing. Pinion bearing preload is set and maintained by the use of a collapsible spacer.

OPERATION

This differentials clutches are engaged by two concurrent forces. The first being the preload force exerted through Belleville spring washers within the clutch packs. The second is the separating forces generated by the side gears as torque is applied through the ring gear (Fig. 48).

This design provides the differential action needed for turning corners and for driving straight ahead during periods of unequal traction. When one wheel looses traction, the clutch packs transfer additional torque to the wheel having the most traction. This differential resist wheel spin on bumpy roads and provide more pulling power when one wheel looses traction. Pulling power is provided continuously until both wheels loose traction. If both wheels slip due to unequal traction, Trac-lok® operation is normal. In extreme cases of differences of traction, the wheel with the least traction may spin.

DIAGNOSIS AND TESTING

The most common problem is a chatter noise when turning corners. Before removing the unit for repair, drain, flush and refill the axle with the specified lubricant. A container of Mopar Trac-lok® Lubricant (friction modifier) should be added after repair service or during a lubricant change.

After changing the lubricant, drive the vehicle and make 10 to 12 slow, figure-eight turns. This maneuver will pump lubricant through the clutches. This will correct the condition in most instances. If chatter persists, clutch damage could have occurred.

DIFFERENTIAL TEST

The differential can be tested without removing the differential case by measuring rotating torque. Make sure brakes are not dragging during this measurement.

(1) Place blocks in front and rear of both front wheels.

(2) Raise one rear wheel until it is completely off the ground.

(3) Engine off, transmission in neutral, and parking brake off.

(4) Remove wheel and bolt Special Tool 6790 or equivalent tool to studs.

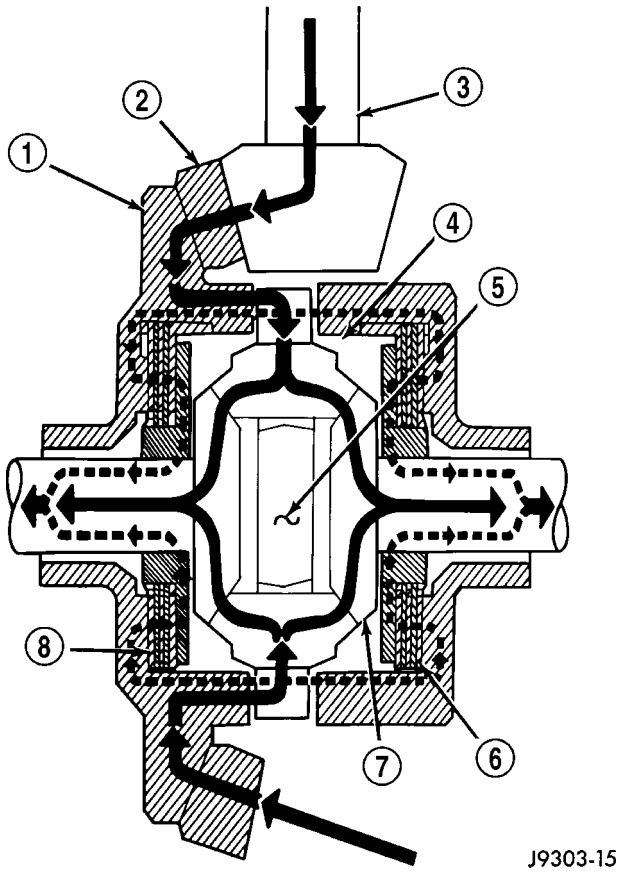
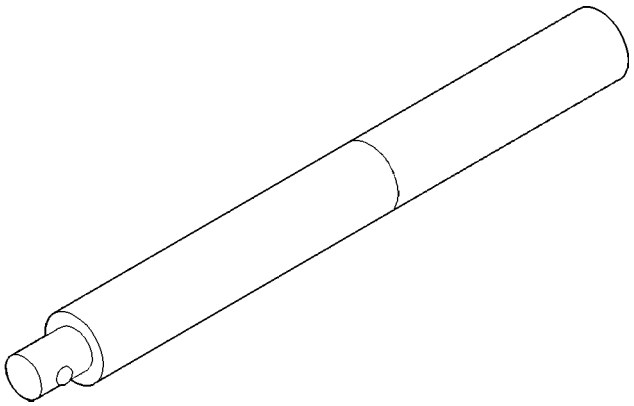


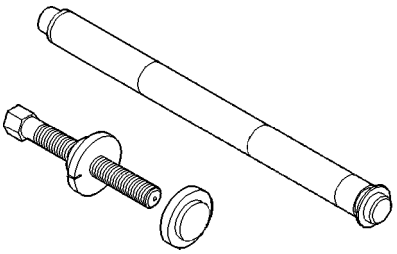
Fig. 48 TRAC-LOK LIMITED SLIP DIFFERENTIAL

1 - CASE
2 - RING GEAR
3 - DRIVE PINION
4 - PINION GEAR
5 - MATE SHAFT
6 - CLUTCH PACK
7 - SIDE GEAR
8 - CLUTCH PACK

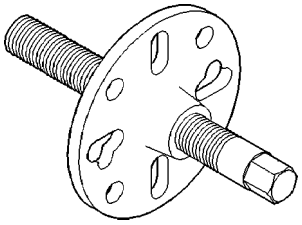
REAR AXLE - 216RBI (Continued)



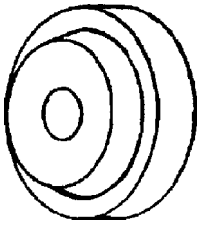
HANDLE C-4171



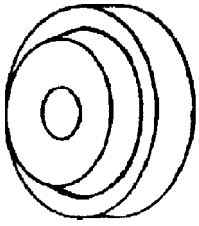
TRAC-LOK TOOLS C-4487



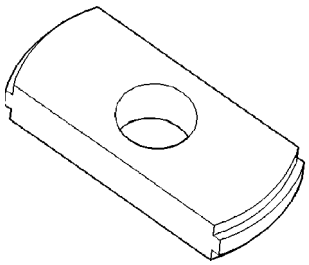
PULLER C-452



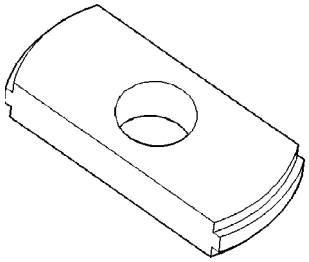
INSTALLER D-144



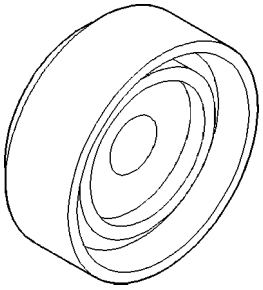
INSTALLER D-145



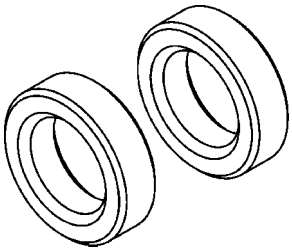
REMOVER D-147



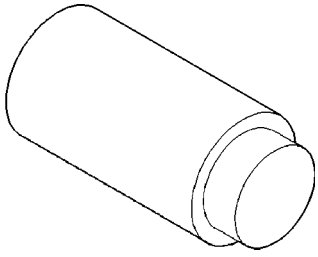
REMOVER D-148



INSTALLER D-156



DUMMY BEARINGS D-345



PLUG SP-3289

PINION GEAR/RING GEAR/TONE RING (Continued)

(8) Remove pinion gear from the housing (Fig. 90).

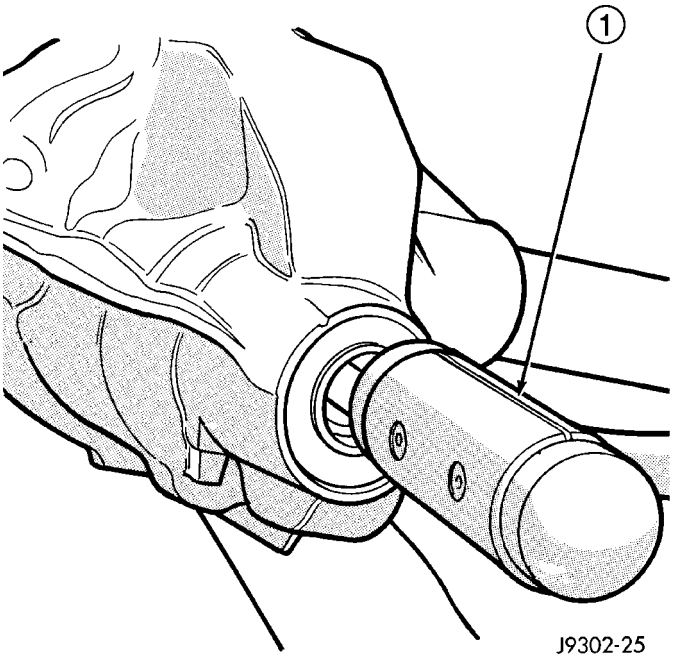


Fig. 90 PINION GEAR

1 - DEAD-BLOW HAMMER

(9) Remove front pinion bearing cup, bearing and pinion seal with Remover D-147 and Handle C-4171 (Fig. 91).

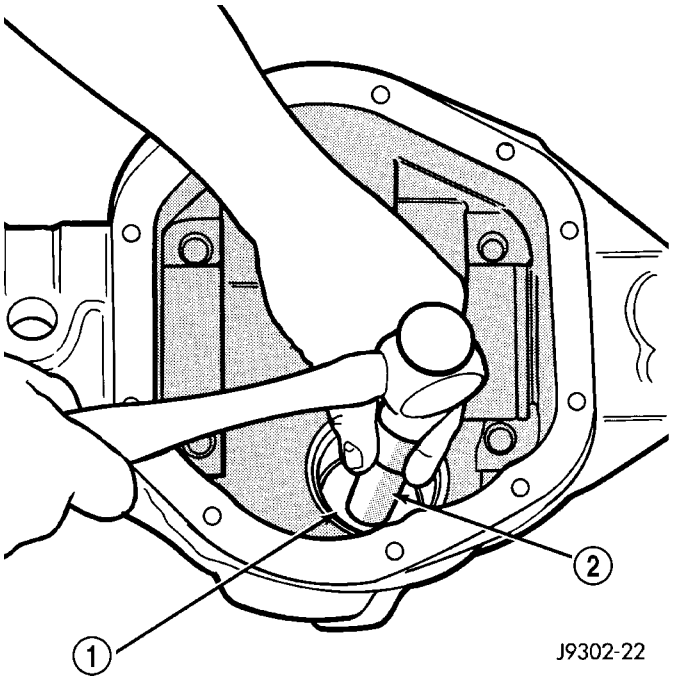


Fig. 91 FRONT BEARING CUP

1 - REMOVER
2 - HANDLE

(10) Remove rear pinion bearing cup from axle housing with remover D-148 and Handle C-4171 (Fig. 92).

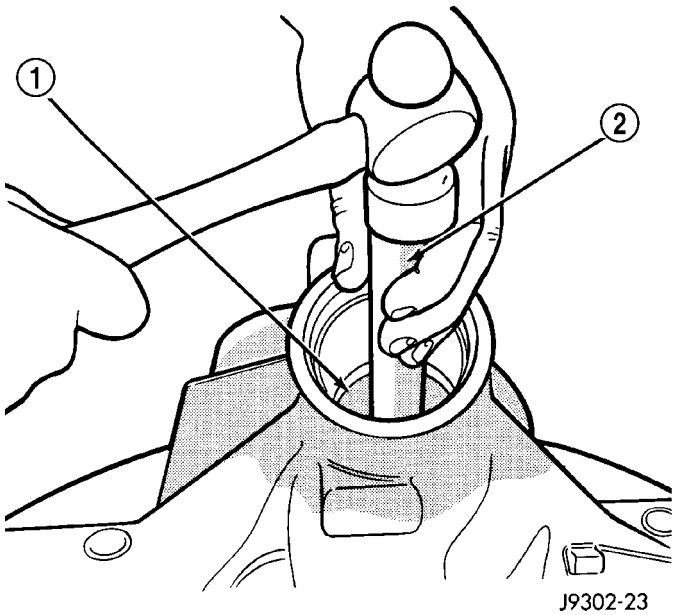


Fig. 92 REAR BEARING CUP

1 - DRIVER
2 - HANDLE

(11) Remove rear pinion bearing from the pinion with Puller/Press C-293-PA and Adapters C-293-39 (Fig. 93).

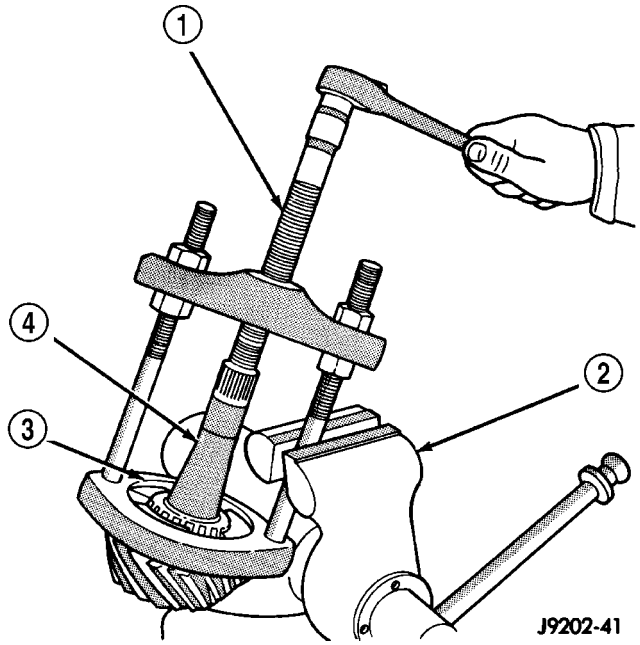


Fig. 93 REAR PINION BEARING

1 - PULLER
2 - VISE
3 - ADAPTERS
4 - PINION GEAR SHAFT

DRUM (Continued)

Inspect the adjuster screw assembly. Replace the assembly if the star wheel or threads are damaged, or the components are severely rusted or corroded.

Discard the brake springs and retainer components if worn, distorted or collapsed. Also replace the springs if a brake drag condition had occurred. Overheating will distort and weaken the springs.

Inspect the brake shoe contact pads on the support plate, replace the support plate if any of the pads are worn or rusted through. Also replace the plate if it is bent or distorted (Fig. 32).

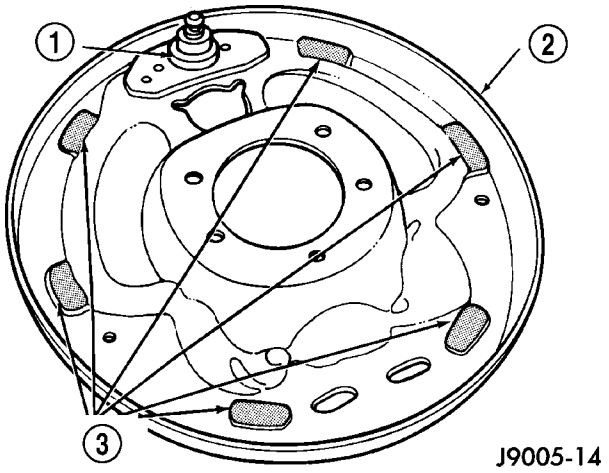


Fig. 32 Shoe Contact Surfaces

1 - ANCHOR PIN
2 - SUPPORT PLATE
3 - SHOE CONTACT SURFACES

ADJUSTMENTS - REAR DRUM BRAKE

The rear drum brakes are equipped with a self-adjusting mechanism. Under normal circumstances, the only time adjustment is required is when the shoes are replaced, removed for access to other parts, or when one or both drums are replaced.

Adjustment can be made with a standard brake gauge or with adjusting tool. Adjustment is performed with the complete brake assembly installed on the backing plate.

ADJUSTMENT WITH BRAKE GAUGE

(1) Be sure parking brakes are fully released.

(2) Raise rear of vehicle and remove wheels and brake drums.

(3) Verify that left and right automatic adjuster levers and cables are properly connected.

(4) Insert brake gauge in drum. Expand gauge until gauge inner legs contact drum braking surface. Then lock gauge in position (Fig. 33).

(5) Reverse gauge and install it on brake shoes. Position gauge legs at shoe centers as shown (Fig. 34). If gauge does not fit (too loose/too tight), adjust shoes.

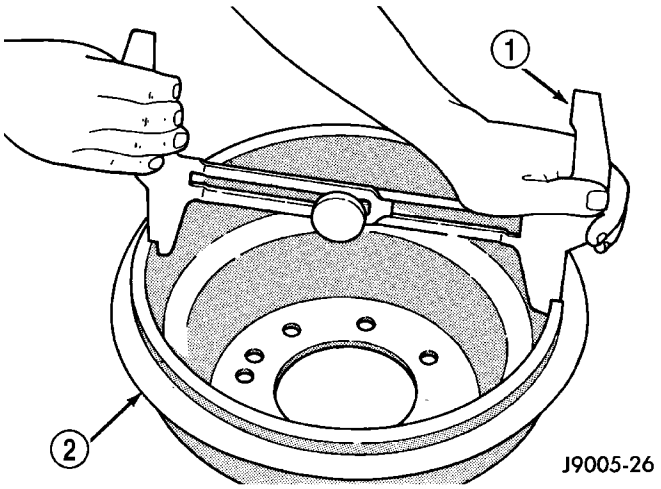


Fig. 33 Adjusting Gauge On Drum

1 - BRAKE GAUGE
2 - BRAKE DRUM

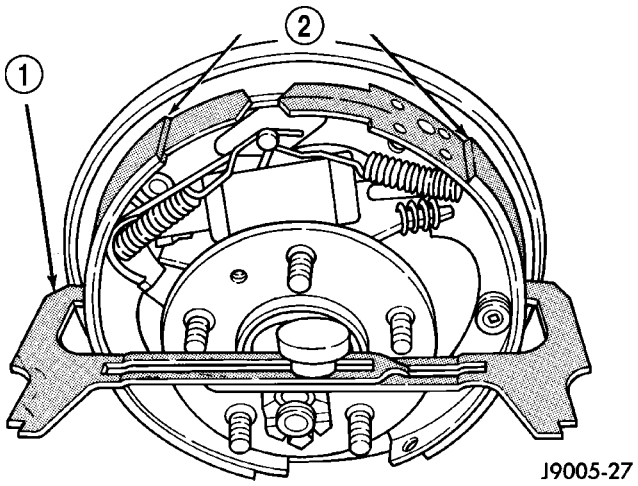


Fig. 34 Adjusting Gauge On Brake Shoes

1 - BRAKE GAUGE
2 - BRAKE SHOES

(6) Pull shoe adjuster lever away from adjuster screw star wheel.

(7) Turn adjuster screw star wheel (by hand) to expand or retract brake shoes. Continue adjustment until gauge outside legs are light drag-fit on shoes.

(8) Install brake drums and wheels and lower vehicle.

(9) Drive vehicle and make one forward stop followed by one reverse stop. Repeat procedure 8-10 times to operate automatic adjusters and equalize adjustment.

NOTE: Bring vehicle to complete standstill at each stop. Incomplete, rolling stops will not activate automatic adjusters.

HCU (HYDRAULIC CONTROL UNIT) (Continued)

The valves modulate brake pressure during antilock braking and are controlled by the CAB.

The HCU provides three channel pressure control to the front and rear brakes. One channel controls the rear wheel brakes in tandem. The two remaining channels control the front wheel brakes individually.

During antilock braking, the solenoid valves are opened and closed as needed. The valves are not static. They are cycled rapidly and continuously to modulate pressure and control wheel slip and deceleration.

During normal braking, the HCU solenoid valves and pump are not activated. The master cylinder and power booster operate the same as a vehicle without an ABS brake system.

During antilock braking, solenoid valve pressure modulation occurs in three stages, pressure increase, pressure hold, and pressure decrease. The valves are all contained in the valve body portion of the HCU.

PRESSURE DECREASE

The outlet valve is opened and the inlet valve is closed during the pressure decrease cycle.

A pressure decrease cycle is initiated when speed sensor signals indicate high wheel slip at one or more wheels. At this point, the CAB closes the inlet then opens the outlet valve, which also opens the return circuit to the accumulators. Fluid pressure is allowed to bleed off (decrease) as needed to prevent wheel lock.

Once the period of high wheel slip has ended, the CAB closes the outlet valve and begins a pressure increase or hold cycle as needed.

PRESSURE HOLD

Both solenoid valves are closed in the pressure hold cycle. Fluid apply pressure in the control channel is maintained at a constant rate. The CAB maintains the hold cycle until sensor inputs indicate a pressure change is necessary.

PRESSURE INCREASE

The inlet valve is open and the outlet valve is closed during the pressure increase cycle. The pressure increase cycle is used to counteract unequal wheel speeds. This cycle controls re-application of fluid apply pressure due to changing road surfaces or wheel speed.

REMOVAL

(1) Install prop rod on the brake pedal to keep pressure on the brake system.

(2) Remove negative battery cable from the battery.

(3) Pull up on the CAB harness connector release (Fig. 8)and remove connector.

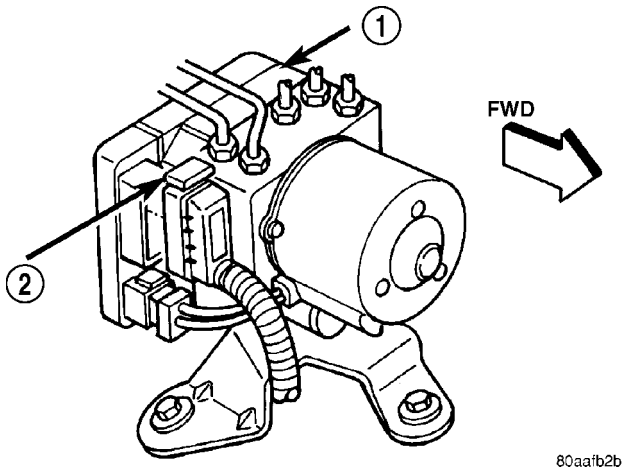


Fig. 8 CAB Harness Connector Release

1 - CAB
2 - CAB HARNESS RELEASE

(4) Remove brake lines from the HCU.

(5) Remove HCU/CAB mounting nuts and bolt (Fig. 9) and remove HCU/CAB.

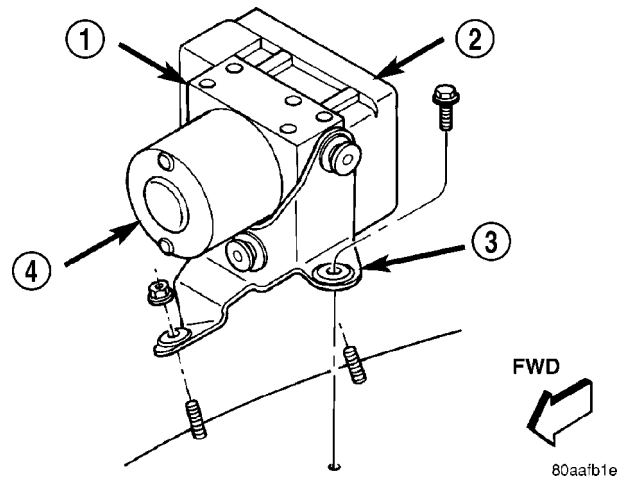


Fig. 9 HCU/CAB Mounting

1 - HCU
2 - CAB
3 - HCU/CAB BRACKET
4 - MOTOR

INSTALLATION

NOTE: If the CAB is being replaced with a new CAB is must be reprogrammed with the use of a DRB III.

(1) Install HCU/CAB on the mounting studs.

(2) Install mounting nuts and bolt. Tighten to 11.5 N·m (102 in. lbs.).

(3) Install brake lines to the HCU and tighten to 19 N·m (170 in. lbs.).

(4) Install wiring harness connector to the CAB and push down on the release to secure the connector.

(5) Install negative battery cable to the battery.

(6) Bleed ABS brake system (Refer to 5 - BRAKES - STANDARD PROCEDURE).

COOLING (Continued)

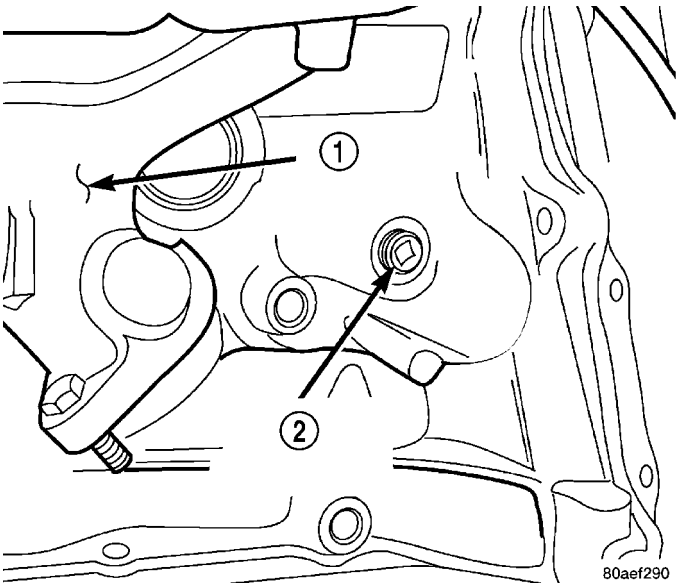


Fig. 7 Draining Coolant From Block - 2.4L/4.0L Engines

1 - EXHAUST MANIFOLD
2 - CYLINDER BLOCK COOLANT DRAIN PLUG

STANDARD PROCEDURE - COOLING SYSTEM - REFILLING

(1) Tighten the radiator draincock and the cylinder block drain plug(s).

(2) Fill system using a 50/50 mixture of water and antifreeze. Fill the radiator to the top and install the radiator cap. Add sufficient coolant to the reserve/overflow tank to raise the level to the FULL mark.

(3) Operate the engine with both the radiator cap and reserve/overflow tank cap in place. After the engine has reached the normal operating temperature, shut the engine off and allow it to cool.

(4) Add coolant to the reserve/overflow tank as necessary. **Only add coolant when the engine is cold. Coolant level in a warm engine will be higher due to thermal expansion.**

STANDARD PROCEDURE - COOLING SYSTEM - REVERSE FLUSHING

CAUTION: The cooling system normally operates at 97 - 110 C.P.A. 14 - 16 -16 psi) pressure. Exceeding this pressure may damage the radiator or hoses.

Reverse flushing of the cooling system is the forcing of water through the cooling system. This is done using air pressure in the opposite direction of normal coolant flow. It is usually only necessary with very dirty systems with evidence of partial plugging.

CHEMICAL CLEANING

If visual inspection indicates the formation of sludge or scaly deposits, use a radiator cleaner (Mopar Radiator Kleen or equivalent) before flushing. This will soften scale and other deposits and aid the flushing operation.

CAUTION: Be sure instructions on the container are followed.

REVERSE FLUSHING RADIATOR

Disconnect the radiator hoses from the radiator fittings. Attach a section of radiator hose to the radiator bottom outlet fitting and insert the flushing gun. Connect a water supply hose and air supply hose to the flushing gun.

CAUTION: The cooling system normally operates at 97 - 110 C.P.A. (14 - 16 psi) pressure. Exceeding this pressure may damage the radiator or hoses.

Allow the radiator to fill with water. When radiator is filled, apply air in short blasts allowing radiator to refill between blasts. Continue this reverse flushing until clean water flows out through rear of radiator cooling tube passages. For more information, refer to operating instructions supplied with flushing equipment. Have radiator cleaned more extensively by a radiator repair shop.

REVERSE FLUSHING ENGINE

Drain the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE). Remove the thermostat housing and thermostat. Install the thermostat housing. Disconnect the radiator upper hose from the radiator and attach the flushing gun to the hose. Disconnect the radiator lower hose from the water pump. Attach a lead away hose to the water pump inlet fitting.

CAUTION: Be sure that the heater control valve is closed (heat off). This is done to prevent coolant flow with scale and other deposits from entering the heater core.

Connect the water supply hose and air supply hose to the flushing gun. Allow the engine to fill with water. When the engine is filled, apply air in short blasts, allowing the system to fill between air blasts. Continue until clean water flows through the lead away hose. For more information, refer to operating instructions supplied with flushing equipment.

Remove the lead away hose, flushing gun, water supply hose and air supply hose. Remove the thermostat housing (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - REMOVAL). Install the thermostat and housing with a replacement gasket (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT -

RADIATOR (Continued)

INSTALLATION

CAUTION: Before installing the radiator or A/C condenser, be sure the radiator-to-body and radiator-to-A/C condenser rubber air seals are properly fastened to their original positions. These are used at the top, bottom and sides of the radiator and A/C condenser. To prevent overheating, these seals must be installed to their original positions.

(1) Guide the two radiator alignment dowels into the rubber grommets located in lower radiator crossmember. Install and tighten the six mounting bolts (Fig. 23) to 8 N·m (72 in. lbs.) torque.
(2) Close radiator draincock.
(3) 2.4L ONLY - Install the electric cooling fan (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).
(4) Position fan shroud and power steering reservoir tank (if equipped). Install and tighten four mounting bolts to 8 N·m (72 in. lbs.) torque.
(5) If equipped, remove plugs and connect automatic transmission fluid cooler lines and constant tension clamps.

CAUTION: The tangs on the hose clamps must be positioned straight down.

(6) Connect radiator hoses and install hose clamps.
(7) Position and install the condenser lower seal (Fig. 22).
(8) Connect battery negative cable.
(9) Fill cooling system with correct coolant (Refer to 7 - COOLING - STANDARD PROCEDURE).
(10) Connect coolant recovery bottle hose.
(11) Install radiator cap.
(12) Check and adjust automatic transmission fluid level (if equipped).
(13) Start engine and check for leaks.

WATER PUMP - 2.4L

DESCRIPTION

The water pump has a cast aluminum body and housing with a stamped steel impeller. The water pump bolts directly to the block (Fig. 25). The cylinder block to water pump seal is provided by a rubber O-ring. The water pump is driven by the engine timing belt.

OPERATION

The water pump is the heart of the cooling system. The coolant is pumped through the engine block, cylinder head, heater core, and radiator.

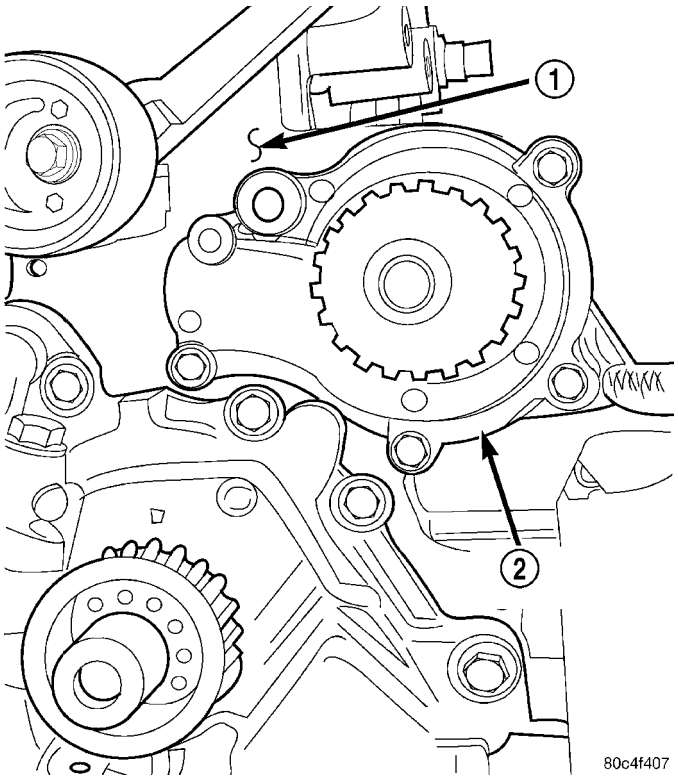


Fig. 25 Water Pump

1 - CYLINDER BLOCK
2 - WATER PUMP

DIAGNOSIS AND TESTING

WATER PUMP

A quick flow test to determine if the water pump is working effectively is to check heater system for proper operation. A defective pump will not provide an adequate flow of heated coolant through the system.

WARNING: DO NOT REMOVE THE COOLING SYSTEM PRESSURE CAP WITH THE SYSTEM HOT AND UNDER PRESSURE BECAUSE SERIOUS BURNS FROM COOLANT CAN OCCUR.

Another flow test to help determine water pump operation is as follows:
(1) Remove cooling system pressure cap.
(2) Remove a small amount of coolant from the system.
(3) Start the engine and warm up until thermostat opens.
(4) With the thermostat open and coolant level low, visually inspect for coolant flow. If flow is present, the water pump is pumping coolant through the system.

BATTERY (Continued)

OPERATION

The battery is designed to store electrical energy in a chemical form. When an electrical load is applied to the terminals of the battery, an electrochemical reaction occurs. This reaction causes the battery to discharge electrical current from its terminals. As the battery discharges, a gradual chemical change takes place within each cell. The sulfuric acid in the electrolyte combines with the plate materials, causing both plates to slowly change to lead sulfate. At the same time, oxygen from the positive plate material combines with hydrogen from the sulfuric acid, causing the electrolyte to become mainly water. The chemical changes within the battery are caused by the movement of excess or free electrons between the positive and negative plate groups. This movement of electrons produces a flow of electrical current through the load device attached to the battery terminals.

As the plate materials become more similar chemically, and the electrolyte becomes less acid, the voltage potential of each cell is reduced. However, by charging the battery with a voltage higher than that of the battery itself, the battery discharging process is reversed. Charging the battery gradually changes the sulfated lead plates back into sponge lead and lead dioxide, and the water back into sulfuric acid. This action restores the difference in the electron charges deposited on the plates, and the voltage potential of the battery cells. For a battery to remain useful, it must be able to produce high-amperage current over an extended period. A battery must also be able to accept a charge, so that its voltage potential may be restored.

The battery is vented to release excess hydrogen gas that is created when the battery is being charged or discharged. However, even with these vents, hydrogen gas can collect in or around the battery. If hydrogen gas is exposed to flame or sparks, it may ignite. If the electrolyte level is low, the battery may arc internally and explode. If the battery is equipped with removable cell caps, add distilled water whenever the electrolyte level is below the top of the plates. If the battery cell caps cannot be removed, the battery must be replaced if the electrolyte level becomes low.

DIAGNOSIS AND TESTING - BATTERY

The battery must be completely charged and the terminals should be properly cleaned and inspected before diagnostic procedures are performed. Refer to Battery System Cleaning for the proper cleaning procedures, and Battery System Inspection for the proper battery inspection procedures. Refer to Standard Procedures for the proper battery charging procedures.

MICRO 420 BATTERY TESTER

The Micro 420 automotive battery tester is designed to help the dealership technicians diagnose the cause of a defective battery. Follow the instruction manual supplied with the tester to properly diagnose a vehicle. If the instruction manual is not available refer to the standard procedure in this section, which includes the directions for using the Micro 420 battery tester.

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

WARNING: 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.

WARNING: 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.

A battery that will not accept a charge is faulty, and must be replaced. Further testing is not required. A fully-charged battery must be load tested to determine its cranking capacity. A battery that is fully-charged, but does not pass the load test, is faulty and must be replaced.

NOTE: Completely discharged batteries may take several hours to accept a charge. Refer to Standard Procedures for the proper battery charging procedures.

STANDARD PROCEDURE

STANDARD PROCEDURE - BATTERY CHARGING

Battery charging is the means by which the battery can be restored to its full voltage potential. A battery is fully-charged when:

- All of the battery cells are gassing freely during battery charging.
- A green color is visible in the sight glass of the battery built-in test indicator.

neutral position switch is installed in series between the starter relay coil ground terminal and ground. This normally open switch prevents the starter relay from being energized and the starter motor from operating unless the automatic transmission gear selector is in the Neutral or Park positions.

When the starter relay coil is energized, the normally open relay contacts close. The relay contacts connect the relay common feed terminal to the relay normally open terminal. The closed relay contacts energize the starter solenoid coil windings.

The energized solenoid pull-in coil pulls in the solenoid plunger. The solenoid plunger pulls the shift lever in the starter motor. This engages the starter overrunning clutch and pinion gear with the starter ring gear on the manual transmission flywheel or on the automatic transmission torque converter or torque converter drive plate.

As the solenoid plunger reaches the end of its travel, the solenoid contact disc completes the high-amperage starter feed circuit and energizes the solenoid plunger hold-in coil. Current now flows between the solenoid battery terminal and the starter motor, energizing the starter.

Once the engine starts, the overrunning clutch protects the starter motor from damage by allowing the starter pinion gear to spin faster than the pinion shaft. When the driver releases the ignition switch to the On position, the starter relay coil is de-energized. This causes the relay contacts to open. When the relay contacts open, the starter solenoid plunger hold-in coil is de-energized.

When the solenoid plunger hold-in coil is de-energized, the solenoid plunger return spring returns the plunger to its relaxed position. This causes the contact disc to open the starter feed circuit, and the shift lever to disengage the overrunning clutch and pinion gear from the starter ring gear.

DIAGNOSIS AND TESTING - STARTING SYSTEM

The battery, starting system and charging system in the vehicle operate with one another, and must be tested as a complete system. In order for the engine to start and the battery to charge properly, all of the components that are used in these systems must perform within specifications. The service information for these systems has been separated within this service manual to make it easier to locate the specific information you are seeking. However, when attempting to diagnose any of these systems, it is important that you keep their interdependency in mind.

The diagnostic procedures used for the battery, starting system and charging system include the most basic conventional diagnostic methods, to the more sophisticated On-Board Diagnostics (OBD) built into the Powertrain Control Module (PCM). Use of an induction-type milliampere ammeter, a volt/ohmmeter, a battery charger, a carbon pile rheostat (load tester) and a 12-volt test lamp may be required. All OBD-sensed systems are monitored by the PCM. Each monitored circuit is assigned a Diagnostic Trouble Code (DTC). The PCM will store a DTC in electronic memory for any failure it detects. Refer to **Charging System, On-Board Diagnostic Test** for on-board diagnostic test procedures.

Starting System Diagnosis		
Condition	Possible Cause	Correction
Starter fails to operate.	1. Battery discharged or faulty.	1. Refer to 8, Battery. Replace faulty battery as required.
	2. Starting circuit wiring faulty.	2. Refer to Wiring. Test and repair faulty starter feed and/or control circuits, as required.
	3. Starter relay faulty.	3. Refer to Starter Relay. Replace faulty starter relay as required.
	4. Ignition switch faulty.	4. Refer to Ignition Switch and Key Lock Cylinder. Replace faulty ignition switch as required.
	5. Clutch pedal position switch faulty.	5. Refer to Clutch Pedal Position Switch. Replace faulty clutch hydraulic linkage unit as required.
	6. Park/Neutral position switch faulty or misadjusted.	6. Refer to Park/Neutral Position Switch. Replace faulty park/neutral position switch as required.
	7. Starter solenoid faulty.	7. Refer to Starter Motors. Replace faulty starter motor as required.

IGNITION CONTROL (Continued)

primary transfers to the secondary causing a spark. The PCM will de-energize the ASD relay if it does not receive inputs from either the crankshaft or camshaft position sensors.

A distributor is not used with the 2.4L engine.

4.0L

The 4.0L 6-cylinder engine uses a one-piece coil rail containing three independent coils. Although cylinder firing order is the same as 4.0L engines of previous years, spark plug firing is not. The 3 coils dual-fire the spark plugs on cylinders 1-6, 2-5 and/or 3-4. When one cylinder is being fired (on compression stroke), the spark to the opposite cylinder is being wasted (on exhaust stroke). The one-piece coil bolts directly to the cylinder head. Rubber boots seal the secondary terminal ends of the coils to the top of all 6 spark plugs. One electrical connector (located at the rear end of the coil rail) is used for all three coils.

Because of coil design, spark plug cables (secondary cables) are not used. A **distributor is not used** with the 4.0L engine.

The ignition system is controlled by the Powertrain Control Module (PCM).

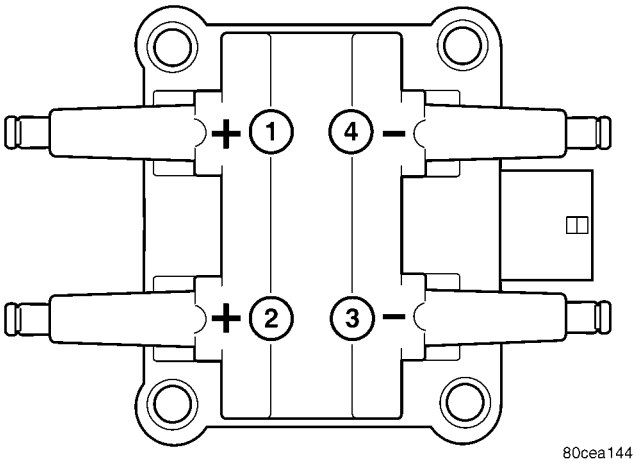
SPECIFICATIONS

SPECIFICATIONS - IGNITION TIMING

Ignition timing is not adjustable on any engine.

IGNITION COIL RESISTANCE - 2.4L

Engine	Coil Manufacture	Primary Resistance at 21°C-27°C (70°F-80°F)	Secondary Resistance at 21°C-27°C (70°F-80°F)
2.4L	Toyodenso or Diamond	0.51 to 0.61 Ohms	11,500 to 13,500 Ohms

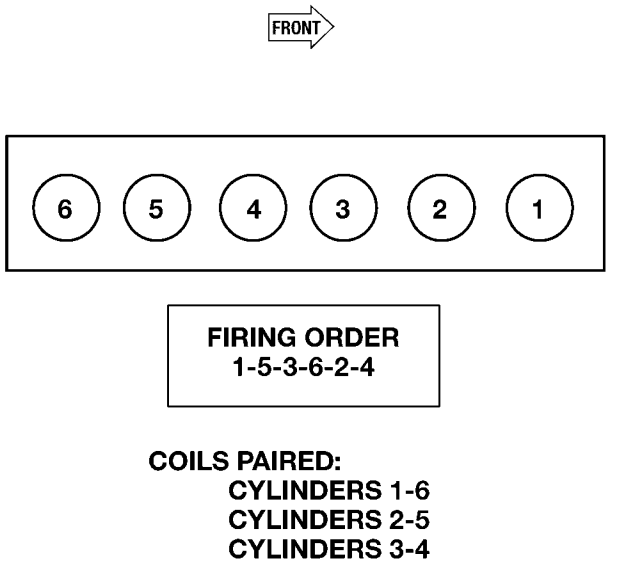


IGNITION COIL - 2.4L

ENGINE FIRING ORDER - 2.4L 4-CYLINDER

1 - 3 - 4 - 2

ENGINE FIRING ORDER - 4.0L 6-CYLINDER ENGINE



FIRING ORDER - 4.0L

each radio contains a Digital Signal Processing (DSP) microprocessor chip. This DSP chip uses the equalization curve information to optimize the radio's sound output characteristics for the unique cabin and speaker architecture found within the particular vehicle into which the radio has been installed.

Proper testing of the PCI data bus and the electronic data bus message inputs to and outputs from the EMIC that control audio system cabin equalization requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

AXLE LOCKER CONTROL

The EMIC contains a logic circuit and programming to perform the axle locker control functions for models equipped with the optional off-road package. The EMIC monitors hard wired inputs from the ignition switch on the fused ignition switch output (run-start) circuit and the key-in ignition switch on the key-in ignition switch sense circuit. The EMIC also monitors vehicle speed and transfer case shift position switch electronic message inputs received from the Powertrain Control Module (PCM) over the PCI data bus. The internal programming of the EMIC then determines whether to activate or deactivate the axle locker function by enabling or disabling the axle lock switch located in the instrument panel accessory switch bezel.

The EMIC programming controls the axle lock switch through two separate axle lock switch enable circuits, enable 1 and enable 2. In all cases, the EMIC will not activate either enable circuit if there are any transfer case shift position switch or vehicle speed sensor faults present. Whenever the ignition switch is in the On or Start positions, the key is in the ignition lock cylinder, the transfer case is in 4 X 4 Low range, and the vehicle speed is less than about 72 kilometers per hour (45 miles per hour) the first enable (enable 1) circuit is activated. The second enable (enable 2) circuit is activated only if the vehicle speed is less than about 16 kilometers per hour (10 miles per hour). When both enable circuits are activated, the axle lock switch becomes functional.

Once activated, the enable 1 circuit is automatically deactivated whenever the transfer case is moved out of the 4 X 4 Low range, or if the vehicle speed is greater than about 72 kilometers per hour (45 miles per hour). If the enable 1 circuit is deactivated after the rear or the front and rear axle lockers are engaged, all outputs from the axle lock switch are dropped causing both axles to unlock. The enable 2 circuit is automatically deactivated whenever the vehicle speed is greater than about 16 kilometers per hour (10 miles per hour). If the enable 2 circuit is deactivated after the rear or the front and rear axle lockers are engaged, the outputs from the axle lock switch are unaffected and the locked axles remain locked. However, an unlocked axle cannot be locked until the vehicle speed is reduced and the enable 2 circuit is again activated.

In addition, once activated, both enable circuits will remain active regardless of the status of the ignition switch input. Therefore, any locked axle will remain locked and the various components of the axle locker system will remain functional after the ignition switch is turned to the Off position. However, while the currently selected axle locker mode remains active with the ignition switch turned Off, if the key is removed from the ignition lock cylinder, Off is the only other axle locker mode that can be selected with the axle lock switch. For as long as the key is removed from the ignition lock cylinder, the cluster logic will interpret any revision to the input status of either request circuit from the axle lock switch as a cancellation request and will deactivate the enable 1 circuit and all outputs from the axle lock switch are dropped, causing both axles to unlock. Otherwise, once locked, any locked axle will remain locked until the axle lock switch is deactivated (enable 1 circuit is deactivated), or until the Off mode is manually selected by moving the axle lock switch rocker to the Off position. The EMIC also provides the vehicle operator with distinct visual and/or audible indications as to the current status of the axle locker system through chime warnings and illumination of the rear/front lock indicators in the cluster as outlined elsewhere in this service information.

The hard wired input and output circuits of the EMIC axle locker control may be diagnosed using conventional diagnostic methods. However, proper testing of the EMIC programming and the electronic vehicle speed and transfer case shift position switch messages received by the EMIC over the PCI data bus requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

CHIME SERVICE

The EMIC is equipped with hardware and software to provide chime service for all available features in the chime warning system. Upon receiving the proper chime inputs, the EMIC activates an integral on-board audible tone generator to provide audible chime tones to the vehicle operator. The chime tone generator in the EMIC is capable of producing single chime tones or repeated chime tones at two different rates: a slow rate of about fifty chime tones per minute, and a fast rate of about 180 chime tones per minute. The internal programming of the EMIC determines the priority of each chime tone request input that is received, as well as the rate and duration of each chime tone that is to be generated.

has increased by more than 0.625 gallons or until the ignition switch is turned to the Off position, whichever occurs first. This strategy is intended to reduce the effect that fuel sloshing within the fuel tank can have on reliable indications. The chime tone feature will occur only once per ignition cycle.

- **Less Than Empty Percent Tank Full Message** - Each time the cluster receives a message from the PCM indicating the percent tank full is less than empty, the low fuel indicator is illuminated immediately. This message would indicate that the fuel tank sender input to the PCM is a short circuit.
- **More Than Full Percent Tank Full Message** - Each time the cluster receives a message from the PCM indicating the percent tank full is more than full, the low fuel indicator is illuminated immediately. This message would indicate that the fuel tank sender input to the PCM is an open circuit.
- **Actuator Test** - Each time the cluster is put through the actuator test, the low fuel indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry.

The PCM continually monitors the fuel tank sending unit to determine the level of fuel in the fuel tank. The PCM then sends the proper fuel level messages to the instrument cluster. For further diagnosis of the low fuel indicator or the instrument cluster circuitry that controls the LED, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the fuel tank sending unit, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the low fuel indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

MALFUNCTION INDICATOR LAMP (MIL)

DESCRIPTION

Fig. 18 Malfunction Indicator Lamp (MIL)

A Malfunction Indicator Lamp (MIL) is standard equipment on all instrument clusters (Fig. 18). The MIL is located near the lower edge of the instrument cluster, to the right of center. The MIL consists of a stencil-like cutout of the International Control and Display Symbol icon for “Engine” in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. An amber Light Emitting Diode (LED) behind the cutout in the opaque layer of the overlay causes the icon to appear in amber through the translucent outer layer of the overlay when the indicator is illuminated from behind by the LED, which is soldered onto the instrument cluster electronic circuit board. The MIL is serviced as a unit with the instrument cluster.

OPERATION

The Malfunction Indicator Lamp (MIL) gives an indication to the vehicle operator when the Powertrain Control Module (PCM) has recorded a Diagnostic Trouble Code (DTC) for an On-Board Diagnostics II (OBDII) emissions-related circuit or component malfunction. The MIL is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the PCM over the Programmable Communications Interface (PCI) data bus. The MIL Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the LED will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the MIL for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the indicator is illuminated for about seven seconds as a bulb test. The entire two seven second bulb test is a function of the PCM.
- **MIL Lamp-On Message** - Each time the cluster receives a MIL lamp-on message from the PCM, the indicator will be illuminated. The indicator can be flashed on and off, or illuminated solid, as dictated by the PCM message. For some DTC's, if a problem does not recur, the PCM will send a lamp-off message automatically. Other DTC's may require that a fault be repaired and the PCM be reset before a lamp-off message will be sent. For more information on the PCM and the DTC set and reset parameters, (Refer to 25 - EMISSIONS CONTROL - OPERATION).
- **Communication Error** - If the cluster receives no lamp-on or lamp-off message from the PCM for twenty seconds, the MIL is illuminated by the instrument cluster and a “no BuS” message will appear in the odometer/trip odometer Vacuum Fluorescent Display (VFD) unit to indicate a loss of bus communication. The indicator remains controlled and illuminated by the cluster until a valid lamp-on or lamp-off message is received from the PCM.

COMBINATION FLASHER (Continued)

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Align the combination flasher terminals with the terminals in the connector on the back of the left multi-function switch housing. (Fig. 9).

(2) Push on the combination flasher until the terminals are fully seated in the left multi-function switch connector.

(3) Position the upper shroud onto the steering column (Fig. 27).

(4) Install and tighten the screws that secure the lower steering column shroud to the upper shroud. Tighten the screws to 2 N·m (18 in. lbs.).

(5) Move the tilt steering column to the fully raised position and secure it in place by moving the tilt release lever back to the locked position.

(6) Reinstall the steering column opening cover. (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - INSTALLATION).

(7) Reconnect the battery negative cable.

DAYTIME RUNNING LAMP MODULE

DESCRIPTION

The Daytime Running Lights (Headlamps) System is installed on vehicles manufactured for sale in Canada only. A separate module, mounted on the cowl, controls the DRL.

OPERATION

Battery positive voltage is supplied to the Daytime Running Lamp (DRL) module through a circuit breaker and a fuse in the PDC. Ignition positive voltage is supplied to the DRL module through a fuse in the fuse block. The DRL module also utilizes a VSS input, high and low beam sense circuits and high beam indicator driver. The DRL module is grounded to the chassis. Once the vehicle reaches a speed of 3 kph (2 mph) and travels more than 1 meter (3 feet) with the headlamp switch in the off position, the DRL module will activate the HIGH beams at a reduced intensity (36% of full intensity). When the headlamp switch is placed in the LOW beam position the DRL will turn off. When the headlamp switch is turned to the HIGH beam position, the high beams will operate normally (full intensity) and the DRL module will also illuminate the HIGH BEAM indicator in the instrument cluster.

DIAGNOSIS AND TESTING - DAYTIME RUNNING LAMP SYSTEM

Always begin any diagnosis by testing all of the fuses and circuit breakers in the system. Refer to the appropriate wiring information.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

DRIVER AIRBAG (Continued)

proper electrical signal to the initiator the electrical energy generates enough heat to initiate a small pyrotechnic charge which, in turn ignites chemical pellets within the inflator. Once ignited, these chemical pellets burn rapidly and produce a large quantity of inert gas. The inflator is sealed to the back of the airbag housing and a diffuser in the inflator directs all of the inert gas into the airbag cushion, causing the cushion to inflate. As the cushion inflates, the driver airbag trim cover will split at predetermined breakout lines, then fold back out of the way along with the horn switch unit. Following an airbag deployment, the airbag cushion quickly deflates by venting the inert gas towards the instrument panel through the porous fabric material used to construct the back (steering wheel side) panel of the airbag cushion.

Some of the chemicals used to create the inert gas may be considered hazardous while in their solid state before they are burned, but they are securely sealed within the airbag inflator. Typically, all potentially hazardous chemicals are burned during an airbag deployment event. The inert gas that is produced when the chemicals are burned is harmless. However, a small amount of residue from the burned chemicals may cause some temporary discomfort if it contacts the skin, eyes, or breathing passages. If skin or eye irritation is noted, rinse the affected area with plenty of cool, clean water. If breathing passages are irritated, move to another area where there is plenty of clean, fresh air to breath. If the irritation is not alleviated by these actions, contact a physician.

REMOVAL

The following procedure is for replacement of a faulty or damaged driver airbag. If the airbag is faulty or damaged, but not deployed, review the recommended procedures for handling non-deployed supplemental restraints. (Refer to 8 - ELECTRICAL/ RESTRAINTS - STANDARD PROCEDURE - HANDLING NON-DEPLOYED SUPPLEMENTAL RESTRAINTS). If the driver airbag has been deployed, review the recommended procedures for service after a supplemental restraint deployment before removing the airbag from the vehicle. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).

WARNING: TO AVOID PERSONAL INJURY OR DEATH, ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT.

WARNING: TO AVOID PERSONAL INJURY OR DEATH, WHEN REMOVING A DEPLOYED AIRBAG, RUBBER GLOVES, EYE PROTECTION, AND A LONG-SLEEVED SHIRT SHOULD BE WORN. THERE MAY BE DEPOSITS ON THE AIRBAG CUSHION AND OTHER INTERIOR SURFACES. IN LARGE DOSES, THESE DEPOSITS MAY CAUSE IRRITATION TO THE SKIN AND EYES.

(1) Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.

(2) From the underside of the steering wheel, remove the two screws that secure the driver airbag to the steering wheel armature (Fig. 22).

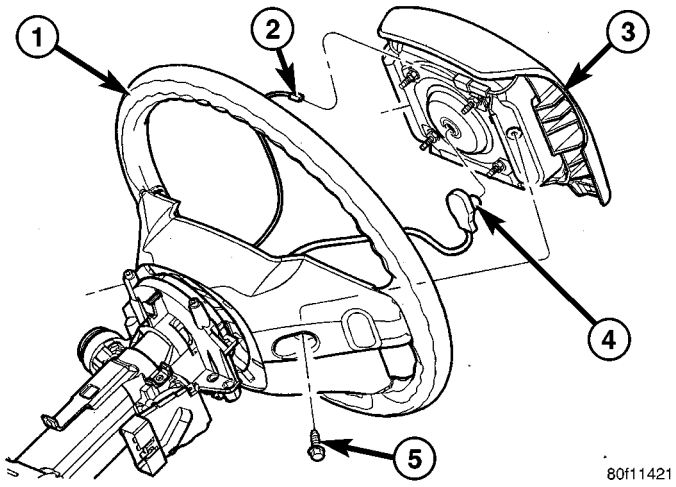


Fig. 22 Driver Airbag Remove/Install

1 - STEERING WHEEL
2 - CLOCKSPRING PIGTAIL WIRE (HORN SWITCH)
3 - DRIVER AIRBAG
4 - CLOCKSPRING PIGTAIL WIRE (AIRBAG)
5 - SCREW (2)

(3) Pull the driver airbag away from the steering wheel far enough to access the two electrical connections at the back of the airbag housing.

(4) Disconnect the clockspring pigtail wire connector for the horn switch from the horn switch feed pigtail wire connector located on the back of the driver airbag.

SWITCH (Continued)

NOTE: Depressing the OFF switch will erase the set speed stored in the PCM's RAM.

If, while the speed control is engaged, the driver wishes to increase vehicle speed, the PCM is programmed for an acceleration feature. With the ACCEL switch held closed, the vehicle accelerates slowly to the desired speed. The new target speed is stored in the PCM's RAM when the ACCEL switch is released. The PCM also has a ″tap-up″ feature in which vehicle speed increases at a rate of approximately 2 mph for each momentary switch activation of the ACCEL switch.

The PCM also provides a means to decelerate without disengaging speed control. To decelerate from an existing recorded target speed, depress and hold the COAST switch until the desired speed is reached. Then release the switch. The ON, OFF switch operates two components: the PCM's ON, OFF input, and the battery voltage to the brake switch, which powers the speed control servo.

Multiplexing

The PCM sends out 5 volts through a fixed resistor and monitors the voltage change between the fixed resistor and the switches. If none of the switches are depressed, the PCM will measure 5 volts at the sensor point (open circuit). If a switch with no resistor is closed, the PCM will measure 0 volts (grounded circuit). Now, if a resistor is added to a switch, then the PCM will measure some voltage proportional to the size of the resistor. By adding a different resistor to each switch, the PCM will see a different voltage depending on which switch is pushed.

Another resistor has been added to the 'at rest circuit' causing the PCM to never see 5 volts. This was done for diagnostic purposes. If the switch circuit should open (bad connection), then the PCM will see the 5 volts and know the circuit is bad. The PCM will then set an open circuit fault.

REMOVAL

WARNING: BEFORE ATTEMPTING TO DIAGNOSE, REMOVE OR INSTALL ANY AIRBAG SYSTEM OR RELATED STEERING WHEEL AND STEERING COLUMN COMPONENTS, YOU MUST FIRST DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE. WAIT 2 MINUTES FOR SYSTEM CAPACITOR TO DISCHARGE BEFORE FURTHER SYSTEM SERVICE. FAILURE TO DO SO COULD RESULT IN ACCIDENTAL DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

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

(2) Remove airbag module. Refer to 8, Passive Restraint Systems.

(3) From underside of steering wheel, remove speed control switch mounting screw (Fig. 5).

(4) Remove switch from steering wheel and unplug electrical connector.

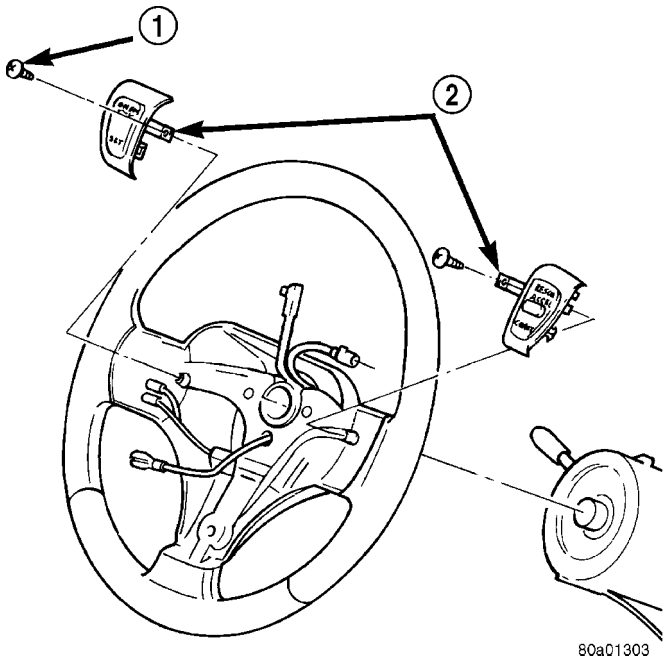


Fig. 5 Speed Control Switches - Remove / Install

1 - MOUNTING SCREW
2 - SPEED CONTROL SWITCHES

INSTALLATION

(1) Plug electrical connector into switch.

(2) Position switch to steering wheel.

(3) Install switch mounting screw and tighten to 1.5 N·m (14 in. lbs.) torque.

(4) Install airbag module. Refer to 8, Passive Restraint Systems.

(5) Connect negative battery cable to battery.

FRONT WIPER MODULE (Continued)

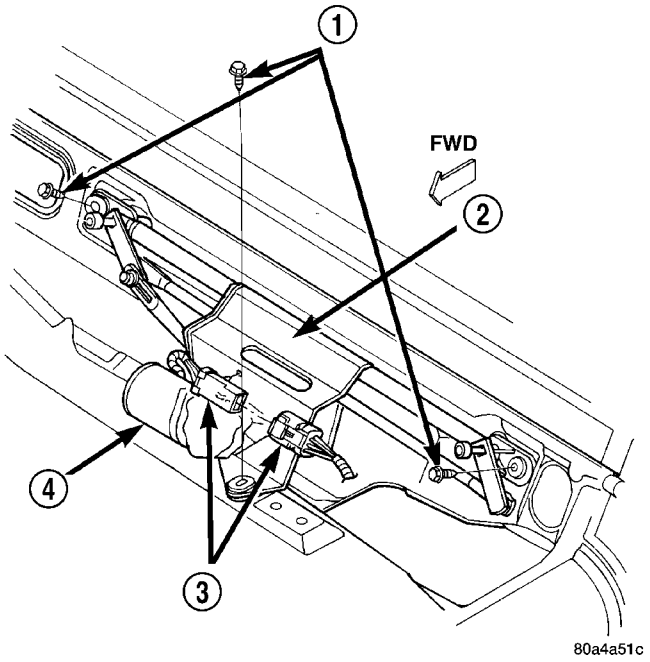


Fig. 17 Front Wiper Module

1 - SCREW (3)
2 - MODULE BRACKET
3 - WIRE HARNESS CONNECTOR
4 - WIPER MOTOR

- **Bracket** - The front wiper module bracket consists of a long tubular steel main member that has a stamped pivot bracket formation near each end where the two wiper pivots are secured. A stamped steel mounting plate for the wiper motor is secured with welds near the center of the main member. The bracket includes metal-sleeved rubber isolators at each of the three bracket mounting points.
- **Crank Arm** - The front wiper motor crank arm is a stamped steel unit with a slotted hole on the driven end that is secured to the wiper motor output shaft with a nut, and has a ball stud secured to the drive end.
- **Linkage** - The two front wiper linkage members are each constructed of stamped steel. A connecting link with a plastic socket-type bushing in each end is fit over the pivot ball studs to join the two pivots. The wiper drive link has a plastic socket-type bushing on each end. One end of the drive link is snap-fit over a second ball stud on the passenger side pivot crank arm, while the other end is snap-fit over the ball stud on the wiper motor crank arm.
- **Motor** - The front wiper motor is secured with three screws to the motor mounting plate near the center of the wiper module bracket and is protected by a rubber boot. The wiper motor output shaft passes through a hole in the module bracket, where a nut secures the wiper motor crank arm to the motor output shaft. The two-speed permanent magnet wiper motor features an integral transmission, an internal park switch, and an internal automatic resetting circuit breaker.
- **Pivots** - The two front wiper pivots are secured to the ends of the wiper module bracket. A crank arm extends from the lower end of each pivot shaft. The driver side pivot crank arm has a single ball stud secured to it, while the passenger side crank arm has two ball studs. The upper end of each pivot shaft where the wiper arms will be fastened each has an externally serrated drum-like driver secured to it.

The front wiper module for this model is serviced only as a complete unit. If any linkage component or the mounting bracket of the module is faulty or damaged, the entire front wiper module unit must be replaced. The front wiper motor and boot are available for service replacement as a unit only.

OPERATION

The front wiper module operation is controlled by the battery current inputs received by the wiper motor through the right multi-function switch on the steering column. The wiper motor is connected to the vehicle electrical system through a dedicated take out and wire harness connector of the body wire harness. The wiper motor speed is controlled by current flow to either the low speed or the high speed set of brushes. The park switch is a single pole, single throw, momentary switch within the wiper motor that is mechanically actuated by the wiper motor transmission components. The park switch alternately closes the wiper park switch sense circuit to ground or to battery current, depending upon the position of the wipers on the glass. This feature allows the motor to complete its current wipe cycle after the wiper system has been turned Off, and to park the wiper blades in the lowest portion of the wipe pattern. The automatic resetting circuit breaker protects the motor from overloads. The wiper motor crank arm, the two wiper linkage members, and the two wiper pivots mechanically convert the rotary output of the wiper motor to the back and forth wiping motion of the wiper arms and blades on the glass.

REMOVAL

(1) Remove the front wiper arms from the wiper pivots. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS/FRONT WIPER ARM - REMOVAL).

(2) Unlatch, open and support the hood.

(3) Disconnect and isolate the battery negative cable.

(4) Remove the cowl plenum cover/grille panel from over the cowl plenum. (Refer to 23 - BODY/EXTERIOR/COWL GRILLE AND SCREEN - REMOVAL).

REAR WIPER MOTOR TRIM COVER (Continued)

INSTALLATION

(1) From the inside of the liftglass, position the trim cover onto the rear wiper motor mounting bracket (Fig. 21).

(2) Install and tighten the three screws that secure the trim cover to the rear wiper motor mounting bracket. Tighten the screws to 1 N·m (10 in. lbs.).

REAR WIPER/WASHER SWITCH

DESCRIPTION

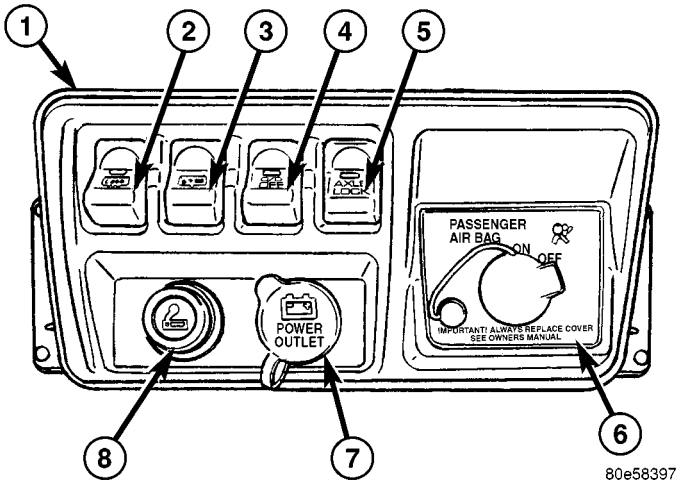


Fig. 22 Accessory Switch Bezel

1 - ACCESSORY SWITCH BEZEL
2 - REAR WINDOW DEFOGGER SWITCH (HARDTOP ONLY)
3 - REAR WIPER/WASHER SWITCH (HARDTOP ONLY)
4 - OVERDRIVE-OFF SWITCH (AUTOMATIC TRANSMISSION ONLY)
5 - AXLE LOCK SWITCH (OFF ROAD PACKAGE ONLY)
6 - PASSENGER AIRBAG ON/OFF SWITCH (WITHOUT REAR SEAT ONLY)
7 - ACCESSORY POWER OUTLET
8 - CIGAR LIGHTER

The rear wiper and washer switch is located in the accessory switch bezel near the bottom of the instrument panel center stack area on the instrument panel (Fig. 22). Only the single switch toggle button is visible through the opening of the accessory switch bezel (Fig. 23). The remainder of the switch is concealed behind the accessory switch bezel within the instrument panel. The single two-function switch housing and switch toggle button are molded from black plastic. The switch toggle button is clearly identified by a white graphic of the International Control and Display Symbol icon for “Rear Wiper and Washer,” making it clearly visible in daylight. When illuminated from behind by an integral panel lamps dimmer controlled illumination lamp with the exterior lamps turned On, the white graphic appears blue-green.

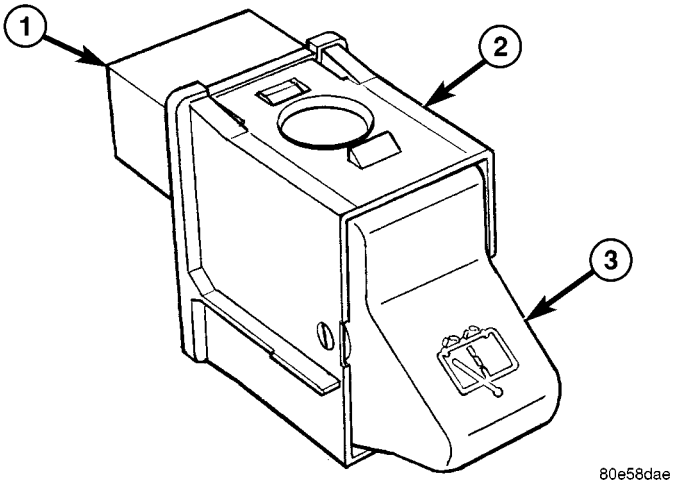


Fig. 23 Rear Wiper/Washer Switch

1 - CONNECTOR RECEPTACLE
2 - HOUSING
3 - TOGGLE BUTTON

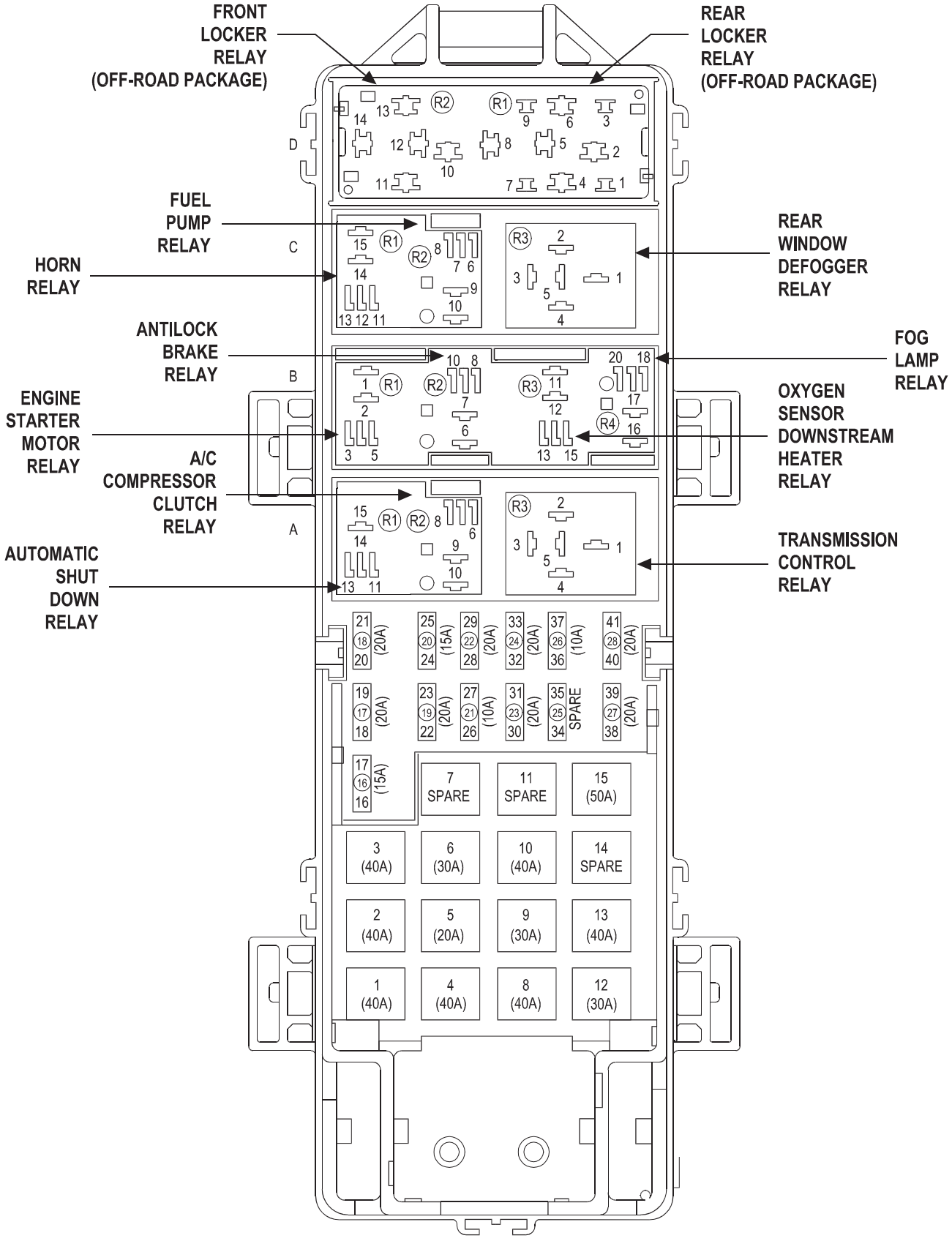
The rear wiper and washer switch is secured by a snap fit within a dedicated receptacle molded into the back of the accessory switch bezel. A single six pin connector receptacle is molded into the back of the switch housing. A dedicated take out and connector of the instrument panel wire harness connects the switch to the vehicle electrical system. The rear wiper and washer switch contains switches and circuitry to control both the rear wiper and the rear washer functions. The rear wiper and washer switch cannot be repaired and, if faulty or damaged, the entire switch unit must be replaced. The incandescent switch illumination bulb and bulb holder unit is available for individual service replacement.

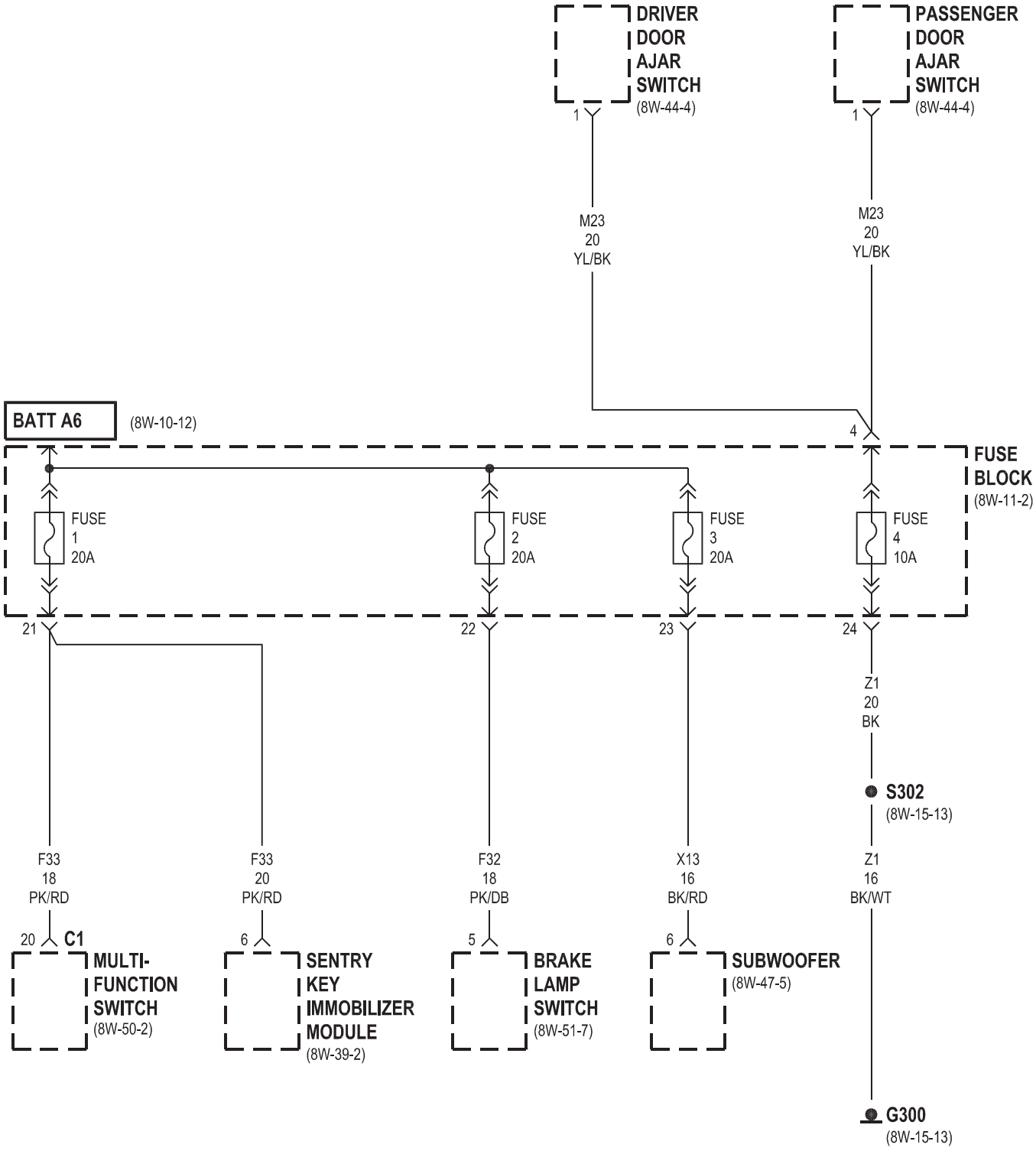
OPERATION

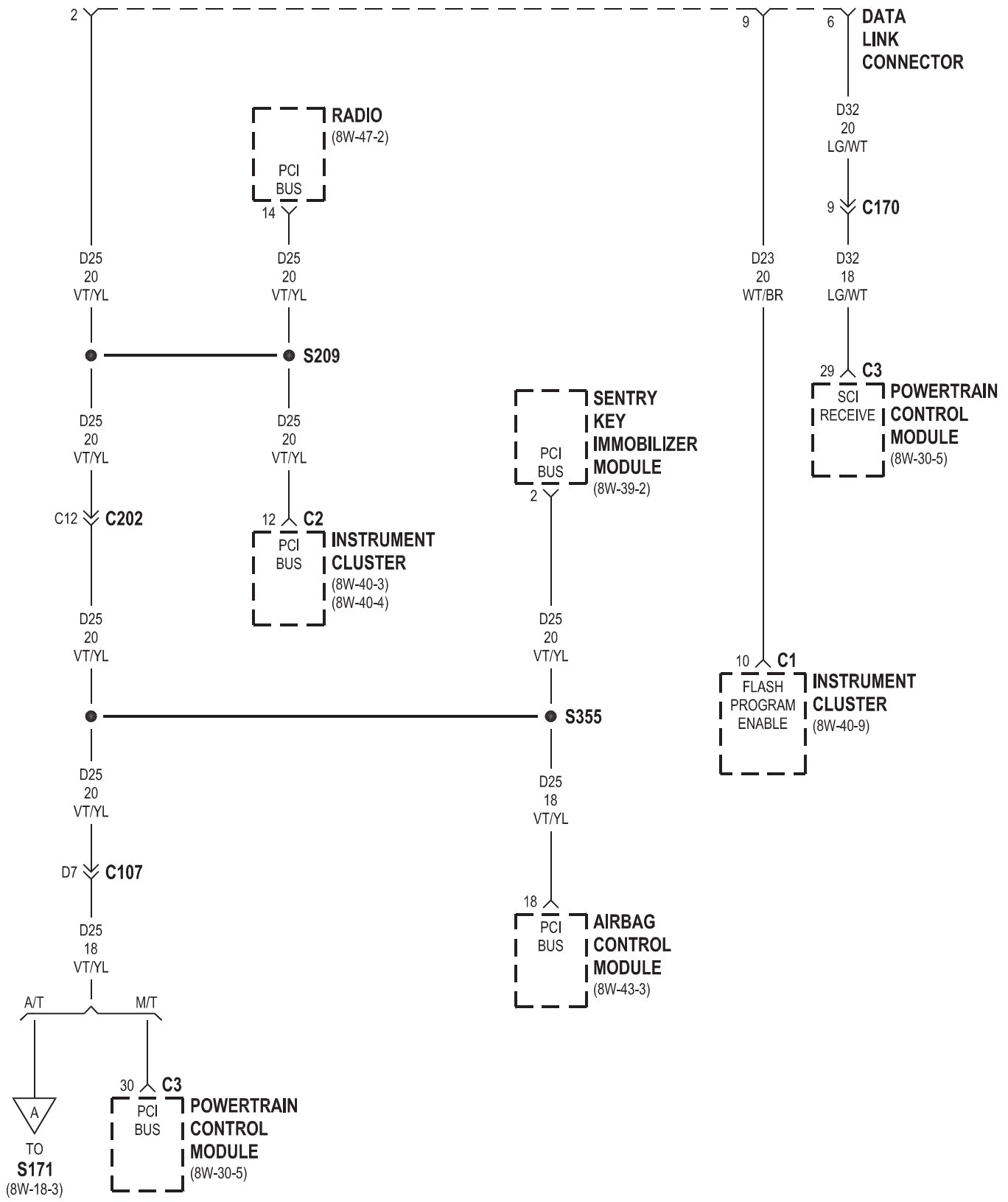
The rear wiper and washer switch uses conventionally switched outputs to control the functions and features of the rear wiper and washer system. The switch receives battery current on a fused ignition switch output (run) circuit from a fuse in the Power Distribution Center (PDC) through the rear wiper and washer system fuse in the fuse block whenever the ignition switch is in the On position. The switch receives a path to ground at all times through a through a take out of the instrument panel wire harness with an eyelet terminal connector that is secured by a ground screw to the support structure near the driver side end of the instrument panel.

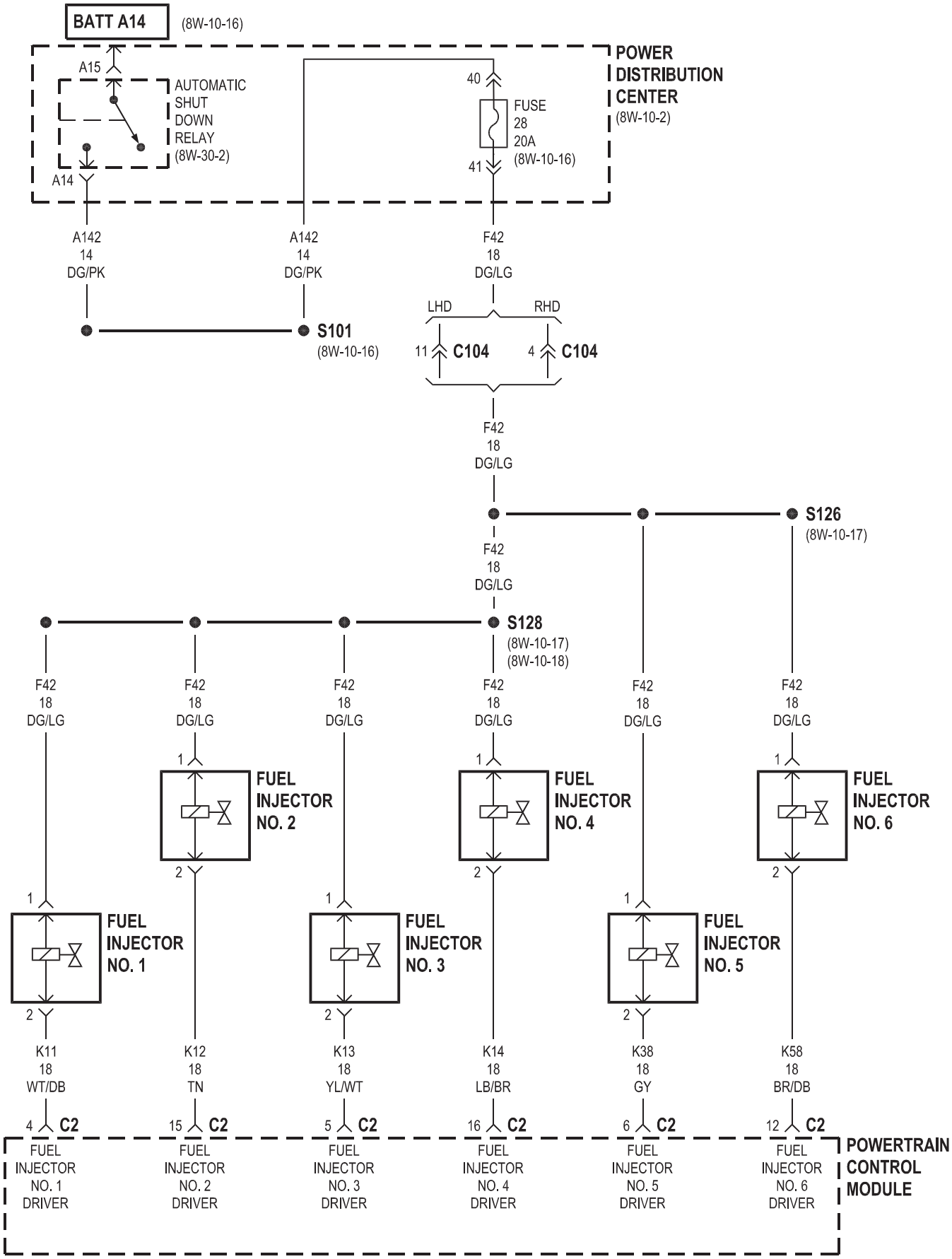
The rear wiper and washer switch features detents in the Off and Wipe positions, and a momentary Wash position. When the switch toggle button is in the Off position it provides a ground path to the park switch within the rear wiper motor. The park switch uses this ground path to operate the rear wiper motor until the wiper blade is in its parked position,

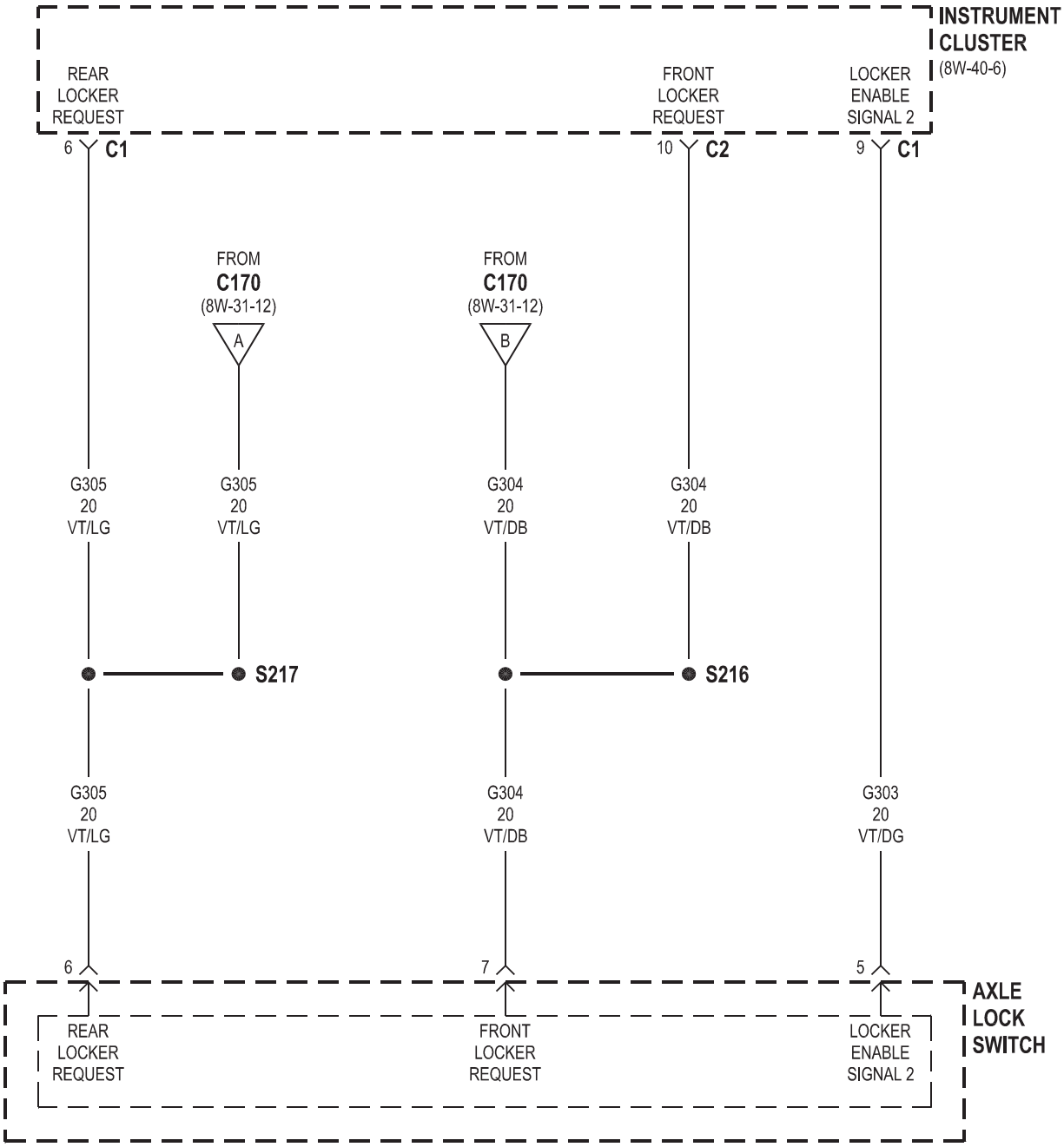
POWER DISTRIBUTION CENTER

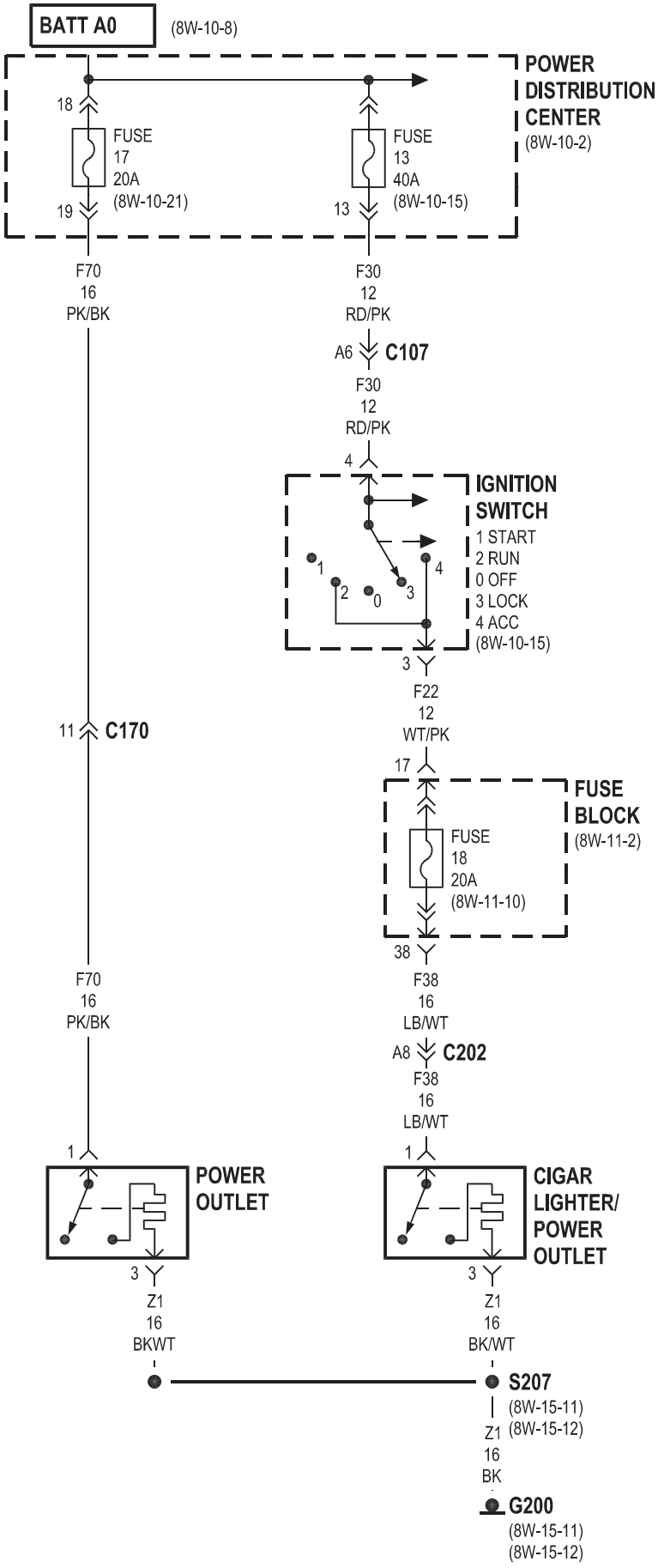


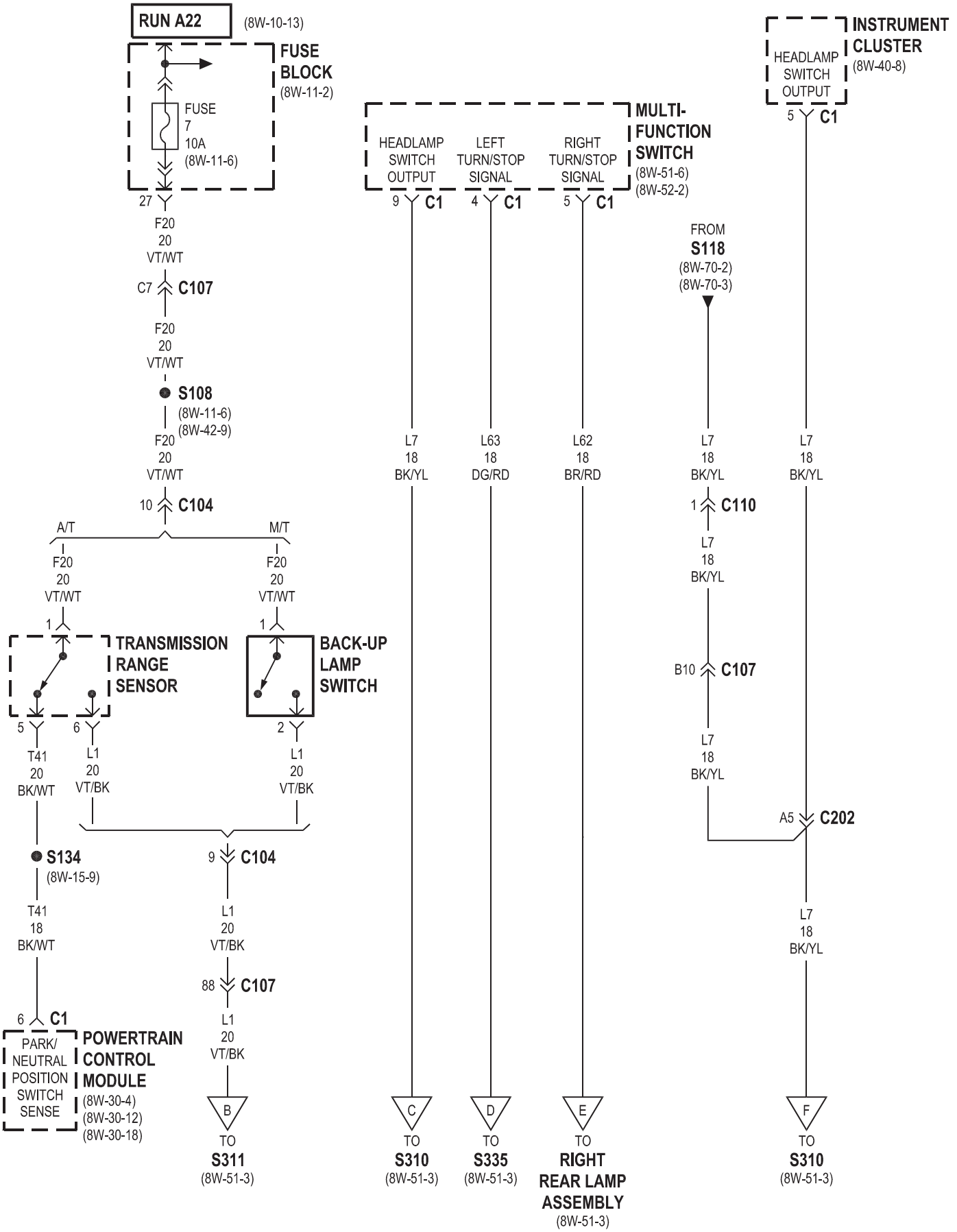

DRIVER DOOR AJAR SWITCH (8W-44-4)
PASSENGER DOOR AJAR SWITCH (8W-44-4)
1
1
M23 20 YL/BK
M23 20 YL/BK
BATT A6 (8W-10-12)
4
FUSE BLOCK (8W-11-2)
FUSE 1 20A
FUSE 2 20A
FUSE 3 20A
FUSE 4 10A
21
22
23
24
Z1 20 BK
S302 (8W-15-13)
F33 18 PK/RD
F33 20 PK/RD
F32 18 PK/DB
X13 16 BK/RD
Z1 16 BK/WT
20 C1
6
5
6
MULTI-FUNCTION SWITCH (8W-50-2)
SENTRY KEY IMMOBILIZER MODULE (8W-39-2)
BRAKE LAMP SWITCH (8W-51-7)
SUBWOOFER (8W-47-5)
G300 (8W-15-13)


2
9
6
DATA LINK CONNECTOR
RADIO
(8W-47-2)
PCI BUS
14
D32 20 LG/WT
9 C170
D25 20 VT/YL
D25 20 VT/YL
D23 20 WT/BR
D32 18 LG/WT
S209
29 C3
SCI RECEIVE
POWERTRAIN CONTROL MODULE
(8W-30-5)
SENTRY KEY IMMOBILIZER MODULE
(8W-39-2)
PCI BUS
2
C12 C202
12 C2
PCI BUS
INSTRUMENT CLUSTER
(8W-40-3)
(8W-40-4)
10 C1
FLASH PROGRAM ENABLE
INSTRUMENT CLUSTER
(8W-40-9)
S355
D7 C107
D25 18 VT/YL
18
PCI BUS
AIRBAG CONTROL MODULE
(8W-43-3)
A/T
M/T
A
TO S171
(8W-18-3)
30 C3
PCI BUS
POWERTRAIN CONTROL MODULE
(8W-30-5)

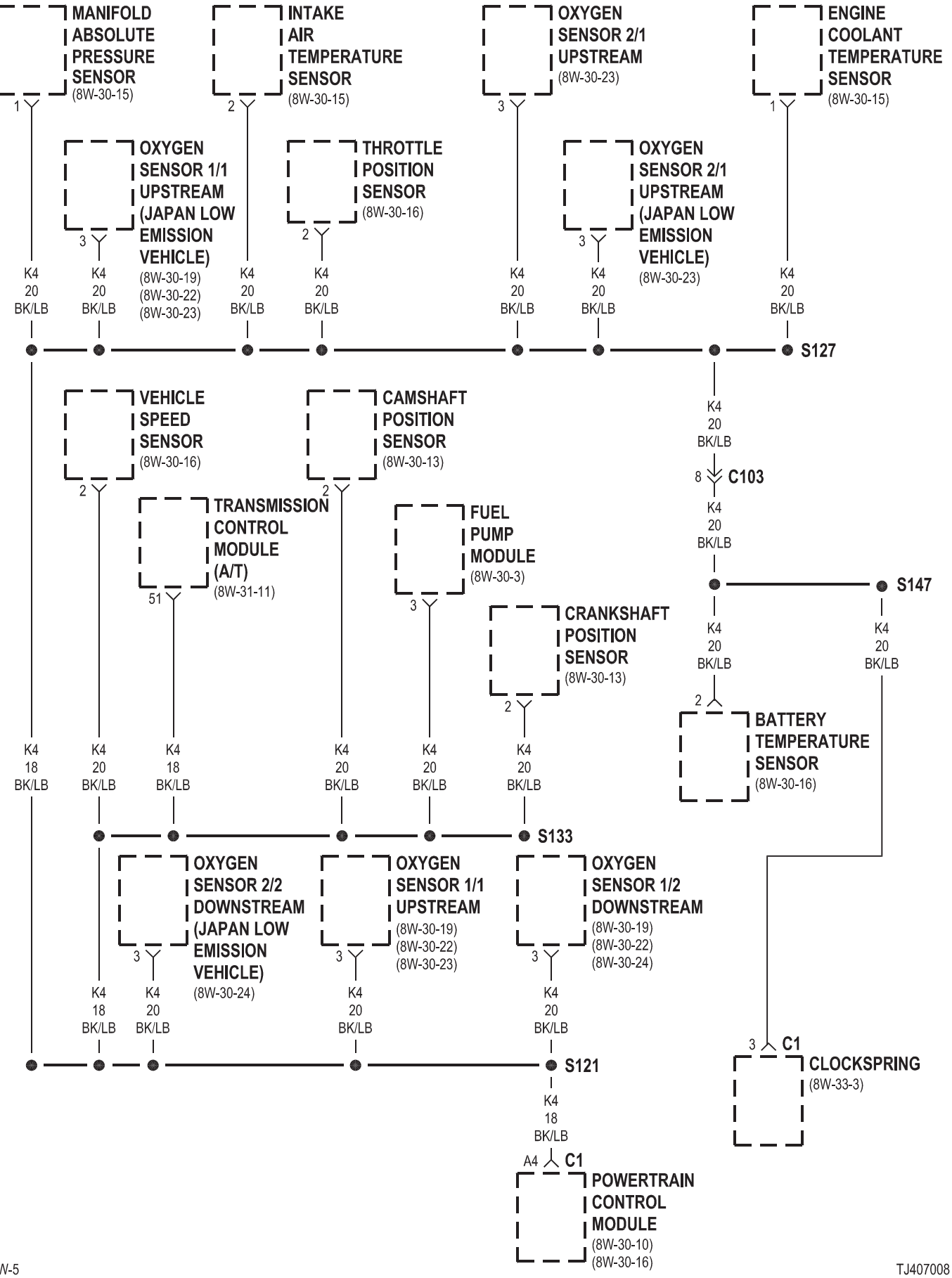

BATT A14
(8W-10-16)
POWER DISTRIBUTION CENTER
(8W-10-2)
A15
AUTOMATIC SHUT DOWN RELAY
(8W-30-2)
A14
40
FUSE 28 20A
(8W-10-16)
41
A142 14 DG/PK
A142 14 DG/PK
F42 18 DG/LG
S101
(8W-10-16)
LHD
RHD
11 C104
4 C104
F42 18 DG/LG
S126
(8W-10-17)
F42 18 DG/LG
S128
(8W-10-17)
(8W-10-18)
F42 18 DG/LG
FUEL INJECTOR NO. 1
FUEL INJECTOR NO. 2
FUEL INJECTOR NO. 3
FUEL INJECTOR NO. 4
FUEL INJECTOR NO. 5
FUEL INJECTOR NO. 6
K11 18 WT/DB
K12 18 TN
K13 18 YL/WT
K14 18 LB/BR
K38 18 GY
K58 18 BR/DB
4 C2
15 C2
5 C2
16 C2
6 C2
12 C2
FUEL INJECTOR NO. 1 DRIVER
FUEL INJECTOR NO. 2 DRIVER
FUEL INJECTOR NO. 3 DRIVER
FUEL INJECTOR NO. 4 DRIVER
FUEL INJECTOR NO. 5 DRIVER
FUEL INJECTOR NO. 6 DRIVER
POWERTRAIN CONTROL MODULE

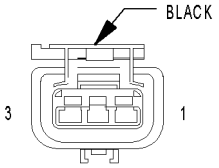

INSTRUMENT CLUSTER
(8W-40-6)
REAR LOCKER REQUEST
6 C1
FRONT LOCKER REQUEST
10 C2
LOCKER ENABLE SIGNAL 2
9 C1
FROM C170 (8W-31-12)
A
FROM C170 (8W-31-12)
B
G305 20 VT/LG
G305 20 VT/LG
G304 20 VT/DB
G304 20 VT/DB
S217
S216
G305 20 VT/LG
G304 20 VT/DB
G303 20 VT/DG
6
7
5
AXLE LOCK SWITCH
REAR LOCKER REQUEST
FRONT LOCKER REQUEST
LOCKER ENABLE SIGNAL 2


BATT A0
(8W-10-8)
POWER DISTRIBUTION CENTER
(8W-10-2)
18
FUSE 17 20A
(8W-10-21)
19
FUSE 13 40A
(8W-10-15)
13
F70 16 PK/BK
F30 12 RD/PK
A6 C107
F30 12 RD/PK
4
IGNITION SWITCH
1 START
2 RUN
0 OFF
3 LOCK
4 ACC
(8W-10-15)
3
F22 12 WT/PK
11 C170
17
FUSE BLOCK
(8W-11-2)
FUSE 18 20A
(8W-11-10)
38
F70 16 PK/BK
F38 16 LB/WT
A8 C202
F38 16 LB/WT
1
POWER OUTLET
CIGAR LIGHTER/ POWER OUTLET
3
Z1 16 BKWT
Z1 16 BK/WT
S207
(8W-15-11)
(8W-15-12)
Z1 16 BK
G200
(8W-15-11)
(8W-15-12)


RUN A22
(8W-10-13)
FUSE BLOCK
(8W-11-2)
FUSE 7 10A
(8W-11-6)
27
F20 20 VT/WT
C7 C107
F20 20 VT/WT
S108
(8W-11-6)
(8W-42-9)
F20 20 VT/WT
10 C104
A/T
M/T
F20 20 VT/WT
1
F20 20 VT/WT
1
TRANSMISSION RANGE SENSOR
BACK-UP LAMP SWITCH
5
6
2
T41 20 BK/WT
L1 20 VT/BK
L1 20 VT/BK
S134
(8W-15-9)
9 C104
T41 18 BK/WT
L1 20 VT/BK
88 C107
L1 20 VT/BK
6 C1
PARK/ NEUTRAL POSITION SWITCH SENSE
POWERTRAIN CONTROL MODULE
(8W-30-4)
(8W-30-12)
(8W-30-18)
B
TO
S311
(8W-51-3)
MULTI-FUNCTION SWITCH
(8W-51-6)
(8W-52-2)
HEADLAMP SWITCH OUTPUT
LEFT TURN/STOP SIGNAL
RIGHT TURN/STOP SIGNAL
9 C1
4 C1
5 C1
L7 18 BK/YL
L63 18 DG/RD
L62 18 BR/RD
C
TO
S310
(8W-51-3)
D
TO
S335
(8W-51-3)
E
TO
RIGHT REAR LAMP ASSEMBLY
(8W-51-3)
FROM
S118
(8W-70-2)
(8W-70-3)
L7 18 BK/YL
1 C110
L7 18 BK/YL
B10 C107
L7 18 BK/YL
INSTRUMENT CLUSTER
(8W-40-8)
HEADLAMP SWITCH OUTPUT
5 C1
L7 18 BK/YL
A5 C202
L7 18 BK/YL
F
TO
S310
(8W-51-3)

4.0L RHD EXPORT

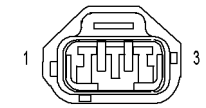




CAMSHAFT POSITION SENSOR (2.4L)

CAMSHAFT POSITION SENSOR (2.4L) - BLACK 3 WAY

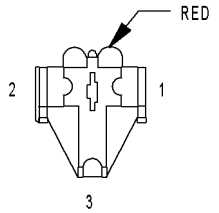
CAV	CIRCUIT	FUNCTION
1	K7 18OR	5 VOLT SUPPLY
2	K4 18BK/LB	SENSOR GROUND 1
3	K44 18TN/YL	CMP SIGNAL



CAMSHAFT POSITION SENSOR (4.0L)

CAMSHAFT POSITION SENSOR (4.0L) - 3 WAY

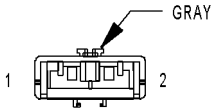
CAV	CIRCUIT	FUNCTION
1	K44 18TN/YL	CMP SIGNAL
2	K4 20BK/LB	SENSOR GROUND 1
3	K7 20OR	5V SUPPLY



CIGAR LIGHTER/ POWER OUTLET

CIGAR LIGHTER/POWER OUTLET - RED 3 WAY

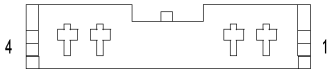
CAV	CIRCUIT	FUNCTION
1	F38 16LB/WT	FUSED CIGAR LIGHTER/ACCESSORY RELAY OUTPUT
2	-	-
3	Z1 16BK/WT	GROUND



CIRCUIT BREAKER

CIRCUIT BREAKER - GRAY 2 WAY

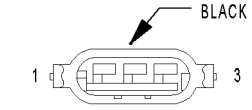
CAV	CIRCUIT	FUNCTION
1	A3 12RD/WT	HEADLAMP SWITCH RELAY FEED
2	F3 14LB/OR	DAYTIME RUNNING LAMP MODULE



CLOCKSPRING C1

CLOCKSPRING C1 - 4 WAY

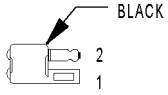
CAV	CIRCUIT	FUNCTION
1	X3 20RD/YL	HORN RELAY CONTROL
2	V37 20RD/LG (EXCEPT RHD HARDTOP SUBWOOFER)	SPEED CONTROL SWITCH SIGNAL
2	V37 20RD/LB (RHD HARDTOP SUB-WOOFER)	SPEED CONTROL SWITCH SIGNAL
3	K4 20BK/LB	SENSOR GROUND 1
4	-	-



RIGHT FRONT PARK/ TURN SIGNAL LAMP (EXCEPT EXPORT)

RIGHT FRONT PARK/ TURN SIGNAL LAMP (EXCEPT EXPORT) - BLACK 3 WAY

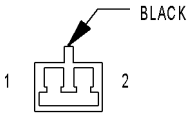
CAV	CIRCUIT	FUNCTION
1	L60 18TN	RIGHT TURN SIGNAL
2	L7 18BK/YL	FUSED PARK LAMP RELAY OUTPUT
3	Z1 18BK	GROUND



RIGHT FRONT POSITION LAMP (EXPORT)

RIGHT FRONT POSITION LAMP (EXPORT) - BLACK 2 WAY

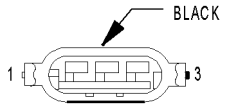
CAV	CIRCUIT	FUNCTION
1	L7 18BK/YL	FUSED PARK LAMP RELAY OUTPUT
2	Z1 20BK	GROUND



RIGHT FRONT SPEAKER

RIGHT FRONT SPEAKER - BLACK 2 WAY

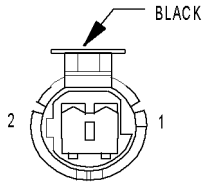
CAV	CIRCUIT	FUNCTION
1	X54 18VT	RIGHT FRONT SPEAKER (+)
2	X56 18DB	RIGHT FRONT SPEAKER (-)



RIGHT FRONT TURN SIGNAL LAMP (EXPORT)

RIGHT FRONT TURN SIGNAL LAMP (EXPORT) - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	L60 18TN	RIGHT TURN SIGNAL
2	-	-
3	Z1 18BK	GROUND



RIGHT FRONT WHEEL SPEED SENSOR

RIGHT FRONT WHEEL SPEED SENSOR - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	B6 18WT/DB	RIGHT FRONT WHEEL SPEED SENSOR (-)
2	B7 18WT	RIGHT FRONT WHEEL SPEED SENSOR (+)

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

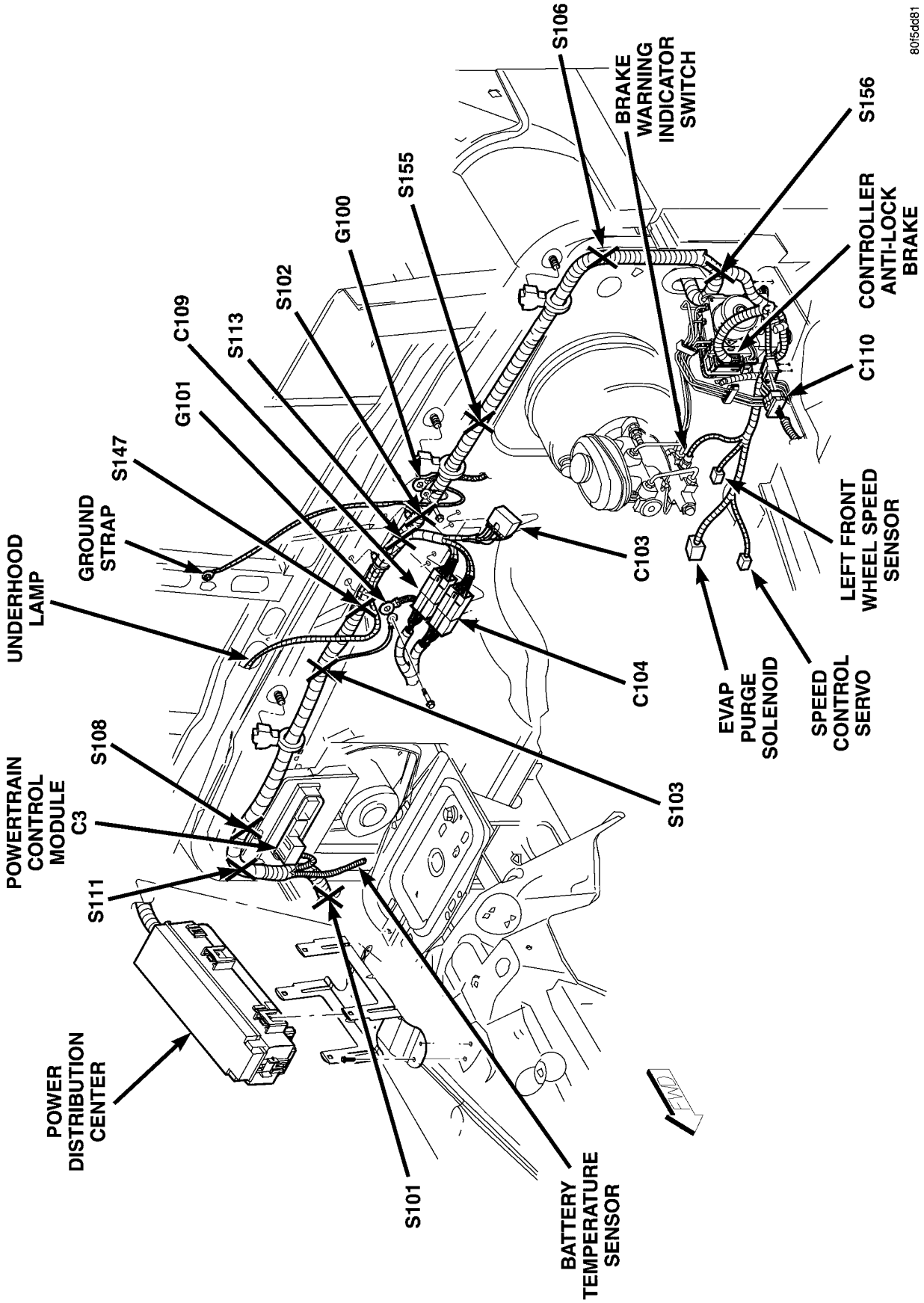


Fig. 7 ENGINE COMPARTMENT REAR LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

81217267

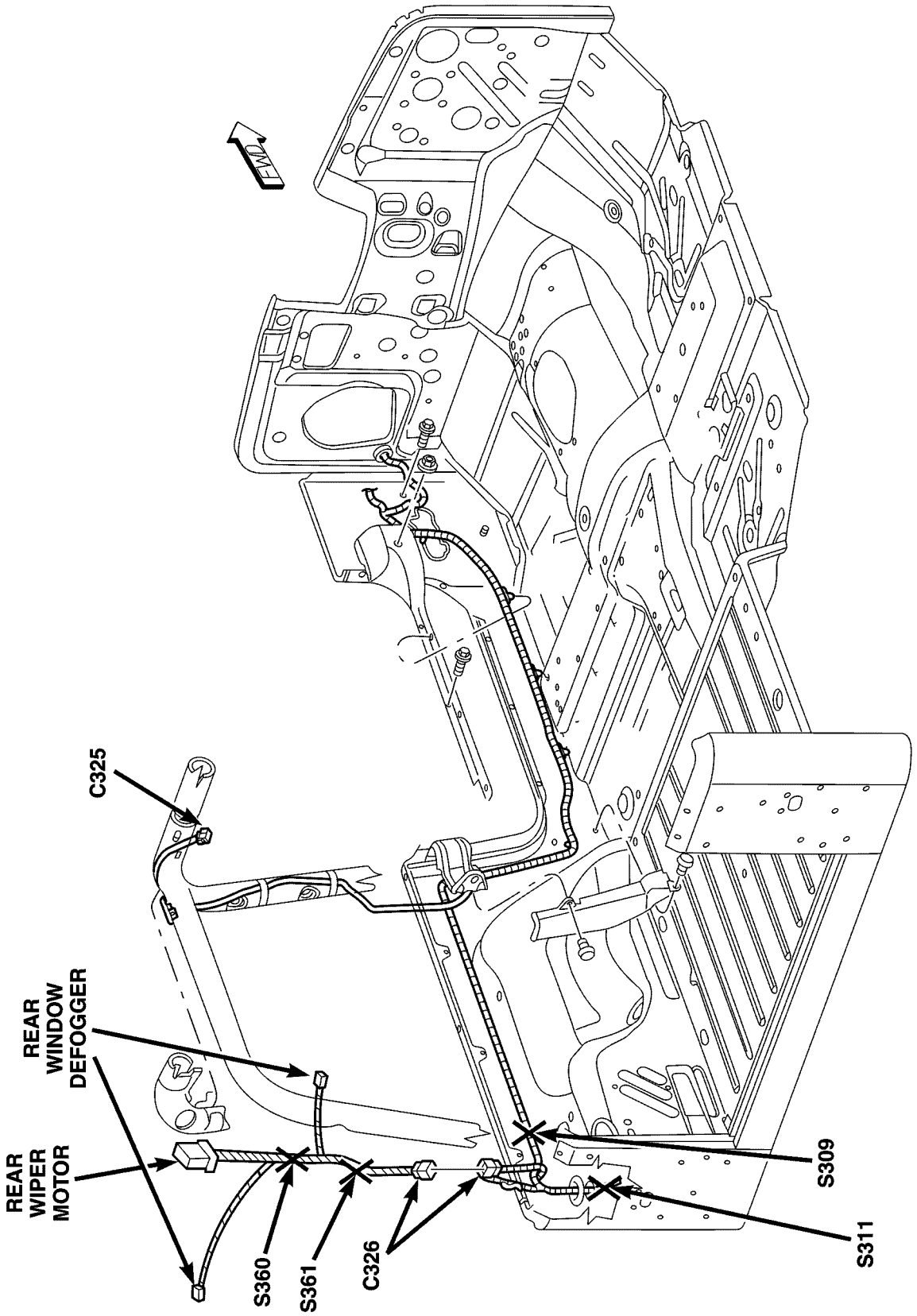


Fig. 36 BODY CONNECTORS RHD

ENGINE 2.4L (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL CONSUMPTION OR SPARK PLUGS FOULED	1. PCV system malfunction.	1. Check system and repair as necessary. (Refer to 25 - EMISSIONS CONTROL/ EVAPORATIVE EMISSIONS/PCV VALVE - DIAGNOSIS AND TESTING)
	2. Worn, scuffed or broken rings.	2. Hone cylinder bores. Install new rings.
	3. Carbon in oil ring slots.	3. Install new rings.
	4. Rings fitted too tightly in grooves.	4. Remove rings and check grooves. If groove is not proper width, replace piston.
	5. Worn valve guide(s).	5. Replace cylinder head assembly.
	6. Valve stem seal(s) worn or damaged.	6. Replace seal(s).

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - PERFORMANCE

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE WILL NOT START	1. Weak battery.	1. Test battery. Charge or replace as necessary. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM - DIAGNOSIS AND TESTING)
	2. Corroded or loose battery connections.	2. Clean and tighten battery connections. Apply a coat of light mineral grease to terminals.
	3. Faulty starter.	3. Test starting system. (Refer to 8 - ELECTRICAL/STARTING - DIAGNOSIS AND TESTING)
	4. Faulty coil(s) or control unit.	4. Test and replace as needed. (Refer to Appropriate Diagnostic Information)
	5. Incorrect spark plug gap.	5. Set gap. (Refer to 8 - ELECTRICAL/IGNITION CONTROL - SPECIFICATIONS)
	6. Contamination in fuel system.	6. Clean system and replace fuel filter.
	7. Faulty fuel pump.	7. Test fuel pump and replace as needed. (Refer to Appropriate Diagnostic Information)
	8. Incorrect engine timing.	8. Check for a skipped timing belt/chain.

ROCKER ARMS (Continued)

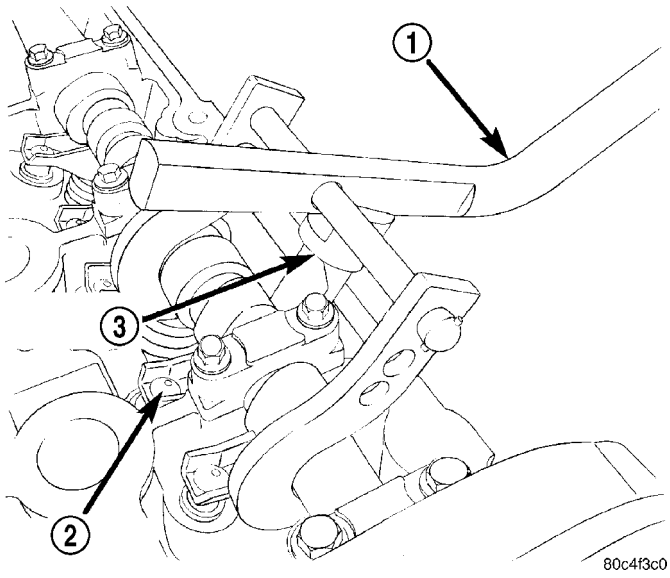


Fig. 33 Rocker Arm - Removal/Installation

1 - SPECIAL TOOL 8215
2 - ROCKER ARM
3 - SPECIAL TOOL 8436

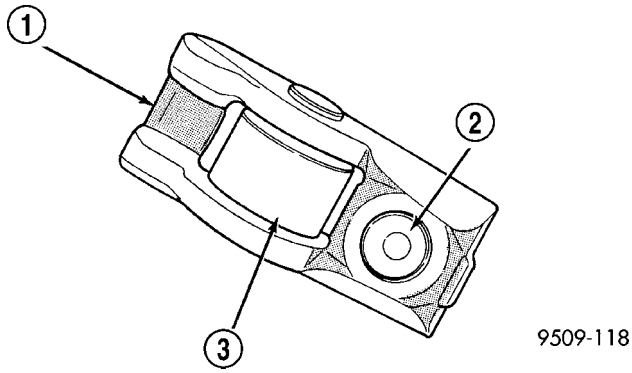


Fig. 34 Rocker Arm - Typical

1 - TIP
2 - LASH ADJUSTER POCKET
3 - ROLLER

(2) Using Special Tools 8215 and 8436 slowly depress valve assembly until rocker arm can be installed on the hydraulic lifter and valve stem.

(3) Repeat installation procedure for each rocker arm.

(4) Install spark plugs.

(5) Install fuel rail. (Refer to 14 - FUEL SYSTEM/ FUEL DELIVERY/FUEL RAIL - INSTALLATION)

(6) Install cylinder head cover. (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION)

ENGINE BLOCK

DESCRIPTION

The cast iron cylinder block is a two-piece assembly, consisting of the cylinder block and bedplate (Fig. 35). The bedplate incorporates the main bearing caps and bolts to the cylinder block. This design offers a much stronger lower end and increased cylinder block rigidity. The rear oil seal retainer is integral with the block. The bedplate and block are serviced as an assembly.

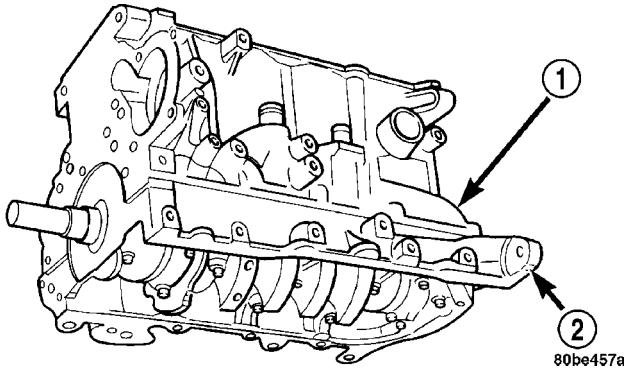


Fig. 35 2.4L Cylinder Block and Bedplate - Typical

1 - CYLINDER BLOCK
2 - BEDPLATE

STANDARD PROCEDURE

STANDARD PROCEDURE - PISTON TO CYLINDER BORE FITTING

Piston and cylinder wall must be clean and dry. Piston diameter should be measured 90 degrees to piston pin about 14 mm (9/16 inch.) from the bottom of the skirt as shown in (Fig. 37). Cylinder bores should be measured halfway down the cylinder bore and transverse to the engine crankshaft center line shown in (Fig. 36). Refer to for Engine Specifications (Refer to 9 - ENGINE - SPECIFICATIONS). Correct piston to bore clearance must be established in order to assure quiet and economical operation.

NOTE: Pistons and cylinder bores should be measured at normal room temperature, 21°C (70°F).

STANDARD PROCEDURE - CYLINDER BORE HONING

(1) Used carefully, the cylinder bore resizing hone, recommended tool C-823 or equivalent, equipped with 220 grit stones, is the best tool for this honing procedure. In addition to deglazing, it will reduce taper and out-of-round as well as removing light scuffing, scoring or scratches. Usually a few strokes will clean up a bore and maintain the required limits.

EXHAUST MANIFOLD (Continued)

CLEANING

(1) Discard gasket (if equipped) and clean all surfaces of manifold and cylinder head.

INSPECTION

(1) Inspect manifold gasket surfaces for flatness with straight edge. Surface must be flat within 0.15 mm per 300 mm (0.006 in. per foot) of manifold length.

(2) Inspect manifolds for cracks or distortion. Replace manifold as necessary.

INSTALLATION

(1) Clean the manifold mating surfaces.

(2) Install exhaust manifold with a new gasket. Tighten attaching nuts to 20 N·m (175 in. lbs.).

(3) Attach exhaust pipe to exhaust manifold and tighten fasteners to 37 N·m (27 ft. lbs.).

(4) Install and connect the oxygen sensor. (Refer to 14 - FUEL SYSTEM/FUEL INJECTION/O2 SENSOR - COMPONENT LOCATION)

(5) Install the heat shield.

(6) Install the air cleaner bracket.

TIMING BELT COVER(S)

REMOVAL

FRONT COVER

(1) Remove crankshaft vibration damper. (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL)

(2) Remove generator drive belt tensioner assembly. (Refer to 7 - COOLING/ACCESSORY DRIVE/ BELT TENSIONERS - REMOVAL)

(3) Remove timing belt front cover bolts, and remove covers.

REAR COVER

(1) Remove front covers.

(2) Remove timing belt. (Refer to 9 - ENGINE/ VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL)

(3) Hold camshaft sprocket with Special Tool 6847 while removing center bolt.

(4) Remove timing belt idler pulley.

(5) Remove rear cover fasteners and remove cover from engine.

INSTALLATION

REAR COVER

(1) Install timing belt rear cover and bolts (Fig. 96). Torque bolts to 12 N·m (105 in. lbs).

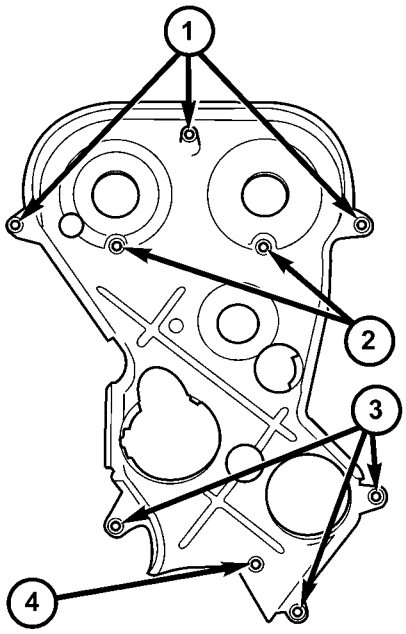


Fig. 96 TIMING BELT REAR COVER FASTENERS

1 - OUTER COVER TO REAR COVER FASTENERS (3)
2 - REAR COVER TO CYLINDER HEAD FASTENERS
3 - OUTER COVER TO REAR COVER FASTENERS (3)
4 - INNER COVER TO BLOCK FASTENERS

CAUTION: Do not use an impact wrench for tightening camshaft sprocket bolt. Damage to the timing locating pin can occur. Hand tighten using a wrench ONLY.

(2) Install camshaft sprockets, and camshaft target ring. Hold sprockets with Special Tool 6848 and tighten center bolt to 101 N·m (75 ft. lbs.).

(3) Install timing belt idler pulley and tighten mounting bolt to 61 N·m (45 ft. lbs.).

(4) Install timing belt. (Refer to 9 - ENGINE/ VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION)

(5) Install accessory drive bracket (Fig. 97).

(6) Install front covers.

FRONT COVER

(1) Install timing belt front covers (Fig. 98). Tighten fasteners to 7 N·m (60 in. lbs.).

(2) Install generator drive belt tensioner. (Refer to 7 - COOLING/ACCESSORY DRIVE/BELT TENSIONERS - INSTALLATION)

(3) Install crankshaft vibration damper. (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION)

ENGINE 4.0L (Continued)

CYLINDER BLOCK

DESCRIPTION	SPECIFICATION	
	Metric	Standard
CylinderBore Diameter	98.45 - 98.48 mm	3.8759 - 3.8775 in.
Out of Round (MAX)	0.025 mm	0.001 in.
Taper (MAX)	0.025 mm	0.001 in.
Deck Height	240.03 - 240.18 mm	9.450 - 9.456 in.
Deck Clearance (Below Deck)	0.546 mm	0.0215 in.
Tappet Bore Diameter	23.000 - 23.025 mm	0.9055 - 0.9065
Flatness	0.03 mm per 25 mm 0.05 mm per 152 mm	0.001 in. per 1 in. 0.002 in. per 6 in.
Flatness (MAX)	0.20 mm (MAX) for total length	0.008 in. MAX) for total length
Main Bearing Bore Diameter	68.351 - 68.376 mm	2.691 - 2.692 in.

PISTONS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Weight (Less Pin)	417 - 429 grams	14.7 - 15.1 oz
Piston Pin Bore Diameter	23.650 - 23.658 mm	0.9312 - 0.9315 in.
Piston Pin To Bore (Centerline To Piston Top)	40.61 - 40.72 mm	1.599 - 1.603 in.
Piston To Bore Clearance	0.018 - 0.038 mm	0.0008 - 0.0015 in.
Piston Ring Groove Height		
Compression Rings	1.530 - 1.555 mm	0.0602 - 0.0612 in.
Oil Control Rings	4.035 - 4.060 mm	0.1589 - 0.1598 in.
Piston Ring Groove Diameter		
No. 1 Compression	88.39 - 88.65 mm	3.48 - 3.49 in
No. 2 Compression	87.63 - 87.88 mm	3.45 - 3.46 in.
No. 3 Oil Control	89.66 - 89.92 mm	3.53 - 3.54 in.

PISTON PINS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Piston To Pin Clearance	0.0102 - 0.0208 mm	0.0005 - 0.0009 in.
Diameter	23.637 - 23.640 mm	0.9306 - 0.9307 in.
Piston-Pin To Connecting Rod (Press Fit)	8.9kN	2000 lbf.

PISTON RINGS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Ring Gap		
Top Compression Ring	0.229 - 0.610 mm	0.0090 - 0.0240 in.
Second Compression Ring	0.483 - 0.965 mm	0.0190 - 0.0380 in.
Oil Control (Steel Rails)	0.254 - 1.500 mm	0.010 - 0.060 in.
Side Clearance		
Top Compression Ring	.042 - .084 mm	0.0017 - 0.0033 in.
Second Compression Ring	0.042 - 0.084 mm	0.0017 - 0.0033 in.
Oil Ring (Steel Ring)	.06 - .21 mm	.0024 - .0083 in.

CRANKSHAFT MAIN BEARINGS (Continued)

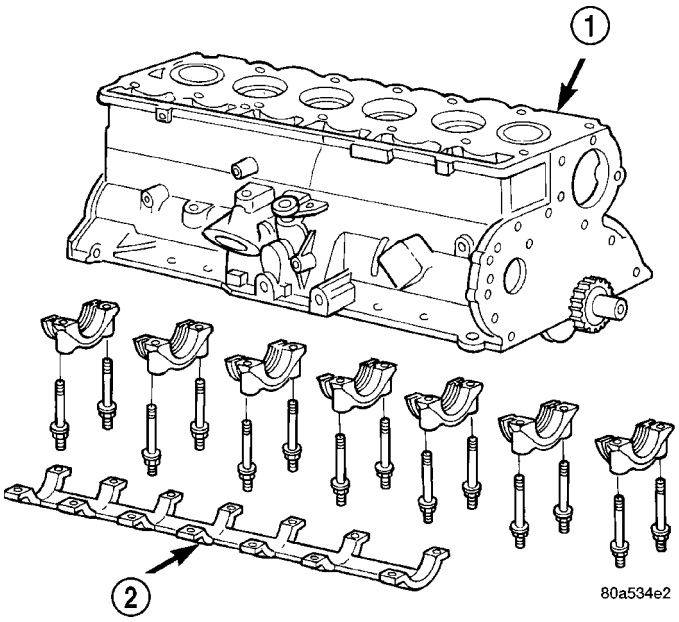


Fig. 45 Main Bearing Caps and Brace.

1 - BLOCK
2 - MAIN BEARING CAP BRACE

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

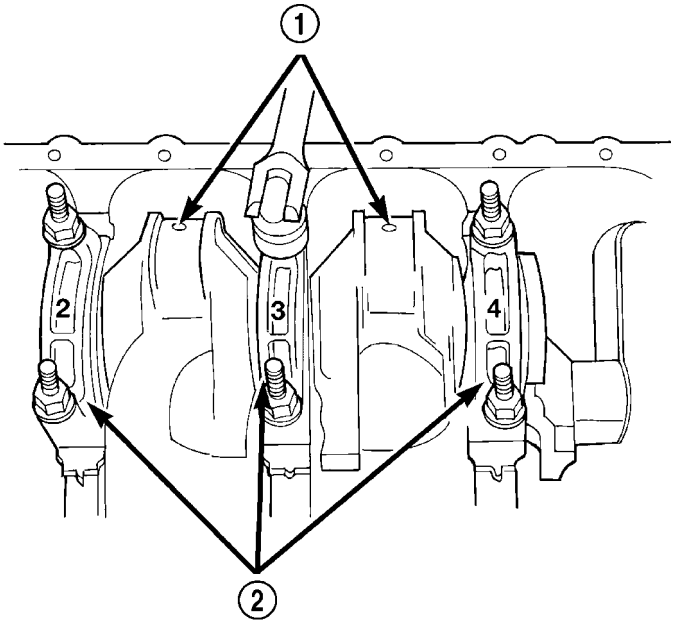


Fig. 46 Removing Main Bearing Caps and Lower Inserts

1 - CONNECTING ROD JOURNAL
2 - MAIN BEARING CAPS

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

(8) 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 the insert approximately 25 mm (1 inch), it can be removed by applying pressure under the tab.

(9) Using the same procedure described above, remove the remaining bearing inserts one at a time for inspection.

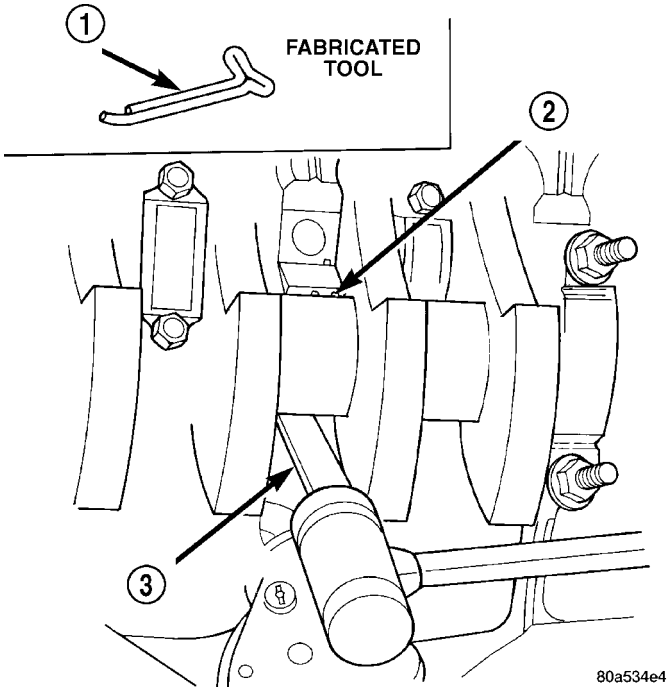


Fig. 47 Removing Upper Inserts

1 - COTTER PIN
2 - BEARING INSERT
3 - TONGUE DEPRESSOR

INSPECTION

Wipe the inserts clean and inspect for abnormal wear patterns and for metal or other foreign material imbedded in the lining. Normal main bearing insert wear patterns are illustrated (Fig. 48). In general the lower bearing half will have a heaver wear pattern.

NOTE: If any of the crankshaft journals are scored, remove the engine for crankshaft repair.

Inspect the back of the inserts for fractures, scrapings or irregular wear patterns.

Inspect the upper insert locking tabs for damage.

Replace all damaged or worn bearing inserts.

EXHAUST MANIFOLD

DESCRIPTION

The two exhaust manifolds (Fig. 93) are log style and are made of high silicon molybdenum cast iron. The exhaust manifolds share a common gasket with the intake manifold. The exhaust manifolds also incorporate ball flange outlets for improved sealing and strain free connections.

REMOVAL

The intake and engine exhaust manifolds on the 4.0L engine must be removed together. The manifolds use a common gasket at the cylinder head.

(Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).

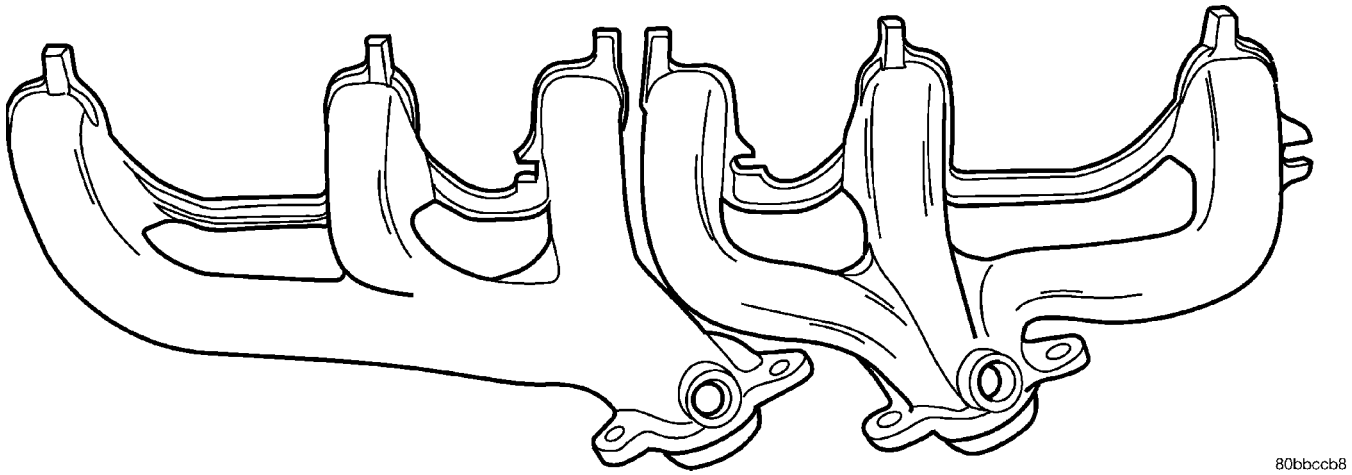


Fig. 93 EXHAUST MANIFOLDS 4.0L ENGINE

CRANKSHAFT POSITION SENSOR (Continued)

REMOVAL

2.4L

The Crankshaft Position (CKP) sensor is mounted into the right front side of the cylinder block (Fig. 4). It is positioned and bolted into a machined hole.

(1) Disconnect sensor electrical connector.
(2) Remove sensor bolt.
(3) Carefully twist sensor from cylinder block.
(4) Check condition of sensor o-ring (Fig. 5).

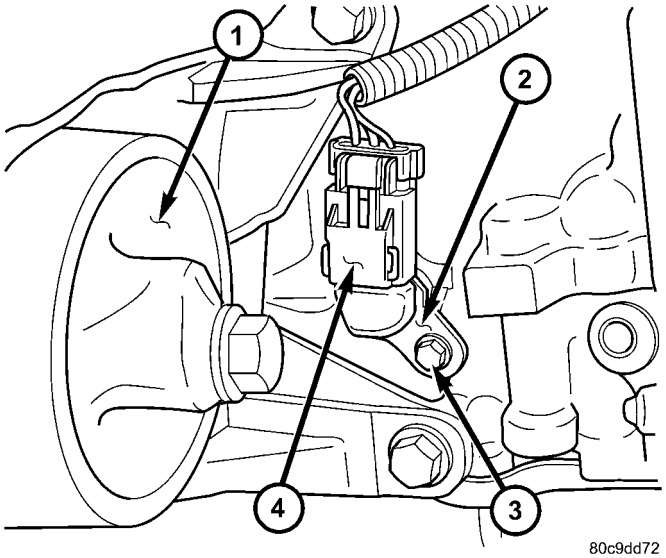


Fig. 4 CKP SENSOR LOCATION - 2.4L

1 - RIGHT FRONT ENGINE MOUNT
2 - CKP SENSOR
3 - MOUNTING BOLT
4 - ELECTRICAL CONNECTOR

4.0L

The crankshaft position (CKP) sensor is mounted to the transmission bellhousing near the rear of the engine block.

The sensor may be mounted to the transmission with one of the following four different configurations:

- with one bolt to the right side of the transmission if equipped with a 42RLE automatic transmission (Fig. 6).

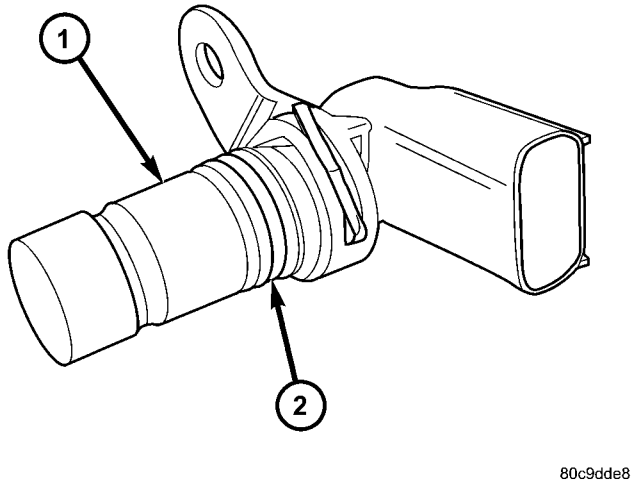


Fig. 5 CKP AND O-RING - 2.4L

1 - CKP SENSOR
2 - O-RING

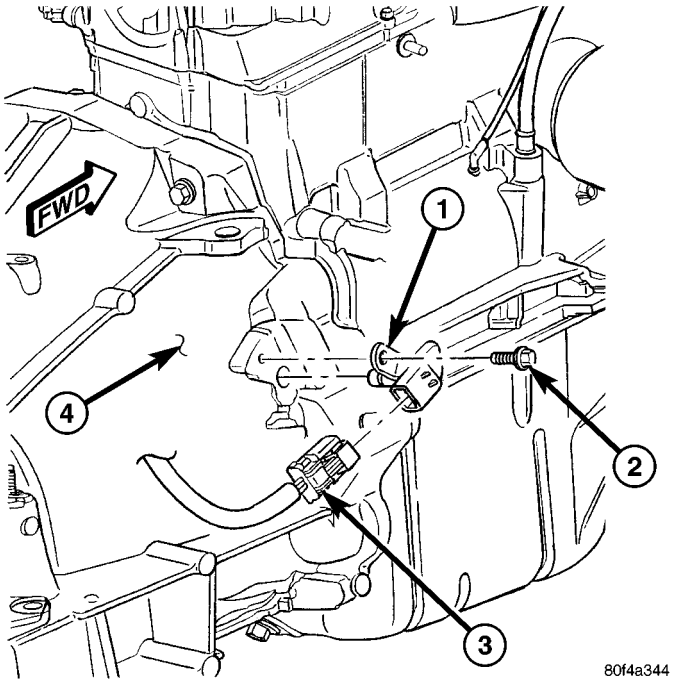


Fig. 6 CKP (WITH 42RLE AUTO. TRANS.)

1 - CKP SENSOR
2 - MOUNTING BOLT
3 - ELEC. CONNECTOR
4 - TRANS. BELLHOUSING

COLUMN

TABLE OF CONTENTS

COLUMN

DESCRIPTION

NOTE: The steering column on vehicles with an automatic transmission may not be equipped with an internal locking shaft that allows the ignition key cylinder to be locked with the key. Alternative methods of locking the steering wheel for service will have to be used.

The standard non-tilt and tilt steering column has been designed to be serviced as an assembly. The column is connected to the steering gear with an upper and lower shaft. The lower shaft has a support bearing mounted to a bracket. The bracket mounts to the frame rail with two bolts. These shafts and bearing are serviceable. The key cylinder, switches, clock spring, trim shrouds and steering wheel are serviced separately.

OPERATION - SERVICE PRECAUTIONS

Safety goggles should be worn at all times when working on steering columns.

To service the steering wheel, switches or airbag, refer to Electrical - Restraints and follow all WARNINGS and CAUTIONS.

WARNING: THE AIRBAG SYSTEM IS A SENSITIVE, COMPLEX ELECTRO-MECHANICAL UNIT. BEFORE ATTEMPTING TO DIAGNOSE, REMOVE OR INSTALL THE AIRBAG SYSTEM COMPONENTS YOU MUST FIRST DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE. THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE. FAILURE TO DO SO COULD RESULT IN ACCIDENTAL DEPLOYMENT OF THE AIRBAG AND POSSIBLE PERSONAL INJURY. THE FASTENERS, SCREWS, AND BOLTS, ORIGINALLY USED FOR THE AIRBAG COMPONENTS, HAVE SPECIAL COATINGS AND ARE SPECIFICALLY DESIGNED FOR THE AIRBAG SYSTEM. THEY MUST NEVER BE REPLACED WITH ANY SUBSTITUTES. ANYTIME A NEW FASTENER IS NEEDED, REPLACE WITH THE CORRECT FASTENERS PROVIDED IN THE SERVICE PACKAGE OR FASTENERS LISTED IN THE PARTS BOOKS.

REMOVAL

(1) Position front wheels **straight ahead.**

(2) Remove and isolate the negative ground cable from the battery.

(3) Remove the airbag, (Refer to 8 - ELECTRICAL/ RESTRAINTS/DRIVER AIRBAG - REMOVAL).

NOTE: If equipped with cruise control, disconnect clock spring harness from the cruise switch harness on the steering wheel.

(4) Remove the steering wheel with an appropriate puller (Fig. 1).

NOTE: Ensure the puller jaws are seated in the pockets (Fig. 2) of the steering wheel armature.

(5) Turn ignition cylinder to the on position and remove cylinder by pressing release through lower shroud access hole (Fig. 3) (Refer to 19 - STEERING/ COLUMN/LOCK CYLINDER HOUSING - REMOVAL).

MANUAL - NV1500 (Continued)

(6) Remove shift shaft detent plug with Remover 8117A (Fig. 6).

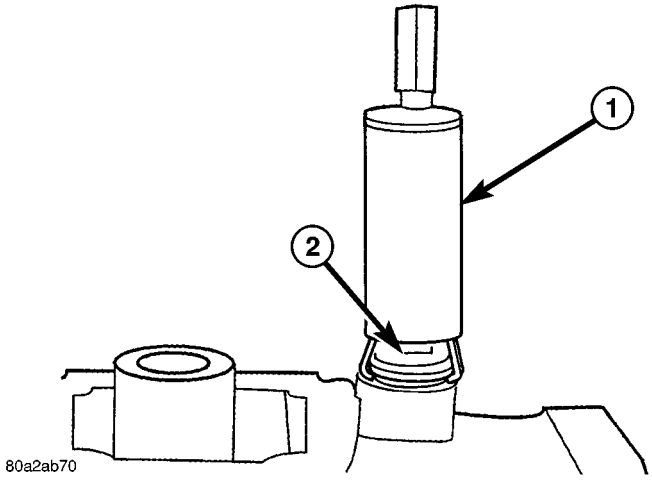


Fig. 6 DETENT PULLER

1 - REMOVER
2 - DETENT PLUG

(7) Remove shift shaft detent plunger and spring with a pencil magnet.

(8) Remove input shaft bearing retainer bolts (Fig. 7).

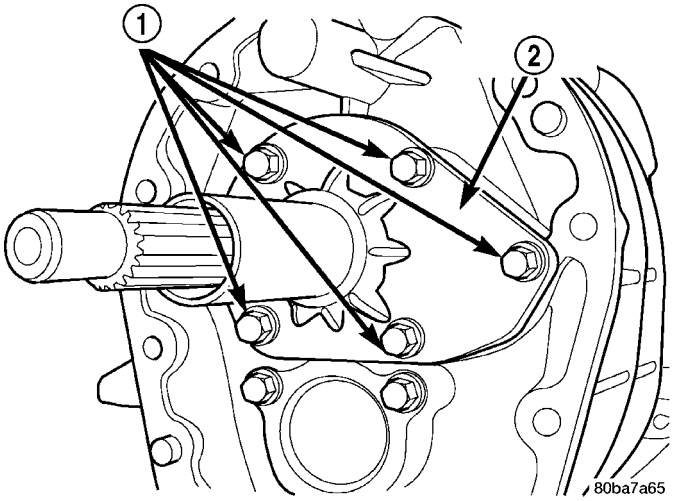


Fig. 7 BEARING RETAINER BOLTS

1 - BOLTS (5)
2 - BEARING RETAINER

(9) Remove bearing retainer from input shaft with a pry tool (Fig. 8).

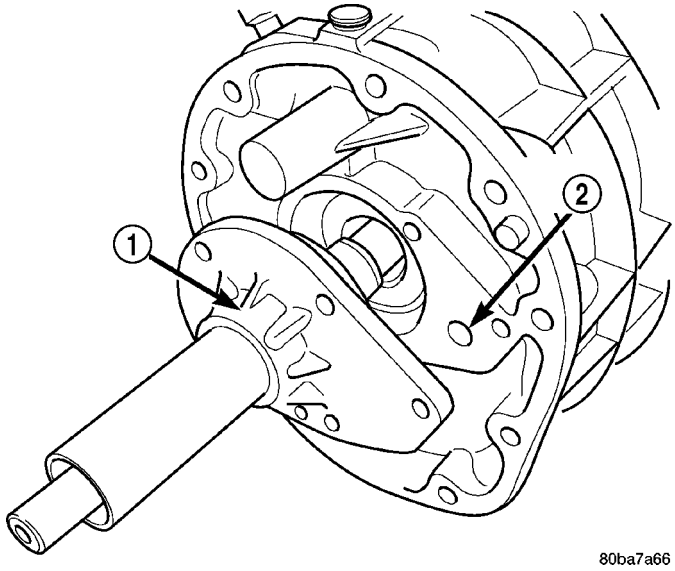


Fig. 8 INPUT SHAFT BEARING RETAINER

1 - BEARING RETAINER
2 - OIL FEED

(10) Remove snap ring securing input shaft in front bearing (Fig. 9).

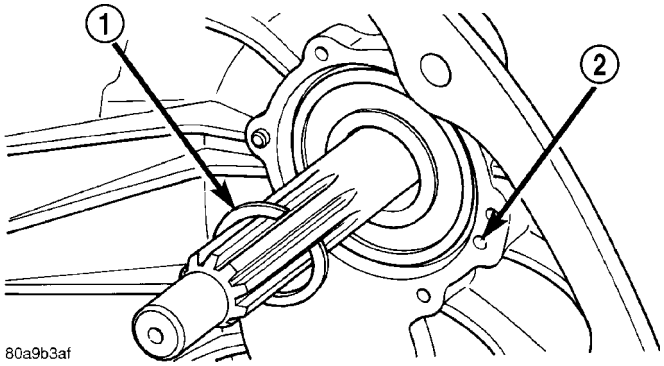


Fig. 9 INPUT SHAFT SNAP RING

1 - INPUT SHAFT SNAP RING
2 - OIL FEED

MANUAL - NV1500 (Continued)

(18) Align and install front bearing retainer over input shaft and onto housing mounting surface (Fig. 90). Although retainer is one-way fit on housing, be sure bolt holes are aligned before seating retainer.

NOTE: Be sure that no sealer gets into the oil feed hole in the transmission case or bearing retainer.

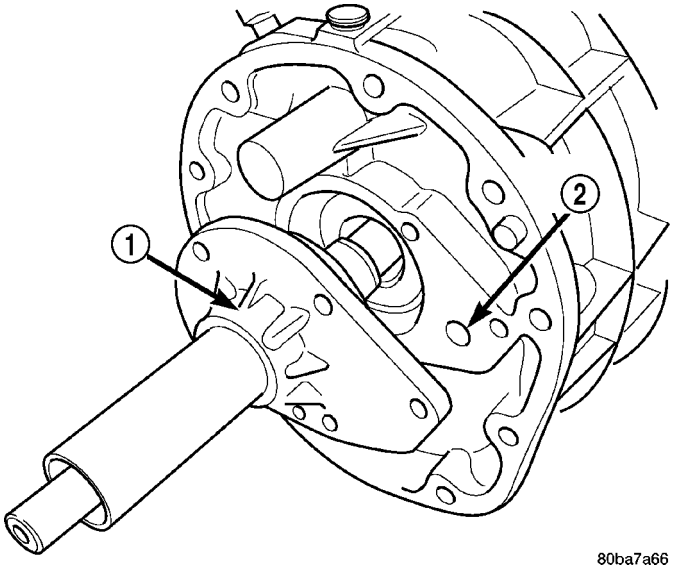


Fig. 90 INPUT SHAFT BEARING RETAINER

1 - BEARING RETAINER
2 - OIL FEED

(19) Install and tighten bearing retainer bolts to 29 N·m (21.4 ft. lbs.) (Fig. 91).

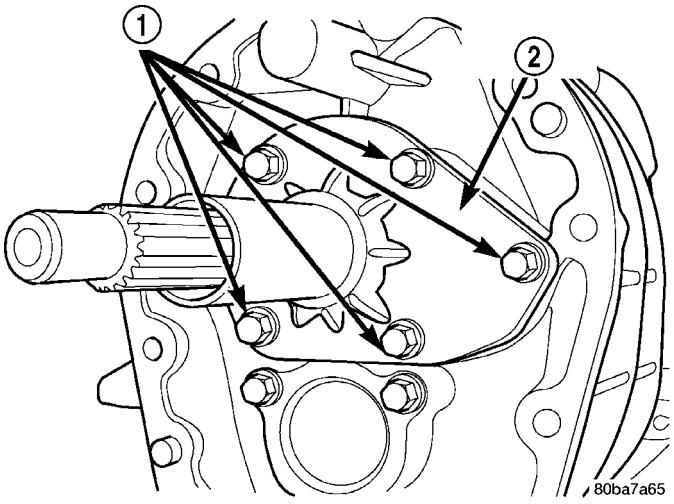


Fig. 91 INPUT SHAFT BEARING RETAINER BOLTS

1 - BOLTS (5)
2 - BEARING RETAINER

SHIFT TOWER AND LEVER

(1) Apply petroleum jelly to ball end of shift lever and interior of shift socket.

(2) Shift the transmission into third gear.

(3) Align and install shift tower and lever assembly (Fig. 92). Verify shift ball is seated in socket and offset in the tower is toward the passenger side of the vehicle before installing tower bolts.

(4) Install shift tower bolts (Fig. 93) and tighten bolts to 8.5 N·m (75.2 in. lbs.).

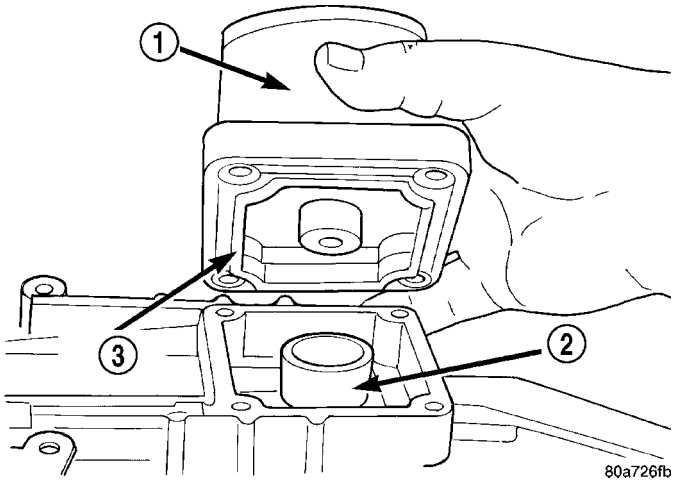


Fig. 92 SHIFT TOWER

1 - SHIFT TOWER AND LEVER ASSEMBLY
2 - SHIFT SOCKET
3 - SEAL

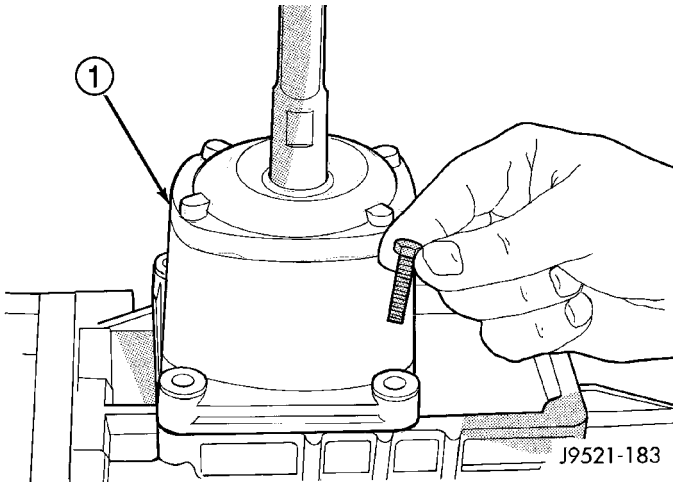


Fig. 93 SHIFT TOWER BOLT

1 - SHIFT TOWER AND LEVER ASSEMBLY

(5) Fill transmission to bottom edge of fill plug hole with Mopar® Transmission.

(6) Install and tighten fill plug to 34 N·m (25 ft. lbs.).

(7) Check transmission vent. Be sure vent is open and not restricted.

INSTALLATION

(1) Install clutch housing on transmission and tighten housing bolts to 46 N·m (34 ft. lbs.).

MANUAL - NV3550 (Continued)

(25) Seat thrust washer retaining ring with plastic mallet (Fig. 67).

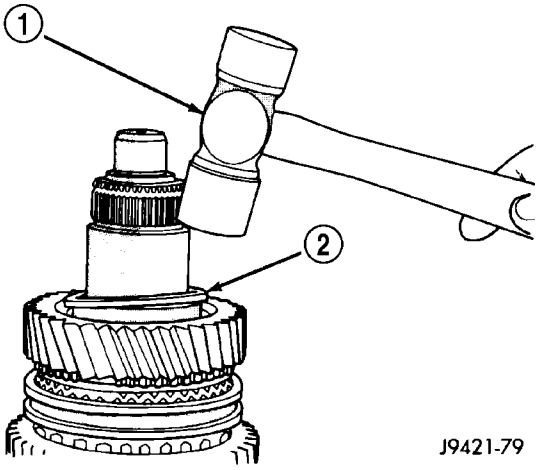


Fig. 67 THRUST RETAINER

1 - PLASTIC MALLET
2 - THRUST WASHER RETAINING RING

(26) Install third gear needle bearing on shaft (Fig. 68).

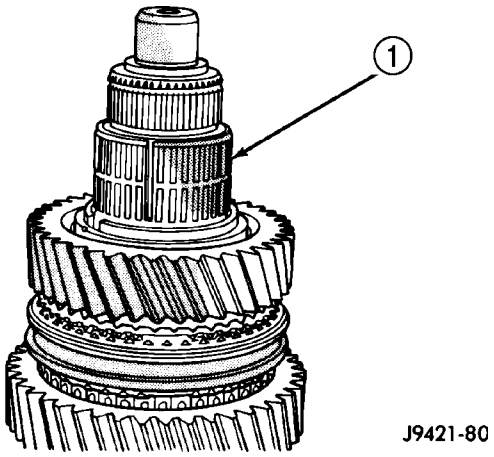


Fig. 68 THIRD GEAR BEARING

1 - THIRD GEAR BEARING

(27) Install third gear on shaft and bearing (Fig. 69).

(28) Install third speed synchro ring on third gear (Fig. 70).

(29) Assemble 3-4 synchro hub, sleeve, springs, struts and detent balls.

(30) Start 3-4 synchro hub on output shaft splines by hand (Fig. 71).

CAUTION: The 3-4 synchro hub and sleeve can be installed backwards. One side of the sleeve has grooves in it. This side of sleeve faces the front of the shaft.

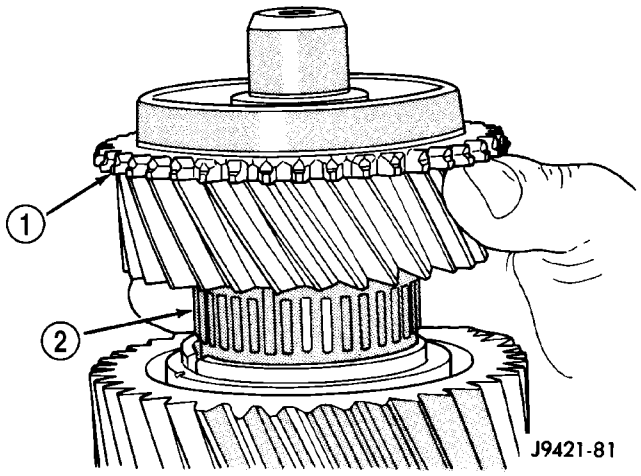


Fig. 69 THIRD GEAR

1 - THIRD GEAR
2 - BEARING

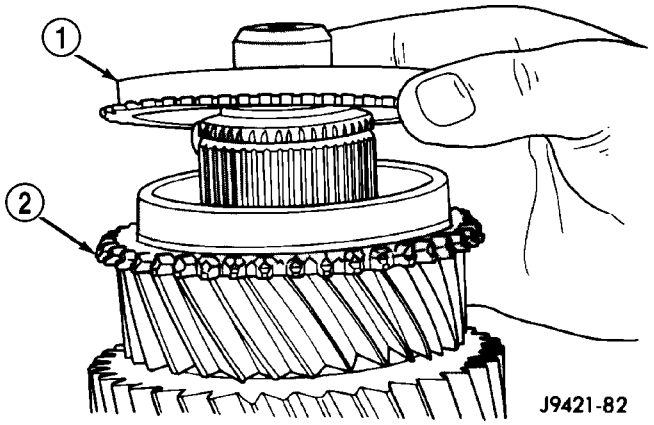


Fig. 70 THIRD SPEED SYNCHRO RING

1 - THIRD SPEED SYNCHRO RING
2 - THIRD GEAR

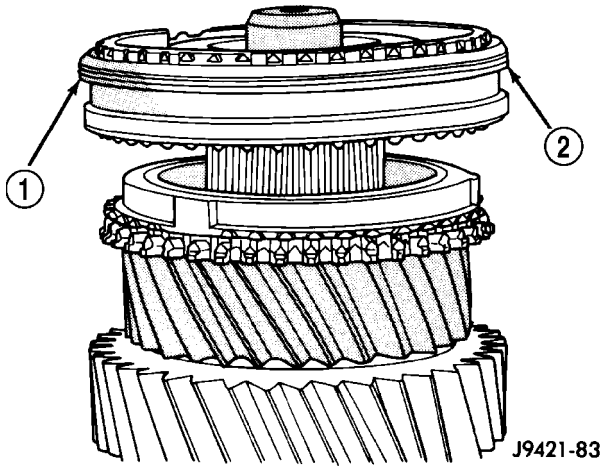


Fig. 71 3-4 SYNCHRO HUB ON OUTPUT SHAFT

1 - GROOVED SIDE OF SLEEVE (TO FRONT)
2 - 3-4 SYNCHRO ASSEMBLY

THIRD GEAR POWERFLOW

In third gear, two input clutches are applied to provide torque input: the underdrive clutch and overdrive clutch (Fig. 5). The underdrive clutch rotates the rear sun gear, while the overdrive clutch rotates the front carrier/rear annulus assembly. The result is two components (rear sun gear and rear annulus gear) rotating at the same speed and in the same direction. This effectively locks the entire planetary gearset together and is rotated as one unit. The gear ratio in third is 1:1.

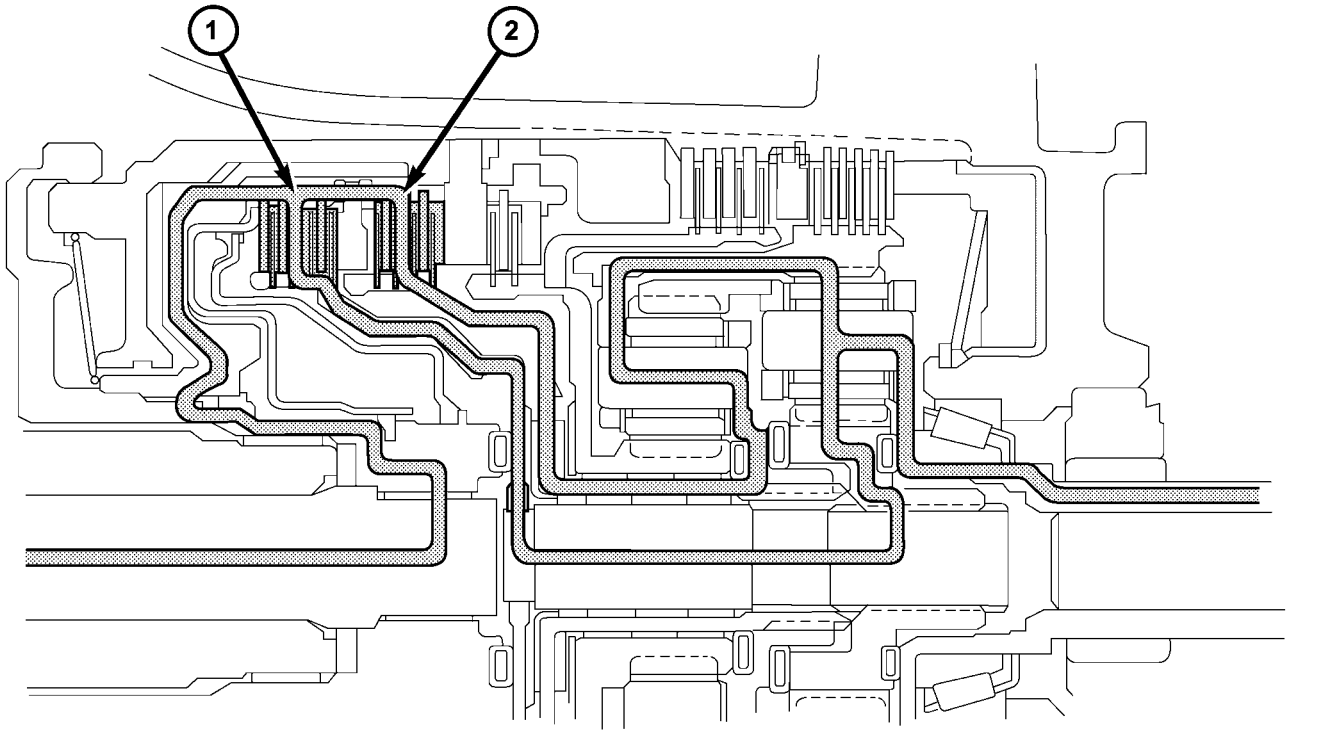


Fig. 5 Third Gear Powerflow

1 - UNDERDRIVE CLUTCH APPLIED (Turns Rear Sun)
2 - OVERDRIVE CLUTCH APPLIED (Turns Front Carrier/Rear Annulus)

AUTOMATIC TRANSMISSION - 42RLE (Continued)

(49) Remove the low/reverse piston belleville spring (Fig. 72).

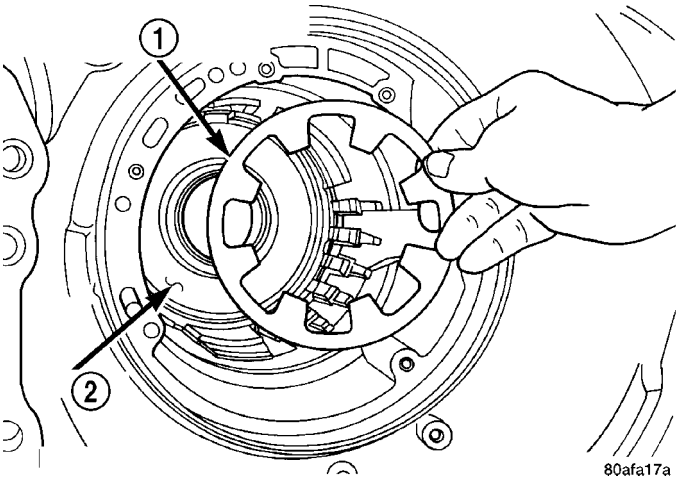


Fig. 72 Low/Reverse Piston Belleville Spring

1 - LOW/REVERSE PISTON RETURN SPRING
2 - PISTON

(50) Remove the park sprag pivot retaining screw.
(51) Drive out the anchor shaft using suitable punch (Fig. 73).

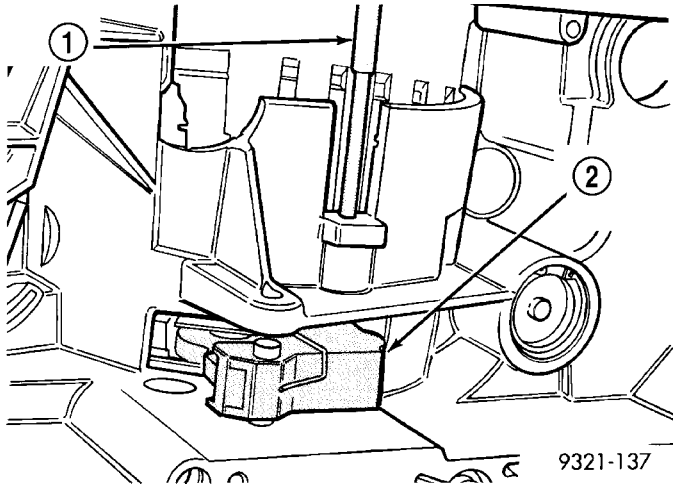


Fig. 73 Anchor Shaft Removal

1 - PIN PUNCH
2 - GUIDE BRACKET ASSEMBLY

(52) Remove the guide bracket pivot shaft (Fig. 74). Inspect all components (Fig. 75) for wear and replace if necessary.

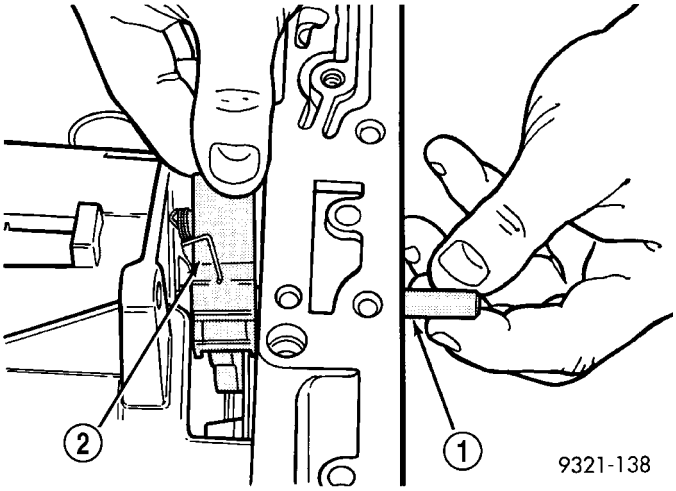


Fig. 74 Remove Guide Bracket Pivot Shaft

1 - PIVOT PIN
2 - GUIDE BRACKET ASSEMBLY

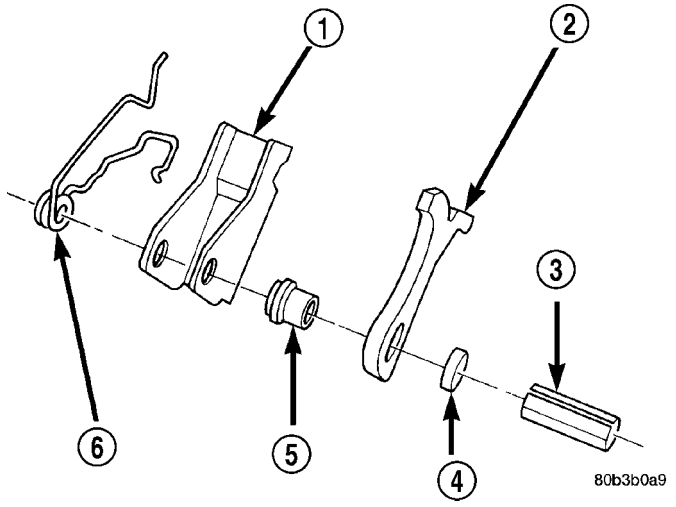
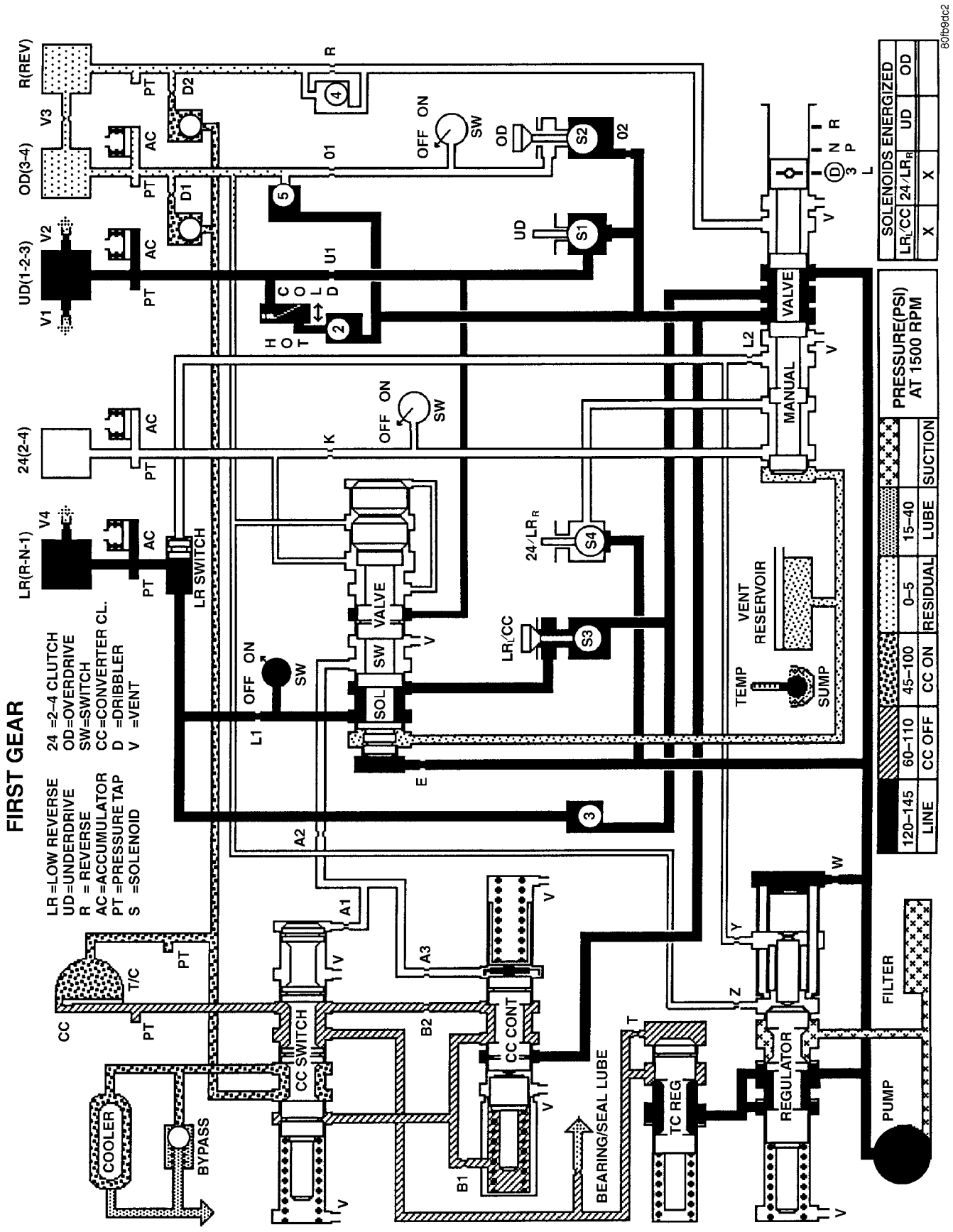


Fig. 75 Guide Bracket Disassembled

1 - GUIDE BRACKET
2 - PAWL
3 - SPLIT SLEEVE
4 - SPACER
5 - STEPPED SPACER
6 - ANTIRATCHET SPRING

AUTOMATIC TRANSMISSION - 42RLE (Continued)



First Gear

INPUT CLUTCH ASSEMBLY (Continued)

(6) Remove the OD/Reverse reaction plate snap ring (Fig. 161).

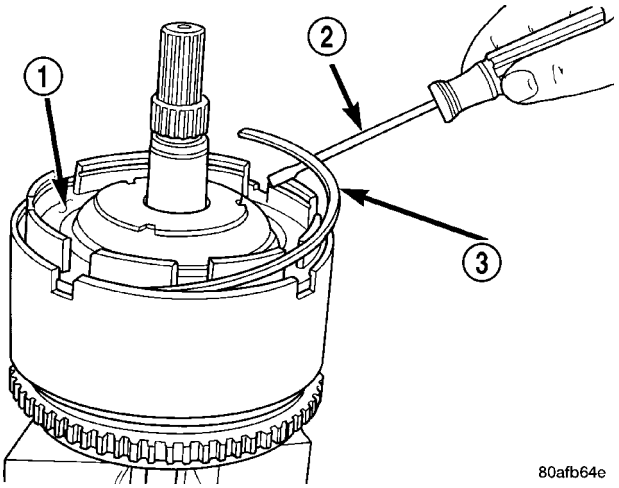


Fig. 161 OD/Reverse Pressure Plate Snap Ring

1 - OD/REVERSE PRESSURE PLATE
2 - SCREWDRIVER
3 - OD/REVERSE PRESSURE PLATE SNAP RING

(7) Remove OD/Reverse pressure plate (Fig. 162).

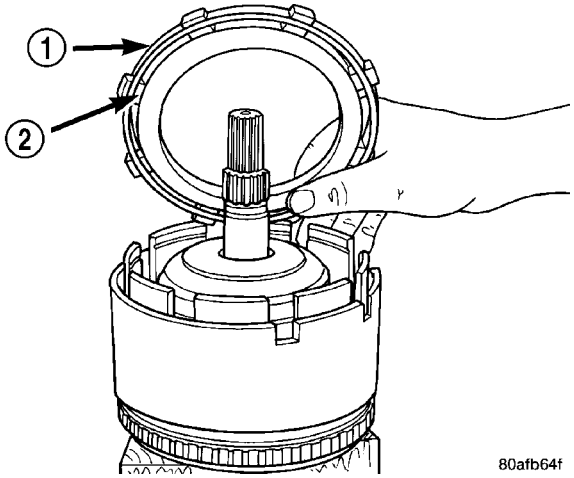


Fig. 162 OD/Reverse Reaction Plate

1 - OD/REVERSE PRESSURE PLATE (STEP SIDE DOWN)
2 - (STEP SIDE DOWN)

(8) Remove OD/Reverse reaction plate wave snap ring (Fig. 163).

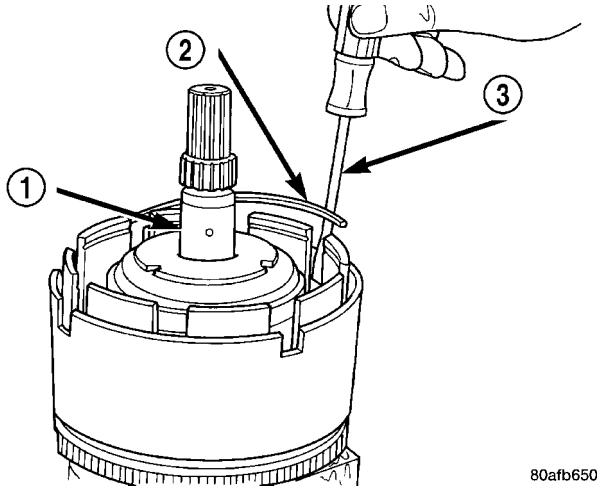


Fig. 163 Waved Snap Ring

1 - OVERDRIVE SHAFT ASSEMBLY
2 - OD/REVERSE CLUTCH WAVED SNAP RING
3 - SCREWDRIVER

(9) Remove OD shaft/hub and OD clutch pack (Fig. 164), (Fig. 165).

NOTE: Tag overdrive clutch pack for reassembly identification.

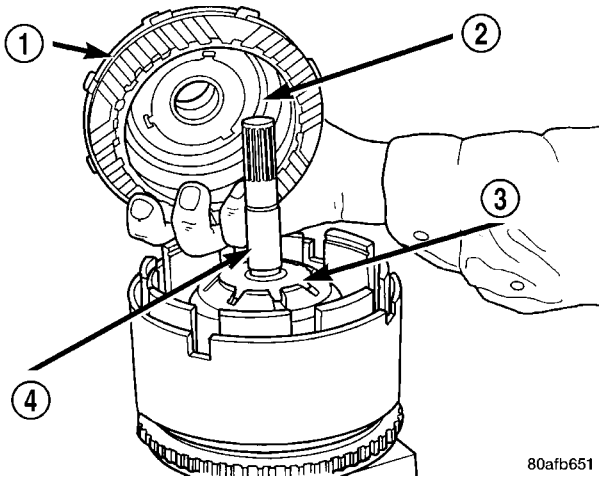


Fig. 164 Remove OD Clutch Pack

1 - OVERDRIVE SHAFT ASSEMBLY AND OD CLUTCH PACK
2 - #3 THRUST PLATE
3 - #3 THRUST WASHER
4 - UNDERDRIVE SHAFT ASSEMBLY

SOLENOID/PRESSURE SWITCH ASSY (Continued)

(1) Install Solenoid/Pressure Switch Assembly and screen to the separator and transfer plates.

(2) Install and tighten retaining screws to 5.5 N·m (50 in. lbs.) torque.

(3) Install valve body. (Refer to 21 - TRANSMISSION/AUTOMATIC - 42RLE/VALVE BODY - INSTALLATION)

TORQUE CONVERTER

DESCRIPTION

The torque converter (Fig. 239) is a hydraulic device that couples the engine crankshaft to the transmission. The torque converter consists of an outer shell with an internal turbine, a stator, an overrunning clutch, an impeller and an electronically applied converter clutch. The converter clutch provides reduced engine speed and greater fuel economy when engaged. Clutch engagement also provides reduced transmission fluid temperatures. The torque converter hub drives the transmission oil (fluid) pump.

The torque converter is a sealed, welded unit that is not repairable and is serviced as an assembly.

CAUTION: The torque converter must be replaced if a transmission failure resulted in large amounts of metal or fiber contamination in the fluid.

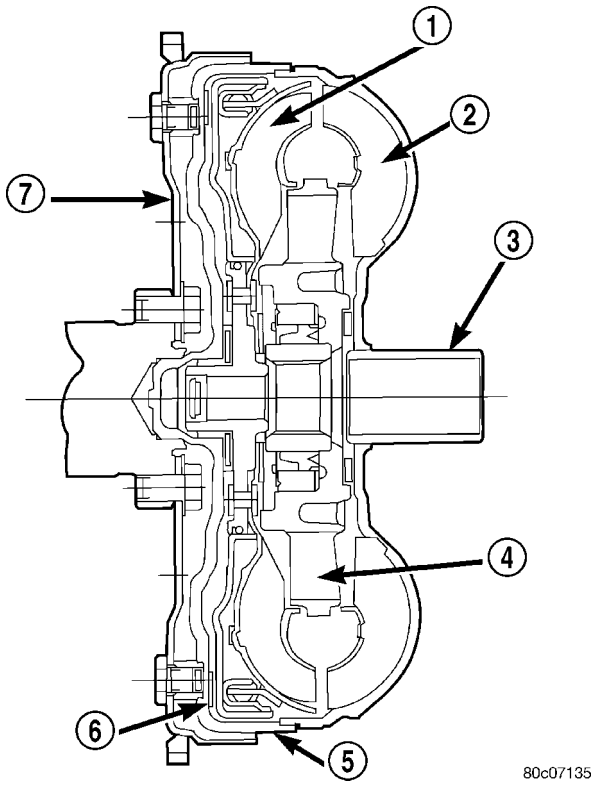


Fig. 239 Torque Converter Assembly

1 - TURBINE
2 - IMPELLER
3 - HUB
4 - STATOR
5 - FRONT COVER
6 - CONVERTER CLUTCH DISC
7 - DRIVE PLATE

TRANSFER CASE - NV231

TABLE OF CONTENTS

TRANSFER CASE - NV231

DESCRIPTION

The NV231 is a part-time transfer case with a low range reduction gear system. The NV231 has three operating ranges plus a NEUTRAL position. A low range system provides a reduction ratio for increased low speed torque capability.

The geartrain is mounted in two aluminum case halves attached with bolts. The mainshaft front and rear bearings are mounted in aluminum retainer housings bolted to the case halves.

OPERATING RANGES

Transfer case operating ranges are:

- 2WD (2-wheel drive)
- 4x4 (4-wheel drive)
- 4 Lo (4-wheel drive low range

The 2WD range is for use on any road surface at any time.

The 4x4 and 4 Lo ranges are for off road use only. They are not for use on hard surface roads. The only exception being when the road surface is wet or slippery or covered by ice and snow.

The low range reduction gear system is operative in 4 Lo range only. This range is for extra pulling power in off road situations. Low range reduction ratio is 2.72:1.

SHIFT MECHANISM

Operating ranges are selected with a floor mounted shift lever. The shift lever is connected to the transfer case range lever by an adjustable linkage rod. A straight line shift pattern is used. Range positions are marked on the shifter bezel cover plate.

IDENTIFICATION

A circular ID tag is attached to the rear case of each transfer case (Fig. 1). The ID tag provides the transfer case model number, assembly number, serial number, and low range ratio.

The transfer case serial number also represents the date of build.

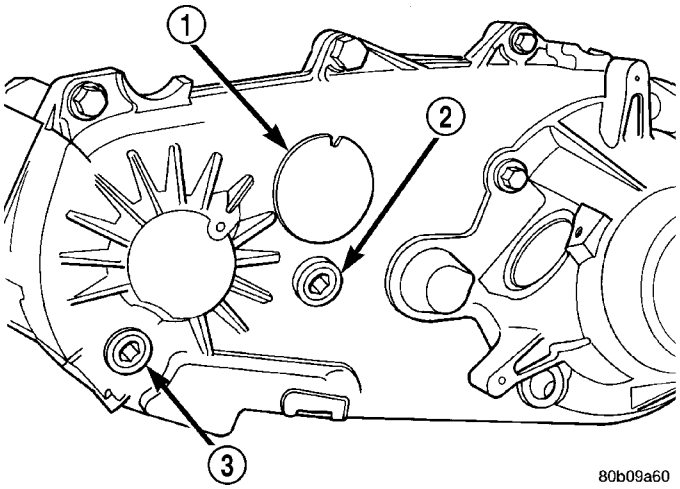


Fig. 1 Fill/Drain Plug And I.D. Tag Locations - Typical

1 - I.D. TAG
2 - FILL PLUG
3 - DRAIN PLUG

TRANSFER CASE - NV231 (Continued)

(b) Position the driver portion of Installer 8422 (Fig. 81) onto the damper, making sure the legs of the damper are positioned through the slots of the damper.

(c) Thread the puller screw of Installer 8422 into the output shaft by hand only. Make sure the screw is fully threaded into the output shaft.

(d) Using a wrench to hold the pulling screw stationary (Fig. 82), turn the pulling screw nut until the driver legs contact the rear face of the transfer case rear retainer. When the legs contact the retainer, the damper is properly positioned on the output shaft.

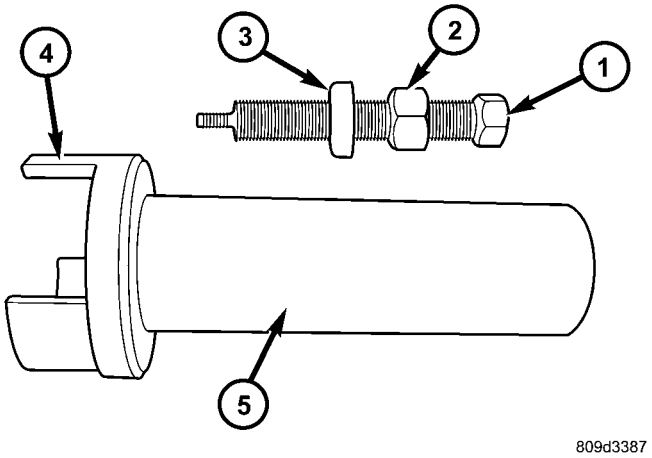


Fig. 81 Driver Installer 8422

1 - Pulling Screw
2 - Pulling Screw Nut
3 - Bearing
4 - Driver Legs
5 -Installer Driver

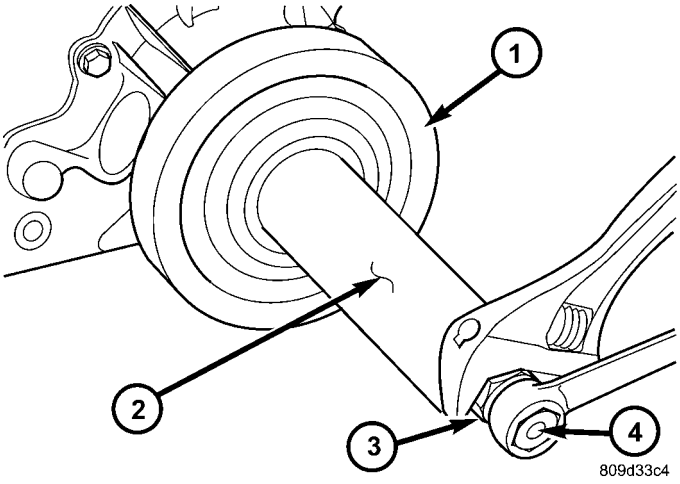


Fig. 82 Install Damper

1 - Damper
2 - Installer Driver
3 - Pulling Screw Nut
4 - Pulling Screw

(9) Install boot on output shaft slinger, or output shaft damper, and crimp retaining clamp with tool C-4975-A (Fig. 83).

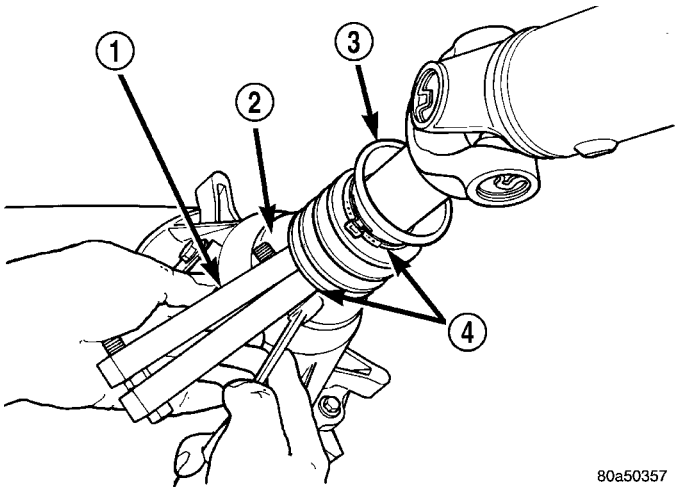


Fig. 83 Slinger Boot Installation - Typical

1 - SPECIAL TOOL C-4975–A
2 - SLINGER
3 - BOOT
4 - CLAMP

INSTALLATION

(1) Mount transfer case on a transmission jack.

(2) Secure transfer case to jack with chains.

(3) Position transfer case under vehicle.

(4) Align transfer case and transmission shafts and install transfer case on transmission.

(5) Install and tighten transfer case attaching nuts to 35 N·m (26 ft. lbs.) torque (Fig. 2).

(6) Connect vehicle speed sensor wires, and vent hose.

(7) Connect indicator switch harness to transfer case switch, if necessary. Secure wire harness to clips on transfer case.

(8) Align and connect propeller shafts. Refer to Differential and Driveline for proper procedures and specifications.

(9) Fill transfer case with correct fluid. Check transmission fluid level. Correct as necessary.

(10) Install rear crossmember, or skid plate. Tighten crossmember bolts to 41 N·m (30 ft. lbs.) torque.

(11) Remove transmission jack and support stand.

(12) Connect shift rod to transfer case range lever.

(13) Adjust transfer case shift linkage.

(14) Lower vehicle and verify transfer case shift operation.

TRANSFER CASE - NV241 (Continued)

(8) Remove the annulus gear (Fig. 41) from the front case half.

(9) Support the input retainer on Cup 8148 as shown (Fig. 42).

(10) While using suitable snap-ring pliers to spread the input gear bearing snap-ring (Fig. 43), press downward on the retainer to remove the bearing.

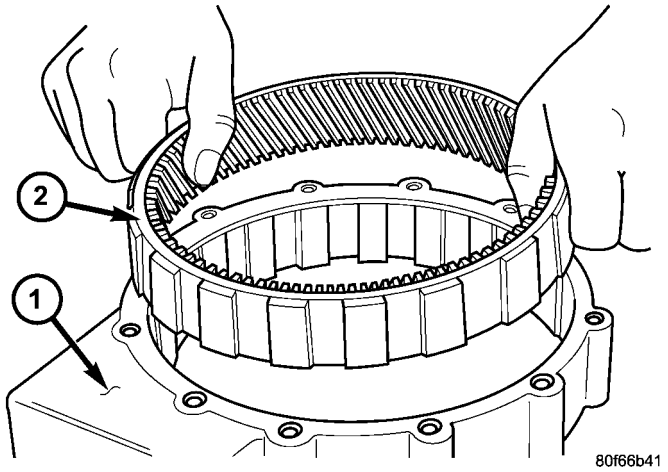


Fig. 41 Remove Annulus Gear

1 - FRONT CASE HALF
2 - ANNULUS GEAR

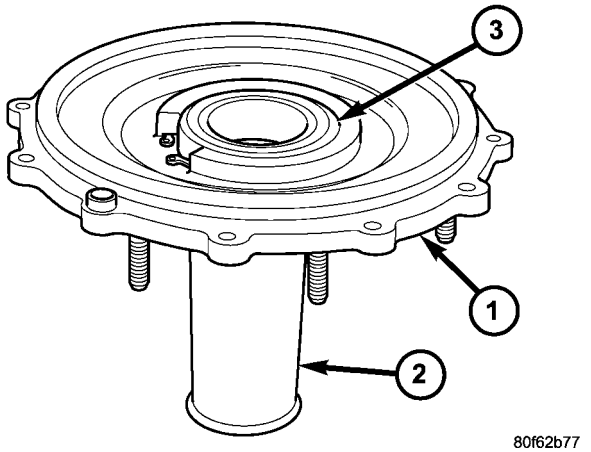


Fig. 42 Support Input Gear Bearing For Removal

1 - INPUT RETAINER
2 - CUP 8148
3 - INPUT GEAR BEARING

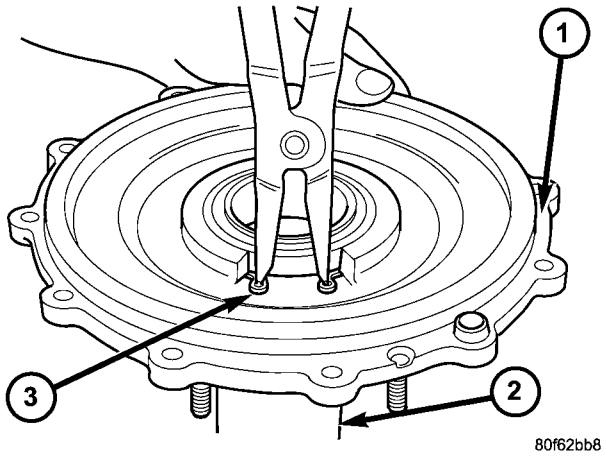


Fig. 43 Input Gear Bearing Removal

1 - INPUT RETAINER
2 - CUP 8148
3 - INPUT GEAR BEARING

(11) Remove the front output shaft bearing with Handle C-4171 and Installer 8239 (Fig. 44).

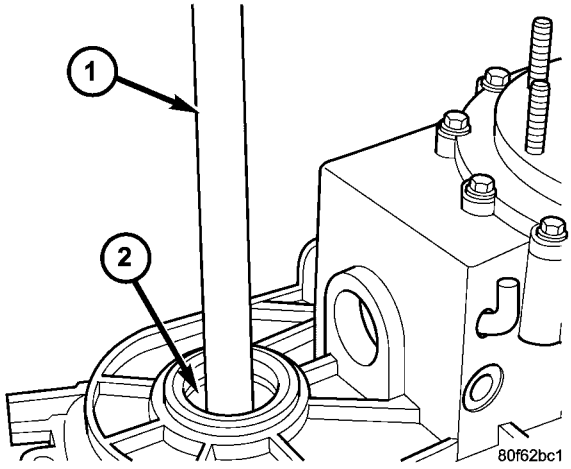


Fig. 44 Front Output Bearing Removal

1 - HANDLE C-4171
2 - INSTALLER 8239

TIRES/WHEELS (Continued)

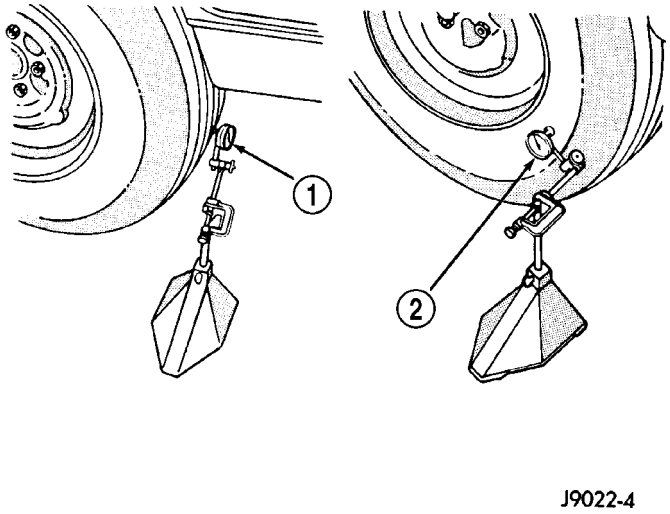


Fig. 1 Checking Tire/Wheel/Hub Runout

1 - RADIAL RUNOUT
2 - LATERAL RUNOUT

(1) Remove tire from wheel and mount wheel on service dynamic balance machine.

(2) Check wheel radial runout (Fig. 2) and lateral runout (Fig. 3).

- STEEL WHEELS: Radial runout 0.040 in., Lateral runout 0.045 in. (average-maximum)
- ALUMINUM WHEELS: Radial runout 0.030 in., Lateral runout 0.035 in. (average-maximum)

(3) If point of greatest wheel lateral runout is near original chalk mark, remount tire 180 degrees. Recheck runout or match mount, (Refer to 22 - TIRES/WHEELS - STANDARD PROCEDURE).

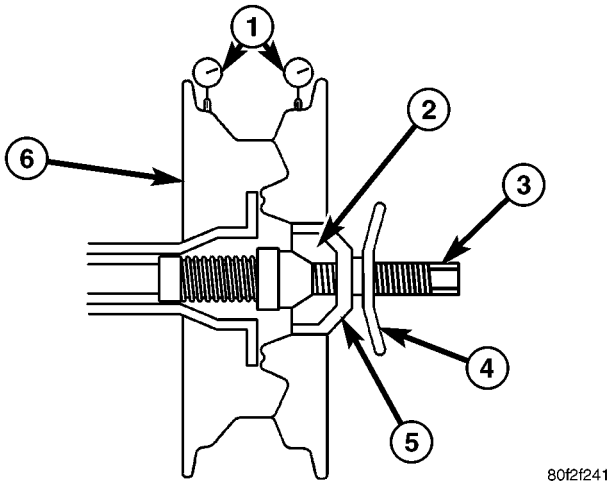


Fig. 2 RADIAL RUNOUT

1 - DIAL INDICATORS
2 - MOUNTING CONE
3 - SPINDLE SHAFT
4 - WING NUT
5 - PLASTIC CUP
6 - WHEEL

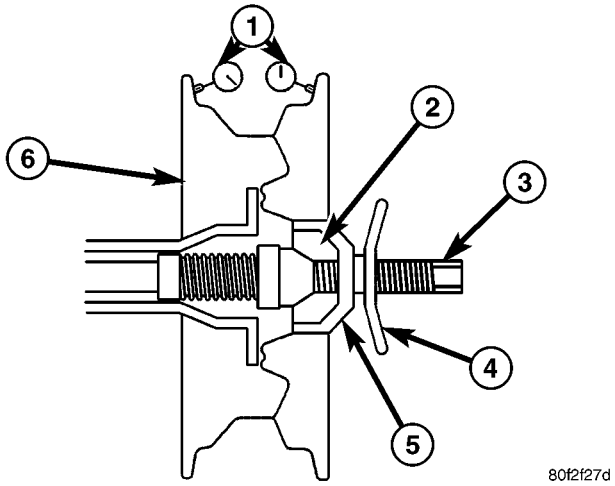


Fig. 3 LATERAL RUNOUT

1 - DIAL INDICATORS
2 - MOUNTING CONE
3 - SPINDLE SHAFT
4 - WING NUT
5 - PLASTIC CUP
6 - WHEEL

STANDARD PROCEDURE

STANDARD PROCEDURE - ROTATION

Tires on the front and rear operate at different loads and perform different steering, driving, and braking functions. For these reasons they wear at unequal rates and tend to develop irregular wear patterns. These effects can be reduced by rotating the tires at regular intervals. The benefits of tire rotation are:

- Increase tread life
- Maintain traction levels
- A smooth, quiet ride

The suggested method of tire rotation is (Fig. 4). Other rotation methods can be used, but they will not provide all the tire longevity benefits.

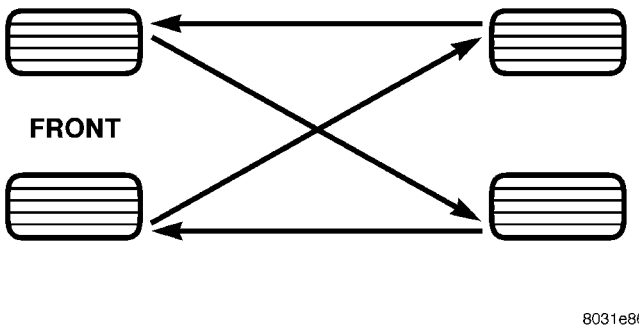


Fig. 4 Tire Rotation Pattern

TAILGATE

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TAILGATE OUTSIDE HANDLE

REMOVAL

(1) Remove the latch from the tailgate. (Refer to 23 - BODY/TAILGATE/LATCH - REMOVAL)

(2) Remove the screws attaching the outside handle to the tailgate (Fig. 1).

(3) Separate the outside handle and seal from the tailgate.

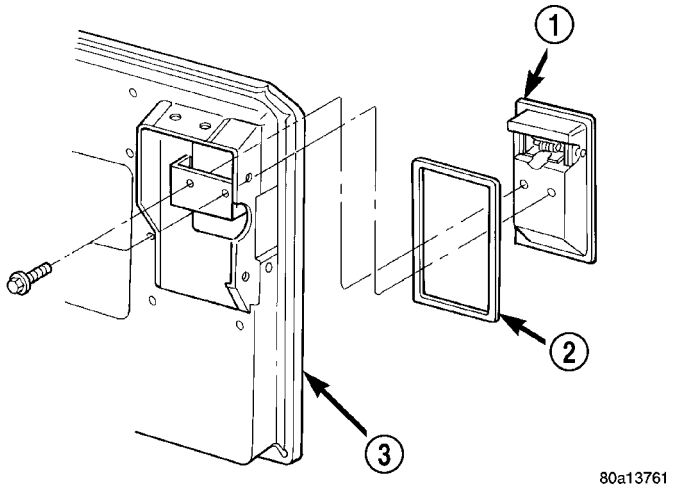

Fig. 1 TAILGATE OUTSIDE HANDLE

1 - OUTSIDE HANDLE
2 - SEAL
3 - TAILGATE

INSTALLATION

(1) Position the seal and outside release handle on the tailgate. and install screws.

(2) Install the screws attaching the outside handle to the tailgate.

(3) Install the latch. (Refer to 23 - BODY/TAILGATE/LATCH - INSTALLATION)

TAILGATE HINGE

REMOVAL

NOTE: Hinges may be serviced individually. If both are to be serviced, remove/install hinges one at a time.

(1) Using a grease pencil or equivalent, mark the position of the hinge on the body.

(2) Remove the screws attaching the hinge to the body and tailgate (Fig. 2).

(3) Separate the hinge from the tailgate.

INSTALLATION

NOTE: Hinges may be serviced individually. If both are to be serviced, remove/install hinges one at a time.

(1) Prepare and paint the replacement hinge to match the body paint color.

INSTRUMENT PANEL

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ACCESSORY SWITCH BEZEL

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the center bezel from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/ CENTER BEZEL - REMOVAL).

(3) Remove the four screws that secure the accessory switch bezel to the instrument panel (Fig. 1).

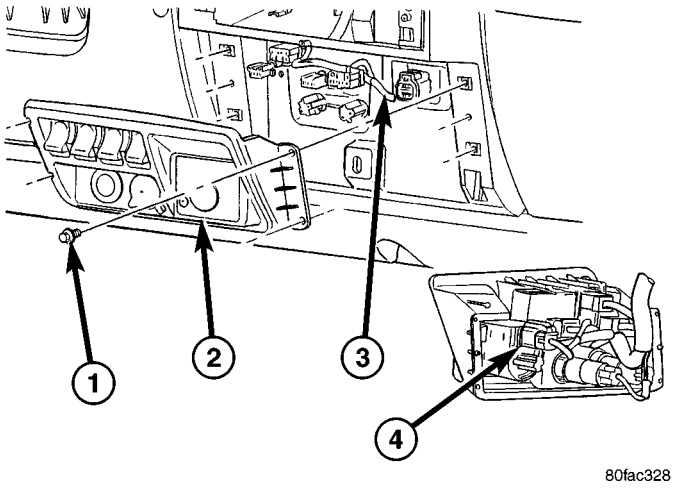


Fig. 1 ACCESSORY SWITCH BEZEL

1 - BEZEL SCREWS (4)
2 - BEZEL
3 - WIRE HARNESS
4 - ELECTRICAL CONNECTORS (7)

SPORT BAR - SPEAKER POD

REMOVAL

(1) On vehicles equipped with a soft top, unzip the side panel next to the pod.

(2) On vehicles equipped with a hard top, unclip the windshield clamps.

(3) Remove the bolts on side of the top next to the pod and loosen the opposite side bolts. (Refer to 23 - BODY/REMOVEABLE TOP/HARD TOP - REMOVAL)

(4) Lift up the side of the top to gain access to the pod bolts and support with a block of wood or similar.

(5) Remove the two bolts securing the pod to the sport bar.

(6) Separate the pod guide pin from the sport bar and disconnect the electrical connector.

INSTALLATION

(1) Connect the pod electrical connector and install the pod onto the guide pin.

(2) Install the bolts and tighten to 68 N·m (50 ft. lbs.).

(3) On vehicles equipped with a hard top, install the hard top. (Refer to 23 - BODY/REMOVABLE TOP/HARD TOP - INSTALLATION)

(4) On vehicles equipped with a soft top, zip up the side panel.

HALF DOOR WEATHERSTRIP (Continued)

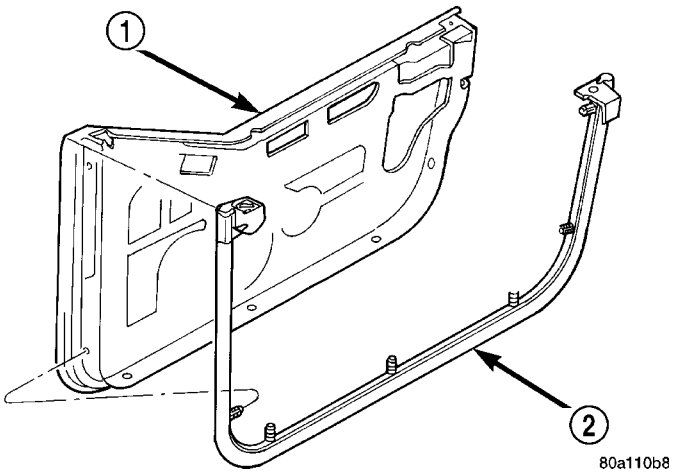


Fig. 4 HALF DOOR WEATHERSTRIP

1 - HALF DOOR
2 - WEATHERSTRIP

(3) Install trim panel. (Refer to 23 - BODY/HALF DOOR/TRIM PANEL - INSTALLATION)

TAILGATE WEATHERSTRIP AND CHANNEL

REMOVAL

(1) Open the tailgate.
(2) Remove the push-in fasteners attaching the weatherstrip to the top corners of the tailgate (Fig. 5).
(3) Peel the weatherstrip from the upper tailgate corners.
(4) Slide the weatherstrip out of the tailgate channel.
(5) If the weatherstrip channel requires replacement, peel the weatherstrip channel from the tailgate.

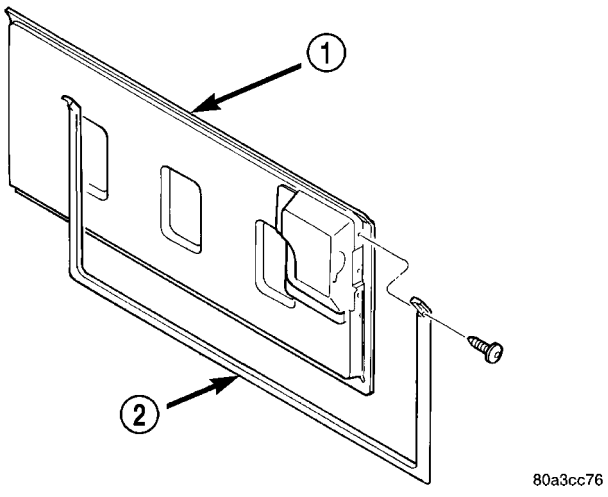


Fig. 5 TAILGATE WEATHERSTRIP

1 - TAILGATE
2 - WEATHERSTRIP

INSTALLATION

(1) If the weatherstrip channel is being replaced;
(a) Clean the channel contact surface on the tailgate with isopropyl alcohol, or equivalent.
(b) Peel the paper backing from the weatherstrip channel.
(c) Install the push pin fasteners attaching the weatherstrip to the tailgate.
(d) Position weatherstrip channel to the tailgate and press into place.
(e) Use hand pressure or a roller to wet out the tape adhesive holding the weatherstrip channel to the tailgate.
(2) Install the push pin fasteners attaching the weatherstrip to the tailgate.
(3) Slide the weatherstrip into the weatherstrip channel.

WINDSHIELD FRAME WEATHERSTRIP

REMOVAL

UPPER (Header)

(1) Disconnect the top from the windshield frame.
(2) Disengage the push-in fasteners attaching the weatherstrip to the windshield frame.
(3) Peel the weatherstrip from the frame.

LOWER

NOTE: The lower windshield frame weatherstrip can be removed with the frame tilted forward to the full horizontal position.

(1) Remove the wiper arms. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER ARMS - REMOVAL)
(2) Disconnect the top from the windshield frame.
(3) Remove the cowl grille. (Refer to 23 - BODY/EXTERIOR/COWL GRILLE AND SCREEN - REMOVAL)
(4) Remove the torx screws on each side of the windshield frame allowing the windshield frame to tilt to the full horizontal position.
(5) Disengage the outboard push-in fasteners at the top of cowl on each hinge pillar (Fig. 6).
(6) Remove the weatherstrip from the cowl.

INSTALLATION

UPPER (Header)

(1) Clean the seal contact surface on the windshield frame with isopropyl alcohol or equivalent.

SEALER LOCATIONS (Continued)

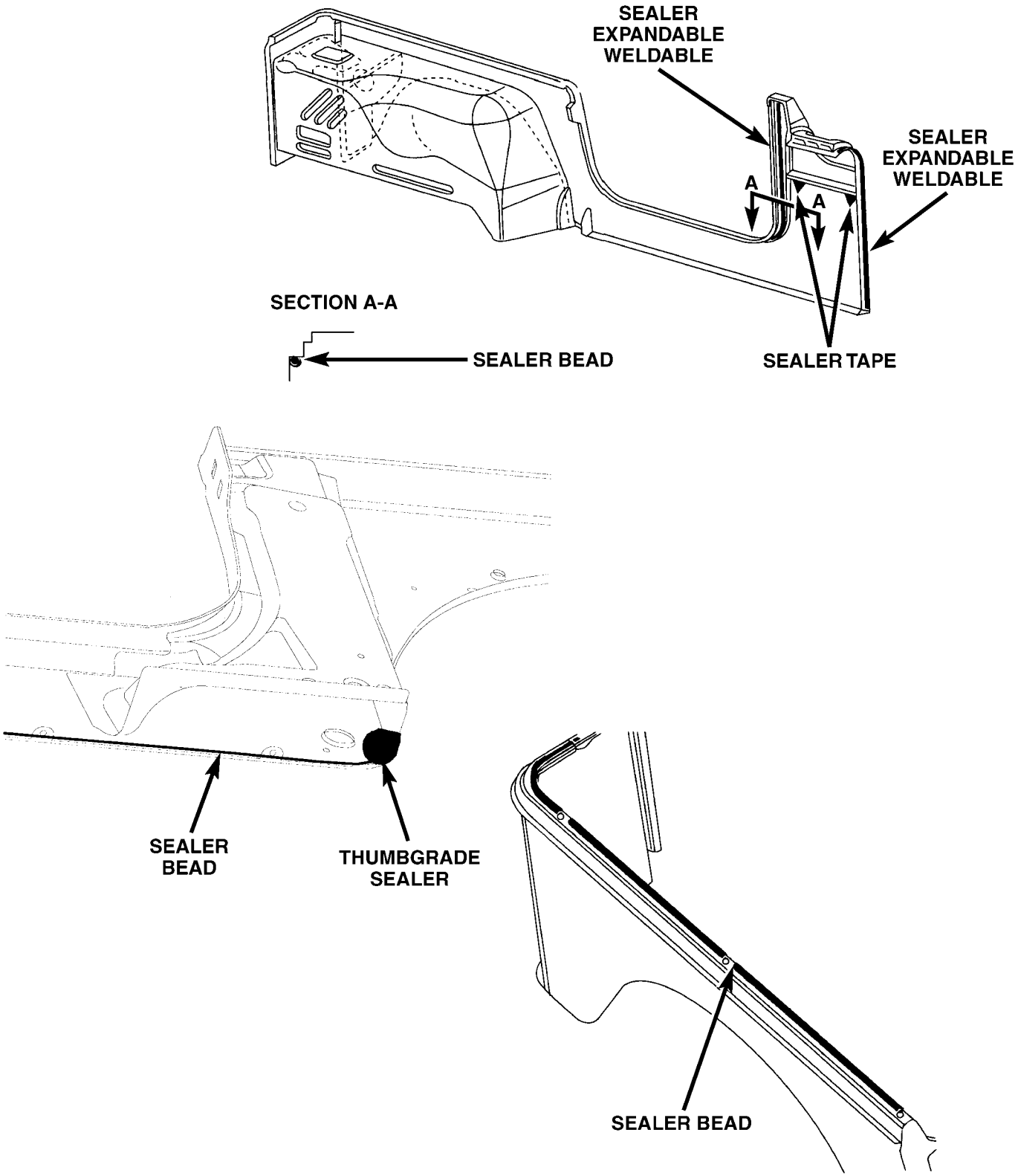


Fig. 24 BODY SIDE APERTURE

WELD LOCATIONS (Continued)

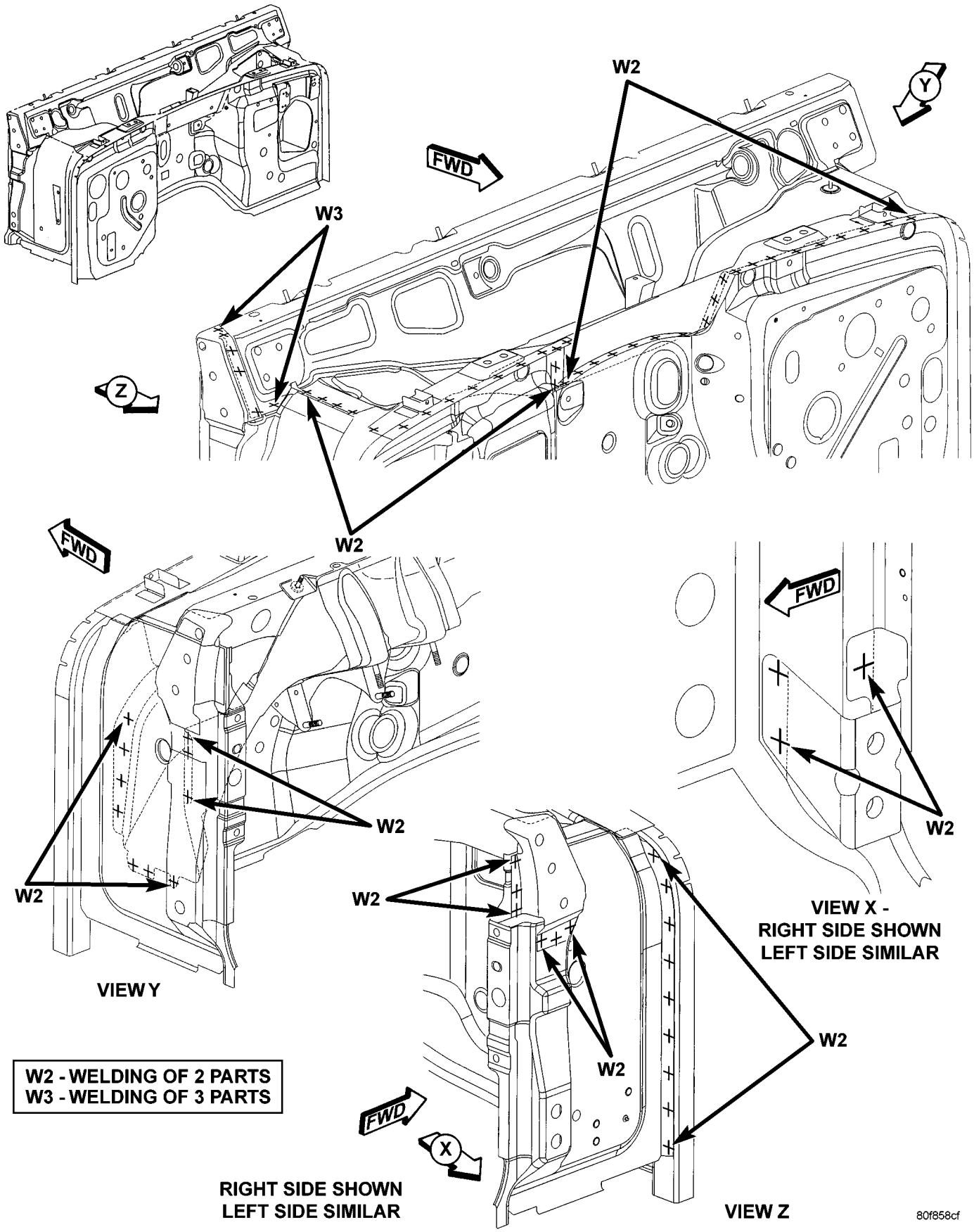


Fig. 49 DASH COWL ASSEMBLY - LEFT HAND DRIVE

WELD LOCATIONS (Continued)

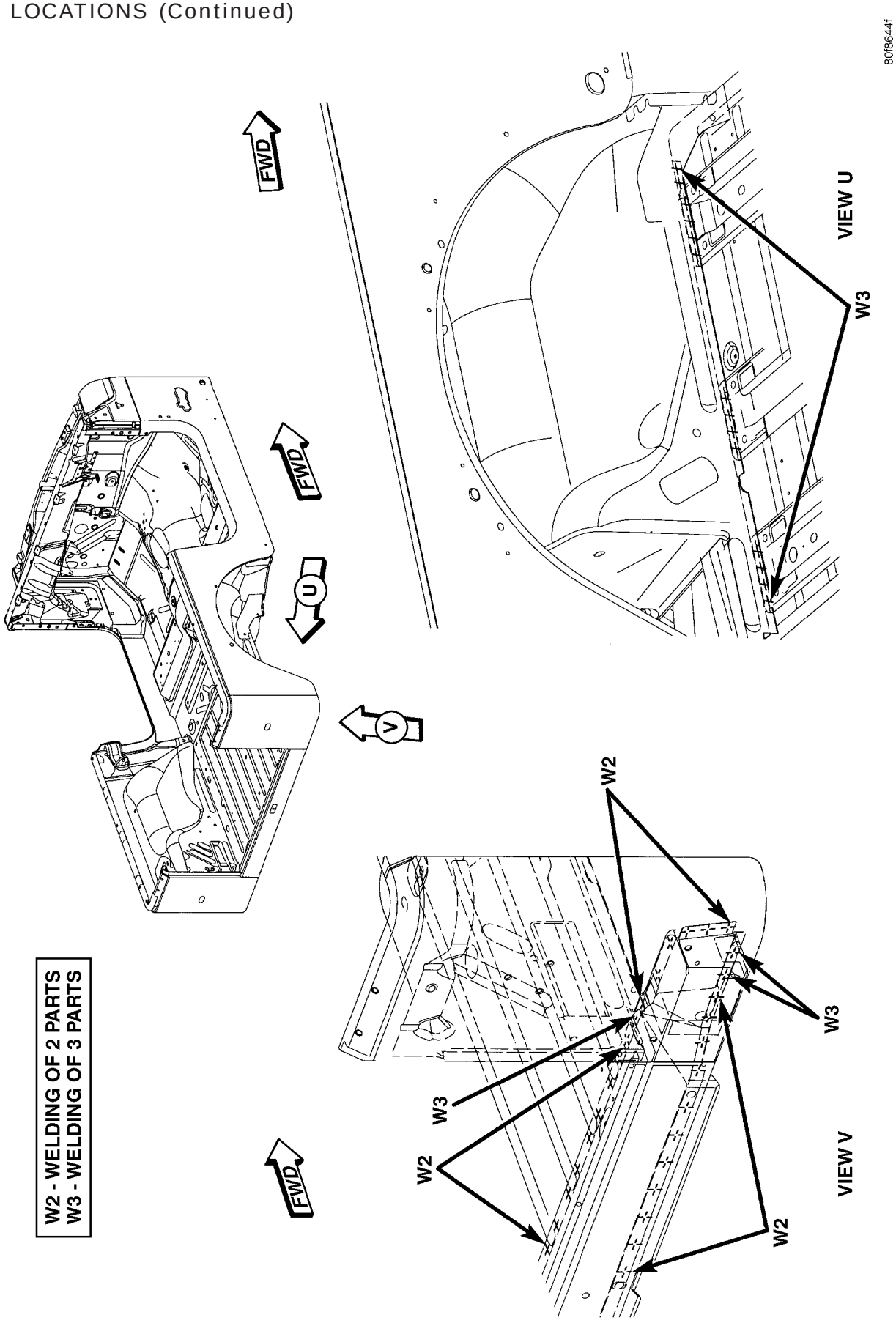


Fig. 73 BODY COMPLETE (3 OF 4)

HEATING & AIR CONDITIONING (Continued)

Description	N·m	Ft. Lbs.	In. Lbs.
Discharge Line to Compressor	25.4	20	–
Discharge Line to Condenser Nut	12	–	105
End Panel Duct Screws	2.2	–	20
Evaporator Tube Clamp Screw	2.2	–	20
Floor Distribution Duct Screws	2.2	–	20
HVAC Housing Screws	2.2	–	20
HVAC Housing Outboard Screw	3.4	–	30
HVAC Housing Stud Nuts	6.2	–	55
Liquid Line to Condenser Nut	12	–	105
Lower Condenser Bracket Screws	2.2	–	20
Main Panel Duct Screws	2.2	–	20
Refrigerant Line Support Bracket Bolt	28	21	–
Radiator Shroud Screws	8	–	72
Recirculation Housing Screws	2.2	–	20
Suction Lines to Accumulator Nut	2.2	–	20
Suction Line to Compressor	25.4	20	–
Upper Condenser Mounting Bracket Screws	2.2	–	20
Vacuum Reservoir Screw	2.2	–	20

VACUUM RESERVOIR

DESCRIPTION

The vacuum reservoir is mounted to the rear of the right front inner fender wheelhouse in the engine compartment, under the battery tray. The battery and battery tray must be removed from the vehicle to access the vacuum reservoir for service.

OPERATION

Engine vacuum is stored in the vacuum reservoir. The stored vacuum is used to operate the vacuum-controlled vehicle accessories during periods of low engine vacuum such as when the vehicle is climbing a steep grade, or under other high engine load operating conditions.

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

REMOVAL

(1) Remove the battery and battery tray from the engine compartment (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - REMOVAL) and (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/TRAY - REMOVAL).

(2) Unplug the accessory vacuum supply line from the vacuum reservoir (Fig. 27).

(3) Remove the one screw that secures the reservoir to the inner fender panel.

(4) Remove the vacuum reservoir from the engine compartment.

INSTALLATION

(1) Position the vacuum reservoir into the engine compartment.

(2) Install the screw that secures the reservoir to the inner fender panel. Tighten the screw to 2.2 N·m (20 in. lbs.).

(3) Connect the accessory vacuum supply line to the vacuum reservoir.

(4) Install the battery tray and battery (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/TRAY - INSTALLATION) and (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - INSTALLATION).

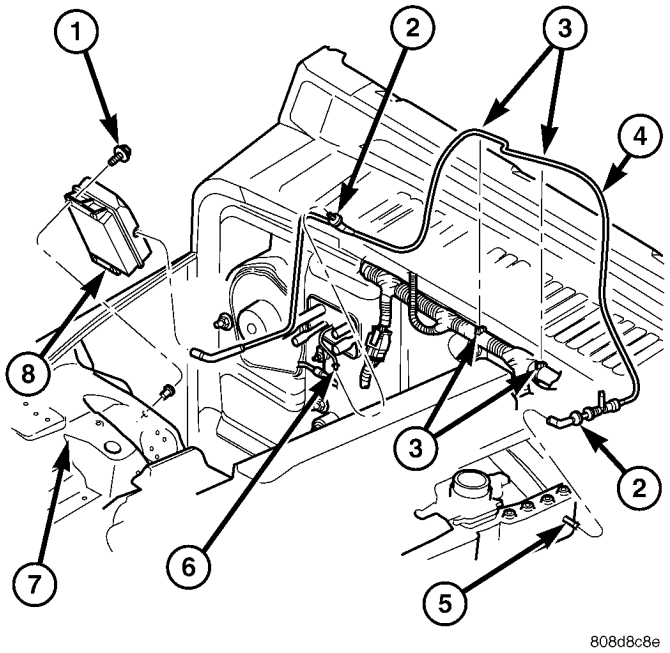


Fig. 27 Vacuum Reservoir - Typical

1 - SCREW
2 - VACUUM CHECK VALVE (2)
3 - VACUUM LINE RETAINER (2)
4 - ACCESSORY VACUUM SUPPLY LINE
5 - ENGINE VACUUM FITTING
6 - HVAC VACUUM SUPPLY LINE
7 - INNER FENDER
8 - VACUUM RESERVOIR

A/C COMPRESSOR (Continued)

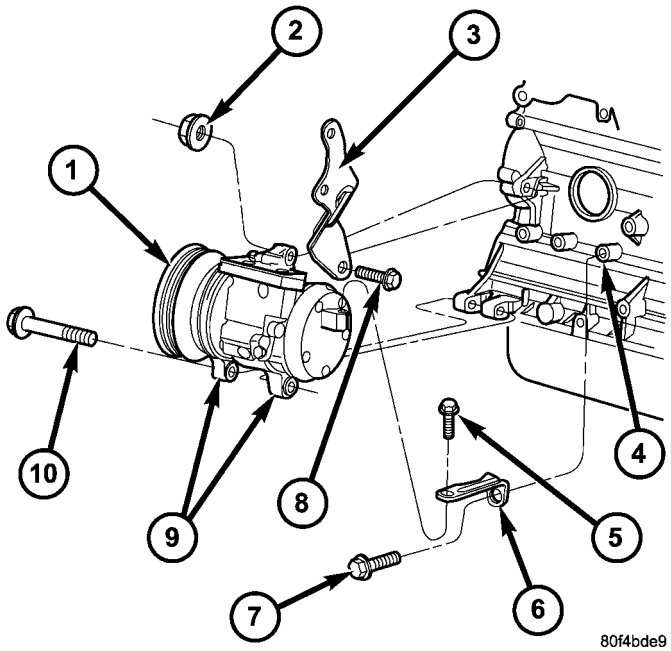


Fig. 6 A/C Compressor and Brackets - 4.0L Engine

1 - A/C COMPRESSOR
2 - A/C COMPRESSOR MOUNTING NUT
3 - A/C COMPRESSOR UPPER MOUNTING BRACKET
4 - ENGINE BLOCK LOWER MOUNTING POINT
5 - A/C COMPRESSOR LOWER BRACKET MOUNTING BOLT
6 - A/C COMPRESSOR LOWER MOUNTING BRACKET
7 - LOWER BRACKET TO ENGINE BLOCK BOLT
8 - A/C COMPRESSOR UPPER BRACKET MOUNTING BOLT
9 - A/C COMPRESSOR LOWER MOUNTING POINT
10 - A/C COMPRESSOR TO BLOCK BOLT

(4) Lubricate new rubber O-ring seals with clean refrigerant oil and install them on the discharge and liquid line fittings. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.

(5) Install the suction line and discharge line fittings onto the compressor.

(6) Install the bolts or nuts (depending on engine application) that secure the suction and discharge line fittings to the compressor. Tighten the bolts or nuts to 25.4 N·m (20 ft. lbs.).

(7) Connect the wire harness connector to the compressor clutch coil.

(8) Install the serpentine drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION) or (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION) 4.0L.

(9) Reconnect the battery negative cable.

(10) Evacuate the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).

(11) Charge the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).

A/C CONDENSER

DESCRIPTION

The A/C condenser is located in the air flow in front of the radiator. The A/C condenser is a heat exchanger that allows the high-pressure refrigerant gas being discharged by the A/C compressor to give up its heat to the air passing over the condenser fins.

OPERATION

When the refrigerant gas gives up its heat, it condenses. When the refrigerant leaves the condenser, it has become a high-pressure liquid refrigerant. The volume of air flowing over the condenser fins is critical to the proper cooling performance of the air conditioning system. Therefore, it is important that there are no objects placed in front of the radiator grille openings in the front of the vehicle or foreign material on the condenser fins that might obstruct proper air flow. Also, any factory-installed air seals or shrouds must be properly reinstalled following radiator or condenser service.

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

REMOVAL

WARNING: Review the warnings and cautions in the front of this section before performing the following operation (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION).

CAUTION: Before removing the A/C condenser, note the location of each of the radiator/condenser air seals. These air seals are used to direct air through the A/C condenser and radiator. The air seals must be reinstalled in their proper locations in order for the A/C and engine cooling systems to perform as designed.

(1) Disconnect and isolate the negative battery cable.

(2) Recover the refrigerant from the refrigerant system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM RECOVERY).

(3) Partially drain the engine cooling system(Refer to 7 - COOLING - STANDARD PROCEDURE - COOLING SYSTEM DRAINING).

(4) Remove the cooling recovery container (Refer to 7 - COOLING/ENGINE/COOLANT RECOVERY CONTAINER - REMOVAL.

PCV VALVE

DESCRIPTION

2.4L

The 2.4L 4-cylinder engine is equipped with a closed crankcase ventilation system and a Positive Crankcase Ventilation (PCV) valve.

This system consists of:

- a PCV valve attached to the left/front side of the valve cover (Fig. 2). It is secured with 1 bolt. An o-ring is used to seal valve to valve cover (Fig. 3). Another type of threaded PCV valve may be used (Fig. 4).
- the air cleaner housing
- tubes and hoses to connect the system components.

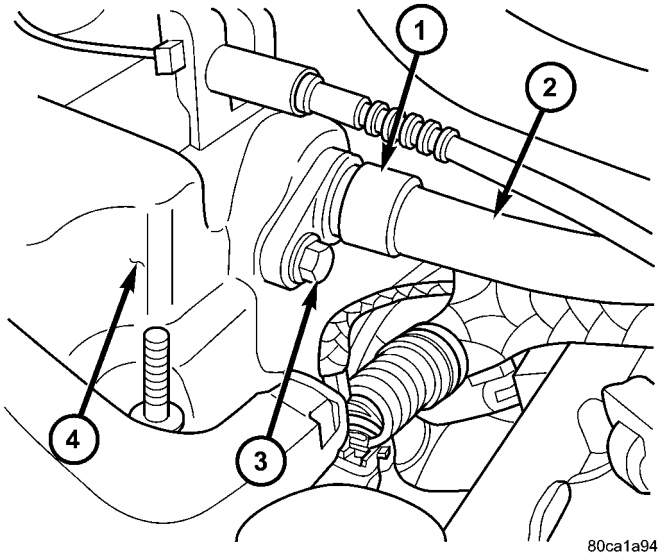


Fig. 2 PCV VALVE LOCATION - 2.4L

1 - PCV VALVE
2 - HOSE
3 - MOUNTING BOLT
4 - VALVE COVER (LEFT SIDE)

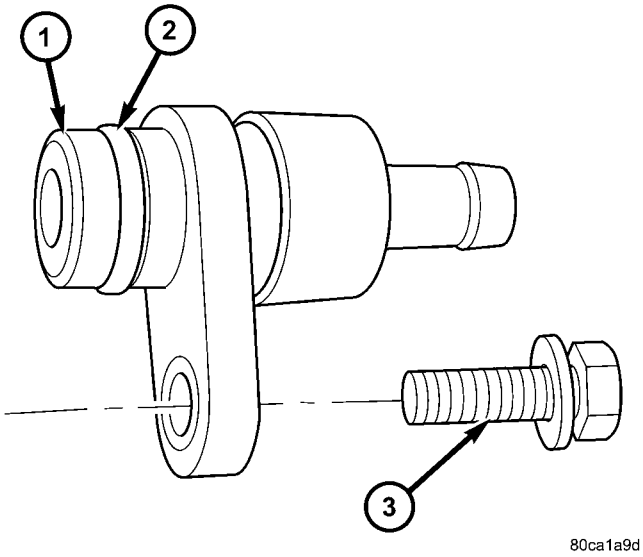


Fig. 3 PCV VALVE AND O-RING - 2.4L

1 - PCV VALVE
2 - O-RING
3 - MOUNTING BOLT

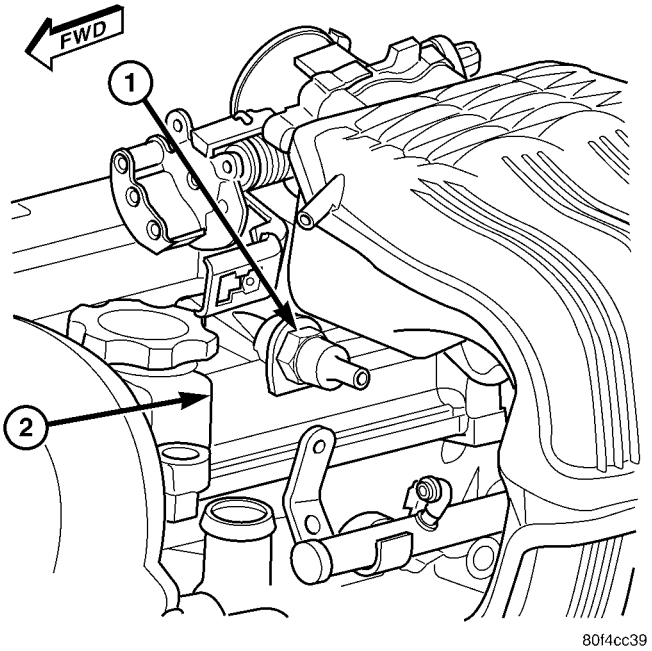
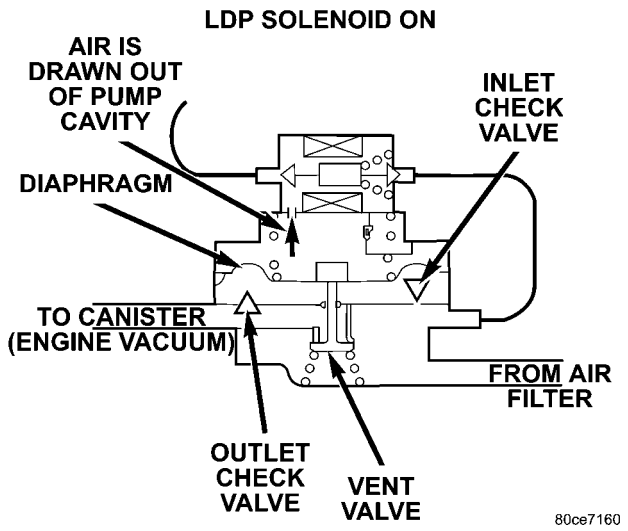


Fig. 4 PCV VALVE - 2.4L - THREADED

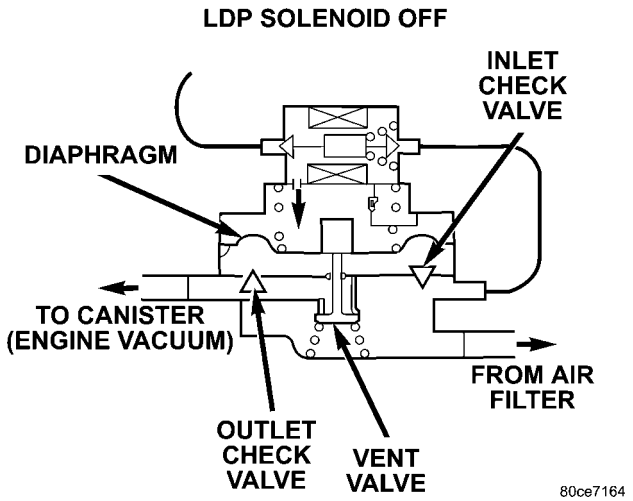
1 - PCV VALVE (THREADED)
2 - VALVE COVER (LEFT SIDE)

phragm, unseating the inlet check valve and allowing air in from the EVAP air filter. When the diaphragm completes its upward movement, the LDP reed switch turns from closed to open (Figure 4).



DIAPHRAGM DOWNWARD MOVEMENT

Based on reed switch input, the PCM de-energizes the LDP solenoid, causing it to block the vacuum port, and open the atmospheric port. This connects the upper pump cavity to atmosphere through the EVAP air filter. The spring is now able to push the diaphragm down. The downward movement of the diaphragm closes the inlet check valve and opens the outlet check valve pumping air into the evaporative system. The LDP reed switch turns from open to closed, allowing the PCM to monitor LDP pumping (diaphragm up/down) activity (Figure 5. During the pumping mode, the diaphragm will not move down far enough to open the vent valve.



The pumping cycle is repeated as the solenoid is turned on and off. When the evaporative system begins to pressurize, the pressure on the bottom of the diaphragm will begin to oppose the spring pressure, slowing the pumping action. The PCM watches the time from when the solenoid is de-energized, until the diaphragm drops down far enough for the reed switch to change from opened to closed. If the reed switch changes too quickly, a leak may be indicated. The longer it takes the reed switch to change state, the tighter the evaporative system is sealed. If the system pressurizes too quickly, a restriction somwehere in the EVAP system may be indicated.

PUMPING ACTION

During portions of this test, the PCM uses the reed switch to monitor diaphragm movement. The solenoid is only turned on by the PCM after the reed switch changes from open to closed, indicating that the diaphragm has moved down. At other times during the test, the PCM will rapidly cycle the LDP solenoid on and off to quickly pressurize the system. During rapid cycling, the diaphragm will not move enough to change the reed switch state. In the state of rapid cycling, the PCM will use a fixed time interval to cycle the solenoid.

If the system does not pass the EVAP Leak Detection Test, the following DTCs may be set:

- P0442 – EVAP LEAK MONITOR 0.040″ LEAK DETECTED
- P0455 – EVAP LEAK MONITOR LARGE LEAK DETECTED
- P0456 – EVAP LEAK MONITOR 0.020″ LEAK DETECTED
- P1486 – EVAP LEAK MON PINCHED HOSE FOUND
- P1494 – LEAK DETECTION PUMP SW OR MECH FAULT
- P1495 – LEAK DETECTION PUMP SOLENOID CIRCUIT

ENABLING CONDITIONS TO RUN EVAP LEAK DETECTION TEST

1. Cold start: with ambient temperature (obtained from modeling the inlet air temperature sensor on passenger vehicles and the battery temperature sensor on Jeep & truck vehicles) between 4°C (40°F) and 32°C (90°F) for 0.040 leak. Between 4°C (40°F) and 29°C (85°F) for 0.020 leak.
2. Engine coolant temperature within: -12° to -8°C (10° to 18°F) of battery/ambient.
3. Battery voltage between 10 and 15 volts.

P0031-O2 SENSOR 1/1 HEATER CIRCUIT LOW — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance of the O2 Heater Control circuit (PWM) from the O2 Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the open in the O2 Heater Control (PWM) circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	Measure the resistance between ground and the O2 Heater Control (PWM) circuit at the Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the Heater Control (PWM) circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	All
6	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0122-THROTTLE POSITION SENSOR VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance between ground and the (K22) TP Sensor No.1 Signal circuit in the TP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K22) TP Sensor No.1 Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	Measure the resistance between the (K22) TP Sensor No.1 Signal circuit and the (K4) Sensor ground circuit in the TP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short between the (K4) Sensor ground and the (K22) TP Sensor No.1 Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	All
6	**NOTE: If the vehicle is not equipped with a TCM, answer No to this test and continue.** Connect the PCM harness connectors. Disconnect the TCM harness connector. Ignition on, engine not running. With the DRBIII®, monitor the Throttle Position Sensor voltage. Is the voltage above 4.5 volts? Yes → Replace the TCM in accordance with the Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 9	All
7	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance of the (K7) 5-volt Supply circuit from the TP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 8 No → Repair the open in the (K7) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
8	Measure the resistance between ground and the (K7) 5-volt Supply circuit in the TP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K7) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 9	All

P0171-1/1 FUEL SYSTEM LEAN — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. **WARNING: The fuel system is under a constant pressure (even with the engine off). Before testing or servicing any fuel system hose, fitting or line, the fuel system pressure must be released.** Remove the Fuel Pump Module and inspect the Fuel Inlet Strainer. Is the Fuel Inlet Strainer plugged? Yes → Replace the Fuel Pump Inlet Strainer. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	If there are no possible causes remaining, view repair. Repair Replace the Fuel Pump Module. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
6	Turn the ignition off. **NOTE: Wait a minimum of 10 minutes to allow the O2 Sensor and Exhaust System to cool down before continuing the test.** Ignition on, engine not running. With the DRBIII®, monitor all of the O2 Sensor voltage readings. Is the voltage above 4.5 volts for all of the O2 Sensors? Yes → Go To 7 No → Go To 13	All
7	Turn the ignition off. **NOTE: Wait a minimum of 10 minutes to allow the O2 Sensor to cool down before continuing the test.** Ignition on, engine not running. With the DRBIII®, actuate the O2 Heater Test. With the DRBIII®, monitor all O2 Sensor voltage readings for at least 2 minutes. Does the voltage stay above 4.5 volts for any of the O2 Sensors? Yes → Replace the O2 Sensor that had the voltage reading above 4.5 volts. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 8	All
8	Ignition on, engine not running. With the DRBIII®, read TP Sensor voltage. **NOTE: The throttle must be against the stop.** Is the voltage 0.92 of a volt or less with the Throttle closed? Yes → Go To 9 No → Check for a binding throttle condition. If OK, replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
9	With the DRBIII®, read the TP Sensor voltage. While monitoring the DRBIII®, slowly open and close the throttle. Does the voltage increase and decrease smoothly? Yes → Go To 10 No → Replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0340-NO CAM REFERENCE SIGNAL AT PCM — Continued

TEST	ACTION	APPLICABILITY
9	Measure the resistance between the (K44) CMP Sensor Signal circuit and the (K7) 5-volt Supply circuit in the CMP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short between the (K7) 5-volt Supply circuit and the (K44) CMP Sensor Signal circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 13	All
10	Turn the ignition off. Disconnect the PCM harness connectors. Ignition on, engine not running. Measure the voltage on the (K7) 5-volt Supply circuit at the CMP Sensor harness connector. Is the voltage above 5.2 volts? Yes → Repair the short to voltage in the (K7) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 11	All
11	Turn the ignition off. Measure the resistance of the (K7) 5-volt Supply circuit from the CMP Sensor harness connector to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 12 No → Repair the open in the (K7) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
12	Measure the resistance between ground and the (K7) 5-volt Supply circuit at the CMP Sensor harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K7) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 13	All
13	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P0505-IDLE AIR CONTROL MOTOR CIRCUITS — Continued

TEST	ACTION	APPLICABILITY
3	Measure the resistance between the IAC #2 Control circuit and #3, #4 Control circuits. Is the resistance below 5.0 ohms on any of the circuits? Yes → Repair the short between the appropriate IAC Control circuits. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 4	All
4	Measure the resistance between the IAC #3 Control circuit and the #4 Control circuit. Is the resistance below 5.0 ohms? Yes → Repair the short between the IAC Control circuits. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 5	All
5	Ignition on, engine not running. Measure the voltage on each of the IAC Control circuits. Is the voltage above 1.0 volt at any IAC Control circuit? Yes → Repair the short to voltage in the appropriate IAC Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 6	All
6	Turn the ignition off. Repeat each measurement for each IAC Control circuit. Measure the resistance between ground and each IAC Control circuit. Is the resistance below 100 ohms at any IAC Control circuit? Yes → Repair the short to ground in the appropriate IAC Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Go To 7	All
7	Connect the PCM harness connectors. Start and idle the engine. Using a test light connected to ground, probe the IAC #1 Control circuit for 10 seconds. Repeat the above test for the remaining IAC Motor Driver circuits. Does the test light turn on and off while probing each IAC Motor Driver circuit? Yes → Replace the Idle Air Control Motor. Perform POWERTRAIN VERIFICATION TEST VER - 5. No → Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

P1388-AUTO SHUTDOWN RELAY CONTROL CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance of the (K51) ASD Relay Control circuit from the ASD Relay cavity in the PDC to the PCM harness connector. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the open in the (K51) ASD Relay Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All
5	Measure the resistance between ground and the (K51) ASD Relay Control circuit at the PDC. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K51) ASD Relay Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 2. No → Go To 6	All
6	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 2.	All

P1495-LEAK DETECTION PUMP SOLENOID CIRCUIT — Continued

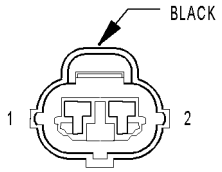
TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Connect a 12-volt test light to a good 12-volt source. Ignition on, engine not running. With the DRBIII®, actuate the LDP Solenoid. Probe the (K106) LDP Solenoid Control circuit with the test light while the Pump is actuating. Does the test light blink? Yes → Go To 4 No → Go To 5	All
4	If there are no possible causes remaining, view repair. Repair Replace the Leak Detection Pump. Perform POWERTRAIN VERIFICATION TEST VER - 6.	All
5	Turn the ignition off. Disconnect the PCM harness connectors. Measure the resistance of the (K106) LDP Solenoid Control circuit from the PCM harness connector to the LDP harness connector. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the open in the (K106) Leak Detection Pump Solenoid Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 6.	All
6	Measure the resistance between ground and the (K106) LDP Solenoid Control circuit at the Solenoid harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K106) LDP Solenoid Control circuit. Perform POWERTRAIN VERIFICATION TEST VER - 6. No → Go To 7	All
7	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 6.	All

P1899-P/N SWITCH PERFORMANCE — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Connect the TRS (P/N) harness connector. Move the gear selector through all gear positions, from Park to 1st and back. While moving the gear selector through the gear positions, measure the resistance between ground and the TRS T41 (P/N) Sense circuit in the PCM C1 harness connector. **NOTE: The circuit is grounded in Park and Neutral and open in the other positions.** Did the display change from above 100 kohms (open) to below 10.0 ohms (grounded)? Yes → Go To 5 No → Replace the TRS Assembly (P/N Switch) per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All
5	**NOTE: Before continuing, check the PCM harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.** Using the schematics as a guide, inspect the wire harness and connectors. Pay particular attention to all Power and Ground circuits. If there are no possible causes remaining, view repair. Repair Replace and program the Powertrain Control Module per Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 5.	All

*NO RESPONSE FROM PCM WITH A NO START CONDITION — Continued

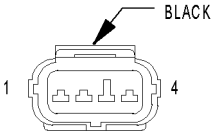
TEST	ACTION	APPLICABILITY
4	Connect the PCM harness connectors. Disconnect the TP Sensor harness connector. Ignition on, engine not running. Measure the voltage on the (K7) 5-volt Supply circuit. Is the voltage between 4.5 and 5.2 volts? Yes → Go To 5 No → Go To 6	All
5	Turn the ignition off. Disconnect the MAP Sensor harness connector. **NOTE: Connect the TP Sensor harness connector.** Ignition on, engine not running. Measure the voltage on the (K7) 5-volt Supply circuit in the MAP Sensor harness connector. Is the voltage between 4.5 and 5.2 volts? Yes → If communication is available with a PCM on a like vehicle, replace and program the Powertrain Control Module in accordance with Service Information. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Replace the Throttle Position Sensor. Perform POWERTRAIN VERIFICATION TEST VER - 1.	All
6	Measure the voltage on the (K7) 5-volt Supply circuit. Disconnect all the sensors that use a 5-volt Supply circuit. Did the voltage return to 4.5 to 5.2 volts when disconnecting any of the sensors. Yes → Replace the sensor that is pulling down the 5-volt supply. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 7	All
7	Turn the ignition off. Disconnect PCM harness connectors. Measure the resistance between ground and the (K7) 5-volt Supply circuit with all the Sensor harness connectors disconnected. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K7) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 8	All
8	Disconnect all sensors that use the (K6) 5-volt Supply. Measure the resistance between ground and the (K6) 5-volt Supply circuit at the PCM harness connector. Is the resistance below 100 ohms? Yes → Repair the short to ground in the (K6) 5-volt Supply circuit. Perform POWERTRAIN VERIFICATION TEST VER - 1. No → Go To 9	All



GENERATOR

GENERATOR - BLACK 2 WAY

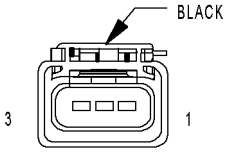
CAV	CIRCUIT	FUNCTION
1	K125 18WT/DB	GENERATOR SOURCE
2	K20 18DG	GENERATOR FIELD



IDLE AIR CONTROL MOTOR

IDLE AIR CONTROL MOTOR - BLACK 4 WAY

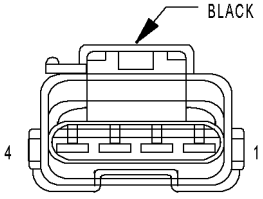
CAV	CIRCUIT	FUNCTION
1	K59 18VT/BK	IDLE AIR CONTROL NO. 4 DRIVER
2	K40 18BR/WT	IDLE AIR CONTROL NO. 3 DRIVER
3	K60 18YL/BK	IDLE AIR CONTROL NO. 2 DRIVER
4	K39 18GY/RD	IDLE AIR CONTROL NO. 1 DRIVER



IGNITION COIL PACK (2.4L)

IGNITION COIL PACK (2.4L) - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	K17 18DB/TN	IGNITION COIL NO. 2 DRIVER
2	F42 18DG/LG	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
3	K19 18GY	IGNITION COIL NO. 1 DRIVER



IGNITION COIL PACK (4.0L)

IGNITION COIL PACK (4.0L) - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	K19 18BK/GY	IGNITION COIL NO. 1 DRIVER
2	F42 18DG/LG	FUSED AUTOMATIC SHUT DOWN RELAY OUTPUT
3	K17 18DB/TN	IGNITION COIL NO. 2 DRIVER
4	K18 18RD/YL	IGNITION COIL NO. 3 DRIVER

DRIVER SQUIB 1 CIRCUIT OPEN — Continued

TEST	ACTION	APPLICABILITY
5	**WARNING: TO AVOID PERSONAL INJURY OR DEATH, TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** **WARNING: IF THE AIRBAG CONTROL MODULE IS DROPPED AT ANY TIME, IT MUST BE REPLACED. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND PERSONAL INJURY OR DEATH.** If there are no possible causes remaining, view repair. Repair: Replace the Airbag Control Module in accordance with Service Information. Perform AIRBAG VERIFICATION TEST - VER 1.	All
6	With the DRBIII®, record and erase all DTC's from all Airbag modules. If equipped with Passenger Airbag On - Off switch, read the DTC's in all switch positions. If any ACTIVE codes are present they must be resolved before diagnosing any stored codes. **WARNING: TO AVOID PERSONAL INJURY OR DEATH, TURN THE IGNITION OFF, DISCONNECT THE BATTERY AND WAIT TWO MINUTES BEFORE PROCEEDING.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Look for chaffed, pierced, pinched, or partially broken wires and broken, bent, pushed out, spread, corroded, or contaminated terminals. The following additional checks may assist you in identifying a possible intermittent problem. Reconnect any disconnected components and harness connector. **WARNING: TO AVOID PERSONAL INJURY OR DEATH, TURN THE IGNITION ON, THEN RECONNECT THE BATTERY.** With the DRBIII® monitor active codes as you work through the following steps. **WARNING: TO AVOID PERSONAL INJURY OR DEATH, MAINTAIN A SAFE DISTANCE FROM ALL AIRBAGS WHILE PERFORMING THE FOLLOWING STEPS.** Wiggle the wiring harness and connectors of the related airbag circuit or component. If codes are related to the Driver Airbag circuits, rotate the steering wheel from stop to stop. You have just attempted to simulate the condition that initially set the trouble code message. Did the DTC become active? Yes → Select appropriate symptom from Symptom List. No → No problem found at this time. Erase all codes before returning vehicle to customer.	All

Symptom:
PASSENGER AIRBAG ON - OFF SWITCH OPEN

When Monitored and Set Condition:

PASSENGER AIRBAG ON - OFF SWITCH OPEN

When Monitored: With the ignition on, the PAB MUX Switch Sense circuit supplies a 3 to 10 ms pulse every 100 ms across the On or Off switch resistor to the MUX Switch Return circuit.

Set Condition: The code will set if the ACM senses an open or high resistance on the PAB MUX Switch Sense circuit or PAB MUX Switch Return circuit.

POSSIBLE CAUSES
CHECKING EQUIPMENT
PAB ON - OFF SWITCH OPEN
SWITCH DISCONNECTED
PASSENGER AIRBAG MUX SWITCH CIRCUIT OPEN
ACM, PASSENGER ON - OFF SWITCH CIRCUIT OPEN
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. **NOTE: Ensure that the battery is fully charged.** **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 7 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All
2	Is this vehicle equipped with a Passenger Airbag On - Off Switch? Yes → Go To 3 No → With the DRBIII® in MISCELLANEOUS, read the Configure for Airbag ON - OFF Switch current status. Enter the number 1 and press enter to re configure the ACM for NO AIRBAG ON/OFF SWITCH. Perform AIRBAG VERIFICATION TEST - VER 1.	All

Symptom:
PASSENGER SQUIB 1 SHORT TO GROUND

When Monitored and Set Condition:

PASSENGER SQUIB 1 SHORT TO GROUND

When Monitored: With the ignition on, the ACM monitors the resistance of the Passenger Squib 1 circuits.

Set Condition: When the ACM detects a short to ground in either Passenger Squib 1 circuits.

POSSIBLE CAUSES
PAB SQUIB 1 CIRCUITS SHORT TO GROUND
PAB SQUIB 1 LINE 1 OR LINE 2 SHORT TO GROUND
ACM, PAB SQUIB 1 SHORT TO GROUND
STORED CODE OR INTERMITTENT CONDITION
ACTIVE CODE PRESENT

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. **NOTE: Ensure the battery is fully charged.** **NOTE: For the purpose of this test, the AECM and ORC modules will be referred to as an ACM.** SELECT ACTIVE or STORED DTC: ACM - ACTIVE DTC Go To 2 ACM - STORED DTC Go To 5 **NOTE: When reconnecting Airbag system components, the ignition must be turned off and the battery must be disconnected.**	All

Symptom:

***CHIME INOPERATIVE WITH EXTERIOR LAMPS ON AND DRIVER DOOR OPEN**

POSSIBLE CAUSES
VERIFY KEY-IN IGNITION, DRIVER'S DOOR OPEN CHIME OPERATION
HEADLAMP SWITCH OUTPUT OPEN
MIC - CHIME INOP WITH EXTERIOR LAMPS ON

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. Ensure the key is in the ignition switch all the way. Open the driver door. Does the chime sound? Yes → Go To 2 No → Refer to symptom *CHIME INOPERATIVE WITH KEY IN IGNITION, DRIVER'S DOOR OPEN in the CHIME category. Perform BODY VERIFICATION TEST - VER 1.	All
2	Turn the ignition off. Remove the Instrument Cluster From the I/P. Turn the Exterior Lamps on. Measure the voltage of the Headlamp Switch Output circuit in the Instrument Cluster C1 connector. Is the voltage above 10.0 volts? Yes → If there are no possible causes remaining, replace the Instrument Cluster. Perform BODY VERIFICATION TEST - VER 1. No → Repair the Headlamp Switch Output circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*PCI BUS COMMUNICATION FAILURE

POSSIBLE CAUSES
WIRING HARNESS INTERMITTENT
OPEN PCI BUS CIRCUIT AT THE DATA LINK CONNECTOR (DLC)
PCI BUS CIRCUIT SHORTED TO VOLTAGE
MODULE SHORT TO VOLTAGE
PCI BUS CIRCUIT SHORTED TO GROUND
MODULE SHORT TO GROUND

TEST	ACTION	APPLICABILITY
1	**Note: Determine which modules this vehicle is equipped with before beginning.** **Note: When attempting to communicate with any of the modules on this vehicle, the DRB will display 1 of 2 different communication errors: a NO RESPONSE message or a BUS +/- SIGNALS OPEN message.** Turn the ignition on. Using the DRB, attempt to communicate with the following control modules: Airbag Control Module SKIM (SENTRY KEY IMMOBILIZER) MIC (INSTRUMENT CLUSTER) Was the DRBIII® able to communicate with one or more Module(s)? Yes → Go To 2 No → Go To 3	All
2	Turn the ignition off. **Note: Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.** **Note: Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.** **Note: If the DRB can not communicate with a single module, refer to the category list for the related symptom.** Were any problems found? Yes → Repair wiring harness/connectors as necessary. Perform BODY VERIFICATION TEST - VER 1. No → Test Complete.	All
3	Turn the ignition off. Disconnect the PCM harness connector. Disconnect the DRB from the Data Link Connector (DLC). Disconnect the negative battery cable. Measure the resistance of the PCI Bus circuit between the Data Link Connector (DLC) and the PCM connector. Is the resistance below 5.0 ohms? Yes → Go To 4 No → Repair the PCI Bus circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:
*AIR BAG INDICATOR INOPERATIVE

POSSIBLE CAUSES
INSTRUMENT CLUSTER
AIR BAG INDICATOR DTC

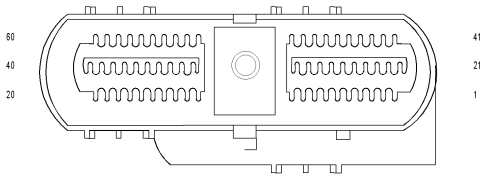
TEST	ACTION	APPLICABILITY
1	**NOTE: The Instrument Cluster Air Bag Indicator will not illuminate during the cluster Self Test. The indicator is controlled by PCI Bus messages received from the Air Bag Control Module (ACM).** **NOTE: The ACM will command the indicator on when the ignition is cycled to the Run/Start position.** With the DRBIII®, select Body, then MIC, read DTCs. Does the DRBIII® display Air Bag Lamp Open or Air Bag Lamp Shorted? Yes → Refer to the Service Information and perform the appropriate symptom. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Instrument Cluster in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom:

*ILLUMINATED ENTRY INOPERATIVE

POSSIBLE CAUSES
COURTESY LAMPS OPERATIONAL
INTERMITTENT CONDITION
ILLUMINATED ENTRY NOT ENABLED

TEST	ACTION	APPLICABILITY
1	Check the Courtesy Lamps for proper operation. Do the Courtesy Lamps operate properly from the Door Ajar Switches? Yes → Go To 2 No → Refer to Symptom list for problems related to COURTESY LAMPS INOPERATIVE. Perform BODY VERIFICATION TEST - VER 1.	All
2	With the DRBIII® select: ENABLE ILLUMINATED ENTRY. With the DRBIII®, read the ILLUMINATED ENTRY status. Does the DRBIII® display ENABLED? Yes → The condition that caused this symptom is currently not present. Inspect the related wiring harness for a possible intermittent condition. Look for any chafed, pierced, pinched or partially broken wires. Perform BODY VERIFICATION TEST - VER 1. No → With the DRB, enable the Illuminated Entry. Perform BODY VERIFICATION TEST - VER 1.	All



TRANSMISSION
CONTROL
MODULE

TRANSMISSION CONTROL MODULE - 60 WAY

CAV	CIRCUIT	FUNCTION
1	T1 18LG/BK	TRS T1 SENSE
2	-	-
3	T3 18VT	TRS T3 SENSE
4	-	-
5	-	-
6	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
7	D21 18PK	SCI TRANSMIT
8	T141 18YL/RD	FUSED IGNITION SWITCH OUTPUT (START)
9	T9 18OR/BK	OVERDRIVE PRESSURE SWITCH SENSE
10	T10 18YL/DG	TORQUE MANAGEMENT REQUEST SENSE
11	F15 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
12	K22 18OR/DB	THROTTLE POSITION SENSOR SIGNAL
13	T13 18DB/BK	SPEED SENSOR GROUND
14	T14 18LG/WT	OUTPUT SPEED SENSOR SIGNAL
15	K30 18PK	TRANSMISSION CONTROL RELAY CONTROL
16	T16 16RD	TRANSMISSION CONTROL RELAY OUTPUT
17	T16 16RD	TRANSMISSION CONTROL RELAY OUTPUT
18	T56 18DG/LB	OVERDRIVE OFF SWITCH INDICATOR
19	T19 16WT	2-4 SOLENOID CONTROL
20	T20 16LB	LOW/REVERSE SOLENOID CONTROL
21	-	-
22	-	-
23	-	-
24	-	-
25	-	-
26	-	-
27	-	-
28	-	-
29	-	-
30	-	-
31	-	-
32	-	-
33	-	-
34	-	-
35	-	-
36	-	-
37	-	-
38	-	-
39	-	-
40	-	-
41	T411 18WT/PK	TRS T41 SENSE
42	T42 16VT/WT	TRS T42 SENSE
43	D25 18VT/YL	PCI BUS
44	-	-
45	-	-
46	D20 18LG	SCI RECEIVE
47	T47 18YL/BK	2-4 PRESSURE SWITCH SENSE
48	-	-
49	T6 18OR/WT	OVERDRIVE OFF SWITCH SENSE
50	T50 18DG	LOW/REVERSE PRESSURE SWITCH SENSE
51	K4 18BK/LB	SENSOR GROUND 1
52	T52 18RD/BK	INPUT SPEED SENSOR SIGNAL
53	Z112 16BK	GROUND
54	T54 18VT	TRANSMISSION TEMPERATURE SENSOR SIGNAL
55	-	-
56	A30 16RD/WT	FUSED B(+)
57	Z113 16BK/YL	GROUND
58	-	-
59	T59 16PK	UNDERDRIVE SOLENOID CONTROL
60	T60 16BR	OVERDRIVE SOLENOID CONTROL

Symptom:

CAB POWER FEED CIRCUIT

When Monitored and Set Condition:

CAB POWER FEED CIRCUIT

When Monitored: Ignition on. The CAB monitors the Fused B(+) circuit at all times for proper system voltage.

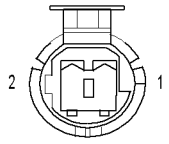
Set Condition: If the Fused B(+) voltage is missing when the CAB detects that an internal main driver is not ″on″, the Diagnostic Trouble Code (DTC) is set.

POSSIBLE CAUSES
INTERMITTENT DTC
B(+) CIRCUIT SHORTED TO GROUND
BLOWN FUSE - FUSED B(+) CIRCUIT
CAB - FUSED B(+) CIRCUIT SHORTED TO GROUND
FUSED B(+) CIRCUIT OPEN
NO B+ SUPPLY TO FUSE
CAB - FUSED B(+) CIRCUIT OPEN

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase DTC's. Turn the ignition off. Turn the ignition on. Drive the vehicle above 25 km/h (15 mph) for at least 10 seconds. Stop the vehicle. With the DRBIII®, read DTC's. Does the DRBIII® display CAB Power Feed Circuit DTC present right now? Yes → Go To 2 No → Go To 9	All
2	Turn the ignition off. Remove and Inspect Fuse 12 in the PDC. Is the Fuse blown? Yes → Go To 3 No → Go To 6	All

*ABS WARNING INDICATOR ALWAYS ON — Continued

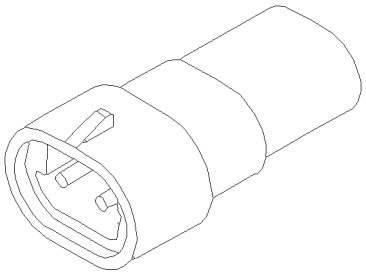
TEST	ACTION	APPLICABILITY
4	Remove the ABS relay from the PDC. Turn the ignition on. Using a 12-volt test light connected to ground, check the Fused B+ circuit. Does the test light illuminate? Yes → Go To 5 No → Repair the ABS relay Fused B+ circuit for an open. The CAB may have to sense all four wheels at 25 km/h (15 mph) before it will extinguish the ABS Indicator. Perform ABS VERIFICATION TEST - VER 1.	All
5	Remove the ABS relay. Disconnect the CAB harness connector. Measure the resistance of the ABS Relay Control circuit. Is the resistance below 5.0 ohms? Yes → Replace the Controller Antilock Brake. Perform ABS VERIFICATION TEST - VER 1. No → Repair the ABS Relay Control circuit for an open. The CAB may have to sense all four wheels at 25 km/h (15 mph) before it will extinguish the ABS Indicator. Perform ABS VERIFICATION TEST - VER 1.	All



LEFT REAR
WHEEL SPEED
SENSOR

LEFT REAR WHEEL SPEED SENSOR - 2 WAY

CAV	CIRCUIT	FUNCTION
1	B3 18LG/DB	LEFT REAR WHEEL SPEED SENSOR (-)
2	B4 18LG	LEFT REAR WHEEL SPEED SENSOR (+)



LEFT REAR
WHEEL SPEED
SENSOR
(SENSOR SIDE)

LEFT REAR WHEEL SPEED SENSOR (SENSOR SIDE) - 2 WAY

CAV	CIRCUIT	FUNCTION
1	LG/DB	LEFT REAR WHEEL SPEED SENSOR (-)
2	LG	LEFT REAR WHEEL SPEED SENSOR (+)

Transmission Effects: EMCC will still be available after code is set. MIL will illuminate after 5 minutes of accumulated slip in FEMCC. The transmission will attempt normal operation (not in Limp-in) even after the MIL is illuminated.

Possible causes:

> Worn pump bushing and/or failed torque converter - both should be replaced during a rebuild with code P0740(38) present

> Solenoid pack.

Name of code: P0750(41) - LR Solenoid Circuit
P0755(42) - 2/4 Solenoid Circuit
P0760(43) - OD Solenoid Circuit
P0765(44) - UD Solenoid Circuit

When monitored: Ignition key is turned from off position to run position and/or ignition key is turned from crank position to run position, then every 10 seconds thereafter, or when a gear ratio or pressure switch error DTC is detected.

Set condition: All four solenoids are tested for continuity continuously immediately upon start up and during vehicle operation. For solenoids that are currently energized, power is momentarily interrupted, then reenergized. For solenoids that are not currently energized, the solenoid is momentarily energized, then deenergized. Under both situations, if an inductive spike is not sensed by the Transmission Control Module (TCM) during the continuity check, it is retested twice. If it fails the test the third time, the appropriate code is set.

SOLENOID APPLICATION CHART

GEAR	UD	OD	REV	2/4	LR
PARK					X
REVERSE			X		X
NEUTRAL					X
1ST	X				X
2ND	X			X	
3RD	X	X			
4TH		X		X	

80ccf4c0

Theory of operation: Four solenoids are used to control the friction elements (clutches). The continuity of the solenoids circuits are periodically tested. Each solenoid is turned on or off depending on it's current state. An inductive spike should be detected by the TCM during this test. If no spike is detected, the circuit is tested again to verify the failure. In addition to the periodic testing, the solenoid circuits are tested if a gear ratio or pressure switch error occurs. In this case, one failure will result in the appropriate code being set.

Transmission Effects: The MIL will illuminate and the transmission goes into neutral if code is set above 35 Km/h (22 MPH), Limp-in mode when vehicle speed is below 35 Km/h (22 MPH).

Possible causes:

> Open or shorted solenoid circuit(s) between TCM and solenoid pack.

> Open ground circuit.

> TCM connector problems.

> Solenoid pack connector problem.

> Solenoid Pack.

> TCM

Name of code: P1776(47) - Solenoid Switch Valve Latched in LR Position

When monitored: Continuously when doing partial or full EMCC (PEMCC or FEMCC)

Set condition: If the transmission senses the LR pressure switch closing while performing PEMCC or FEMCC. This code will be set after two unsuccessful attempts to perform PEMCC or FEMCC.

Theory of operation: The solenoid switch valve (SSV) controls the direction of the transmission fluid when the LR/TCC solenoid is energized. SSV will be in the downshifted position in 1st gear, thus directing the fluid to the LR clutch circuits. In 2nd, 3rd, and 4th, the SSV will be in the upshifted position and directs the fluid into the torque converter clutch (TCC).

When doing PEMCC or FEMCC, the LR pressure switch should indicate no pressure if the SSV is in the TCC position. If the LR pressure switch indicates pressure while in PEMCC or FEMCC, EMCC operation is aborted and inhibited to avoid inadvertent application of the LR clutch. Partial EMCC will be attempted if the LR pressure switch does not indicate pressure. A second detection of LR pressure results in setting the code.

Transmission Effects: At speeds above 72 Km/h (45 MPH), EMCC is inhibited. Once speed falls below 72 Km/h (45 MPH), the transmission will go into Limp-in mode and the MIL will illuminate after 5 minutes of substituted operation.

Possible causes:

> Valve body - Solenoid valve stuck in LR position

> Intermittent short to ground or open circuit in LR Pressure Switch Sense circuit (with code 24 only)

> Solenoid pack (with code P0841(24) only)

> TCM (with code P0841(24) only)

P0562-LOW BATTERY VOLTAGE — Continued

TEST	ACTION	APPLICABILITY
2	With the DRBIII®, read the PCM DTC's. Are there any Charging System related DTC's stored in the PCM? Yes → Refer to the Charging System category and repair any PCM Charging System DTC's first. NOTE: After repairing the PCM charging system DTC's, perform the Transmission Verification test to verify the transmission was not damaged. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 3	All
3	**NOTE: Generator, battery, and charging system must be fully functional before performing this test.** With the DRBIII®, read Transmission DTC's. With the DRBIII®, Check the STARTS SINCE SET counter for P0562. **Note: This counter only applies to the last DTC set.** Is the Starts Since Set counter for P0562 set at 0? Yes → Go To 4 No → Go To 9	All
4	Turn the ignition off to the lock position. Disconnect the TCM harness connector. **Note: Check connectors - Clean/repair as necessary.** Using a 12-volt test light connected to 12-volts, check the ground circuits in the TCM harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly for all the ground circuits? Yes → Go To 5 No → Repair the Ground circuit(s) for an open or high resistance. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All
5	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Remove the Transmission Control Relay. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output in the Transmission Control Relay connector in the PDC. Ignition on, engine not running. Using a 12-volt test light connected to ground, check the Fused B+ circuit in the TCM harness connector. **NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.** Does the test light illuminate brightly? Yes → Go To 6 No → Repair the Fused B+ circuit for an open or high resistance. If the fuse is open make sure to check for a short to ground. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

P0715-INPUT SPEED SENSOR ERROR — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off to the lock position. Disconnect the Input Speed Sensor harness connector. Disconnect the TCM harness connector. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector. Ignition on, engine not running. Measure the voltage of the Input Speed Sensor Signal circuit in the TCM harness connector. Is the voltage above 0.5 volts? Yes → Repair the Input Speed Sensor Signal circuit for a short to voltage. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 8	All
8	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the Input Speed Sensor harness connector. **Note: Check connectors - Clean/repair as necessary.** Measure the resistance of the Speed Sensor Ground circuit from the TCM harness connector to the Input Speed Sensor harness connector. Is the resistance above 5.0 ohms? Yes → Repair the Speed Sensor Ground circuit for an open. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 9	All
9	Turn the ignition off to the lock position. Disconnect the TCM harness connector. Disconnect the TRS harness connector. Remove the Transmission Control Relay from the PDC. **Note: Check connectors - Clean/repair as necessary.** Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector in the PDC. Ignition on, engine not running. Measure the voltage of the Speed Sensor Ground circuit in the TCM harness connector. Is the voltage above 0.5 volts? Yes → Repair the Speed Sensor Ground circuit for a short to voltage. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1. No → Go To 10	All
10	Using the schematics as a guide, inspect the wiring and connectors. Repair as necessary. Pay particular attention to all power and ground circuits. If there are no possible causes remaining, view repair. Repair Replace the Transmission Control Module per the Service Information. WITH THE DRBIII® PERFORM QUICK LEARN. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All

Symptom:

P0750-LR SOLENOID CIRCUIT

When Monitored and Set Condition:

P0750-LR SOLENOID CIRCUIT

When Monitored: Initially at power-up, then every 10 seconds thereafter. The solenoids will also be tested immediately after a Gear Ratio or Pressure Switch error is detected.

Set Condition: Three consecutive solenoid continuity test failures, or one failure if a test is run in response to a Gear Ratio or Pressure Switch error.

POSSIBLE CAUSES
RELATED RELAY DTC'S PRESENT
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
L/R SOLENOID CONTROL CIRCUIT OPEN
L/R SOLENOID CONTROL CIRCUIT SHORT TO GROUND
L/R SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE
L/R SOLENOID
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

Symptom:

P0846-2/4 PRESSURE SWITCH SENSE CIRCUIT

When Monitored and Set Condition:

P0846-2/4 PRESSURE SWITCH SENSE CIRCUIT

When Monitored: Whenever the engine is running.

Set Condition: The appropriate DTC is set if one of the Pressure Switches are open or closed at the wrong time in a given gear .

POSSIBLE CAUSES
TRANSMISSION RELAY DTC'S PRESENT
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
2/4 PRESSURE SWITCH SENSE CIRCUIT OPEN
2/4 PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
2/4 PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
2/4 PRESSURE SWITCH
TRANSMISSION CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

TEST	ACTION	APPLICABILITY
1	**NOTE: Low fluid level can be the cause of many Transmission problems. If the fluid level is low, locate and repair the leak, then check and adjust the fluid level per the Service Information.** **NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.** With the DRBIII®, read the engine DTC's. Check and repair all engine DTC's prior to performing Transmission Symptom Diagnostics. With the DRBIII®, read Transmission DTC's. Record all DTC's and 1 Trip Failures. **NOTE: Diagnose 1 Trip Failures as a fully matured DTC.** Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary. Perform the Shift Lever Position Test. If the test does not pass, refer to Symptom test for P0706 Check Shifter Signal. For Gear Ratio DTC's, check and record all CVI's. Most DTC's set on start up but some must be set by driving the vehicle such that all diagnostic monitors have run. **NOTE: Verify flash level of Transmission Control Module. Some problems are corrected by software upgrades to the Transmission Control Module.** **NOTE: Check for applicable TSB's related to the symptom.** Perform this procedure prior to Symptom diagnosis. Continue Go To 2	All

P0944-LOSS OF PRIME — Continued

TEST	ACTION	APPLICABILITY
7	If there are no possible causes remaining, view repair. Repair Replace the Transmission Oil Pump per the Service Information. Perform 42RLE TRANSMISSION VERIFICATION TEST - VER 1.	All