TRANSMISSION AND TRANSFER CASE

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42RE AUTOMATIC TRANSMISSION

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DESCRIPTION AND OPERATION

42RE AUTOMATIC TRANSMISSION

DESCRIPTION

The 42RE is a four speed fully automatic transmission (Fig. 1) with an electronic governor. The 42RE is equipped with a lock-up clutch in the torque converter. First through third gear ranges are provided by the clutches, bands, overrunning clutch, and planetary gear sets in the transmission. Fourth gear range is provided by the overdrive unit that contains an overdrive clutch, direct clutch, planetary gear set, and overrunning clutch.

The transmission contains a front, rear, and direct clutch which function as the input driving components. They also contain the kickdown (front) and the low/reverse (rear) bands which, along with the overrunning clutch and overdrive clutch, serve as the holding components. The driving and holding components combine to select the necessary planetary gear components, in the front, rear, or overdrive planetary gear set, transfer the engine power from the input shaft through to the output shaft.

The valve body is mounted to the lower side of the transmission and contains the valves to control pressure regulation, fluid flow control, and clutch/band application. The oil pump is mounted at the front of the transmission and is driven by the torque converter hub. The pump supplies the oil pressure necessary for clutch/band actuation and transmission lubrication.

The 42RE transmission is cooled by an integral fluid cooler inside the radiator.

DESCRIPTION AND OPERATION (Continued)

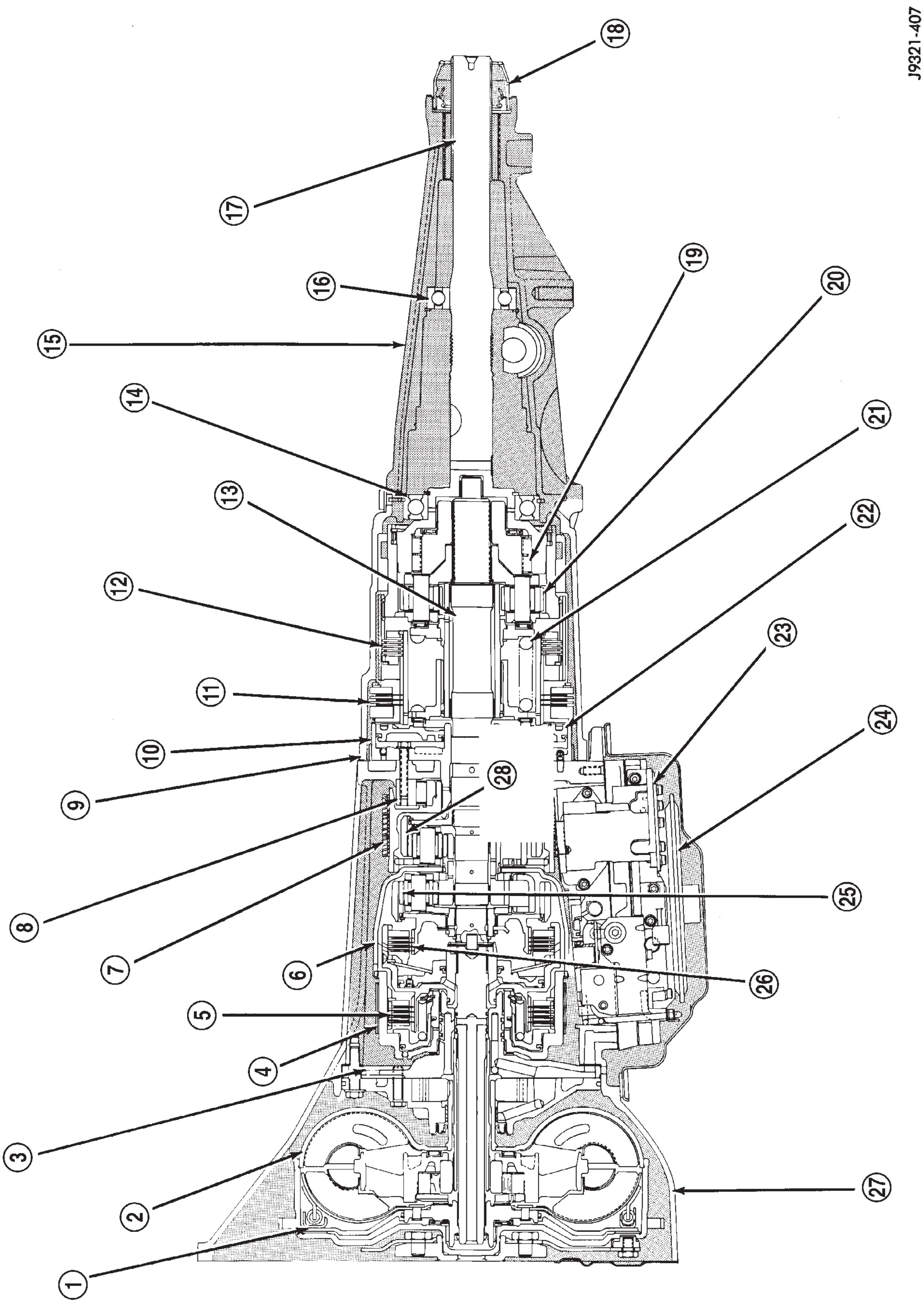

Fig. 1 42RE Transmission

DESCRIPTION AND OPERATION (Continued)

1 – CONVERTER CLUTCH
2 – TORQUE CONVERTER
3 – OIL PUMP AND REACTION SHAFT SUPPORT ASSEMBLY
4 – FRONT BAND
5 – FRONT CLUTCH
6 – DRIVING SHELL
7 – REAR BAND
8 – TRANSMISSION OVERRUNNING CLUTCH
9 – OVERDRIVE UNIT
10 – PISTON RETAINER
11 – OVERDRIVE CLUTCH
12 – DIRECT CLUTCH
13 – INTERMEDIATE SHAFT
14 – FRONT BEARING
15 – HOUSING
16 – REAR BEARING
17 – OUTPUT SHAFT
18 – SEAL
19 – OVERDRIVE OVERRUNNING CLUTCH
20 – OVERDRIVE PLANETARY GEAR
21 – DIRECT CLUTCH SPRING
22 – OVERDRIVE CLUTCH PISTON
23 – VALVE BODY ASSEMBLY
24 – FILTER
25 – FRONT PLANETARY GEAR
26 – REAR CLUTCH
27 – TRANSMISSION
28 – REAR PLANETARY GEAR

IDENTIFICATION

Transmission identification numbers are stamped on the left side of the case just above the oil pan gasket surface (Fig. 2). Refer to this information when ordering replacement parts.

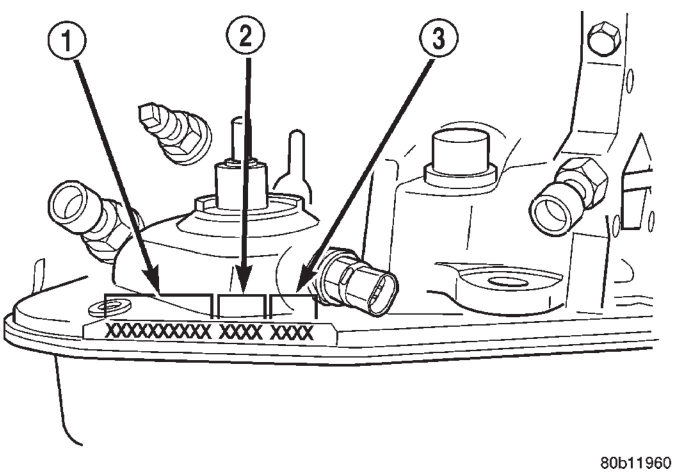

Fig. 2 Transmission Part And Serial Number Location

1 – PART NUMBER
2 – BUILD DATE
3 – SERIAL NUMBER

GEAR RATIOS

The 42RE gear ratios are:

- **1st** 2.74:1
- **2nd** 1.54:1
- **3rd** 1.00:1
- **4th** 0.69:1
- **Rev.** 2.21

OPERATION

The application of each driving or holding component is controlled by the valve body based upon the manual lever position and governor pressure. The governor pressure is a variable pressure input to the valve body and is one of the signals that a shift is necessary. First through fourth gear are obtained by selectively applying and releasing the different clutches and bands. Engine power is thereby routed to the various planetary gear assemblies which combine with the overrunning clutch assemblies to generate the different gear ratios. The torque converter clutch is hydraulically applied and is released when fluid is vented from the hydraulic circuit by the torque converter control (TCC) solenoid on the valve body. The torque converter clutch is controlled by the Powertrain Control Module (PCM). The torque converter clutch engages in fourth gear, and in third gear when the O/D switch is OFF, when the vehicle is cruising on a level plane after the vehicle has warmed up. The torque converter clutch will disengage momentarily when an increase in engine load is sensed by the PCM, such as when the vehicle begins to go uphill or the throttle pressure is increased. The torque converter clutch feature increases fuel economy and reduces the transmission fluid temperature.

Since the overdrive clutch is applied in fourth gear only and the direct clutch is applied in all ranges except fourth gear, the transmission operation for park, neutral, and first through third gear will be described first. Once these powerflows are described, the third to fourth shift sequence will be described.

DESCRIPTION AND OPERATION (Continued)

PARK POWERFLOW

As the engine is running and the crankshaft is rotating, the flexplate and torque converter, which are also bolted to it, are all rotating in a clockwise direction as viewed from the front of the engine. The notched hub of the torque converter is connected to the oil pump's internal gear, supplying the transmission with oil pressure. As the converter turns, it turns the input shaft in a clockwise direction. As the input shaft is rotating, the front clutch hub-rear clutch retainer and all their associated parts are also rotating, all being directly connected to the input shaft. The power flow from the engine through the front-clutch-hub and rear-clutch-retainer stops at the rear-clutch-retainer. Therefore, no power flow to the output shaft occurs because no clutches are applied. The only mechanism in use at this time is the parking sprag (Fig. 3), which locks the parking gear on the output shaft to the transmission case.

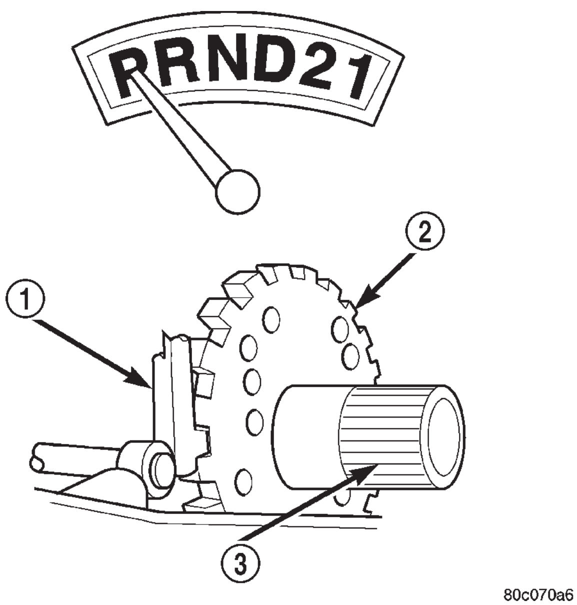

Fig. 3 Park Powerflow

1 – LEVER ENGAGED FOR PARK
2 – PARK SPRAG
3 – OUTPUT SHAFT

NEUTRAL POWERFLOW

With the gear selector in the neutral position (Fig. 4), the power flow of the transmission is essentially the same as in the park position. The only operational difference is that the parking sprag has been disengaged, unlocking the output shaft from the transmission case and allowing it to move freely.

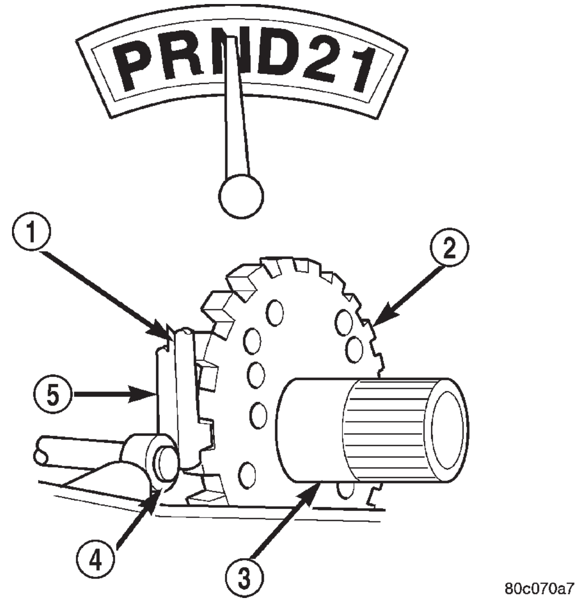

Fig. 4 Neutral Powerflow

1 – LEVER DISENGAGED FOR NEUTRAL
2 – PARK SPRAG
3 – OUTPUT SHAFT
4 – CAM
5 – LEVER

DESCRIPTION AND OPERATION (Continued)

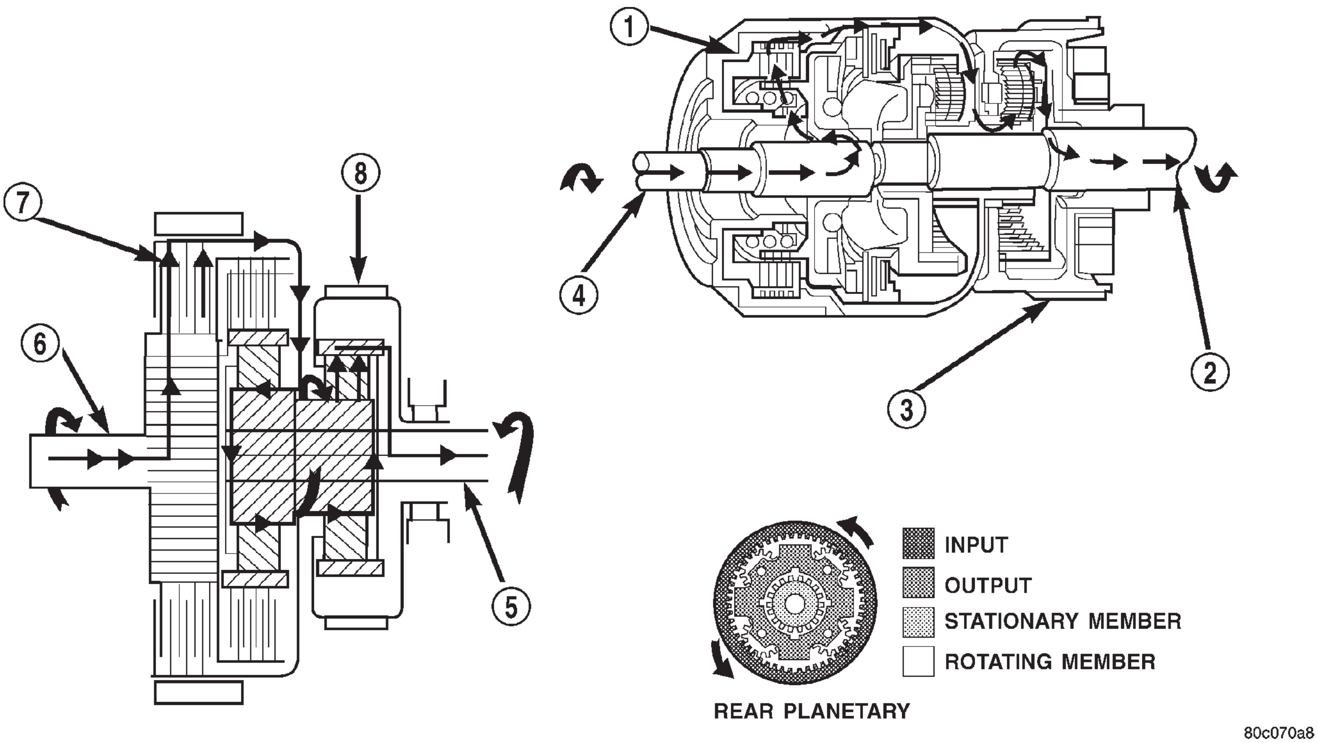

Fig. 5 Reverse Powerflow

1 – FRONT CLUTCH ENGAGED
2 – OUTPUT SHAFT
3 – LOW/REVERSE BAND APPLIED
4 – INPUT SHAFT
5 – OUTPUT SHAFT
6 – INPUT SHAFT
7 – FRONT CLUTCH ENGAGED
8 – LOW/REVERSE BAND APPLIED

REVERSE POWERFLOW

When the gear selector is moved into the reverse position (Fig. 5), the front clutch and the rear band are applied. With the application of the front clutch, engine torque is applied to the sun gear, turning it in a clockwise direction. The clockwise rotation of the sun gear causes the rear planet pinions to rotate against engine rotation in a counterclockwise direction. The rear band is holding the low reverse drum, which is splined to the rear carrier. Since the rear carrier is being held, the torque from the planet pinions is transferred to the rear annulus gear, which is splined to the output shaft. The output shaft in turn rotates with the annulus gear in a counterclockwise direction giving a reverse gear output. The entire transmission of torque is applied to the rear planetary gearset only. Although there is torque input to the front gearset through the sun gear, no other member of the gearset is being held. During the entire reverse stage of operation, the front planetary gears are in an idling condition.

DESCRIPTION AND OPERATION (Continued)

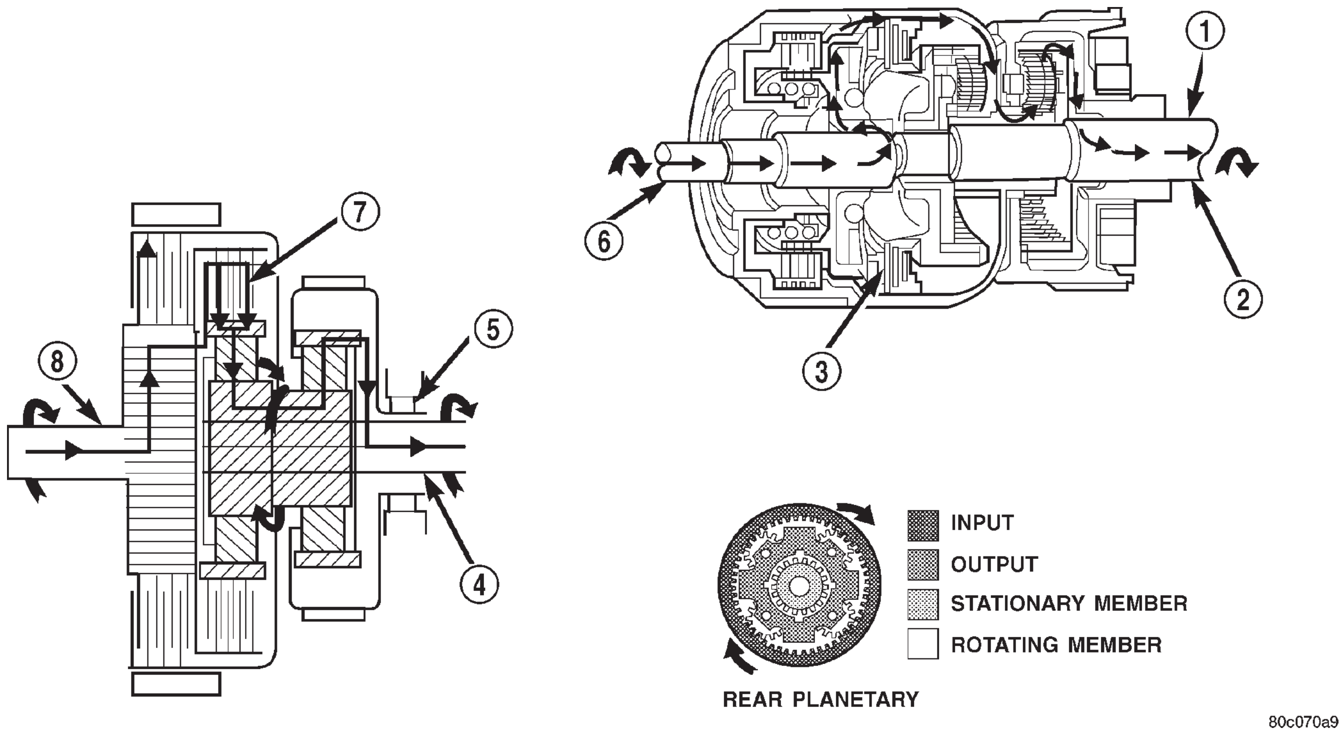

Fig. 6 First Gear Powerflow

1 – OUTPUT SHAFT
2 – OVER-RUNNING CLUTCH HOLDING
3 – REAR CLUTCH APPLIED
4 – OUTPUT SHAFT
5 – OVER-RUNNING CLUTCH HOLDING
6 – INPUT SHAFT
7 – REAR CLUTCH APPLIED
8 – INPUT SHAFT

FIRST GEAR POWERFLOW

When the gearshift lever is moved into the drive position the transmission goes into first gear (Fig. 6). As soon as the transmission is shifted from park or neutral to drive, the rear clutch applies, applying the rear clutch pack to the front annulus gear. Engine torque is now applied to the front annulus gear turning it in a clockwise direction. With the front annulus gear turning in a clockwise direction, it causes the front planets to turn in a clockwise direction. The rotation of the front planets cause the sun to revolve in a counterclockwise direction. The sun gear now transfers its counterclockwise rotation to the rear planets which rotate back in a clockwise direction. With the rear annulus gear stationary, the rear planet rotation on the annulus gear causes the rear planet carrier to revolve in a counterclockwise direction. The rear planet carrier is splined into the low-reverse drum, and the low reverse drum is splined to the inner race of the over-running clutch. With the over-running clutch locked, the planet carrier is held, and the resulting torque provided by the planet pinions is transferred to the rear annulus gear. The rear annulus gear is splined to the output shaft and rotated along with it (clockwise) in an underdrive gear reduction mode.

DESCRIPTION AND OPERATION (Continued)

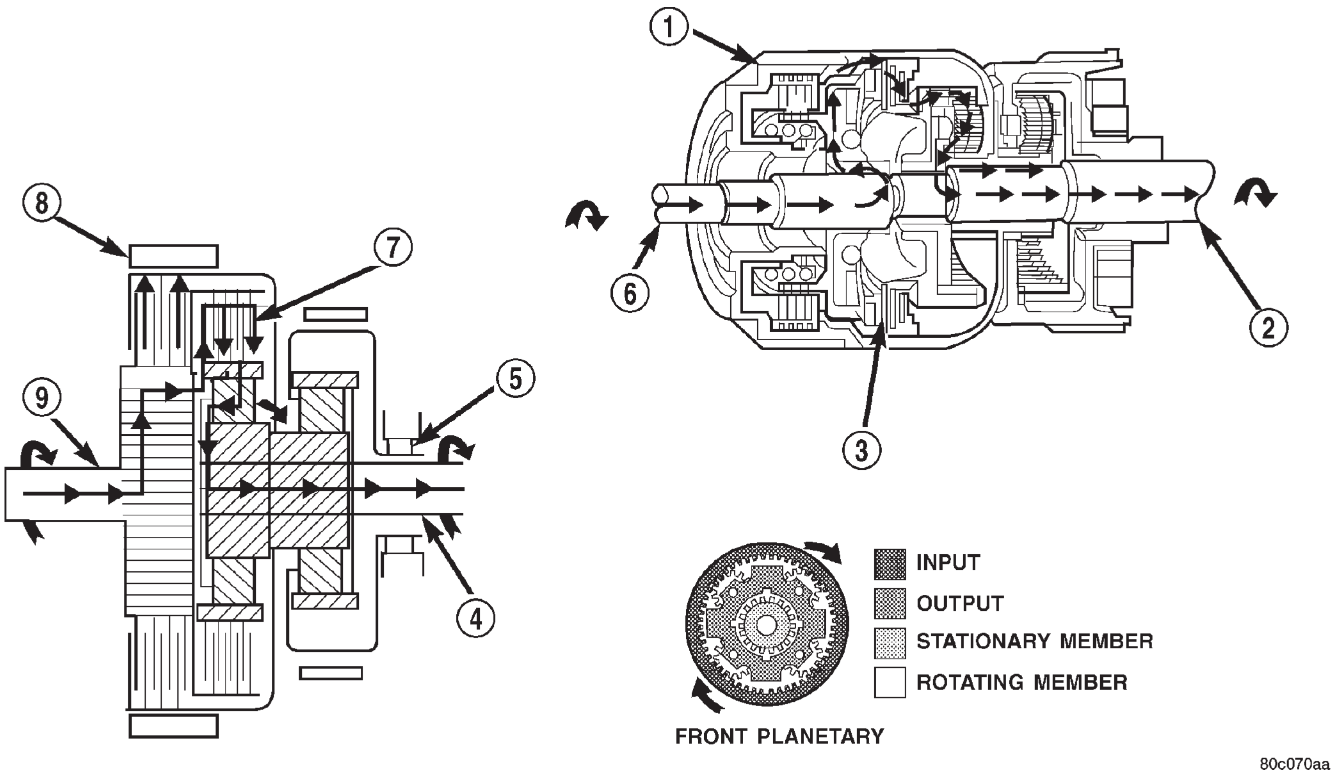

Fig. 7 Second Gear Powerflow

1 – KICKDOWN BAND APPLIED
2 – OUTPUT SHAFT
3 – REAR CLUTCH ENGAGED
4 – OUTPUT SHAFT
5 – OVER-RUNNING CLUTCH FREE-WHEELING
6 – INPUT SHAFT
7 – REAR CLUTCH APPLIED
8 – KICKDOWN BAND APPLIED
9 – INPUT SHAFT

SECOND GEAR POWERFLOW

In drive-second (Fig. 7), the same elements are applied as in manual-second. Therefore, the power flow will be the same, and both gears will be discussed as one in the same. In drive-second, the transmission has proceeded from first gear to its shift point, and is shifting from first gear to second. The second gear shift is obtained by keeping the rear clutch applied and applying the front (kickdown) band. The front band holds the front clutch retainer that is locked to the sun gear driving shell. With the rear clutch still applied, the input is still on the front annulus gear turning it clockwise at engine speed. Now that the front band is holding the sun gear stationary, the annulus rotation causes the front planets to rotate in a clockwise direction. The front carrier is then also made to rotate in a clockwise direction but at a reduced speed. This will transmit the torque to the output shaft, which is directly connected to the front planet carrier. The rear planetary annulus gear will also be turning because it is directly splined to the output shaft. All power flow has occurred in the front planetary gear set during the drive-second stage of operation, and now the over-running clutch, in the rear of the transmission, is disengaged and freewheeling on its hub.

DESCRIPTION AND OPERATION (Continued)

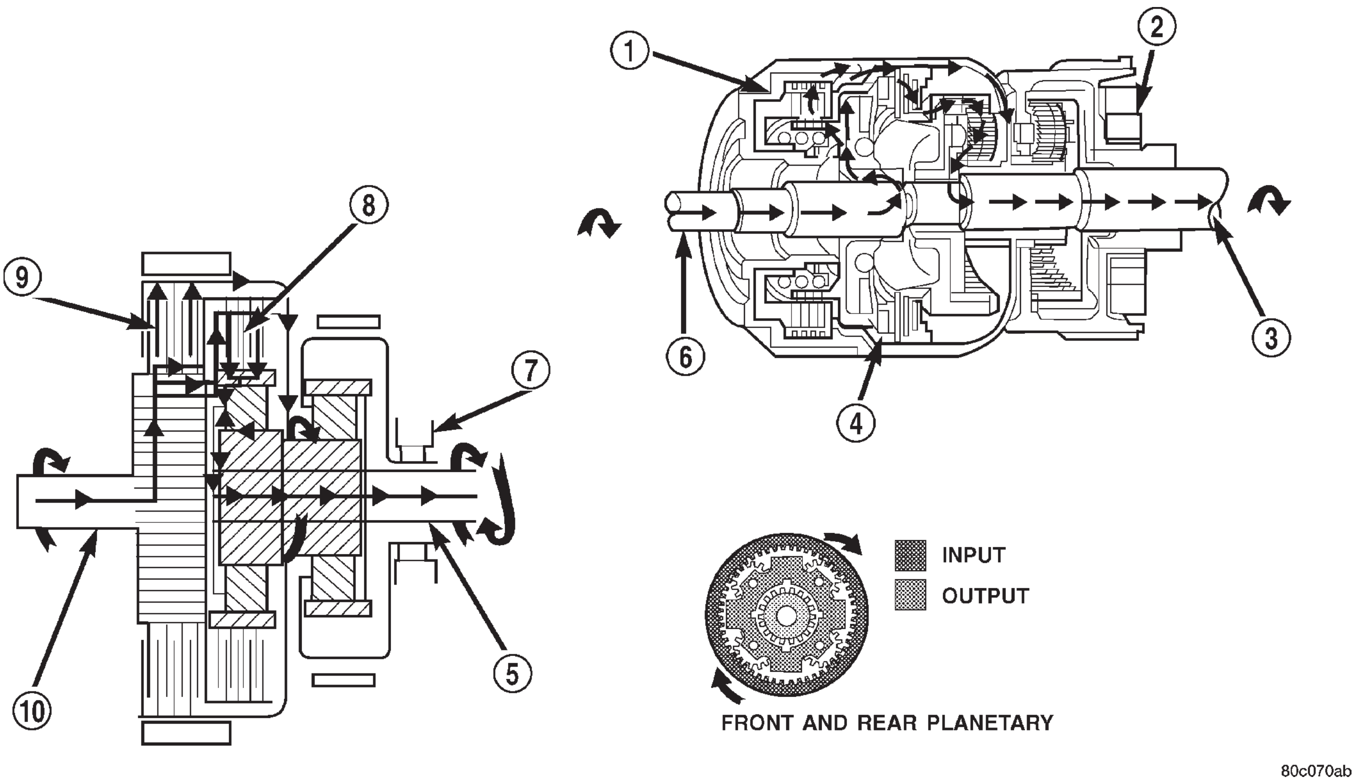

Fig. 8 Direct Drive Powerflow

1 – FRONT CLUTCH APPLIED
2 – OVER-RUNNING CLUTCH FREE-WHEELING
3 – OUTPUT SHAFT
4 – REAR CLUTCH APPLIED
5 – OUTPUT SHAFT
6 – INPUT SHAFT
7 – OVER-RUNNING CLUTCH FREE-WHEELING
8 – REAR CLUTCH APPLIED
9 – FRONT CLUTCH APPLIED
10 – INPUT SHAFT

DIRECT DRIVE POWERFLOW

The vehicle has accelerated and reached the shift point for the 2–3 upshift into direct drive (Fig. 8). When the shift takes place, the front band is released, and the front clutch is applied. The rear clutch stays applied as it has been in all the forward gears. With the front clutch now applied, engine torque is now on the front clutch retainer, which is locked to the sun gear driving shell. This means that the sun gear is now turning in engine rotation (clockwise) and at engine speed. The rear clutch is still applied so engine torque is also still on the front annulus gear. If two members of the same planetary set are driven, direct drive results. Therefore, when two members are rotating at the same speed and in the same direction, it is the same as being locked up. The rear planetary set is also locked up, given the sun gear is still the input, and the rear annulus gear must turn with the output shaft. Both gears are turning in the same direction and at the same speed. The front and rear planet pinions do not turn at all in direct drive. The only rotation is the input from the engine to the connected parts, which are acting as one common unit, to the output shaft.

DESCRIPTION AND OPERATION (Continued)

FOURTH GEAR POWERFLOW

Fourth gear overdrive range is electronically controlled and hydraulically activated. Various sensor inputs are supplied to the powertrain control module to operate the overdrive solenoid on the valve body. The solenoid contains a check ball that opens and closes a vent port in the 3-4 shift valve feed passage. The overdrive solenoid (and check ball) are not energized in first, second, third, or reverse gear. The vent port remains open, diverting line pressure from the 2-3 shift valve away from the 3-4 shift valve. The overdrive control switch must be in the ON position to transmit overdrive status to the PCM. A 3-4 upshift occurs only when the overdrive solenoid is energized by the PCM. The PCM energizes the overdrive solenoid during the 3-4 upshift. This causes the solenoid check ball to close the vent port allowing line pressure from the 2-3 shift valve to act directly on the 3-4 upshift valve. Line pressure on the 3-4 shift valve overcomes valve spring pressure moving the valve to the upshift position. This action exposes the feed passages to the 3-4 timing valve, 3-4 quick fill valve, 3-4 accumulator, and ultimately to the overdrive piston. Line pressure through the timing valve moves the overdrive piston into contact with the overdrive clutch. The direct clutch is disengaged before the overdrive clutch is engaged. The boost valve provides increased fluid apply pressure to the overdrive clutch during 3-4 upshifts, and when accelerating in fourth gear. The 3-4 accumulator cushions overdrive clutch engagement to smooth 3-4 upshifts. The accumulator is charged at the same time as apply pressure acts against the overdrive piston.

RECOMMENDED FLUID

NOTE: Refer to the Service Procedures section of this Group for fluid level checking procedures.

FLUID TYPE

Mopar® ATF Plus 3, Type 7176 automatic transmission fluid is the recommended fluid for Chrysler automatic transmissions.

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

FLUID ADDITIVES

Fluid additives other than Mopar® approved fluorescent leak detection dyes are not to be used in this transmission.

FLUID

NOTE: Refer to the maintenance schedules in Group 0, Lubrication and Maintenance for the recommended maintenance (fluid/filter change) intervals for this transmission.

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

DESCRIPTION

Mopar® ATF Plus 3, Type 7176, automatic transmission fluid is the recommended fluid for DaimlerChrysler automatic transmissions.

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

Mopar® ATF Plus 3, Type 7176, automatic transmission fluid when new is red in color. The ATF is dyed red so it can be identified from other fluids used in the vehicle such as engine oil or antifreeze. The red color is not permanent and is not an indicator of fluid condition. As the vehicle is driven, the ATF will begin to look darker in color and may eventually become brown. **This is normal.** A dark brown/black fluid accompanied with a burnt odor and/or deterioration in shift quality may indicate fluid deterioration or transmission component failure.

FLUID ADDITIVES

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

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

OPERATION

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

DESCRIPTION AND OPERATION (Continued)

TORQUE CONVERTER

DESCRIPTION

The torque converter (Fig. 9) 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 converter clutch engages in third gear. 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. If the fluid is contaminated, flush the fluid cooler and lines.

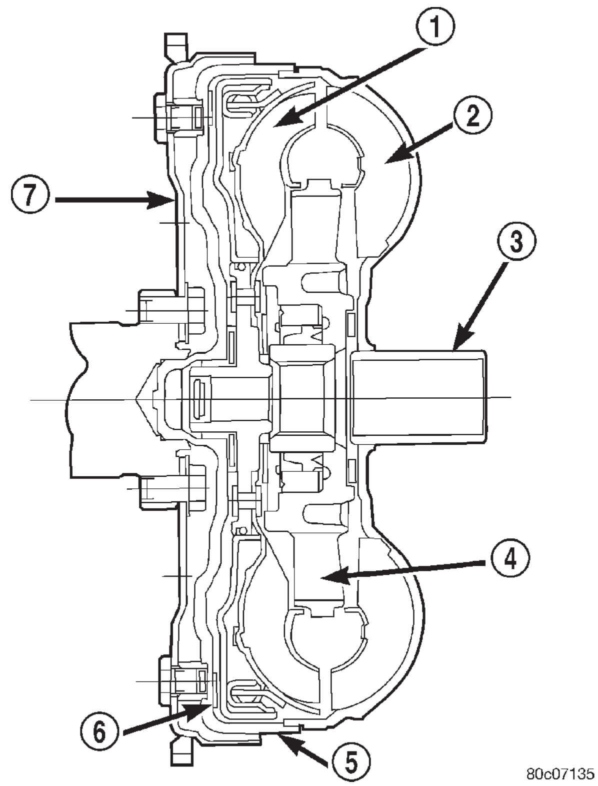

Fig. 9 Torque Converter Assembly

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

DESCRIPTION AND OPERATION (Continued)

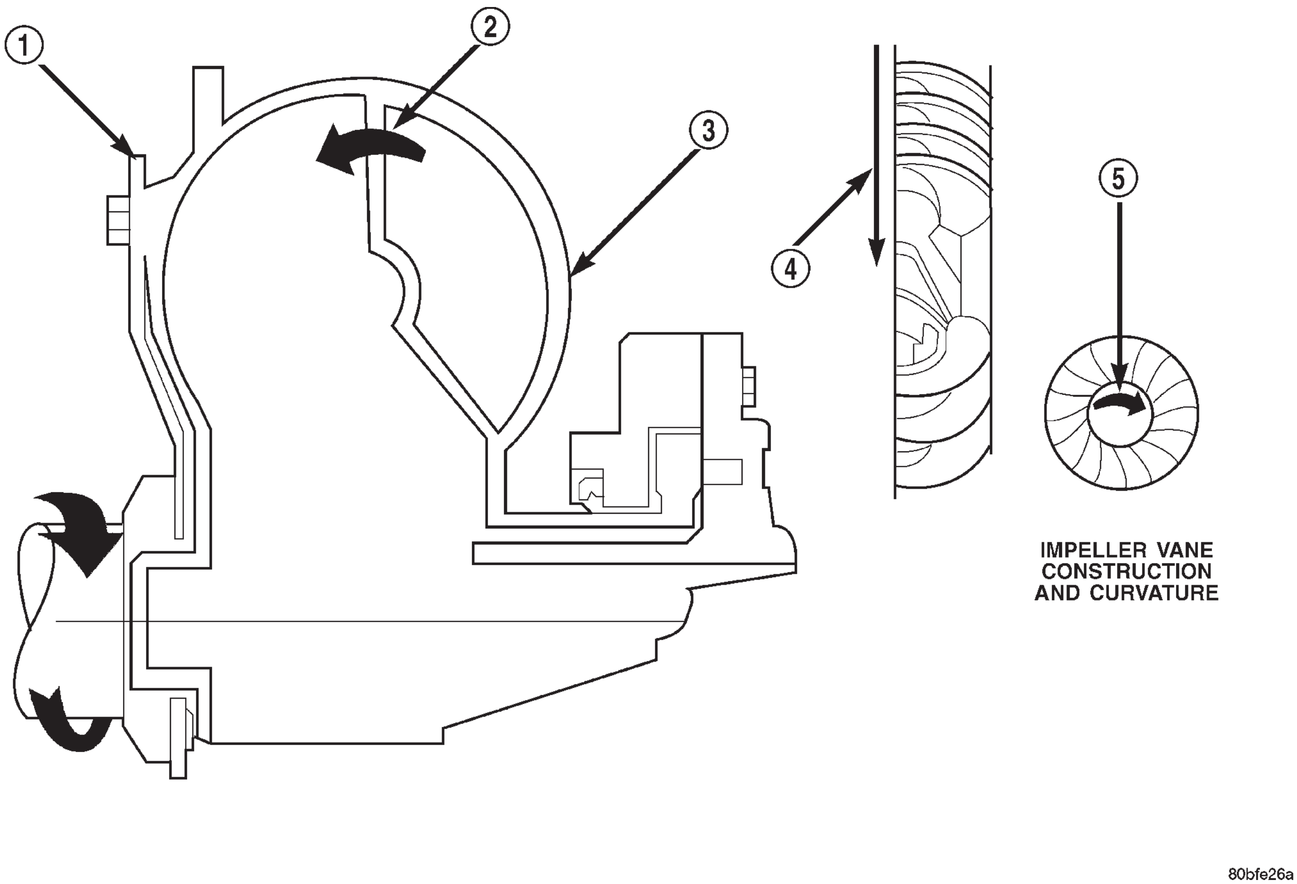

Fig. 10 Impeller

1 – ENGINE FLEXPLATE
2 – OIL FLOW FROM IMPELLER SECTION INTO TURBINE SECTION
3 – IMPELLER VANES AND COVER ARE INTEGRAL
4 – ENGINE ROTATION
5 – ENGINE ROTATION

IMPELLER

The impeller (Fig. 10) is an integral part of the converter housing. The impeller consists of curved blades placed radially along the inside of the housing on the transmission side of the converter. As the converter housing is rotated by the engine, so is the impeller, because they are one and the same and are the driving member of the system.

DESCRIPTION AND OPERATION (Continued)

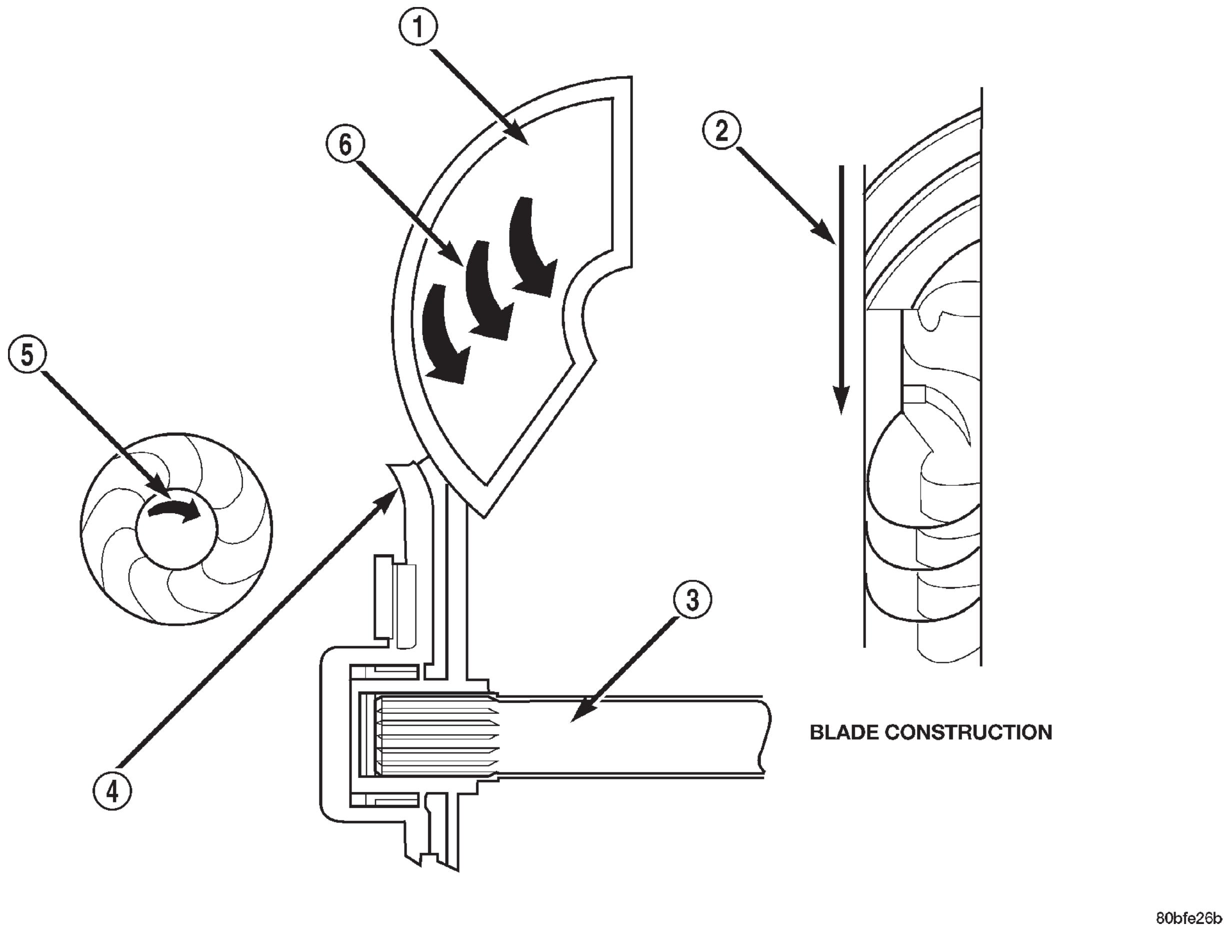

Fig. 11 Turbine

1 – TURBINE VANE
2 – ENGINE ROTATION
3 – INPUT SHAFT
4 – PORTION OF TORQUE CONVERTER COVER
5 – ENGINE ROTATION
6 – OIL FLOW WITHIN TURBINE SECTION

TURBINE

The turbine (Fig. 11) is the output, or driven, member of the converter. The turbine is mounted within the housing opposite the impeller, but is not attached to the housing. The input shaft is inserted through the center of the impeller and splined into the turbine. The design of the turbine is similar to the impeller, except the blades of the turbine are curved in the opposite direction.

DESCRIPTION AND OPERATION (Continued)

STATOR

The stator assembly (Fig. 12) is mounted on a stationary shaft which is an integral part of the oil pump. The stator is located between the impeller and turbine within the torque converter case (Fig. 13). The stator contains an over-running clutch, which allows the stator to rotate only in a clockwise direction. When the stator is locked against the over-running clutch, the torque multiplication feature of the torque converter is operational.

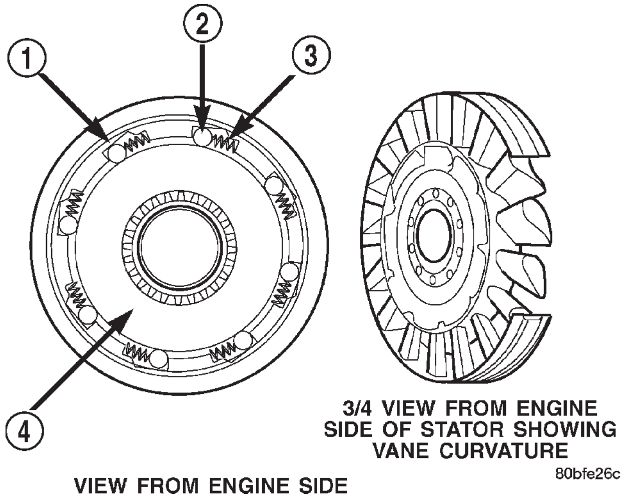

Fig. 12 Stator Components

1 – CAM (OUTER RACE)
2 – ROLLER
3 – SPRING
4 – INNER RACE

TORQUE CONVERTER CLUTCH (TCC)

The TCC (Fig. 14) was installed to improve the efficiency of the torque converter that is lost to the slippage of the fluid coupling. Although the fluid coupling provides smooth, shock–free power transfer, it is natural for all fluid couplings to slip. If the impeller and turbine were mechanically locked together, a zero slippage condition could be obtained. A hydraulic piston was added to the turbine, and a friction material was added to the inside of the front cover to provide this mechanical lock-up.

OPERATION

The converter impeller (Fig. 15) (driving member), which is integral to the converter housing and bolted to the engine drive plate, rotates at engine speed. The converter turbine (driven member), which reacts from fluid pressure generated by the impeller, rotates and turns the transmission input shaft.

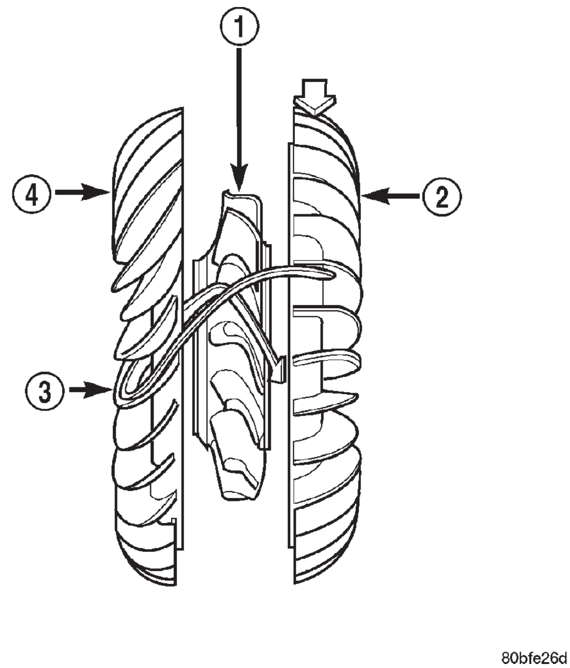

Fig. 13 Stator Location

1 – STATOR
2 – IMPELLER
3 – FLUID FLOW
4 – TURBINE

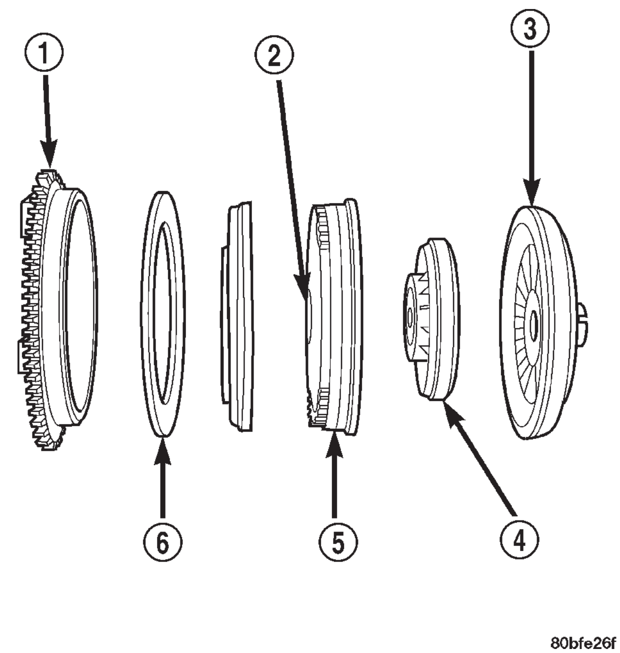

Fig. 14 Torque Converter Clutch (TCC)

1 – IMPELLER FRONT COVER
2 – THRUST WASHER ASSEMBLY
3 – IMPELLER
4 – STATOR
5 – TURBINE
6 – FRICTION DISC

DESCRIPTION AND OPERATION (Continued)

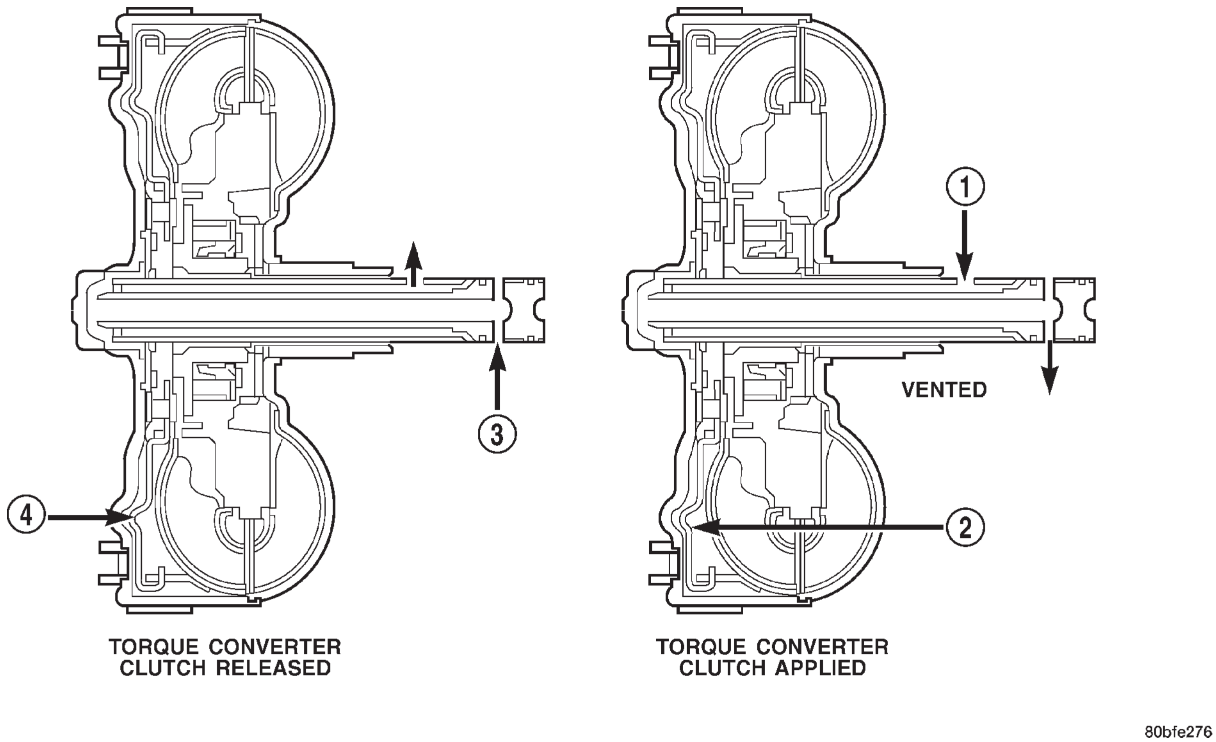

Fig. 15 Torque Converter Fluid Operation

1 – APPLY PRESSURE
2 – THE PISTON MOVES SLIGHTLY FORWARD
3 – RELEASE PRESSURE
4 – THE PISTON MOVES SLIGHTLY REARWARD

TURBINE

As the fluid that was put into motion by the impeller blades strikes the blades of the turbine, some of the energy and rotational force is transferred into the turbine and the input shaft. This causes both of them (turbine and input shaft) to rotate in a clockwise direction following the impeller. As the fluid is leaving the trailing edges of the turbine's blades it continues in a "hindering" direction back toward the impeller. If the fluid is not redirected before it strikes the impeller, it will strike the impeller in such a direction that it would tend to slow it down.

STATOR

Torque multiplication is achieved by locking the stator's over-running clutch to its shaft (Fig. 16). Under stall conditions (the turbine is stationary), the oil leaving the turbine blades strikes the face of the stator blades and tries to rotate them in a counterclockwise direction. When this happens the over–running clutch of the stator locks and holds the stator from rotating. With the stator locked, the oil strikes the stator blades and is redirected into a "helping" direction before it enters the impeller. This circulation of oil from impeller to turbine, turbine to stator, and stator to impeller, can produce a maximum torque multiplication of about 2.4:1. As the turbine begins to match the speed of the impeller, the fluid that was hitting the stator in such as way as to cause it to lock–up is no longer doing so. In this condition of operation, the stator begins to free wheel and the converter acts as a fluid coupling.

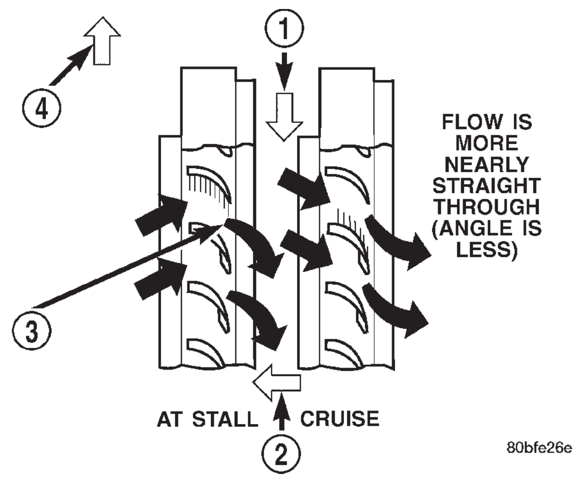

Fig. 16 Stator Operation

1 – DIRECTION STATOR WILL FREE WHEEL DUE TO OIL PUSHING ON BACKSIDE OF VANES
2 – FRONT OF ENGINE
3 – INCREASED ANGLE AS OIL STRIKES VANES
4 – DIRECTION STATOR IS LOCKED UP DUE TO OIL PUSHING AGAINST STATOR VANES

DESCRIPTION AND OPERATION (Continued)

TORQUE CONVERTER CLUTCH (TCC)

In a standard torque converter, the impeller and turbine are rotating at about the same speed and the stator is freewheeling, providing no torque multiplication. By applying the turbine's piston to the front cover's friction material, a total converter engagement can be obtained. The result of this engagement is a direct 1:1 mechanical link between the engine and the transmission.

Converter clutch engagement in third or fourth gear range is controlled by sensor inputs to the powertrain control module. Inputs that determine clutch engagement are: coolant temperature, engine rpm, vehicle speed, throttle position, and manifold vacuum. The torque converter clutch is engaged by the clutch solenoid on the valve body. The clutch can be engaged in third and fourth gear ranges depending on overdrive control switch position. If the overdrive control switch is in the normal ON position, the clutch will engage after the shift to fourth gear, and above approximately 72 km/h (45 mph). If the control switch is in the OFF position, the clutch will engage after the shift to third gear, at approximately 56 km/h (35 mph) at light throttle.

OIL PUMP

DESCRIPTION

The oil pump (Fig. 17) is located in the pump housing inside the bell housing of the transmission case. The oil pump consists of an inner and outer gear, a housing, and a cover that also serves as the reaction shaft support.

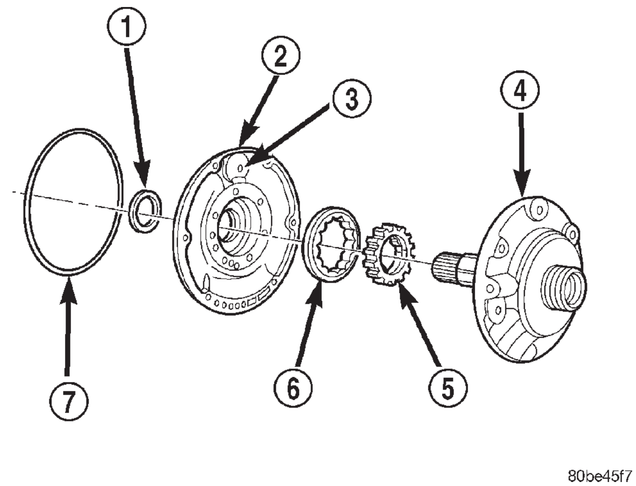

Fig. 17 Oil Pump Assembly

1 – OIL SEAL
2 – OIL PUMP BODY
3 – VENT
4 – REACTION SHAFT SUPPORT
5 – INNER ROTOR
6 – OUTER ROTOR
7 – “O” RING

OPERATION

As the torque converter rotates, the converter hub rotates the inner and outer gears. As the gears rotate, the clearance between the gear teeth increases in the crescent area, and creates a suction at the inlet side of the pump. This suction draws fluid through the pump inlet from the oil pan. As the clearance between the gear teeth in the crescent area decreases, it forces pressurized fluid into the pump outlet and to the valve body.

DESCRIPTION AND OPERATION (Continued)

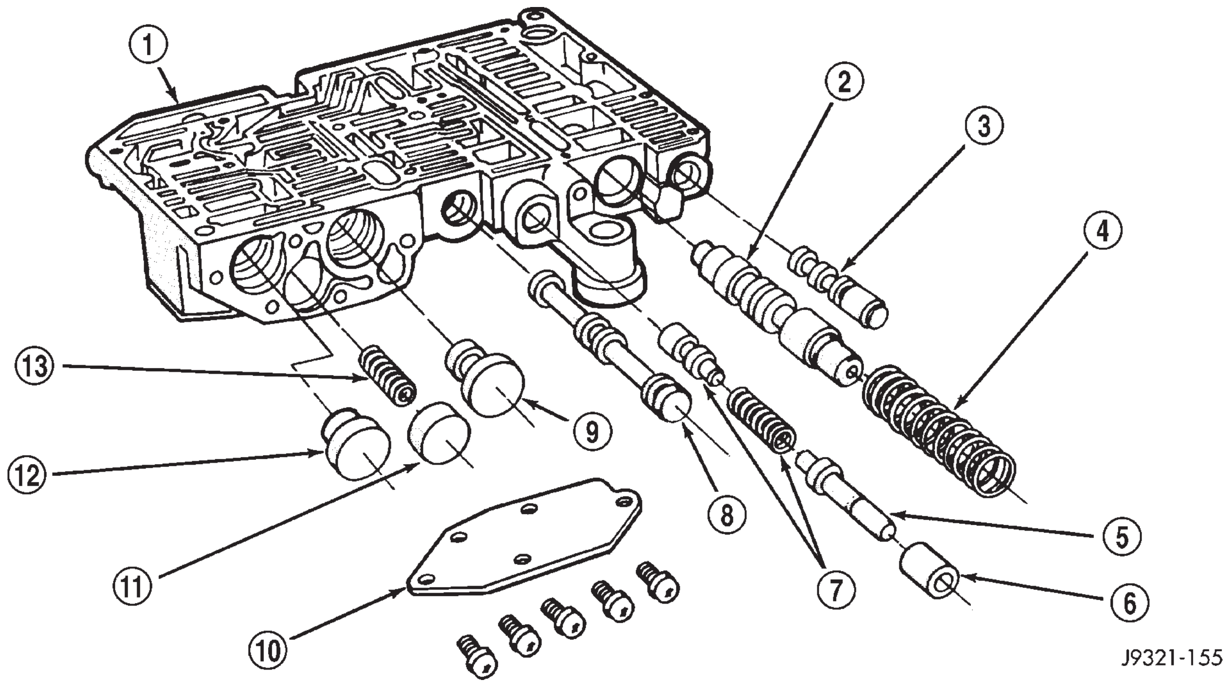

Fig. 18 Upper Housing Control Valve Locations

1 – UPPER HOUSING
2 – REGULATOR VALVE
3 – SWITCH VALVE
4 – REGULATOR VALVE SPRING
5 – KICKDOWN VALVE
6 – KICKDOWN DETENT
7 – THROTTLE VALVE AND SPRING
8 – MANUAL VALVE
9 – 1–2 GOVERNOR PLUG
10 – GOVERNOR PLUG COVER
11 – THROTTLE PLUG
12 – 2–3 GOVERNOR PLUG
13 – SHUTTLE VALVE PRIMARY SPRING

VALVE BODY

DESCRIPTION

The valve body consists of a cast aluminum valve body, a separator plate, and transfer plate. The valve body contains valves and check balls that control fluid delivery to the torque converter clutch, bands, and frictional clutches. The valve body contains the following components (Fig. 18), (Fig. 19), (Fig. 20), and (Fig. 21):

- Regulator valve
- Regulator valve throttle pressure plug
- Line pressure plug and sleeve
- Kickdown valve
- Kickdown limit valve
- 1–2 shift valve
- 1–2 control valve
- 2–3 shift valve
- 2–3 governor plug
- 3–4 shift valve
- 3–4 timing valve
- 3–4 quick fill valve
- 3–4 accumulator
- Throttle valve
- Throttle pressure plug
- Switch valve
- Manual valve
- Converter clutch lock-up valve
- Converter clutch lock-up timing Valve
- Shuttle valve
- Shuttle valve throttle plug
- Boost Valve
- 10 check balls

By adjusting the spring pressure acting on the regulator valve, transmission line pressure can be adjusted.

DESCRIPTION AND OPERATION (Continued)

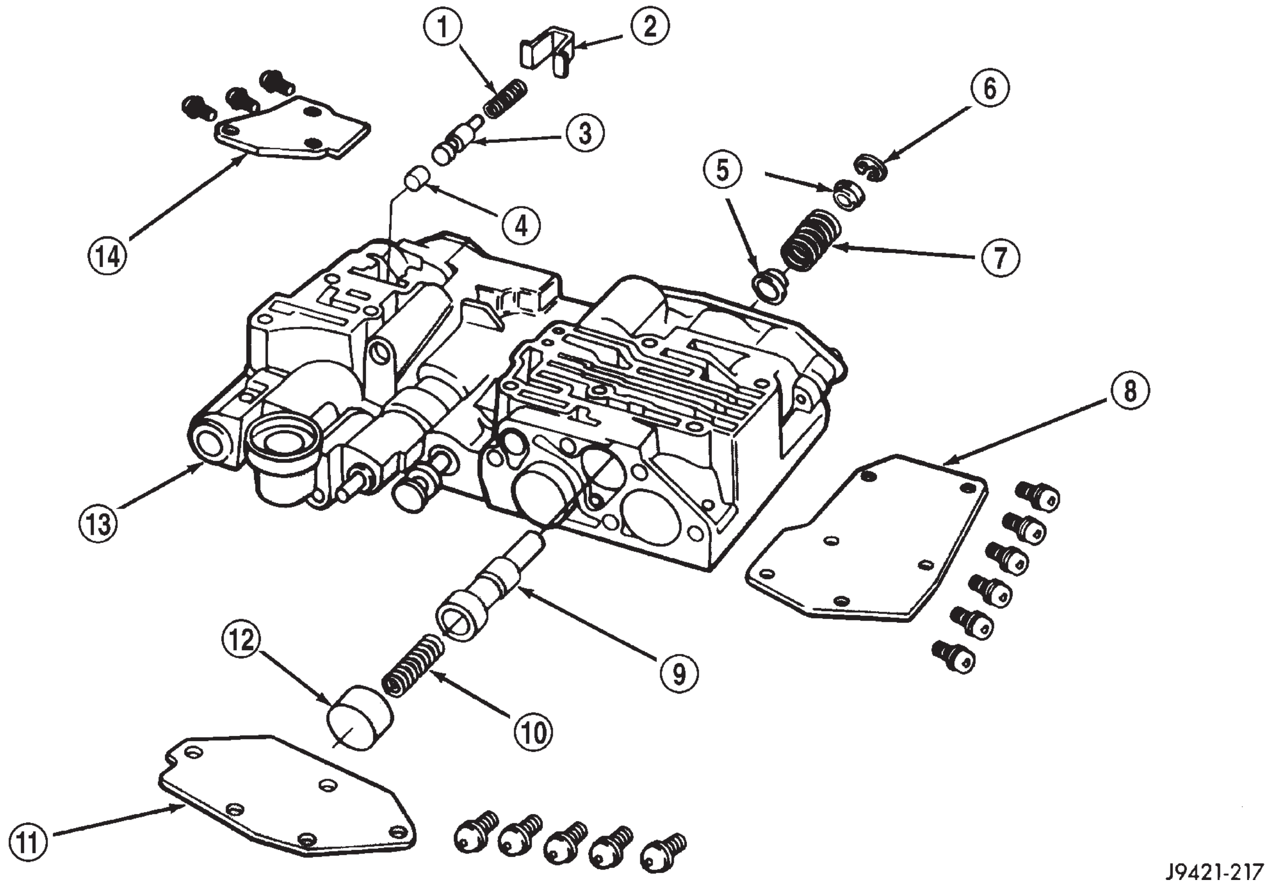

Fig. 19 Shuttle and Boost Valve Locations

1 – SPRING
2 – RETAINER
3 – BOOST VALVE
4 – BOOST VALVE PLUG
5 – SPRING GUIDES
6 – E-CLIP
7 – SHUTTLE VALVE SECONDARY SPRING
8 – SHUTTLE VALVE COVER
9 – SHUTTLE VALVE
10 – SHUTTLE VALVE PRIMARY SPRING
11 – GOVERNOR PLUG COVER
12 – THROTTLE PLUG
13 – UPPER HOUSING
14 – BOOST VALVE COVER

DESCRIPTION AND OPERATION (Continued)

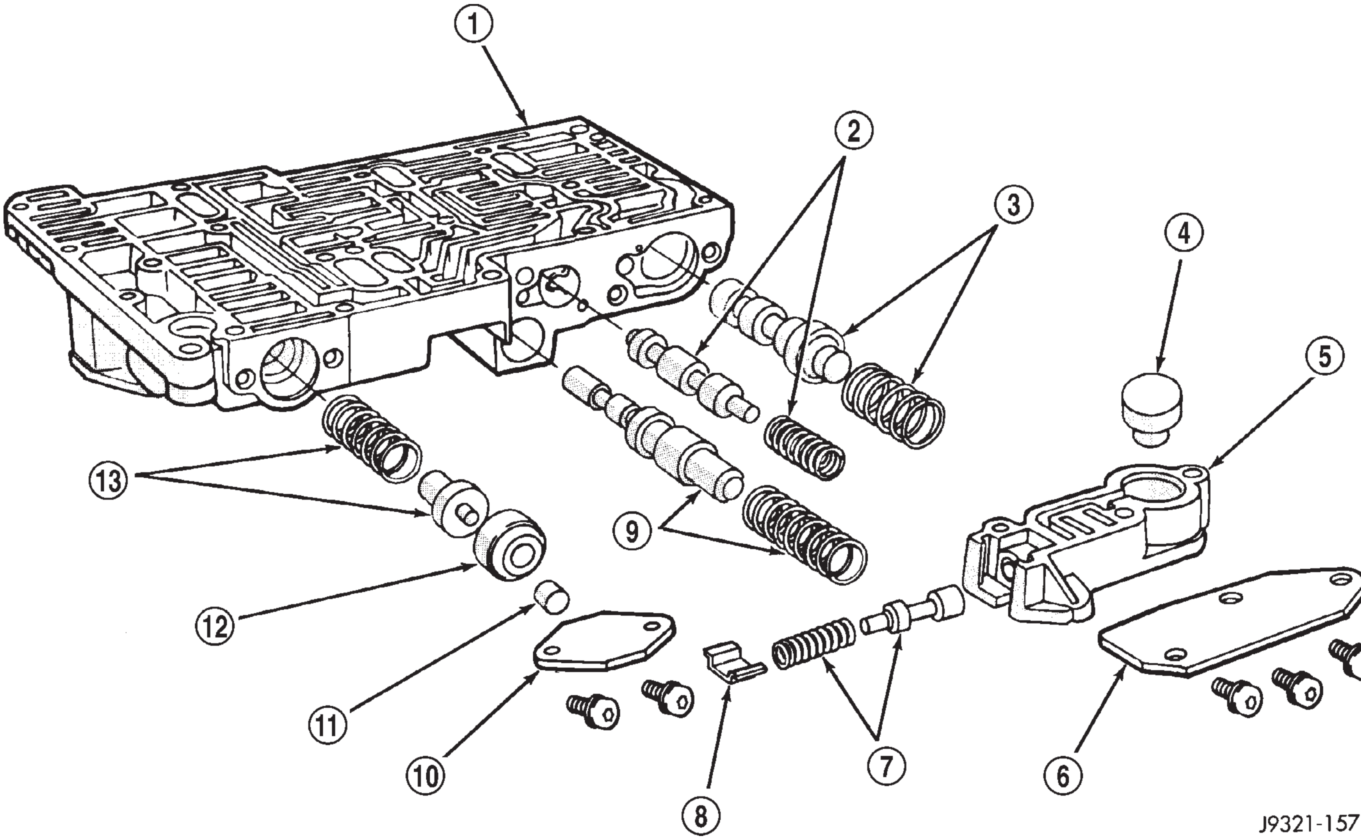

Fig. 20 Upper Housing Shift Valve and Pressure Plug Locations

1 – UPPER HOUSING
2 – 1–2 SHIFT VALVE AND SPRING
3 – 2–3 SHIFT VALVE AND SPRING
4 – 2–3 THROTTLE PLUG
5 – LIMIT VALVE HOUSING
6 – LIMIT VALVE COVER
7 – LIMIT VALVE AND SPRING
8 – RETAINER
9 – 1–2 SHIFT CONTROL VALVE AND SPRING
10 – PRESSURE PLUG COVER
11 – LINE PRESSURE PLUG
12 – PLUG SLEEVE
13 – THROTTLE PRESSURE SPRING AND PLUG

DESCRIPTION AND OPERATION (Continued)

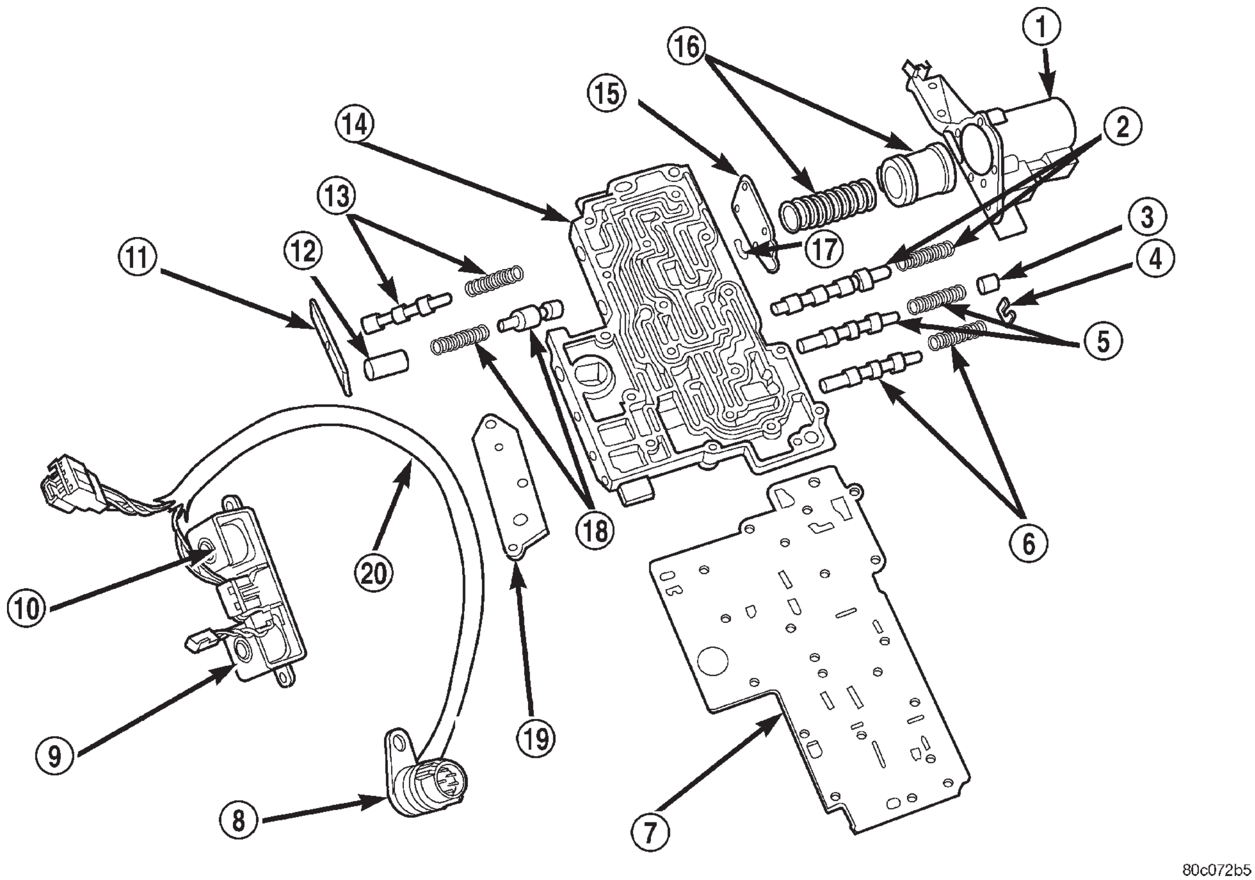

Fig. 21 Lower Housing Shift Valves and Springs

1 – 3-4 ACCUMULATOR HOUSING
2 – 3-4 SHIFT VALVE AND SPRING
3 – PLUG
4 – SPRING RETAINER
5 – CONVERTER CLUTCH VALVE AND SPRING
6 – CONVERTER CLUTCH TIMING VALVE AND SPRING
7 – OVERDRIVE SEPARATOR PLATE
8 – CASE CONNECTOR
9 – CONVERTER CLUTCH SOLENOID
10 – OVERDRIVE SOLENOID
11 – TIMING VALVE COVER
12 – PLUG
13 – 3-4 TIMING VALVE AND SPRING
14 – LOWER HOUSING
15 – ACCUMULATOR END PLATE
16 – 3-4 ACCUMULATOR PISTON AND SPRING
17 – E-CLIP
18 – 3-4 QUICK FILL SPRING AND VALVE
19 – SOLENOID GASKET
20 – HARNESS

DESCRIPTION AND OPERATION (Continued)

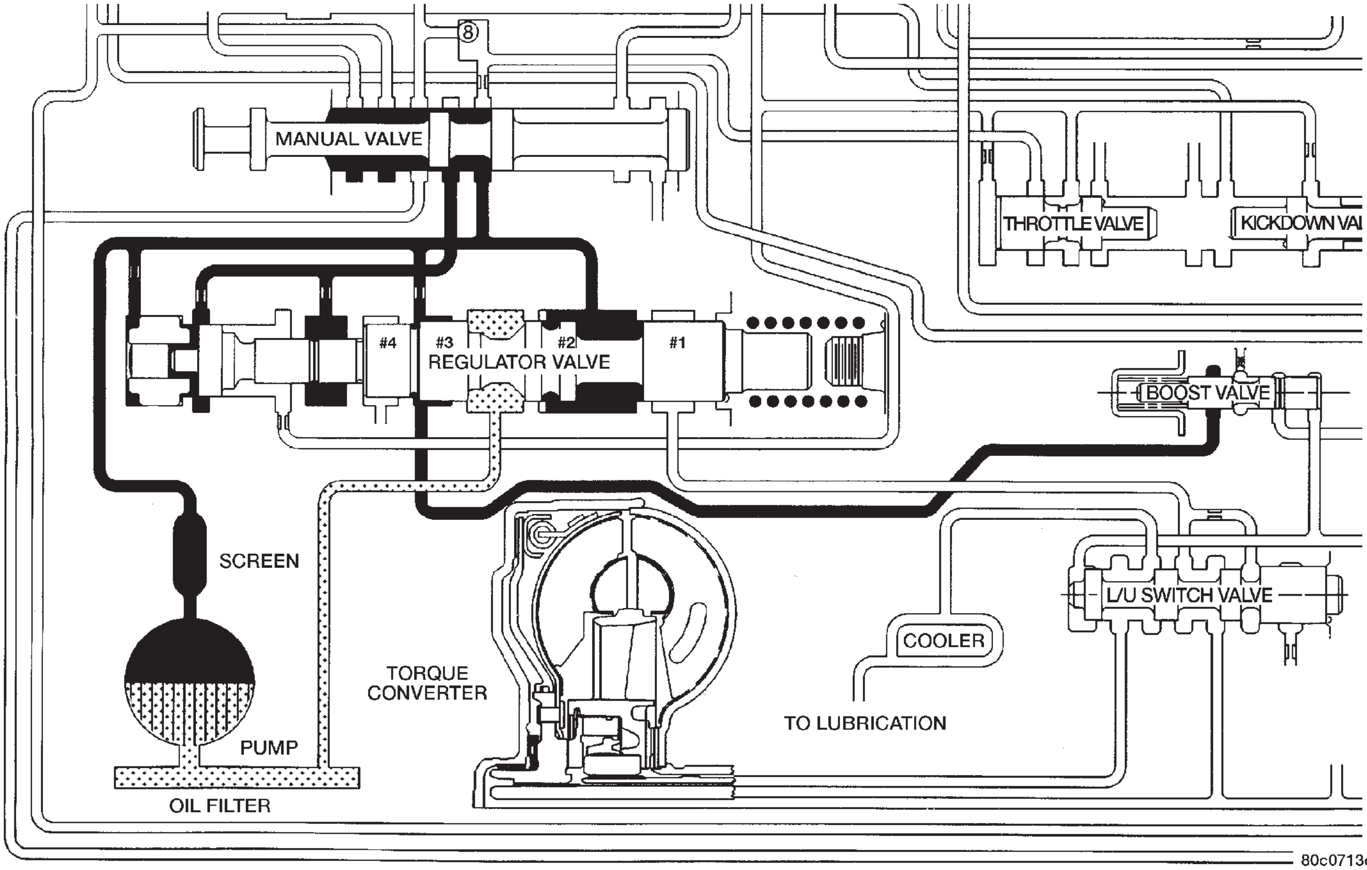

Fig. 22 Regulator Valve in Park Position

OPERATION

NOTE: Refer to the Hydraulic Schematics for a visual aid in determining valve location, operation and design.

REGULATOR VALVE

The pressure regulator valve is needed to control the hydraulic pressure within the system and reduce the amount of heat produced in the fluid. The pressure regulator valve is located in the valve body near the manual valve. The pressure regulator valve train controls the maximum pressure in the lines by metering the dumping of fluid back into the sump. Regulated pressure is referred to as “line pressure.”

The regulator valve (Fig. 22) has a spring on one end that pushes the valve to the left. This closes a dump (vent) that is used to lower pressure. The closing of the dump will cause the oil pressure to increase. Oil pressure on the opposite end of the valve pushes the valve to the right, opening the dump and lowering oil pressure. The result is spring pressure working against oil pressure to maintain the oil at specific pressures. With the engine running, fluid flows from the pump to the pressure regulator valve, manual valve, and the interconnected circuits. As fluid is sent through passages to the regulator valve, the pressure pushes the valve to the right against the large spring. It is also sent to the reaction areas on the left side of the throttle pressure plug and the line pressure plug. With the gear selector in the park position, fluid recirculates through the regulator and manual valves back to the sump.

DESCRIPTION AND OPERATION (Continued)

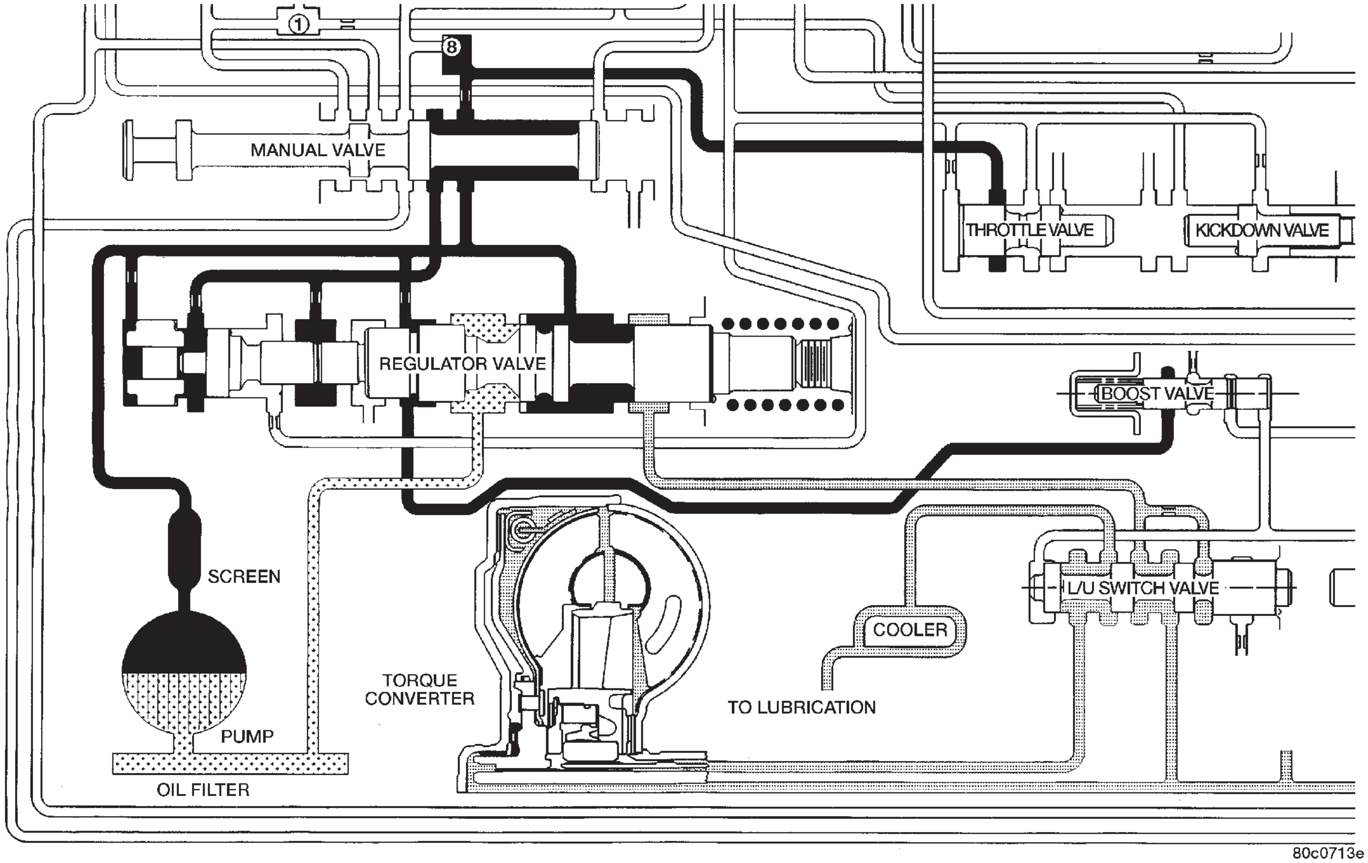

Fig. 23 Regulator Valve in Neutral Position

Meanwhile, the torque converter is filled slowly. In all other gear positions (Fig. 23), fluid flows between two right side lands to the switch valve and torque converter. At low pump speeds, the flow is controlled by the pressure valve groove to reduce pressure to the torque converter. After the torque converter and switch valve fill with fluid, the switch valve becomes the controlling metering device for torque converter pressure. The regulator valve then begins to control the line pressure for the other transmission circuits. The balance of the fluid pressure pushing the valve to the right and the spring pressure pushing to the left determines the size of the metering passage at land #2 (land #1 being at the far right of the valve in the diagram). As fluid leaks past the land, it moves into a groove connected to the filter or sump. As the land meters the fluid to the sump, it causes the pressure to reduce and the spring decreases the size of the metering passage. When the size of the metering passage is reduced, the pressure rises again and the size of the land is increased again. Pressure is regulated by this constant balance of hydraulic and spring pressure.

DESCRIPTION AND OPERATION (Continued)

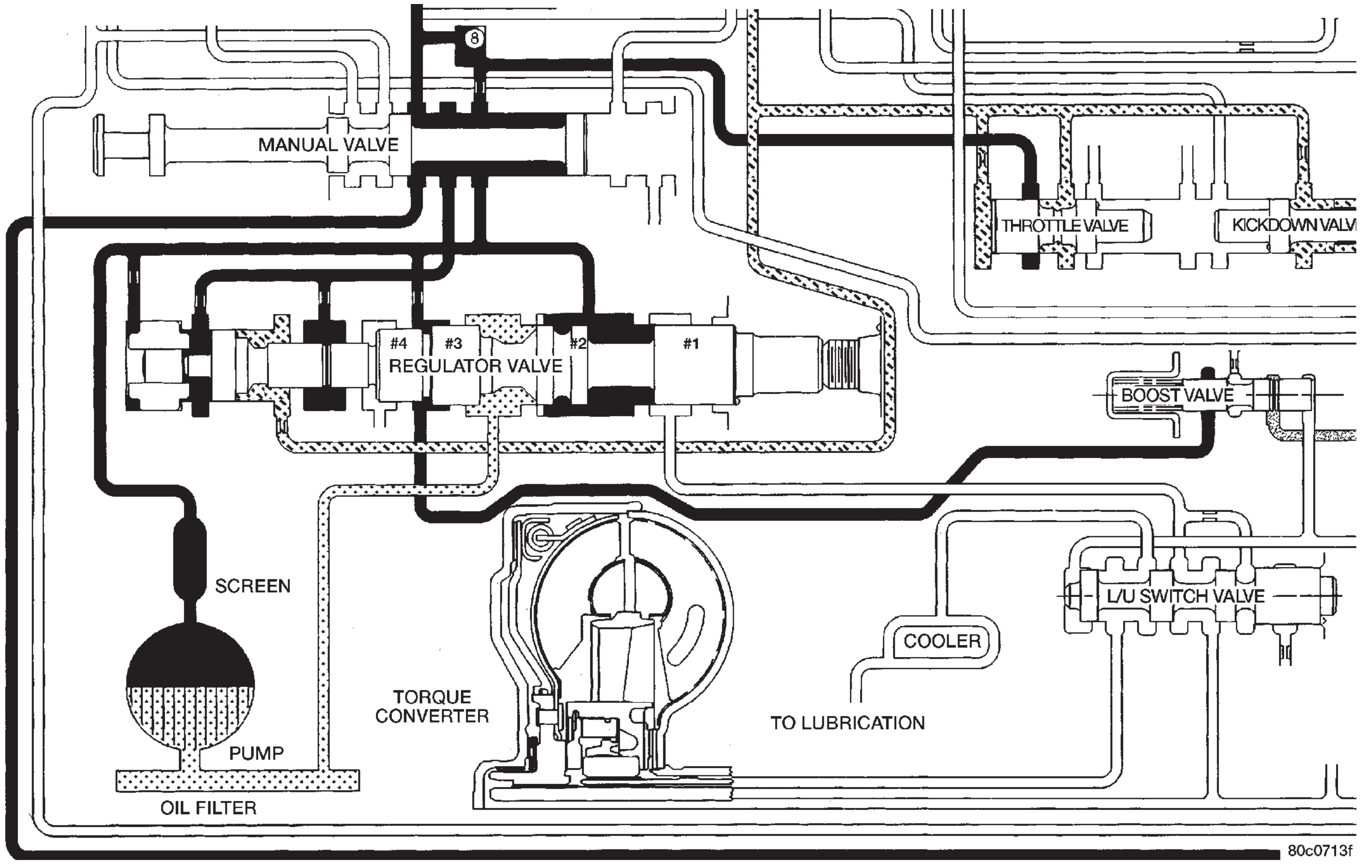

Fig. 24 Regulator Valve in Drive Position

The metering at land #2 establishes the line pressure throughout the transmission. It is varied according to changes in throttle position, engine speed, and transmission condition within a range of 57–94 psi (except in reverse) (Fig. 24). The regulated line pressure in reverse (Fig. 25) is held at much higher pressures than in the other gear positions: 145–280 psi. The higher pressure for reverse is achieved by the manual valve blocking the supply of line pressure to the reaction area left of land #4. With this pressure blocked, there is less area for pressure to act on to balance the force of the spring on the right. This allows line pressure to push the valve train to the right, reducing the amount of fluid returned to the pump's inlet, increasing line pressure.

DESCRIPTION AND OPERATION (Continued)

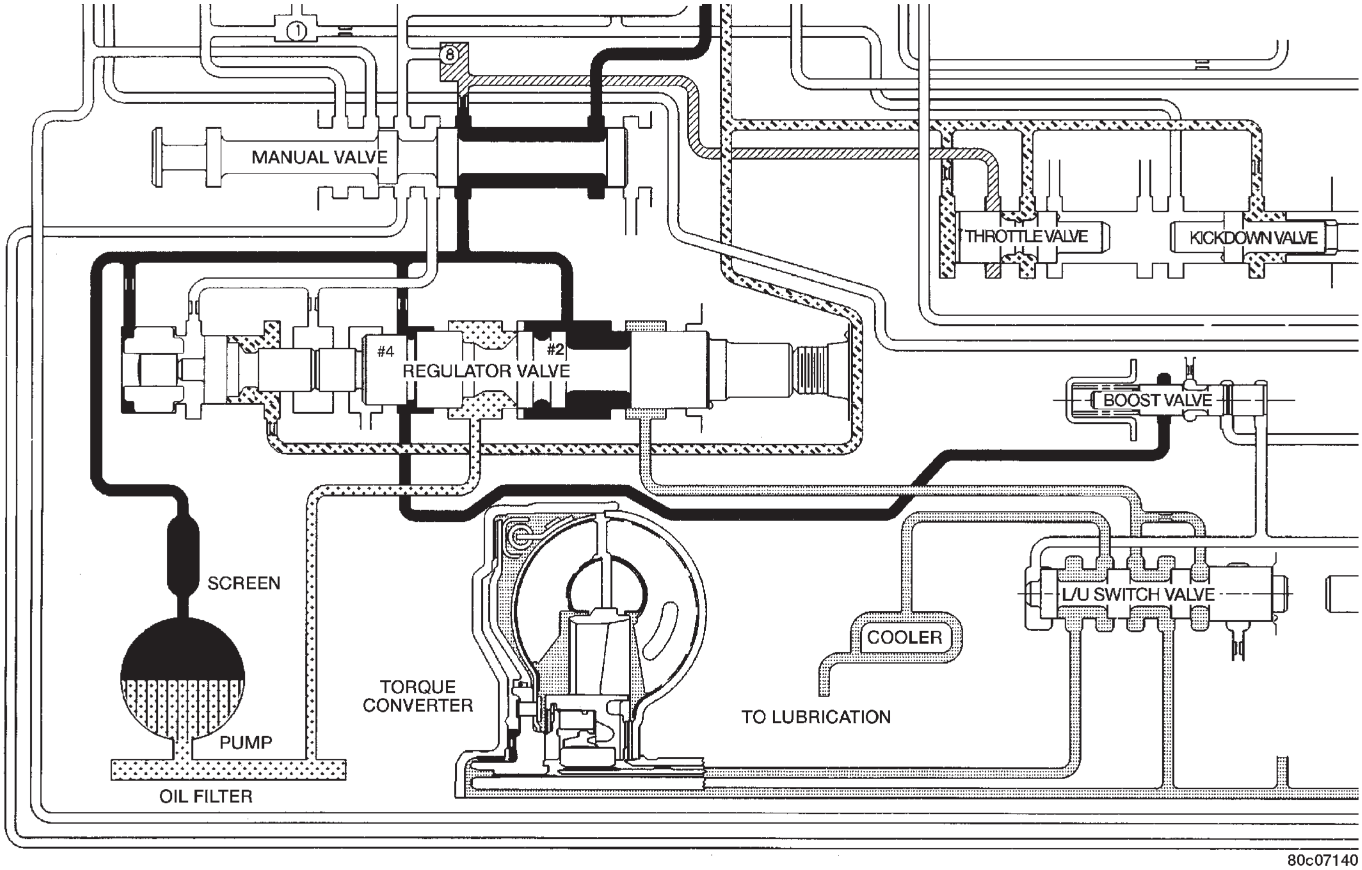

Fig. 25 Regulator Valve in Reverse Position

DESCRIPTION AND OPERATION (Continued)

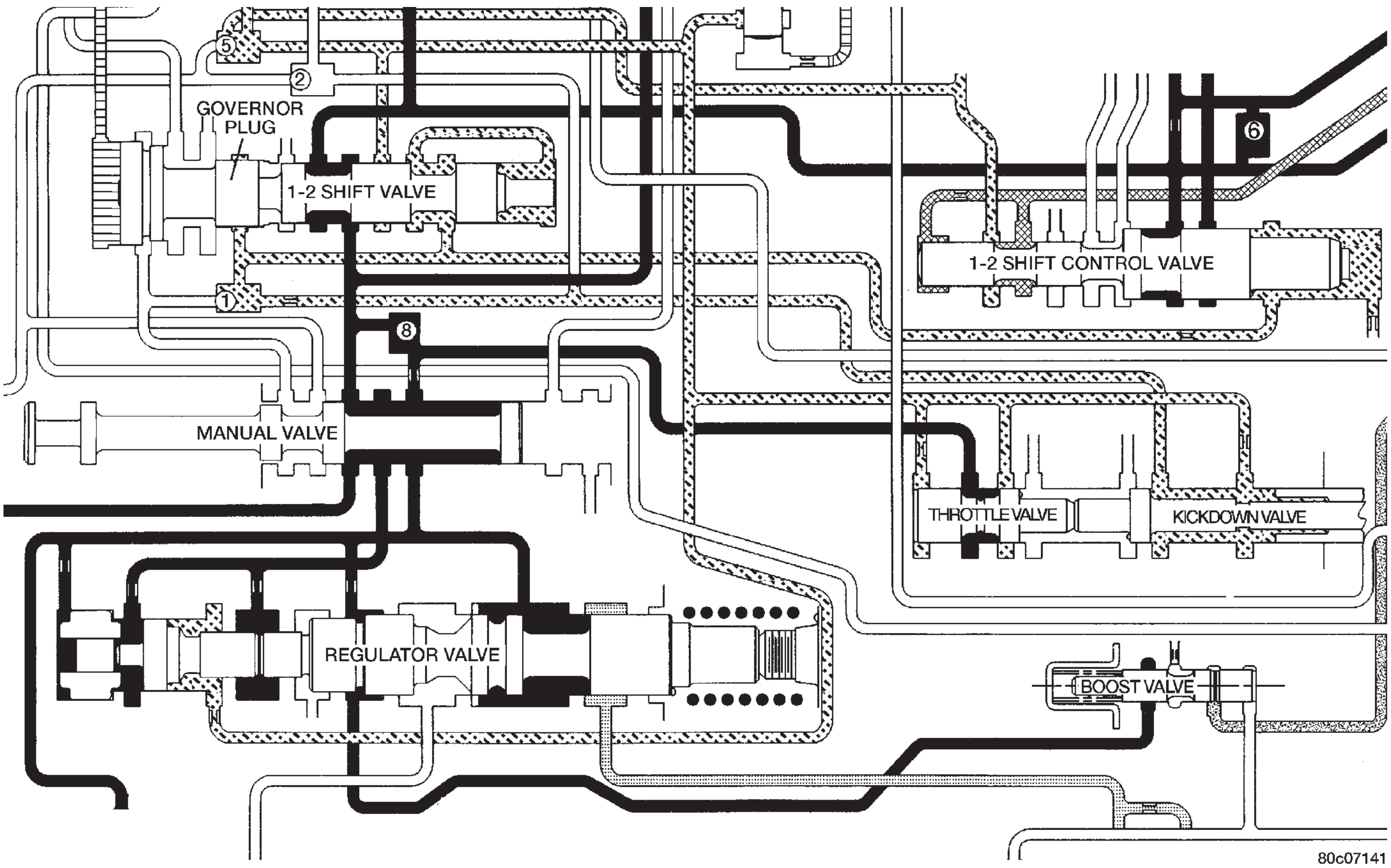

Fig. 26 Kickdown Valve–Wide Open Throttle

KICKDOWN VALVE

When the throttle valve is as far over to the left as it can go, the maximum line pressure possible will enter the throttle pressure circuit. In this case, throttle pressure will equal line pressure. With the kickdown valve (Fig. 26) pushed into the bore as far as it will go, fluid initially flows through the annular groove of the 2–3 shift valve (which will be in the direct drive position to the right).

After passing the annular groove, the fluid is routed to the spring end of the 2–3 shift valve. Fluid pressure reacting on the area of land #1 overcomes governor pressure, downshifting the 2–3 shift valve into the kickdown, or second gear stage of operation. The valve is held in the kickdown position by throttle pressure routed from a seated check ball (#2). Again, if vehicle speed is low enough, throttle pressure will also push the 1–2 shift valve left to seat its governor plug, and downshift to drive breakaway.

DESCRIPTION AND OPERATION (Continued)

KICKDOWN LIMIT VALVE

The purpose of the limit valve is to prevent a 3–2 downshift at higher speeds when a part–throttle downshift is not desirable. At these higher speeds only a full throttle 3–2 downshift will occur. At low road speeds (Fig. 27) the limit valve does not come into play and does not affect the downshifts. As the vehicle's speed increases (Fig. 28), the governor pressure also increases. The increased governor pressure acts on the reaction area of the bottom land of the limit valve overcoming the spring force trying to push the valve toward the bottom of its bore. This pushes the valve upward against the spring and bottoms the valve against the top of the housing. With the valve bottomed against the housing, the throttle pressure supplied to the valve will be closed off by the bottom land of the limit valve. When the supply of throttle pressure has been shut off, the 3–2 part throttle downshift plug becomes inoperative, because no pressure is acting on its reaction area.

1–2 SHIFT VALVE

The 1–2 shift valve assembly (Fig. 29), or mechanism, consists of: the 1–2 shift valve, governor plug, and a spring on the end of the valve. After the manual valve has been placed into a forward gear range, line pressure is directed to the 1–2 shift valve. As the throttle is depressed, throttle pressure is applied to the right side of the 1–2 shift valve assembly. With throttle pressure applied to the right side of the valve, there is now both spring pressure and throttle pressure acting on the valve, holding it against the governor plug. As the vehicle begins to move and build speed, governor pressure is created and is applied to the left of the valve at the governor plug.

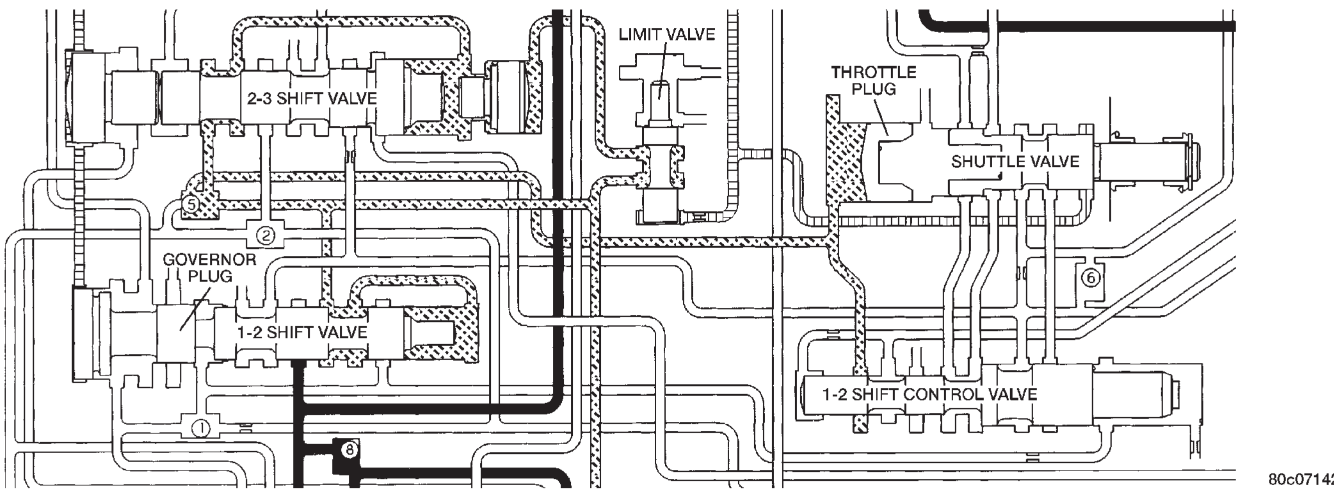

Fig. 27 Kickdown Limit Valve-Low Speeds

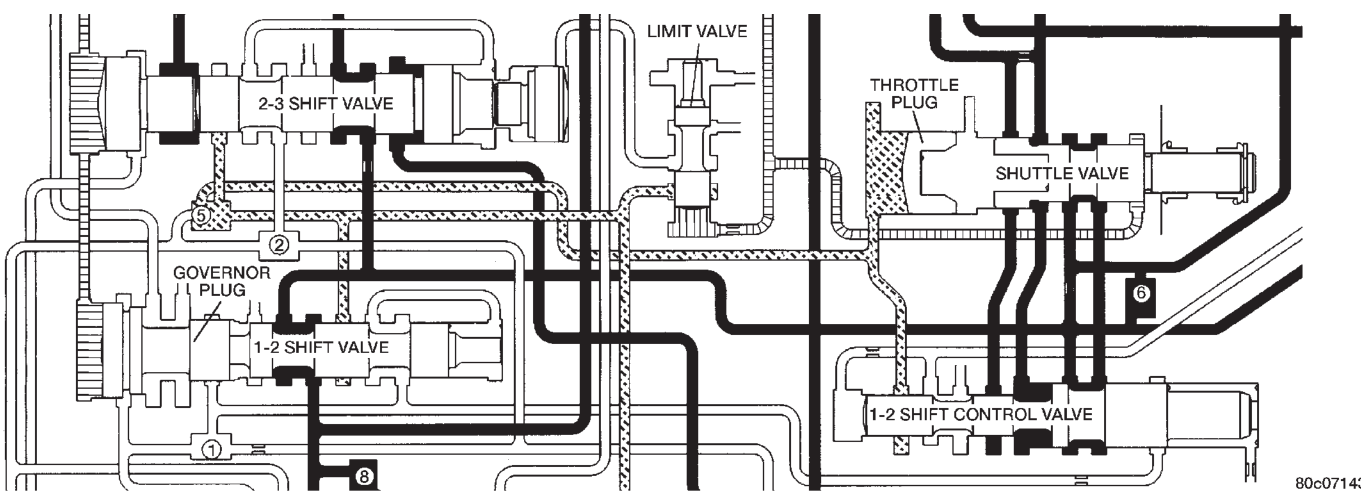

Fig. 28 Kickdown Limit Valve-High Speeds

DESCRIPTION AND OPERATION (Continued)

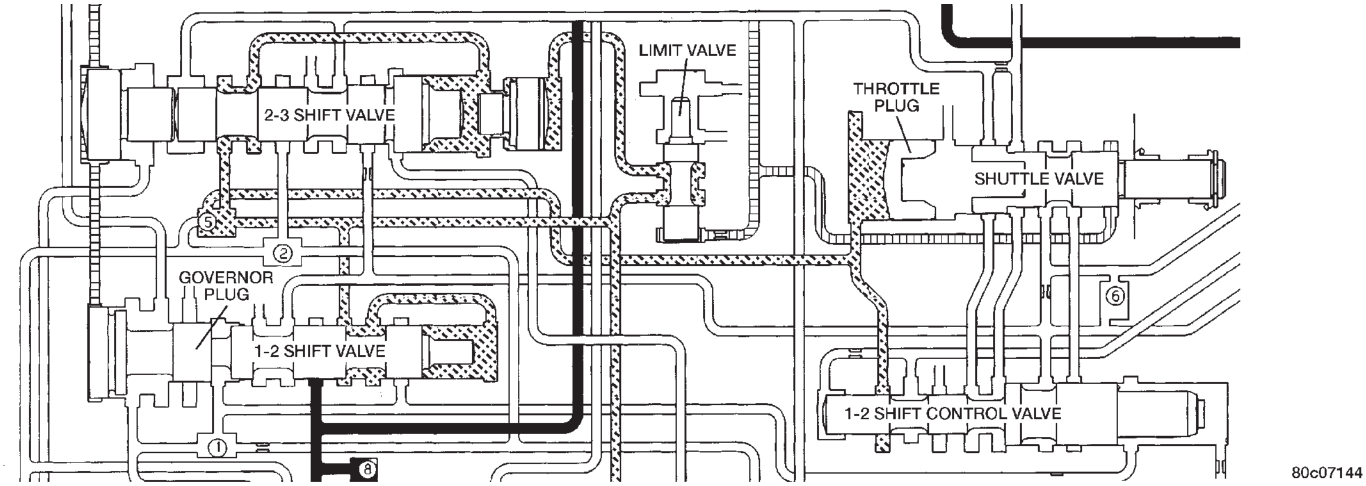

Fig. 29 1–2 Shift Valve-Before Shift

When governor pressure builds to a point where it can overcome the combined force of the spring and throttle pressure on the other side of the valve, the valve will begin to move over to the right. As the valve moves to the right, the middle land of the valve will close off the circuit supplying the throttle pressure to the right side of the valve. When the throttle pressure is closed off, the valve will move even farther to the right, allowing line pressure to enter another circuit and energize the front servo, applying the front band (Fig. 30).

The governor plug serves a dual purpose:

- It allows the shift valves to move either left or right, allowing both upshifts and downshifts.
- When in a manual selection position, it will be hydraulically "blocked" into position so no upshift can occur.

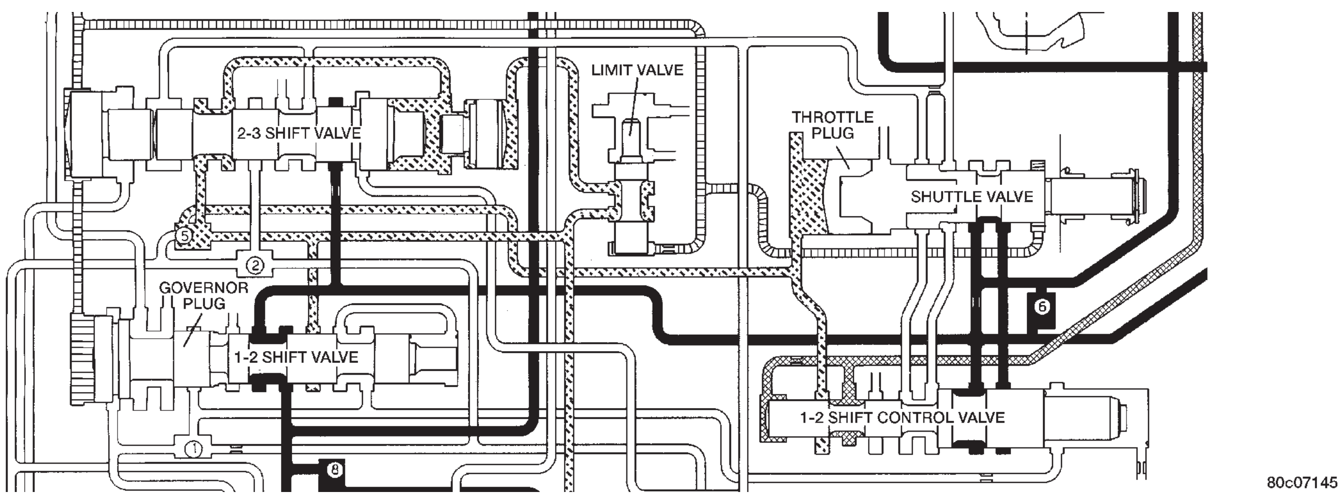

Fig. 30 1–2 Shift Valve-After Shift

DESCRIPTION AND OPERATION (Continued)

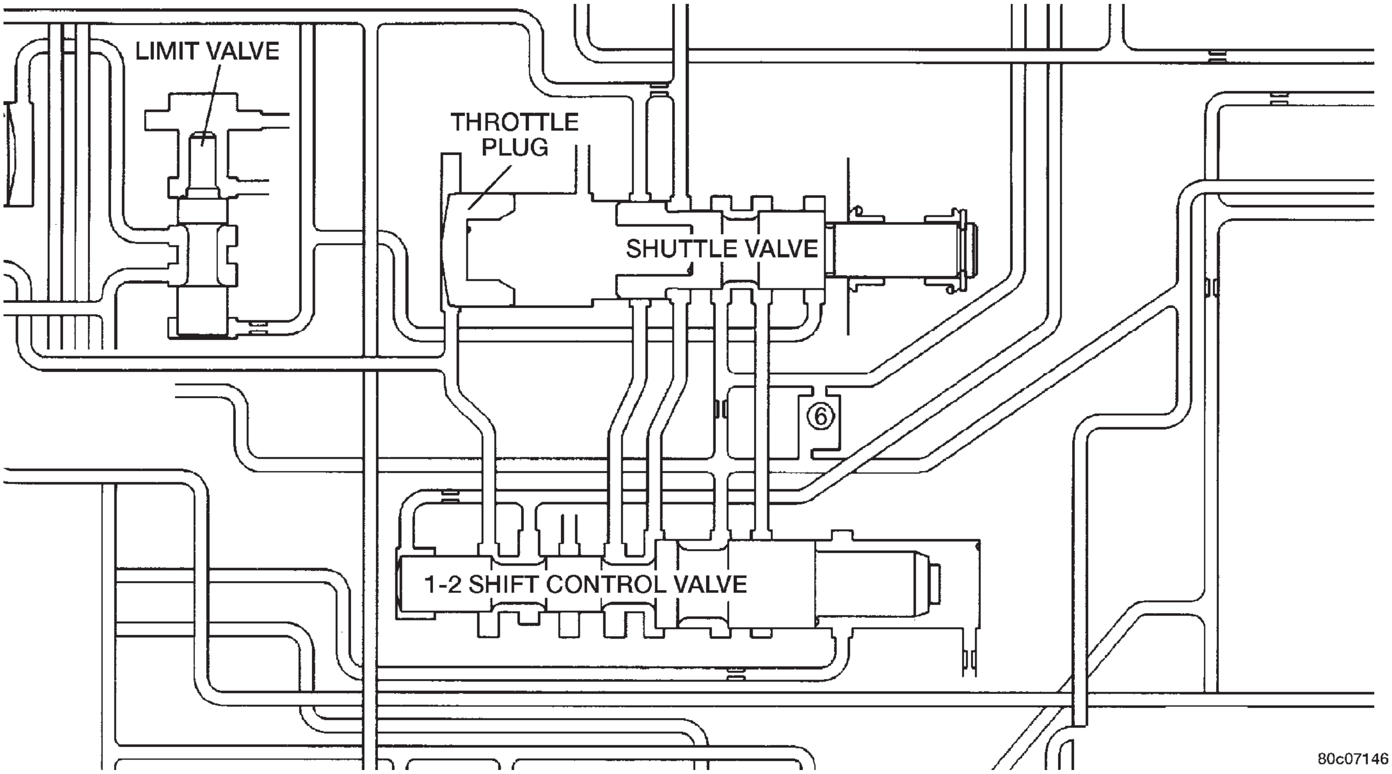

Fig. 31 1–2 Shift Control Valve

The physical blocking of the upshift while in the manual "1" position is accomplished by the directing of line pressure between both lands of the governor plug. The line pressure reacts against the larger land of the plug, pushing the plug back against the end plate overcoming governor pressure. With the combination of the line pressure and spring pressure, the valve cannot move, preventing any upshift.

1–2 SHIFT CONTROL VALVE

It contains a valve with four lands and a spring. It is used as both a "relay" and "balanced" valve.

The valve has two specific operations (Fig. 31):

- Aid in quality of the 1–2 upshift.
- Aid in the quality and timing of the 3–2 kickdown ranges.

When the manual valve is set to the Drive position and the transmission is in the first or second gear range, 1–2 shift control or "modulated throttle pressure" is supplied to the middle of the accumulator piston by the 1–2 shift control valve. During the 1–2 upshift, this pressure is used to control the kickdown servo apply pressure that is needed to apply the kickdown and accumulator pistons. Thus, the 1–2 shift point is "cushioned" and the quality is improved. During a WOT kickdown, kickdown pressure is applied between the kickdown valve and the 1–2 shift control valve. This additional pressure is directed to the 1–2 shift control's spring cavity, adding to the spring load on the valve. The result of this increased "modulated" throttle pressure is a firmer WOT upshift.

DESCRIPTION AND OPERATION (Continued)

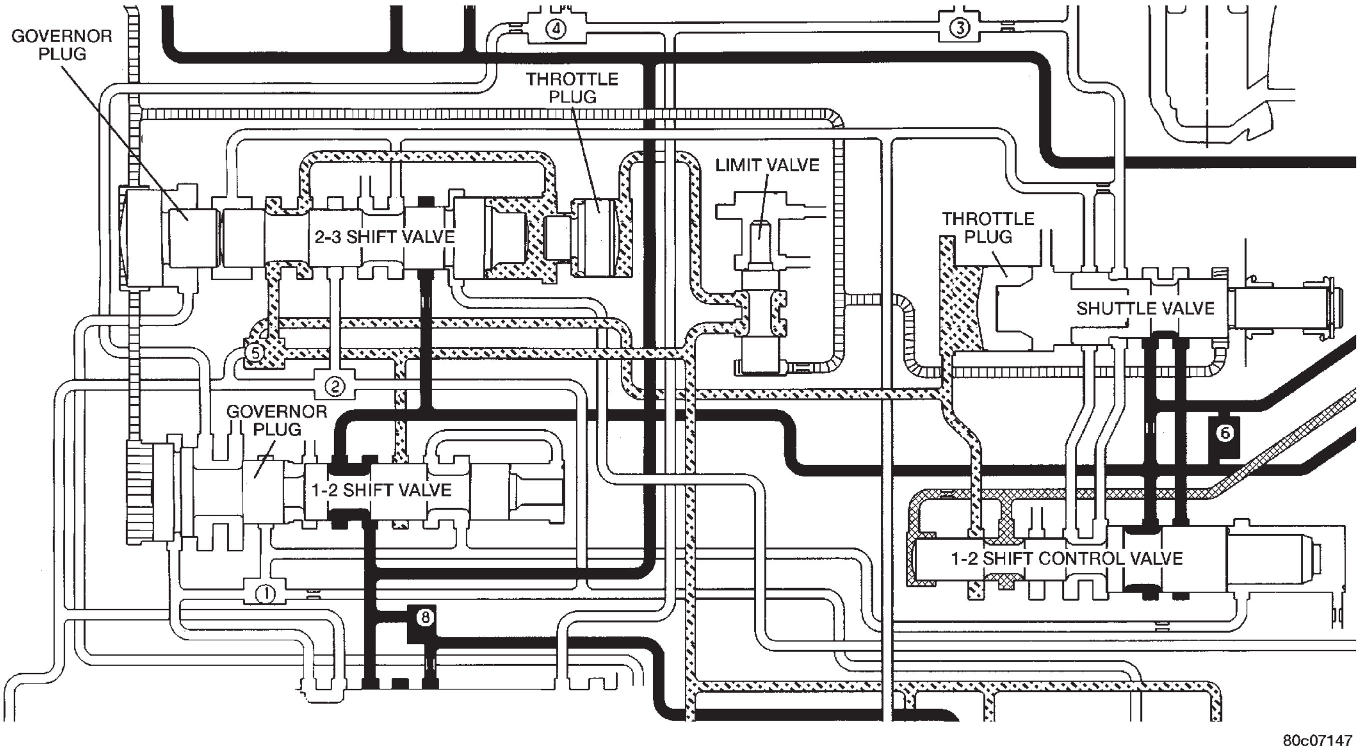

Fig. 32 2–3 Shift Valve-Before Shift

2–3 SHIFT VALVE

The 2–3 shift valve mechanism (Fig. 32) consists of the 2–3 shift valve, governor plug and spring, and a throttle plug. After the 1–2 shift valve has completed its operation and applied the front band, line pressure is directed to the 2–3 shift valve through the connecting passages from the 1–2 shift valve. The line pressure will then dead–end at land #2 until the 2–3 valve is ready to make its shift. Now that the vehicle is in motion and under acceleration, there is throttle pressure being applied to the spring side of the valve and between lands #3 and #4.

As vehicle speed increases, governor pressure increases proportionately, until it becomes great enough to overcome the combined throttle and spring pressure on the right side of the valve. When this happens, the governor plug is forced against the shift valve moving it to the right. The shift valve causes land #4 to close the passage supplying throttle pressure to the 2–3 shift valve. Without throttle pressure present in the circuit now, the governor plug will push the valve over far enough to bottom the valve in its bore. This allows land #2 to direct line pressure to the front clutch.

DESCRIPTION AND OPERATION (Continued)

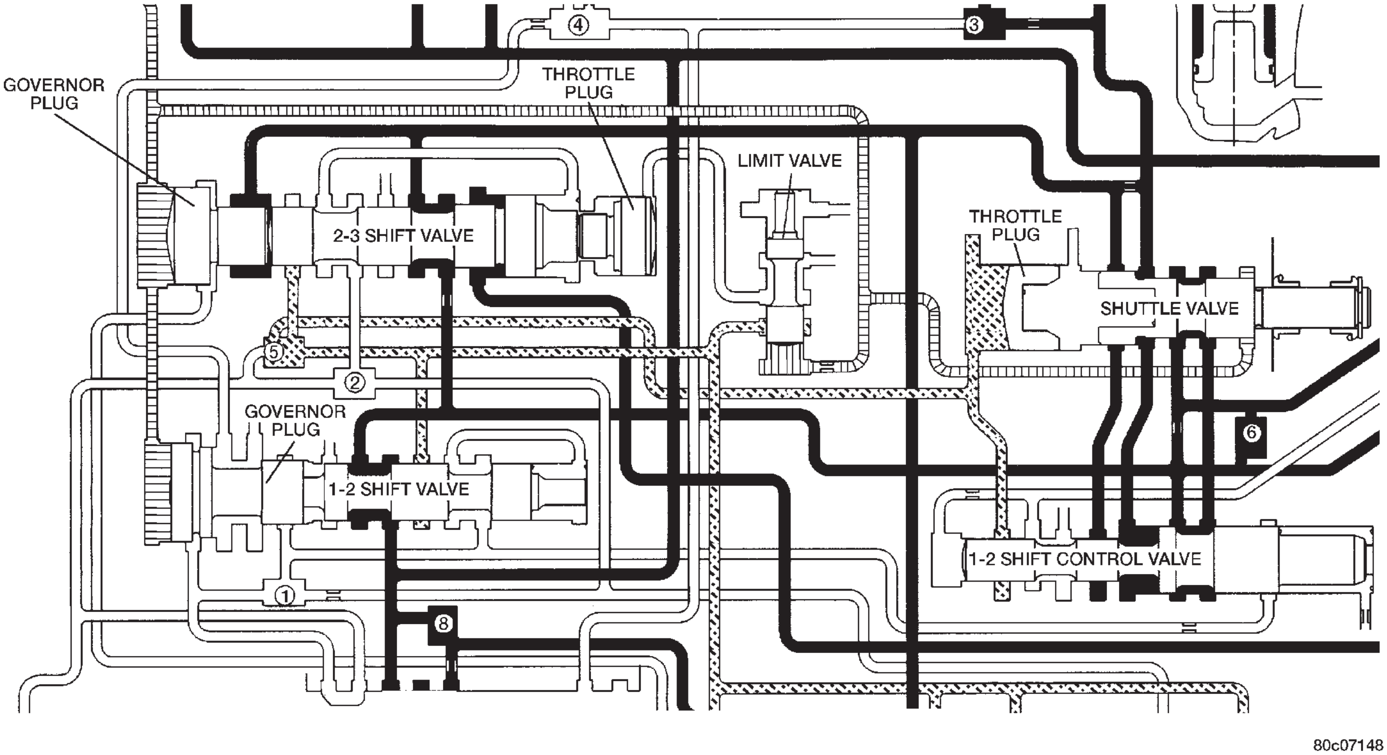

Fig. 33 2–3 Shift Valve-After Shift

After the shift (Fig. 33), line pressure is directed to the land between the shift valve and the governor plug, and to the release side of the kickdown servo. This releases the front band and applies the front clutch, shifting into third gear or direct drive. The rear clutch remains applied, as it has been in the other gears. During a manual “1” or manual “2” gear selection, line pressure is sent between the two lands of the 2–3 governor plug. This line pressure at the governor plug locks the shift valve into the second gear position, preventing an upshift into direct drive. The theory for the blocking of the valve is the same as that of the 1–2 shift valve.

DESCRIPTION AND OPERATION (Continued)

3–4 SHIFT VALVE

The PCM energizes the overdrive solenoid during the 3-4 upshift (Fig. 34). This causes the solenoid check ball to close the vent port allowing line pressure from the 2-3 shift valve to act directly on the 3-4 upshift valve. Line pressure on the 3-4 shift valve overcomes valve spring pressure moving the valve to the upshift position (Fig. 35). This action exposes the feed passages to the 3-4 timing valve, 3-4 quick fill valve, 3-4 accumulator, and ultimately to the overdrive piston.

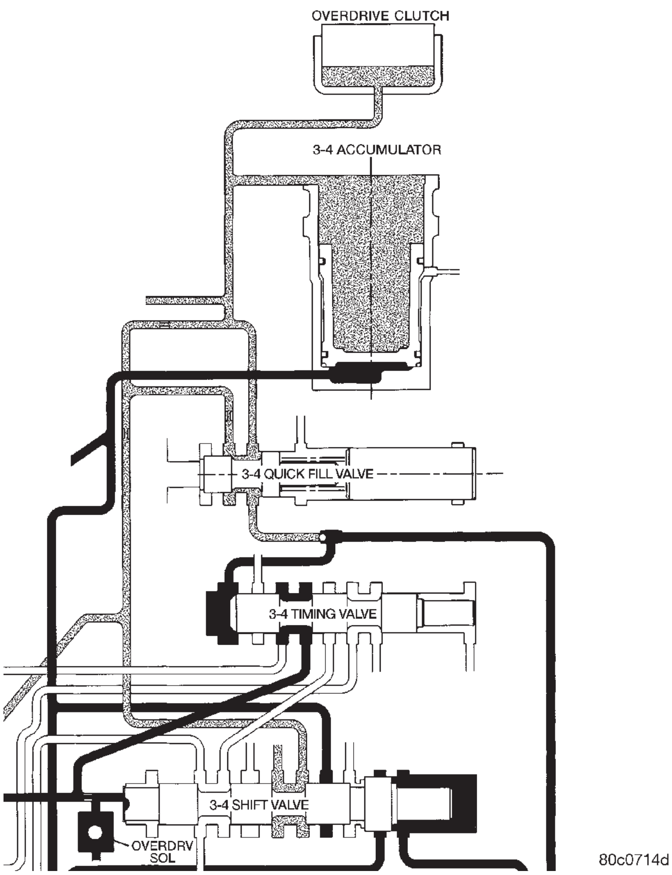

Fig. 34 3–4 Shift Valve Before Shift

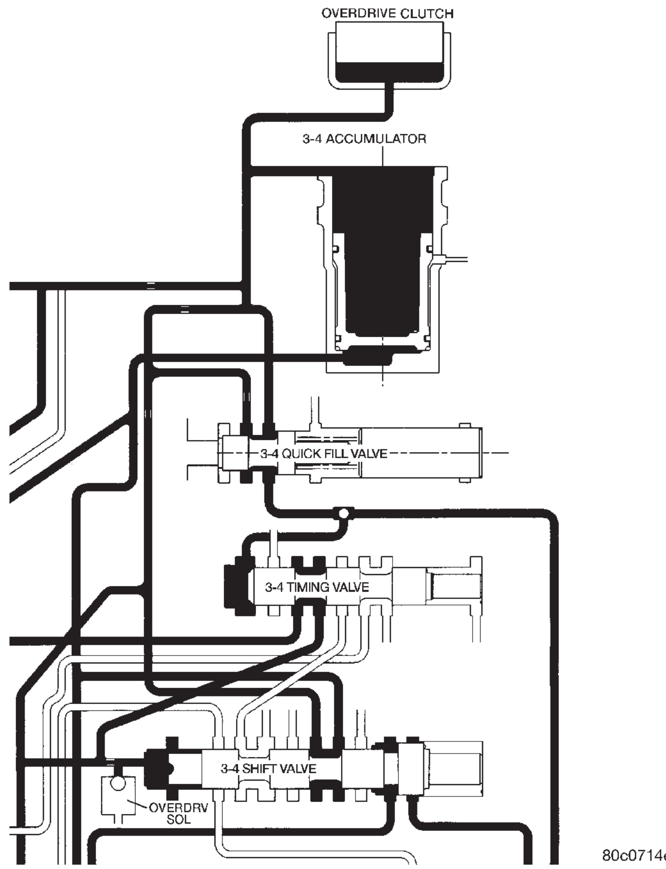

Fig. 35 3–4 Shift Valve After Shift

DESCRIPTION AND OPERATION (Continued)

3–4 TIMING VALVE

The 3-4 timing valve is moved by line pressure coming through the 3-4 shift valve (Fig. 36). The timing valve holds the 2-3 shift valve in an upshift position. The purpose is to prevent the 2-3 valve from up or downshifting before the 3-4 valve (Fig. 37).

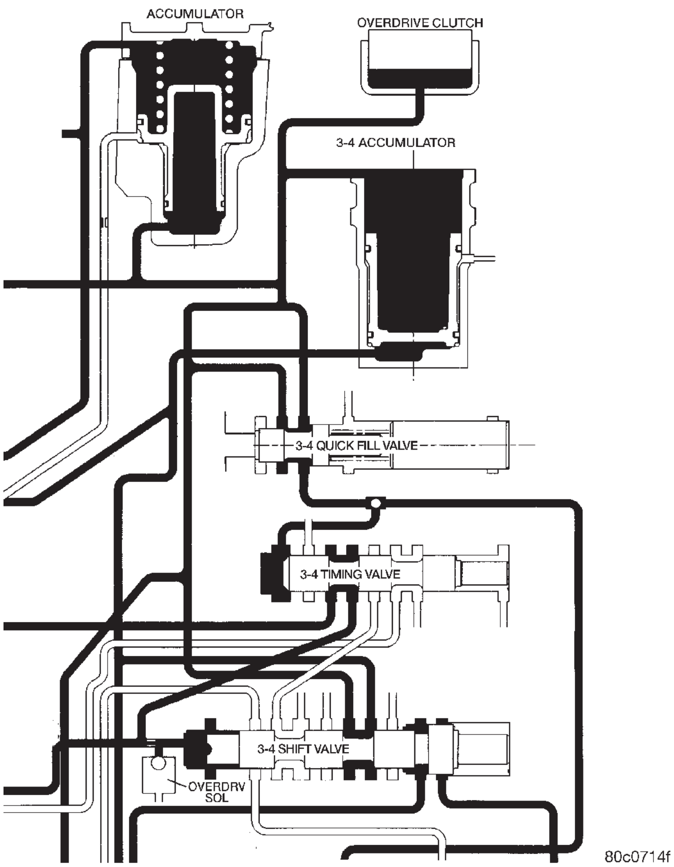

Fig. 36 3–4 Timing Valve Allowing 4–3 Shift

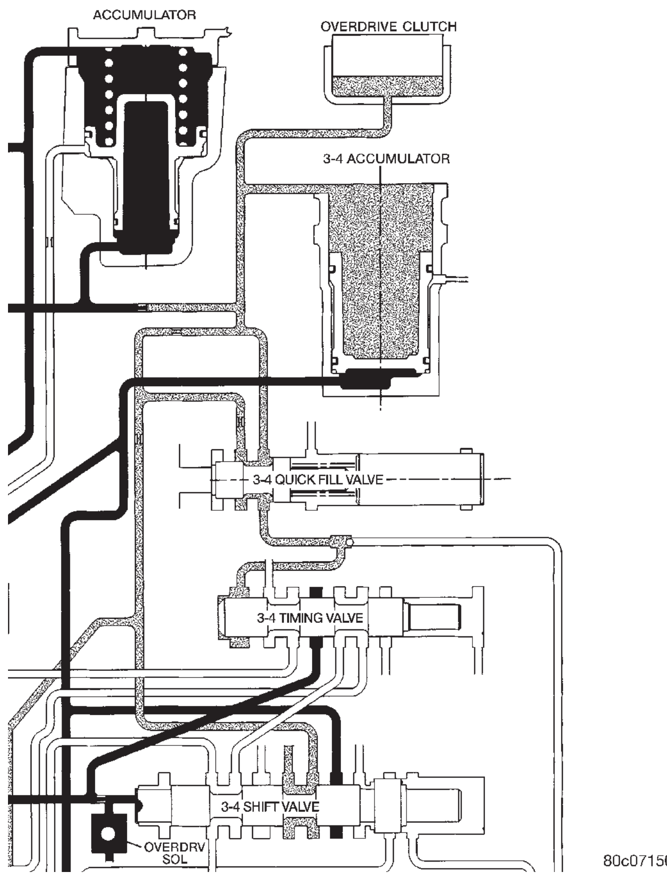

Fig. 37 3–4 Timing Valve Allowing 3–2 Shift

DESCRIPTION AND OPERATION (Continued)

3–4 QUICK FILL VALVE

The 3-4 quick fill valve provides faster engagement of the overdrive clutch during 3-4 upshifts. The valve temporarily bypasses the clutch piston feed orifice at the start of a 3-4 upshift (Fig. 39). This exposes a larger passage into the piston retainer resulting in a much faster clutch fill and apply sequence. The quick fill valve does not bypass the regular clutch feed orifice throughout the 3-4 upshift. Instead, once a predetermined pressure develops within the clutch, the valve closes the bypass. Clutch fill is then completed through the regular feed orifice.

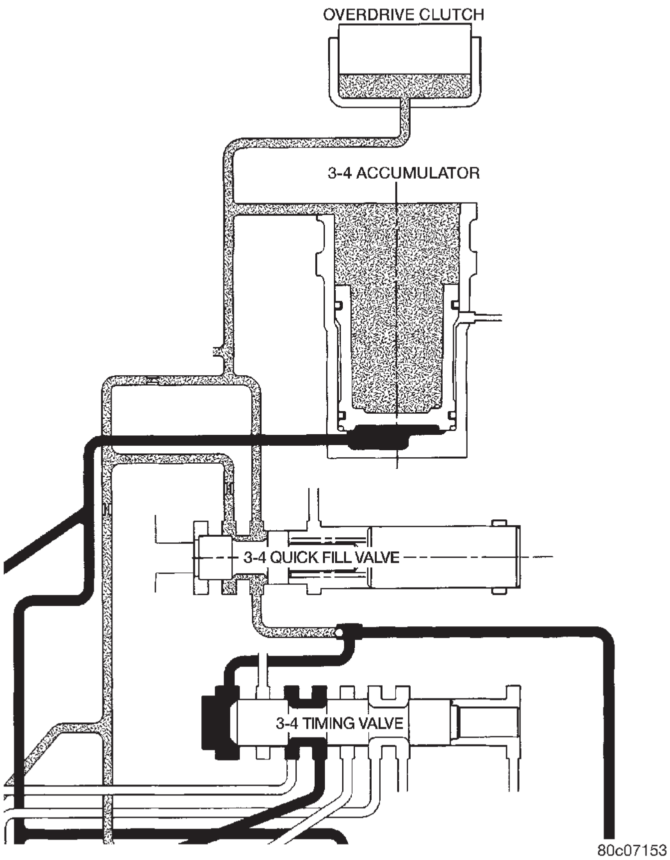

Fig. 38 3–4 Quick Fill Valve Before Shift

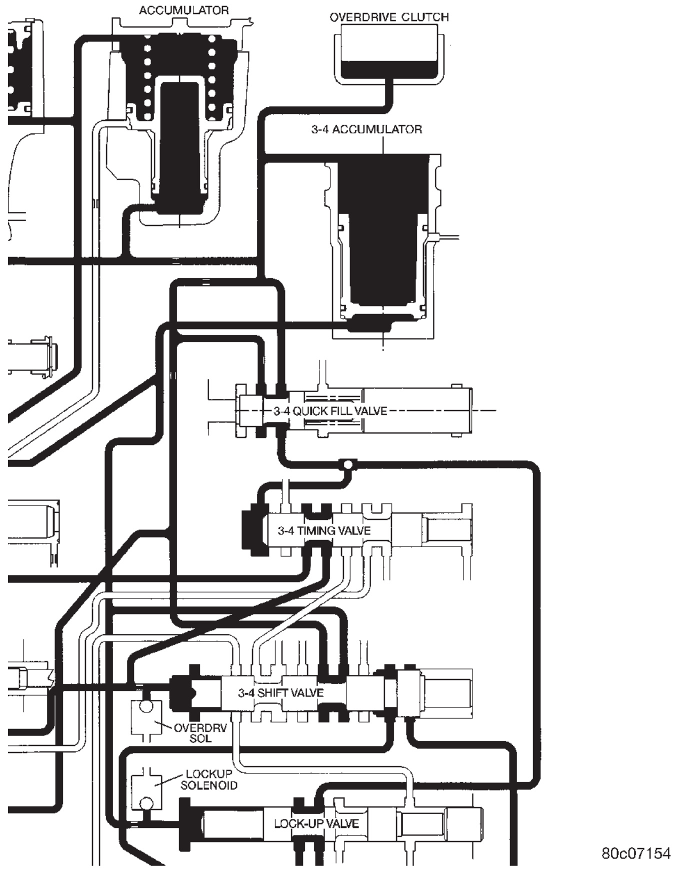

Fig. 39 3–4 Quick Fill Valve After Shift

DESCRIPTION AND OPERATION (Continued)

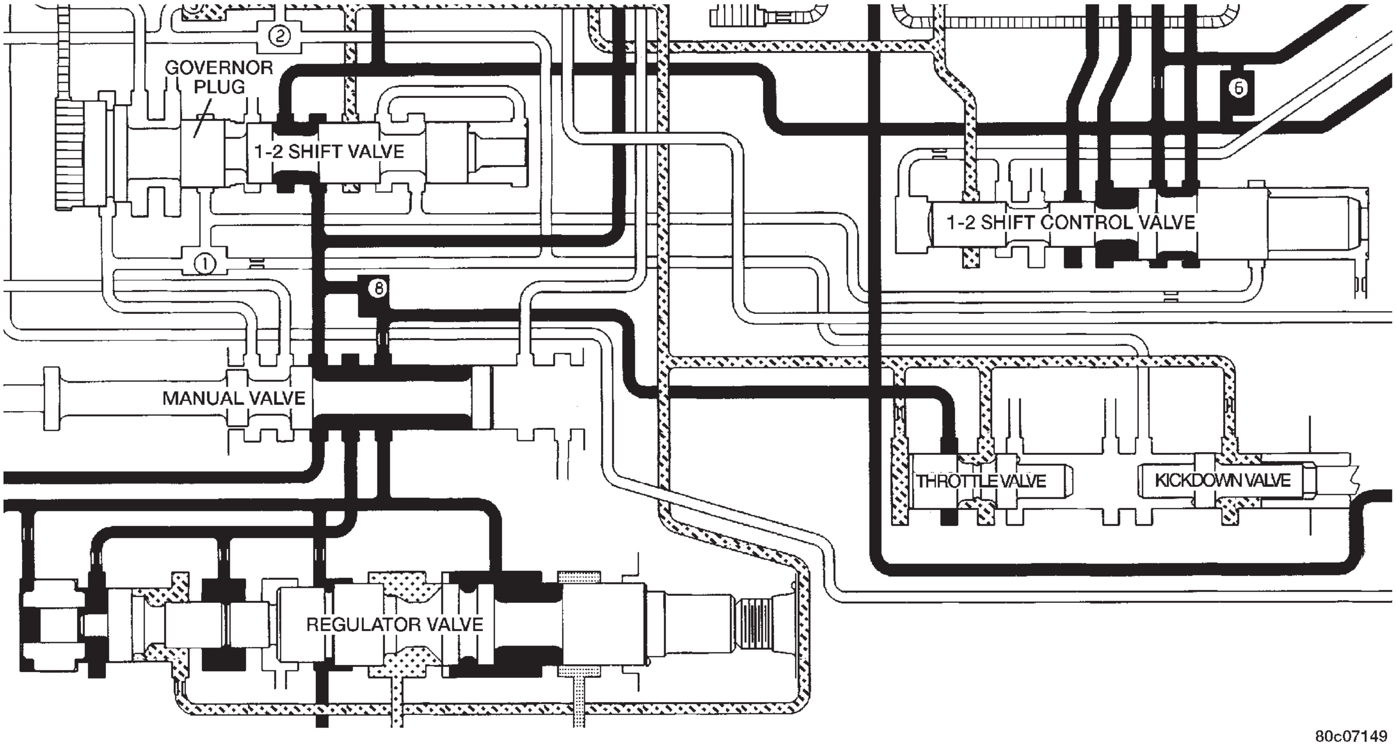

Fig. 40 Throttle Valve

THROTTLE VALVE

In all gear positions the throttle valve (Fig. 40) is being supplied with line pressure. The throttle valve meters and reduces the line pressure that now becomes throttle pressure. The throttle valve is moved by a spring and the kickdown valve, which is mechanically connected to the throttle. The larger the throttle opening, the higher the throttle pressure (to a maximum of line pressure). The smaller the throttle opening, the lower the throttle pressure (to a minimum of zero at idle). As engine speed increases, the increase in pump speed increases pump output. The increase in pressure and volume must be regulated to maintain the balance within the transmission. To do this, throttle pressure is routed to the reaction area on the right side of the throttle pressure plug (in the regulator valve).

The higher engine speed and line pressure would open the vent too far and reduce line pressure too much. Throttle pressure, which increases with engine speed (throttle opening), is used to oppose the movement of the pressure valve to help control the metering passage at the vent. The throttle pressure is combined with spring pressure to reduce the force of the throttle pressure plug on the pressure valve. The larger spring at the right closes the regulator valve passage and maintains or increases line pressure. The increased line pressure works against the reaction area of the line pressure plug and the reaction area left of land #3 simultaneously moves the regulator valve train to the right and controls the metering passage.

The kickdown valve, along with the throttle valve, serve to delay upshifts until the correct vehicle and engine speed have been reached. It also controls downshifts upon driver demand, or increased engine load. If these valves were not in place, the shift points would be at the same speed for all throttle positions. The kickdown valve is actuated by a cam connected to the throttle. This is accomplished through either a linkage or a cable. The cam forces the kickdown valve toward the throttle valve compressing the spring between them and moving the throttle valve. As the throttle valve land starts to uncover its port, line pressure is “metered” out into the circuits and viewed as throttle pressure. This increased throttle pressure is metered out into the circuits it is applied to: the 1–2 and 2–3 shift valves. When the throttle pressure is high enough, a 3–2 downshift will occur. If the vehicle speed is low enough, a 2–1 downshift will occur.

DESCRIPTION AND OPERATION (Continued)

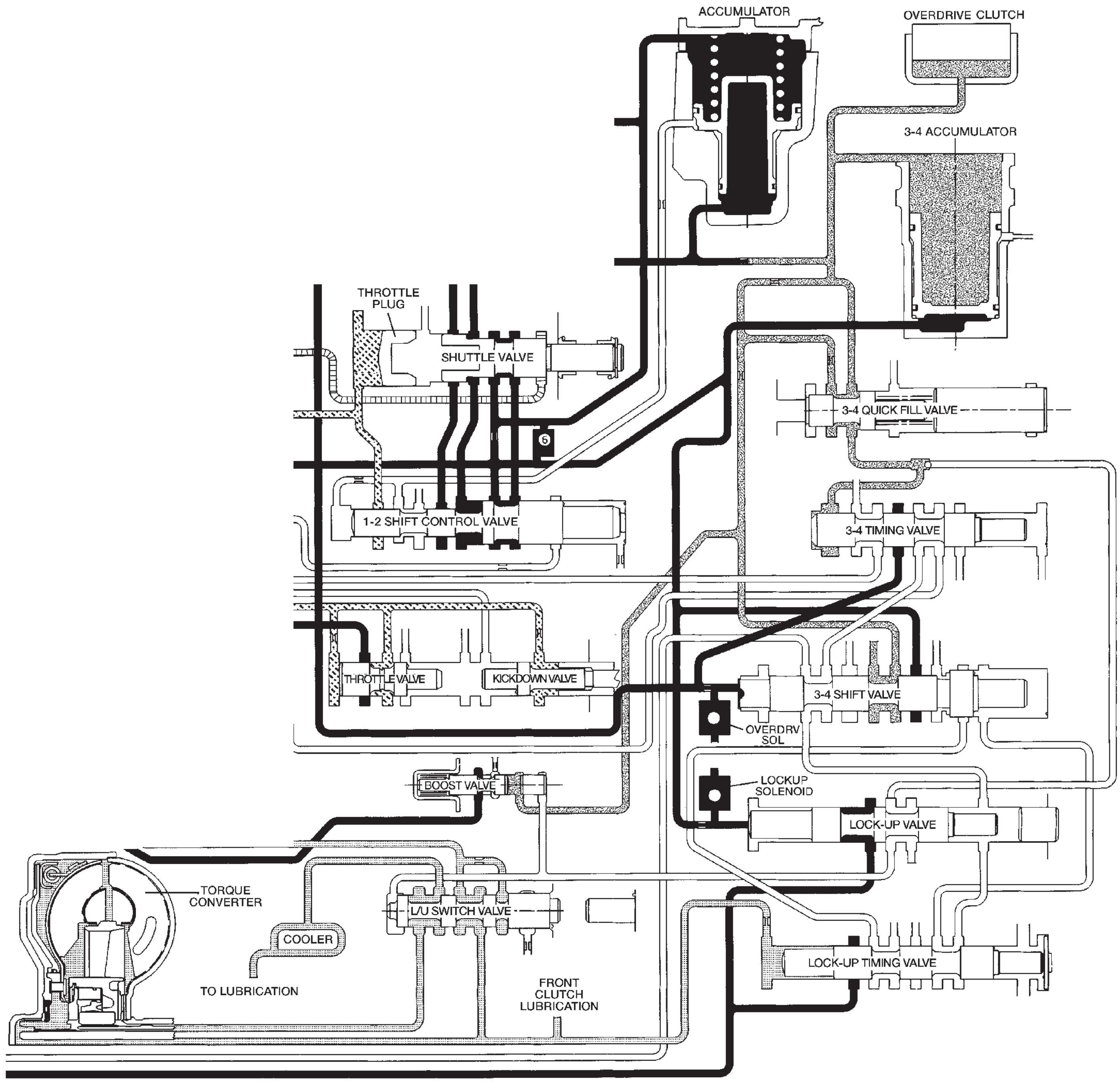

Fig. 41 Switch Valve-Torque Converter Unlocked

SWITCH VALVE

When the transmission is in Drive Second just before the TCC application occurs (Fig. 41), the pressure regulator valve is supplying torque converter pressure to the switch valve. The switch valve directs this pressure through the transmission input shaft, into the converter, through the converter, back out between the input shaft and the reaction shaft, and back up to the switch valve. From the switch valve, the fluid pressure is directed to the transmission cooler, and lubrication pressure returns from the cooler to lubricate different portions of the transmission.

DESCRIPTION AND OPERATION (Continued)

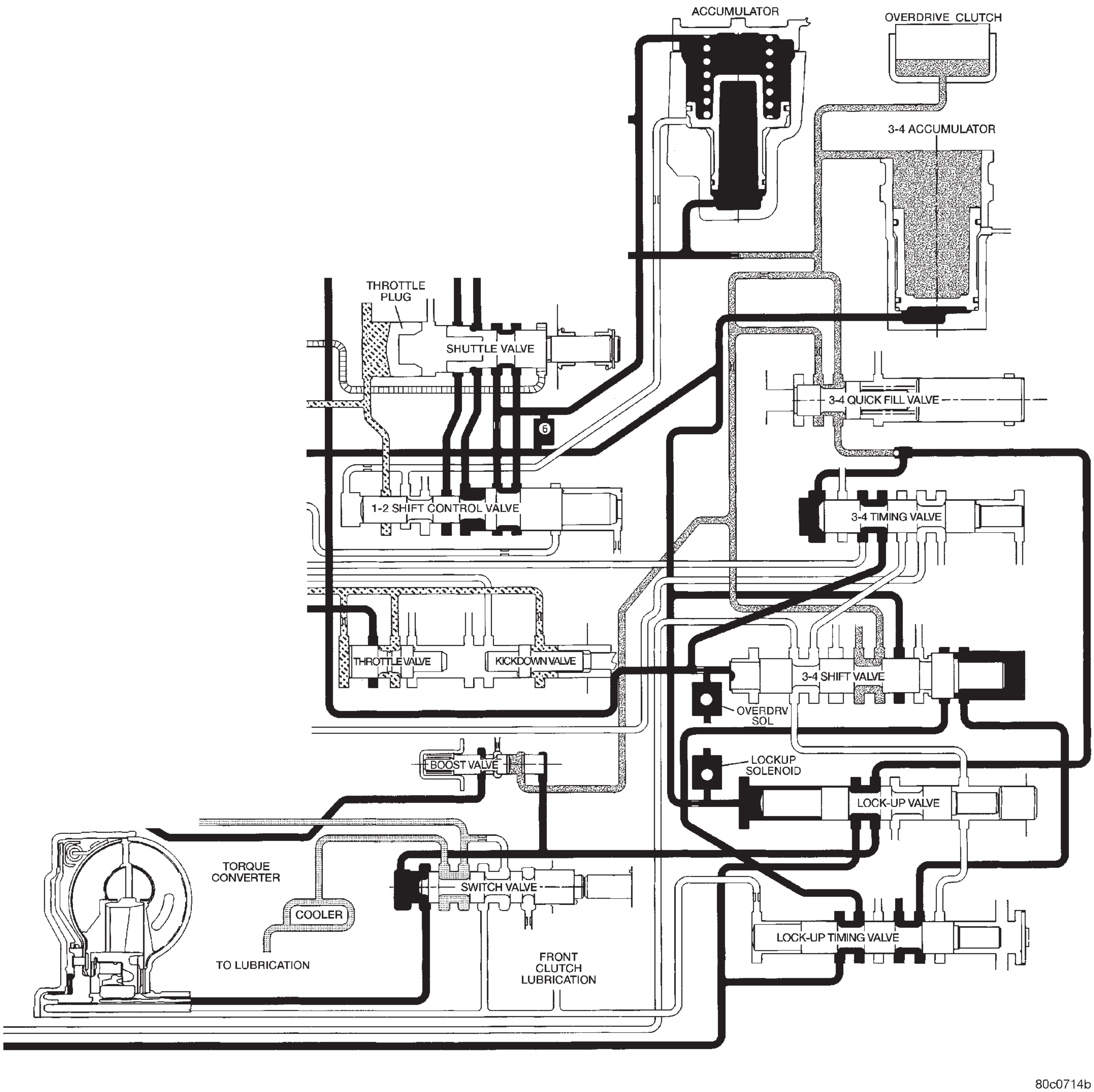

Fig. 42 Switch Valve-Torque Converter Locked

Once the TCC control valve has moved to the left (Fig. 42), line pressure is directed to the tip of the switch valve, forcing the valve to the right. The switch valve now vents oil from the front of the piston in the torque converter, and supplies line pressure to the (rear) apply side of the torque converter piston. This pressure differential causes the piston to apply against the friction material, cutting off any further flow of line pressure oil. After the switch valve is shuttled right allowing line pressure to engage the TCC, torque converter pressure is directed past the switch valve into the transmission cooler and lubrication circuits.

DESCRIPTION AND OPERATION (Continued)

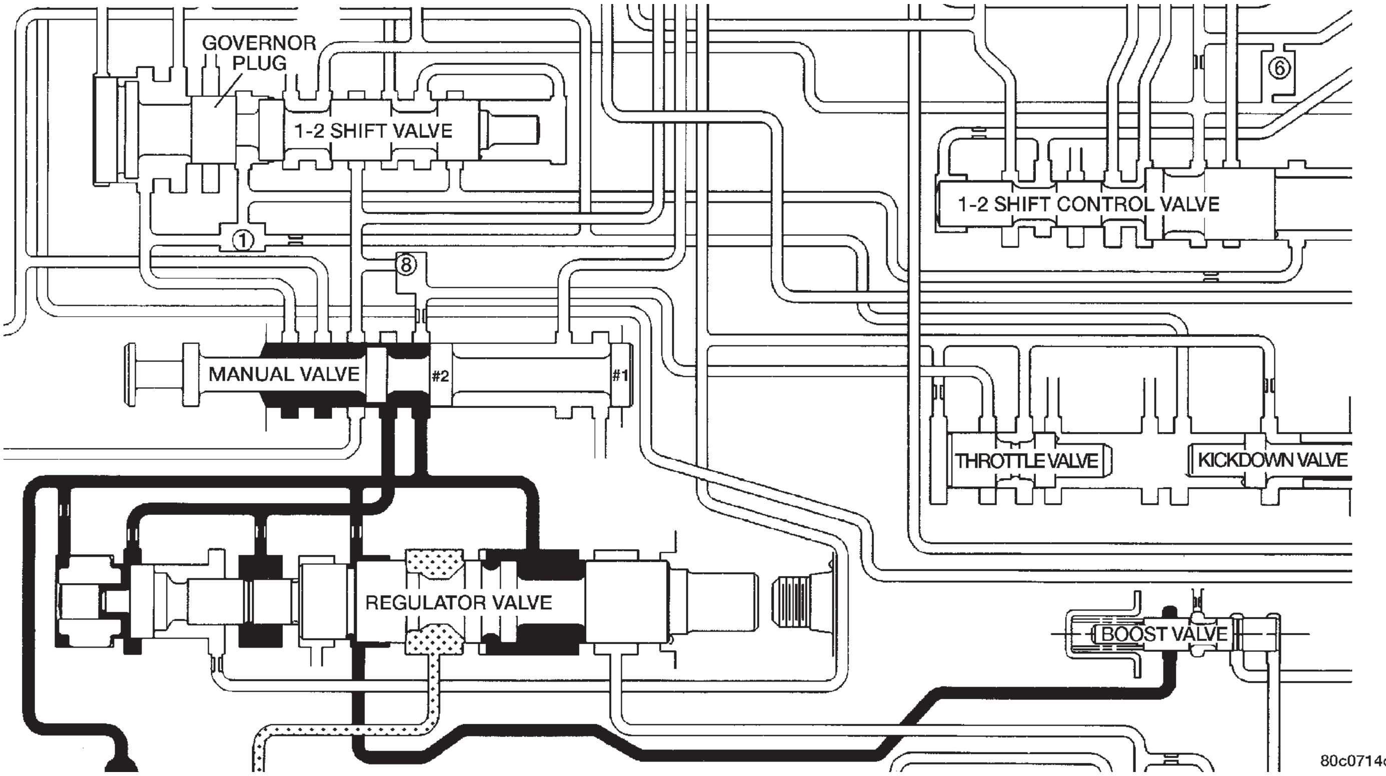

Fig. 43 Manual Valve

MANUAL VALVE

The manual valve (Fig. 43) is a relay valve. The purpose of the manual valve is to direct fluid to the correct circuit needed for a specific gear or driving range. The manual valve, as the name implies, is manually operated by the driver with a lever located on the side of the valve body. The valve is connected mechanically by either a cable or linkage to the gear-shift mechanism. The valve is held in each of its positions by a spring–loaded roller or ball that engages the “roostercomb” of the manual valve.

CONVERTER CLUTCH LOCK-UP VALVE

The torque converter clutch (TCC) lock-up valve controls the back (ON) side of the torque converter clutch. When the PCM energizes the TCC solenoid to engage the converter clutch piston, pressure is applied to the TCC lock-up valve which moves to the right and applies pressure to the torque converter clutch.

CONVERTER CLUTCH LOCK-UP TIMING VALVE

The torque converter clutch (TCC) lock-up timing valve is there to block any 4–3 downshift until the TCC is completely unlocked and the clutch is disengaged.

SHUTTLE VALVE

The assembly is contained in a bore in the valve body above the shift valves. When the manual valve is positioned in the Drive range, throttle pressure acts on the throttle plug of the shuttle valve (Fig. 31) to move it against a spring, increasing the spring force on the shuttle valve. During a part or full throttle 1–2 upshift, the throttle plug is bottomed by throttle pressure, holding the shuttle valve to the right against governor pressure, and opening a by–pass circuit. The shuttle valve controls the quality of the kickdown shift by restricting the rate of fluid discharge from the front clutch and servo release circuits. During a 3–2 kickdown, fluid discharges through the shuttle by–pass circuit. When the shuttle valve closes the by–pass circuit, fluid discharge is restricted and controlled for the application of the front band. During a 2–3 “lift foot” upshift, the shuttle valve by–passes the restriction to allow full fluid flow through the by-pass groove for a faster release of the band.

DESCRIPTION AND OPERATION (Continued)

BOOST VALVE

The boost valve (Fig. 44) provides increased fluid apply pressure to the overdrive clutch during 3-4 upshifts (Fig. 45), and when accelerating in fourth gear.

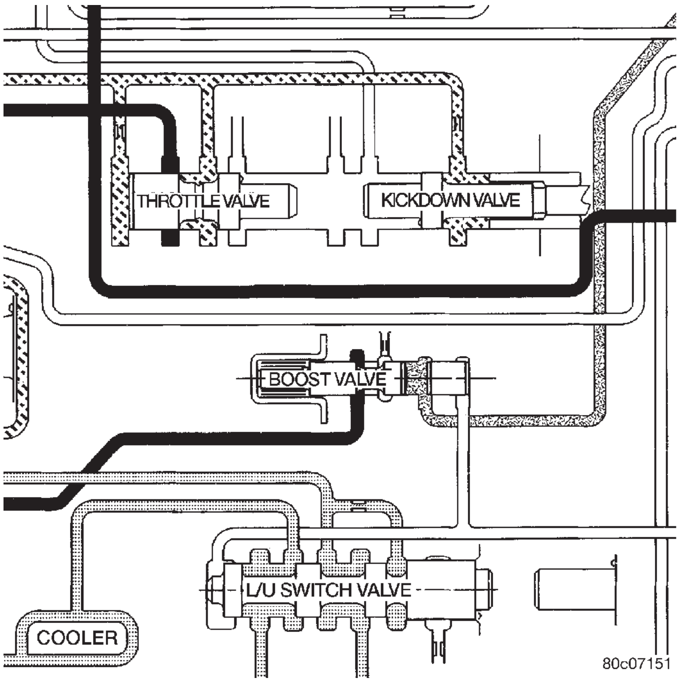

Fig. 44 Boost Valve Before Lock-up

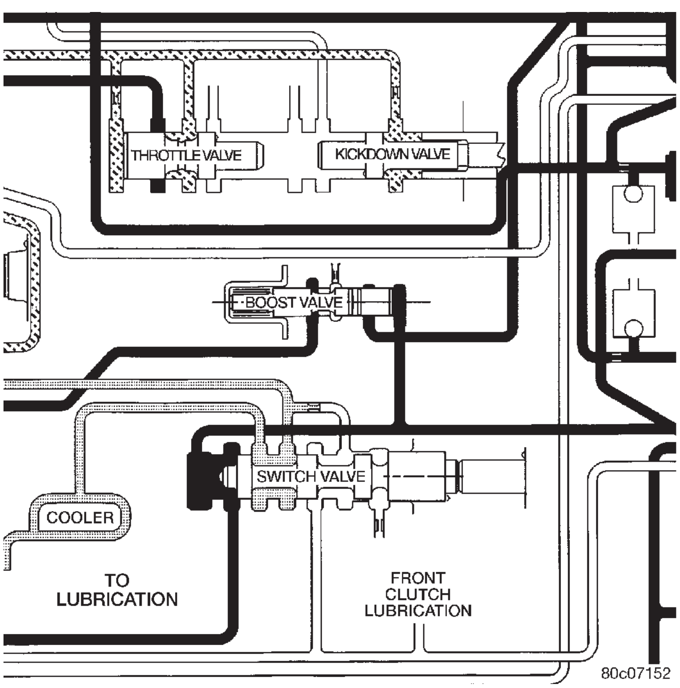

Fig. 45 Boost Valve After Lock-up

ACCUMULATOR

DESCRIPTION

The accumulator (Fig. 46) is a hydraulic device that has the sole purpose of cushioning the application of a band or clutch. The accumulator consists of a dual–land piston and a spring located in a bore in the transmission case. The 3–4 accumulator is located in a housing attached to the side of the valve body (Fig. 47).

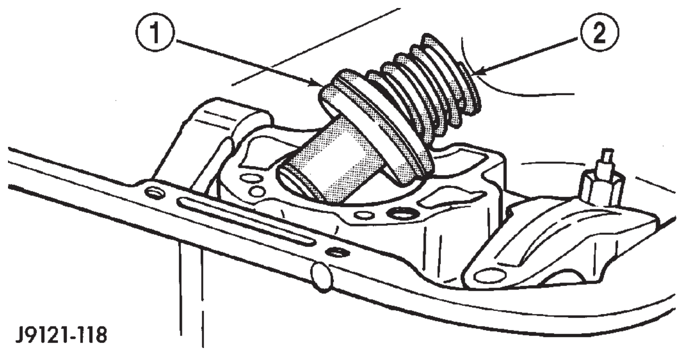

Fig. 46 Accumulator

1 – ACCUMULATOR PISTON
2 – PISTON SPRING

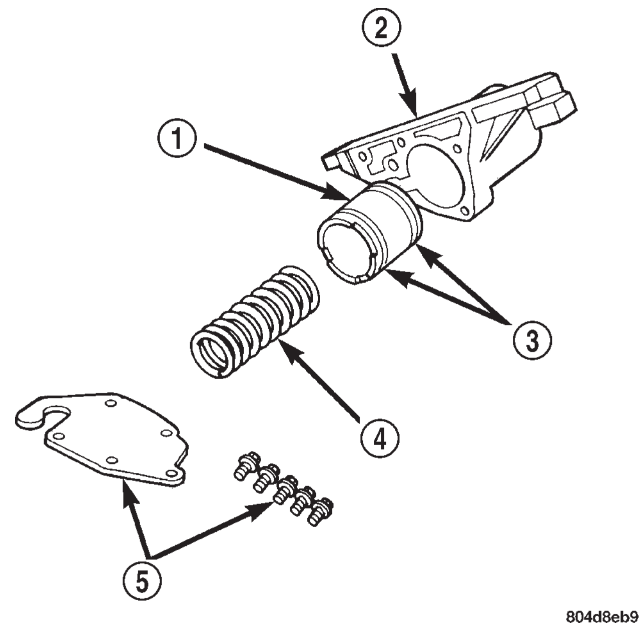

Fig. 47 3–4 Accumulator and Housing

1 – ACCUMULATOR PISTON
2 – 3–4 ACCUMULATOR HOUSING
3 – TEFLON SEALS
4 – PISTON SPRING
5 – COVER PLATE AND SCREWS

DESCRIPTION AND OPERATION (Continued)

OPERATION

Both the accumulator and the 3–4 accumulator function the same. Line pressure is directed between the lands of the piston (Fig. 48), bottoming it against the accumulator plate. The accumulator stays in this position after the transmission is placed into a Drive position. When the 1–2 upshift occurs (Fig. 49), line pressure is directed to the large end of the piston and then to the kickdown servo. As the line pressure reaches the accumulator, the combination of spring pressure and line pressure forces the piston away from the accumulator plate. This causes a balanced pressure situation, which results in a cushioned band application. After the kickdown servo has become immovable, line pressure will finish pushing the accumulator up into its bore. When the large end of the accumulator piston is seated in its bore, the band or clutch is fully applied.

NOTE: The accumulator is shown in the inverted position for illustrative purposes.

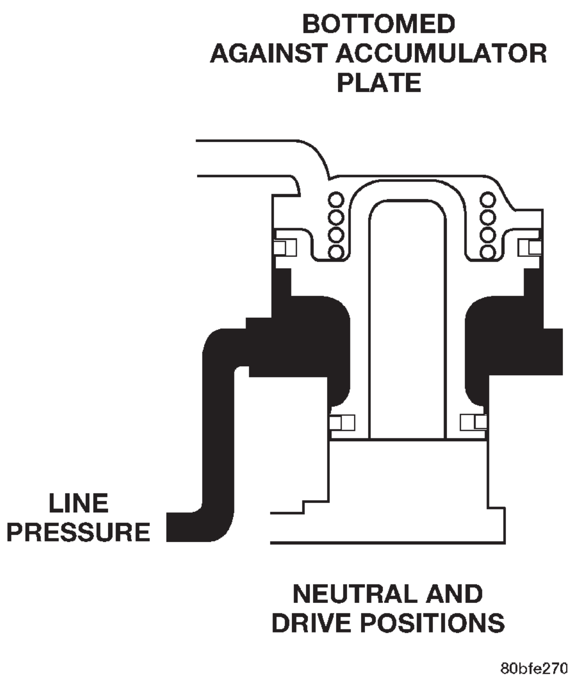

Fig. 48 Accumulator in Neutral and Drive Positions

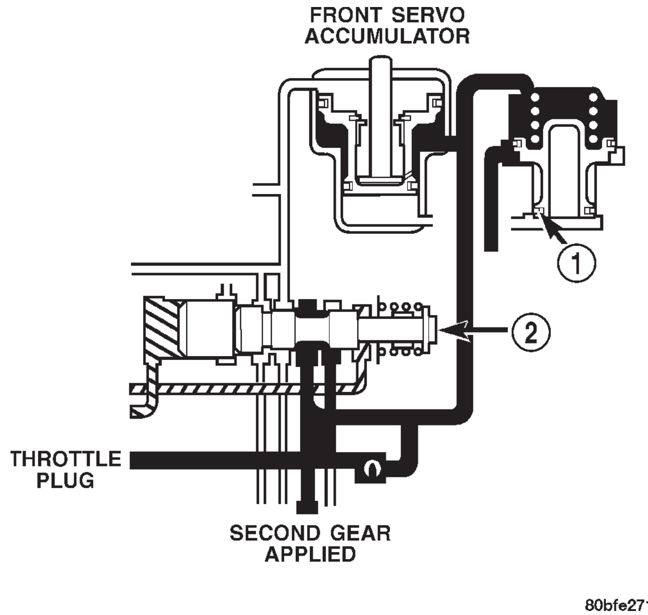

Fig. 49 Accumulator in Second Gear Position

1 – BOTTOM IN BORE
2 – SHUTTLE VALVE

PISTONS

DESCRIPTION

There are several sizes and types of pistons used in an automatic transmission. Some pistons are used to apply clutches, while others are used to apply bands. They all have in common the fact that they are round or circular in shape, located within a smooth walled cylinder, which is closed at one end and converts fluid pressure into mechanical movement. The fluid pressure exerted on the piston is contained within the system through the use of piston rings or seals.

OPERATION

The principal which makes this operation possible is known as Pascal's Law. Pascal's Law can be stated as: "Pressure on a confined fluid is transmitted equally in all directions and acts with equal force on equal areas."

DESCRIPTION AND OPERATION (Continued)

PRESSURE

Pressure (Fig. 50) is nothing more than force (lbs.) divided by area (in. or ft.), or force per unit area. Given a 100 lb. block and an area of 100 sq. in. on the floor, the pressure exerted by the block is: 100 lbs. 100 in. or 1 pound per square inch, or PSI as it is commonly referred to.

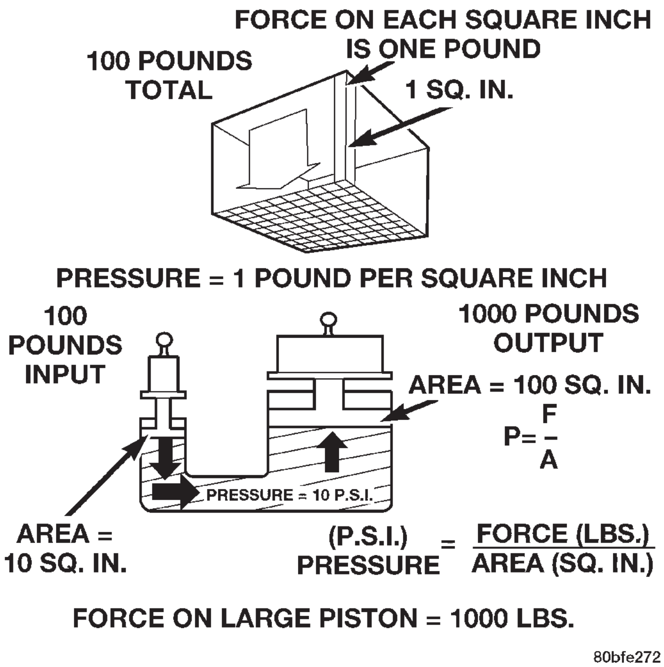

Fig. 50 Force and Pressure Relationship

PRESSURE ON A CONFINED FLUID

Pressure is exerted on a confined fluid (Fig. 51) by applying a force to some given area in contact with the fluid. A good example of this is a cylinder filled with fluid and equipped with a piston that is closely fitted to the cylinder wall. If a force is applied to the piston, pressure will be developed in the fluid. Of course, no pressure will be created if the fluid is not confined. It will simply "leak" past the piston. There must be a resistance to flow in order to create pressure. Piston sealing is extremely important in hydraulic operation. Several kinds of seals are used to accomplish this within a transmission. These include but are not limited to O–rings, D–rings, lip seals, sealing rings, or extremely close tolerances between the piston and the cylinder wall. The force exerted is downward (gravity), however, the principle remains the same no matter which direction is taken. The pressure created in the fluid is equal to the force applied, divided by the piston area. If the force is 100 lbs., and the piston area is 10 sq. in., then the pressure created equals 10 PSI. Another interpretation of Pascal's Law is that regardless of container shape or size, the pressure will be maintained throughout, as long as the fluid is confined. In other words, the pressure in the fluid is the same everywhere within the container.

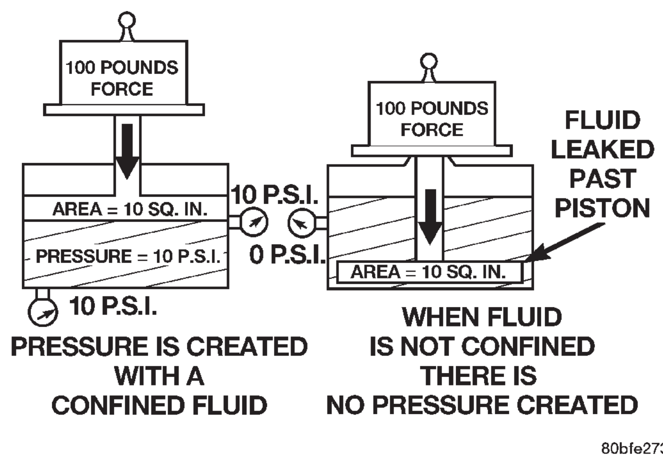

Fig. 51 Pressure on a Confined Fluid

DESCRIPTION AND OPERATION (Continued)

FORCE MULTIPLICATION

Using the 10 PSI example used in the illustration (Fig. 52), a force of 1000 lbs. can be moved with a force of only 100 lbs. The secret of force multiplication in hydraulic systems is the total fluid contact area employed. The illustration, (Fig. 52), shows an area that is ten times larger than the original area. The pressure created with the smaller 100 lb. input is 10 PSI. The concept "pressure is the same everywhere" means that the pressure underneath the larger piston is also 10 PSI. Pressure is equal to the force applied divided by the contact area. Therefore, by means of simple algebra, the output force may be found. This concept is extremely important, as it is also used in the design and operation of all shift valves and limiting valves in the valve body, as well as the pistons, of the transmission, which activate the clutches and bands. It is nothing more than using a difference of area to create a difference in pressure to move an object.

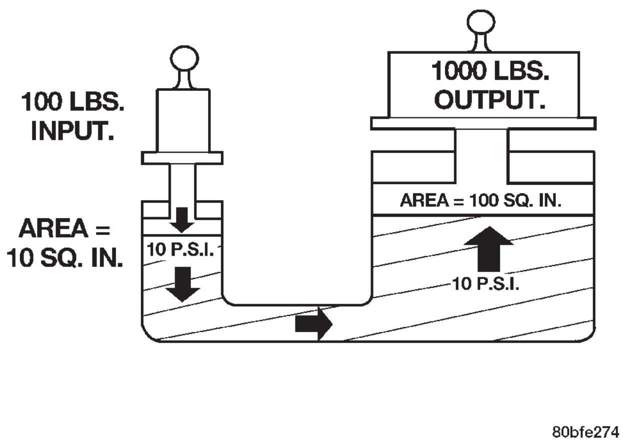

Fig. 52 Force Multiplication

PISTON TRAVEL

The relationship between hydraulic lever and a mechanical lever is the same. With a mechanical lever it's a weight–to–distance output rather than a pressure–to–area output. Using the same forces and areas as in the previous example, the smaller piston (Fig. 53) has to move ten times the distance required to move the larger piston one inch. Therefore, for every inch the larger piston moves, the smaller piston moves ten inches. This principle is true in other instances also. A common garage floor jack is a good example. To raise a car weighing 2000 lbs., an effort of only 100 lbs. may be required. For every inch the car moves upward, the input piston at the jack handle must move 20 inches downward.

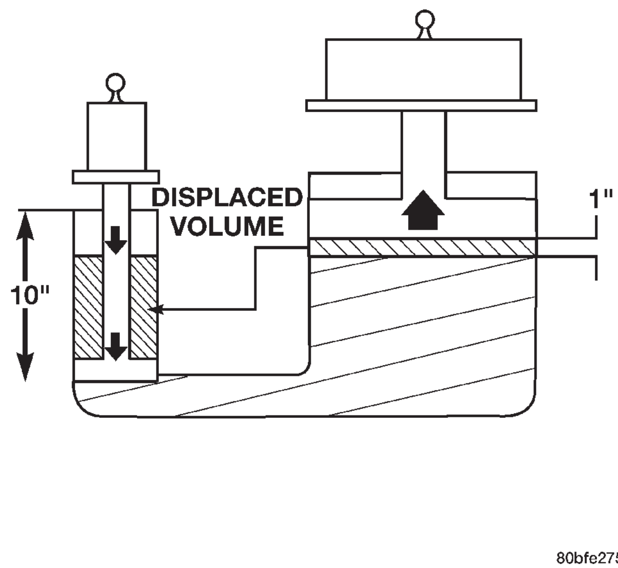

Fig. 53 Piston Travel

DESCRIPTION AND OPERATION (Continued)

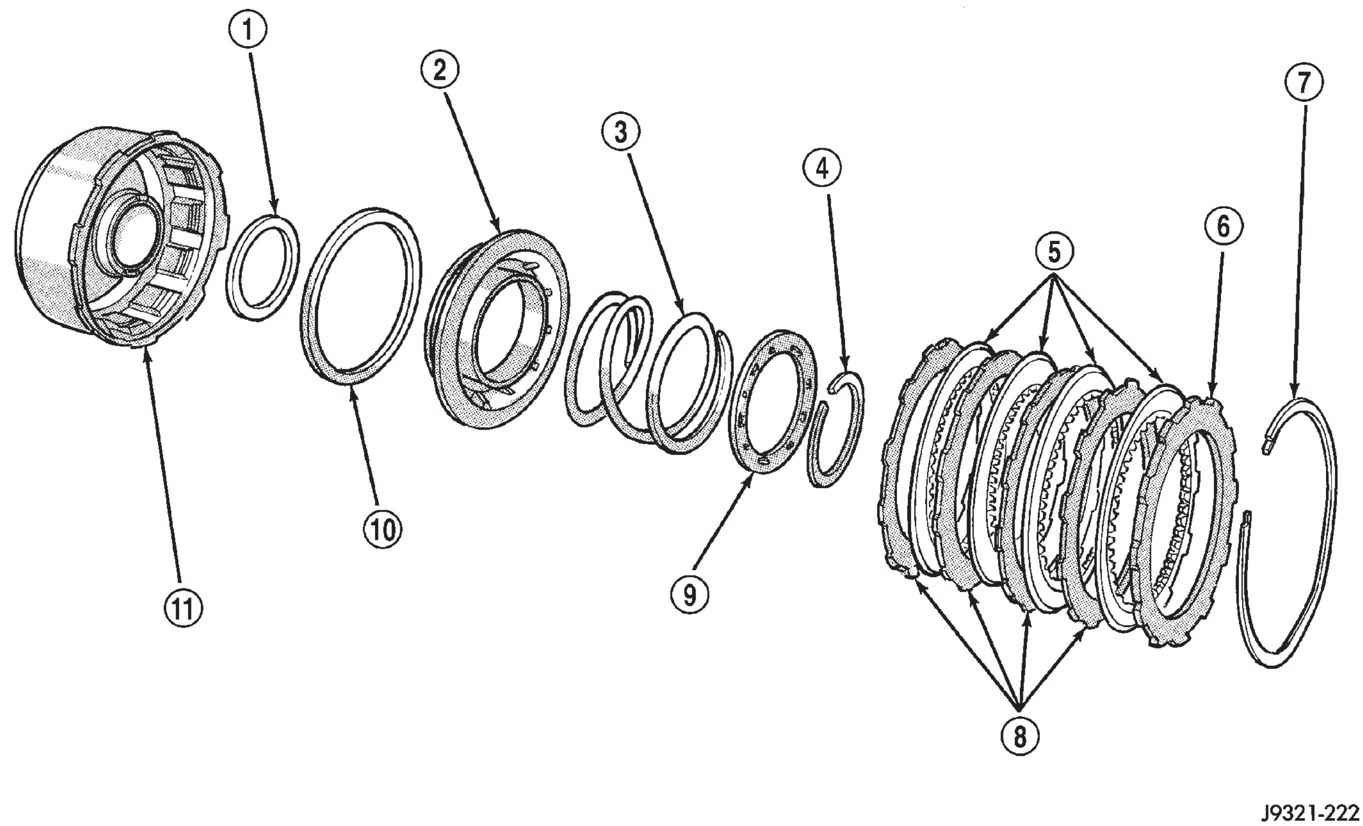

Fig. 54 Front Clutch

1 – RETAINER HUB SEAL
2 – CLUTCH PISTON
3 – PISTON SPRING
4 – SPRING RETAINER SNAP RING
5 – CLUTCH DISCS
6 – PRESSURE PLATE
7 – SNAP RING (WAVED)
8 – CLUTCH PLATES
9 – SPRING RETAINER
10 – PISTON SEAL
11 – FRONT CLUTCH RETAINER

FRONT CLUTCH

DESCRIPTION

The front clutch assembly (Fig. 54) is composed of the front clutch retainer, pressure plate, four clutch plates, four driving discs, piston, piston return spring, return spring retainer, and snap rings. The front clutch is the forwardmost component in the transmission geartrain and is directly behind the oil pump and is considered a driving component.

NOTE: The number of discs and plates may vary with each engine and vehicle combination.

OPERATION

To apply the clutch, pressure is applied between the clutch retainer and piston. The fluid pressure is provided by the oil pump, transferred through the control valves and passageways, and enters the clutch through the hub of the reaction shaft support. With pressure applied between the clutch retainer and piston, the piston moves away from the clutch retainer and compresses the clutch pack. This action applies the clutch pack, allowing torque to flow through the input shaft into the driving discs, and into the clutch plates and pressure plate that are lugged to the clutch retainer. The waved snap ring is used to cushion the application of the clutch pack. In some transmissions, the snap ring is selective and used to adjust clutch pack clearance.

When pressure is released from the piston, the spring returns the piston to its fully released position and disengages the clutch. The release spring also helps to cushion the application of the clutch assembly. When the clutch is in the process of being released by the release spring, fluid flows through a vent and one–way ball–check–valve located in the clutch retainer. The check–valve is needed to eliminate the possibility of plate drag caused by centrifugal force acting on the residual fluid trapped in the clutch piston retainer.

DESCRIPTION AND OPERATION (Continued)

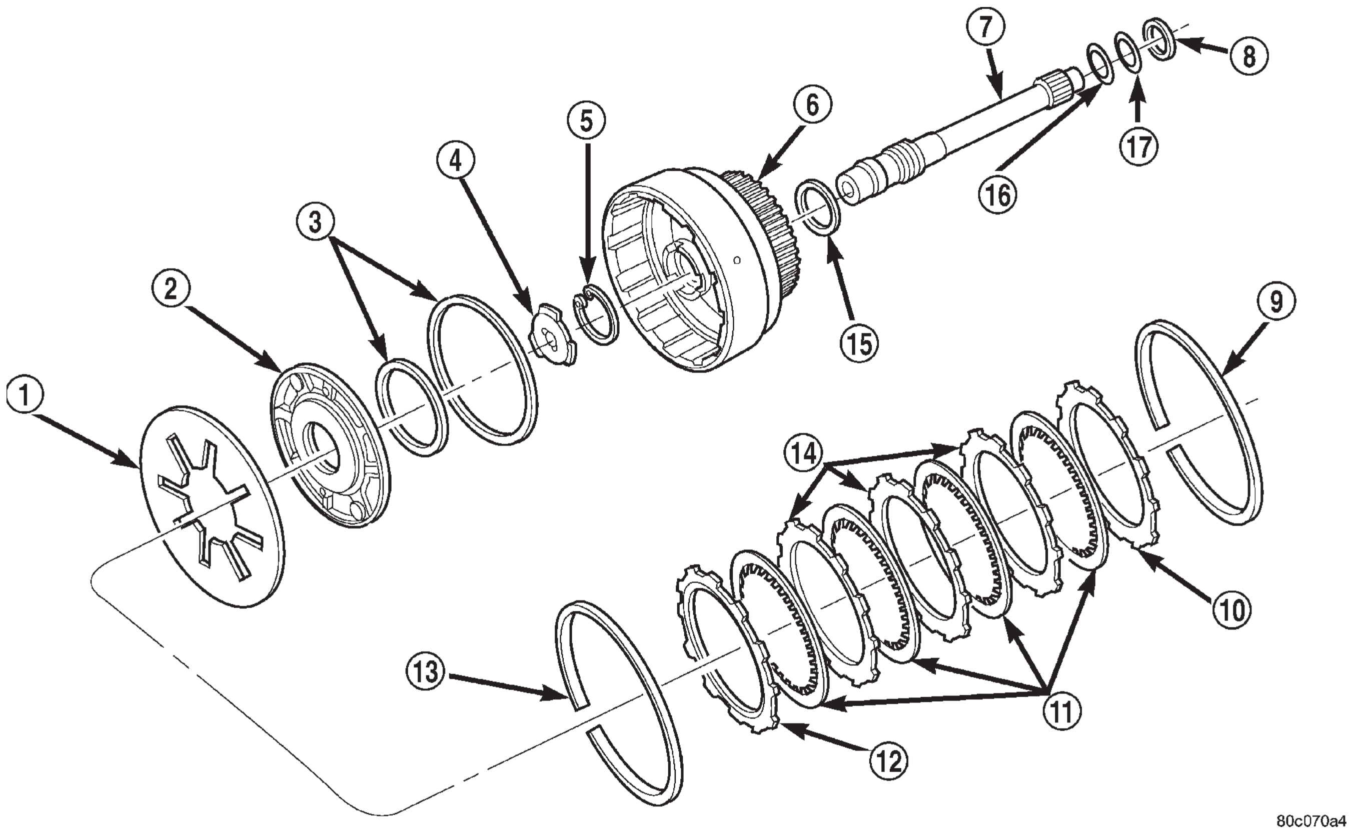

Fig. 55 Rear Clutch

1 – PISTON SPRING
2 – REAR CLUTCH PISTON
3 – CLUTCH PISTON SEALS
4 – OUTPUT SHAFT THRUST WASHER (METAL)
5 – INPUT SHAFT SNAP RING
6 – REAR CLUTCH RETAINER
7 – INPUT SHAFT
8 – REAR CLUTCH THRUST WASHER (FIBER)
9 – CLUTCH PACK SNAP RING (SELECTIVE)
10 – TOP PRESSURE PLATE
11 – CLUTCH DISCS (4)
12 – BOTTOM PRESSURE PLATE
13 – WAVE SPRING
14 – CLUTCH PLATES (3)
15 – RETAINER SEAL RING
16 – SHAFT REAR SEAL RING (PLASTIC)
17 – SHAFT FRONT SEAL RING (TEFLON)

REAR CLUTCH

DESCRIPTION

The rear clutch assembly (Fig. 55) is composed of the rear clutch retainer, pressure plate, three clutch plates, four driving discs, piston, Belleville spring, and snap rings. The Belleville spring acts as a lever to multiply the force applied on to it by the apply piston. The increased apply force on the rear clutch pack, in comparison to the front clutch pack, is needed to hold against the greater torque load imposed onto the rear pack. The rear clutch is directly behind the front clutch and is considered a driving component.

NOTE: The number of discs and plates may vary with each engine and vehicle combination.

OPERATION

To apply the clutch, pressure is applied between the clutch retainer and piston. The fluid pressure is provided by the oil pump, transferred through the control valves and passageways, and enters the clutch through the hub of the reaction shaft support. With pressure applied between the clutch retainer and piston, the piston moves away from the clutch retainer and compresses the clutch pack. This action applies the clutch pack, allowing torque to flow through the input shaft into the driving discs, and into the clutch plates and pressure plate that are lugged to the clutch retainer. The waved snap ring is used to cushion the application of the clutch pack. In some transmissions, the snap ring is selective and used to adjust clutch pack clearance.

DESCRIPTION AND OPERATION (Continued)

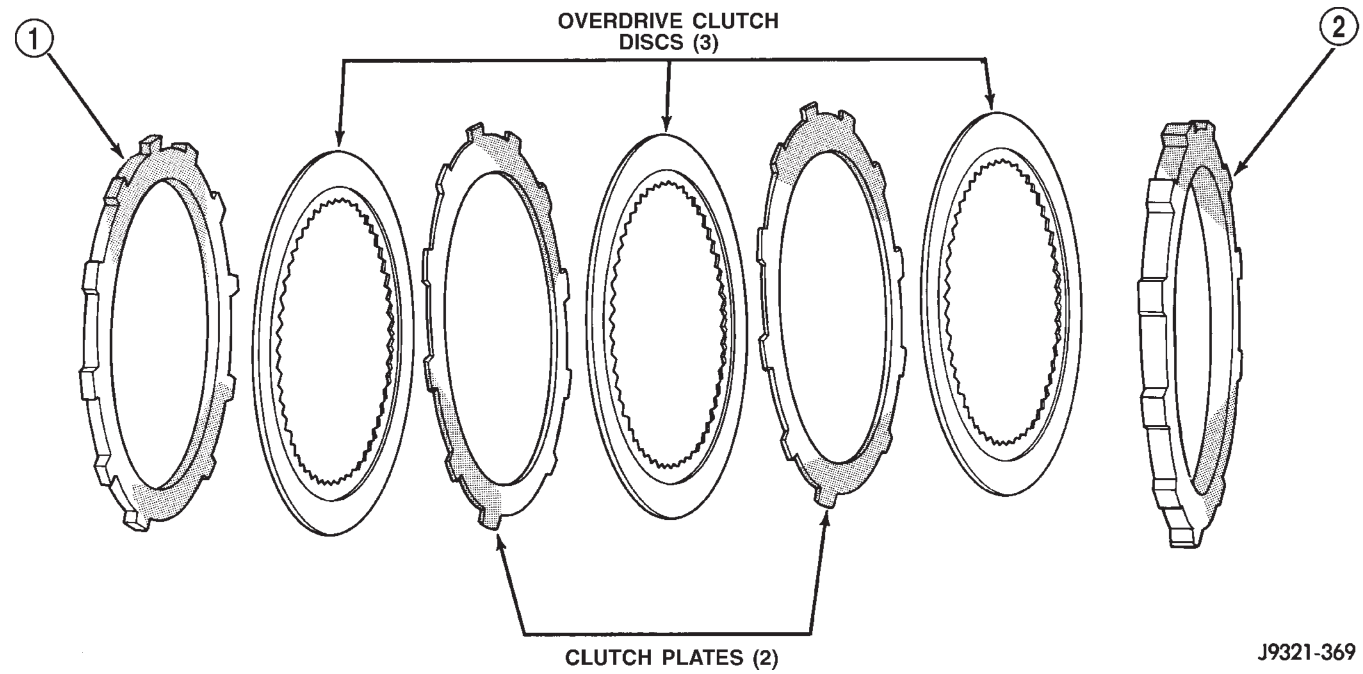

Fig. 56 Overdrive Clutch

1 – REACTION PLATE
2 – PRESSURE PLATE

When pressure is released from the piston, the spring returns the piston to its fully released position and disengages the clutch. The release spring also helps to cushion the application of the clutch assembly. When the clutch is in the process of being released by the release spring, fluid flows through a vent and one–way ball–check–valve located in the clutch retainer. The check–valve is needed to eliminate the possibility of plate drag caused by centrifugal force acting on the residual fluid trapped in the clutch piston retainer.

OVERDRIVE CLUTCH

DESCRIPTION

The overdrive clutch (Fig. 56) is composed of the pressure plate, two clutch plates, three holding discs, overdrive piston retainer, piston, piston spacer, and snap rings. The overdrive clutch is the forwardmost component in the transmission overdrive unit and is considered a holding component. The overdrive piston retainer, piston, and piston spacer are located on the rear of the main transmission case.

NOTE: The number of discs and plates may vary with each engine and vehicle combination.

OPERATION

To apply the clutch, pressure is applied between the piston retainer and piston. The fluid pressure is provided by the oil pump, transferred through the control valves and passageways, and enters the clutch through passages at the lower rear portion of the valve body area. With pressure applied between the piston retainer and piston, the piston moves away from the piston retainer and compresses the clutch pack. This action applies the clutch pack, allowing torque to flow through the intermediate shaft into the overdrive planetary gear set. The overdrive clutch discs are attached to the overdrive clutch hub while the overdrive clutch plates, reaction plate, and pressure plate are lugged to the overdrive housing. This allows the intermediate shaft to transfer the engine torque to the planetary gear and overrunning clutch. This drives the planetary gear inside the annulus, which is attached to the overdrive clutch drum and output shaft, creating the desired gear ratio. The waved snap ring is used to cushion the application of the clutch pack.

DESCRIPTION AND OPERATION (Continued)

OVERRUNNING CLUTCH

DESCRIPTION

The overrunning clutch (Fig. 57) consists of an inner race, an outer race (or cam), rollers and springs, and the spring retainer. The number of rollers and springs depends on what transmission and which overrunning clutch is being dealt with.

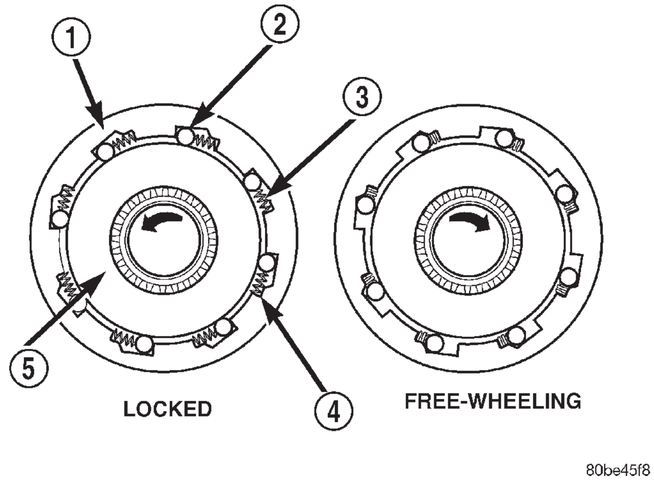

Fig. 57 Overrunning Clutch

1 – OUTER RACE (CAM)
2 – ROLLER
3 – SPRING
4 – SPRING RETAINER
5 – INNER RACE (HUB)

OPERATION

As the inner race is rotated in a clockwise direction (as viewed from the front of the transmission), the race causes the rollers to roll toward the springs, causing them to compress against their retainer. The compression of the springs increases the clearance between the rollers and cam. This increased clearance between the rollers and cam results in a freewheeling condition. When the inner race attempts to rotate counterclockwise, the action causes the rollers to roll in the same direction as the race, aided by the pushing of the springs. As the rollers try to move in the same direction as the inner race, they are wedged between the inner and outer races due to the design of the cam. In this condition, the clutch is locked and acts as one unit.

PLANETARY GEARSET

DESCRIPTION

The planetary gearsets (Fig. 58) are designated as the front, rear, and overdrive planetary gear assemblies and located in such order. A simple planetary gearset consists of three main members:

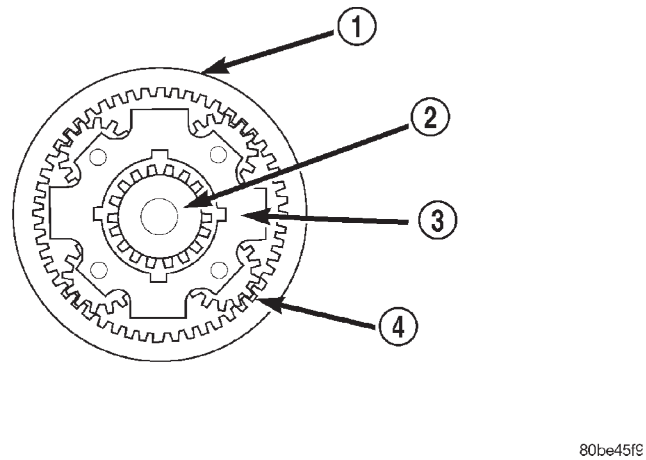

Fig. 58 Planetary Gearset

1 – ANNULUS GEAR
2 – SUN GEAR
3 – PLANET CARRIER
4 – PLANET PINIONS (4)

- The sun gear which is at the center of the system.
- The planet carrier with planet pinion gears which are free to rotate on their own shafts and are in mesh with the sun gear.
- The annulus gear, which rotates around and is in mesh with the planet pinion gears.

NOTE: The number of pinion gears does not affect the gear ratio, only the duty rating.

OPERATION

With any given planetary gearset, several conditions must be met for power to be able to flow:

- One member must be held.
- Another member must be driven or used as an input.
- The third member may be used as an output for power flow.
- For direct drive to occur, two gear members in the front planetary gearset must be driven.

NOTE: Gear ratios are dependent on the number of teeth on the annulus and sun gears.

BANDS

DESCRIPTION

KICKDOWN (FRONT) BAND

The kickdown, or “front”, band (Fig. 59) holds the common sun gear of the planetary gear sets. The front (kickdown) band is made of steel, and faced on its inner circumference with a friction–type lining.

DESCRIPTION AND OPERATION (Continued)

One end of the band is anchored to the transmission case, and the other is acted on with a pushing force by a servo piston. The front band is a single–wrap design (the band does not completely encompass/ wrap the drum that it holds).

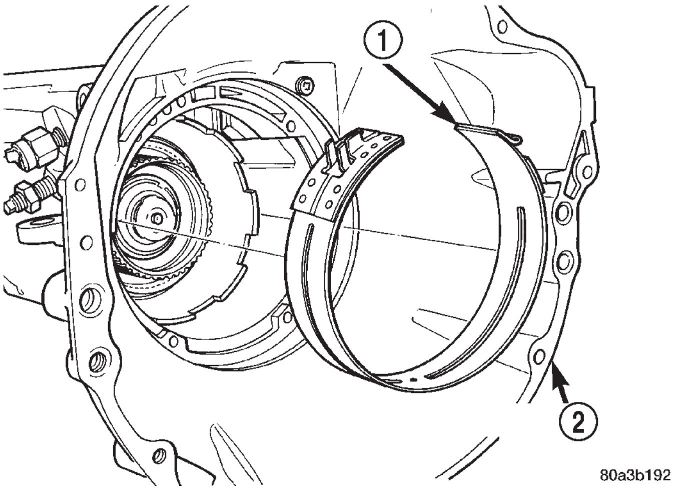

Fig. 59 Front Band

1 – FRONT BAND
2 – TRANSMISSION HOUSING

LOW/REVERSE (REAR) BAND

The low/reverse band, or "rear", band (Fig. 60) is similar in appearance and operation to the front band.

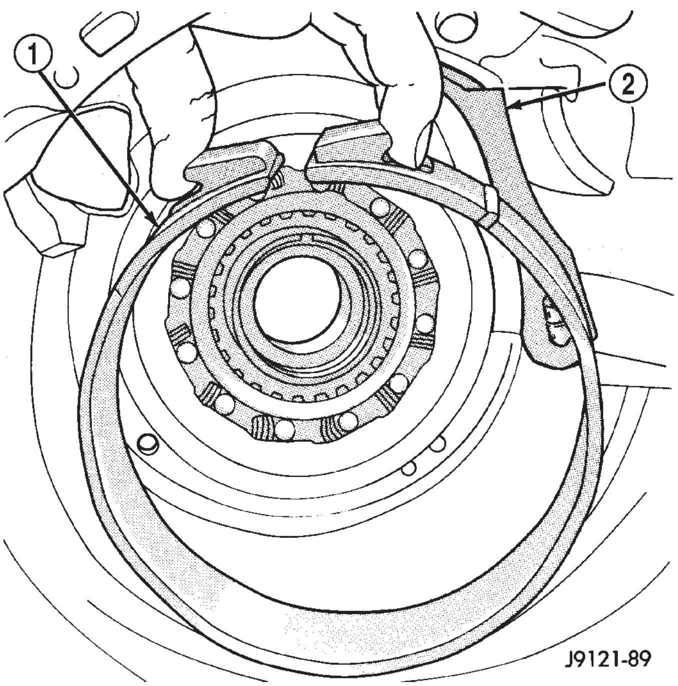

Fig. 60 Rear Band

1 – REAR BAND
2 – BAND LINK

OPERATION

KICKDOWN (FRONT) BAND

The kickdown band holds the common sun gear of the planetary gear sets by applying and holding the front clutch retainer, which is splined to the sun gear driving shell, and in turn splined directly to the sun gear. The application of the band by the servo is typically done by an apply lever and link bar.

LOW/REVERSE (REAR) BAND

The rear band holds the rear planet carrier stationary by being mounted around and applied to the low/reverse drum.

SERVOS

DESCRIPTION

KICKDOWN (FRONT) SERVO

The kickdown servo (Fig. 61) consists of a two–land piston with an inner piston, a piston rod and guide, and a return spring. The dual–land piston uses seal rings on its outer diameters and an O–ring for the inner piston.

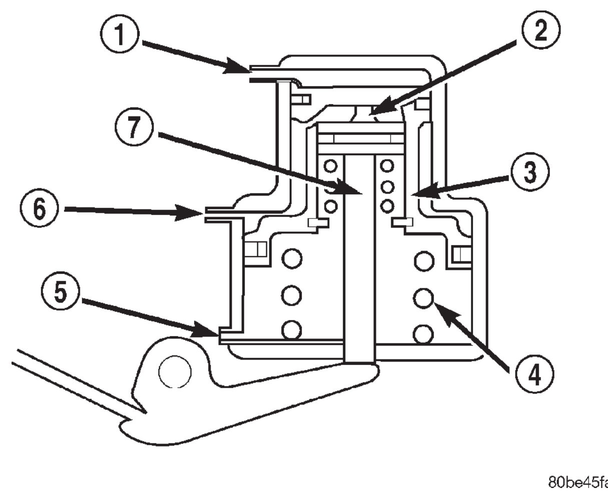

Fig. 61 Front Servo

1 – VENT
2 – INNER PISTON
3 – PISTON
4 – SPRING
5 – RELEASE PRESSURE
6 – APPLY PRESSURE
7 – PISTON ROD

LOW/REVERSE (REAR) SERVO

The rear (low/reverse) servo consists of a single stage or diameter piston and a spring loaded plug. The spring is used to cushion the application of the rear (low/reverse) band.

DESCRIPTION AND OPERATION (Continued)

OPERATION

KICKDOWN (FRONT) SERVO

The application of the piston is accomplished by applying pressure between the two lands of the piston. The pressure acts against the larger lower land to push the piston downward, allowing the piston rod to extend though its guide against the apply lever. Release of the servo at the 2–3 upshift is accomplished by a combination of spring and line pressure, acting on the bottom of the larger land of the piston. The small piston is used to cushion the application of the band by bleeding oil through a small orifice in the larger piston. The release timing of the kickdown servo is very important to obtain a smooth but firm shift. The release has to be very quick, just as the front clutch application is taking place. Otherwise, engine runaway or a shift hesitation will occur. To accomplish this, the band retains its holding capacity until the front clutch is applied, giving a small amount of overlap between them.

LOW/REVERSE (REAR) SERVO

While in the de-energized state (no pressure applied), the piston is held up in its bore by the piston spring. The plug is held down in its bore, in the piston, by the plug spring. When pressure is applied to the top of the piston, the plug is forced down in its bore, taking up any clearance. As the piston moves, it causes the plug spring to compress, and the piston moves down over the plug. The piston continues to move down until it hits the shoulder of the plug and fully applies the band. The period of time from the initial application, until the piston is against the shoulder of the plug, represents a reduced shocking of the band that cushions the shift.

GEARSHIFT MECHANISM

DESCRIPTION

The gear shift mechanism provides six shift positions which are:

- Park (P)
- Reverse (R)
- Neutral (N)
- Drive (D)
- Manual second (2)
- Manual low (1)

OPERATION

Manual low (1) range provides first gear only. Overrun braking is also provided in this range. Manual second (2) range provides first and second gear only.

Drive range provides first, second third and overdrive fourth gear ranges. The shift into overdrive fourth gear range occurs only after the transmission has completed the shift into D third gear range. No further movement of the shift mechanism is required to complete the 3-4 shift.

The fourth gear upshift occurs automatically when the overdrive selector switch is in the ON position. No upshift to fourth gear will occur if any of the following are true:

- The transmission fluid temperature is below 10° C (50° F) or above 121° C (250° F).
- The shift to third is not yet complete.
- Vehicle speed is too low for the 3–4 shift to occur.
- Battery temperature is below –5° C (23° F).

CONVERTER DRAINBACK VALVE

DESCRIPTION

The drainback valve is located in the transmission cooler outlet (pressure) line.

OPERATION

The valve prevents fluid from draining from the converter into the cooler and lines when the vehicle is shut down for lengthy periods. Production valves have a hose nipple at one end, while the opposite end is threaded for a flare fitting. All valves have an arrow (or similar mark) to indicate direction of flow through the valve.

POWERTRAIN CONTROL MODULE (PCM)

DESCRIPTION

The Powertrain Control Module (PCM) is located in the engine compartment (Fig. 62). The PCM is referred to as JTEC.

OPERATION

(1) Also refer to Modes of Operation.

The PCM operates the fuel system. The PCM is a pre-programmed, triple microprocessor digital computer. It regulates ignition timing, air-fuel ratio, emission control devices, charging system, certain transmission features, speed control, air conditioning compressor clutch engagement and idle speed. The PCM can adapt its programming to meet changing operating conditions.

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

DESCRIPTION AND OPERATION (Continued)

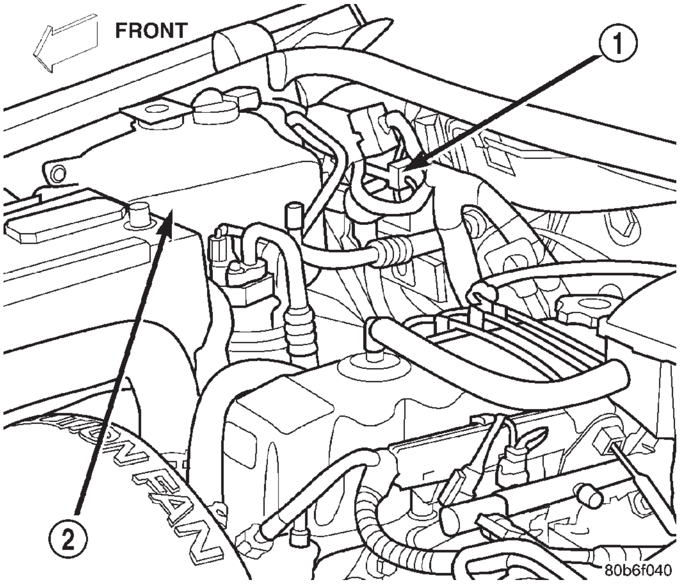

Fig. 62 PCM Location

1 – PCM
2 – COOLANT TANK

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

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

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

NOTE: PCM Inputs:

- A/C request
- Auto shutdown (ASD) sense
- Battery temperature
- Battery voltage
- Brake switch
- J1850 bus circuits
- Camshaft position sensor signal
- Crankshaft position sensor
- Data link connections for DRB scan tool
- Engine coolant temperature sensor
- Five volts (primary)
- Five volts (secondary)
- Fuel level
- Generator (battery voltage) output
- Ignition circuit sense (ignition switch in on/off/crank/run position)
- Intake manifold air temperature sensor
- Leak detection pump (switch) sense (if equipped)
- Manifold absolute pressure (MAP) sensor
- Oil pressure
- Overdrive/override switch
- Oxygen sensors
- Park/neutral switch (auto. trans. only)
- Power ground
- Sensor return
- Signal ground
- Speed control multiplexed single wire input
- Throttle position sensor
- Transmission governor pressure sensor
- Transmission temperature sensor
- Vehicle speed (from ABS module)

NOTE: PCM Outputs:

- A/C clutch relay
- Auto shutdown (ASD) relay
- J1850 (+/-) circuits for: speedometer, voltmeter, fuel gauge, oil pressure gauge/lamp, engine temp. gauge and speed control warn. lamp
- Data link connection for DRB scan tool
- EGR valve control solenoid (if equipped)
- EVAP canister purge solenoid
- Fuel injectors
- Fuel pump relay
- Generator field driver (-)
- Generator field driver (+)
- Generator lamp (if equipped)
- Idle air control (IAC) motor
- Ignition coil
- Leak detection pump
- Malfunction indicator lamp (Check engine lamp). Driven through J1850 circuits.
- Overdrive indicator lamp (if equipped). Driven through J1850 circuits.
- Oxygen sensor heater relays (if equipped).
- Radiator cooling fan relay (pulse width modulated)
- Speed control source
- Speed control vacuum solenoid
- Speed control vent solenoid
- Tachometer (if equipped). Driven through J1850 circuits.
- Transmission convertor clutch circuit
- Transmission 3–4 shift solenoid
- Transmission relay
- Transmission temperature lamp (if equipped)
- Transmission variable force solenoid

DESCRIPTION AND OPERATION (Continued)

ELECTRONIC GOVERNOR

DESCRIPTION

Governor pressure is controlled electronically. Components used for governor pressure control include:

- Governor body
- Valve body transfer plate
- Governor pressure solenoid valve
- Governor pressure sensor
- Fluid temperature thermistor
- Throttle position sensor (TPS)
- Transmission speed sensor
- Powertrain control module (PCM)

GOVERNOR PRESSURE SOLENOID VALVE

The solenoid valve is a duty-cycle solenoid which regulates the governor pressure needed for upshifts and downshifts. It is an electro-hydraulic device located in the governor body on the valve body transfer plate (Fig. 63).

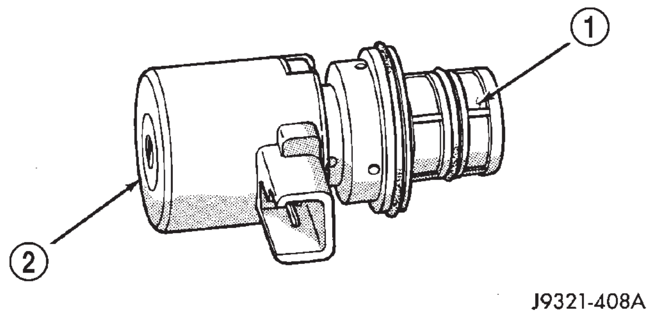

Fig. 63 Governor Pressure Solenoid Valve

1 – SOLENOID FILTER
2 – GOVERNOR PRESSURE SOLENOID

GOVERNOR PRESSURE SENSOR

The governor pressure sensor measures output pressure of the governor pressure solenoid valve (Fig. 64).

GOVERNOR BODY AND TRANSFER PLATE

The transfer plate is designed to supply transmission line pressure to the governor pressure solenoid valve and to return governor pressure.

The governor pressure solenoid valve is mounted in the governor body. The body is bolted to the lower side of the transfer plate (Fig. 64).

TRANSMISSION FLUID TEMPERATURE THERMISTOR

Transmission fluid temperature readings are supplied to the transmission control module by the thermistor. The temperature readings are used to control engagement of the fourth gear overdrive clutch, the converter clutch, and governor pressure. Normal resistance value for the thermistor at room temperature is approximately 1000 ohms.

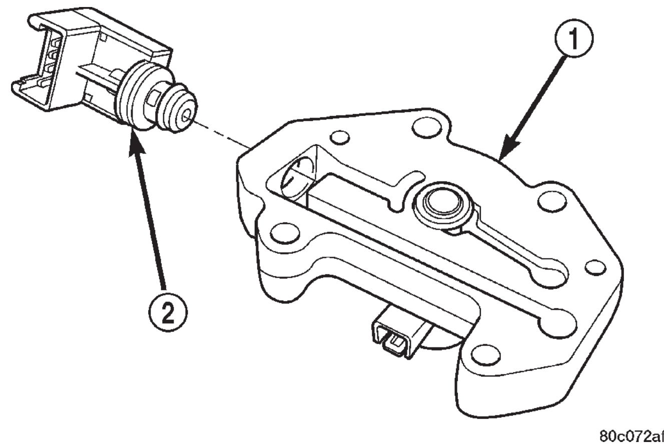

Fig. 64 Governor Pressure Sensor

1 – GOVERNOR BODY
2 – GOVERNOR PRESSURE SENSOR/TRANSMISSION FLUID TEMPERATURE THERMISTOR

The thermistor is part of the governor pressure sensor assembly and is immersed in transmission fluid at all times.

TRANSMISSION SPEED SENSOR

The speed sensor (Fig. 65) is located in the overdrive gear case. The sensor is positioned over the park gear and monitors transmission output shaft rotating speed.

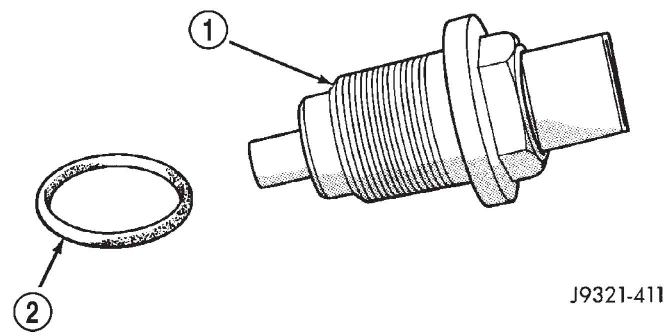

Fig. 65 Transmission Output Speed Sensor

1 – TRANSMISSION OUTPUT SHAFT SPEED SENSOR
2 – SEAL

OPERATION

Compensation is required for performance variations of two of the input devices. Though the slope of the transfer functions is tightly controlled, offset may vary due to various environmental factors or manufacturing tolerances.

The pressure transducer is affected by barometric pressure as well as temperature. Calibration of the zero pressure offset is required to compensate for shifting output due to these factors.

Normal calibration will be performed when sump temperature is above 50 degrees F, or in the absence of sump temperature data, after the first 10 minutes of vehicle operation. Calibration of the pressure transducer offset occurs each time the output shaft speed falls below 200 RPM. Calibration shall be repeated each 3 seconds the output shaft speed is below 200 RPM. A.5 second pulse of 95% duty cycle is applied to the governor pressure solenoid valve and the transducer output is read during this pulse. Averaging of the transducer signal is necessary to reject electrical noise.

Under cold conditions (below 50 degrees F sump), the governor pressure solenoid valve response may be too slow to guarantee 0 psi during the .5 second calibration pulse. Calibration pulses are continued during this period, however the transducer output valves are discarded. Transducer offset must be read at key-on, under conditions which promote a stable reading. This value is retained and becomes the offset during the “cold” period of operation.

GOVERNOR PRESSURE SOLENOID VALVE

The inlet side of the solenoid valve is exposed to normal transmission line pressure. The outlet side of the valve leads to the valve body governor circuit.

The solenoid valve regulates line pressure to produce governor pressure. The average current supplied to the solenoid controls governor pressure. One amp current produces zero kPa/psi governor pressure. Zero amps sets the maximum governor pressure.

The powertrain control module (PCM) turns on the trans control relay which supplies electrical power to the solenoid valve. Operating voltage is 12 volts (DC). The PCM controls the ground side of the solenoid using the governor pressure solenoid control circuit.

GOVERNOR PRESSURE SENSOR

The sensor output signal provides the necessary feedback to the PCM. This feedback is needed to adequately control governor pressure.

GOVERNOR BODY AND TRANSFER PLATE

The transfer plate channels line pressure to the solenoid valve through the governor body. It also channels governor pressure from the solenoid valve to the governor circuit. It is the solenoid valve that develops the necessary governor pressure.

TRANSMISSION FLUID TEMPERATURE THERMISTOR

The PCM prevents engagement of the converter clutch and overdrive clutch, when fluid temperature is below approximately 10°C (50°F).

If fluid temperature exceeds 126°C (260°F), the PCM causes a 4-3 downshift and engage the converter clutch. Engagement is according to the third gear converter clutch engagement schedule.

The overdrive OFF lamp in the instrument panel illuminates when the shift back to third occurs. The transmission will not allow fourth gear operation until fluid temperature decreases to approximately 110°C (230°F).

TRANSMISSION SPEED SENSOR

Speed sensor signals are triggered by the park gear lugs as they rotate past the sensor pickup face. Input signals from the sensor are sent to the transmission control module for processing. The vehicle speed sensor also serves as a backup for the transmission speed sensor. Signals from this sensor are shared with the powertrain control module.

GOVERNOR PRESSURE CURVES

DESCRIPTION

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

OPERATION

LOW TRANSMISSION FLUID TEMPERATURE

When the transmission fluid is cold the conventional governor can delay shifts, resulting in higher than normal shift speeds and harsh shifts. The electronically controlled low temperature governor pressure curve is higher than normal to make the transmission shift at normal speeds and sooner. The PCM uses a temperature sensor in the transmission oil sump to determine when low temperature governor pressure is needed.

NORMAL OPERATION

Normal operation is refined through the increased computing power of the PCM and through access to data on engine operating conditions provided by the PCM that were not available with the previous stand-alone electronic module. This facilitated the development of a load adaptive shift strategy - the ability to alter the shift schedule in response to vehicle load condition. One manifestation of this capability is grade “hunting” prevention - the ability of the transmission logic to delay an upshift on a grade if the engine does not have sufficient power to maintain speed in the higher gear. The 3-2 downshift and

DESCRIPTION AND OPERATION (Continued)

the potential for hunting between gears occurs with a heavily loaded vehicle or on steep grades. When hunting occurs, it is very objectionable because shifts are frequent and accompanied by large changes in noise and acceleration.

WIDE OPEN THROTTLE OPERATION

In wide-open throttle (WOT) mode, adaptive memory in the PCM assures that up-shifts occur at the preprogrammed optimum speed. WOT operation is determined from the throttle position sensor, which is also a part of the emission control system. The initial setting for the WOT upshift is below the optimum engine speed. As WOT shifts are repeated, the PCM learns the time required to complete the shifts by comparing the engine speed when the shifts occur to the optimum speed. After each shift, the PCM adjusts the shift point until the optimum speed is reached. The PCM also considers vehicle loading, grade and engine performance changes due to high altitude in determining when to make WOT shifts. It does this by measuring vehicle and engine acceleration and then factoring in the shift time.

TRANSFER CASE LOW RANGE OPERATION

On four-wheel drive vehicles operating in low range, the engine can accelerate to its peak more rapidly than in Normal range, resulting in delayed shifts and undesirable engine “flare”. The low range governor pressure curve is also higher than normal to initiate upshifts sooner. The PCM compares electronic vehicle speed signal used by the speedometer to the transmission output shaft speed signal to determine when the transfer case is in low range.

OVERDRIVE OFF SWITCH

DESCRIPTION

The overdrive OFF (control) switch is located in the shifter handle. The switch is a momentary contact device that signals the PCM to toggle current status of the overdrive function.

OPERATION

At key-on, overdrive operation is allowed. Pressing the switch once causes the overdrive OFF mode to be entered and the overdrive OFF switch lamp to be illuminated. Pressing the switch a second time causes normal overdrive operation to be restored and the overdrive lamp to be turned off. The overdrive OFF mode defaults to ON after the ignition switch is cycled OFF and ON. The normal position for the control switch is the ON position. The switch must be in this position to energize the solenoid and allow a 3-4 upshift. The control switch indicator light illuminates only when the overdrive switch is turned to the OFF position, or when illuminated by the transmission control module.

BRAKE TRANSMISSION SHIFT INTERLOCK MECHANISM

DESCRIPTION

The Brake Transmission Shifter/Ignition Interlock (BTSI), is a cable and solenoid operated system. It interconnects the automatic transmission floor mounted shifter to the steering column ignition switch (Fig. 66).

OPERATION

The system locks the shifter into the PARK position. The interlock system is engaged whenever the ignition switch is in the LOCK or ACCESSORY position. An additional electrically activated feature will prevent shifting out of the PARK position unless the brake pedal is depressed at least one-half an inch. A magnetic holding device in line with the park lock cable is energized when the ignition is in the RUN position. When the key is in the RUN position and the brake pedal is depressed, the shifter is unlocked and will move into any position. The interlock system also prevents the ignition switch from being turned to the LOCK or ACCESSORY position, unless the shifter is fully locked into the PARK position.

DIAGNOSIS AND TESTING

AUTOMATIC TRANSMISSION DIAGNOSIS

Automatic transmission problems can be a result of poor engine performance, incorrect fluid level, incorrect linkage or cable adjustment, band or hydraulic control pressure adjustments, hydraulic system malfunctions or electrical/mechanical component malfunctions. Begin diagnosis by checking the easily accessible items such as: fluid level and condition, linkage adjustments and electrical connections. A road test will determine if further diagnosis is necessary.

EFFECTS OF INCORRECT FLUID LEVEL

A low fluid level allows the pump to take in air along with the fluid. Air in the fluid will cause fluid pressures to be low and develop slower than normal. If the transmission is overfilled, the gears churn the fluid into foam. This aerates the fluid and causing the same conditions occurring with a low level. In either case, air bubbles cause fluid overheating, oxidation and varnish buildup which interferes with valve, clutch and servo operation. Foaming also causes fluid expansion which can result in fluid overflow from the transmission vent or fill tube. Fluid

DIAGNOSIS AND TESTING (Continued)

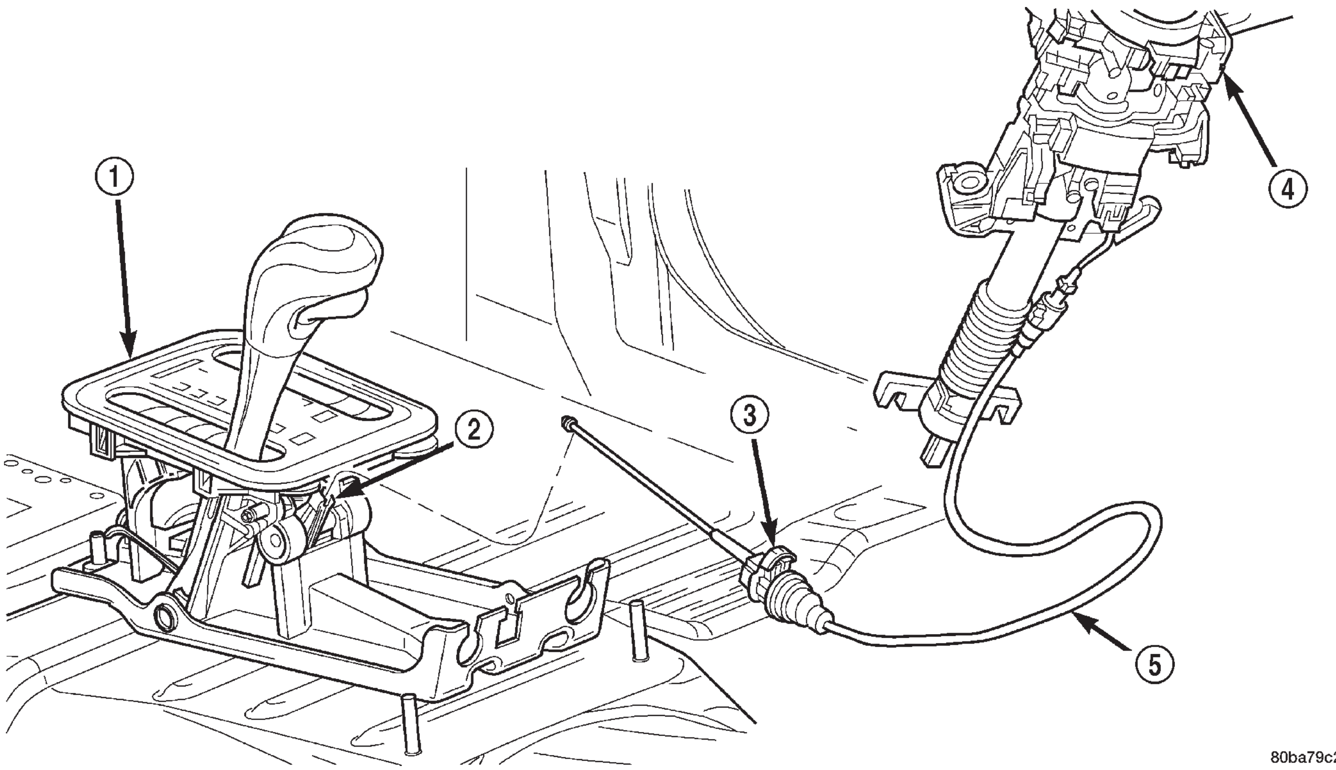

Fig. 66 Ignition Interlock Cable

1 – SHIFT MECHANISM
2 – SHIFTER BTSI LEVER
3 – ADJUSTMENT CLIP
4 – STEERING COLUMN ASSEMBLY
5 – INTERLOCK CABLE

overflow can easily be mistaken for a leak if inspection is not careful.

CAUSES OF BURNT FLUID

Burnt, discolored fluid is a result of overheating which has two primary causes.

(1) A result of restricted fluid flow through the main and/or auxiliary cooler. This condition is usually the result of a faulty or improperly installed drainback valve, a damaged main cooler, or severe restrictions in the coolers and lines caused by debris or kinked lines.

(2) Heavy duty operation with a vehicle not properly equipped for this type of operation. Trailer towing or similar high load operation will overheat the transmission fluid if the vehicle is improperly equipped. Such vehicles should have an auxiliary transmission fluid cooler, a heavy duty cooling system, and the engine/axle ratio combination needed to handle heavy loads.

FLUID CONTAMINATION

Transmission fluid contamination is generally a result of:

- adding incorrect fluid
- failure to clean dipstick and fill tube when checking level
- engine coolant entering the fluid
- internal failure that generates debris
- overheat that generates sludge (fluid breakdown)
- failure to reverse flush cooler and lines after repair
- failure to replace contaminated converter after repair

The use of non recommended fluids can result in transmission failure. The usual results are erratic shifts, slippage, abnormal wear and eventual failure due to fluid breakdown and sludge formation. Avoid this condition by using recommended fluids only.

The dipstick cap and fill tube should be wiped clean before checking fluid level. Dirt, grease and other foreign material on the cap and tube could fall into the tube if not removed beforehand. Take the time to wipe the cap and tube clean before withdrawing the dipstick.

Engine coolant in the transmission fluid is generally caused by a cooler malfunction. The only remedy is to replace the radiator as the cooler in the radiator is not a serviceable part. If coolant has circulated

DIAGNOSIS AND TESTING (Continued)

through the transmission for some time, an overhaul may also be necessary; especially if shift problems had developed.

The transmission cooler and lines should be reverse flushed whenever a malfunction generates sludge and/or debris. The torque converter should also be replaced at the same time.

Failure to flush the cooler and lines will result in recontamination. Flushing applies to auxiliary coolers as well. The torque converter should also be replaced whenever a failure generates sludge and debris. This is necessary because normal converter flushing procedures will not remove all contaminants.

PRELIMINARY DIAGNOSIS

Two basic procedures are required. One procedure for vehicles that are drivable and an alternate procedure for disabled vehicles (will not back up or move forward).

VEHICLE IS DRIVEABLE

(1) Check for transmission fault codes using DRB scan tool.

(2) Check fluid level and condition.

(3) Adjust throttle and gearshift linkage if complaint was based on delayed, erratic, or harsh shifts.

(4) Road test and note how transmission upshifts, downshifts, and engages.

(5) Perform stall test if complaint is based on sluggish acceleration. Or, if abnormal throttle opening is needed to maintain normal speeds with a properly tuned engine.

(6) Perform hydraulic pressure test if shift problems were noted during road test.

(7) Perform air-pressure test to check clutch-band operation.

VEHICLE IS DISABLED

(1) Check fluid level and condition.

(2) Check for broken or disconnected gearshift or throttle linkage.

(3) Check for cracked, leaking cooler lines, or loose or missing pressure-port plugs.

(4) Raise and support vehicle on safety stands, start engine, shift transmission into gear, and note following:

(a) If propeller shaft turns but wheels do not, problem is with differential or axle shafts.

(b) If propeller shaft does not turn and transmission is noisy, stop engine. Remove oil pan, and check for debris. If pan is clear, remove transmission and check for damaged drive plate, converter, oil pump, or input shaft.

(c) If propeller shaft does not turn and transmission is not noisy, perform hydraulic-pressure test to determine if problem is hydraulic or mechanical.

PARK/NEUTRAL POSITION SWITCH

The center terminal of the park/neutral position switch is the starter-circuit terminal. It provides the ground for the starter solenoid circuit through the selector lever in PARK and NEUTRAL positions only. The outer terminals on the switch are for the backup lamp circuit.

SWITCH TEST

To test the switch, remove the wiring connector. Test for continuity between the center terminal and the transmission case. Continuity should exist only when the transmission is in PARK or NEUTRAL.

Shift the transmission into REVERSE and test continuity at the switch outer terminals. Continuity should exist only when the transmission is in REVERSE. Continuity should not exist between the outer terminals and the case.

Check gearshift linkage adjustment before replacing a switch that tests faulty.

OVERDRIVE ELECTRICAL CONTROLS

The overdrive off switch, valve body solenoid, case connectors and related wiring can all be tested with a 12 volt test lamp or a volt/ohmmeter. Check continuity of each component when diagnosis indicates this is necessary. Refer to Group 8W, Wiring Diagrams, for component locations and circuit information.

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

BRAKE TRANSMISSION SHIFT INTERLOCK

(1) Verify that the key can only be removed in the PARK position

(2) When the shift lever is in PARK And the shift handle pushbutton is in the “OUT” position, the ignition key cylinder should rotate freely from OFF to LOCK. When the shifter is in any other gear or neutral position, the ignition key cylinder should not rotate to the LOCK position.

(3) Shifting out of PARK should be possible when the ignition key cylinder is in the OFF position.

(4) Shifting out of PARK should not be possible while applying 25 lb. maximum handle pushbutton force and ignition key cylinder is in the RUN or START positions unless the foot brake pedal is depressed approximately 1/2 inch (12 mm).

DIAGNOSIS AND TESTING (Continued)

SHIFT LEVER POSITION	TRANSMISSION CLUTCHES AND BANDS					OVERDRIVE CLUTCHES		
	FRONT CLUTCH	FRONT BAND	REAR CLUTCH	REAR BAND	OVERRUN. CLUTCH	OVERDRIVE CLUTCH	DIRECT CLUTCH	OVERRUN. CLUTCH
Reverse	X			X			X	
Drive Range								
First			X		X		X	X
Second		X	X				X	X
Third	X		X				X	X
Fourth	X		X			X		
2-Range (Manual) Second)		X	X		X		X	X
1-Range (Manual Low)			X	X	X		X	X

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Clutch And Band Application Chart

(5) Shifting out of PARK should not be possible when the ignition key cylinder is in the ACCESSORY or LOCK positions.

(6) Shifting between any gears, NEUTRAL or into PARK may be done without depressing foot brake pedal with ignition switch in RUN or START positions and vehicle stationary or in motion.

GEARSHIFT CABLE

(1) The floor shifter lever and gate positions should be in alignment with all transmission PARK, NEUTRAL, and gear detent positions.

(2) Engine starts must be possible with floor shift lever in PARK or NEUTRAL gate positions only. Engine starts must not be possible in any other gear position.

(3) With floor shift lever handle push-button not depressed and lever in:

(a) PARK position—Apply forward force on center of handle and remove pressure. Engine starts must be possible.

(b) PARK position—Apply rearward force on center of handle and remove pressure. Engine starts must be possible.

(c) NEUTRAL position—Normal position. Engine starts must be possible.

(d) NEUTRAL position—Engine running and brakes applied, apply forward force on center of shift handle. Transmission shall not be able to shift from neutral to reverse.

THROTTLE VALVE CABLE

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

If cable setting is too loose, early shifts and slippage between shifts may occur. If the setting is too tight, shifts may be delayed and part throttle downshifts may be very sensitive. Refer to the Adjustments section for the proper adjustment procedure.

ROAD TESTING

Before road testing, be sure the fluid level and control cable adjustments have been checked and adjusted if necessary. Verify that diagnostic trouble codes have been resolved.

Observe engine performance during the road test. A poorly tuned engine will not allow accurate analysis of transmission operation.

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

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

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

DIAGNOSIS AND TESTING (Continued)

ANALYZING ROAD TEST

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

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

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

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

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

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

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

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

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

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

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

HYDRAULIC PRESSURE TEST

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

An accurate tachometer and pressure test gauges are required. Test Gauge C-3292 has a 100 psi range and is used at the accumulator, governor, and front servo ports. Test Gauge C-3293-SP has a 300 psi range and is used at the rear servo and overdrive ports where pressures exceed 100 psi.

Pressure Test Port Locations

Test ports are located at both sides of the transmission case (Fig. 67).

Line pressure is checked at the accumulator port on the right side of the case. The front servo pressure port is at the right side of the case just behind the filler tube opening.

The rear servo and governor pressure ports are at the right rear of the transmission case. The overdrive clutch pressure port is at the left rear of the case.

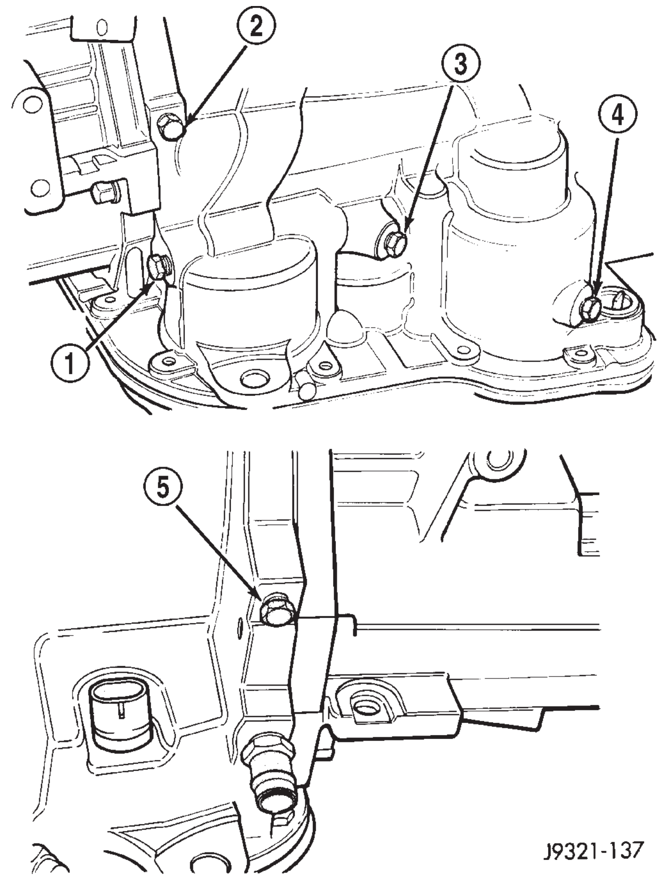


Fig. 67 Pressure Test Port Locations

1 – REAR SERVO TEST PORT
2 – GOVERNOR TEST PORT
3 – ACCUMULATOR TEST PORT
4 – FRONT SERVO TEST PORT
5 – OVERDRIVE CLUTCH TEST PORT

DIAGNOSIS AND TESTING (Continued)

Test One - Transmission In Manual Low

NOTE: This test checks pump output, pressure regulation, and condition of the rear clutch and servo circuit. Both test gauges are required for this test.

(1) Connect tachometer to engine. Position tachometer so it can be observed from driver seat if helper will be operating engine. Raise vehicle on hoist that will allow rear wheels to rotate freely.

(2) Connect 100 psi Gauge C-3292 to accumulator port. Then connect 300 psi Gauge C-3293-SP to rear servo port.

(3) Disconnect throttle and gearshift cables from levers on transmission valve body manual shaft.

(4) Have helper start and run engine at 1000 rpm.

(5) Move transmission shift lever fully forward into 1 range.

(6) Gradually move transmission throttle lever from full forward to full rearward position and note pressures on both gauges:

- Line pressure at accumulator port should be 54-60 psi (372-414 kPa) with throttle lever forward and gradually increase to 90-96 psi (621-662 kPa) as throttle lever is moved rearward.
- Rear servo pressure should be same as line pressure within 3 psi (20.68 kPa).

Test Two—Transmission In 2 Range

NOTE: This test checks pump output, line pressure and pressure regulation. Use 100 psi Test Gauge C-3292 for this test.

(1) Leave vehicle in place on hoist and leave Test Gauge C-3292 connected to accumulator port.

(2) Have helper start and run engine at 1000 rpm.

(3) Move transmission shift lever one detent rearward from full forward position. This is 2 range.

(4) Move transmission throttle lever from full forward to full rearward position and read pressure on gauge.

(5) Line pressure should be 54-60 psi (372-414 kPa) with throttle lever forward and gradually increase to 90-96 psi (621-662 kPa) as lever is moved rearward.

Test Three—Transmission In D Range Third Gear

NOTE: This test checks pressure regulation and condition of the clutch circuits. Both test gauges are required for this test.

(1) Turn OD switch off.

(2) Leave vehicle on hoist and leave Gauge C-3292 in place at accumulator port.

(3) Move Gauge C-3293-SP over to front servo port for this test.

(4) Have helper start and run engine at 1600 rpm for this test.

(5) Move transmission shift lever two detents rearward from full forward position. This is D range.

(6) Read pressures on both gauges as transmission throttle lever is gradually moved from full forward to full rearward position:

- Line pressure at accumulator in D range third gear, should be 54-60 psi (372-414 kPa) with throttle lever forward and increase as lever is moved rearward.
- Front servo pressure in D range third gear, should be within 3 psi (21 kPa) of line pressure up to kickdown point.

Test Four—Transmission In Reverse

NOTE: This test checks pump output, pressure regulation and the front clutch and rear servo circuits. Use 300 psi Test Gauge C-3293-SP for this test.

(1) Leave vehicle on hoist and leave gauge C-3292 in place at accumulator port.

(2) Move 300 psi Gauge C-3293-SP back to rear servo port.

(3) Have helper start and run engine at 1600 rpm for test.

(4) Move transmission shift lever four detents rearward from full forward position. This is Reverse range.

(5) Move transmission throttle lever fully forward then fully rearward and note reading at Gauge C-3293-SP.

(6) Pressure should be 145 - 175 psi (1000-1207 kPa) with throttle lever forward and increase to 230 - 280 psi (1586-1931 kPa) as lever is gradually moved rearward.

Test Five—Governor Pressure

NOTE: This test checks governor operation by measuring governor pressure response to changes in vehicle speed. It is usually not necessary to check governor operation unless shift speeds are incorrect or if the transmission will not downshift. The test should be performed on the road or on a hoist that will allow the rear wheels to rotate freely.

(1) Move 100 psi Test Gauge C-3292 to governor pressure port.

(2) Move transmission shift lever two detents rearward from full forward position. This is D range.

(3) Have helper start and run engine at curb idle speed. Then firmly apply service brakes so wheels will not rotate.

(4) Note governor pressure:

DIAGNOSIS AND TESTING (Continued)

- Governor pressure should be no more than 20.6 kPa (3 psi) at curb idle speed and wheels not rotating.
- If pressure exceeds 20.6 kPa (3 psi), a fault exists in governor pressure control system.

(5) Release brakes, slowly increase engine speed, and observe speedometer and pressure test gauge (do not exceed 30 mph on speedometer). Governor pressure should increase in proportion to vehicle speed. Or approximately 6.89 kPa (1 psi) for every 1 mph.

(6) Governor pressure rise should be smooth and drop back to no more than 20.6 kPa (3 psi), after engine returns to curb idle and brakes are applied to prevent wheels from rotating.

(7) Compare results of pressure test with analysis chart.

Test Six—Transmission In Overdrive Fourth Gear

NOTE: This test checks line pressure at the overdrive clutch in fourth gear range. Use 300 psi Test Gauge C-3293-SP for this test. The test should be performed on the road or on a chassis dyno.

(1) Remove tachometer; it is not needed for this test.

(2) Move 300 psi Gauge to overdrive clutch pressure test port. Then remove other gauge and reinstall test port plug.

(3) Lower vehicle.

(4) Turn OD switch on.

(5) Secure test gauge so it can be viewed from drivers seat.

(6) Start engine and shift into D range.

(7) Increase vehicle speed gradually until 3-4 shift occurs and note gauge pressure.

(8) Pressure should be 469-496 kPa (68-72 psi) with closed throttle and increase to 620-827 kPa (90-120 psi) at 1/2 to 3/4 throttle. Note that pressure can increase to around 896 kPa (130 psi) at full throttle.

(9) Return to shop or move vehicle off chassis dyno.

AIR TESTING TRANSMISSION CLUTCH AND BAND OPERATION

Air-pressure testing can be used to check transmission front/rear clutch and band operation. The test can be conducted with the transmission either in the vehicle or on the work bench, as a final check, after overhaul.

Air-pressure testing requires that the oil pan and valve body be removed from the transmission. The servo and clutch apply passages are shown (Fig. 68).

PRESSURE TEST ANALYSIS CHART

TEST CONDITION	INDICATION
Line pressure OK during any one test	Pump and regulator valve OK
Line pressure OK in R but low in D, 2, 1	Leakage in rear clutch area (seal rings, clutch seals)
Pressure low in D Fourth Gear Range	Overdrive clutch piston seal, or check ball problem
Pressure OK in 1, 2 but low in D3 and R	Leakage in front clutch area
Pressure OK in 2 but low in R and 1	Leakage in rear servo
Front servo pressure low in 2	Leakage in servo; broken servo ring or cracked servo piston
Pressure low in all positions	Clogged filter, stuck regulator valve, worn or faulty pump, low oil level
Governor pressure too high at idle speed	Governor pressure solenoid valve system fault. Refer to diagnostic book.
Governor pressure low at all mph figures	Faulty governor pressure solenoid, transmission control module, or governor pressure sensor
Lubrication pressure low at all throttle positions	Clogged fluid cooler or lines, seal rings leaking, worn pump bushings, pump, clutch retainer, or clogged filter.
Line pressure high	Output shaft plugged, sticky regulator valve
Line pressure low	Sticky regulator valve, clogged filter, worn pump

Front Clutch Air Test

Place one or two fingers on the clutch housing and apply air pressure through front clutch apply passage. Piston movement can be felt and a soft thump heard as the clutch applies.

Rear Clutch Air Test

Place one or two fingers on the clutch housing and apply air pressure through rear clutch apply passage. Piston movement can be felt and a soft thump heard as the clutch applies.

DIAGNOSIS AND TESTING (Continued)

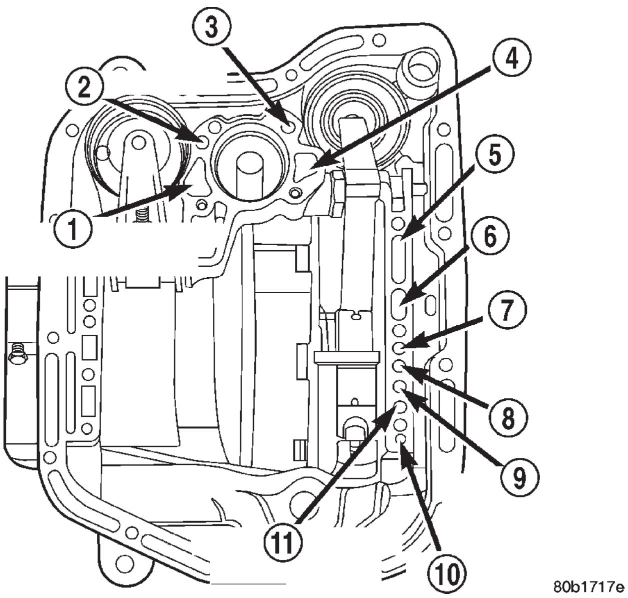


Fig. 68 Air Pressure Test Passages

1 – LINE PRESSURE TO ACCUMULATOR
2 – REAR SERVO APPLY
3 – FRONT SERVO APPLY
4 – FRONT SERVO RELEASE
5 – PUMP SUCTION
6 – PUMP PRESSURE
7 – FRONT CLUTCH APPLY
8 – REAR CLUTCH APPLY
9 – TO TORQUE CONVERTOR
10 – TO COOLER
11 – FROM TORQUE CONVERTER

Front Servo Air Test

Apply air pressure to the front servo apply passage. The servo rod should extend and cause the band to tighten around the drum. Spring pressure should release the servo when air pressure is removed.

Rear Servo Air Test

Apply air pressure to the rear servo apply passage. The servo rod should extend and cause the band to tighten around the drum. Spring pressure should release the servo when air pressure is removed.

CONVERTER HOUSING FLUID LEAK DIAGNOSIS

When diagnosing converter housing fluid leaks, two items must be established before repair.

(1) Verify that a leak condition actually exists.

(2) Determined the true source of the leak.

Some suspected converter housing fluid leaks may not be leaks at all. They may only be the result of residual fluid in the converter housing, or excess fluid spilled during factory fill or fill after repair. Converter housing leaks have several potential sources. Through careful observation, a leak source can be identified before removing the transmission for repair. Pump seal leaks tend to move along the drive hub and onto the rear of the converter. Pump O-ring or pump body leaks follow the same path as a seal leak (Fig. 69). Pump vent or pump attaching bolt leaks are generally deposited on the inside of the converter housing and not on the converter itself (Fig. 69). Pump seal or gasket leaks usually travel down the inside of the converter housing. Front band lever pin plug leaks are generally deposited on the housing and not on the converter.

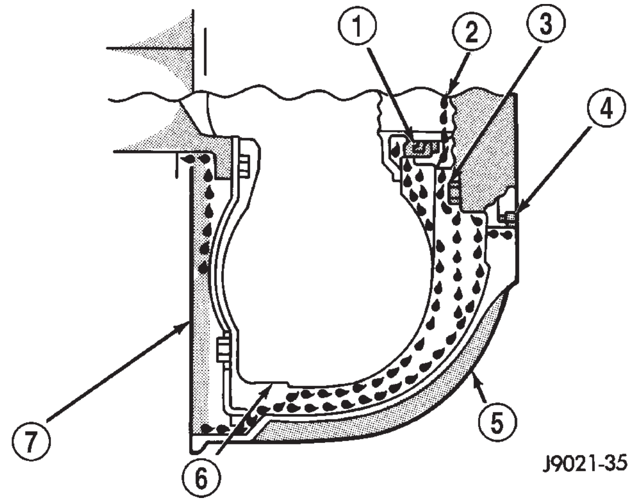


Fig. 69 Converter Housing Leak Paths

1 – PUMP SEAL
2 – PUMP VENT
3 – PUMP BOLT
4 – PUMP GASKET
5 – CONVERTER HOUSING
6 – CONVERTER
7 – REAR MAIN SEAL LEAK

TORQUE CONVERTER LEAK POINTS

Possible sources of converter leaks are:

(1) Leaks at the weld joint around the outside diameter weld (Fig. 70).

(2) Leaks at the converter hub weld (Fig. 70).

CONVERTER HOUSING AREA LEAK CORRECTION

(1) Remove converter.

(2) Tighten front band adjusting screw until band is tight around front clutch retainer. This prevents front/rear clutches from coming out when oil pump is removed.

(3) Remove oil pump and remove pump seal. Inspect pump housing drainback and vent holes for obstructions. Clear holes with solvent and wire.

(4) Inspect pump bushing and converter hub. If bushing is scored, replace it. If converter hub is scored, either polish it with crocus cloth or replace converter.

DIAGNOSIS AND TESTING (Continued)

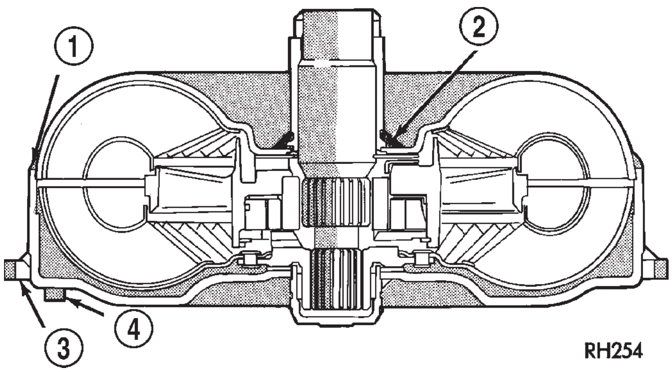


Fig. 70 Converter Leak Points—Typical

1 – OUTSIDE DIAMETER WELD
2 – TORQUE CONVERTER HUB WELD
3 – STARTER RING GEAR
4 – LUG

(5) Install new pump seal, O-ring, and gasket. Replace oil pump if cracked, porous or damaged in any way. Be sure to loosen the front band before installing the oil pump, damage to the oil pump seal may occur if the band is still tightened to the front clutch retainer.

(6) Loosen kickdown lever pin access plug three turns. Apply Loctite 592, or Permatex No. 2 to plug threads and tighten plug to 17 N·m (150 in. lbs.) torque.

(7) Adjust front band.

(8) Lubricate pump seal and converter hub with transmission fluid or petroleum jelly and install converter.

(9) Install transmission and converter housing dust shield.

(10) Lower vehicle.

DIAGNOSIS TABLES AND CHARTS—RE TRANSMISSION

The diagnosis charts provide additional reference when diagnosing a transmission fault. The charts provide general information on a variety of transmission, overdrive unit and converter clutch fault conditions.

The hydraulic flow charts in the Schematics and Diagrams section of this group, outline fluid flow and hydraulic circuitry. Circuit operation is provided for neutral, third, fourth and reverse gear ranges. Normal working pressures are also supplied for each of the gear ranges.

DIAGNOSIS AND TESTING (Continued)

DIAGNOSIS CHARTS

CONDITION	POSSIBLE CAUSES	CORRECTION
HARSH ENGAGEMENT (FROM NEUTRAL TO DRIVE OR REVERSE)	1. Fluid Level Low	1. Add Fluid
	2. Throttle Linkage Misadjusted	2. Adjust linkage - setting may be too long.
	3. Mount and Driveline Bolts Loose	3. Check engine mount, transmission mount, propeller shaft, rear spring to body bolts, rear control arms, crossmember and axle bolt torque. Tighten loose bolts and replace missing bolts.
	4. U-Joint Worn/Broken	4. Remove propeller shaft and replace U-Joint.
	5. Axle Backlash Incorrect	5. Check per Service Manual. Correct as needed.
	6. Hydraulic Pressure Incorrect	6. Check pressure. Remove, overhaul or adjust valve body as needed.
	7. Band Misadjusted.	7. Adjust rear band.
	8. Valve Body Check Balls Missing.	8. Inspect valve body for proper check ball installation.
	9. Axle Pinion Flange Loose.	9. Replace nut and check pinion threads before installing new nut. Replace pinion gear if threads are damaged.
	10. Clutch, band or planetary component damaged.	10. Remove, disassemble and repair transmission as necessary.
	11. Converter Clutch Faulty.	11. Replace converter and flush cooler and line before installing new converter.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
DELAYED ENGAGEMENT (FROM NEUTRAL TO DRIVE OR REVERSE)	1. Fluid Level Low.	1. Correct level and check for leaks.
	2. Filter Clogged.	2. Change filter.
	3. Gearshift Linkage Misadjusted.	3. Adjust linkage and repair linkage if worn or damaged.
	4. Torque Converter Drain Back (Oil drains from torque converter into transmission sump)	4. If vehicle moves normally after 5 seconds after shifting into gear, no repair is necessary. If longer, inspect pump bushing for wear. Replace pump house.
	5. Rear Band Misadjusted.	5. Adjust band.
	6. Valve Body Filter Plugged.	6. Replace fluid and filter. If oil pan and old fluid were full of clutch disc material and/or metal particles, overhaul will be necessary.
	7. Oil Pump Gears Worn/Damaged.	7. Remove transmission and replace oil pump.
	8. Governor Circuit and Solenoid Valve Electrical Fault.	8. Test with DRB scan tool and repair as required.
	9. Hydraulic Pressure Incorrect.	9. Perform pressure test, remove transmission and repair as needed.
	10. Reaction Shaft Seal Rings Worn/Broken.	10. Remove transmission, remove oil pump and replace seal rings.
	11. Rear Clutch/Input Shaft, Rear Clutch Seal Rings Damaged.	11. Remove and disassemble transmission and repair as necessary.
	12. Regulator Valve Stuck.	12. Clean.
	13. Cooler Plugged.	13. Transfer case failure can plug cooler.
NO DRIVE RANGE (REVERSE OK)	1. Fluid Level Low.	1. Add fluid and check for leaks if drive is restored.
	2. Gearshift Linkage/Cable Loose/Misadjusted.	2. Repair or replace linkage components.
	3. Rear Clutch Burnt.	3. Remove and disassemble transmission and rear clutch and seals. Repair/replace worn or damaged parts as needed.
	4. Valve Body Malfunction.	4. Remove and disassemble valve body. Replace assembly if any valves or bores are damaged.
	5. Transmission Overrunning Clutch Broken.	5. Remove and disassemble transmission. Replace overrunning clutch.
	6. Input Shaft Seal Rings Worn/ Damaged.	6. Remove and disassemble transmission. Replace seal rings and any other worn or damaged parts.
	7. Front Planetary Failed Broken.	7. Remove and repair.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
NO DRIVE OR REVERSE (VEHICLE WILL NOT MOVE)	1. Fluid Level Low.	1. Add fluid and check for leaks if drive is restored.
	2. Gearshift Linkage/Cable Loose/Misadjusted.	2. Inspect, adjust and reassemble linkage as needed. Replace worn/damaged parts.
	3. U-Joint/Axle/Transfer Case Broken.	3. Perform preliminary inspection procedure for vehicle that will not move. Refer to procedure in diagnosis section.
	4. Filter Plugged.	4. Remove and disassemble transmission. Repair or replace failed components as needed. Replace filter. If filter and fluid contained clutch material or metal particles, an overhaul may be necessary. Perform lube flow test. Flush oil. Replace cooler as necessary.
	5. Oil Pump Damaged.	5. Perform pressure test to confirm low pressure. Replace pump body assembly if necessary.
	6. Valve Body Malfunctioned.	6. Check and inspect valve body. Replace valve body (as assembly) if any valve or bore is damaged. Clean and reassemble correctly if all parts are in good condition.
	7. Transmission Internal Component Damaged.	7. Remove and disassemble transmission. Repair or replace failed components as needed.
	8. Park Sprag not Releasing - Check Stall Speed, Worn/Damaged/Stuck.	8. Remove, disassemble, repair.
	9. Torque Converter Damage.	9. Inspect and replace as required.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
SHIFTS DELAYED OR ERRATIC (SHIFTS ALSO HARSH AT TIMES)	1. Fluid Level Low/High.	1. Correct fluid level and check for leaks if low.
	2. Fluid Filter Clogged.	2. Replace filter. If filter and fluid contained clutch material or metal particles, an overhaul may be necessary. Perform lube flow test.
	3. Throttle Linkage Misadjusted.	3. Adjust linkage as described in service section.
	4. Throttle Linkage Binding.	4. Check cable for binding. Check for return to closed throttle at transmission.
	5. Gearshift Linkage/Cable Misadjusted.	5. Adjust linkage/cable as described in service section.
	6. Clutch or Servo Failure.	6. Remove valve body and air test clutch, and band servo operation. Disassemble and repair transmission as needed.
	7. Governor Circuit Electrical Fault.	7. Test using DRB scan tool and repair as required.
	8. Front Band Misadjusted.	8. Adjust band.
	9. Pump Suction Passage Leak.	9. Check for excessive foam on dipstick after normal driving. Check for loose pump bolts, defective gasket. Replace pump assembly if needed.
NO REVERSE (D RANGES OK)	1. Gearshift Linkage/Cable Misadjusted/Damaged.	1. Repair or replace linkage parts as needed.
	2. Park Sprag Sticking.	2. Replace overdrive annulus gear.
	3. Rear Band Misadjusted/Worn.	3. Adjust band; replace.
	4. Valve Body Malfunction.	4. Remove and service valve body. Replace valve body if any valves or valve bores are worn or damaged.
	5. Rear Servo Malfunction.	5. Remove and disassemble transmission. Replace worn/damaged servo parts as necessary.
	6. Direct Clutch in Overdrive Worn	6. Disassemble overdrive. Replace worn or damaged parts.
	7. Front Clutch Burnt.	7. Remove and disassemble transmission. Replace worn, damaged clutch parts as required.
HAS FIRST/REVERSE ONLY (NO 1-2 OR 2-3 UPSHIFT)	1. Governor Circuit Electrical Fault.	1. Test using DRB scan tool and repair as required.
	2. Valve Body Malfunction.	2. Repair stuck 1-2 shift valve or governor plug.
	3. Front Servo/Kickdown Band Damaged/Burned.	3. Repair/replace.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
MOVES IN 2ND OR 3RD GEAR, ABRUPTLY DOWNSHIFTS TO LOW	1. Valve Body Malfunction.	1. Remove, clean and inspect. Look for stuck 1-2 valve or governor plug.
	2. Governor Valve Sticking.	2. Remove, clean and inspect. Replace faulty parts.
NO LOW GEAR (MOVES IN 2ND OR 3RD GEAR ONLY)	1. Governor Valve Sticking.	1. Remove governor, clean, inspect and repair as required.
	2. Governor Circuit Electrical Fault.	2. Test with DRB scan tool and repair as required.
	3. Valve Body Malfunction.	3. Remove, clean and inspect. Look for sticking 1-2 shift valve, 2-3 shift valve, governor plug or broken springs.
	4. Front Servo Piston Cocked in Bore.	4. Inspect servo and repair as required.
	5. Front Band Linkage Malfunction.	5. Inspect linkage and look for bind in linkage.
NO KICKDOWN OR NORMAL DOWNSHIFT	1. Throttle Linkage Misadjusted.	1. Adjust linkage.
	2. Accelerator Pedal Travel Restricted.	2. Verify floor mat is not under pedal, repair worn accelerator cable or bent brackets.
	3. Valve Body Hydraulic Pressures Too High or Too Low Due to Valve Body Malfunction or Incorrect Hydraulic Control Pressure Adjustments.	3. Perform hydraulic pressure tests to determine cause and repair as required. Correct valve body pressure adjustments as required.
	4. Governor Circuit Electrical Fault.	4. Test with DRB scan tool and repair as required.
	5. Valve Body Malfunction.	5. Perform hydraulic pressure tests to determine cause and repair as required. Correct valve body pressure adjustments as required.
	6. TPS Malfunction.	6. Replace sensor, check with DRB scan tool.
	7. PCM Malfunction.	7. Check with DRB scan tool and replace if required.
	8. Valve Body Malfunction.	8. Repair sticking 1-2, 2-3 shift valves, governor plugs, 3-4 solenoid, 3-4 shift valve, 3-4 timing valve.
STUCK IN LOW GEAR (WILL NOT UPSHIFT)	1. Throttle Linkage Misadjusted/ Stuck.	1. Adjust linkage and repair linkage if worn or damaged. Check for binding cable or missing return spring.
	2. Gearshift Linkage Misadjusted.	2. Adjust linkage and repair linkage if worn or damaged.
	3. Governor Component Electrical Fault.	3. Check operating pressures and test with DRB scan tool, repair faulty component.
	4. Front Band Out of Adjustment.	4. Adjust Band.
	5. Clutch or Servo Malfunction.	5. Air pressure check operation of clutches and bands. Repair faulty component.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
CREEPS IN NEUTRAL	1. Gearshift Linkage Misadjusted.	1. Adjust linkage.
	2. Rear Clutch Dragging/Warped.	2. Disassemble and repair.
	3. Valve Body Malfunction.	3. Perform hydraulic pressure test to determine cause and repair as required.
BUZZING NOISE	1. Fluid Level Low.	1. Add fluid and check for leaks.
	2. Shift Cable Misassembled.	2. Route cable away from engine and bell housing.
	3. Valve Body Misassembled.	3. Remove, disassemble, inspect valve body. Reassemble correctly if necessary. Replace assembly if valves or springs are damaged. Check for loose bolts or screws.
	4. Pump Passages Leaking.	4. Check pump for porous casting, scores on mating surfaces and excess rotor clearance. Repair as required. Loose pump bolts.
	5. Cooling System Cooler Plugged.	5. Flow check cooler circuit. Repair as needed.
	6. Overrunning Clutch Damaged.	6. Replace clutch.
SLIPS IN REVERSE ONLY	1. Fluid Level Low.	1. Add fluid and check for leaks.
	2. Gearshift Linkage Misadjusted.	2. Adjust linkage.
	3. Rear Band Misadjusted.	3. Adjust band.
	4. Rear Band Worn.	4. Replace as required.
	5. Overdrive Direct Clutch Worn.	5. Disassemble overdrive. Repair as needed.
	6. Hydraulic Pressure Too Low.	6. Perform hydraulic pressure tests to determine cause.
	7. Rear Servo Leaking.	7. Air pressure check clutch-servo operation and repair as required.
	8. Band Linkage Binding.	8. Inspect and repair as required.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
SLIPS IN FORWARD DRIVE RANGES	1. Fluid Level Low.	1. Add fluid and check for leaks.
	2. Fluid Foaming.	2. Check for high oil level, bad pump gasket or seals, dirt between pump halves and loose pump bolts. Replace pump if necessary.
	3. Throttle Linkage Misadjusted.	3. Adjust linkage.
	4. Gearshift Linkage Misadjusted.	4. Adjust linkage.
	5. Rear Clutch Worn.	5. Inspect and replace as needed.
	6. Low Hydraulic Pressure Due to Worn Pump, Incorrect Control Pressure Adjustments, Valve Body Warpage or Malfunction, Sticking, Leaking Seal Rings, Clutch Seals Leaking, Servo Leaks, Clogged Filter or Cooler Lines.	6. Perform hydraulic and air pressure tests to determine cause.
	7. Rear Clutch Malfunction, Leaking Seals or Worn Plates.	7. Air pressure check clutch-servo operation and repair as required.
	8. Overrunning Clutch Worn, Not Holding (Slips in 1 Only).	8. Replace Clutch.
SLIPS IN LOW GEAR “D” ONLY, BUT NO IN 1 POSITION	Overrunning Clutch Faulty.	Replace overrunning clutch.
GROWLING, GRATING OR SCRAPING NOISES	1. Drive Plate Broken.	1. Replace.
	2. Torque Converter Bolts Hitting Dust Shield.	2. Dust shield bent. Replace or repair.
	3. Planetary Gear Set Broken/ Seized.	3. Check for debris in oil pan and repair as required.
	4. Overrunning Clutch Worn/Broken.	4. Inspect and check for debris in oil pan. Repair as required.
	5. Oil Pump Components Scored/ Binding.	5. Remove, inspect and repair as required.
	6. Output Shaft Bearing or Bushing Damaged.	6. Remove, inspect and repair as required.
	7. Clutch Operation Faulty.	7. Perform air pressure check and repair as required.
	8. Front and Rear Bands Misadjusted.	8. Adjust bands.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
DRAGS OR LOCKS UP	1. Fluid Level Low.	1. Check and adjust level.
	2. Clutch Dragging/Failed.	2. Air pressure check clutch operation and repair as required.
	3. Front or Rear Band Misadjusted.	3. Adjust bands.
	4. Case Leaks Internally.	4. Check for leakage between passages in case.
	5. Servo Band or Linkage Malfunction.	5. Air pressure check servo operation and repair as required.
	6. Overrunning Clutch Worn.	6. Remove and inspect clutch. Repair as required.
	7. Planetary Gears Broken.	7. Remove, inspect and repair as required (look for debris in oil pan).
	8. Converter Clutch Dragging.	8. Check for plugged cooler. Perform flow check. Inspect pump for excessive side clearance. Replace pump as required.
NO 4-3 DOWNSHIFT	1. Circuit Wiring and/or Connectors Shorted.	1. Test wiring and connectors with test lamp and volt/ohmmeter. Repair wiring as necessary. Replace connectors and/or harnesses as required.
	2. PCM Malfunction.	2. Check PCM operation with DRB scan tool. Replace PCM only if faulty.
	3. TPS Malfunction.	3. Check TPS with DRB scan tool at PCM.
	4. Lockup Solenoid Not Venting.	4. Remove valve body and replace solenoid assembly if plugged or shorted.
	5. Overdrive Solenoid Not Venting.	5. Remove valve body and replace solenoid if plugged or shorted.
	6. Valve Body Valve Sticking.	6. Repair stuck 3-4 shift valve or lockup timing valve.
NO 4-3 DOWNSHIFT WHEN CONTROL SWITCH IS TURNED OFF	1. Control Switch Open/Shorted.	1. Test and replace switch if faulty.
	2. Overdrive Solenoid Connector Shorted.	2. Test solenoids and replace if seized or shorted.
	3. PCM Malfunction.	3. Test with DRB scan tool. Replace PCM if faulty.
	4. Valve Body Stuck Valves.	4. Repair stuck 3-4, lockup or lockup timing valve.
CLUNK NOISE FROM DRIVELINE ON CLOSED THROTTLE 4-3 DOWNSHIFT	1. Transmission Fluid Low.	1. Add Fluid.
	2. Throttle Cable Misadjusted.	2. Adjust cable.
	3. Overdrive Clutch Select Spacer Wrong Spacer.	3. Replace overdrive piston thrust plate spacer.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
3-4 UPSHIFT OCCURS IMMEDIATELY AFTER 2-3 SHIFT	1. Overdrive Solenoid Connector or Wiring Shorted.	1. Test connector and wiring for loose connections, shorts or ground and repair as needed.
	2. TPS Malfunction.	2. Test TPS and replace as necessary. Check with DRB scan tool.
	3. PCM Malfunction.	3. Test PCM with DRB scan tool and replace controller if faulty.
	4. Overdrive Solenoid Malfunction.	4. Replace solenoid.
	5. Valve Body Malfunction.	5. Remove, disassemble, clean and inspect valve body components. Make sure all valves and plugs slide freely in bores. Polish valves with crocus cloth if needed.
WHINE/NOISE RELATED TO ENGINE SPEED	1. Fluid Level Low.	1. Add fluid and check for leaks.
	2. Shift Cable Incorrect Routing.	2. Check shift cable for correct routing. Should not touch engine or bell housing.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
NO 3-4 UPSHIFT	1. Dash O/D Switch In OFF Position.	1. Turn control switch to ON position.
	2. Overdrive Circuit Fuse Blown.	2. Replace fuse. Determine why fuse failed and repair as necessary (i.e., shorts or grounds in circuit).
	3. O/D Switch Wire Shorted/Open Cut.	3. Check wires/connections with 12V test lamp and voltmeter. Repair damaged or loose wire/connection as necessary.
	4. Distance or Coolant Sensor Malfunction.	4. Check with DRB scan tool and repair or replace as necessary.
	5. TPS Malfunction.	5. Check with DRB scan tool and replace if necessary.
	6. Neutral Switch to PCM Wire Shorted/Cut.	6. Test switch as described in service section and replace if necessary. Engine no start.
	7. PCM Malfunction.	7. Check with DRB scan tool and replace if necessary.
	8. Overdrive Solenoid Shorted/Open.	8. Replace solenoid if shorted or open and repair loose or damaged wires (DRB scan tool).
	9. Solenoid Feed Orifice in Valve Body Blocked.	9. Remove, disassemble, and clean valve body thoroughly. Check feed orifice.
	10. Overdrive Clutch Failed.	10. Disassemble overdrive and repair as needed.
	11. Hydraulic Pressure Low.	11. Pressure test transmission to determine cause.
	12. Valve Body Valve Stuck.	12. Repair stuck 3-4 shift valve, 3-4 timing valve.
	13. O/D Piston Incorrect Spacer.	13. Remove unit, check end play and install correct spacer.
	14. Overdrive Piston Seal Failure.	14. Replace both seals.
	15. O/D Check Valve/Orifice Failed.	15. Check for free movement and secure assembly (in piston retainer). Check ball bleed orifice.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
SLIPS IN OVERDRIVE FOURTH GEAR	1. Fluid Level Low.	1. Add fluid and check for leaks.
	2. Overdrive Clutch Pack Worn.	2. Remove overdrive unit and rebuild clutch pack.
	3. Overdrive Piston Retainer Bleed Orifice Blown Out.	3. Disassemble transmission, remove retainer and replace orifice.
	4. Overdrive Piston or Seal Malfunction.	4. Remove overdrive unit. Replace seals if worn. Replace piston if damaged. If piston retainer is damaged, remove and disassemble the transmission.
	5. 3-4 Shift Valve, Timing Valve or Accumulator Malfunction.	5. Remove and overhaul valve body. Replace accumulator seals. Make sure all valves operate freely in bores and do not bind or stick. Make sure valve body screws are correctly tightened and separator plates are properly positioned.
	6. Overdrive Unit Thrust Bearing Failure.	6. Disassemble overdrive unit and replace thrust bearing (NO. 1 thrust bearing is between overdrive piston and clutch hub; NO. 2 thrust bearing is between the planetary gear and the direct clutch spring plate; NO. 3 thrust bearing is between overrunning clutch hub and output shaft).
	7. O/D Check Valve/Bleed Orifice Failure.	7. Check for function/secure orifice insert in O/D piston retainer.
DELAYED 3-4 UPSHIFT (SLOW TO ENGAGE)	1. Fluid Level Low.	1. Add fluid and check for leaks.
	2. Throttle Valve Cable Misadjusted.	2. Adjust throttle valve cable.
	3. Overdrive Clutch Pack Worn/ Burnt.	3. Remove unit and rebuild clutch pack.
	4. TPS Faulty.	4. Test with DRB scan tool and replace as necessary.
	5. Overdrive Clutch Bleed Orifice Plugged.	5. Disassemble transmission and replace orifice.
	6. Overdrive Solenoid or Wiring Shorted/Open.	6. Test solenoid and check wiring for loose/corroded connections or shorts/ grounds. Replace solenoid if faulty and repair wiring if necessary.
	7. Overdrive Excess Clearance.	7. Remove unit. Measure end play and select proper spacer.
	8. O/D Check Valve Missing or Stuck.	8. Check for presence of check valve. Repair or replace as required.
TORQUE CONVERTER LOCKS UP IN SECOND AND/OR THIRD GEAR	Lockup Solenoid, Relay or Wiring Shorted/Open.	Test solenoid, relay and wiring for continuity, shorts or grounds. Replace solenoid and relay if faulty. Repair wiring and connectors as necessary.
HARSH 1-2, 2-3, 3-4 OR 3-2 SHIFTS	Lockup Solenoid Malfunction.	Remove valve body and replace solenoid assembly.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
NO START IN PARK OR NEUTRAL	1. Gearshift Linkage/Cable Misadjusted.	1. Adjust linkage/cable.
	2. Neutral Switch Wire Open/Cut.	2. Check continuity with test lamp. Repair as required.
	3. Neutral Switch Faulty.	3. Refer to service section for test and replacement procedure.
	4. Neutral Switch Connect Faulty.	4. Connectors spread open. Repair.
	5. Valve Body Manual Lever Assembly Bent/Worn/Broken.	5. Inspect lever assembly and replace if damaged.
NO REVERSE (OR SLIPS IN REVERSE)	1. Direct Clutch Pack (front clutch) Worn.	1. Disassemble unit and rebuild clutch pack.
	2. Rear Band Misadjusted.	2. Adjust band.
	3. Front Clutch Malfunctioned/ Burned.	3. Air-pressure test clutch operation. Remove and rebuild if necessary.
	4. Overdrive Thrust Bearing Failure.	4. Disassemble geartrain and replace bearings.
	5. Direct Clutch Spring Collapsed/ Broken.	5. Remove and disassemble unit. Check clutch position and replace spring.
OIL LEAKS	1. Fluid Lines and Fittings Loose/ Leaks/Damaged.	1. Tighten fittings. If leaks persist, replace fittings and lines if necessary.
	2. Fill Tube (where tube enters case) Leaks/Damaged.	2. Replace tube seal. Inspect tube for cracks in fill tube.
	3. Pressure Port Plug Loose Loose/Damaged.	3. Tighten to correct torque. Replace plug or reseal if leak persists.
	4. Pan Gasket Leaks.	4. Tighten pan screws (150 in. lbs.). If leaks persist, replace gasket.
	5. Valve Body Manual Lever Shaft Seal Leaks/Worn.	5. Replace shaft seal.
	6. Rear Bearing Access Plate Leaks.	6. Replace gasket. Tighten screws.
	7. Gasket Damaged or Bolts are Loose.	7. Replace bolts or gasket or tighten both.
	8. Adapter/Extension Gasket Damaged Leaks/Damaged.	8. Replace gasket.
	9. Neutral Switch Leaks/Damaged.	9. Replace switch and gasket.
	10. Converter Housing Area Leaks.	10. Check for leaks at seal caused by worn seal or burr on converter hub (cutting seal), worn bushing, missing oil return, oil in front pump housing or hole plugged. Check for leaks past O-ring seal on pump or past pump-to-case bolts; pump housing porous, oil coming out vent due to overfill or leak past front band shaft access plug.
	11. Pump Seal Leaks/Worn/ Damaged.	11. Replace seal.
	12. Torque Converter Weld Leak/Cracked Hub.	12. Replace converter.
	13. Case Porosity Leaks.	13. Replace case.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
NOISY OPERATION IN FOURTH GEAR ONLY	1. Overdrive Clutch Discs, Plates or Snap Rings Damaged.	1. Remove unit and rebuild clutch pack.
	2. Overdrive Piston or Planetary Thrust Bearing Damaged.	2. Remove and disassemble unit. Replace either thrust bearing if damaged.
	3. Output Shaft Bearings Scored/ Damaged.	3. Remove and disassemble unit. Replace either bearing if damaged.
	4. Planetary Gears Worn/Chipped.	4. Remove and overhaul overdrive unit.
	5. Overdrive Unit Overrunning Clutch Rollers Worn/Scored.	5. Remove and overhaul overdrive unit.

SERVICE PROCEDURES

FLUID LEVEL CHECK

Transmission fluid level should be checked monthly under normal operation. If the vehicle is used for trailer towing or similar heavy load hauling, check fluid level and condition weekly. Fluid level is checked with the engine running at curb idle speed, the transmission in NEUTRAL and the transmission fluid at normal operating temperature.

FLUID LEVEL CHECK PROCEDURE

(1) Transmission fluid must be at normal operating temperature for accurate fluid level check. Drive vehicle if necessary to bring fluid temperature up to normal hot operating temperature of 82°C (180°F).

(2) Position vehicle on level surface.

(3) Start and run engine at curb idle speed.

(4) Apply parking brakes.

(5) Shift transmission momentarily into all gear ranges. Then shift transmission back to Neutral.

(6) Clean top of filler tube and dipstick to keep dirt from entering tube.

(7) Remove dipstick (Fig. 71) and check fluid level as follows:

(a) Correct acceptable level is in crosshatch area.

(b) Correct maximum level is to MAX arrow mark.

(c) Incorrect level is at or below MIN line.

(d) If fluid is low, add only enough Mopar® ATF Plus 3 to restore correct level. Do not overfill.

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

FLUID AND FILTER REPLACEMENT

Refer to the Maintenance Schedules in Group 0, Lubrication and Maintenance, for proper service intervals. The service fluid fill after a filter change is approximately 3.8 liters (4.0 quarts).

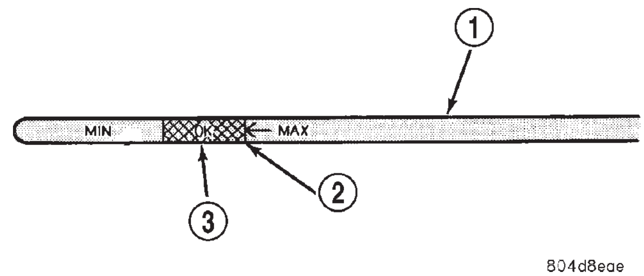


Fig. 71 Dipstick Fluid Level Marks—Typical

1 – DIPSTICK
2 – MAXIMUM CORRECT FLUID LEVEL
3 – ACCEPTABLE FLUID LEVEL

REMOVAL

(1) Hoist and support vehicle on safety stands.

(2) Place a large diameter shallow drain pan beneath the transmission pan.

(3) Remove bolts holding front and sides of pan to transmission (Fig. 72).

(4) Loosen bolts holding rear of pan to transmission.

(5) Slowly separate front of pan away from transmission allowing the fluid to drain into drain pan.

(6) Hold up pan and remove remaining bolt holding pan to transmission.

(7) While holding pan level, lower pan away from transmission.

(8) Pour remaining fluid in pan into drain pan.

(9) Remove screws holding filter to valve body (Fig. 73).

(10) Separate filter from valve body and pour fluid in filter into drain pan.

(11) Dispose of used trans fluid and filter properly.

INSPECTION

Inspect bottom of pan and magnet for excessive amounts of metal or fiber contamination. A light coating of clutch or band material on the bottom of the pan does not indicate a problem unless accompa-

SERVICE PROCEDURES (Continued)

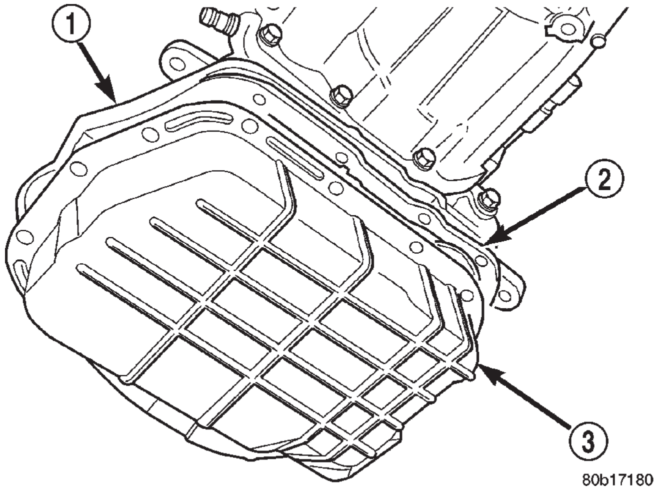


Fig. 72 Transmission Pan

1 – TRANSMISSION
2 – GASKET
3 – PAN

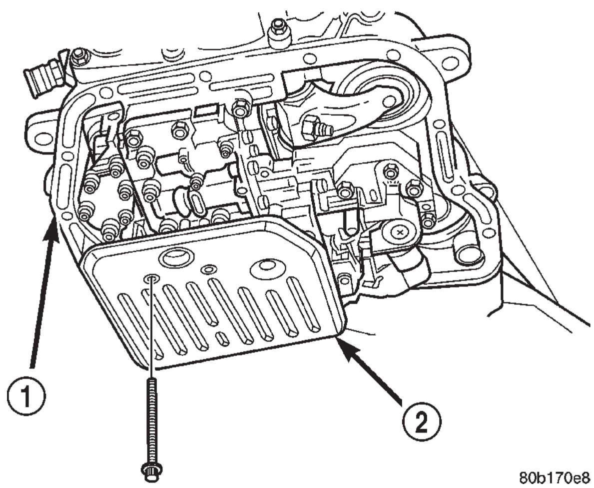


Fig. 73 Transmission Filter

1 – TRANSMISSION
2 – FILTER

nied by slipping condition or shift lag. If fluid and pan are contaminated with excessive amounts or debris, refer to the diagnosis section of this group.

Check the adjustment of the front and rear bands, adjust if necessary.

CLEANING

(1) Using a suitable solvent, clean pan and magnet.

(2) Using a suitable gasket scraper, clean gasket material from gasket surface of transmission case and the gasket flange around the pan.

INSTALLATION

(1) Place replacement filter in position on valve body.

(2) Install screws to hold filter to valve body (Fig. 73). Tighten screws to 4 N·m (35 in. lbs.) torque.

(3) Place new gasket in position on pan and install pan on transmission.

(4) Place pan in position on transmission.

(5) Install screws to hold pan to transmission (Fig. 72). Tighten bolts to 17 N·m (150 in. lbs.) torque.

(6) Lower vehicle and fill transmission with Mopar® ATF Plus 3, type 7176 fluid.

TRANSMISSION FILL PROCEDURE

To avoid overfilling transmission after a fluid change or overhaul, perform the following procedure:

(1) Remove dipstick and insert clean funnel in transmission fill tube.

(2) Add following initial quantity of Mopar® ATF Plus 3 to transmission:

(a) If only fluid and filter were changed, add **3 pints (1-1/2 quarts)** of ATF Plus 3 to transmission.

(b) If transmission was completely overhauled, torque converter was replaced or drained, and cooler was flushed, add **12 pints (6 quarts)** of ATF Plus 3 to transmission.

(3) Apply parking brakes.

(4) Start and run engine at normal curb idle speed.

(5) Apply service brakes, shift transmission through all gear ranges then back to NEUTRAL, set parking brake, and leave engine running at curb idle speed.

(6) Remove funnel, insert dipstick and check fluid level. If level is low, **add fluid to bring level to MIN mark on dipstick.** Check to see if the oil level is equal on both sides of the dipstick. If one side is noticably higher than the other, the dipstick has picked up some oil from the dipstick tube. Allow the oil to drain down the dipstick tube and re-check.

(7) Drive vehicle until transmission fluid is at normal operating temperature.

(8) With the engine running at curb idle speed, the gear selector in NEUTRAL, and the parking brake applied, check the transmission fluid level.

CAUTION: Do not overfill transmission, fluid foaming and shifting problems can result.

(9) Add fluid to bring level up to MAX arrow mark.

When fluid level is correct, shut engine off, release park brake, remove funnel, and install dipstick in fill tube.

CONVERTER DRAINBACK CHECK VALVE SERVICE

The converter drainback check valve is located in the cooler outlet (pressure) line near the radiator tank. The valve prevents fluid drainback when the vehicle is parked for lengthy periods. The valve check ball is spring loaded and has an opening pressure of approximately 2 psi.

The valve is serviced as an assembly; it is not repairable. Do not clean the valve if restricted, or contaminated by sludge, or debris. If the valve fails, or if a transmission malfunction occurs that generates significant amounts of sludge and/or clutch particles and metal shavings, the valve must be replaced.

The valve must be removed whenever the cooler and lines are reverse flushed. The valve can be flow tested when necessary. The procedure is exactly the same as for flow testing a cooler.

If the valve is restricted, installed backwards, or in the wrong line, it will cause an overheating condition and possible transmission failure.

CAUTION: The drainback valve is a one-way flow device. It must be properly oriented in terms of flow direction for the cooler to function properly. The valve must be installed in the pressure line. Otherwise flow will be blocked and would cause an overheating condition and eventual transmission failure.

OIL PUMP VOLUME CHECK

Measuring the oil pump output volume will determine if sufficient oil flow to the transmission oil cooler exists, and whether or not an internal transmission failure is present.

Verify that the transmission fluid is at the proper level. Refer to the Fluid Level Check procedure in this section. If necessary, fill the transmission to the proper level with Mopar® ATF+3, type 7176, Automatic Transmission Fluid.

(1) Disconnect the **To cooler** line at the cooler inlet and place a collecting container under the disconnected line.

CAUTION: With the fluid set at the proper level, fluid collection should not exceed (1) quart or internal damage to the transmission may occur.

(2) Run the engine **at curb idle speed**, with the shift selector in neutral.

(3) If one quart of transmission fluid is collected in the container in 20 seconds or less, oil pump flow volume is within acceptable limits. If fluid flow is intermittent, or it takes more than 20 seconds to collect one quart of fluid, refer to the Hydraulic Pressure tests in this section for further diagnosis.

(4) Re-connect the **To cooler** line to the transmission cooler inlet.

(5) Refill the transmission to proper level.

FLUSHING COOLERS AND TUBES

When a transmission failure has contaminated the fluid, the oil cooler(s) must be flushed. The torque converter must also be replaced. This will insure that metal particles or sludged oil are not later transferred back into the reconditioned (or replaced) transmission.

The only recommended procedure for flushing coolers and lines is to use Tool 6906A Cooler Flusher.

WARNING: WEAR PROTECTIVE EYEWEAR THAT MEETS THE REQUIREMENTS OF OSHA AND ANSI Z87.1–1968. WEAR STANDARD INDUSTRIAL RUBBER GLOVES.

KEEP LIGHTED CIGARETTES, SPARKS, FLAMES, AND OTHER IGNITION SOURCES AWAY FROM THE AREA TO PREVENT THE IGNITION OF COMBUSTIBLE LIQUIDS AND GASES. KEEP A CLASS (B) FIRE EXTINGUISHER IN THE AREA WHERE THE FLUSHER WILL BE USED.

KEEP THE AREA WELL VENTILATED.

DO NOT LET FLUSHING SOLVENT COME IN CONTACT WITH YOUR EYES OR SKIN: IF EYE CONTAMINATION OCCURS, FLUSH EYES WITH WATER FOR 15 TO 20 SECONDS. REMOVE CONTAMINATED CLOTHING AND WASH AFFECTED SKIN WITH SOAP AND WATER. SEEK MEDICAL ATTENTION.

COOLER FLUSH USING TOOL 6906A

(1) Remove cover plate filler plug on Tool 6906A. Fill reservoir 1/2 to 3/4 full of fresh flushing solution. Flushing solvents are petroleum based solutions generally used to clean automatic transmission components. **DO NOT** use solvents containing acids, water, gasoline, or any other corrosive liquids.

(2) Reinstall filler plug on Tool 6906A.

(3) Verify pump power switch is turned OFF. Connect red alligator clip to positive (+) battery post. Connect black (-) alligator clip to a good ground.

(4) Disconnect the cooler lines at the transmission.

NOTE: When flushing transmission cooler and lines, ALWAYS reverse flush.

SERVICE PROCEDURES (Continued)

NOTE: The converter drainback valve must be removed and an appropriate replacement hose installed to bridge the space between the transmission cooler line and the cooler fitting. Failure to remove the drainback valve will prevent reverse flushing the system. A suitable replacement hose can be found in the adapter kit supplied with the flushing tool.

(5) Connect the BLUE pressure line to the OUTLET (From) cooler line.

(6) Connect the CLEAR return line to the INLET (To) cooler line

(7) Turn pump ON for two to three minutes to flush cooler(s) and lines.

(8) Turn pump OFF.

(9) Disconnect CLEAR suction line from reservoir at cover plate. Disconnect CLEAR return line at cover plate, and place it in a drain pan.

(10) Turn pump ON for 30 seconds to purge flushing solution from cooler and lines. Turn pump OFF.

(11) Place CLEAR suction line into a one quart container of Mopar® ATF Plus 3, type 7176 automatic transmission fluid.

(12) Turn pump ON until all transmission fluid is removed from the one quart container and lines. This purges any residual cleaning solvent from the transmission cooler and lines. Turn pump OFF.

(13) Disconnect alligator clips from battery. Reconnect flusher lines to cover plate, and remove flushing adapters from cooler lines.

ALUMINUM THREAD REPAIR

Damaged or worn threads in the aluminum transmission case and valve body can be repaired by the use of Heli-Coils, or equivalent. This repair consists of drilling out the worn-out damaged threads. Then tap the hole with a special Heli-Coil tap, or equivalent, and installing a Heli-Coil insert, or equivalent, into the hole. This brings the hole back to its original thread size.

Heli-Coil, or equivalent, tools and inserts are readily available from most automotive parts suppliers.

REMOVAL AND INSTALLATION

TRANSMISSION

The overdrive unit can be removed and serviced separately. It is not necessary to remove the entire transmission assembly to perform overdrive unit repairs.

If only the overdrive unit requires service, refer to the overdrive unit removal and installation procedures.

CAUTION: The transmission and torque converter must be removed as an assembly to avoid component damage. The converter driveplate, pump bushing, or oil seal can be damaged if the converter is left attached to the driveplate during removal. Be sure to remove the transmission and converter as an assembly.

REMOVAL

(1) Disconnect battery negative cable.

(2) Disconnect and lower or remove necessary exhaust components.

(3) Disconnect fluid cooler lines at transmission.

(4) Remove starter motor.

(5) Disconnect and remove crankshaft position sensor. Retain sensor attaching bolts.

CAUTION: The crankshaft position sensor will be damaged if the transmission is removed, or installed, while the sensor is still bolted to the engine block, or transmission (4.0L only). To avoid damage, be sure to remove the sensor before removing the transmission.

(6) Remove the bolts holding the bell housing brace to the transmission.

(7) Remove nut holding the bell housing brace to the engine to transmission bending brace.

(8) Remove the bell housing brace from the transmission (Fig. 74).

(9) Remove the bolt holding the torque converter cover to the transmission.

(10) Remove the torque converter cover from the transmission.

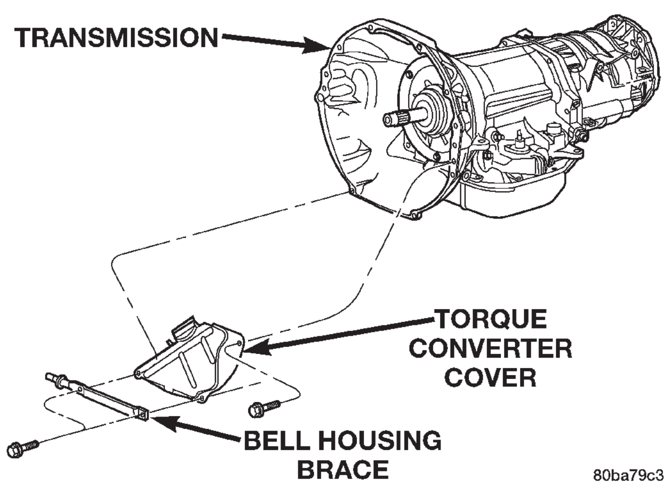


Fig. 74 Bell Housing Brace and Converter Cover

(11) If transmission is being removed for overhaul, remove transmission oil pan, drain fluid and reinstall pan.

REMOVAL AND INSTALLATION (Continued)

(12) Remove fill tube bracket bolts and pull tube out of transmission. Retain fill tube seal. On 4 x 4 models, it will also be necessary to remove bolt attaching transfer case vent tube to converter housing.

(13) Rotate crankshaft in clockwise direction until converter bolts are accessible. Then remove bolts one at a time. Rotate crankshaft with socket wrench on dampener bolt.

(14) Mark propeller shaft and axle yokes for assembly alignment. Then disconnect and remove propeller shaft. On 4 x 4 models, remove both propeller shafts.

(15) Disconnect wires from park/neutral position switch and transmission solenoid.

(16) Disconnect gearshift cable from transmission manual valve lever (Fig. 75).

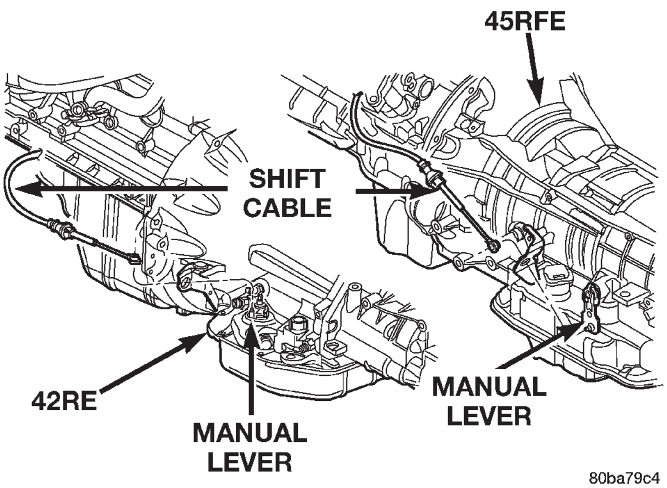


Fig. 75 Transmission Shift Cable

(17) Disconnect throttle valve cable from transmission bracket and throttle valve lever (Fig. 76).

(18) Disconnect transfer case shift cable from the transfer case shift lever (Fig. 77).

(19) Remove the clip securing the transfer case shift cable into the cable support bracket.

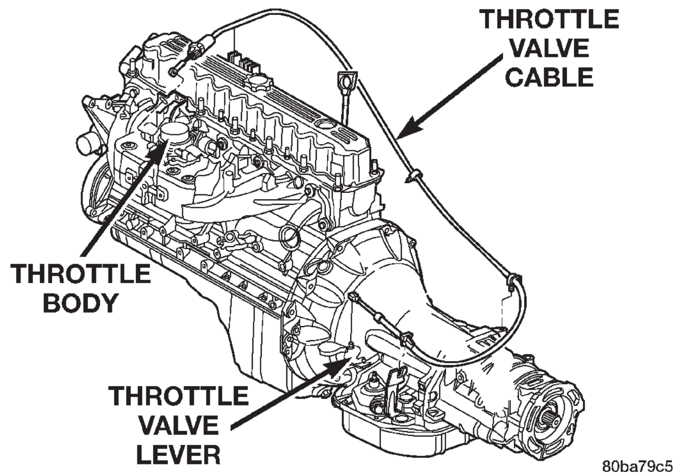


Fig. 76 Throttle Valve Cable

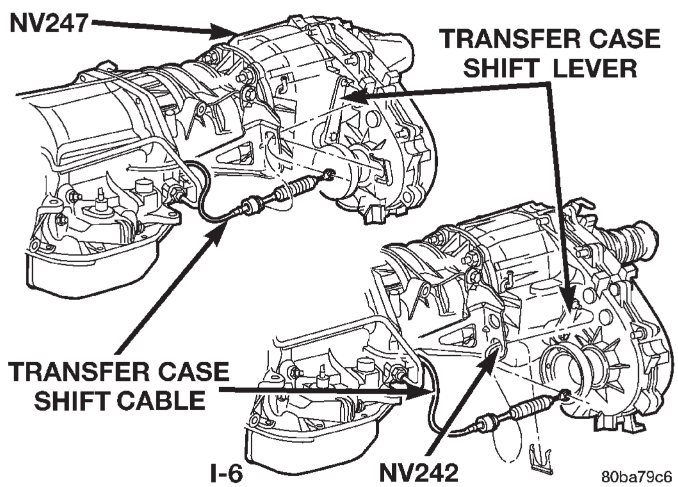


Fig. 77 Transfer Case Shift Cable

(20) Disconnect transmission fluid cooler lines at transmission fittings and clips.

(21) Support rear of engine with safety stand or jack.

(22) Raise transmission slightly with service jack to relieve load on crossmember and supports.

REMOVAL AND INSTALLATION (Continued)

(23) Remove bolts securing rear support and cushion to transmission and crossmember (Fig. 78).

(24) Remove bolts attaching crossmember to frame and remove crossmember.

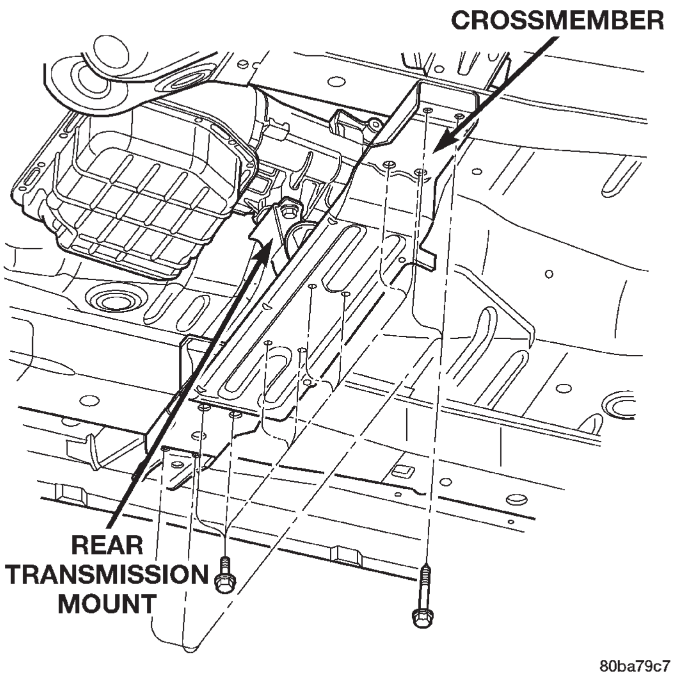


Fig. 78 Rear Transmission Crossmember

(25) Remove transfer case (Fig. 79) and (Fig. 80).

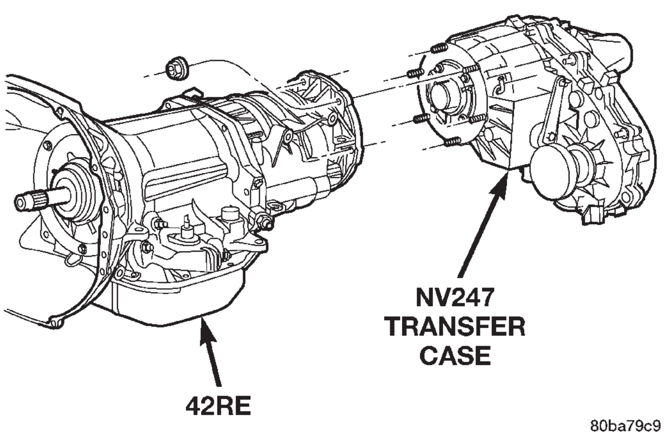


Fig. 79 Remove NV247 Transfer Case

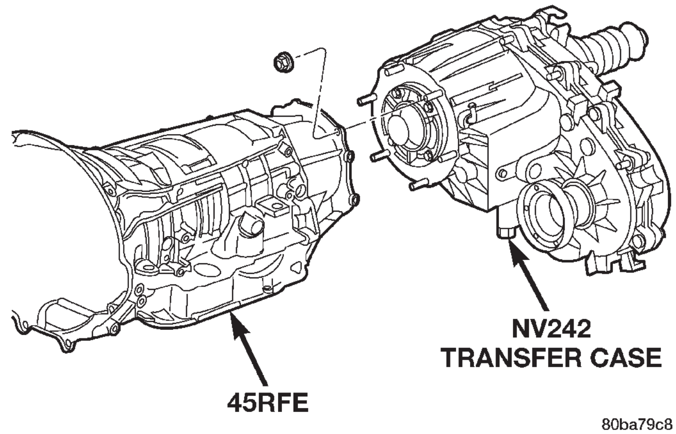


Fig. 80 Remove NV242 Transfer Case

(26) Remove bolts holding the upper transmission bending braces to the torque converter housing and the overdrive unit (Fig. 81).

(27) Remove all remaining converter housing bolts.

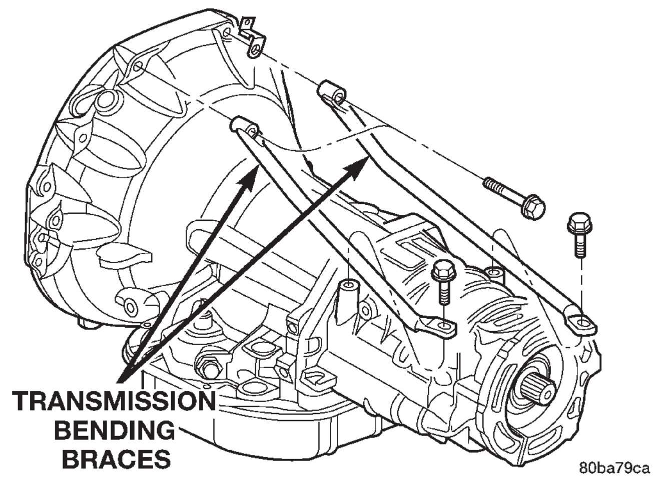


Fig. 81 Remove Upper Transmission Bending Braces

(28) Carefully work transmission and torque converter assembly rearward off engine block dowels.

(29) Hold torque converter in place during transmission removal.

(30) Lower transmission and remove assembly from under the vehicle.

(31) To remove torque converter, carefully slide torque converter out of the transmission.

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Check torque converter hub and hub drive notches for sharp edges burrs, scratches, or nicks. Polish the hub and notches with 320/400 grit paper and crocus cloth if necessary. The hub must be smooth to avoid damaging pump seal at installation.

(2) Lubricate oil pump seal lip with transmission fluid.

(3) Align converter and oil pump.

(4) Carefully insert converter in oil pump. Then rotate converter back and forth until fully seated in pump gears.

(5) Check converter seating with steel scale and straightedge (Fig. 82). Surface of converter lugs should be 1/2 in. to rear of straightedge when converter is fully seated.

(6) Temporarily secure converter with C-clamp.

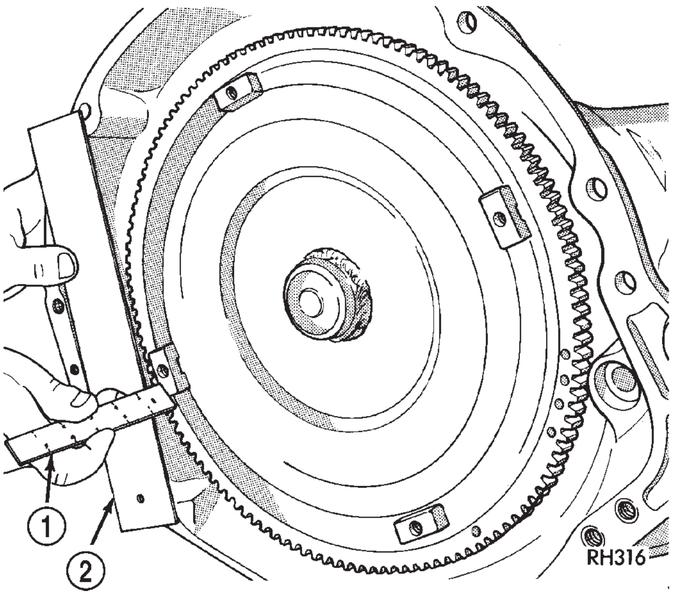


Fig. 82 Typical Method Of Checking Converter Seating

1 – SCALE
2 – STRAIGHTEDGE

(7) Position transmission on jack and secure it with chains.

(8) Check condition of converter driveplate. Replace the plate if cracked, distorted or damaged. **Also be sure transmission dowel pins are seated in engine block and protrude far enough to hold transmission in alignment.**

(9) Apply a light coating of Mopar® High Temp grease to the torque converter hub pocket in the rear of the crankshaft.

(10) Raise transmission and align converter with drive plate and converter housing with engine block.

(11) Move transmission forward. Then raise, lower or tilt transmission to align converter housing with engine block dowels.

(12) Carefully work transmission forward and over engine block dowels until converter hub is seated in crankshaft.

(13) Install two bolts to attach converter housing to engine.

(14) Install the upper transmission bending braces to the torque converter housing and the overdrive unit. Tighten the bolts to 41 N·m (30 ft. lbs.).

(15) Install remaining torque converter housing to engine bolts. Tighten to 68 N·m (50 ft. lbs.).

(16) Install rear transmission crossmember. Tighten crossmember to frame bolts to 68 N·m (50 ft. lbs.).

(17) Install rear support to transmission. Tighten bolts to 47 N·m (35 ft. lbs.).

(18) Lower transmission onto crossmember and install bolts attaching transmission mount to crossmember. Tighten clevis bracket to crossmember bolts to 47 N·m (35 ft. lbs.). Tighten the clevis bracket to rear support bolt to 68 N·m (50 ft. lbs.).

(19) Remove engine support fixture.

(20) Install crankshaft position sensor.

(21) Install new plastic retainer grommet on any shift cable that was disconnected. Grommets should not be reused. Use pry tool to remove rod from grommet and cut away old grommet. Use pliers to snap new grommet into cable and to snap grommet onto lever.

(22) Connect gearshift and throttle valve cable to transmission.

(23) Connect wires to park/neutral position switch and transmission solenoid connector. Be sure transmission harnesses are properly routed.

CAUTION: It is essential that correct length bolts be used to attach the converter to the driveplate. Bolts that are too long will damage the clutch surface inside the converter.

(24) Install torque converter-to-driveplate bolts. Tighten bolts to 31 N·m (270 in. lbs.).

(25) Install converter housing access cover. Tighten bolt to 23 N·m (200 in. lbs.).

(26) Install the bell housing brace to the torque converter cover and the engine to transmission bending brace. Tighten the bolts and nut to 41 N·m (30 ft. lbs.).

(27) Install starter motor and cooler line bracket.

(28) Connect cooler lines to transmission.

(29) Install transmission fill tube. Install new seal on tube before installation.

(30) Install exhaust components.

(31) Install transfer case. Tighten transfer case nuts to 35 N·m (26 ft. lbs.).

REMOVAL AND INSTALLATION (Continued)

(32) Install the transfer case shift cable to the cable support bracket and the transfer case shift lever.

(33) Align and connect propeller shaft(s).

(34) Adjust gearshift linkage and throttle valve cable if necessary.

(35) Lower vehicle.

(36) Fill transmission with Mopar® ATF Plus 3, Type 7176 fluid.

TORQUE CONVERTER

REMOVAL

(1) Remove transmission and torque converter from vehicle.

(2) Place a suitable drain pan under the converter housing end of the transmission.

CAUTION: Verify that transmission is secure on the lifting device or work surface, the center of gravity of the transmission will shift when the torque converter is removed creating an unstable condition.

The torque converter is a heavy unit. Use caution when separating the torque converter from the transmission.

(3) Pull the torque converter forward until the center hub clears the oil pump seal.

(4) Separate the torque converter from the transmission.

INSTALLATION

Check converter hub and drive notches for sharp edges, burrs, scratches, or nicks. Polish the hub and notches with 320/400 grit paper or crocus cloth if necessary. The hub must be smooth to avoid damaging the pump seal at installation. Check that the torque converter hub o-ring on the 45RFE torque converter hub is not damaged. Replace if necessary.

(1) Lubricate oil pump seal lip with transmission fluid.

(2) Place torque converter in position on transmission.

CAUTION: Do not damage oil pump seal or bushing while inserting torque converter into the front of the transmission.

(3) Align torque converter to oil pump seal opening.

(4) Insert torque converter hub into oil pump.

(5) While pushing torque converter inward, rotate converter until converter is fully seated in the oil pump gears.

(6) Check converter seating with a scale and straightedge (Fig. 83). Surface of converter lugs should be 1/2 in. to rear of straightedge when converter is fully seated.

(7) If necessary, temporarily secure converter with C-clamp attached to the converter housing.

(8) Install the transmission in the vehicle.

(9) Fill the transmission with the recommended fluid.

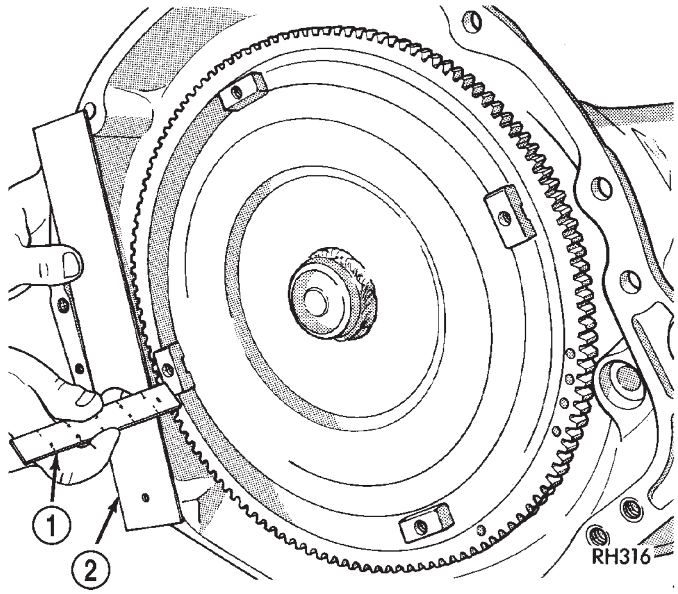


Fig. 83 Checking Torque Converter Seating–Typical

1 – SCALE
2 – STRAIGHTEDGE

PARK/NEUTRAL POSITION SWITCH

REMOVAL

(1) Raise vehicle and position drain pan under switch.

(2) Disconnect switch wires.

(3) Remove switch from case.

INSTALLATION

(1) Move shift lever to Park and Neutral positions. Verify that switch operating lever fingers are centered in switch opening in case (Fig. 84).

(2) Install new seal on switch and install switch in case. Tighten switch to 34 N·m (25 ft. lbs.) torque.

(3) Test continuity of new switch with 12V test lamp.

(4) Connect switch wires and lower vehicle.

(5) Top off transmission fluid level.

GEARSHIFT CABLE

REMOVAL

(1) Shift transmission into Park.

(2) Raise vehicle.

REMOVAL AND INSTALLATION (Continued)

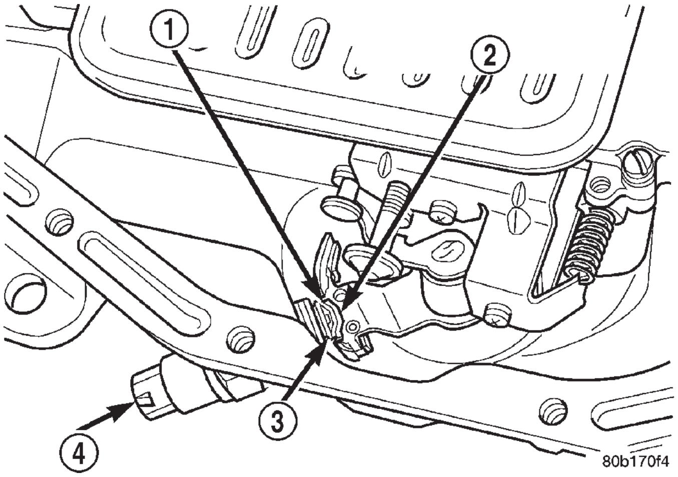


Fig. 84 Park/Neutral Position Switch

1 – NEUTRAL CONTACT
2 – MANUAL LEVER AND SWITCH PLUNGER IN REVERSE POSITION
3 – PARK CONTACT
4 – SWITCH

(3) Remove the shift cable eyelet from the transmission manual shift lever (Fig. 85).

(4) Remove shift cable from the cable support bracket.

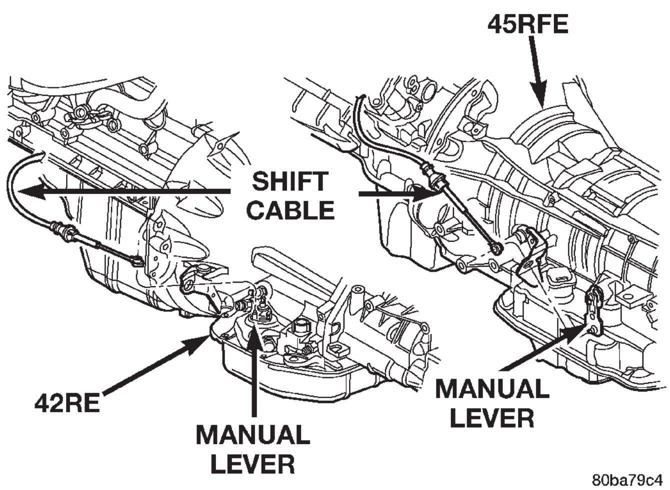


Fig. 85 Remove Shift Cable From Transmission

(5) Lower vehicle.

(6) Remove shift lever bezel and necessary console parts for access to shift lever assembly and shift cable.

(7) Disconnect cable at shift lever and shifter assembly bracket (Fig. 86).

(8) Remove the nuts holding the shift cable seal plate to the floor pan (Fig. 87).

(9) Pull cable through floor panel opening.

(10) Remove shift cable from vehicle.

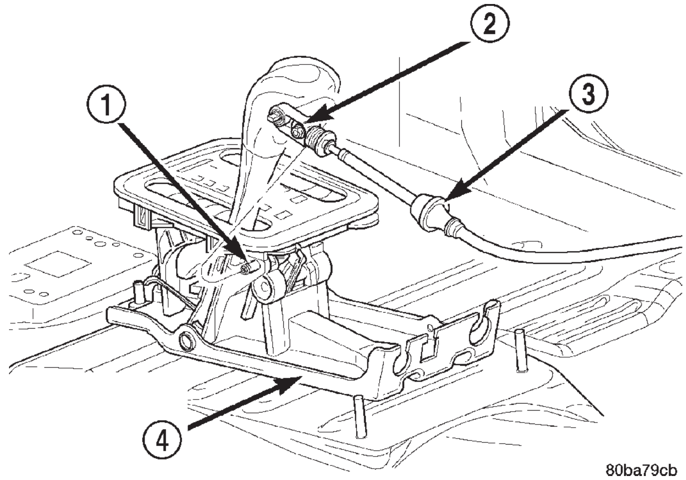


Fig. 86 Transmission Shift Cable at Shifter

1 – SHIFT LEVER PIN
2 – ADJUSTMENT SCREW
3 – SHIFT CABLE
4 – SHIFTER ASSEMBLY BRACKET

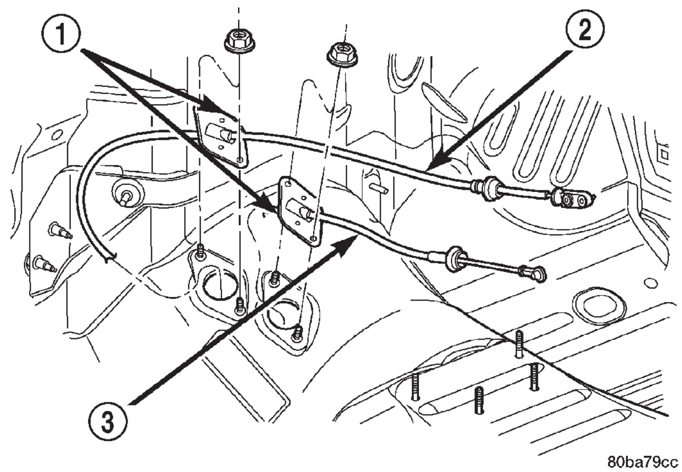


Fig. 87 Shift Cables at Floor Pan

1 – SEAL PLATES
2 – TRANSMISSION SHIFT CABLE
3 – TRANSFER CASE SHIFT CABLE

INSTALLATION

(1) Route cable through hole in floor pan.

(2) Install seal plate to studs in floor pan.

(3) Install nuts to hold seal plate to floor pan. Tighten nuts to 7 N·m (65 in. lbs.).

(4) Install the shift cable to the shifter assembly bracket. Push cable into the bracket until secure.

(5) Place the floor shifter lever in park position.

(6) Loosen the adjustment screw on the shift cable.

(7) Snap the shift cable onto the shift lever pin.

(8) Raise the vehicle.

(9) Install the shift cable to the shift cable support bracket.

REMOVAL AND INSTALLATION (Continued)

(10) Shift the transmission into PARK. PARK is the rearmost detent position on the transmission manual shift lever.

(11) Snap the shift cable onto the transmission manual shift lever.

(12) Lower vehicle.

(13) Verify that the shift lever is in the PARK position.

(14) Tighten the adjustment screw to 7 N·m (65 in. lbs.).

(15) Verify correct shifter operation.

(16) Install shift lever bezel and any console parts removed for access to shift lever assembly and shift cable.

SHIFTER

REMOVAL

(1) Shift transmission into Park.

(2) Remove shift lever bezel and any necessary console parts for access to shift lever assembly and shifter cables.

(3) Disconnect the transmission shift cable at shift lever and shifter assembly bracket (Fig. 88).

(4) Disconnect the brake transmission interlock cable from the shifter BTSI lever and the shifter assembly bracket.

(5) Disconnect the transfer case shift cable from the transfer case shift lever pin (Fig. 90).

(6) Remove the clip holding the transfer case shift cable to the shifter assembly bracket.

(7) Remove the transfer case shift cable from the shifter assembly bracket.

(8) Disengage all wiring connectors from the shifter assembly.

(9) Remove all nuts holding the shifter assembly to the floor pan (Fig. 91).

(10) Remove the shifter assembly from the vehicle.

INSTALLATION

(1) Install shifter assembly onto the shifter assembly studs on the floor pan.

(2) Install the nuts to hold the shifter assembly onto the floor pan. Tighten nuts to 28 N·m (250 in. lbs.).

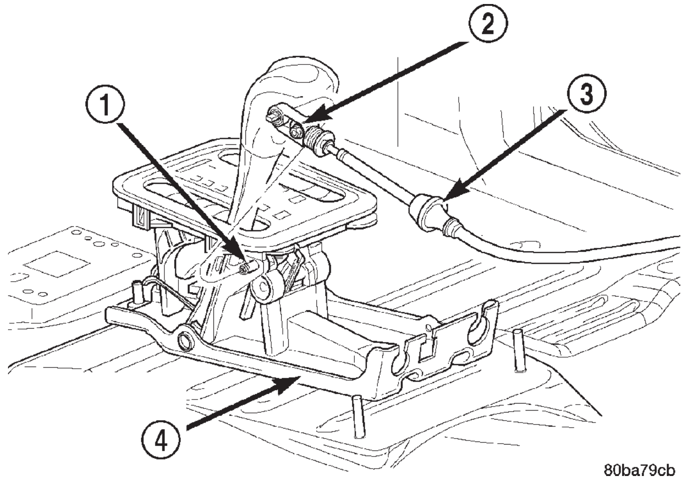


Fig. 88 Transmission Shift Cable at Shifter

1 – SHIFT LEVER PIN
2 – ADJUSTMENT SCREW
3 – SHIFT CABLE
4 – SHIFTER ASSEMBLY BRACKET

(3) Install wiring harness to the shifter assembly bracket. Engage any wire connectors removed from the shifter assembly.

(4) Install the transfer case shift cable to the shifter assembly bracket. Install clip to hold cable to the bracket.

(5) Snap the transfer case shift cable onto the transfer case shift lever pin.

(6) Install the brake transmission interlock cable into the shifter assembly bracket and into the shifter BTSI lever.

(7) Install the shift cable to the shifter assembly bracket. Push cable into the bracket until secure.

(8) Place the floor shifter lever in park position.

(9) Loosen the adjustment screw on the shift cable.

(10) Snap the shift cable onto the shift lever pin.

(11) Verify that the shift lever is in the PARK position.

(12) Tighten the adjustment screw to 7 N·m (65 in. lbs.).

(13) Verify correct shifter operation.

(14) Install shift lever bezel and any console parts removed for access to shift lever assembly and shift cables.

REMOVAL AND INSTALLATION (Continued)

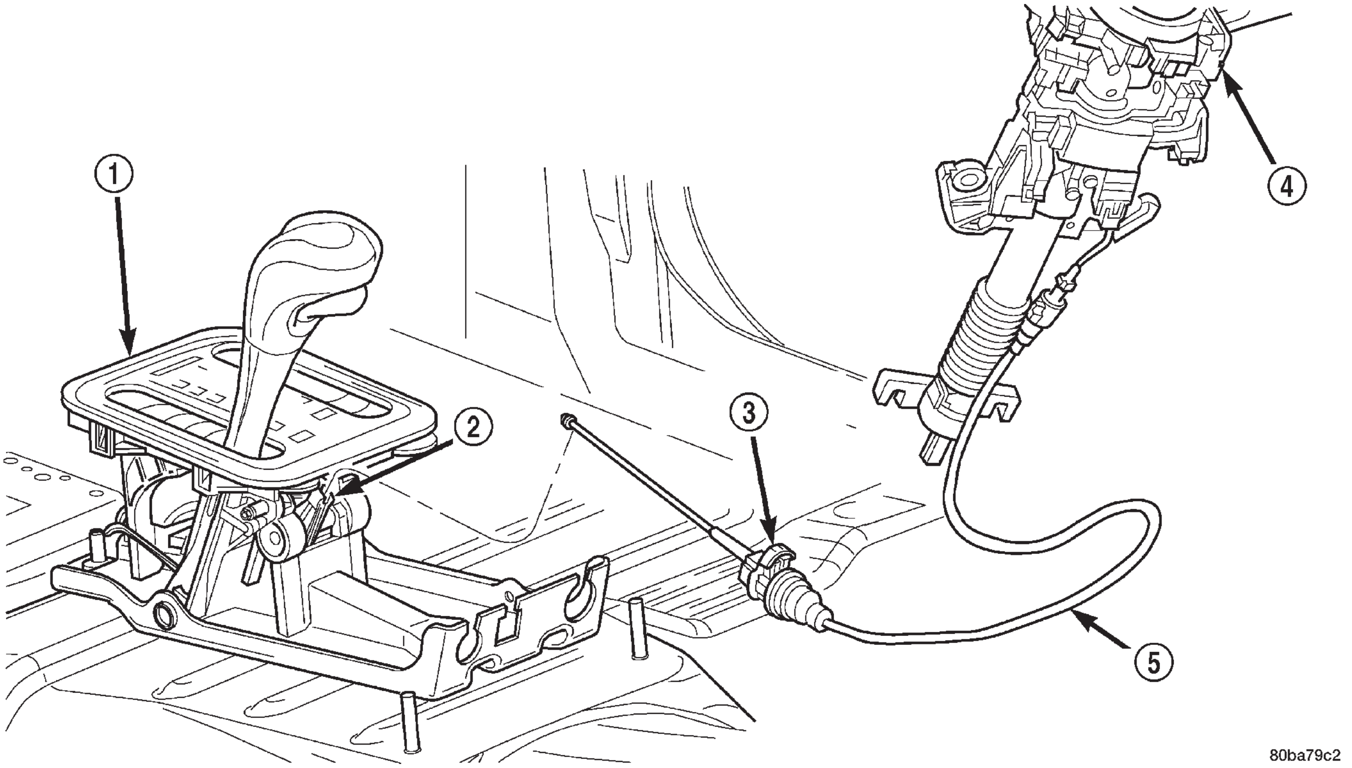


Fig. 89 Brake Transmission Interlock Cable

1 – SHIFT MECHANISM
2 – SHIFTER BTSI LEVER
3 – ADJUSTMENT CLIP
4 – STEERING COLUMN ASSEMBLY
5 – INTERLOCK CABLE

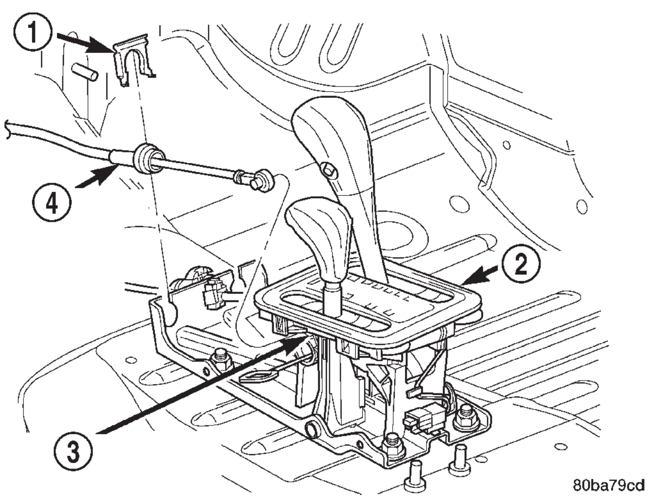


Fig. 90 Transfer Case Shift Cable

1 – CLIP
2 – SHIFTER
3 – TRANSFER CASE SHIFT LEVER PIN
4 – TRANSFER CASE SHIFT CABLE

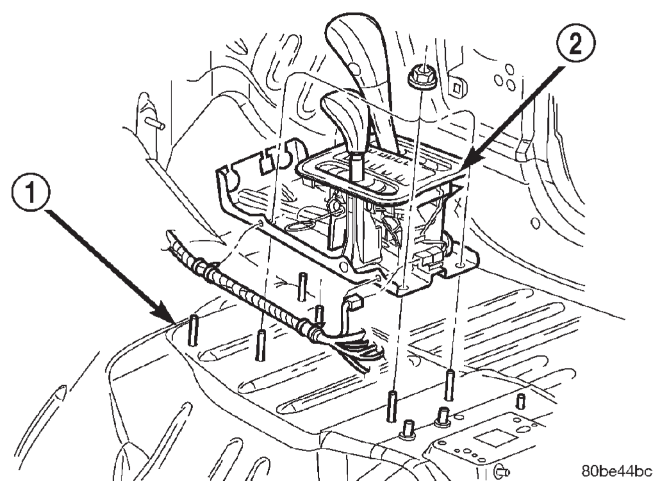


Fig. 91 Shifter Assembly

1 – FLOOR PAN
2 – SHIFTER ASSEMBLY

REMOVAL AND INSTALLATION (Continued)

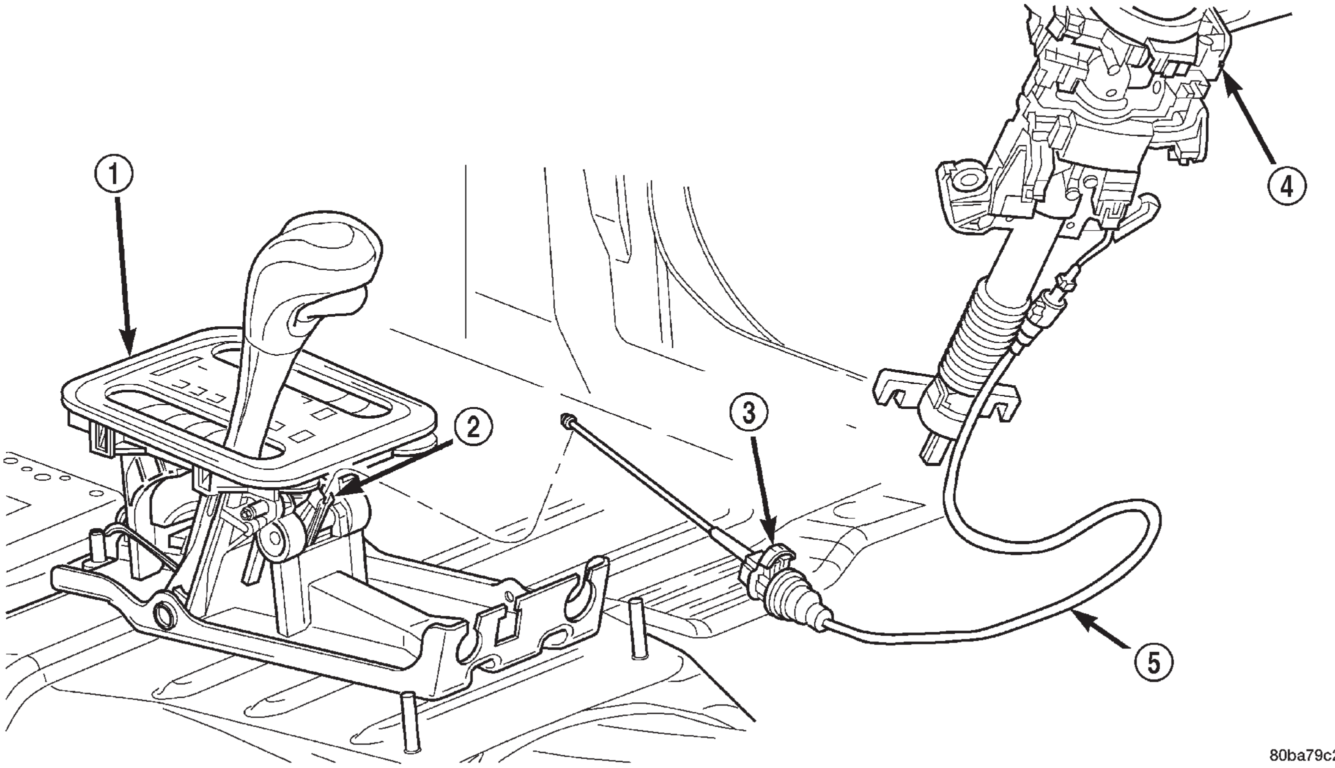


Fig. 92 Brake Transmission Shift Interlock

1 – SHIFT MECHANISM
2 – SHIFTER BTSI LEVER
3 – ADJUSTMENT CLIP
4 – STEERING COLUMN ASSEMBLY
5 – INTERLOCK CABLE

BRAKE TRANSMISSION SHIFT INTERLOCK

REMOVAL

(1) Lower the steering column.

(2) Remove the transmission shift interlock cable from steering column (Fig. 92).

(3) Remove the center console and related trim. Refer to Group 23, Body, for proper procedures.

(4) Disconnect the BTSI cable from the shift BTSI lever and remove the cable from the shifter assembly bracket.

(5) Disengage the wire connector at the solenoid on the cable

(6) Release the BTSI cable from any remaining clips.

(7) Remove BTSI cable from the vehicle.

INSTALLATION

NOTE: The gearshift cable must be secured into position and properly adjusted before the installation of the Brake Transmission Interlock Cable (BTSI).

(1) Snap the BTSI cable assembly into the steering column.

(2) Snap BTSI cable solenoid tie strap into hole in steering column tube.

(3) Engage the wiring connector from brake light switch into BTSI cable solenoid housing.

(4) Route BTSI cable to the shifter mechanism.

(5) Install the BTSI cable end fitting into shifter BTSI lever.

(6) Pull rearward on the BTSI cable housing and install the cable housing into the shifter assembly bracket.

(7) Place the ignition key cylinder in the LOCK position.

(8) Snap BTSI cable adjuster ears into floor shifter bracket and

(9) Push the cable adjuster lock clamp downward to lock it.

(10) Install the center console and related trim. Refer to Group 23, Body, for proper procedures.

(11) Test the BTSI cable operation.

REMOVAL AND INSTALLATION (Continued)

GOVERNOR SOLENOID AND PRESSURE SENSOR

REMOVAL

(1) Hoist and support vehicle on safety stands.

(2) Remove transmission fluid pan and filter.

(3) Disengage wire connectors from pressure sensor and solenoid (Fig. 93).

(4) Remove screws holding pressure solenoid retainer to governor body.

(5) Separate solenoid retainer from governor (Fig. 94).

(6) Pull solenoid from governor body (Fig. 95).

(7) Pull pressure sensor from governor body.

(8) Remove bolts holding governor body to valve body.

(9) Separate governor body from valve body (Fig. 96).

(10) Remove governor body gasket.

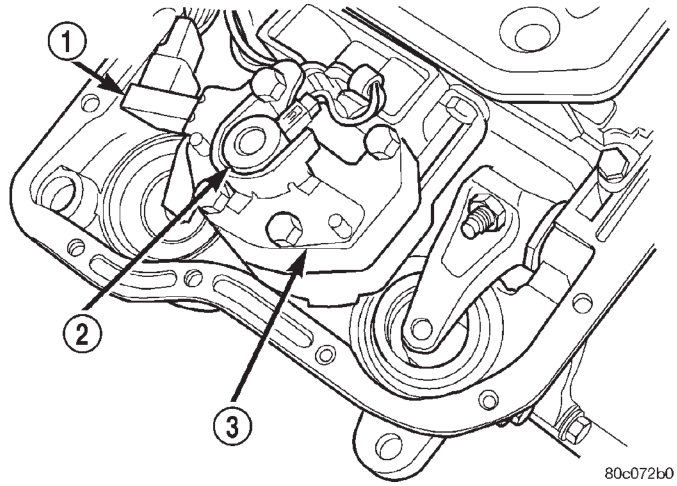


Fig. 93 Governor Solenoid And Pressure Sensor

1 – PRESSURE SENSOR
2 – PRESSURE SOLENOID
3 – GOVERNOR

INSTALLATION

Before installing the pressure sensor and solenoid in the governor body, replace O-ring seals, clean the gasket surfaces and replace gasket.

(1) Place gasket in position on back of governor body (Fig. 96).

(2) Place governor body in position on valve body.

(3) Install bolts to hold governor body to valve body.

(4) Lubricate O-ring on pressure sensor with transmission fluid.

(5) Align pressure sensor to bore in governor body.

(6) Push pressure sensor into governor body.

(7) Lubricate O-ring, on pressure solenoid, with transmission fluid.

(8) Align pressure solenoid to bore in governor body (Fig. 95).

(9) Push solenoid into governor body.

(10) Place solenoid retainer in position on governor (Fig. 94).

(11) Install screws to hold pressure solenoid retainer to governor body.

(12) Engage wire connectors into pressure sensor and solenoid (Fig. 93).

(13) Install transmission fluid pan and (new) filter.

(14) Lower vehicle and road test to verify repair.

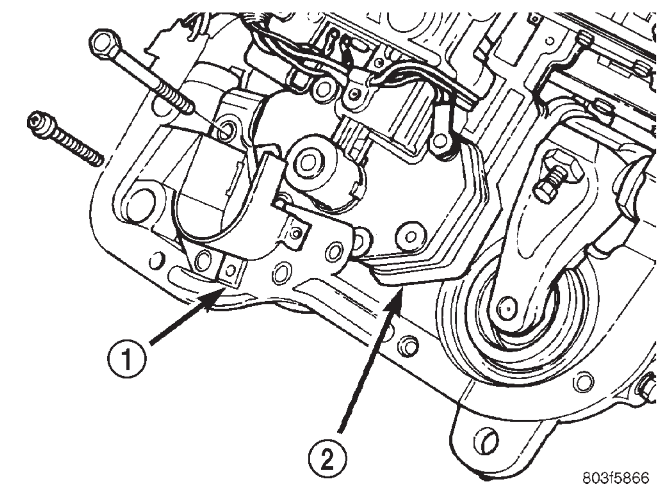


Fig. 94 Pressure Solenoid Retainer

1 – PRESSURE SOLENOID RETAINER
2 – GOVERNOR

VALVE BODY

The valve body can be removed for service without having to remove the transmission assembly.

The valve body can be disassembled for cleaning and inspection of the individual components. Refer to Disassembly and Assembly section for proper procedures.

The only replaceable valve body components are:

- Manual lever.
- Manual lever washer, seal, E-clip, and shaft seal.
- Manual lever detent ball.
- Throttle lever.
- Fluid filter.
- Pressure adjusting screw bracket.
- Governor pressure solenoid.
- Governor pressure sensor (includes transmission temperature thermistor).
- Converter clutch/overdrive solenoid assembly and harness.
- Governor housing gasket.
- Solenoid case connector O-rings.

The remaining valve body components are serviced only as part of a complete valve body assembly.

REMOVAL AND INSTALLATION (Continued)

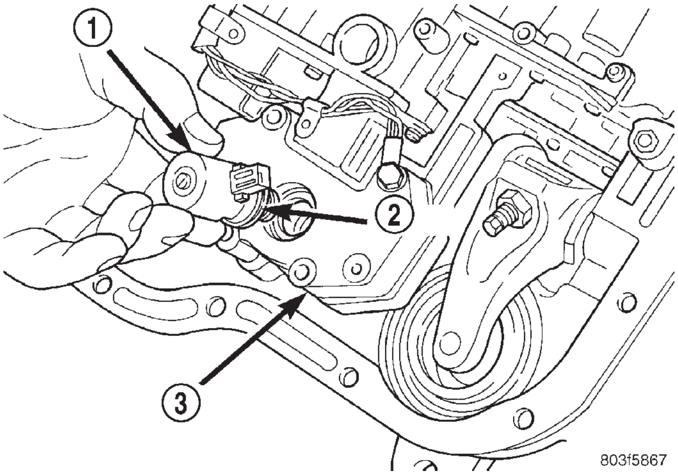


Fig. 95 Pressure Solenoid and O-ring

1 – PRESSURE SOLENOID
2 – O-RING
3 – GOVERNOR

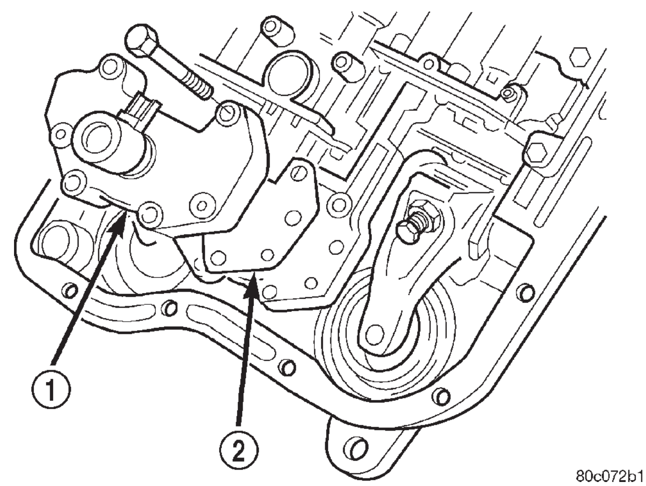


Fig. 96 Governor Body and Gasket

1 – GOVERNOR BODY
2 – GASKET

REMOVAL

(1) Shift transmission into NEUTRAL.

(2) Raise vehicle.

(3) Remove gearshift and throttle levers from shaft of valve body manual lever.

(4) Disconnect wires at solenoid case connector (Fig. 97).

(5) Position drain pan under transmission oil pan.

(6) Remove transmission oil pan and gasket.

(7) Remove fluid filter from valve body.

(8) Remove bolts attaching valve body to transmission case.

(9) Lower valve body enough to remove accumulator piston and springs.

(10) Work manual lever shaft and electrical connector out of transmission case.

(11) Lower valve body, rotate valve body away from case, pull park rod out of sprag, and remove valve body (Fig. 98).

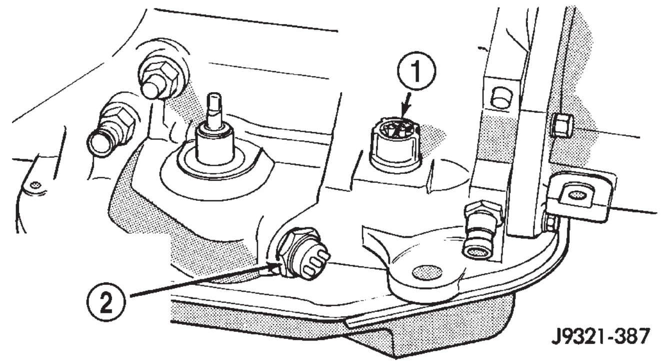


Fig. 97 Transmission Case Connector

1 – SOLENOID CASE CONNECTOR
2 – PARK/NEUTRAL POSITION SWITCH CONNECTOR TERMINAL

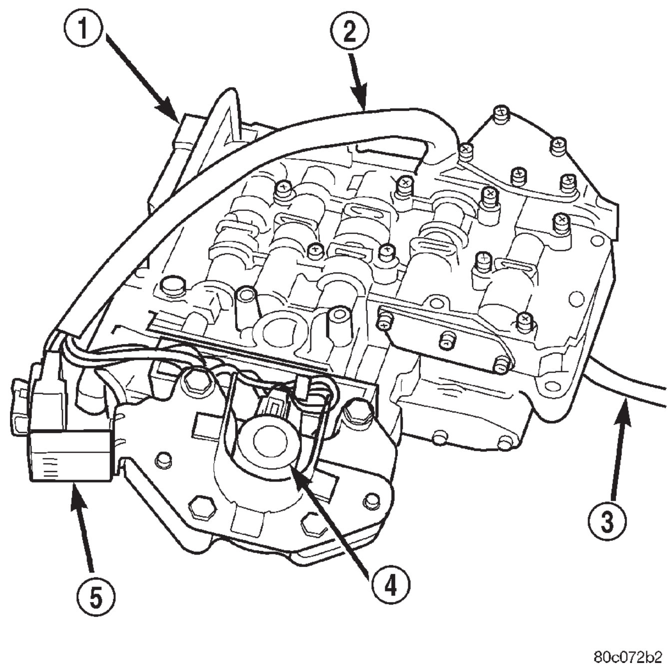


Fig. 98 Valve Body

1 – VALVE BODY
2 – WIRE HARNESS
3 – PARK ROD
4 – GOVERNOR PRESSURE SOLENOID
5 – GOVERNOR PRESSURE SENSOR

INSTALLATION

(1) Check condition of O-ring seals on valve body harness connector (Fig. 99). Replace seals on connector body if cut or worn.

REMOVAL AND INSTALLATION (Continued)

(2) Check condition of manual lever shaft seal in transmission case. Replace seal if lip is cut or worn. Install new seal with 15/16 deep well socket (Fig. 100).

(3) Check condition of seals on accumulator piston (Fig. 101). Install new piston seals, if necessary.

(4) Place valve body manual lever in low (1 position) so ball on park lock rod will be easier to install in sprag.

(5) Lubricate shaft of manual lever with petroleum jelly. This will ease inserting shaft through seal in case.

(6) Lubricate seal rings on valve body harness connector with petroleum jelly.

(7) Position valve body in case and work end of park lock rod into and through pawl sprag. Turn propeller shaft to align sprag and park lock teeth if necessary. The rod will click as it enters pawl. Move rod to check engagement.

CAUTION: It is possible for the park rod to displace into a cavity just above the pawl sprag during installation. Make sure the rod is actually engaged in the pawl and has not displaced into this cavity.

(8) Install accumulator springs and piston into case. Then swing valve body over piston and outer spring to hold it in place.

(9) Align accumulator piston and outer spring, manual lever shaft and electrical connector in case.

(10) Then seat valve body in case and install one or two bolts to hold valve body in place.

(11) Tighten valve body bolts alternately and evenly to 11 N·m (100 in. lbs.) torque.

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

(13) Install throttle and gearshift levers on valve body manual lever shaft.

(14) Check and adjust front and rear bands if necessary.

(15) Connect solenoid case connector wires.

(16) Install oil pan and new gasket. Tighten pan bolts to 17 N·m (13 ft. lbs.) torque.

(17) Lower vehicle and fill transmission with Mopar® ATF Plus 3, type 7176 fluid.

(18) Check and adjust gearshift and throttle valve cables, if necessary.

OVERDRIVE UNIT

REMOVAL

(1) Shift transmission into Park.

(2) Raise vehicle.

(3) Remove transfer case, if equipped.

(4) Mark propeller shaft universal joint(s) and axle pinion yoke, or the companion flange and flange

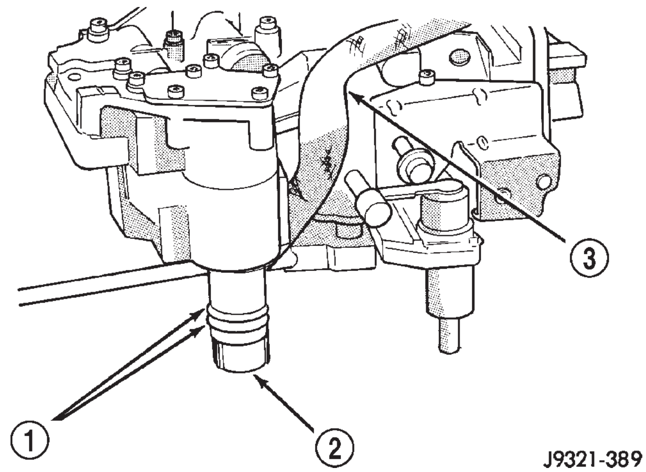


Fig. 99 Valve Body Harness Connector O-Ring Seal

1 – CONNECTOR O-RINGS
2 – VALVE BODY HARNESS CONNECTOR
3 – HARNESS

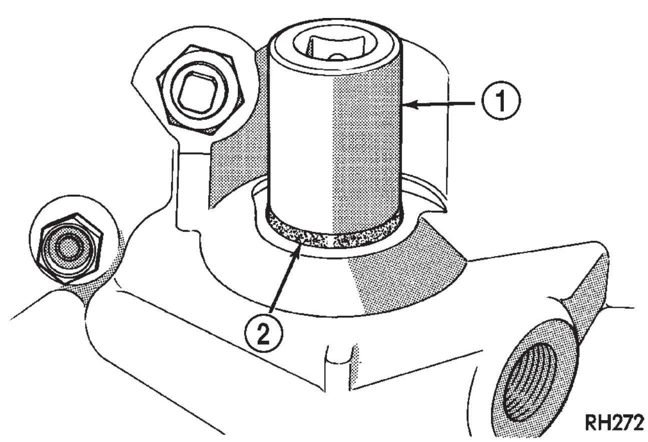


Fig. 100 Manual Lever Shaft Seal

1 – 15/16” SOCKET
2 – SEAL

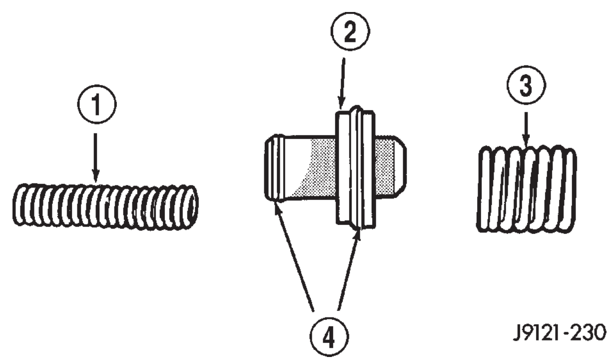


Fig. 101 Accumulator Piston Components

1 – INNER SPRING
2 – ACCUMULATOR PISTON
3 – OUTER SPRING
4 – SEAL RINGS

REMOVAL AND INSTALLATION (Continued)

yoke, for alignment reference at installation, if neccesary.

(5) Disconnect and remove the rear propeller shaft, if necessary.

(6) Remove transmission oil pan, remove gasket, drain oil and reinstall pan.

(7) If overdrive unit had malfunctioned, or if fluid is contaminated, remove entire transmission. If diagnosis indicated overdrive problems only, remove just the overdrive unit.

(8) Support transmission with transmission jack.

(9) Remove vehicle speed sensor.

(10) Remove bolts attaching overdrive unit to transmission (Fig. 102).

CAUTION: Support the overdrive unit with a jack before moving it rearward. This is necessary to prevent damaging the intermediate shaft. Do not allow the shaft to support the entire weight of the overdrive unit.

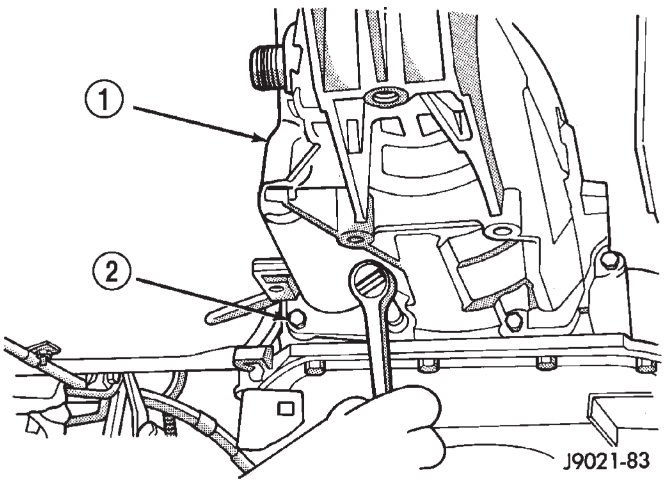


Fig. 102 Overdrive Unit Bolts

1 – OVERDRIVE UNIT
2 – ATTACHING BOLTS (7)

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

(12) If overdrive unit does not require service, immediately insert Alignment Tool 6227-2 in splines of planetary gear and overrunning clutch to prevent splines from rotating out of alignment. If misalignment occurs, overdrive unit will have to be disassembled in order to realign splines.

(13) Remove and retain overdrive piston thrust bearing. Bearing may remain on piston or in clutch hub during removal.

(14) Position drain pan on workbench.

(15) Place overdrive unit over drain pan. Tilt unit to drain residual fluid from case.

(16) Examine fluid for clutch material or metal fragments. If fluid contains these items, overhaul will be necessary.

(17) If overdrive unit does not require any service, leave alignment tool in position. Tool will prevent accidental misalignment of planetary gear and overrunning clutch splines.

INSTALLATION

(1) Be sure overdrive unit Alignment Tool 6227-2 is fully seated before moving unit. If tool is not seated and gear splines rotate out of alignment, overdrive unit will have to be disassembled in order to realign splines.

(2) If overdrive piston retainer was not removed during service and original case gasket is no longer reusable, prepare new gasket by trimming it.

(3) Cut out old case gasket around piston retainer with razor knife (Fig. 103).

(4) Use old gasket as template and trim new gasket to fit.

(5) Position new gasket over piston retainer and on transmission case. Use petroleum jelly to hold gasket in place if necessary. Do not use any type of sealer to secure gasket. Use petroleum jelly only.

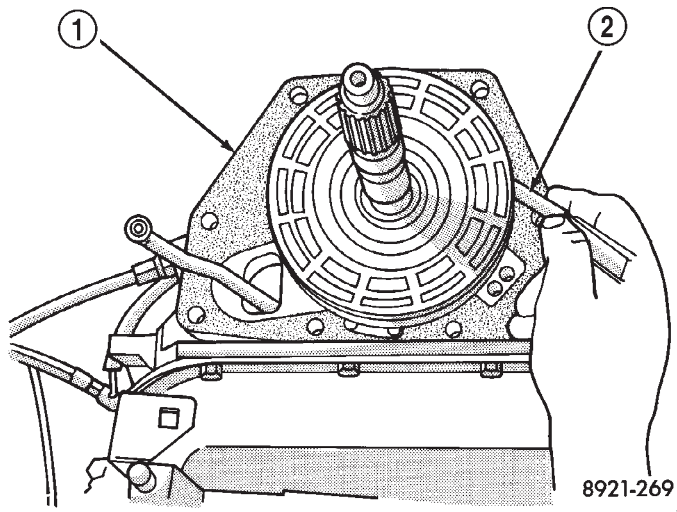


Fig. 103 Trimming Overdrive Case Gasket

1 – GASKET
2 – SHARP KNIFE

(6) Install selective spacer on intermediate shaft, if removed. Spacer goes in groove just rearward of shaft rear splines (Fig. 104).

(7) Install thrust bearing in overdrive unit sliding hub. Use petroleum jelly to hold bearing in position.

CAUTION: Be sure the shoulder on the inside diameter of the bearing is facing forward.

REMOVAL AND INSTALLATION (Continued)

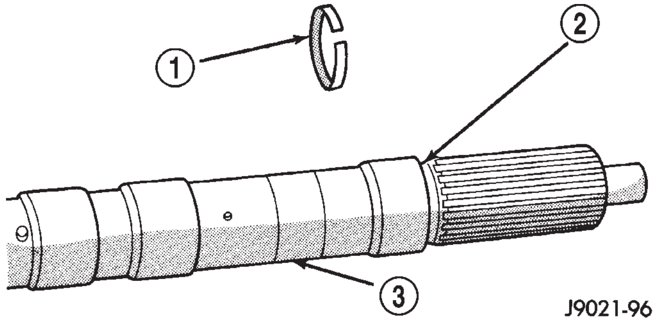


Fig. 104 Intermediate Shaft Selective Spacer Location

1 – SELECTIVE SPACER
2 – SPACER GROOVE
3 – INTERMEDIATE SHAFT

(8) Verify that splines in overdrive planetary gear and overrunning clutch hub are aligned with Alignment Tool 6227-2. Overdrive unit cannot be installed if splines are not aligned. If splines have rotated out of alignment, unit will have to be disassembled to realign splines.

(9) Carefully slide Alignment Tool 6227-2 out of overdrive planetary gear and overrunning clutch splines.

(10) Raise overdrive unit and carefully slide it straight onto intermediate shaft. Insert park rod into park lock reaction plug at same time. Avoid tilting overdrive during installation as this could cause planetary gear and overrunning clutch splines to rotate out of alignment. If this occurs, it will be necessary to remove and disassemble overdrive unit to realign splines.

(11) Work overdrive unit forward on intermediate shaft until seated against transmission case.

(12) Install bolts attaching overdrive unit to transmission unit. Tighten bolts in diagonal pattern to 34 N·m (25 ft. lbs).

(13) Install speed sensor.

(14) Connect speed sensor and overdrive wires.

(15) Install the transfer case, if equipped.

(16) Align and install rear propeller shaft, if necessary.

OVERDRIVE HOUSING BUSHING

REMOVAL

(1) Remove overdrive housing yoke seal.

(2) Insert Remover 6957 into overdrive housing. Tighten tool to bushing and remove bushing (Fig. 105).

INSTALLATION

(1) Align bushing oil hole with oil slot in overdrive housing.

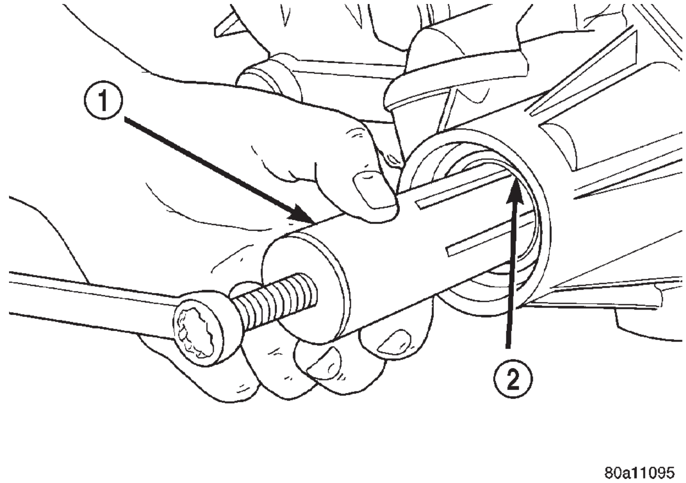


Fig. 105 Bushing Removal—Typical

1 – REMOVER 6957
2 – EXTENSION HOUSING BUSHING

(2) Tap bushing into place with Installer 6951 and Handle C-4171.

(3) Install new oil seal in housing using Seal Installer C-3995–A (Fig. 106).

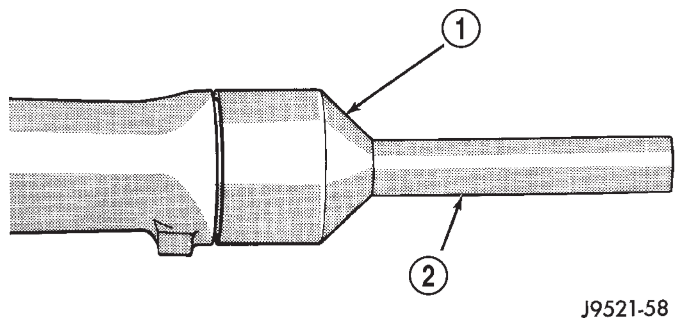


Fig. 106 Overdrive Housing Seal Installation

1 – SPECIAL TOOL C-3995–A OR C-3972–A
2 – SPECIAL TOOL C-4471

OUTPUT SHAFT REAR BEARING

REMOVAL

(1) Remove overdrive unit from the vehicle.

(2) Remove overdrive geartrain from housing.

(3) Remove snap ring holding output shaft rear bearing into overdrive housing (Fig. 107).

(4) Using a suitable driver inserted through the rear end of housing, drive bearing from housing.

INSTALLATION

(1) Place replacement bearing in position in housing.

(2) Using a suitable driver, drive bearing into housing until the snap ring groove is visible.

(3) Install snap ring to hold bearing into housing (Fig. 107).

REMOVAL AND INSTALLATION (Continued)

(4) Install overdrive geartrain into housing.
(5) Install overdrive unit in vehicle.

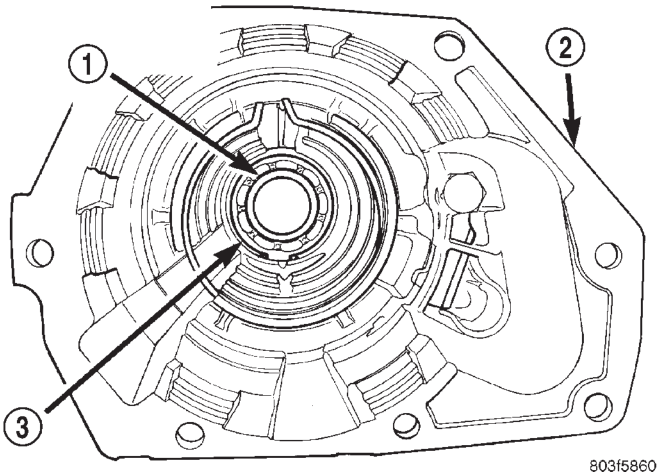


Fig. 107 Output Shaft Rear Bearing

1 – OUTPUT SHAFT REAR BEARING
2 – OVERDRIVE HOUSING
3 – SNAP RING

OUTPUT SHAFT FRONT BEARING

REMOVAL

(1) Remove overdrive unit from the vehicle.
(2) Remove overdrive geartrain from housing.
(3) Remove snap ring holding output shaft front bearing to overdrive geartrain. (Fig. 108).
(4) Pull bearing from output shaft.

INSTALLATION

(1) Place replacement bearing in position on geartrain with locating retainer groove toward the rear.
(2) Push bearing onto shaft until the snap ring groove is visible.
(3) Install snap ring to hold bearing onto output shaft (Fig. 108).
(4) Install overdrive geartrain into housing.
(5) Install overdrive unit in vehicle.

DISASSEMBLY AND ASSEMBLY

VALVE BODY

Remove the valve body from the transmission, refer to Removal and Installation procedures section in this group.

DISASSEMBLY

CAUTION: Do not clamp any valve body component in a vise. This practice can damage the component resulting in unsatisfactory operation after assembly and installation. Do not use pliers to remove any of the valves, plugs or springs and do not force any of the components out or into place. The valves and valve body housings will be damaged if force is used. Tag or mark the valve body springs for reference as they are removed. Do not allow them to become intermixed.

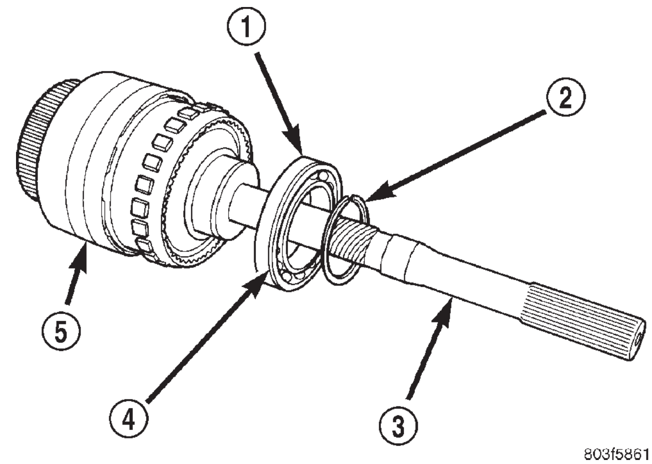


Fig. 108 Output Shaft Front Bearing

1 – OUTPUT SHAFT FRONT BEARING
2 – SNAP RING
3 – OUTPUT SHAFT
4 – GROOVE TO REAR
5 – OVERDRIVE GEARTRAIN

(1) Remove fluid filter.
(2) Disconnect wires from governor pressure sensor and solenoid.
(3) Remove screws attaching governor body and retainer plate to transfer plate.
(4) Remove retainer plate, governor body and gasket from transfer plate.
(5) Remove governor pressure sensor from governor body
(6) Remove governor pressure solenoid by pulling it straight out of bore in governor body. Remove and discard solenoid O-rings if worn, cut, or torn.
(7) Remove small shoulder bolt that secures solenoid harness case connector to 3-4 accumulator housing (Fig. 109). **Retain shoulder bolt. Either tape it to harness or thread it back into accumulator housing after connector removal.**
(8) Unhook overdrive/converter solenoid harness from 3-4 accumulator cover plate (Fig. 110).
(9) Turn valve body over and remove screws that attach overdrive/converter solenoid assembly to valve body (Fig. 111).
(10) Remove solenoid and harness assembly from valve body (Fig. 112).
(11) Remove boost valve cover (Fig. 113).
(12) Remove boost valve retainer, valve spring and boost valve (Fig. 114).

DISASSEMBLY AND ASSEMBLY (Continued)

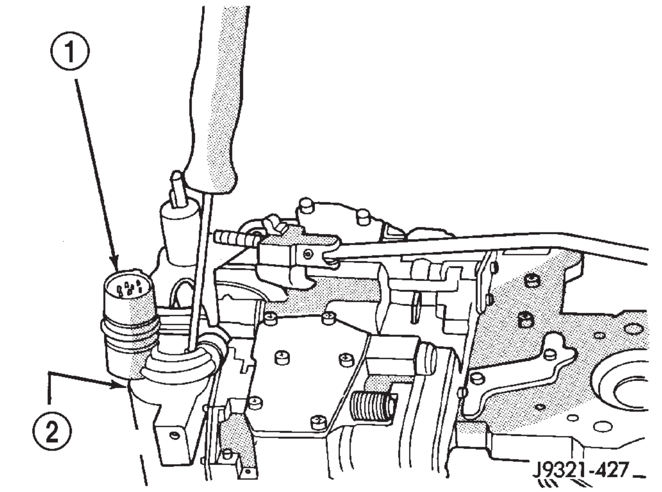


Fig. 109 Solenoid Harness Case Connector Shoulder Bolt

1 – SOLENOID HARNESS CASE CONNECTOR
2 – 3–4 ACCUMULATOR HOUSING

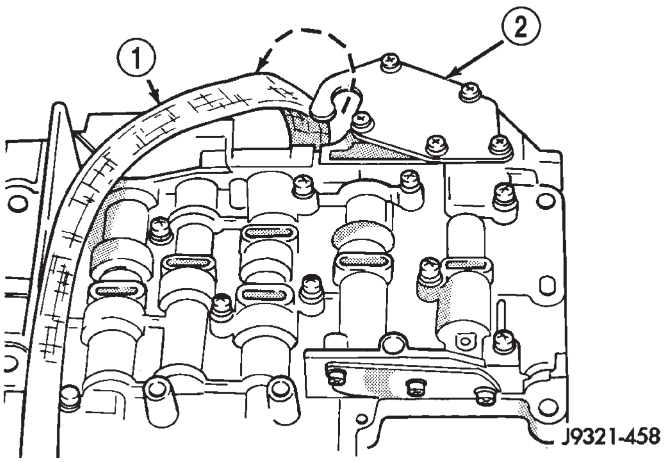


Fig. 110 Unhooking Solenoid Harness From Accumulator Cover Plate

1 – OVERDRIVE/CONVERTER SOLENOID WIRE HARNESS
2 – 3–4 ACCUMULATOR COVER PLATE

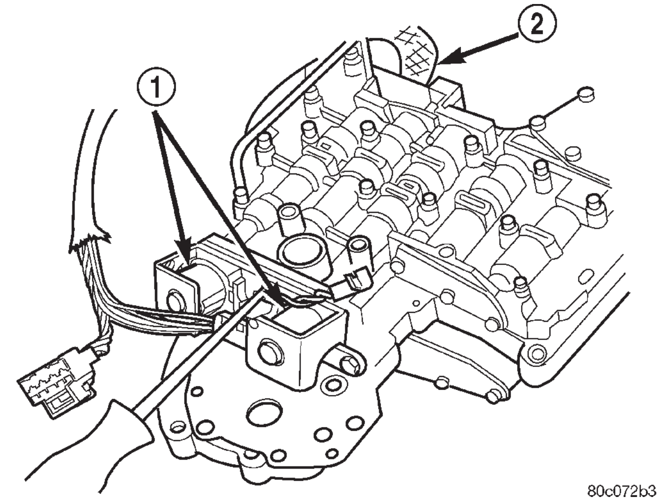


Fig. 111 Solenoid Assembly Screws

1 – OVERDRIVE/CONVERTER CLUTCH SOLENOID ASSEMBLY
2 – HARNESS

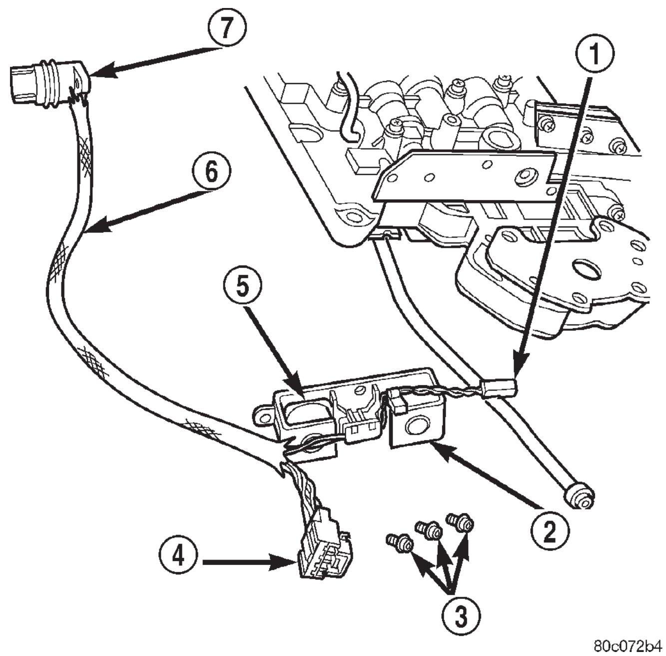


Fig. 112 Solenoid Assembly

1 – GOVERNOR SOLENOID WIRES
2 – CONVERTER CLUTCH SOLENOID
3 – SOLENOID SCREWS
4 – GOVERNOR SENSOR WIRES
5 – OVERDRIVE SOLENOID
6 – HARNESS
7 – CASE CONNECTOR

DISASSEMBLY AND ASSEMBLY (Continued)

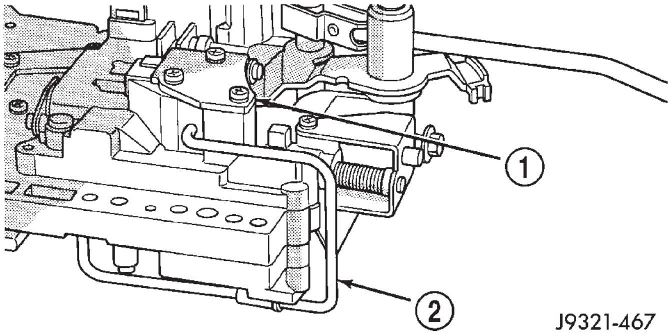


Fig. 113 Boost Valve Cover Location

1 – BOOST VALVE HOUSING AND COVER
2 – BOOST VALVE TUBE

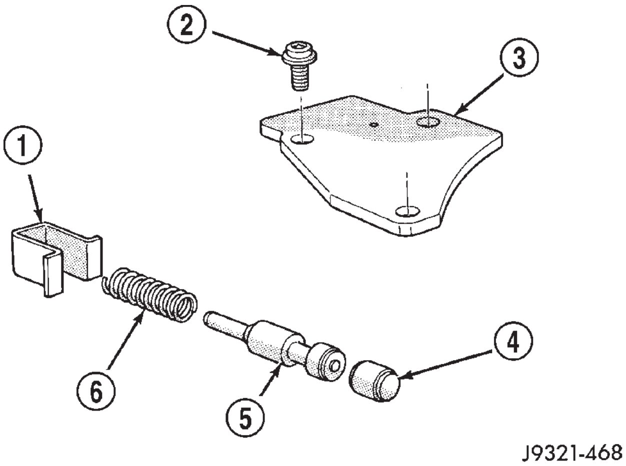


Fig. 114 Boost Valve Components

1 – SPRING AND VALVE RETAINER
2 – COVER SCREWS
3 – BOOST VALVE COVER
4 – BOOST VALVE PLUG
5 – BOOST VALVE
6 – BOOST VALVE SPRING

(13) Secure detent ball and spring with Retainer Tool 6583 (Fig. 115).

(14) Remove park rod E-clip and separate rod from manual lever (Fig. 116).

(15) Remove E-clip and washer that retains throttle lever shaft in manual lever (Fig. 117).

(16) Remove manual lever and throttle lever (Fig. 118). Rotate and lift manual lever off valve body and throttle lever shaft. Then slide throttle lever out of valve body.

(17) Position pencil magnet next to detent housing to catch detent ball and spring. Then carefully remove Retainer Tool 6583 and remove detent ball and spring (Fig. 119).

(18) Remove screws attaching pressure adjusting screw bracket to valve body and transfer plate (Fig. 120). Hold bracket firmly against spring tension while removing last screw.

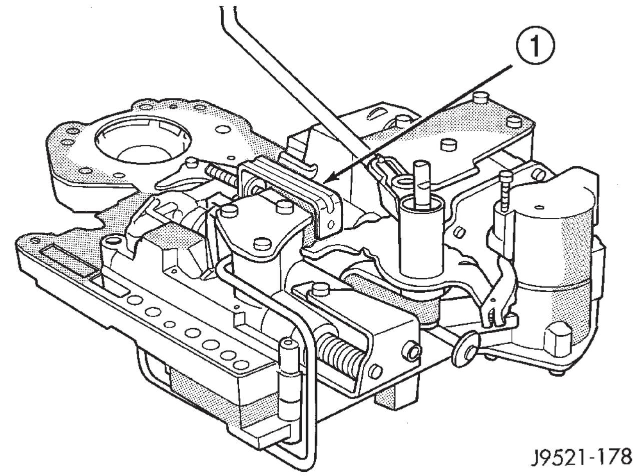


Fig. 115 Detent Ball And Spring

1 – SPECIAL TOOL 6583 POSITIONED ON DETENT HOUSING

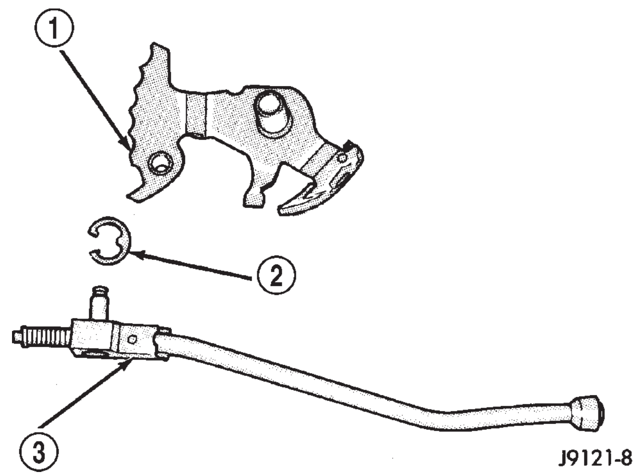


Fig. 116 Park Rod

1 – MANUAL LEVER
2 – E-CLIP
3 – PARK ROD

DISASSEMBLY AND ASSEMBLY (Continued)

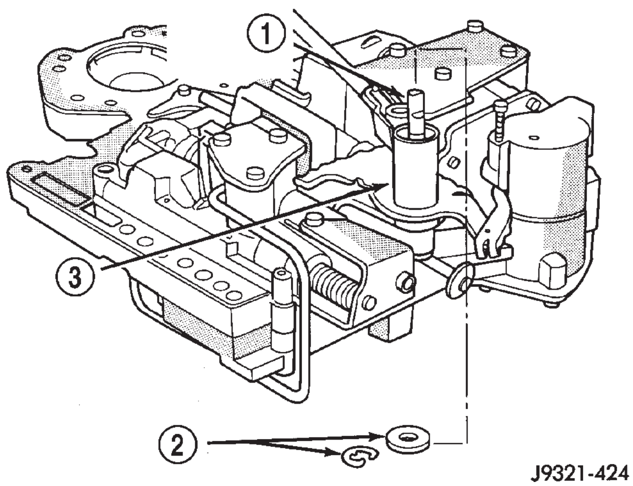


Fig. 117 Throttle Lever E-Clip And Washer

1 – THROTTLE LEVER SHAFT
2 – E-CLIP AND WASHER
3 – MANUAL SHAFT

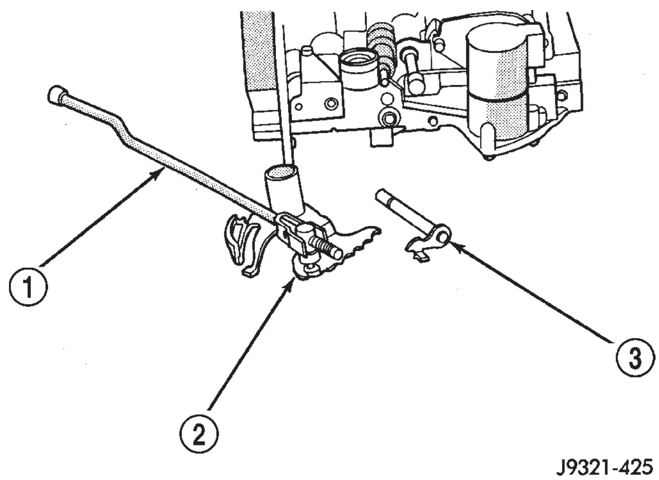


Fig. 118 Manual And Throttle Lever

1 – PARK ROD
2 – MANUAL LEVER ASSEMBLY
3 – THROTTLE LEVER

(19) Remove adjusting screw bracket, line pressure adjusting screw, pressure regulator valve spring and switch valve spring (Fig. 121). **Do not remove throttle pressure adjusting screw from bracket and do not disturb setting of either adjusting screw during removal.**

(20) Turn upper housing over and remove switch valve, regulator valve and spring, and manual valve (Fig. 122).

(21) Remove kickdown detent, kickdown valve, and throttle valve and spring (Fig. 122).

(22) Loosen left-side 3-4 accumulator housing attaching screw about 2-3 threads. Then remove center and right-side housing attaching screws (Fig. 123).

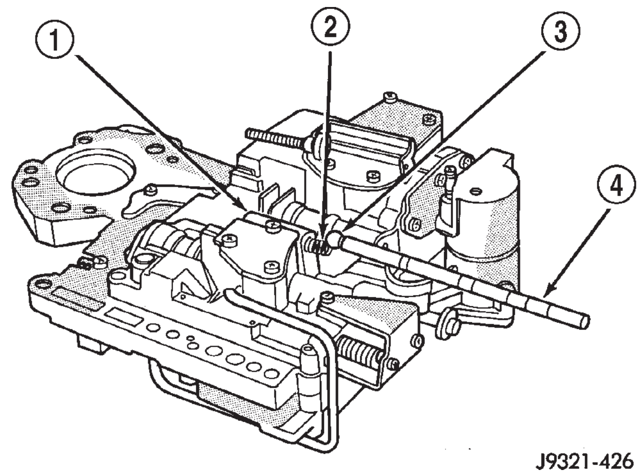


Fig. 119 Detent Ball And Spring

1 – DETENT HOUSING
2 – DETENT SPRING
3 – DETENT BALL
4 – PENCIL MAGNET

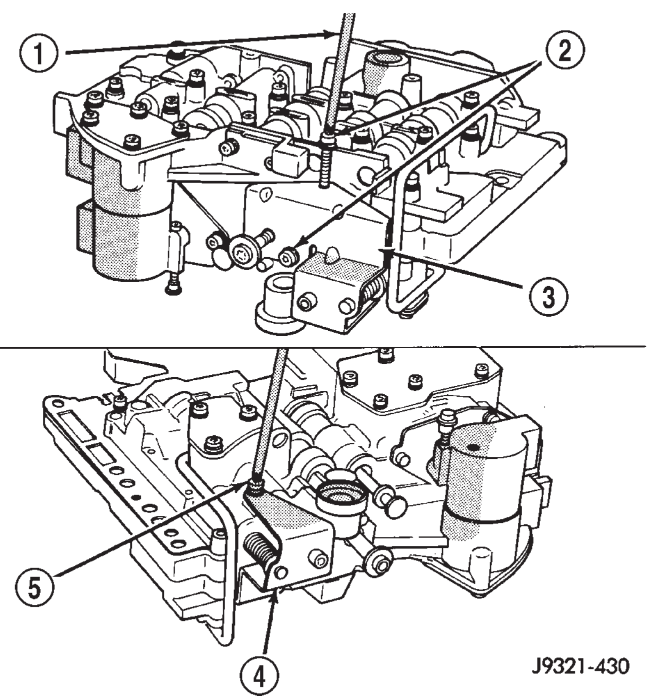


Fig. 120 Adjusting Screw Bracket Fastener

1 – T25 TORX BIT
2 – REMOVE THESE SCREWS FIRST
3 – BRACKET
4 – BRACKET
5 – REMOVE THIS SCREW LAST

(23) Carefully rotate 3-4 accumulator housing upward and remove 3-4 shift valve spring and converter clutch valve plug and spring (Fig. 124).

(24) Remove left-side screw and remove 3-4 accumulator housing from valve body (Fig. 125).

(25) Bend back tabs on boost valve tube brace (Fig. 126).

DISASSEMBLY AND ASSEMBLY (Continued)

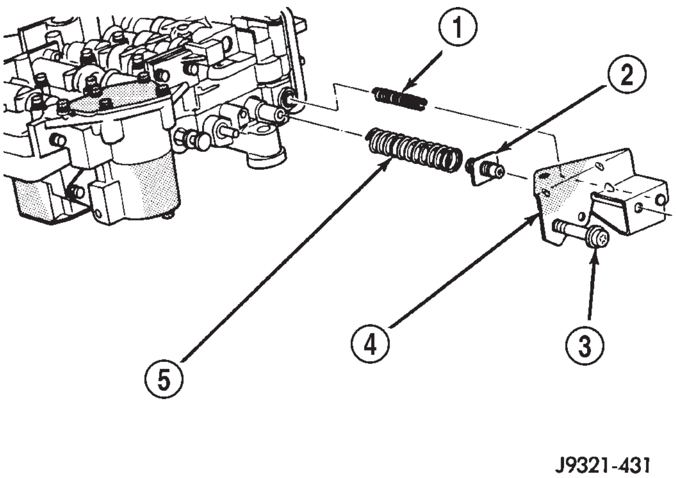


Fig. 121 Adjusting Screw Bracket And Spring

1 – SWITCH VALVE SPRING
2 – LINE PRESSURE SCREW
3 – THROTTLE PRESSURE ADJUSTING SCREW
4 – ADJUSTING SCREW BRACKET
5 – PRESSURE REGULATOR VALVE SPRING

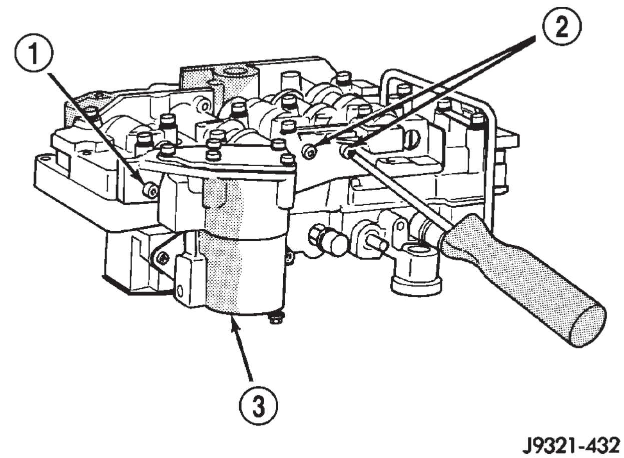


Fig. 123 Accumulator Housing Screw Locations

1 – LOOSEN THIS SCREW
2 – REMOVE THESE SCREWS
3 – 3–4 ACCUMULATOR HOUSING

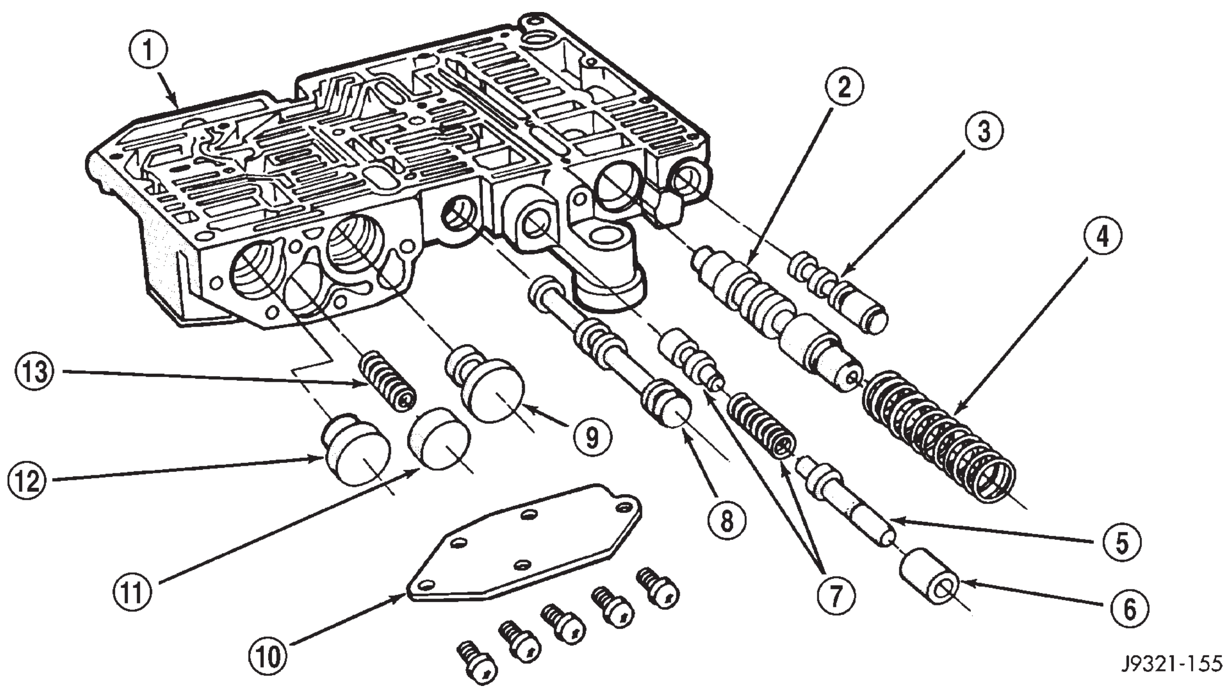


Fig. 122 Upper Housing Control Valve Locations

1 – UPPER HOUSING
2 – REGULATOR VALVE
3 – SWITCH VALVE
4 – REGULATOR VALVE SPRING
5 – KICKDOWN VALVE
6 – KICKDOWN DETENT
7 – THROTTLE VALVE AND SPRING
8 – MANUAL VALVE
9 – 1–2 GOVERNOR PLUG
10 – GOVERNOR PLUG COVER
11 – THROTTLE PLUG
12 – 2–3 GOVERNOR PLUG
13 – SHUTTLE VALVE PRIMARY SPRING

DISASSEMBLY AND ASSEMBLY (Continued)

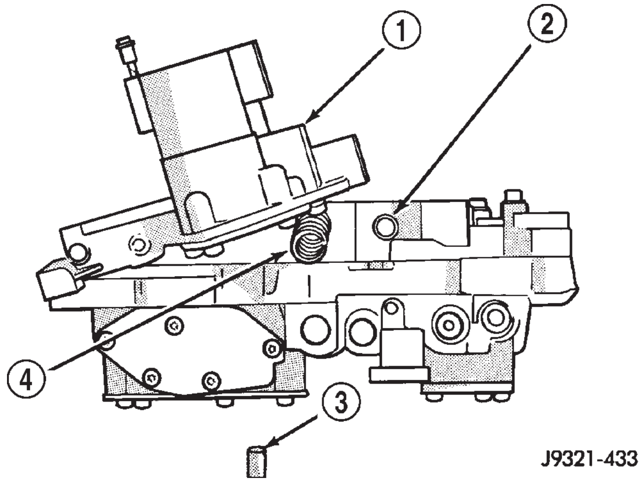


Fig. 124 3-4 Shift And Converter Clutch Valve Springs And Plug

1 – ACCUMULATOR HOUSING
2 – CONVERTER CLUTCH VALVE SPRING
3 – CLUTCH VALVE PLUG
4 – 3–4 SHIFT VALVE SPRING

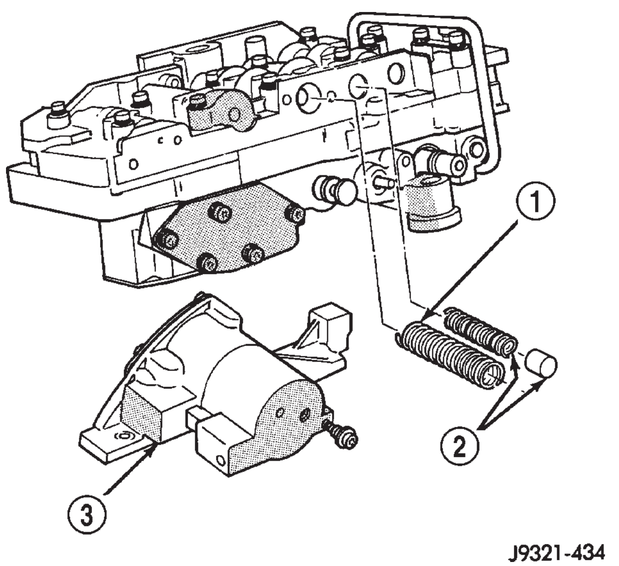


Fig. 125 Accumulator Housing, Valve Springs And Plug

1 – 3–4 SHIFT VALVE SPRING
2 – CONVERTER CLUTCH VALVE SPRING AND PLUG
3 – 3–4 ACCUMULATOR HOUSING

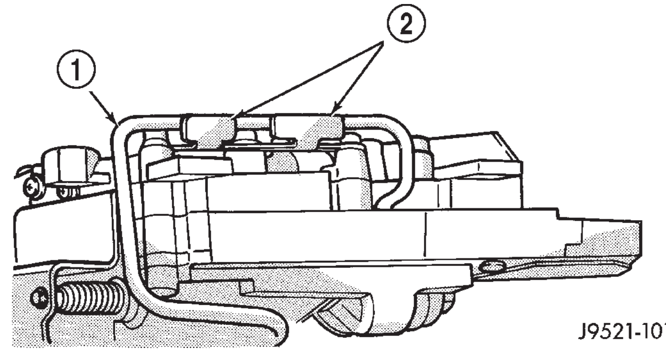


Fig. 126 Boost Valve Tube Brace

1 – BOOST VALVE TUBE
2 – TUBE BRACE (DOUBLE TAB)

(26) Remove boost valve connecting tube (Fig. 127). Disengage tube from upper housing port first. Then rock opposite end of tube back and forth to work it out of lower housing.

CAUTION: Do not use tools to loosen or pry the connecting tube out of the valve body housings. Loosen and remove the tube by hand only.

(27) Turn valve body over so lower housing is facing upward (Fig. 128). In this position, the two check balls in upper housing will remain in place and not fall out when lower housing and separator plate are removed.

(28) Remove screws attaching valve body lower housing to upper housing and transfer plate (Fig. 128). **Note position of boost valve tube brace for assembly reference.**

(29) Remove lower housing and overdrive separator plate from transfer plate (Fig. 128).

(30) Remove the ECE check ball from the transfer plate (Fig. 129). The ECE check ball is approximately 4.8 mm (3/16 in.) in diameter.

(31) Remove transfer plate from upper housing (Fig. 130).

DISASSEMBLY AND ASSEMBLY (Continued)

(32) Turn transfer plate over so upper housing separator plate is facing upward.

(33) Remove upper housing separator plate from transfer plate (Fig. 131). Note position of filter in separator plate for assembly reference.

(34) Remove rear clutch and rear servo check balls from transfer plate. Note check ball location for assembly reference (Fig. 132).

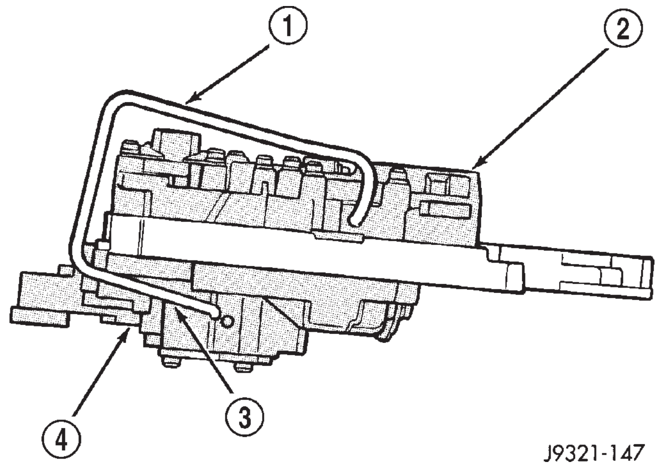


Fig. 127 Boost Valve Tube

1 – BOOST VALVE TUBE
2 – LOWER HOUSING
3 – DISENGAGE THIS END OF TUBE FIRST
4 – UPPER HOUSING

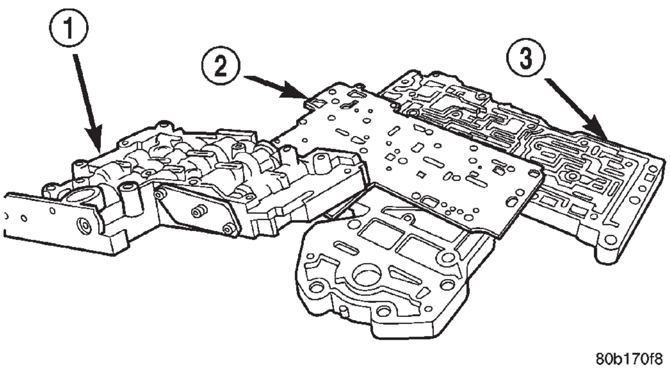


Fig. 128 Lower Housing

1 – LOWER HOUSING
2 – OVERDRIVE SEPARATOR PLATE
3 – TRANSFER PLATE AND UPPER HOUSING

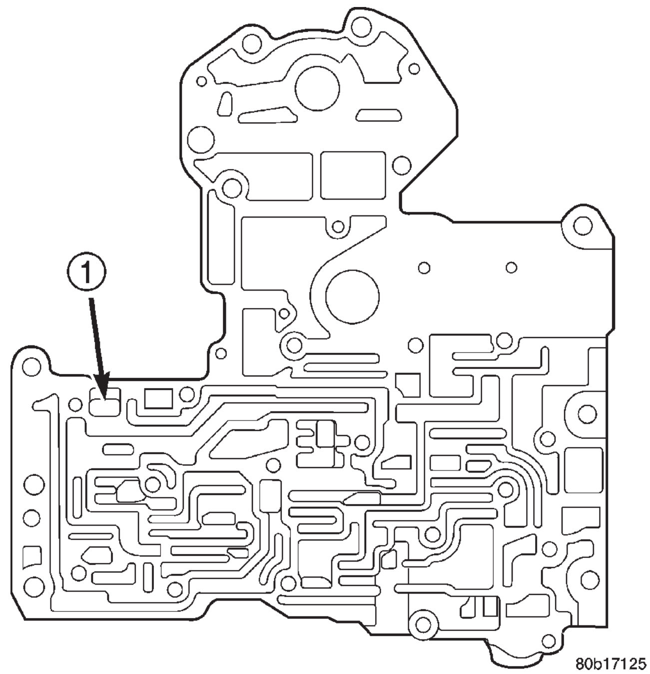


Fig. 129 ECE Check Ball

1 – ECE CHECK BALL (3/16”)

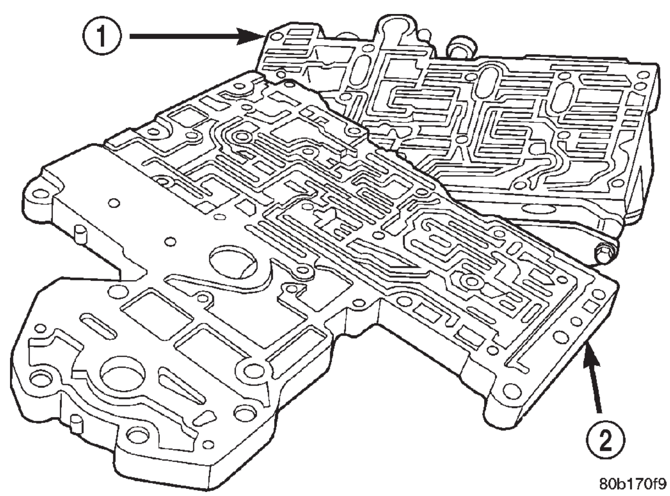


Fig. 130 Transfer Plate

1 – UPPER HOUSING
2 – TRANSFER PLATE

VALVE BODY UPPER HOUSING

(1) Note location of check balls in valve body upper housing (Fig. 133). Then remove the one large diameter and the six smaller diameter check balls.

(2) Remove governor plug and shuttle valve covers (Fig. 135).

(3) Remove E-clip that secures shuttle valve secondary spring on valve stem (Fig. 134).

(4) Remove throttle plug, primary spring, shuttle valve, secondary spring, and spring guides (Fig. 135).

DISASSEMBLY AND ASSEMBLY (Continued)

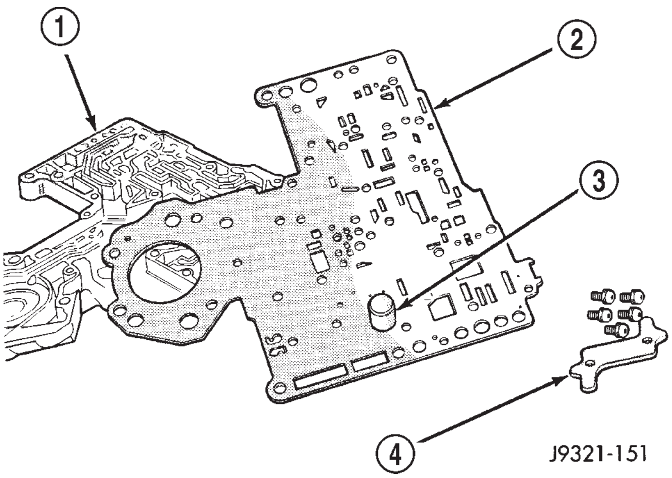


Fig. 131 Upper Housing Separator Plate

1 – TRANSFER PLATE
2 – UPPER HOUSING SEPARATOR PLATE
3 – FILTER SCREEN
4 – BRACE

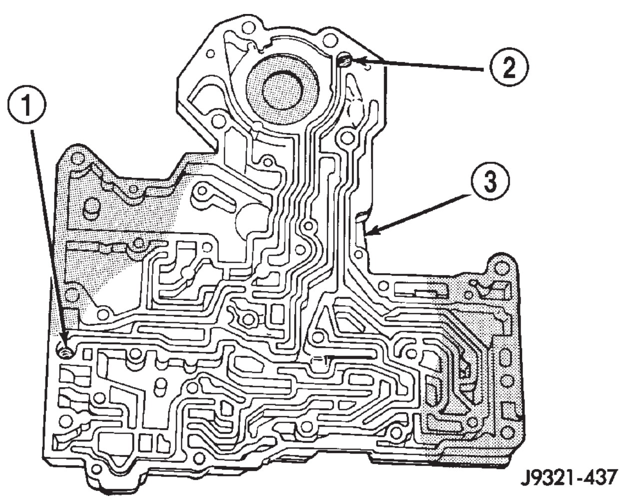


Fig. 132 Rear Clutch And Rear Servo Check Ball Locations

1 – REAR CLUTCH CHECK BALL
2 – REAR SERVO CHECK BALL
3 – TRANSFER PLATE

(5) Remove boost valve retainer, spring and valve if not previously removed.

(6) Remove throttle plug and 1-2 and 2-3 governor plugs (Fig. 122).

(7) Turn upper housing around and remove limit valve and shift valve covers (Fig. 136).

(8) Remove limit valve housing. Then remove retainer, spring, limit valve, and 2-3 throttle plug from limit valve housing (Fig. 136).

(9) Remove 1-2 shift control valve and spring (Fig. 136).

(10) Remove 1-2 shift valve and spring (Fig. 136).

(11) Remove 2-3 shift valve and spring from valve body (Fig. 136).

(12) Remove pressure plug cover (Fig. 136).

(13) Remove line pressure plug, sleeve, throttle pressure plug and spring (Fig. 136).

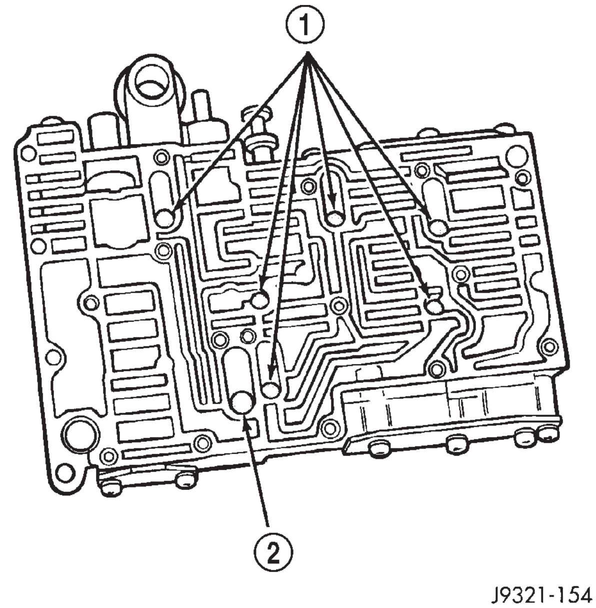


Fig. 133 Check Ball Locations In Upper Housing

1 – SMALL DIAMETER CHECK BALLS (6)
2 – LARGE DIAMETER CHECK BALL (1)

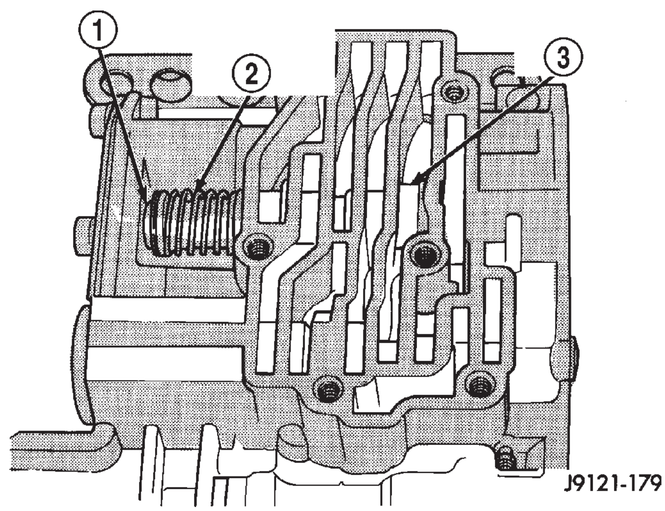


Fig. 134 Shuttle Valve E-Clip And Secondary Spring Location

1 – E-CLIP
2 – SECONDARY SPRING AND GUIDES
3 – SHUTTLE VALVE

DISASSEMBLY AND ASSEMBLY (Continued)

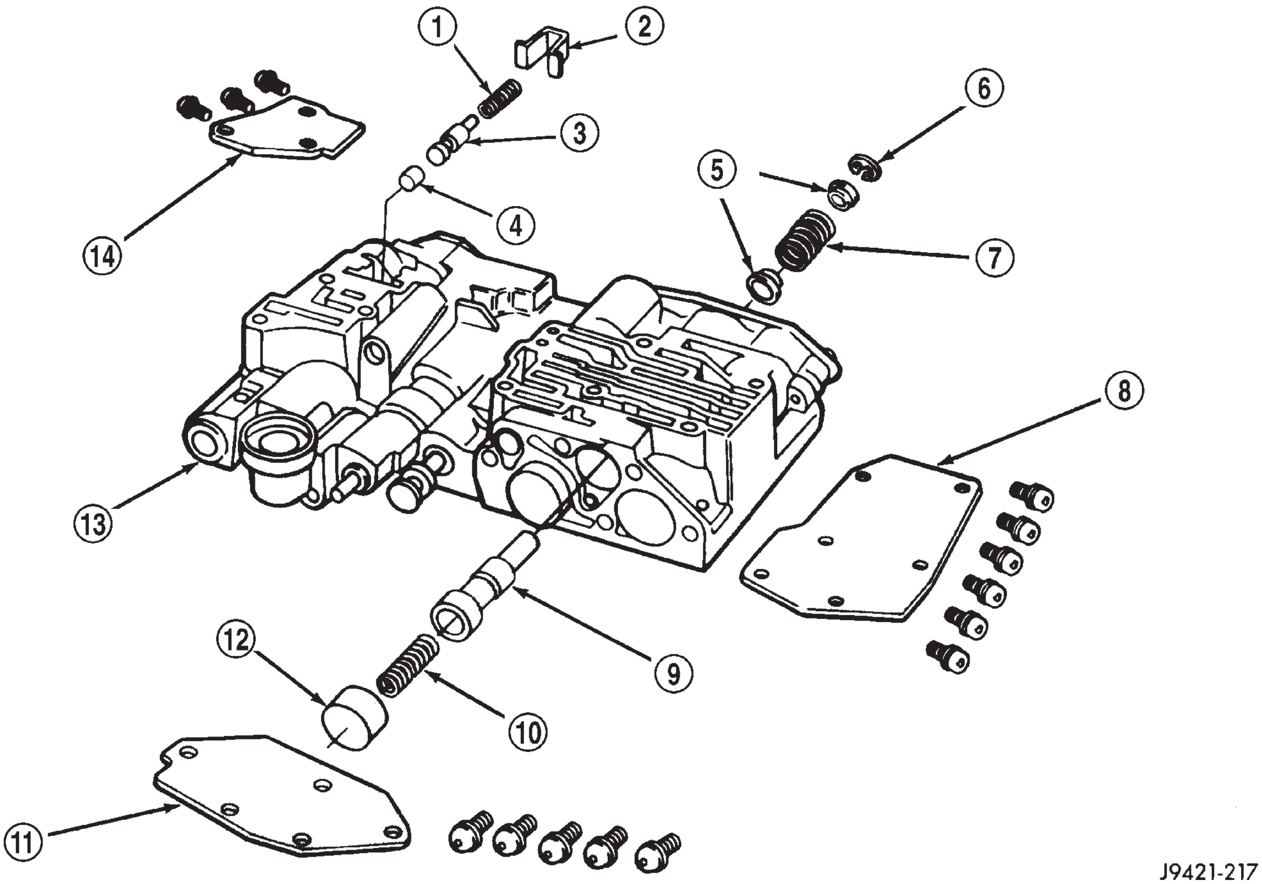


Fig. 135 Shuttle And Boost Valve Components

1 – SPRING
2 – RETAINER
3 – BOOST VALVE
4 – BOOST VALVE PLUG
5 – SPRING GUIDES
6 – E-CLIP
7 – SHUTTLE VALVE SECONDARY SPRING
8 – SHUTTLE VALVE COVER
9 – SHUTTLE VALVE
10 – SHUTTLE VALVE PRIMARY SPRING
11 – GOVERNOR PLUG COVER
12 – THROTTLE PLUG
13 – UPPER HOUSING
14 – BOOST VALVE COVER

DISASSEMBLY AND ASSEMBLY (Continued)

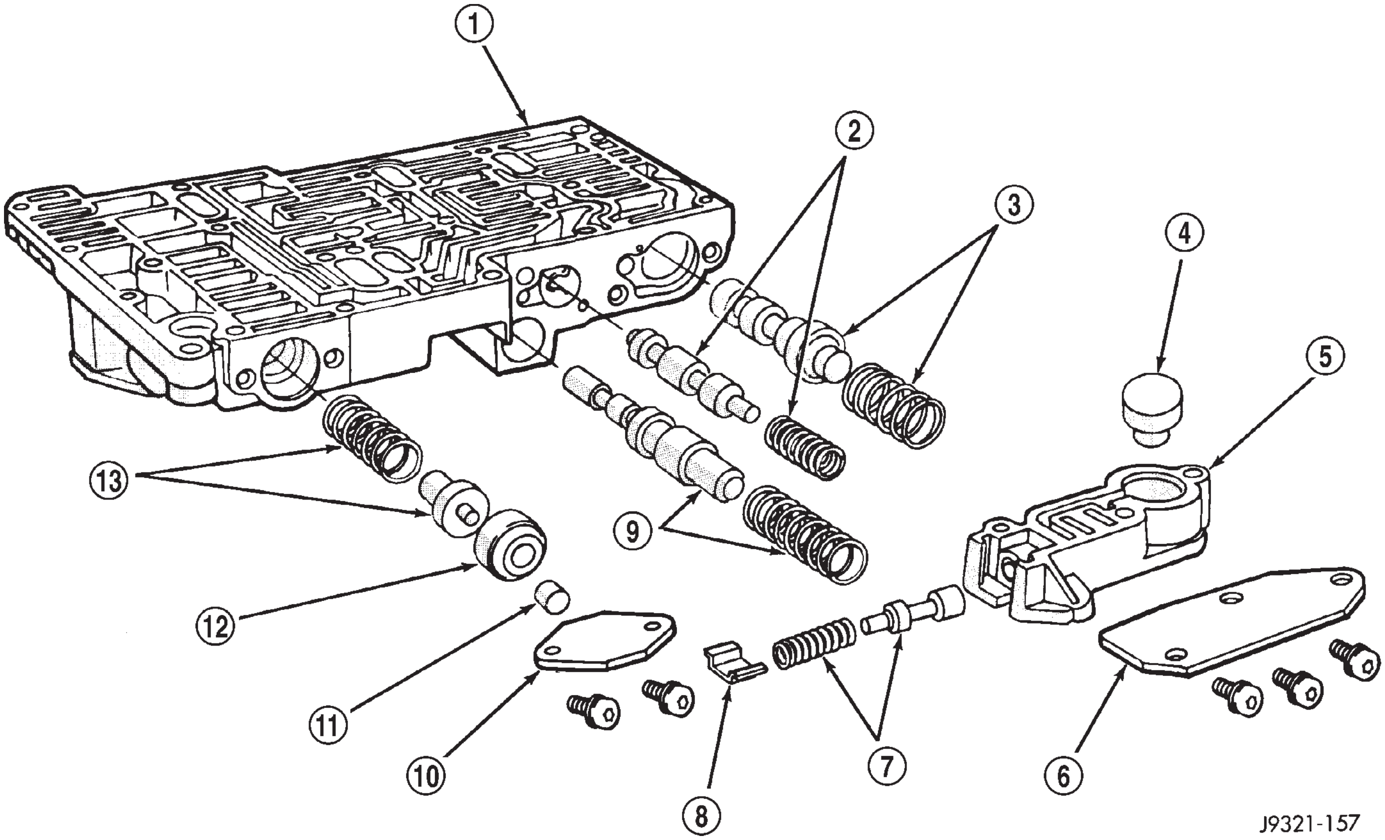


Fig. 136 Upper Housing Shift Valve And Pressure Plug Locations

1 – UPPER HOUSING
2 – 1–2 SHIFT VALVE AND SPRING
3 – 2–3 SHIFT VALVE AND SPRING
4 – 2–3 THROTTLE PLUG
5 – LIMIT VALVE HOUSING
6 – LIMIT VALVE COVER
7 – LIMIT VALVE AND SPRING
8 – RETAINER
9 – 1–2 SHIFT CONTROL VALVE AND SPRING
10 – PRESSURE PLUG COVER
11 – LINE PRESSURE PLUG
12 – PLUG SLEEVE
13 – THROTTLE PRESSURE SPRING AND PLUG

DISASSEMBLY AND ASSEMBLY (Continued)

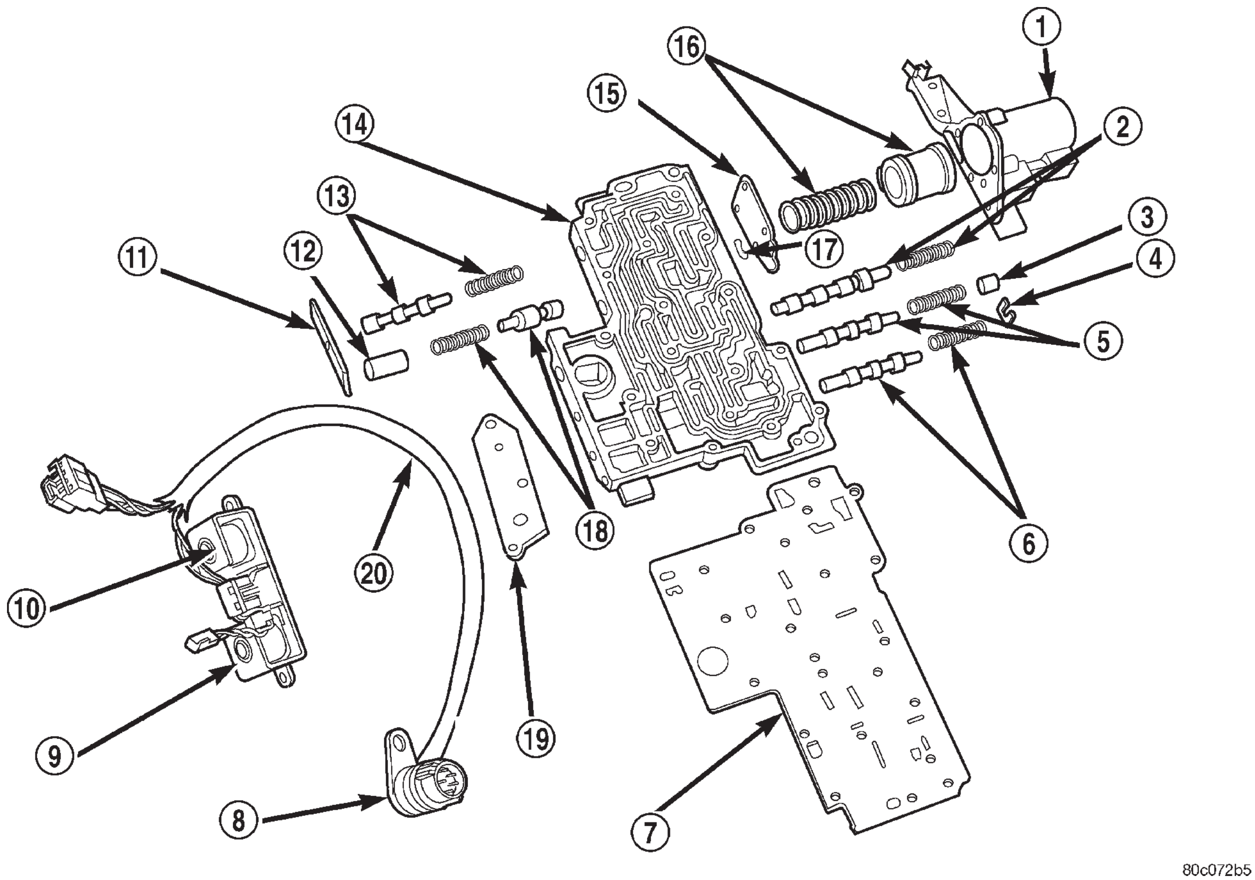


Fig. 137 Lower Housing Shift Valves And Springs

1 – 3-4 ACCUMULATOR HOUSING
2 – 3-4 SHIFT VALVE AND SPRING
3 – PLUG
4 – SPRING RETAINER
5 – CONVERTER CLUTCH VALVE AND SPRING
6 – CONVERTER CLUTCH TIMING VALVE AND SPRING
7 – OVERDRIVE SEPARATOR PLATE
8 – CASE CONNECTOR
9 – CONVERTER CLUTCH SOLENOID
10 – OVERDRIVE SOLENOID
11 – TIMING VALVE COVER
12 – PLUG
13 – 3-4 TIMING VALVE AND SPRING
14 – LOWER HOUSING
15 – ACCUMULATOR END PLATE
16 – 3-4 ACCUMULATOR PISTON AND SPRING
17 – E-CLIP
18 – 3-4 QUICK FILL SPRING AND VALVE
19 – SOLENOID GASKET
20 – HARNESS

VALVE BODY LOWER HOUSING

(1) Remove timing valve cover.
(2) Remove 3-4 timing valve and spring.
(3) Remove 3-4 quick fill valve, spring and plug.
(4) Remove 3-4 shift valve and spring.
(5) Remove converter clutch valve, spring and plug (Fig. 137).
(6) Remove converter clutch timing valve, retainer and valve spring.

DISASSEMBLY AND ASSEMBLY (Continued)

3-4 ACCUMULATOR HOUSING

(1) Remove end plate from housing.

(2) Remove piston spring.

(3) Remove piston. Remove and discard piston seals (Fig. 138).

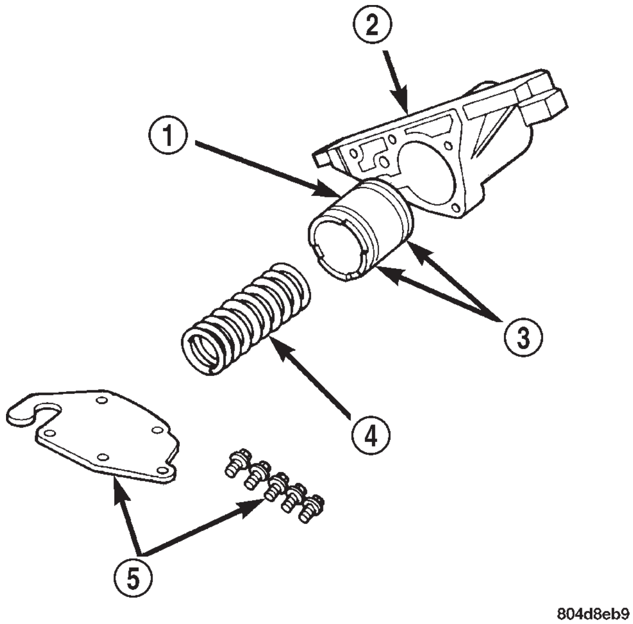


Fig. 138 Accumulator Housing Components

1 – ACCUMULATOR PISTON
2 – 3–4 ACCUMULATOR HOUSING
3 – TEFLON SEALS
4 – PISTON SPRING
5 – COVER PLATE AND SCREWS

ASSEMBLY

CAUTION: Do not force valves or plugs into place during reassembly. If the valve body bores, valves and plugs are free of distortion or burrs, the valve body components should all slide into place easily. In addition, do not overtighten the transfer plate and valve body screws during reassembly. Overtightening can distort the housings resulting in valve sticking, cross leakage and unsatisfactory operation. Tighten valve body screws to recommended torque only.

LOWER HOUSING

(1) Lubricate valves, springs, and the housing valve and plug bores with clean transmission fluid (Fig. 137).

(2) Install 3-4 timing valve spring and valve in lower housing.

(3) Install 3-4 quick fill valve in lower housing.

(4) Install 3-4 quick fill valve spring and plug in housing.

(5) Install timing valve end plate. Tighten end plate screws to 4 N·m (35 in. lbs.) torque.

3-4 ACCUMULATOR

(1) Lubricate accumulator piston, seals and housing piston bore with clean transmission fluid (Fig. 138).

(2) Install new seal rings on accumulator piston.

(3) Install piston and spring in housing.

(4) Install end plate on housing.

TRANSFER PLATE

(1) Install rear clutch and rear servo check balls in transfer plate (Fig. 139).

(2) Install filter screen in upper housing separator plate (Fig. 140).

(3) Align and position upper housing separator plate on transfer plate (Fig. 141).

(4) Install brace plate (Fig. 141). Tighten brace attaching screws to 4 N·m (35 in. lbs.) torque.

(5) Install remaining separator plate attaching screws. Tighten screws to 4 N·m (35 in. lbs.) torque.

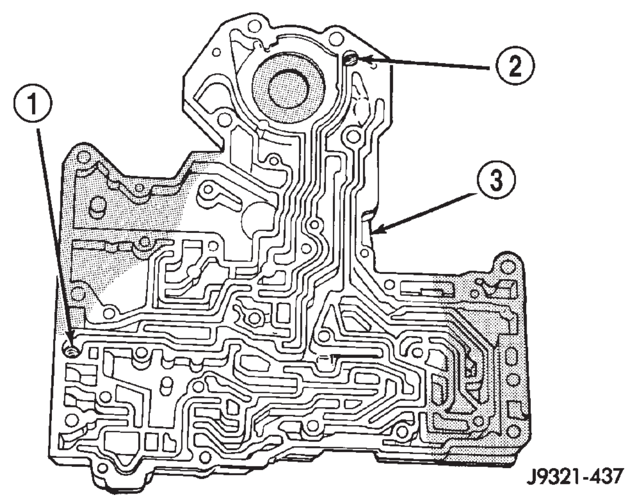


Fig. 139 Rear Clutch And Rear Servo Check Ball Locations

1 – REAR CLUTCH CHECK BALL
2 – REAR SERVO CHECK BALL
3 – TRANSFER PLATE

DISASSEMBLY AND ASSEMBLY (Continued)

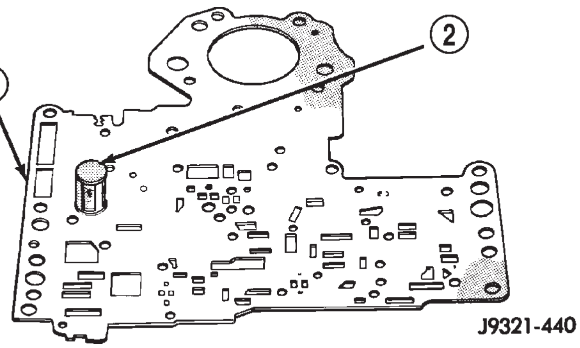


Fig. 140 Separator Plate Filter Screen Installation

1 – UPPER HOUSING SEPARATOR PLATE
2 – FILTER SCREEN

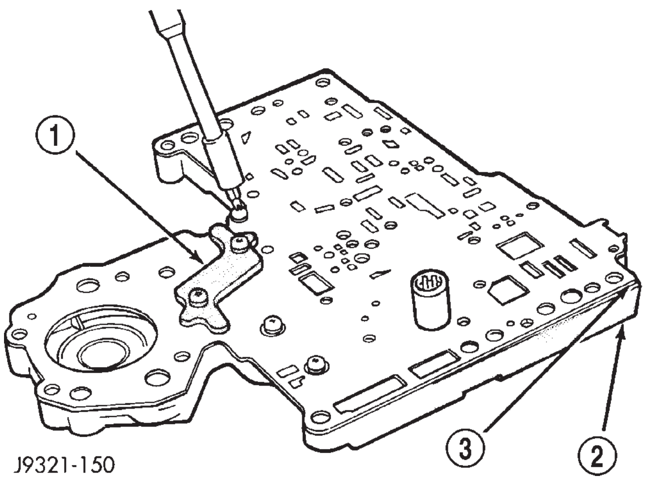


Fig. 141 Brace Plate

1 – BRACE
2 – TRANSFER PLATE
3 – SEPARATOR PLATE

UPPER AND LOWER HOUSING

(1) Position upper housing so internal passages and check ball seats are facing upward. Then install check balls in housing (Fig. 142). Eight check balls are used. The single large check ball is approximately 8.7 mm (11/32 in.) diameter. The single small check ball is approximately 4.8 mm (3/16 in.) in diameter. The remaining 6 check balls are approximately 6.3 mm (1/4 in.) in diameter.

(2) Position assembled transfer plate and upper housing separator plate on upper housing (Fig. 143). Be sure filter screen is seated in proper housing recess.

(3) Install the ECE check ball into the transfer plate (Fig. 129). The ECE check ball is approximately 4.8 mm (3/16 in.) in diameter.

(4) Position lower housing separator plate on transfer plate (Fig. 144).

(5) Install lower housing on assembled transfer plate and upper housing (Fig. 145).

(6) Install and start all valve body screws by hand except for the screws to hold the boost valve tube brace. Save those screws for later installation. Then tighten screws evenly to 4 N·m (35 in. lbs.) torque. Start at center and work out to sides when tightening screws (Fig. 145).

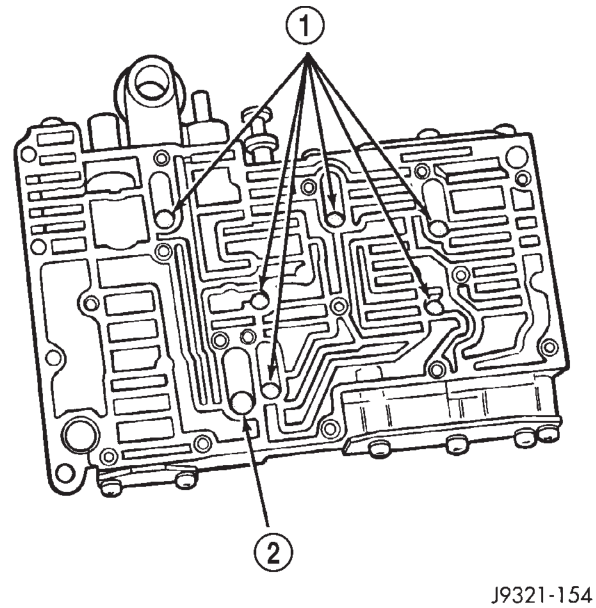


Fig. 142 Check Ball Locations In Upper Housing

1 – SMALL DIAMETER CHECK BALLS (6)
2 – LARGE DIAMETER CHECK BALL (1)

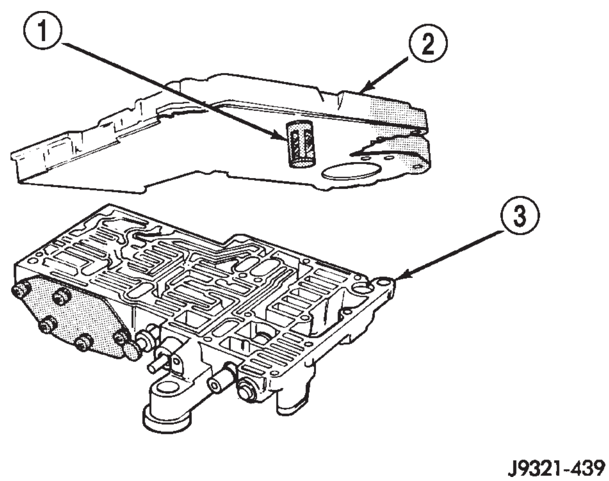


Fig. 143 Installing Transfer Plate On Upper Housing

1 – FILTER SCREEN
2 – TRANSFER PLATE/SEPARATOR PLATE ASSEMBLY
3 – UPPER HOUSING

DISASSEMBLY AND ASSEMBLY (Continued)

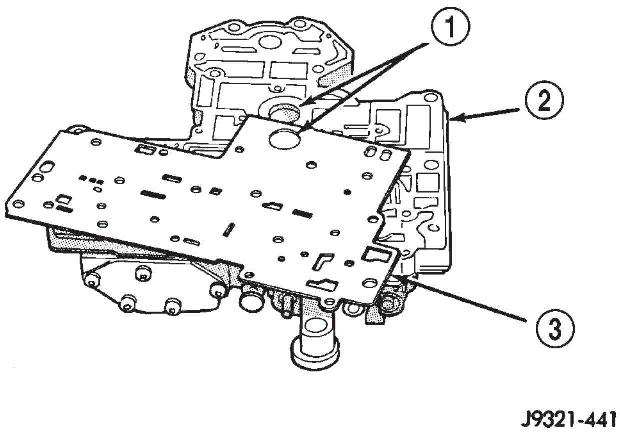


Fig. 144 Lower Housing Separator Plate

1 – BE SURE TO ALIGN BORES
2 – TRANSFER PLATE
3 – LOWER HOUSING (OVERDRIVE) SEPARATOR PLATE

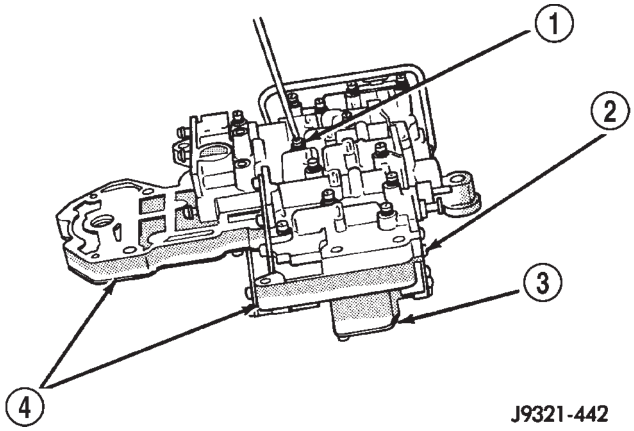


Fig. 145 Installing Lower Housing On Transfer Plate And Upper Housing

1 – VALVE BODY SCREWS (13)
2 – LOWER HOUSING
3 – UPPER HOUSING
4 – TRANSFER PLATE

UPPER HOUSING VALVE AND PLUG

Refer to (Fig. 146), (Fig. 147) and (Fig. 148) to perform the following steps.

(1) Lubricate valves, plugs, springs with clean transmission fluid.

(2) Assemble regulator valve line pressure plug, sleeve, throttle plug and spring. Insert assembly in upper housing and install cover plate. Tighten cover plate screws to 4 N·m (35 in. lbs.) torque.

(3) Install 1-2 and 2-3 shift valves and springs.

(4) Install 1-2 shift control valve and spring.

(5) Install retainer, spring, limit valve, and 2-3 throttle plug from limit valve housing.

(6) Install limit valve housing and cover plate. Tighten screws to 4 N·m (35 in. lbs.).

(7) Install shuttle valve as follows:

(a) Insert plastic guides in shuttle valve secondary spring and install spring on end of valve.

(b) Install shuttle valve into housing.

(c) Hold shuttle valve in place.

(d) Compress secondary spring and install E-clip in groove at end of shuttle valve.

(e) Verify that spring and E-clip are properly seated before proceeding.

(8) Install shuttle valve cover plate. Tighten cover plate screws to 4 N·m (35 in. lbs.) torque.

(9) Install 1-2 and 2-3 valve governor plugs in valve body.

(10) Install shuttle valve primary spring and throttle plug.

(11) Align and install governor plug cover. Tighten cover screws to 4 N·m (35 in. lbs.) torque.

DISASSEMBLY AND ASSEMBLY (Continued)

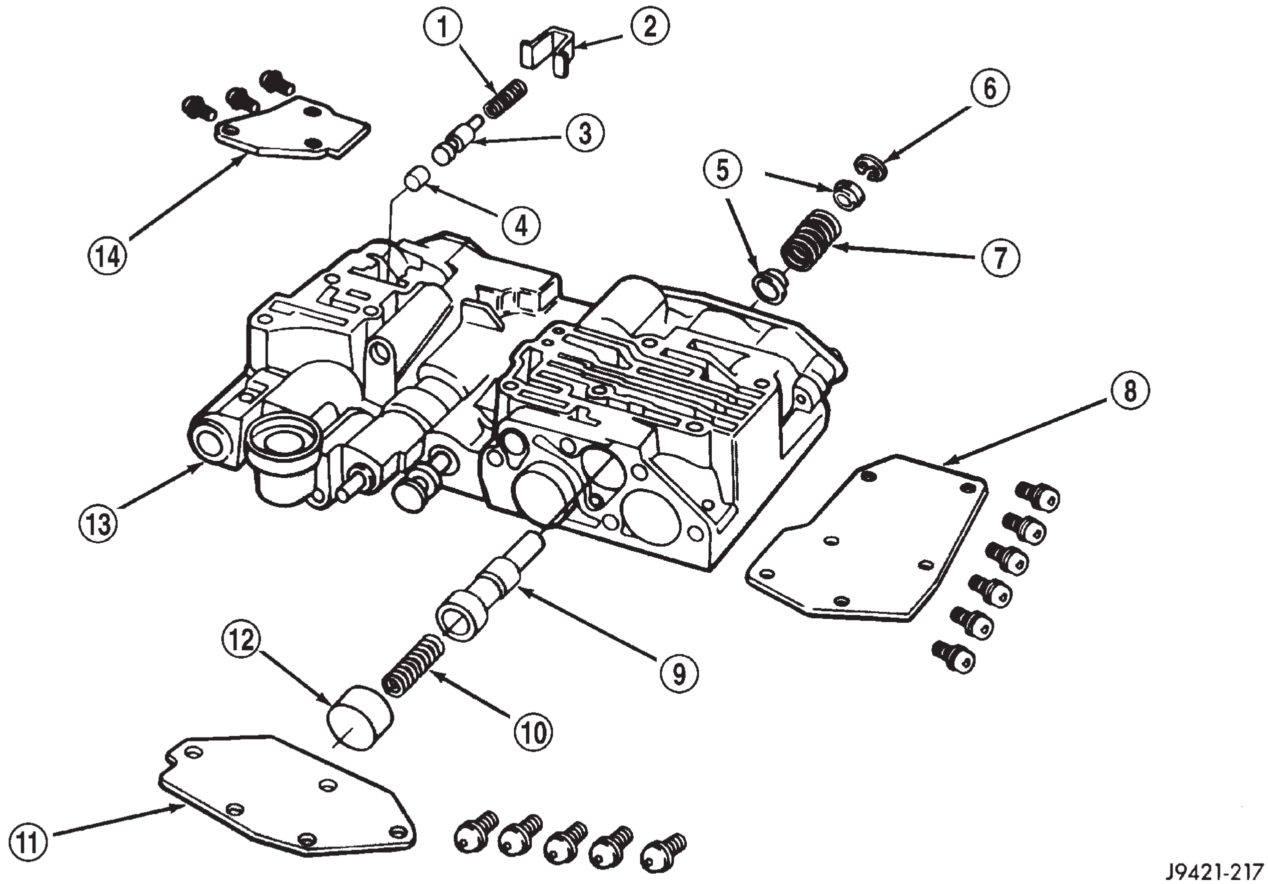


Fig. 146 Shuttle And Boost Valve Components

1 – SPRING
2 – RETAINER
3 – BOOST VALVE
4 – BOOST VALVE PLUG
5 – SPRING GUIDES
6 – E-CLIP
7 – SHUTTLE VALVE SECONDARY SPRING
8 – SHUTTLE VALVE COVER
9 – SHUTTLE VALVE
10 – SHUTTLE VALVE PRIMARY SPRING
11 – GOVERNOR PLUG COVER
12 – THROTTLE PLUG
13 – UPPER HOUSING
14 – BOOST VALVE COVER

DISASSEMBLY AND ASSEMBLY (Continued)

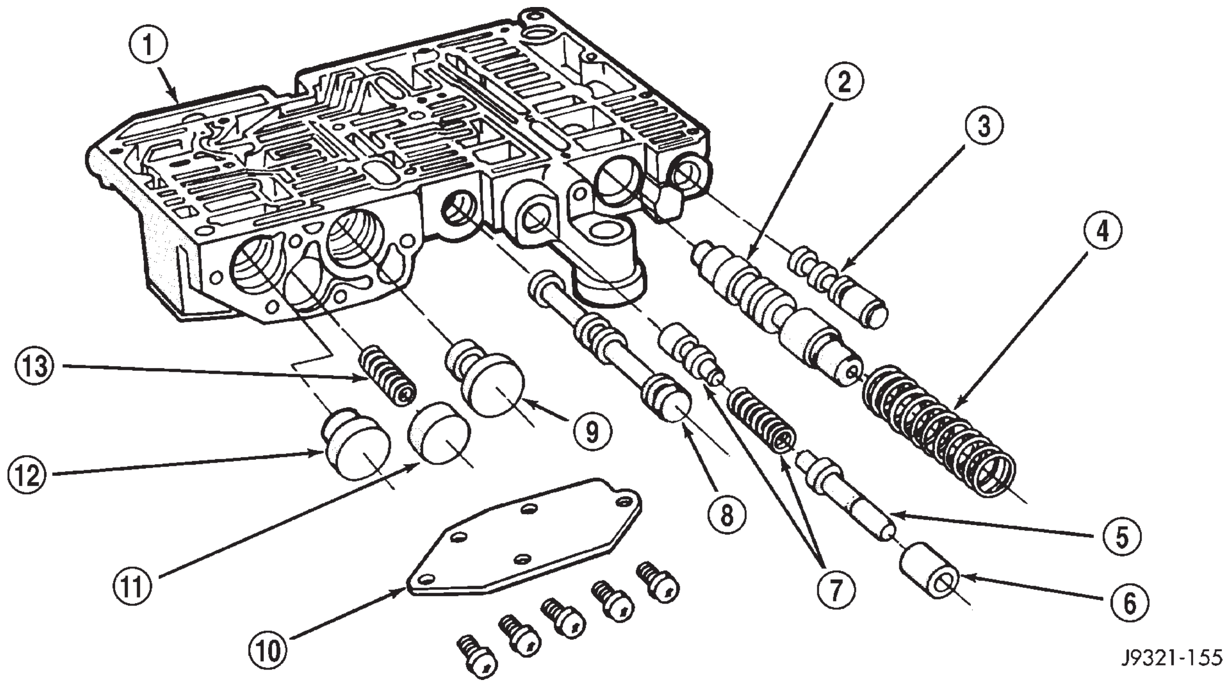


Fig. 147 Upper Housing Control Valve Locations

1 – UPPER HOUSING
2 – REGULATOR VALVE
3 – SWITCH VALVE
4 – REGULATOR VALVE SPRING
5 – KICKDOWN VALVE
6 – KICKDOWN DETENT
7 – THROTTLE VALVE AND SPRING
8 – MANUAL VALVE
9 – 1–2 GOVERNOR PLUG
10 – GOVERNOR PLUG COVER
11 – THROTTLE PLUG
12 – 2–3 GOVERNOR PLUG
13 – SHUTTLE VALVE PRIMARY SPRING

DISASSEMBLY AND ASSEMBLY (Continued)

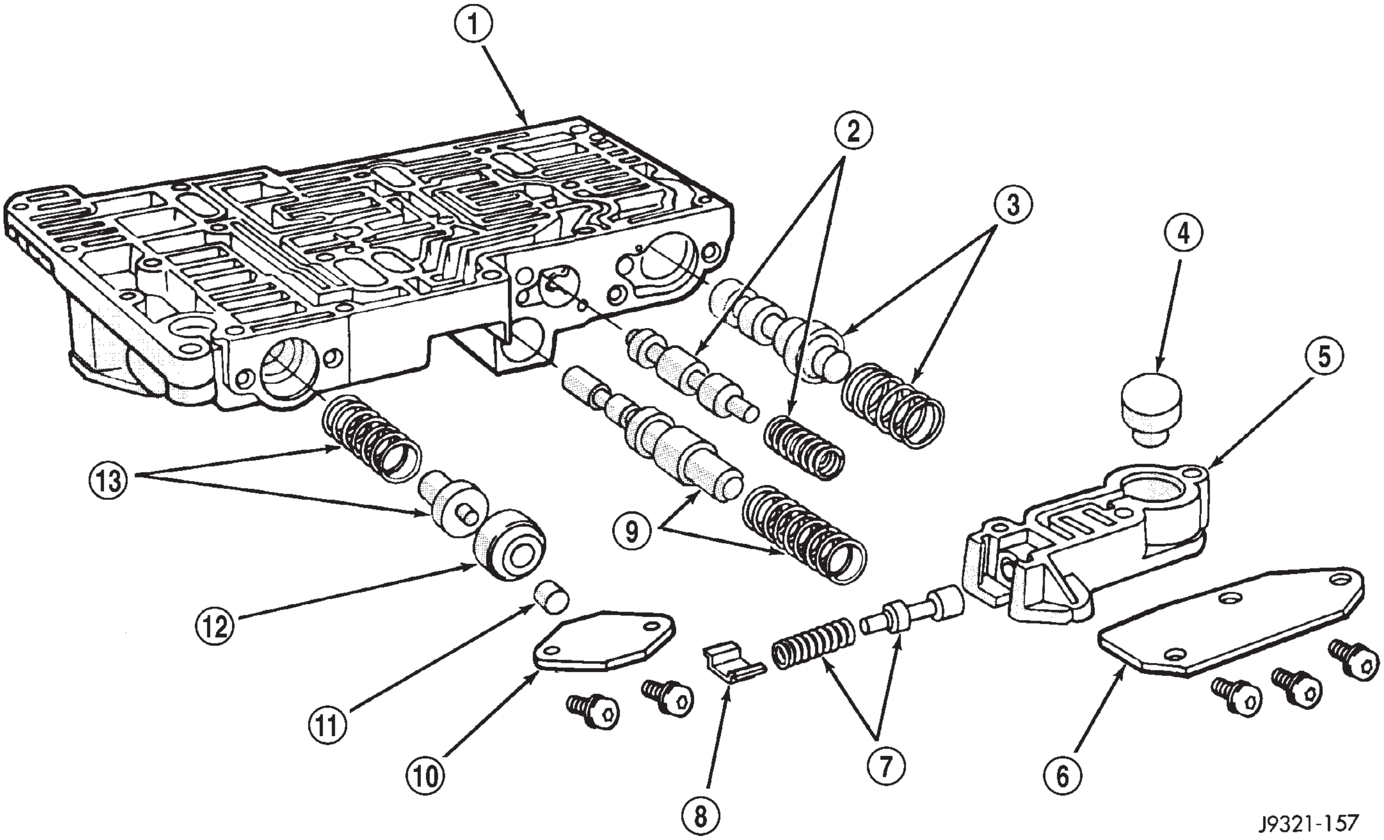


Fig. 148 Upper Housing Shift Valve And Pressure Plug Locations

1 – UPPER HOUSING
2 – 1–2 SHIFT VALVE AND SPRING
3 – 2–3 SHIFT VALVE AND SPRING
4 – 2–3 THROTTLE PLUG
5 – LIMIT VALVE HOUSING
6 – LIMIT VALVE COVER
7 – LIMIT VALVE AND SPRING
8 – RETAINER
9 – 1–2 SHIFT CONTROL VALVE AND SPRING
10 – PRESSURE PLUG COVER
11 – LINE PRESSURE PLUG
12 – PLUG SLEEVE
13 – THROTTLE PRESSURE SPRING AND PLUG

DISASSEMBLY AND ASSEMBLY (Continued)

BOOST VALVE TUBE AND BRACE

(1) Position valve body assembly so lower housing is facing upward (Fig. 149).

(2) Lubricate tube ends and housing ports with transmission fluid or petroleum jelly.

(3) Start tube in lower housing port first. Then swing tube downward and work opposite end of tube into upper housing port (Fig. 149).

(4) Insert and seat each end of tube in housings.

(5) Slide tube brace under tube and into alignment with valve body screw holes (Fig. 150).

(6) Install and finger tighten three screws that secure tube brace to valve body housings (Fig. 150).

(7) Bend tube brace tabs up and against tube to hold it in position (Fig. 151).

(8) Tighten all valve body housing screws to 4 N·m (35 in. lbs.) torque after tube and brace are installed. Tighten screws in diagonal pattern starting at center and working outward.

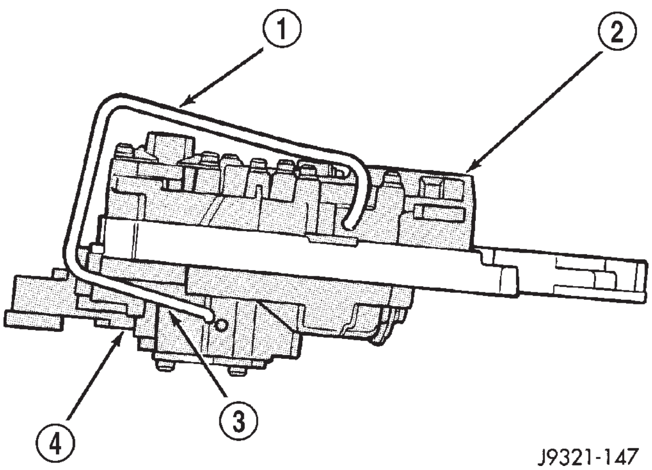


Fig. 149 Boost Valve Tube

1 – BOOST VALVE TUBE
2 – LOWER HOUSING
3 – DISENGAGE THIS END OF TUBE FIRST
4 – UPPER HOUSING

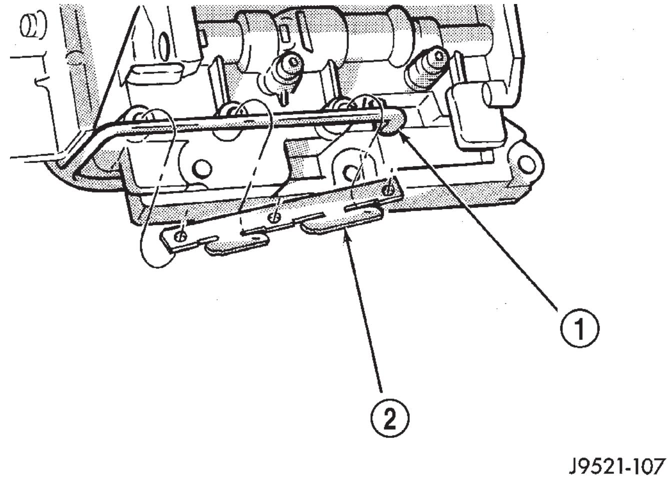


Fig. 150 Boost Valve Tube And Brace

1 – BOOST VALVE TUBE
2 – TUBE BRACE

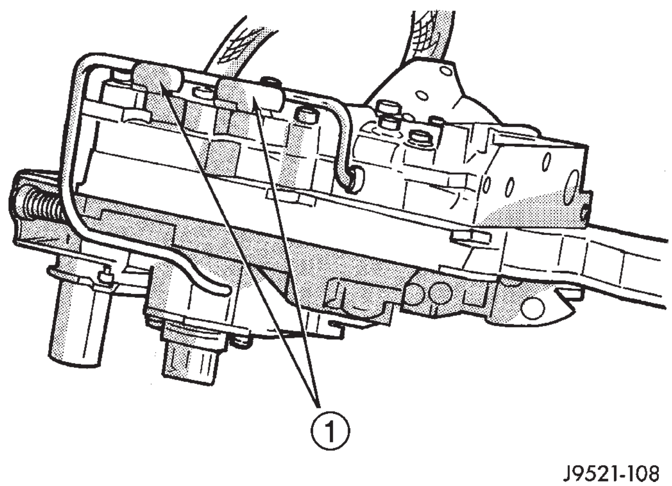


Fig. 151 Securing Boost Valve Tube With Brace Tabs

1 – BEND TABS UP AGAINST TUBE AS SHOWN

3-4 ACCUMULATOR

(1) Position converter clutch valve and 3-4 shift valve springs in housing (Fig. 152).

(2) Loosely attach accumulator housing with right-side screw (Fig. 152). Install only one screw at this time as accumulator must be free to pivot upward for ease of installation.

(3) Install 3-4 shift valve and spring.

(4) Install converter clutch timing valve and spring.

(5) Position plug on end of converter clutch valve spring. Then compress and hold springs and plug in place with fingers of one hand.

(6) Swing accumulator housing upward over valve springs and plug.

(7) Hold accumulator housing firmly in place and install remaining two attaching screws. Be sure springs and clutch valve plug are properly seated (Fig. 153). Tighten screws to 4 N·m (35 in. lbs.).

VALVE BODY FINAL

(1) Install boost valve, valve spring, retainer and cover plate. Tighten cover plate screws to 4 N·m (35 in. lbs.) torque.

(2) Insert manual lever detent spring in upper housing.

(3) Position detent ball on end of spring. Then hold detent ball and spring in detent housing with Retainer Tool 6583 (Fig. 154).

DISASSEMBLY AND ASSEMBLY (Continued)

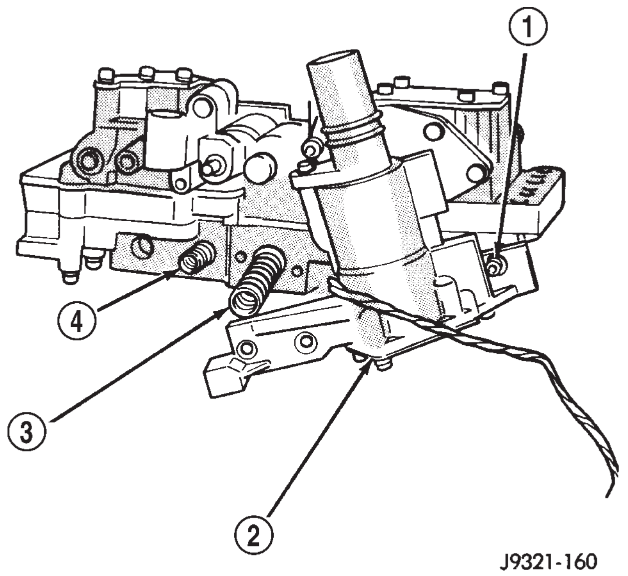


Fig. 152 Converter Clutch And 3-4 Shift Valve Springs

1 – RIGHT-SIDE SCREW
2 – 3–4 ACCUMULATOR
3 – 3–4 SHIFT VALVE SPRING
4 – CONVERTER CLUTCH VALVE SPRING

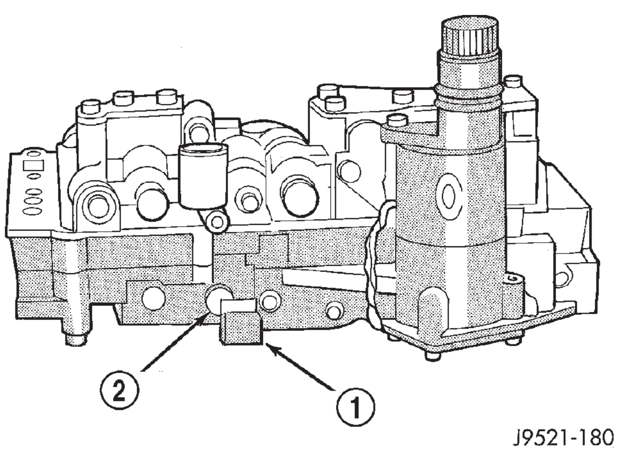


Fig. 153 Seating 3-4 Accumulator On Lower Housing

1 – ACCUMULATOR BOX
2 – CONVERTER CLUTCH VALVE PLUG

(4) Install throttle lever in upper housing. Then install manual lever over throttle lever and start manual lever into housing.

(5) Align manual lever with detent ball and manual valve. Hold throttle lever upward. Then press down on manual lever until fully seated. Remove detent ball retainer tool after lever is seated.

(6) Then install manual lever seal, washer and E-clip.

(7) Verify that throttle lever is aligned with end of kickdown valve stem and that manual lever arm is engaged in manual valve (Fig. 155).

(8) Position line pressure adjusting screw in adjusting screw bracket.

(9) Install spring on end of line pressure regulator valve.

(10) Install switch valve spring on tang at end of adjusting screw bracket.

(11) Install manual valve.

(12) Install throttle valve and spring.

(13) Install kickdown valve and detent.

(14) Install pressure regulator valve.

(15) Install switch valve.

(16) Position adjusting screw bracket on valve body. Align valve springs and press bracket into place. Install short, upper bracket screws first and long bottom screw last. Verify that valve springs and bracket are properly aligned. Then tighten all three bracket screws to 4 N·m (35 in. lbs.) torque.

(17) Perform Line Pressure and Throttle Pressure adjustments. Refer to adjustment section of this group for proper procedures.

(18) Lubricate solenoid case connector O-rings and shaft of manual lever with light coat of petroleum jelly.

(19) Attach solenoid case connector to 3-4 accumulator with shoulder-type screw. Connector has small locating tang that fits in dimple at top of accumulator housing (Fig. 156). Seat tang in dimple before tightening connector screw.

(20) Install solenoid assembly and gasket. Tighten solenoid attaching screws to 8 N·m (72 in. lbs.) torque.

(21) Verify that solenoid wire harness is properly routed (Fig. 157). **Solenoid harness must be clear of manual lever and park rod and not be pinched between accumulator housing and cover.**

DISASSEMBLY AND ASSEMBLY (Continued)

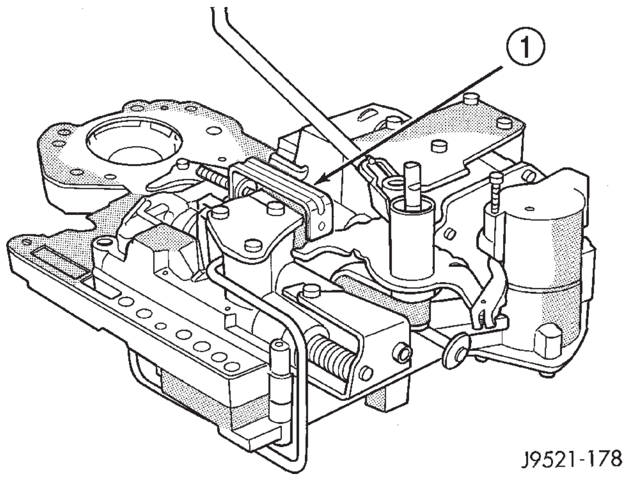


Fig. 154 Detent Ball Spring

1 – SPECIAL TOOL 6583 POSITIONED ON DETENT HOUSING

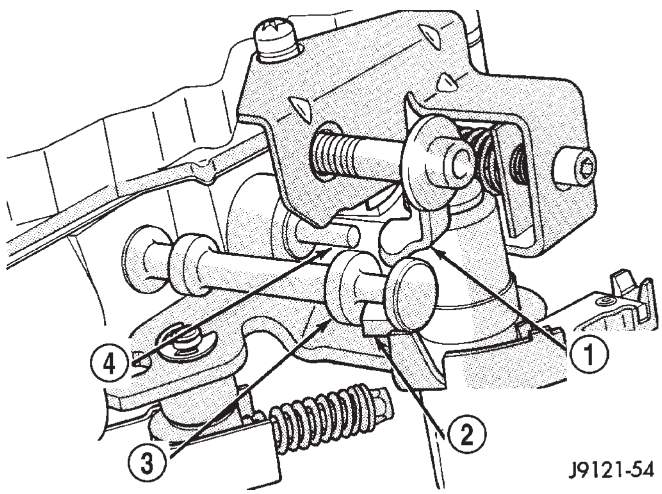


Fig. 155 Manual And Throttle Lever Alignment

1 – THROTTLE LEVER
2 – MANUAL LEVER VALVE ARM
3 – MANUAL VALVE
4 – KICKDOWN VALVE

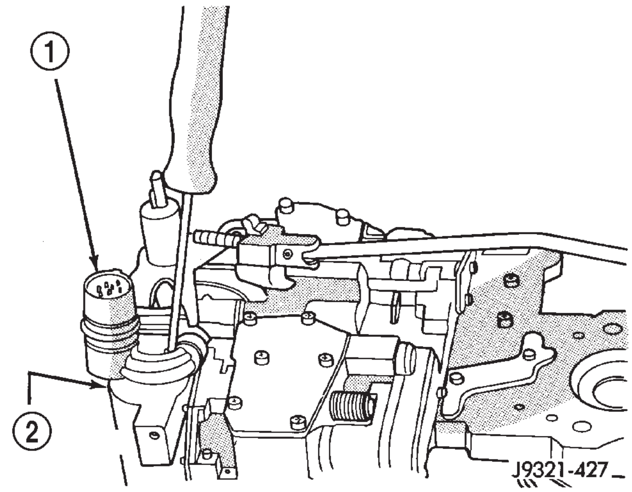


Fig. 156 Solenoid Harness Case Connector Shoulder Bolt

1 – SOLENOID HARNESS CASE CONNECTOR
2 – 3–4 ACCUMULATOR HOUSING

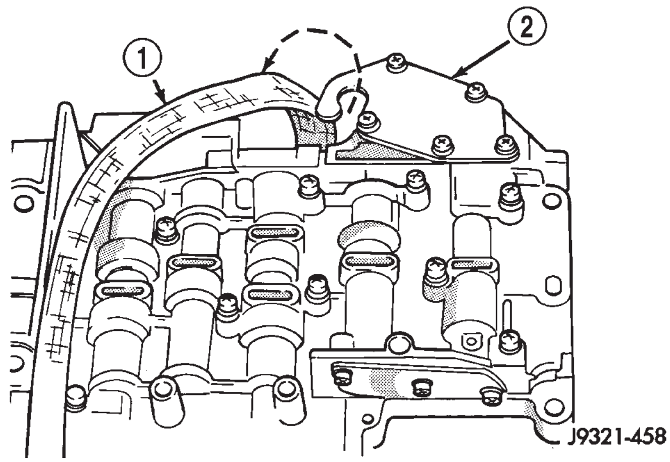


Fig. 157 Solenoid Harness Routing

1 – OVERDRIVE/CONVERTER SOLENOID WIRE HARNESS
2 – 3–4 ACCUMULATOR COVER PLATE

GOVERNOR BODY, SENSOR AND SOLENOID

(1) Turn valve body assembly over so accumulator side of transfer plate is facing down.

(2) Install new O-rings on governor pressure solenoid and sensor.

(3) Lubricate solenoid and sensor O-rings with clean transmission fluid.

(4) Install governor pressure sensor in governor body.

(5) Install governor pressure solenoid in governor body. Push solenoid in until it snaps into place in body.

(6) Position governor body gasket on transfer plate.

(7) Install retainer plate on governor body and around solenoid. Be sure solenoid connector is positioned in retainer cutout.

(8) Align screw holes in governor body and transfer plate. Then install and tighten governor body screws to 4 N·m (35 in. lbs.) torque.

(9) Connect harness wires to governor pressure solenoid and governor pressure sensor.

(10) Install fluid filter and pan.

(11) Lower vehicle.

(12) Fill transmission with recommended fluid and road test vehicle to verify repair.

DISASSEMBLY AND ASSEMBLY (Continued)

TRANSMISSION

DISASSEMBLY

(1) Clean transmission exterior with steam gun or with solvent. Wear eye protection during cleaning operations.

(2) Place transmission in a vertical position.

(3) Measure and record input shaft end play readings.

(4) Remove shift and throttle levers from valve body manual lever shaft.

(5) Place transmission in horizontal position.

(6) Remove transmission oil pan and gasket.

(7) Remove filter from valve body (Fig. 158). Keep filter screws separate from other valve body screws. Filter screws are longer and should be kept with filter.

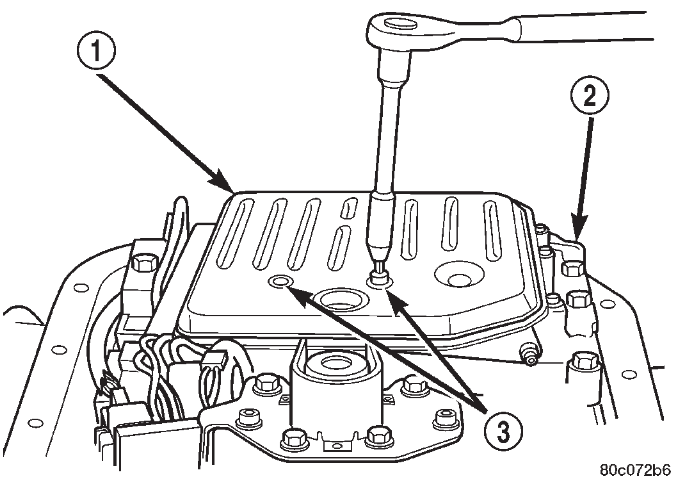


Fig. 158 Oil Filter Removal

1 – OIL FILTER
2 – VALVE BODY
3 – FILTER SCREWS (2)

(8) Remove park/neutral position switch.

(9) Remove hex head bolts attaching valve body to transmission case (Fig. 159). A total of 10 bolts are used. Note different bolt lengths for assembly reference.

(10) Remove valve body assembly. Push valve body harness connector out of case. Then work park rod and valve body out of case (Fig. 160).

(11) Remove accumulator piston and inner and outer springs (Fig. 161).

(12) Remove pump oil seal with suitable pry tool or slide-hammer mounted screw.

(13) Loosen front band adjusting screw locknut 4-5 turns. Then tighten band adjusting screw until band is tight around front clutch retainer. This prevents front/rear clutches from coming out with pump and possibly damaging clutch or pump components.

(14) Remove oil pump bolts.

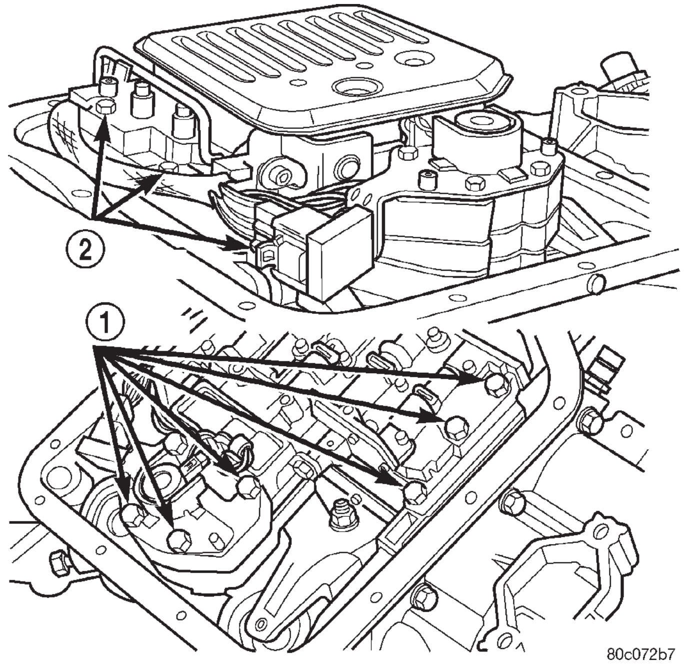


Fig. 159 Valve Body Bolt Locations

1 – VALVE BODY BOLTS
2 – VALVE BODY BOLTS

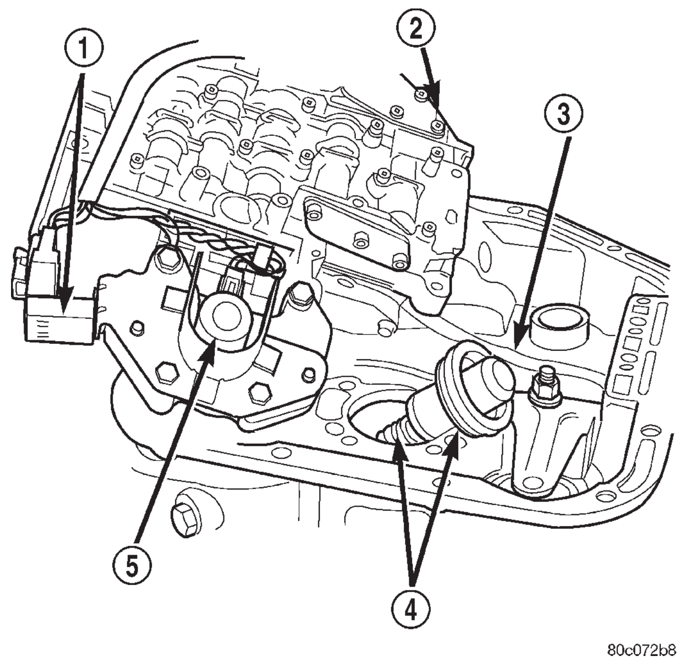


Fig. 160 Valve Body Removal

1 – GOVERNOR PRESSURE SENSOR
2 – VALVE BODY
3 – PARK ROD
4 – ACCUMULATOR PISTON
5 – GOVERNOR PRESSURE SOLENOID

(15) Thread bolts of Slide Hammer Tools C-3752 into threaded holes in pump body flange (Fig. 162).

DISASSEMBLY AND ASSEMBLY (Continued)

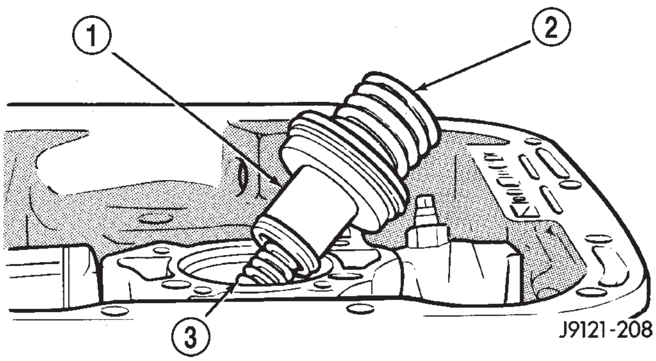


Fig. 161 Accumulator Piston And Springs

1 – ACCUMULATOR PISTON
2 – OUTER SPRING
3 – INNER SPRING

(16) Bump slide hammer weights outward to remove pump and reaction shaft support assembly from case (Fig. 162).

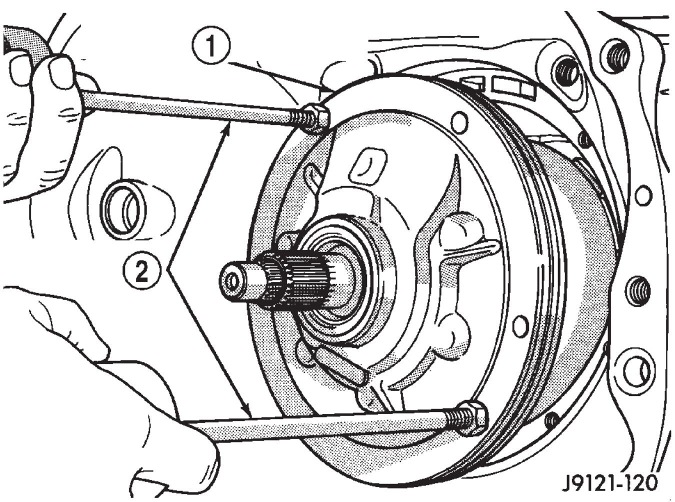


Fig. 162 Removing Oil Pump And Reaction Shaft Support Assembly

1 – OIL PUMP AND REACTION SHAFT SUPPORT ASSEMBLY
2 – SLIDE HAMMER TOOLS C-3752

(17) Loosen front band adjusting screw until band is completely loose.

(18) Squeeze front band together and remove band strut (Fig. 163).

(19) Remove front band lever (Fig. 164).

(20) Remove front band lever shaft plug, if necessary, from converter housing.

(21) Remove front band lever shaft.

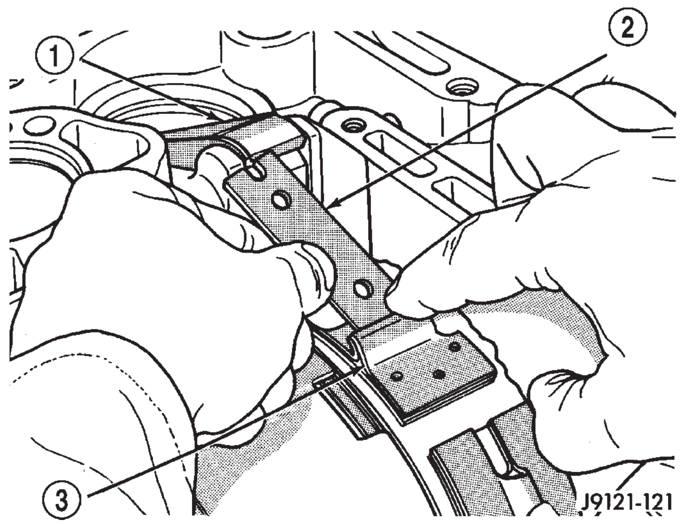


Fig. 163 Removing/Installing Front Band Strut

1 – BAND LEVER
2 – BAND STRUT
3 – FRONT BAND

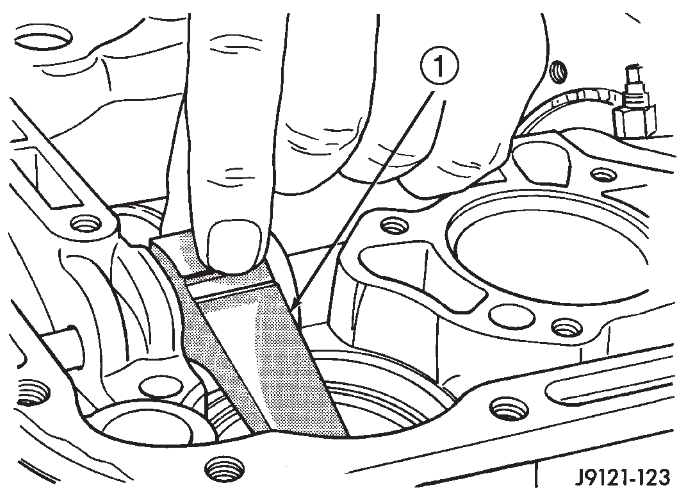


Fig. 164 Removing/Installing Front Band Lever

1 – FRONT BAND LEVER

DISASSEMBLY AND ASSEMBLY (Continued)

(22) Remove front and rear clutch units as assembly. Grasp input shaft, hold clutch units together and remove them from case (Fig. 165).

(23) Lift front clutch off rear clutch (Fig. 166). Set clutch units aside for overhaul.

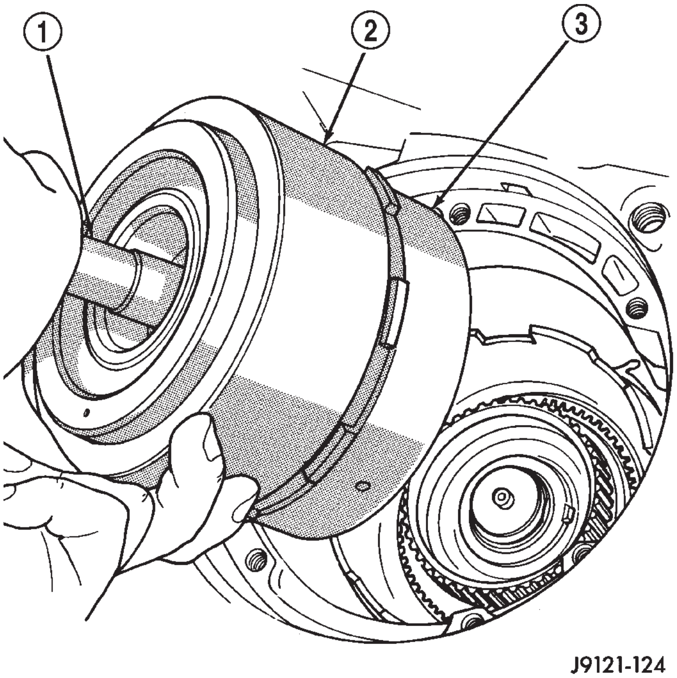


Fig. 165 Removing Front/Rear Clutch Assemblies

1 – INPUT SHAFT
2 – FRONT CLUTCH
3 – REAR CLUTCH

(24) Remove intermediate shaft thrust washer from front end of shaft or from rear clutch hub (Fig. 167).

(25) Remove output shaft thrust plate from intermediate shaft hub (Fig. 168).

(26) Slide front band off driving shell (Fig. 169) and remove band from case.

(27) Remove planetary geartrain as assembly (Fig. 170). Support geartrain with both hands during removal. Do not allow machined surfaces on intermediate shaft or overdrive piston retainer to become nicked or scratched.

(28) If overdrive unit is not to be serviced, install Alignment Shaft 6227-2 into the overdrive unit to prevent misalignment of the overdrive clutches during service of main transmission components.

(29) Loosen rear band adjusting screw 4-5 turns.

(30) Remove low-reverse drum snap ring (Fig. 171).

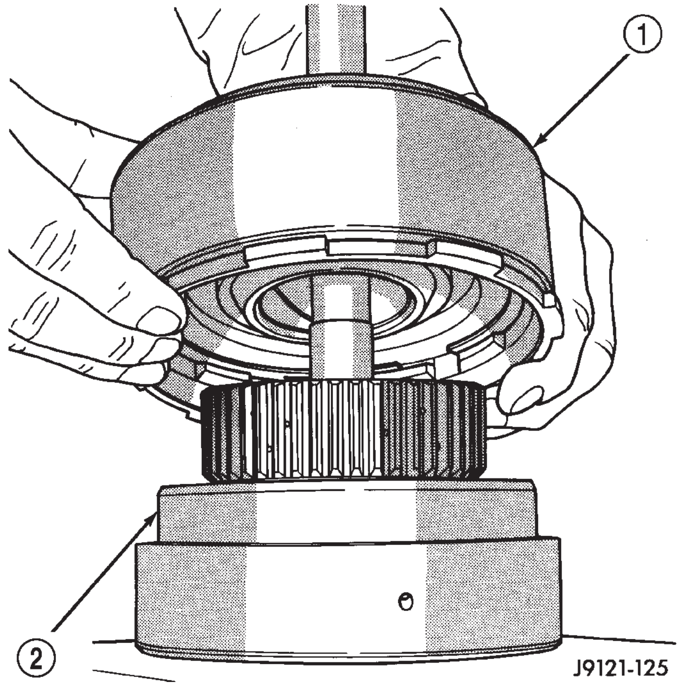


Fig. 166 Separating Front/Rear Clutch Assemblies

1 – FRONT CLUTCH
2 – REAR CLUTCH

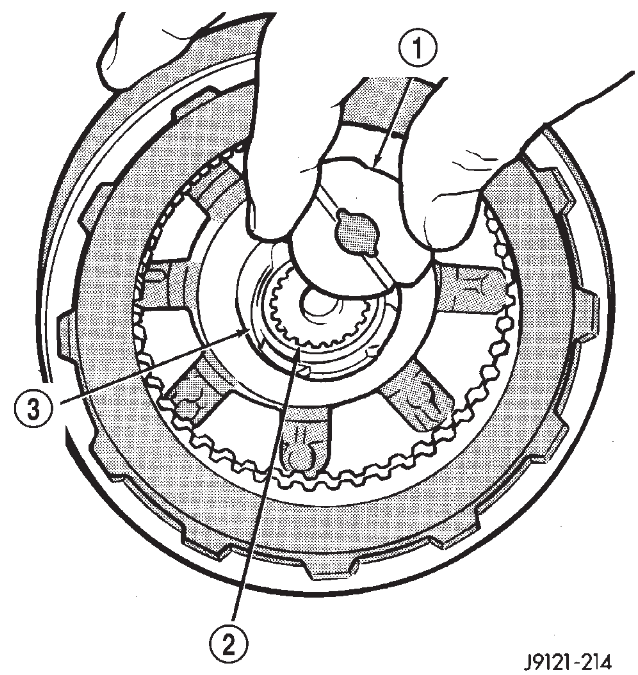


Fig. 167 Removing Intermediate Shaft Thrust Washer

1 – INTERMEDIATE SHAFT THRUST WASHER
2 – INPUT SHAFT
3 – REAR CLUTCH RETAINER HUB

DISASSEMBLY AND ASSEMBLY (Continued)

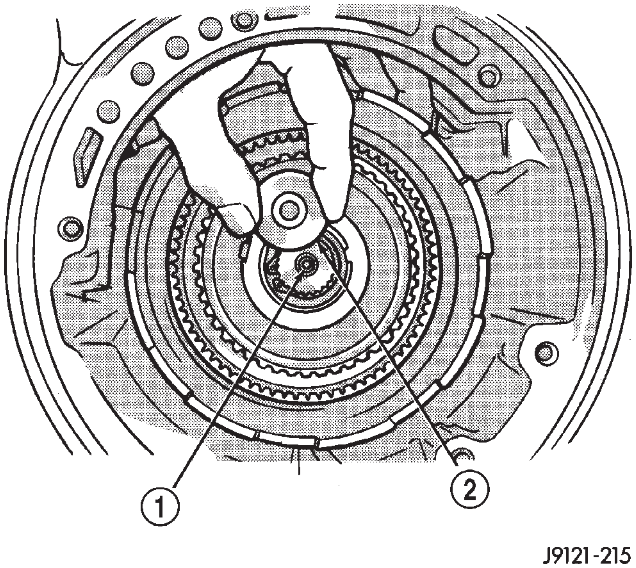


Fig. 168 Removing Intermediate Shaft Thrust Plate

1 – INTERMEDIATE SHAFT HUB
2 – INTERMEDIATE SHAFT THRUST PLATE

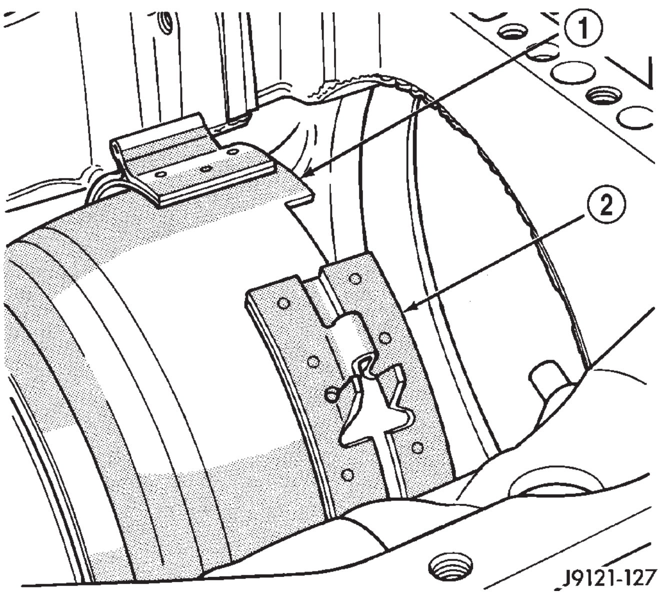


Fig. 169 Front Band Removal/Installation

1 – DRIVING SHELL
2 – FRONT BAND

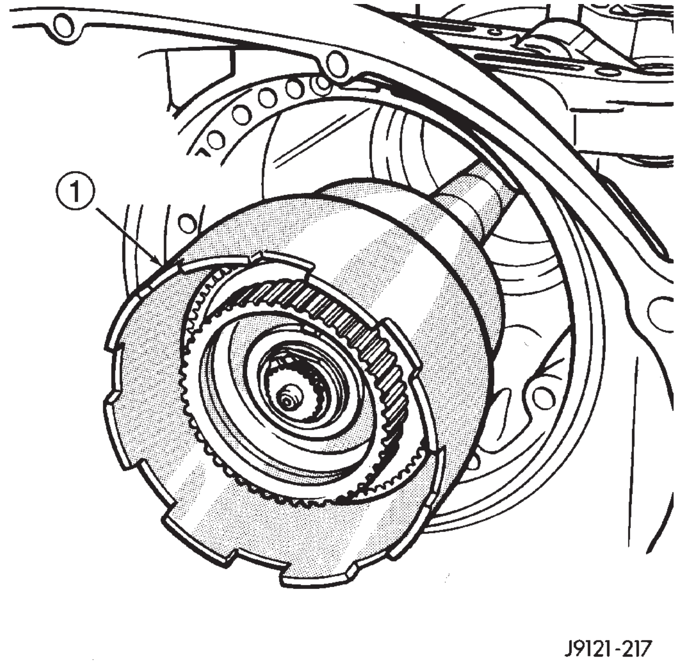


Fig. 170 Removing Planetary Geartrain And Intermediate Shaft Assembly

1 – PLANETARY GEARTRAIN AND INTERMEDIATE SHAFT ASSEMBLY

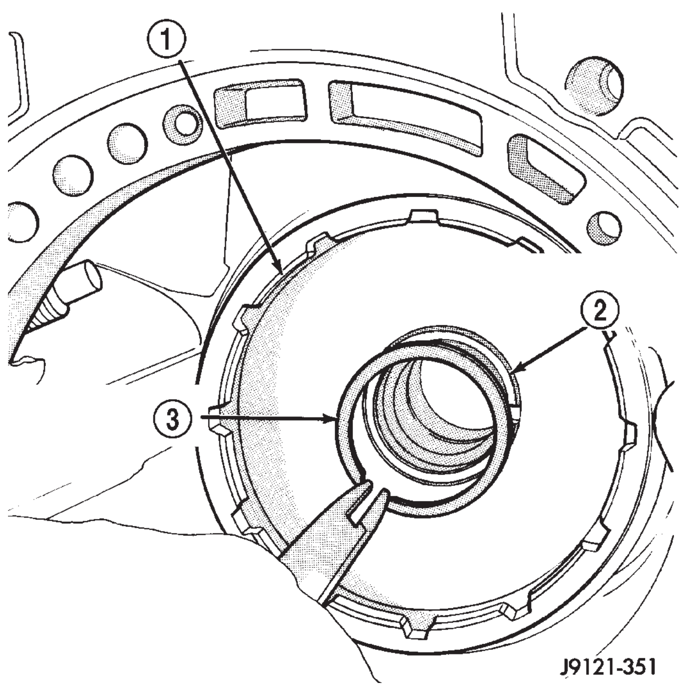


Fig. 171 Removing Low-Reverse Drum Snap Ring

1 – LOW-REVERSE DRUM
2 – HUB OF OVERDRIVE PISTON RETAINER
3 – LOW-REVERSE DRUM SNAP RING

DISASSEMBLY AND ASSEMBLY (Continued)

(31) Remove low-reverse drum and reverse band.

(32) Remove overrunning clutch roller and spring assembly as a unit (Fig. 172).

(33) Compress front servo rod guide about 1/8 inch with Valve Spring Compressor C-3422-B (Fig. 173).

(34) Remove front servo rod guide snap ring. **Exercise caution when removing snap ring. Servo bore can be scratched or nicked if care is not exercised.**

(35) Remove compressor tools and remove front servo rod guide, spring and servo piston.

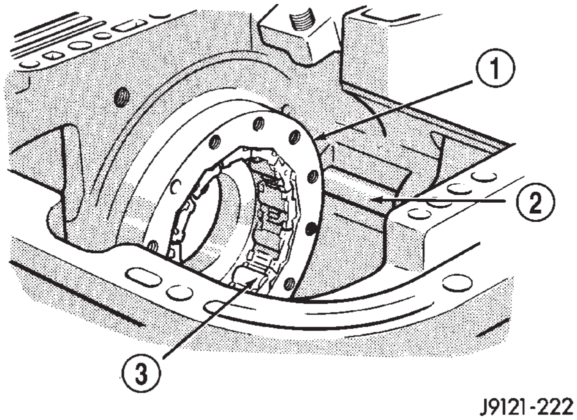


Fig. 172 Overrunning Clutch Assembly Removal

1 – OVERRUNNING CLUTCH CAM
2 – REAR BAND REACTION PIN
3 – OVERRUNNING CLUTCH ASSEMBLY

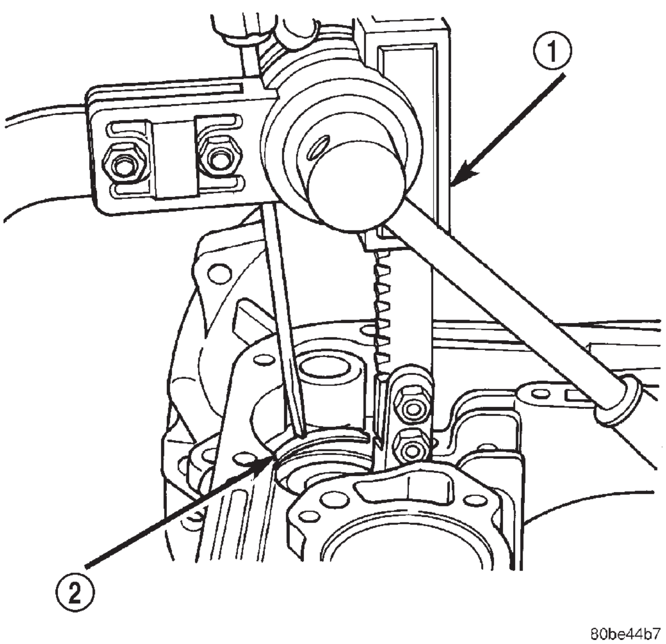


Fig. 173 Compressing Front Servo Rod Guide

1 – SPRING COMPRESSOR TOOL C-3422-B
2 – ROD GUIDE SNAP RING

(36) Compress rear servo spring retainer about 1/16 inch with Valve Spring Compressor C-3422-B (Fig. 174).

(37) Remove rear servo spring retainer snap ring. Then remove compressor tools and remove rear servo spring and piston.

(38) Inspect transmission components.

NOTE: TO SERVICE THE OVERRUNNING CLUTCH CAM OR OVERDRIVE PISTON RETAINER, REFER TO OVERRUNNING CLUTCH CAM SERVICE IN THIS SECTION.

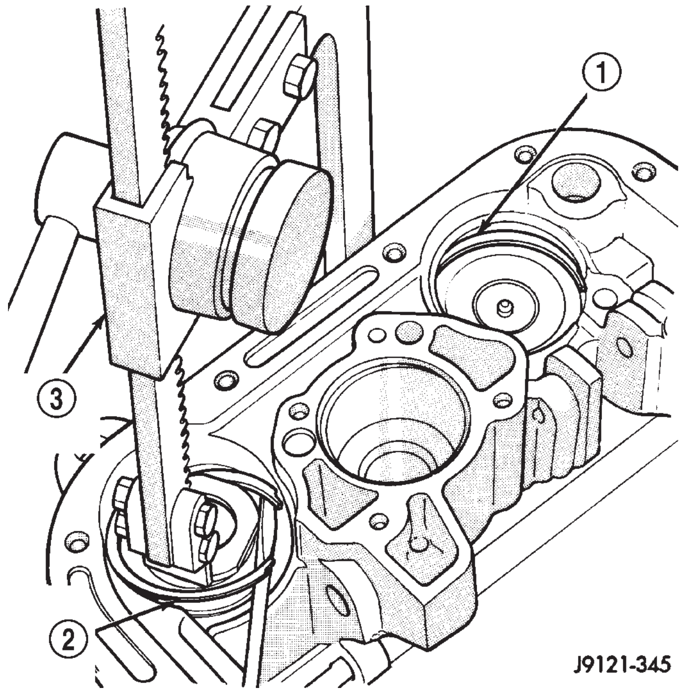


Fig. 174 Compressing Rear Servo Spring

1 – FRONT SERVO SNAP RING
2 – REAR SERVO SNAP RING
3 – SPECIAL TOOL

ASSEMBLY

Do not allow dirt, grease, or foreign material to enter the case or transmission components during assembly. Keep the transmission case and components clean. Also make sure the tools and workbench area used for assembly operations are equally clean.

Shop towels used for wiping off tools and hands must be made from **lint free** material. Lint will stick to transmission parts and could interfere with valve operation, or even restrict fluid passages.

Lubricate the transmission components with Mopar® transmission fluid during reassembly. Use Mopar® Door Ease, or Ru-Glyde on seals and O-rings to ease installation.

Petroleum jelly can also be used to hold thrust washers, thrust plates and gaskets in position during assembly. However, **do not** use chassis grease, bearing grease, white grease, or similar lubricants on any transmission part. These types of lubricants can eventually block or restrict fluid passages and interfere with valve operation. Use petroleum jelly only.

Do not force parts into place. The transmission components and subassemblies are easily installed by hand when properly aligned.

If a part seems extremely difficult to install, it is either misaligned or incorrectly assembled. Also verify that thrust washers, thrust plates and seal rings are correctly positioned before assembly. These parts can interfere with proper assembly if mis-positioned.

The planetary geartrain, front/rear clutch assemblies and oil pump are all much easier to install when the transmission case is upright.

(1) Install rear servo piston, spring and retainer (Fig. 175). Install spring on top of servo piston and install retainer on top of spring.

(2) Install front servo piston assembly, servo spring and rod guide (Fig. 176).

(3) Compress front/rear servo springs with Valve Spring Compressor C-3422-B and install each servo snap ring (Fig. 177).

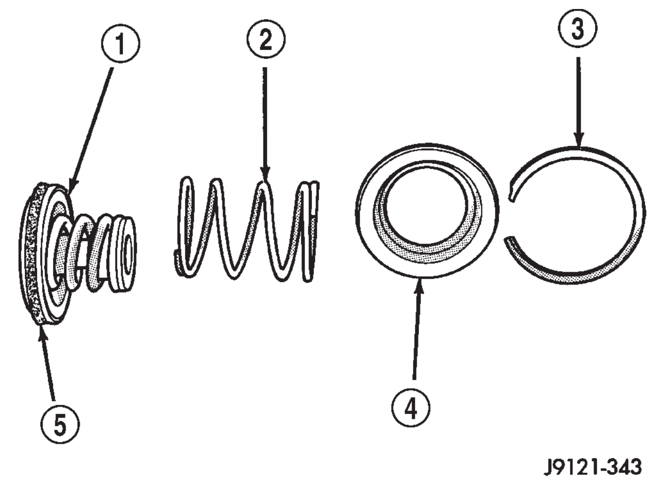


Fig. 175 Rear Servo Components

1 – SERVO PISTON
2 – PISTON SPRING
3 – SNAP RING
4 – RETAINER
5 – PISTON SEAL

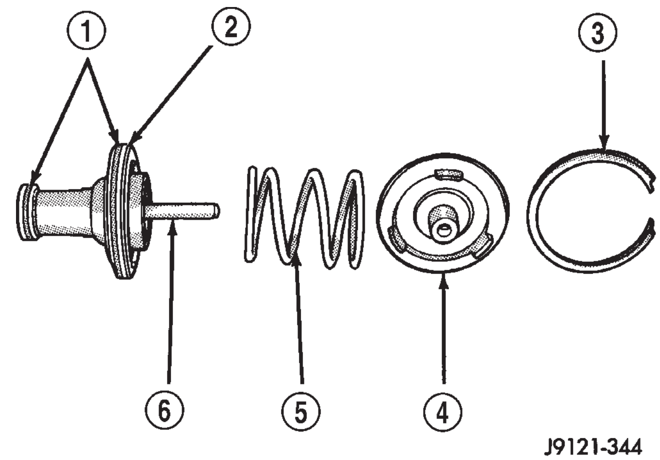


Fig. 176 Front Servo Components

1 – PISTON SEAL RINGS
2 – SERVO PISTON
3 – SNAP RING
4 – ROD GUIDE
5 – SPRING
6 – ROD

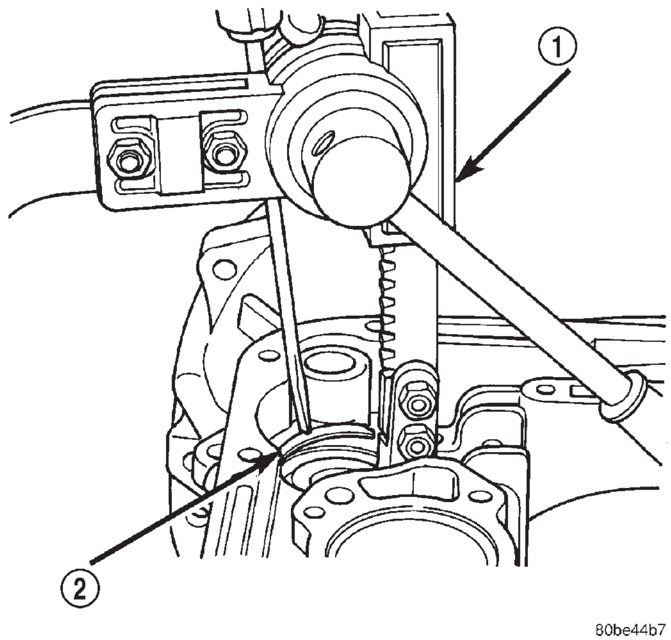


Fig. 177 Compressing Front/Rear Servo Springs

1 – SPRING COMPRESSOR TOOL C-3422-B
2 – ROD GUIDE SNAP RING

DISASSEMBLY AND ASSEMBLY (Continued)

(4) Lubricate clutch cam rollers with transmission fluid.

(5) Install rear band in case (Fig. 178). Be sure twin lugs on band are seated against reaction pin.

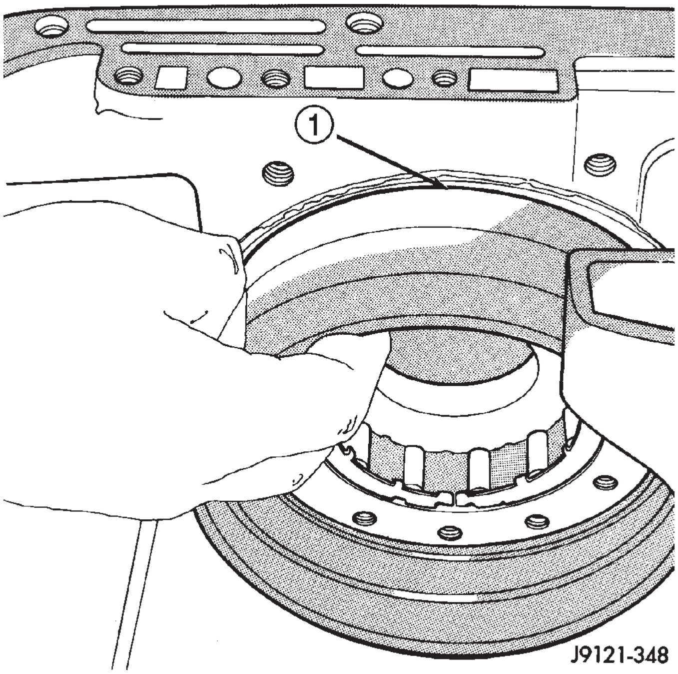


Fig. 178 Rear Band Installation

1 – REAR BAND

(6) Install low-reverse drum and check overrunning clutch operation as follows:

(a) Lubricate overrunning clutch race (on drum hub) with transmission fluid.

(b) Guide drum through rear band.

(c) Tilt drum slightly and start race (on drum hub) into overrunning clutch rollers.

(d) Press drum rearward and turn it in clockwise direction until drum seats in overrunning clutch (Fig. 179).

(e) Turn drum back and forth. **Drum should rotate freely in clockwise direction and lock in counterclockwise direction (as viewed from front of case).**

(7) Install snap ring that secures low-reverse drum to hub of overdrive piston retainer (Fig. 180).

(8) Install rear band lever and pivot pin (Fig. 181). Align lever with pin bores in case and push pivot pin into place.

(9) Install planetary geartrain assembly (Fig. 182).

(10) Install thrust plate on intermediate shaft hub (Fig. 183). Use petroleum jelly to hold thrust plate in place.

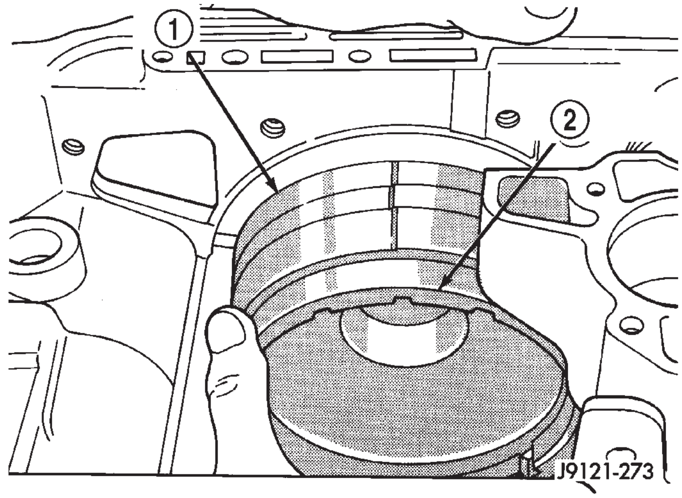


Fig. 179 Installing Low-Reverse Drum

1 – REAR BAND
2 – LOW-REVERSE DRUM

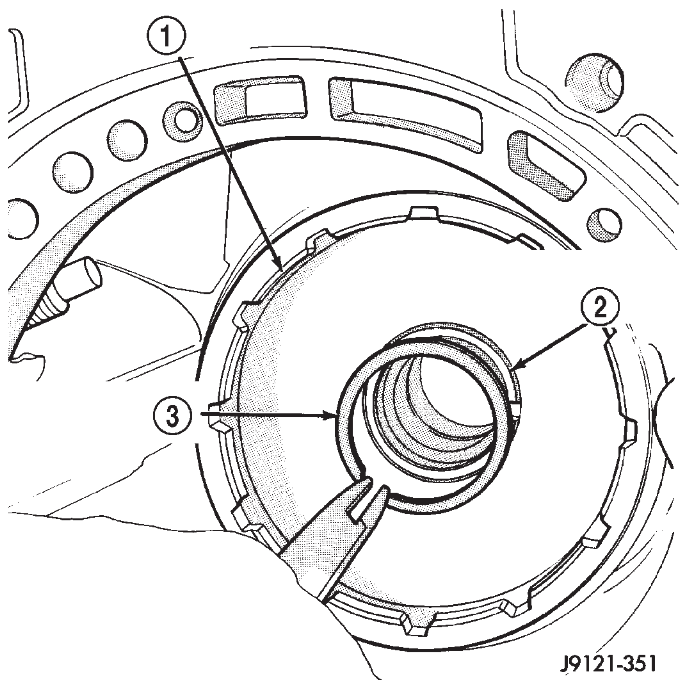


Fig. 180 Installing Low-Reverse Drum Retaining Snap Ring

1 – LOW-REVERSE DRUM
2 – HUB OF OVERDRIVE PISTON RETAINER
3 – LOW-REVERSE DRUM SNAP RING

DISASSEMBLY AND ASSEMBLY (Continued)

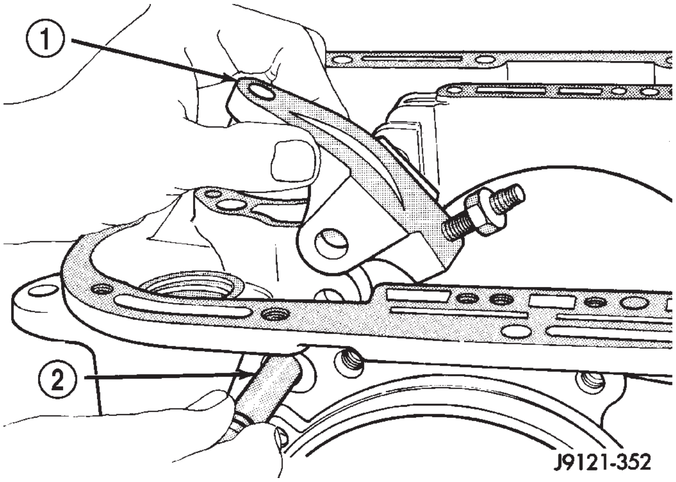


Fig. 181 Rear Band Lever And Pivot Pin Installation

1 – REAR BAND LEVER
2 – LEVER PIVOT PIN

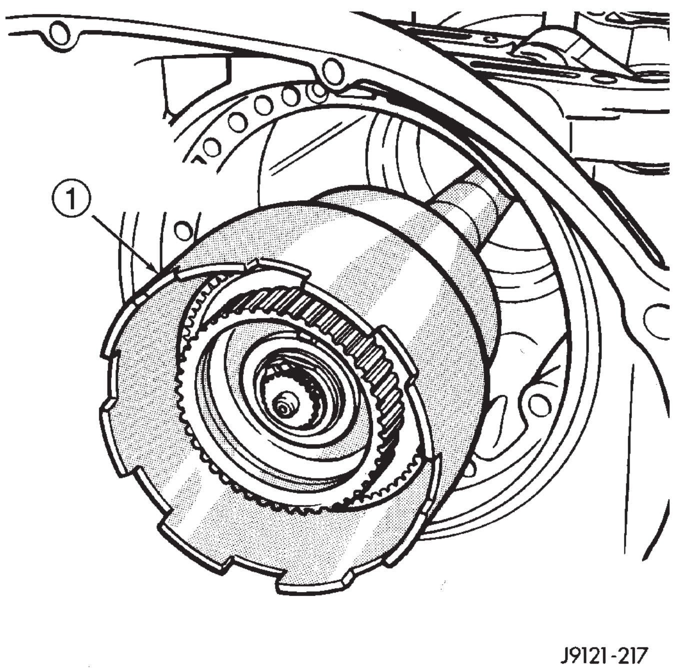


Fig. 182 Installing Planetary Geartrain

1 – PLANETARY GEARTRAIN AND INTERMEDIATE SHAFT ASSEMBLY

(11) Check seal ring on rear clutch retainer hub and seal rings on input shaft (Fig. 184). Also verify that shaft seal rings are installed in sequence shown.

(12) Install rear clutch thrust washer (Fig. 185). Use additional petroleum jelly to hold washer in place if necessary.

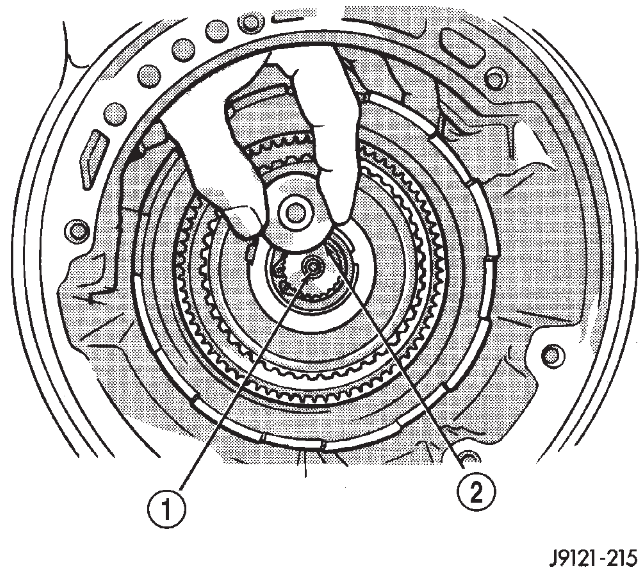


Fig. 183 Installing Intermediate Shaft Thrust Plate

1 – INTERMEDIATE SHAFT HUB
2 – INTERMEDIATE SHAFT THRUST PLATE

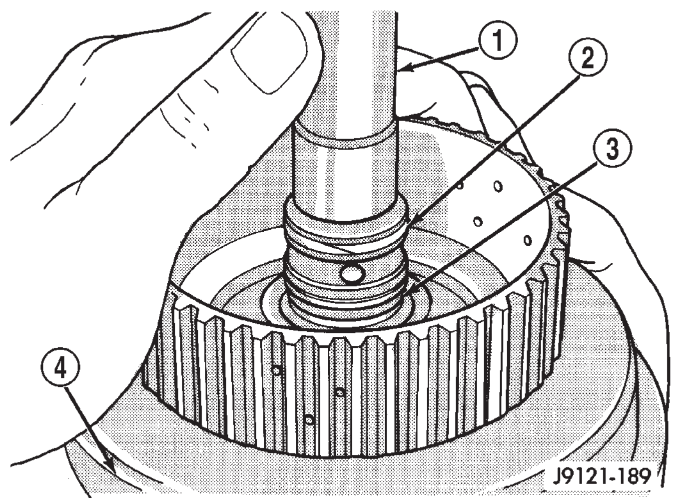


Fig. 184 Input Shaft Seal Ring Location

1 – INPUT SHAFT
2 – TEFLON SEAL RING
3 – METAL SEAL RING
4 – REAR CLUTCH RETAINER

DISASSEMBLY AND ASSEMBLY (Continued)

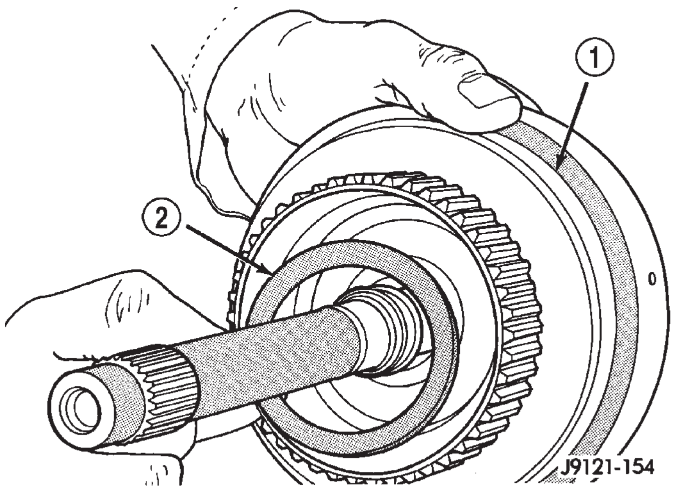


Fig. 185 Installing Rear Clutch Thrust Washer

1 – REAR CLUTCH RETAINER
2 – REAR CLUTCH THRUST WASHER (FIBER)

(13) Align clutch discs in front clutch and install front clutch on rear clutch (Fig. 186). Rotate front clutch retainer back and forth until completely seated on rear clutch retainer.

(14) Coat intermediate shaft thrust washer with petroleum jelly. Then install washer in rear clutch hub (Fig. 187). Use enough petroleum jelly to hold washer in place. **Be sure grooved side of washer faces rearward (toward output shaft) as shown. Also note that washer only fits one way in clutch hub.** Note thickness of this washer. It is a select fit part and is used to control transmission end play.

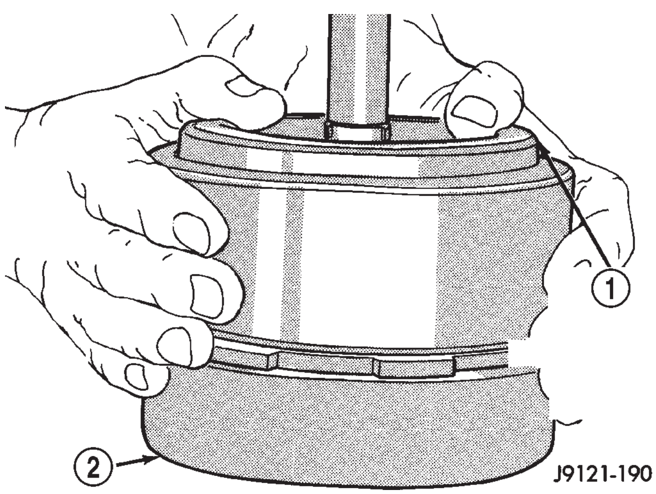


Fig. 186 Assembling Front And Rear Clutch Units

1 – TURN FRONT CLUTCH BACK & FORTH UNTIL SEATED
2 – REAR CLUTCH ASSEMBLY

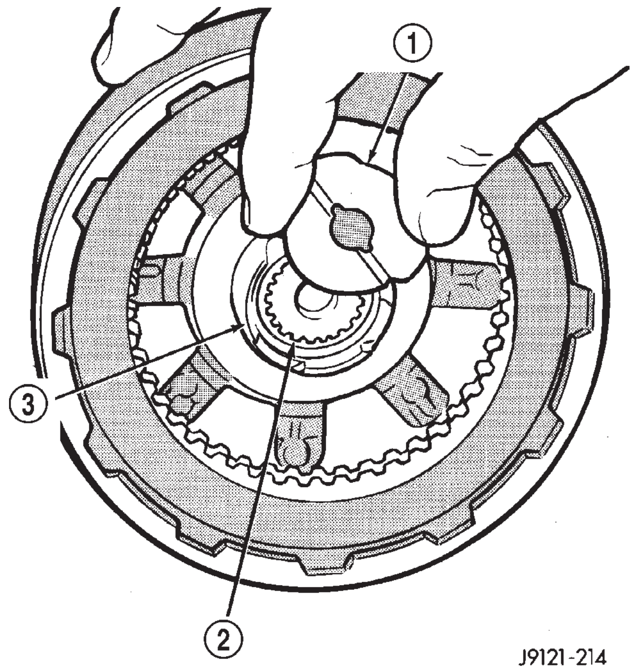


Fig. 187 Installing Intermediate Shaft Thrust Plate

1 – INTERMEDIATE SHAFT THRUST WASHER
2 – INPUT SHAFT
3 – REAR CLUTCH RETAINER HUB

(15) Align drive teeth on rear clutch discs with small screwdriver (Fig. 188). This makes installation on front planetary easier.

(16) Raise front end of transmission upward as far as possible and support case with wood blocks. Front/ rear clutch and oil pump assemblies are easier to install if transmission is as close to upright position as possible.

(17) Slide front band into case.

(18) Install front and rear clutch units as assembly (Fig. 189). Align rear clutch with front annulus gear and install assembly in driving shell. **Be sure output shaft thrust washer and thrust plate are not displaced during installation.**

(19) Carefully work assembled clutches back and forth to engage and seat rear clutch discs on front annulus gear. Also be sure front clutch drive lugs are fully engaged in slots of driving shell after installation.

(20) Assemble front band strut.

(21) Install front band adjuster, strut and adjusting screw (Fig. 190).

(22) Tighten band adjusting screw until band just grips clutch retainer. Verify that front/rear clutches are still seated before continuing.

(23) Check seal rings on reaction shaft support hub. Verify that seal rings are hooked together and that front clutch thrust washer is properly positioned

DISASSEMBLY AND ASSEMBLY (Continued)

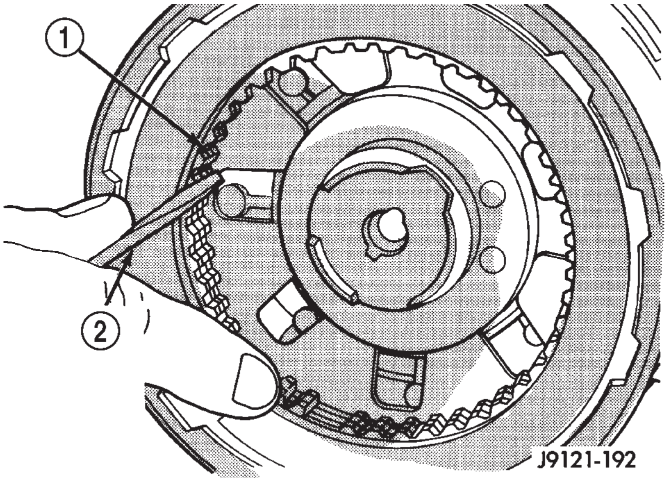


Fig. 188 Aligning Rear Clutch Disc Lugs

1 – REAR CLUTCH DISCS
2 – USE SMALL SCREWDRIVER TO ALIGN CLUTCH DISC TEETH

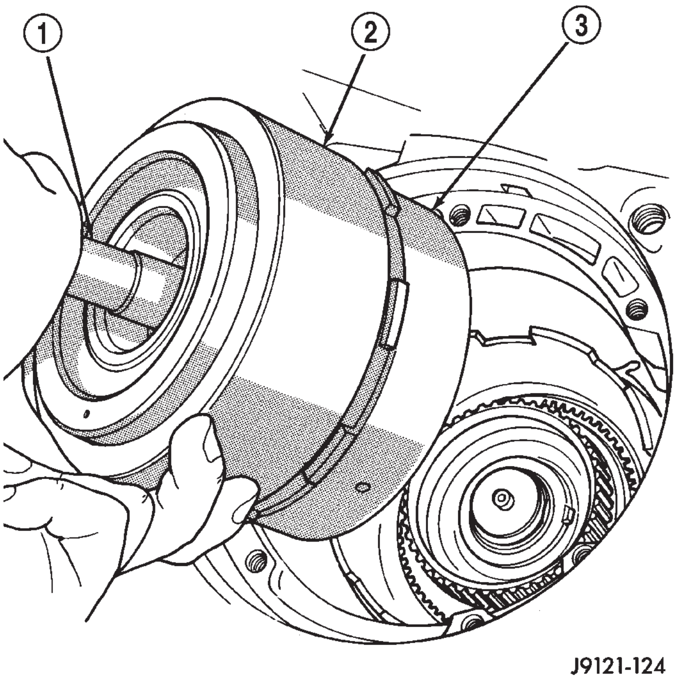


Fig. 189 Installing Front/Rear Clutch Assemblies

1 – INPUT SHAFT
2 – FRONT CLUTCH
3 – REAR CLUTCH

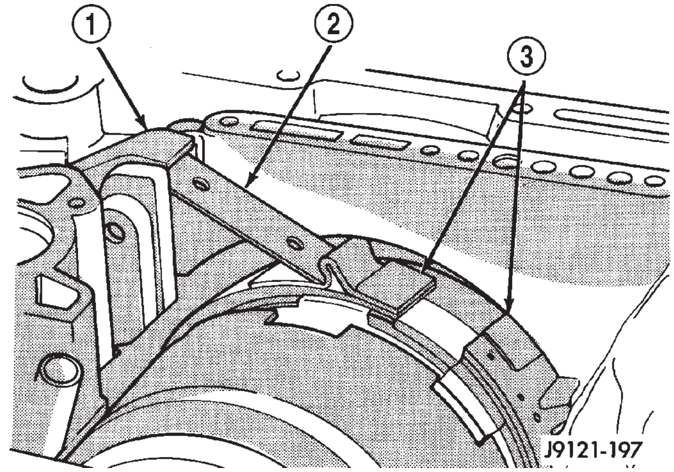


Fig. 190 Front Band Linkage Installation

1 – BAND LEVER
2 – BAND STRUT
3 – FRONT BAND

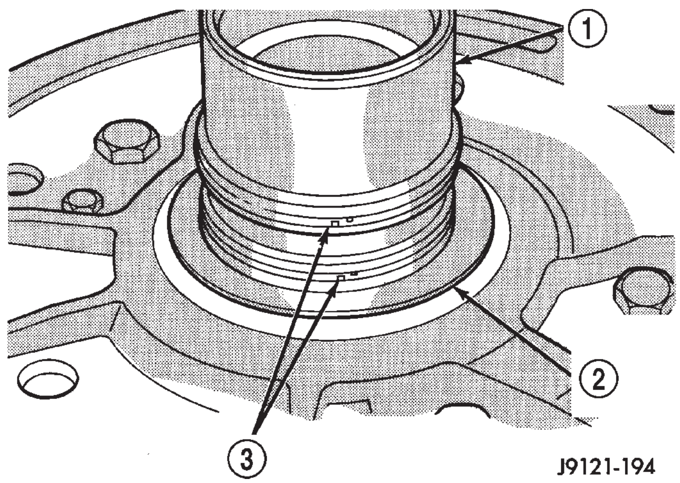


Fig. 191 Reaction Shaft Support Seal Rings And Front Clutch Thrust Washer

1 – REACTION SHAFT SUPPORT HUB
2 – FRONT CLUTCH THRUST WASHER
3 – SEAL RINGS

(Fig. 191). Use petroleum jelly to hold thrust washer in place if necessary.

(24) Lubricate oil pump body seal with petroleum jelly. Lubricate pump shaft seal lip with petroleum jelly.

(25) Thread two Pilot Stud Tools C-3288-B into bolt holes in oil pump bore flange (Fig. 192).

(26) Align and install oil pump gasket (Fig. 192).

(27) Install oil pump (Fig. 193). Align and position pump on pilot studs. Slide pump down studs and work it into front clutch hub and case by hand. Then install 2 or 3 pump bolts to hold pump in place.

(28) Remove pilot stud tools and install remaining oil pump bolts. Tighten bolts alternately in diagonal pattern to 20 N·m (15 ft. lbs.).

(29) Measure input shaft end play (Fig. 194).

NOTE: If end play is incorrect, transmission is incorrectly assembled, or the intermediate shaft thrust washer is incorrect. The intermediate shaft thrust washer is selective.

DISASSEMBLY AND ASSEMBLY (Continued)

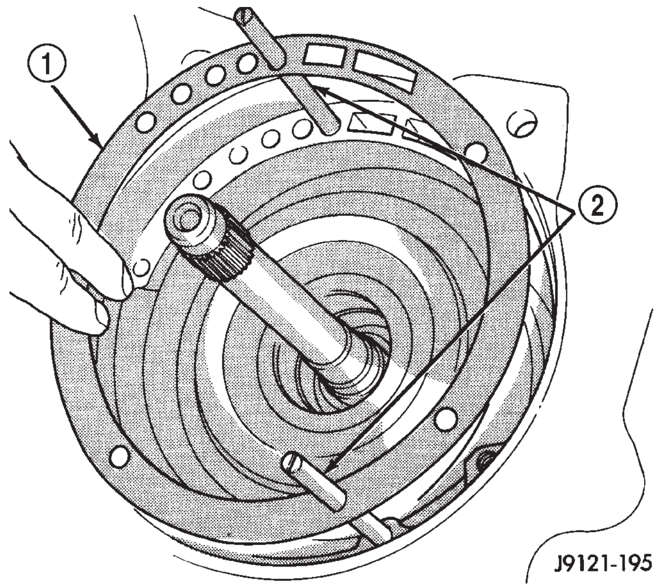


Fig. 192 Installing Pilot Studs And Oil Pump Gasket

1 – OIL PUMP GASKET
2 – PILOT STUD TOOLS C-3288–B

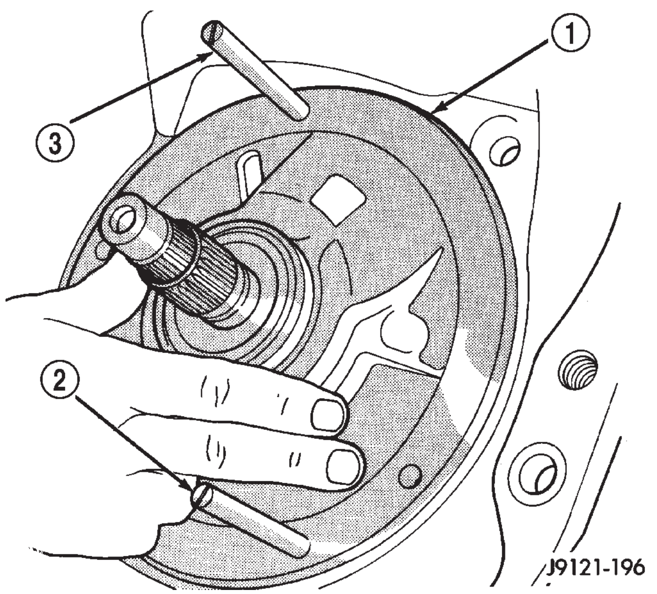


Fig. 193 Installing Oil Pump Assembly In Case

1 – OIL PUMP
2 – PILOT STUD TOOL
3 – PILOT STUD TOOL

(a) Attach Adapter 8266–6 to Handle 8266–8.

(b) Attach dial indicator C-3339 to Handle 8266–8.

(c) Install the assembled tool onto the input shaft of the transmission and tighten the retaining screw on Adapter 8266–6 to secure it to the input shaft.

(d) Position the dial indicator plunger against a flat spot on the oil pump and zero the dial indicator.

(e) Move input shaft in and out and record reading. End play should be 0.56 - 2.31 mm (0.022 - 0.091 in.). Adjust as necessary.

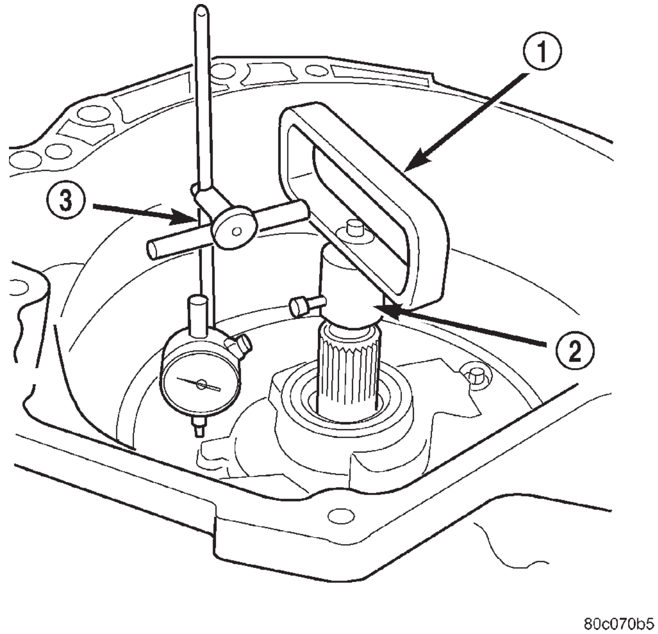


Fig. 194 Checking Input Shaft End Play

1 – TOOL 8266-8
2 – TOOL 8266-6
3 – TOOL C-3339

(30) Install accumulator piston and inner and outer springs (Fig. 195).

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

(32) Install valve body as follows:

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

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

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

CAUTION: It is possible for the park rod to displace into a cavity just above the pawl sprag during installation. Make sure the rod is actually engaged in the pawl and has not displaced into the cavity.

DISASSEMBLY AND ASSEMBLY (Continued)

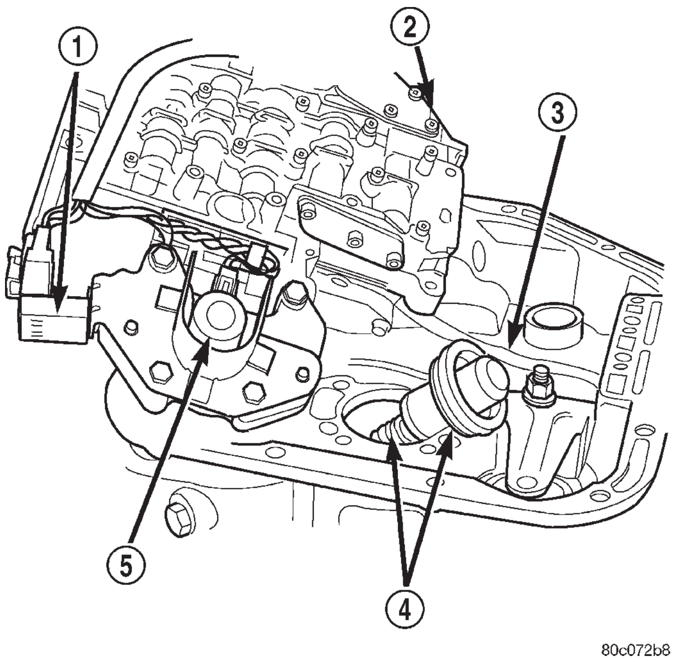


Fig. 195 Accumulator Piston And Springs

1 – GOVERNOR PRESSURE SENSOR
2 – VALVE BODY
3 – PARK ROD
4 – ACCUMULATOR PISTON
5 – GOVERNOR PRESSURE SOLENOID

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

(34) Adjust front and rear bands.

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

(36) Install magnet in oil pan. Magnet goes on small protrusion at corner of pan.

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

(38) Install new valve body manual shaft seal in case (Fig. 196). Lubricate seal lip and manual shaft with petroleum jelly. Start seal over shaft and into case. Seat seal with 15/16 inch, deep well socket.

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

OVERRUNNING CLUTCH CAM/OVERDRIVE PISTON RETAINER

DISASSEMBLY

NOTE: TO SERVICE THE OVERRUNNING CLUTCH CAM AND THE OVERDRIVE PISTON RETAINER, THE TRANSMISSION GEARTRAIN AND OVERDRIVE UNIT MUST BE REMOVED FROM THE TRANSMISSION.

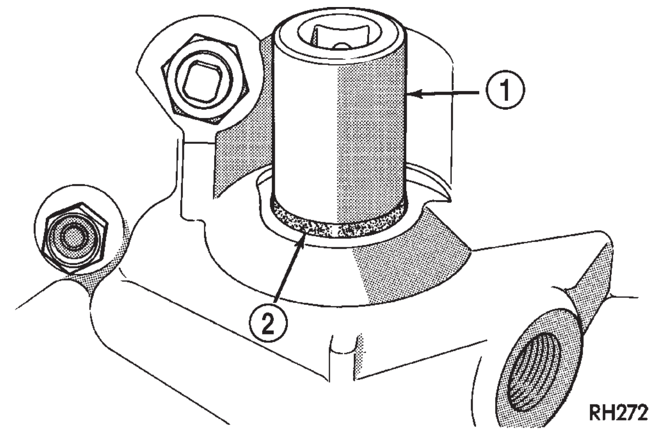


Fig. 196 Installing Manual Lever Shaft Seal

1 – 15/16" SOCKET
2 – SEAL

(1) Remove the overdrive piston (Fig. 197).

(2) Remove the overdrive piston retainer bolts.

(3) Remove overdrive piston retainer.

(4) Remove case gasket.

(5) Mark the position of the overrunning clutch cam in the case (Fig. 198).

(6) Remove the overrunning clutch cam bolts.

(7) Remove the overrunning clutch cam.

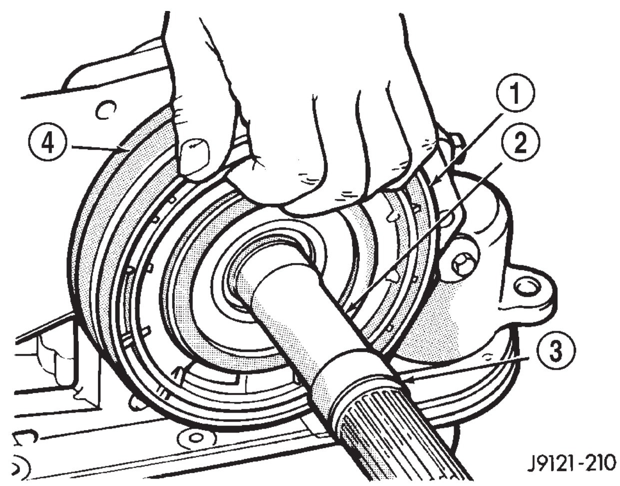


Fig. 197 Overdrive Piston Removal

1 – OVERDRIVE CLUTCH PISTON
2 – INTERMEDIATE SHAFT
3 – SELECTIVE SPACER
4 – PISTON RETAINER

ASSEMBLY

(1) Examine bolt holes in overrunning clutch cam. Note that one hole is **not threaded** (Fig. 199). This hole must align with blank area in clutch cam bolt circle (Fig. 200). Mark hole location on clutch cam and blank area in case with grease pencil, paint stripe, or scribe mark for assembly reference.

DISASSEMBLY AND ASSEMBLY (Continued)

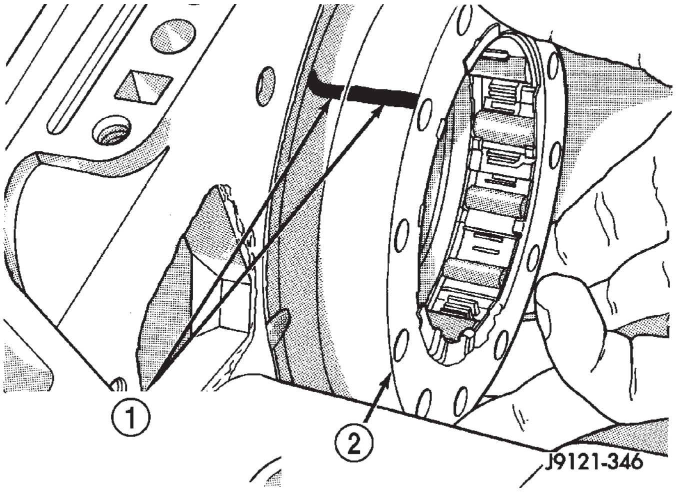


Fig. 198 Overrunning Clutch Cam Removal

1 – ALIGN MARKS IDENTIFYING NON-THREADED HOLE IN CAM AND CASE
2 – OVERRUNNING CLUTCH ASSEMBLY

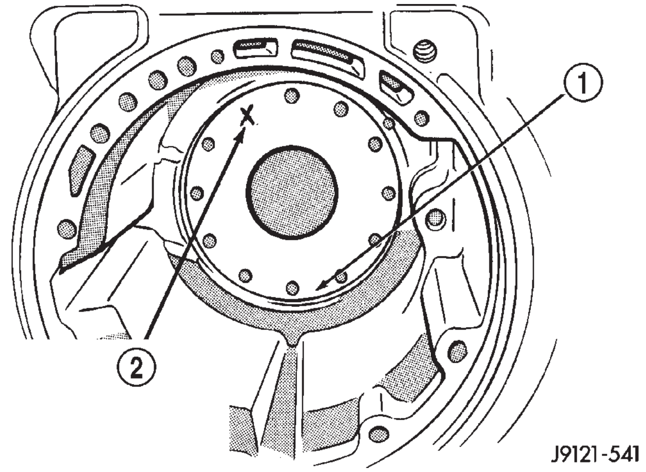


Fig. 200 Location Of Blank Area In Clutch Cam Bolt Circle

1 – OVERRUNNING CLUTCH CAM SEAT IN CASE
2 – NON-THREADED HOLE IN CLUTCH CAM ALIGNS HERE (BLANK AREA) OF SEAT

(2) Mark location of non-threaded hole in clutch cam and blank area in bolt circle with grease pencil.

(3) Align and install overrunning clutch and cam in case (Fig. 201). **Be sure cam is correctly installed. Bolt holes in cam are slightly counter-sunk on one side. Be sure this side of cam faces rearward (toward piston retainer).**

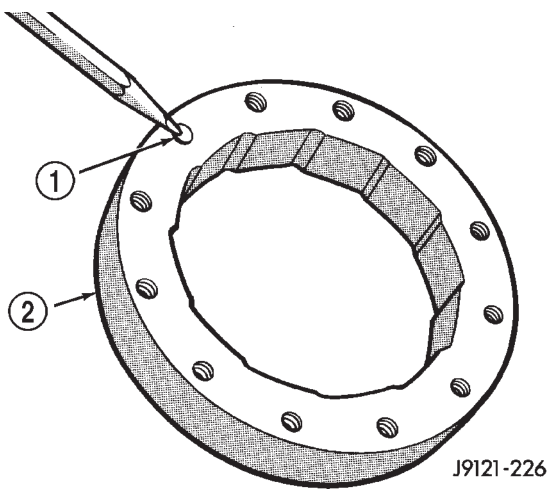


Fig. 199 Location Of Non-Threaded Hole In Clutch Cam

1 – NON-THREADED HOLE
2 – OVERRUNNING CLUTCH CAM

(4) Verify that non-threaded hole in clutch cam is properly aligned. Check alignment by threading a bolt into each bolt hole. Adjust clutch cam position if necessary.

(5) Install and tighten overrunning clutch cam bolts to 17 N·m (13 ft. lbs.) torque. Note that clutch cam bolts are shorter than piston retainer bolts.

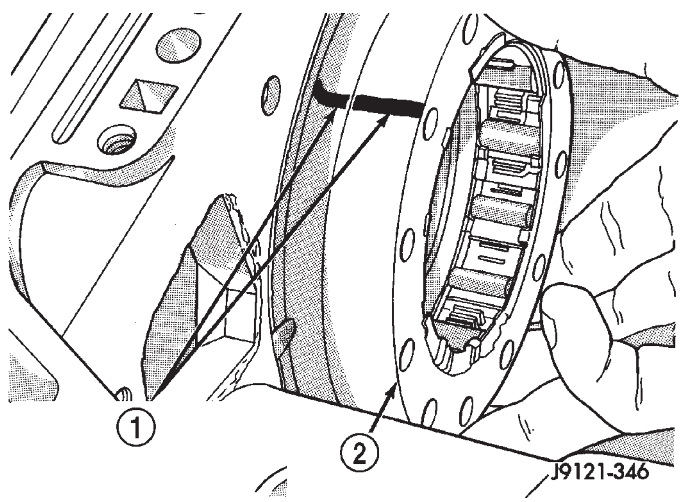


Fig. 201 Overrunning Clutch Installation

1 – ALIGN MARKS IDENTIFYING NON-THREADED HOLE IN CAM AND CASE
2 – OVERRUNNING CLUTCH ASSEMBLY

(6) Install new gasket at rear of transmission case. Use petroleum jelly to hold gasket in place. Be sure to align governor feed holes in gasket with feed passages in case (Fig. 202). Also install gasket before overdrive piston retainer. Center hole in gasket is smaller than retainer and cannot be installed over retainer.

(7) Position overdrive piston retainer on transmission case and align bolt holes in retainer, gasket and case (Fig. 203). Then install and tighten retainer bolts to 17 N·m (13 ft. lbs.) torque.

(8) Install new seals on over drive piston.

(9) Stand transmission case upright on bellhousing.

DISASSEMBLY AND ASSEMBLY (Continued)

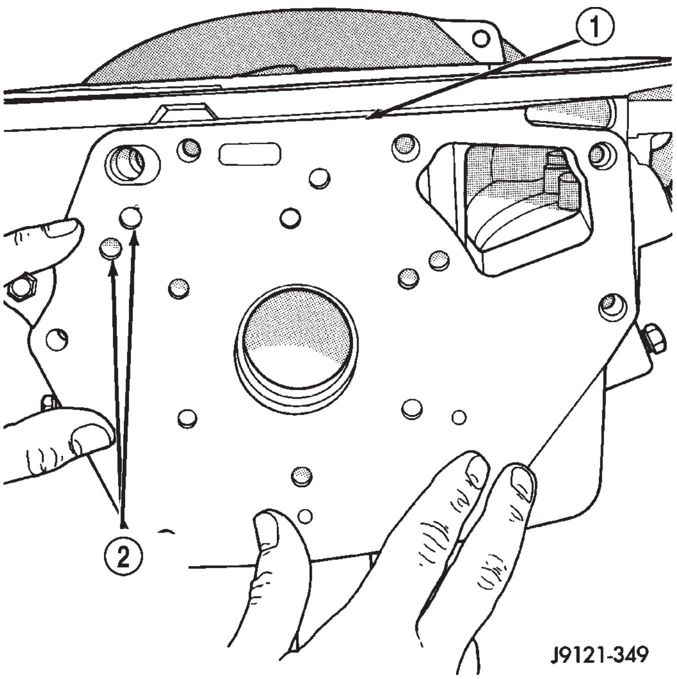


Fig. 202 Installing/Aligning Case Gasket

1 – CASE GASKET
2 – BE SURE GOVERNOR TUBE FEED HOLES IN CASE AND GASKET ARE ALIGNED

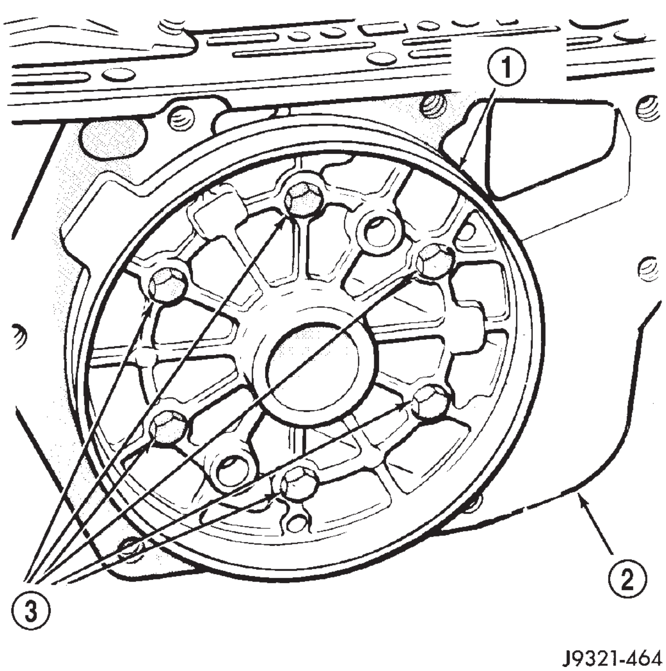


Fig. 203 Aligning Overdrive Piston Retainer

1 – PISTON RETAINER
2 – GASKET
3 – RETAINER BOLTS

(10) Position Guide Ring 8114-1 on outer edge of overdrive piston retainer.

(11) Position Seal Guide 8114-2 on inner edge of overdrive piston retainer.

(12) Install overdrive piston in overdrive piston retainer by: aligning locating lugs on overdrive piston to the two mating holes in retainer.

(a) Aligning locating lugs on overdrive piston to the two mating holes in retainer.

(b) Lubricate overdrive piston seals with Mopar® Door Ease, or equivalent.

(c) Install piston over Seal Guide 8114–2 and inside Guide Ring 8114–1.

(d) Push overdrive piston into position in retainer.

(e) Verify that the locating lugs entered the lug bores in the retainer.

NOTE: INSTALL THE REMAINING TRANSMISSION COMPONENTS AND OVERDRIVE UNIT.

FRONT SERVO PISTON

DISASSEMBLY

(1) Remove seal ring from rod guide (Fig. 204).

(2) Remove small snap ring from servo piston rod. Then remove piston rod, spring and washer from piston.

(3) Remove and discard servo component O-ring and seal rings.

ASSEMBLY

Clean and inspect front servo components.

(1) Lubricate new O-ring and seal rings with petroleum jelly and install them on piston, guide and rod.

(2) Install rod in piston. Install spring and washer on rod. Compress spring and install snap ring (Fig. 204).

(3) Set servo components aside for installation during transmission reassembly.

REAR SERVO PISTON

DISASSEMBLY

(1) Remove small snap ring and remove plug and spring from servo piston (Fig. 205).

(2) Remove and discard servo piston seal ring.

ASSEMBLY

(1) Lubricate piston and guide seals with petroleum jelly. Lubricate other servo parts with Mopar® ATF Plus 3, Type 7176, transmission fluid.

(2) Install new seal ring on servo piston.

(3) Assemble piston, plug, spring and new snap ring.

(4) Lubricate piston seal lip with petroleum jelly.

DISASSEMBLY AND ASSEMBLY (Continued)

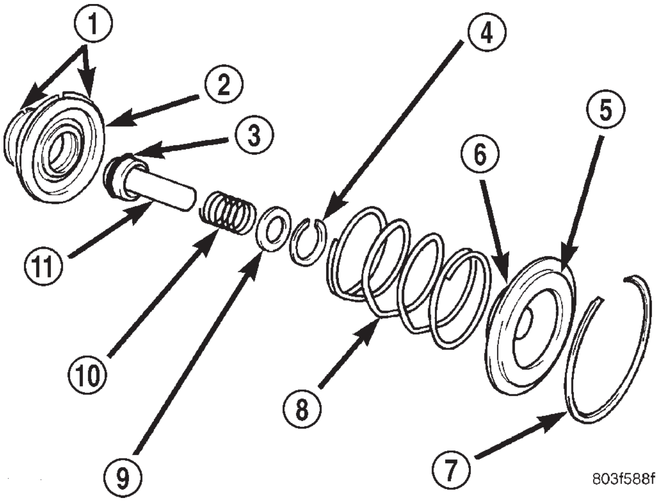


Fig. 204 Front Servo

1 – PISTON RINGS
2 – SERVO PISTON
3 – O-RING
4 – SNAP RING
5 – PISTON ROD GUIDE
6 – SEAL RING
7 – SNAP RING
8 – SERVO SPRING
9 – WASHER
10 – SPRING
11 – PISTON ROD

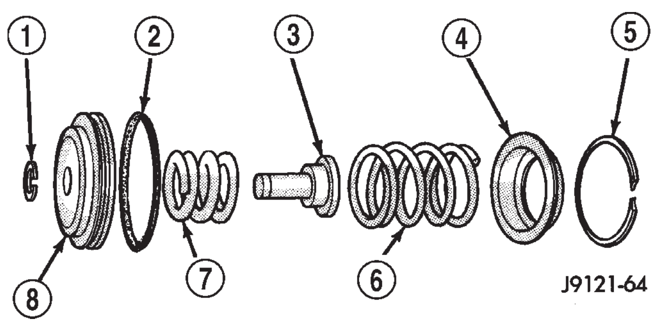


Fig. 205 Rear Servo Components

1 – SNAP RING
2 – PISTON SEAL
3 – PISTON PLUG
4 – SPRING RETAINER
5 – SNAP RING
6 – PISTON SPRING
7 – CUSHION SPRING
8 – PISTON

OIL PUMP AND REACTION SHAFT SUPPORT

DISASSEMBLY

(1) Remove seal ring from housing and reaction shaft support (Fig. 206).

(2) Mark pump housing and support assembly for alignment reference.

(3) Remove bolts attaching pump body to support (Fig. 207).

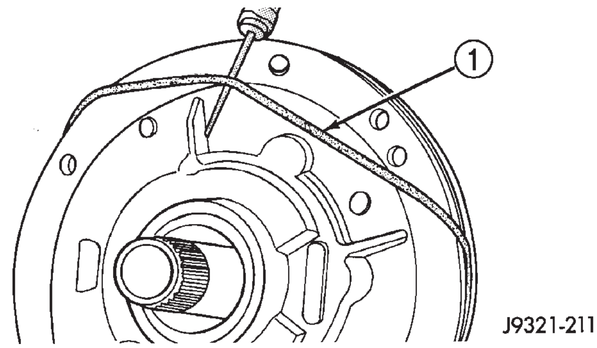


Fig. 206 Removing Pump Seal Ring

1 – PUMP HOUSING SEAL RING

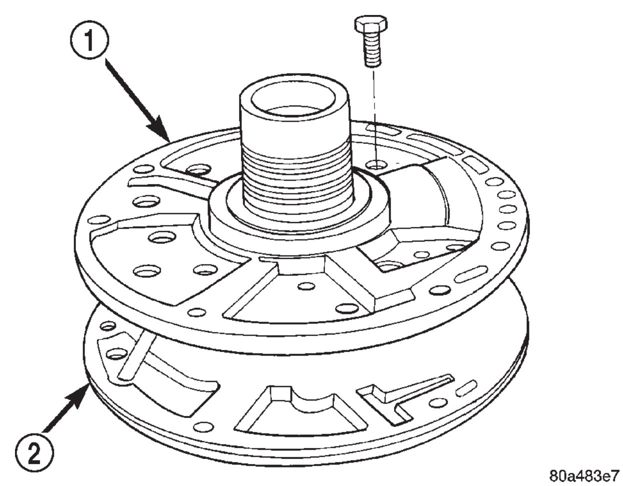


Fig. 207 Pump Support Bolts

1 – REACTION SHAFT SUPPORT
2 – PUMP

DISASSEMBLY AND ASSEMBLY (Continued)

(4) Separate support from pump housing (Fig. 208).

(5) Remove inner and outer gears from reaction shaft support (Fig. 209).

(6) If pump seal was not removed during transmission disassembly, remove seal with punch and hammer.

(7) Remove front clutch thrust washer from support hub (Fig. 210).

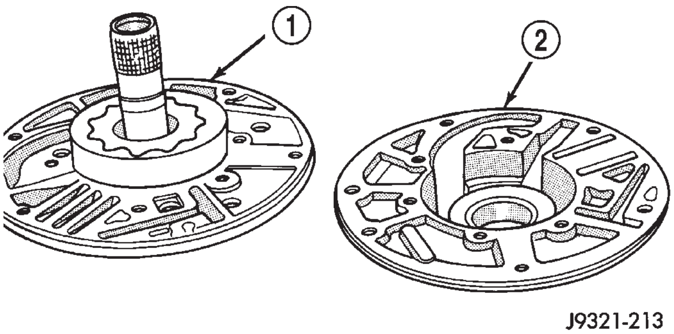


Fig. 208 Separating Pump Housing From Reaction Shaft Support

1 – REACTION SHAFT SUPPORT
2 – PUMP HOUSING

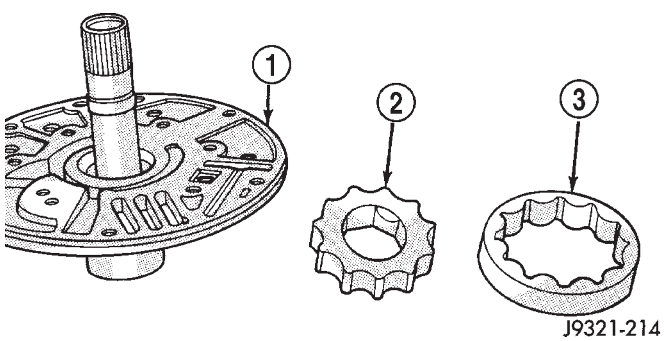


Fig. 209 Pump Gear Removal

1 – REACTION SHAFT SUPPORT
2 – INNER GEAR
3 – OUTER GEAR

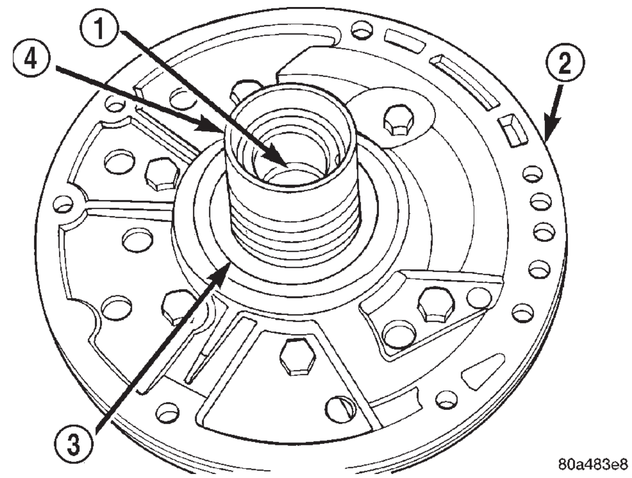


Fig. 210 Support Hub Thrust Washer

1 – BUSHING
2 – REACTION SHAFT SUPPORT
3 – THRUST WASHER
4 – HUB

OIL PUMP BUSHING REPLACEMENT

(1) Remove pump bushing with Tool Handle C-4171 and Bushing Remover SP-3551 from Tool Set C-3887-J (Fig. 211).

(2) Install new pump bushing with Tool Handle C-4171 and Bushing Installer SP-5117 (Fig. 211). Bushing should be flush with pump housing bore.

(3) Stake new pump bushing in two places with blunt punch (Fig. 212). Remove burrs from stake points with knife blade afterward.

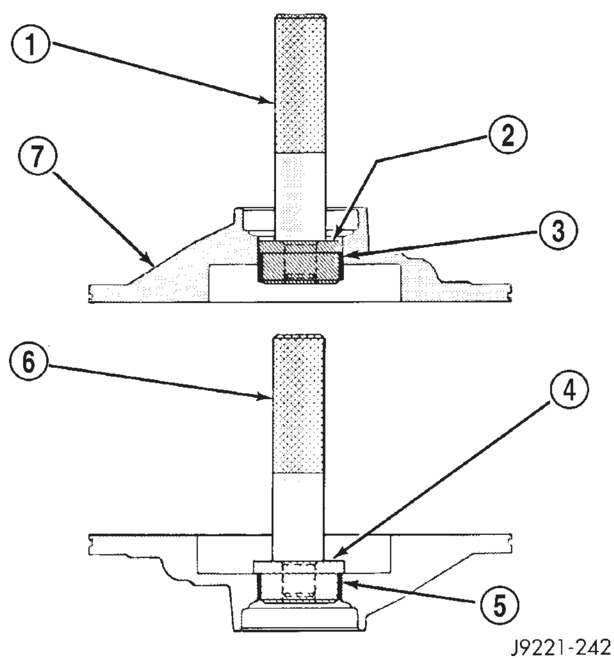


Fig. 211 Removing Oil Pump Bushing

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL SP-3551
3 – BUSHING
4 – SPECIAL TOOL SP-5117
5 – BUSHING
6 – SPECIAL TOOL C-4171
7 – PUMP HOUSING

REACTION SHAFT SUPPORT BUSHING REMOVAL

(1) Assemble Bushing Remover Tools SP-1191, 3633 and 5324 (Fig. 213). **Do not clamp any part of reaction shaft or support in vise.**

DISASSEMBLY AND ASSEMBLY (Continued)

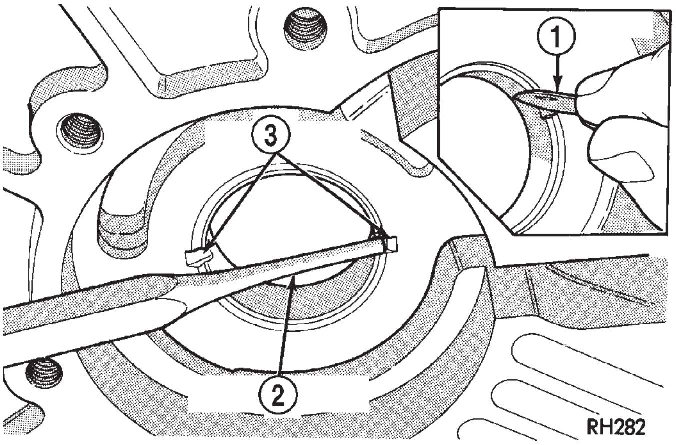


Fig. 212 Staking Oil Pump Bushing

1 – NARROW BLADE
2 – BLUNT PUNCH
3 – TWO STAKES

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

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

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

(5) Assemble Bushing Installer Tools C-4171 and SP-5325 (Fig. 213).

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

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

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

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

ASSEMBLY

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

(2) Lubricate pump gears with transmission fluid.

(3) Support pump housing on wood blocks (Fig. 214).

(4) Install outer gear in pump housing (Fig. 214). Gear can be installed either way (it is not a one-way fit).

(5) Install pump inner gear (Fig. 215).

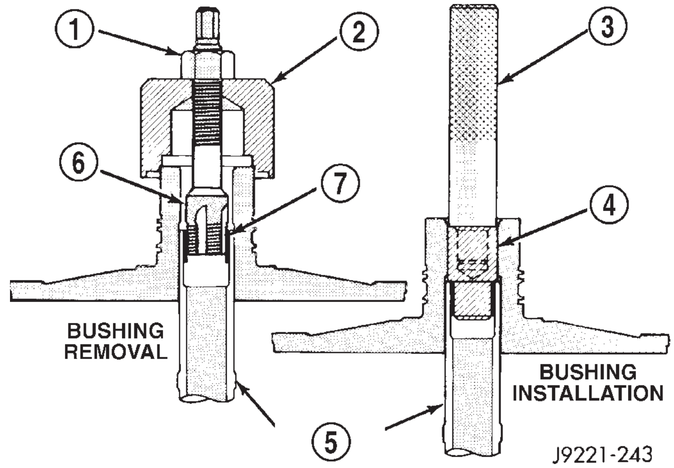


Fig. 213 Replacing Reaction Shaft Support Bushing

1 – SPECIAL TOOL SP-1191
2 – SPECIAL TOOL SP-3633
3 – SPECIAL TOOL C-4171
4 – SPECIAL TOOL SP-5325
5 – REACTION SHAFT
6 – SPECIAL TOOL SP-5324
7 – BUSHING

CAUTION: The pump inner gear is a one way fit. The bore on one side of the gear inside diameter (I.D.) is chamfered. Be sure the chamfered side faces forward (to front of pump).

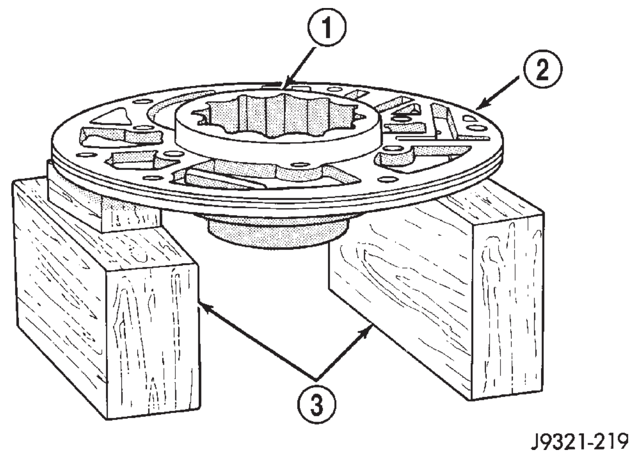


Fig. 214 Supporting Pump And Installing Outer Gear

1 – OUTER GEAR
2 – PUMP HOUSING
3 – WOOD BLOCKS

DISASSEMBLY AND ASSEMBLY (Continued)

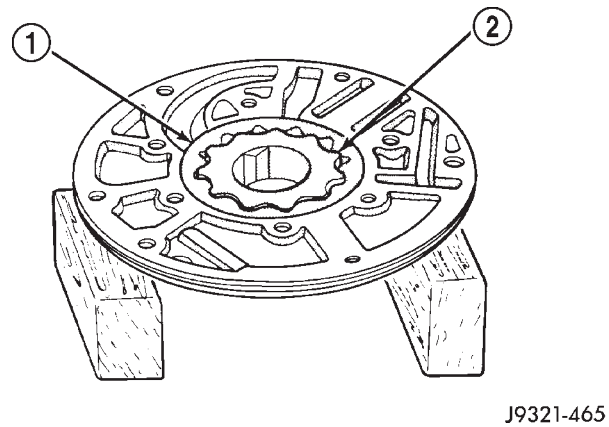


Fig. 215 Pump Inner Gear Installation

1 – OUTER GEAR
2 – INNER GEAR

(6) Install new thrust washer on hub of reaction shaft support. Lubricate washer with transmission fluid or petroleum jelly.

(7) If reaction shaft seal rings are being replaced, install new seal rings on support hub (Fig. 216). Lubricate seal rings with transmission fluid or petroleum jelly after installation. Squeeze each ring until ring ends are securely hooked together.

CAUTION: The reaction shaft support seal rings will break if overspread, or twisted. If new rings are being installed, spread them only enough for installation. Also be very sure the ring ends are securely hooked together after installation. Otherwise, the rings will either prevent pump installation, or break during installation.

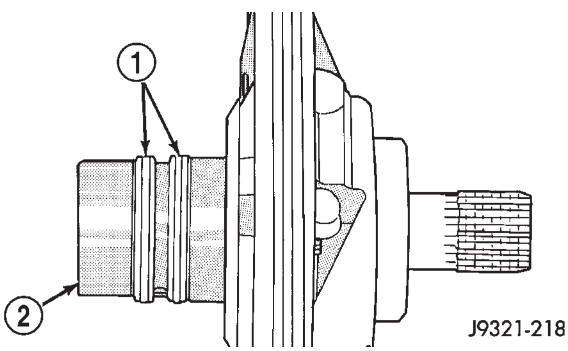


Fig. 216 Hub Seal Ring Position

1 – SEAL RINGS
2 – SUPPORT HUB

(8) Install reaction shaft support on pump housing (Fig. 217).

(9) Align reaction support on pump housing. Use alignment marks made at disassembly. Or, rotate support until bolt holes in support and pump housing are all aligned (holes are offset for one-way fit).

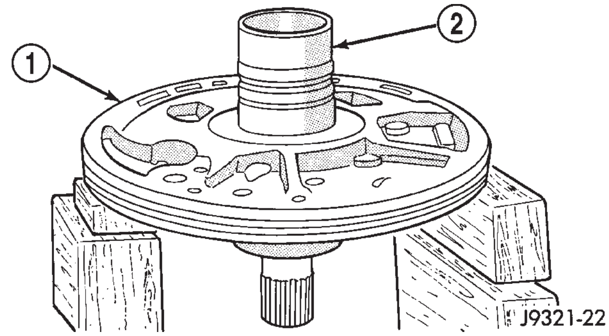


Fig. 217 Assembling Reaction Shaft Support And Pump Housing

1 – PUMP HOUSING
2 – REACTION SHAFT SUPPORT

(10) Install all bolts that attach support to pump housing. Then tighten bolts finger tight.

(11) Tighten support-to-pump bolts to required torque as follows:

(a) Reverse pump assembly and install it in transmission case. Position pump so bolts are facing out and are accessible.

(b) Secure pump assembly in case with 2 or 3 bolts, or with pilot studs.

(c) Tighten support-to-pump bolts to 20 N·m (15 ft. lbs.).

(d) Remove pump assembly from transmission case.

(12) Install new oil seal in pump with Special Tool C-4193 and Tool Handle C-4171 (Fig. 218). Be sure seal lip faces inward.

(13) Install new seal ring around pump housing. Be sure seal is properly seated in groove.

(14) Lubricate lip of pump oil seal and O-ring seal with transmission fluid.

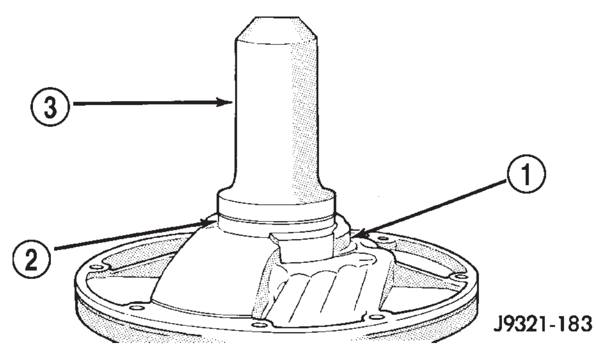


Fig. 218 Pump Oil Seal Installation

1 – PUMP BODY
2 – PUMP SEAL
3 – SPECIAL TOOL C-4193

DISASSEMBLY AND ASSEMBLY (Continued)

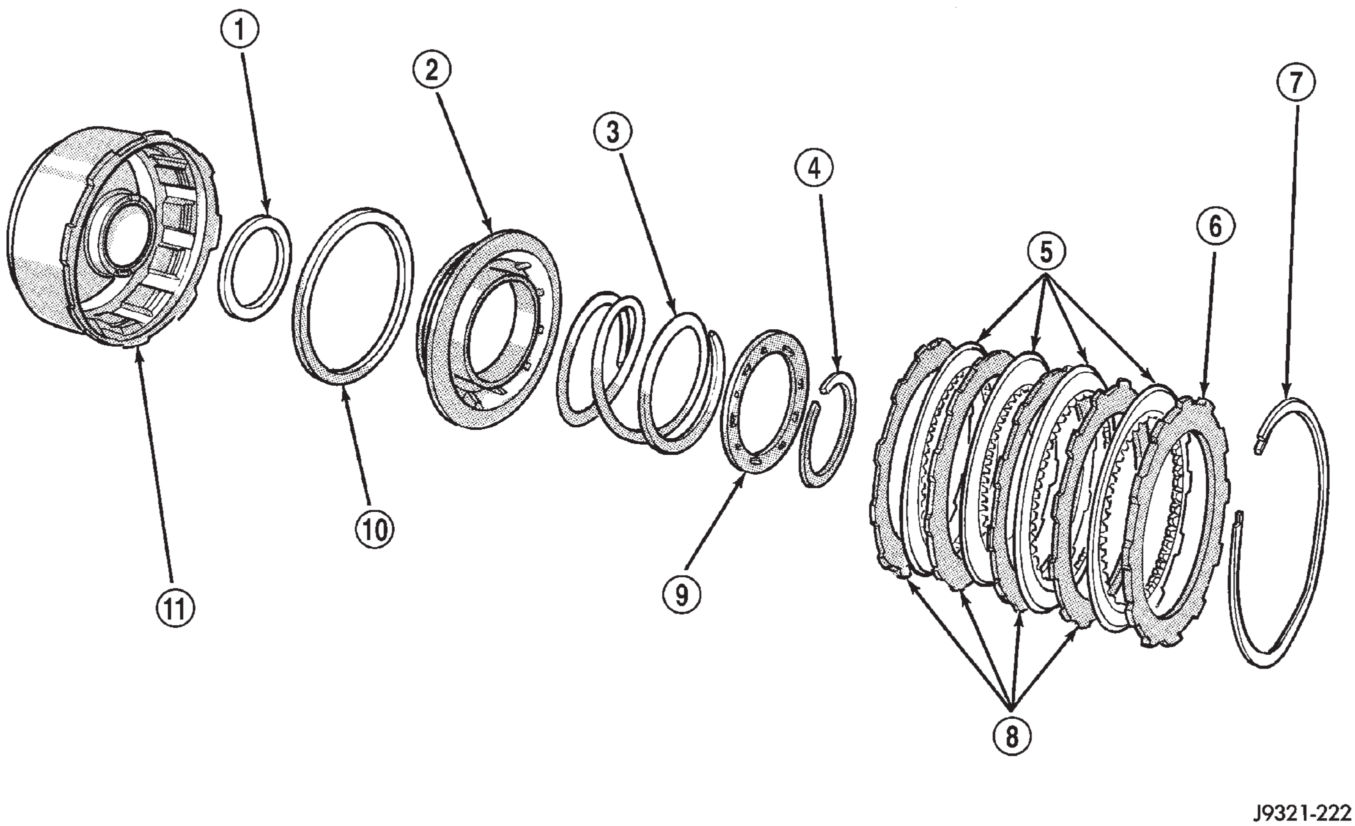


Fig. 219 42RE Front Clutch Components

1 – RETAINER HUB SEAL
2 – CLUTCH PISTON
3 – PISTON SPRING
4 – SPRING RETAINER SNAP RING
5 – CLUTCH DISCS
6 – PRESSURE PLATE
7 – SNAP RING (WAVED)
8 – CLUTCH PLATES
9 – SPRING RETAINER
10 – PISTON SEAL
11 – FRONT CLUTCH RETAINER

FRONT CLUTCH

NOTE: The 42RE transmission uses four plates and discs for the front clutch.

DISASSEMBLY

(1) Remove waved snap ring and remove pressure plate, clutch plates and clutch discs (Fig. 219).

(2) Compress clutch piston spring with Compressor Tool C-3575-A (Fig. 220). Be sure legs of tool are seated squarely on spring retainer before compressing spring.

(3) Remove retainer snap ring and remove compressor tool.

(4) Remove spring retainer and clutch spring. Note position of retainer on spring for assembly reference.

(5) Remove clutch piston from clutch retainer. Remove piston by rotating it up and out of retainer.

(6) Remove seals from clutch piston and clutch retainer hub. Discard both seals as they are not reusable.

DISASSEMBLY AND ASSEMBLY (Continued)

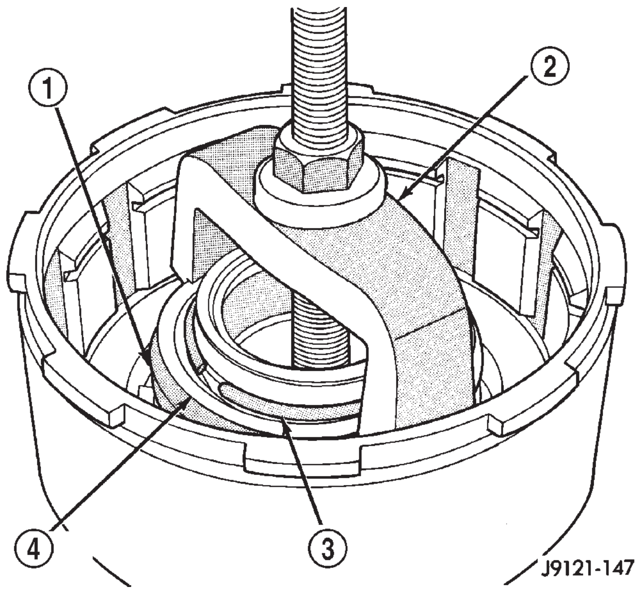


Fig. 220 Compressing Front Clutch Piston Spring

1 – FRONT CLUTCH SPRING
2 – COMPRESSOR TOOL C-3575–A
3 – RETAINER SNAP RING
4 – SPRING RETAINER

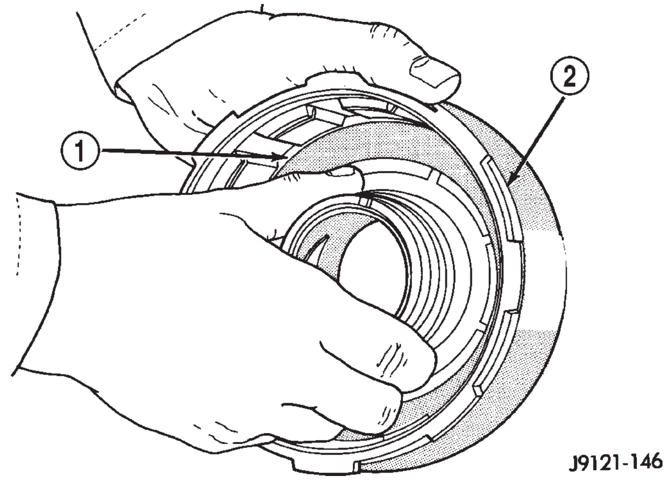


Fig. 221 Front Clutch Piston Installation

1 – CLUTCH PISTON
2 – FRONT CLUTCH RETAINER

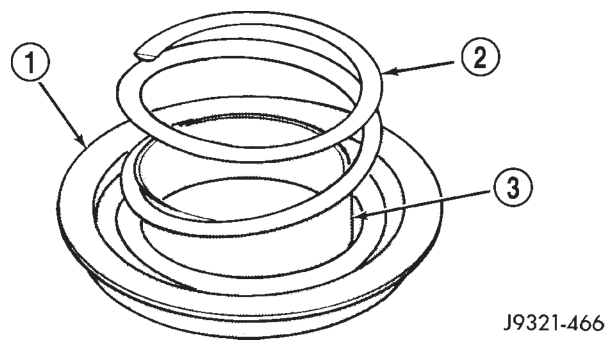


Fig. 222 Clutch Piston Spring Installation

1 – RETAINER
2 – CLUTCH SPRING
3 – PISTON

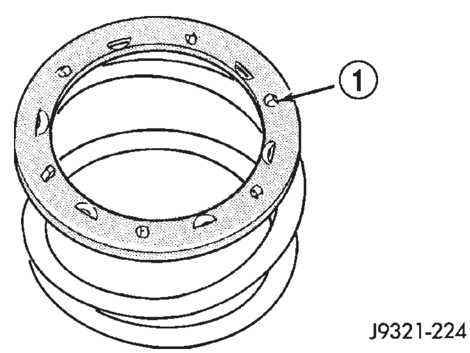


Fig. 223 Correct Spring Retainer Installed Position

1 – SMALL TABS ON RETAINER FACE UPWARD

ASSEMBLY

(1) Soak clutch discs in transmission fluid while assembling other clutch parts.

(2) Install new seals on piston and in hub of retainer. Be sure lip of each seal faces interior of clutch retainer.

(3) Lubricate lips of piston and retainer seals with liberal quantity of Mopar® Door Ease. Then lubricate retainer hub, bore and piston with light coat of transmission fluid.

(4) Install clutch piston in retainer (Fig. 221). Use twisting motion to seat piston in bottom of retainer.

CAUTION: Never push the clutch piston straight in. This will fold the seals over causing leakage and clutch slip.

(5) Position spring in clutch piston (Fig. 222).

(6) Position spring retainer on top of piston spring (Fig. 223). **Make sure retainer is properly installed. Small raised tabs should be facing upward. Semicircular lugs on underside of retainer are for positioning retainer in spring.**

(7) Compress piston spring and retainer with Compressor Tool C-3575-A (Fig. 220). Then install new snap ring to secure spring retainer and spring.

(8) Install clutch plates and discs (Fig. 219). Install steel plate then disc until all plates and discs are installed. The front clutch uses 4 clutch discs and plates in a 42RE transmission.

(9) Install pressure plate and waved snap ring (Fig. 219).

DISASSEMBLY AND ASSEMBLY (Continued)

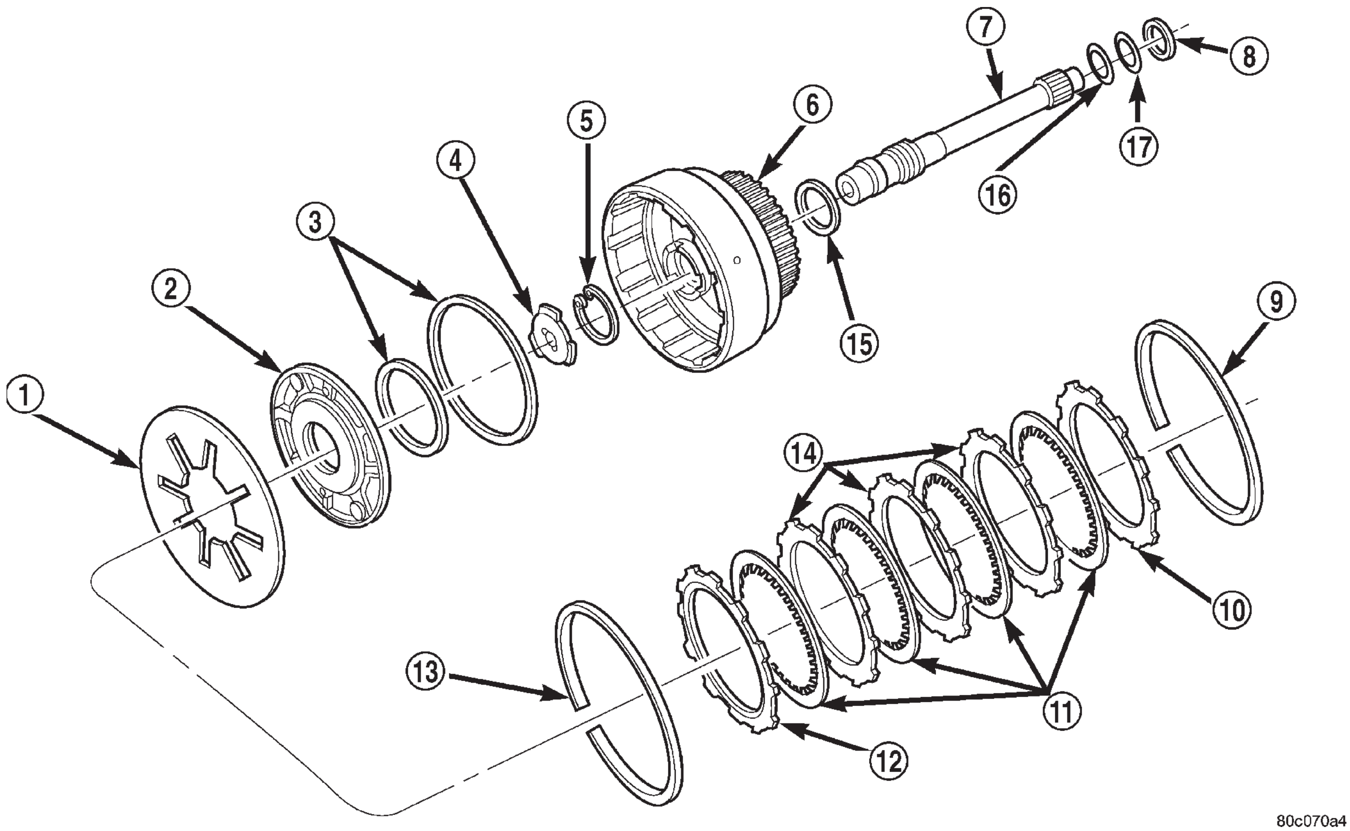


Fig. 224 Rear Clutch Components

1 – PISTON SPRING
2 – REAR CLUTCH PISTON
3 – CLUTCH PISTON SEALS
4 – OUTPUT SHAFT THRUST WASHER (METAL)
5 – INPUT SHAFT SNAP RING
6 – REAR CLUTCH RETAINER
7 – INPUT SHAFT
8 – REAR CLUTCH THRUST WASHER (FIBER)
9 – CLUTCH PACK SNAP RING (SELECTIVE)
10 – TOP PRESSURE PLATE
11 – CLUTCH DISCS (4)
12 – BOTTOM PRESSURE PLATE
13 – WAVE SPRING
14 – CLUTCH PLATES (3)
15 – RETAINER SEAL RING
16 – SHAFT REAR SEAL RING (PLASTIC)
17 – SHAFT FRONT SEAL RING (TEFLON)

Clearance should be 1.70 to 3.40 mm (0.067 to 0.134 in.). If clearance is incorrect, clutch discs, plates, pressure plates and snap ring may have to be changed.

REAR CLUTCH

DISASSEMBLY

(1) Remove fiber thrust washer from forward side of clutch retainer.

(2) Remove input shaft front/rear seal rings.

(3) Remove selective clutch pack snap ring (Fig. 224).

(4) Remove top pressure plate, clutch discs, steel plates, bottom pressure plate and wave snap ring and wave spring (Fig. 224).

(5) Remove clutch piston with rotating motion.

(6) Remove and discard piston seals.

(7) Remove input shaft snap-ring (Fig. 225). It may be necessary to press the input shaft in slightly to relieve tension on the snap-ring

(8) Press input shaft out of retainer with shop press and suitable size press tool. Use a suitably sized press tool to support the retainer as close to the input shaft as possible.

DISASSEMBLY AND ASSEMBLY (Continued)

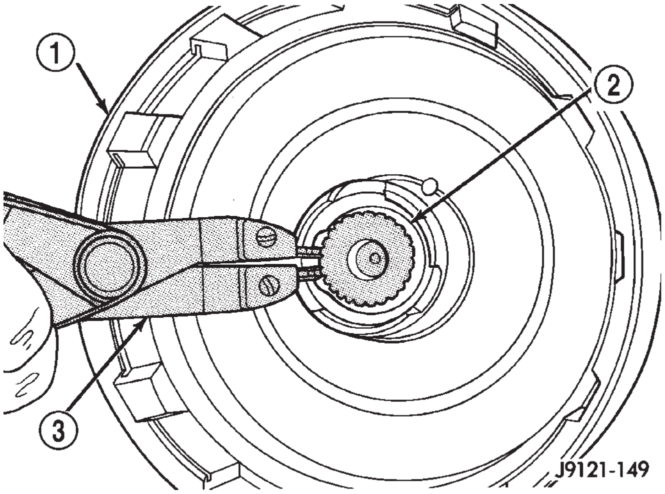


Fig. 225 Removing/Installing Input Shaft Snap-Ring

1 – REAR CLUTCH RETAINER
2 – INPUT SHAFT SNAP RING
3 – SNAP RING PLIERS

ASSEMBLY

(1) Soak clutch discs in transmission fluid while assembling other clutch parts.

(2) Install new seal rings on clutch retainer hub and input shaft if necessary (Fig. 226).

(a) Be sure clutch hub seal ring is fully seated in groove and is not twisted.

(3) Lubricate splined end of input shaft and clutch retainer with transmission fluid. Then press input shaft into retainer. Use a suitably sized press tool to support retainer as close to input shaft as possible.

(4) Install input shaft snap-ring (Fig. 225).

(5) Invert retainer and press input shaft in opposite direction until snap-ring is seated.

(6) Install new seals on clutch piston. Be sure lip of each seal faces interior of clutch retainer.

(7) Lubricate lip of piston seals with generous quantity of Mopar® Door Ease. Then lubricate retainer hub and bore with light coat of transmission fluid.

(8) Install clutch piston in retainer. Use twisting motion to seat piston in bottom of retainer. A thin strip of plastic (about 0.020” thick), can be used to guide seals into place if necessary.

CAUTION: Never push the clutch piston straight in. This will fold the seals over causing leakage and clutch slip. In addition, never use any type of metal tool to help ease the piston seals into place. Metal tools will cut, shave, or score the seals.

(9) Install piston spring in retainer and on top of piston (Fig. 229). Concave side of spring faces downward (toward piston).

(10) Install wave spring in retainer (Fig. 229). Be sure spring is completely seated in retainer groove.

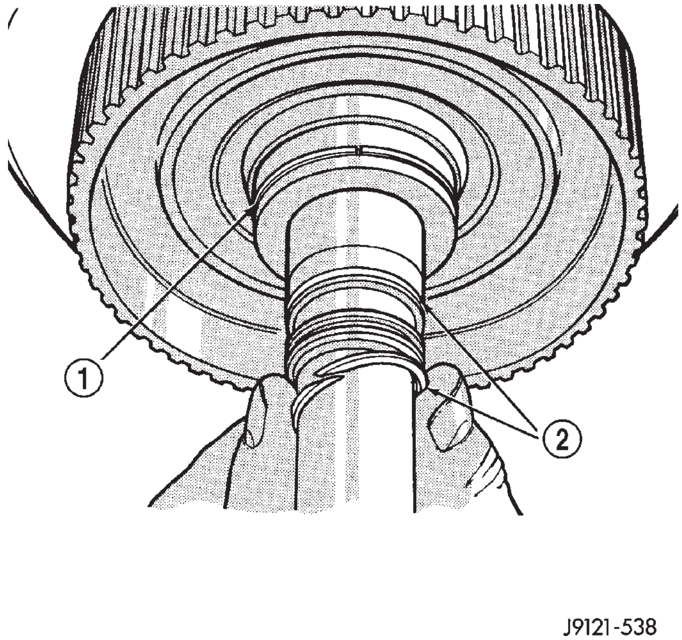


Fig. 226 Rear Clutch Retainer And Input Shaft Seal Ring Installation

1 – REAR CLUTCH RETAINER HUB SEAL RING
2 – INPUT SHAFT SEAL RINGS

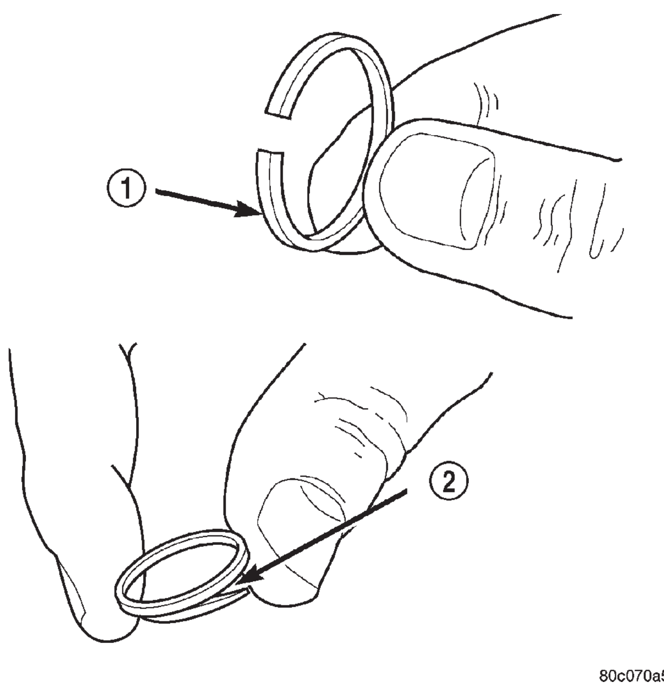


Fig. 227 Input Shaft Seal Ring Identification

1 – PLASTIC REAR SEAL RING
2 – TEFLON FRONT SEAL RING (SQUEEZE RING TOGETHER SLIGHTLY BEFORE INSTALLATION FOR BETTER FIT)

DISASSEMBLY AND ASSEMBLY (Continued)

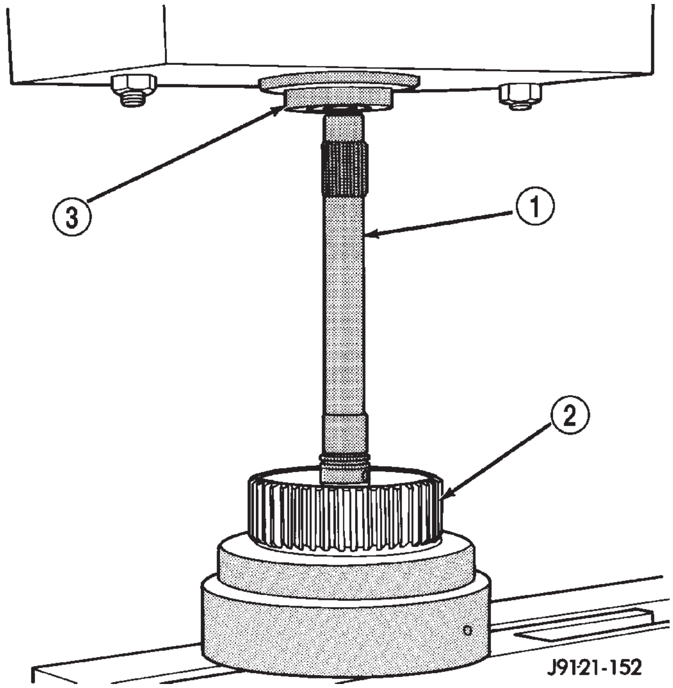


Fig. 228 Pressing Input Shaft Into Rear Clutch Retainer

1 – INPUT SHAFT
2 – REAR CLUTCH RETAINER
3 – PRESS RAM

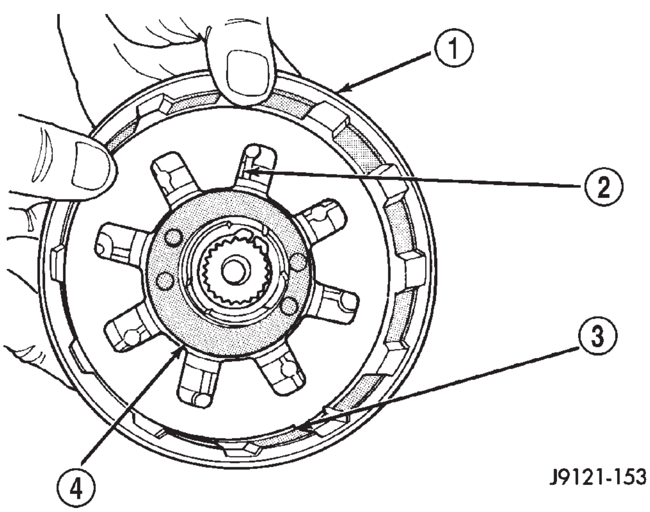


Fig. 229 Piston Spring/Wave Spring Position

1 – REAR CLUTCH RETAINER
2 – PISTON SPRING
3 – WAVE SPRING
4 – CLUTCH PISTON

(11) Install bottom pressure plate (Fig. 224). Ridged side of plate faces downward (toward piston) and flat side toward clutch pack.

(12) Install first clutch disc in retainer on top of bottom pressure plate. Then install a clutch plate followed by a clutch disc until entire clutch pack is installed (4 discs and 3 plates are required) (Fig. 224).

(13) Install top pressure plate.

(14) Install selective snap ring. Be sure snap ring is fully seated in retainer groove.

(15) Using a suitable gauge bar and dial indicator, measure clutch pack clearance (Fig. 230).

(a) Position gauge bar across the clutch drum with the dial indicator pointer on the pressure plate (Fig. 230).

(b) Using two small screw drivers, lift the pressure plate and release it.

(c) Zero the dial indicator.

(d) Lift the pressure plate until it contacts the snap-ring and record the dial indicator reading.

Clearance should be 0.559 - 0.914 mm (0.022 - 0.036 in.). If clearance is incorrect, steel plates, discs, selective snap ring and pressure plates may have to be changed.

The selective snap ring thicknesses are:

- .107–.109 in.
- .098–.100 in.
- .095–.097 in.
- .083–.085 in.
- .076–.078 in.
- .071–.073 in.
- .060–.062 in.

(16) Coat rear clutch thrust washer with petroleum jelly and install washer over input shaft and into clutch retainer (Fig. 231). Use enough petroleum jelly to hold washer in place.

(17) Set rear clutch aside for installation during final assembly.

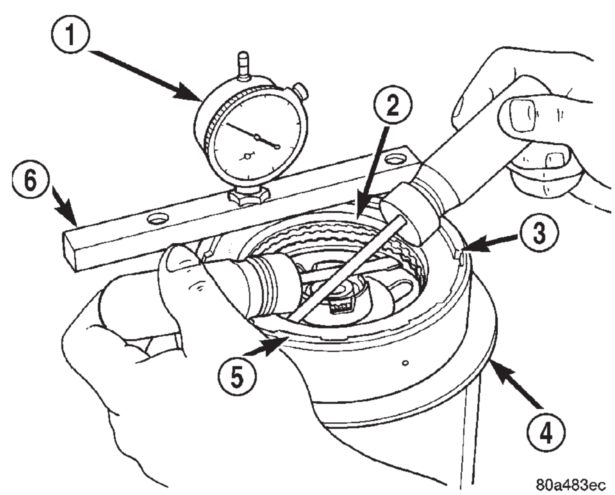


Fig. 230 Checking Rear Clutch Pack Clearance

1 – DIAL INDICATOR
2 – PRESSURE PLATE
3 – SNAP RING
4 – STAND
5 – REAR CLUTCH
6 – GAUGE BAR

DISASSEMBLY AND ASSEMBLY (Continued)

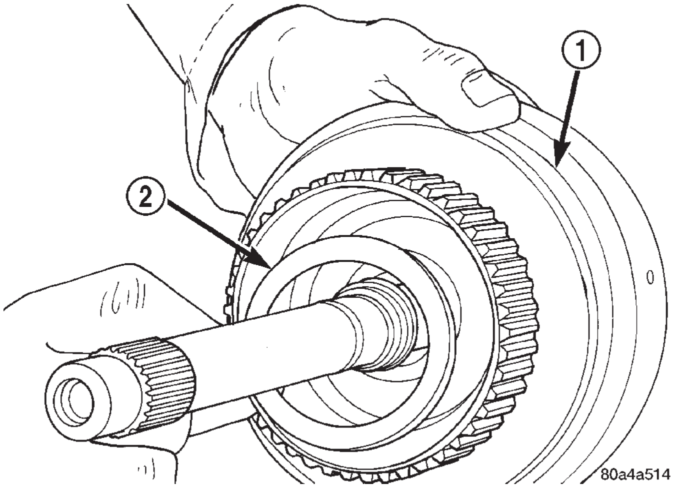


Fig. 231 Installing Rear Clutch Thrust Washer

1 – REAR CLUTCH RETAINER
2 – REAR CLUTCH THRUST WASHER

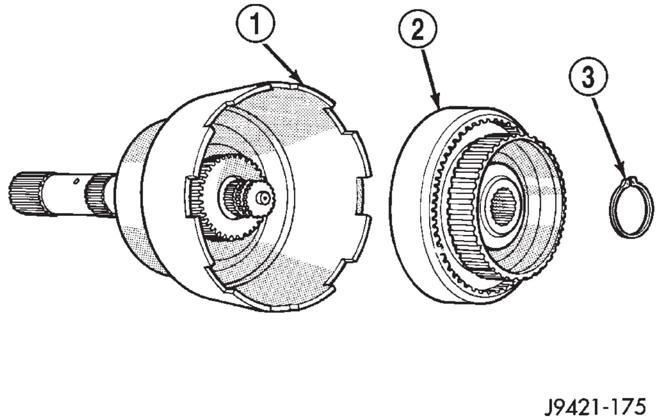


Fig. 232 Front Annulus And Planetary Assembly Removal

1 – DRIVING SHELL
2 – FRONT ANNULUS AND PLANETARY ASSEMBLY
3 – PLANETARY SNAP RING

PLANETARY GEARTRAIN/OUTPUT SHAFT

DISASSEMBLY

(1) Remove planetary snap ring (Fig. 232).

(2) Remove front annulus and planetary assembly from driving shell (Fig. 232).

(3) Remove snap ring that retains front planetary gear in annulus gear (Fig. 233).

(4) Remove tabbed thrust washer and tabbed thrust plate from hub of front annulus (Fig. 234).

(5) Separate front annulus and planetary gears (Fig. 234).

(6) Remove front planetary gear front thrust washer from annulus gear hub.

(7) Separate and remove driving shell, rear planetary and rear annulus from output shaft (Fig. 235).

(8) Remove front planetary rear thrust washer from driving shell.

(9) Remove tabbed thrust washers from rear planetary gear.

(10) Remove lock ring that retains sun gear in driving shell. Then remove sun gear, spacer and thrust plates.

ASSEMBLY

(1) Lubricate output shaft and planetary components with transmission fluid. Use petroleum jelly to lubricate and hold thrust washers and plates in position.

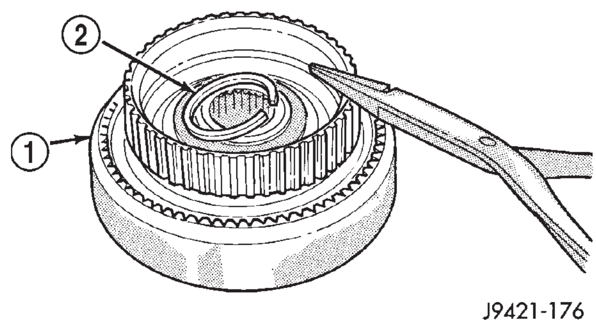


Fig. 233 Front Planetary Snap Ring Removal

1 – FRONT ANNULUS GEAR
2 – PLANETARY SNAP RING

(2) Assemble rear annulus gear and support if disassembled. Be sure support snap ring is seated and that shoulder-side of support faces rearward (Fig. 236).

(3) Install rear thrust washer on rear planetary gear. Use enough petroleum jelly to hold washer in place. Also be sure all four washer tabs are properly engaged in gear slots.

(4) Install rear annulus over and onto rear planetary gear (Fig. 236).

(5) Install assembled rear planetary and annulus gear on output shaft (Fig. 237). Verify that assembly is fully seated on shaft.

DISASSEMBLY AND ASSEMBLY (Continued)

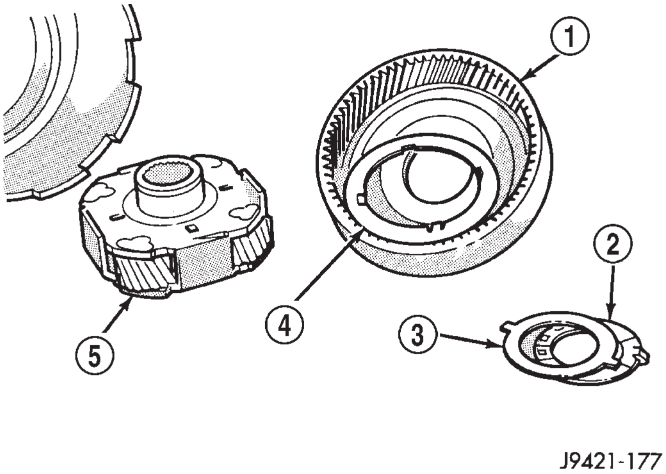


Fig. 234 Front Planetary And Annulus Gear Disassembly

1 – FRONT ANNULUS
2 – THRUST WASHER
3 – THRUST PLATE
4 – FRONT THRUST WASHER
5 – FRONT PLANETARY

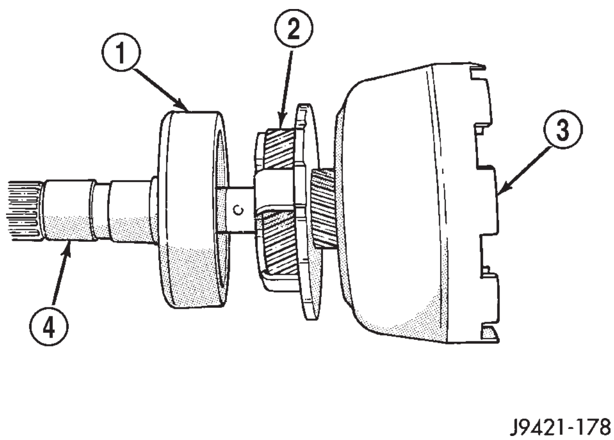


Fig. 235 Removing Driving Shell, Rear Planetary And Rear Annulus

1 – REAR ANNULUS
2 – REAR PLANETARY
3 – DRIVING SHELL
4 – OUTPUT SHAFT

(6) Install front thrust washer on rear planetary gear (Fig. 238). Use enough petroleum jelly to hold washer on gear. Be sure all four washer tabs are seated in slots.

(7) Install spacer on sun gear (Fig. 239).

(8) Install thrust plate on sun gear (Fig. 240). Note that driving shell thrust plates are interchangeable. Use either plate on sun gear and at front/rear of shell.

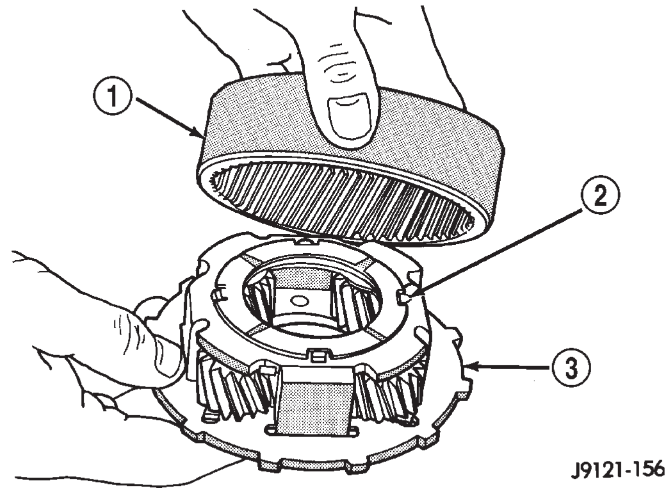


Fig. 236 Assembling Rear Annulus And Planetary Gear

1 – REAR ANNULUS GEAR
2 – TABBED THRUST WASHER
3 – REAR PLANETARY

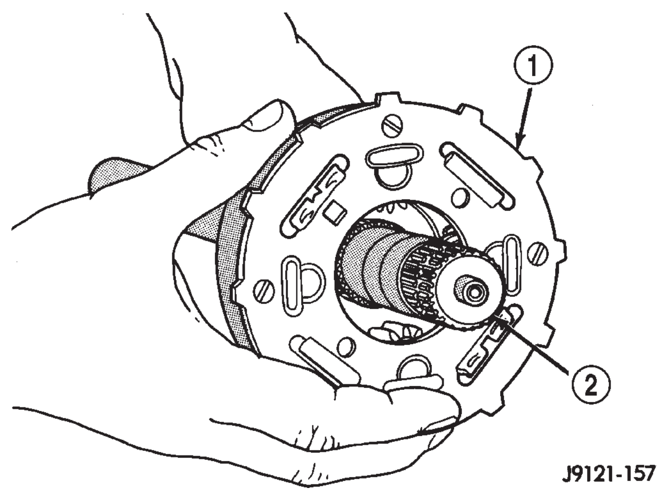


Fig. 237 Installing Rear Annulus And Planetary On Output Shaft

1 – REAR ANNULUS AND PLANETARY GEAR ASSEMBLY
2 – OUTPUT SHAFT

DISASSEMBLY AND ASSEMBLY (Continued)

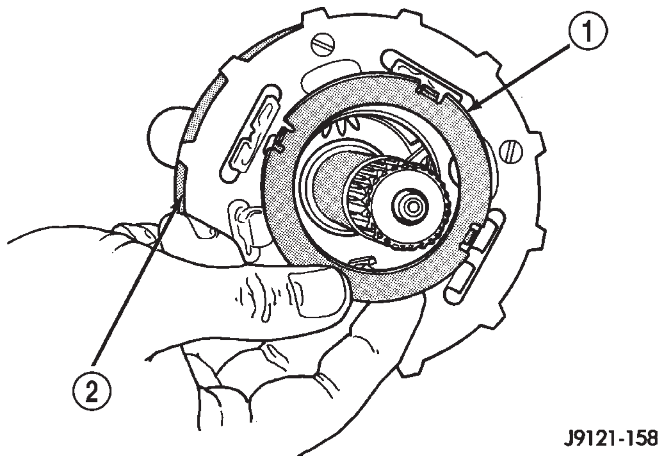


Fig. 238 Installing Rear Planetary Front Thrust Washer

1 – FRONT TABBED THRUST WASHER
2 – REAR PLANETARY GEAR

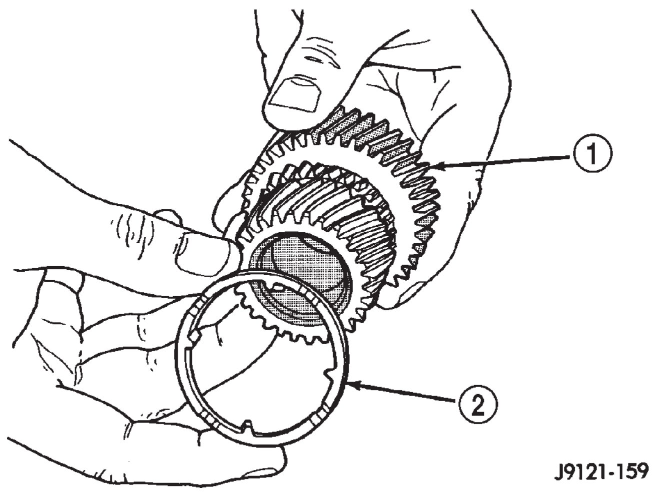


Fig. 239 Installing Spacer On Sun Gear

1 – SUN GEAR
2 – SUN GEAR SPACER

(9) Hold sun gear in place and install thrust plate over sun gear at rear of driving shell (Fig. 241).

(10) Position wood block on bench and support sun gear on block (Fig. 242). This makes it easier to align and install sun gear lock ring. Keep wood block handy as it will also be used for geartrain end play check.

(11) Align rear thrust plate on driving shell and install sun gear lock ring. Be sure ring is fully seated in sun gear ring groove (Fig. 243).

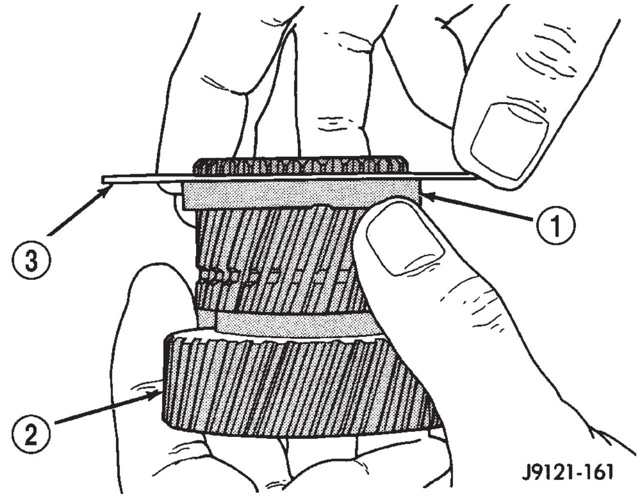


Fig. 240 Installing Driving Shell Front Thrust Plate On Sun Gear

1 – SPACER
2 – SUN GEAR
3 – THRUST PLATE

(12) Install assembled driving shell and sun gear on output shaft (Fig. 244).

(13) Install rear thrust washer on front planetary gear (Fig. 245). Use enough petroleum jelly to hold washer in place and be sure all four washer tabs are seated.

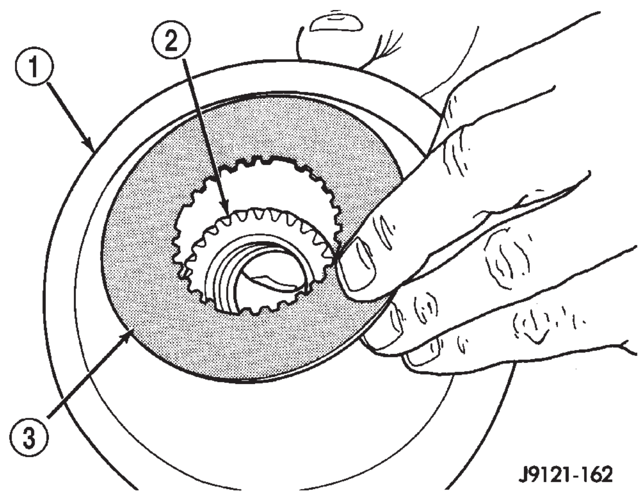


Fig. 241 Installing Driving Shell Rear Thrust Plate

1 – DRIVING SHELL
2 – SUN GEAR
3 – REAR THRUST PLATE

DISASSEMBLY AND ASSEMBLY (Continued)

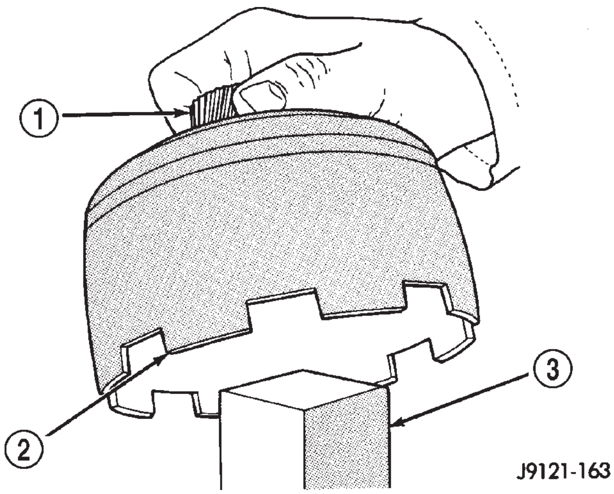


Fig. 242 Supporting Sun Gear On Wood Block

1 – SUN GEAR
2 – DRIVING SHELL
3 – WOOD BLOCK

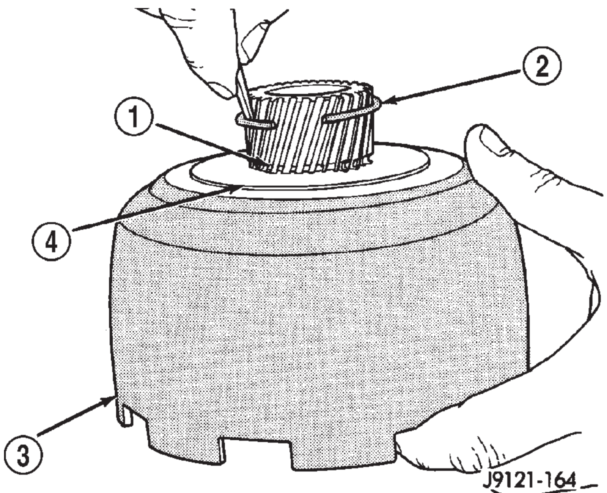


Fig. 243 Installing Sun Gear Lock Ring

1 – LOCK RING GROOVE
2 – SUN GEAR LOCK RING
3 – DRIVING SHELL
4 – REAR THRUST PLATE

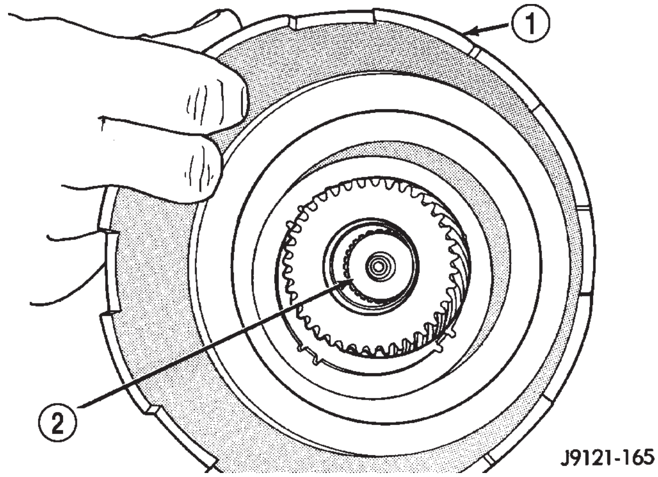


Fig. 244 Installing Assembled Sun Gear And Driving Shell On Output Shaft

1 – SUN GEAR/DRIVING SHELL ASSEMBLY
2 – OUTPUT SHAFT

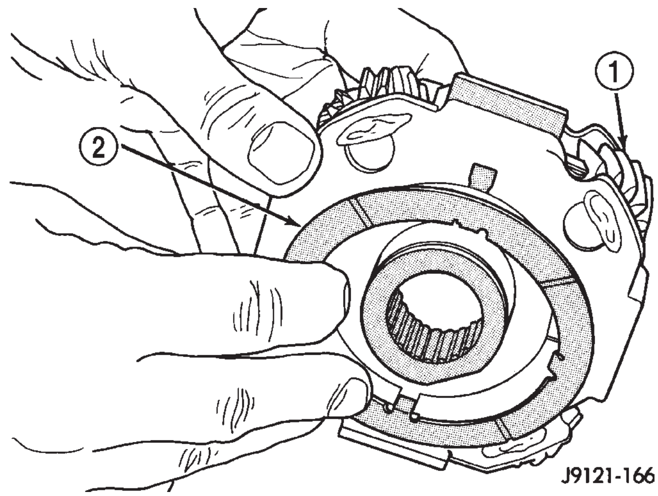


Fig. 245 Installing Rear Thrust Washer On Front Planetary Gear

1 – FRONT PLANETARY GEAR
2 – REAR TABBED THRUST WASHER

DISASSEMBLY AND ASSEMBLY (Continued)

(14) Install front planetary gear on output shaft and in driving shell (Fig. 246).

(15) Install front thrust washer on front planetary gear. Use enough petroleum jelly to hold washer in place and be sure all four washer tabs are seated.

(16) Assemble front annulus gear and support, if necessary. Be sure support snap ring is seated.

(17) Install front annulus on front planetary (Fig. 246).

(18) Position thrust plate on front annulus gear support (Fig. 247). **Note that plate has two tabs on it. These tabs fit in notches of annulus hub.**

(19) Install thrust washer in front annulus (Fig. 248). **Align flat on washer with flat on planetary hub. Also be sure washer tab is facing up.**

(20) Install front annulus snap ring (Fig. 249). Use snap ring pliers to avoid distorting ring during installation. Also be sure ring is fully seated.

(21) Install planetary selective snap ring with snap ring pliers (Fig. 250). Be sure ring is fully seated.

(22) Turn planetary geartrain assembly over so driving shell is facing workbench. Then support geartrain on wood block positioned under forward end of output shaft. This allows geartrain components to move forward for accurate end play check.

(23) Check planetary geartrain end play with feeler gauge (Fig. 251). Gauge goes between shoulder on output shaft and end of rear annulus support.

(24) Geartrain end play should be 0.12 to 1.22 mm (0.005 to 0.048 in.). If end play is incorrect, snap ring (or thrust washers) may have to be replaced. Snap ring is available in three different thicknesses for adjustment purposes.

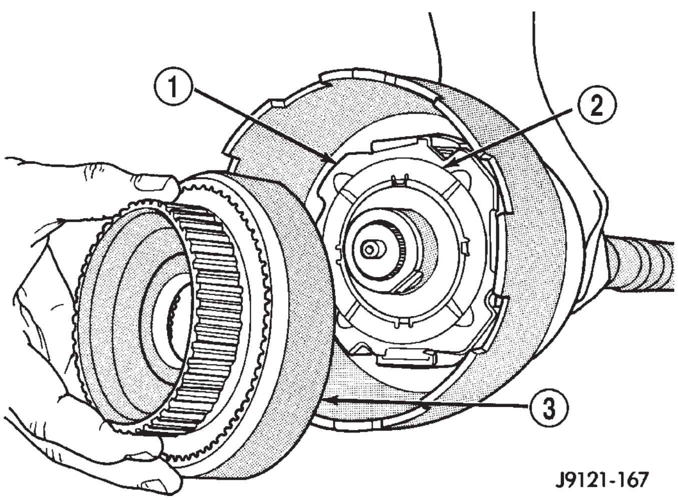


Fig. 246 Installing Front Planetary And Annulus Gears

1 – FRONT PLANETARY GEAR
2 – FRONT THRUST WASHER
3 – FRONT ANNULUS GEAR

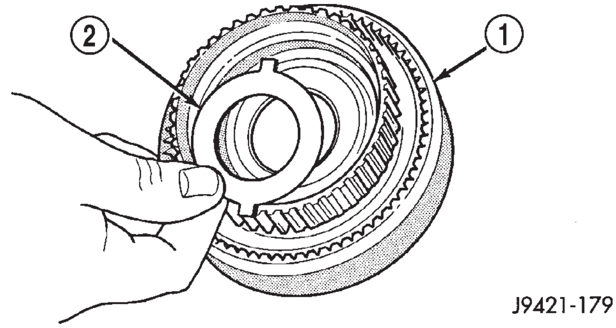


Fig. 247 Positioning Thrust Plate On Front Annulus Support

1 – FRONT ANNULUS
2 – THRUST PLATE

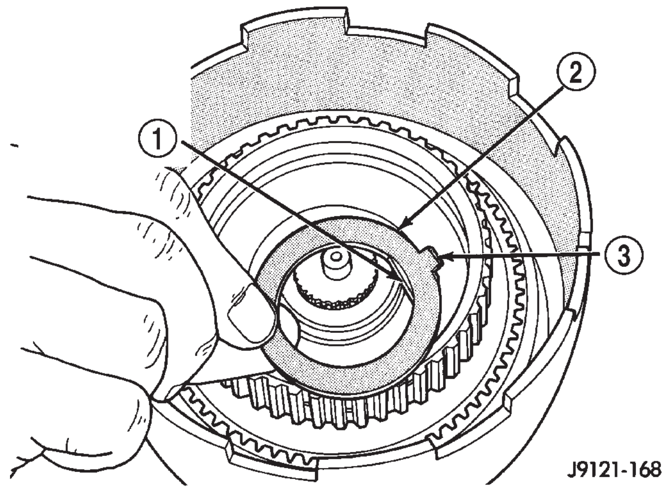


Fig. 248 Installing Front Annulus Thrust Washer

1 – WASHER FLAT ALIGNS WITH FLAT ON PLANETARY HUB
2 – FRONT ANNULUS THRUST WASHER
3 – TAB FACES FRONT

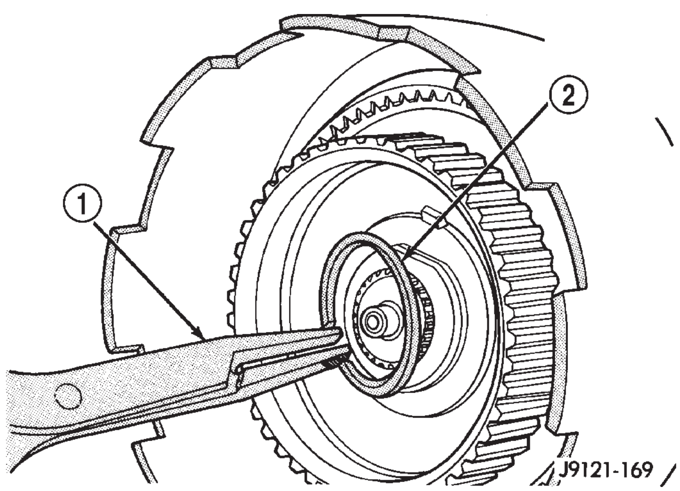


Fig. 249 Installing Front Annulus Snap Ring

1 – SNAP RING PLIERS
2 – FRONT ANNULUS SNAP RING

DISASSEMBLY AND ASSEMBLY (Continued)

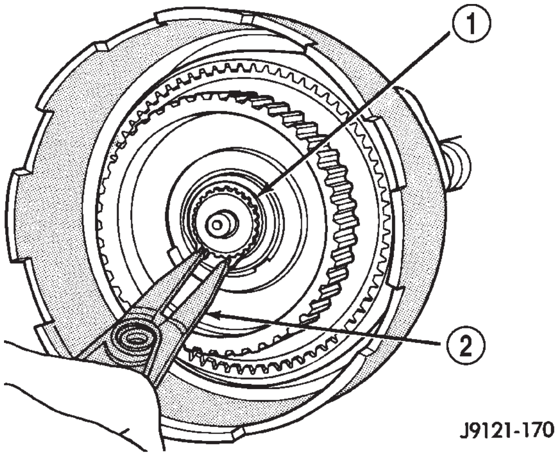


Fig. 250 Installing Planetary Selective Snap Ring

1 – SELECTIVE SNAP RING
2 – SNAP RING PLIERS

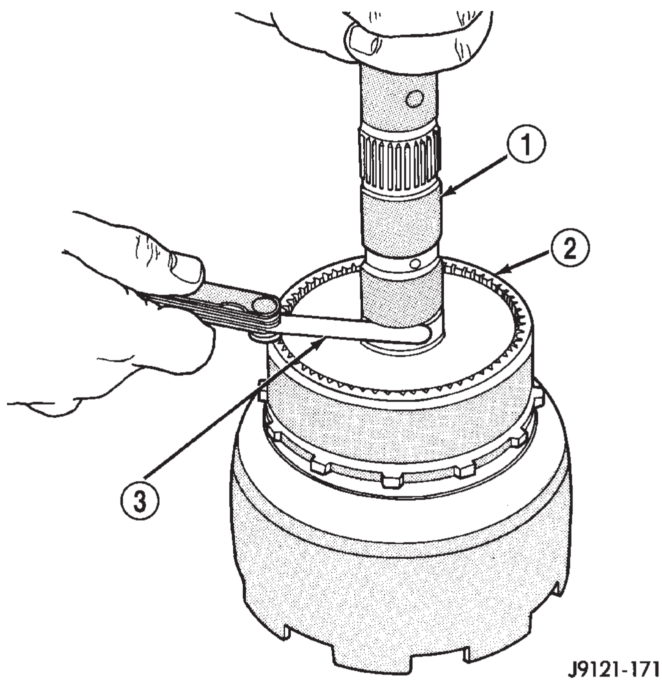


Fig. 251 Checking Planetary Geartrain End Play

1 – OUTPUT SHAFT
2 – REAR ANNULUS GEAR
3 – FEELER GAUGE

OVERDRIVE UNIT

DISASSEMBLY

(1) Remove transmission speed sensor and O-ring seal from overdrive case (Fig. 252).

(2) Remove overdrive piston thrust bearing (Fig. 253).

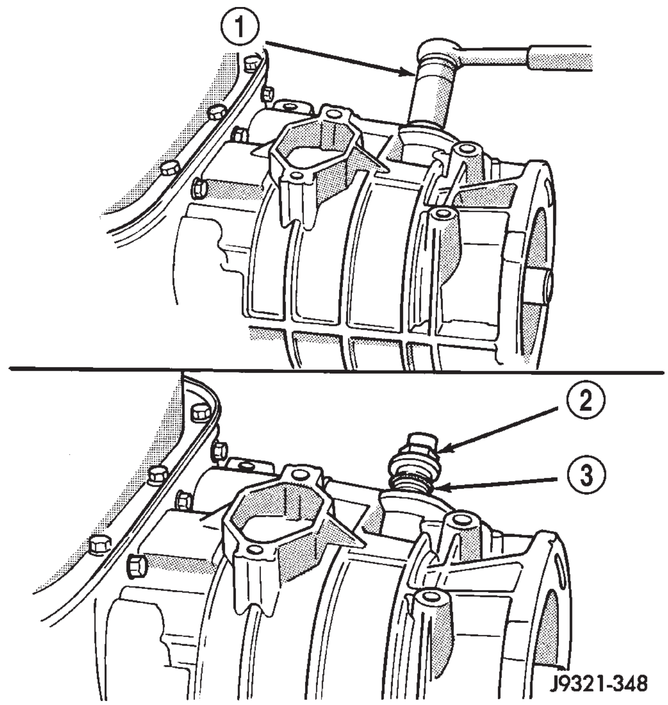


Fig. 252 Transmission Speed Sensor Removal/ Installation

1 – SOCKET AND WRENCH
2 – SPEED SENSOR
3 – O-RING

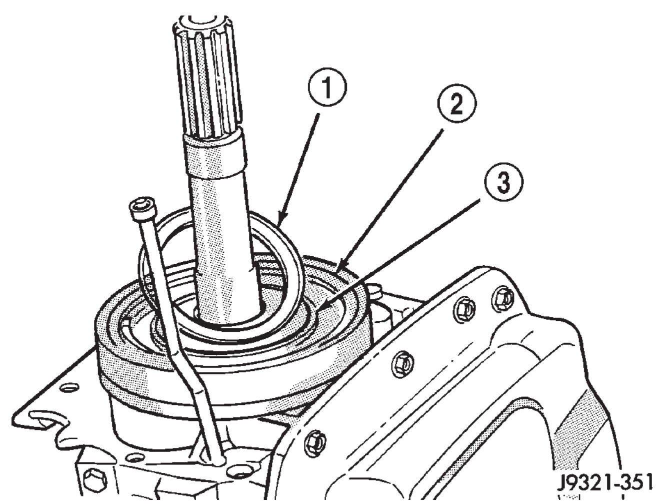


Fig. 253 Overdrive Piston Thrust Bearing Removal/ Installation

1 – THRUST BEARING
2 – OVERDRIVE PISTON
3 – THRUST PLATE

DISASSEMBLY AND ASSEMBLY (Continued)

OVERDRIVE PISTON DISASSEMBLY

(1) Remove overdrive piston thrust plate (Fig. 254). Retain thrust plate. It is a select fit part and may possibly be reused.

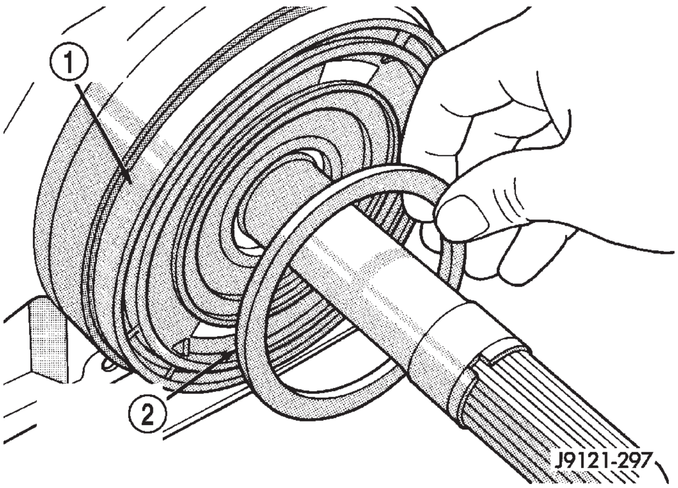


Fig. 254 Overdrive Piston Thrust Plate Removal/ Installation

1 – OVERDRIVE PISTON
2 – OVERDRIVE PISTON SPACER (SELECT FIT)

(2) Remove intermediate shaft spacer (Fig. 255). Retain spacer. It is a select fit part and may possibly be reused.

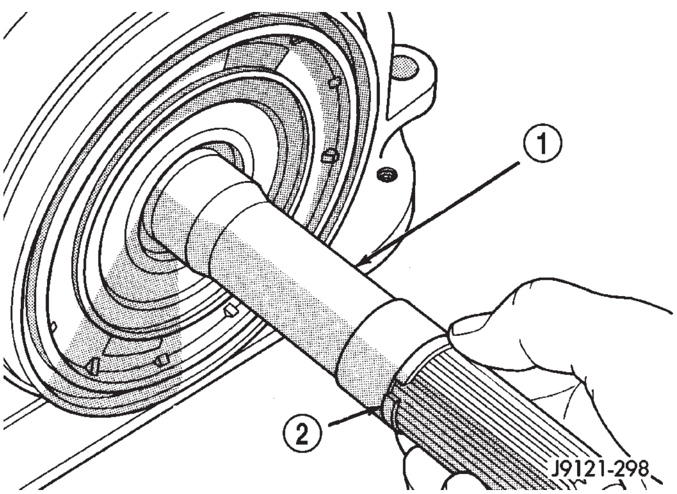


Fig. 255 Intermediate Shaft Spacer Location

1 – INTERMEDIATE SHAFT
2 – INTERMEDIATE SHAFT SPACER (SELECT FIT)

(3) Remove overdrive piston from retainer (Fig. 256).

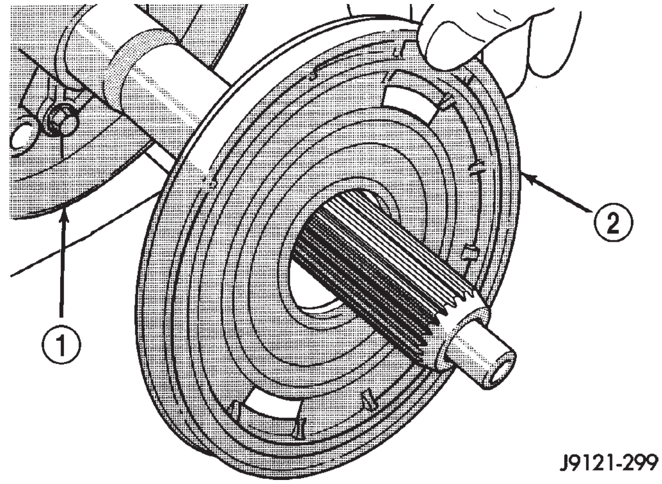


Fig. 256 Overdrive Piston Removal

1 – PISTON RETAINER
2 – OVERDRIVE PISTON

OVERDRIVE CLUTCH PACK DISASSEMBLY

(1) Remove overdrive clutch pack wire retaining ring (Fig. 257).

(2) Remove overdrive clutch pack (Fig. 258).

NOTE: The 42RE transmission has three clutch discs and two clutch plates.

(3) Note position of clutch pack components for assembly reference (Fig. 259).

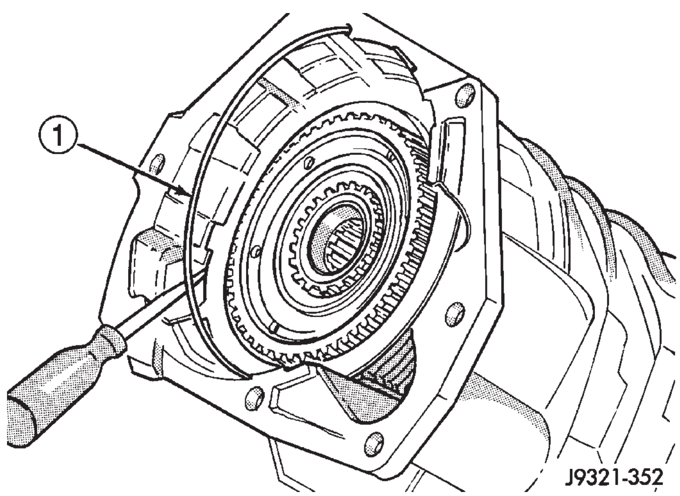


Fig. 257 Removing Overdrive Clutch Pack Retaining Ring

1 – OVERDRIVE CLUTCH PACK RETAINING RING

DISASSEMBLY AND ASSEMBLY (Continued)

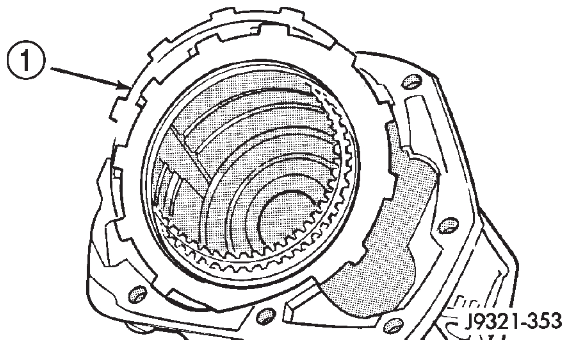


Fig. 258 Overdrive Clutch Pack Removal

1 – OVERDRIVE CLUTCH PACK

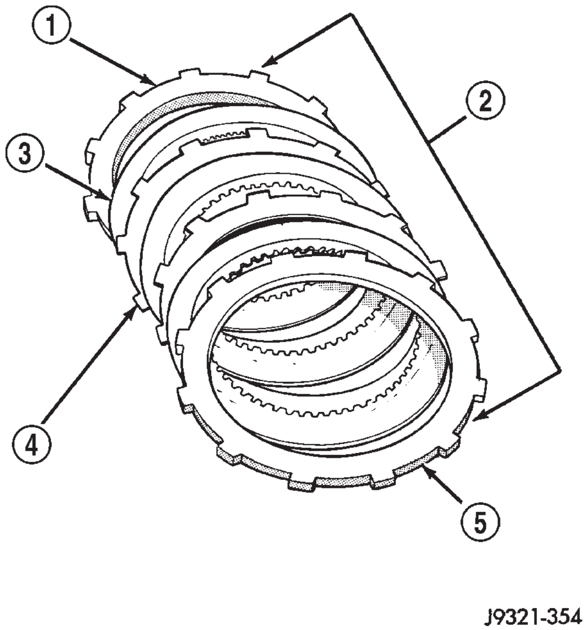


Fig. 259 42RE Overdrive Clutch Component Position

1 – PRESSURE PLATE (TO FRONT)
2 – OVERDRIVE CLUTCH PACK
3 – CLUTCH DISC (3)
4 – CLUTCH PLATE (2)
5 – REACTION PLATE (TO REAR)

OVERDRIVE GEARTRAIN DISASSEMBLY

(1) Remove overdrive clutch wave spring (Fig. 260).

(2) Remove overdrive clutch reaction snap ring (Fig. 261). Note that snap ring is located in same groove as wave spring.

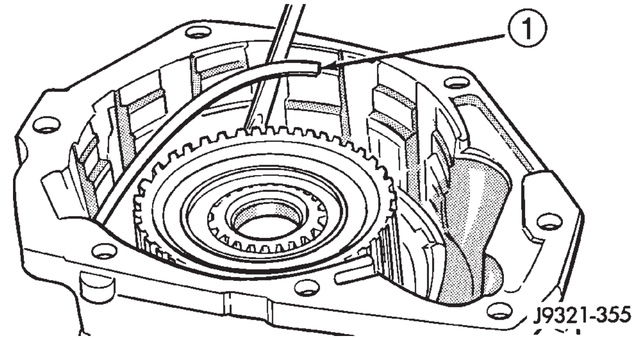


Fig. 260 Overdrive Clutch Wave Spring Removal/Installation

1 – WAVE SPRING

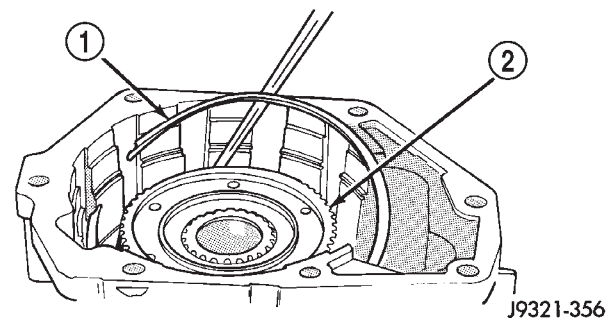


Fig. 261 Overdrive Clutch Reaction Snap Ring Removal/Installation

1 – REACTION RING
2 – CLUTCH HUB

(3) Remove Torx head screws that attach access cover and gasket to overdrive case (Fig. 262).

(4) Remove access cover and gasket (Fig. 263).

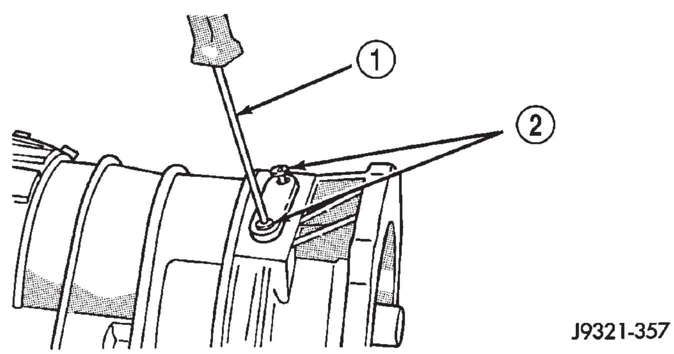


Fig. 262 Access Cover Screw Removal/Installation

1 – TORX SCREWDRIVER (T25)
2 – ACCESS COVER SCREWS

DISASSEMBLY AND ASSEMBLY (Continued)

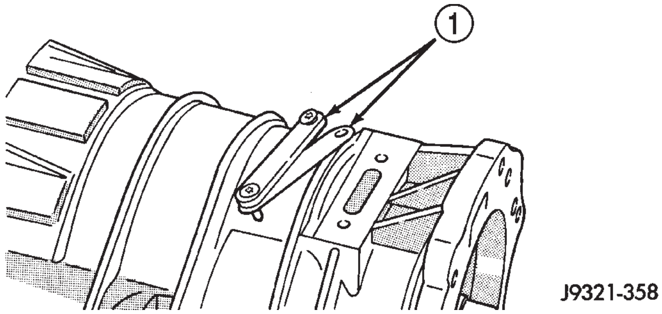


Fig. 263 Access Cover And Gasket Removal/ Installation

1 – ACCESS COVER AND GASKET

(5) Expand output shaft bearing snap ring with expanding-type snap ring pliers. Then push output shaft forward to release shaft bearing from locating ring (Fig. 264).

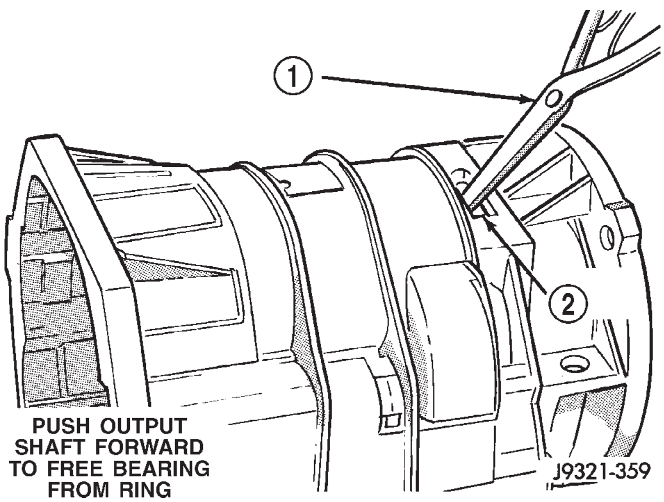


Fig. 264 Releasing Bearing From Locating Ring

1 – EXPAND BEARING LOCATING RING WITH SNAP RING PLIERS

2 – ACCESS HOLE

(6) Lift gear case up and off geartrain assembly (Fig. 265).

(7) Remove snap ring that retains rear bearing on output shaft.

(8) Remove rear bearing from output shaft (Fig. 266).

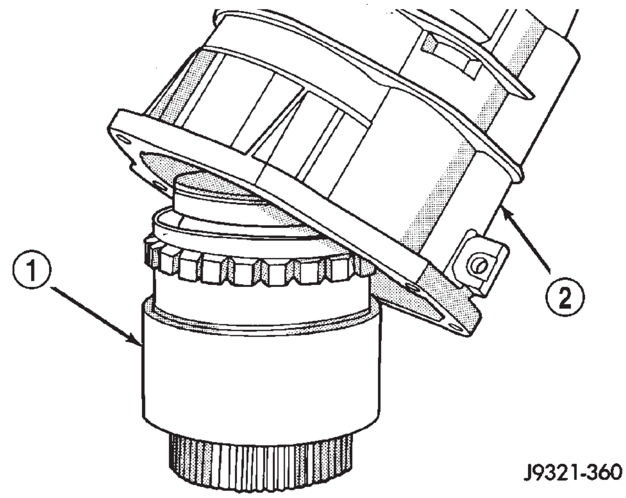


Fig. 265 Removing Gear Case From Geartrain Assembly

1 – GEARTRAIN ASSEMBLY

2 – GEAR CASE

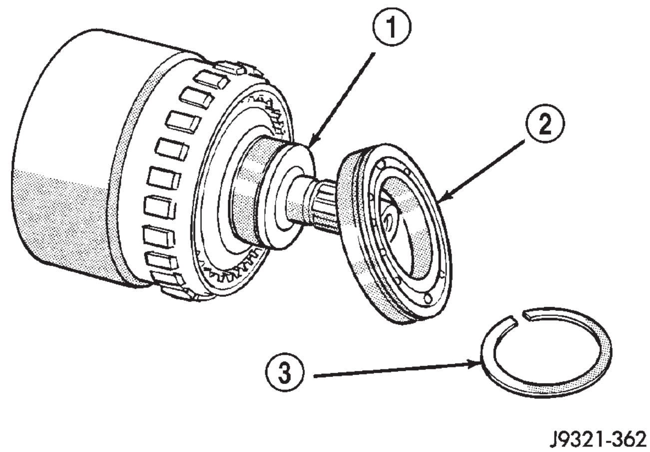


Fig. 266 Rear Bearing Removal

1 – OUTPUT SHAFT

2 – REAR BEARING

3 – SNAP RING

DIRECT CLUTCH, HUB AND SPRING DISASSEMBLY

WARNING: THE NEXT STEP IN DISASSEMBLY INVOLVES COMPRESSING THE DIRECT CLUTCH SPRING. IT IS EXTREMELY IMPORTANT THAT PROPER EQUIPMENT BE USED TO COMPRESS THE SPRING AS SPRING FORCE IS APPROXIMATELY 830 POUNDS. USE SPRING COMPRESSOR TOOL 6227-1 AND A HYDRAULIC SHOP PRESS WITH A MINIMUM RAM TRAVEL OF 5-6 INCHES. THE PRESS MUST ALSO HAVE A BED THAT CAN BE ADJUSTED UP OR DOWN AS REQUIRED. RELEASE CLUTCH SPRING TENSION SLOWLY AND COMPLETELY TO AVOID PERSONAL INJURY.

(1) Mount geartrain assembly in shop press (Fig. 267).

(2) Position Compressor Tool 6227-1 on clutch hub (Fig. 267). Support output shaft flange with steel press plates as shown and center assembly under press ram.

DISASSEMBLY AND ASSEMBLY (Continued)

(3) Apply press pressure slowly. Compress hub and spring far enough to expose clutch hub retaining ring and relieve spring pressure on clutch pack snap ring (Fig. 267).

(4) Remove direct clutch pack snap ring (Fig. 268).

(5) Remove direct clutch hub retaining ring (Fig. 269).

(6) Release press load slowly and completely (Fig. 270).

(7) Remove Special Tool 6227-1. Then remove clutch pack from hub (Fig. 270).

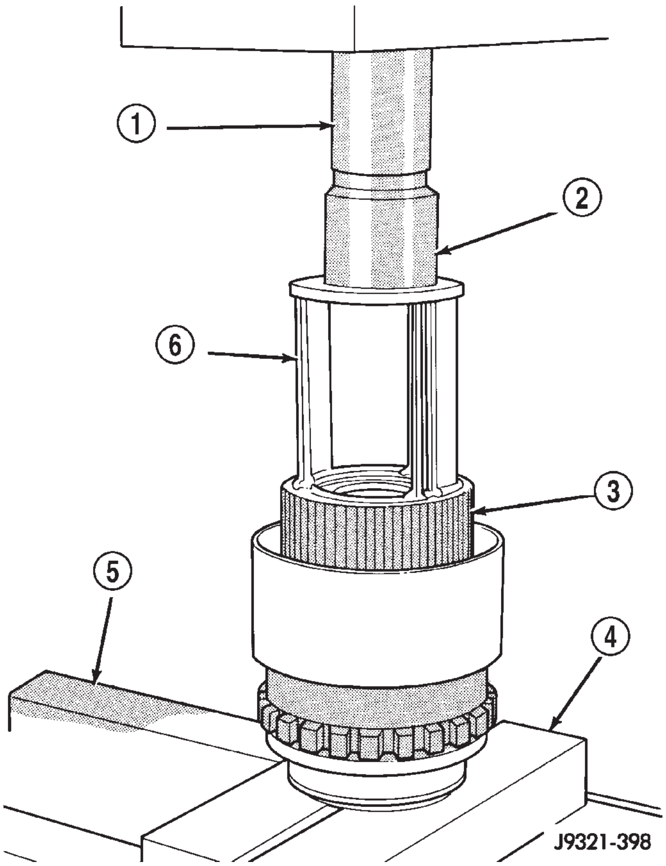


Fig. 267 Geartrain Mounted In Shop Press

1 – PRESS RAM
2 – SPECIAL TOOL C-3995–A (OR SIMILAR TOOL)
3 – CLUTCH HUB
4 – PLATES
5 – PRESS BED
6 – SPECIAL TOOL 6227–1

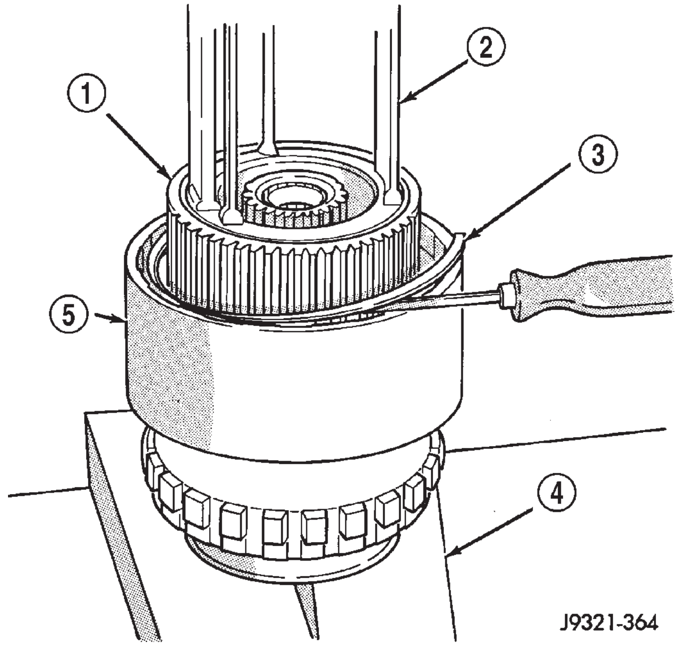


Fig. 268 Direct Clutch Pack Snap Ring Removal

1 – CLUTCH HUB
2 – SPECIAL TOOL 6227–1
3 – DIRECT CLUTCH PACK SNAP RING
4 – PRESS PLATES
5 – CLUTCH DRUM

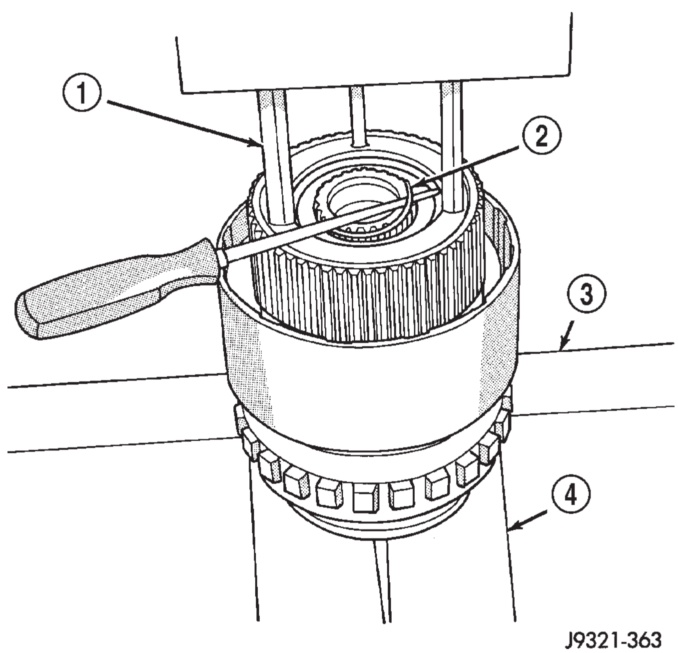


Fig. 269 Direct Clutch Hub Retaining Ring Removal

1 – SPECIAL TOOL 6227–1
2 – CLUTCH HUB RETAINING RING
3 – PRESS BED
4 – PRESS PLATES

DISASSEMBLY AND ASSEMBLY (Continued)

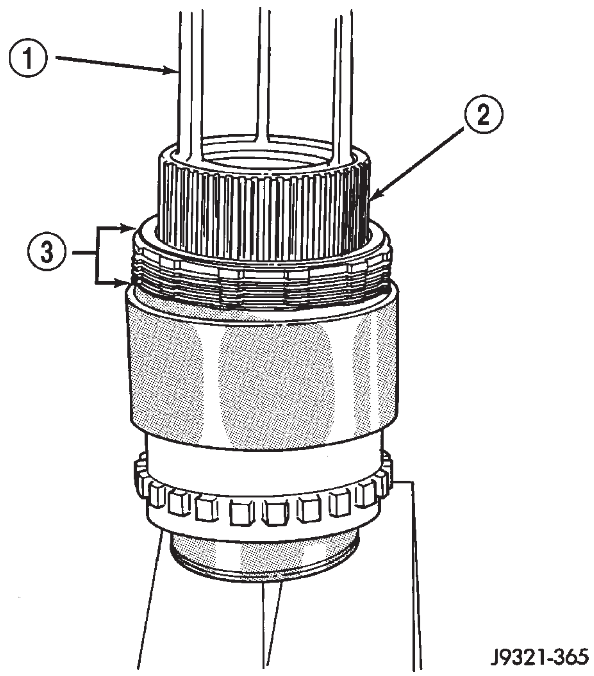


Fig. 270 Direct Clutch Pack Removal

1 – SPECIAL TOOL 6227–1
2 – DIRECT CLUTCH HUB
3 – DIRECT CLUTCH PACK

Geartrain Disassembly

(1) Remove direct clutch hub and spring (Fig. 271).

(2) Remove sun gear and spring plate. Then remove planetary thrust bearing and planetary gear (Fig. 272).

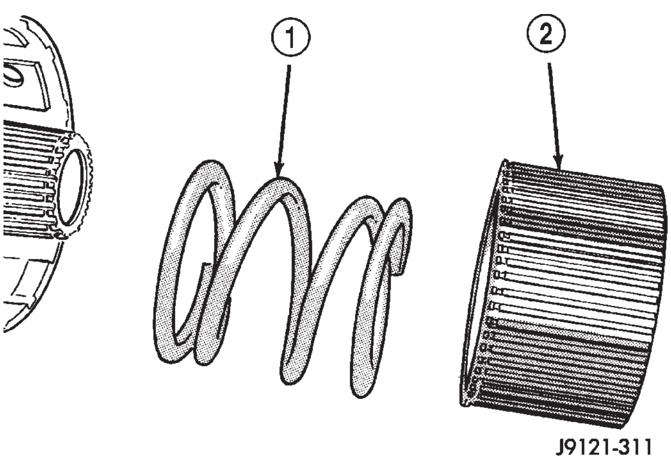


Fig. 271 Direct Clutch Hub And Spring Removal

1 – DIRECT CLUTCH SPRING
2 – DIRECT CLUTCH HUB

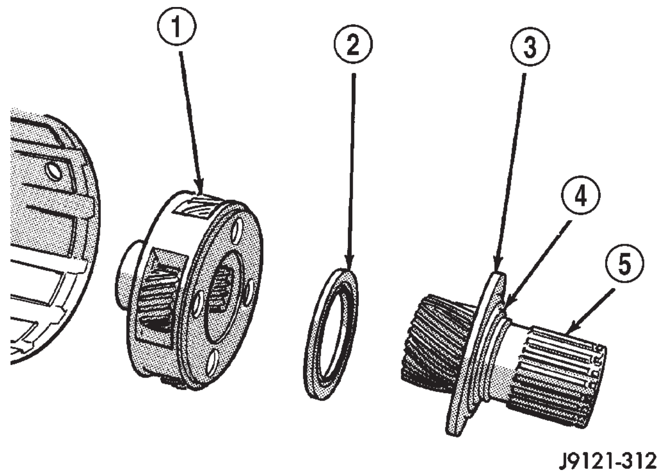


Fig. 272 Removing Sun Gear, Thrust Bearing And Planetary Gear

1 – PLANETARY GEAR
2 – PLANETARY THRUST BEARING
3 – CLUTCH SPRING PLATE
4 – SPRING PLATE SNAP RING
5 – SUN GEAR

(3) Remove overrunning clutch assembly with expanding type snap ring pliers (Fig. 273). Insert pliers into clutch hub. Expand pliers to grip hub splines and remove clutch with counterclockwise, twisting motion.

(4) Remove thrust bearing from overrunning clutch hub.

(5) Remove overrunning clutch from hub.

(6) Mark position of annulus gear and direct clutch drum for assembly alignment reference (Fig. 274). Use small center punch or scriber to make alignment marks.

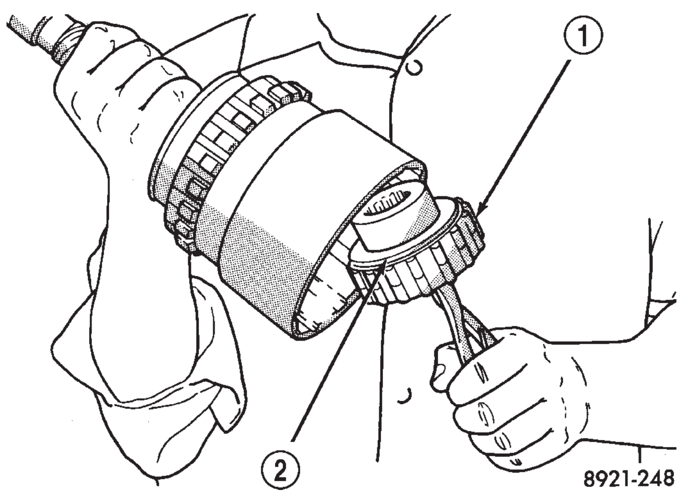


Fig. 273 Overrunning Clutch Assembly Removal/ Installation

1 – OVERRUNNING CLUTCH
2 – NEEDLE BEARING

DISASSEMBLY AND ASSEMBLY (Continued)

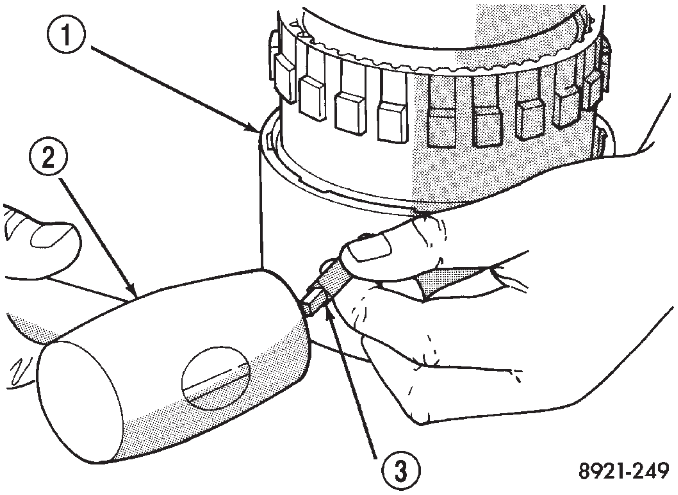


Fig. 274 Marking Direct Clutch Drum And Annulus Gear For Assembly Alignment

1 – DIRECT CLUTCH DRUM
2 – HAMMER
3 – PUNCH

(7) Remove direct clutch drum rear retaining ring (Fig. 275).

(8) Remove direct clutch drum outer retaining ring (Fig. 276).

(9) Mark annulus gear and output shaft for assembly alignment reference (Fig. 277). Use punch or scriber to mark gear and shaft.

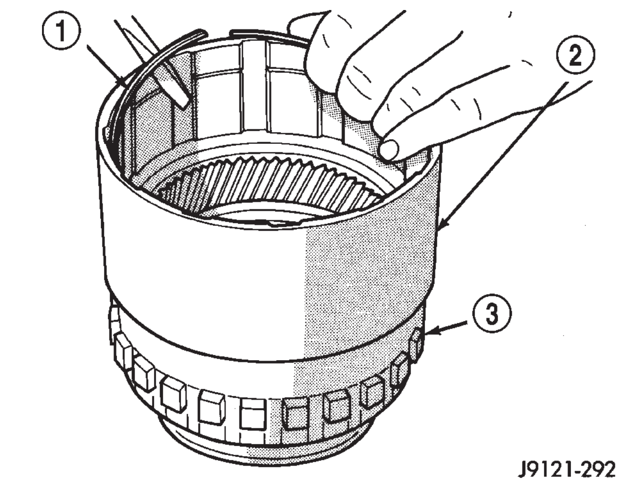


Fig. 275 Clutch Drum Inner Retaining Ring Removal

1 – INNER RETAINING RING
2 – DIRECT CLUTCH DRUM
3 – ANNULUS GEAR

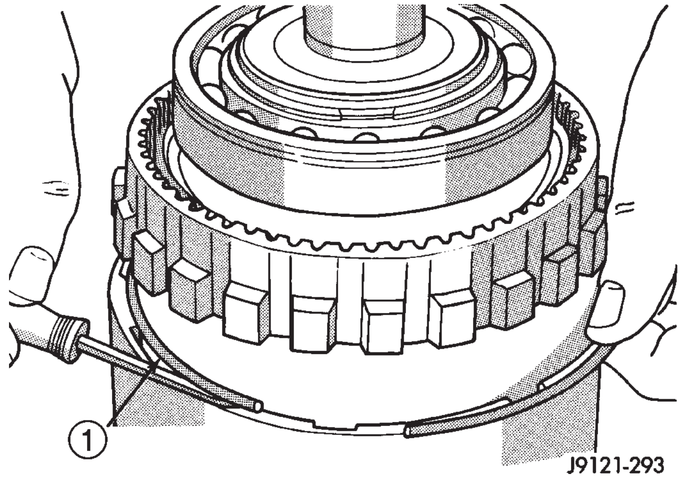


Fig. 276 Clutch Drum Outer Retaining Ring Removal

1 – OUTER RETAINING RING

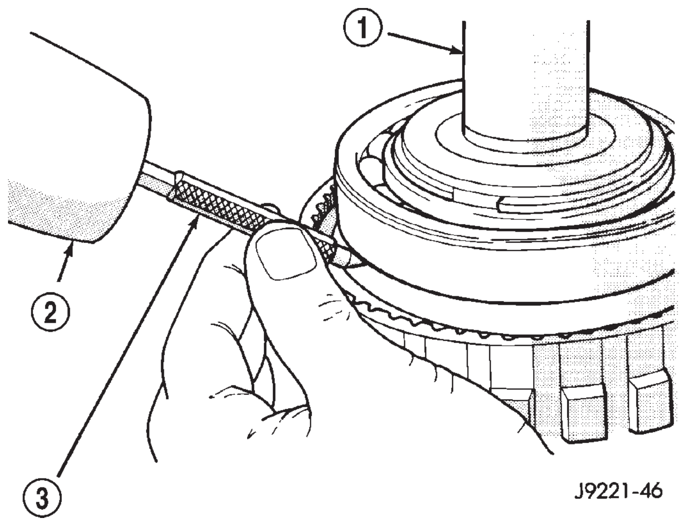


Fig. 277 Marking Annulus Gear And Output Shaft For Assembly Alignment

1 – OUTPUT SHAFT
2 – HAMMER
3 – PUNCH

DISASSEMBLY AND ASSEMBLY (Continued)

(10) Remove snap ring that secures annulus gear on output shaft (Fig. 278). Use two screwdrivers to unseat and work snap ring out of groove as shown.

(11) Remove annulus gear from output shaft (Fig. 279). Use rawhide or plastic mallet to tap gear off shaft.

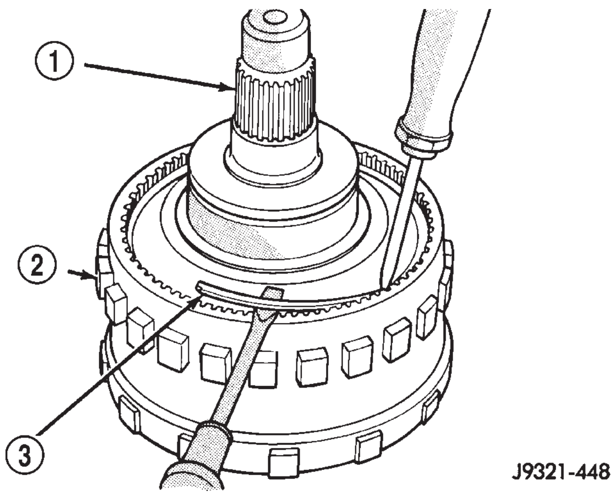


Fig. 278 Annulus Gear Snap Ring Removal

1 – OUTPUT SHAFT
2 – ANNULUS GEAR
3 – SNAP RING

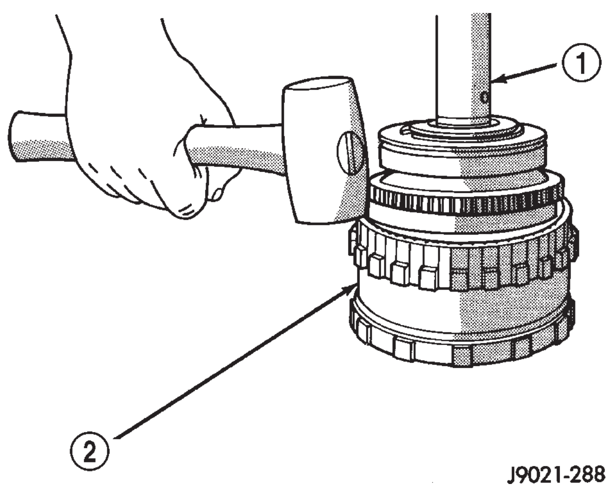


Fig. 279 Annulus Gear Removal

1 – OUTPUT SHAFT
2 – ANNULUS GEAR

GEAR CASE AND PARK LOCK DISASSEMBLY

(1) Remove locating ring from gear case.

(2) Remove park pawl shaft retaining bolt and remove shaft, pawl and spring.

(3) Remove reaction plug snap ring and remove reaction plug.

(4) Remove output shaft seal.

ASSEMBLY

GEARTRAIN AND DIRECT CLUTCH ASSEMBLY

(1) Soak direct clutch and overdrive clutch discs in Mopar® ATF Plus 3, type 7176, transmission fluid. Allow discs to soak for 10-20 minutes.

(2) Install new pilot bushing and clutch hub bushing in output shaft if necessary (Fig. 280). Lubricate bushings with petroleum jelly, or transmission fluid.

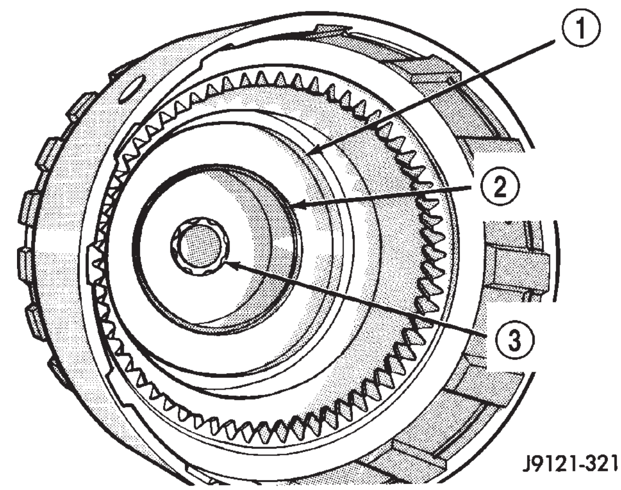


Fig. 280 Output Shaft Pilot Bushing

1 – OUTPUT SHAFT HUB
2 – OVERRUNNING CLUTCH HUB BUSHING
3 – INTERMEDIATE SHAFT PILOT BUSHING

(3) Install annulus gear on output shaft, if removed. Then install annulus gear retaining snap ring (Fig. 281).

(4) Align and install clutch drum on annulus gear (Fig. 282). Be sure drum is engaged in annulus gear lugs.

(5) Install clutch drum outer retaining ring (Fig. 282).

DISASSEMBLY AND ASSEMBLY (Continued)

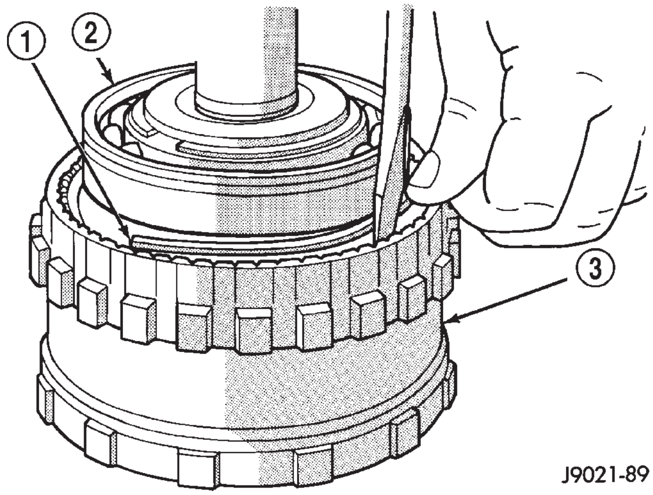


Fig. 281 Annulus Gear Installation

1 – SNAP RING
2 – OUTPUT SHAFT FRONT BEARING
3 – ANNULUS GEAR

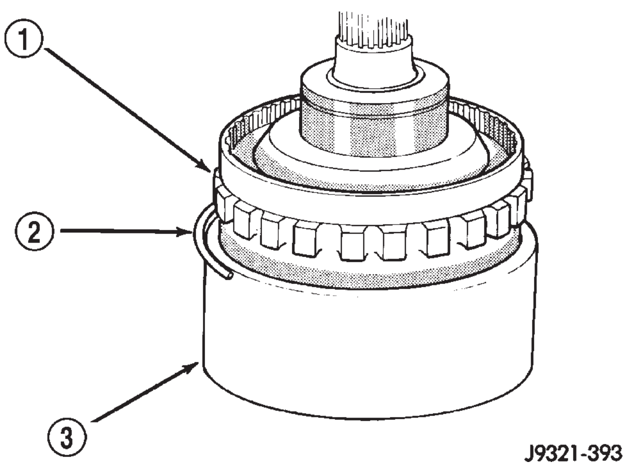


Fig. 282 Clutch Drum And Outer Retaining Ring Installation

1 – ANNULUS GEAR
2 – OUTER SNAP RING
3 – CLUTCH DRUM

(6) Slide clutch drum forward and install inner retaining ring (Fig. 283).

(7) Install rear bearing and snap ring on output shaft (Fig. 284). Be sure locating ring groove in bearing is toward rear.

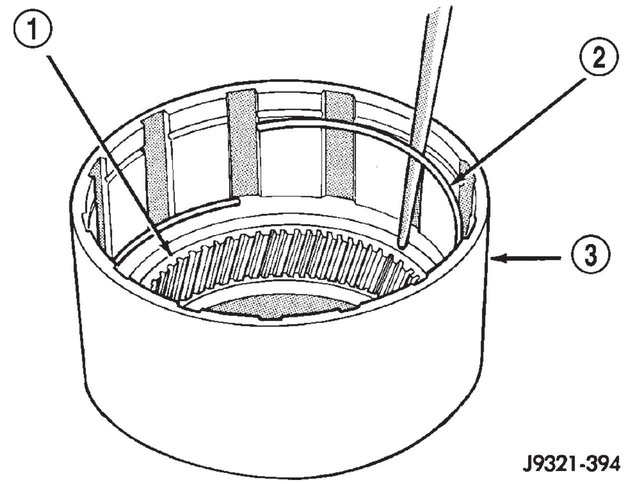


Fig. 283 Clutch Drum Inner Retaining Ring Installation

1 – ANNULUS GEAR
2 – INNER SNAP RING
3 – CLUTCH DRUM

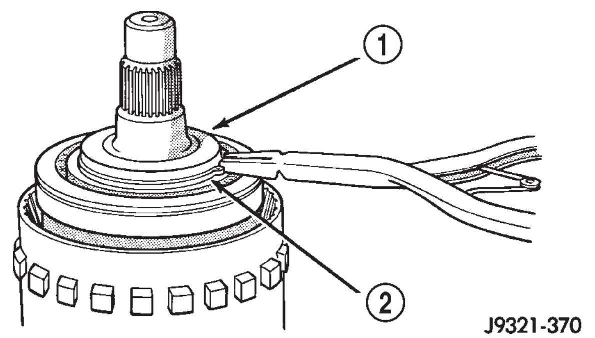


Fig. 284 Rear Bearing And Snap Ring Installation

1 – REAR BEARING
2 – SNAP RING

DISASSEMBLY AND ASSEMBLY (Continued)

(8) Install overrunning clutch on hub (Fig. 285). **Note that clutch only fits one way. Shoulder on clutch should seat in small recess at edge of hub.**

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

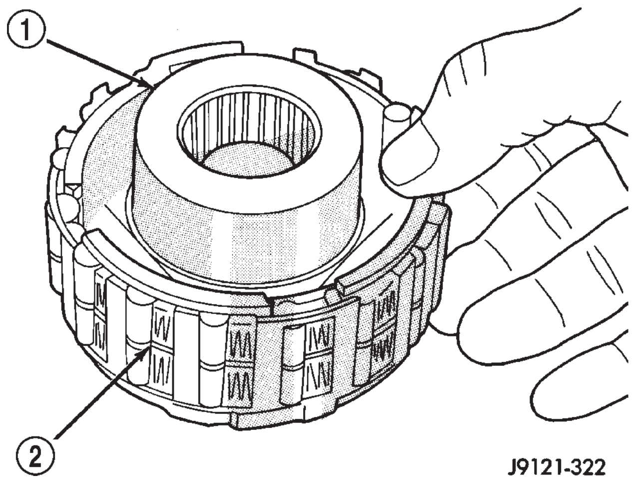


Fig. 285 Assembling Overrunning Clutch And Hub

1 – CLUTCH HUB
2 – OVERRUNNING CLUTCH

(10) Install overrunning clutch in output shaft (Fig. 286). Insert snap ring pliers in hub splines. Expand pliers to grip hub. Then install assembly with counterclockwise, twisting motion.

(11) Install planetary gear in annulus gear (Fig. 287). **Be sure planetary pinions are fully seated in annulus gear before proceeding.**

(12) Coat planetary thrust bearing and bearing contact surface of spring plate with generous amount of petroleum jelly. This will help hold bearing in place during installation.

(13) Install planetary thrust bearing on sun gear (Fig. 288). Slide bearing onto gear and seat it against spring plate as shown. **Bearing fits one way only. If it does not seat squarely against spring plate, remove and reposition bearing.**

(14) Install assembled sun gear, spring plate and thrust bearing (Fig. 289). Be sure sun gear and thrust bearing are fully seated before proceeding.

(15) Mount assembled output shaft, annulus gear, and clutch drum in shop press. Direct clutch spring, hub and clutch pack are easier to install with assembly mounted in press.

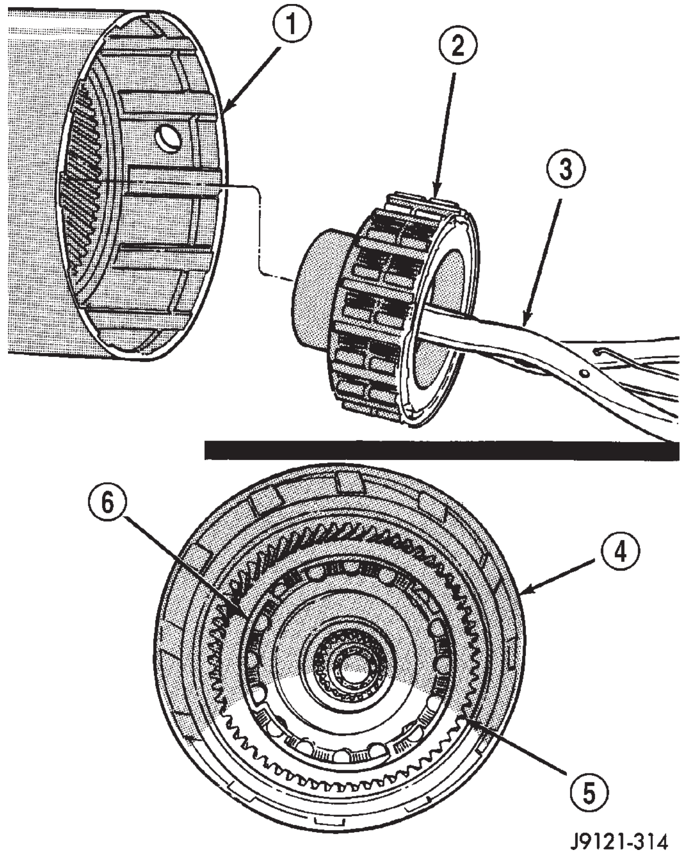


Fig. 286 Overrunning Clutch Installation

1 – CLUTCH DRUM
2 – OVERRUNNING CLUTCH ASSEMBLY
3 – EXPANDING-TYPE SNAP RING PLIERS
4 – CLUTCH DRUM
5 – ANNULUS GEAR
6 – OVERRUNNING CLUTCH ASSEMBLY SEATED IN OUTPUT SHAFT

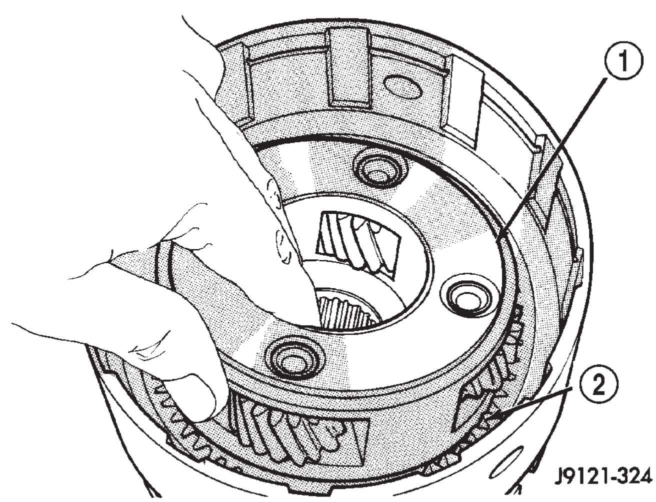


Fig. 287 Planetary Gear Installation

1 – PLANETARY GEAR
2 – ANNULUS GEAR

DISASSEMBLY AND ASSEMBLY (Continued)

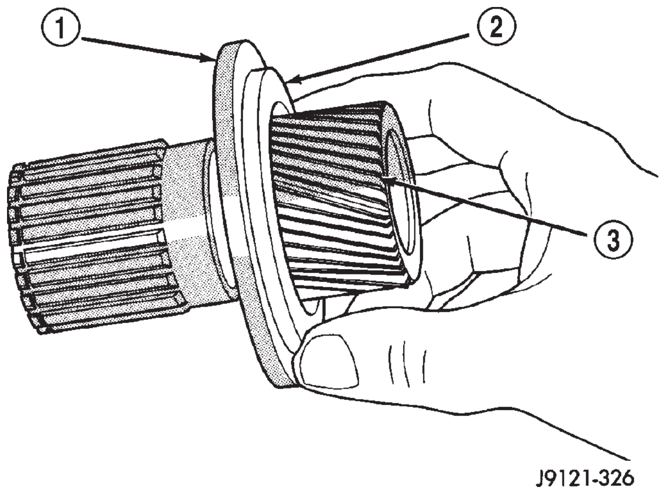


Fig. 288 Planetary Thrust Bearing Installation

1 – SPRING PLATE
2 – PLANETARY THRUST BEARING
3 – SUN GEAR

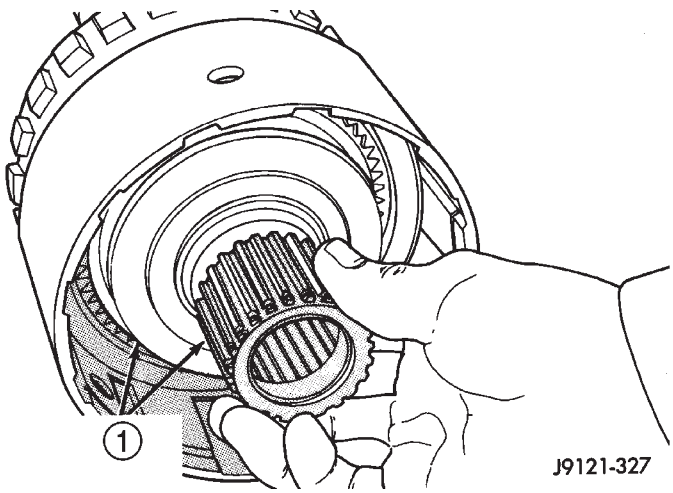


Fig. 289 Sun Gear Installation

1 – SUN GEAR AND SPRING PLATE ASSEMBLY

(16) Align splines in hubs of planetary gear and overrunning clutch with Alignment tool 6227-2 (Fig. 290). Insert tool through sun gear and into splines of both hubs. Be sure alignment tool is fully seated before proceeding.

(17) Install direct clutch spring (Fig. 291). Be sure spring is properly seated on spring plate.

NOTE: The 42RE transmission has 6 direct clutch discs and 5 clutch plates.

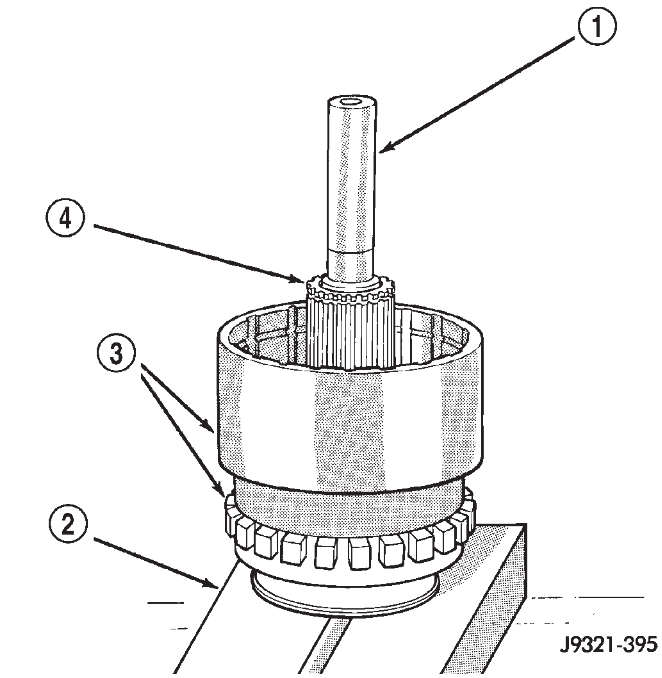


Fig. 290 Alignment Tool Installation

1 – SPECIAL TOOL 6227–2
2 – PRESS PLATES
3 – ASSEMBLED DRUM AND ANNULUS GEAR
4 – SUN GEAR

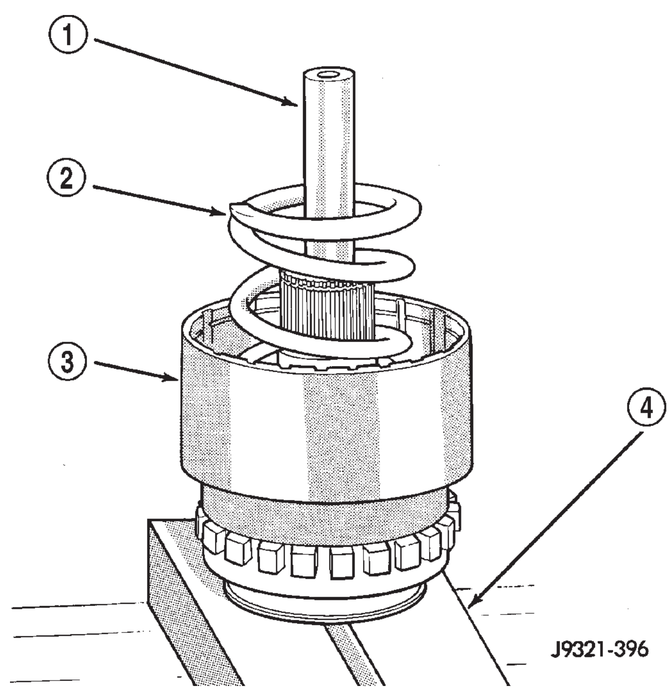


Fig. 291 Direct Clutch Spring Installation

1 – SPECIAL TOOL 6227–2
2 – DIRECT CLUTCH SPRING
3 – CLUTCH HUB
4 – PRESS PLATES

DISASSEMBLY AND ASSEMBLY (Continued)

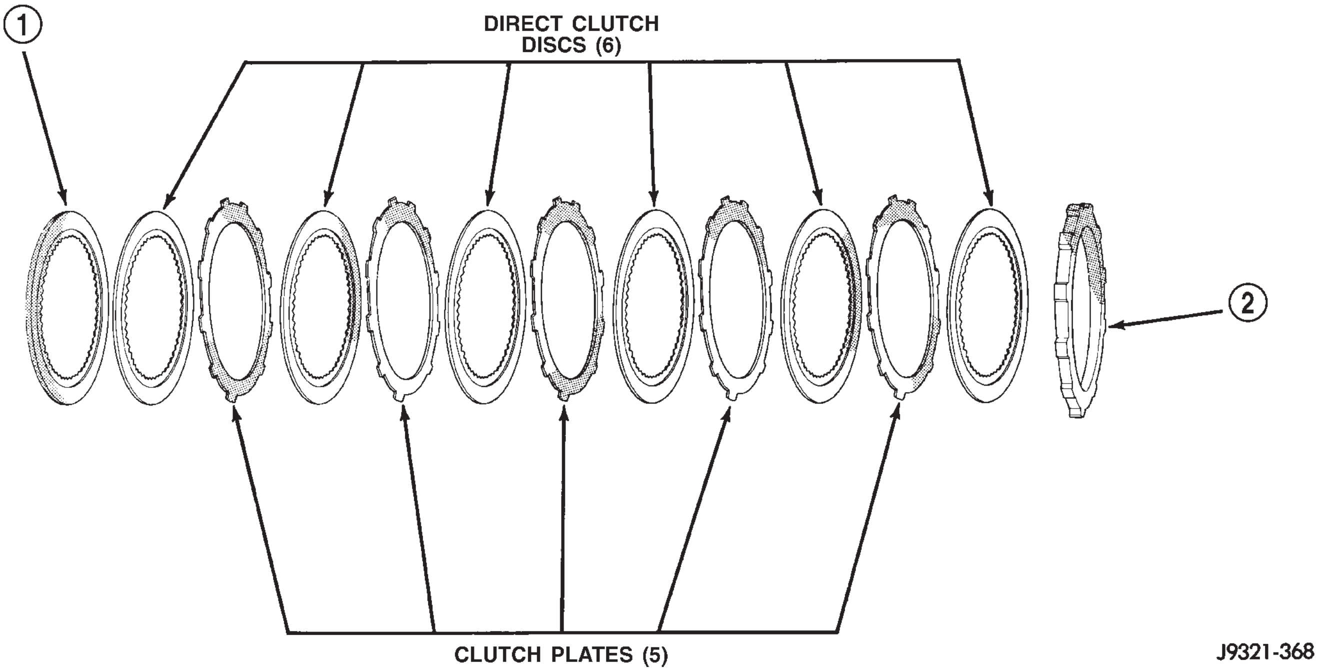


Fig. 292 42RE Direct Clutch Pack Components

1 – REACTION PLATE
2 – PRESSURE PLATE

(18) Assemble and install direct clutch pack on hub as follows:

(a) Assemble clutch pack components (Fig. 292).

(b) Install direct clutch reaction plate on clutch hub first. **Note that one side of reaction plate is counterbored. Be sure this side faces rearward. Splines at rear of hub are raised slightly. Counterbore in plate fits over raised splines. Plate should be flush with this end of hub (Fig. 293).**

(c) Install first clutch disc followed by a steel plate until all discs and plates have been installed.

(d) Install pressure plate. This is last clutch pack item to be installed. **Be sure plate is installed with shoulder side facing upward (Fig. 294).**

(19) Install clutch hub and clutch pack on direct clutch spring (Fig. 295). **Be sure hub is started on sun gear splines before proceeding.**

DISASSEMBLY AND ASSEMBLY (Continued)

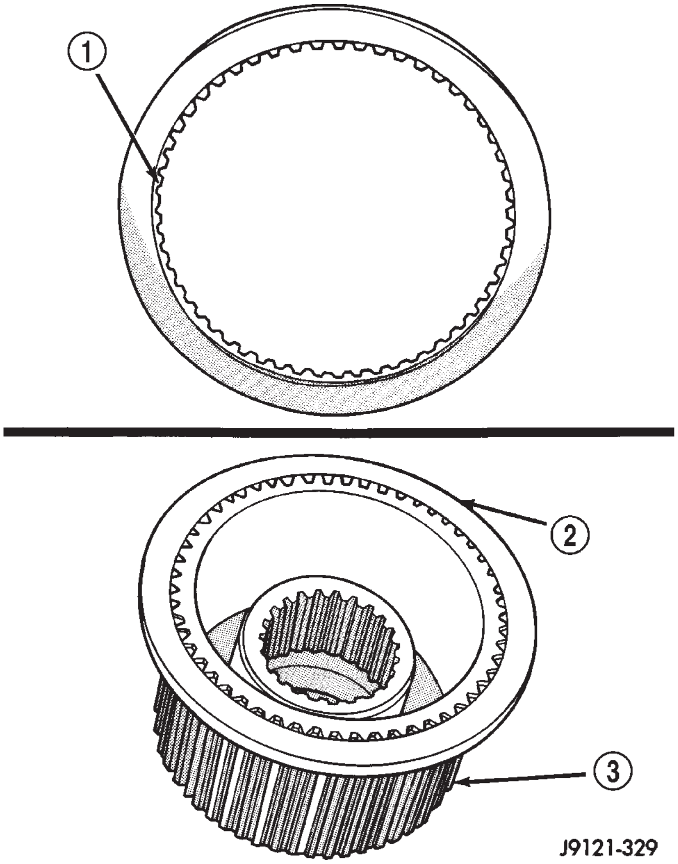


Fig. 293 Correct Position Of Direct Clutch Reaction Plate

1 – REACTION PLATE COUNTERBORE
2 – DIRECT CLUTCH REACTION PLATE (FLUSH WITH END OF HUB)
3 – CLUTCH HUB

WARNING: THE NEXT STEP IN GEARTRAIN ASSEMBLY INVOLVES COMPRESSING THE DIRECT CLUTCH HUB AND SPRING. IT IS EXTREMELY IMPORTANT THAT PROPER EQUIPMENT BE USED TO COMPRESS THE SPRING AS SPRING FORCE IS APPROXIMATELY 830 POUNDS. USE COMPRESSOR TOOL C-6227-1 AND A HYDRAULIC-TYPE SHOP PRESS WITH A MINIMUM RAM TRAVEL OF 6 INCHES. THE PRESS MUST ALSO HAVE A BED THAT CAN BE ADJUSTED UP OR DOWN AS REQUIRED. RELEASE CLUTCH SPRING TENSION SLOWLY AND COMPLETELY TO AVOID PERSONAL INJURY.

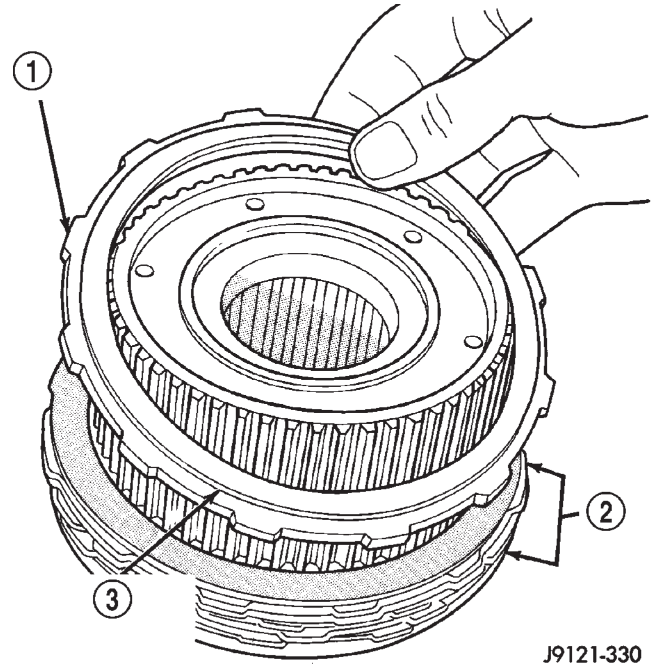


Fig. 294 Correct Position Of Direct Clutch Pressure Plate

1 – DIRECT CLUTCH PRESSURE PLATE
2 – CLUTCH PACK
3 – BE SURE SHOULDER SIDE OF PLATE FACES UPWARD

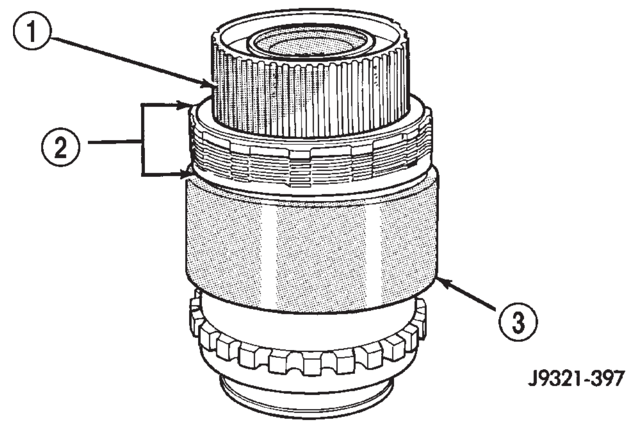


Fig. 295 Direct Clutch Pack And Clutch Hub Installation

1 – CLUTCH HUB
2 – DIRECT CLUTCH PACK
3 – CLUTCH DRUM

DISASSEMBLY AND ASSEMBLY (Continued)

(20) Position Compressor Tool 6227-1 on clutch hub.

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

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

(23) Realign clutch pack on hub and seat clutch discs and plates in clutch drum.

(24) Install direct clutch pack snap ring (Fig. 296). **Be very sure snap ring is fully seated in clutch drum ring groove.**

(25) Install clutch hub retaining ring (Fig. 297). **Be very sure retaining ring is fully seated in sun gear ring groove.**

(26) Slowly release press ram, remove compressor tools and remove geartrain assembly.

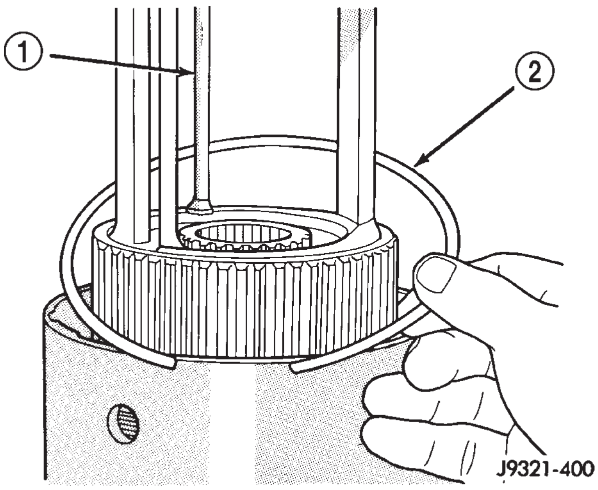


Fig. 296 Direct Clutch Pack Snap Ring Installation

1 – SPECIAL TOOL 6227–1
2 – DIRECT CLUTCH PACK SNAP RING

GEAR CASE ASSEMBLY

(1) Position park pawl and spring in case and install park pawl shaft. Verify that end of spring with 90° bend is hooked to pawl and straight end of spring is seated against case.

(2) Install pawl shaft retaining bolt. Tighten bolt to 27 N·m (20 ft. lbs.) torque.

(3) Install park lock reaction plug. **Note that plug has locating pin at rear (Fig. 298). Be sure pin is seated in hole in case before installing snap ring.**

(4) Install reaction plug snap-ring (Fig. 299). **Compress snap ring only enough for installation; do not distort it.**

(5) Install new seal in gear case. On 4x4 gear case, use Tool Handle C-4171 and Installer C-3860-A to seat seal in case. On 4 x 2 gear case, use same Handle C-4171 and Installer C-3995-A to seat seal in case.

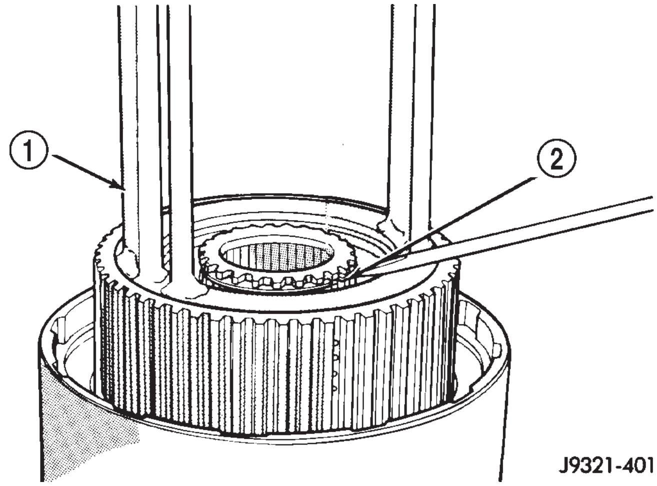


Fig. 297 Clutch Hub Retaining Ring Installation

1 – SPECIAL TOOL 6227–1
2 – CLUTCH HUB RETAINING RING

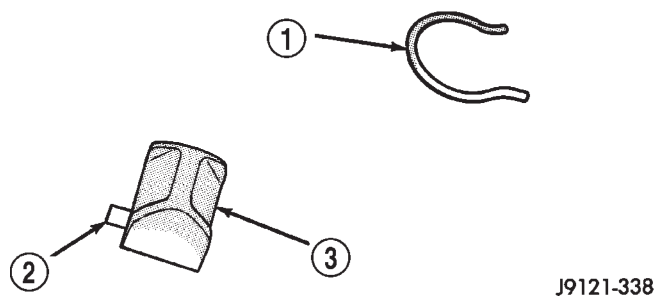


Fig. 298 Reaction Plug Locating Pin And Snap-Ring

1 – REACTION PLUG SNAP RING (DO NOT OVERCOMPRESS TO INSTALL)
2 – LOCATING PIN
3 – PARK LOCK REACTION PLUG

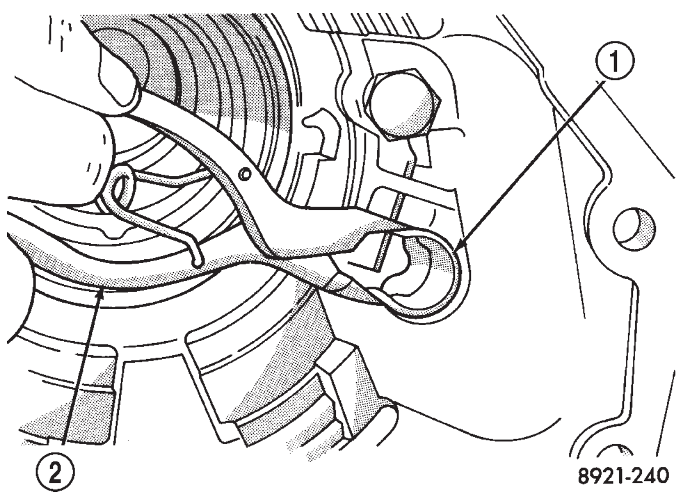


Fig. 299 Reaction Plug And Snap-Ring Installation

1 – REACTION PLUG SNAP RING
2 – SNAP RING PLIERS

DISASSEMBLY AND ASSEMBLY (Continued)

(6) Verify that tab ends of rear bearing locating ring extend into access hole in gear case (Fig. 300).

(7) Support geartrain on Tool 6227-1 (Fig. 301). Be sure tool is securely seated in clutch hub.

(8) Install overdrive gear case on geartrain (Fig. 301).

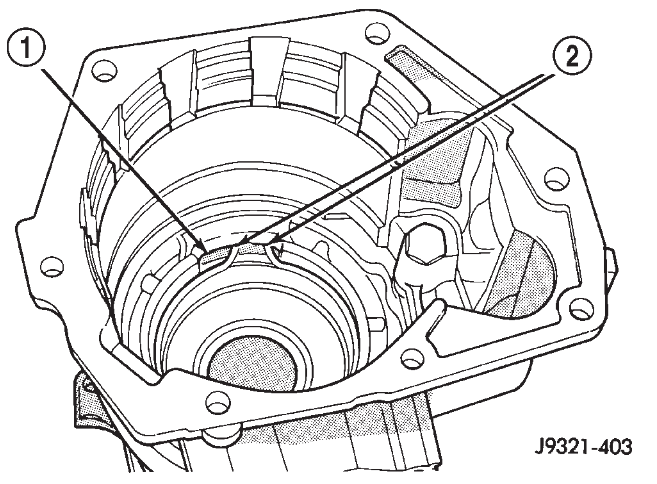


Fig. 300 Correct Rear Bearing Locating Ring Position

1 – CASE ACCESS HOLE
2 – TAB ENDS OF LOCATING RING

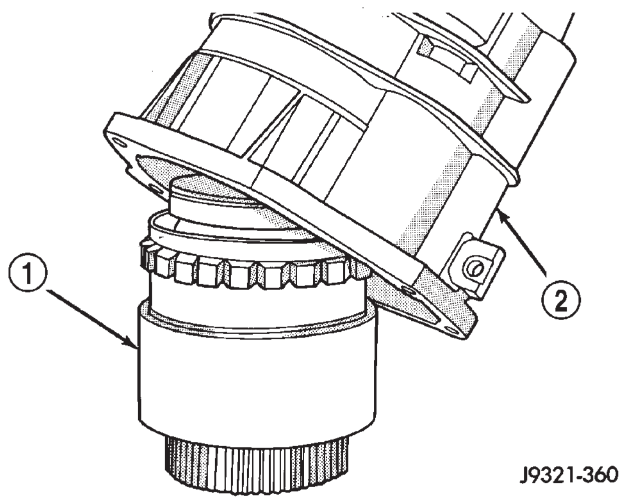


Fig. 301 Overdrive Gear Case Installation

1 – GEARTRAIN ASSEMBLY
2 – GEAR CASE

(9) Expand front bearing locating ring with snap ring pliers (Fig. 302). Then slide case downward until locating ring locks in bearing groove and release snap ring.

(10) Install locating ring access cover and gasket in overdrive unit case (Fig. 303).

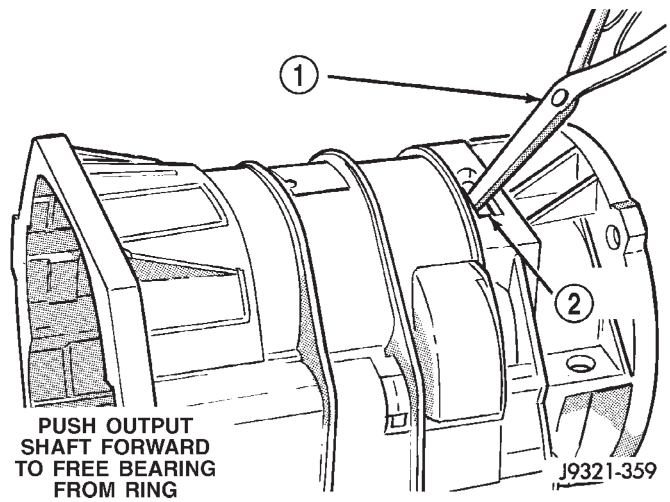


Fig. 302 Seating Locating Ring In Rear Bearing

1 – EXPAND BEARING LOCATING RING WITH SNAP RING PLIERS
2 – ACCESS HOLE

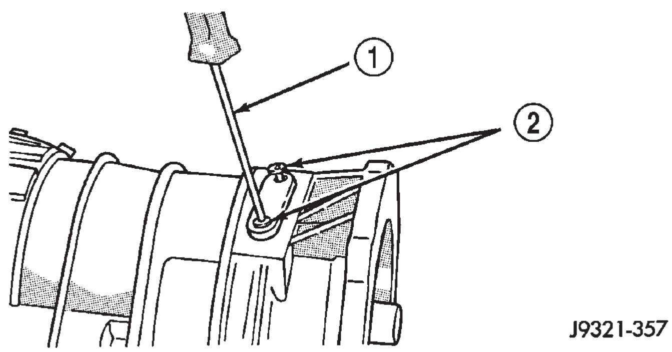


Fig. 303 Locating Ring Access Cover And Gasket Installation

1 – TORX SCREWDRIVER (T25)
2 – ACCESS COVER SCREWS

DISASSEMBLY AND ASSEMBLY (Continued)

OVERDRIVE CLUTCH ASSEMBLY

(1) Install overdrive clutch reaction ring first. Reaction ring is flat with notched ends (Fig. 304).

(2) Install wave spring on top of reaction ring (Fig. 305). **Reaction ring and wave ring both fit in same ring groove.** Use screwdriver to seat each ring securely in groove. Also ensure that the ends of the two rings are offset from each other.

NOTE: The 42RE transmission has 3 overdrive clutch discs and 2 plates.

(3) Assemble overdrive clutch pack (Fig. 306).

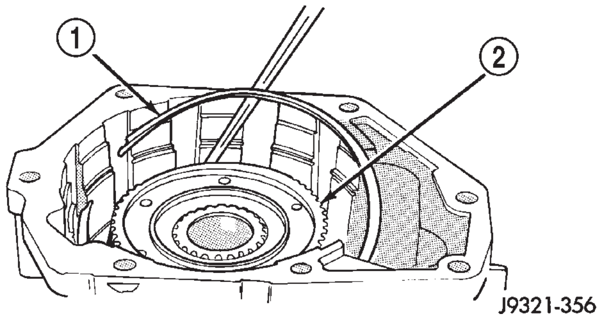


Fig. 304 Overdrive Clutch Reaction Ring Installation

1 – REACTION RING
2 – CLUTCH HUB

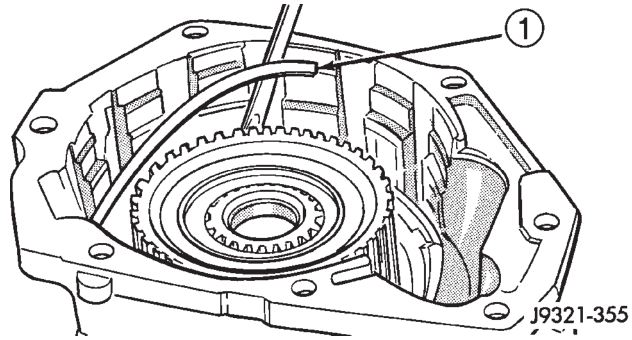


Fig. 305 Overdrive Clutch Wave Spring Installation

1 – WAVE SPRING

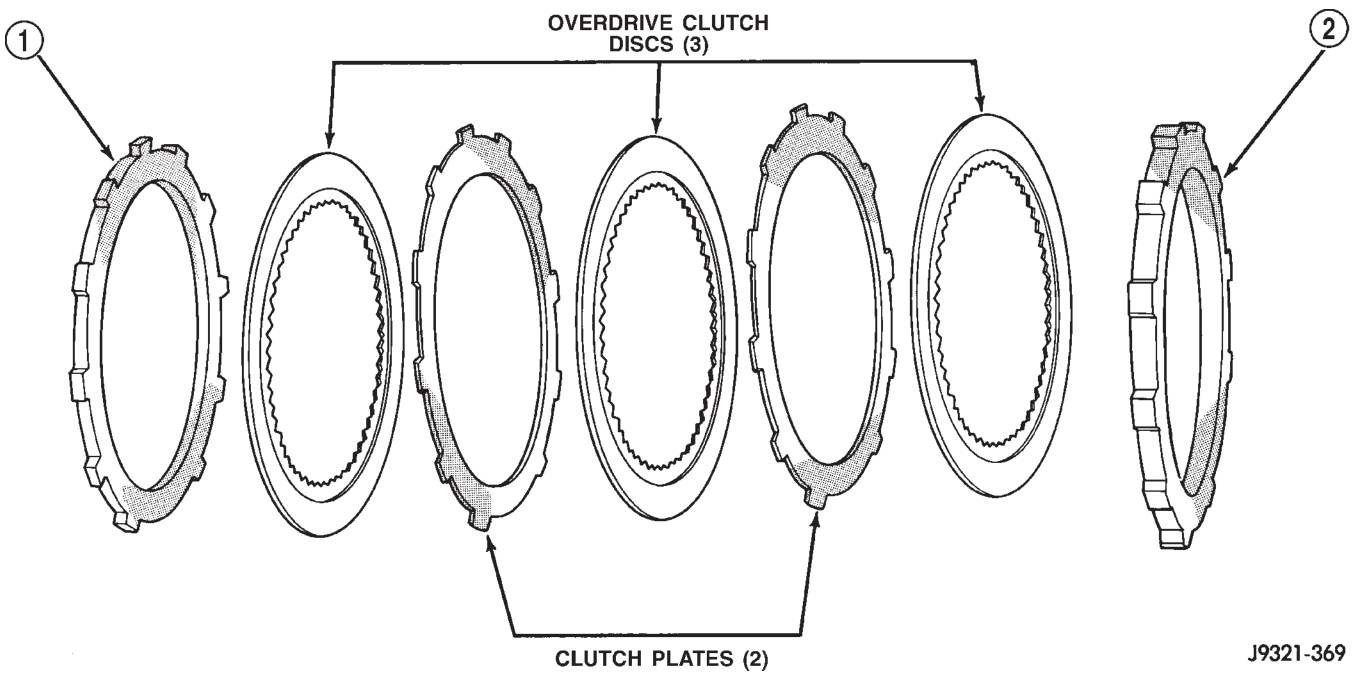


Fig. 306 42RE Overdrive Clutch Components

1 – REACTION PLATE
2 – PRESSURE PLATE

DISASSEMBLY AND ASSEMBLY (Continued)

(4) Install overdrive clutch reaction plate first.

(5) Install first clutch disc followed by first clutch plate. Then install remaining clutch discs and plates in same order.

(6) Install clutch pack pressure plate.

(7) Install clutch pack wire-type retaining ring (Fig. 307).

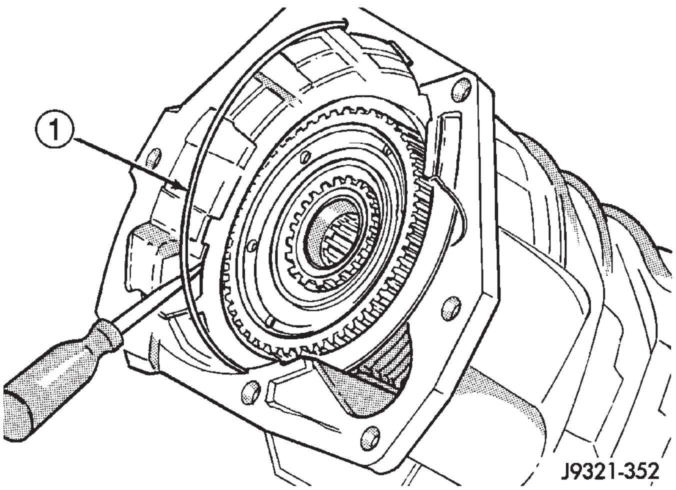


Fig. 307 Overdrive Clutch Pack Retaining Ring Installation

1 – OVERDRIVE CLUTCH PACK RETAINING RING

INTERMEDIATE SHAFT SPACER SELECTION

(1) Place overdrive unit in vertical position. Mount it on blocks, or in workbench with appropriate size mounting hole cut into it. Be sure unit is facing upward for access to direct clutch hub. Also be sure output shaft is not loaded and internal components are moved rearward for accurate measurement.

(2) Determine correct thickness intermediate shaft spacer as follows:

(a) Insert Special Tool 6312 through sun gear, planetary gear and into pilot bushing in output shaft. Be sure tool bottoms against planetary shoulder.

(b) Position Gauge Tool 6311 across face of overdrive case (Fig. 308). Then position Dial Caliper C-4962 over gauge tool.

(c) Extend sliding scale of dial caliper downward through gauge tool slot until scale contacts end of Gauge Alignment Tool 6312. Lock scale in place. Remove dial caliper tool and note distance measured (Fig. 308).

(d) Select proper thickness end play spacer from spacer chart based on distance measured (Fig. 309).

(e) Remove Gauge Alignment Tool 6312.

OD THRUST PLATE SELECTION

(1) Place overdrive unit in vertical position. Mount it on blocks, or in workbench with appropriate size mounting hole cut into it. Be sure unit is facing upward for access to direct clutch hub. Also be sure output shaft is not loaded and internal components are moved rearward for accurate measurement.

(2) Determine correct thickness overdrive piston thrust plate as follows:

(a) Position Gauge Tool 6311 across face of overdrive case. Then position Dial Caliper C-4962 over gauge tool (Fig. 310).

(b) Measure distance to clutch hub thrust bearing seat at four points 90° apart. Then average measurements by adding them and dividing by 4.

(c) Select and install required thrust plate from information in thrust plate chart (Fig. 311).

(3) Leave Alignment Tool 6227-2 in place. Tool will keep planetary and clutch hub splines in alignment until overdrive unit is ready for installation on transmission.

(4) Transmission speed sensor can be installed at this time if desired. However, it is recommended that sensor not be installed until after overdrive unit is secured to transmission.

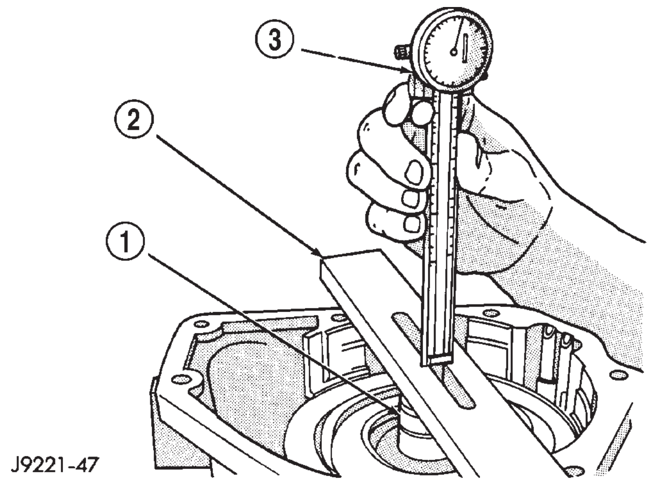


Fig. 308 Shaft End Play Measurement

1 – SPECIAL TOOL 6312
2 – SPECIAL TOOL 6311
3 – SPECIAL TOOL C-4962

End Play Measurement (Inches)	Spacer Thickness (Inches)
.7336 - .7505	.158 - .159
.7506 - .7675	.175 - .176
.7676 - .7855	.193 - .194
.7856 - .8011	.211 - .212

J9121-341

Fig. 309 Intermediate Shaft End Play Spacer Selection

DISASSEMBLY AND ASSEMBLY (Continued)

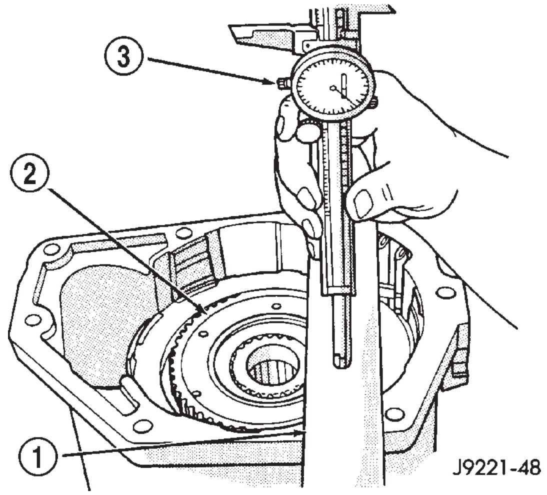


Fig. 310 Overdrive Piston Thrust Plate Measurement

1 – SPECIAL TOOL 6311
2 – DIRECT CLUTCH HUB THRUST BEARING SEAT
3 – SPECIAL TOOL C-4962

End Play Measurement (Inches)	Spacer Thickness (Inches)
1.7500 - 1.7649	.108 - .110
1.7650 - 1.7799	.123 - .125
1.7800 - 1.7949	.138 - .140
1.7950 - 1.8099	.153 - .155
1.8100 - 1.8249	.168 - .170
1.8250 - 1.8399	.183 - .185
1.8400 - 1.8549	.198 - .200
1.8550 - 1.8699	.213 - .215
1.8700 - 1.8849	.228 - .230
1.8850 - 1.8999	.243 - .245

J9121-342

Fig. 311 Overdrive Piston Thrust Plate Selection

OVERDRIVE PISTON ASSEMBLY

(1) Install new seals on over drive piston.

(2) Stand transmission case upright on bellhousing.

(3) Position Guide Ring 8114-1 on outer edge of overdrive piston retainer.

(4) Position Seal Guide 8114-2 on inner edge of overdrive piston retainer.

(5) Install overdrive piston in overdrive piston retainer by: aligning locating lugs on overdrive piston to the two mating holes in retainer.

(a) Aligning locating lugs on overdrive piston to the two mating holes in retainer.

(b) Lubricate overdrive piston seals with Mopar® Door Ease, or equivalent.

(c) Install piston over Seal Guide 8114–2 and inside Guide Ring 8114–1.

(d) Push overdrive piston into position in retainer.

(e) Verify that the locating lugs entered the lug bores in the retainer.

(6) Install intermediate shaft spacer on intermediate shaft.

(7) Install overdrive piston thrust plate on overdrive piston.

(8) Install overdrive piston thrust bearing on overdrive piston.

(9) Install transmission speed sensor and O-ring seal in overdrive case (Fig. 252).

CLEANING AND INSPECTION

VALVE BODY

Clean the valve housings, valves, plugs, springs, and separator plates with a standard parts cleaning solution only. Do not use gasoline, kerosene, or any type of caustic solution.

Do not immerse any of the electrical components in cleaning solution. Clean the governor solenoid and sensor and the dual solenoid and harness assembly by wiping them off with dry shop towels only.

Dry all except the electrical parts with compressed air. Make sure all passages are clean and free from obstructions. **Do not use rags or shop towels to dry or wipe off valve body components. Lint from these materials can stick to valve body parts, interfere with valve operation, and clog filters and fluid passages.**

Wipe the governor pressure sensor and solenoid valve with dry, lint free shop towels only. The O-rings on the sensor and solenoid valve are the only serviceable components. Be sure the vent ports in the solenoid valve are open and not blocked by dirt or debris. Replace the valve and/or sensor only when DRB scan tool diagnosis indicates this is necessary. Or, if either part has sustained physical damage (dented, deformed, broken, etc.).

CAUTION: Do not turn the small screw at the end of the solenoid valve for any reason. Turning the screw in either direction will ruin solenoid calibration and result in solenoid failure. In addition, the filter on the solenoid valve is NOT serviceable. Do not try to remove the filter as this will damage the valve housing.

Inspect the throttle and manual valve levers and shafts. Do not attempt to straighten a bent shaft or correct a loose lever. Replace these components if worn, bent, loose or damaged in any way.

Inspect all of the valve body mating surfaces for scratches, nicks, burrs, or distortion. Use a straightedge to check surface flatness. Minor scratches may be removed with crocus cloth using only very light pressure.

CLEANING AND INSPECTION (Continued)

Minor distortion of a valve body mating surface may be corrected by smoothing the surface with a sheet of crocus cloth. Position the crocus cloth on a surface plate, sheet of plate glass or equally flat surface. If distortion is severe or any surfaces are heavily scored, the valve body will have to be replaced.

CAUTION: Many of the valves and plugs, such as the throttle valve, shuttle valve plug, 1-2 shift valve and 1-2 governor plug, are made of coated aluminum. Aluminum components are identified by the dark color of the special coating applied to the surface (or by testing with a magnet). Do not sand aluminum valves or plugs under any circumstances. This practice could damage the special coating causing the valves/plugs to stick and bind.

Inspect the valves and plugs for scratches, burrs, nicks, or scores. Minor surface scratches on steel valves and plugs can be removed with crocus cloth but **do not round off the edges of the valve or plug lands.** Maintaining sharpness of these edges is vitally important. The edges prevent foreign matter from lodging between the valves and plugs and the bore.

Inspect all the valve and plug bores in the valve body. Use a penlight to view the bore interiors. Replace the valve body if any bores are distorted or scored. Inspect all of the valve body springs. The springs must be free of distortion, warpage or broken coils.

Check the two separator plates for distortion or damage of any kind. Inspect the upper housing, lower housing, 3-4 accumulator housing, and transfer plate carefully. Be sure all fluid passages are clean and clear. Check condition of the upper housing and transfer plate check balls as well. The check balls and ball seats must not be worn or damaged.

Trial fit each valve and plug in its bore to check freedom of operation. When clean and dry, the valves and plugs should drop freely into the bores.

Valve body bores do not change dimensionally with use. If the valve body functioned correctly when new, it will continue to operate properly after cleaning and inspection. It should not be necessary to replace a valve body assembly unless it is damaged in handling.

The only serviceable valve body components are listed below. The remaining valve body components are serviced only as part of a complete valve body assembly. Serviceable parts are:

- dual solenoid and harness assembly
- solenoid gasket
- solenoid case connector O-rings and shoulder bolt
- switch valve and spring
- pressure adjusting screw and bracket assembly
- throttle lever
- manual lever and shaft seal
- throttle lever shaft seal, washer, and E-clip
- fluid filter and screws
- detent ball and spring
- valve body screws
- governor pressure solenoid
- governor pressure sensor and retaining clip
- park lock rod and E-clip

TRANSMISSION

GENERAL INFORMATION

Inspect the transmission bushings during overhaul. Bushing condition is important as worn, scored bushings contribute to low pressures, clutch slip and accelerated wear of other components. However, do not replace bushings as a matter of course. Replace bushings only when they are actually worn, or scored.

Use recommended tools to replace bushings. The tools are sized and designed to remove, install, and seat bushings correctly. The bushing replacement tools are included in Bushing Tool Set C-3887-B.

Pre-sized service bushings are available for replacement purposes. Only the sun gear bushings are not serviced. Low cost of the sun gear assembly makes it easier to simply replace the gear and bushings as an assembly.

Heli-Coil inserts can be used to repair damaged, stripped or worn threads in aluminum parts. These inserts are available from most automotive parts suppliers. Stainless steel inserts are recommended.

The use of crocus cloth is permissible where necessary, providing it is used carefully. When used on shafts, or valves, use extreme care to avoid rounding off sharp edges. Sharp edges are vital as they prevent foreign matter from getting between the valve and valve bore.

Do not reuse oil seals, gaskets, seal rings, or O-rings during overhaul. Replace these parts as a matter of course. Also do not reuse snap rings or E-clips that are bent or distorted. Replace these parts as well.

Lubricate transmission parts with Mopar® ATF Plus 3, Type 7176, transmission fluid during overhaul and assembly. Use petroleum jelly, Mopar® Door Ease, or Ru-Glyde to prelubricate seals, O-rings, and thrust washers. Petroleum jelly can also be used to hold parts in place during reassembly.

TRANSMISSION CASE CLEANING AND INSPECTION

Clean the case in a solvent tank. Flush the case bores and fluid passages thoroughly with solvent.

CLEANING AND INSPECTION (Continued)

Dry the case and all fluid passages with compressed air. Be sure all solvent is removed from the case and that all fluid passages are clear.

NOTE: Do not use shop towels or rags to dry the case (or any other transmission component) unless they are made from lint-free materials. Lint will stick to case surfaces and transmission components and circulate throughout the transmission after assembly. A sufficient quantity of lint can block fluid passages and interfere with valve body operation.

Inspect the case for cracks, porous spots, worn bores, or damaged threads. Damaged threads can be repaired with Helicoil thread inserts. However, the case will have to be replaced if it exhibits any type of damage or wear.

Lubricate the front band adjusting screw threads with petroleum jelly and thread the screw part-way into the case. Be sure the screw turns freely.

OVERRUNNING CLUTCH/LOW-REVERSE DRUM/OVERDRIVE PISTON RETAINER

Clean the overrunning clutch assembly, clutch cam, low-reverse drum, and overdrive piston retainer in solvent. Dry them with compressed air after cleaning.

Inspect condition of each clutch part after cleaning. Replace the overrunning clutch roller and spring assembly if any rollers or springs are worn or damaged, or if the roller cage is distorted, or damaged. Replace the cam if worn, cracked or damaged.

Replace the low-reverse drum if the clutch race, roller surface or inside diameter is scored, worn or damaged. **Do not remove the clutch race from the low-reverse drum under any circumstances. Replace the drum and race as an assembly if either component is damaged.**

Examine the overdrive piston retainer carefully for wear, cracks, scoring or other damage. Be sure the retainer hub is a snug fit in the case and drum. Replace the retainer if worn or damaged.

ACCUMULATOR

Inspect the accumulator piston and seal rings (Fig. 312). Replace the seal rings if worn or cut. Replace the piston if chipped or cracked.

Check condition of the accumulator inner and outer springs (Fig. 312). Replace the springs if the coils are cracked, distorted or collapsed.

FRONT SERVO

Clean the servo piston components with solvent and dry them with compressed air. Wipe the band clean with lint free shop towels.

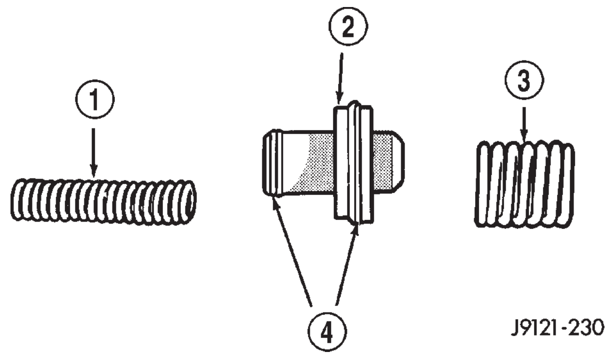


Fig. 312 Accumulator Components

1 – INNER SPRING
2 – ACCUMULATOR PISTON
3 – OUTER SPRING
4 – SEAL RINGS

Replace the front band if distorted, lining is burned, flaking off, or worn to the point where the grooves in the lining material are no longer visible.

Inspect the servo components. Replace the springs if collapsed, distorted or broken. Replace the guide, rod and piston if cracked, bent, or worn. Discard the servo snap ring if distorted or warped.

Check the servo piston bore for wear. If the bore is severely scored, or damaged, it will be necessary to replace the case.

Replace any servo component if doubt exists about condition. Do not reuse suspect parts.

REAR SERVO

Remove and discard the servo piston seal ring (Fig. 313). Then clean the servo components with solvent and dry with compressed air. Replace either spring if collapsed, distorted or broken. Replace the plug and piston if cracked, bent, or worn. Discard the servo snap rings and use a new ones at assembly.

OIL PUMP AND REACTION SHAFT SUPPORT

(1) Clean pump and support components with solvent and dry them with compressed air.

(2) Check condition of the seal rings and thrust washer on the reaction shaft support. The seal rings do not need to be replaced unless cracked, broken, or severely worn.

(3) Inspect the pump and support components. Replace the pump or support if the seal ring grooves or machined surfaces are worn, scored, pitted, or damaged. Replace the pump gears if pitted, worn chipped, or damaged.

(4) Inspect the pump bushing. Then check the reaction shaft support bushing. Replace either bushing only if heavily worn, scored or damaged. It is not necessary to replace the bushings unless they are actually damaged.

CLEANING AND INSPECTION (Continued)

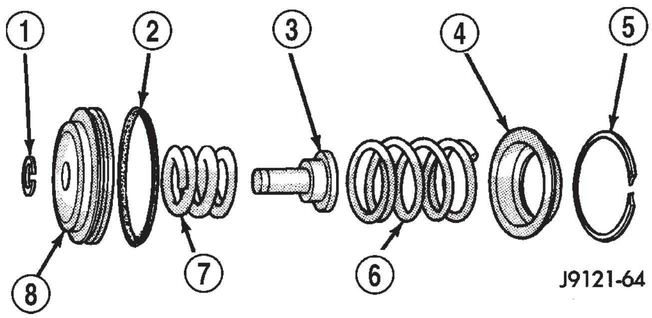


Fig. 313 Rear Servo Components

1 – SNAP RING
2 – PISTON SEAL
3 – PISTON PLUG
4 – SPRING RETAINER
5 – SNAP RING
6 – PISTON SPRING
7 – CUSHION SPRING
8 – PISTON

(5) Install the gears in the pump body and measure pump component clearances as follows:

(a) Clearance between outer gear and reaction shaft housing should be 0.010 to 0.063 mm (0.0004 to 0.0025 in.). Clearance between inner gear and reaction shaft housing should be 0.010 to 0.063 mm (0.0004 to 0.0025 in.). Both clearances can be measured at the same time by:

(I) Installing the pump gears in the pump housing.

(II) Position an appropriate piece of Plastigage™ across both gears.

(III) Align the plastigage to a flat area on the reaction shaft housing.

(IV) Install the reaction shaft to the pump housing.

(V) Separate the reaction shaft housing from the pump housing and measure the Plastigage™ following the instructions supplied with it.

(b) Clearance between inner gear tooth and outer gear should be 0.08 to 0.19 mm (0.0035 to 0.0075 in.). Measure clearance with an appropriate feeler gauge.

(c) Clearance between outer gear and pump housing should also be 0.010 to 0.19 mm (0.0035 to 0.0075 in.). Measure clearance with an appropriate feeler gauge.

FRONT CLUTCH

Clean and inspect the front clutch components. Replace the clutch discs if warped, worn, scored, burned or charred, or if the facing is flaking off. Replace the steel plates if heavily scored, warped, or broken. Be sure the driving lugs on the plates are in good condition. The lugs must not be bent, cracked or damaged in any way.

Replace the clutch spring and spring retainer if either is distorted, warped or broken.

Check the lug grooves in the clutch retainer. The steel plates should slide freely in the slots. Replace the retainer if the grooves are worn or damaged.

Check action of the check ball in the retainer (Fig. 314). The ball must move freely and not stick.

NOTE: Inspect the clutch retainer bushings carefully (Fig. 315). The retainer bushings are NOT serviceable. It will be necessary to replace the retainer if either bushing is scored, or worn.

Inspect the piston and retainer seal surfaces for nicks or scratches. Minor scratches can be removed with crocus cloth. However, replace the piston and/or retainer if the seal surfaces are seriously scored.

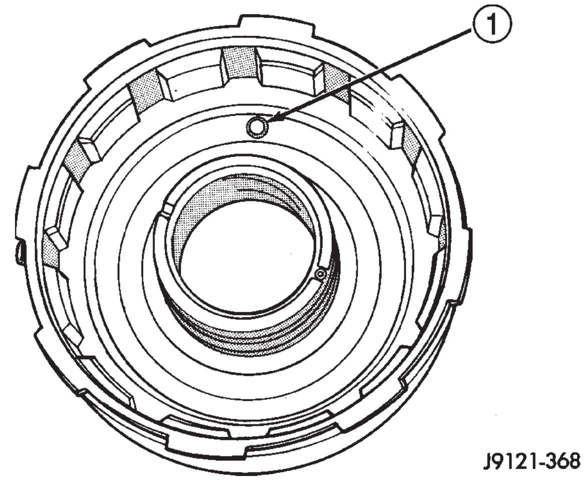


Fig. 314 Front Clutch Piston Retainer Check Ball Location

1 – RETAINER CHECK BALL

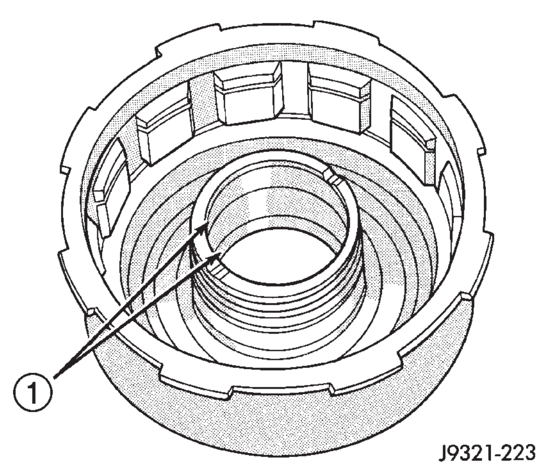


Fig. 315 Retainer Bushing Location/Inspection

1 – FRONT CLUTCH RETAINER BUSHINGS (NON-SERVICEABLE)

CLEANING AND INSPECTION (Continued)

REAR CLUTCH

Clean the clutch components with solvent and dry them with compressed air. Do not use rags or shop towels to dry any of the clutch parts. Lint from such materials will adhere to component surfaces and could restrict or block fluid passages after assembly.

Replace the clutch discs if warped, worn, scored, burned/charred, the lugs are damaged, or if the facing is flaking off. Replace the top and bottom pressure plates if scored, warped, or cracked. Be sure the driving lugs on the pressure and clutch plates are also in good condition. The lugs must not be bent, cracked or damaged in any way.

Replace the piston spring and wave spring if either part is distorted, warped or broken.

Check the lug grooves in the clutch retainer. The clutch and pressure plates should slide freely in the slots. Replace the retainer if the grooves are worn or damaged. Also check action of the check balls in the retainer and piston. Each check ball must move freely and not stick.

Replace the retainer bushing if worn, scored, or doubt exists about bushing condition.

Inspect the piston and retainer seal surfaces for nicks or scratches. Minor scratches can be removed with crocus cloth. However, replace the piston and/or retainer if the seal surfaces are seriously scored.

Check condition of the fiber thrust washer and metal output shaft thrust washer. Replace either washer if worn or damaged.

Check condition of the seal rings on the input shaft and clutch retainer hub. Replace the seal rings only if worn, distorted, or damaged. The input shaft front seal ring is teflon with chamfered ends. The rear ring is metal with interlocking ends.

Check the input shaft for wear, or damage. Replace the shaft if worn, scored or damaged in any way.

PLANETARY GEARTRAIN

Clean the planetary components in solvent and dry them with compressed air.

Check sun gear and driving shell condition. Replace the gear if damaged or if the bushings are scored or worn. The bushings are not serviceable. Replace the driving shell if worn, cracked or damaged.

Replace planetary gear sets if gears, pinion pins, or carrier are damaged in any way. Replace the annulus gears and supports if either component is worn or damaged.

Inspect the geartrain spacers, thrust plates, snap rings, and thrust washers. Replace any of these parts that are worn, distorted or damaged. Do not attempt to reuse these parts.

The planetary gear thrust washers are different sizes. The large diameter washers go on the front planetary and the smaller washers go on the rear planetary. All the washers have four locating tabs on them. These tabs fit in the holes or slots provided in each planetary gear.

Inspect the output shaft carefully. Pay particular attention to the machined bushing/bearing surfaces on the shaft and the governor valve shaft bore at the shaft rear.

Replace the output shaft if the machined surfaces are scored, pitted, or damaged in any way. Also replace the shaft if the splines are damaged, or exhibits cracks at any location (especially at the governor valve shaft bore).

The annulus gears can be removed from their supports if necessary. Just remove the snap rings and separate the two parts when replacement is necessary. In addition, the annulus gear bushings can be replaced if severely worn, or scored. However it is not necessary to replace the bushings if they only exhibit normal wear. Check bushing fit on the output shaft to be sure.

OVERDRIVE UNIT

Clean the geartrain and case components with solvent. Dry all parts except the bearings with compressed air. Allow bearings to air dry.

Do not use shop towels for wiping parts dry unless the towels are made from a lint-free material. A sufficient quantity of lint (from shop towels, cloths, rags, etc.) could plug the transmission filter and fluid passages.

Discard the old case gasket and seals. Do not attempt to salvage these parts. They are not reusable. Replace any of the overdrive unit snap rings if distorted or damaged.

Minor nicks or scratches on components can be smoothed with crocus cloth. However, do not attempt to reduce severe scoring on any components with abrasive materials. Replace severely scored components; do not try to salvage them.

Check condition of the park lock components and the overdrive case.

Replace the case if cracked, scored, or damaged. Replace the park lock pawl, plug, or spring if worn or damaged. Be sure the bullet at the end of the park lock rod is in good condition. Replace the rod if the bullet is worn or the rod itself is bent or distorted. Do not attempt to straighten the rod.

Check the bushings in the overdrive case. Replace the bushings if severely scored or worn. Also replace the case seal if loose, distorted, or damaged.

Examine the overdrive and direct clutch discs and plates. Replace the discs if the facing is worn, severely scored, or burned and flaking off. Replace the clutch plates if worn, heavily scored, or cracked. Check the lugs on the clutch plates for wear. The

CLEANING AND INSPECTION (Continued)

plates should slide freely in the drum. Replace the plates or drum if binding occurs.

Check condition of the annulus gear, direct clutch hub, clutch drum and clutch spring. Replace the gear, hub and drum if worn or damaged. Replace the spring if collapsed, distorted, or cracked.

Be sure the splines and lugs on the gear, drum and hub are in good condition. The clutch plates and discs should slide freely in these components.

Inspect the thrust bearings and spring plate. Replace the plate if worn or scored. Replace the bearings if rough, noisy, brinnelled, or worn.

Inspect the planetary gear assembly and the sun gear and bushings. If either the sun gear or the bushings are damaged, replace the gear and bushings as an assembly. The gear and bushings are not serviced separately.

The planetary carrier and pinions must be in good condition. Also be sure the pinion pins are secure and in good condition. Replace the carrier if worn or damaged.

Inspect the overrunning clutch and race. The race surface should be smooth and free of scores. Replace the overrunning clutch assembly or the race if either assembly is worn or damaged in any way.

Inspect the output shaft and governor components. Replace the shaft pilot bushing and inner bushing if damaged. Replace either shaft bearing if rough or noisy. Replace the bearing snap rings if distorted or cracked.

Check the machined surfaces on the output shaft. These surfaces should clean and smooth. Very minor nicks or scratches can be smoothed with crocus cloth. Replace the shaft if worn, scored or damaged in any way.

Inspect the output shaft bushings. The small bushing is the intermediate shaft pilot bushing. The large bushing is the overrunning clutch hub bushing. Replace either bushing if scored, pitted, cracked, or worn.

ADJUSTMENTS

BRAKE TRANSMISSION SHIFT INTERLOCK

The park interlock cable is part of the brake/shift lever interlock system. Correct cable adjustment is important to proper interlock operation. The gear shift and park lock cables must both be correctly adjusted in order to shift out of Park.

Park Interlock Cable Adjustment Procedure

(1) Shift the transmission into the PARK position.

(2) Turn ignition switch to LOCK position. **Be sure ignition key cylinder is in the LOCK position. Cable will not adjust correctly in any other position.**

(3) Remove shift lever bezel and floor console as necessary for access to the brake transmission shift interlock cable.

(4) Pull cable lock button up to release cable (Fig. 316).

(5) Pull cable rearward. Then release cable and press lock button down until it snaps in place.

BTSI FUNCTION CHECK

(1) Verify removal of ignition key allowed in park position only.

(2) When the shift lever is in park, and the shift handle push-button is in the out position, the ignition key cylinder should rotate freely from off to lock. When the shifter is in any other position, the ignition key should not rotate from off to lock.

(3) Shifting out of park should be possible when the ignition key cylinder is in the off position.

(4) Shifting out of park should not be possible while applying 25 lb. max. handle push-button force, and ignition key cylinder is in the run or start positions, unless the foot brake pedal is depressed approximately 1/2 inch (12 mm).

(5) Shifting out of park should not be possible when the ignition key cylinder is in the accessory or lock position.

(6) Shifting between any gears neutral or park may be done without depressing foot brake with ignition switch in run or start positions and vehicle stationary or in motion.

(7) The floor shifter lever and gate positions should be in alignment with all transmission detent positions.

(8) Engine starts must be possible with shifter lever in park or neutral gate positions only. Engine starts must not be possible in any other gate positions other than park or neutral.

(9) With shifter lever handle push-button not depressed and lever detent in:

- PARK POSITION- apply forward force on center of handle and remove pressure. Engine start must be possible.
- PARK POSITION- apply rearward force on center of handle and remove pressure. Engine start must be possible.
- NEUTRAL POSITION- engine start must be possible.
- NEUTRAL POSITION, ENGINE RUNNING AND BRAKES APPLIED- Apply forward force on center of shift handle. Transmission should not be able to shift into reverse detent.

TRANSMISSION THROTTLE VALVE CABLE ADJUSTMENT

The transmission throttle valve is operated by a cam on the throttle lever. The throttle lever is oper-

ADJUSTMENTS (Continued)

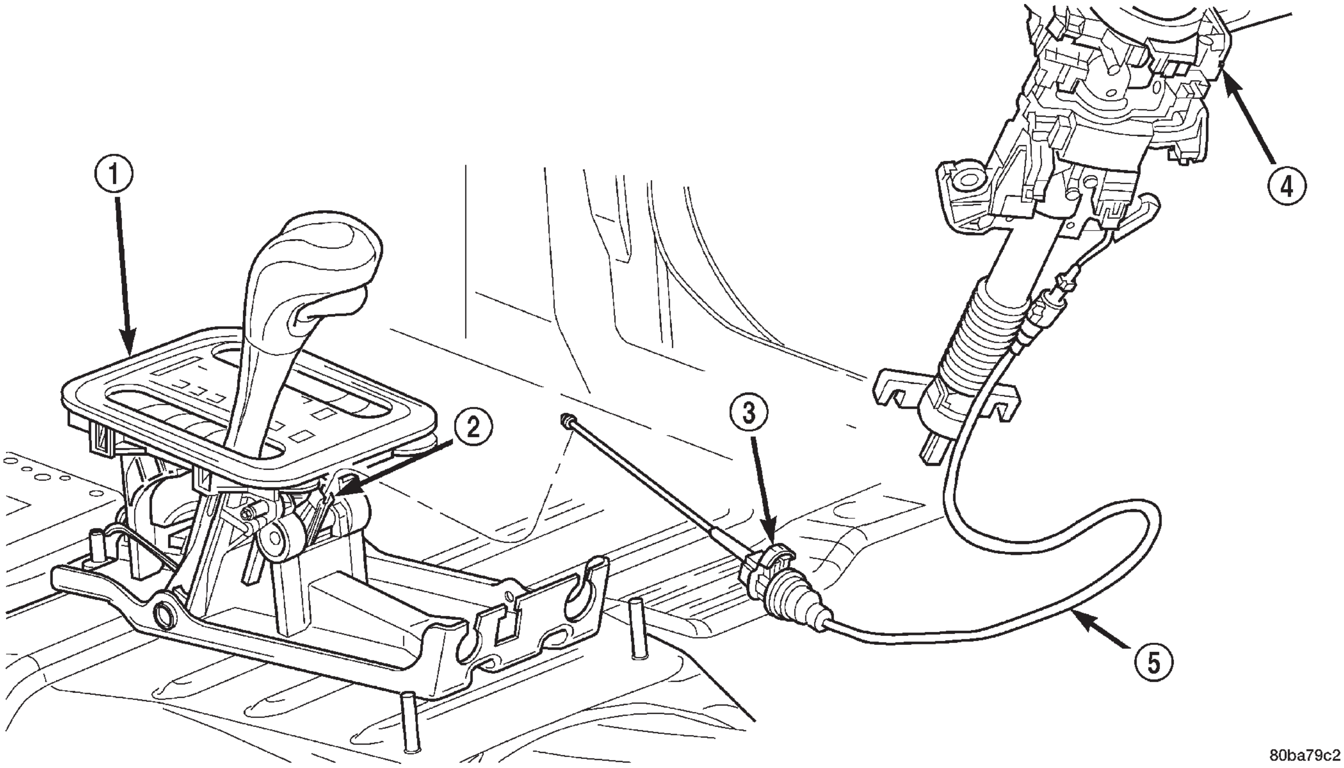


Fig. 316 Brake Transmission Shift Interlock Cable

1 – SHIFT MECHANISM
2 – SHIFTER BTSI LEVER
3 – ADJUSTMENT CLIP
4 – STEERING COLUMN ASSEMBLY
5 – INTERLOCK CABLE

ated by an adjustable cable (Fig. 317). The cable is attached to an arm mounted on the throttle lever shaft. A retaining clip at the engine-end of the cable is removed to provide for cable adjustment. The retaining clip is then installed back onto the throttle valve cable to lock in the adjustment.

A correctly adjusted throttle valve cable will cause the throttle lever on the transmission to move simultaneously with the throttle body lever from the idle position. Proper adjustment will allow simultaneous movement without causing the transmission throttle lever to either move ahead of, or lag behind the lever on the throttle body.

Checking Throttle Valve Cable Adjustment

(1) Turn ignition key to OFF position.

(2) Remove air cleaner.

(3) Verify that lever on throttle body is at curb idle position. Then verify that transmission throttle lever (Fig. 317) is also at idle (fully forward) position.

(4) Slide cable off attachment stud on throttle body lever.

(5) Compare position of cable end to attachment stud on throttle body lever:

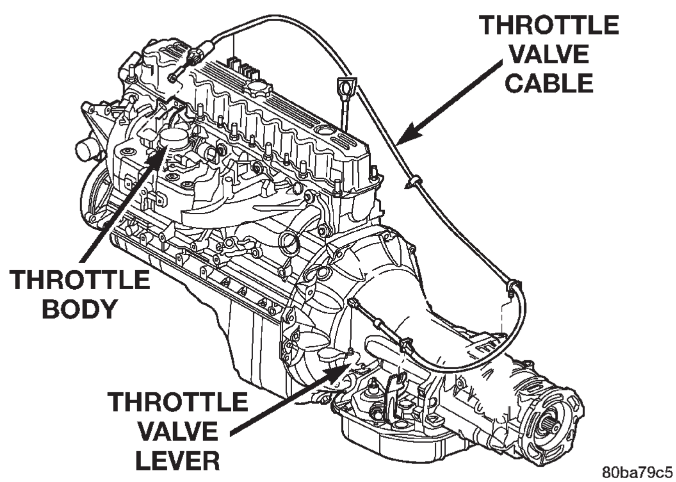


Fig. 317 Throttle Valve Cable

- Cable end and attachment stud should be aligned (or centered on one another) to within 1 mm (0.039 in.) in either direction.
- If cable end and attachment stud are misaligned (off center), cable will have to be adjusted as described in Throttle Valve Cable Adjustment procedure.

ADJUSTMENTS (Continued)

(6) Reconnect cable end to attachment stud. Then with aid of a helper, observe movement of transmission throttle lever and lever on throttle body.

- If both levers move simultaneously from idle to half-throttle and back to idle position, adjustment is correct.
- If transmission throttle lever moves ahead of, or lags behind throttle body lever, cable adjustment will be necessary. Or, if throttle body lever prevents transmission lever from returning to closed position, cable adjustment will be necessary.

Throttle Valve Cable Adjustment Procedure

(1) Turn ignition switch to OFF position.
(2) Remove air cleaner if necessary.
(3) Disconnect cable end from attachment stud. **Carefully slide cable off stud. Do not pry or pull cable off.**
(4) Verify that transmission throttle lever is in fully closed position. Then be sure lever on throttle body is at curb idle position.
(5) Insert a small screwdriver under edge of retaining clip and remove retaining clip.
(6) Center cable end on attachment stud to within 1 mm (0.039 in.).

NOTE: Be sure that as the cable is pulled forward and centered on the throttle lever stud, the cable housing moves smoothly with the cable. Due to the angle at which the cable housing enters the spring housing, the cable housing may bind slightly and create an incorrect adjustment.

(7) Install retaining clip onto cable housing.
(8) Check cable adjustment. Verify transmission throttle lever and lever on throttle body move simultaneously.

GEARSHIFT CABLE

Check adjustment by starting the engine in Park and Neutral. Adjustment is OK if the engine starts only in these positions. Adjustment is incorrect if the engine starts in one but not both positions. If the engine starts in any position other than Park or Neutral, or if the engine will not start at all, the park/neutral position switch or TRS may be faulty.

Gearshift Adjustment Procedure

(1) Shift transmission into Park.
(2) Remove shift lever bezel and floor console as necessary for access to the shift cable adjustment.
(3) Loosen the shift cable adjustment screw (Fig. 318).
(4) Raise vehicle.

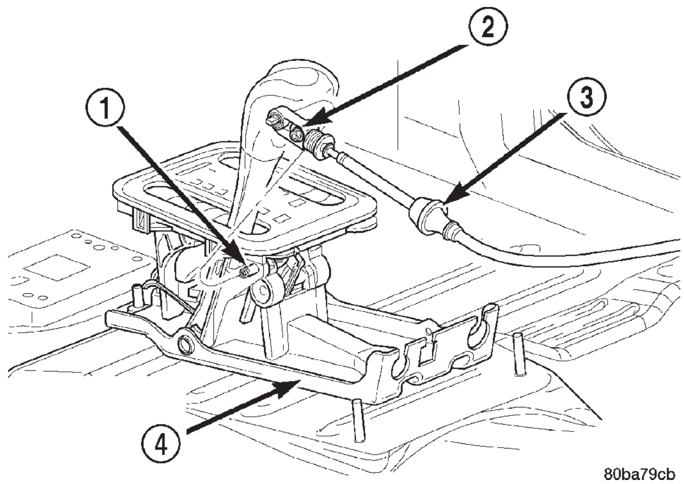


Fig. 318 Shift Cable at the Shifter

1 – SHIFT LEVER PIN
2 – ADJUSTMENT SCREW
3 – SHIFT CABLE
4 – SHIFTER ASSEMBLY BRACKET

(5) Unsnap cable eyelet from transmission shift lever (Fig. 319).
(6) Verify transmission shift lever is in Park detent by moving lever fully rearward. Last rearward detent is Park position.
(7) Verify positive engagement of transmission park lock by attempting to rotate propeller shaft. Shaft will not rotate when park lock is engaged.
(8) Snap cable eyelet onto transmission shift lever.
(9) Lower vehicle
(10) Tighten the shift cable adjustment screw to 7 N·m (65 in. lbs.).
(11) Verify correct operation.
(12) Install the shifter bezel and any floor console components removed for access.

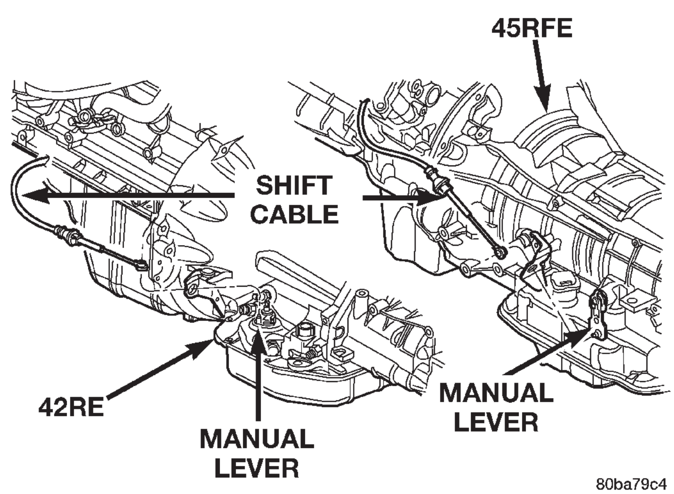


Fig. 319 Shift Cable Attachment At Transmission

ADJUSTMENTS (Continued)

BAND ADJUSTMENTS

FRONT BAND ADJUSTMENT

The front (kickdown) band adjusting screw is located on the left side of the transmission case above the manual valve and throttle valve levers.

(1) Raise vehicle.

(2) Loosen band adjusting screw locknut (Fig. 320). Then back locknut off 3-5 turns. Be sure adjusting screw turns freely in case. Apply lubricant to screw threads if necessary.

(3) Tighten band adjusting screw to 8 N·m (72 in. lbs.) torque with Inch Pound Torque Wrench C-3380-A, a 3-in. extension and appropriate Torx™ socket.

CAUTION: If Adapter C-3705 is needed to reach the adjusting screw, tighten the screw to only 5 N·m (47-50 in. lbs.) torque.

(4) Back off front band adjusting screw 3 turns.

(5) Hold adjuster screw in position and tighten locknut to 41 N·m (30 ft. lbs.) torque.

(6) Lower vehicle.

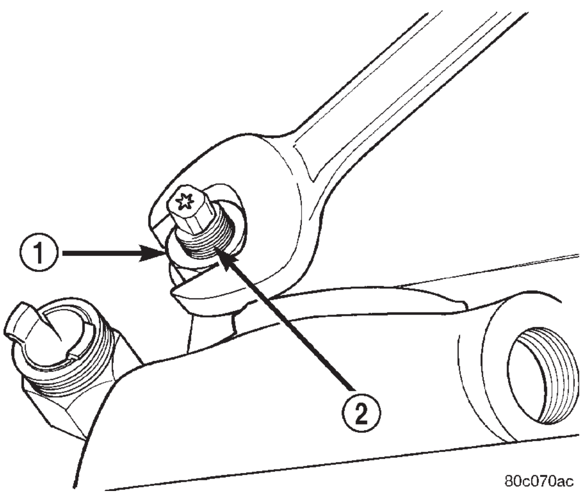


Fig. 320 Front Band Adjustment Screw Location

1 – LOCK-NUT
2 – FRONT BAND ADJUSTER

REAR BAND ADJUSTMENT

The transmission oil pan must be removed for access to the rear band adjusting screw.

(1) Raise vehicle.

(2) Remove transmission oil pan and drain fluid.

(3) Loosen band adjusting screw locknut 5-6 turns (Fig. 321). Be sure adjusting screw turns freely in lever.

(4) Tighten adjusting screw to 8 N·m (72 in. lbs.) torque.

(5) Back off adjusting screw 4 turns.

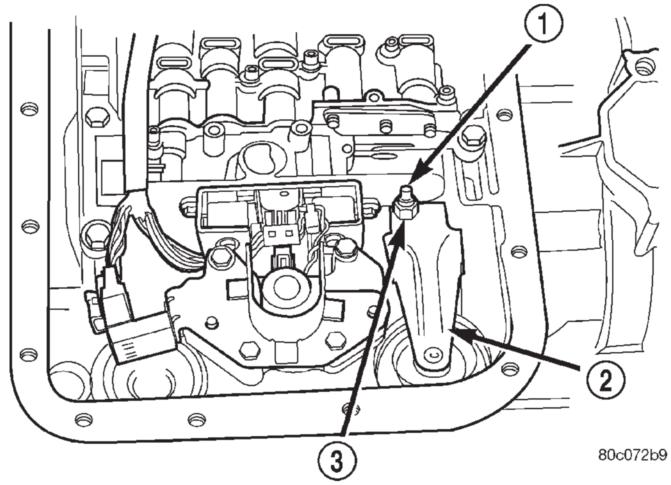


Fig. 321 Rear Band Adjusting Screw Location

1 – ADJUSTING SCREW
2 – REAR BAND LEVER
3 – LOCKNUT

(6) Hold adjusting screw in place and tighten locknut to 34 N·m (25 ft. lbs.) torque.

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

(8) Lower vehicle and refill transmission with Mopar® ATF Plus 3, Type 7176 fluid.

VALVE BODY

CONTROL PRESSURE ADJUSTMENTS

There are two control pressure adjustments on the valve body;

- Line Pressure
- Throttle Pressure

Line and throttle pressures are interdependent because each affects shift quality and timing. As a result, both adjustments must be performed properly and in the correct sequence. Adjust line pressure first and throttle pressure last.

LINE PRESSURE ADJUSTMENT

Measure distance from the valve body to the inner edge of the adjusting screw with an accurate steel scale (Fig. 322).

Distance should be 33.4 mm (1-5/16 in.).

If adjustment is required, turn the adjusting screw in, or out, to obtain required distance setting.

NOTE: The 33.4 mm (1-5/16 in.) setting is an approximate setting. Manufacturing tolerances may make it necessary to vary from this dimension to obtain desired pressure.

One complete turn of the adjusting screw changes line pressure approximately 1-2/3 psi (9 kPa).

ADJUSTMENTS (Continued)

Turning the adjusting screw counterclockwise increases pressure while turning the screw clockwise decreases pressure.

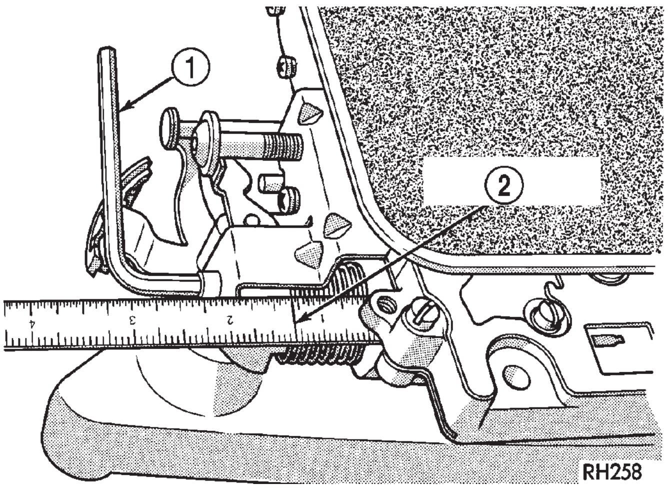


Fig. 322 Line Pressure Adjustment

1 – WRENCH
2 – 1–5/16 INCH

THROTTLE PRESSURE ADJUSTMENT

Insert Gauge Tool C-3763 between the throttle lever cam and the kickdown valve stem (Fig. 323).

Push the gauge tool inward to compress the kickdown valve against the spring and bottom the throttle valve.

Maintain pressure against kickdown valve spring. Turn throttle lever stop screw until the screw head touches throttle lever tang and the throttle lever cam touches gauge tool.

NOTE: The kickdown valve spring must be fully compressed and the kickdown valve completely bottomed to obtain correct adjustment.

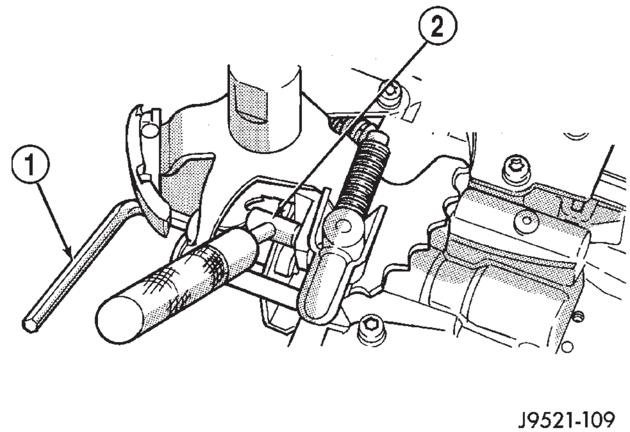
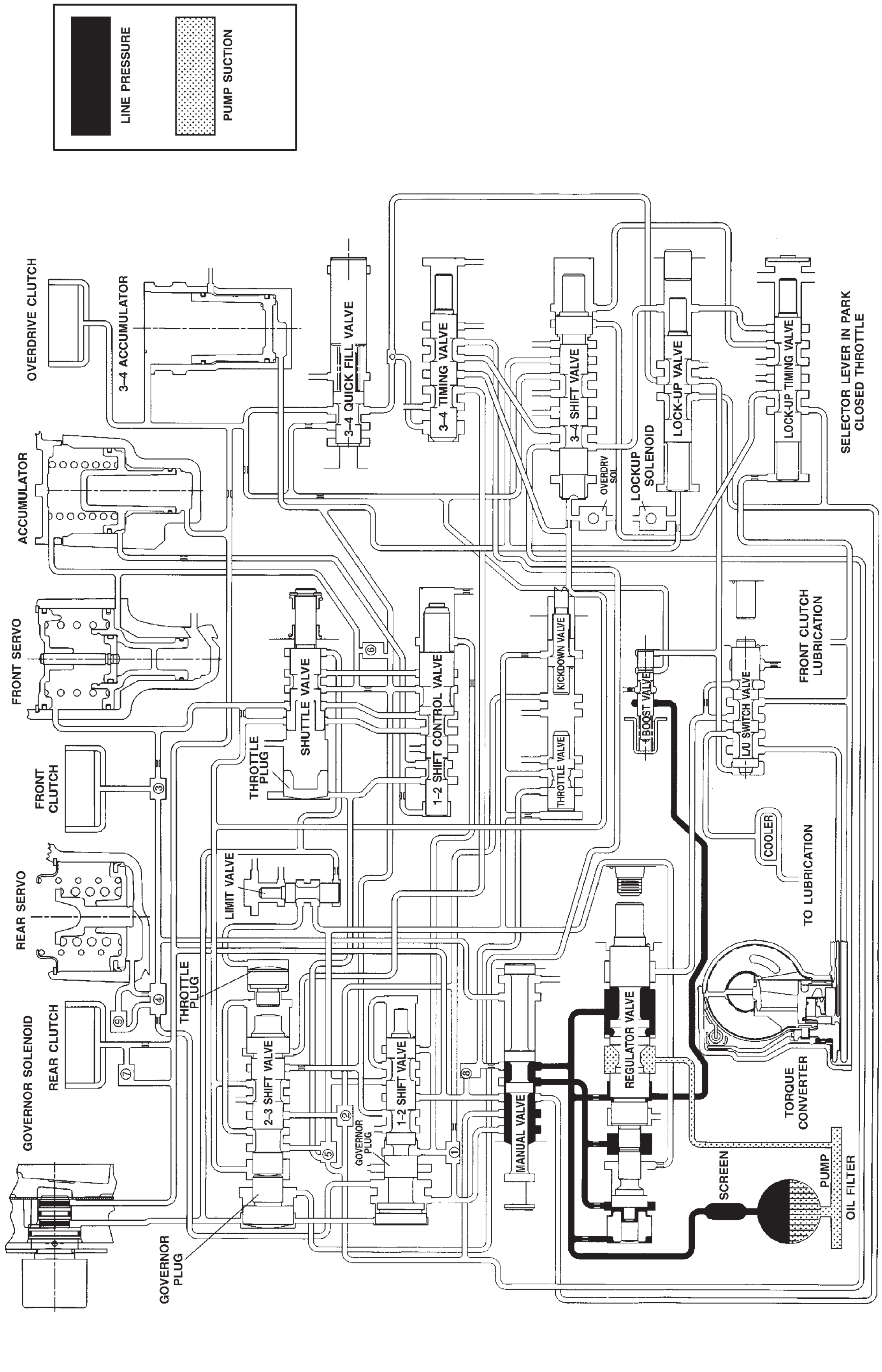


Fig. 323 Throttle Pressure Adjustment

1 – HEX WRENCH (IN THROTTLE LEVER ADJUSTING SCREW)
2 – SPECIAL TOOL C-3763 (POSITIONED BETWEEN THROTTLE LEVER AND KICKDOWN VALVE)

SCHEMATICS AND DIAGRAMS

HYDRAULIC SCHEMATICS



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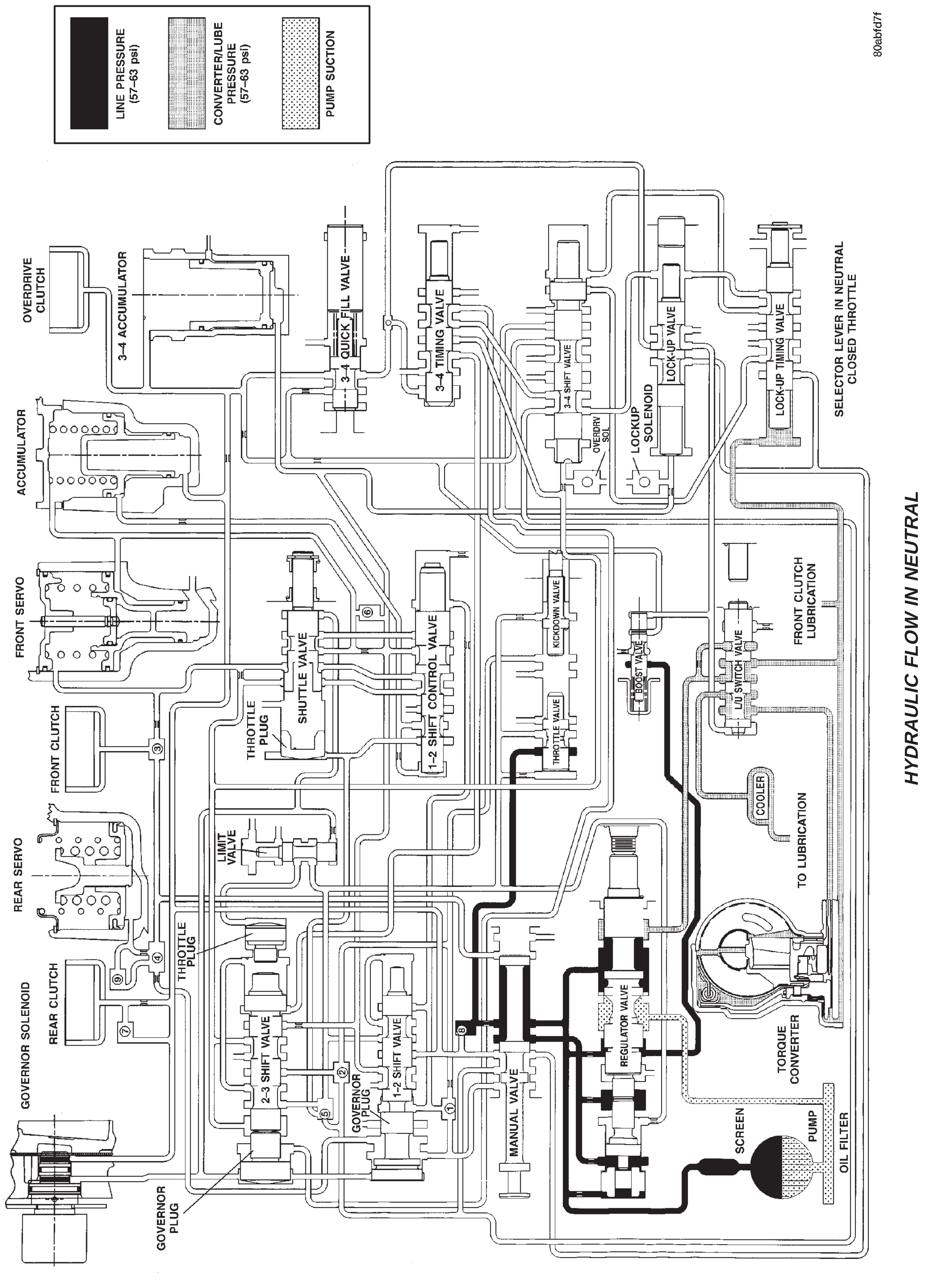
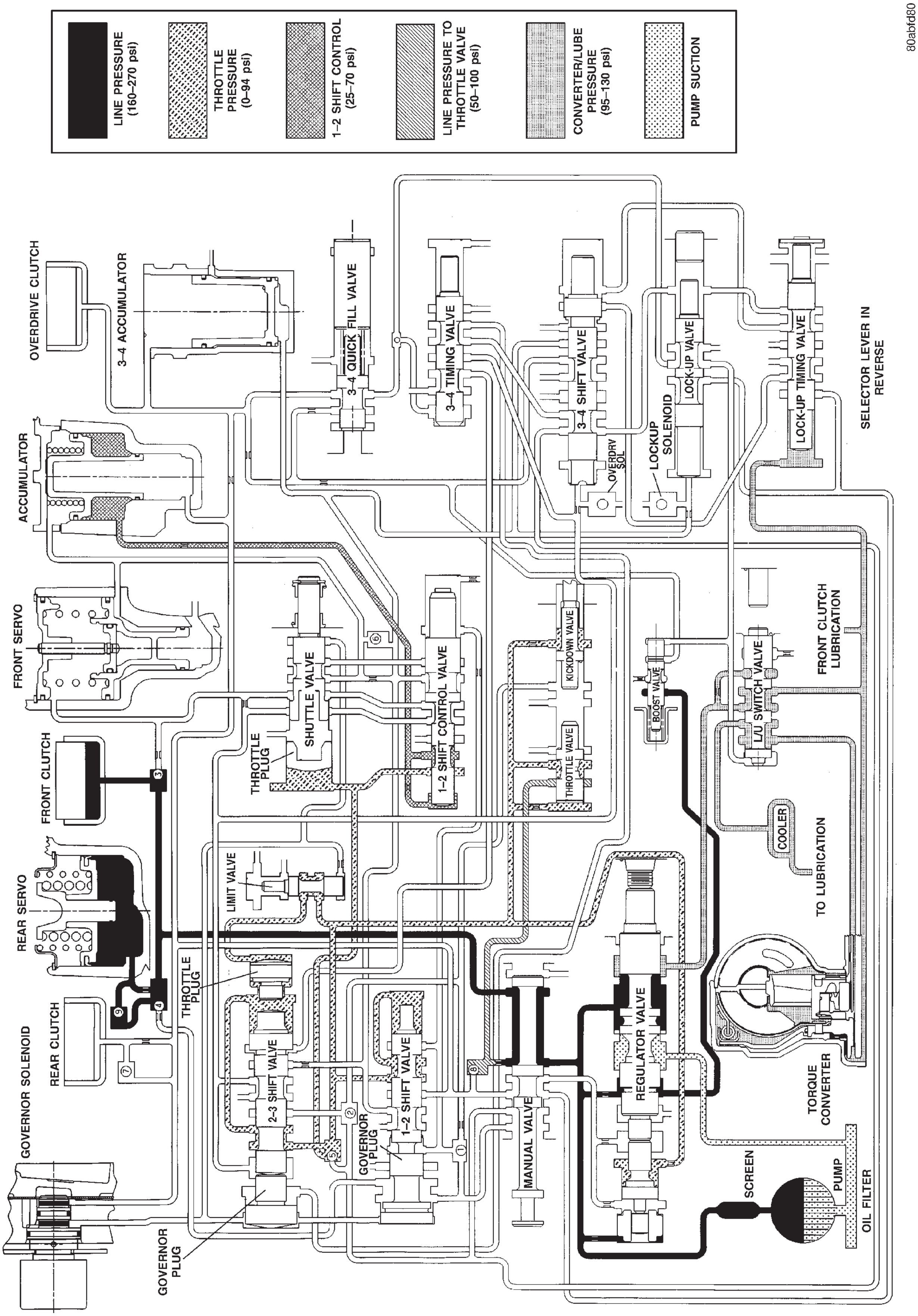
HYDRAULIC FLOW IN PARK

SCHEMATICS AND DIAGRAMS (Continued)



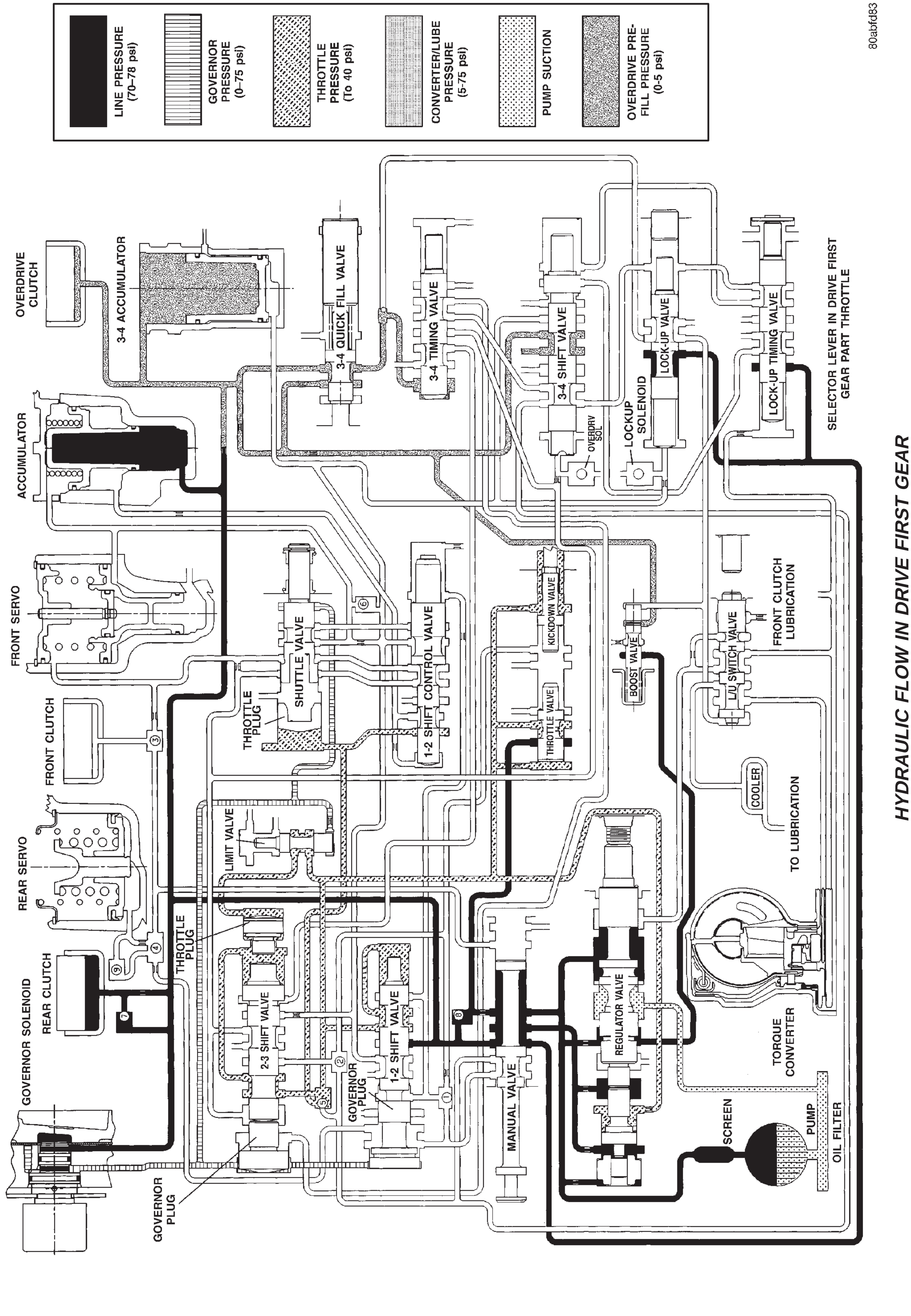
HYDRAULIC FLOW IN NEUTRAL

SCHEMATICS AND DIAGRAMS (Continued)



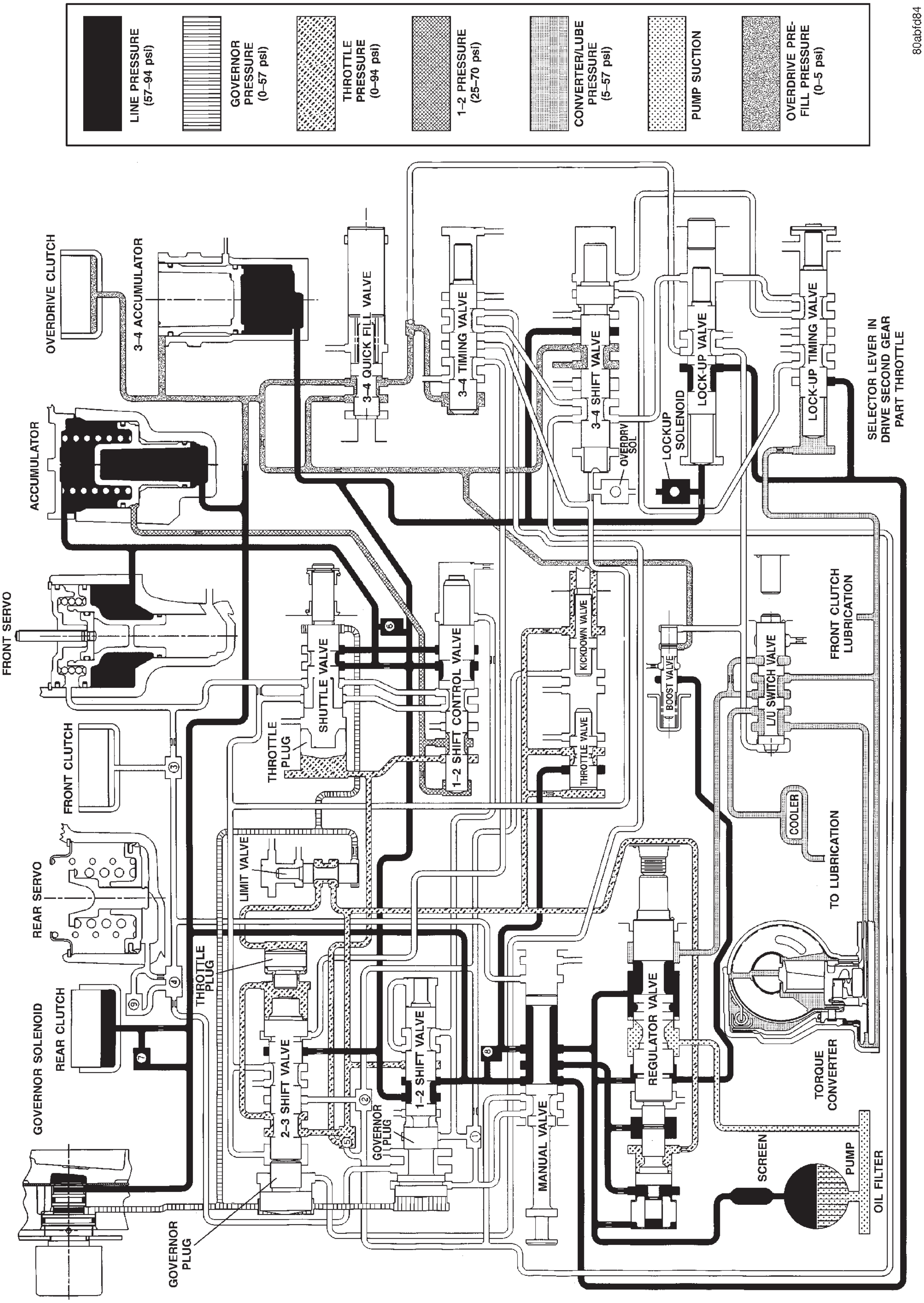
HYDRAULIC FLOW IN REVERSE

SCHEMATICS AND DIAGRAMS (Continued)



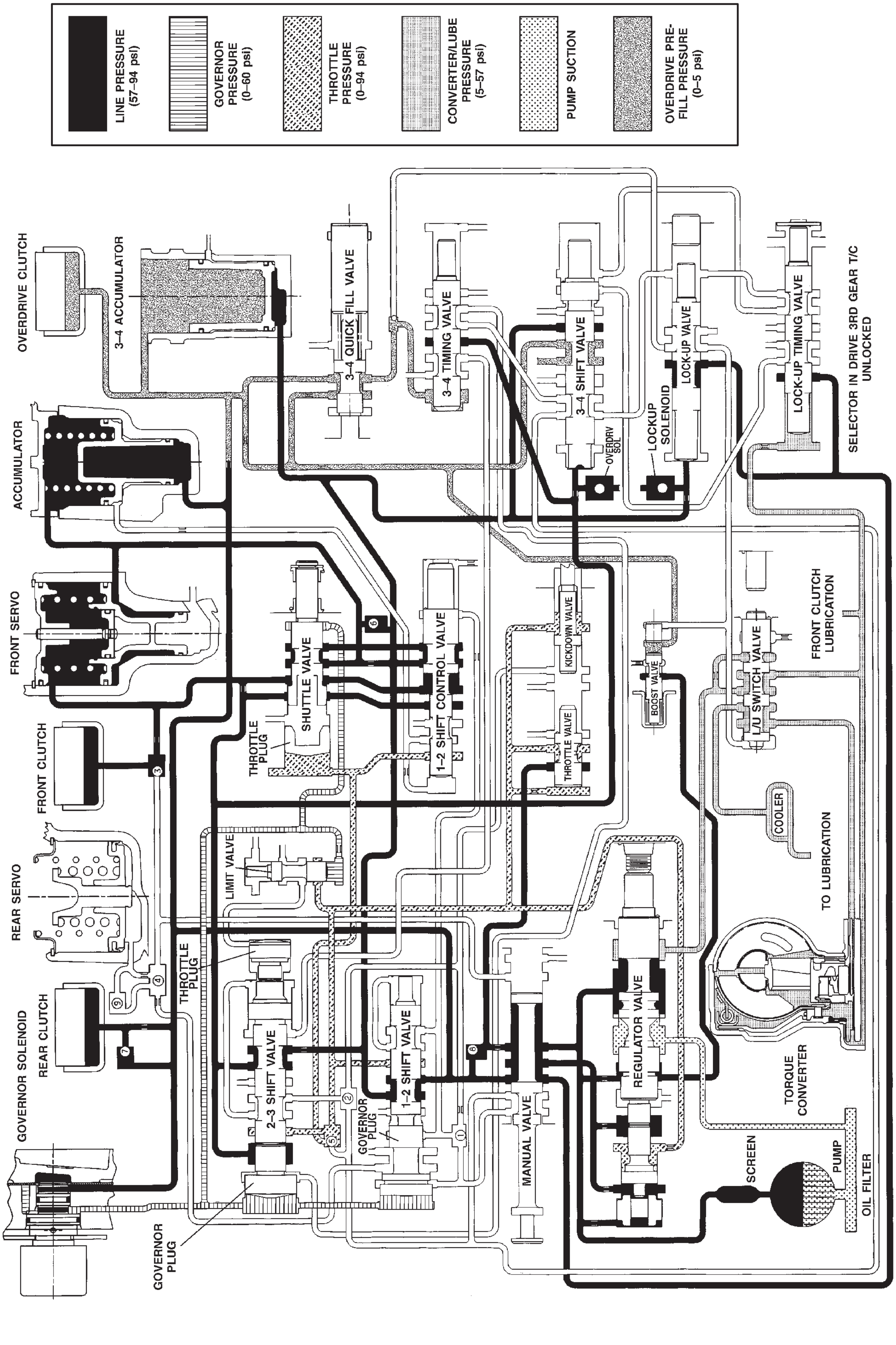
HYDRAULIC FLOW IN DRIVE FIRST GEAR

SCHEMATICS AND DIAGRAMS (Continued)



HYDRAULIC FLOW IN DRIVE SECOND GEAR

SCHEMATICS AND DIAGRAMS (Continued)



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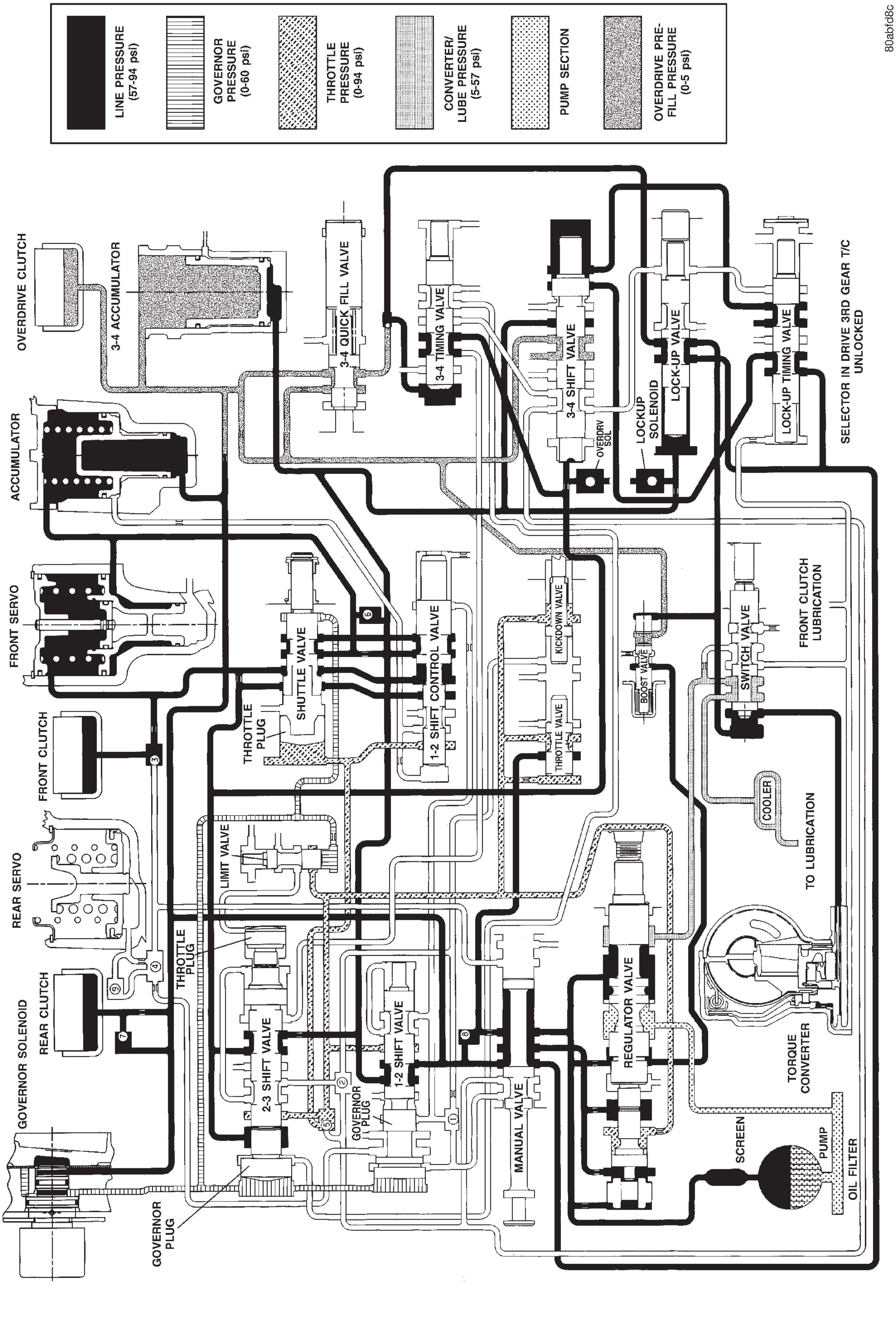
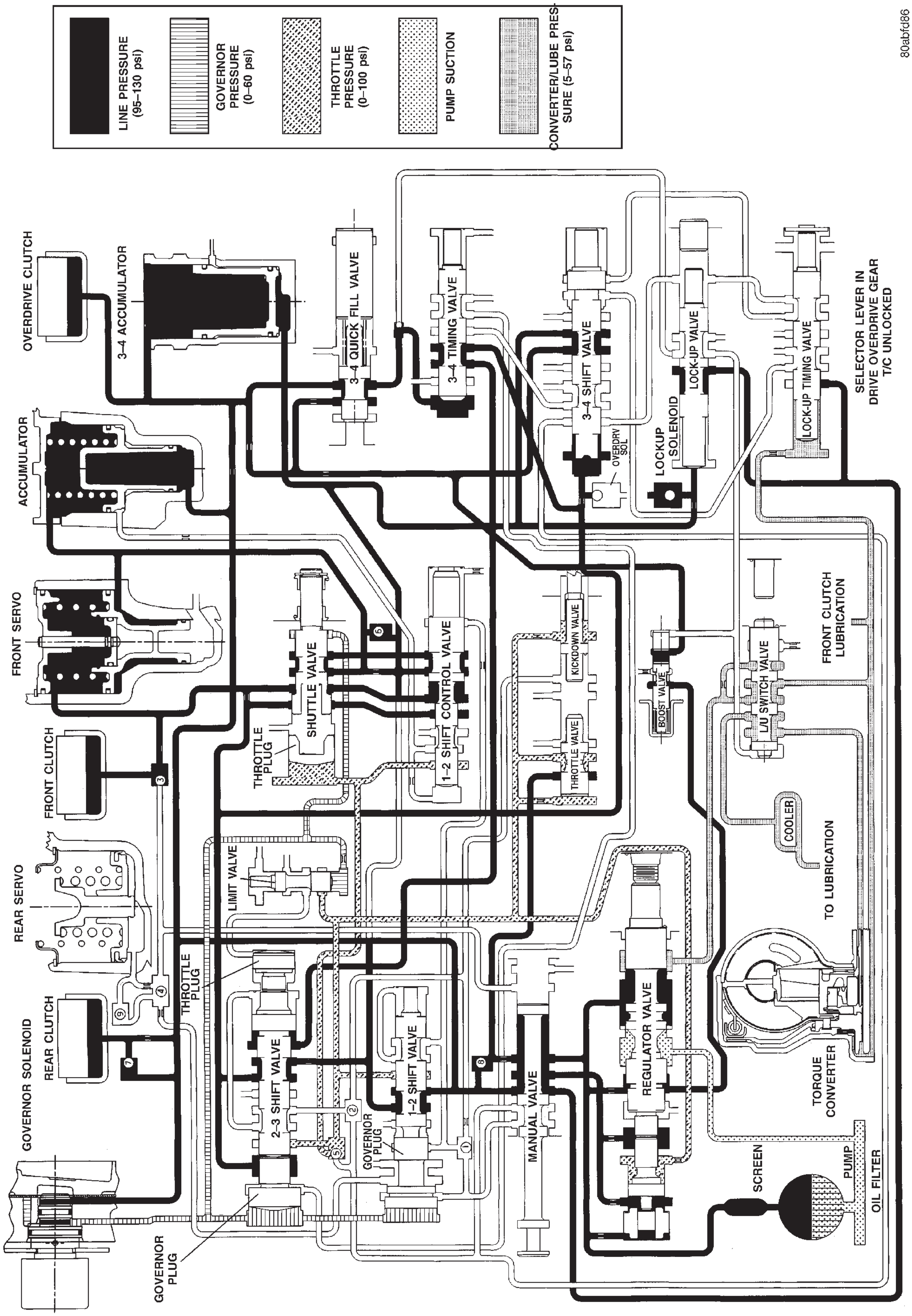
HYDRAULIC FLOW IN DRIVE THIRD GEAR (CONVERTER CLUTCH NOT APPLIED)

SCHEMATICS AND DIAGRAMS (Continued)



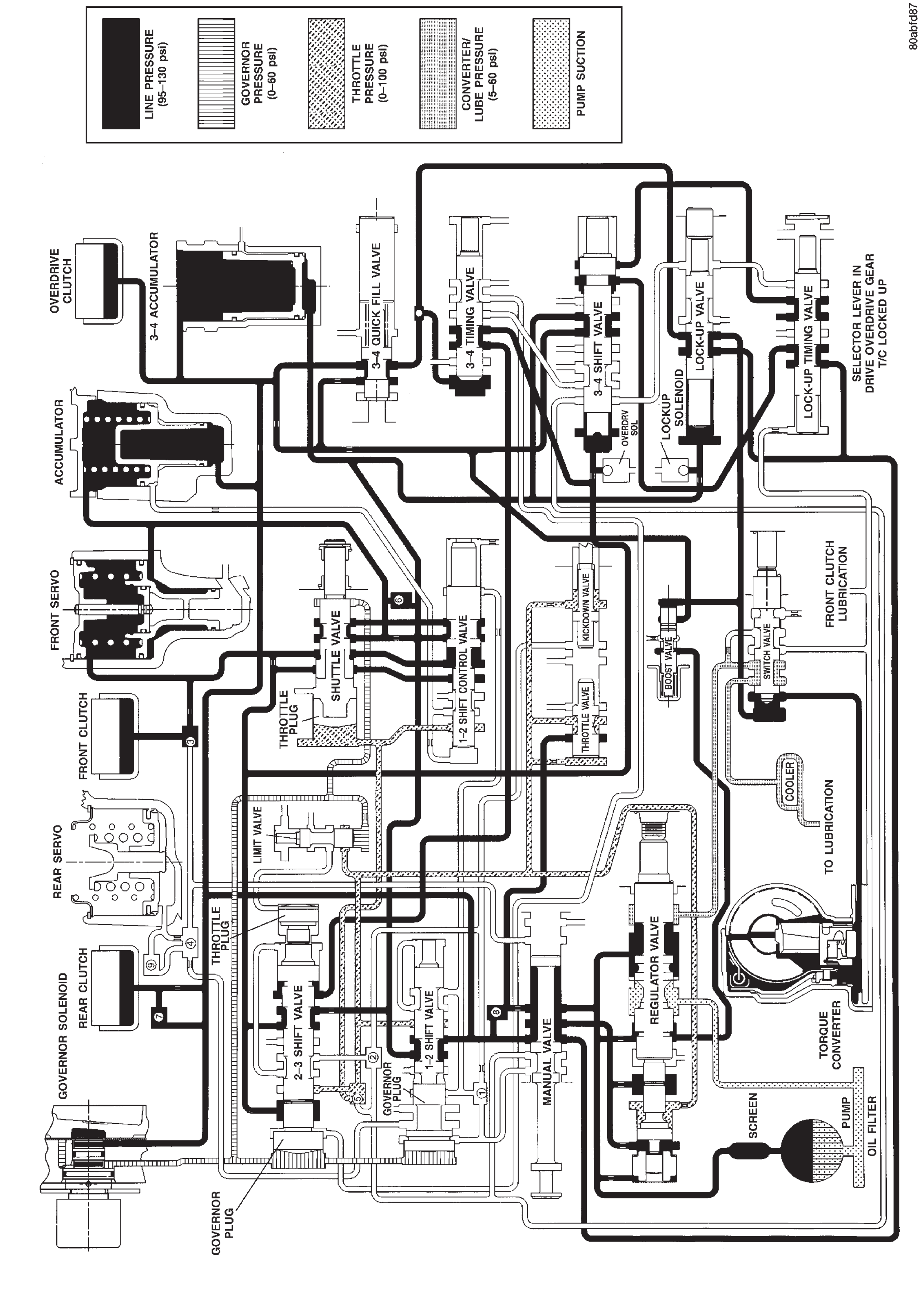
HYDRAULIC FLOW IN DRIVE THIRD GEAR (CONVERTER CLUTCH APPLIED)

SCHEMATICS AND DIAGRAMS (Continued)



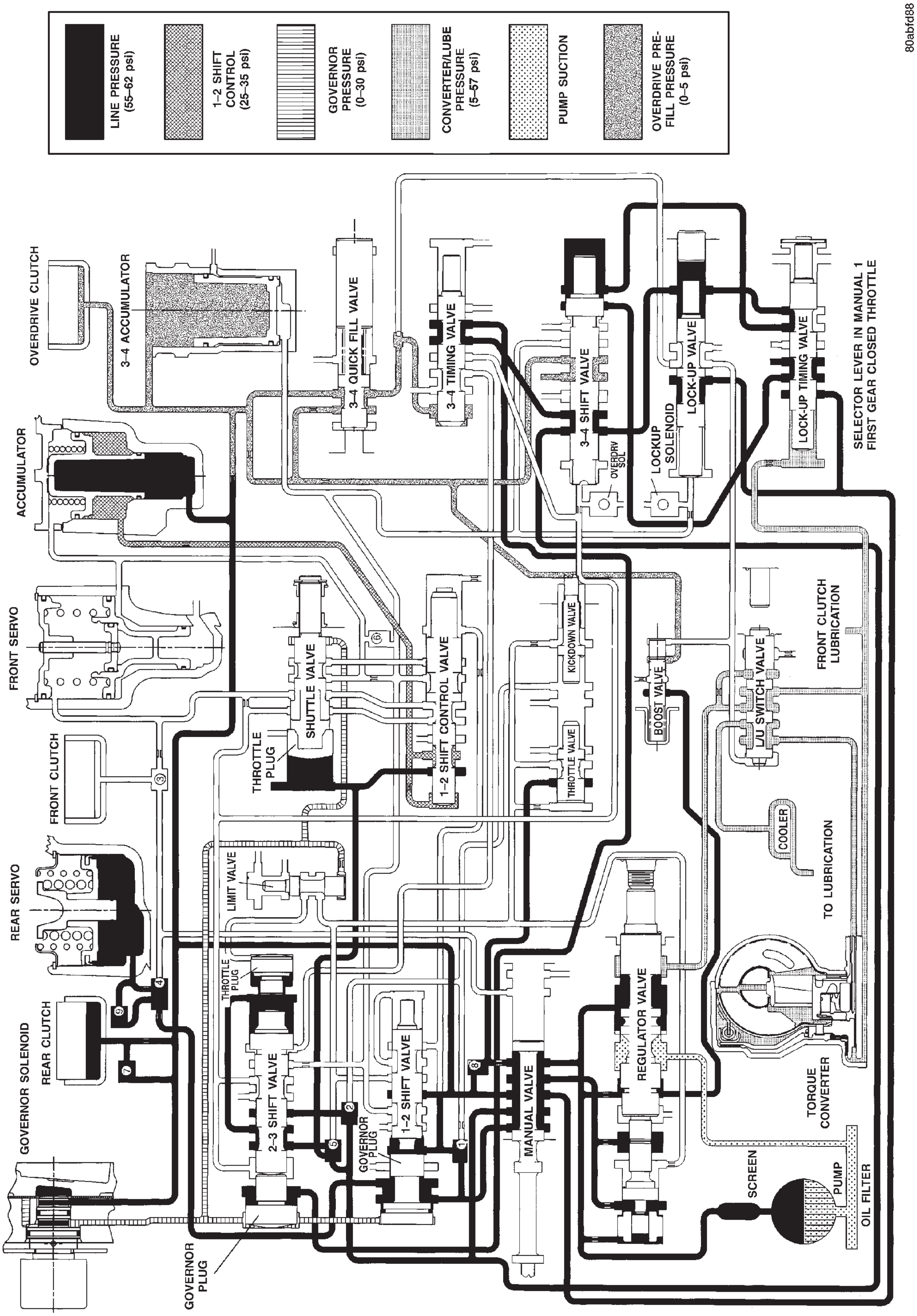
HYDRAULIC FLOW IN DRIVE FOURTH GEAR (CONVERTER CLUTCH NOT APPLIED)

SCHEMATICS AND DIAGRAMS (Continued)



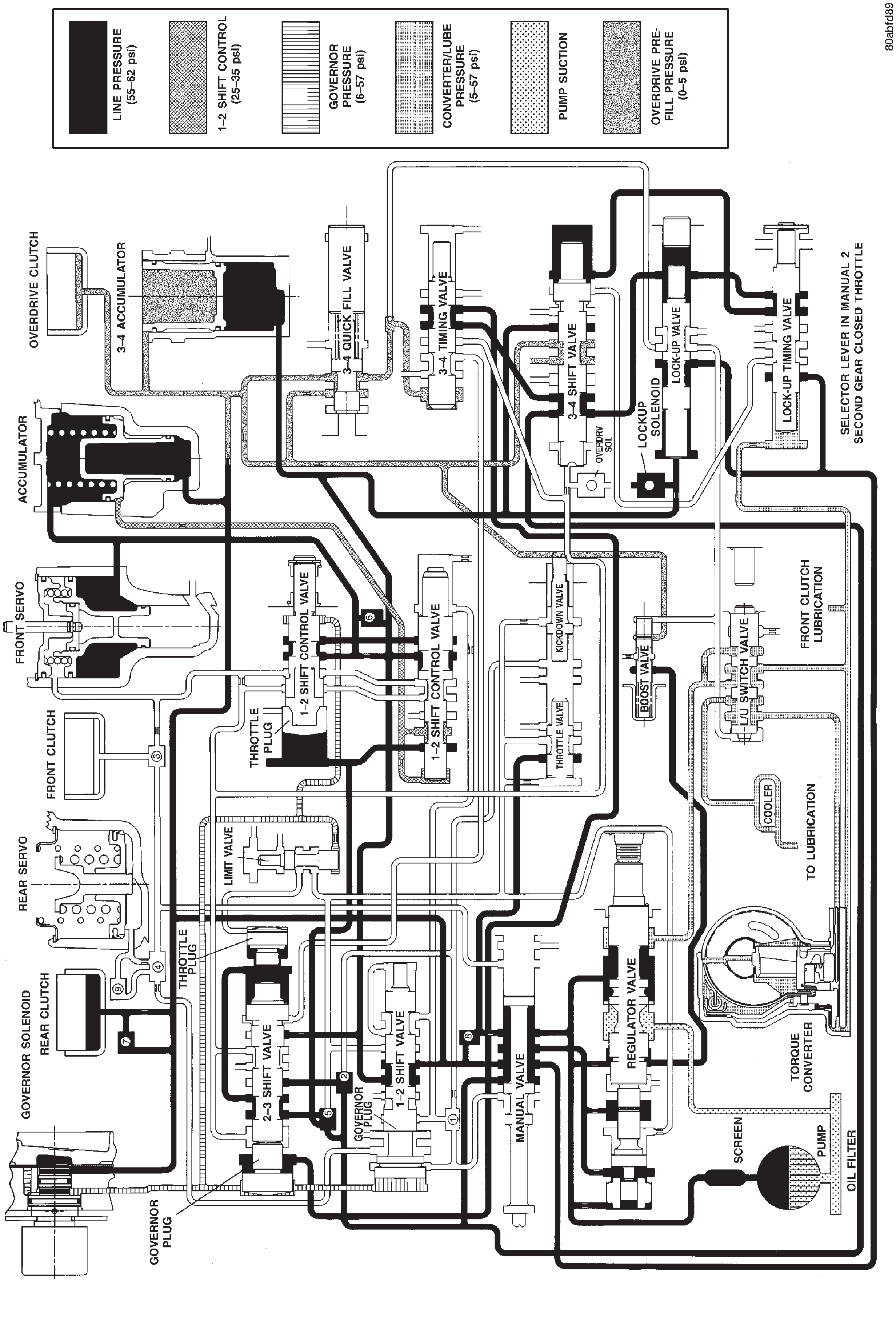
HYDRAULIC FLOW IN DRIVE FOURTH GEAR (CONVERTER CLUTCH APPLIED)

SCHEMATICS AND DIAGRAMS (Continued)



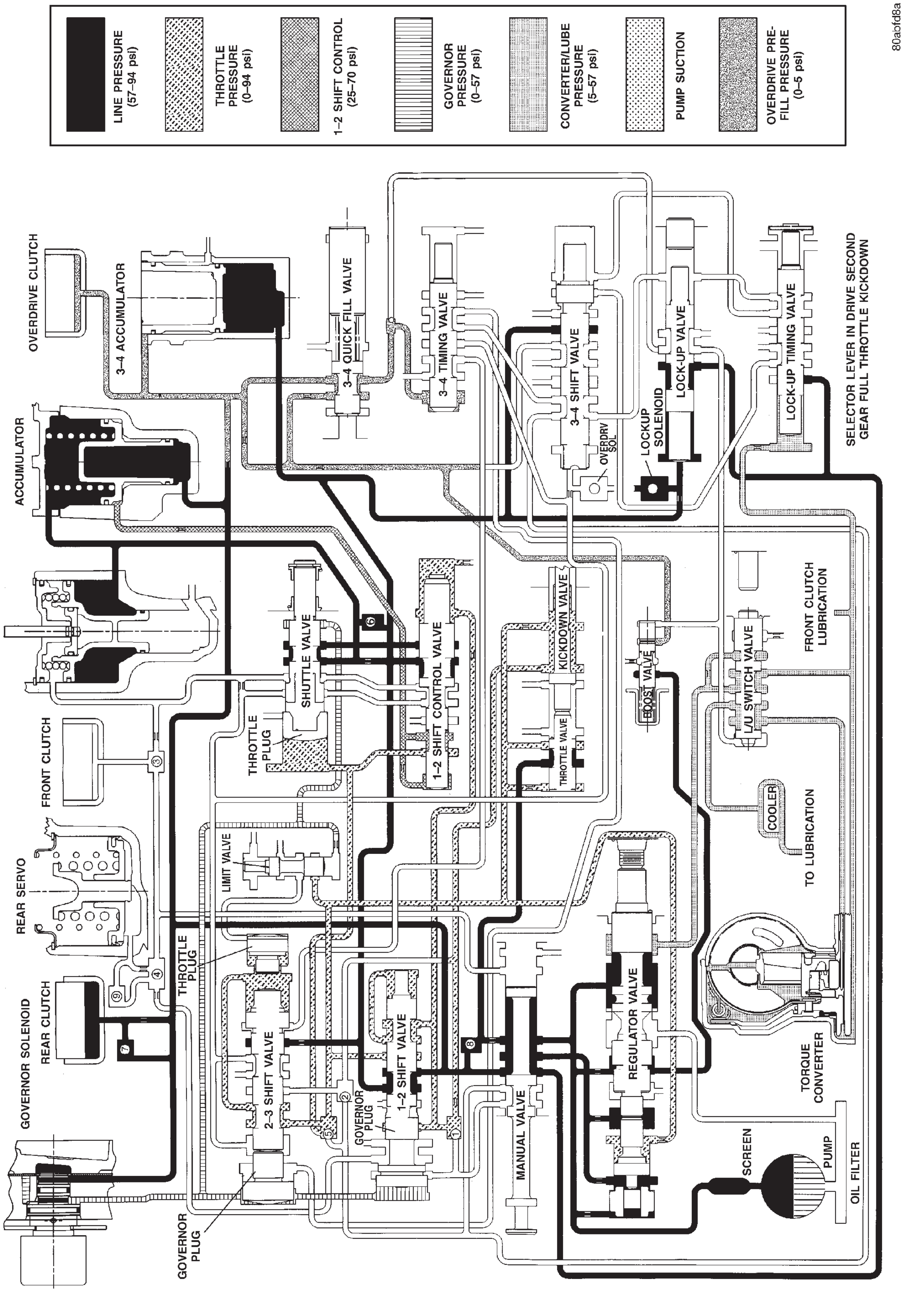
HYDRAULIC FLOW IN MANUAL LOW (1)

SCHEMATICS AND DIAGRAMS (Continued)



HYDRAULIC FLOW IN MANUAL SECOND (2)

SCHEMATICS AND DIAGRAMS (Continued)



HYDRAULIC FLOW DURING FULL THROTTLE 3–2 DOWNSHIFT (PASSING GEAR)

SPECIFICATIONS

TRANSMISSION

GENERAL

Component	Metric	Inch
Planetary end play	0.127-1.22 mm	0.005-0.048 in.
Input shaft end play	0.56-2.31 mm	0.022-0.091 in.
Clutch pack clearance/ Front.	1.70-3.40 mm	0.067-0.134 in.
Clutch pack clearance/ Rear.	0.559-0.914 mm	0.022-0.036 in.
Front clutch	4 discs	
Rear clutch	4 discs	
Overdrive clutch	3 discs	
Direct clutch	6 discs	
42RE Band adjustment from 72 in. lbs.		
Front band	Back off 3 turns	
Rear band	Back off 4 turns	
Recommended fluid	Mopar® ATF Plus 3,type 7176	

GEAR RATIOS

- 1ST GEAR-2.74
- 2ND GEAR-1.54
- 3RD GEAR-1.00
- 4TH GEAR-0.69
- REV. GEAR-2.21

TORQUE

DESCRIPTION	TORQUE
Fitting, cooler line at trans	18 N·m (13 ft. lbs.)
Bolt, torque convertor	31 N·m (23 ft. lbs.)
Bolt/nut, crossmember	68 N·m (50 ft. lbs.)
Bolt, driveplate to crankshaft	75 N·m (55 ft. lbs.)
Plug, front band reaction	17 N·m (13 ft. lbs.)
Locknut, front band adj.	34 N·m (25 ft. lbs.)
Switch, park/neutral	34 N·m (25 ft. lbs.)
Bolt, fluid pan	17 N·m (13 ft. lbs.)
Screws, fluid filter	4 N·m (35 in. lbs.)
Bolt, oil pump	20 N·m (15 ft. lbs.)
Bolt, overrunning clutch cam	17 N·m (13 ft. lbs.)
Bolt, O/D to trans.	34 N·m (25 ft. lbs.)
Bolt, O/D piston retainer	17 N·m (13 ft. lbs.)
Plug, pressure test port	14 N·m (10 ft. lbs.)
Bolt, reaction shaft support	20 N·m (15 ft. lbs.)
Locknut, rear band	41 N·m (30 ft. lbs.)
Bolt. speedometer adapter	11 N·m (8 ft. lbs.)
Bolt, valve body to case	12 N·m (100 in. lbs.)
Sensor, trans speed	27 N·m (20 ft. lbs.)
Screw, solenoid wiring connector	4 N·m (35 in. lbs.)
Screw, solenoid to transfer plate	4 N·m (35 in. lbs.)

SPECIFICATIONS (Continued)

THRUST WASHER/SPACER/SNAP RING DIMENSIONS

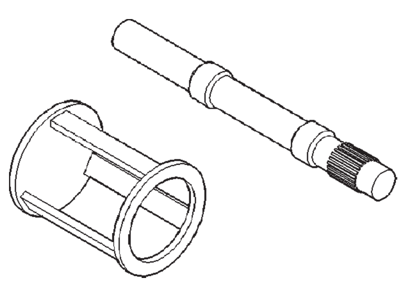
Component	Metric	Inch
Front clutch thrust washer (reaction shaft support hub)	1.55 mm	0.061 in.
Rear clutch thrust washer (clutch retainer)	1.55 mm	0.061 in.
Intermediate shaft thrust plate (shaft hub pilot)	1.5-1.6 mm	0.060-0.063 in.
Output shaft thrust washer (rear clutch hub)	Select fit to set end play	
Rear clutch pack snap ring	1.5 mm 1.95 mm 2.45 mm	0.060 in. 0.076 in. 0.098 in.
Planetary geartrain snap ring (at front of output shaft)	Select fit (three thicknesses avalible)	
Overdrive piston thrust plate	Thrust plate and spacer are select fit. Refer to size charts and selection procedures in Overdrive Unit D&A procedures	
Intermiediate shaft spacer		

PRESSURE TEST

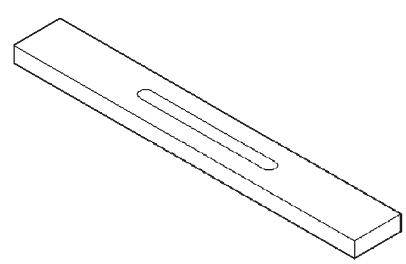
Overdrive clutch	Fourth gear only	Pressure should be 469-496 kPa (68-72 psi) with closed throttle and increase to 620-896 kPa (90-130 psi) at 1/2 to 3/4 throttle.
Line pressure (at accumulator)	Closed throttle	372-414 kPa (54-60 psi).
Front servo	Third gear only	No more than 21 kPa (3 psi) lower than line pressure.
Rear servo	1 range R range	No more than 21 kPa (3 psi) lower than line pressure. 1103 kPa (160 psi) at idle, builds to 1862 kPa (270 psi) at 1600 rpm.
Governor	D range closed throttle	Pressure should respond smoothly to changes in mph and return to 0-7 kPa (0-1.5 psi) when stopped with transmission in D, 1, 2. Pressure above 7 kPa (1.5 psi) at stand still will prevent transmission from downshifting.

SPECIAL TOOLS

RE TRANSMISSIONS

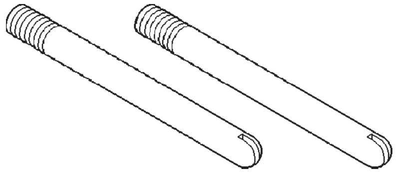


Spring Compressor and Alignment Shaft—6227

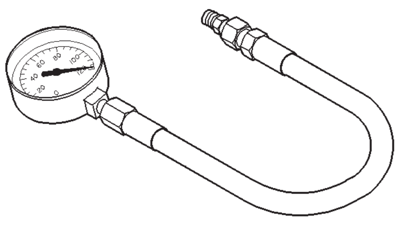


Gauge Bar—6311

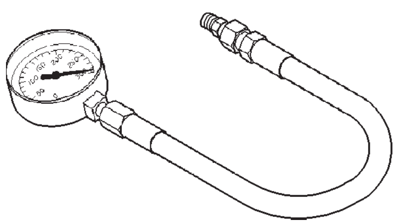
SPECIAL TOOLS (Continued)



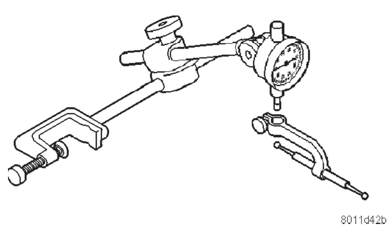
Extension Housing Pilot—C-3288-B



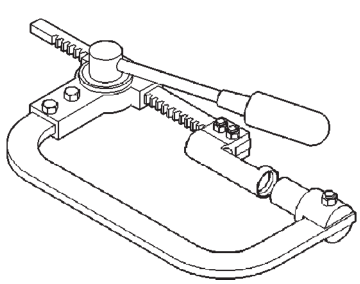
Pressure Gauge—C-3292



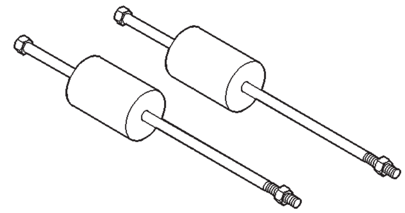
Pressure Gauge—C-3293SP



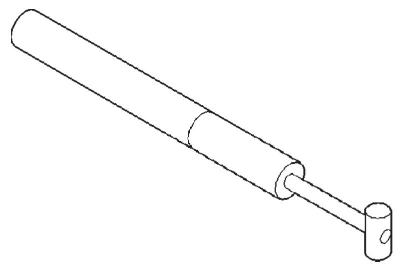
Dial Indicator—C-3339



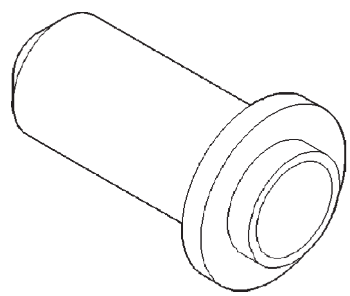
Spring Compressor—C-3422-B



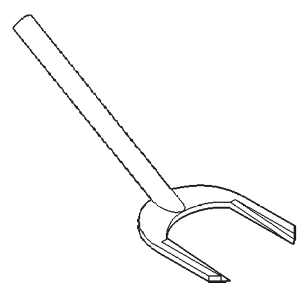
Puller, Slide Hammer—C-3752



Gauge, Throttle Setting—C-3763

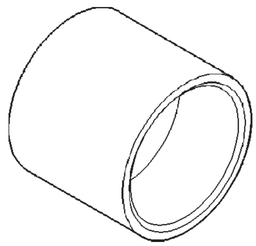


Seal Installer—C-3860–A

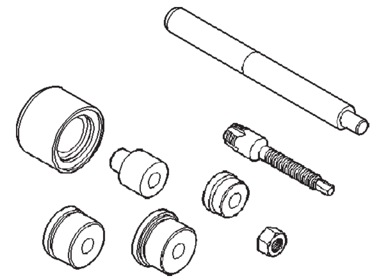


Seal Remover—C-3985-B

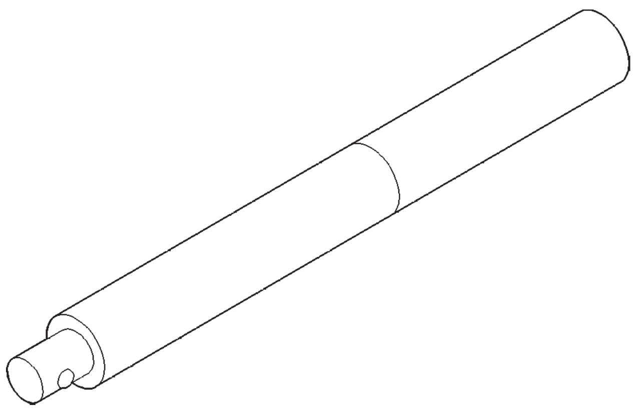
SPECIAL TOOLS (Continued)



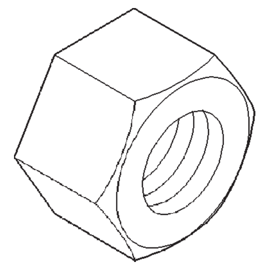
Installer—C-3995-A



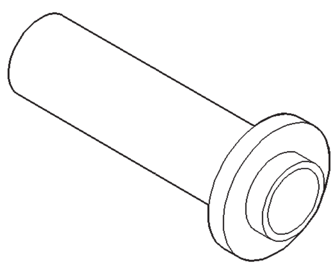
Bushing Remover/Installer Set—C-3887-J



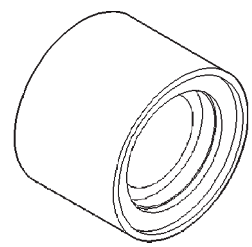
Universal Handle—C-4171



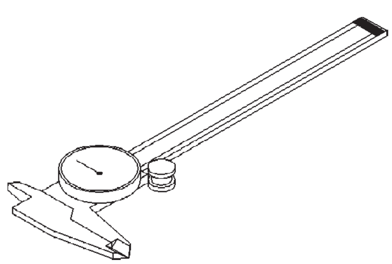
Nut, Bushing Remover—SP-1191, From kit C-3887-J



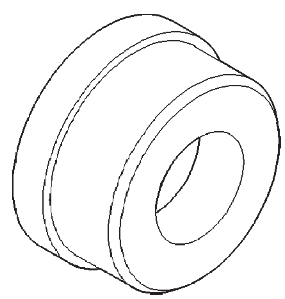
Seal Installer—C-4193-A



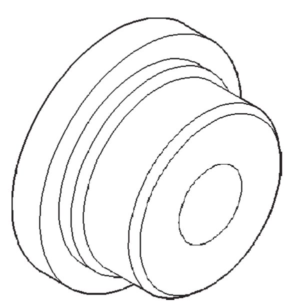
Cup, Bushing Remover—SP-3633, From kit C-3887-J



Dial Caliper—C-4962

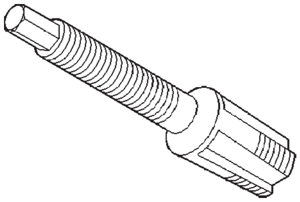


Remover, Bushing—SP-3551



Installer, Bushing—SP-5117

SPECIAL TOOLS (Continued)



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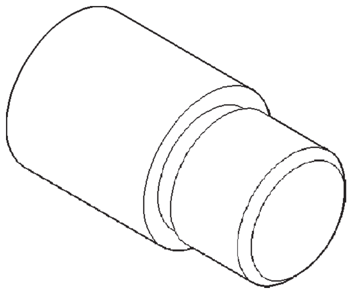
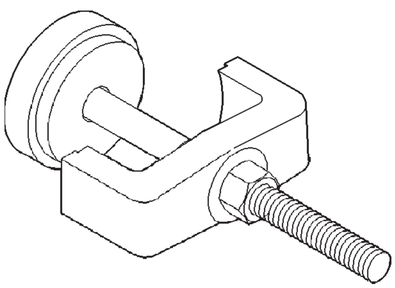
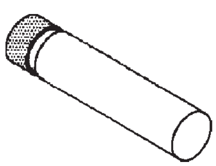


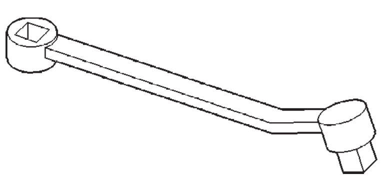
Installer, Bushing—SP-5325



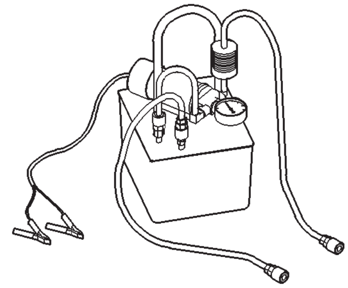
Compressor, Spring—C-3575-A



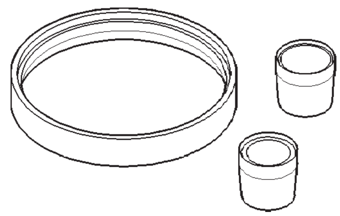
Gauge—6312



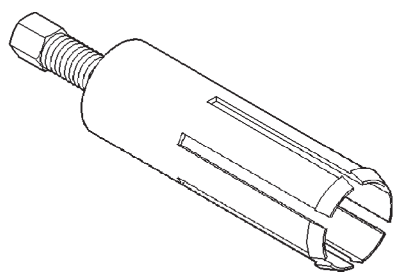
Adapter—C-3705



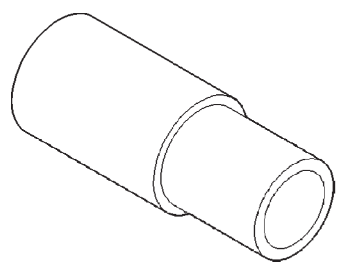
Flusher—6906



Installer—8114



Remover—6957



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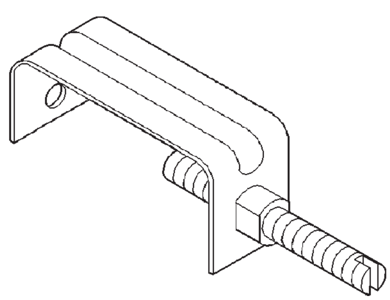

Retainer—6583

45RFE AUTOMATIC TRANSMISSION

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DESCRIPTION AND OPERATION

45RFE AUTOMATIC TRANSMISSION

DESCRIPTION

The 45RFE automatic transmission is a sophisticated, multi-range, electronically controlled transmission which combines optimized gear ratios for responsive performance, state of the art efficiency features and low NVH. Other features include driver adaptive shifting and three planetary gear sets to provide wide ratio capability with precise ratio steps for optimum driveability. The three planetary gear sets also make available a unique alternate second gear ratio. The primary 2nd gear ratio fits between 1st and 3rd gears for normal through-gear accelerations. The alternate second gear ratio (2 prime) allows smoother 4–2 kickdowns at high speeds to provide 2nd gear passing performance over a wider highway cruising range.

The hydraulic portion of the transmission consists of the transmission fluid, fluid passages, hydraulic valves, and various line pressure control components.

The primary mechanical components of the transmission consist of the following:

- Three multiple disc input clutches
- Three multiple disc holding clutches
- Five hydraulic accumulators
- Three planetary gear sets
- Dual Stage Hydraulic oil pump
- Valve body
- Solenoid pack

The TCM is the “heart” or “brain” of the electronic control system and relies on information from various direct and indirect inputs (sensors, switches, etc.) to determine driver demand and vehicle operating conditions. With this information, the TCM can calculate and perform timely and quality shifts through various output or control devices (solenoid pack, transmission control relay, etc.).

TRANSMISSION IDENTIFICATION

Transmission identification numbers are stamped on the left side of the case just above the oil pan gasket surface (Fig. 1). Refer to this information when ordering replacement parts. A label is attached to the transmission case above the stamped numbers. The label gives additional information which may also be necessary for identification purposes.

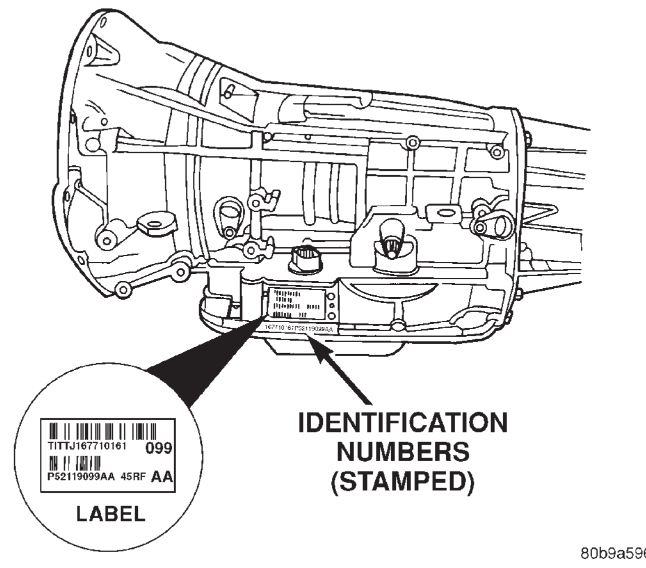


Fig. 1 Transmission Part And Serial Number Location

GEAR RATIOS

The 45RFE gear ratios are:

1st	3.00:1
2nd	1.67:1
2nd Prime	1.50:1
3rd	1.00:1
4th	0.75:1
Reverse	3.00:1

OPERATION

The 45RFE offers full electronic control of all automatic up and downshifts, and features real-time adaptive closed-loop shift and pressure control. Electronic shift and torque converter clutch controls help protect the transmission from damage due to high temperatures, which can occur under severe operating conditions. By altering shift schedules, line pressure, and converter clutch control, these controls reduce heat generation and increase transmission cooling.

To help reduce efficiency-robbing parasitic losses, the transmission includes a dual-stage transmission fluid pump with electronic output pressure control. Under most driving conditions, pump output pressure greatly exceeds that which is needed to keep the clutches applied. The 45RFE pump-pressure control system monitors input torque and adjusts the pump pressure accordingly. The primary stage of the pump works continuously; the second stage is bypassed when demand is low. The control system also monitors input and output speed and, if incipient clutch slip is observed, the pressure control solenoid duty cycle is varied, increasing pressure in proportion to demand.

DESCRIPTION AND OPERATION (Continued)

A high-travel torque converter damper assembly allow earlier torque converter clutch engagement to reduce slippage. Needle-type thrust bearings reduce internal friction. The 45RFE is packaged in a one-piece die-cast aluminum case. To reduce NVH, the case has high lateral, vertical and torsional stiffness. It is also designed to maximize the benefit of the structural dust cover that connects the bottom of the bell housing to the engine bedplate, enhancing overall power train stiffness. Dual filters protect the pump and other components. A pump return filter is added to the customary main sump filter. Independent lubrication and cooler circuits assure ample pressure for normal transmission operation even if the cooler is obstructed or the fluid cannot flow due to extremely low temperatures.

The hydraulic control system design (without electronic assist) provides the transmission with PARK, REVERSE, NEUTRAL, SECOND, and THIRD gears, based solely on driver shift lever selection. This design allows the vehicle to be driven (in "limp-in" mode) in the event of a electronic control system failure, or a situation that the Transmission Control Module (TCM) recognizes as potentially damaging to the transmission.

The TCM also performs certain self-diagnostic functions and provides comprehensive information (sensor data, DTC's, etc.) which is helpful in proper diagnosis and repair. This information can be viewed with the DRB scan tool.

FLUID

NOTE: Refer to the maintenance schedules in Group 0, Lubrication and Maintenance for the recommended maintenance (fluid/filter change) intervals for this transmission.

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

DESCRIPTION

Mopar® ATF Plus 3, Type 7176, automatic transmission fluid is the recommended fluid for DaimlerChrysler automatic transmissions.

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

Mopar® ATF Plus 3, Type 7176, automatic transmission fluid when new is red in color. The ATF is dyed red so it can be identified from other fluids used in the vehicle such as engine oil or antifreeze. The red color is not permanent and is not an indicator of fluid condition. As the vehicle is driven, the ATF will begin to look darker in color and may eventually become brown. **This is normal.** A dark brown/black fluid accompanied with a burnt odor and/or deterioration in shift quality may indicate fluid deterioration or transmission component failure.

FLUID ADDITIVES

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

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

OPERATION

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

TORQUE CONVERTER

DESCRIPTION

The torque converter (Fig. 2) 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 converter clutch engages in third gear. The torque converter hub drives the transmission oil (fluid) pump and contains an o-ring seal to better control oil flow.

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

DESCRIPTION AND OPERATION (Continued)

CAUTION: The torque converter must be replaced if a transmission failure resulted in large amounts of metal or fiber contamination in the fluid. If the fluid is contaminated, flush the fluid cooler and lines.

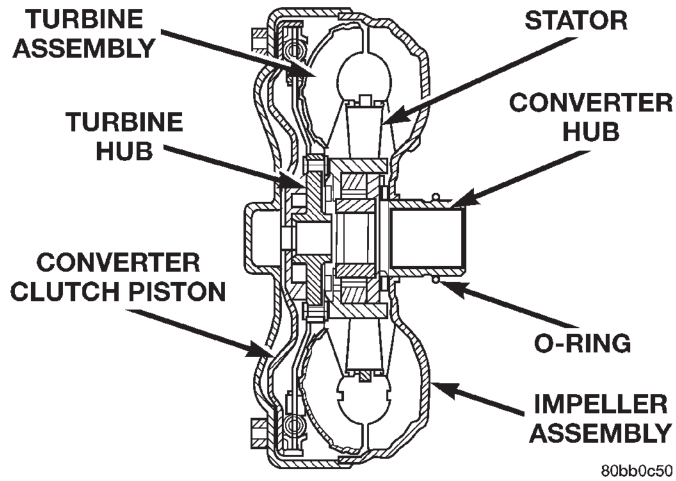


Fig. 2 Torque Converter Assembly

IMPELLER

The impeller (Fig. 3) is an integral part of the converter housing. The impeller consists of curved blades placed radially along the inside of the housing on the transmission side of the converter. As the converter housing is rotated by the engine, so is the impeller, because they are one and the same and are the driving member of the system.

TURBINE

The turbine (Fig. 4) is the output, or driven, member of the converter. The turbine is mounted within the housing opposite the impeller, but is not attached to the housing. The input shaft is inserted through the center of the impeller and splined into the turbine. The design of the turbine is similar to the impeller, except the blades of the turbine are curved in the opposite direction.

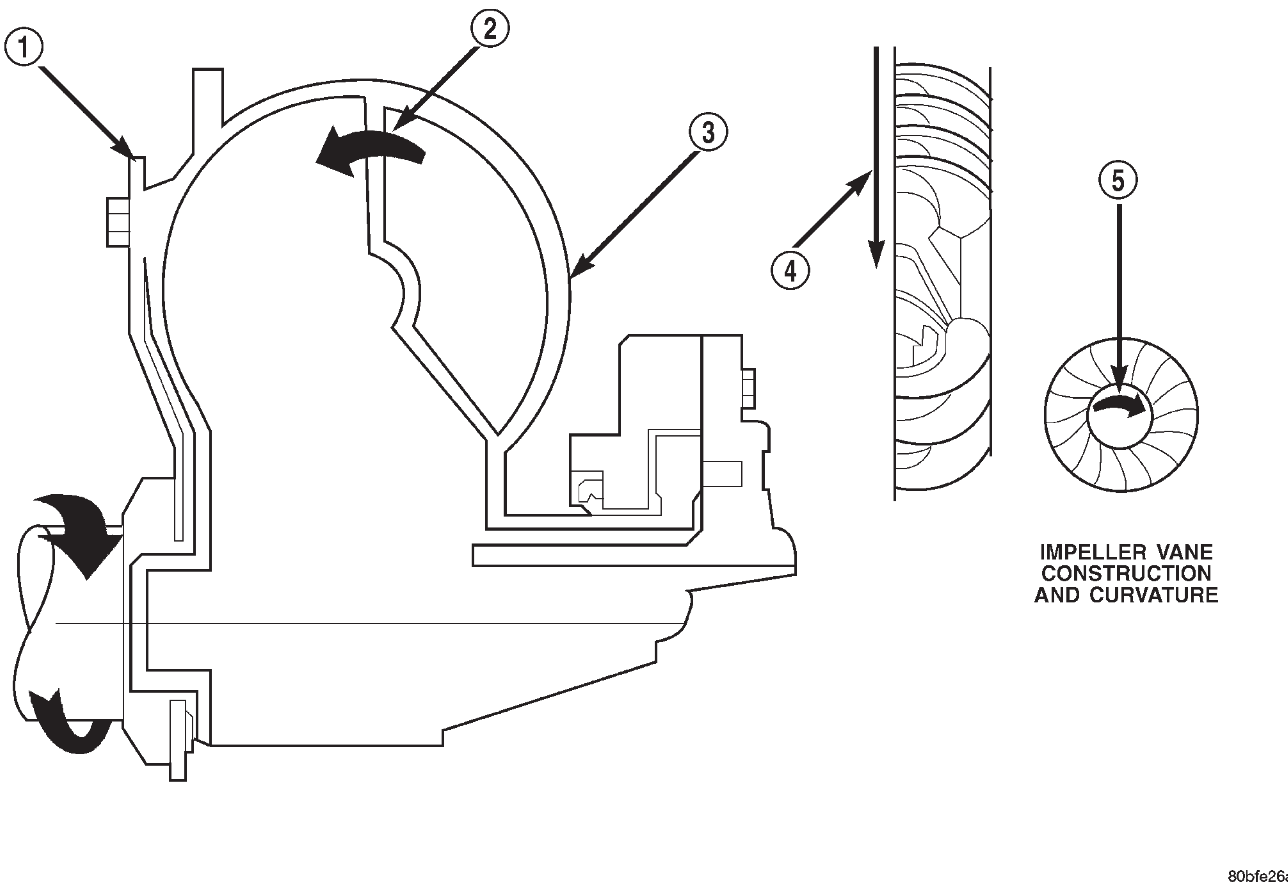


Fig. 3 Impeller

1 – ENGINE FLEXPLATE
2 – OIL FLOW FROM IMPELLER SECTION INTO TURBINE SECTION
3 – IMPELLER VANES AND COVER ARE INTEGRAL
4 – ENGINE ROTATION
5 – ENGINE ROTATION

DESCRIPTION AND OPERATION (Continued)

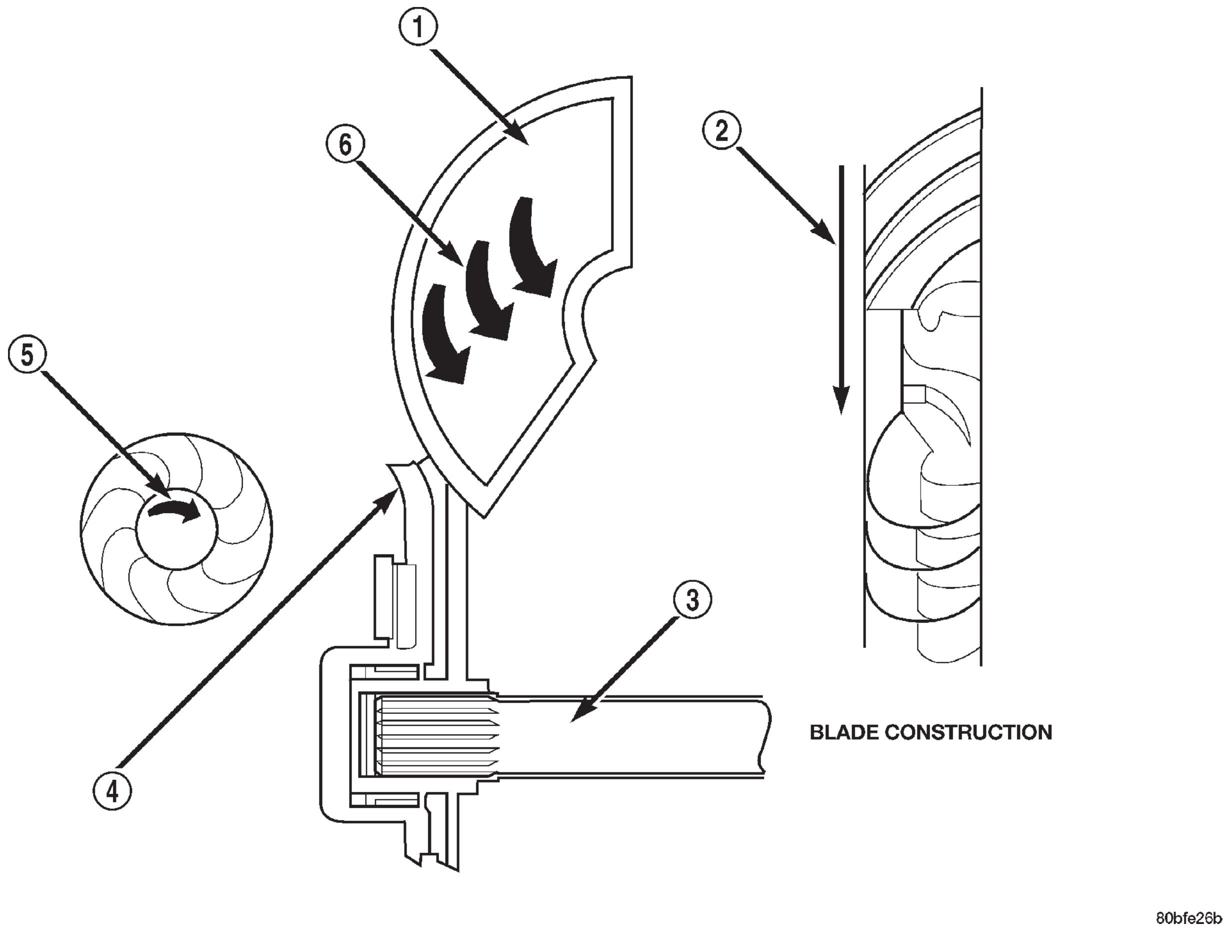


Fig. 4 Turbine

1 – TURBINE VANE
2 – ENGINE ROTATION
3 – INPUT SHAFT
4 – PORTION OF TORQUE CONVERTER COVER
5 – ENGINE ROTATION
6 – OIL FLOW WITHIN TURBINE SECTION

DESCRIPTION AND OPERATION (Continued)

STATOR

The stator assembly (Fig. 5) is mounted on a stationary shaft which is an integral part of the oil pump. The stator is located between the impeller and turbine within the torque converter case (Fig. 6). The stator contains an over-running clutch, which allows the stator to rotate only in a clockwise direction. When the stator is locked against the over-running clutch, the torque multiplication feature of the torque converter is operational.

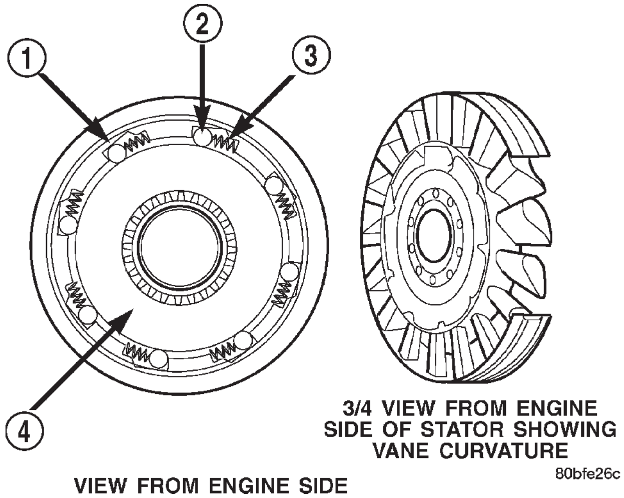


Fig. 5 Stator Components

1 – CAM (OUTER RACE)
2 – ROLLER
3 – SPRING
4 – INNER RACE

TORQUE CONVERTER CLUTCH (TCC)

The TCC (Fig. 7) was installed to improve the efficiency of the torque converter that is lost to the slippage of the fluid coupling. Although the fluid coupling provides smooth, shock–free power transfer, it is natural for all fluid couplings to slip. If the impeller and turbine were mechanically locked together, a zero slippage condition could be obtained. A hydraulic piston was added to the turbine, and a friction material was added to the inside of the front cover to provide this mechanical lock-up.

OPERATION

The converter impeller (Fig. 8) (driving member), which is integral to the converter housing and bolted to the engine drive plate, rotates at engine speed. The converter turbine (driven member), which reacts from fluid pressure generated by the impeller, rotates and turns the transmission input shaft.

TURBINE

As the fluid that was put into motion by the impeller blades strikes the blades of the turbine, some of

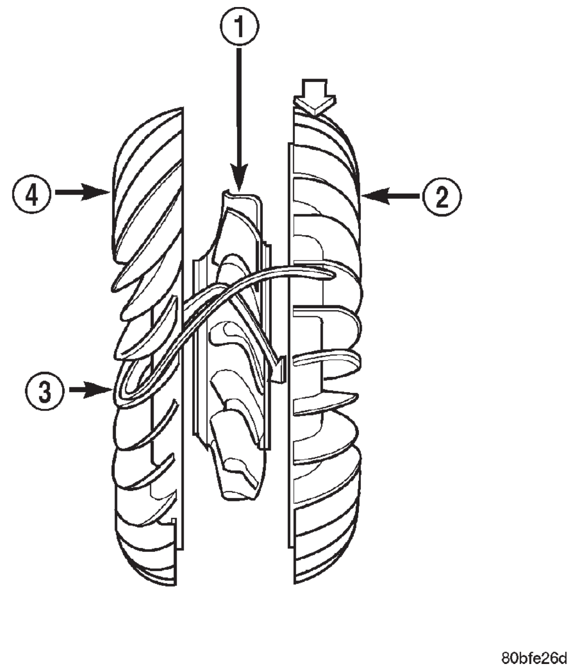


Fig. 6 Stator Location

1 – STATOR
2 – IMPELLER
3 – FLUID FLOW
4 – TURBINE

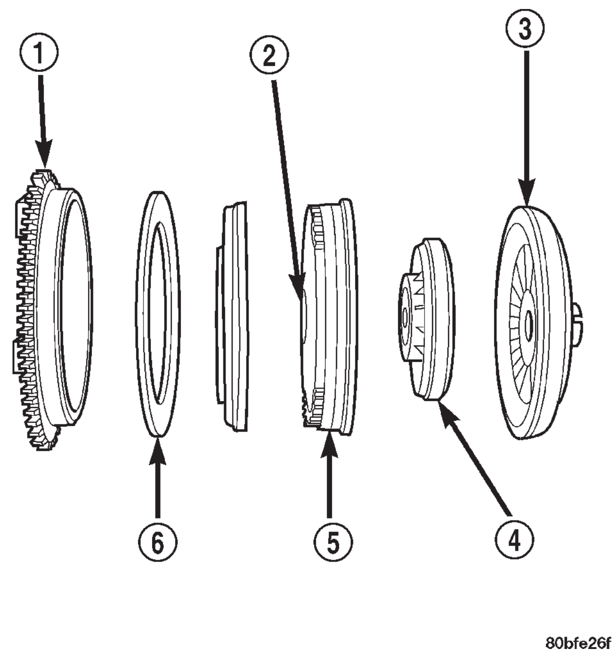


Fig. 7 Torque Converter Clutch (TCC)

1 – IMPELLER FRONT COVER
2 – THRUST WASHER ASSEMBLY
3 – IMPELLER
4 – STATOR
5 – TURBINE
6 – FRICTION DISC

DESCRIPTION AND OPERATION (Continued)

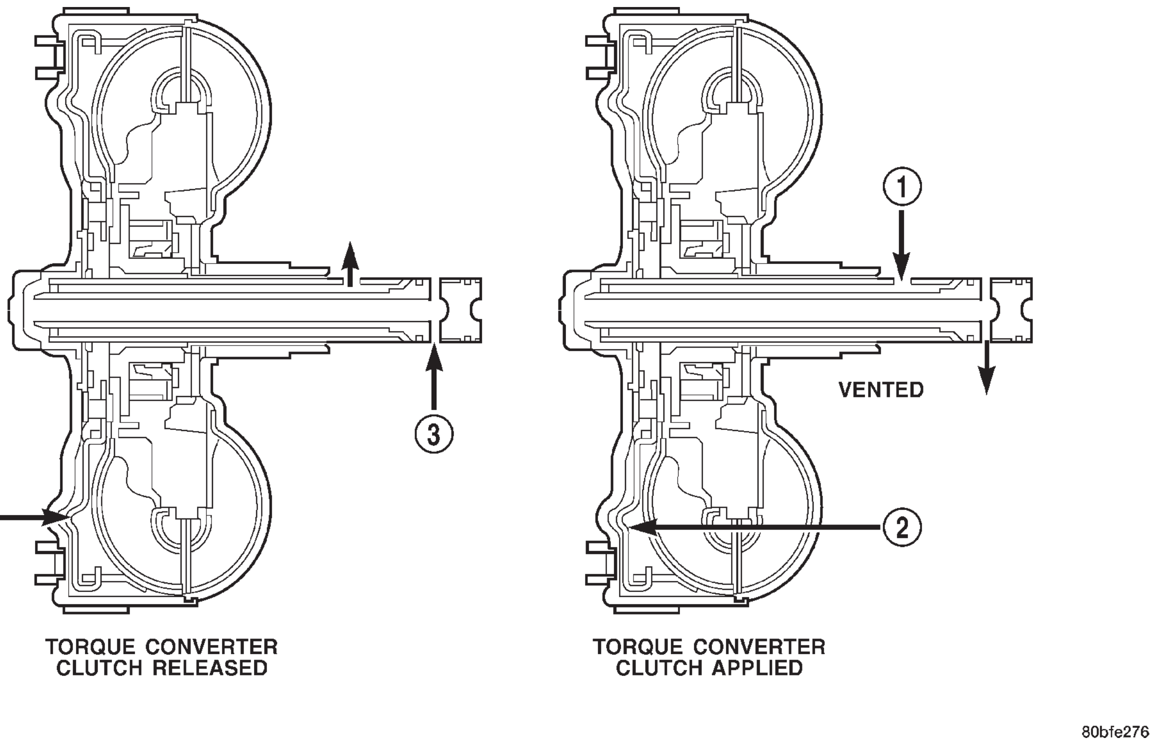


Fig. 8 Torque Converter Fluid Operation

1 – APPLY PRESSURE
2 – THE PISTON MOVES SLIGHTLY FORWARD
3 – RELEASE PRESSURE
4 – THE PISTON MOVES SLIGHTLY REARWARD

the energy and rotational force is transferred into the turbine and the input shaft. This causes both of them (turbine and input shaft) to rotate in a clockwise direction following the impeller. As the fluid is leaving the trailing edges of the turbine's blades it continues in a "hindering" direction back toward the impeller. If the fluid is not redirected before it strikes the impeller, it will strike the impeller in such a direction that it would tend to slow it down.

STATOR

Torque multiplication is achieved by locking the stator's over-running clutch to its shaft (Fig. 9). Under stall conditions (the turbine is stationary), the oil leaving the turbine blades strikes the face of the stator blades and tries to rotate them in a counter-clockwise direction. When this happens the over–running clutch of the stator locks and holds the stator from rotating. With the stator locked, the oil strikes the stator blades and is redirected into a "helping" direction before it enters the impeller. This circulation of oil from impeller to turbine, turbine to stator, and stator to impeller, can produce a maximum torque multiplication of about 2.4:1. As the turbine begins to match the speed of the impeller, the fluid that was hitting the stator in such as way as to cause it to lock–up is no longer doing so. In this condition of operation, the stator begins to free wheel and the converter acts as a fluid coupling.

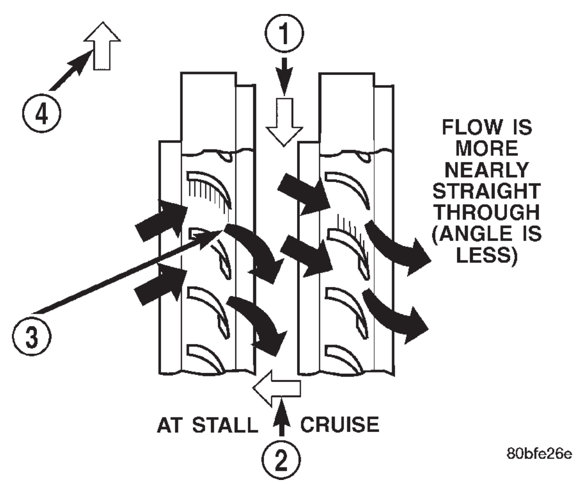


Fig. 9 Stator Operation

1 – DIRECTION STATOR WILL FREE WHEEL DUE TO OIL PUSHING ON BACKSIDE OF VANES
2 – FRONT OF ENGINE
3 – INCREASED ANGLE AS OIL STRIKES VANES
4 – DIRECTION STATOR IS LOCKED UP DUE TO OIL PUSHING AGAINST STATOR VANES

DESCRIPTION AND OPERATION (Continued)

TORQUE CONVERTER CLUTCH (TCC)

In a standard torque converter, the impeller and turbine are rotating at about the same speed and the stator is freewheeling, providing no torque multiplication. By applying the turbine's piston to the front cover's friction material, a total converter engagement can be obtained. The result of this engagement is a direct 1:1 mechanical link between the engine and the transmission.

Converter clutch engagement in third or fourth gear range is controlled by sensor inputs to the powertrain control module. Inputs that determine clutch engagement are: coolant temperature, engine rpm, vehicle speed, throttle position, and manifold vacuum. The torque converter clutch is engaged by the clutch solenoid on the valve body. The clutch can be engaged in third and fourth gear ranges depending on overdrive control switch position. If the overdrive control switch is in the normal ON position, the clutch will engage after the shift to fourth gear, and above approximately 72 km/h (45 mph). If the control switch is in the OFF position, the clutch will engage after the shift to third gear, at approximately 56 km/h (35 mph) at light throttle.

ELECTRONICALLY MODULATED CONVERTER CLUTCH ENGAGEMENT

DESCRIPTION

In order to reduce heat build-up in the transmission and buffer the powertrain against torsional vibrations, the TCM can duty cycle the L/R-CC Solenoid to achieve a smooth application of the torque converter clutch. This function, referred to as Electronically Modulated Converter Clutch (EMCC) can occur at various times depending on the following variables:

- Shift lever position
- Current gear range
- Transmission fluid temperature
- Engine coolant temperature
- Input speed
- Throttle angle
- Engine speed

OPERATION

The TCM controls the torque converter by way of internal logic software. The programming of the software provides the TCM with control over the L/R-CC Solenoid. There are four output logic states that can be applied as follows:

- No EMCC
- Partial EMCC
- Full EMCC
- Gradual-to-no EMCC

NO EMCC

Under No EMCC conditions, the L/R Solenoid is OFF. There are several conditions that can result in NO EMCC operations. No EMCC can be initiated due to a fault in the transmission or because the TCM does not see the need for EMCC under current driving conditions.

PARTIAL EMCC

Partial EMCC operation modulates the L/R Solenoid (duty cycle) to obtain partial torque converter clutch application. Partial EMCC operation is maintained until Full EMCC is called for and actuated. During Partial EMCC some slip does occur. Partial EMCC will usually occur at low speeds, low load and light throttle situations.

FULL EMCC

During Full EMCC operation, the TCM increases the L/R Solenoid duty cycle to full ON after Partial EMCC control brings the engine speed within the desired slip range of transmission input speed relative to engine rpm.

GRADUAL-TO-NO EMCC

This operation is to soften the change from Full or Partial EMCC to No EMCC. This is done at mid-throttle by decreasing the L/R Solenoid duty cycle.

OIL PUMP

DESCRIPTION

The oil pump (Fig. 10) is located at the front of the transmission inside the bell housing and behind the transmission front cover. The oil pump consists of two independent pumps (Fig. 11), a number of valves (Fig. 12), a front seal (Fig. 13), and a bolt on reaction shaft. The converter clutch switch and regulator valves, pressure regulator valve, and converter pressure limit valve are all located in the oil pump housing.

OPERATION

As the torque converter rotates, the converter hub rotates the oil pump drive gear. As the drive gear rotates both driven gears, the clearance between the gear teeth increases in the crescent area, and creates a suction at the inlet side of the pump. This suction draws fluid through the pump inlet from the oil pan. As the clearance between the gear teeth in the crescent area decreases, it forces pressurized fluid into the pump outlet and to the oil pump valves.

DESCRIPTION AND OPERATION (Continued)

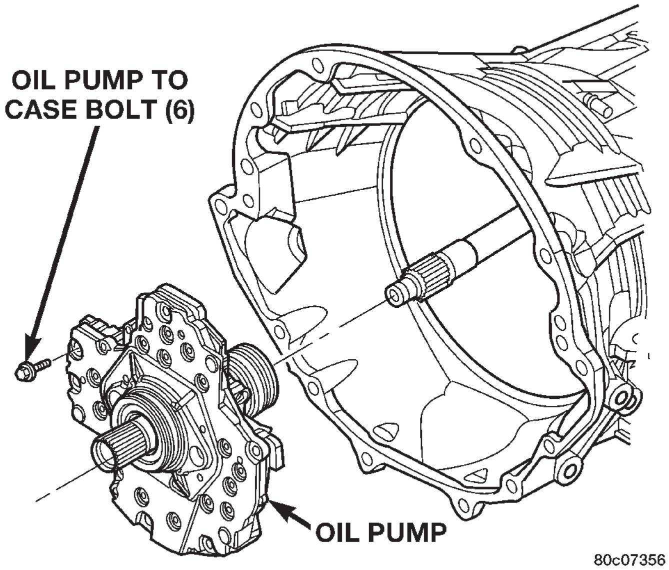


Fig. 10 Oil Pump

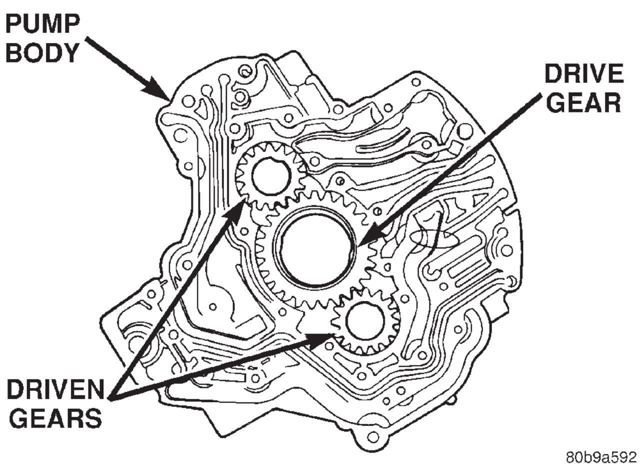


Fig. 11 Oil Pump Gears

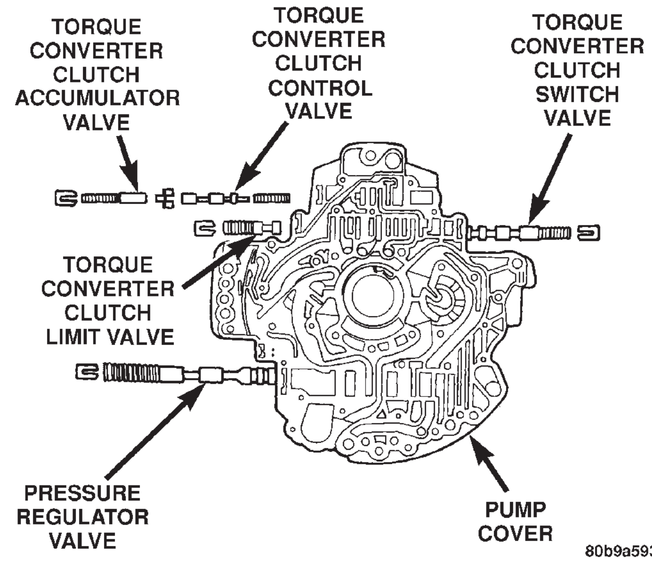


Fig. 12 Oil Pump Valves

At low speeds, both pumps supply fluid to the transmission. As the speed of the torque converter increases, the pressure output of both pumps increases until the primary pump pressure reaches the point where it can close off the check valve located between the two pumps. When the check valve is closed, the secondary pump is shut down and the primary pump supplies all the fluid to the transmission.

CONVERTER CLUTCH SWITCH VALVE

The converter clutch switch valve is used to control the hydraulic pressure supplied to the front (OFF) side of the torque converter clutch.

CONVERTER CLUTCH REGULATOR VALVE

The converter clutch regulator valve is used to control the hydraulic pressure supplied to the back (ON) side of the torque converter clutch.

TORQUE CONVERTER LIMIT VALVE

The torque converter limit valve serves to limit the available line pressure to the torque converter clutch to approximately 120 psi.

DESCRIPTION AND OPERATION (Continued)

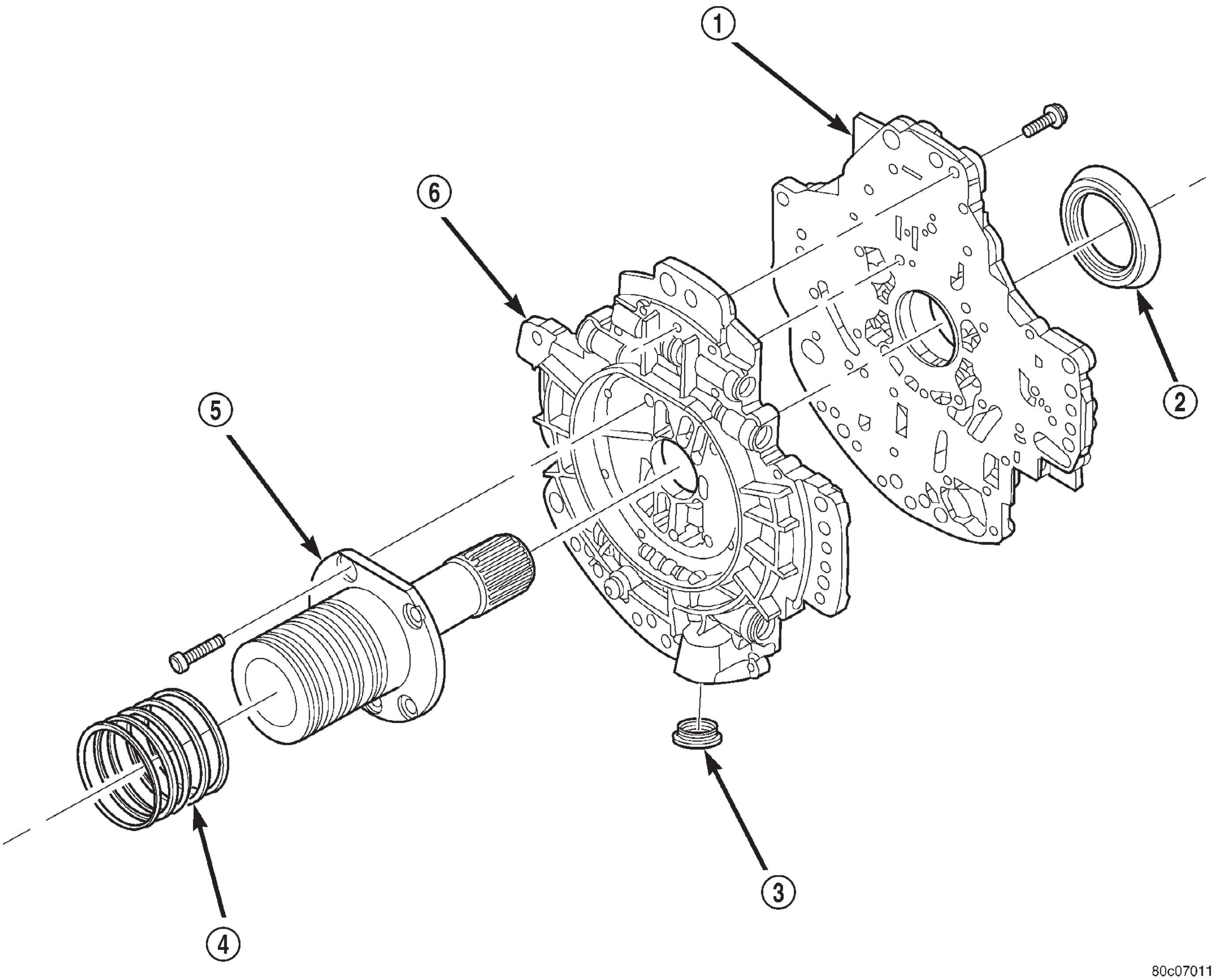


Fig. 13 Oil Pump Reaction Shaft and Seal

VALVE BODY

DESCRIPTION

The valve body consists of a cast aluminum valve body, a separator plate, and a transfer plate. The valve body contains valves and check balls that control fluid delivery to the torque converter clutch, bands, and frictional clutches. The valve body contains the following components (Fig. 14) and (Fig. 15):

- Solenoid switch valve
- Manual valve
- Low/reverse switch valve
- 5 Accumulators
- 7 check balls

OPERATION

NOTE: Refer to the Hydraulic Schematics for a visual aid in determining valve location, operation and design.

SOLENOID SWITCH VALVE

The Solenoid Switch Valve (SSV) controls the direction of the transmission fluid when the L/R-TCC solenoid is energized.

The Solenoid Switch Valve controls line pressure from the LR-TCC solenoid. In 1st gear, the SSV will be in the downshifted position, thus directing fluid to the L/R clutch circuit. In 2nd, 3rd, and 4th, it will be in the upshifted position and directs the fluid into the torque converter clutch (TCC) circuit.

DESCRIPTION AND OPERATION (Continued)

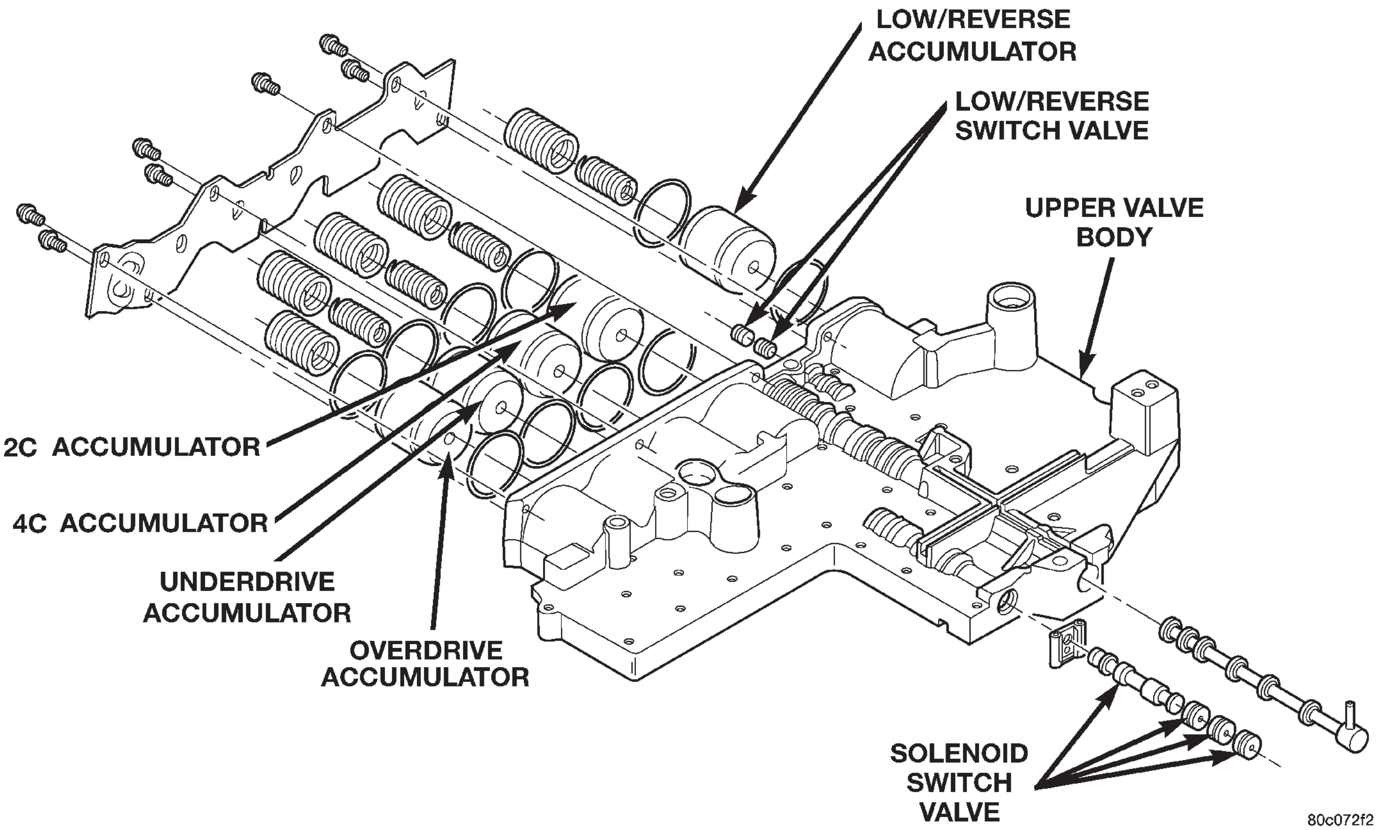


Fig. 14 Valve Body Components

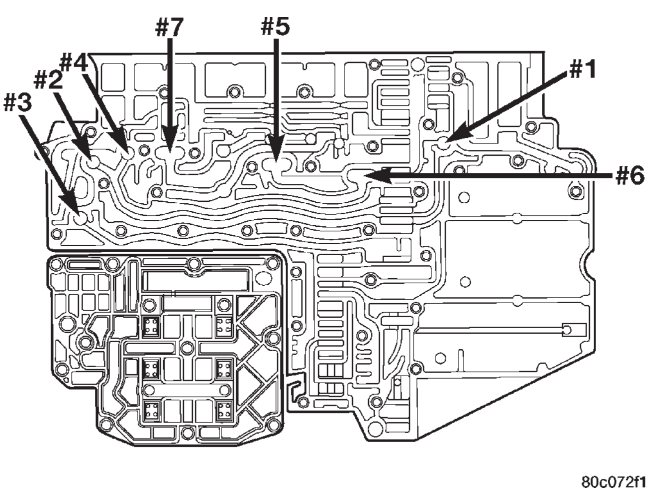


Fig. 15 Check Ball Locations

When shifting into 1st gear, a special hydraulic sequence is performed to ensure SSV movement into the downshifted position. The L/R pressure switch is monitored to confirm SSV movement. If the movement is not confirmed (the L/R pressure switch does not close), 2nd gear is substituted for 1st. A DTC will be set after three unsuccessful attempts are made to get into 1st gear in one given key start.

MANUAL VALVE

The manual valve is a relay valve. The purpose of the manual valve is to direct fluid to the correct circuit needed for a specific gear or driving range. The manual valve, as the name implies, is manually operated by the driver with a lever located on the top of the valve body. The valve is connected mechanically by a cable to the gearshift mechanism. The valve is held in each of its positions by a roller detent spring (Fig. 16) that engages the “roostercomb” of the TRS selector plate.

LOW/REVERSE SWITCH VALVE

Allows the low/reverse clutch to be operated by either the LR/CC solenoid or the MS solenoid.

DESCRIPTION AND OPERATION (Continued)

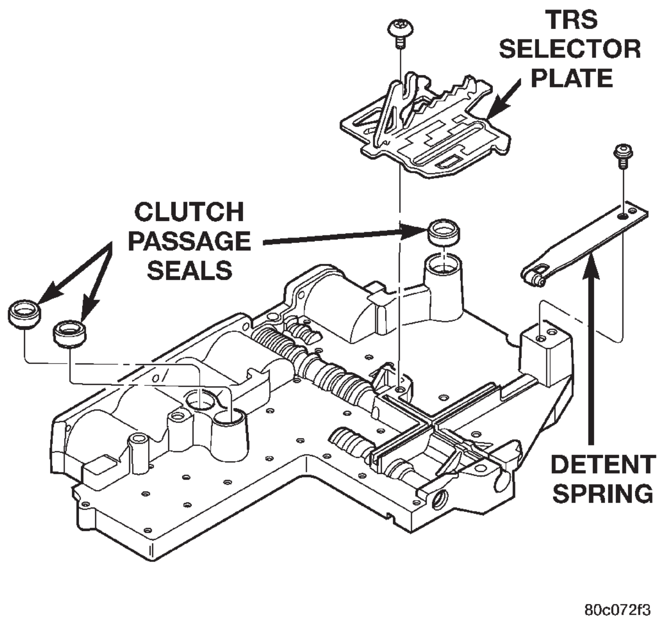


Fig. 16 TRS Selector Plate and Detent Spring

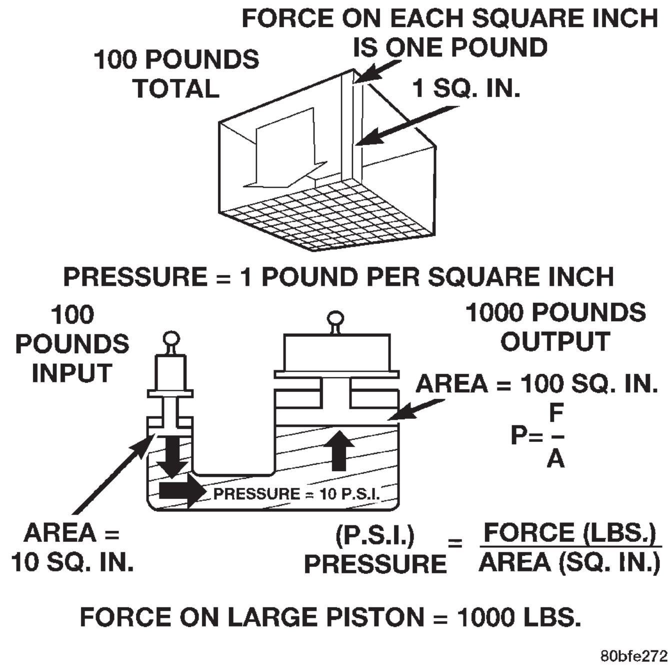


Fig. 17 Force and Pressure Relationship

PISTONS

DESCRIPTION

There are several sizes and types of pistons used in an automatic transmission. Some pistons are used to apply clutches, while others are used to apply bands. They all have in common the fact that they are round or circular in shape, located within a smooth walled cylinder, which is closed at one end and converts fluid pressure into mechanical movement. The fluid pressure exerted on the piston is contained within the system through the use of piston rings or seals.

OPERATION

The principal which makes this operation possible is known as Pascal's Law. Pascal's Law can be stated as: "Pressure on a confined fluid is transmitted equally in all directions and acts with equal force on equal areas".

PRESSURE

Pressure (Fig. 17) is nothing more than force (lbs.) divided by area (in. or ft.), or force per unit area. Given a 100 lb. block and an area of 100 sq. in. on the floor, the pressure exerted by the block is: 100 lbs. 100 in. or 1 pound per square inch, or PSI as it is commonly referred to.

PRESSURE ON A CONFINED FLUID

Pressure is exerted on a confined fluid (Fig. 18) by applying a force to some given area in contact with the fluid. A good example of this is a cylinder filled with fluid and equipped with a piston that is closely fitted to the cylinder wall. If a force is applied to the piston, pressure will be developed in the fluid. Of course, no pressure will be created if the fluid is not confined. It will simply "leak" past the piston. There must be a resistance to flow in order to create pressure. Piston sealing is extremely important in hydraulic operation. Several kinds of seals are used to accomplish this within a transmission. These include but are not limited to O–rings, D–rings, lip seals, sealing rings, or extremely close tolerances between the piston and the cylinder wall. The force exerted is downward (gravity), however, the principle remains the same no matter which direction is taken. The pressure created in the fluid is equal to the force applied, divided by the piston area. If the force is 100 lbs., and the piston area is 10 sq. in., then the pressure created equals 10 PSI. Another interpretation of Pascal's Law is that regardless of container shape or size, the pressure will be maintained throughout, as long as the fluid is confined. In other words, the pressure in the fluid is the same everywhere within the container.

FORCE MULTIPLICATION

Using the 10 PSI example used in the illustration (Fig. 19), a force of 1000 lbs. can be moved with a force of only 100 lbs. The secret of force multiplication in hydraulic systems is the total fluid contact area employed. The illustration, (Fig. 19), shows an area that is ten times larger than the original area. The pressure created with the smaller 100 lb. input is 10 PSI. The concept "pressure is the same every-

DESCRIPTION AND OPERATION (Continued)

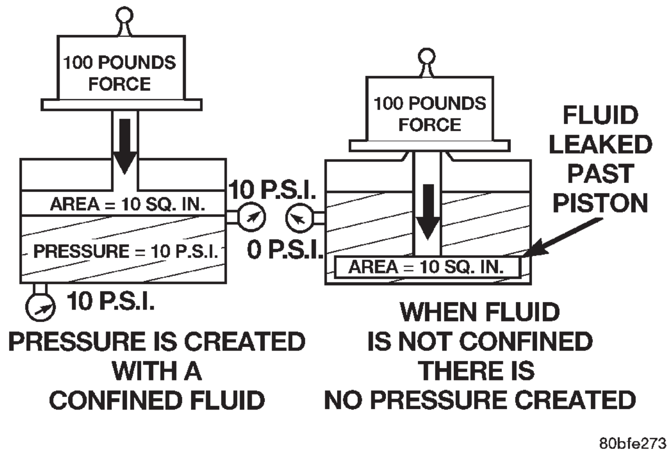


Fig. 18 Pressure on a Confined Fluid

where" means that the pressure underneath the larger piston is also 10 PSI. Pressure is equal to the force applied divided by the contact area. Therefore, by means of simple algebra, the output force may be found. This concept is extremely important, as it is also used in the design and operation of all shift valves and limiting valves in the valve body, as well as the pistons, of the transmission, which activate the clutches and bands. It is nothing more than using a difference of area to create a difference in pressure to move an object.

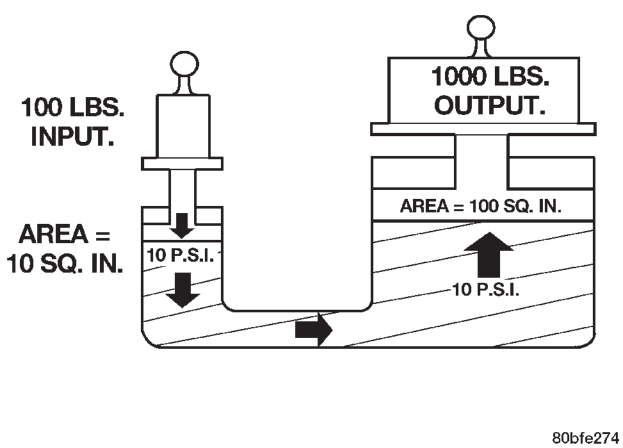


Fig. 19 Force Multiplication

PISTON TRAVEL

The relationship between hydraulic lever and a mechanical lever is the same. With a mechanical lever it's a weight–to–distance output rather than a pressure–to–area output. Using the same forces and areas as in the previous example, the smaller piston (Fig. 20) has to move ten times the distance required to move the larger piston one inch. Therefore, for every inch the larger piston moves, the smaller piston moves ten inches. This principle is true in other instances also. A common garage floor jack is a good example. To raise a car weighing 2000 lbs., an effort of only 100 lbs. may be required. For every inch the car moves upward, the input piston at the jack handle must move 20 inches downward.

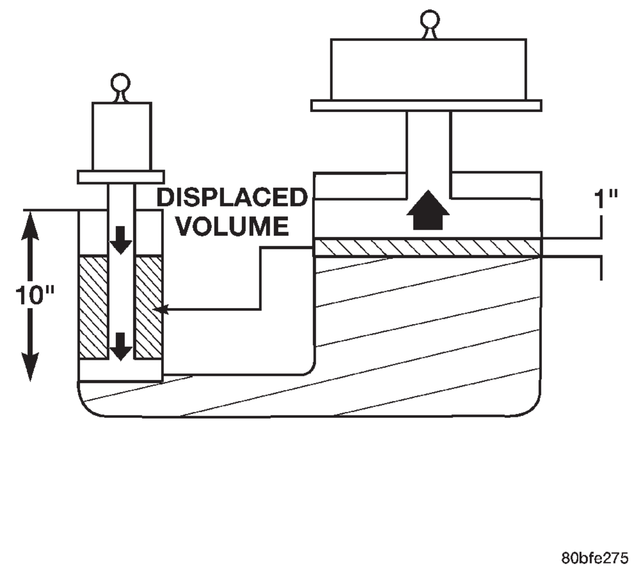


Fig. 20 Piston Travel

DESCRIPTION AND OPERATION (Continued)

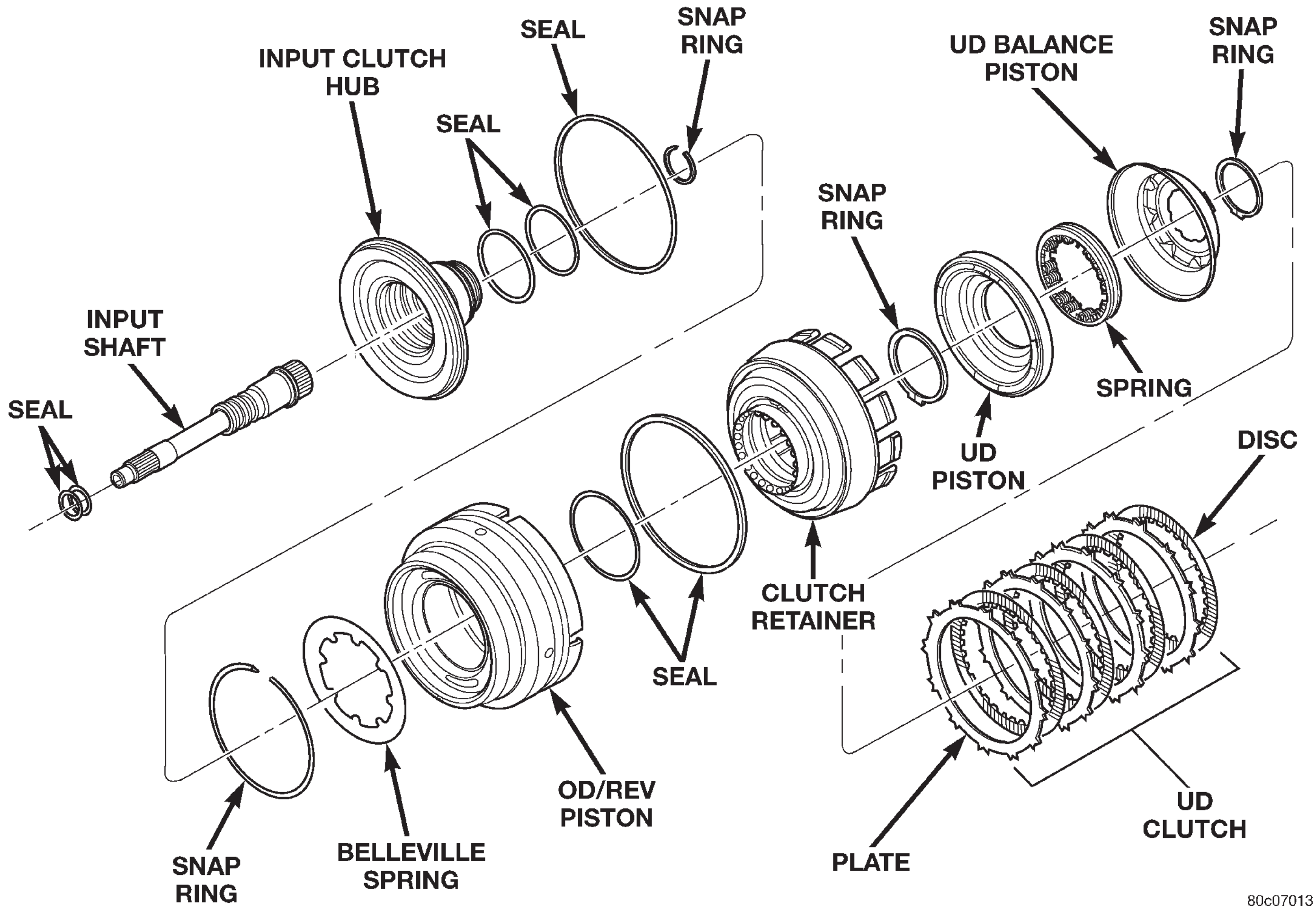


Fig. 21 Input Clutch Assembly-Part 1

INPUT CLUTCHES

DESCRIPTION

Three hydraulically applied input clutches are used to drive planetary components. The underdrive, overdrive, and reverse clutches are considered input clutches and are contained within the input clutch assembly (Fig. 21) and (Fig. 22). The input clutch assembly also contains:

- Input shaft
- Input hub
- Clutch retainer
- Underdrive piston
- Overdrive/reverse piston
- Overdrive hub
- Underdrive hub

OPERATION

The three input clutches are responsible for driving different components of the planetary geartrain.

UNDERDRIVE CLUTCH

The underdrive clutch is hydraulically applied in first, second, and third (direct) gears by pressurized fluid against the underdrive piston. When the underdrive clutch is applied, the underdrive hub drives the input sun gear.

DESCRIPTION AND OPERATION (Continued)

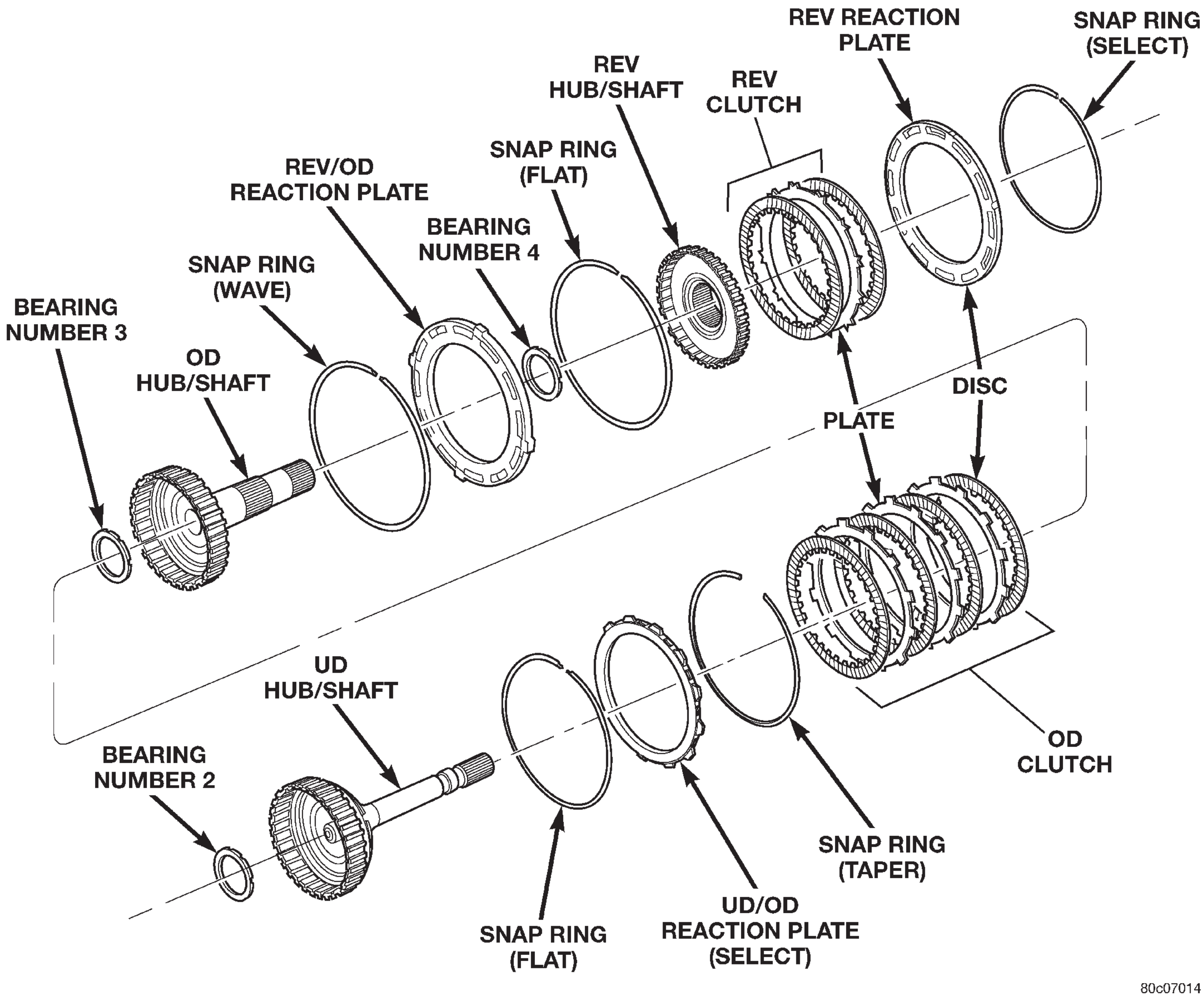


Fig. 22 Input Clutch Assembly-Part 2

OVERDRIVE CLUTCH

The overdrive clutch is hydraulically applied in third (direct) and overdrive gears by pressurized fluid against the overdrive/reverse piston. When the overdrive clutch is applied, the overdrive hub drives the reverse carrier/input annulus assembly.

REVERSE CLUTCH

The reverse clutch is hydraulically applied in reverse gear by pressurized fluid against the overdrive/reverse piston. When the reverse clutch is applied, the reaction annulus gear is driven.

DESCRIPTION AND OPERATION (Continued)

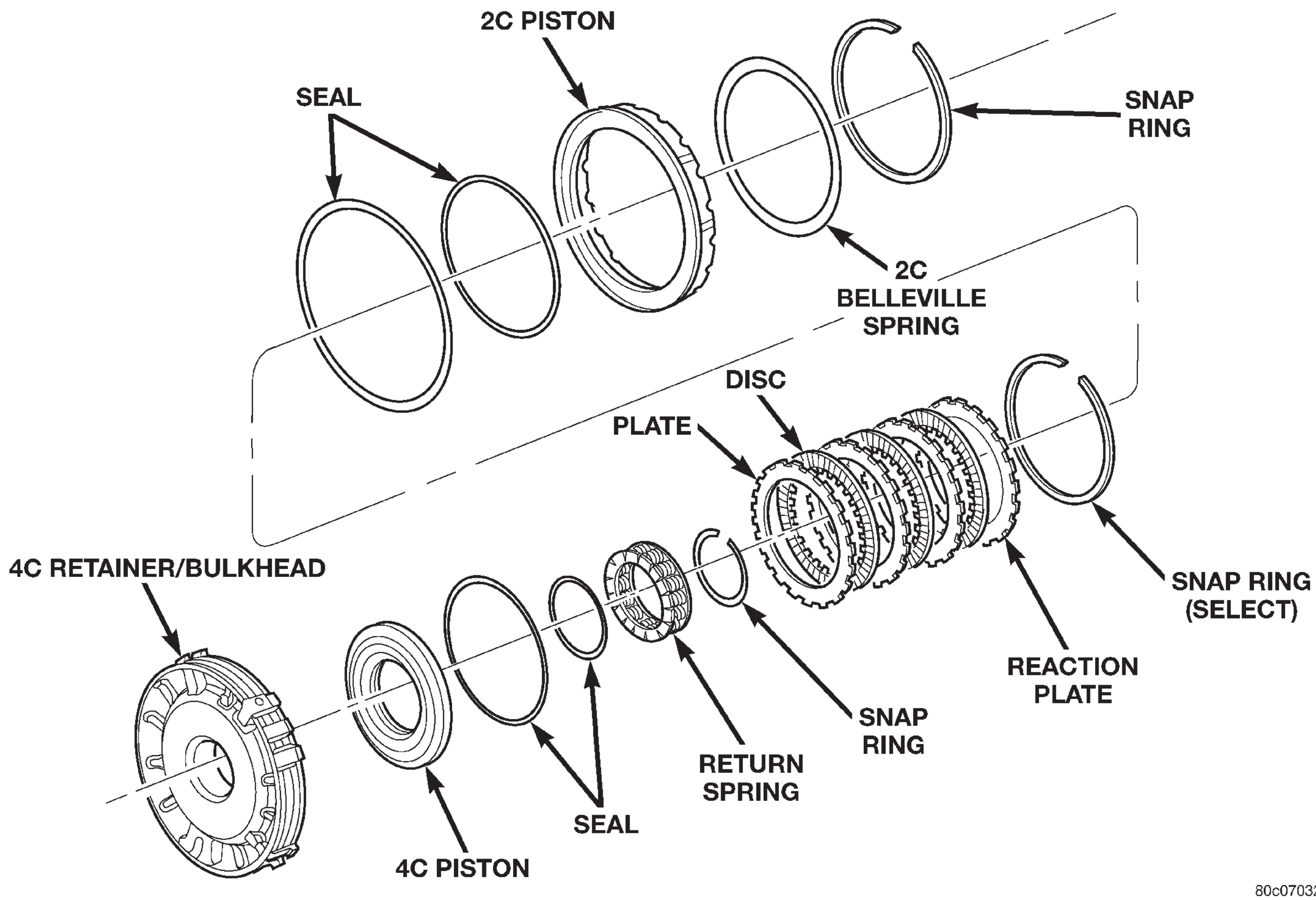


Fig. 23 2C and 4C Clutches

HOLDING CLUTCHES

DESCRIPTION

Three hydraulically applied multi-disc clutches are used to hold planetary geartrain components stationary while the input clutches drive others. The 2C, 4C, and Low/Reverse clutches are considered holding clutches. The 2C and 4C clutches are located in the 4C retainer/bulkhead (Fig. 23), while the Low/Reverse clutch is located at the rear of the transmission case (Fig. 24).

OPERATION

2C CLUTCH

The 2C clutch is hydraulically applied in second gear by pressurized fluid against the 2C piston. When the 2C clutch is applied, the reverse sun gear assembly is held or grounded to the transmission case by holding the reaction planetary carrier.

DESCRIPTION AND OPERATION (Continued)

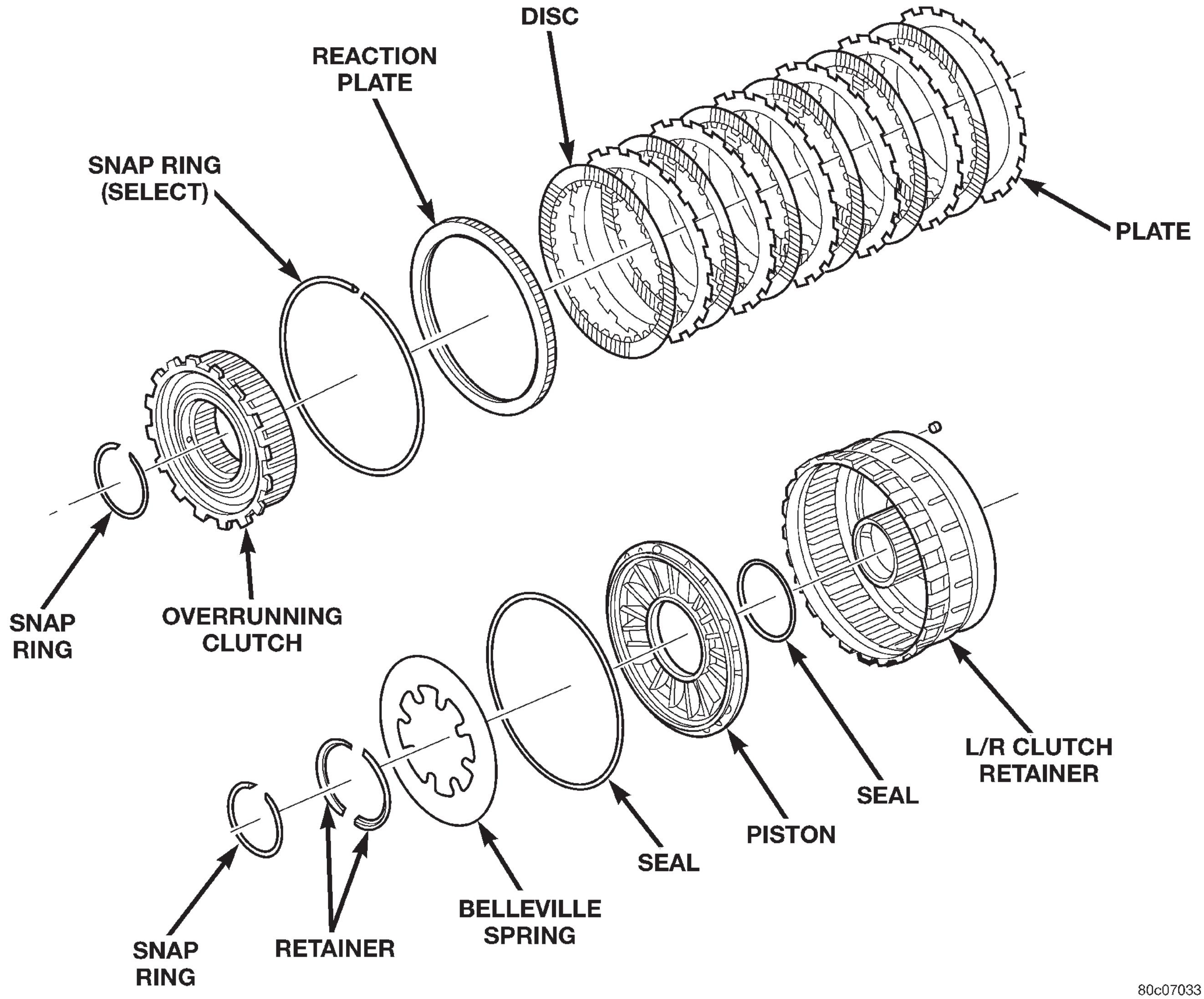


Fig. 24 Low/Reverse Clutch

4C CLUTCH

The 4C clutch is hydraulically applied in fourth gear by pressurized fluid against the 4C clutch piston. When the 4C clutch is applied, the reaction annulus gear is held or grounded to the transmission case.

LOW/REVERSE CLUTCH

The Low/Reverse clutch is hydraulically applied in park, reverse, neutral, and first gears by pressurized fluid against the Low/Reverse clutch piston. When the Low/Reverse clutch is applied, the input annulus assembly is held or grounded to the transmission case.

DESCRIPTION AND OPERATION (Continued)

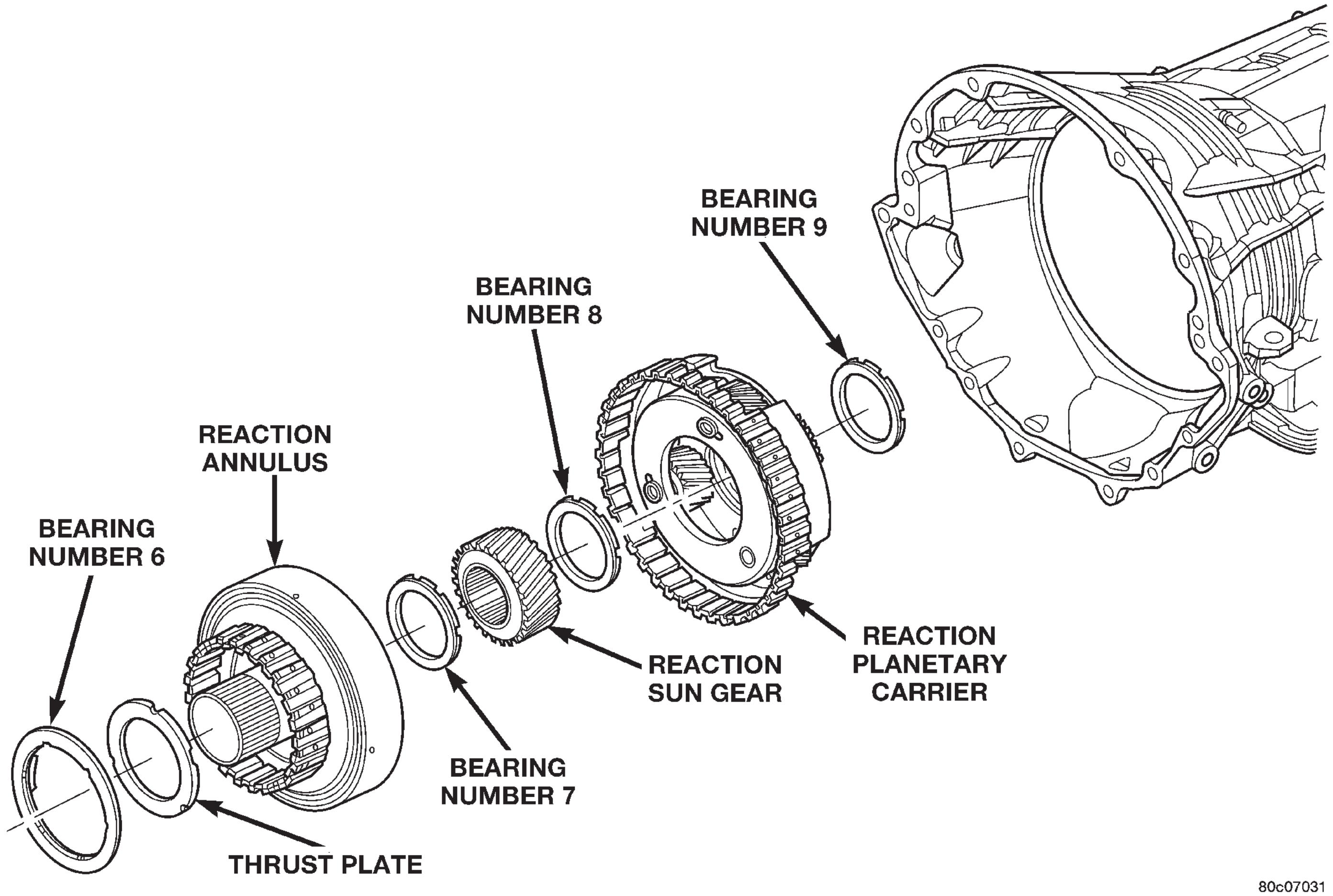


Fig. 25 Reaction Planetary Geartrain

PLANETARY GEARTRAIN

DESCRIPTION

The planetary geartrain is located behind the 4C retainer/bulkhead, toward the rear of the transmission. The planetary geartrain consists of three primary assemblies:

- Reaction (Fig. 25).
- Reverse (Fig. 26).
- Input (Fig. 26).

OPERATION

REACTION PLANETARY GEARTRAIN

The reaction planetary carrier and reverse sun gear of the reaction planetary geartrain are a single component which is held by the 2C clutch when required. The reaction annulus gear is a stand alone component that can be driven by the reverse clutch or held by the 4C clutch. The reaction sun gear is driven by the overdrive clutch.

REVERSE PLANETARY GEARTRAIN

The reverse planetary geartrain is the middle of the three planetary sets. The reverse planetary carrier can be driven by the overdrive clutch as required. The reverse planetary carrier is also splined to the input annulus gear, which can be held by the low/reverse clutch. The reverse planetary annulus, input planetary carrier, and output shaft are all one piece.

INPUT PLANETARY GEARTRAIN

The input sun gear of the input planetary geartrain is driven by the underdrive clutch.

GEARSHIFT MECHANISM

DESCRIPTION

The gear shift mechanism provides six shift positions which are:

- Park (P)
- Reverse (R)
- Neutral (N)
- Drive (D)
- Manual second (2)
- Manual low (1)

DESCRIPTION AND OPERATION (Continued)

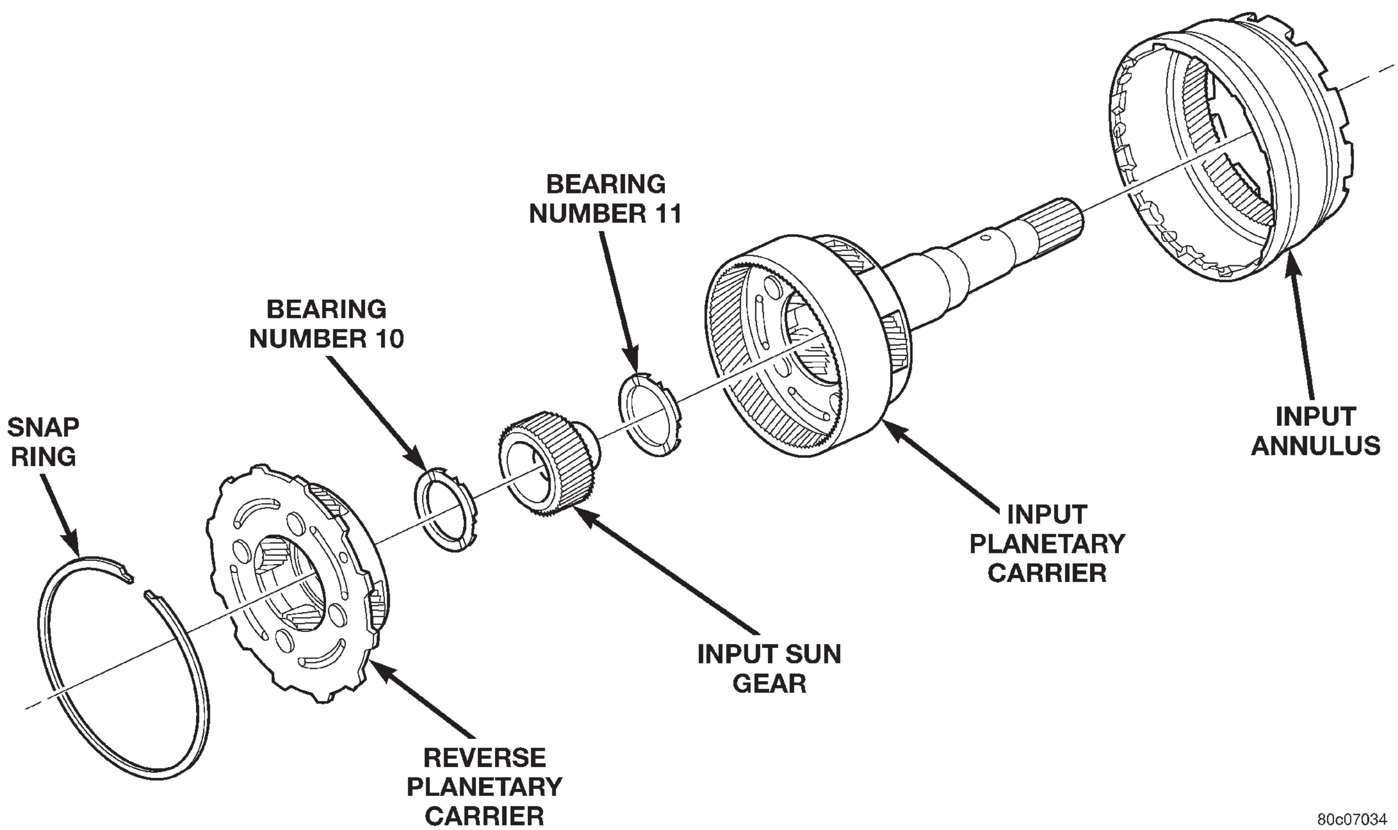


Fig. 26 Reverse/Input Planetary Geartrain

OPERATION

Manual low (1) range provides first gear only. Overrun braking is also provided in this range. Manual second (2) range provides first and second gear only.

Drive range provides first, second third and overdrive fourth gear ranges. The shift into overdrive fourth gear range occurs only after the transmission has completed the shift into D third gear range. No further movement of the shift mechanism is required to complete the 3-4 shift.

The fourth gear upshift occurs automatically when the overdrive selector switch is in the ON position. An upshift to fourth gear may not occur or may be delayed in some of the possible shift schedules. Refer to the Transmission Control Module information for further details.

OVERDRIVE OFF SWITCH

DESCRIPTION

The overdrive OFF (control) switch is located in the shifter handle. The switch is a momentary contact device that signals the PCM to toggle current status of the overdrive function.

OPERATION

At key-on, overdrive operation is allowed. Pressing the switch once causes the overdrive OFF mode to be entered and the overdrive OFF switch lamp to be illuminated. Pressing the switch a second time causes normal overdrive operation to be restored and the overdrive lamp to be turned off. The overdrive OFF mode defaults to ON after the ignition switch is cycled OFF and ON. The normal position for the control switch is the ON position. The switch must be in this position to energize the solenoid and allow a 3-4 upshift. The control switch indicator light illuminates only when the overdrive switch is turned to the OFF position, or when illuminated by the transmission control module.

BRAKE TRANSMISSION SHIFT INTERLOCK MECHANISM

DESCRIPTION

The Brake Transmission Shifter/Ignition Interlock (BTSI), is a cable and solenoid operated system. It interconnects the automatic transmission floor mounted shifter to the steering column ignition switch (Fig. 27).

DESCRIPTION AND OPERATION (Continued)

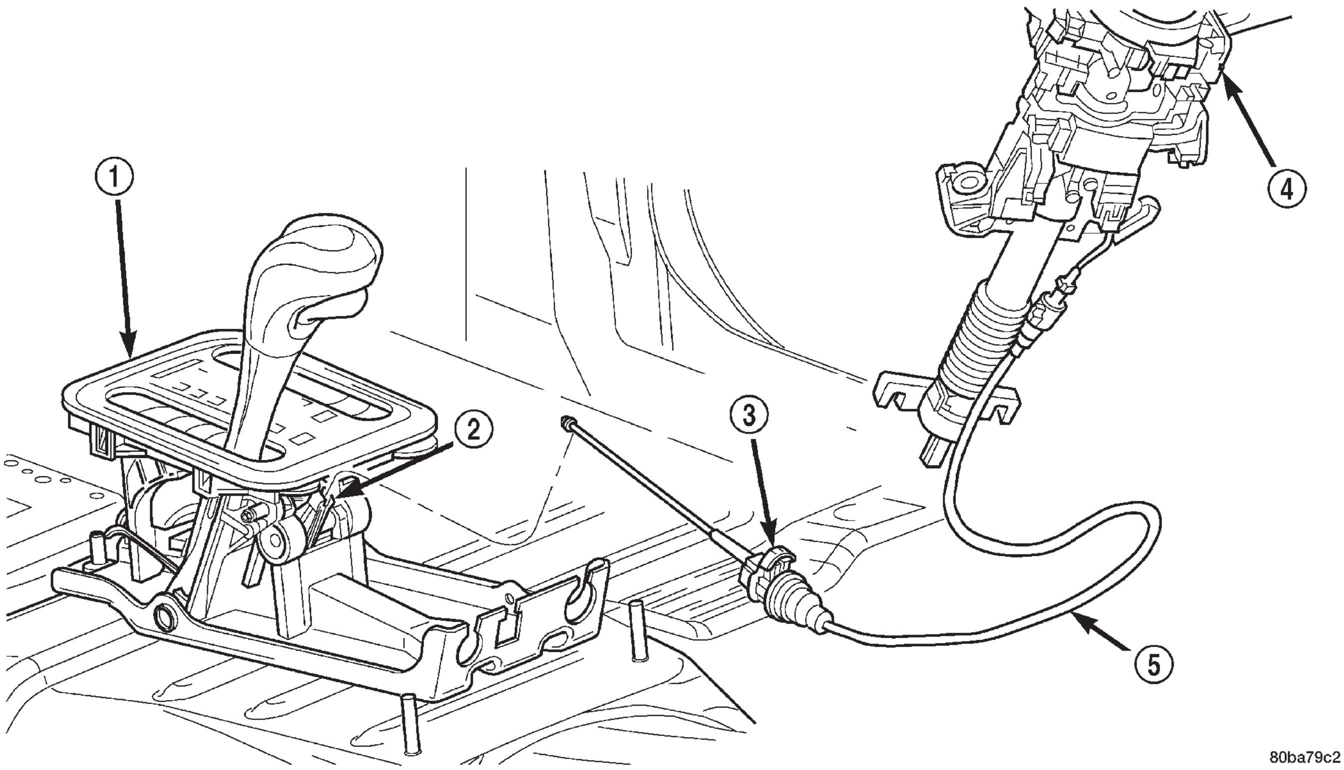


Fig. 27 Ignition Interlock Cable

1 – SHIFT MECHANISM
2 – SHIFTER BTSI LEVER
3 – ADJUSTMENT CLIP
4 – STEERING COLUMN ASSEMBLY
5 – INTERLOCK CABLE

OPERATION

The system locks the shifter into the PARK position. The interlock system is engaged whenever the ignition switch is in the LOCK or ACCESSORY position. An additional electrically activated feature will prevent shifting out of the PARK position unless the brake pedal is depressed at least one-half an inch. A magnetic holding device in line with the park lock cable is energized when the ignition is in the RUN position. When the key is in the RUN position and the brake pedal is depressed, the shifter is unlocked and will move into any position. The interlock system also prevents the ignition switch from being turned to the LOCK or ACCESSORY position, unless the shifter is fully locked into the PARK position.

TRANSMISSION CONTROL MODULE

DESCRIPTION

The Transmission Control Module (TCM) is located in the engine compartment on the right (passenger) side and is mounted to the inner fender (Fig. 28).

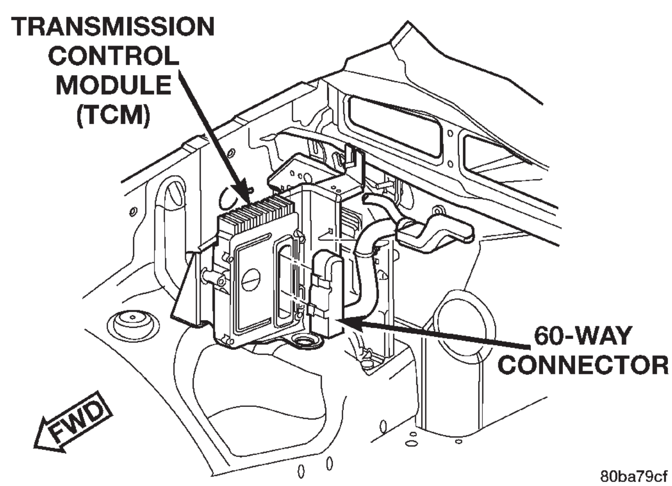


Fig. 28 Transmission Control Module Location

OPERATION

The TCM is the controlling unit for all electronic operations of the transmission. The TCM receives information regarding vehicle operation from both direct and indirect inputs, and selects the operational mode of the transmission. Direct inputs are hard-wired to, and used specifically by the TCM. Indirect inputs originate from other components/modules, and

DESCRIPTION AND OPERATION (Continued)

are shared with the TCM via the vehicle communication bus.

Some examples of **direct inputs** to the TCM are:

- Battery (B+) voltage
- Ignition "ON" voltage
- Transmission Control Relay (Switched B+)
- Throttle Position Sensor
- Crankshaft Position Sensor
- Transmission Range Sensor
- Pressure Switches
- Transmission Temperature Sensor
- Input Shaft Speed Sensor
- Output Shaft Speed Sensor
- Line Pressure Sensor

Some examples of **indirect inputs** to the TCM are:

- Engine/Body Identification
- Manifold Pressure
- Target Idle
- Torque Reduction Confirmation
- Engine Coolant Temperature
- Ambient/Battery Temperature
- DRB Scan Tool Communication

Based on the information received from these various inputs, the TCM determines the appropriate shift schedule and shift points, depending on the present operating conditions and driver demand. This is possible through the control of various direct and indirect outputs.

Some examples of TCM **direct outputs** are:

- Transmission Control Relay
- Solenoids
- Torque Reduction Request

Some examples of TCM **indirect outputs** are:

- Transmission Temperature (to PCM)
- PRNDL Position (to BCM)

In addition to monitoring inputs and controlling outputs, the TCM has other important responsibilities and functions:

- Storing and maintaining Clutch Volume Indexes (CVI)
- Storing and selecting appropriate Shift Schedules
- System self-diagnostics
- Diagnostic capabilities (with DRB scan tool)

NOTE: If the TCM has been replaced, the "Quick Learn Procedure" must be performed. Refer to "Quick Learn Procedure" in Service Procedures of this group.

CLUTCH VOLUME INDEXES

An important function of the TCM is to monitor Clutch Volume Indexes (CVI). CVIs represent the volume of fluid needed to compress a clutch pack.

The TCM monitors gear ratio changes by monitoring the Input and Output Speed Sensors. The Input, or Turbine Speed Sensor sends an electrical signal to the TCM that represents input shaft rpm. The Output Speed Sensor provides the TCM with output shaft speed information.

By comparing the two inputs, the TCM can determine transmission gear position. This is important to the CVI calculation because the TCM determines CVIs by monitoring how long it takes for a gear change to occur (Fig. 29).

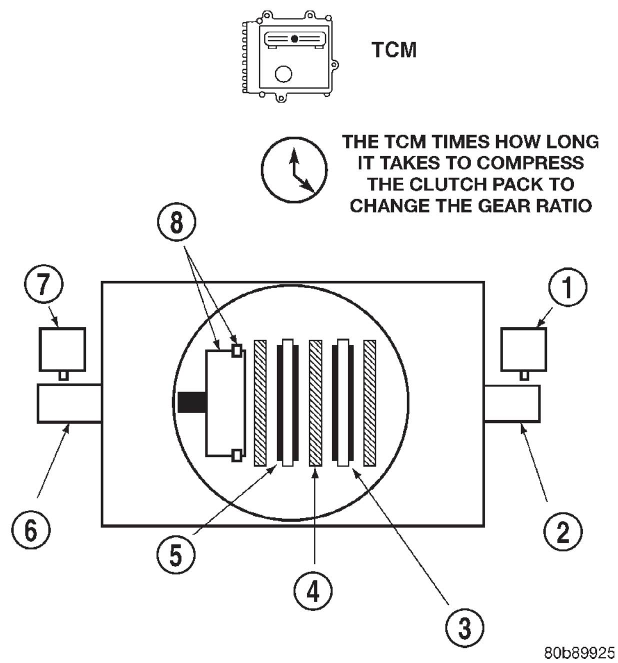


Fig. 29 Example of CVI Calculation

1 – OUTPUT SPEED SENSOR
2 – OUTPUT SHAFT
3 – CLUTCH PACK
4 – SEPARATOR PLATE
5 – FRICTION DISCS
6 – INPUT SHAFT
7 – INPUT SPEED SENSOR
8 – PISTON AND SEAL

Gear ratios can be determined by using the DRB Scan Tool and reading the Input/Output Speed Sensor values in the "Monitors" display. Gear ratio can be obtained by dividing the Input Speed Sensor value by the Output Speed Sensor value.

For example, if the input shaft is rotating at 1000 rpm and the output shaft is rotating at 500 rpm, then the TCM can determine that the gear ratio is 2:1. In direct drive (3rd gear), the gear ratio changes to 1:1. The gear ratio changes as clutches are applied and released. By monitoring the length of time it takes for the gear ratio to change following a shift request, the TCM can determine the volume of fluid used to apply or release a friction element.

DESCRIPTION AND OPERATION (Continued)

The volume of transmission fluid needed to apply the friction elements are continuously updated for adaptive controls. As friction material wears, the volume of fluid need to apply the element increases.

Certain mechanical problems within the input clutch assembly (broken return springs, out of position snap rings, excessive clutch pack clearance, improper assembly, etc.) can cause inadequate or out-of-range element volumes. Also, defective Input/Output Speed Sensors and wiring can cause these conditions. The following chart identifies the appropriate clutch volumes and when they are monitored/updated:

CLUTCH VOLUMES

Clutch	When Updated	Proper Clutch Volume
L/R	2-1 or 3-1 downshift	45 to 134
2C	3-2 kickdown shift	25 to 85
OD	2-3 upshift	30 to 100
4C	3-4 upshift	30 to 85
UD	4-3 kickdown shift	30 to 100

SHIFT SCHEDULES

As mentioned earlier, the TCM has programming that allows it to select a variety of shift schedules. Shift schedule selection is dependent on the following:

- Shift lever position
- Throttle position
- Engine load
- Fluid temperature
- Software level

As driving conditions change, the TCM appropriately adjusts the shift schedule. Refer to the following chart to determine the appropriate operation expected, depending on driving conditions.

Schedule	Condition	Expected Operation
Extreme Cold	Oil temperature below -16° F	–Park, Reverse, Neutral and 1st and 3rd gear only in D position, 2nd gear only in Manual 2 or L –No EMCC
Super Cold	Oil temperature between -12° F and 10° F	– Delayed 2-3 upshift – Delayed 3-4 upshift – Early 4-3 coastdown shift – High speed 4-2, 3-2, 2-1 kickdown shifts are prevented – Shifts at high throttle openings willl be early. – No EMCC
Cold	Oil temperature between 10° F and 36° F	– Shift schedule is the same as Super Cold except that the 2-3 upshifts are not delayed.
Warm	Oil temperature 40° F and 80° F	– Normal operation (upshift, kickdowns, and coastdowns) – No EMCC
Hot	Oil temperature above 80° F and 240° F	– Normal operation (upshift, kickdowns, and coastdowns) – Normal EMCC operation
Overheat	Oil temperature above 240° F or engine coolant temperature above 244° F	– Delayed 2-3 upshift – Delayed 3-4 upshift – 3rd gear FEMCC from 30-48 mph – 3rd gear PEMCC above 35 mph – Above 25 mph the torque converter will not unlock unless the throttle is closed or if a wide open throttle 2nd PEMCC to 1 kickdown is made

DESCRIPTION AND OPERATION (Continued)

SOLENOID AND PRESSURE SWITCH ASSEMBLY

DESCRIPTION

The solenoid and pressure switch assembly is internal to the transmission and mounted on the valve body assembly (Fig. 30). The assembly consists of six solenoids that control hydraulic pressure to the six friction elements (transmission clutches), and the torque converter clutch. The pressure control solenoid is located on the side of the solenoid and pressure switch assembly. The solenoid assembly also contains five pressure switches that feed information to the TCM.

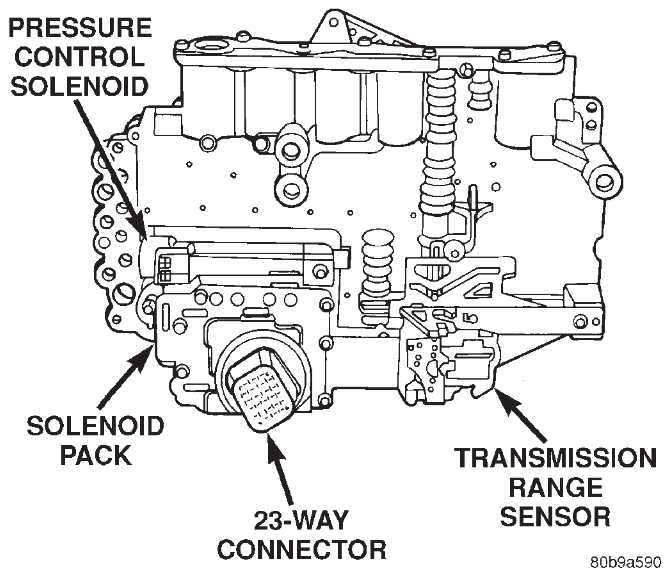


Fig. 30 SOLENOID AND PRESSURE SWITCH ASSEMBLY

OPERATION

The solenoids within the assembly are supplied voltage by the Transmission Control Relay. The solenoids are energized when the TCM grounds the return wire for the solenoid that is needed. The pressure switches simply tell the TCM whether or not pressure exists within a clutch circuit.

BATTERY FEED (TCM)

DESCRIPTION

A fused, direct battery feed to the TCM is used for continuous power.

OPERATION

This battery voltage is necessary to retain adaptive learn values in the TCM's RAM (Random Access Memory). When the battery (B+) is disconnected, this memory is lost. When the battery (B+) is restored, this memory loss is detected by the TCM and a Diagnostic Trouble Code (DTC) is set.

TRANSMISSION CONTROL RELAY

DESCRIPTION

The relay is supplied fused B+ voltage, energized by the TCM, and is used to supply power to the solenoid pack when the transmission is in normal operating mode.

OPERATION

When the relay is "off", no power is supplied to the solenoid pack and the transmission is in "limp-in" mode. After a controller reset, the TCM energizes the relay. Prior to this, the TCM verifies that the contacts are open by checking for no voltage at the switched battery terminals. After this is verified, the voltage at the solenoid pack pressure switches is checked. After the relay is energized, the TCM monitors the terminals to verify that the voltage is greater than 3 volts.

PRESSURE SWITCHES

DESCRIPTION

The pressure switches are located inside the solenoid and pressure switch assembly and are only serviced by replacing the assembly.

OPERATION

The TCM relies on five pressure switches to monitor fluid pressure in the L/R, 2C, 4C, UD, and OD hydraulic circuits. The primary purpose of these switches is to help the TCM detect when clutch circuit hydraulic failures occur. The switches close at 23 psi and open at 11 psi, and simply indicate whether or not pressure exists. The switches are continuously monitored by the TCM for the correct states (open or closed) in each gear as shown in the following chart:

GEAR	L/R	2C	4C	UD	OD
R	OP	OP	OP	OP	OP
P/N	CL	OP	OP	OP	OP
1ST	CL*	OP	OP	CL	OP
2ND	OP	CL	OP	CL	OP
2ND PRIME	OP	OP	CL	CL	OP
D	OP	OP	OP	CL	CL
OD	OP	OP	CL	OP	CL

*L/R is closed if output speed is below 100 rpm in Drive and Manual 2. L/R is open in Manual 1.

DESCRIPTION AND OPERATION (Continued)

A Diagnostic Trouble Code (DTC) will set if the TCM senses any switch open or closed at the wrong time in a given gear.

INPUT AND OUTPUT SPEED SENSORS

DESCRIPTION

The Input and Output Speed Sensors are two-wire magnetic pickup devices that generate AC signals as rotation occurs. They are mounted in the left side of the transmission case and are considered primary inputs to the Transmission Control Module (TCM).

OPERATION

The Input Speed Sensor provides information on how fast the input shaft is rotating. As the teeth of the input clutch hub pass by the sensor coil, an AC voltage is generated and sent to the TCM. The TCM interprets this information as input shaft rpm.

The Output Speed Sensor generates an AC signal in a similar fashion, though its coil is excited by rotation of the rear planetary carrier lugs. The TCM interprets this information as output shaft rpm.

The TCM compares the input and output speed signals to determine the following:

- Transmission gear ratio
- Speed ratio error detection
- CVI calculation

The TCM also compares the input speed signal and the engine speed signal to determine the following:

- Torque converter clutch slippage
- Torque converter element speed ratio

LINE PRESSURE CONTROL

DESCRIPTION

The TCM utilizes a closed-loop system to control transmission line pressure. The system contains a variable force style solenoid, the Pressure Control Solenoid, mounted on the side of the solenoid and pressure switch assembly. The solenoid is duty cycle controlled by the TCM to vent the unnecessary line pressure supplied by the oil pump back to the sump. The system also contains a variable pressure style sensor, the Line Pressure Sensor, which is a direct input to the TCM. The line pressure solenoid monitors the transmission line pressure and completes the feedback loop to the TCM. The TCM uses this information to adjust its control of the pressure control solenoid to achieve the desired line pressure.

OPERATION

The TCM calculates the desired line pressure based upon inputs from the transmission and engine. The TCM calculates the torque input to the transmission and uses that information as the primary input to the calculation. The line pressure is set to a predetermined value during shifts and when the transmission is in the PARK and NEUTRAL positions. This is done to ensure consistent shift quality. During all other operation, the actual line pressure is compared to the desired line pressure and adjustments are made to the pressure control solenoid duty cycle.

THROTTLE POSITION SENSOR

OPERATION

The Transmission Control Module (TCM) receives the throttle position signal and its ground from the Throttle Position Sensor (TPS). The TPS has a 5 volt pull up supplied by the engine controller. The throttle signal is checked by the TCM for out-of-range as well as intermittence (excessive signal changes).

TRANSMISSION RANGE SENSOR

DESCRIPTION

The Transmission Range Sensor (TRS) is mounted to the top of the valve body inside the transmission.

The Transmission Range Sensor (TRS) has six switch contacts that:

- Determine shift lever position
- Supply ground to the Starter Relay in Park and Neutral only.
- Supply ground to the TCM for backup lamp control in Reverse only.

The TRS also has an integrated temperature sensor (thermistor) that communicates transmission temperature to the TCM and PCM.

OPERATION

The Transmission Range Sensor (TRS) communicates shift lever position to the TCM as a combination of open and closed switches. Each shift lever position has an assigned combination of switch states (open/closed) that the TCM receives from four sense circuits. The TCM interprets this information and determines the appropriate transmission gear position and shift schedule.

There are many possible combinations of open and closed switches (codes). Seven of these possible codes are related to gear position and five are recognized as “between gear” codes. This results in many codes which should **never occur**. These are called “invalid” codes. An invalid code will result in a DTC, and the TCM will then determine the shift lever position based on pressure switch data. This allows reasonably normal transmission operation with a TRS failure.

DESCRIPTION AND OPERATION (Continued)

GEAR	C5	C4	C3	C2	C1
Park	CL	OP	OP	CL	CL
Temp 1	CL	OP	OP	CL	OP
Reverse	OP	OP	OP	CL	OP
Temp 2	OP	OP	CL	CL	OP
Neutral 1	OP	OP	CL	CL	CL
Neutral 2	OP	CL	CL	CL	CL
Temp 3	OP	CL	CL	CL	OP
Drive	OP	CL	CL	OP	OP
Temp 4	OP	CL	OP	OP	OP
Manual 2	CL	CL	OP	OP	OP
Temp 5	CL	OP	OP	OP	OP
Manual 1	CL	OP	CL	OP	OP

TRANSMISSION TEMPERATURE SENSOR

DESCRIPTION

The transmission temperature sensor is a thermistor that is integral to the Transmission Range Sensor (TRS).

OPERATION

The transmission temperature sensor is used by the TCM to sense the temperature of the fluid in the sump. Since fluid temperature can affect transmission shift quality and convertor lock up, the TCM requires this information to determine which shift schedule to operate in.

Calculated Temperature

A failure in the temperature sensor or circuit will result in calculated temperature being substituted for actual temperature. Calculated temperature is a predicted fluid temperature which is calculated from a combination of inputs:

- Battery (ambient) temperature
- Engine coolant temperature
- In-gear run time since start-up

SOLENOIDS

DESCRIPTION

Solenoids are used to control the L/R, 2C, 4C, OD, and UD friction elements. The reverse clutch is controlled by line pressure and the position of the manual valve in the valve body. All the solenoids are contained within the Solenoid and Pressure Switch Assembly. The solenoid and pressure switch assembly contains one additional solenoid, Multi-Select (MS), which serves primarily to provide 2nd and 3rd gear limp-in operation.

OPERATION

The solenoids receive electrical power from the Transmission Control Relay through a single wire. The TCM energizes or operates the solenoids individually by grounding the return wire of the solenoid as necessary. When a solenoid is energized, the solenoid valve shifts, and a fluid passage is opened or closed (vented or applied), depending on its default operating state. The result is an apply or release of a frictional element.

The MS and UD solenoids are normally applied to allow transmission limp-in in the event of an electrical failure.

The continuity of the solenoids and circuits are periodically tested. Each solenoid is turned on or off depending on its 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 speed ratio or pressure switch error occurs.

SOLENOID SWITCH VALVE

DESCRIPTION

The Solenoid Switch Valve (SSV) is located in the valve body controls the direction of the transmission fluid when the L/R-TCC solenoid is energized.

OPERATION

The Solenoid Switch Valve controls line pressure from the LR-TCC solenoid. In 1st gear, the SSV will be in the downshifted position, thus directing fluid to the L/R clutch circuit. In 2nd, 3rd, and 4th, it will be in the upshifted position and directs the fluid into the torque converter clutch (TCC) circuit.

When shifting into 1st gear, a special hydraulic sequence is performed to ensure SSV movement into the downshifted position. The L/R pressure switch is monitored to confirm SSV movement. If the movement is not confirmed (the L/R pressure switch does not close), 2nd gear is substituted for 1st. A DTC will be set after three unsuccessful attempts are made to get into 1st gear in one given key start.

DIAGNOSIS AND TESTING

EFFECTS OF INCORRECT FLUID LEVEL

A low fluid level allows the pump to take in air along with the fluid. Air in the fluid will cause fluid pressures to be low and develop slower than normal. If the transmission is overfilled, the gears churn the fluid into foam. This aerates the fluid and causing the same conditions occurring with a low level. In either case, air bubbles cause fluid overheating, oxi-

DIAGNOSIS AND TESTING (Continued)

dation and varnish buildup which interferes with valve, clutch and servo operation. Foaming also causes fluid expansion which can result in fluid overflow from the transmission vent or fill tube. Fluid overflow can easily be mistaken for a leak if inspection is not careful.

CAUSES OF BURNT FLUID

Burnt, discolored fluid is a result of overheating which has two primary causes.

(1) A result of restricted fluid flow through the main and/or auxiliary cooler. This condition is usually the result of a faulty or damaged main/auxiliary cooler, or severe restrictions in the coolers and lines caused by debris or kinked lines.

(2) Heavy duty operation with a vehicle not properly equipped for this type of operation. Trailer towing or similar high load operation will overheat the transmission fluid if the vehicle is improperly equipped. Such vehicles should have an auxiliary transmission fluid cooler, a heavy duty cooling system, and the engine/axle ratio combination needed to handle heavy loads.

FLUID CONTAMINATION

Transmission fluid contamination is generally a result of:

- adding incorrect fluid
- failure to clean dipstick and fill tube when checking level
- engine coolant entering the fluid
- internal failure that generates debris
- overheat that generates sludge (fluid breakdown)
- failure to reverse flush cooler and lines after repair
- failure to replace contaminated converter after repair

The use of non recommended fluids can result in transmission failure. The usual results are erratic shifts, slippage, abnormal wear and eventual failure due to fluid breakdown and sludge formation. Avoid this condition by using recommended fluids only.

The dipstick cap and fill tube should be wiped clean before checking fluid level. Dirt, grease and other foreign material on the cap and tube could fall into the tube if not removed beforehand. Take the time to wipe the cap and tube clean before withdrawing the dipstick.

Engine coolant in the transmission fluid is generally caused by a cooler malfunction. The only remedy is to replace the radiator as the cooler in the radiator is not a serviceable part. If coolant has circulated through the transmission for some time, an overhaul may also be necessary; especially if shift problems had developed.

The transmission cooler and lines should be reverse flushed whenever a malfunction generates sludge and/or debris. The torque converter should also be replaced at the same time.

Failure to flush the cooler and lines will result in recontamination. Flushing applies to auxiliary coolers as well. The torque converter should also be replaced whenever a failure generates sludge and debris. This is necessary because normal converter flushing procedures will not remove all contaminants.

45RFE AUTOMATIC TRANSMISSION GENERAL DIAGNOSIS

CAUTION: Before attempting any repair on a 45RFE automatic transmission, check for Diagnostic Trouble Codes with the DRB scan tool.

Transmission malfunctions may be caused by these general conditions:

- Poor engine performance
- Improper adjustments
- Hydraulic malfunctions
- Mechanical malfunctions
- Electronic malfunctions

Diagnosis of these problems should always begin by checking the easily accessible variables: fluid level and condition, gearshift cable adjustment. Then perform a road test to determine if the problem has been corrected or if more diagnosis is necessary. If the problem persists after the preliminary tests and corrections are completed, hydraulic pressure checks should be performed.

PRELIMINARY DIAGNOSIS

Two basic procedures are required. One procedure for vehicles that are drivable and an alternate procedure for disabled vehicles (will not back up or move forward).

VEHICLE IS DRIVABLE

(1) Check for transmission fault codes using DRB scan tool.

(2) Check fluid level and condition.

(3) Adjust gearshift cable if complaint was based on delayed, erratic, or harsh shifts.

(4) Road test and note how transmission upshifts, downshifts, and engages.

(5) Perform stall test if complaint is based on sluggish acceleration. Or, if abnormal throttle opening is needed to maintain normal speeds with a properly tuned engine.

(6) Perform hydraulic pressure test if shift problems were noted during road test.

DIAGNOSIS AND TESTING (Continued)

(7) Perform air-pressure test to check clutch operation.

VEHICLE IS DISABLED

(1) Check fluid level and condition.

(2) Check for broken or disconnected gearshift cable.

(3) Check for cracked, leaking cooler lines, or loose or missing pressure-port plugs.

(4) Raise and support vehicle on safety stands, start engine, shift transmission into gear, and note following:

(a) If propeller shaft turns but wheels do not, problem is with differential or axle shafts.

(b) If propeller shaft does not turn and transmission is noisy, stop engine. Remove oil pan, and check for debris. If pan is clear, remove transmission and check for damaged driveplate, converter, oil pump, or input shaft.

(c) If propeller shaft does not turn and transmission is not noisy, perform hydraulic-pressure test to determine if problem is hydraulic or mechanical.

BRAKE TRANSMISSION SHIFT INTERLOCK

(1) Verify that the key can only be removed in the PARK position

(2) When the shift lever is in PARK And the shift handle pushbutton is in the "OUT" position, the ignition key cylinder should rotate freely from OFF to LOCK. When the shifter is in any other gear or neutral position, the ignition key cylinder should not rotate to the LOCK position.

(3) Shifting out of PARK should be possible when the ignition key cylinder is in the OFF position.

(4) Shifting out of PARK should not be possible while applying 25 lb. maximum handle pushbutton force and ignition key cylinder is in the RUN or START positions unless the foot brake pedal is depressed approximately 1/2 inch (12 mm).

(5) Shifting out of PARK should not be possible when the ignition key cylinder is in the ACCESSORY or LOCK positions.

(6) Shifting between any gears, NEUTRAL or into PARK may be done without depressing foot brake pedal with ignition switch in RUN or START positions and vehicle stationary or in motion.

GEARSHIFT CABLE

(1) The floor shifter lever and gate positions should be in alignment with all transmission PARK, NEUTRAL, and gear detent positions.

(2) Engine starts must be possible with floor shift lever in PARK or NEUTRAL gate positions only. Engine starts must not be possible in any other gear position.

(3) With floor shift lever handle push-button not depressed and lever in:

(a) PARK position—Apply forward force on center of handle and remove pressure. Engine starts must be possible.

(b) PARK position—Apply rearward force on center of handle and remove pressure. Engine starts must be possible.

(c) NEUTRAL position—Normal position. Engine starts must be possible.

(d) NEUTRAL position—Engine running and brakes applied, apply forward force on center of shift handle. Transmission shall not be able to shift from neutral to reverse.

ROAD TESTING

Before road testing, be sure the fluid level and control cable adjustments have been checked and adjusted if necessary. Verify that all diagnostic trouble codes have been resolved.

Observe engine performance during the road test. A poorly tuned engine will not allow accurate analysis of transmission operation.

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

Slippage indicated by engine flare, usually means clutch or overrunning clutch problems.

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

DIAGNOSIS AND TESTING (Continued)

CLUTCH APPLICATION CHART

SLP	UD	OD	R	2C	4C	L/R	OVERRUNNING
P–PARK						ON	
R–REVERSE			ON			ON	
N-NEUTRAL						ON	
D–OVERDRIVE FIRST	ON					ON*	ON
SECOND	ON			ON			
SECOND PRIME	ON				ON		
THIRD	ON	ON					
FOURTH		ON			ON		
LIMP-IN	ON	ON					
2–FIRST	ON					ON*	ON
SECOND	ON			ON			
LIMP-IN	ON			ON			
1–LOW	ON					ON	ON

*L/R clutch is on only with the output shaft speed below 150 rpm.

HYDRAULIC PRESSURE TEST

An accurate tachometer and pressure test gauges are required. Test Gauge C-3293-SP has a 300 psi range and is used at all locations where pressures exceed 100 psi.

Pressure Test Port Locations

Only two pressure ports are supplied on the transmission case. The torque converter ON and torque converter OFF ports are located on the right side of the transmission case (Fig. 31).

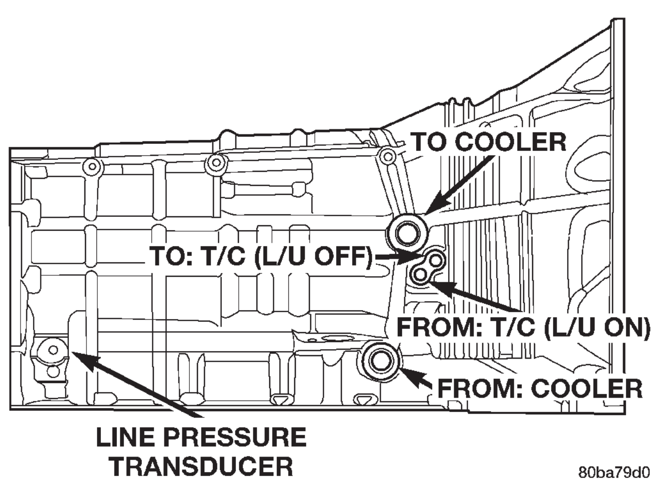


Fig. 31 Torque Converter Pressure Locations

To determine the line pressure, there are two available methods. The DRB scan tool can be used to read line pressure from the line pressure sensor. The second method is to install Line Pressure Adapter 8259 (Fig. 33) into the transmission case and then install the pressure gauge and the original sensor into the adapter. This will allow a comparison of the DRB readings and the gauge reading to make a determination regarding the accuracy of the feedback controls.

In order to access any other pressure tap locations, the transmission oil pan must be removed, the pressure port plugs removed and Valve Body Pressure Tap Adapter 8258 (Fig. 34) installed. The extensions supplied with Adapter 8258 will allow the installation of pressure gauges to the valve body. Refer to (Fig. 32) for correct pressure tap location identification.

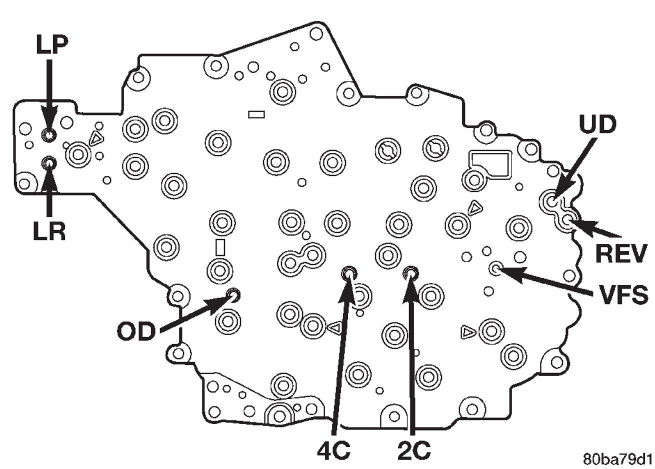


Fig. 32 Pressure Tap Locations

DIAGNOSIS AND TESTING (Continued)

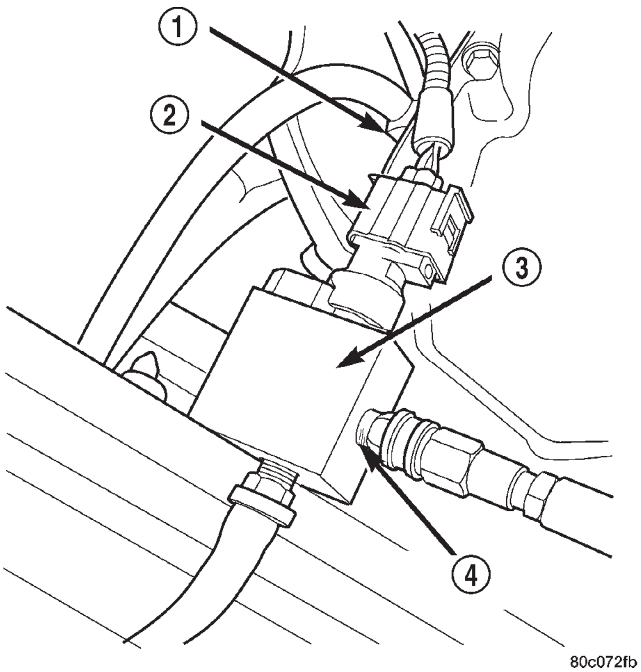


Fig. 33 Line Pressure Adapter 8259

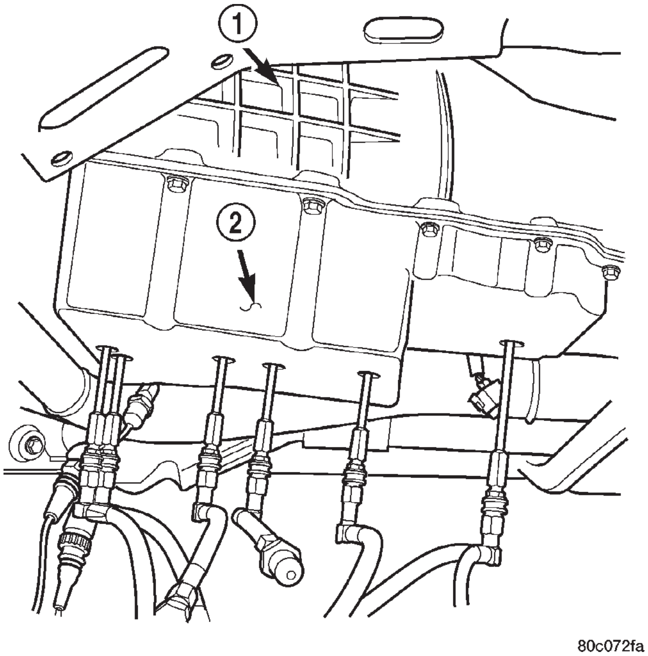


Fig. 34 Valve Body Pressure Tap Adapter 8258

TEST PROCEDURE

All pressure readings should be taken with the transmission fluid level full, transmission oil at the normal operating temperature, and the engine at 1500 rpm. Check the transmission for proper operation in each gear position that is in question or if a specific element is in question, check the pressure readings in at least two gear positions that employs that element. Refer to the Hydraulic Schematics at the rear of this section to determine the correct pressures for each element in a given gear position.

NOTE: The 45RFE utilizes closed loop control of pump line pressure. The pressure readings may therefore vary greatly but should always follow line pressure.

Some common pressures that can be measured to evaluate pump and clutch performance are the upshift/downshift pressures and the garage shift pressures. The upshift/downshift pressure for all shifts except the 3–4, 4–3, and 4–2prime shifts is 120 psi. The upshift/downshift pressure for the 3–4, 4–3, and the 4–2prime shifts is 100 psi. The garage shift pressure when performing a N–R shift is 220 psi. The garage shift pressure for the R–N and N–1 shifts is 120 psi.

AIR TESTING TRANSMISSION CLUTCH OPERATION

Air-pressure testing can be used to check transmission clutch operation. The test can be conducted with the transmission either in the vehicle or on the work bench, as a final check.

Air-pressure testing requires that the oil pan and valve body be removed from the transmission. The clutch apply passages are shown (Fig. 35).

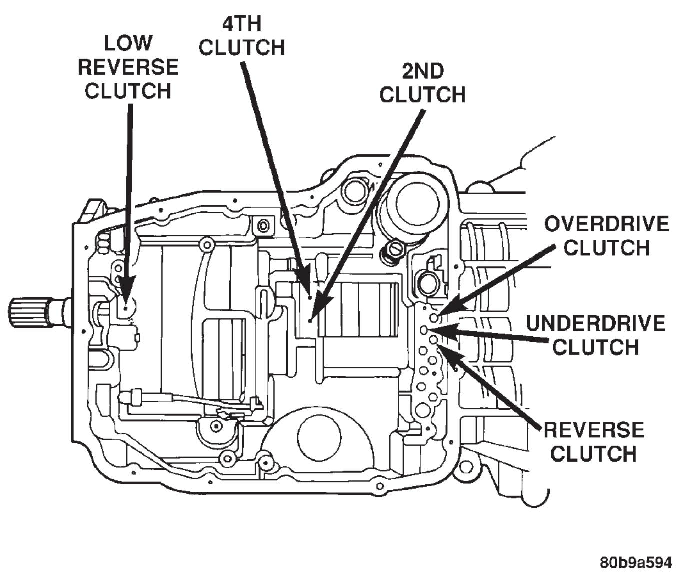


Fig. 35 Air Pressure Test Passages

NOTE: The air supply which is used must be free of moisture and dirt. Use a pressure of 30 psi to test clutch operation.

Apply air pressure at each port. If the clutch is functioning, a soft thump will be heard as the clutch is applied. The clutch application can also be felt by touching the appropriate element while applying air

DIAGNOSIS AND TESTING (Continued)

pressure. As the air pressure is released, the clutch should also release.

CONVERTER HOUSING FLUID LEAK DIAGNOSIS

When diagnosing converter housing fluid leaks, two items must be established before repair.

(1) Verify that a leak condition actually exists.

(2) Determined the true source of the leak.

Some suspected converter housing fluid leaks may not be leaks at all. They may only be the result of residual fluid in the converter housing, or excess fluid spilled during factory fill or fill after repair. Converter housing leaks have several potential sources. Through careful observation, a leak source can be identified before removing the transmission for repair. Pump seal leaks tend to move along the drive hub and onto the rear of the converter. Pump cover O-ring leaks follow the same path as a seal leak.

TORQUE CONVERTER LEAK POINTS

Possible sources of converter leaks are:

(1) Leaks at the weld joint around the outside diameter weld (Fig. 36).

(2) Leaks at the converter hub weld (Fig. 36).

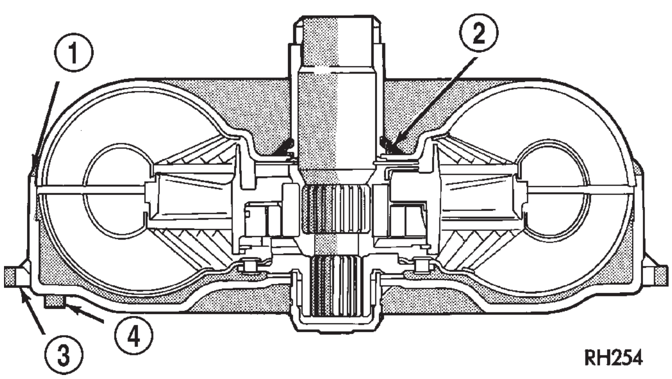


Fig. 36 Converter Leak Points—Typical

1 – OUTSIDE DIAMETER WELD
2 – TORQUE CONVERTER HUB WELD
3 – STARTER RING GEAR
4 – LUG

SERVICE PROCEDURES

FLUID LEVEL CHECK

Low fluid level can cause a variety of conditions because it allows the pump to take in air along with the fluid. As in any hydraulic system, air bubbles make the fluid spongy, therefore, pressures will be low and build up slowly.

Improper filling can also raise the fluid level too high. When the transmssion has too much fluid, the geartrain churns up foam and cause the same conditions which occur with a low fluid level.

In either case, air bubbles can cause overheating and/or fluid oxidation, and varnishing. This can interfere with normal valve, clutch, and accumulator operation. Foaming can also result in fluid escaping from the transmission vent where it may be mistaken for a leak.

Along with fluid level, it is important to check the condition of the fluid. When the fluid smells burned, and is contaminated with metal or friction material particles, a complete transmission recondition is needed. Be sure to examine the fluid on the dipstick closely. If there is any doubt about its condition, drain out a sample for a double check.

After the fluid has been checked, seat the dipstick fully to seal out water and dirt.

The transmission fluid level should be inspected at least every six months.

FLUID LEVEL CHECK PROCEDURE

The transmission has a dipstick to check oil level. It is located on the right side of the engine. Be sure to wipe all dirt from dipstick handle before removing.

The torque converter fills in both the P Park and N Neutral positions. Place the selector lever in P Park to be sure that the fluid level check is accurate. **The engine should be running at idle speed for at least one minute, with the vehicle on level ground.** At normal operating temperature (approximately 82° C or 180° F), the fluid level is correct if it is in the HOT region (cross-hatched area) on the oil level indicator. The fluid level will be approximately at the upper COLD hole of the dipstick at 70° F fluid temperature.

NOTE: Engine and Transmission should be at normal operating temperature before performing this procedure.

(1) Start engine and apply parking brake.

(2) Shift the transmission into Drive for approximately 2 seconds.

(3) Shift the transmission into Reverse for approximately 2 seconds.

(4) Shift the transmission into Park.

(5) Hook up DRB III scan tool and select transmission.

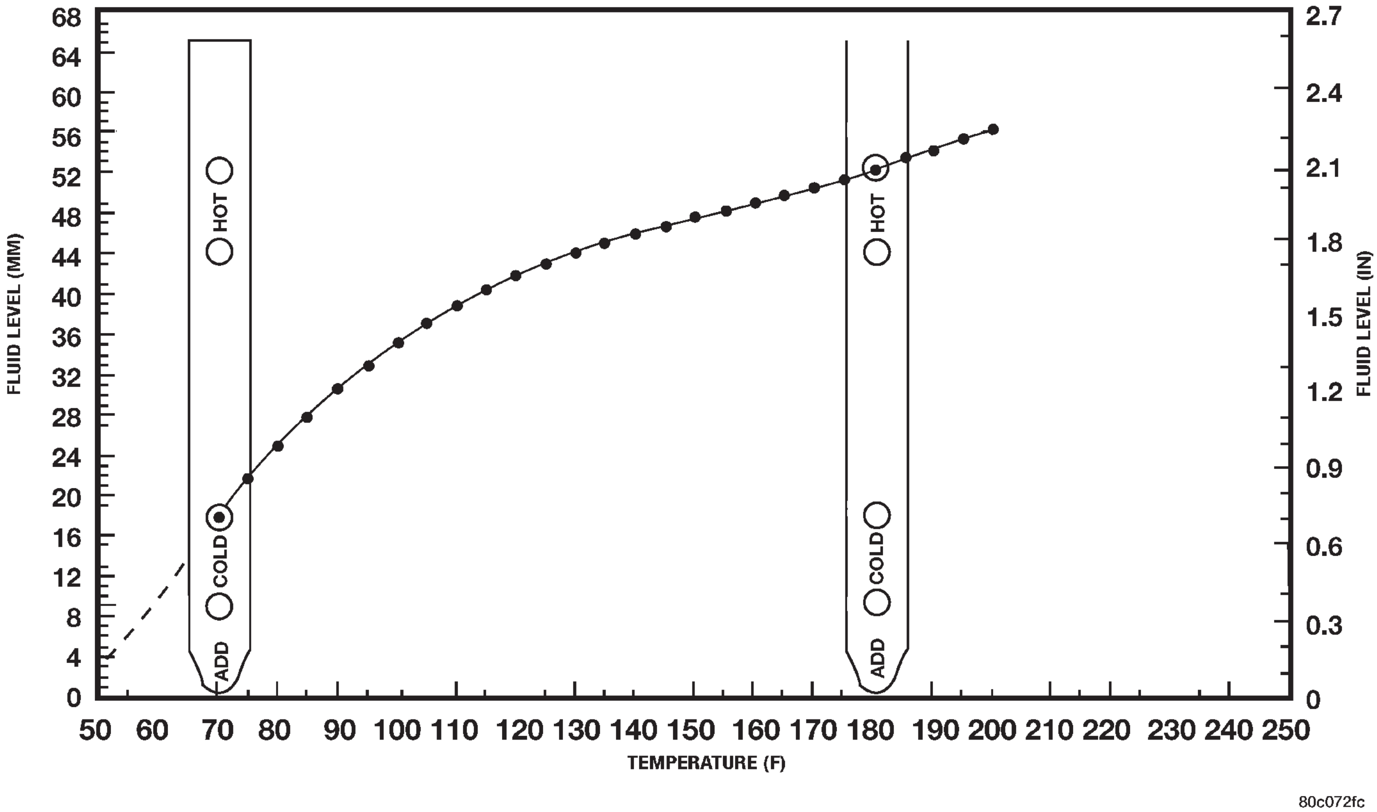
(6) Select sensors.

(7) Read the transmission temperature value.

(8) Compare the fluid temperature value with the chart.

(9) Adjust transmission fluid level shown on the dipstick according to the chart.

SERVICE PROCEDURES (Continued)



Transmission Fluid Temperature Chart

NOTE: After adding any fluid to the transmission, wait a minimum of 2 minutes for the oil to fully drain from the fill tube into the transmission before rechecking the fluid level.

(10) Check transmission for leaks.

FLUID AND FILTER REPLACEMENT

Refer to the Maintenance Schedules in Group 0, Lubrication and Maintenance, for proper service intervals. The fluid capacity of the 45RFE is approximately 13.25 liters (14.0 quarts).

REMOVAL

(1) Hoist and support vehicle on safety stands.

(2) Place a large diameter shallow drain pan beneath the transmission pan.

(3) Remove bolts holding front and sides of pan to transmission.

(4) Loosen bolts holding rear of pan to transmission.

(5) Slowly separate front of pan away from transmission allowing the fluid to drain into drain pan.

(6) Hold up pan and remove remaining bolt holding pan to transmission.

(7) While holding pan level, lower pan away from transmission.

(8) Pour remaining fluid in pan into drain pan.

(9) Remove screws holding filter to valve body (Fig. 37).

(10) Separate filter from valve body and oil pump and pour fluid in filter into drain pan.

(11) Remove and discard the oil filter seal from the bottom of the oil pump.

(12) Using Oil Filter Wrench 8321, remove the cooler return filter from the transmission.

(13) Dispose of used trans fluid and filter properly.

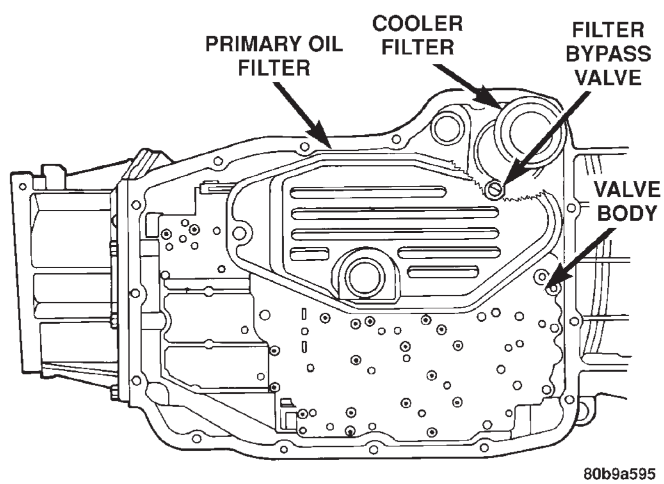


Fig. 37 Transmission Filters

SERVICE PROCEDURES (Continued)

INSPECTION

Inspect bottom of pan and magnet for excessive amounts of metal. A light coating of clutch material on the bottom of the pan does not indicate a problem unless accompanied by a slipping condition or shift lag. If fluid and pan are contaminated with excessive amounts or debris, refer to the diagnosis section of this group.

CLEANING

(1) Using a suitable solvent, clean pan and magnet.

(2) Using a suitable gasket scraper, clean original sealing material from surface of transmission case and the transmission pan.

INSTALLATION

(1) Install a new oil filter seal into the bottom of the oi pump.

NOTE: Do not attempt to install the seal onto the oil filter first and then into the oil pump. An unsatisfactory seal between the oil pump and filter will result, allowing air to be drawn into the pump.

(2) Place replacement filter in position on valve body and into the oil pump.

(3) Install screws to hold filter to valve body (Fig. 37). Tighten screws to 4.5 N·m (40 in. lbs.) torque.

(4) Install new cooler return filter onto the transmission. Torque the filter to 14.12 N·m (125 in. lbs.).

(5) Place bead of Mopar® RTV sealant onto the transmission case sealing surface.

(6) Place pan in position on transmission.

(7) Install screws to hold pan to transmission. Tighten bolts to 11.8 N·m (105 in. lbs.) torque.

(8) Lower vehicle and fill transmission with Mopar® ATF Plus 3, type 7176 fluid.

TRANSMISSION FILL PROCEDURE

To avoid overfilling transmission after a fluid change or overhaul, perform the following procedure:

(1) Remove dipstick and insert clean funnel in transmission fill tube.

(2) Add following initial quantity of Mopar® ATF Plus 3 to transmission:

(a) If only fluid and filter were changed, add **10 pints (5 quarts)** of ATF Plus 3 to transmission.

(b) If transmission was completely overhauled, torque converter was replaced or drained, and cooler was flushed, add **24 pints (12 quarts)** of ATF Plus 3 to transmission.

(3) Refer to the Fluid Level Check information in this group for the proper fill procedures.

OIL PUMP VOLUME CHECK

Measuring the oil pump output volume will determine if sufficient oil flow to the transmission oil cooler exists, and whether or not an internal transmission failure is present.

Verify that the transmission fluid is at the proper level. Refer to the Fluid Level Check procedure in this section. If necessary, fill the transmission to the proper level with Mopar® ATF+3, type 7176, Automatic Transmission Fluid.

(1) Disconnect the **To cooler** line at the cooler inlet and place a collecting container under the disconnected line.

CAUTION: With the fluid set at the proper level, fluid collection should not exceed (1) quart or internal damage to the transmission may occur.

(2) Run the engine **at curb idle speed**, with the shift selector in neutral.

(3) If one quart of transmission fluid is collected in the container in 20 seconds or less, oil pump flow volume is within acceptable limits. If fluid flow is intermittent, or it takes more than 20 seconds to collect one quart of fluid, refer to the Hydraulic Pressure tests in this section for further diagnosis.

(4) Re-connect the **To cooler** line to the transmission cooler inlet.

(5) Refill the transmission to proper level.

FLUSHING COOLERS AND TUBES

When a transmission failure has contaminated the fluid, the oil cooler(s) must be flushed. The torque converter must also be replaced. This will insure that metal particles or sludged oil are not later transferred back into the reconditioned (or replaced) transmission.

The only recommended procedure for flushing coolers and lines is to use Tool 6906A Cooler Flusher.

WARNING: WEAR PROTECTIVE EYEWEAR THAT MEETS THE REQUIREMENTS OF OSHA AND ANSI Z87.1–1968. WEAR STANDARD INDUSTRIAL RUBBER GLOVES.

KEEP LIGHTED CIGARETTES, SPARKS, FLAMES, AND OTHER IGNITION SOURCES AWAY FROM THE AREA TO PREVENT THE IGNITION OF COMBUSTIBLE LIQUIDS AND GASES. KEEP A CLASS (B) FIRE EXTINGUISHER IN THE AREA WHERE THE FLUSHER WILL BE USED.

KEEP THE AREA WELL VENTILATED.

DO NOT LET FLUSHING SOLVENT COME IN CONTACT WITH YOUR EYES OR SKIN: IF EYE CONTAMINATION OCCURS, FLUSH EYES WITH WATER FOR 15 TO 20 SECONDS. REMOVE CONTAMINATED CLOTHING AND WASH AFFECTED SKIN WITH SOAP AND WATER. SEEK MEDICAL ATTENTION.

SERVICE PROCEDURES (Continued)

COOLER FLUSH USING TOOL 6906A

(1) Remove cover plate filler plug on Tool 6906A. Fill reservoir 1/2 to 3/4 full of fresh flushing solution. Flushing solvents are petroleum based solutions generally used to clean automatic transmission components. **DO NOT** use solvents containing acids, water, gasoline, or any other corrosive liquids.

(2) Reinstall filler plug on Tool 6906A.

(3) Verify pump power switch is turned OFF. Connect red alligator clip to positive (+) battery post. Connect black (-) alligator clip to a good ground.

(4) Disconnect the cooler lines at the transmission.

NOTE: When flushing transmission cooler and lines, ALWAYS reverse flush.

(5) Connect the BLUE pressure line to the OUTLET (From) cooler line.

(6) Connect the CLEAR return line to the INLET (To) cooler line

(7) Turn pump ON for two to three minutes to flush cooler(s) and lines.

(8) Turn pump OFF.

(9) Disconnect CLEAR suction line from reservoir at cover plate. Disconnect CLEAR return line at cover plate, and place it in a drain pan.

(10) Turn pump ON for 30 seconds to purge flushing solution from cooler and lines. Turn pump OFF.

(11) Place CLEAR suction line into a one quart container of Mopar® ATF Plus 3, type 7176 automatic transmission fluid.

(12) Turn pump ON until all transmission fluid is removed from the one quart container and lines. This purges any residual cleaning solvent from the transmission cooler and lines. Turn pump OFF.

(13) Disconnect alligator clips from battery. Reconnect flusher lines to cover plate, and remove flushing adapters from cooler lines.

TRANSMISSION QUICK LEARN PROCEDURE

The quick learn procedure requires the use of the DRB scan tool.

This program allows the electronic transmission system to recalibrate itself. This will provide the best possible transmission operation. The quick learn procedure should be performed if any of the following procedures are performed:

- Transmission Assembly Replacement
- Transmission Control Module Replacement
- Solenoid Pack Replacement
- Clutch Plate and/or Seal Replacement
- Valve Body Replacement or Recondition

To perform the Quick Learn Procedure, the following conditions must be met:

- The brakes must be applied
- The engine speed must be above 500 rpm
- The throttle angle (TPS) must be less than 3 degrees
- The shift lever position must stay until prompted to shift to overdrive
- The shift lever position must stay in overdrive after the Shift to Overdrive prompt until the DRB indicates the procedure is complete
- The calculated oil temperature must be above 60° and below 200°

ALUMINUM THREAD REPAIR

Damaged or worn threads in the aluminum transmission case and valve body can be repaired by the use of Heli-Coils, or equivalent. This repair consists of drilling out the worn-out damaged threads. Then tap the hole with a special Heli-Coil tap, or equivalent, and installing a Heli-Coil insert, or equivalent, into the hole. This brings the hole back to its original thread size.

Heli-Coil, or equivalent, tools and inserts are readily available from most automotive parts suppliers.

REMOVAL AND INSTALLATION

INPUT SPEED SENSOR

REMOVAL

(1) Raise vehicle.

(2) Place a suitable fluid catch pan under the transmission.

(3) Remove the wiring connector from the input speed sensor (Fig. 38).

(4) Remove the bolt holding the input speed sensor to the transmission case.

(5) Remove the input speed sensor from the transmission case.

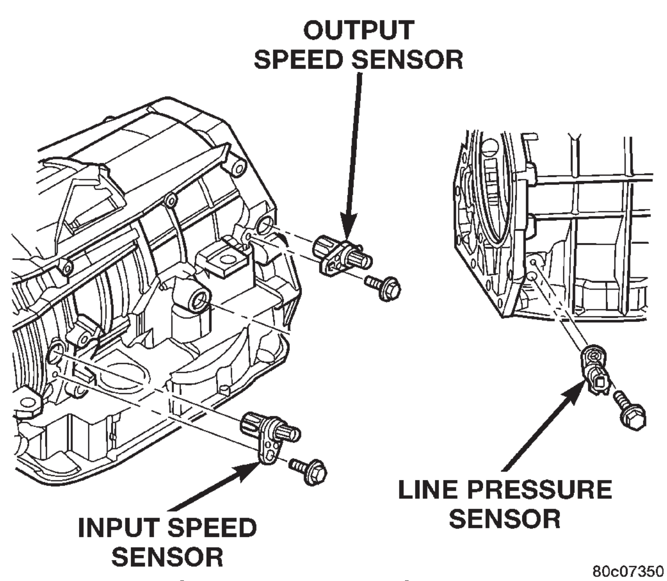


Fig. 38 Input Speed Sensor

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Install the input speed sensor into the transmission case.

(2) Install the bolt to hold the input speed sensor into the transmission case. Tighten the bolt to 11.9 N·m (105 in. lbs.).

(3) Install the wiring connector onto the input speed sensor

(4) Verify the transmission fluid level. Add fluid as necessary.

(5) Lower vehicle.

OUTPUT SPEED SENSOR

REMOVAL

(1) Raise vehicle.

(2) Place a suitable fluid catch pan under the transmission.

(3) Remove the wiring connector from the output speed sensor (Fig. 39).

(4) Remove the bolt holding the output speed sensor to the transmission case.

(5) Remove the output speed sensor from the transmission case.

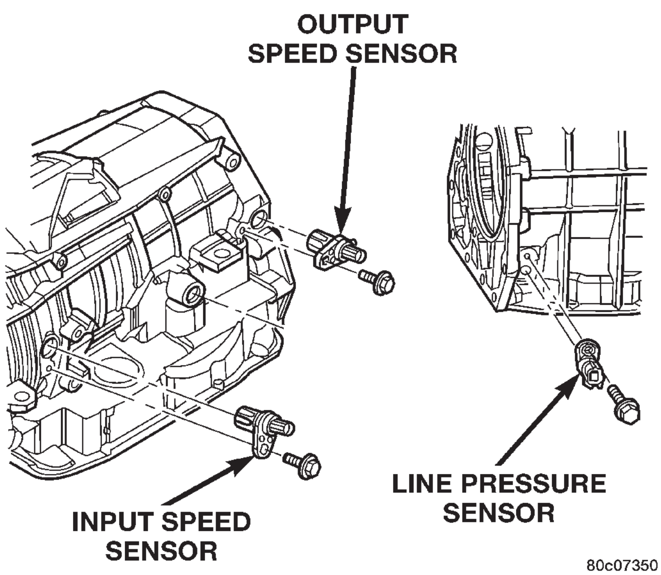


Fig. 39 Output Speed Sensor

INSTALLATION

(1) Install the output speed sensor into the transmission case.

(2) Install the bolt to hold the output speed sensor into the transmission case. Tighten the bolt to 11.9 N·m (105 in. lbs.).

(3) Install the wiring connector onto the output speed sensor

(4) Verify the transmission fluid level. Add fluid as necessary.

(5) Lower vehicle.

LINE PRESSURE SENSOR

REMOVAL

(1) Raise vehicle.

(2) Place a suitable fluid catch pan under the transmission.

(3) Remove the wiring connector from the line pressure sensor (Fig. 40).

(4) Remove the bolt holding the line pressure sensor to the transmission case.

(5) Remove the line pressure sensor from the transmission case.

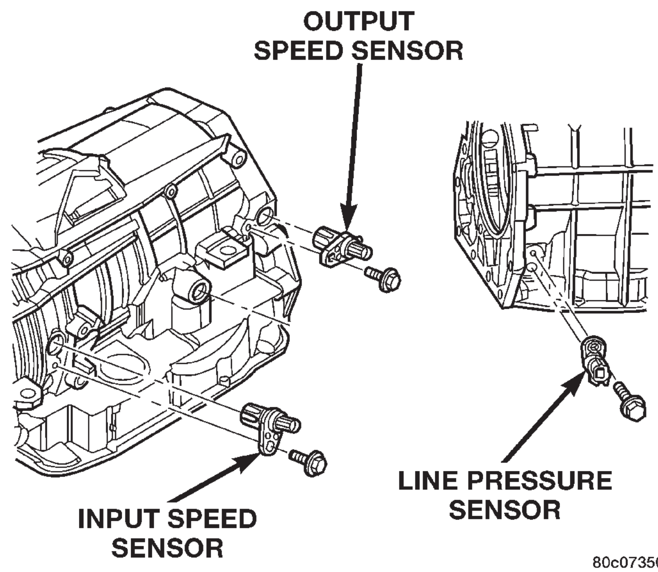


Fig. 40 Line Pressure Sensor

INSTALLATION

(1) Install the line pressure sensor into the transmission case.

(2) Install the bolt to hold the line pressure sensor into the transmission case. Tighten the bolt to 11.9 N·m (105 in. lbs.).

(3) Install the wiring connector onto the line pressure sensor

(4) Verify the transmission fluid level. Add fluid as necessary.

(5) Lower vehicle.

VALVE BODY

The valve body can be removed for service without having to remove the transmission assembly.

The valve body can be disassembled for cleaning and inspection of the individual components. Refer to Disassembly and Assembly section for proper procedures.

REMOVAL

(1) Shift transmission into PARK.

(2) Raise vehicle.

REMOVAL AND INSTALLATION (Continued)

(3) Disconnect wires at the solenoid and pressure switch assembly connector.

(4) Position drain pan under transmission oil pan.

(5) Remove transmission oil pan.

(6) Remove the primary oil filter from valve body.

(7) Remove bolts attaching valve body to transmission case (Fig. 41).

(8) Lower the valve body and work the electrical connector out of transmission case.

(9) Separate the valve body from the transmission.

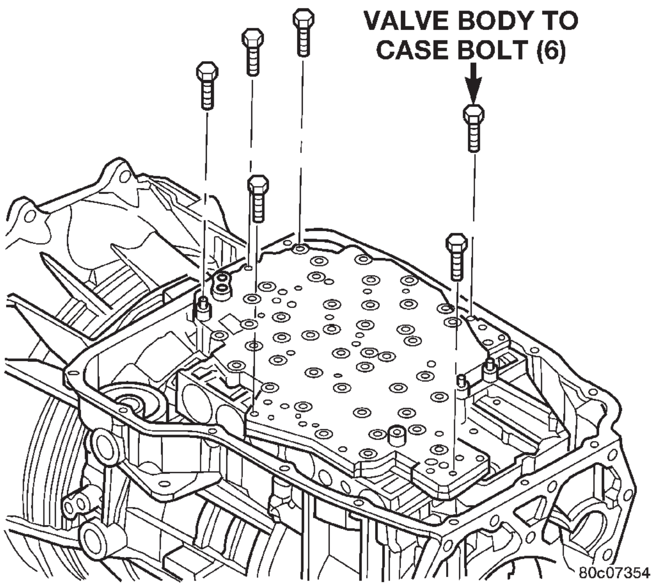


Fig. 41 Valve Body Bolts

INSTALLATION

(1) Check condition of seals on valve body and the solenoid and pressure switch assembly. Replace seals if cut or worn.

(2) Place TRS selector plate in the PARK position.

(3) Place the transmission in the PARK position.

(4) Lubricate seal on the solenoid and pressure switch assembly connector with petroleum jelly.

(5) Position valve body in transmission and align the manual lever on the valve body to the pin on the transmission manual shift lever.

(6) Seat valve body in case and install one or two bolts to hold valve body in place.

(7) Tighten valve body bolts alternately and evenly to 12 N·m (105 in. lbs.) torque.

(8) Install new fluid filter on valve body. Tighten filter screws to 4.5 N·m (40 in. lbs.) torque.

(9) Connect the solenoid and pressure switch assembly connector.

(10) Install oil pan. Tighten pan bolts to 12 N·m (105 in. lbs.) torque.

(11) Lower vehicle and fill transmission with Mopar® ATF Plus 3, type 7176 fluid.

(12) Check and adjust gearshift cable, if necessary.

SOLENOID AND PRESSURE SWITCH ASSEMBLY

REMOVAL

(1) Remove the valve body from the transmission (Fig. 42).

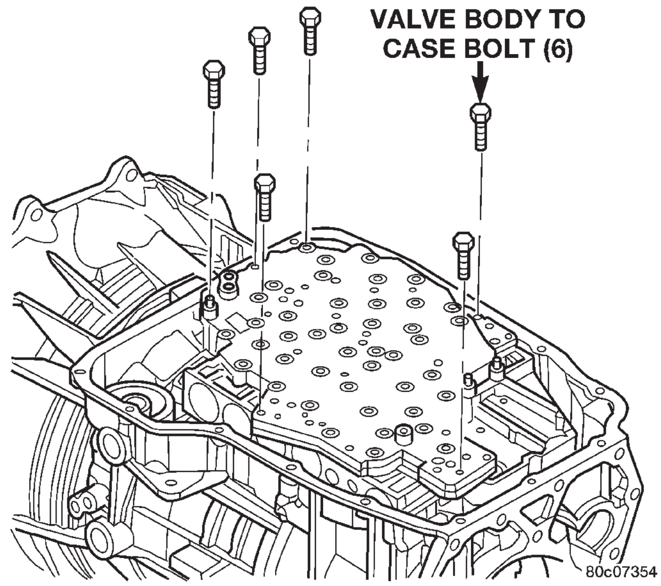


Fig. 42 Valve Body Bolts

(2) Remove the screws holding the solenoid and pressure switch assembly onto the valve body (Fig. 43).

(3) Separate the solenoid and pressure switch assembly from the valve body.

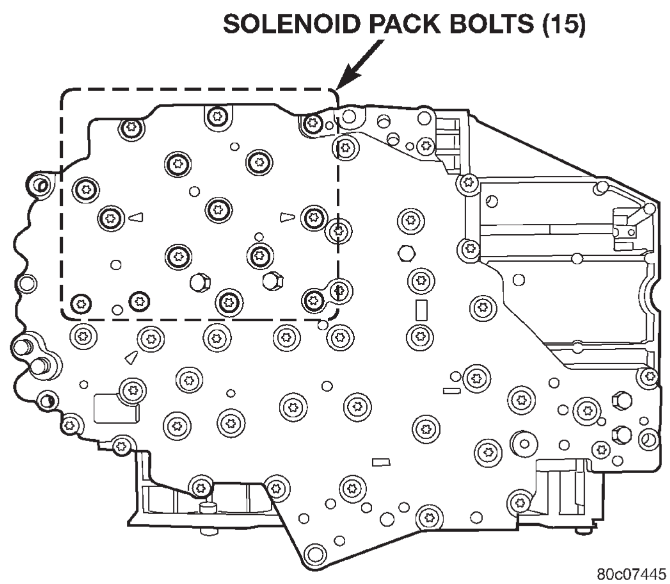


Fig. 43 Solenoid and Pressure Switch Assembly Screws

INSTALLATION

(1) Place TRS selector plate in the PARK position.

REMOVAL AND INSTALLATION (Continued)

(2) Position the solenoid and pressure switch assembly onto the valve body. Be sure that both alignment dowels are fully seated in the valve body and that the TRS switch contacts are properly positioned in the selector plate

(3) Install the screws to hold the solenoid and pressure switch assembly onto the valve body.

(4) Tighten the solenoid assembly screws adjacent to the arrows cast into the bottom of the valve body first. Tighten the screws to 5.7 N·m (50 in. lbs.).

(5) Tighten the remainder of the solenoid assembly screws to 5.7 N·m (50 in. lbs.).

(6) Install the valve body into the transmission.

TRANSMISSION

CAUTION: The transmission and torque converter must be removed as an assembly to avoid component damage. The converter driveplate, pump bushing, or oil seal can be damaged if the converter is left attached to the driveplate during removal. Be sure to remove the transmission and converter as an assembly.

REMOVAL

(1) Disconnect the negative battery cable.

(2) Raise and support the vehicle

(3) Mark propeller shaft and axle yokes for assembly alignment.

(4) Remove the rear propeller shaft

(5) Remove the front propeller shaft.

(6) Remove the engine to transmission collar (Fig. 44).

(7) Remove the exhaust support bracket from the rear of the transmission.

(8) Disconnect and lower or remove any necessary exhaust components.

(9) Remove the starter motor.

(10) Rotate crankshaft in clockwise direction until converter bolts are accessible. Then remove bolts one at a time. Rotate crankshaft with socket wrench on dampener bolt.

(11) Disconnect wires from solenoid and pressure switch assembly, input and output speed sensors, and line pressure sensor.

(12) Disconnect gearshift cable from transmission manual valve lever (Fig. 45).

(13) Disconnect transfer case shift cable from the transfer case shift lever (Fig. 46).

(14) Remove the clip securing the transfer case shift cable into the cable support bracket.

(15) Disconnect transmission fluid cooler lines at transmission fittings and clips.

(16) Disconnect the transmission vent hose from the transmission.

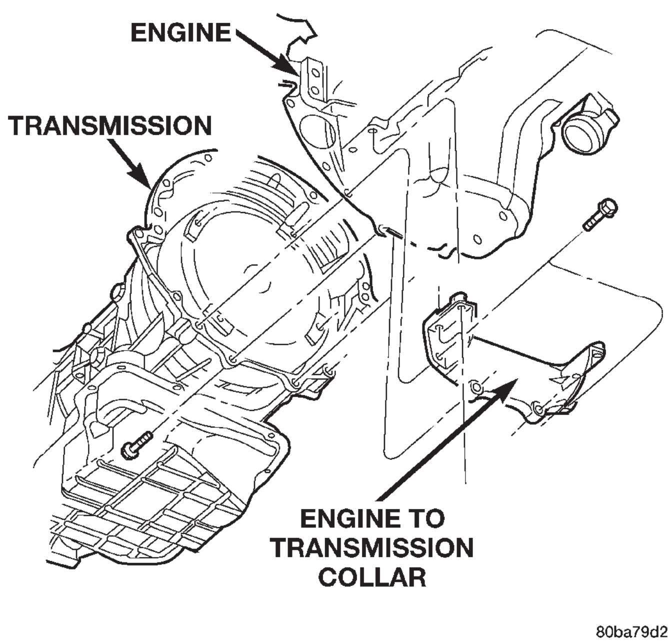


Fig. 44 Transmission Collar

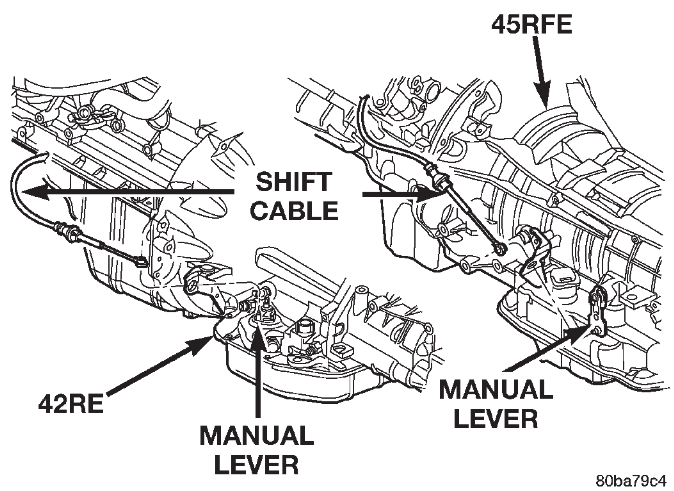


Fig. 45 Transmission Shift Cable

(17) Support rear of engine with safety stand or jack.

(18) Raise transmission slightly with service jack to relieve load on crossmember and supports.

(19) Remove bolts securing rear support and cushion to transmission and crossmember (Fig. 47).

(20) Remove bolts attaching crossmember to frame and remove crossmember.

(21) Remove transfer case (Fig. 48) and (Fig. 49).

(22) Remove all remaining converter housing bolts.

(23) Carefully work transmission and torque converter assembly rearward off engine block dowels.

(24) Hold torque converter in place during transmission removal.

(25) Lower transmission and remove assembly from under the vehicle.

REMOVAL AND INSTALLATION (Continued)

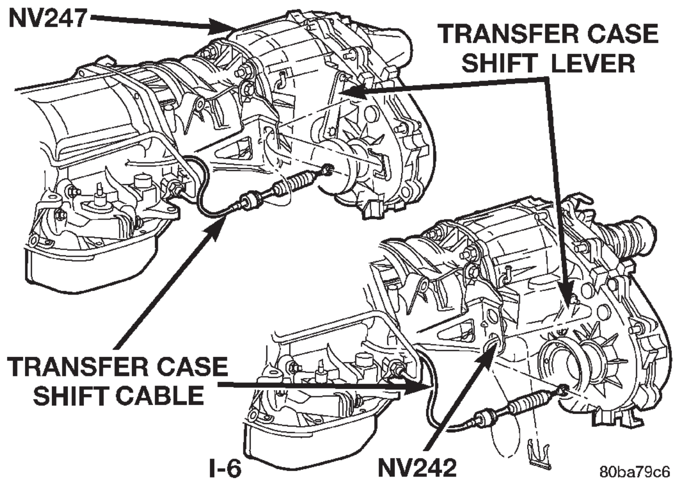


Fig. 46 Transfer Case Shift Cable

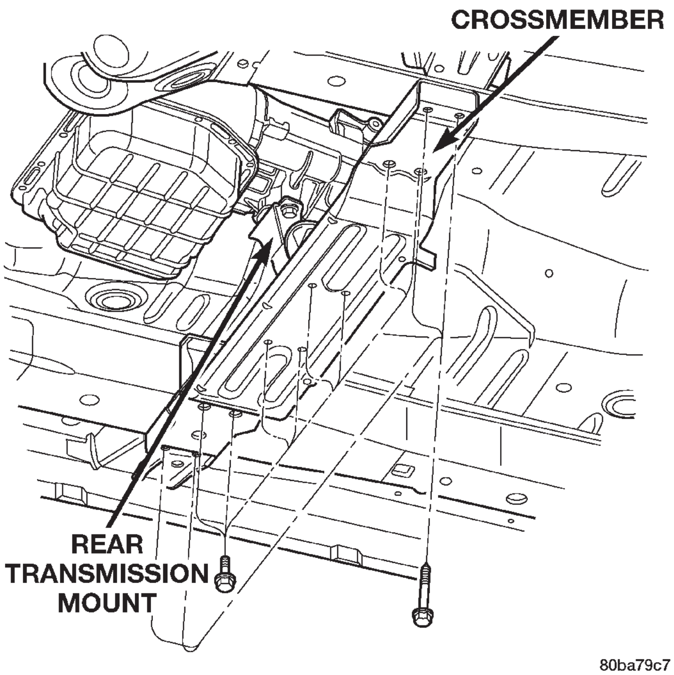


Fig. 47 Rear Transmission Crossmember

(26) To remove torque converter, carefully slide torque converter out of the transmission.

INSTALLATION

(1) Check torque converter hub and hub drive notches for sharp edges burrs, scratches, or nicks. Polish the hub and notches with 320/400 grit paper and crocus cloth if necessary. The hub must be smooth to avoid damaging pump seal at installation.

(2) If a replacement transmission is being installed, transfer any components necessary, such as the manual shift lever and shift cable bracket, from the original transmission onto the replacement transmission.

(3) Lubricate oil pump seal lip with transmission fluid.

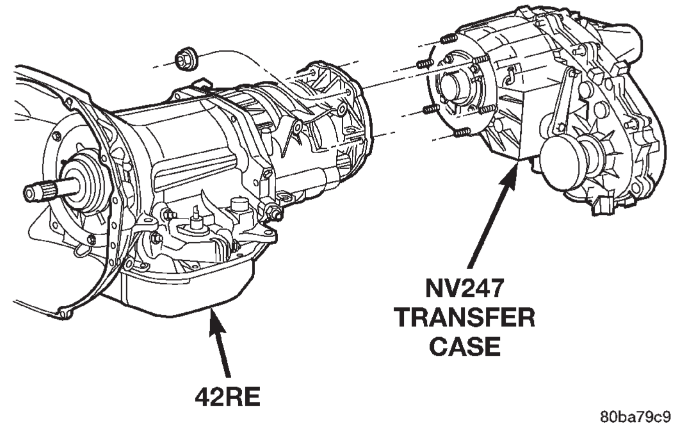


Fig. 48 Remove NV247 Transfer Case

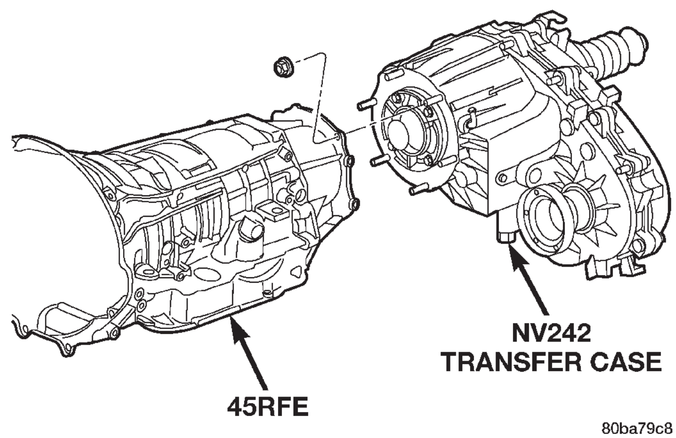


Fig. 49 Remove NV242 Transfer Case

(4) Align converter and oil pump.

(5) Carefully insert converter in oil pump. Then rotate converter back and forth until fully seated in pump gears.

(6) Check converter seating with steel scale and straightedge (Fig. 50). Surface of converter lugs should be 1/2 in. to rear of straightedge when converter is fully seated.

(7) Temporarily secure converter with C-clamp.

(8) Position transmission on jack and secure it with chains.

(9) Check condition of converter driveplate. Replace the plate if cracked, distorted or damaged. **Also be sure transmission dowel pins are seated in engine block and protrude far enough to hold transmission in alignment.**

(10) Apply a light coating of Mopar® High Temp Grease to the torque converter hub pocket in the rear

(11) Raise transmission and align converter with drive plate and converter housing with engine block.

REMOVAL AND INSTALLATION (Continued)

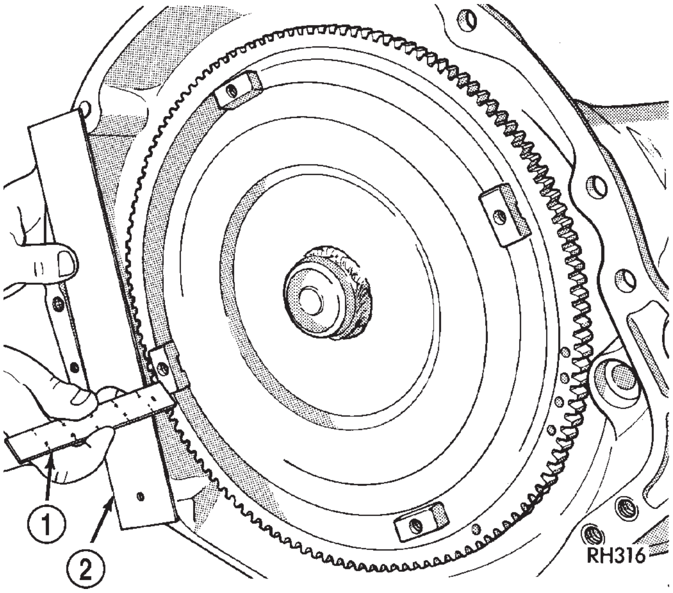


Fig. 50 Typical Method Of Checking Converter Seating

1 – SCALE
2 – STRAIGHTEDGE

(12) Move transmission forward. Then raise, lower or tilt transmission to align converter housing with engine block dowels.

(13) Carefully work transmission forward and over engine block dowels until converter hub is seated in crankshaft.

(14) Install two bolts to attach converter housing to engine.

(15) Install remaining torque converter housing to engine bolts. Tighten to 68 N·m (50 ft. lbs.).

(16) Install rear transmission crossmember. Tighten crossmember to frame bolts to 68 N·m (50 ft.lbs.).

(17) Install rear support to transmission. Tighten bolts to 47 N·m (35 ft. lbs.).

(18) Lower transmission onto crossmember and install bolts attaching transmission mount to crossmember. Tighten clevis bracket to crossmember bolts to 47 N·m (35 ft. lbs.). Tighten the clevis bracket to rear support bolt to 68 N·m (50 ft. lbs.).

(19) Remove engine support fixture.

(20) Install new plastic retainer grommet on any shift cable that was disconnected. Grommets should not be reused. Use pry tool to remove rod from grommet and cut away old grommet. Use pliers to snap new grommet into cable and to snap grommet onto lever.

(21) Connect gearshift cable to transmission.

(22) Connect wires to solenoid and pressure switch assembly connector, input and output speed sensors, and line pressure sensor. Be sure transmission harnesses are properly routed.

CAUTION: It is essential that correct length bolts be used to attach the converter to the driveplate. Bolts that are too long will damage the clutch surface inside the converter.

(23) Install torque converter-to-driveplate bolts. Tighten bolts to 31 N·m (270 in. lbs.).

(24) Install starter motor and cooler line bracket.

(25) Connect cooler lines to transmission.

(26) Install transmission fill tube.

(27) Install exhaust components.

(28) Install transfer case. Tighten transfer case nuts to 35 N·m (26 ft. lbs.).

(29) Install the transfer case shift cable to the cable support bracket and the transfer case shift lever.

(30) Install the transmission collar onto the transmission and the engine. Tighten the bolts to 54 N·m (40 ft. lbs.).

(31) Align and connect propeller shaft(s).

(32) Adjust gearshift cable if necessary.

(33) Lower vehicle.

(34) Fill transmission with Mopar® ATF Plus 3, Type 7176 fluid.

TORQUE CONVERTER

REMOVAL

(1) Remove transmission and torque converter from vehicle.

(2) Place a suitable drain pan under the converter housing end of the transmission.

CAUTION: Verify that transmission is secure on the lifting device or work surface, the center of gravity of the transmission will shift when the torque converter is removed creating an unstable condition.

The torque converter is a heavy unit. Use caution when separating the torque converter from the transmission.

(3) Pull the torque converter forward until the center hub clears the oil pump seal.

(4) Separate the torque converter from the transmission.

INSTALLATION

Check converter hub and drive notches for sharp edges, burrs, scratches, or nicks. Polish the hub and notches with 320/400 grit paper or crocus cloth if necessary. The hub must be smooth to avoid damaging the pump seal at installation. Check that the torque converter hub o-ring on the 45RFE torque converter hub is not damaged. Replace if necessary.

(1) Lubricate oil pump seal lip with transmission fluid.

REMOVAL AND INSTALLATION (Continued)

(2) Place torque converter in position on transmission.

CAUTION: Do not damage oil pump seal or bushing while inserting torque converter into the front of the transmission.

(3) Align torque converter to oil pump seal opening.

(4) Insert torque converter hub into oil pump.

(5) While pushing torque converter inward, rotate converter until converter is fully seated in the oil pump gears.

(6) Check converter seating with a scale and straightedge (Fig. 51). Surface of converter lugs should be 1/2 in. to rear of straightedge when converter is fully seated.

(7) If necessary, temporarily secure converter with C-clamp attached to the converter housing.

(8) Install the transmission in the vehicle.

(9) Fill the transmission with the recommended fluid.

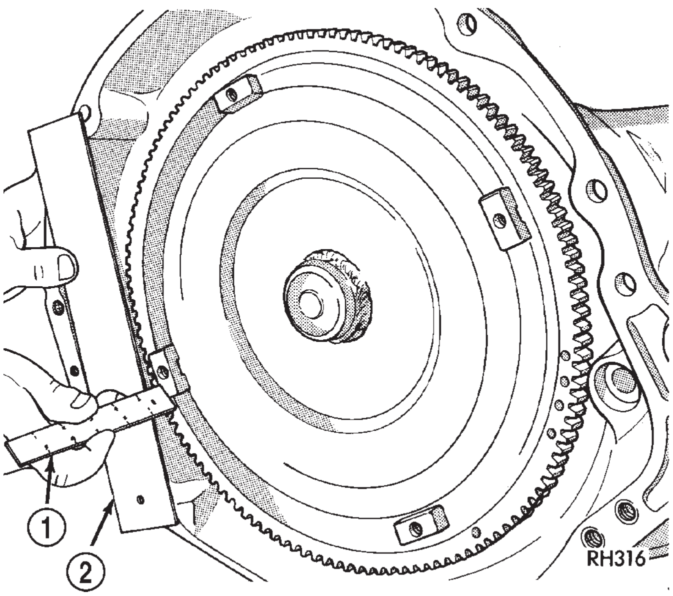


Fig. 51 Checking Torque Converter Seating–Typical

1 – SCALE
2 – STRAIGHTEDGE

OIL PUMP FRONT SEAL

REMOVAL

(1) Remove transmission from the vehicle.

(2) Remove the torque converter from the transmission.

(3) Using a screw mounted in a slide hammer, remove the oil pump front seal.

INSTALLATION

(1) Clean seal bore of the oil pump of any residue or particles from the original seal.

(2) Install new oil seal in the oil pump housing using Seal Installer C-3860-A (Fig. 52).

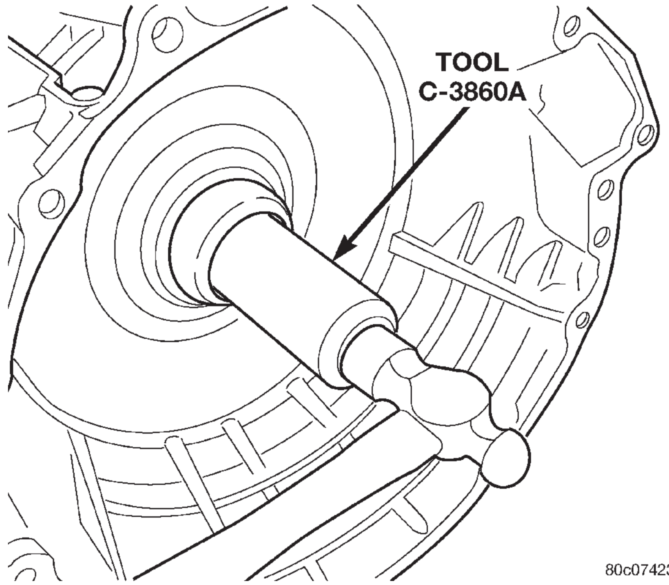


Fig. 52 Install Oil Pump Front Seal

ADAPTER HOUSING SEAL

REMOVAL

(1) Remove the transfer case from the transmission.

(2) Using a screw mounted on a slide hammer, remove the adapter housing seal.

INSTALLATION

(1) Clean the adapter seal bore in the adapter housing of any residue or particles remaining from the original seal.

(2) Install new oil seal in the adapter housing using Seal Installer C-3860-A (Fig. 53).

(3) Install the transfer case onto the transmission.

GEARSHIFT CABLE

REMOVAL

(1) Shift transmission into Park.

(2) Raise vehicle.

(3) Remove the shift cable eyelet from the transmission manual shift lever (Fig. 54).

(4) Remove shift cable from the cable support bracket.

(5) Lower vehicle.

(6) Remove shift lever bezel and necessary console parts for access to shift lever assembly and shift cable.

REMOVAL AND INSTALLATION (Continued)

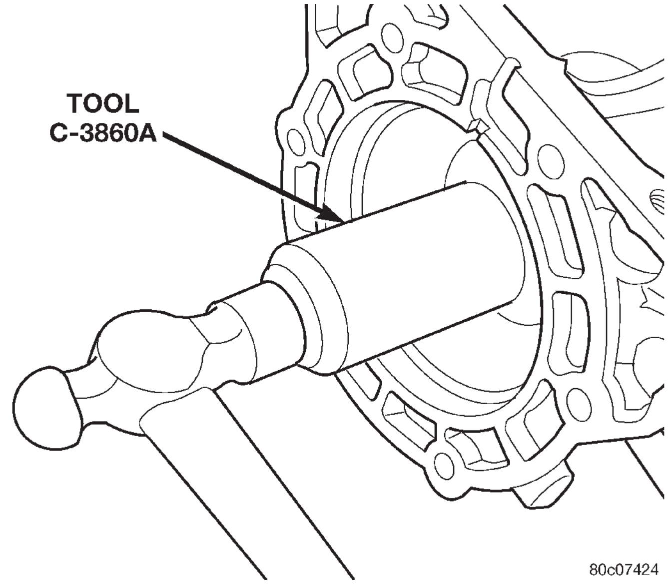


Fig. 53 Adapter Housing Seal Installation

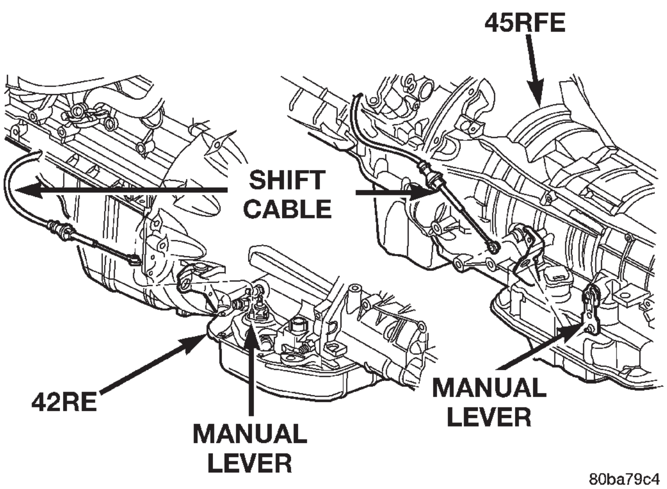


Fig. 54 Remove Shift Cable From Transmission

(7) Disconnect cable at shift lever and shifter assembly bracket (Fig. 55).

(8) Remove the nuts holding the shift cable seal plate to the floor pan (Fig. 56).

(9) Pull cable through floor panel opening.

(10) Remove shift cable from vehicle.

INSTALLATION

(1) Route cable through hole in floor pan.

(2) Install seal plate to studs in floor pan.

(3) Install nuts to hold seal plate to floor pan. Tighten nuts to 7 N·m (65 in. lbs.).

(4) Install the shift cable to the shifter assembly bracket. Push cable into the bracket until secure.

(5) Place the floor shifter lever in park position.

(6) Loosen the adjustment screw on the shift cable.

(7) Snap the shift cable onto the shift lever pin.

(8) Raise the vehicle.

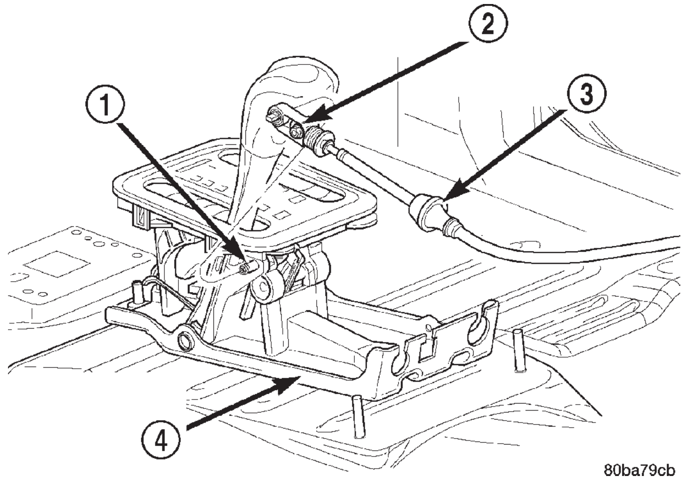


Fig. 55 Transmission Shift Cable at Shifter

1 – SHIFT LEVER PIN
2 – ADJUSTMENT SCREW
3 – SHIFT CABLE
4 – SHIFTER ASSEMBLY BRACKET

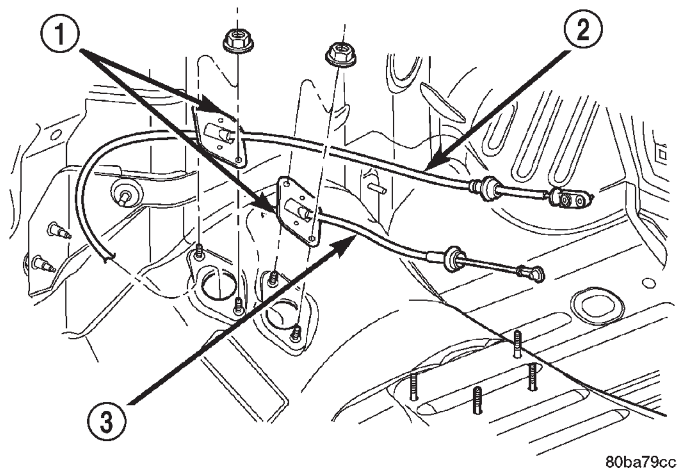


Fig. 56 Shift Cables at Floor Pan

1 – SEAL PLATES
2 – TRANSMISSION SHIFT CABLE
3 – TRANSFER CASE SHIFT CABLE

(9) Install the shift cable to the shift cable support bracket.

(10) Shift the transmission into PARK. PARK is the rearmost detent position on the transmission manual shift lever.

(11) Snap the shift cable onto the transmission manual shift lever.

(12) Lower vehicle.

(13) Verify that the shift lever is in the PARK position.

(14) Tighten the adjustment screw to 7 N·m (65 in. lbs.).

(15) Verify correct shifter operation.

REMOVAL AND INSTALLATION (Continued)

(16) Install shift lever bezel and any console parts removed for access to shift lever assembly and shift cable.

SHIFTER

REMOVAL

(1) Shift transmission into Park.

(2) Remove shift lever bezel and any necessary console parts for access to shift lever assembly and shifter cables.

(3) Disconnect the transmission shift cable at shift lever and shifter assembly bracket (Fig. 57).

(4) Disconnect the brake transmission interlock cable from the shifter BTSI lever and the shifter assembly bracket.

(5) Disconnect the transfer case shift cable from the transfer case shift lever pin (Fig. 59).

(6) Remove the clip holding the transfer case shift cable to the shifter assembly bracket.

(7) Remove the transfer case shift cable from the shifter assembly bracket.

(8) Disengage all wiring connectors from the shifter assembly.

(9) Remove all nuts holding the shifter assembly to the floor pan (Fig. 60).

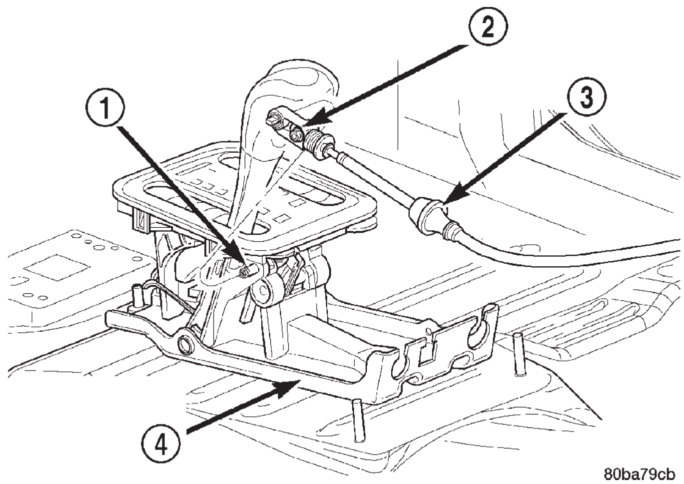


Fig. 57 Transmission Shift Cable at Shifter

1 – SHIFT LEVER PIN
2 – ADJUSTMENT SCREW
3 – SHIFT CABLE
4 – SHIFTER ASSEMBLY BRACKET

(10) Remove the shifter assembly from the vehicle.

INSTALLATION

(1) Install shifter assembly onto the shifter assembly studs on the floor pan.

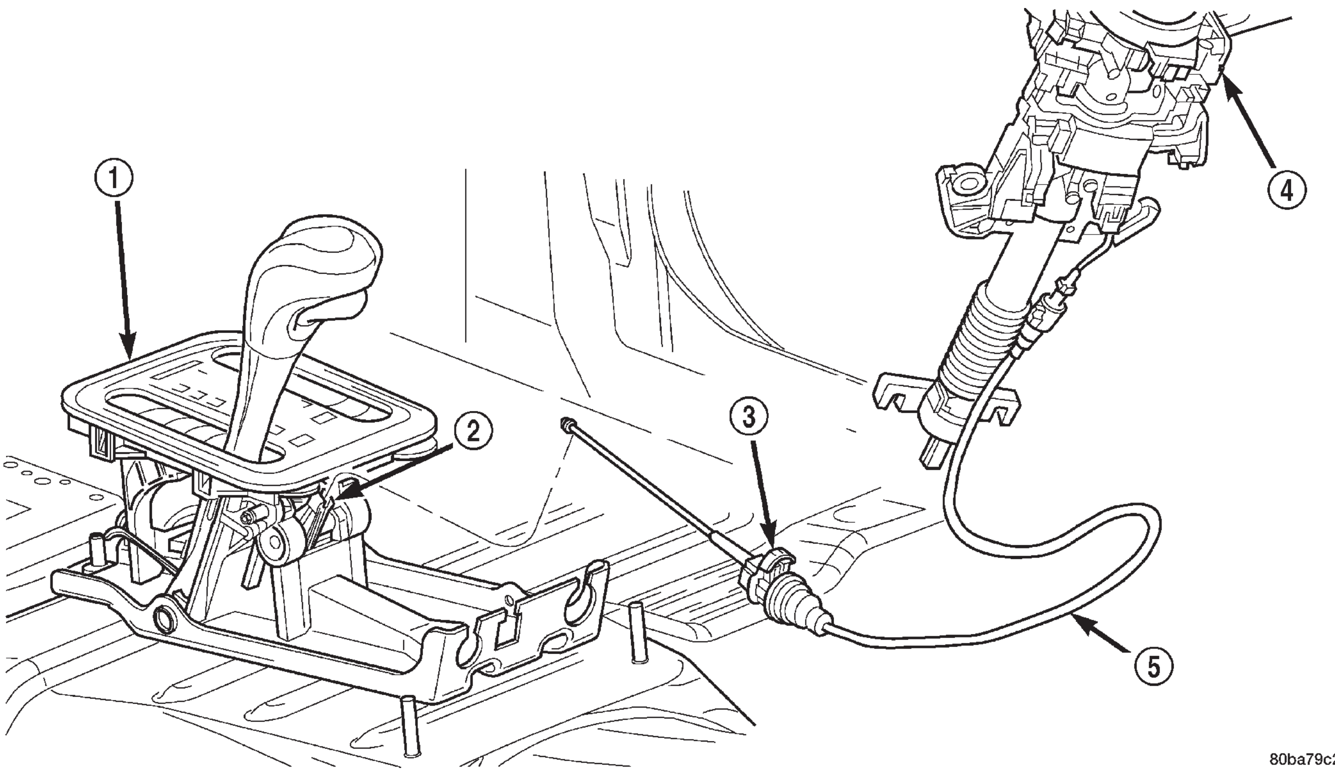


Fig. 58 Brake Transmission Interlock Cable

1 – SHIFT MECHANISM
2 – SHIFTER BTSI LEVER
3 – ADJUSTMENT CLIP
4 – STEERING COLUMN ASSEMBLY
5 – INTERLOCK CABLE

REMOVAL AND INSTALLATION (Continued)

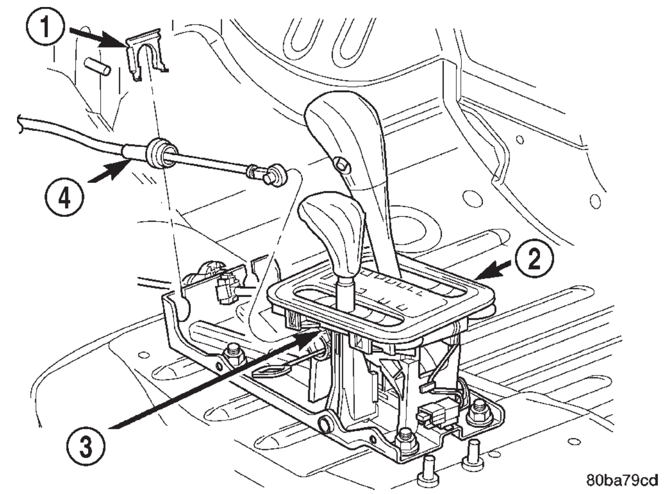


Fig. 59 Transfer Case Shift Cable

1 – CLIP
2 – SHIFTER
3 – TRANSFER CASE SHIFT LEVER PIN
4 – TRANSFER CASE SHIFT CABLE

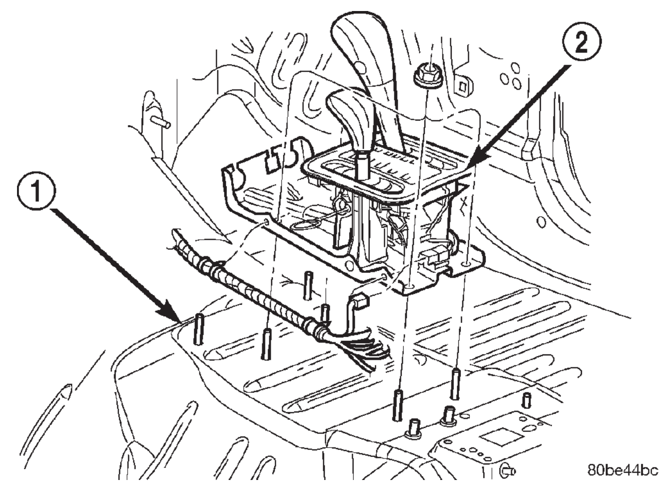


Fig. 60 Shifter Assembly

1 – FLOOR PLAN
2 – SHIFTER ASSEMBLY

(2) Install the nuts to hold the shifter assembly onto the floor pan. Tighten nuts to 28 N·m (250 in. lbs.).

(3) Install wiring harness to the shifter assembly bracket. Engage any wire connectors removed from the shifter assembly.

(4) Install the transfer case shift cable to the shifter assembly bracket. Install clip to hold cable to the bracket.

(5) Snap the transfer case shift cable onto the transfer case shift lever pin.

(6) Install the brake transmission interlock cable into the shifter assembly bracket and into the shifter BTSI lever.

(7) Install the shift cable to the shifter assembly bracket. Push cable into the bracket until secure.

(8) Place the floor shifter lever in park position.

(9) Loosen the adjustment screw on the shift cable.

(10) Snap the shift cable onto the shift lever pin.

(11) Verify that the shift lever is in the PARK position.

(12) Tighten the adjustment screw to 7 N·m (65 in. lbs.).

(13) Verify correct shifter operation.

(14) Install shift lever bezel and any console parts removed for access to shift lever assembly and shift cables.

BRAKE TRANSMISSION SHIFT INTERLOCK

REMOVAL

(1) Lower the steering column.

(2) Remove the transmission shift interlock cable from steering column (Fig. 61).

(3) Remove the center console and related trim. Refer to Group 23, Body, for proper procedures.

(4) Disconnect the BTSI cable from the shift BTSI lever and remove the cable from the shifter assembly bracket.

(5) Disengage the wire connector at the solenoid on the cable

(6) Release the BTSI cable from any remaining clips.

(7) Remove BTSI cable from the vehicle.

INSTALLATION

NOTE: The gearshift cable must be secured into position and properly adjusted before the installation of the Brake Transmission Interlock Cable (BTSI).

(1) Snap the BTSI cable assembly into the steering column.

(2) Snap BTSI cable solenoid tie strap into hole in steering column tube.

(3) Engage the wiring connector from brake light switch into BTSI cable solenoid housing.

(4) Route BTSI cable to the shifter mechanism.

(5) Install the BTSI cable end fitting into shifter BTSI lever.

(6) Pull rearward on the BTSI cable housing and install the cable housing into the shifter assembly bracket.

(7) Place the ignition key cylinder in the LOCK position.

(8) Snap BTSI cable adjuster ears into floor shifter bracket and

(9) Push the cable adjuster lock clamp downward to lock it.

REMOVAL AND INSTALLATION (Continued)

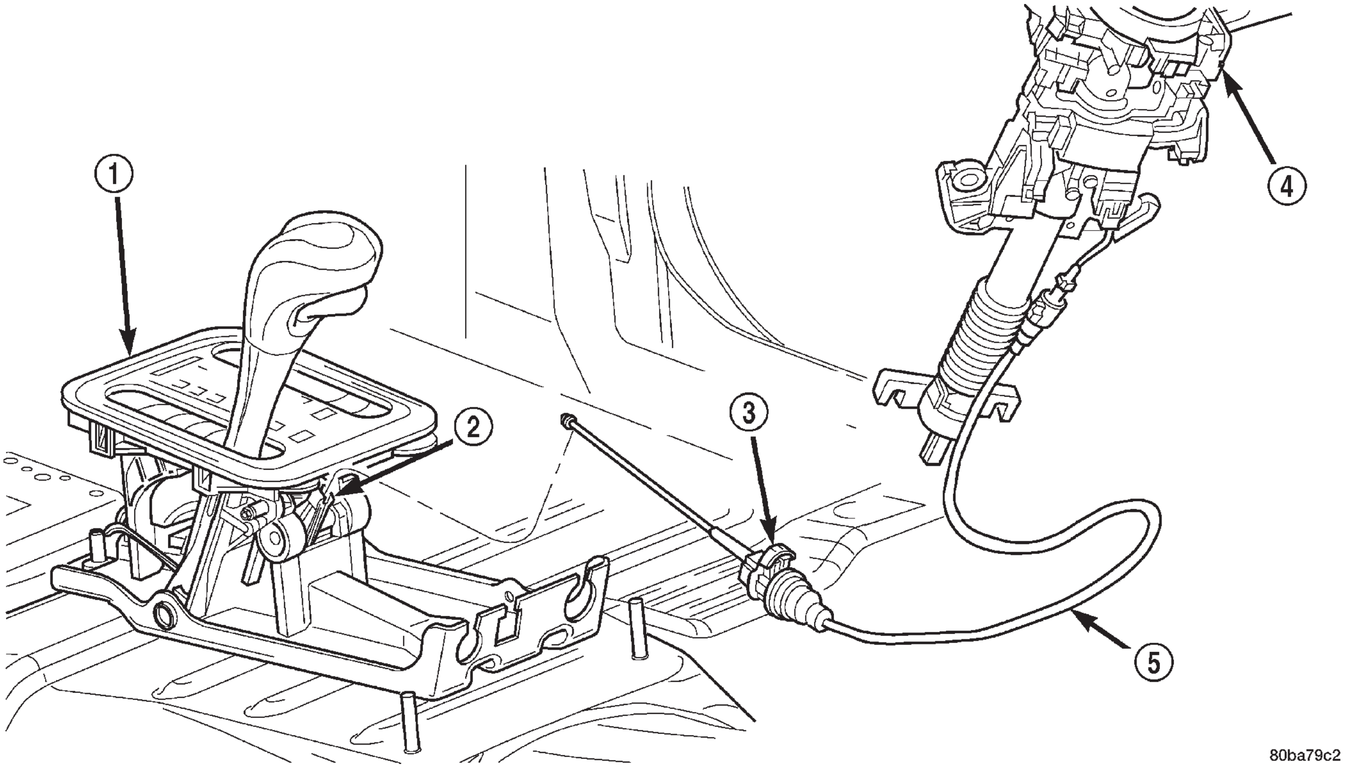


Fig. 61 Brake Transmission Shift Interlock

1 – SHIFT MECHANISM
2 – SHIFTER BTSI LEVER
3 – ADJUSTMENT CLIP
4 – STEERING COLUMN ASSEMBLY
5 – INTERLOCK CABLE

(10) Install the center console and related trim. Refer to Group 23, Body, for proper procedures.

(11) Test the BTSI cable operation.

DISASSEMBLY AND ASSEMBLY

TRANSMISSION

DISASSEMBLY

(1) Drain fluid from transmission.

(2) Clean exterior of transmission with suitable solvent or pressure washer.

(3) Remove the torque converter from the transmission.

(4) Remove the manual shift lever from the transmission.

(5) Remove the input, output, and line pressure sensors from the transmission case (Fig. 62).

(6) Inspect the ends of the sensors for debris, which may indicate the nature of the transmission failure.

(7) Install Support Stand 8257 onto the transmission case (Fig. 63).

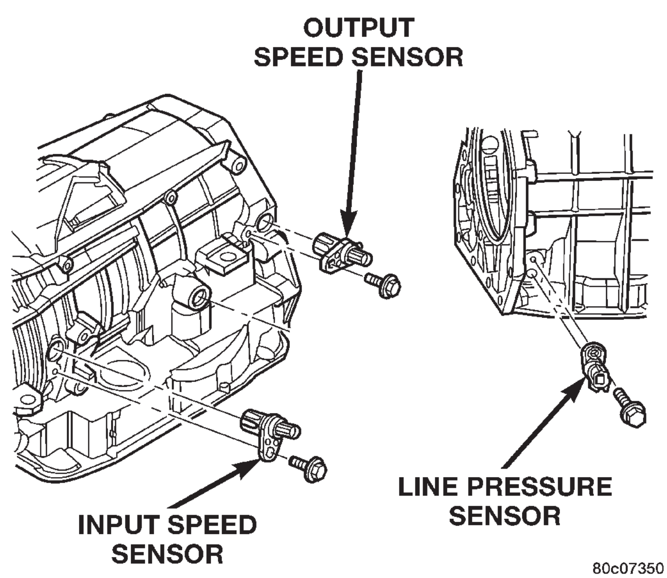


Fig. 62 Remove Input, Output, and Line Pressure Sensors

(8) Using Adapter 8266-1 from End-Play Tool Set 8266 and Dial Indicator C-3339, measure and record the input shaft end-play (Fig. 64).

DISASSEMBLY AND ASSEMBLY (Continued)

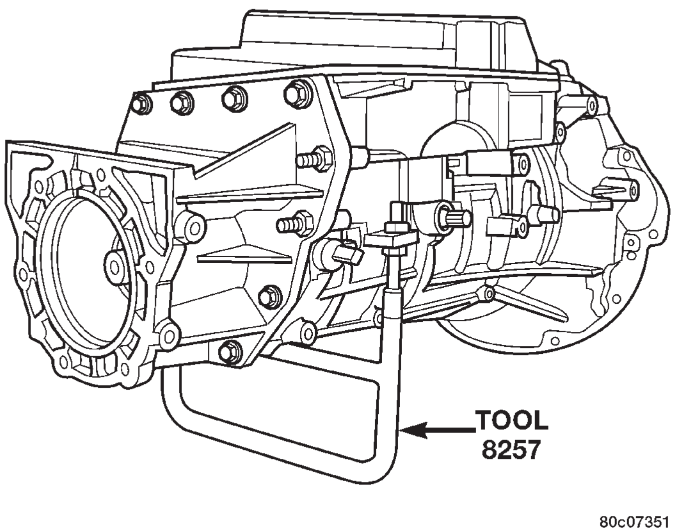


Fig. 63 Install Support Stand—Tool 8257

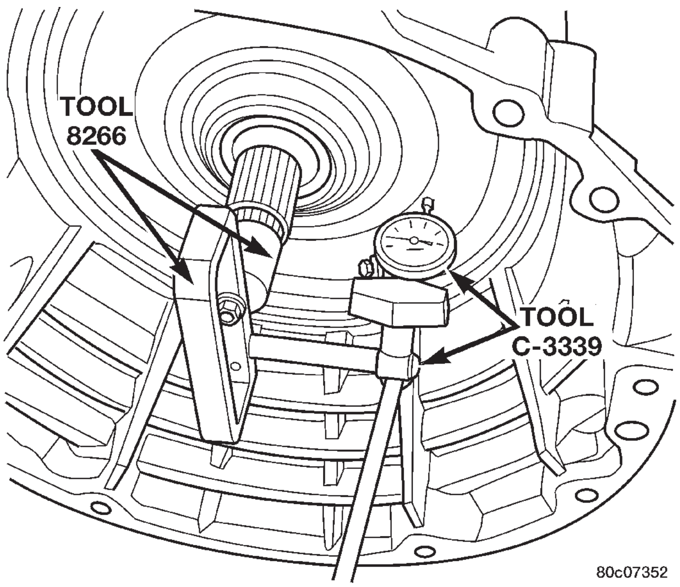


Fig. 64 Measure Input Shaft End Play

NOTE: When measuring the input shaft end-play, two “stops” will be felt. When the input shaft is pushed inward and the dial indicator zeroed, the first “stop” felt when the input shaft is pulled outward is the movement of the input shaft in the input clutch housing hub. This value should not be included in the end-play measured value and therefore must be recorded and subtracted from the dial indicator reading.

(9) Remove the bolts holding the transmission extension/adapter housing to the transmission case.

(10) Remove the extension/adapter housing from the transmission case.

(11) Using Alignment Plate 8261, Adapter 8266-17 from End-Play Tool Set 8266 and Dial Indicator C-3339, measure and record the output shaft end-play (Fig. 65).

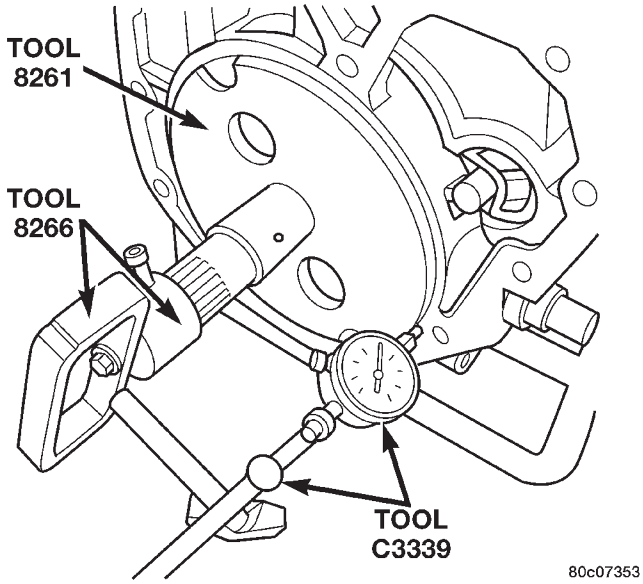


Fig. 65 Measure Output Shaft End Play

(12) Remove the bolts holding the transmission oil pan to the transmission case.

(13) Remove the transmission oil pan from the transmission case.

(14) Remove the primary oil filter and the oil cooler filter (Fig. 66).

(15) Remove the cooler bypass valve.

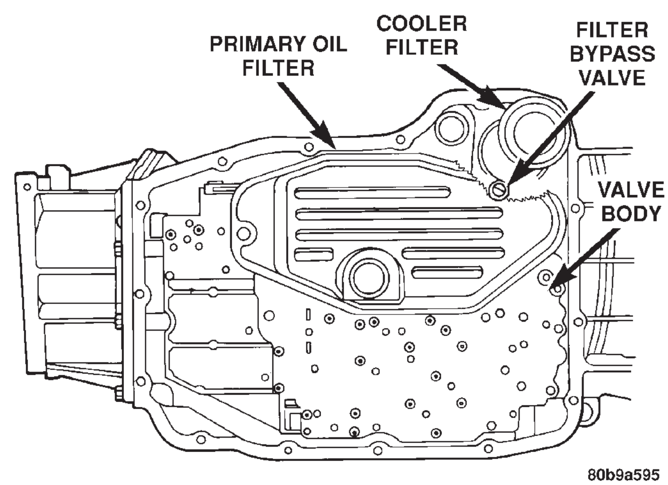


Fig. 66 Remove Primary Oil and Cooler Filters

(16) Remove the bolts holding the valve body to the transmission case (Fig. 67).

(17) Remove the valve body from the transmission case.

(18) Remove the outer snap-ring securing the transmission front cover into the transmission case (Fig. 68).

(19) Remove the inner snap-ring securing the transmission front cover to the oil pump (Fig. 68).

DISASSEMBLY AND ASSEMBLY (Continued)

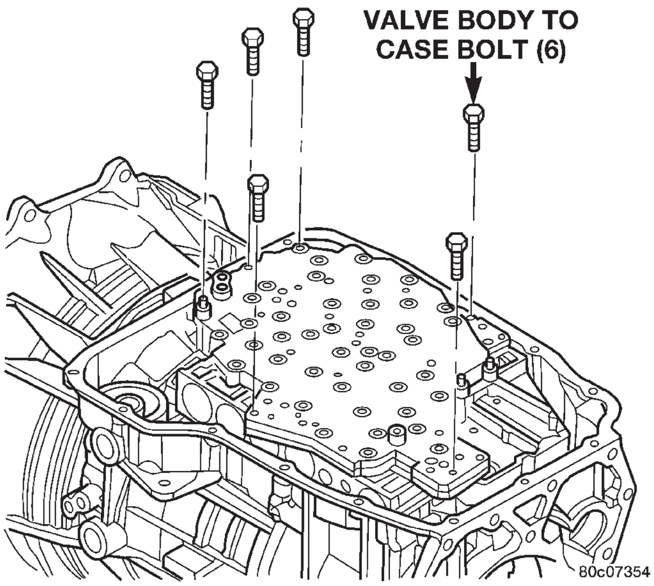


Fig. 67 Remove Valve Body Assembly

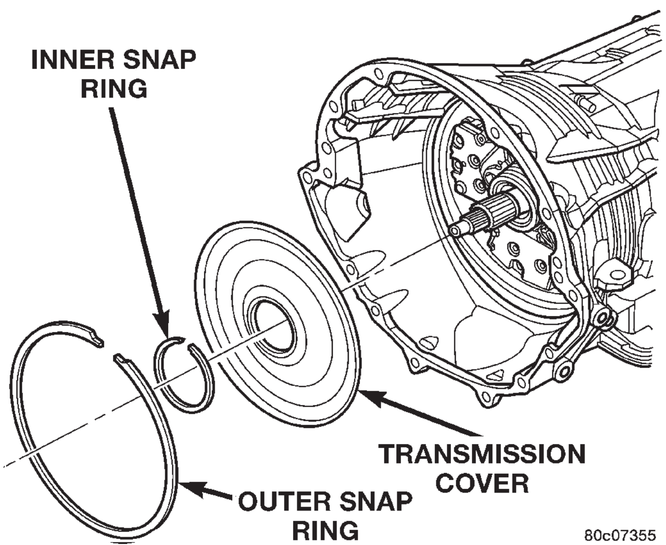


Fig. 68 Remove Transmission Front Cover

(20) Reaching through a case opening in the valve body area with a long blunted tool, remove the transmission front cover from the transmission case.

(21) Remove the bolts holding the oil pump into the transmission case (Fig. 69).

(22) Remove the oil pump. Hold inward on the input shaft to prevent pulling the input clutch assembly with the oil pump (Fig. 69).

(23) Remove the number 1 bearing from the input clutch assembly (Fig. 70).

(24) Remove the input clutch assembly from the transmission case (Fig. 70).

(25) Remove the number 5 bearing and selective thrust plate from the input clutch assembly (Fig. 70), or the 4C clutch retainer/bulkhead.

(26) Remove the 4C clutch retainer/bulkhead tapered snap-ring from the transmission case (Fig. 71).

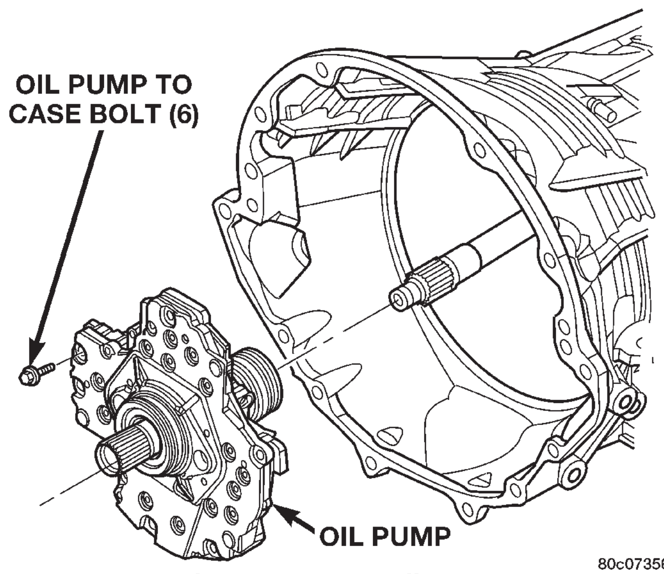


Fig. 69 Remove Oil Pump

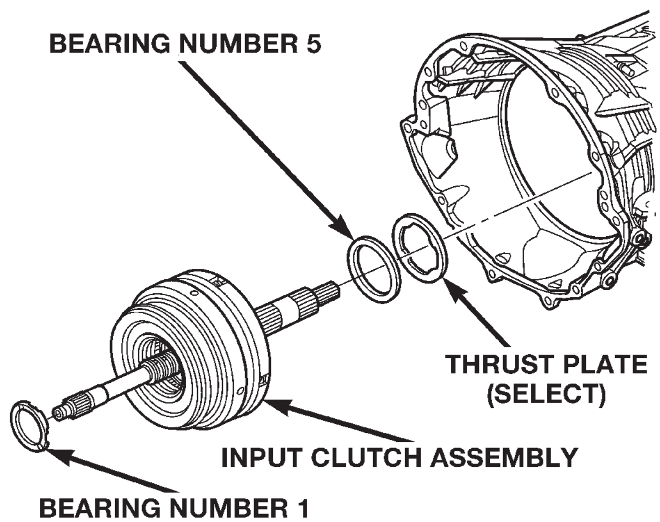


Fig. 70 Remove Input Clutch Assembly

(27) Remove the 4C clutch retainer/bulkhead from the transmission case (Fig. 71).

(28) Remove the front 2C clutch pack snap-ring from the transmission case (Fig. 72).

(29) Remove the 2C clutch pack from the transmission case (Fig. 72).

(30) Remove the rear selective plate and number 6 bearing from the reaction annulus (Fig. 73).

(31) Remove the reaction annulus from the reaction planetary carrier (Fig. 73).

(32) Remove the number 7 bearing (Fig. 73).

(33) Remove the reaction sun gear (Fig. 73).

(34) Remove the number 8 bearing from the reaction planetary carrier (Fig. 73).

(35) Remove the reaction planetary carrier (Fig. 73). Note that this planetary gear set has three pinion gears.

DISASSEMBLY AND ASSEMBLY (Continued)

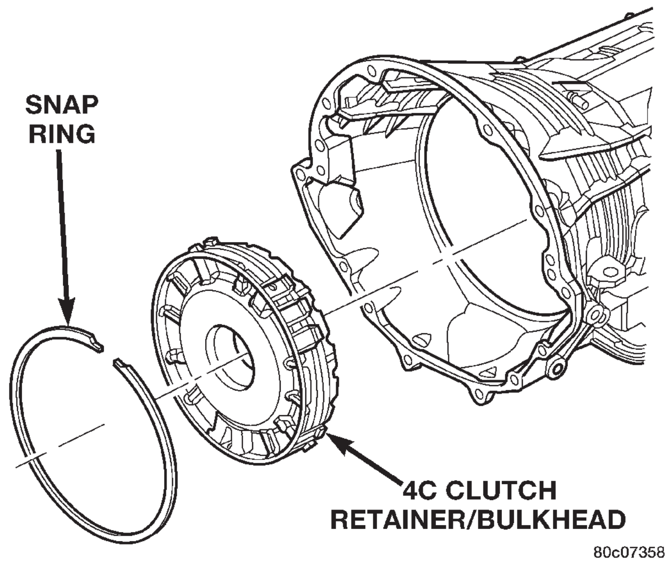


Fig. 71 Remove 4C Clutch Retainer/Bulkhead

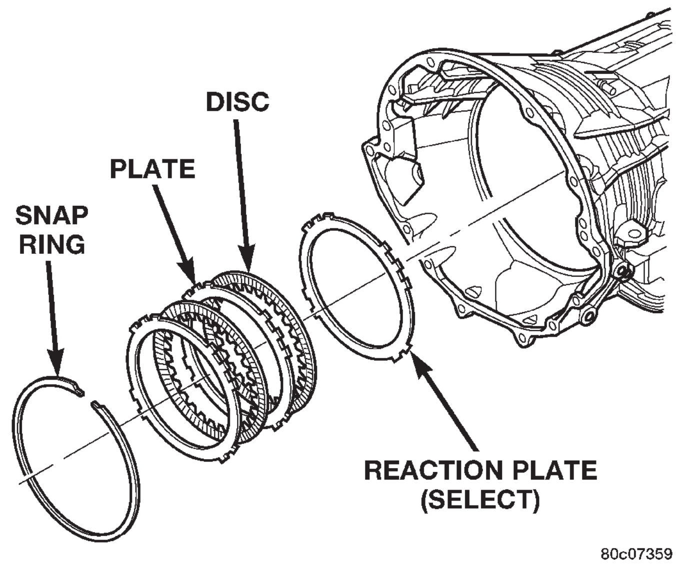


Fig. 72 Remove 2C Clutch Pack

(36) Remove the number 9 bearing from the reverse planetary gear set (Fig. 73).

(37) Remove the snap-ring holding the park sprag gear onto the output shaft (Fig. 74).

(38) Remove the park sprag gear from the output shaft (Fig. 75).

(39) Remove the input/reverse planetary assembly (Fig. 76).

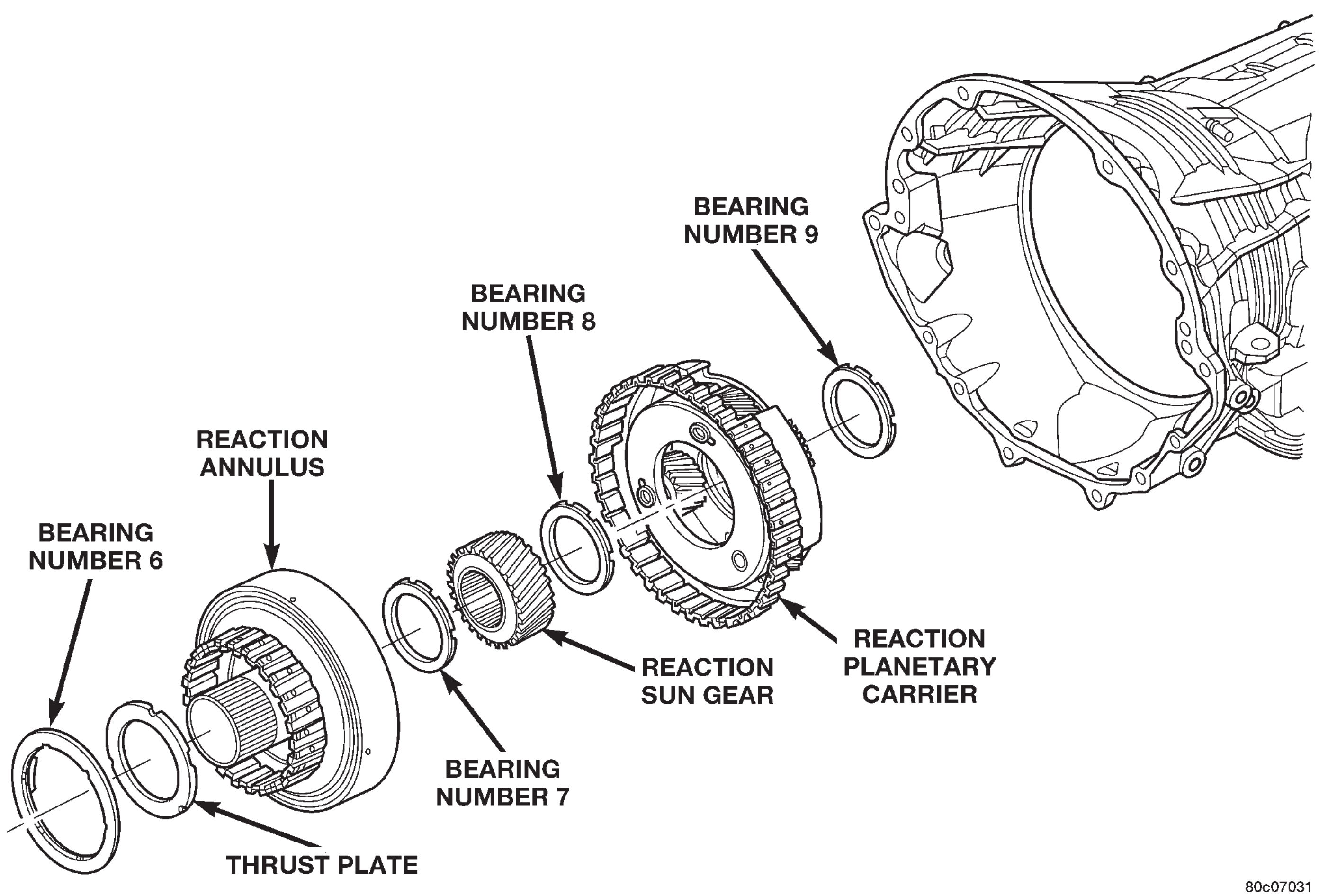


Fig. 73 Remove Reaction Annulus and Carrier

DISASSEMBLY AND ASSEMBLY (Continued)

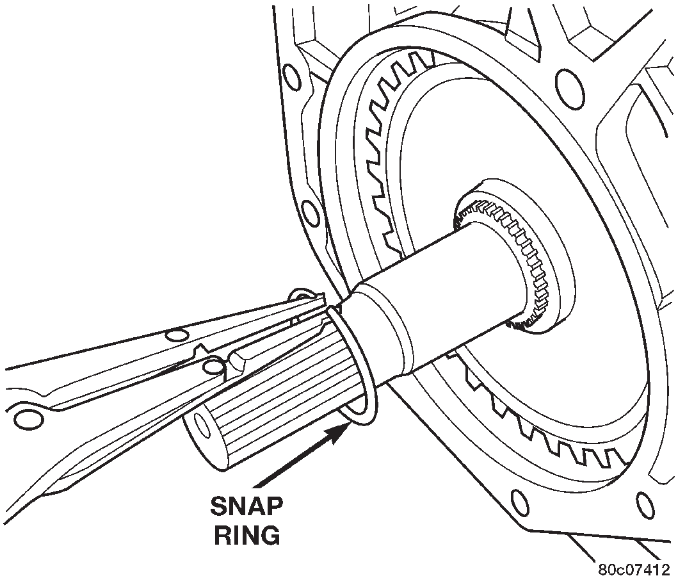


Fig. 74 Remove Park Sprag Snap Ring

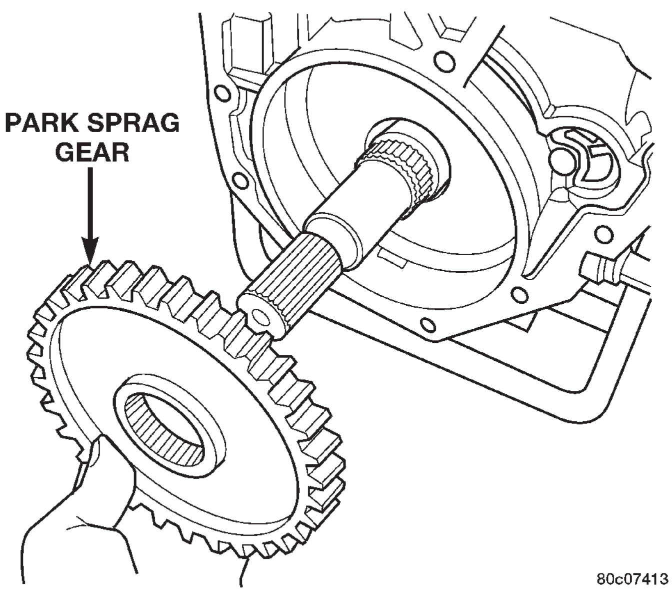


Fig. 75 Remove Park Sprag Gear

(40) Remove the number 12 bearing from the input/reverse planetary assembly (Fig. 76).

(41) Remove the snap-ring holding the low/reverse clutch retainer into the transmission case (Fig. 77).

(42) Remove the low/reverse clutch retainer from the transmission case (Fig. 77).

(43) Remove the park pawl rod and e-clip (Fig. 78).

(44) Remove the park pawl rod guide snap-ring (Fig. 78).

(45) Remove the park pawl rod guide (Fig. 78).

(46) Remove the park pawl pivot shaft, park pawl, and spring (Fig. 78).

(47) Remove the manual selector shaft (Fig. 78).

(48) Remove the manual selector shaft seal.

(49) Remove the dipstick tube seal.

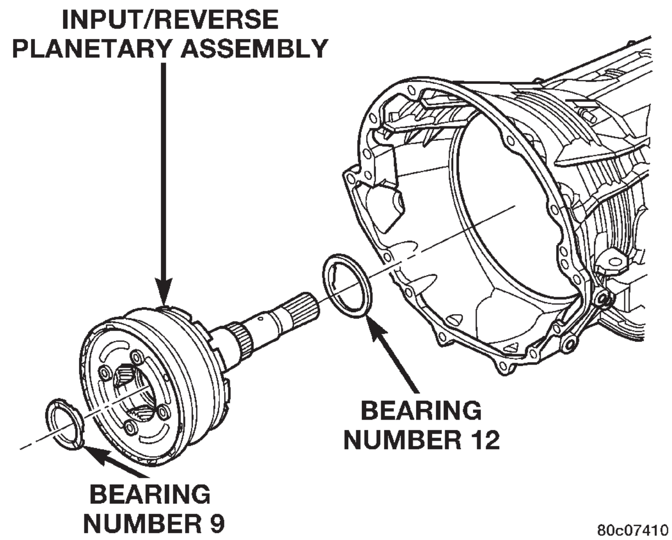


Fig. 76 Remove Input/Reverse Planetary Assembly

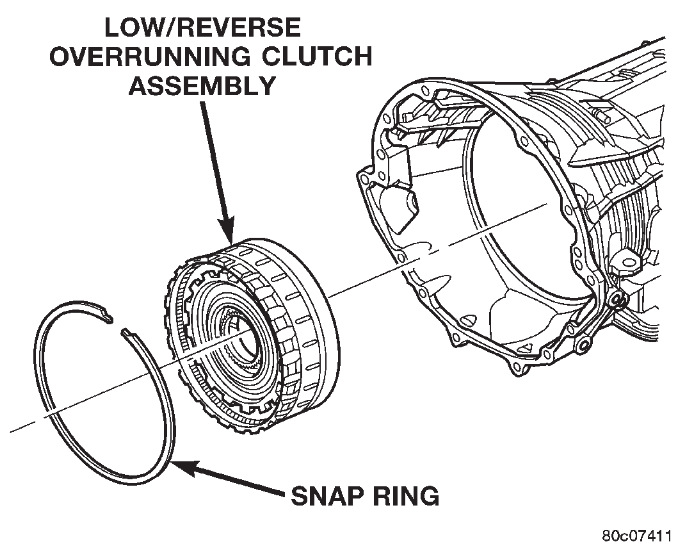


Fig. 77 Remove Low/Reverse Clutch Retainer

ASSEMBLY

(1) Clean and inspect all components. Replace any components which show evidence of excessive wear or scoring.

(2) Install the cooler filter bypass valve.

(3) Torque the bypass valve to specification. The valve uses a tapered pipe thread and excessive torque can damage the transmission case. Tighten the cooler filter bypass valve to 11.3 N·m (100 in. lbs.).

(4) Install a new selector shaft seal using Seal Installer 8253 (Fig. 79).

(5) Install the manual selector shaft and retaining screw. Tighten the manual selector shaft retaining screw to 28 N·m (250 in. lbs.).

(6) Install the park pawl, spring, and shaft (Fig. 78).

DISASSEMBLY AND ASSEMBLY (Continued)

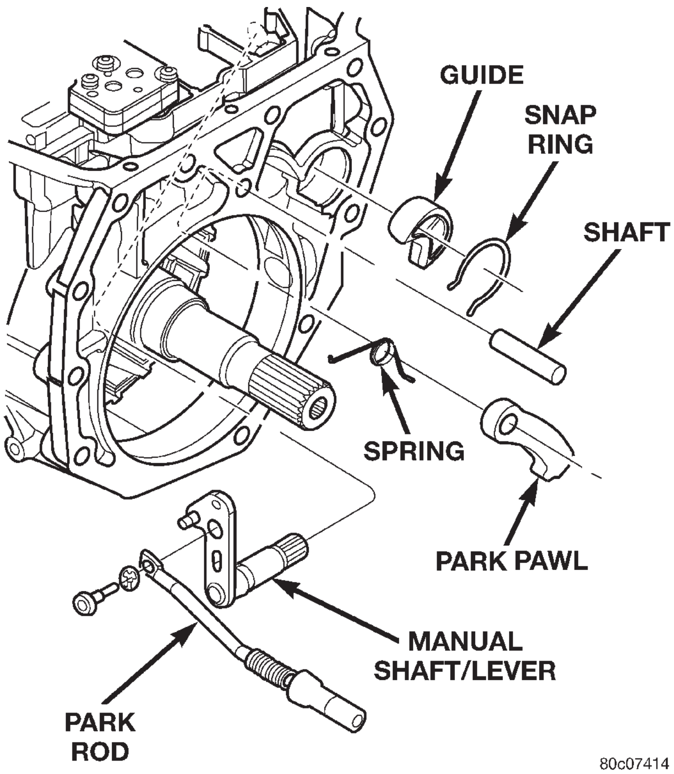


Fig. 78 Manual Shaft/Park Lock Components

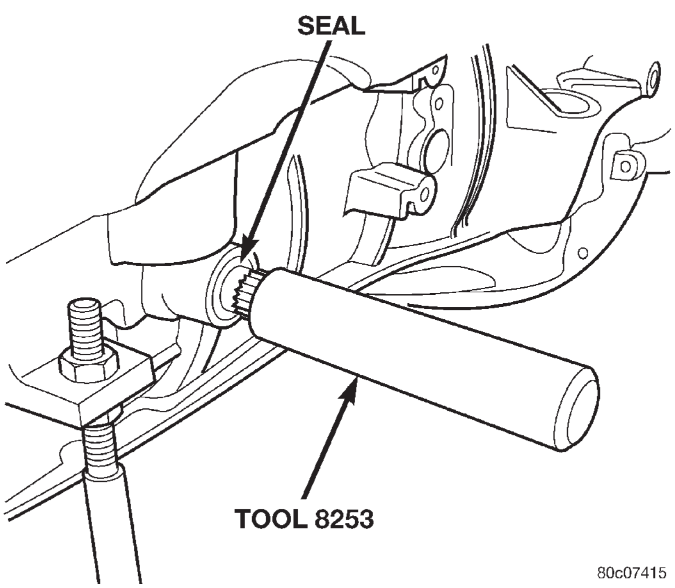


Fig. 79 Install Selector Shaft Seal Using Tool 8253

(7) Install the park rod and e-clip (Fig. 78).

(8) Install the park rod guide and snap-ring (Fig. 78).

(9) Install a new dipstick tube seal using Seal Installer 8254 (Fig. 80).

NOTE: Before final assembly of transmission centerline, the 2C/4C clutch components should be installed into position and measured/adjusted as follows:

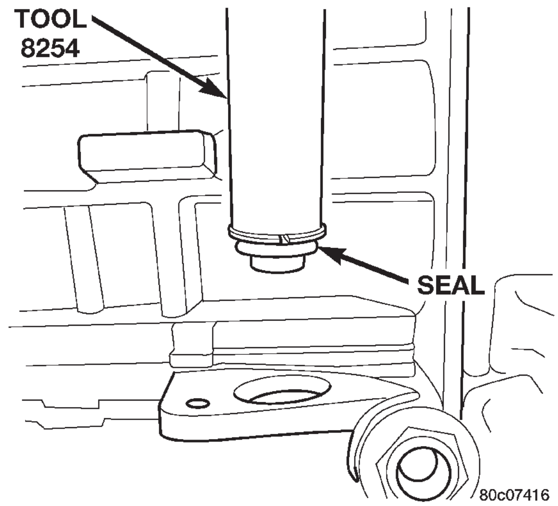


Fig. 80 Install Dipstick Tube Seal Using Tool 8254

(10) Install the 2C reaction plate into the transmission case (Fig. 72). The reaction plate is selective and directional. The plate must be installed with the flat side toward the front.

(11) Install the 2C clutch pack into the transmission case (Fig. 72).

(12) Install the flat 2C clutch snap-ring into the transmission case (Fig. 72).

(13) Install the 4C retainer/bulkhead into the transmission case. Make sure that the oil feed holes are pointing toward the valve body area.

(14) Install the 4C retainer/bulkhead tapered snap-ring into the transmission case. Make sure that the open ends of the snap-ring are located in the case opening toward the valve body area.

(15) Using a feeler gauge through the opening in the rear of the transmission case, measure the 2C clutch pack clearance between the 2C reaction plate and the transmission case at four different points. The average of these measurements is the 2C clutch pack clearance. Adjust the clearance as necessary. The correct clutch clearance is 0.533–1.27 mm (0.021–0.050 in.). The reaction plate is selective. Install the chosen reaction plate and re-measure the clutch clearance to verify the selection.

(16) Remove the 4C retainer/bulkhead and all of the 2C clutch components from the transmission case.

(17) Install the low/reverse clutch assembly (Fig. 81). Make sure that the oil feed hole points toward the valve body area and that the bleed orifice is aligned with the notch in the rear of the transmission case.

(18) Install the snap-ring to hold the low/reverse clutch retainer into the transmission case (Fig. 81). The snap-ring is tapered and must be installed with the tapered side forward. Once installed, verify that the snap-ring is fully seated in the snap-ring groove.

DISASSEMBLY AND ASSEMBLY (Continued)

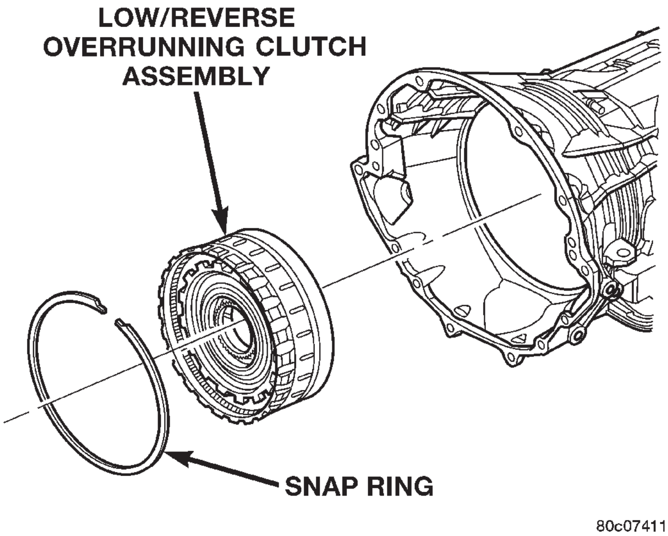


Fig. 81 Install Low/Reverse Clutch Retainer

(19) Air check the low/reverse clutch and verify correct overrunning clutch operation.

(20) Install the reverse/input planetary assembly through the low/reverse clutch assembly (Fig. 82).

(21) Install the number 12 bearing over the output shaft of the rear planetary gear set and onto the low/reverse clutch assembly. The flat side of the bearing goes toward the clutch assembly.

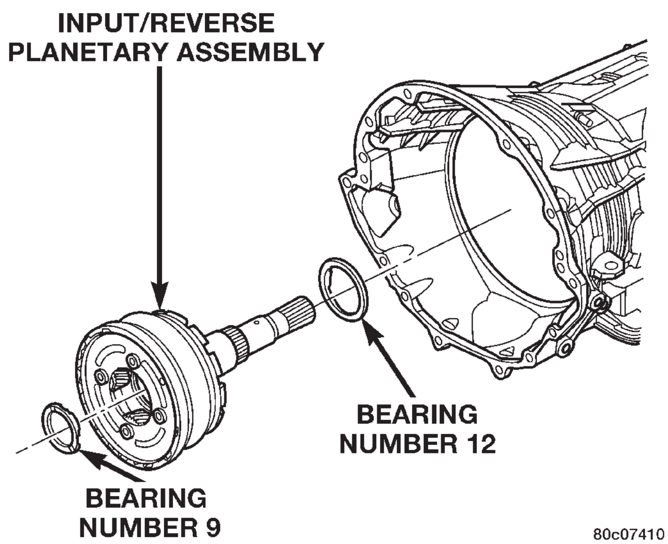


Fig. 82 Install Input/Reverse Planetary Assembly

(22) Install the park sprag onto the output shaft (Fig. 83).

(23) Install the snap-ring to hold the park sprag onto the output shaft (Fig. 84).

(24) Install the 2C reaction plate into the transmission case (Fig. 85). The reaction plate is selective and directional. The plate must be installed with the flat side toward the front.

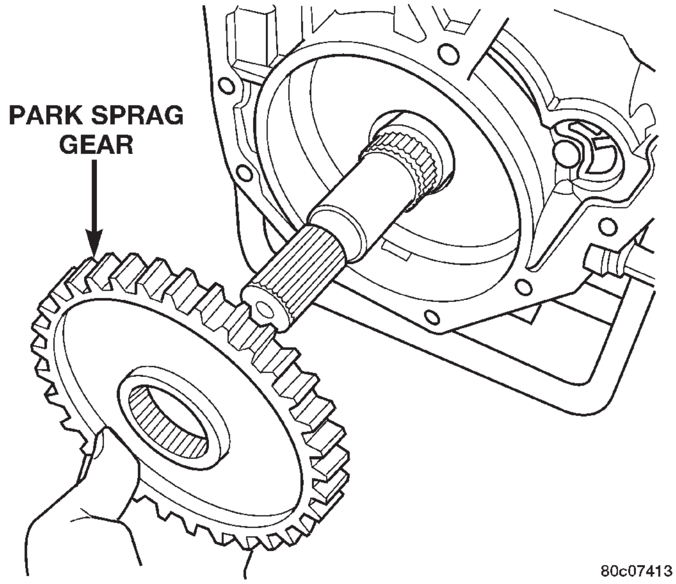


Fig. 83 Install Park Sprag Gear

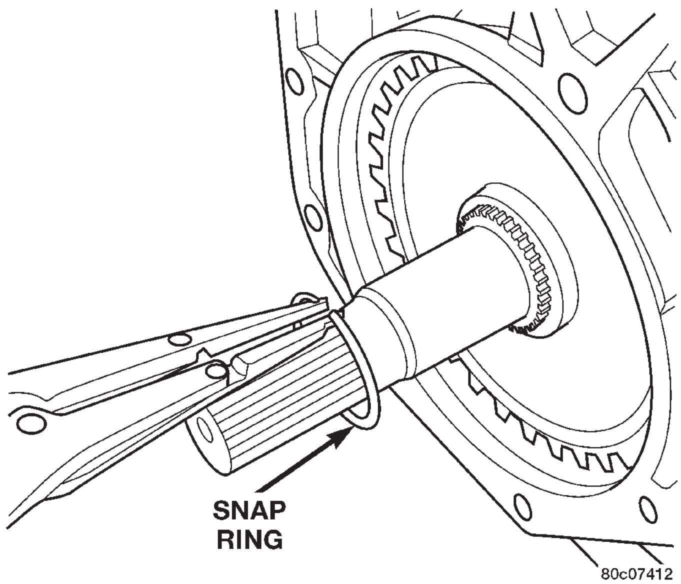


Fig. 84 Install Park Sprag Snap Ring

(25) Install the 2C clutch pack into the transmission case (Fig. 85).

(26) Install the number 8 bearing inside the reaction carrier with the round side against the planetary carrier.

(27) Install the reaction planetary gear set and the number 9 bearing into the transmission case (Fig. 86).

(28) Install the flat 2C clutch snap-ring into the transmission case (Fig. 85).

(29) Install the reaction sun gear into the reaction planetary gear set with the small shoulder facing the front of the transmission (Fig. 86).

DISASSEMBLY AND ASSEMBLY (Continued)

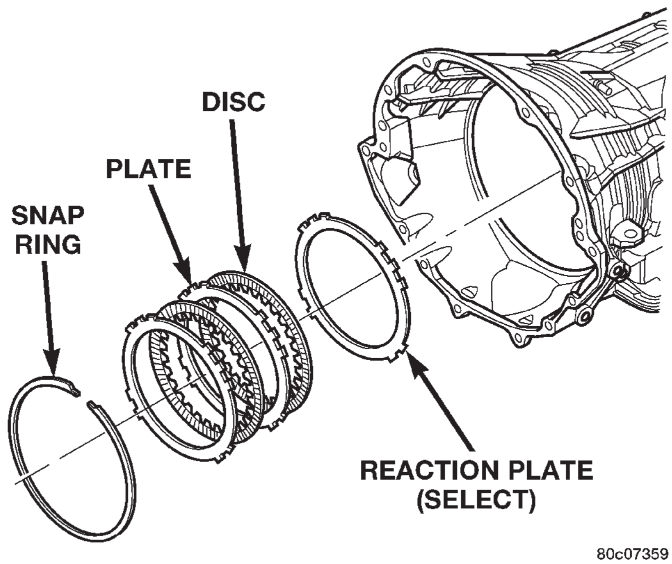


Fig. 85 Install 2C Clutch Pack

(30) Install the number 7 bearing onto the reaction sun gear with the flat side against the sun gear (Fig. 86).

(31) Install the output shaft selective thrust plate onto the reaction annulus with the oil grooves facing the annulus gear and the tabs and notches aligned as shown in (Fig. 87).

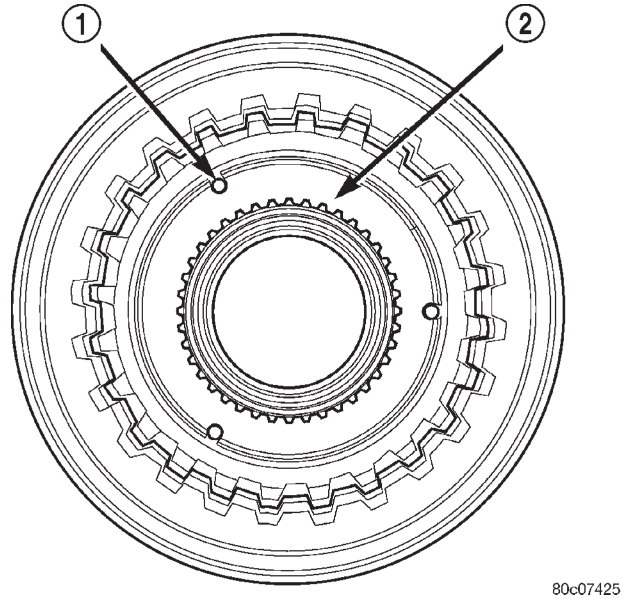


Fig. 87 Thrust Plate Alignment

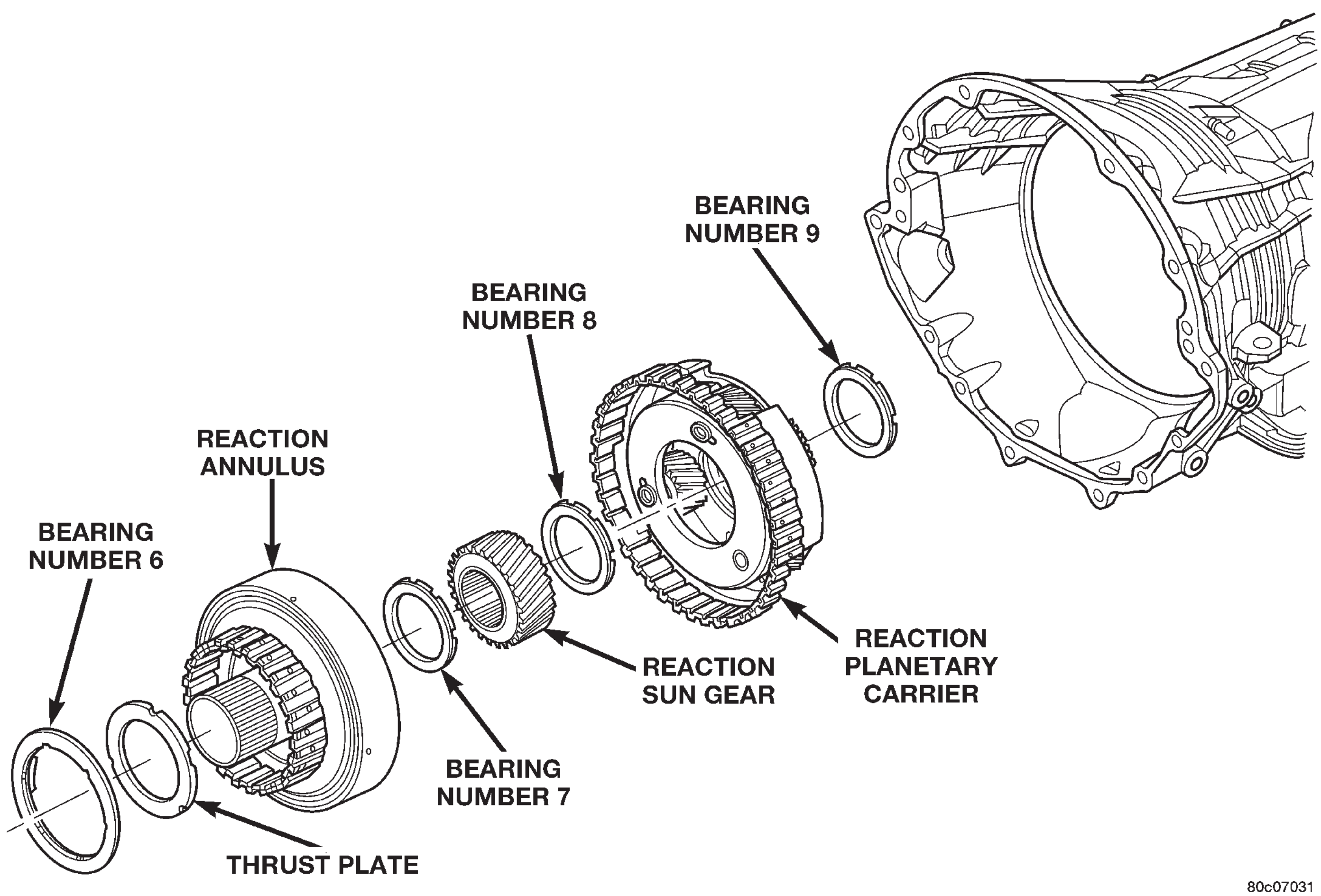


Fig. 86 Install Reaction Annulus and Carrier

DISASSEMBLY AND ASSEMBLY (Continued)

(32) Install the number 6 bearing against the output shaft selective spacer with the flat side against the spacer (Fig. 86).

(33) Install the reaction annulus into the reaction planetary gear set (Fig. 86).

(34) Install the 4C retainer/bulkhead into the transmission case. Make sure that the oil feed holes are pointing toward the valve body area. Rotate the reaction annulus during the installation of the 4C retainer/bulkhead to ease installation.

(35) Install the 4C retainer/bulkhead tapered snap-ring into the transmission case (Fig. 88). Make sure that the open ends of the snap-ring are located in the case opening toward the valve body area.

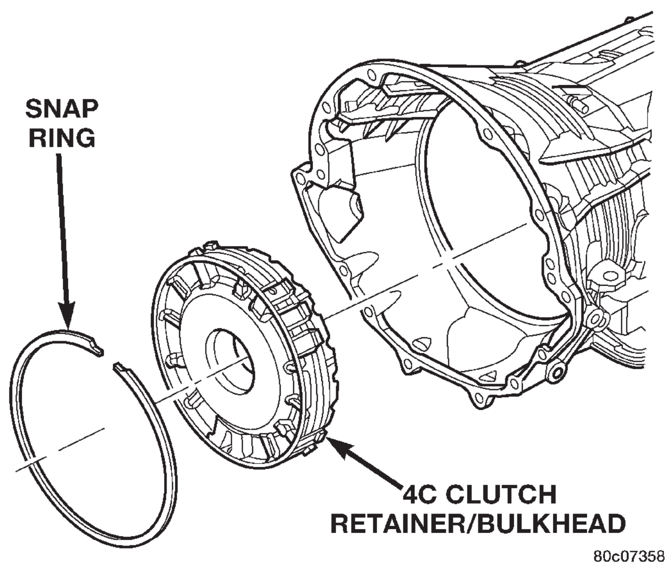


Fig. 88 Install 4C Clutch Retainer/Bulkhead

(36) Air check the 2C and 4C clutch operation.

(37) Using Alignment Plate 8261, Adapter 8266-17 from End-Play Tool Set 8266 and Dial Indicator C-3339, measure and record the output shaft end-play (Fig. 89). The correct output shaft end-play is 0.53–0.78 mm (0.021–0.031 in.). Adjust as necessary. Install the chosen output shaft selective spacer and re-measure end-play to verify selection.

(38) Apply a bead of RTV silicone and install the extension/adapter housing onto the transmission case.

(39) Install and torque the bolts to hold the extension/adapter housing onto the transmission case. The correct torque is 54 N·m (40 ft. lbs.).

(40) Install the number 5 bearing and spacer onto the 4C retainer/bulkhead (Fig. 90).

(41) Install the input clutch assembly into the transmission case (Fig. 90). Make sure that the input clutch assembly is fully installed by performing a visual inspection through the input speed sensor hole. If the tone wheel on the input clutch assembly is visible, the assembly is fully installed.

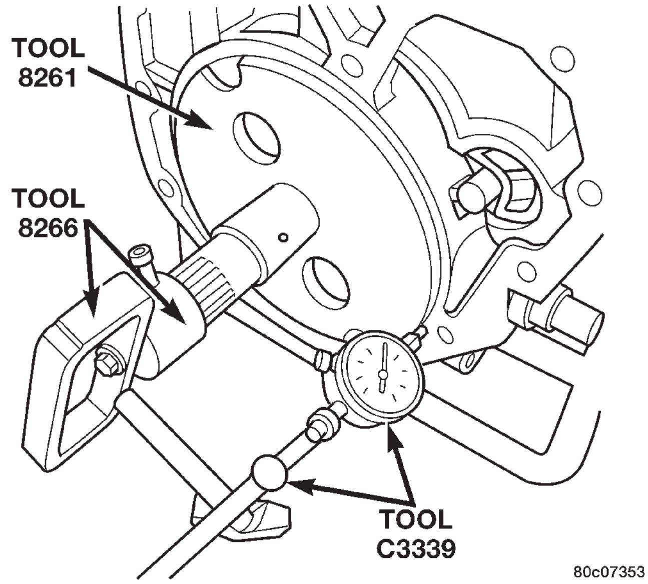


Fig. 89 Measure Output Shaft End Play

(42) Install the number 1 bearing with the flat side down in the pocket of the input clutch assembly (Fig. 90).

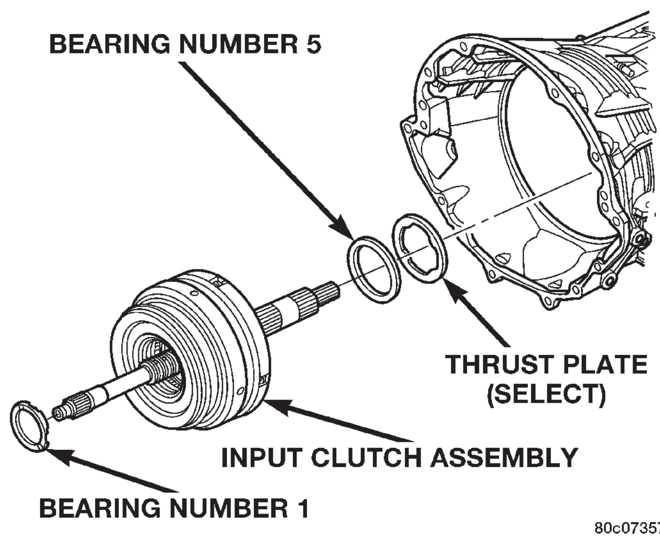


Fig. 90 Install Input Clutch Assembly

(43) Install the oil pump into the transmission case (Fig. 91).

(44) Install the bolts to hold the oil pump into the transmission case. Tighten the oil pump bolts to 28 N·m (250 in. lbs.).

(45) Using Adapter 8266-1 from End-Play Tool Set 8266 and Dial Indicator C-3339, measure and record the input shaft end-play (Fig. 92). The correct end-play is 0.79–1.07 mm (0.031–0.042 in.). Adjust as necessary. Install the chosen spacer on the number 5 bearing and re-measure end-play to verify selection.

DISASSEMBLY AND ASSEMBLY (Continued)

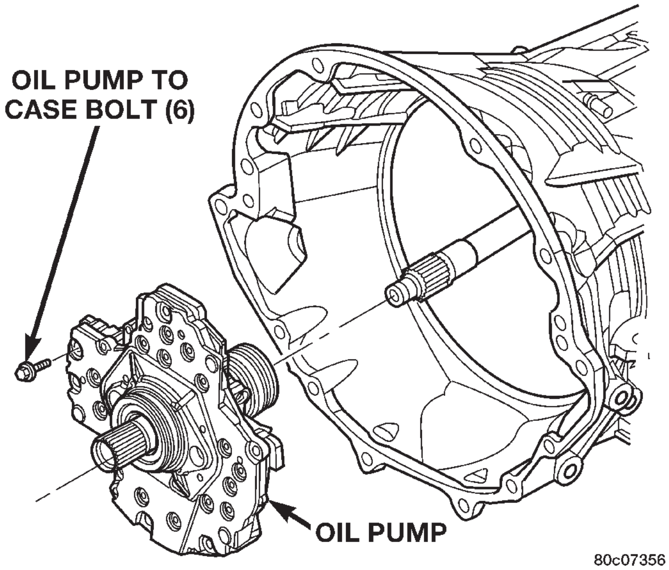


Fig. 91 Install Oil Pump

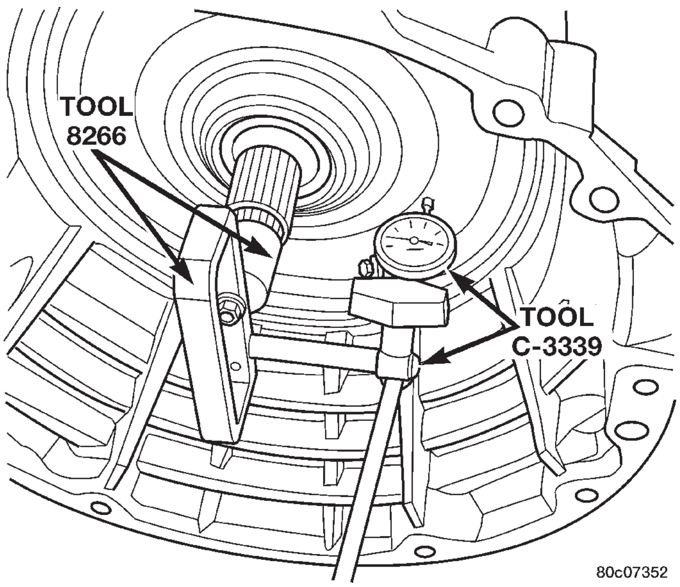


Fig. 92 Measure Input Shaft End Play

NOTE: When measuring the input shaft end-play, two "stops" will be felt. When the input shaft is pushed inward and the dial indicator zeroed, the first "stop" felt when the input shaft is pulled outward is the movement of the input shaft in the input clutch housing hub. This value should not be included in the end-play measured value and therefore must be recorded and subtracted from the dial indicator reading.

(46) Install the transmission front cover into the transmission case (Fig. 93).

(47) Install the outer snap-ring to hold the transmission front cover into the transmission case (Fig. 93).

(48) Partially install the inner transmission front cover snap-ring onto the oil pump (Fig. 93).

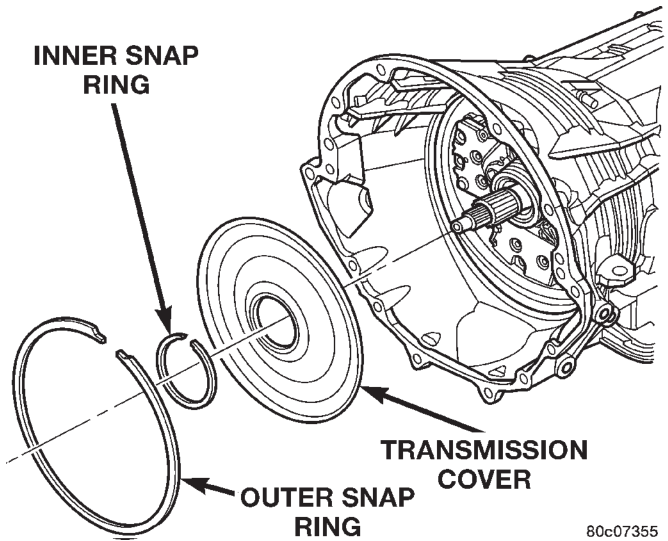


Fig. 93

(49) Using Installer 8255, install the inner transmission front cover snap-ring the remainder of the way onto the oil pump (Fig. 94).

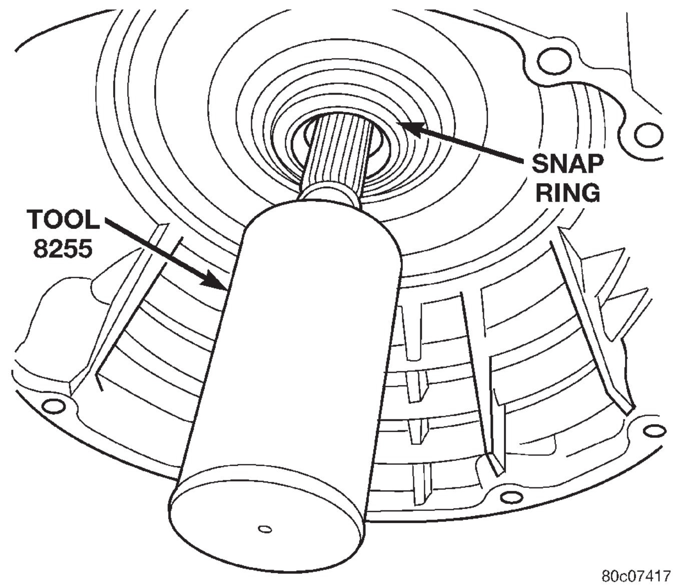


Fig. 94 Seat Snap Ring Using Tool 8255

(50) Install the valve body (Fig. 95). Tighten the valve body to transmission case bolts to 12 N·m (105 in. lbs.).

(51) Install the primary oil filter and the oil cooler filter (Fig. 96). Tighten the screws to hold the primary oil filter to the valve body to 4.5 N·m (40 in. lbs.). Using Oil Filter Wrench 8321, tighten the cooler return oil filter to the transmission case to 14 N·m (125 in. lbs.).

(52) Apply RTV silicone to the oil pan and install the transmission oil pan. Tighten the bolts to 12 N·m (105 in. lbs.).

DISASSEMBLY AND ASSEMBLY (Continued)

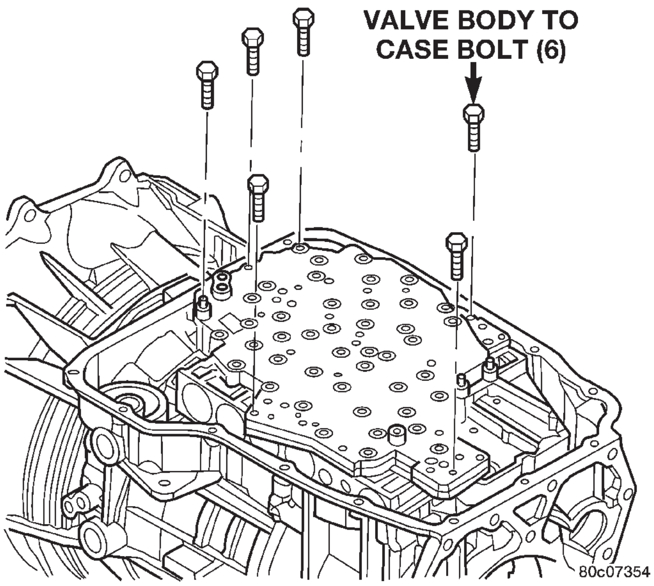


Fig. 95 Install Valve Body Assembly

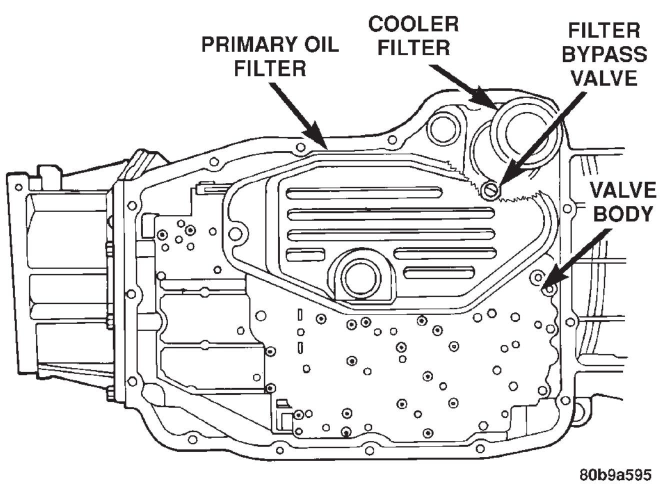


Fig. 96 Install Primary Oil and Cooler Filters

(53) Install the input, output, and line pressure sensors (Fig. 97). Tighten the bolts to 12 N·m (105 in. lbs.).

(54) Install the manual shift lever from the transmission. Torque the retaining cross-bolt to 16 N·m (140 in. lbs.).

VALVE BODY

DISASSEMBLY

(1) Remove the screws holding the solenoid and pressure switch assembly to the valve body (Fig. 98). Do not remove the screws on the top of the solenoid and pressure switch assembly.

(2) Separate the solenoid and pressure switch assembly from the valve body.

(3) Remove the screw holding the detent spring (Fig. 99) onto the valve body.

(4) Remove the detent spring from the valve body.

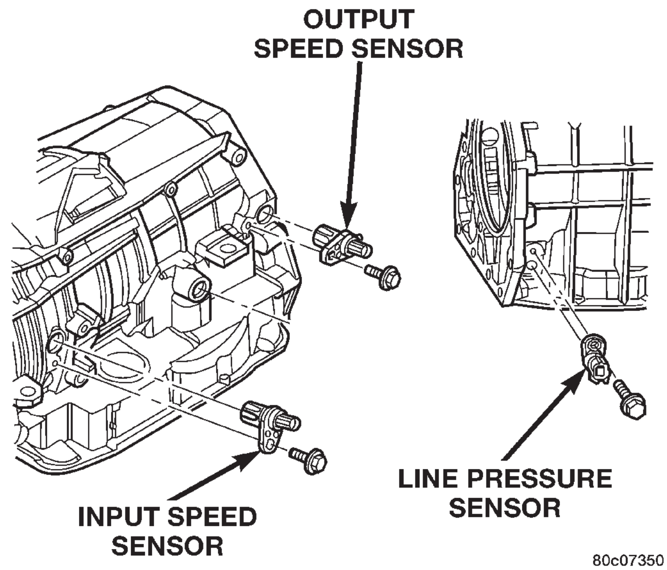


Fig. 97 Install Input, Output, and Line Pressure Sensors

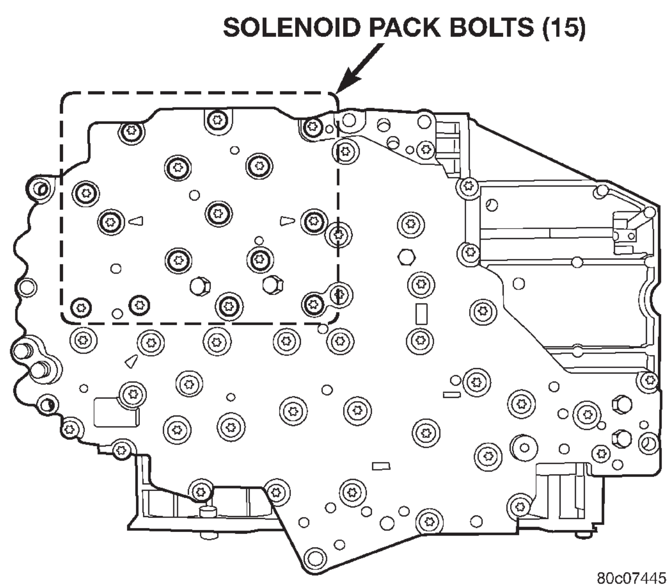


Fig. 98 Solenoid and Pressure Switch Assembly Screws

(5) Remove the TRS selector plate from the valve body and the manual valve.

(6) Remove the clutch passage seals from the valve body, if necessary.

(7) Remove the screws holding the accumulator cover onto the valve body (Fig. 100).

(8) Remove the accumulator springs and pistons from the valve body. Note which accumulator piston and spring belong in each location.

(9) Place the valve body on the bench with the transfer plate upward.

DISASSEMBLY AND ASSEMBLY (Continued)

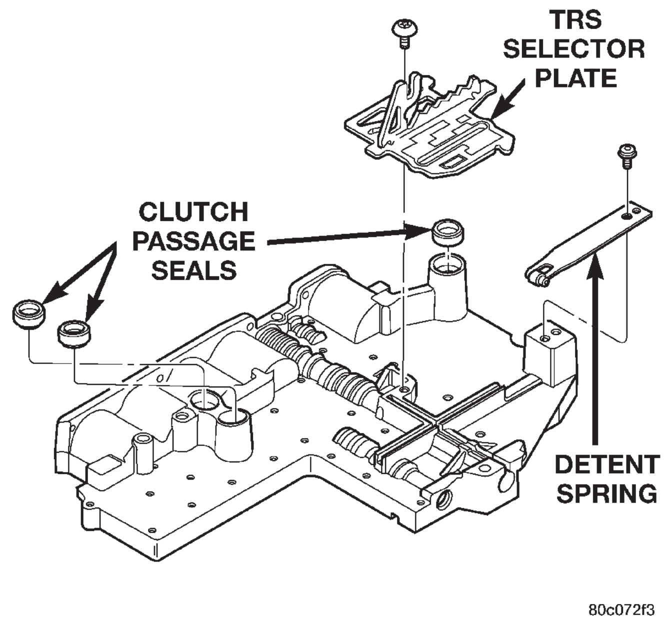


Fig. 99 Valve Body External Components

NOTE: The valve body contains seven check balls. The transfer plate must be placed upward to prevent losing the check balls when the transfer plate is removed from the valve body.

(10) Remove the screws holding the valve body to the valve body transfer plate.

(11) Remove the transfer plate from the valve body. Note the location of all check balls (Fig. 101).

(12) Remove the check balls from the valve body.

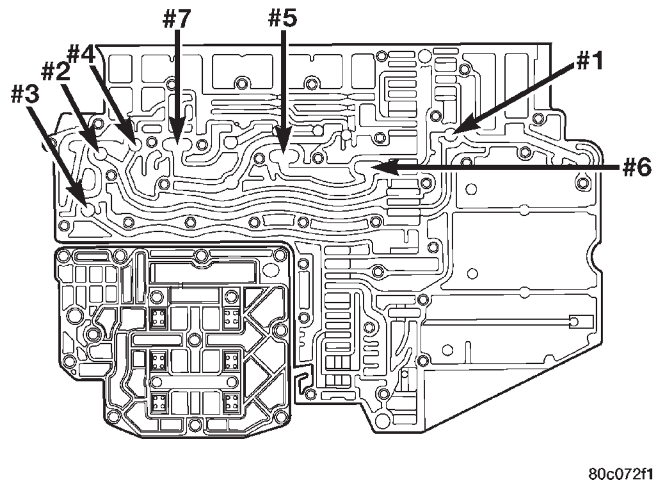


Fig. 101 Check Ball Locations

(13) Remove the retainers securing the solenoid switch valve, manual valve, and the low/reverse switch valve into the valve body and remove the associated valve and spring. Tag each valve and

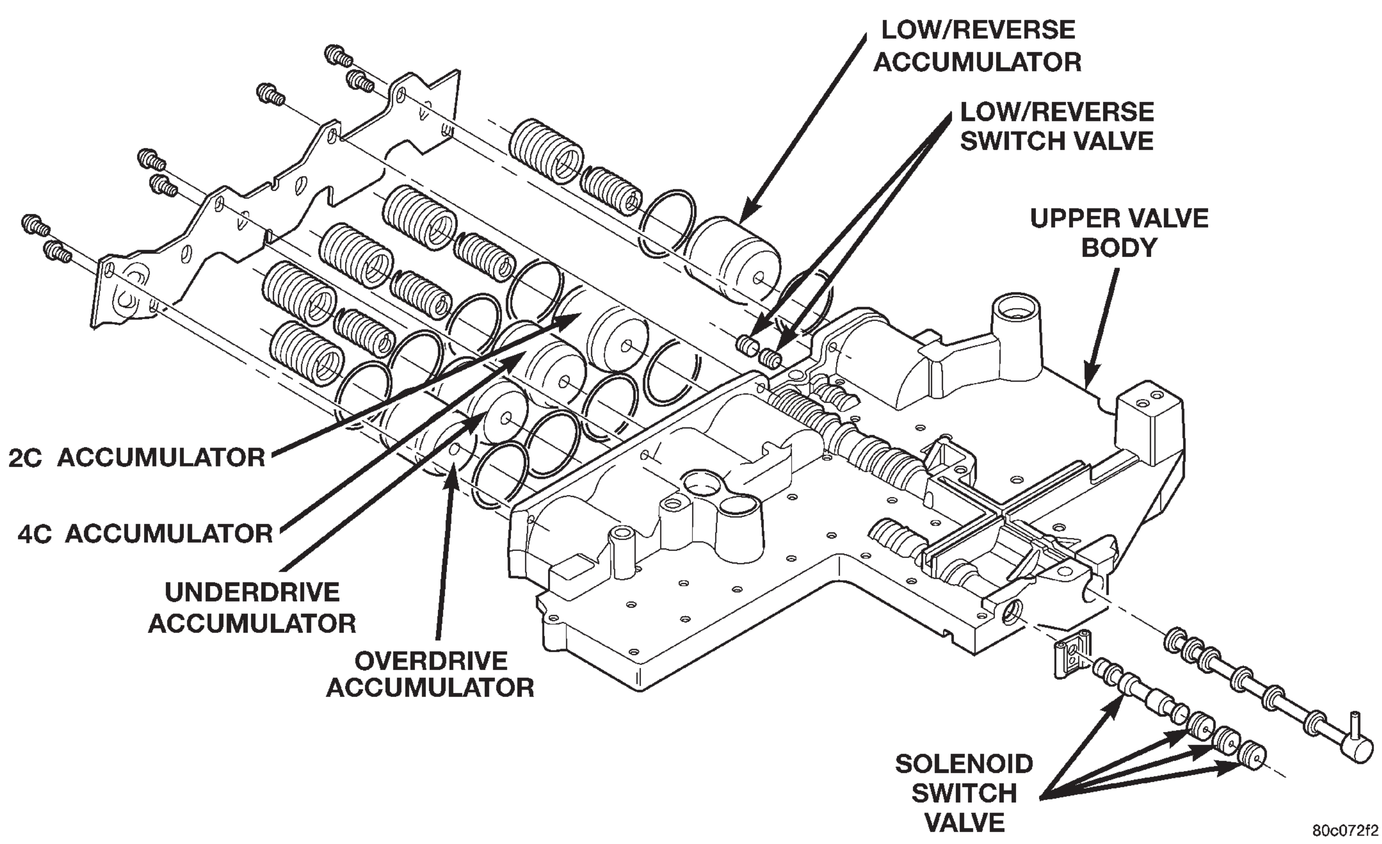


Fig. 100 Valve Body Components

DISASSEMBLY AND ASSEMBLY (Continued)

spring combination with location information to aid in assembly.

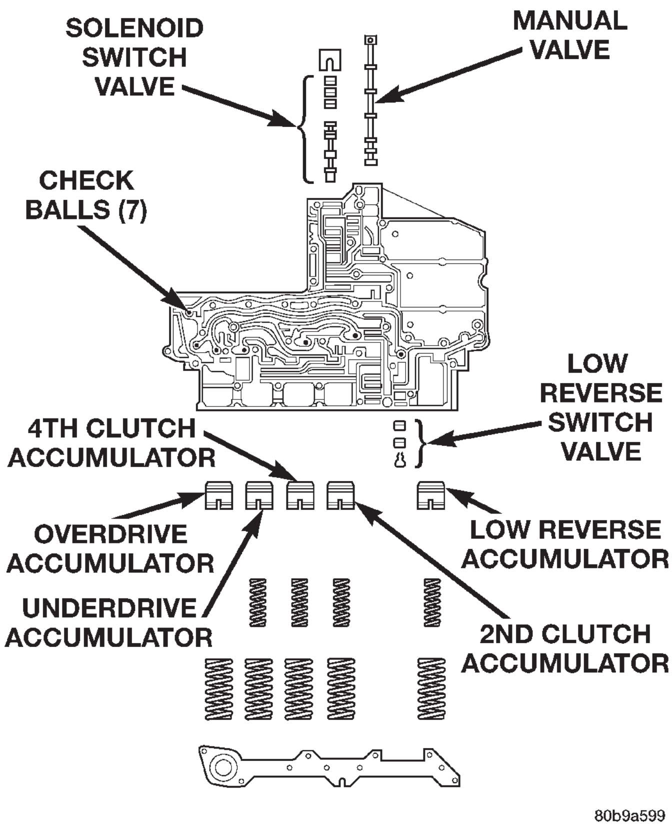


Fig. 102 Valve Body Components

ASSEMBLY

(1) Lubricate valves, springs, and the housing valve bores with clean transmission fluid.

(2) Install solenoid switch valve, manual valve, and the low/reverse switch valve into the valve body.

(3) Install the retainers to hold each valve into the valve body.

(4) Install the valve body check balls into their proper locations.

(5) Position the transfer plate onto the valve body.

(6) Install the screws to hold the transfer plate to the valve body. Tighten the screws to 4.5 N·m (40 in. lbs.).

(7) Install the accumulator pistons and springs into the valve body in the location from which they were removed. Note that all accumulators except the overdrive have two springs. The overdrive accumulator piston has only one spring.

(8) Position the accumulator cover onto the valve body.

(9) Install the screws to hold the accumulator cover onto the valve body. Tighten the screws to 4.5 N·m (40 in. lbs.).

(10) Install the TRS selector plate onto the valve body and the manual valve.

(11) Install the solenoid and pressure switch assembly onto the valve body.

(12) Install the screws to hold the solenoid and pressure switch assembly onto the valve body. Tighten the screws to 5.7 N·m (50 in. lbs.). Tighten the screws adjacent to the arrows cast into the bottom of the transfer plate first.

(13) Position the detent spring onto the valve body.

(14) Install the screw to hold the detent spring onto the valve body. Tighten the screw to 4.5 N·m (40 in. lbs.).

(15) Install new clutch passage seals onto the valve body, if necessary

OIL PUMP

DISASSEMBLY

(1) Remove the bolts holding the reaction shaft support to the oil pump (Fig. 103).

(2) Remove the reaction shaft support from the oil pump (Fig. 103).

(3) Remove all bolts holding the oil pump halves together (Fig. 103).

(4) Using suitable prying tools, separate the oil pump sections by inserting the tools in the supplied areas and prying the halves apart.

NOTE: The oil pump halves are aligned to each other through the use of two dowels. Be sure to pry upward evenly to prevent damage to the oil pump components.

DISASSEMBLY AND ASSEMBLY (Continued)

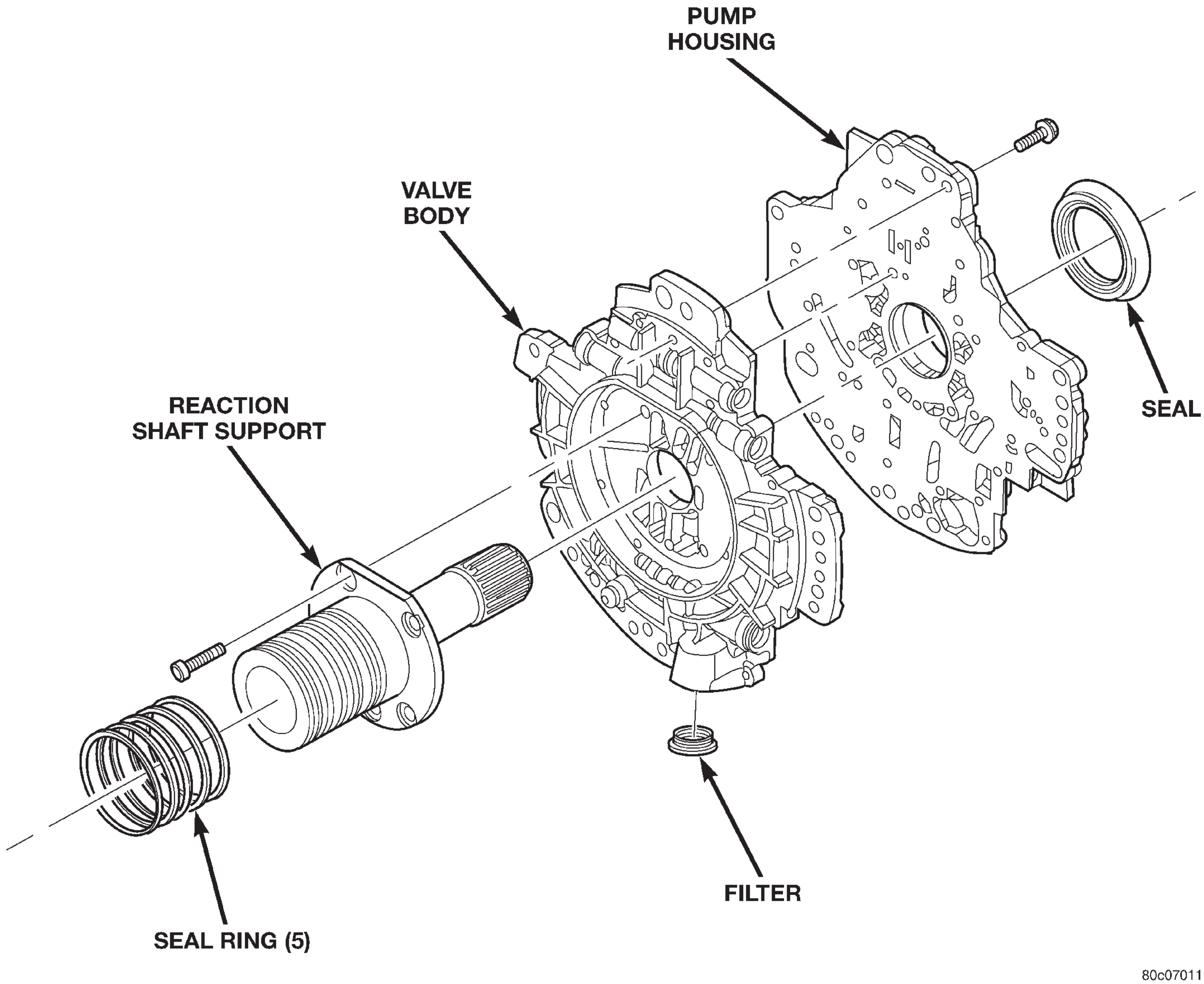


Fig. 103 Oil Pump Assembly

(5) Remove the screws holding the separator plate onto the oil pump body (Fig. 104).

(6) Remove the separator plate from the oil pump body (Fig. 104).

(7) Mark all gears for location. The gears are select fit and if the oil pump is to be reused, the gears must be returned to their original locations.

(8) Remove the oil pump gears from the oil pump case (Fig. 104).

(9) Remove the oil pump valve retainers and associated valve and spring one at a time (Fig. 105) (Fig. 106). Mark the combination of components as a group and tag them as to the location from which they were removed.

ASSEMBLY

(1) Clean and inspect all components. Make sure that all passages are thoroughly cleaned and are free from dirt or debris. Make sure that all valves move freely in their proper bore. Make sure that all gear pockets and bushings are free from excessive wear and scoring. Replace the oil pump if any excessive wear or scoring is found.

(2) Coat the gears with Mopar® ATF+3, type 7176 and install into their original locations.

(3) Lubricate the oil pump valves with Mopar® ATF+3, type 7176 and install the valve, spring and retainer into the appropriate oil pump valve body bore (Fig. 105) (Fig. 106).

(4) Place the separator plate onto the oil pump body (Fig. 104).

DISASSEMBLY AND ASSEMBLY (Continued)

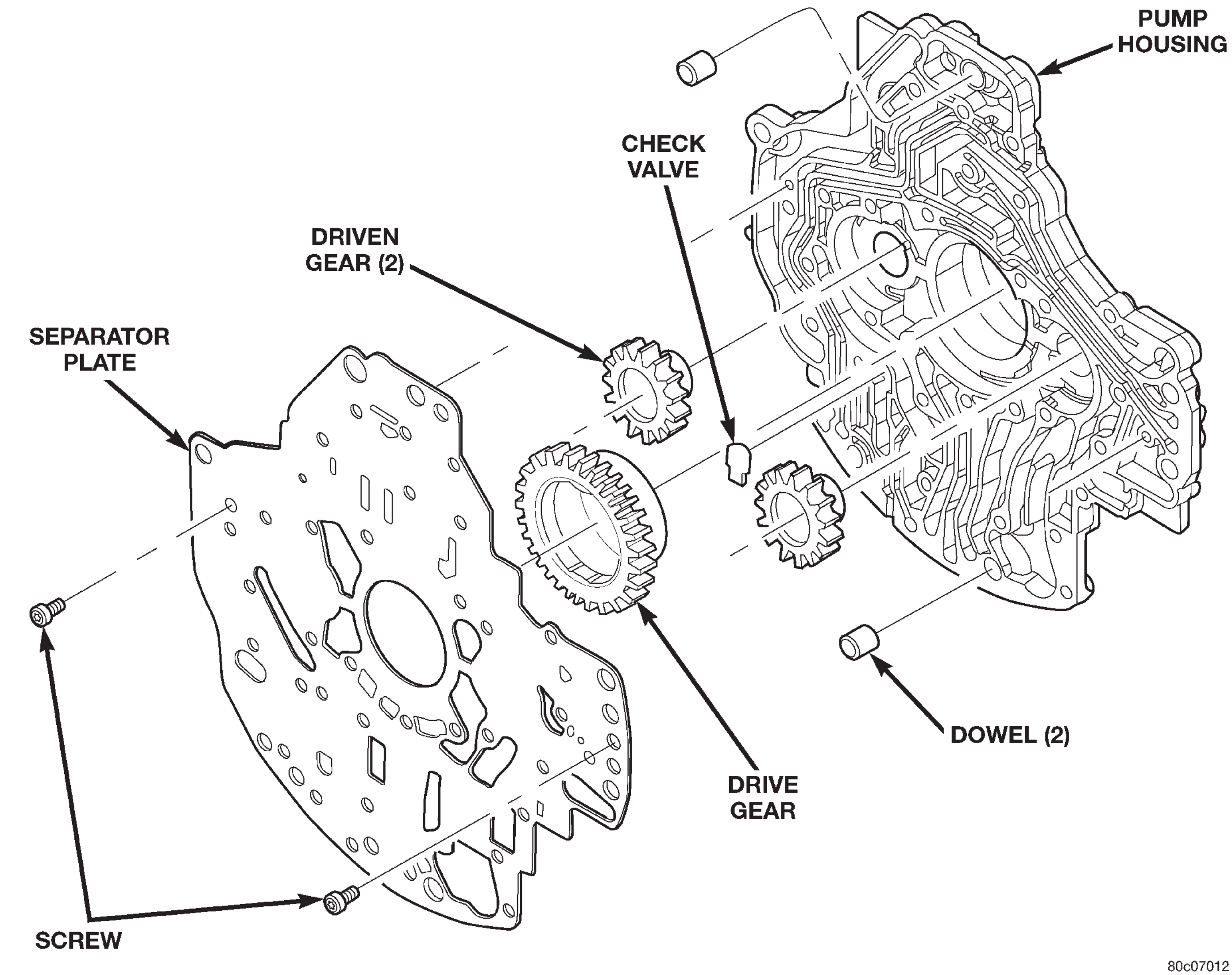


Fig. 104 Oil Pump Housing and Gears

(5) Install the screws to hold the separator plate onto the oil pump body (Fig. 104). Tighten the screws to 4.5 N·m (40 in. lbs.).

(6) Position the oil pump cover onto the locating dowels (Fig. 103).

(7) Seat the two oil pump halves together and install all bolts finger tight.

(8) Torque all bolts down slowly starting in the center and working outward. The correct torque is 4.5 N·m (40 in. lbs.).

(9) Verify that the oil pump gears rotate freely and smoothly.

(10) Position the reaction shaft support into the oil pump (Fig. 103).

(11) Install and torque the bolts to hold the reaction shaft support to the oil pump (Fig. 103). The correct torque is 12 N·m (105 in. lbs.).

DISASSEMBLY AND ASSEMBLY (Continued)

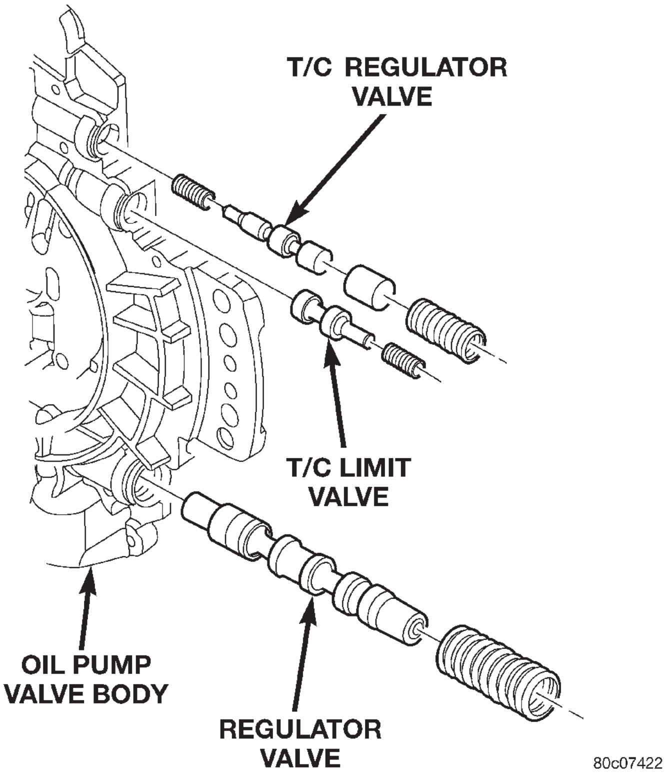


Fig. 105 Oil Pump Valve Body

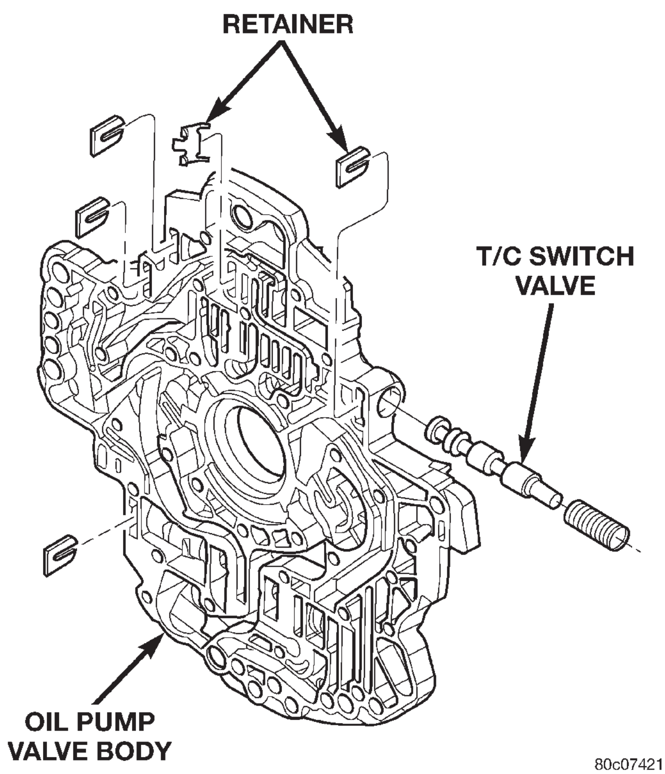


Fig. 106 T/C Switch Valve

INPUT CLUTCH ASSEMBLY

DISASSEMBLY

(1) Remove the reverse reaction plate selective snap-ring from the input clutch retainer (Fig. 107).

(2) Remove the reverse reaction plate from the input clutch retainer.

(3) Remove the reverse hub and reverse clutch pack from the input clutch retainer.

(4) Remove the number 4 bearing from the overdrive hub.

(5) Remove the overdrive hub from the input clutch retainer (Fig. 107).

(6) Remove the number 3 bearing from the underdrive hub.

(7) Remove the OD/reverse reaction plate snap-ring from the input clutch retainer.

(8) Remove the underdrive hub, overdrive clutch, and overdrive reaction plate from the input clutch retainer (Fig. 107).

NOTE: The overdrive friction discs and steel discs are thicker than the matching components in the underdrive and reverse clutches.

(9) Remove the number 2 bearing from the input clutch hub.

(10) Remove the overdrive clutch wave snap-ring from the input clutch retainer.

(11) Remove the UD/OD reaction plate tapered snap-ring from the input clutch retainer.

(12) Remove the UD/OD reaction plate from the input clutch retainer.

(13) Remove the UD/OD reaction plate flat snap-ring from the input clutch retainer (Fig. 107).

(14) Remove the underdrive clutch pack from the input clutch retainer (Fig. 109).

(15) Using Spring Compressor 8251, compress the UD/OD balance piston and remove the snap-ring from the input clutch hub (Fig. 108).

(16) Remove the UD/OD balance piston and piston return spring from the input clutch retainer (Fig. 109).

(17) Remove the underdrive piston from the input clutch retainer (Fig. 109).

NOTE: Both the UD/OD balance piston and the underdrive piston have seals molded onto them. If the seal is damaged, do not attempt to install a new seal onto the piston. The piston/seal must be replaced as an assembly.

(18) Remove the input clutch retainer tapered snap-ring.

(19) Separate input clutch retainer from input clutch hub.

DISASSEMBLY AND ASSEMBLY (Continued)

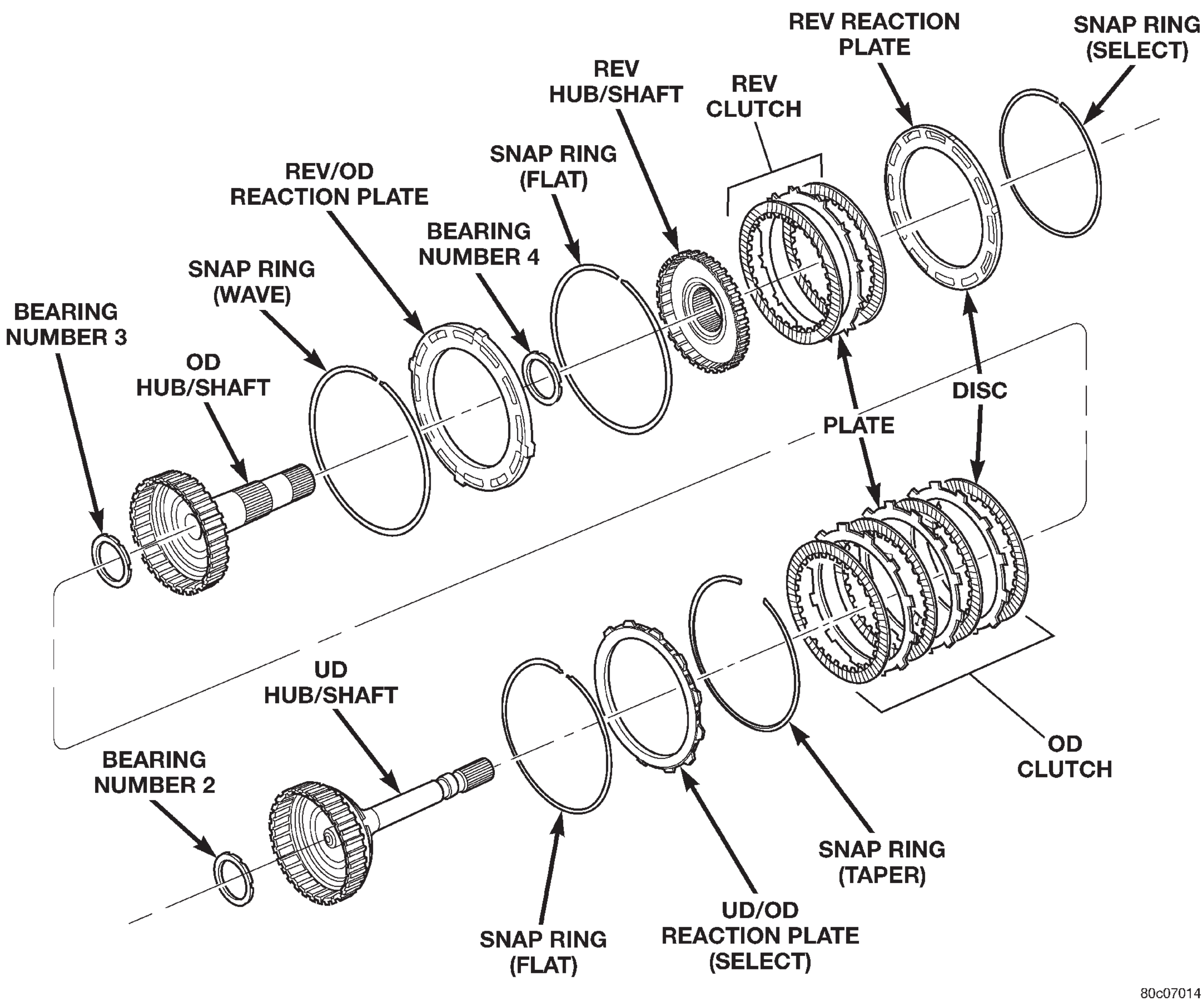


Fig. 107 Input Clutch Assembly—Part I

(20) Separate OD/reverse piston from input clutch hub retainer (Fig. 109).

(21) Remove all seals and o-rings from the input shaft and input hub. The o-rings on the input hub are color coded. Be sure to make note of which o-ring belongs in which location.

ASSEMBLY

(1) Install all new seals and o-rings onto the input shaft and input hub. The o-rings on the input hub are color coded. Be sure to install the correct o-ring in the correct location.

(2) Lubricate all seals with Mopar® ATF+3, type 7176 prior to installation.

(3) Assemble the OD/reverse piston onto the input clutch hub (Fig. 109).

(4) Assemble the input clutch retainer onto the input clutch hub.

(5) Install the input clutch retainer tapered snap-ring with tapered side up onto the input clutch hub.

(6) Install Piston Guides 8504 into the input clutch retainer (Fig. 110) and onto the input clutch hub to guide the inner and outer underdrive piston seals into position.

(7) Install the underdrive piston into the input clutch retainer and over the input clutch hub (Fig. 109).

(8) Install the UD/OD balance piston return spring pack into the input clutch retainer.

(9) Install Piston Guide 8252 into the input clutch retainer (Fig. 111) to guide the UD/OD balance piston seal into position inside the underdrive piston.

(10) Install the UD/OD balance piston into the input clutch retainer and the underdrive piston.

DISASSEMBLY AND ASSEMBLY (Continued)

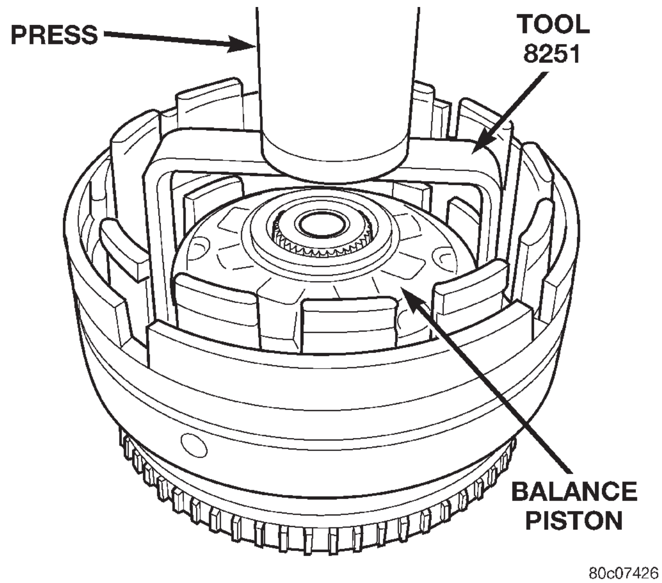


Fig. 108 Compressing UD/OD Balance Piston Using Tool 8251

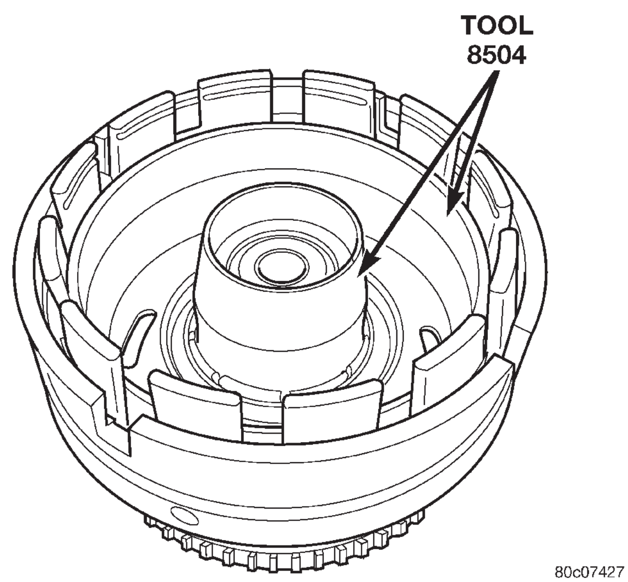


Fig. 110 Install Underdrive Piston Using Tool 8504

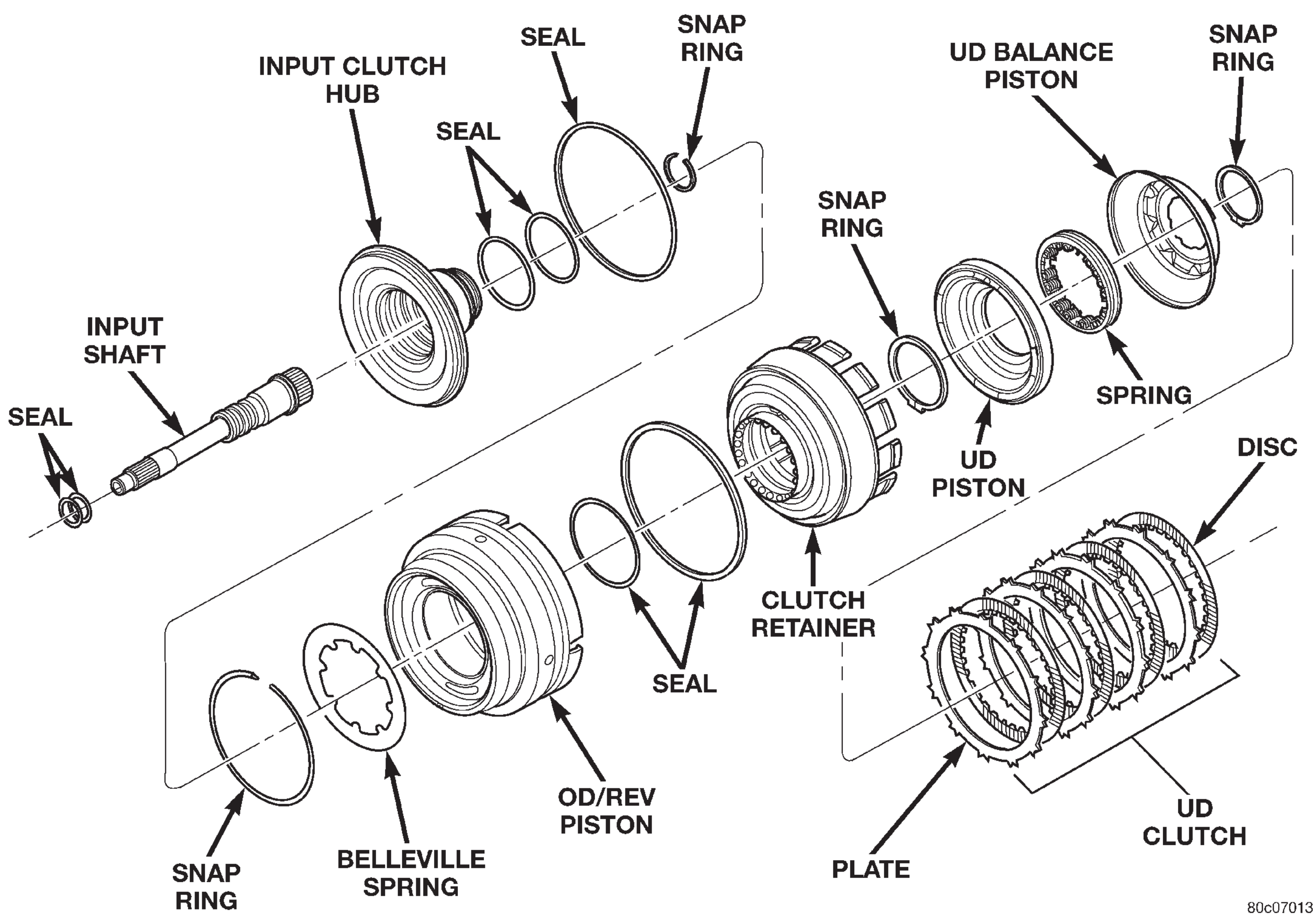


Fig. 109 Input Clutch Assembly—Part II

DISASSEMBLY AND ASSEMBLY (Continued)

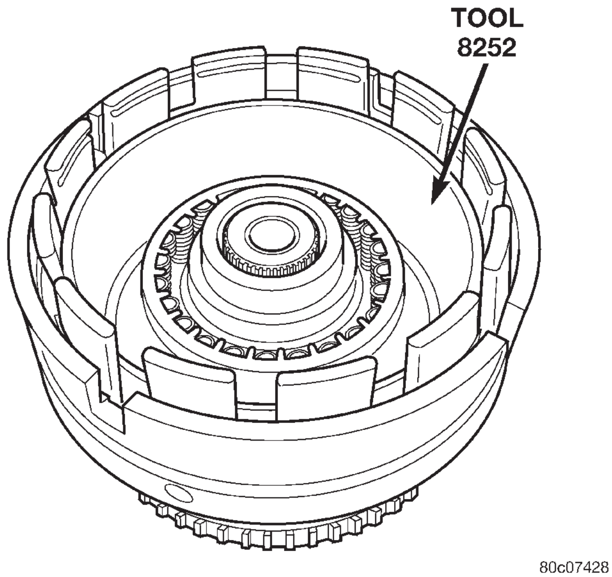


Fig. 111 Install Balance Piston Using Tool 8252

(11) Using Spring Compressor 8251, compress the UD/OD return spring pack and secure the piston in place with the snap-ring (Fig. 112).

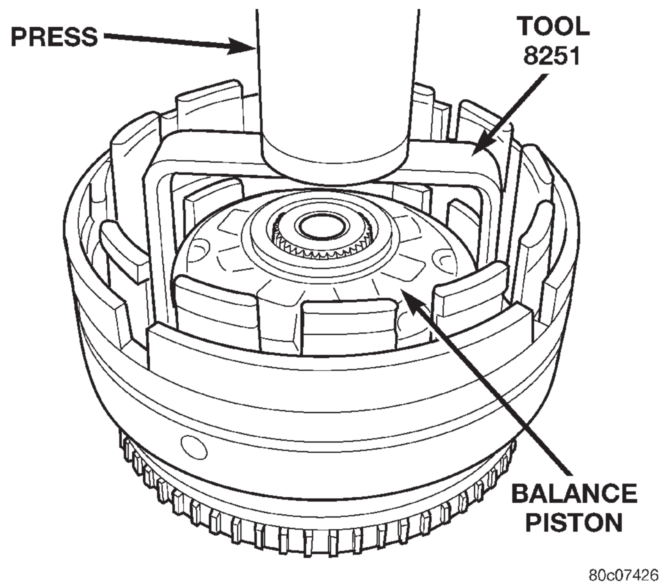


Fig. 112 Compressing UD/OD Balance Piston Using Tool 8251

(12) Install the underdrive clutch pack into the input clutch retainer (Fig. 109).

(13) Install the UD/OD reaction plate lower flat snap-ring (Fig. 107). The correct snap-ring can be identified by the two tabbed ears.

(14) Install the UD/OD reaction plate into the input clutch retainer. The reaction plate is to be installed with the big step down. The reaction plate is also selectable and should be changed to achieve the correct clutch clearances.

(15) Install the UD/OD reaction plate upper tapered snap-ring with tapered side up.

(16) Install the input clutch assembly into Input Clutch Pressure Fixture 8260 (Fig. 113). Mount a dial indicator to the assembly, push down on the clutch discs and zero the indicator against the underdrive clutch discs (Fig. 114). Apply 20 psi of air pressure to the underdrive clutch and record the dial indicator reading. Measure and record UD clutch pack measurement in four (4) places, 90° apart. Take average of four measurements and compare with UD clutch pack clearance specification. The correct clutch clearance is 0.76–1.16 mm (0.030–0.063 in.). Adjust as necessary. Install the chosen reaction plate and re-measure to verify selection.

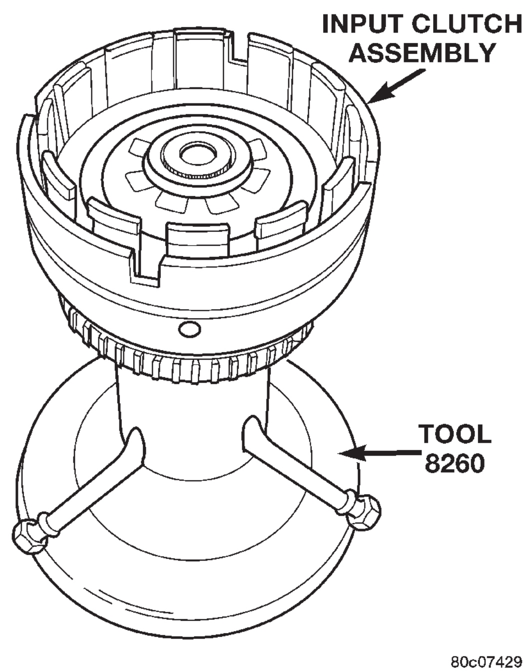


Fig. 113 Input Clutch Assembly Mounted on Tool 8260

(17) Install the overdrive clutch pack into the input clutch retainer (Fig. 107). The overdrive steel separator plates can be identified by the lack of the half-moon cuts in the locating tabs.

(18) Install the overdrive clutch wavy snap-ring with the two tabbed ears into the input clutch retainer.

(19) Install the OD/reverse reaction plate into the input clutch retainer. The reaction plate is non-directional (Fig. 107).

(20) Install the OD/reverse reaction plate flat snap-ring into the input clutch retainer.

(21) Mount a dial indicator to the assembly and zero the indicator against the OD/reverse reaction plate (Fig. 115). Apply 20 psi of air pressure to the overdrive clutch and record the dial indicator reading. Measure and record OD clutch pack measure-

DISASSEMBLY AND ASSEMBLY (Continued)

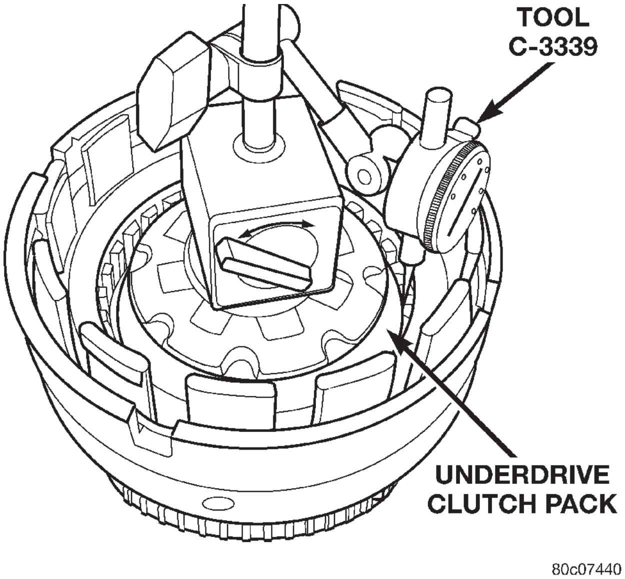


Fig. 114 Measuring UD Clutch Clearance

ment in four (4) places, 90° apart. Take average of four measurements and compare with OD clutch pack clearance specification.Verify that the clutch clearance is 1.016–1.65 mm (0.040–0.065 in.).

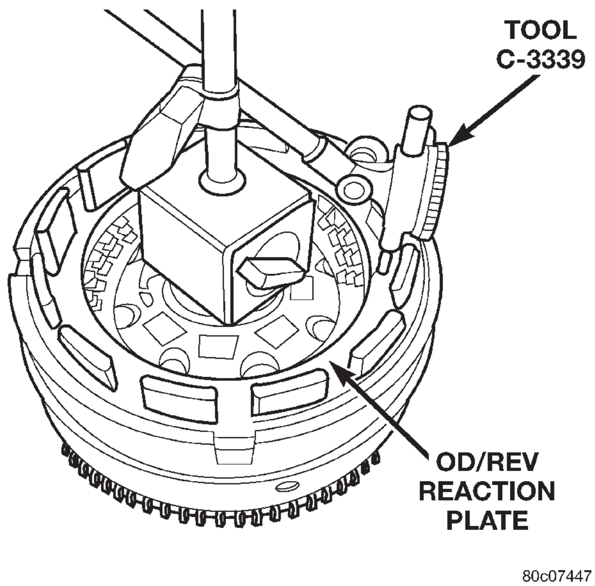


Fig. 115 Measuring OD Clutch Clearance

(22) Install the reverse clutch pack into the input clutch retainer (Fig. 107).

(23) Install the reverse reaction plate into the input clutch retainer.

(24) Install the reverse reaction plate selective snap-ring into the input clutch retainer.

(25) Mount a dial indicator to the assembly, push down on the clutch discs, pull up on the reaction planetary plate to ensure the plate is properly seated and zero the indicator against the reverse clutch discs (Fig. 116). Apply 20 psi of air pressure to the reverse clutch and record the dial indicator reading. Measure and record Reverse clutch pack measurement in four (4) places, 90° apart. Take average of four measurements and compare with Reverse clutch pack clearance specification. The correct clutch clearance is 0.81–1.24 mm (0.032–0.049 in.). Adjust as necessary. Install the chosen snap-ring and re-measure to verify selection.

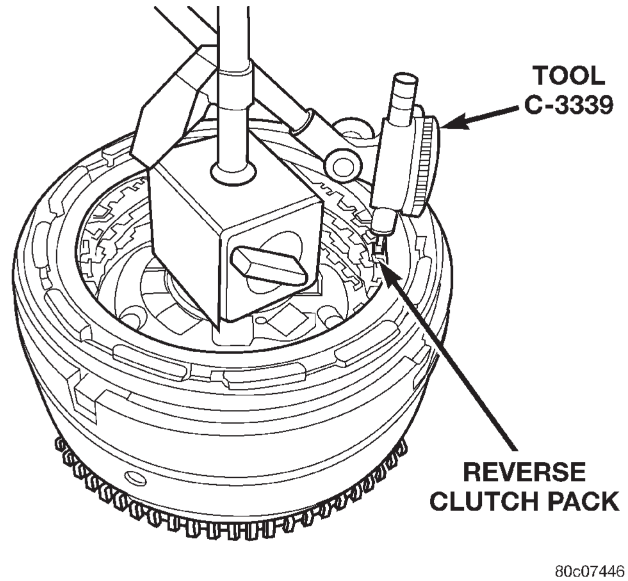


Fig. 116 Measuring Reverse Clutch Clearance

(26) Remove the reverse clutch pack from the input clutch retainer.

(27) Install the number 2 bearing onto the underdrive hub with flat side up/forward with petroleum jelly.

(28) Install the underdrive hub into the input clutch retainer.

(29) Install the number 3 bearing into the overdrive hub with the flat side up/forward with petroleum jelly.

(30) Install the overdrive hub into the input clutch retainer.

(31) Install the number 4 bearing into the reverse hub with flat side up/forward with petroleum jelly.

(32) Install the reverse hub into the input clutch retainer.

(33) Install the complete reverse clutch pack.

(34) Install the reverse reaction plate and snap-ring.

(35) Push up on reaction plate to allow reverse clutch to move freely.

4C RETAINER/BULKHEAD

DISASSEMBLY

(1) Remove the 2C piston belleville spring snap-ring from the 4C retainer/bulkhead (Fig. 117).

DISASSEMBLY AND ASSEMBLY (Continued)

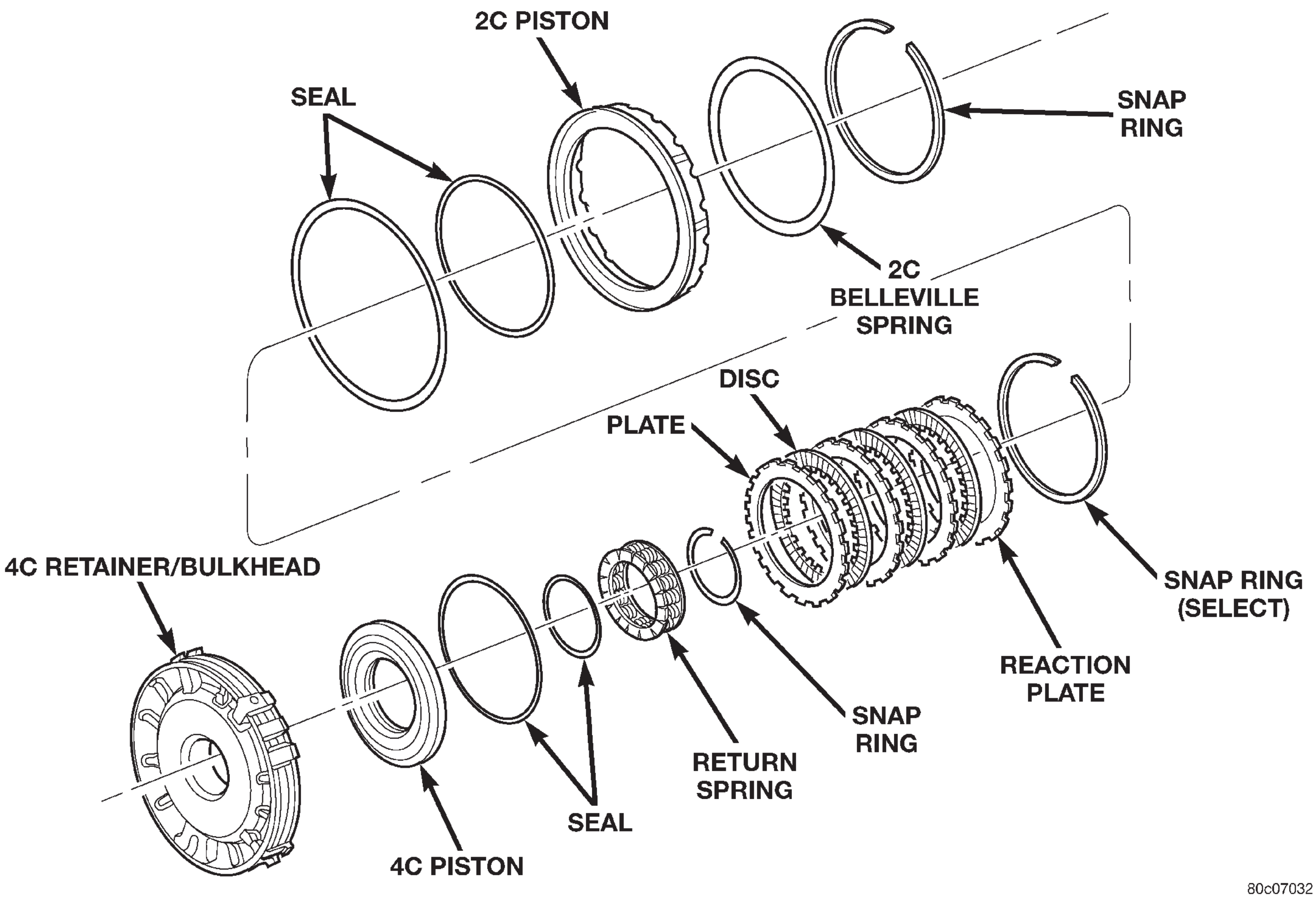


Fig. 117 4C Retainer/Bulkhead Components

(2) Remove the 2C piston Belleville spring from the retainer/bulkhead (Fig. 117).

(3) Remove the 2C piston from the retainer/bulkhead. Use 20 psi of air pressure to remove the piston if necessary.

(4) Remove the 4C clutch snap-ring from the retainer/bulkhead (Fig. 117).

(5) Remove the 4C clutch pack from the retainer/bulkhead (Fig. 117).

(6) Using Spring Compressor 8250 and a suitable shop press, compress the 4C piston return spring and remove the snap-ring (Fig. 117).

(7) Remove the 4C piston return spring and piston from the retainer/bulkhead (Fig. 117). Use 20 psi of air pressure to remove the piston if necessary.

ASSEMBLY

(1) Clean and inspect all components. Replace any components which show evidence of excessive wear or scoring.

(2) Install new seals on the 2C and 4C pistons (Fig. 117).

(3) Lubricate all seals with Mopar® ATF+3, type 7176 prior to installation.

(4) Install the 4C piston into the 4C retainer/bulkhead (Fig. 117).

(5) Position the 4C piston return spring onto the 4C piston.

(6) Using Spring Compressor 8250 and a suitable shop press, compress the 4C piston return spring and install the snap-ring (Fig. 118).

(7) Assemble and install the 4C clutch pack into the retainer/bulkhead (Fig. 117).

(8) Install the 4C reaction plate and snap-ring into the retainer/bulkhead (Fig. 117). The 4C reaction plate is non-directional.

(9) Measure the 4C clutch clearance. The correct clutch clearance is 0.81–1.35 mm (0.032–0.053 in.). The snap-ring is selectable. Install the chosen snap-ring and re-measure to verify the selection.

(10) Install the 2C piston into the retainer/bulkhead (Fig. 117).

(11) Position the 2C Belleville spring onto the 2C piston.

(12) Position the 2C Belleville spring snap-ring onto the 2C Belleville spring (Fig. 117).

(13) Using Spring Compressor 8249 and a suitable shop press (Fig. 119), compress the belleville spring

DISASSEMBLY AND ASSEMBLY (Continued)

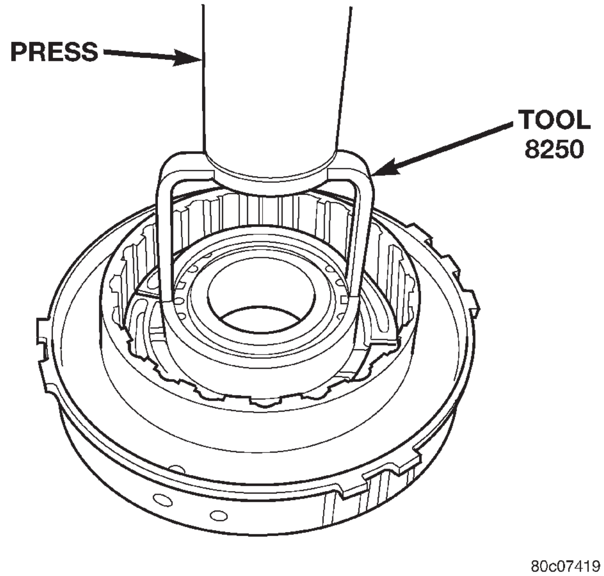


Fig. 118 Compress 4C Piston Return Spring Using Tool 8250

until the snap-ring is engaged with the snap-ring groove in the retainer/bulkhead.

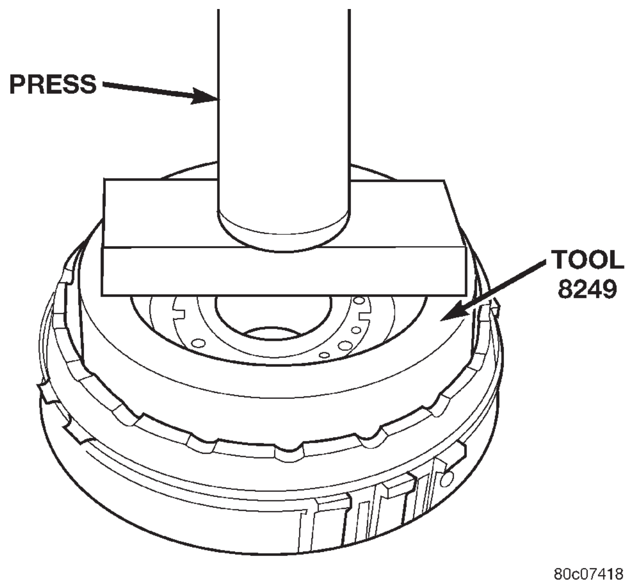


Fig. 119 Compress 2C Belleville Spring Using Tool 8249

PLANETARY GEAR SET

DISASSEMBLY

(1) Remove the snap-ring holding the input annulus into the input carrier (Fig. 120).

(2) Remove the input annulus from the input carrier (Fig. 120).

(3) Remove the number 9 bearing from the reverse planetary carrier. Note that this planetary carrier has four pinion gears.

(4) Remove the reverse planetary gear carrier (Fig. 120).

(5) Remove the number 10 bearing from the input sun gear (Fig. 120).

(6) Remove the input sun gear from the input carrier (Fig. 120).

(7) Remove the number 11 bearing from the input carrier (Fig. 120).

ASSEMBLY

(1) Clean and inspect all components. Replace any components which show evidence of excessive wear or scoring.

(2) Install the number 11 bearing into the input planetary carrier with the flat side up and facing forward (Fig. 120).

(3) Install the input sun gear into the input carrier (Fig. 120).

(4) Install the number 10 bearing onto the rear of the reverse planetary carrier with the flat side toward the carrier (Fig. 120).

(5) Install the number 9 bearing onto the front of the reverse planetary carrier with the rounded side toward the carrier and the flat side facing upward (Fig. 120).

(6) Install the reverse planetary gear carrier into the input carrier (Fig. 120).

(7) Install the input annulus gear into the input carrier (Fig. 120).

(8) Install the snap-ring to hold the input annulus gear into the input carrier (Fig. 120).

DISASSEMBLY AND ASSEMBLY (Continued)

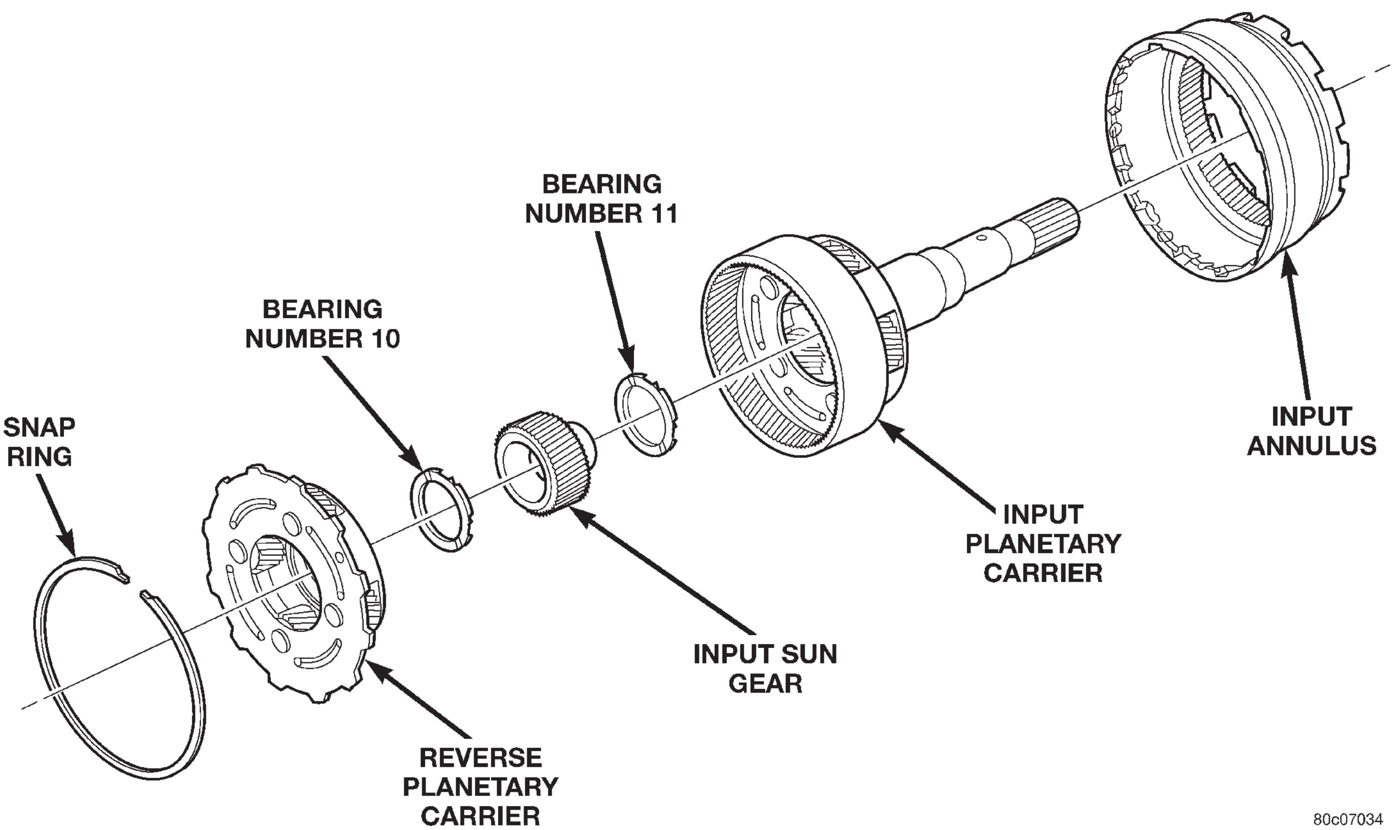


Fig. 120 Reverse/Input Planetary Carrier Assembly

LOW/REVERSE CLUTCH

DISASSEMBLY

(1) Remove the inner overrunning clutch snap-ring from the low/reverse clutch retainer (Fig. 121).

(2) Remove the outer low/reverse reaction plate flat snap-ring (Fig. 121).

(3) Remove the low/reverse clutch and the overrunning clutch from the low/reverse clutch retainer as an assembly (Fig. 121).

(4) Separate the low/reverse clutch from the overrunning clutch.

(5) Remove the overrunning clutch snap-ring (Fig. 122).

(6) Remove the spacer from the overrunning clutch (Fig. 122).

(7) Separate the inner and outer races of the overrunning clutch (Fig. 122).

DISASSEMBLY AND ASSEMBLY (Continued)

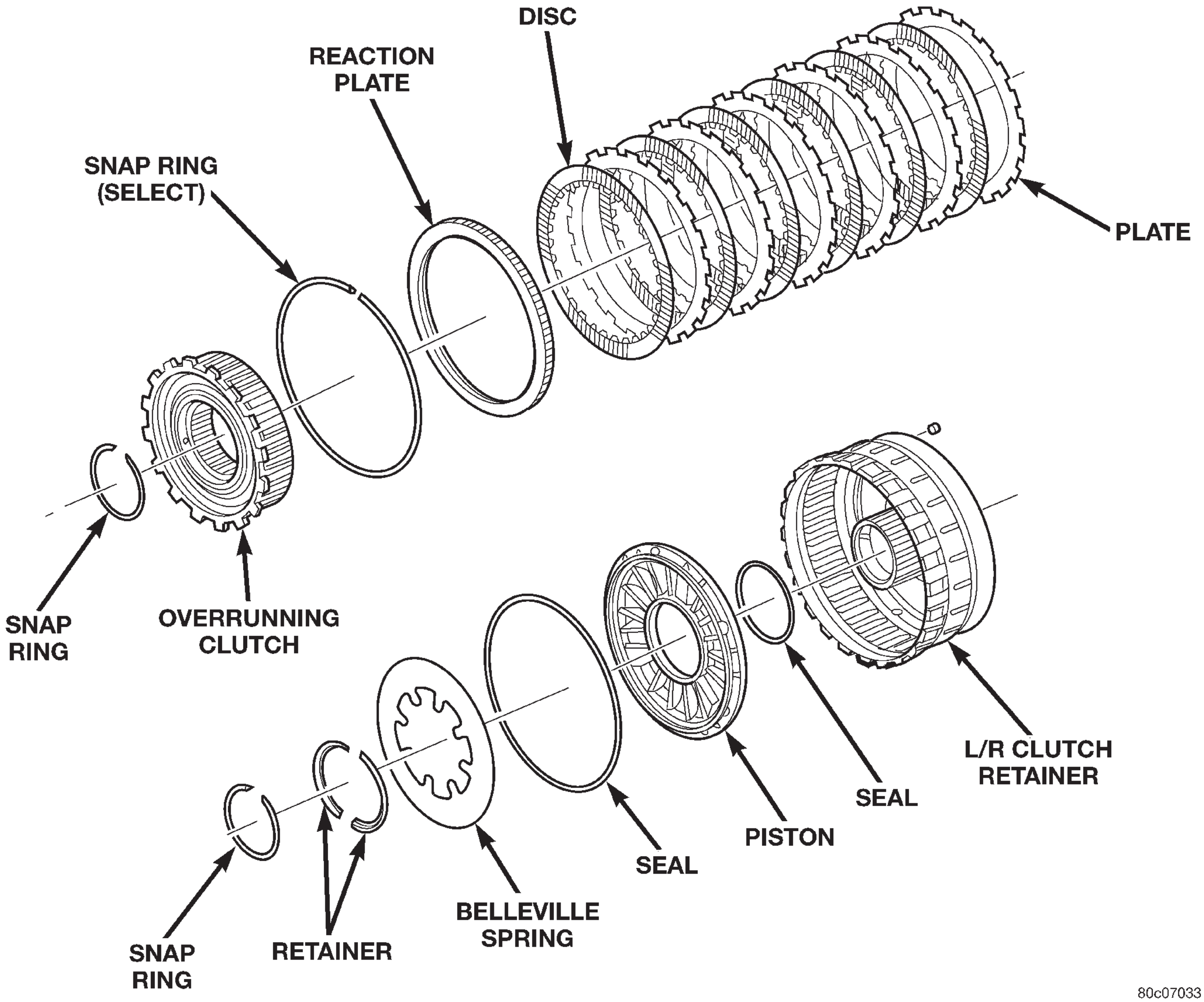


Fig. 121 Low/Reverse Clutch Assembly

(8) Remove the overrunning clutch lower snap-ring (Fig. 122).

(9) Using Spring Compressor 8285 and a suitable shop press (Fig. 123), compress the low/reverse piston Belleville spring and remove the split retaining ring holding the Belleville spring into the low/reverse clutch retainer.

(10) Remove the low/reverse clutch Belleville spring and piston from the low/reverse clutch retainer. Use 20 psi of air pressure to remove the piston if necessary.

ASSEMBLY

(1) Clean and inspect all components. Replace any components which show evidence of excessive wear or scoring.

(2) Check the bleed orifice to ensure that it is not plugged or restricted.

(3) Install a new seal on the low/reverse piston. Lubricate the seal with Mopar® ATF+3, type 7176 prior to installation.

(4) Install the low/reverse piston into the low/reverse clutch retainer.

(5) Position the low/reverse piston Belleville spring on the low/reverse piston.

(6) Using Spring Compressor 8285 and a suitable shop press (Fig. 123), compress the low/reverse piston Belleville spring and install the split retaining ring to hold the Belleville spring into the low/reverse clutch retainer.

(7) Install the lower overrunning clutch snap-ring (Fig. 122).

(8) Assemble the inner and outer races of the overrunning clutch (Fig. 122).

(9) Position the overrunning clutch spacer on the overrunning clutch.

DISASSEMBLY AND ASSEMBLY (Continued)

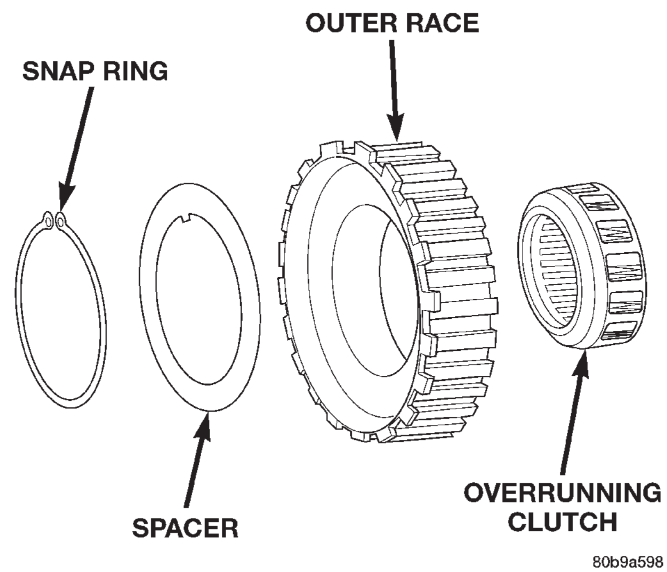


Fig. 122 Overrunning Clutch

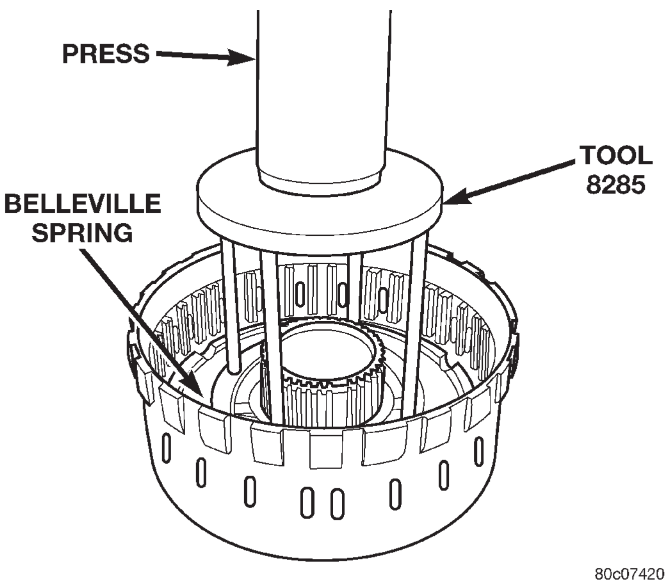


Fig. 123 Compress Low/Reverse Belleville Spring Using Tool 8285

(10) Install the upper overrunning clutch snap-ring (Fig. 122).

(11) Assemble and install the low/reverse clutch pack into the low/reverse clutch retainer (Fig. 121).

(12) Install the low/reverse reaction plate into the low/reverse clutch retainer (Fig. 121). The reaction plate is directional and must be installed with the flat side down.

(13) Install the low/reverse clutch pack snap-ring (Fig. 121). The snap-ring is selectable and should be chosen to give the correct clutch pack clearance.

(14) Measure the low/reverse clutch pack clearance and adjust as necessary. The correct clutch clearance is 1.14–1.91 mm (0.045–0.05 in.).

(15) Install the overrunning clutch into the low/reverse clutch retainer making sure that the index splines are aligned with the retainer.

(16) Install the overrunning clutch inner snap-ring.

CLEANING AND INSPECTION

VALVE BODY

Clean the valve housings, valves, plugs, springs, and separator plates with a standard parts cleaning solution only. Do not use gasoline, kerosene, or any type of caustic solution.

Do not immerse any of the electrical components in cleaning solution. Clean the electrical components by wiping them off with dry shop towels only.

Dry all except the electrical parts with compressed air. Make sure all passages are clean and free from obstructions. **Do not use rags or shop towels to dry or wipe off valve body components. Lint from these materials can stick to valve body parts, interfere with valve operation, and clog filters and fluid passages.**

Inspect all of the valve body mating surfaces for scratches, nicks, burrs, or distortion. Use a straight-edge to check surface flatness. Minor scratches may be removed with crocus cloth using only very light pressure.

Minor distortion of a valve body mating surface may be corrected by smoothing the surface with a sheet of crocus cloth. Position the crocus cloth on a surface plate, sheet of plate glass or equally flat surface. If distortion is severe or any surfaces are heavily scored, the valve body will have to be replaced.

Inspect the valves and plugs (Fig. 124) for scratches, burrs, nicks, or scores. Minor surface scratches on steel valves and plugs can be removed with crocus cloth but **do not round off the edges of the valve or plug lands.** Maintaining sharpness of these edges is vitally important. The edges prevent foreign matter from lodging between the valves and plugs and the bore.

Inspect all the valve and plug bores in the valve body. Use a penlight to view the bore interiors. Replace the valve body if any bores are distorted or scored. Inspect all of the valve body springs. The springs must be free of distortion, warpage or broken coils.

Trial fit each valve and plug in its bore to check freedom of operation. When clean and dry, the valves and plugs should drop freely into the bores.

Valve body bores do not change dimensionally with use. If the valve body functioned correctly when new, it will continue to operate properly after cleaning and inspection. It should not be necessary to replace a

CLEANING AND INSPECTION (Continued)

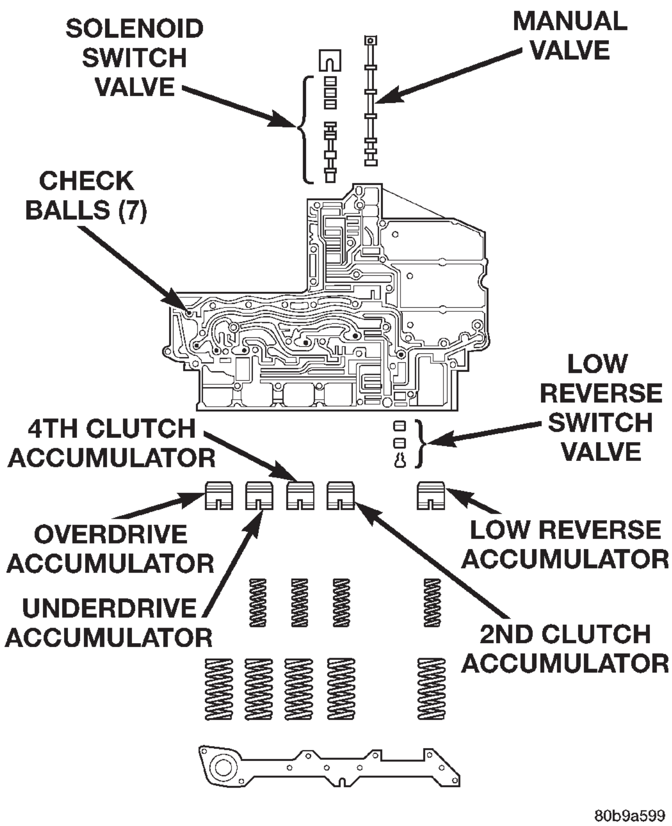


Fig. 124 Valve Body Components

valve body assembly unless it is damaged in handling.

Inspect all the accumulator bores in the valve body. Use a penlight to view the bore interiors. Replace the valve body if any bores are distorted or scored. Inspect all of the accumulator springs. The springs must be free of distortion, warpage or broken coils.

Inspect all the fluid seals on the valve body (Fig. 125). Replace any seals that are cracked, distorted, or damaged in any way. These seals pass fluid pressure directly to the clutches. Any pressure leak at these points, may cause transmission performance problems.

TRANSMISSION

GENERAL INFORMATION

Heli-Coil inserts can be used to repair damaged, stripped or worn threads in aluminum parts. These inserts are available from most automotive parts suppliers. Stainless steel inserts are recommended.

The use of crocus cloth is permissible where necessary, providing it is used carefully. When used on shafts, or valves, use extreme care to avoid rounding off sharp edges. Sharp edges are vital as they prevent foreign matter from getting between the valve and valve bore.

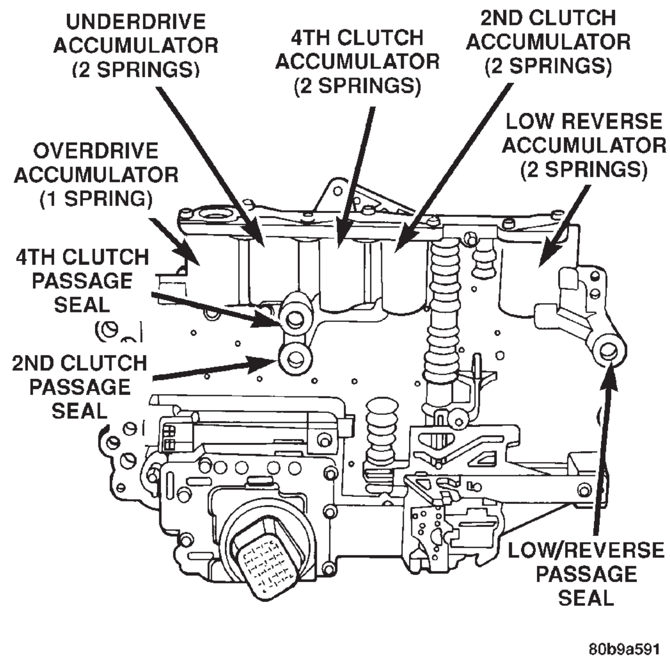


Fig. 125 Valve Body Seals

Do not reuse oil seals, gaskets, seal rings, or O-rings during overhaul. Replace these parts as a matter of course. Also do not reuse snap rings or E-clips that are bent or distorted. Replace these parts as well.

Lubricate transmission parts with Mopar® ATF Plus 3, Type 7176, transmission fluid during overhaul and assembly. Use petroleum jelly, Mopar® Door Ease, or Ru-Glyde to prelubricate seals, O-rings, and thrust washers. Petroleum jelly can also be used to hold parts in place during reassembly.

TRANSMISSION CASE CLEANING AND INSPECTION

Clean the case in a solvent tank. Flush the case bores and fluid passages thoroughly with solvent. Dry the case and all fluid passages with compressed air. Be sure all solvent is removed from the case and that all fluid passages are clear.

NOTE: Do not use shop towels or rags to dry the case (or any other transmission component) unless they are made from lint-free materials. Lint will stick to case surfaces and transmission components and circulate throughout the transmission after assembly. A sufficient quantity of lint can block fluid passages and interfere with valve body operation.

Inspect the case for cracks, porous spots, worn bores, or damaged threads. Damaged threads can be repaired with Helicoil thread inserts. However, the case will have to be replaced if it exhibits any type of damage or wear.

CLEANING AND INSPECTION (Continued)

LOW/REVERSE CLUTCH ASSEMBLY

Clean the overrunning clutch assembly, clutch cam, and low-reverse clutch retainer. Dry them with compressed air after cleaning.

Inspect condition of each clutch part after cleaning. Replace the overrunning clutch roller and spring assembly if any rollers or springs are worn or damaged, or if the roller cage is distorted, or damaged. Replace the cam if worn, cracked or damaged.

Replace the low-reverse clutch retainer if the clutch race, roller surface or inside diameter is scored, worn or damaged.

ACCUMULATOR

Inspect the accumulator piston and seal rings. Replace the seal rings if worn or cut. Replace the piston if chipped or cracked.

Check condition of the accumulator inner and outer springs. Replace the springs if the coils are cracked, distorted or collapsed.

OIL PUMP AND REACTION SHAFT SUPPORT

Clean pump and support components with solvent and dry them with compressed air.

Check condition of the seal rings and thrust washer on the reaction shaft support. The seal rings do not need to be replaced unless cracked, broken, or severely worn.

Inspect the pump and support components. Replace the pump or support if the seal ring grooves or machined surfaces are worn, scored, pitted, or damaged. Replace the pump gears if pitted, worn chipped, or damaged.

Inspect the pump bushing. Then check the reaction shaft support bushing. Replace either bushing only if heavily worn, scored or damaged. It is not necessary to replace the bushings unless they are actually damaged.

Inspect the valves and plugs for scratches, burrs, nicks, or scores. Minor surface scratches on steel valves and plugs can be removed with crocus cloth but **do not round off the edges of the valve or plug lands.** Maintaining sharpness of these edges is vitally important. The edges prevent foreign matter from lodging between the valves and plugs and the bore.

Inspect all the valve and plug bores in the oil pump cover. Use a penlight to view the bore interiors. Replace the oil pump if any bores are distorted or scored. Inspect all of the valve springs. The springs must be free of distortion, warpage or broken coils.

Trial fit each valve and plug in its bore to check freedom of operation. When clean and dry, the valves and plugs should drop freely into the bores.

PLANETARY GEARTRAIN

Clean the planetary components in solvent and dry them with compressed air.

Check sun gear and driving shell condition. Replace the gear if damaged or if the bushings are scored or worn. The bushings are not serviceable. Replace the driving shell if worn, cracked or damaged.

Replace planetary gear sets if gears, pinion pins, or carrier are damaged in any way. Replace the annulus gears and supports if either component is worn or damaged.

Replace the output shaft if the machined surfaces are scored, pitted, or damaged in any way. Also replace the shaft if the splines are damaged, or exhibits cracks at any location.

ADJUSTMENTS

BRAKE TRANSMISSION SHIFT INTERLOCK

The park interlock cable is part of the brake/shift lever interlock system. Correct cable adjustment is important to proper interlock operation. The gear shift and park lock cables must both be correctly adjusted in order to shift out of Park.

Park Interlock Cable Adjustment Procedure

(1) Shift the transmission into the PARK position.

(2) Turn ignition switch to LOCK position. **Be sure ignition key cylinder is in the LOCK position. Cable will not adjust correctly in any other position.**

(3) Remove shift lever bezel and floor console as necessary for access to the brake transmission shift interlock cable.

(4) Pull cable lock button up to release cable (Fig. 126).

(5) Pull cable rearward. Then release cable and press lock button down until it snaps in place.

BTSI FUNCTION CHECK

(1) Verify removal of ignition key allowed in park position only.

(2) When the shift lever is in park, and the shift handle push-button is in the out position, the ignition key cylinder should rotate freely from off to lock. When the shifter is in any other position, the ignition key should not rotate from off to lock.

(3) Shifting out of park should be possible when the ignition key cylinder is in the off position.

(4) Shifting out of park should not be possible while applying 25 lb. max. handle push-button force, and ignition key cylinder is in the run or start positions, unless the foot brake pedal is depressed approximately 1/2 inch (12 mm).

ADJUSTMENTS (Continued)

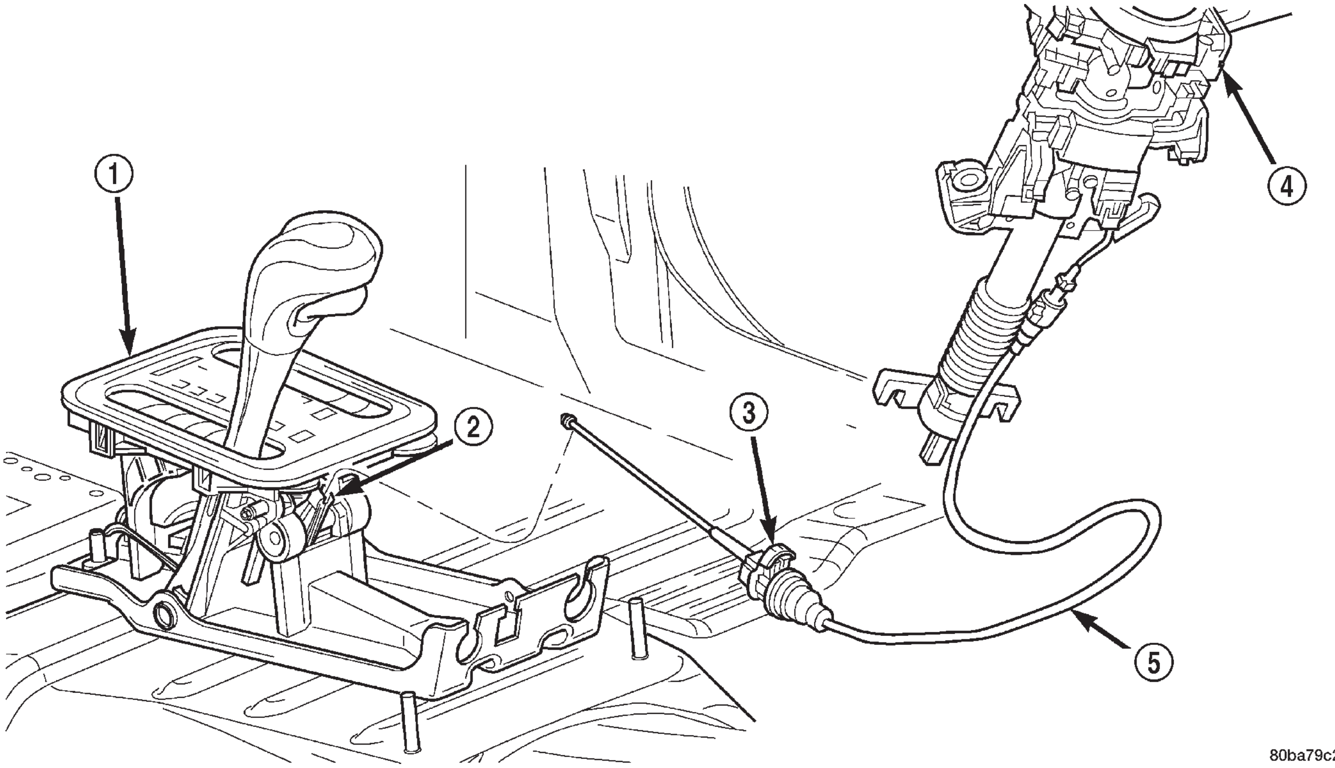


Fig. 126 Brake Transmission Shift Interlock Cable

1 – SHIFT MECHANISM
2 – SHIFTER BTSI LEVER
3 – ADJUSTMENT CLIP
4 – STEERING COLUMN ASSEMBLY
5 – INTERLOCK CABLE

(5) Shifting out of park should not be possible when the ignition key cylinder is in the accessory or lock position.

(6) Shifting between any gears neutral or park may be done without depressing foot brake with ignition switch in run or start positions and vehicle stationary or in motion.

(7) The floor shifter lever and gate positions should be in alignment with all transmission detent positions.

(8) Engine starts must be possible with shifter lever in park or neutral gate positions only. Engine starts must not be possible in any other gate positions other than park or neutral.

(9) With shifter lever handle push-button not depressed and lever detent in:

- PARK POSITION- apply forward force on center of handle and remove pressure. Engine start must be possible.
- PARK POSITION- apply rearward force on center of handle and remove pressure. Engine start must be possible.
- NEUTRAL POSITION- engine start must be possible.
- NEUTRAL POSITION, ENGINE RUNNING AND BRAKES APPLIED- Apply forward force on center of shift handle. Transmission should not be able to shift into reverse detent.

GEARSHIFT CABLE

Check adjustment by starting the engine in Park and Neutral. Adjustment is OK if the engine starts only in these positions. Adjustment is incorrect if the engine starts in one but not both positions. If the engine starts in any position other than Park or Neutral, or if the engine will not start at all, the park/neutral position switch or TRS may be faulty.

Gearshift Adjustment Procedure

(1) Shift transmission into Park.

(2) Remove shift lever bezel and floor console as necessary for access to the shift cable adjustment.

(3) Loosen the shift cable adjustment screw (Fig. 127).

(4) Raise vehicle.

(5) Unsnap cable eyelet from transmission shift lever (Fig. 128).

ADJUSTMENTS (Continued)

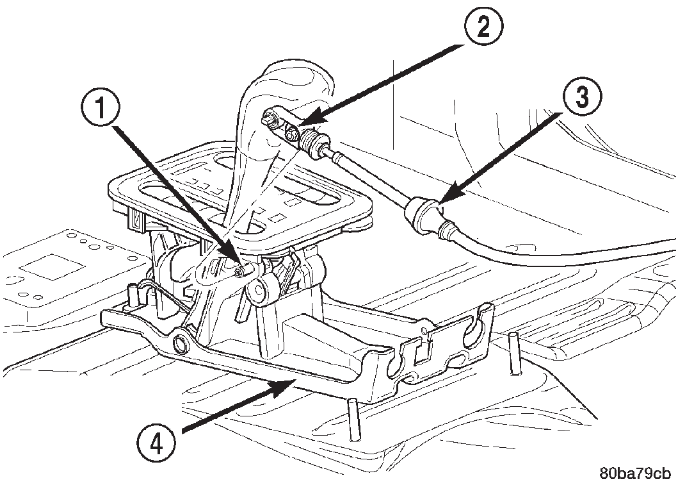


Fig. 127 Shift Cable at the Shifter

1 – SHIFT LEVER PIN
2 – ADJUSTMENT SCREW
3 – SHIFT CABLE
4 – SHIFTER ASSEMBLY BRACKET

(6) Verify transmission shift lever is in Park detent by moving lever fully rearward. Last rearward detent is Park position.

(7) Verify positive engagement of transmission park lock by attempting to rotate propeller shaft. Shaft will not rotate when park lock is engaged.

(8) Snap cable eyelet onto transmission shift lever.

(9) Lower vehicle

(10) Tighten the shift cable adjustment screw to 7 N·m (65 in. lbs.).

(11) Verify correct operation.

(12) Install the shifter bezel and any floor console components removed for access.

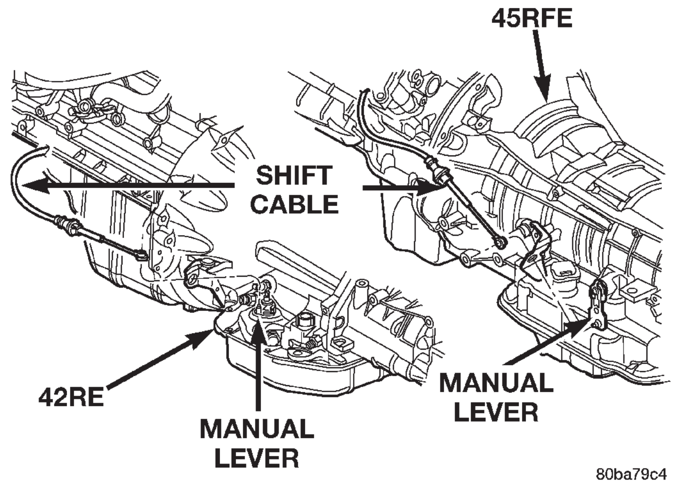
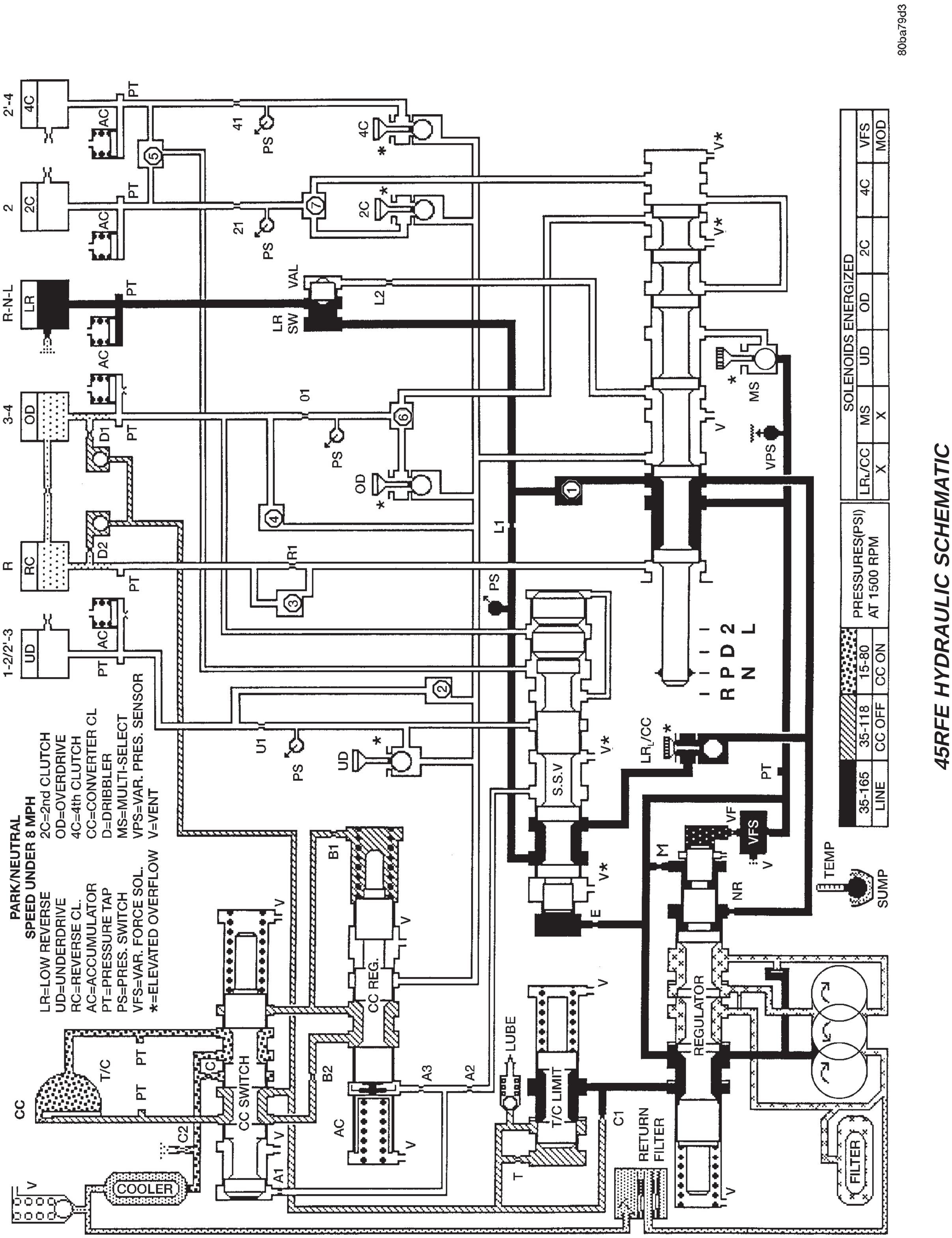


Fig. 128 Shift Cable Attachment At Transmission

SCHEMATICS AND DIAGRAMS

HYDRAULIC SCHEMATICS



SCHEMATICS AND DIAGRAMS (Continued)

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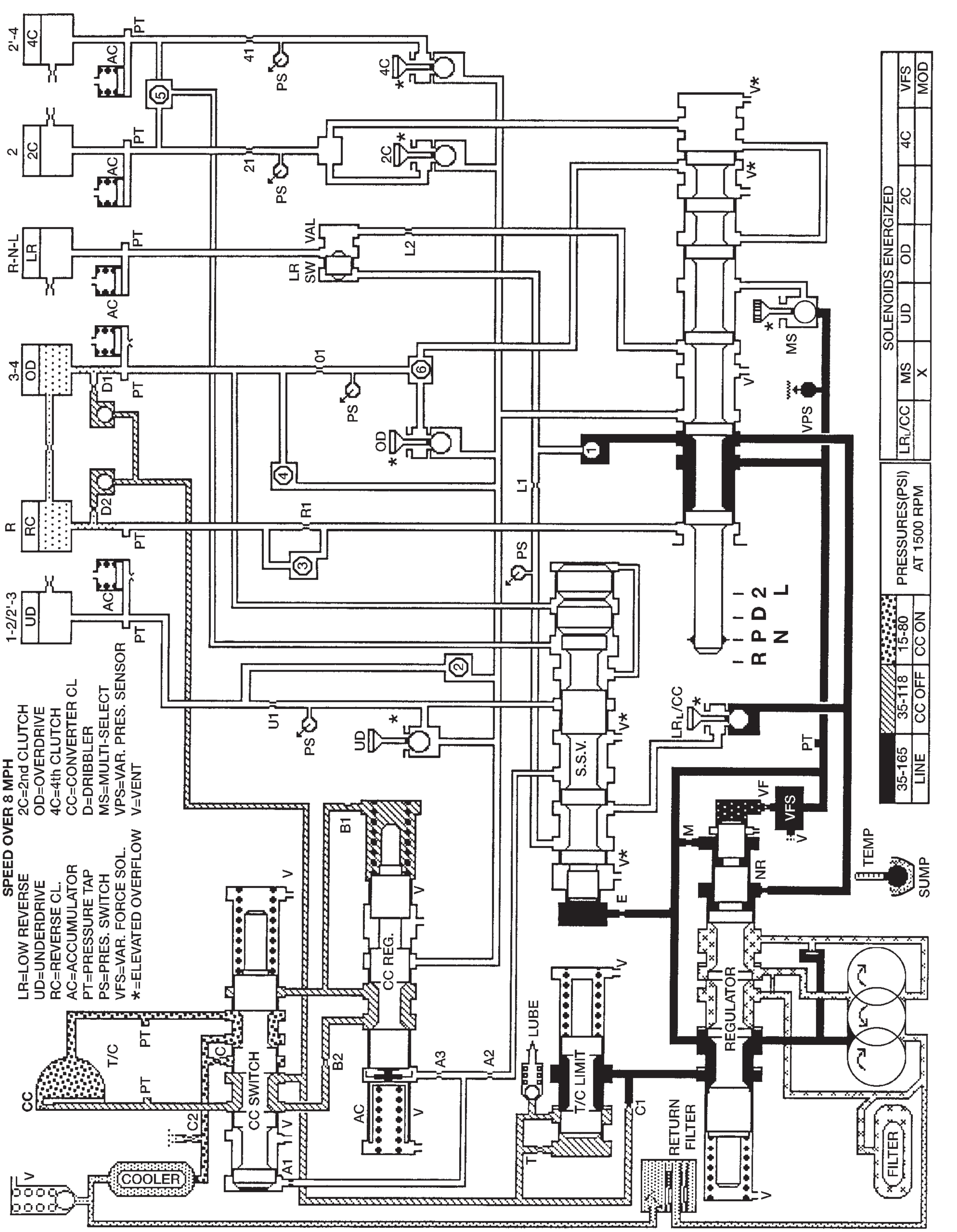
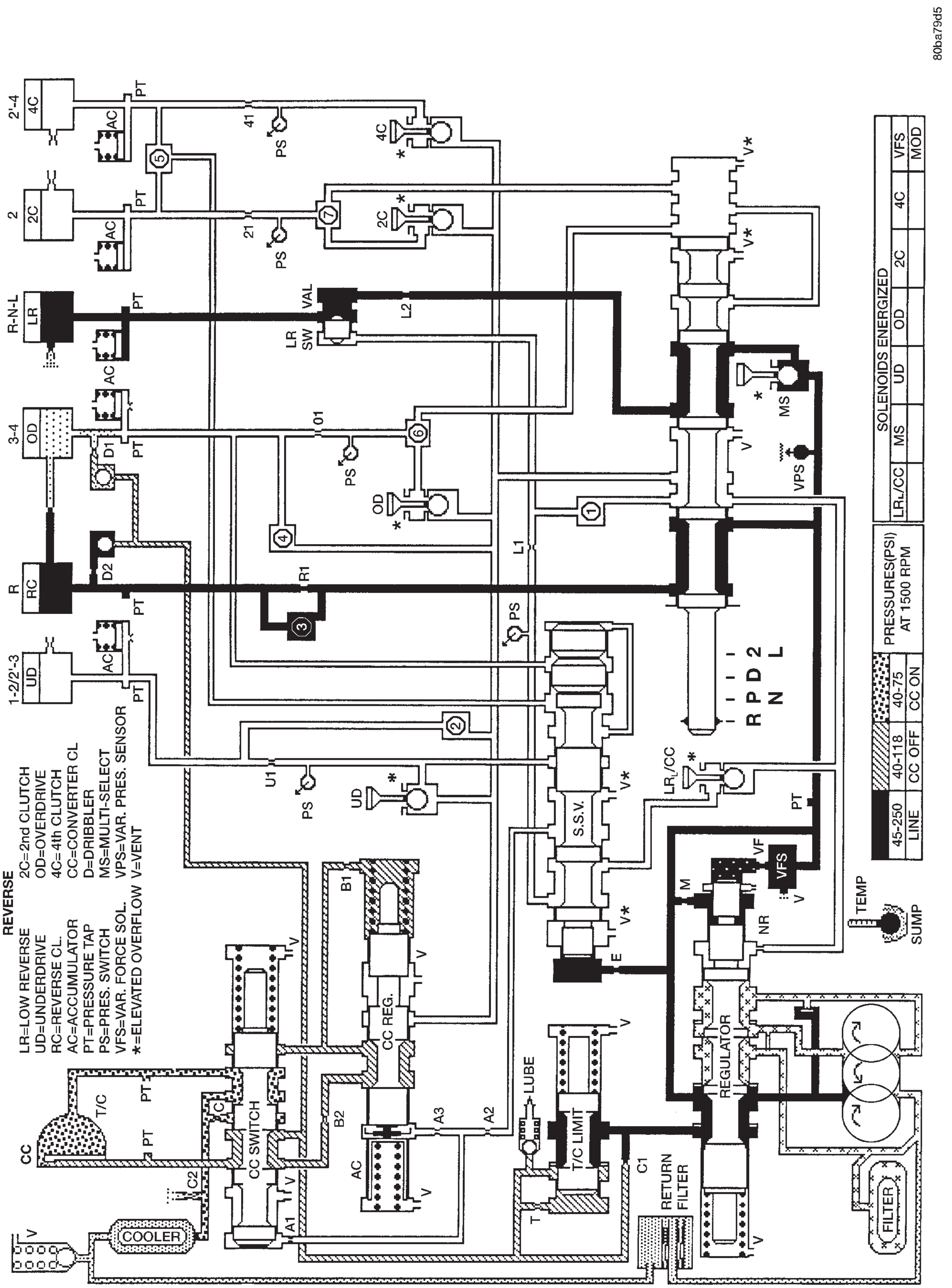


45RFE HYDRAULIC SCHEMATIC

SCHEMATICS AND DIAGRAMS (Continued)



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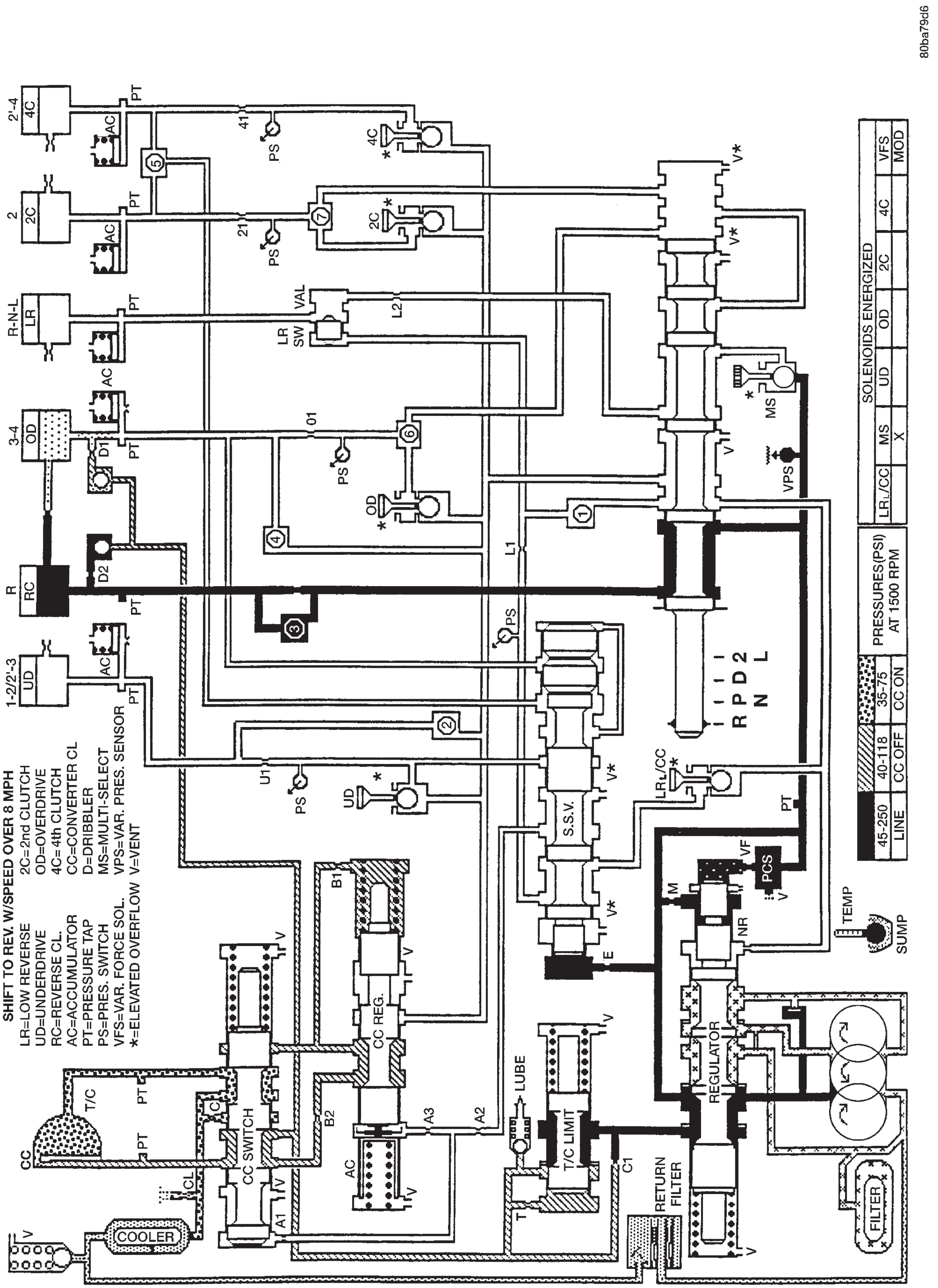
SCHEMATICS AND DIAGRAMS (Continued)



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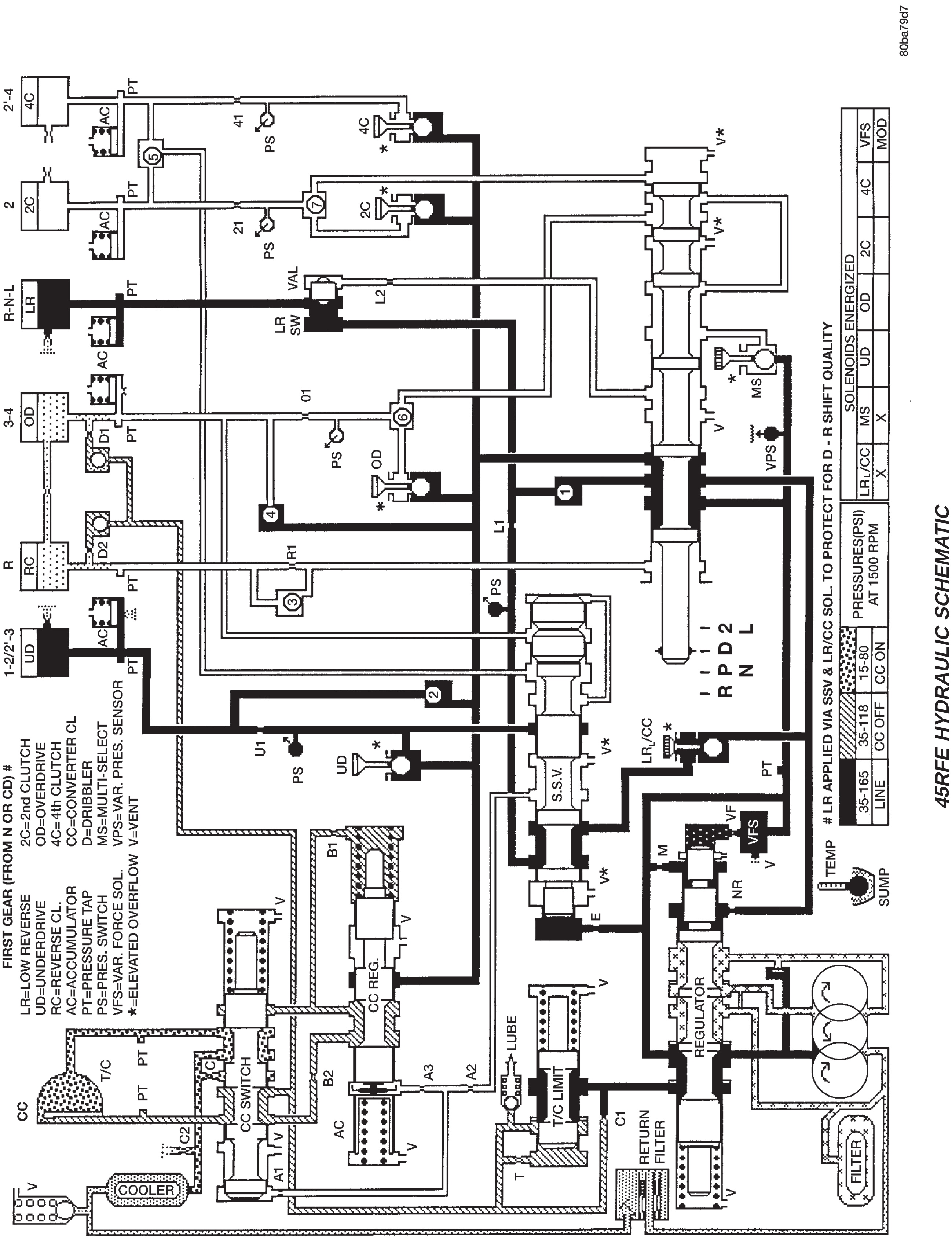
SCHEMATICS AND DIAGRAMS (Continued)



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SCHEMATICS AND DIAGRAMS (Continued)

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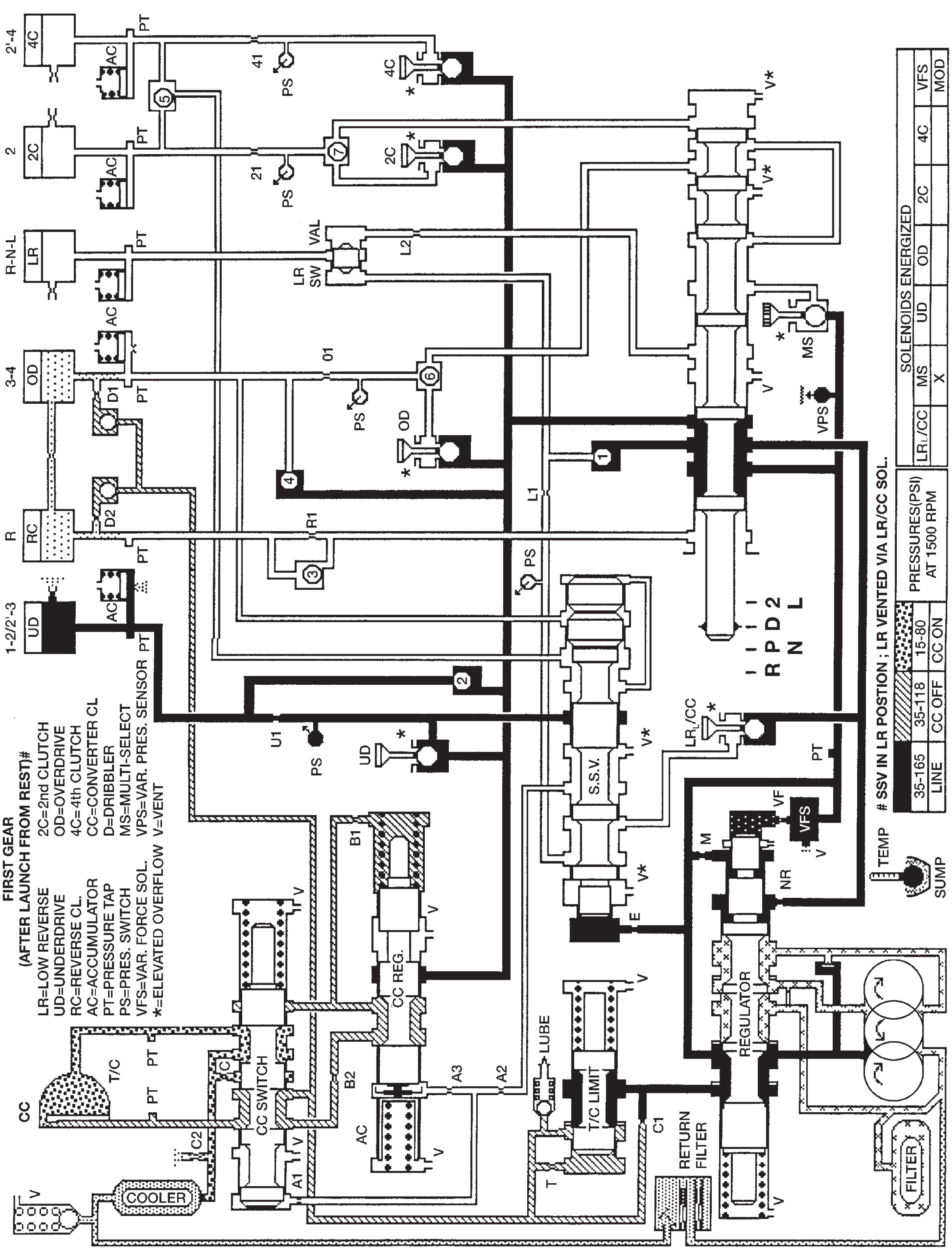

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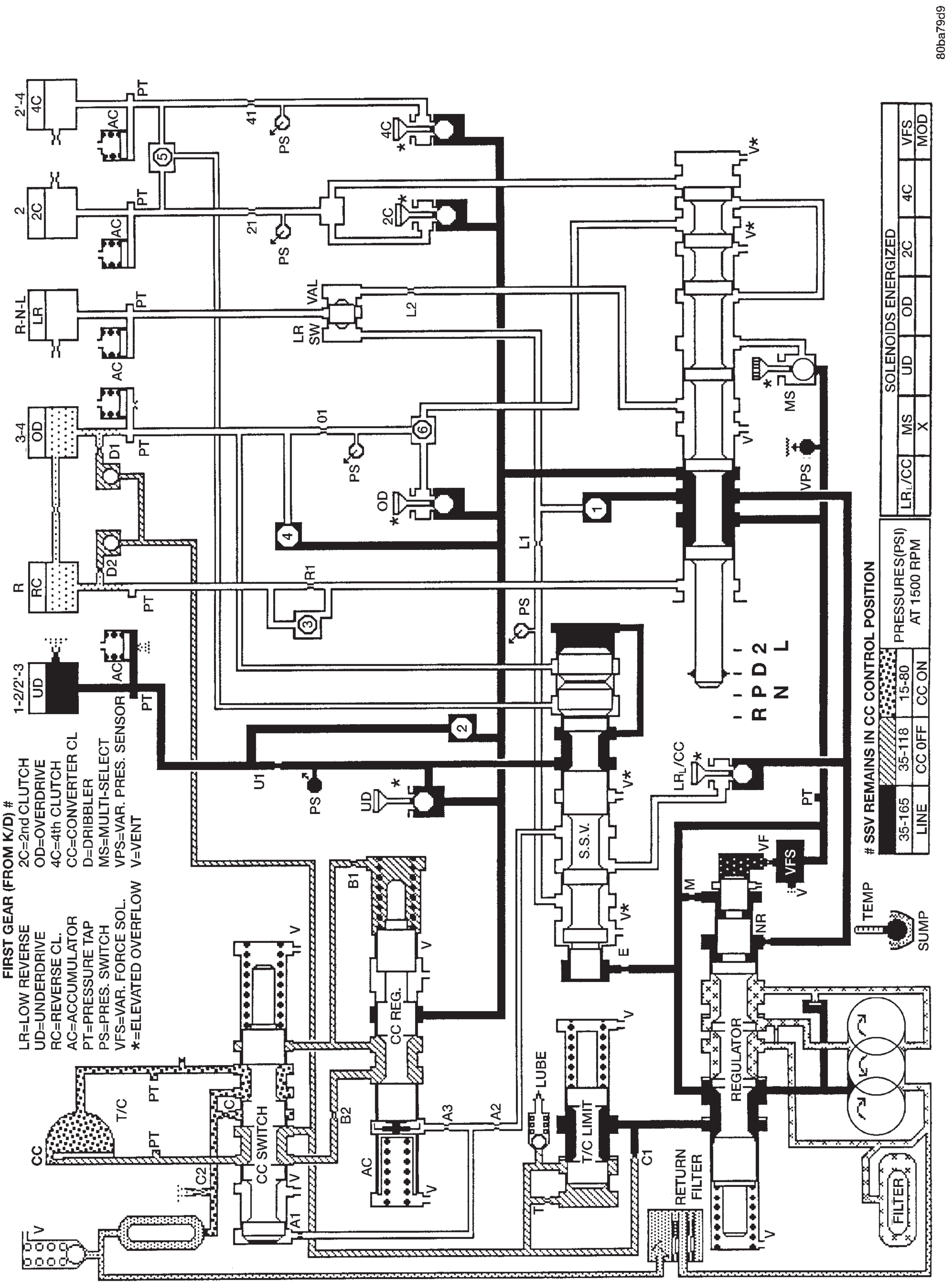

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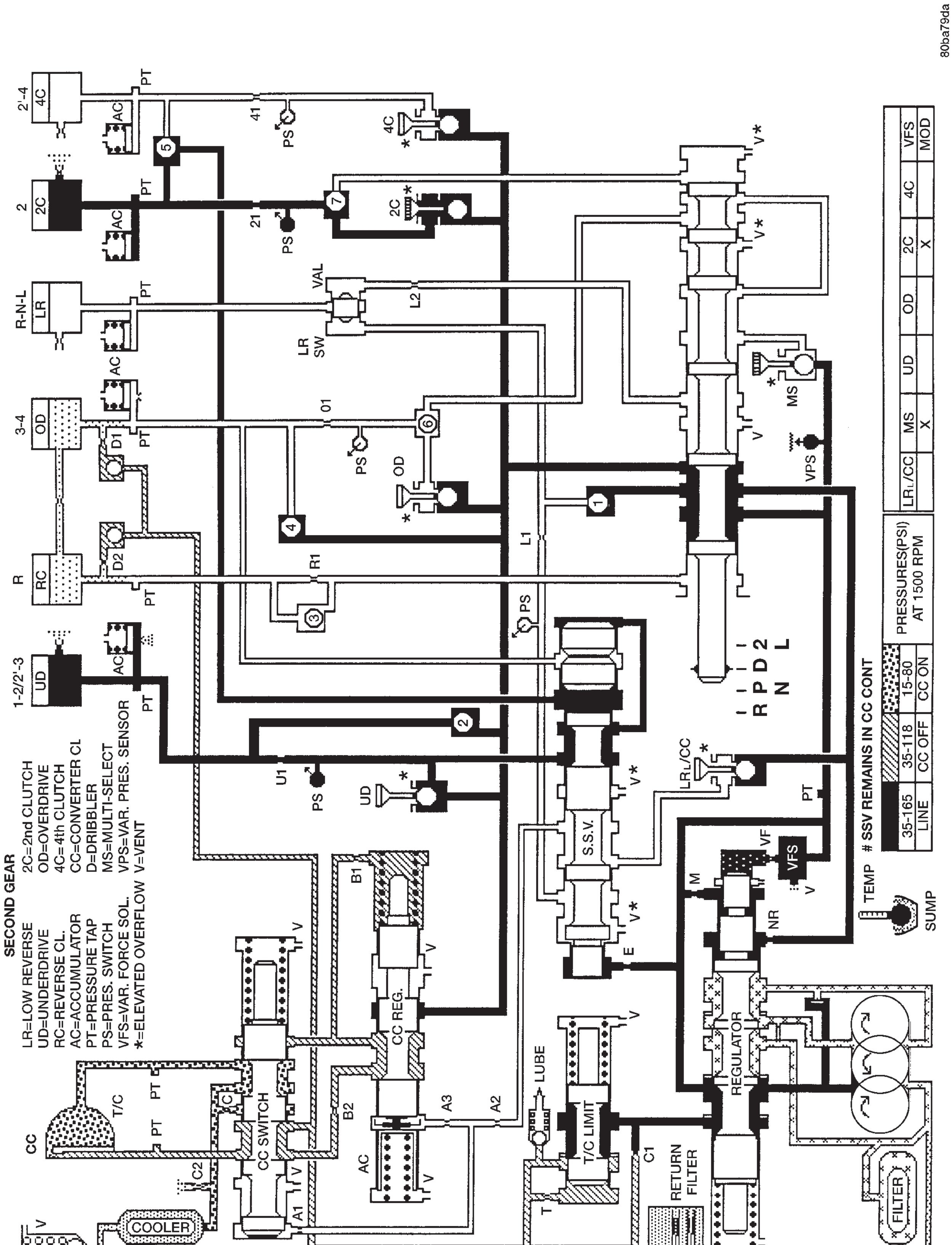

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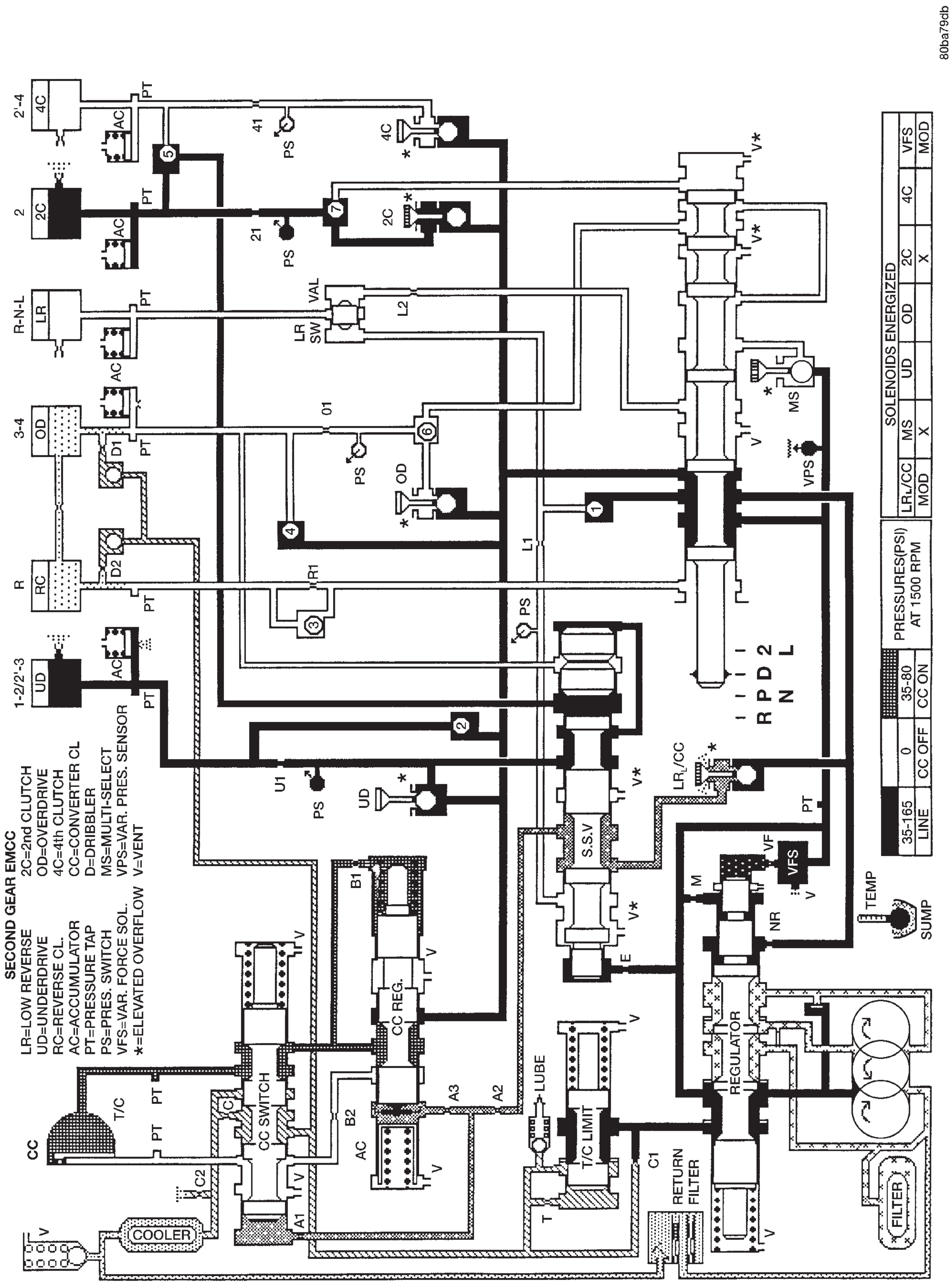

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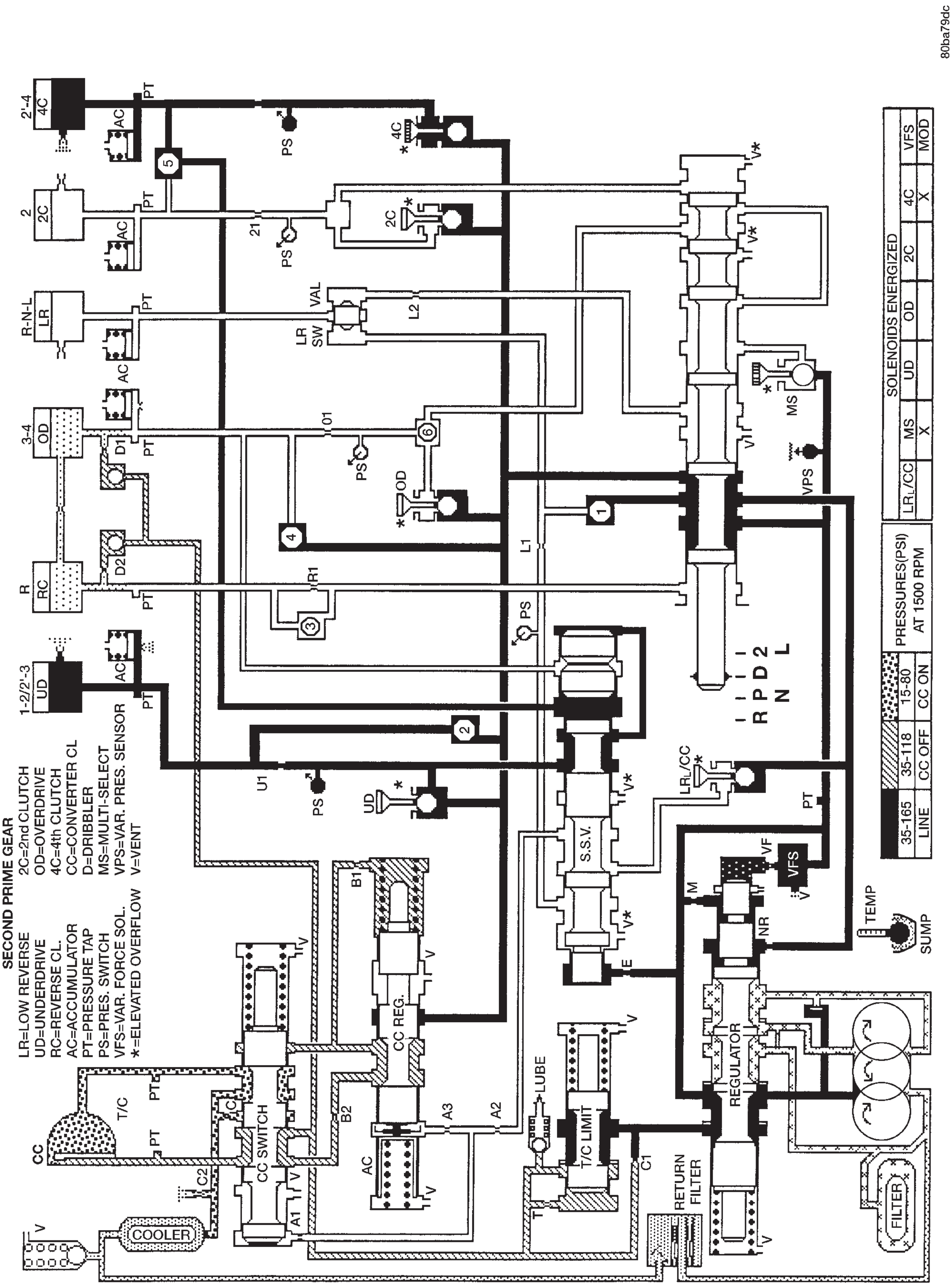

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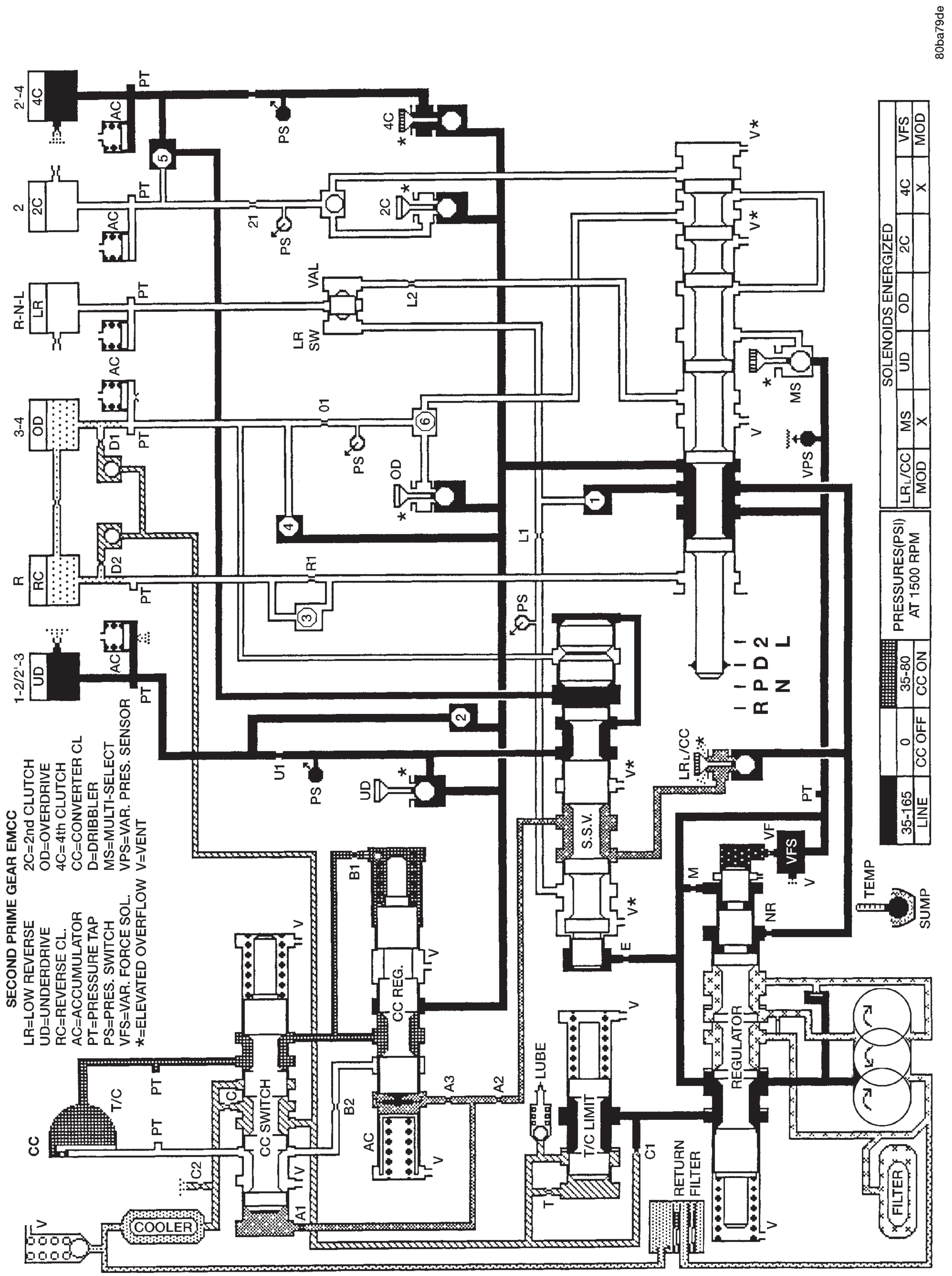

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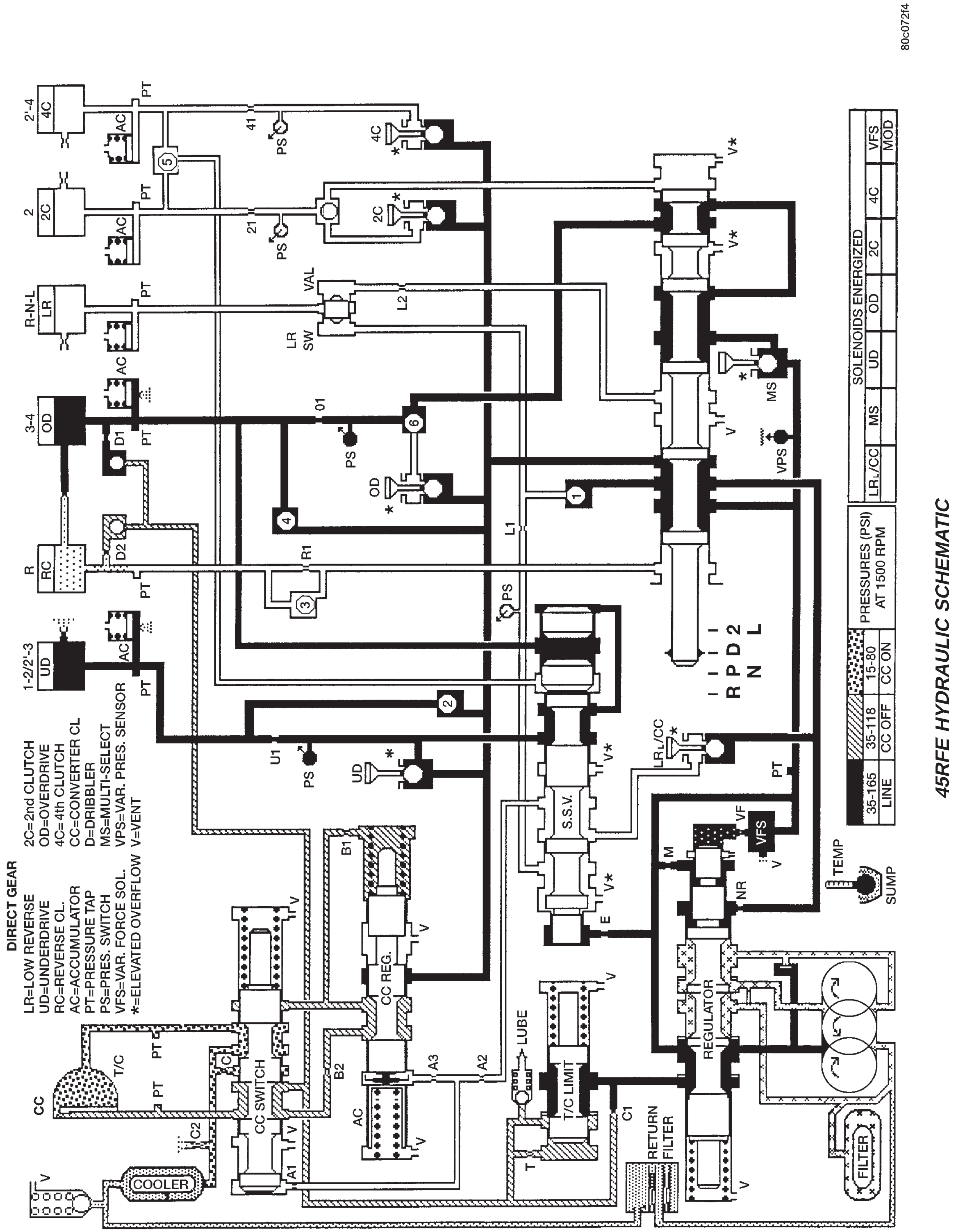

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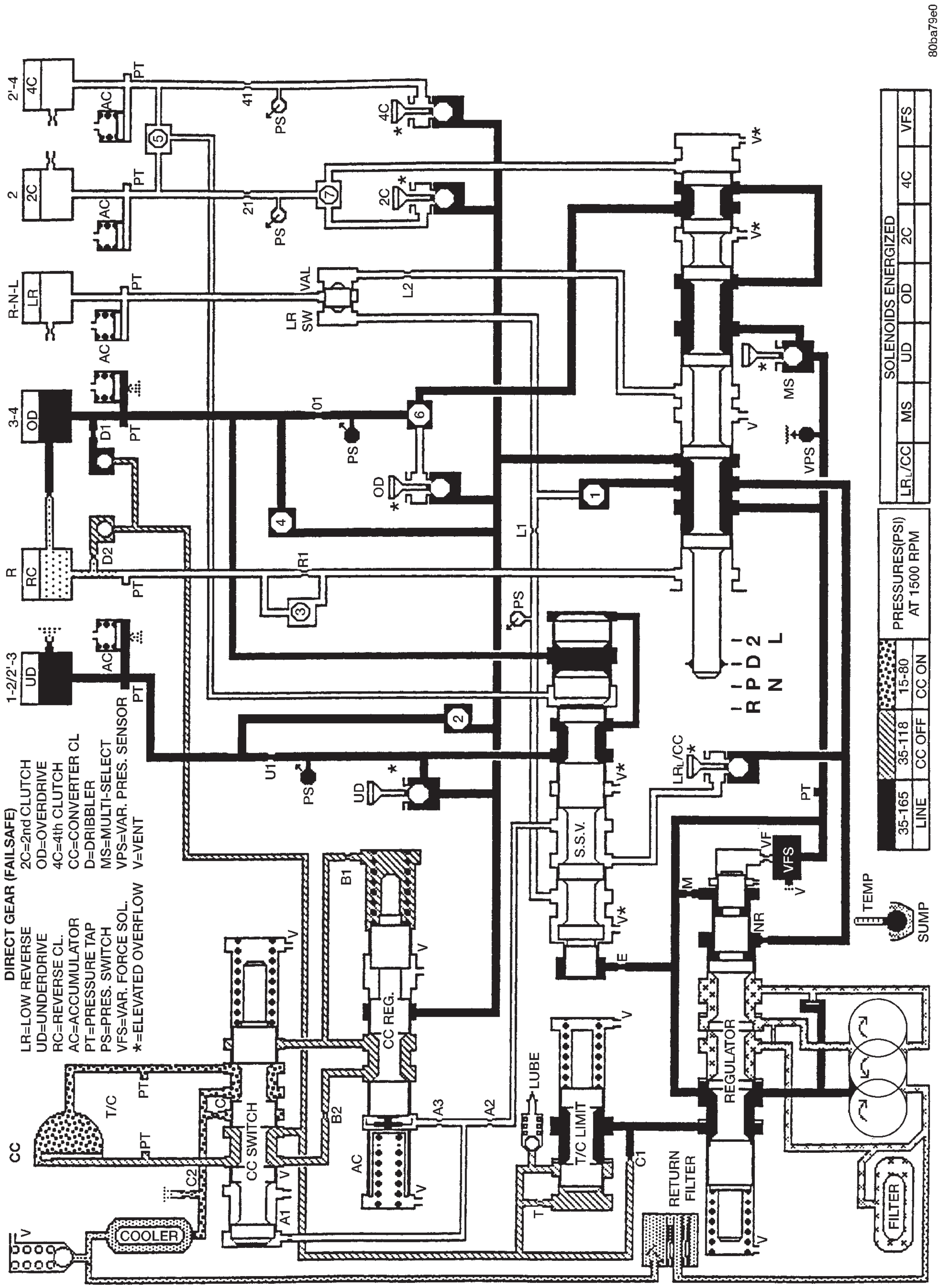

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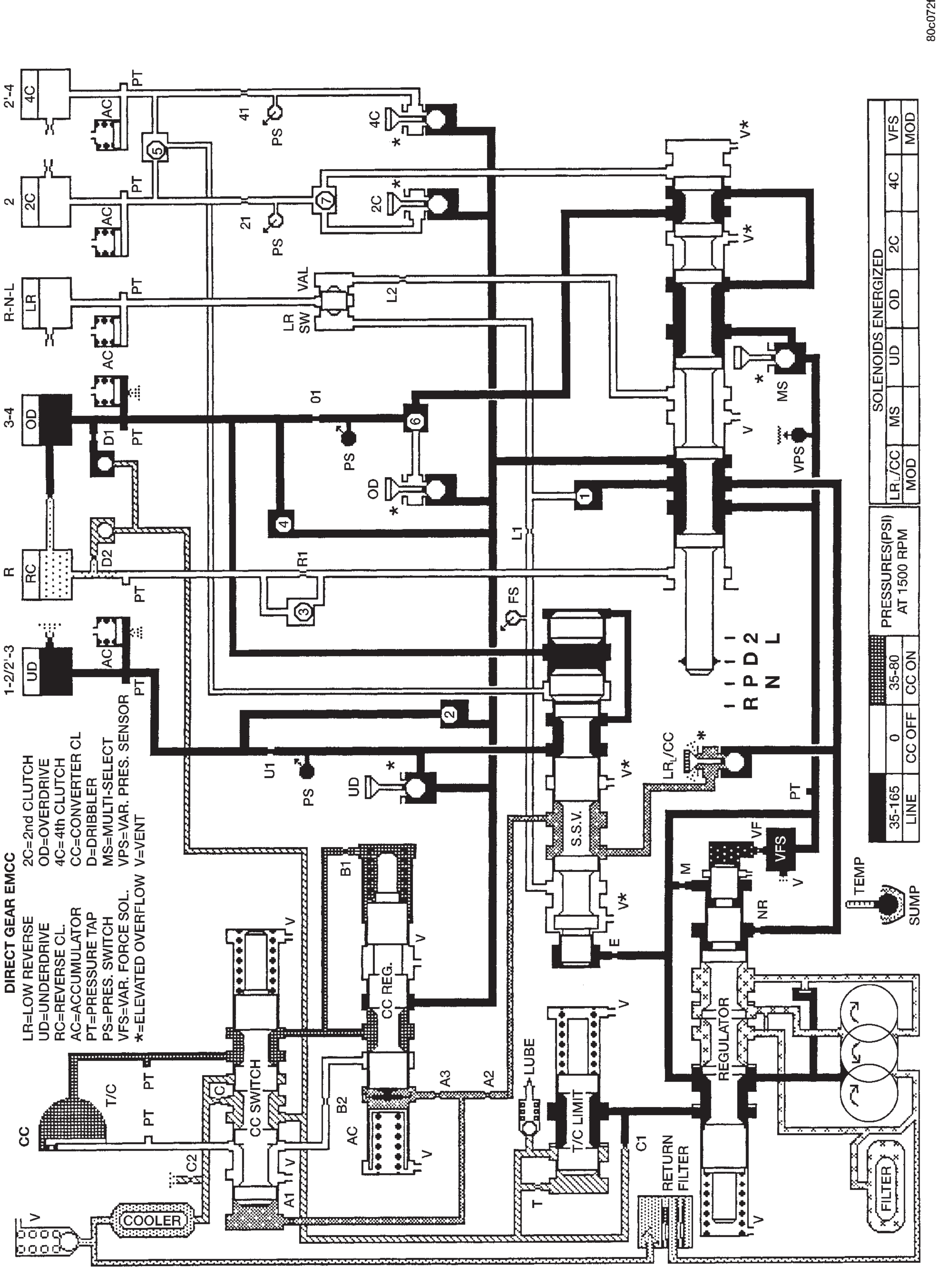

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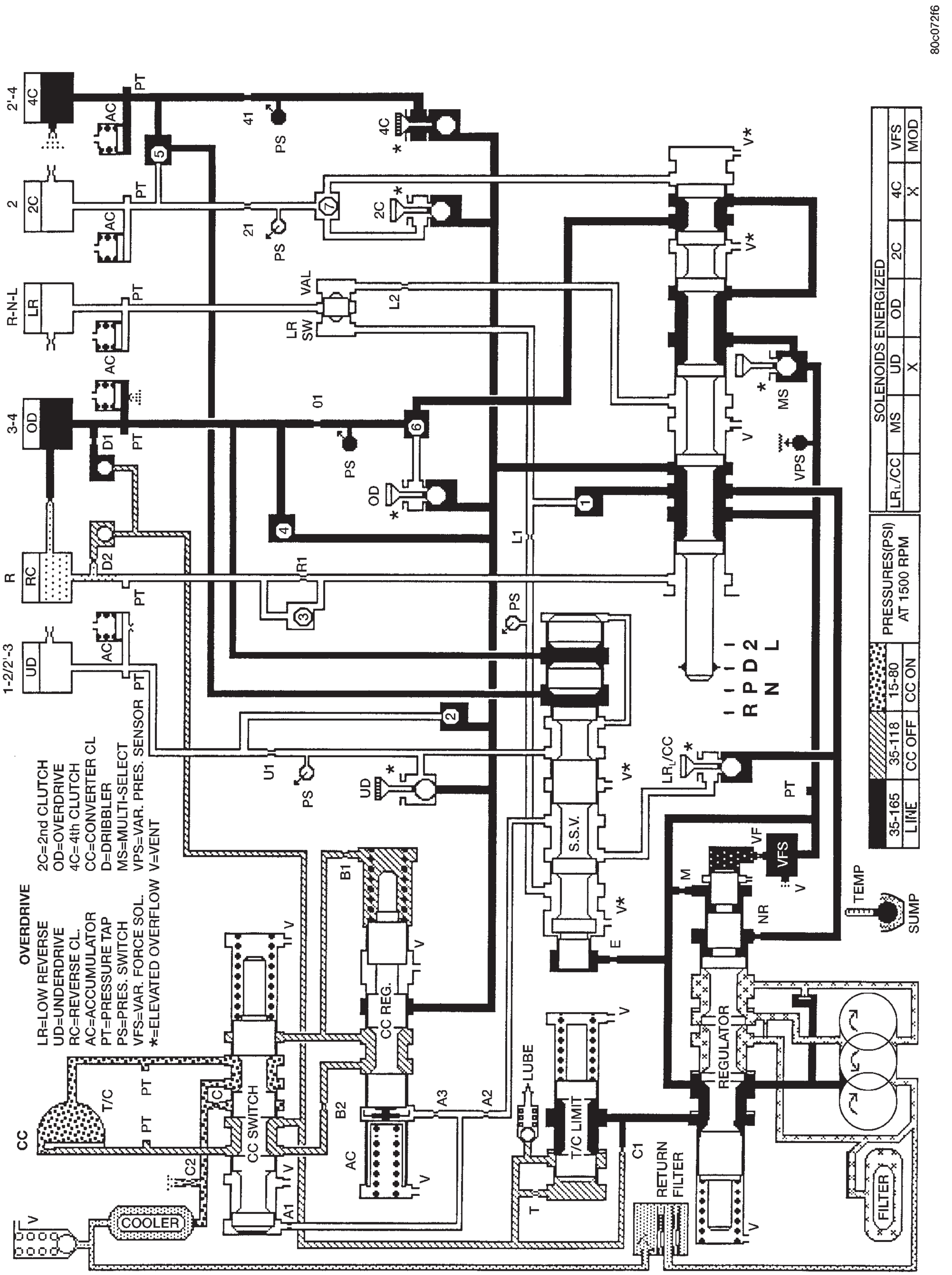

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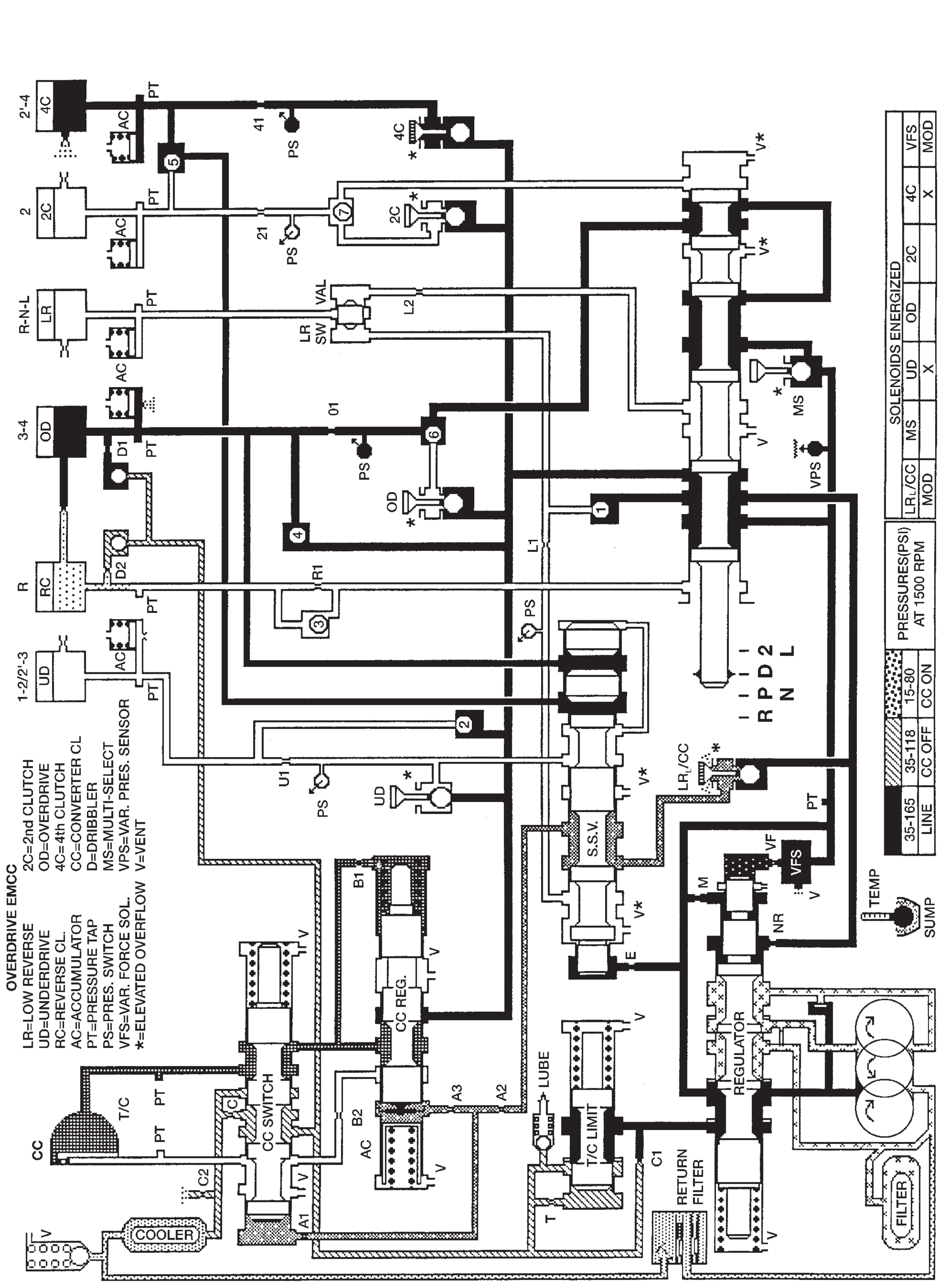

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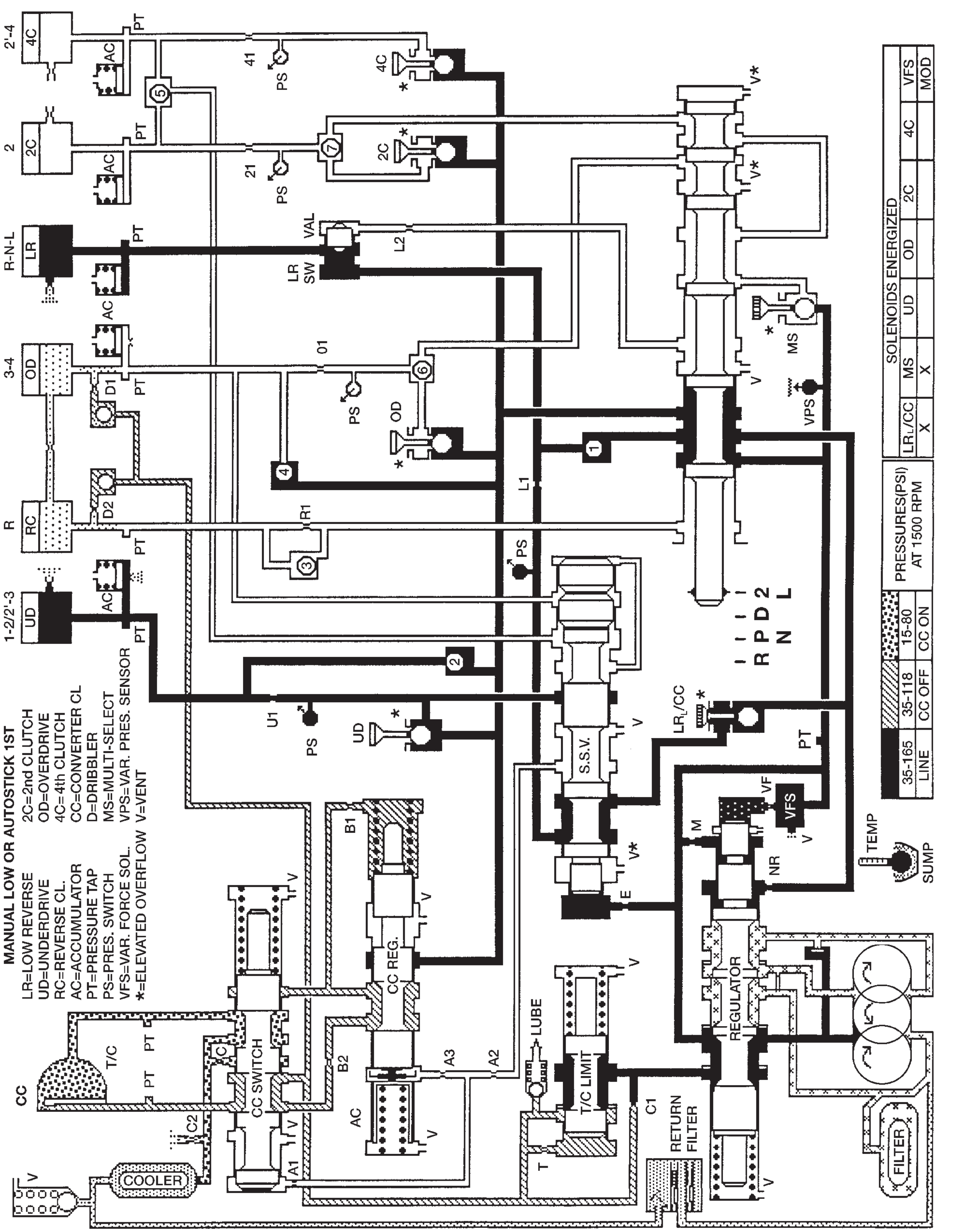

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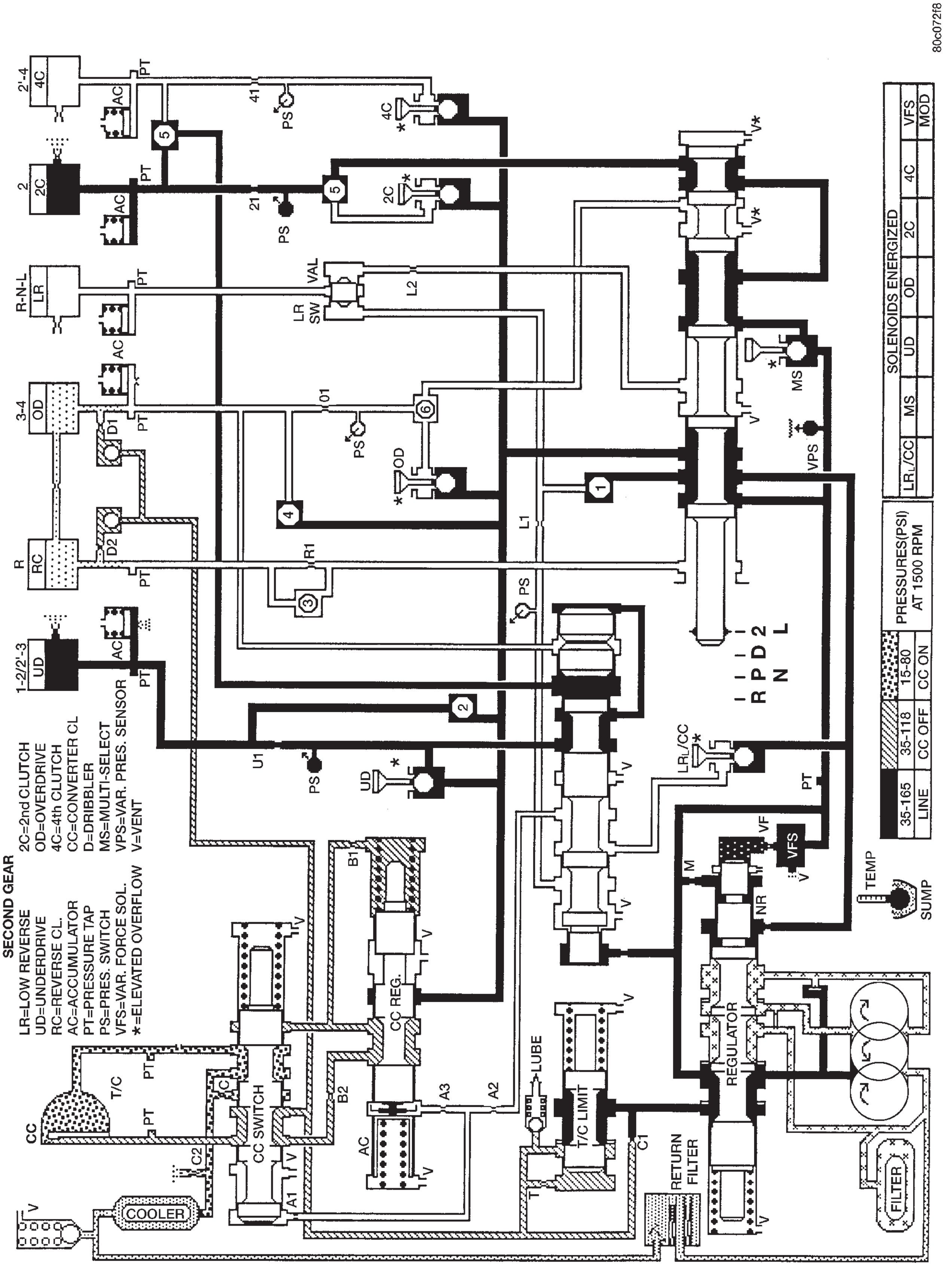
SCHEMATICS AND DIAGRAMS (Continued)



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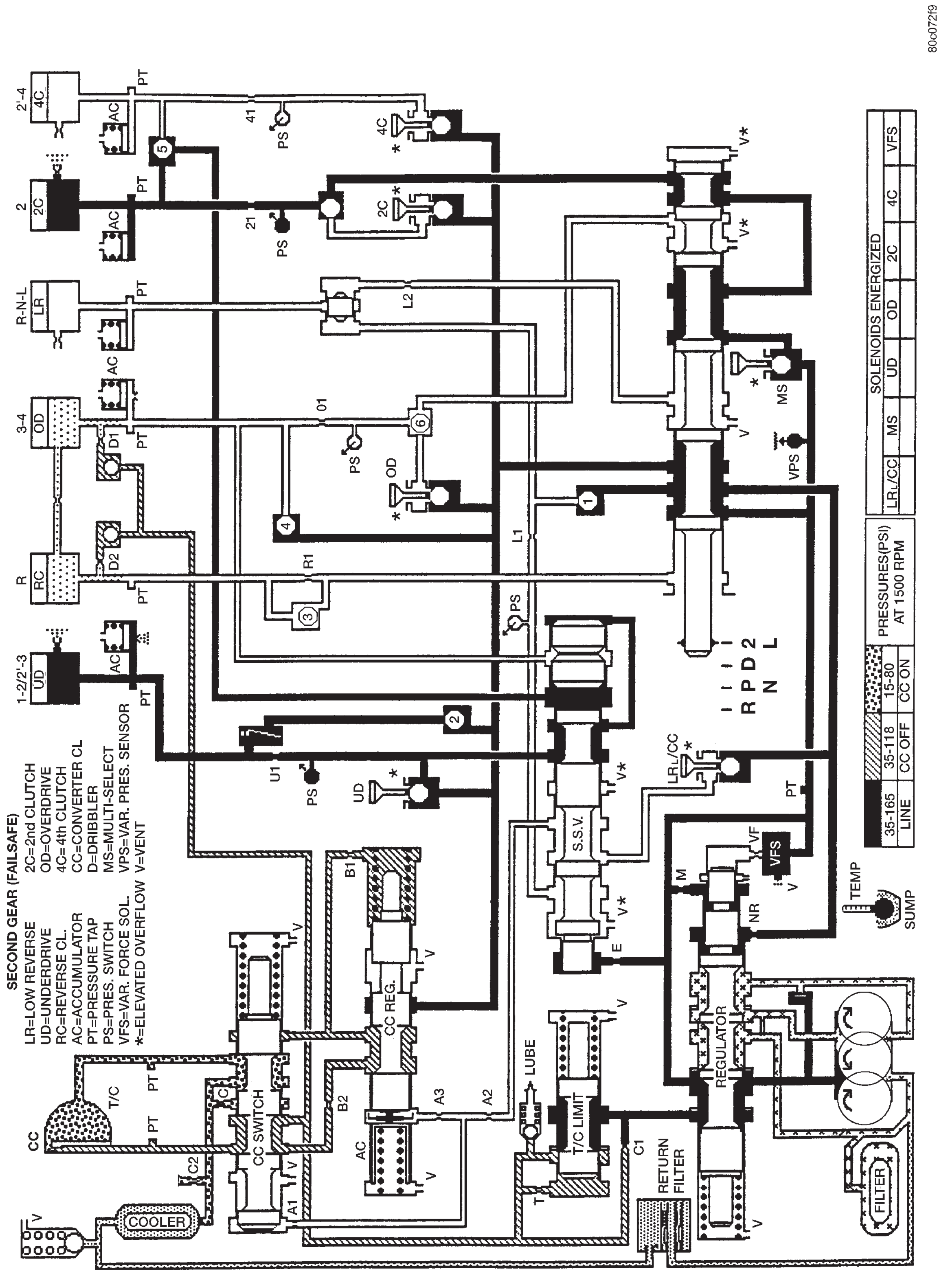


SPECIFICATIONS

TRANSMISSION

GENERAL

Component	Metric	Inch
Output Shaft End Play	0.53-0.78 mm	0.021-0.031 in.
Input Shaft End Play	0.79-1.07 mm	0.031-0.042 in.
2C Clutch Pack Clearance	0.53-1.27 mm	0.021-0.050 in.
4C Clutch Pack Clearance	0.81-1.35 mm	0.032-0.053 in.
L/R Clutch Pack Clearance	1.14-1.91 mm	0.045-0.075 in.
OD Clutch Pack Clearance	1.016-1.65 mm	0.040-0.065 in.
UD Clutch Pack Clearance	0.76-1.160 mm	0.030-0.063 in.
Reverse Clutch Pack Clearance	0.81-1.24 mm	0.032-0.049 in.
Recommended fluid	Mopar® ATF Plus 3, type 7176	

GEAR RATIOS

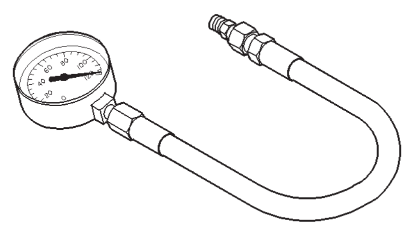
GEAR	RATIO
1ST	3.00:1
2ND	1.67:1
2ND PRIME	1.50:1
3RD	1.00:1
4TH	0.75:1
REVERSE	3.00:1

TORQUE

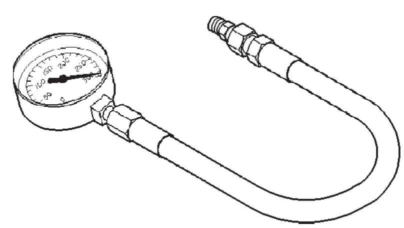
DESCRIPTION	TORQUE
Fitting, Cooler Line	17.5 N·m (155 in. lbs.)
Bolt, Torque Convertor	31 N·m (23 ft. lbs.)
Bolt, Driveplate	75 N·m (55 ft. lbs.)
Bolt/nut, Crossmember	68 N·m (50 ft. lbs.)
Bolt, Oil Pan	11.8 N·m (105 in. lbs.)
Screw, Primary Oil Filter	4.5 N·m (40 in. lbs.)
Filter, Cooler Return	14 N·m (125 in. lbs.)
Bolt, Oil Pump	28.2 N·m (250 in. lbs.)
Bolt, Oil Pump Body to Cover	4.5 N·m (40 in. lbs.)
Screw, Plate to Oil Pump Body	4.5 N·m (40 in. lbs.)
Plug, Pressure Test Port	5.1 N·m (45 in. lbs.)
Bolt, Reaction Shaft Support	11.8 N·m (105 in. lbs.)
Bolt, Valve Body	11.8 N·m (105 in. lbs.)
Screw, Valve Body to Transfer Plate	4.5 N·m (40 in. lbs.)
Screw, Solenoid Module to Transfer Plate	5.7 N·m (50 in. lbs.)
Screw, Accumulator Cover	4.5 N·m (40 in. lbs.)
Screw, Detent Spring	4.5 N·m (40 in. lbs.)
Bolt, Input Speed Sensor	11.8 N·m (105 in. lbs.)
Bolt, Output Speed Sensor	11.8 N·m (105 in. lbs.)
Bolt, Line Pressure Sensor	11.8 N·m (105 in. lbs.)
Bolt, Extension Housing	54 N·m (40 ft. lbs.)
Fitting, Vent	12 N·m (100 in. lbs.)
Screw, Manual Valve Cam Retaining	4.5 N·m (40 in. lbs.)
Bolt, Manual Lever	28.2 N·m (250 in. lbs.)

SPECIAL TOOLS

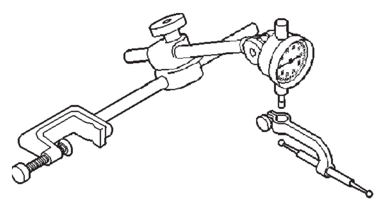
45RFE TRANSMISSION



Pressure Gauge—C-3292

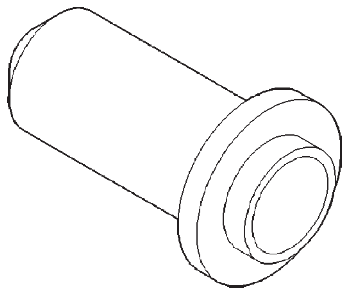


Pressure Gauge—C-3293SP

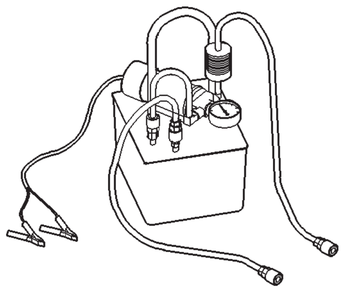


Dial Indicator—C-3339

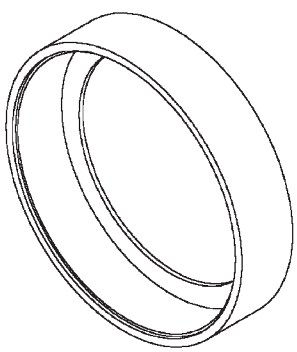
SPECIAL TOOLS (Continued)



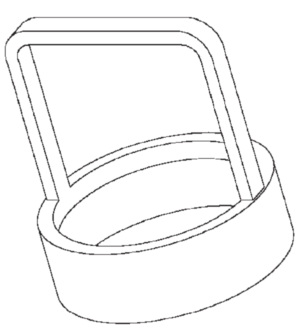
Seal Installer—C-3860–A



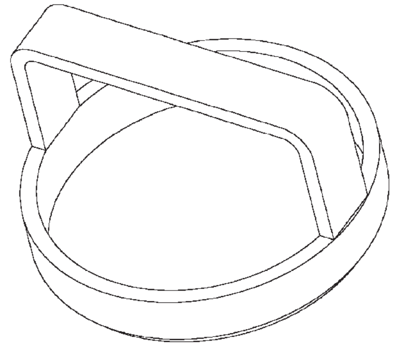
Flusher—6906



Spring Compressor—8249



Spring Compressor—8250



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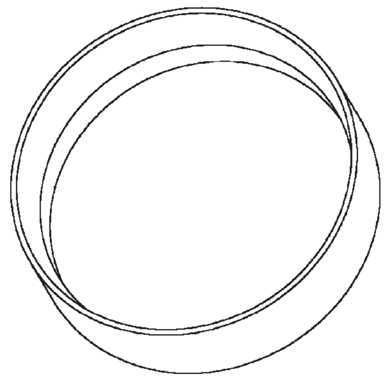
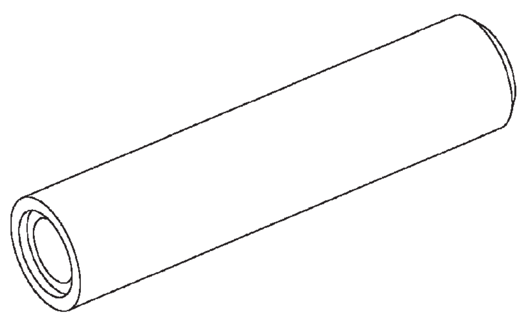
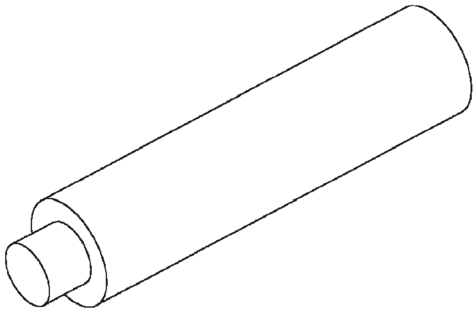


Piston Installer—8252



Seal Installer—8253

SPECIAL TOOLS (Continued)



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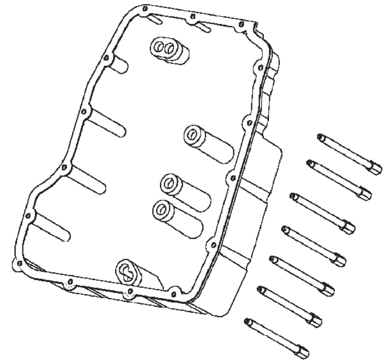
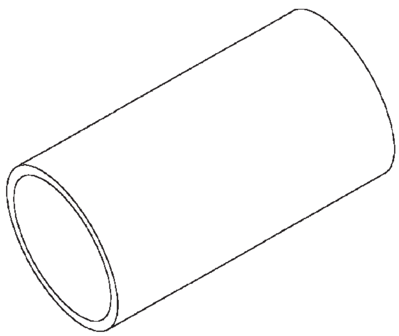
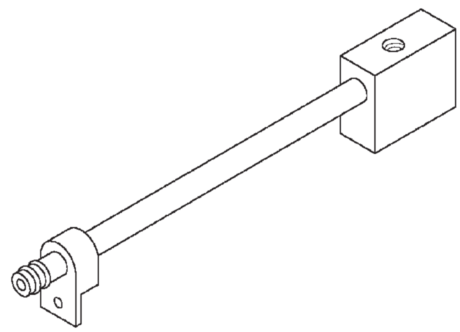


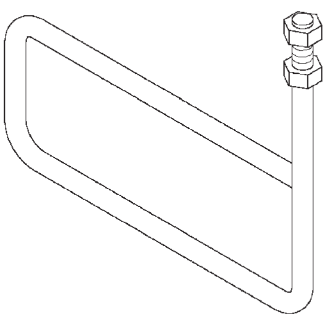
Pressure Tap Adapter—8258



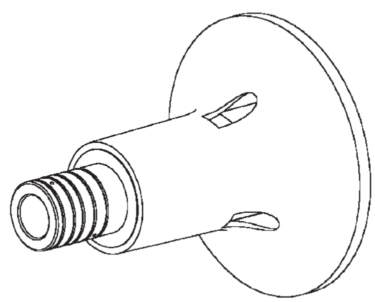
Installer—8255



Line Pressure Adapter—8259

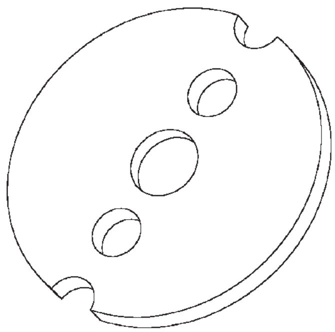


Support Stand—8257

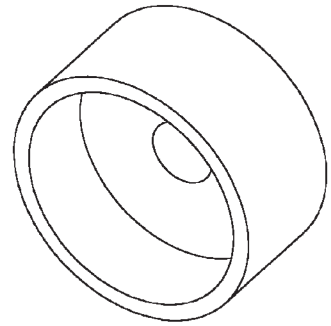


Input Clutch Pressure Fixture—8260

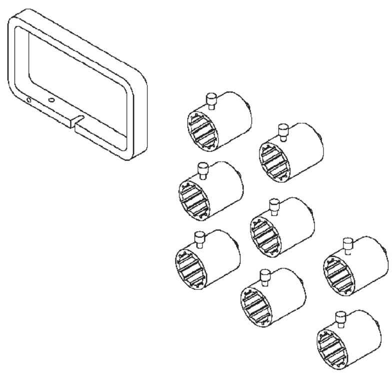
SPECIAL TOOLS (Continued)



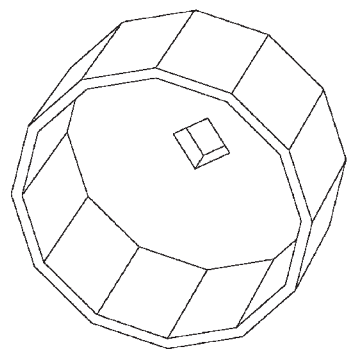
Alignment Plate—8261



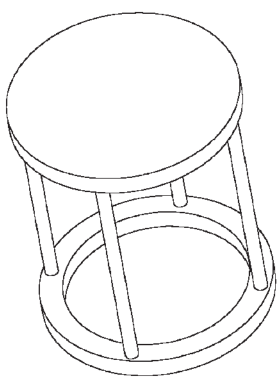
Bearing Installer—8320



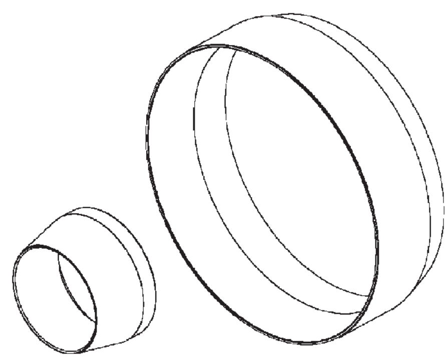
End Play Set—8266



Filter Wrench—8321



Spring Compressor—8285



Piston Installer—8504

NV242 TRANSFER CASE

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DESCRIPTION AND OPERATION

NV242 TRANSFER CASE

DESCRIPTION

The NV242 is a full transfer case (Fig. 1). It provides full time 2-wheel, or 4-wheel drive operation.

A differential in the transfer case is used to control torque transfer to the front and rear axles. A low range gear provides increased low speed torque capability for off road operation. The low range provides a 2.72:1 reduction ratio.

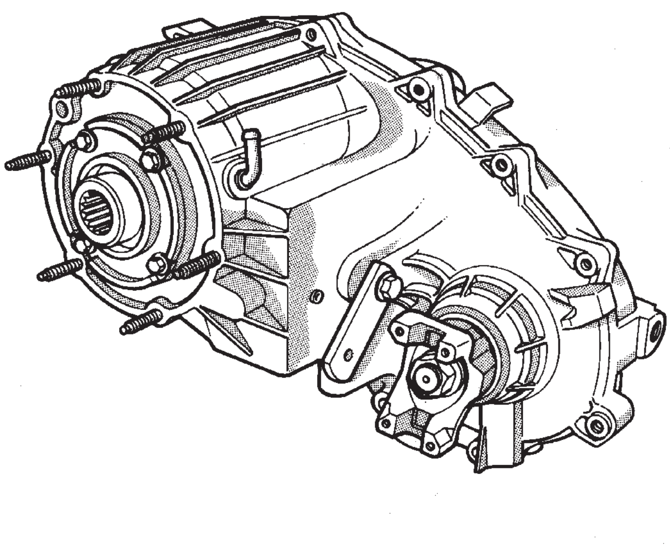


Fig. 1 NV242 Transfer Case

The input gear is splined to the transmission output shaft. It drives the mainshaft through the planetary gear and range hub. The front output shaft is operated by a drive chain that connects the shaft to a drive sprocket on the mainshaft. The drive sprocket is engaged/disengaged by the mode fork, which operates the mode sleeve and hub. The sleeve and hub are not equipped with a synchro mechanism for shifting.

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.

TRANSFER CASE IDENTIFICATION

Two versions of the NV242 are used in the WJ vehicles, NV242LD and NV242HD. The two transfer cases can be distinguished from one another by the rear output shaft retainer. The NV242LD uses a rubber boot to cover the rear output shaft, while the NV242HD uses a cast aluminum housing. Other than this difference, the two transfer cases are serviced the same.

A circular ID tag is attached to the rear case of each transfer case (Fig. 2). 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.

OPERATING RANGES

NV242 operating ranges are 2WD (2-wheel drive), 4x4 part-time, 4x4 full time, and 4 Lo.

The 2WD and 4x4 full time ranges can be used at any time and on any road surface.

The 4x4 part-time and 4 Lo ranges are for off road use only. The only time these ranges can be used on hard surface roads, is when the surface is covered with snow and ice.

SHIFT MECHANISM

Operating ranges are selected with a lever in the floor mounted shifter assembly. The shift lever is con-

DESCRIPTION AND OPERATION (Continued)

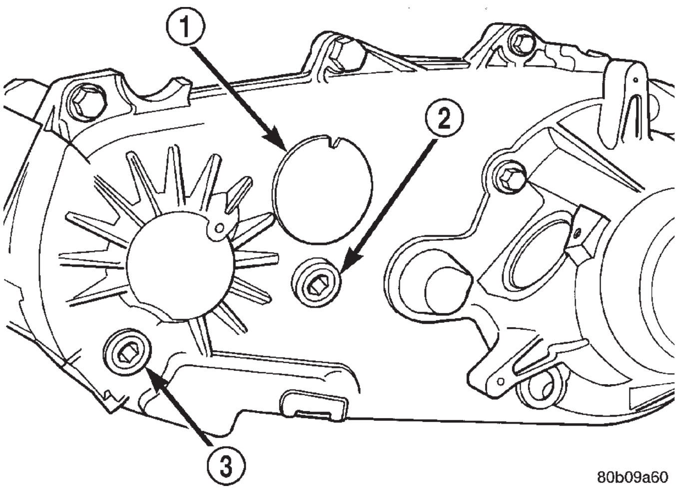


Fig. 2 Fill/Drain Plug And I.D. Tag Locations

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

nected to the transfer case range lever by an adjustable cable. A straight line shift pattern is used. Range positions are marked on the shifter bezel.

LUBRICANT AND FILL LEVEL

DESCRIPTION

Recommended lubricant for the NV242 transfer case is Mopar® Dexron II, or ATF Plus, type 7176. Approximate lubricant fill capacity is 1.35 liters (2.85 pints).

The fill and drain plugs are both in the rear case (Fig. 3). Correct fill level is to the bottom edge of the fill plug hole. Be sure the vehicle is level to ensure an accurate fluid level check.

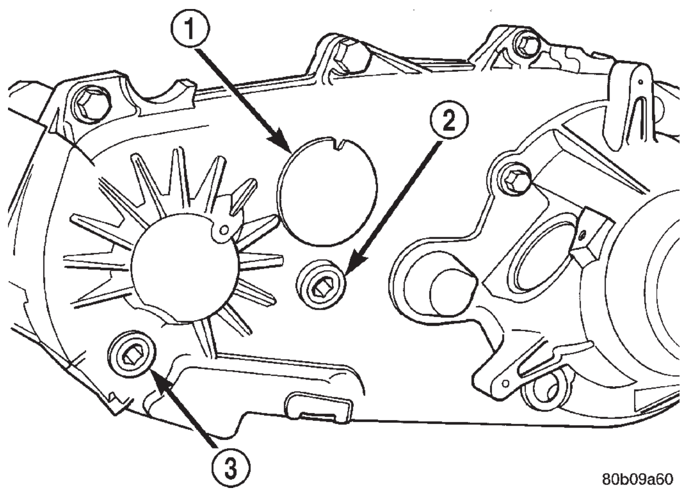


Fig. 3 Fill/Drain Plug Locations

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

DIAGNOSIS AND TESTING

NV242 DIAGNOSIS

DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
Transfer case difficult to shift or will not shift into desired range.	1) Transfer case shift linkage binding. 2) Insufficient or incorrect lubricant. 3) Internal transfer case components binding, worn, or damaged.	1) Repair or replace linkage as necessary. 2) Drain and refill transfer case with the correct type and quantity of lubricant. 3) Repair or replace components as necessary.
Transfer case noisy in all drive modes.	1) Insufficient or incorrect lubricant.	1) Drain and refill transfer case with the correct type and quantity of lubricant.
Lubricant leaking from transfer case seals or vent.	1) Transfer case overfilled. 2) Transfer case vent closed or restricted. 3) Transfer case seals damaged or installed incorrectly.	1) Drain lubricant to the correct level. 2) Clean or replace vent as necessary. 3) Replace suspect seal.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSE	CORRECTION
Transfer case will not shift through 4X4 part time range (light remains on)	1) Incomplete shift due to drivetrain torque load.	1) Momentarily release the accelerator pedal to complete the shift.
	2) Incorrect tire pressure.	2) Correct tire pressure as necessary.
	3) Excessive Tire wear.	3) Correct tire condition as necessary.
	4) Excessive vehicle loading.	4) Correct as necessary.

REMOVAL AND INSTALLATION

TRANSFER CASE

REMOVAL

(1) Shift transfer case into Neutral.

(2) Raise vehicle.

(3) Remove transfer case drain plug and drain transfer case lubricant.

(4) Mark front and rear propeller shaft yokes for alignment reference.

(5) Support transmission with jack stand.

(6) Remove rear crossmember and skid plate, if equipped (Fig. 4).

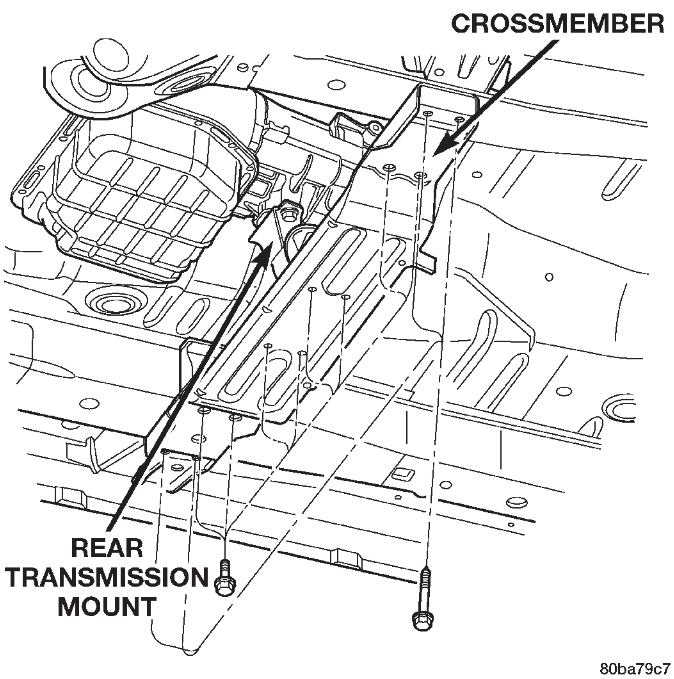


Fig. 4 Crossmember Removal/Installation

(7) Disconnect front/rear propeller shafts at transfer case. Refer to Group 3, Differential and Driveline for the correct procedures.

(8) Disconnect transfer case cable from range lever.

(9) Disconnect transfer case vent hose (Fig. 5) and indicator switch harness, if necessary.

(10) Support transfer case with transmission jack.

(11) Secure transfer case to jack with chains.

(12) Remove nuts attaching transfer case to transmission.

(13) Pull transfer case and jack rearward to disengage transfer case.

(14) Remove transfer case from under vehicle.

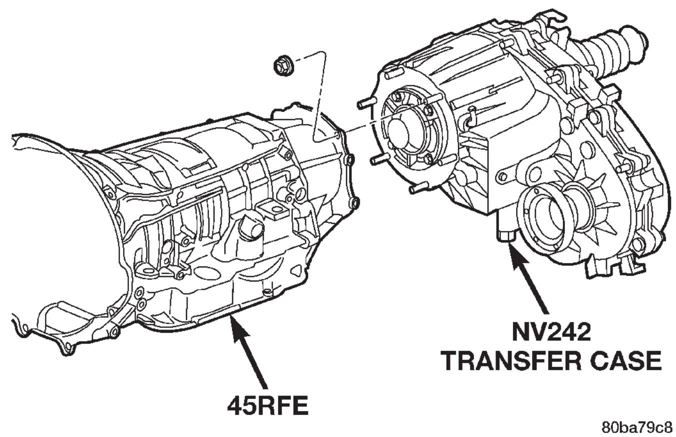


Fig. 5 Transfer Case Mounting

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. 5).

(6) Align and connect propeller shafts. Refer to Group 3, Differential and Driveline, for proper procedures and specifications.

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

(8) Install rear crossmember and skid plate, if equipped. Tighten crossmember bolts to 41 N·m (30 ft. lbs.) torque.

(9) Remove transmission jack and support stand.

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

(11) Adjust transfer case shift cable.

REMOVAL AND INSTALLATION (Continued)

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

FRONT OUTPUT SHAFT SEAL

REMOVAL

(1) Raise vehicle.

(2) Remove front propeller shaft. Refer to Group 3, Differential and Driveline, for proper procedure.

(3) Remove front output shaft companion flange.

(4) Remove seal from front case with pry tool (Fig. 6).

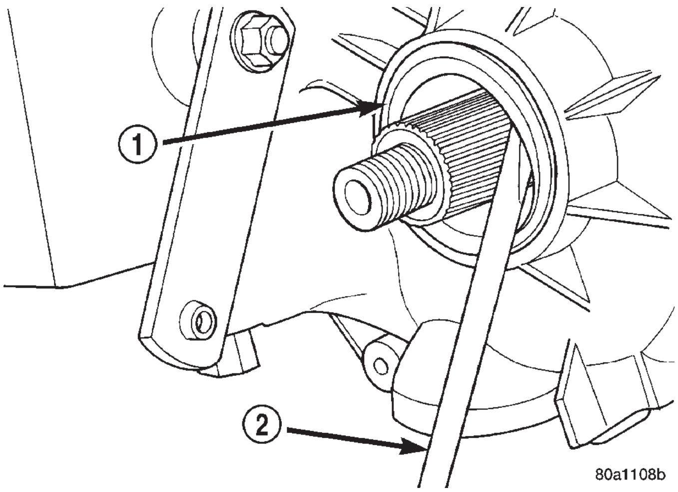


Fig. 6 Remove Front Output Shaft Seal

1 – OUTPUT SHAFT SEAL
2 – PRYBAR

INSTALLATION

(1) Install new front output seal in front case with Installer Tool 6952-A as follows:

(a) Place new seal on tool. Garter spring on seal goes toward interior of case.

(b) Start seal in bore with light taps from hammer (Fig. 7). Once seal is started, continue tapping seal into bore until installer tool seats against case.

(2) Install companion flange and tighten nut to 122–176 (90–130 ft. lbs.) torque.

(3) Install front propeller shaft. Refer to Group 3, Differential and Driveline for the correct procedure and torque specification.

NV242HD REAR RETAINER BUSHING AND SEAL

REMOVAL

(1) Raise vehicle.

(2) Remove rear propeller shaft. Refer to Group 3, Differential and Driveline, for proper procedure.

(3) Using a suitable pry tool or slide-hammer mounted screw, remove the rear retainer seal.

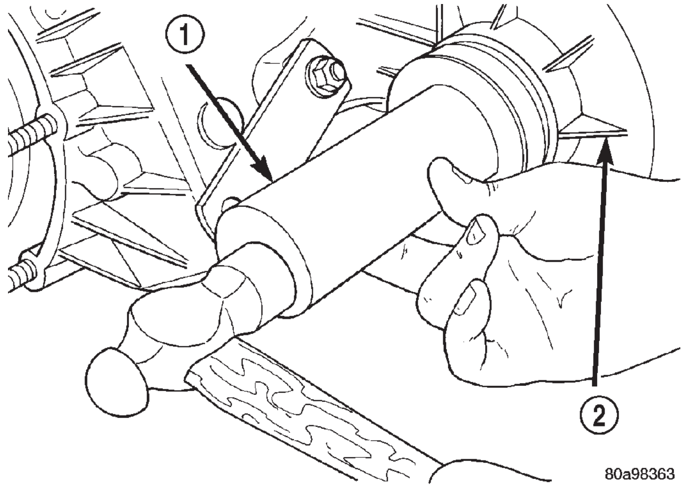


Fig. 7 Front Output Seal Installation

1 – INSTALLER 6952–A
2 – TRANSFER CASE

(4) Using Remover 6957, remove bushing from rear retainer (Fig. 8).

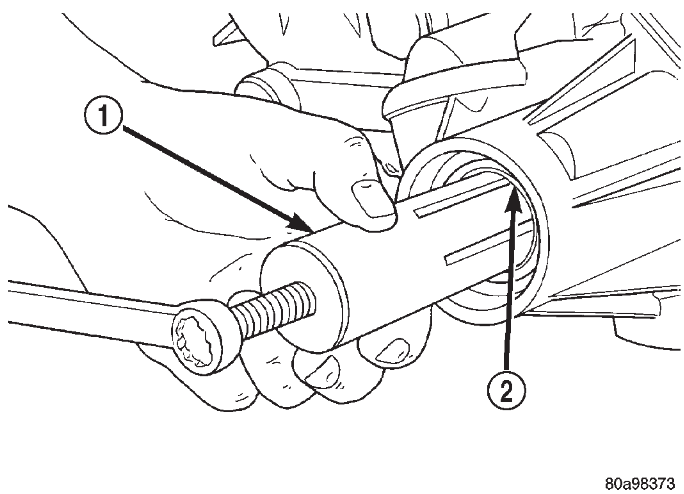


Fig. 8 Rear Retainer Bushing Removal

1 – REMOVER 6957
2 – REAR RETAINER BUSHING

INSTALLATION

(1) Clean fluid residue from sealing surface and inspect for defects.

(2) Position replacement bushing in rear retainer with fluid port in bushing aligned with slot in retainer.

(3) Using Installer 8160, drive bushing into retainer until installer seats against case (Fig. 9).

(4) Using Installer C-3995-A, install seal in rear retainer (Fig. 10).

(5) Install propeller shaft.

(6) Verify proper fluid level.

(7) Lower vehicle.

REMOVAL AND INSTALLATION (Continued)

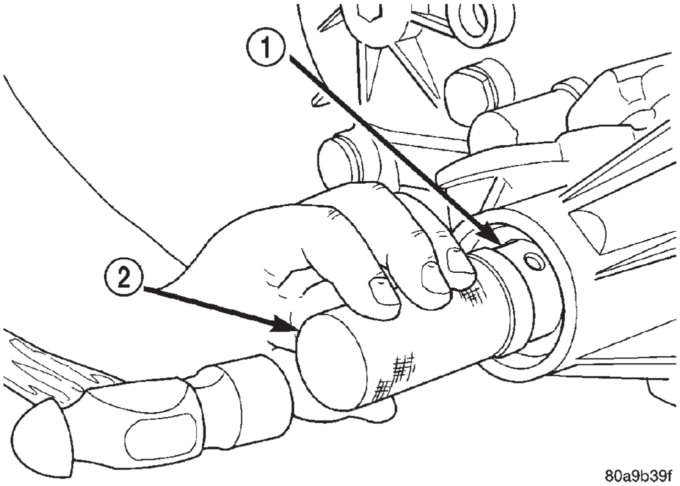


Fig. 9 Rear Retainer Bushing Install

1 – REAR RETAINER BUSHING
2 – INSTALLER 8160

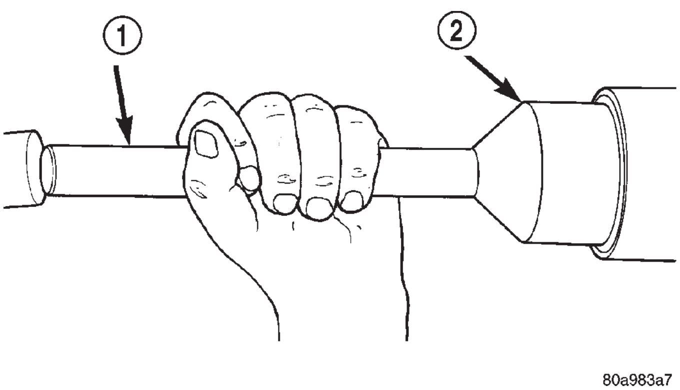


Fig. 10 Install Rear Retainer Seal

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL C-3995-A

TRANSFER CASE SHIFT CABLE

REMOVAL

(1) Shift transfer case into neutral.

(2) Raise vehicle.

(3) Disconnect the shift cable eyelet from the transfer case shift lever (Fig. 11).

(4) Remove shift cable from the cable support bracket.

(5) Lower vehicle.

(6) Remove shift lever bezel and necessary console parts for access to shift lever assembly and shift cable.

(7) Disconnect cable at shift lever and shifter assembly bracket (Fig. 12).

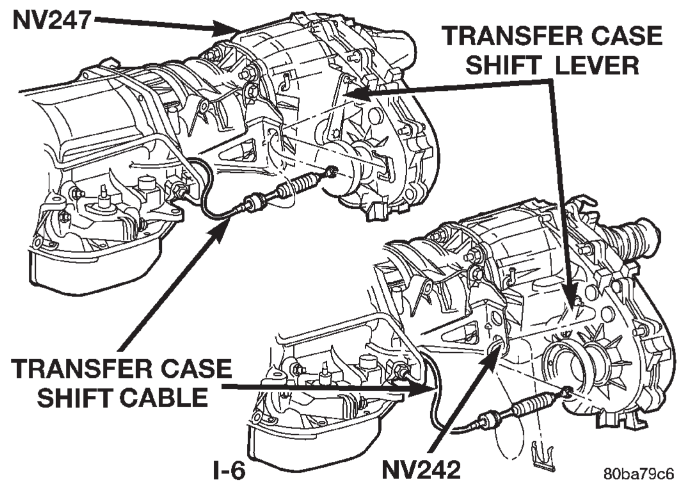


Fig. 11 Transfer Case Shift Cable at Transfer Case

(8) Remove the nuts holding the shift cable seal plate to the floor pan (Fig. 13).

(9) Pull cable through floor panel opening.

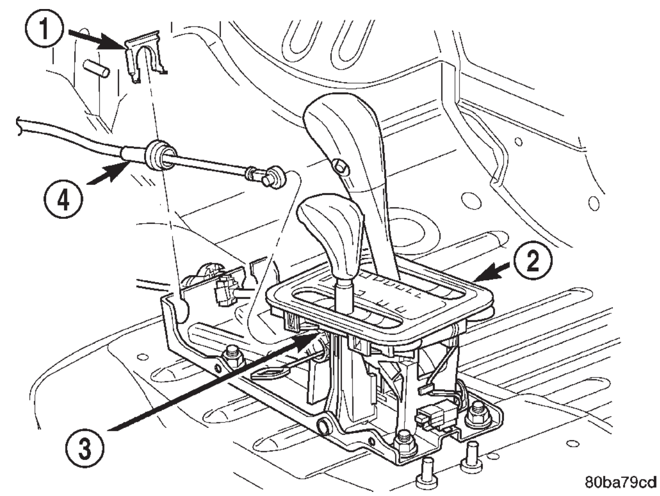


Fig. 12 Transfer Case Shift Cable at Shifter

1 – CLIP
2 – SHIFTER
3 – TRANSFER CASE SHIFT LEVER PIN
4 – TRANSFER CASE SHIFT CABLE

(10) Remove transfer case shift cable from vehicle.

INSTALLATION

(1) Route cable through hole in floor pan.

(2) Install seal plate to studs in floor pan.

(3) Install nuts to hold seal plate to floor pan (Fig. 13) Tighten nuts to 7 N·m (65 in. lbs.).

(4) Install the transfer case shift cable to the shifter assembly bracket. Seat cable in bracket and install clip (Fig. 12).

(5) Verify the transfer case shift lever (at console) is in the NEUTRAL position.

REMOVAL AND INSTALLATION (Continued)

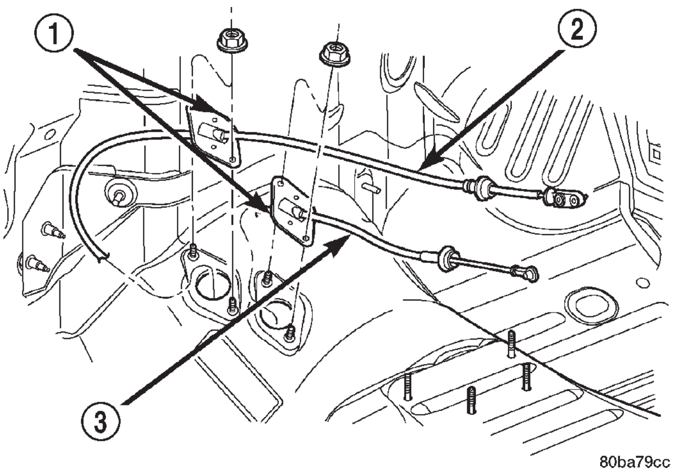


Fig. 13 Shift Cables at Floor Pan

1 – SEAL PLATES
2 – TRANSMISSION SHIFT CABLE
3 – TRANSFER CASE SHIFT CABLE

(6) Snap the cable onto the shift lever pin (Fig. 12).

(7) Raise the vehicle.

(8) Install the shift cable to the shift cable support bracket and install clip (Fig. 11).

(9) Verify that the transfer case is still in the NEUTRAL position.

(10) Snap the shift cable onto the transfer case shift lever (Fig. 11).

(11) Lower vehicle.

(12) Verify correct transfer case operation in all ranges.

(13) Install shift lever bezel and any console parts removed for access to transfer case shift cable.

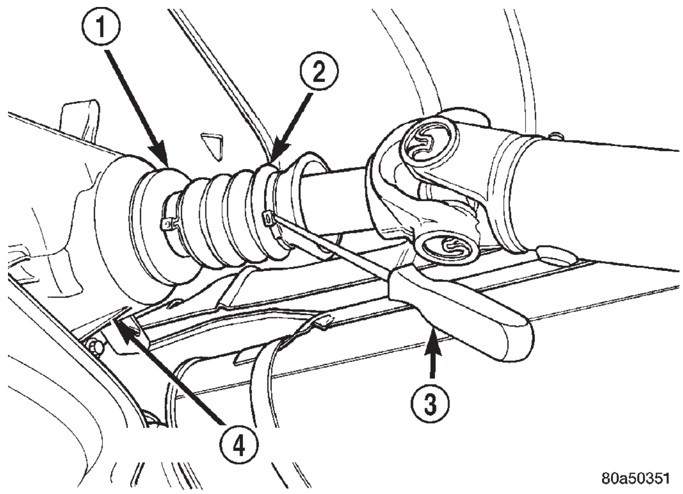


Fig. 14 Output Boot—Typical

1 – SLINGER
2 – BOOT
3 – AWL
4 – TRANSFER CASE

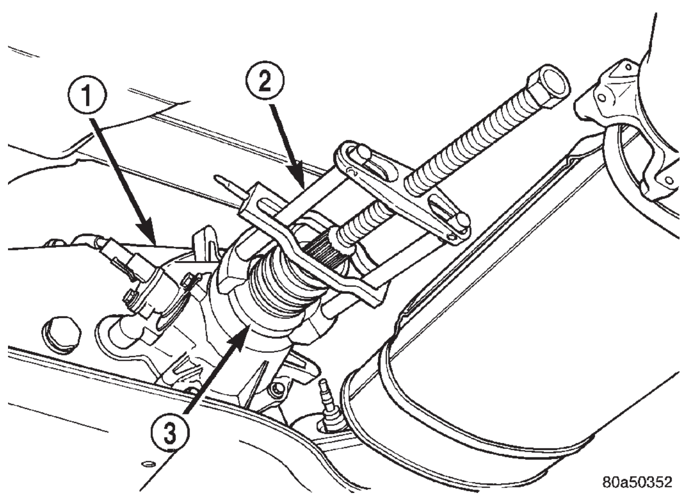


Fig. 15 Rear Slinger Removal

1 – TRANSFER CASE
2 – SPECIAL TOOL MD998056–A
3 – SLINGER

DISASSEMBLY AND ASSEMBLY

NV242 TRANSFER CASE

DISASSEMBLY

NV242LD REAR RETAINER

(1) Remove output shaft boot. Spread band clamp that secures boot on slinger with a suitable awl. Then slide boot off shaft (Fig. 14).

(2) Using puller MD-998056-A, remove rear slinger (Fig. 15).

(3) Remove rear seal from retainer (Fig. 16). Use pry tool, or collapse seal with punch to remove it.

(4) Remove rear output bearing I.D. retaining ring (Fig. 17).

(5) Remove speedometer adapter.

(6) Remove rear retainer bolts.

(7) Remove rear retainer. Tap retainer with mallet and pry upward to break sealer bead. Then slide retainer off case and output shaft (Fig. 18).

NV242HD REAR RETAINER

(1) Remove extension housing bolts.

(2) Tap extension housing with plastic or rawhide mallet to loosen sealer (Fig. 19).

(3) Separate extension housing from rear retainer.

(4) Remove rear bearing snap-ring (Fig. 20).

(5) Remove bolts holding rear retainer to rear case half.

(6) Remove speedometer adapter.

DISASSEMBLY AND ASSEMBLY (Continued)

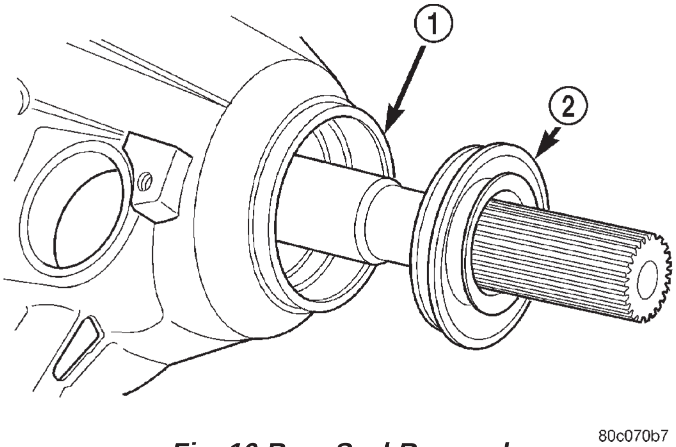


Fig. 16 Rear Seal Removal

1 – REAR RETAINER
2 – OUTPUT SHAFT SEAL

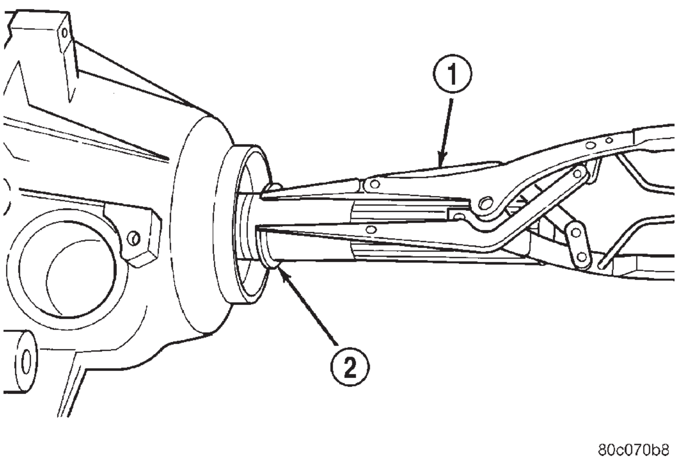


Fig. 17 Rear Bearing I.D. Retaining Ring Removal

1 – SNAP RING PLIERS
2 – REAR BEARING I.D. RETAINING RING

(7) Loosen rear retainer with pry tool to break sealer bead. Pry only against retainer boss as shown (Fig. 21).

(8) Slide retainer off case and output shaft (Fig. 22).

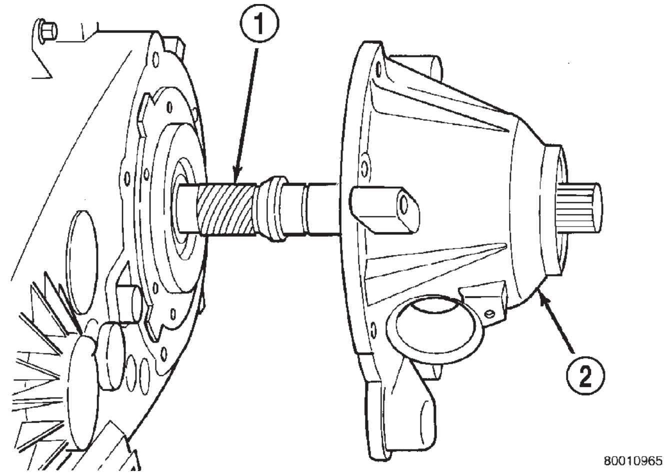


Fig. 18 Rear Retainer Removal

1 – MAINSHAFT
2 – REAR RETAINER

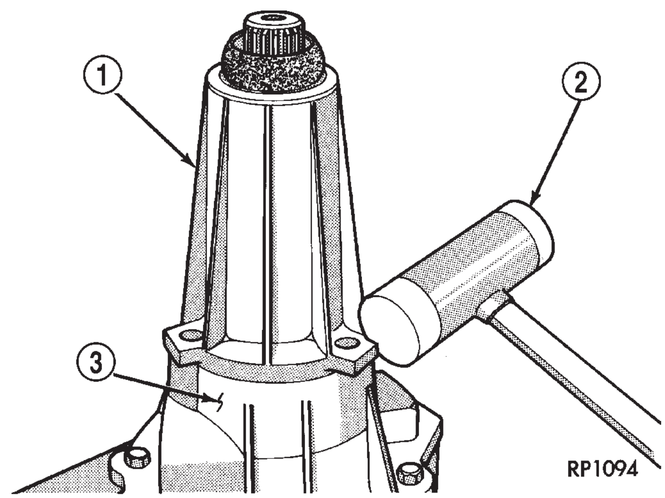


Fig. 19 Remove Extension Housing

1 – EXTENSION HOUSING
2 – PLASTIC HAMMER
3 – REAR RETAINER

DISASSEMBLY AND ASSEMBLY (Continued)

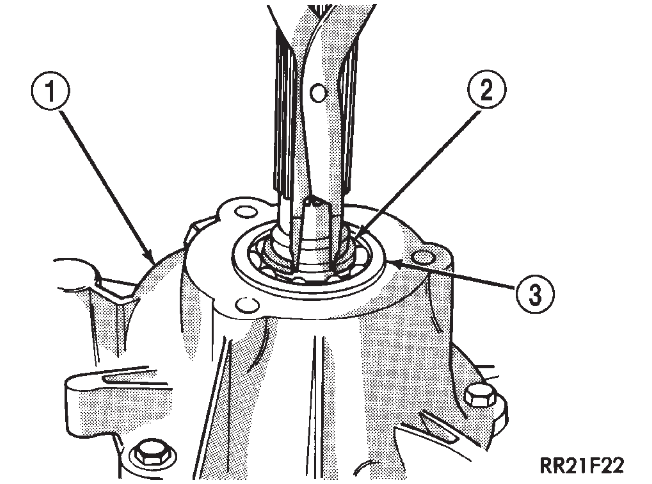


Fig. 20 Remove Rear Bearing Snap-ring

1 – REAR RETAINER
2 – SNAP RING
3 – REAR BEARING

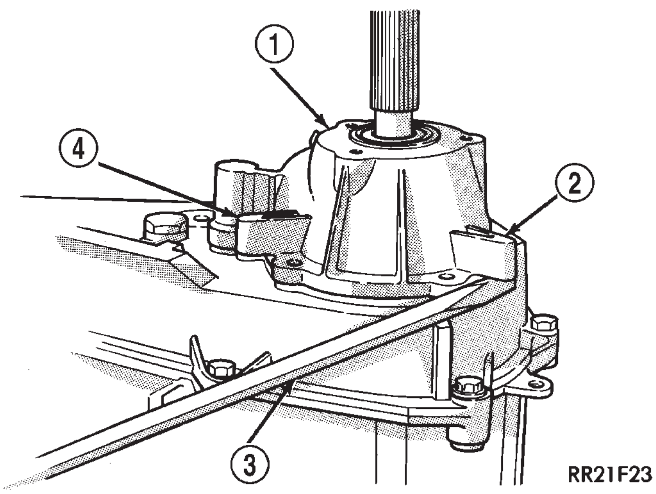


Fig. 21 Loosening Rear Retainer

1 – REAR RETAINER
2 – TAB (2)
3 – SCREWDRIVER
4 – TAB

OIL PUMP AND REAR CASE HALF

(1) Remove rear bearing O.D. retaining ring with snap ring pliers. Then tilt pump and slide it off output shaft (Fig. 23).

(2) Remove pickup tube O-ring from pump (Fig. 24) but do not disassemble pump; it is not a repairable part.

(3) Remove seal from oil pump with pry tool.

(4) Remove bolts attaching rear case to front case (Fig. 25). Note position of the two black finish bolts at each end of the case. These bolts go through the case dowels and require a washer under the bolt head.

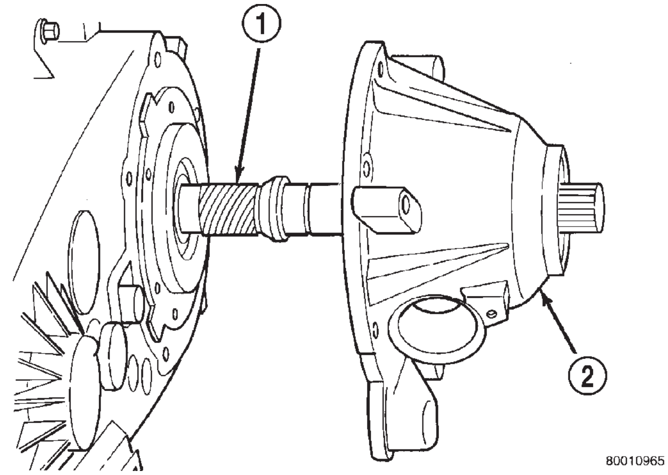


Fig. 22 Remove Rear Retainer

1 – MAINSHAFT
2 – REAR RETAINER

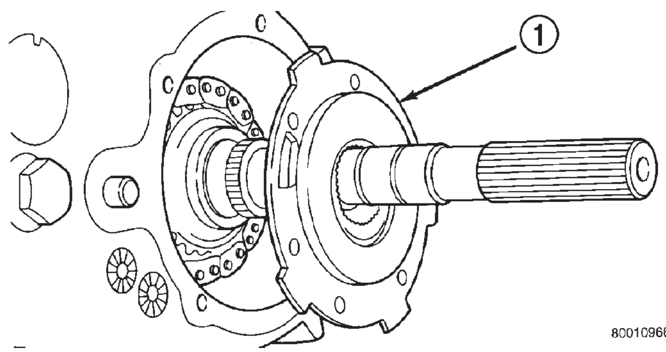


Fig. 23 Oil Pump Removal

1 – OIL PUMP

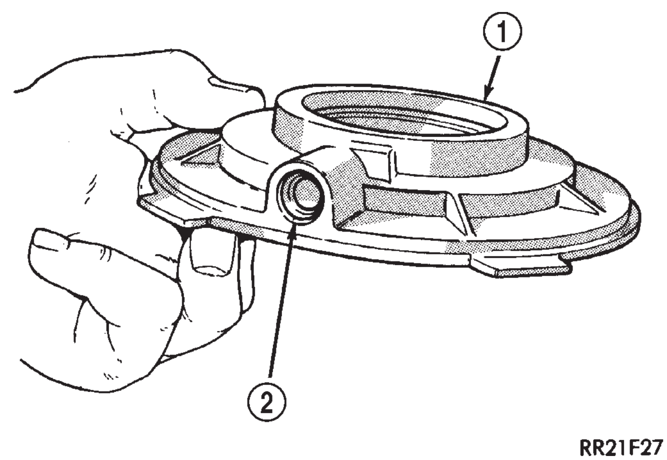


Fig. 24 Pickup Tube O-Ring Location

1 – OIL PUMP
2 – O-RING

(5) Remove rear case from front case (Fig. 26). Insert screwdrivers into slots cast into each end of case. Then pry upward to break sealer bead and remove rear case.

DISASSEMBLY AND ASSEMBLY (Continued)

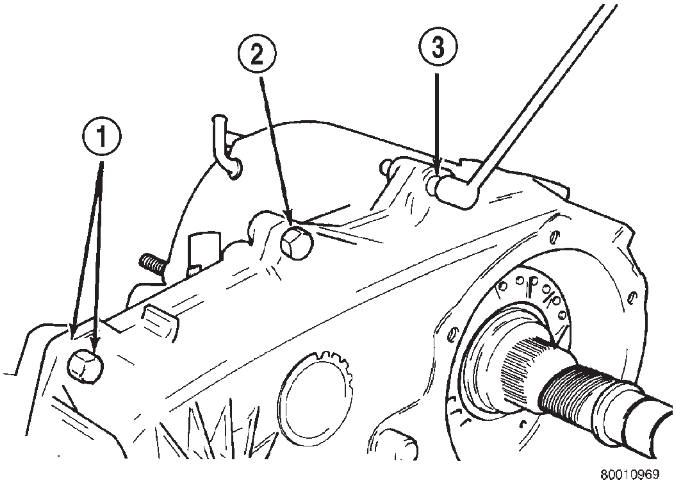


Fig. 25 Spline And Dowel Bolt Locations

1 – DOWEL BOLT AND WASHER (2)
2 – CASE BOLT (5)
3 – SPLINE HEAD BOLT (1)

CAUTION: Do not pry on the sealing surface of either case half as the surfaces will become damaged.

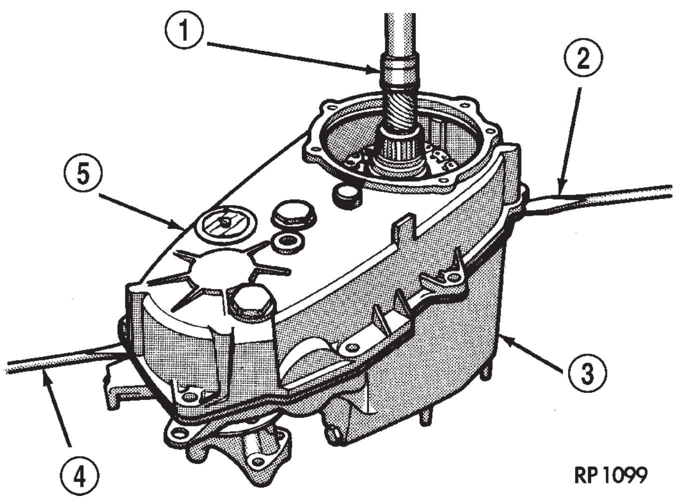


Fig. 26 Loosening/Removing Rear case

1 – MAINSHAFT
2 – SCREWDRIVER
3 – FRONT CASE
4 – SCREWDRIVER
5 – REAR CASE

(6) Remove oil pickup tube and screen from rear case (Fig. 27).

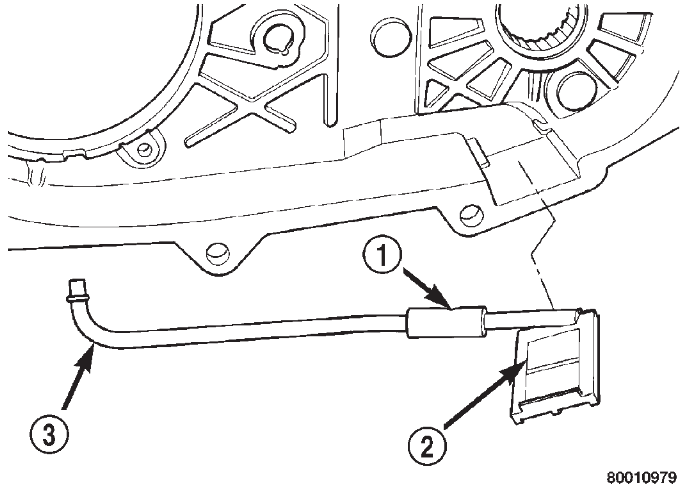


Fig. 27 Oil Pickup Screen, Hose And Tube Removal

1 – CONNECTING HOSE
2 – PICKUP SCREEN
3 – PICKUP TUBE

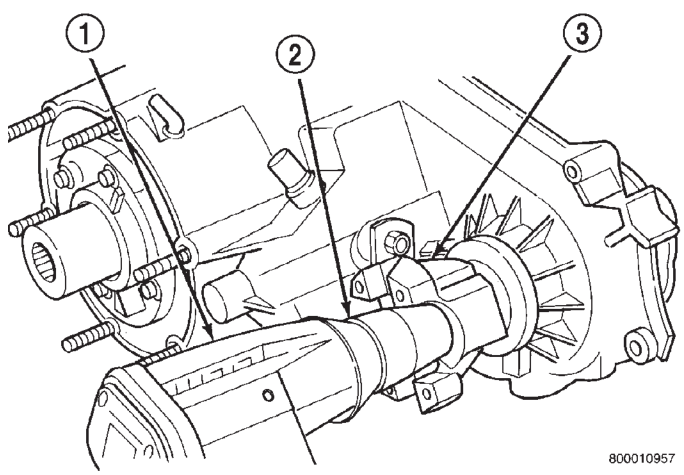


Fig. 28 Yoke Nut Removal

1 – IMPACT WRENCH
2 – SOCKET
3 – YOKE

YOKE AND RANGE LEVER

(1) Remove front yoke nut:

(a) Move range lever to 4L position.

(b) Remove nut with socket and impact wrench (Fig. 28).

(2) Remove yoke. If yoke is difficult to remove by hand, remove it with bearing splitter, or with standard two jaw puller (Fig. 29). Be sure puller tool is positioned on yoke and not on slinger as slinger will be damaged.

(3) Remove seal washer from front output shaft. Discard washer as it should not be reused.

(4) Remove nut and washer that attach range lever to sector shaft. Then move sector to neutral position and remove range lever from shaft (Fig. 30).

DISASSEMBLY AND ASSEMBLY (Continued)

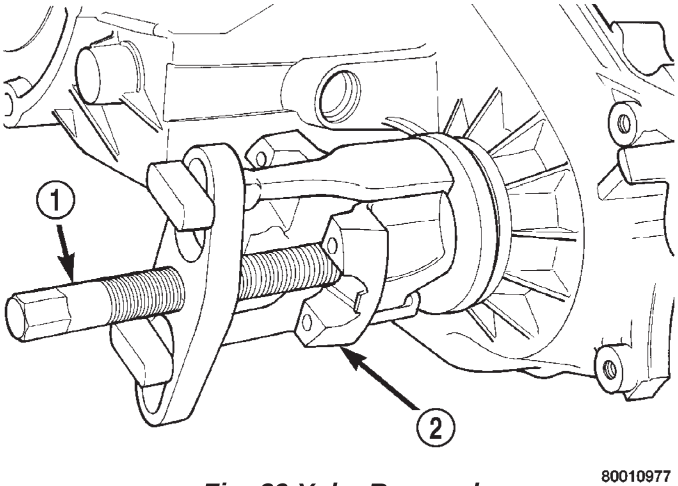


Fig. 29 Yoke Removal

1 – PULLER TOOL
2 – YOKE

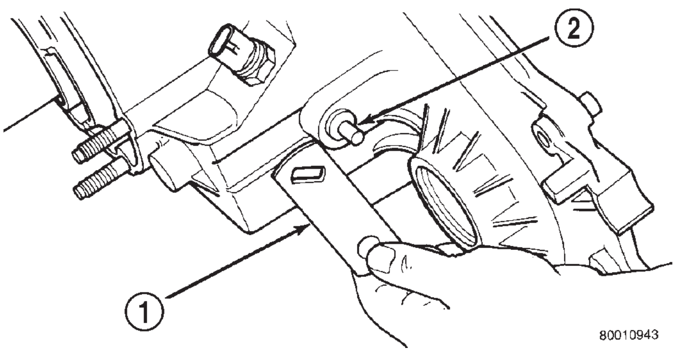


Fig. 30 Range Lever Removal

1 – RANGE LEVER
2 – SECTOR SHAFT

FRONT OUTPUT SHAFT AND DRIVE CHAIN

(1) Remove drive sprocket snap-ring (Fig. 31).
(2) Remove drive sprocket and chain (Fig. 32).
(3) Remove front output shaft (Fig. 33).

SHIFT FORKS AND MAINSHAFT

(1) Remove shift detent plug, spring and pin (Fig. 34).

(2) Remove seal plug from low range fork lockpin access hole. Then move shift sector to align low range fork lockpin with access hole.

(3) Remove range fork lockpin with size number one easy-out tool as follows:

(a) Insert easy-out tool through access hole in side of transfer case and into lock-pin.

(b) Tap easy-out tool into lock-pin with hammer until tool is securely engaged into the lock-pin.

(c) Install a t-handle, such as from a tap and die set, onto the easy-out tool.

(d) Securely tighten the t-handle onto the tool.

(e) In one motion, pull upward and turn the t-handle counter-clockwise to remove the lock-pin.

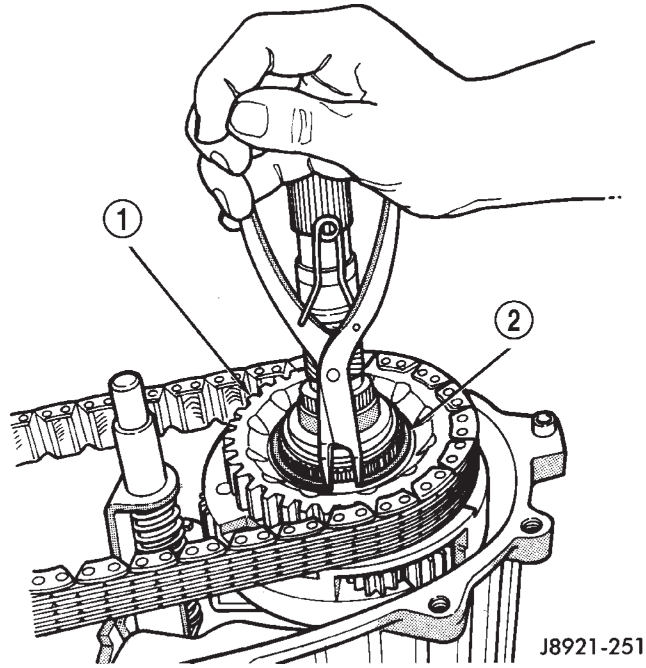


Fig. 31 Drive Sprocket Snap-Ring Removal

1 – DRIVE SPROCKET
2 – DRIVE SPROCKET SNAP RING

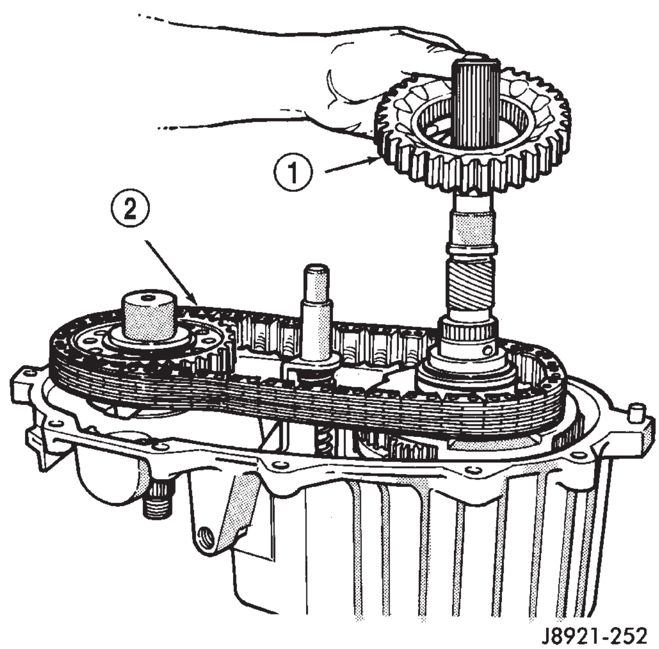


Fig. 32 Drive Sprocket And Chain Removal

1 – DRIVE SPROCKET
2 – DRIVE CHAIN

(4) Remove shift rail by pulling it straight up and out of fork (Fig. 35).

(5) Remove mode fork and mainshaft as assembly (Fig. 36).

DISASSEMBLY AND ASSEMBLY (Continued)

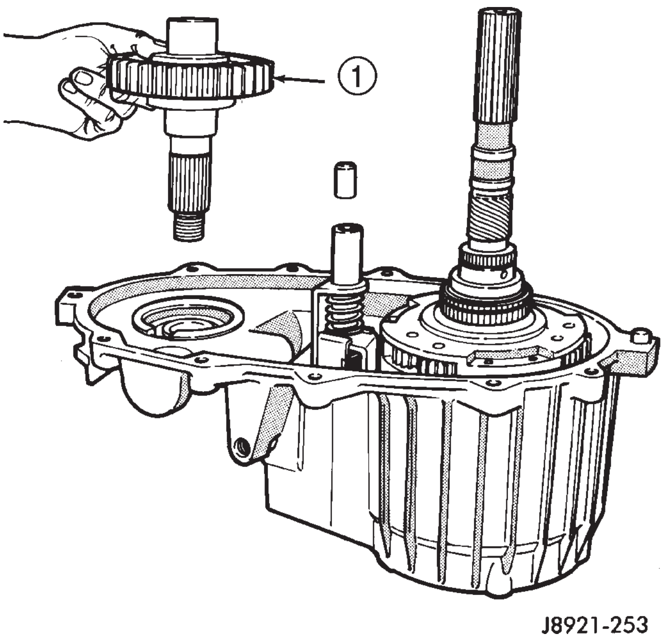


Fig. 33 Removing Front Output Shaft

1 – FRONT OUTPUT SHAFT

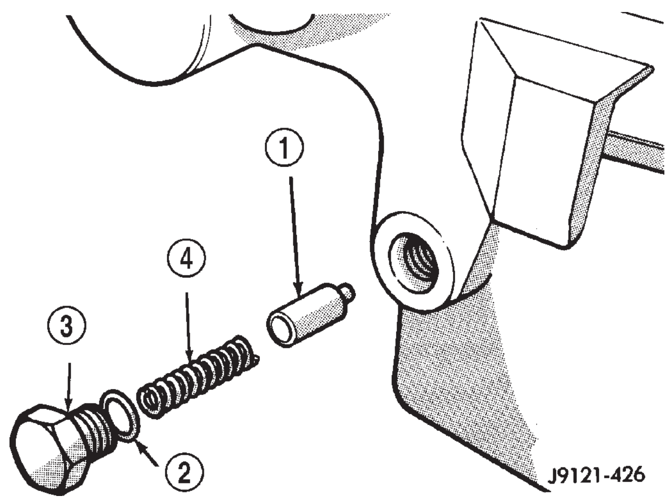


Fig. 34 Detent Component Removal

1 – PLUNGER
2 – O-RING
3 – PLUG
4 – SPRING

(6) Remove mode shift sleeve and mode fork assembly from mainshaft (Fig. 37). Note position of mode sleeve in fork and remove sleeve.

(7) Remove intermediate clutch shaft snap-ring (Fig. 38).

(8) Remove clutch shaft thrust ring (Fig. 39).

(9) Remove intermediate clutch shaft (Fig. 40).

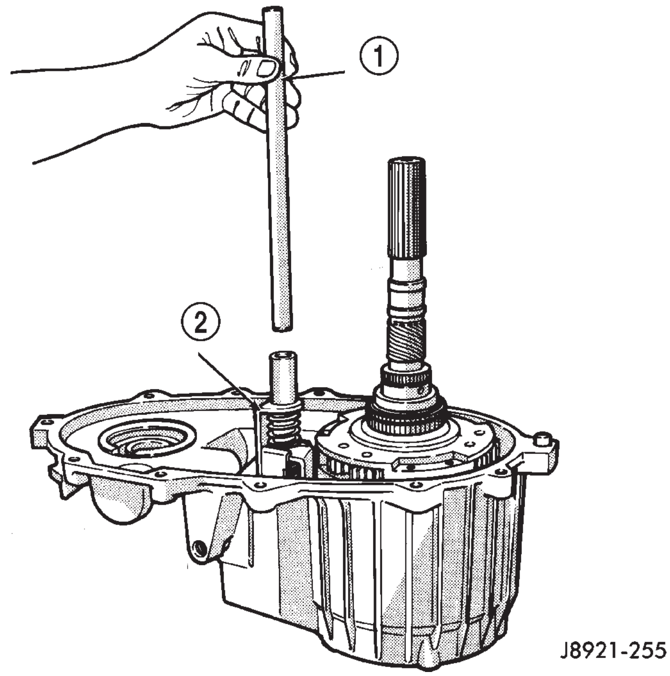


Fig. 35 Shift Rail Removal

1 – SHIFT RAIL
2 – MODE FORK

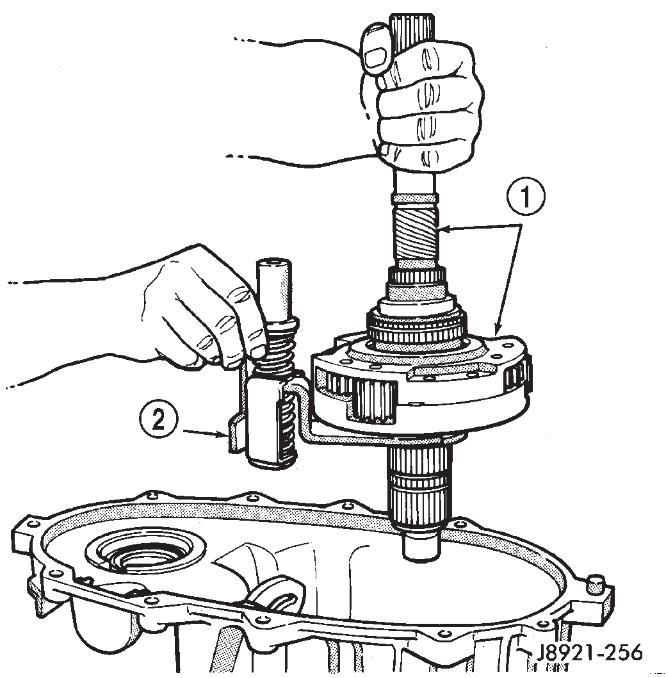


Fig. 36 Mode Fork And Mainshaft Removal

1 – MAINSHAFT ASSEMBLY
2 – MODE FORK

DISASSEMBLY AND ASSEMBLY (Continued)

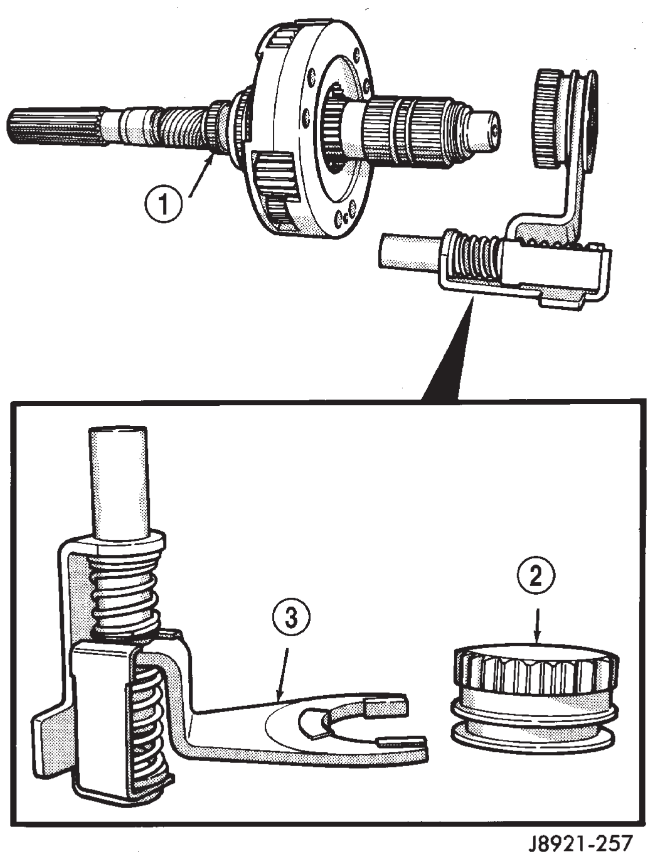


Fig. 37 Mode Fork And Sleeve Removal

1 – MAINSHAFT
2 – SLEEVE
3 – MODE FORK ASSEMBLY

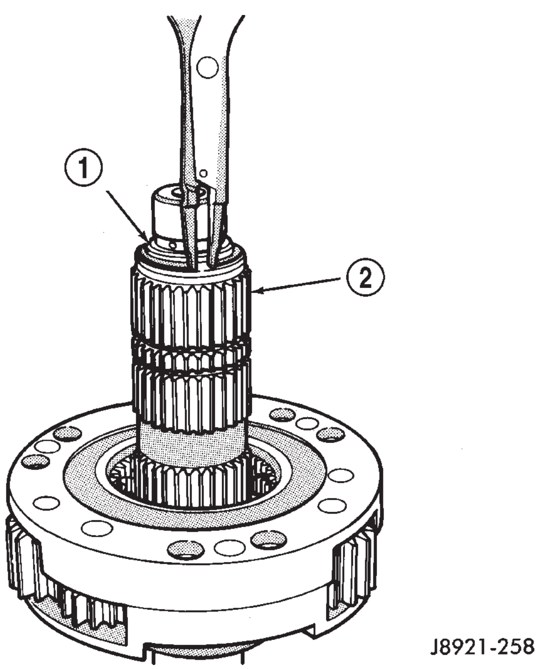


Fig. 38 Intermediate Clutch Shaft Snap-Ring Removal

1 – SNAP RING
2 – INTERMEDIATE CLUTCH SHAFT

Fig. 39 Clutch Shaft Thrust Ring Removal

1 – CLUTCH SHAFT THRUST RING

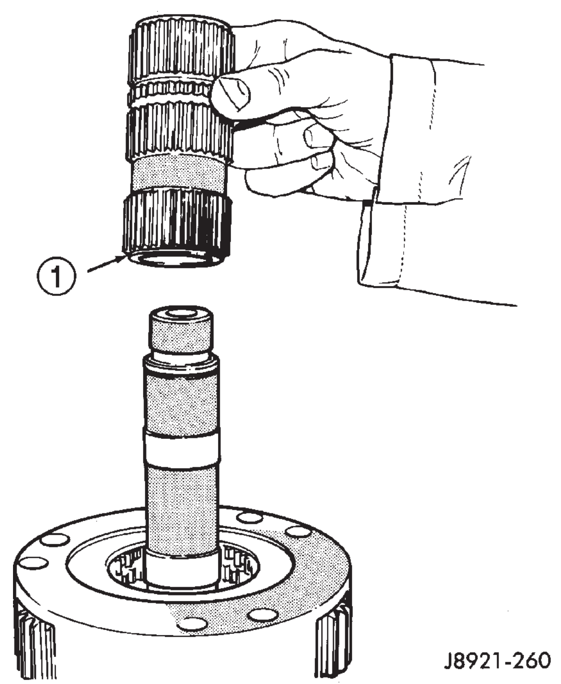


Fig. 40 Intermediate Clutch Shaft Removal

1 – INTERMEDIATE CLUTCH SHAFT

(10) Remove differential snap-ring (Fig. 41).

(11) Remove differential (Fig. 42).

(12) Remove differential needle bearings and both needle bearing thrust washers from mainshaft.

(13) Slide low range fork pin out of shift sector slot (Fig. 43).

DISASSEMBLY AND ASSEMBLY (Continued)

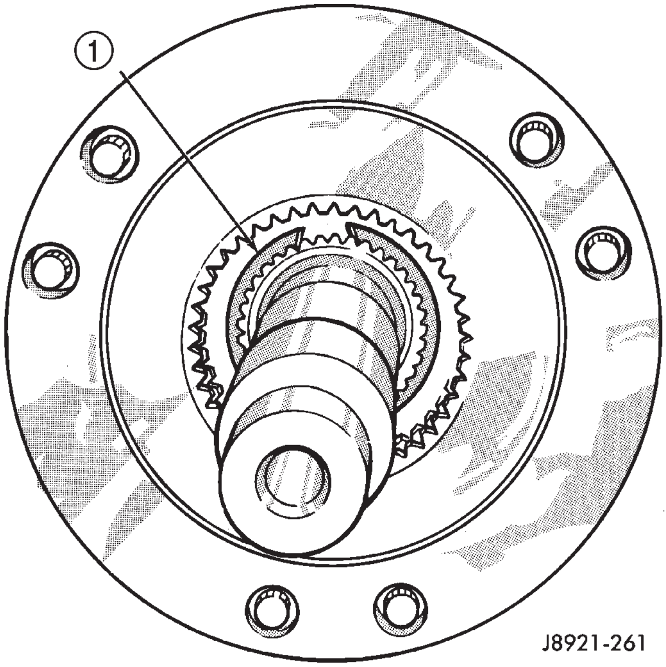


Fig. 41 Differential Snap-Ring Removal

1 – DIFFERENTIAL SNAP RING

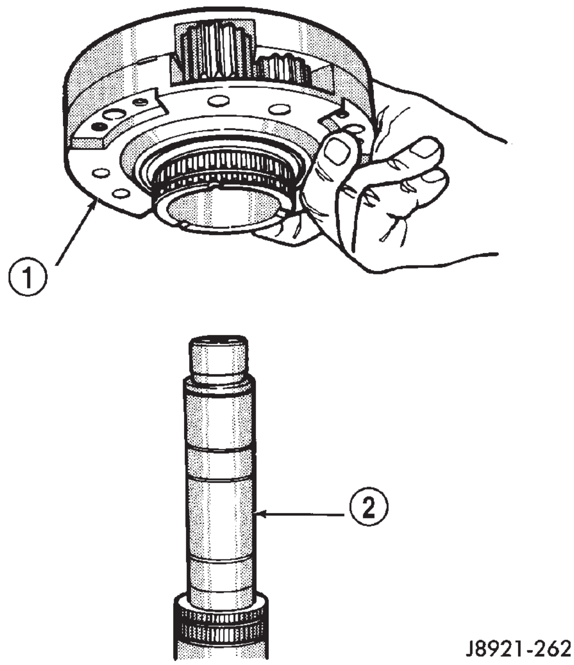


Fig. 42 Differential Removal

1 – DIFFERENTIAL
2 – MAINSHAFT

(14) Remove low range fork and hub (Fig. 44).
(15) Remove shift sector (Fig. 45).
(16) Remove shift sector bushing and O-ring (Fig. 46).

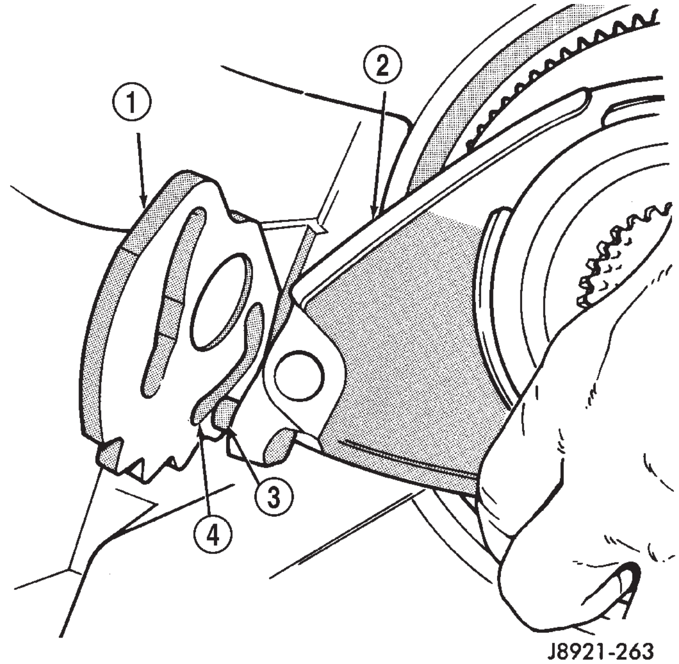


Fig. 43 Disengaging Low Range Fork

1 – SHIFT SECTOR
2 – LOW RANGE FORK
3 – PIN
4 – SLOT

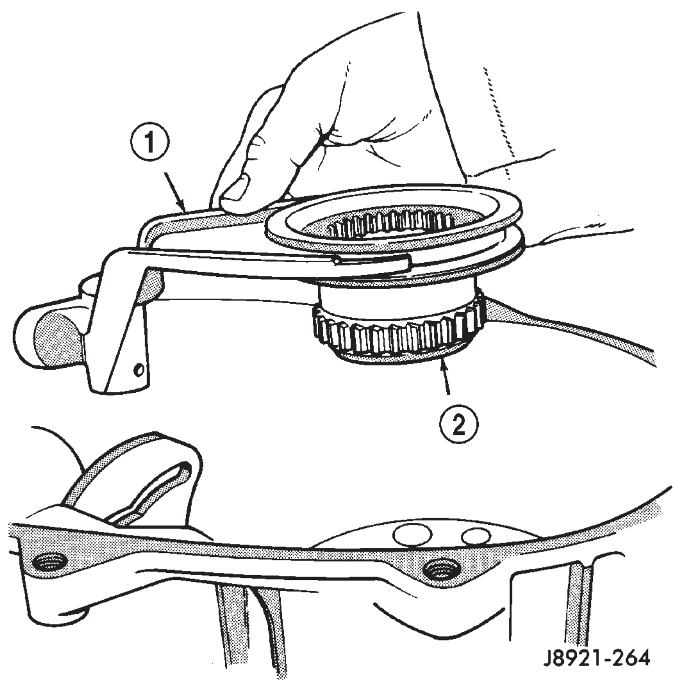


Fig. 44 Low Range Fork And Hub Removal

1 – LOW RANGE FORK
2 – FORK HUB

INPUT GEAR/LOW RANGE ASSEMBLY

(1) Remove front bearing retainer bolts.

DISASSEMBLY AND ASSEMBLY (Continued)

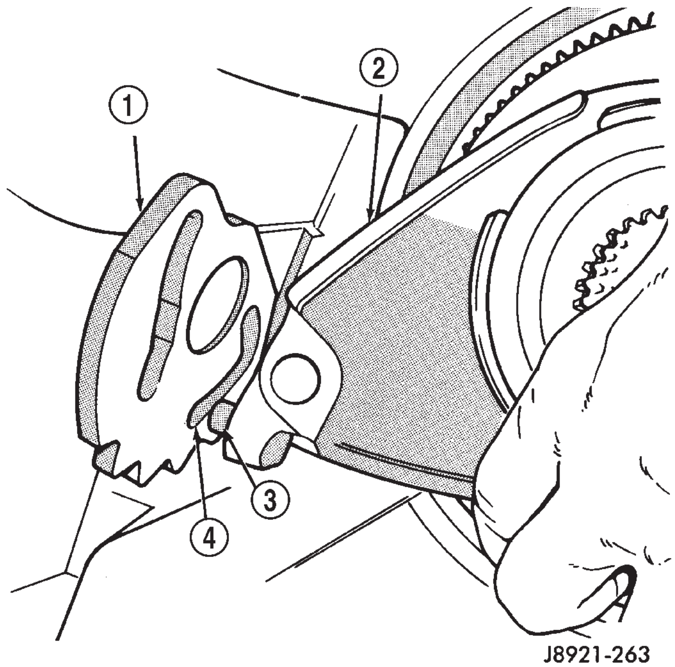


Fig. 45 Shift Sector Position

1 – SHIFT SECTOR
2 – LOW RANGE FORK
3 – PIN
4 – SLOT

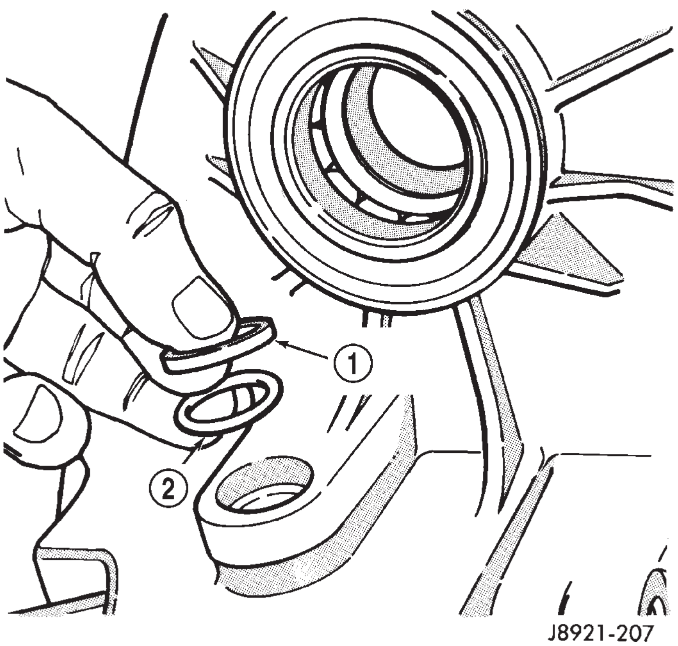


Fig. 46 Sector Bushing And O-Ring Removal

1 – SHIFT SECTOR BUSHING
2 – O-RING

(2) Remove front bearing retainer. Carefully pry retainer loose with screwdriver (Fig. 47). Position screwdriver in slots cast into retainer.

(3) Remove input gear snap-ring (Fig. 48).

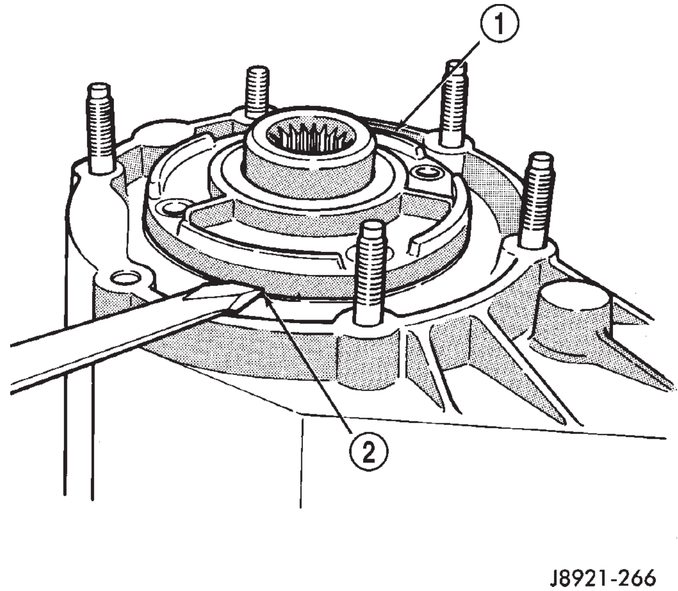


Fig. 47 Front Bearing Retainer Removal

1 – FRONT BEARING RETAINER
2 – RETAINER SLOT

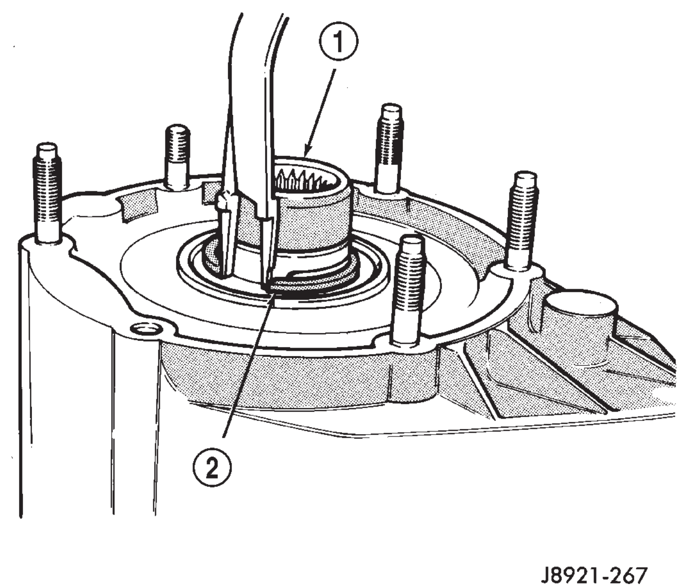


Fig. 48 Input Gear Snap-Ring Removal

1 – INPUT GEAR
2 – SNAP RING

(4) Remove input/low range gear assembly from bearing with Tool Handle C-4171 and Tool 7829A (Fig. 49).

(5) Remove low range gear snap-ring (Fig. 50).

(6) Remove input gear retainer, thrust washers and input gear from low range gear (Fig. 51).

DISASSEMBLY AND ASSEMBLY (Continued)

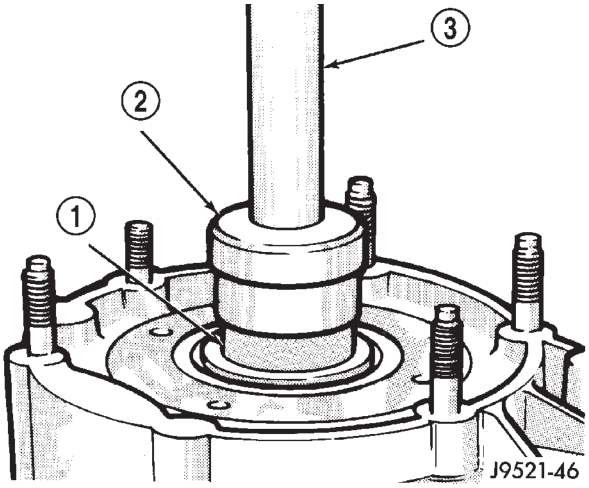


Fig. 49 Input And Low Range Gear Assembly Removal

1 – INPUT-LOW RANGE GEARS
2 – SPECIAL TOOL 7829A
3 – SPECIAL TOOL C-4171

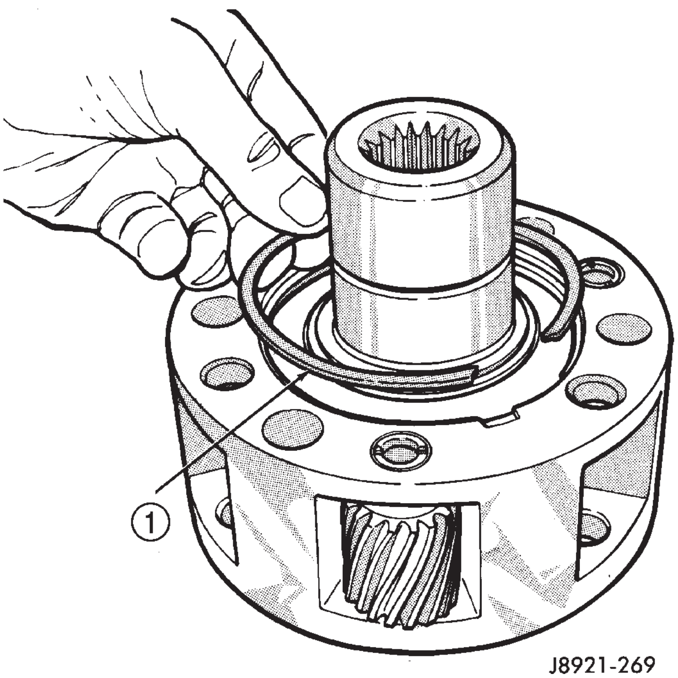


Fig. 50 Low Range Gear Snap-Ring Removal/ Installation

1 – LOW RANGE GEAR SNAP RING

(7) Inspect low range annulus gear (Fig. 52). **Gear is not a serviceable component. If damaged, replace gear and front case as assembly.**

(8) Remove oil seals from following components:

- front bearing retainer.
- rear retainer.
- oil pump.
- case halves.

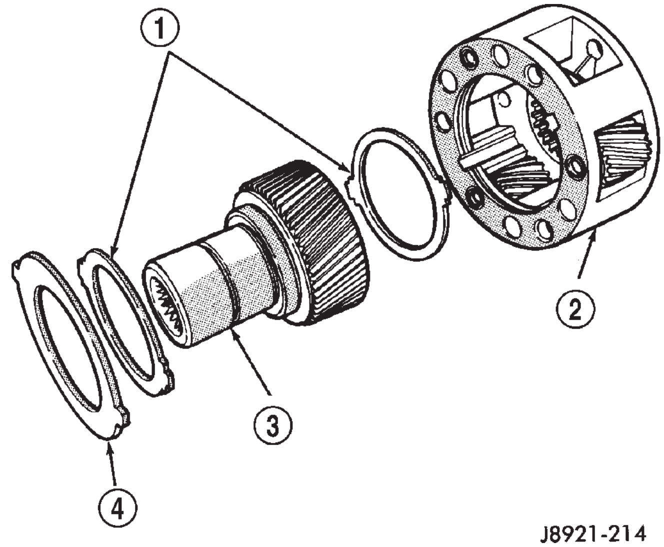


Fig. 51 Low Range Gear Disassembly

1 – THRUST WASHERS
2 – LOW RANGE GEAR
3 – INPUT GEAR
4 – RETAINER

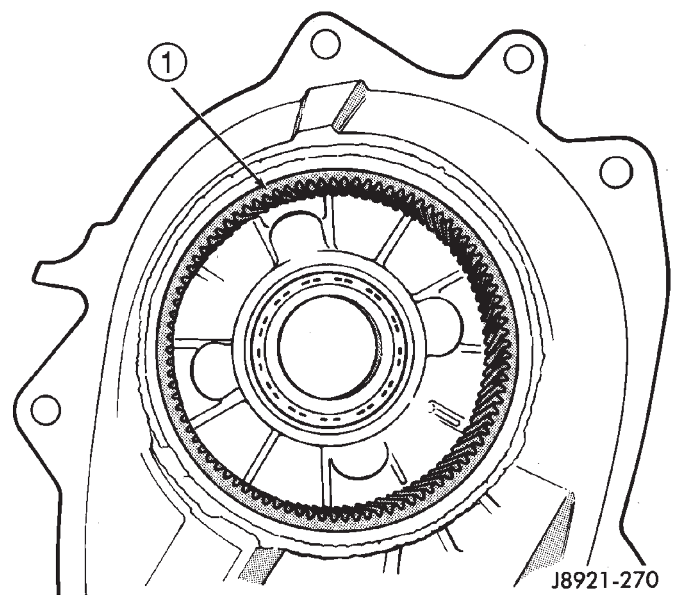


Fig. 52 Inspecting Low Range Annulus Gear

1 – LOW RANGE ANNULUS GEAR

DIFFERENTIAL

(1) Mark differential case halves for reference.

(2) Remove differential case bolts.

(3) Invert differential on workbench.

(4) Separate top case from bottom case. Use slots in case halves to pry them apart (Fig. 53).

(5) Remove thrust washers and planet gears from case pins (Fig. 54).

DISASSEMBLY AND ASSEMBLY (Continued)

(6) Remove mainshaft and sprocket gears from bottom case (Fig. 55). Note gear position for reference before separating them.

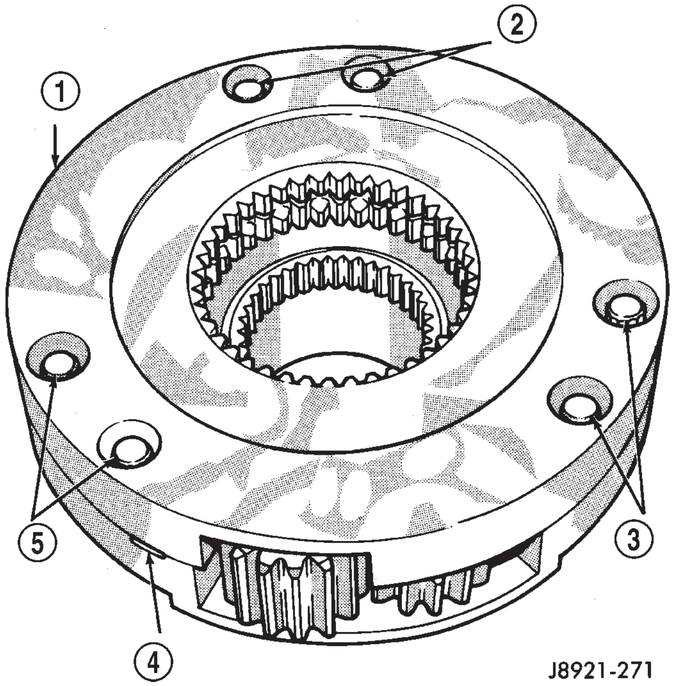


Fig. 53 Separating Differential Case Halves

1 – TOP CASE
2 – CASE BOLTS
3 – CASE BOLTS
4 – CASE SLOTS
5 – CASE BOLTS

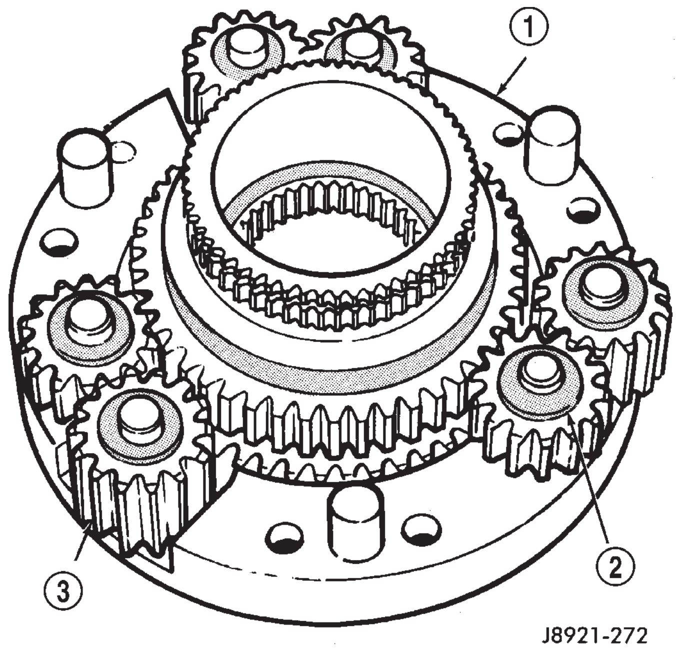


Fig. 54 Planet Gears And Thrust Washer Removal

1 – BOTTOM CASE
2 – THRUST WASHERS (12)
3 – PLANET GEARS (6)

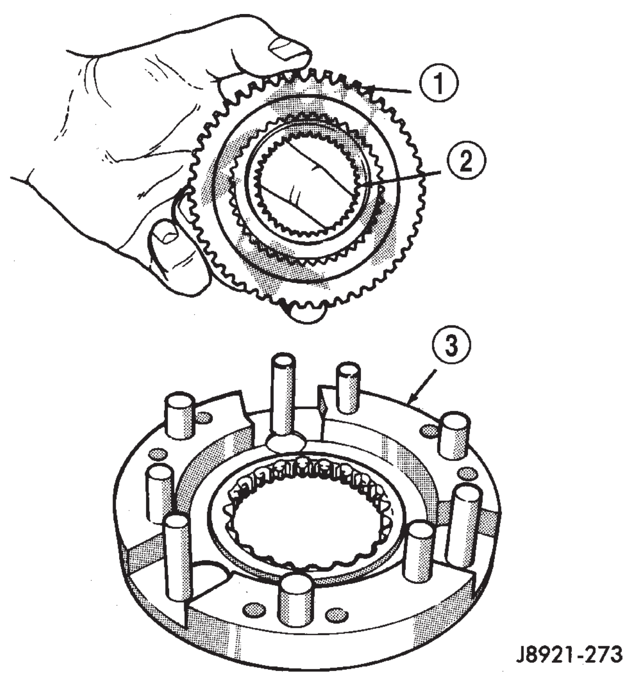


Fig. 55 Mainshaft And Sprocket Gear Removal

1 – MAINSHAFT GEAR
2 – SPROCKET GEAR
3 – BOTTOM CASE

ASSEMBLY

Lubricate transfer case components with automatic transmission fluid or petroleum jelly (where indicated) during assembly.

CAUTION: The bearing bores in various transfer case components contain oil feed holes. Make sure replacement bearings do not block the holes.

BEARING AND SEAL

(1) Remove snap-ring that retains front output shaft front bearing in case (Fig. 56). Then remove bearing. Use hammer handle, or hammer and brass punch to tap bearing out of case.

DISASSEMBLY AND ASSEMBLY (Continued)

(2) Install new front output shaft front bearing with Tool Handle C-4171 and Installer 8033A with the tapered cone upward (Fig. 57).

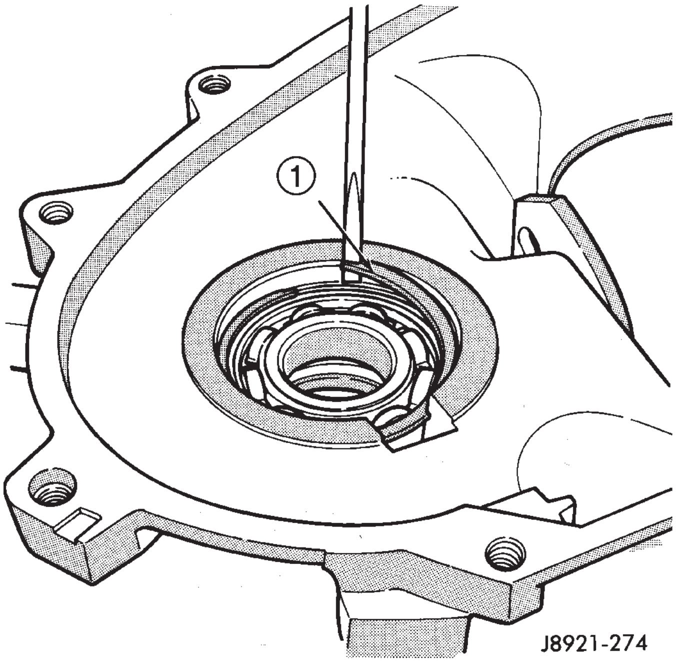


Fig. 56 Front Output Shaft Front Bearing Snap-Ring Removal

1 – FRONT BEARING SNAP RING

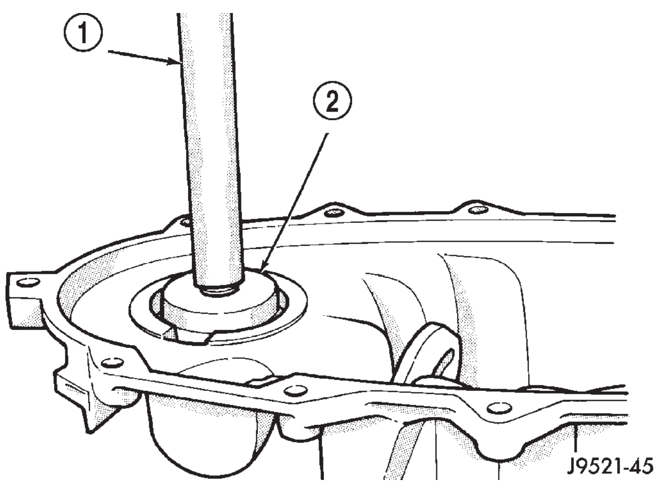


Fig. 57 Front Output Shaft Front Bearing Installation

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL 8033A

(3) Install front bearing snap-ring (Fig. 56).

(4) Remove front output shaft seal using an appropriate pry tool (Fig. 58) or slide-hammer mounted screw.

(5) Install new front output shaft oil seal with Installer 6952-A (Fig. 59).

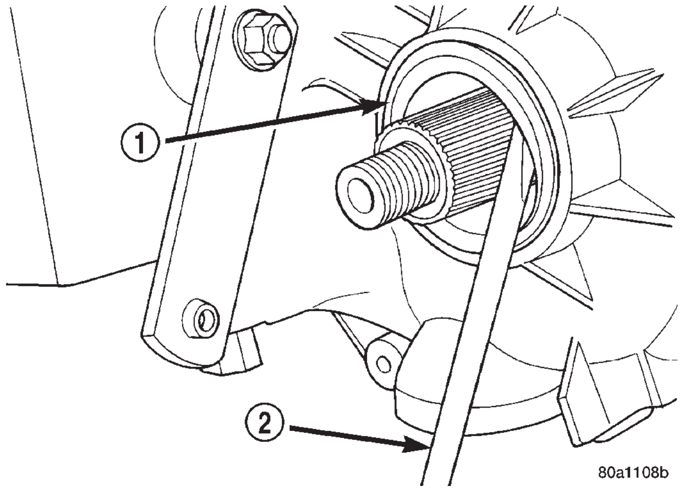


Fig. 58 Remove Front Output Shaft Seal

1 – OUTPUT SHAFT SEAL
2 – PRYBAR

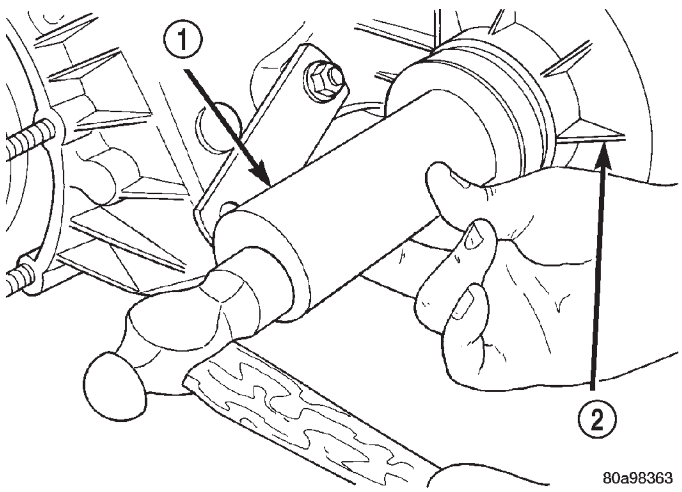


Fig. 59 Install Front Output Shaft Seal

1 – INSTALLER 6952–A
2 – TRANSFER CASE

(6) Remove input gear bearing with Tool Handle C-4171 and Remover C-4210 (Fig. 60).

(7) Install snap-ring on new input gear bearing.

DISASSEMBLY AND ASSEMBLY (Continued)

(8) Install new input gear bearing with Tool Handle C-4171 and Remover C-4210. Install bearing far enough to seat snap-ring against case (Fig. 61).

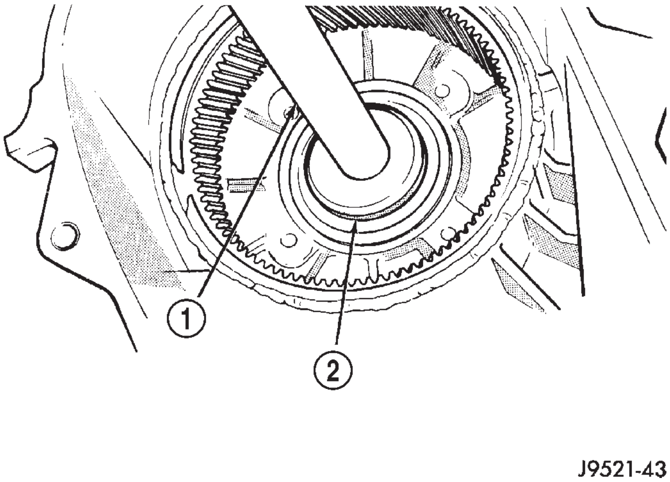


Fig. 60 Input Gear Bearing Removal

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL C-4210

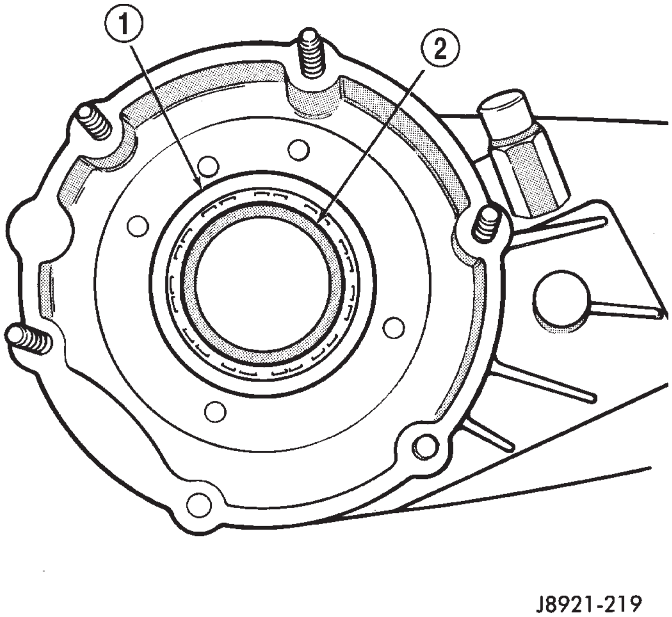


Fig. 61 Seating Input Gear Bearing

1 – SNAP RING
2 – INPUT SHAFT BEARING

(9) Remove the input gear pilot bearing by inserting a suitably sized drift into the splined end of the input gear and driving the bearing out with the drift and a hammer (Fig. 62).

(10) Install new pilot bearing with Installer 8128 and Handle C-4171 (Fig. 63).

(11) Install new seal in front bearing retainer with Installer 7884 (Fig. 64).

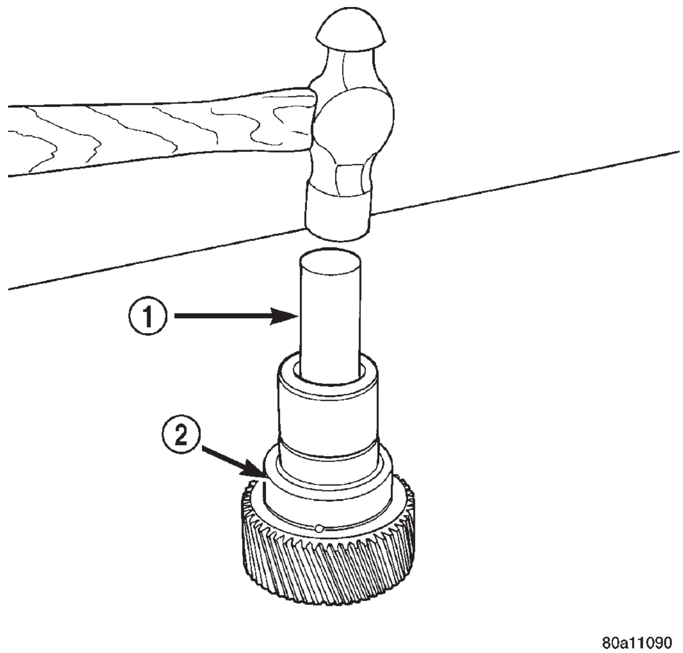


Fig. 62 Remove Input Gear Pilot Bearing

1 – DRIFT
2 – INPUT GEAR

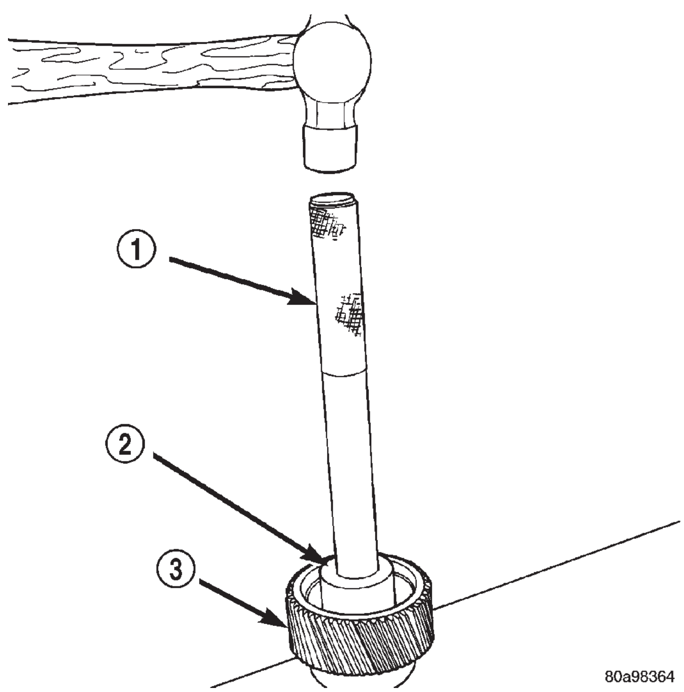


Fig. 63 Install Input Gear Pilot Bearing

1 – HANDLE C-4171
2 – INSTALLER 8128
3 – INPUT GEAR

(12) Remove output shaft rear bearing with the screw and jaws from Remover L-4454 and Cup 8148 (Fig. 65).

DISASSEMBLY AND ASSEMBLY (Continued)

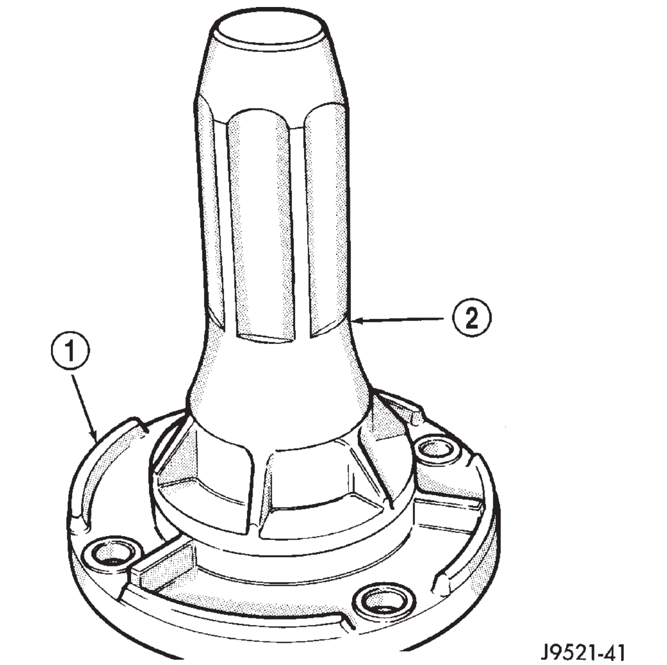


Fig. 64 Front Bearing Retainer Seal Installation

1 – FRONT BEARING RETAINER
2 – SPECIAL TOOL 7884

(13) Install new bearing with Tool Handle C-4171 and Installer 5066 (Fig. 66). Lubricate bearing after installation.

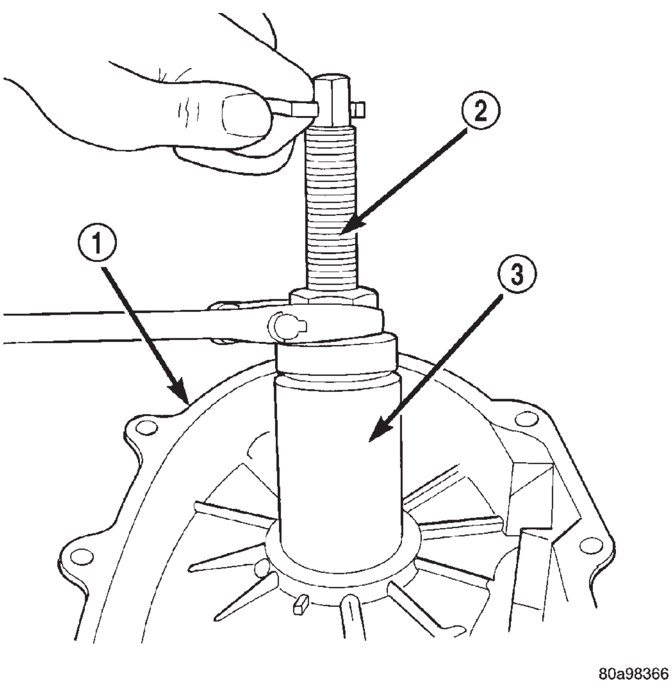


Fig. 65 Remove Front Output Shaft Rear Bearing

1 – REAR CASE
2 – SPECIAL TOOL L-4454–1 AND L-4454–3
3 – SPECIAL TOOL 8148

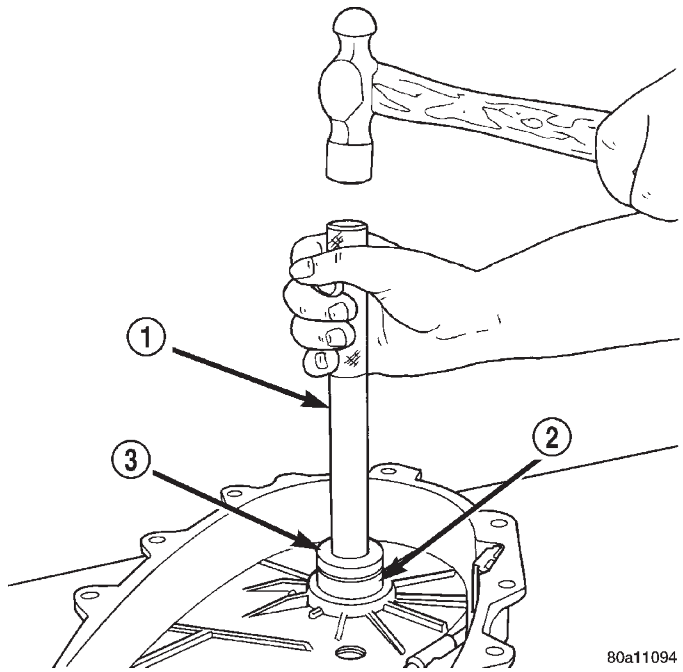


Fig. 66 Install Front Output Shaft Rear Bearing

1 – HANDLE C-4171
2 – OUTPUT SHAFT INNER BEARING
3 – INSTALLER 5066

(14) Install new seal in oil pump feed housing with Special Tool 7888 (Fig. 67).

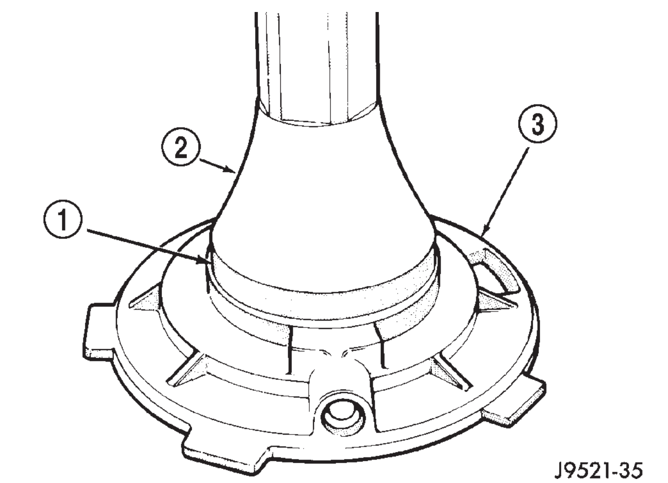


Fig. 67 Oil Pump Seal Installation

1 – HOUSING SEAL
2 – SPECIAL TOOL 7888
3 – OIL PUMP FEED HOUSING

(15) Install new pickup tube O-ring in oil pump (Fig. 68).

(16) Remove rear retainer bearing with Installer 8128 and Handle C-4171, NV242HD only.

(17) Install rear bearing in retainer with Handle C-4171 and Installer 5064 (Fig. 69), NV242HD only.

DISASSEMBLY AND ASSEMBLY (Continued)

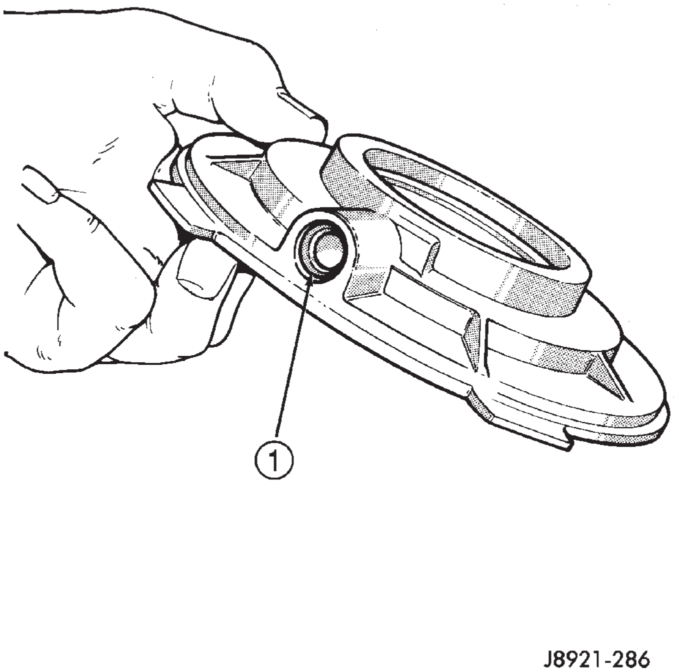


Fig. 68 Pickup Tube O-Ring Installation

1 – PICKUP TUBE O-RING

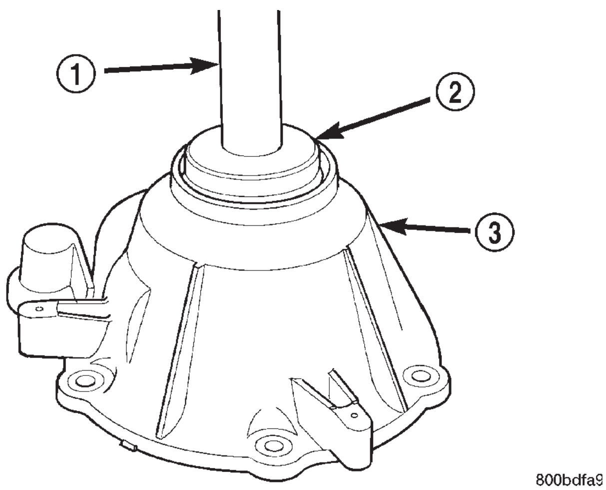


Fig. 69 Installing Rear Bearing In Retainer

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL 5064
3 – REAR RETAINER

DIFFERENTIAL

(1) Lubricate differential components with automatic transmission fluid.

(2) Install sprocket gear in differential bottom case (Fig. 70).

(3) Install differential planet gears and new thrust washers (Fig. 71). **Be sure thrust washers are installed at top and bottom of each planet gear.**

(4) Install differential mainshaft gear (Fig. 71).

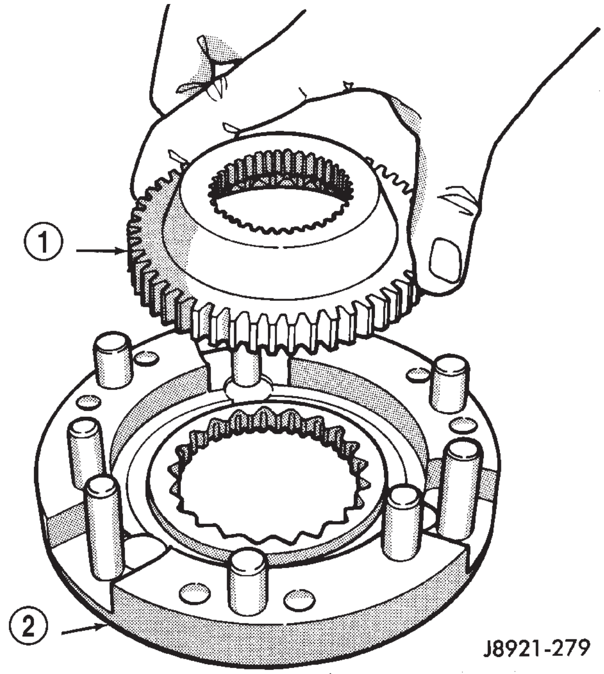


Fig. 70 Installing Differential Sprocket Gear

1 – SPROCKET GEAR
2 – BOTTOM CASE

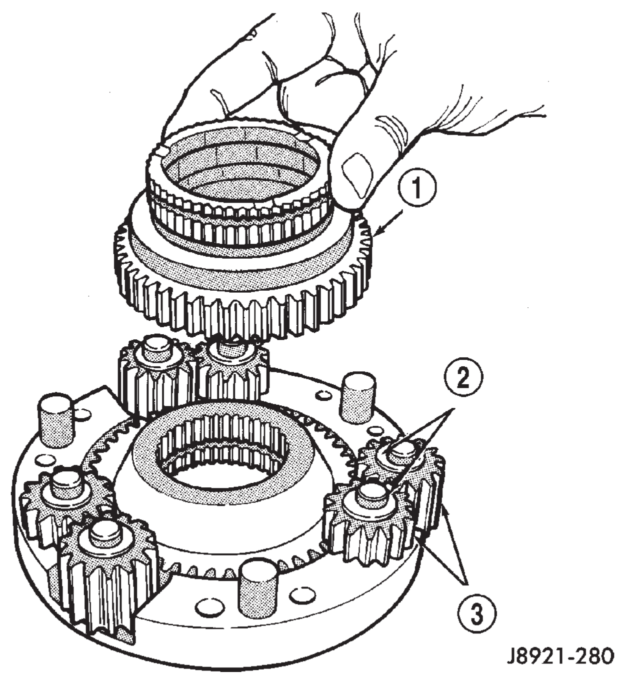


Fig. 71 Installing Mainshaft And Planet Gears

1 – MAINSHAFT GEAR
2 – THRUST WASHERS (12)
3 – PLANET GEARS (6)

(5) Align and position differential top case on bottom case (Fig. 72). Align using scribe marks made at disassembly.

DISASSEMBLY AND ASSEMBLY (Continued)

(6) While holding differential case halves together, invert the differential and start the differential case bolts.

(7) Tighten differential case bolts to specified torque.

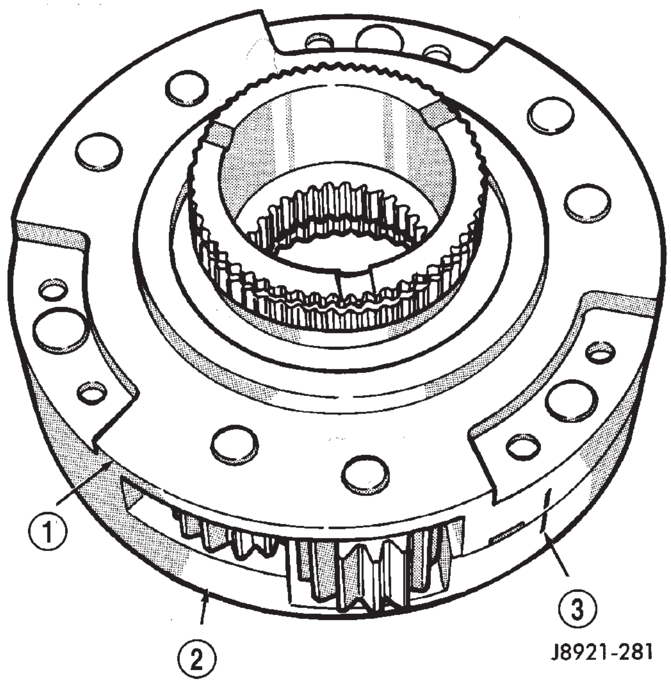


Fig. 72 Differential Case Assembly

1 – TOP CASE
2 – BOTTOM CASE
3 – CASE ALIGNMENT MARKS

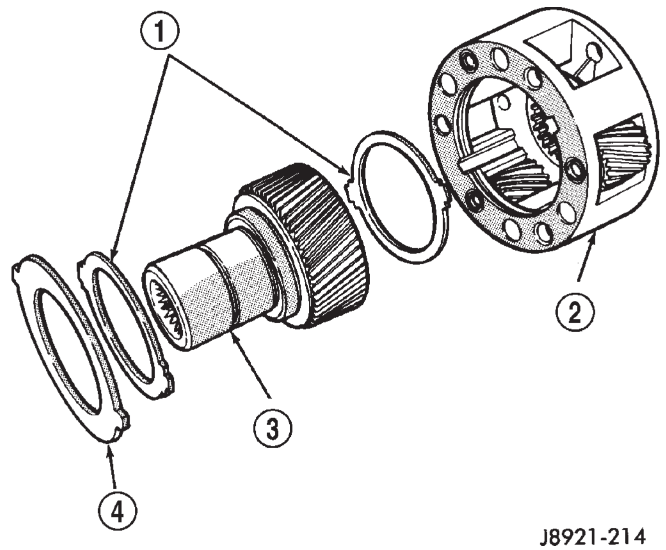


Fig. 73 Low Range And Input Gear Assembly

1 – THRUST WASHERS
2 – LOW RANGE GEAR
3 – INPUT GEAR
4 – RETAINER

INPUT GEAR/LOW RANGE ASSEMBLY

(1) Assemble low range gear, input gear thrust washers, input gear and input gear retainer (Fig. 73).

(2) Install low range gear snap ring (Fig. 74).

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

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

(5) Press input gear shaft into front bearing.

(6) Install new input gear snap ring (Fig. 75).

(7) Apply 3 mm (1/8 in.) wide bead of Mopar® gasket maker or silicone adhesive sealer to seal surface of front bearing retainer.

(8) Install front bearing retainer (Fig. 76). Tighten retainer bolts to 16 ft. lbs. (21 N·m) torque.

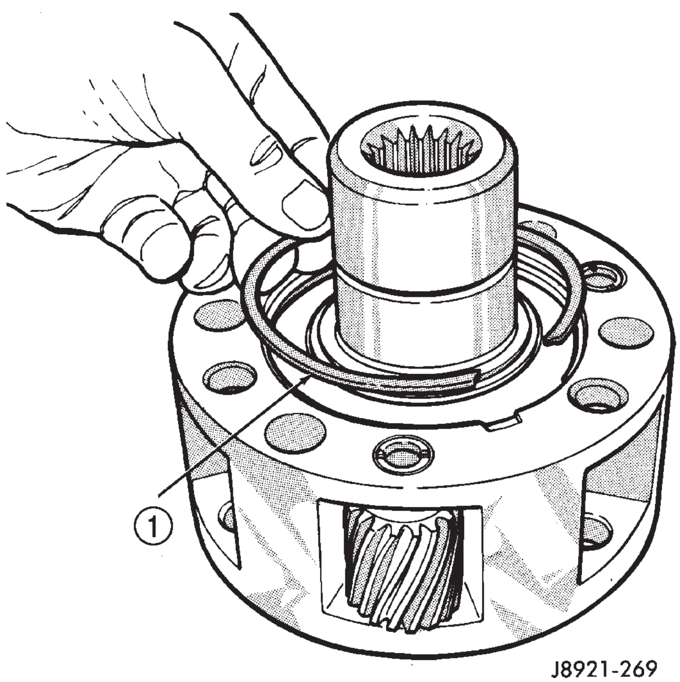


Fig. 74 Install Low Range Gear Snap Ring

1 – LOW RANGE GEAR SNAP RING

DISASSEMBLY AND ASSEMBLY (Continued)

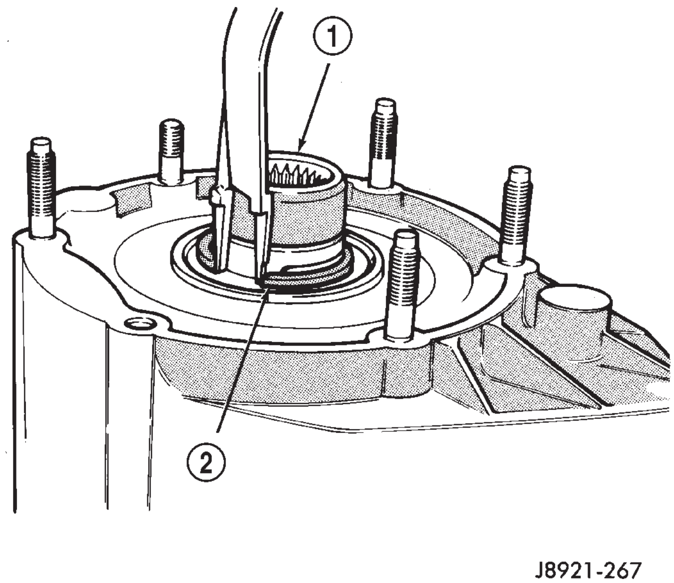


Fig. 75 Input Gear Snap Ring Installation

1 – INPUT GEAR
2 – SNAP RING

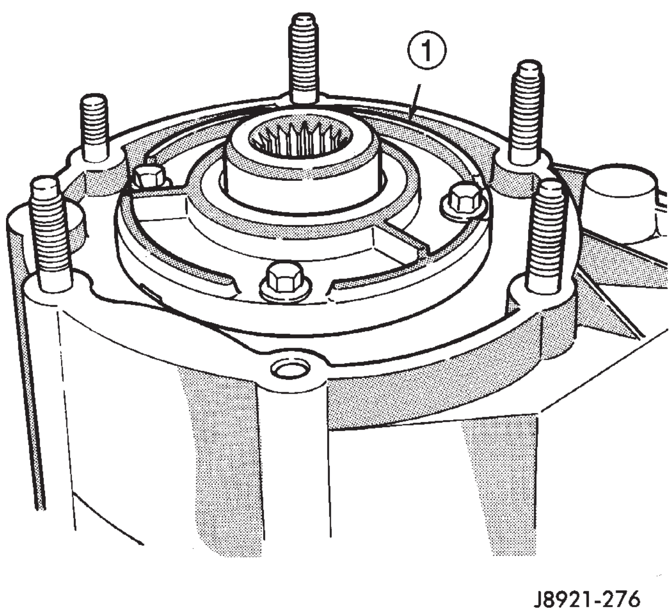


Fig. 76 Installing Front Bearing Retainer

1 – FRONT BEARING RETAINER

SHIFT FORKS AND MAINSHAFT

(1) Install new sector shaft O-ring and bushing (Fig. 77).

(2) Install shift sector.

(3) Install new pads on low range fork, if necessary, (Fig. 78).

(4) Assemble low range fork and hub (Fig. 78).

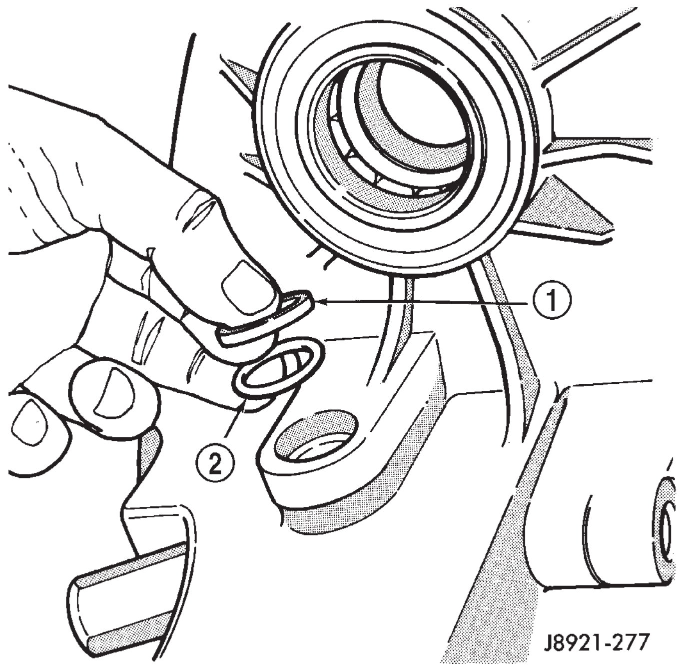


Fig. 77 Sector O-Ring And Bushing Installation

1 – SECTOR BUSHING
2 – O-RING

(5) Position low range fork and hub in case. Be sure low range fork pin is engaged in shift sector slot (Fig. 79).

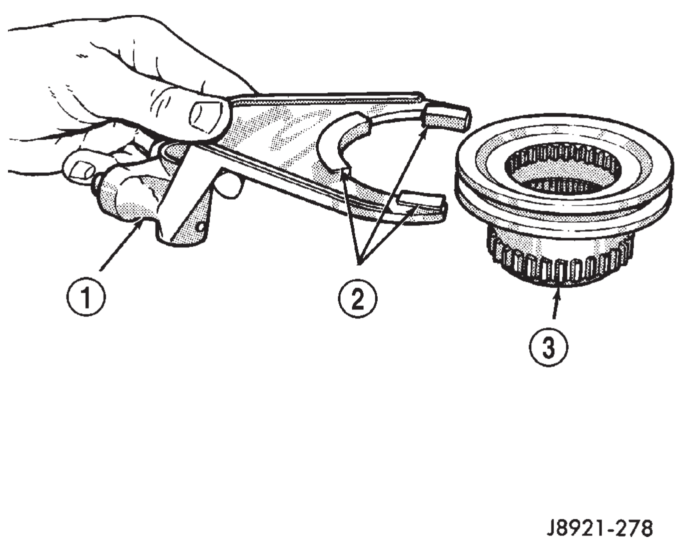


Fig. 78 Assembling Low Range Fork And Hub

1 – LOW RANGE FORK
2 – PADS
3 – HUB

(6) Install first mainshaft bearing spacer on mainshaft (Fig. 80).

(7) Install bearing rollers on mainshaft (Fig. 80). **Coat bearing rollers with generous quantity of petroleum jelly to hold them in place.**

DISASSEMBLY AND ASSEMBLY (Continued)

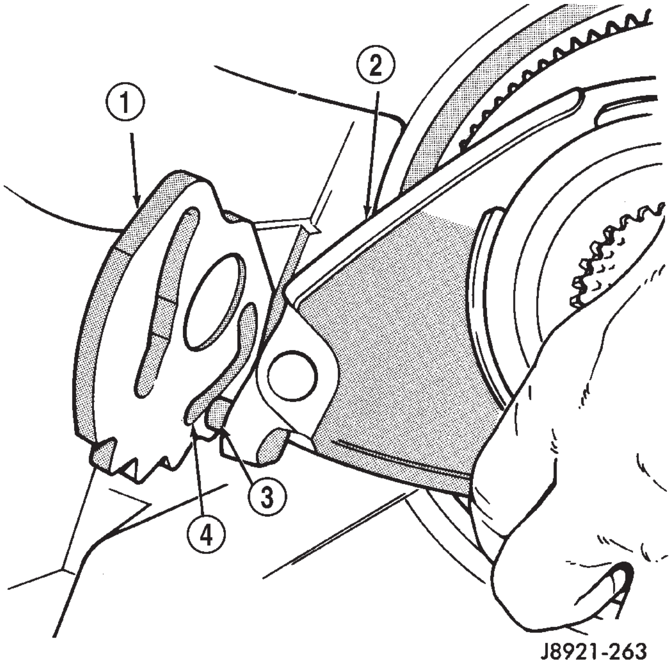


Fig. 79 Positioning Low Range Fork

1 – SHIFT SECTOR
2 – LOW RANGE FORK
3 – PIN
4 – SLOT

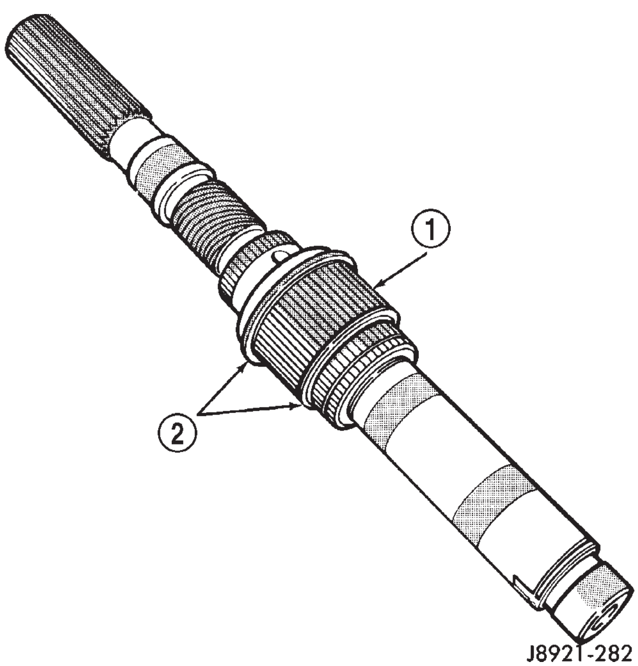


Fig. 80 Installing Mainshaft Bearing Rollers and Spacers

1 – MAINSHAFT BEARING ROLLERS
2 – BEARING SPACERS

(8) Install remaining bearing spacer on mainshaft (Fig. 80). Do not displace any bearings while installing spacer.

(9) Install differential (Fig. 81). **Do not displace mainshaft bearings when installing differential.**

(10) Install differential snap-ring (Fig. 82).

(11) Install intermediate clutch shaft (Fig. 83).

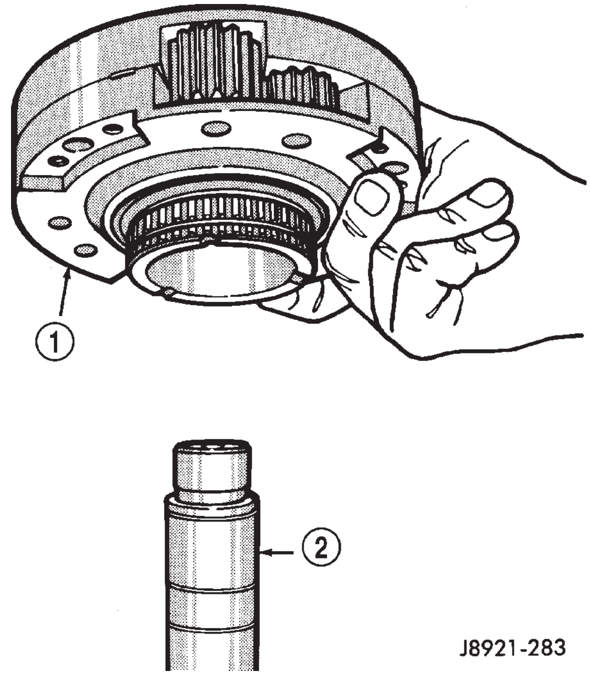


Fig. 81 Differential Installation

1 – DIFFERENTIAL
2 – MAINSHAFT

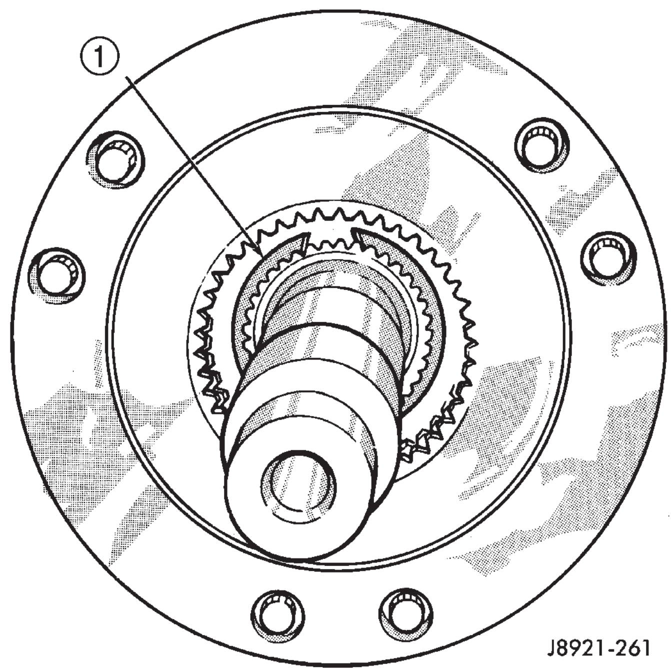


Fig. 82 Installing Differential Snap-Ring

1 – DIFFERENTIAL SNAP RING

(12) Install clutch shaft thrust washer (Fig. 84).

(13) Install clutch shaft snap-ring (Fig. 85).

DISASSEMBLY AND ASSEMBLY (Continued)

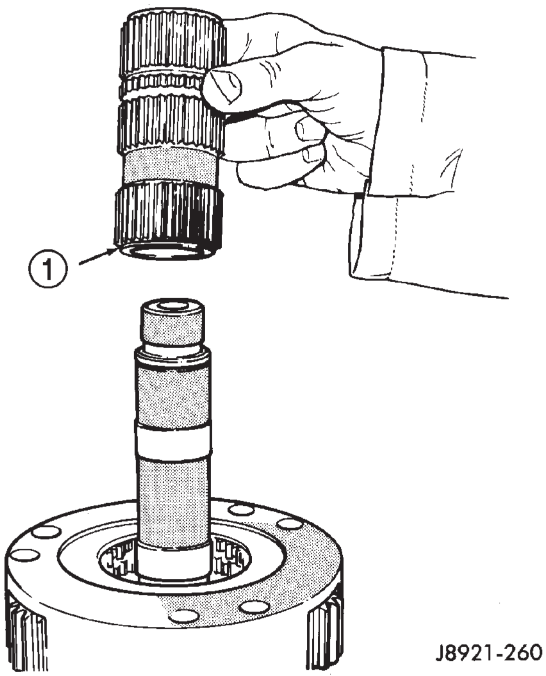


Fig. 83 Installing Intermediate Clutch Shaft

1 – INTERMEDIATE CLUTCH SHAFT

(14) Inspect mode fork assembly (Fig. 86). Replace pads and bushing if necessary. Replace fork tube if bushings inside tube are worn or damaged. Also check springs and slider bracket (Fig. 86). Replace worn, damaged components.

Fig. 84 Installing Clutch Shaft Thrust Washer

1 – CLUTCH SHAFT THRUST RING

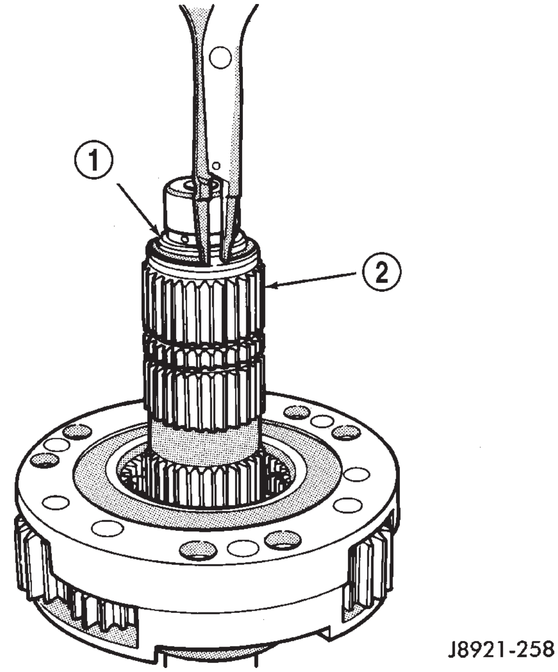


Fig. 85 Installing Clutch Shaft Snap-Ring

1 – SNAP RING
2 – INTERMEDIATE CLUTCH SHAFT

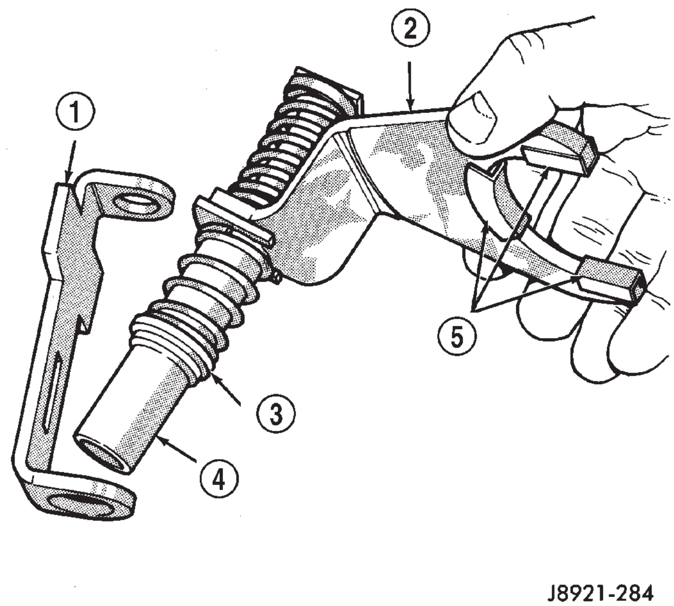


Fig. 86 Mode Fork Assembly Inspection

1 – SLIDER
2 – MODE FORK
3 – BUSHING/SPRING
4 – TUBE
5 – PADS

(15) Install mode sleeve in mode fork (Fig. 87). Then install assembled sleeve and fork on mainshaft. Be sure mode sleeve splines are engaged in differential splines.

DISASSEMBLY AND ASSEMBLY (Continued)

(16) Install mode fork and mainshaft assembly in case (Fig. 88). Rotate mainshaft slightly to engage shaft with low range gears.

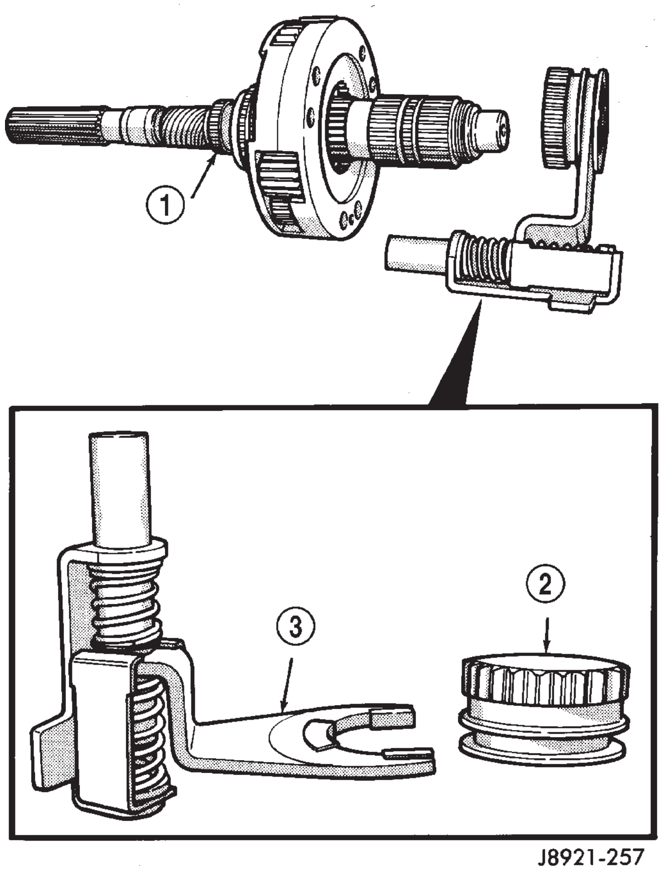


Fig. 87 Installing Mode Fork And Sleeve

1 – MAINSHAFT
2 – SLEEVE
3 – MODE FORK ASSEMBLY

(17) Rotate mode fork pin into shift sector slot.

(18) Install shift rail (Fig. 89). **Be sure rail is seated in both shift forks.**

(19) Rotate shift sector to align lockpin hole in low range fork with access hole in case.

(20) Insert an easy-out in range fork lockpin to hold it securely for installation (Fig. 90). **Lockpin is slightly tapered on one end. Insert tapered end into fork and rail.**

(21) Insert lockpin through access hole and into shift fork (Fig. 90). Then remove easy-out and seat the pin with pin punch.

(22) Install plug in lockpin access hole.

(23) Install detent plunger, detent spring and detent plug in case (Fig. 91).

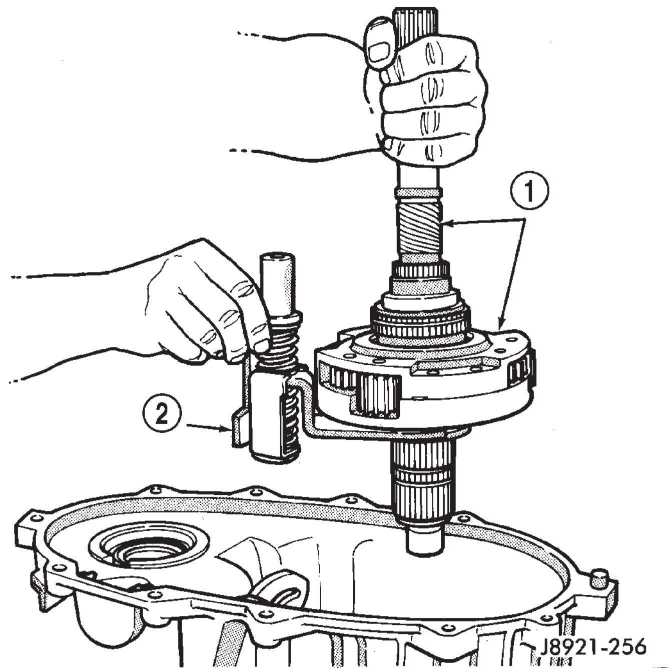


Fig. 88 Assembled Mainshaft And Mode Fork Installation

1 – MAINSHAFT ASSEMBLY
2 – MODE FORK

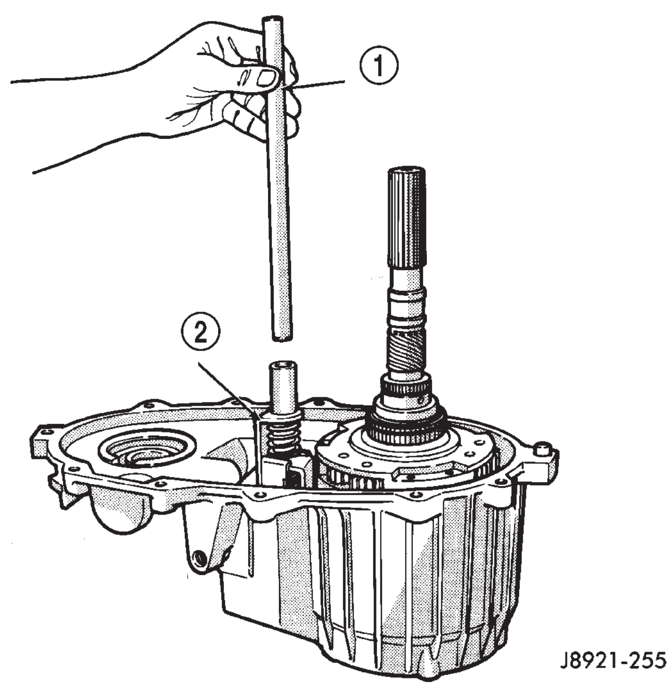


Fig. 89 Shift Rail Installation

1 – SHIFT RAIL
2 – MODE FORK

DISASSEMBLY AND ASSEMBLY (Continued)

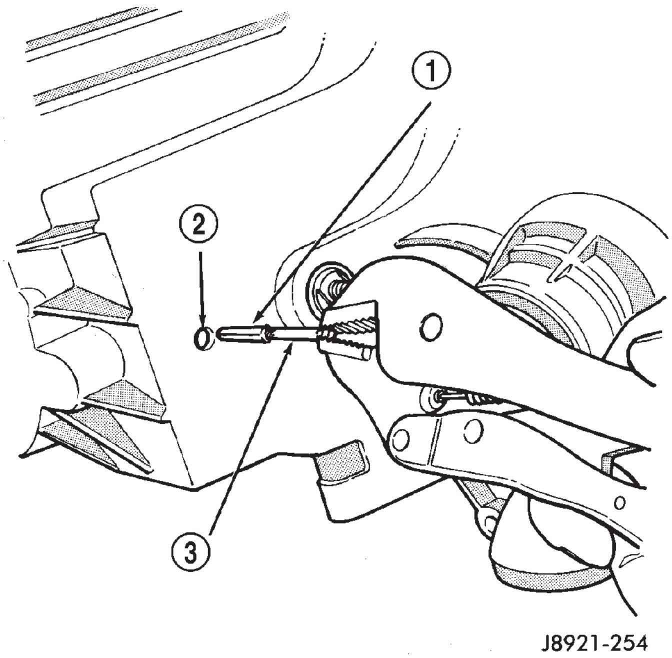


Fig. 90 Installing Low Range Fork Lockpin

1 – LOW RANGE FORK LOCK PIN
2 – ACCESS HOLE
3 – EASY-OUT

FRONT OUTPUT SHAFT AND DRIVE CHAIN

(1) Install front output shaft (Fig. 92).

(2) Install drive chain (Fig. 92). Engage chain with front output shaft sprocket teeth.

(3) Install drive sprocket (Fig. 92). Engage drive sprocket teeth with chain. Then engage sprocket splines with mainshaft splines.

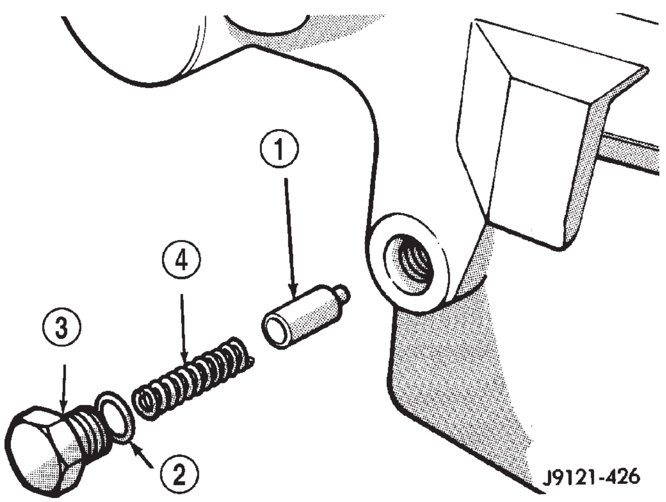


Fig. 91 Detent Pin, Spring And Plug Installation

1 – PLUNGER
2 – O-RING
3 – PLUG
4 – SPRING

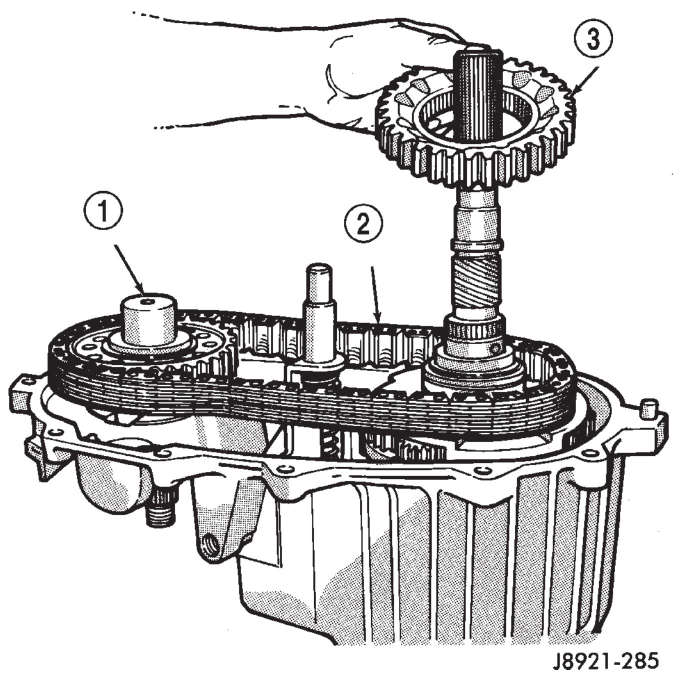


Fig. 92 Drive Chain And Sprocket Installation

1 – FRONT OUTPUT SHAFT
2 – DRIVE CHAIN
3 – DRIVE SPROCKET

(4) Install drive sprocket snap-ring (Fig. 93).

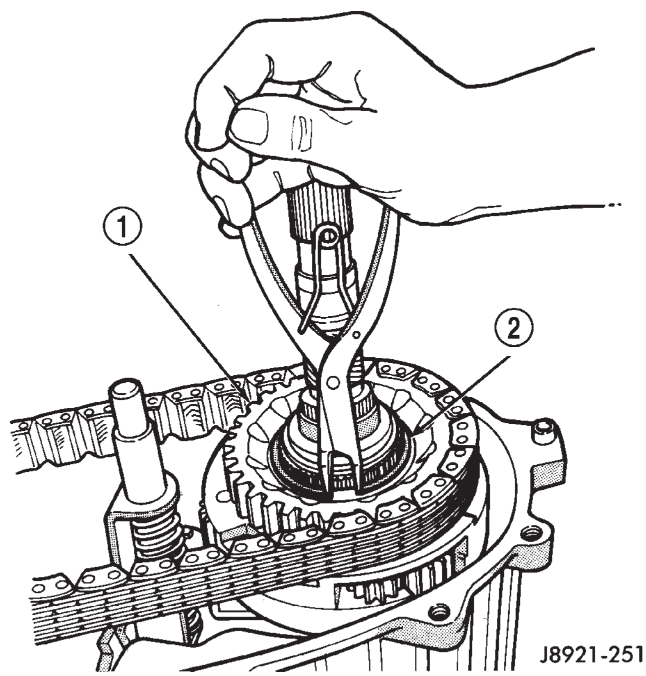


Fig. 93 Drive Sprocket Snap-Ring Installation

1 – DRIVE SPROCKET
2 – DRIVE SPROCKET SNAP RING

DISASSEMBLY AND ASSEMBLY (Continued)

OIL PUMP AND REAR CASE

(1) Insert oil pickup tube in oil pump and attach oil screen and connector hose to pickup tube. Then install assembled pump, tube and screen in rear case (Fig. 94). Be sure screen is seated in case slot as shown.

(2) Install magnet in front case pocket (Fig. 95).

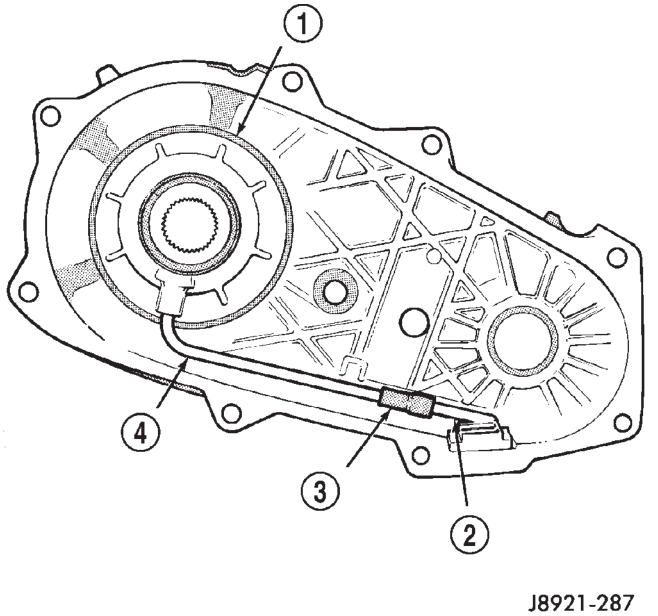


Fig. 94 Oil Screen And Pickup Tube Installation

1 – OIL PUMP
2 – OIL SCREEN
3 – CONNECTOR
4 – PICKUP TUBE

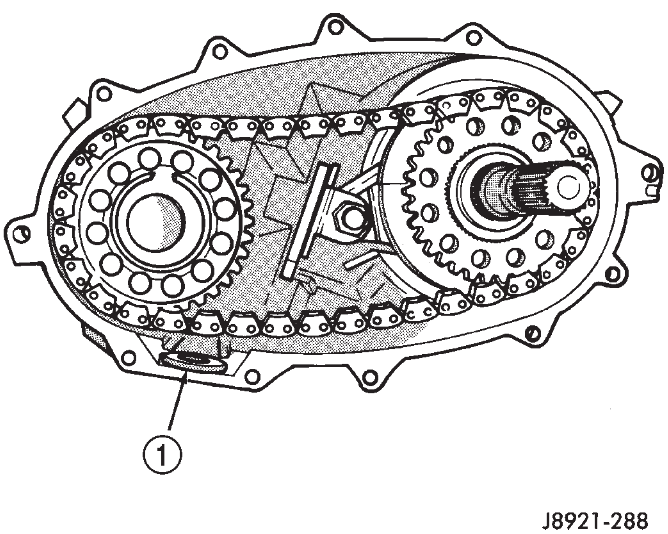


Fig. 95 Installing Case Magnet

1 – MAGNET

(3) Apply 3 mm (1/8 in.) wide bead of Mopar gasket maker or silicone adhesive sealer to seal surface of front case.

(4) Align and install rear case on front case. Be sure case locating dowels are in place and that mainshaft splines are engaged in oil pump inner gear.

(5) Install and tighten front case-to-rear case bolts to 41 N·m (30 ft. lbs.) torque. **Be sure to install a washer under each bolt used at case dowel locations.**

NV242 LD REAR RETAINER

(1) Remove rear bearing in retainer using Installer 8128 and Handle C-4171.

(2) Install rear bearing in retainer with Tools C-4171 and 5064 (Fig. 96).

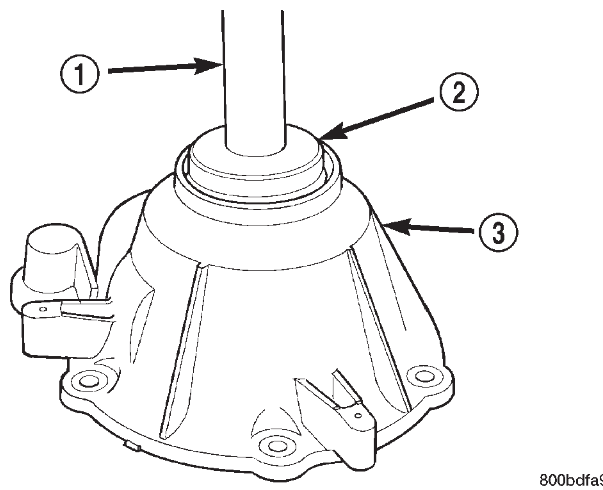


Fig. 96 Installing Rear Bearing In Retainer

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL 5064
3 – REAR RETAINER

(3) Install rear bearing O.D. retaining ring with snap-ring pliers (Fig. 97). Be sure retaining ring is fully seated in retainer groove.

(4) Apply bead of Mopar® Sealer P/N 82300234, or Loctite™ Ultra Gray, to mating surface of rear retainer. Sealer bead should be a maximum of 3/16 in.

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

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

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

(8) Slide seal onto Seal Protector 6992 (Fig. 98). Slide seal protector and seal onto output shaft.

(9) Slide Installer C-4076-B onto seal protector with the recessed side of the tool toward the seal.

DISASSEMBLY AND ASSEMBLY (Continued)

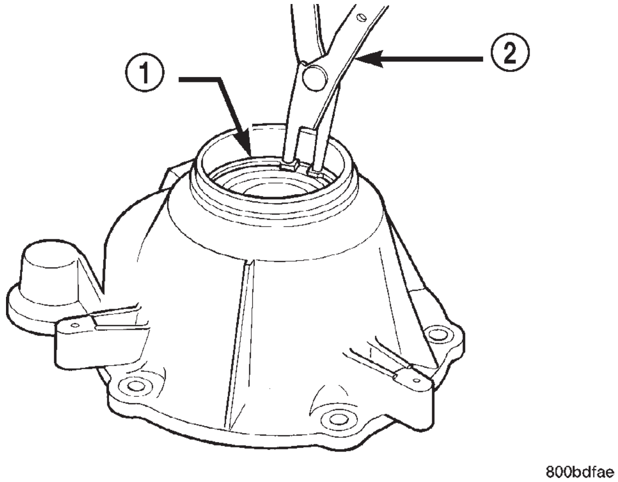


Fig. 97 Rear Bearing Retaining Ring Installation

1 – REAR BEARING O.D. RETAINING RING
2 – SNAP RING PLIERS

Drive seal into rear bearing retainer with Installer C-4076-B and Handle MD-998323 (Fig. 99).

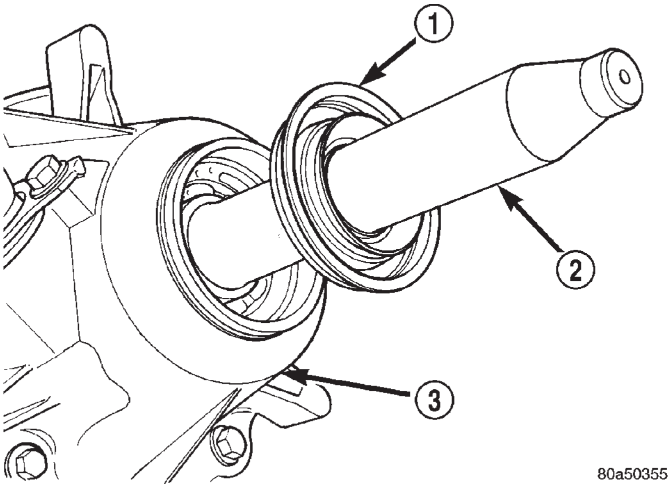


Fig. 98 Output Shaft Seal and Protector

1 – OUTPUT SHAFT SEAL
2 – SPECIAL TOOL 6992
3 – TRANSFER CASE

(10) Install rear slinger with Installer 8408.

(11) Install boot on output shaft slinger and crimp retaining clamp with tool C-4975-A (Fig. 100).

NV242HD REAR RETAINER

(1) Install rear bearing O.D. retaining ring with snap-ring pliers (Fig. 101). Be sure retaining ring is fully seated in retainer groove.

(2) Apply bead of Mopar® Sealer P/N 82300234, or Loctite™ Ultra Gray, to mating surface of rear retainer. Sealer bead should be a maximum of 3/16 in.

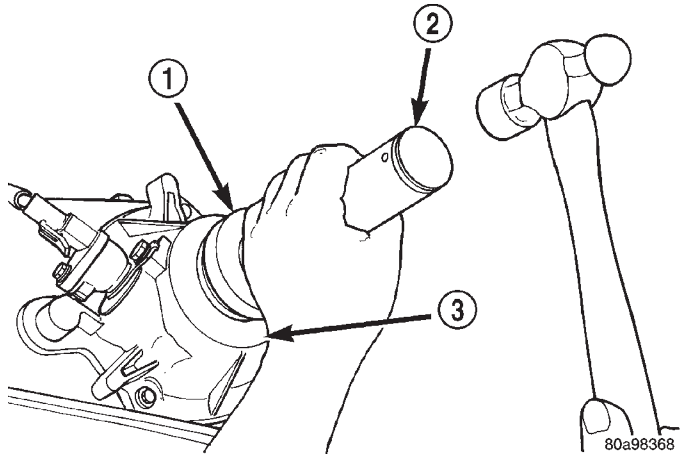


Fig. 99 Rear Seal Installation

1 – SPECIAL TOOL C-4076–B
2 – SPECIAL TOOL MD998323
3 – TRANSFER CASE

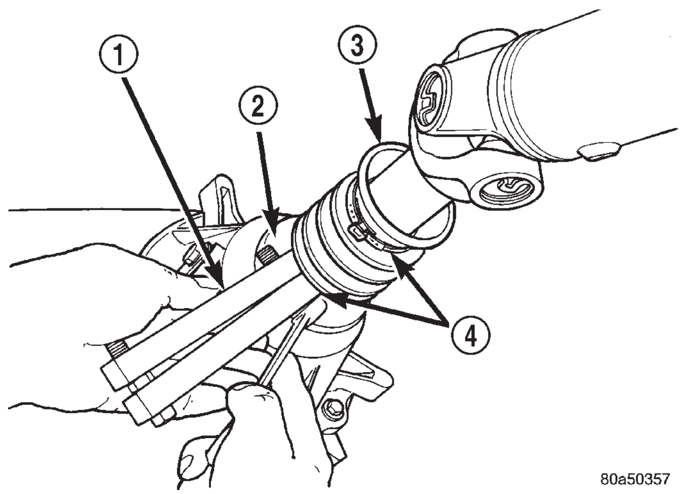


Fig. 100 Slinger Boot Installation

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

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

(4) Install new output shaft bearing snap-ring (Fig. 102). Lift mainshaft slightly to seat snap-ring in shaft groove, if necessary.

(5) Apply 3 mm (1/8 in.) wide bead of Mopar® gasket maker or silicone adhesive sealer to mounting surface of extension housing. Allow sealer to set-up slightly before proceeding.

(6) Install extension housing on rear retainer.

(7) Install extension housing bolts and tighten to 35–46 N·m (26–34 ft. lbs.).

DISASSEMBLY AND ASSEMBLY (Continued)

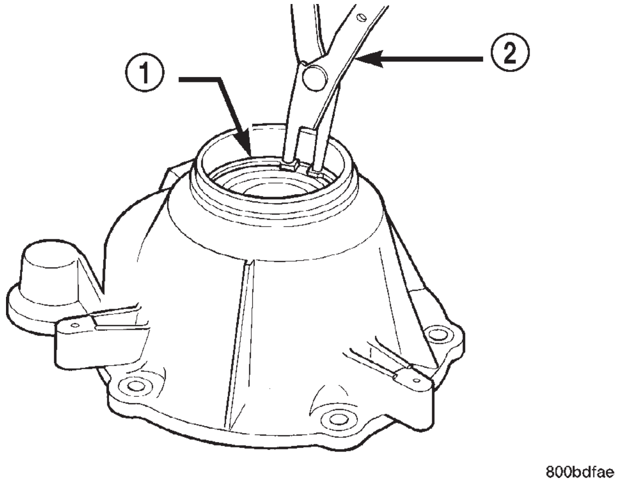


Fig. 101 Rear Bearing Retaining Ring Installation

1 – REAR BEARING O.D. RETAINING RING
2 – SNAP RING PLIERS

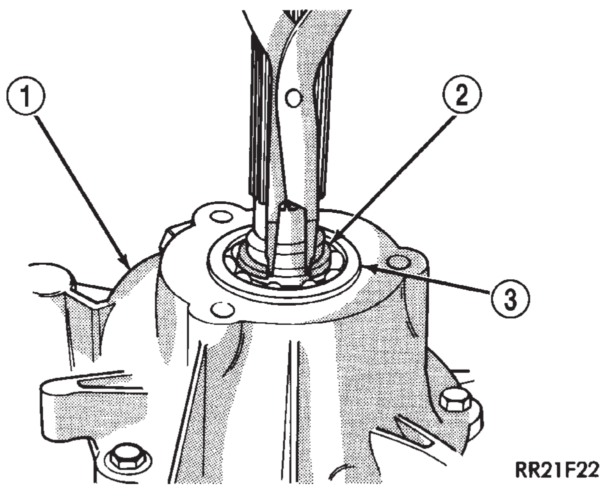


Fig. 102 Install Output Bearing Snap-ring

1 – REAR RETAINER
2 – SNAP RING
3 – REAR BEARING

COMPANION FLANGE INSTALLATION

(1) Lubricate companion flange hub with transmission fluid and install flange on front shaft.

(2) Install new seal washer on front shaft.

(3) Install flange on front shaft and tighten nut to 122–176 N·m (90–130 ft. lbs.).

CLEANING AND INSPECTION

NV242 TRANSFER CASE

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

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

MAINSHAFT/SPROCKET/HUB INSPECTION

Inspect the splines on the hub and shaft and the teeth on the sprocket. Minor nicks and scratches can be smoothed with an oilstone. However, replace any part is damaged.

Check the contact surfaces in the sprocket bore and on the mainshaft. Minor nicks and scratches can be smoothed with 320–400 grit emery cloth but do not try to salvage the shaft if nicks or wear is severe.

INPUT GEAR AND PLANETARY CARRIER

Check the teeth on the gear (Fig. 103). Minor nicks can be dressed off with an oilstone but replace the gear if any teeth are broken, cracked, or chipped. The bearing surface on the gear can be smoothed with 300–400 grit emery cloth if necessary.

Examine the carrier body and pinion gears for wear or damage. The carrier will have to be replaced as an assembly if the body, pinion pins, or pinion gears are damaged.

Check the lock ring and both thrust washers for wear or cracks. Replace them if necessary. Also replace the lock retaining ring if bent, distorted, or broken.

SHIFT FORKS/HUBS/SLEEVES

Check condition of the shift forks and mode fork shift rail (Fig. 104). Minor nicks on the shift rail can be smoothed with 320–400 grit emery cloth.

Inspect the shift fork wear pads. The mode fork pads are serviceable and can be replaced if necessary. The range fork pads are also serviceable.

Check both of the sleeves for wear or damage, especially on the interior teeth. Replace the sleeves if wear or damage is evident.

REAR RETAINER/BEARING/ SEAL/SLINGER/BOOT

Inspect the retainer components (Fig. 105). Replace the bearing if rough or noisy. Check the retainer for cracks or wear in the bearing bore. Clean the retainer sealing surfaces with a scraper and all purpose cleaner. This will ensure proper adhesion of the sealer during reassembly.

Replace the slinger and seal outright; do not reuse either part.

Inspect the retaining rings and washers. Replace any part if distorted, bent, or broken. Reuse is not recommended. Also replace the boot if cut or torn. Replace the boot band clamps, do not reuse them.

CLEANING AND INSPECTION (Continued)

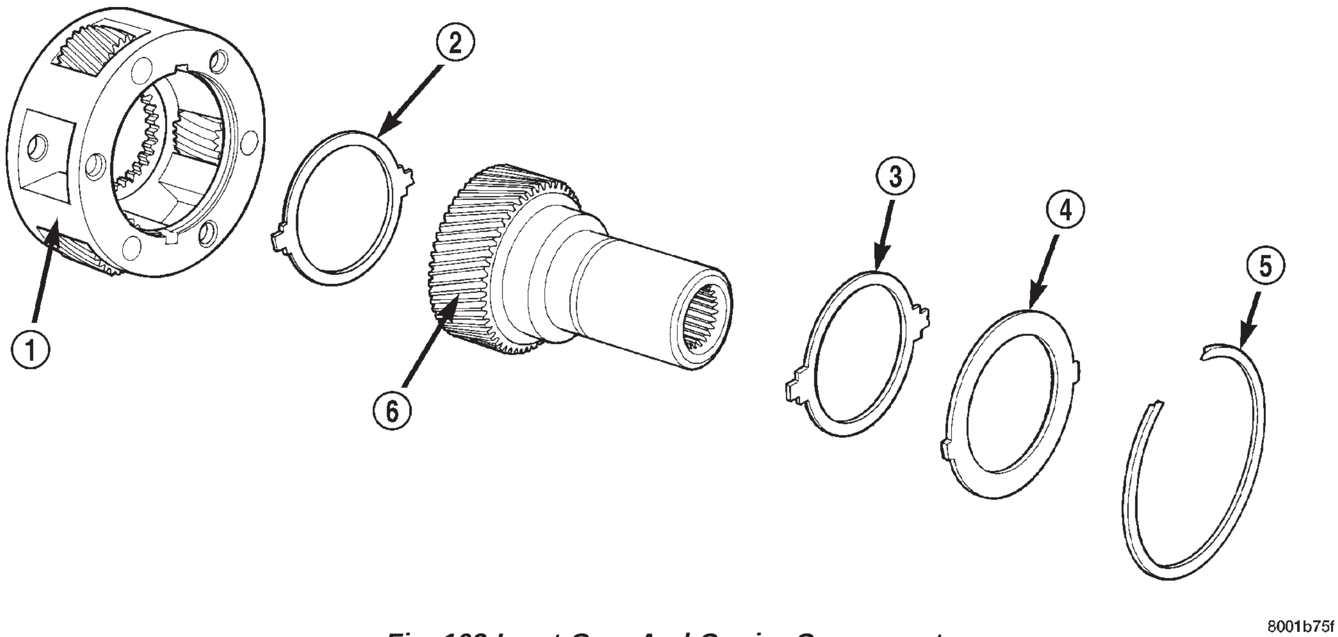


Fig. 103 Input Gear And Carrier Components

1 – PLANETARY CARRIER
2 – REAR THRUST WASHER
3 – FRONT THRUST WASHER
4 – CARRIER LOCK RING
5 – CARRIER LOCK RETAINING RING
6 – INPUT GEAR

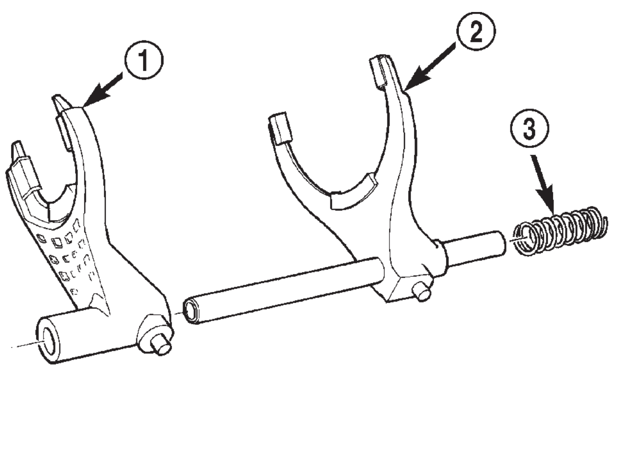


Fig. 104 Shift forks

1 – RANGE FORK
2 – MODE FORK AND RAIL
3 – MODE SPRING

REAR OUTPUT SHAFT/YOKE/DRIVE CHAIN

Check condition of the seal contact surfaces of the yoke slinger (Fig. 106). This surface must be clean and smooth to ensure proper seal life. Replace the yoke nut and seal washer as neither part should be reused.

Inspect the shaft threads, sprocket teeth, and bearing surfaces. Minor nicks on the teeth can be smoothed with an oilstone. Use 320–400 grit emery to smooth minor scratches on the shaft bearing surfaces. Rough threads on the shaft can be chased if necessary. Replace the shaft if the threads are damaged, bearing surfaces are scored, or if any sprocket teeth are cracked or broken.

Examine the drive chain and shaft bearings. Replace the chain and both sprockets if the chain is stretched, distorted, or if any of the links bind. Replace the bearings if rough, or noisy.

LOW RANGE ANNULUS GEAR

Inspect annulus gear condition carefully. The gear is only serviced as part of the front case. If the gear is damaged, it will be necessary to replace the gear and front case as an assembly. Do not attempt to remove the gear (Fig. 107).

FRONT-REAR CASES AND FRONT RETAINER

Inspect the cases and retainer for wear and damage. Clean the sealing surfaces with a scraper and all purpose cleaner. This will ensure proper sealer adhesion at assembly. Replace the input retainer seal; do not reuse it.

Check case condition. If leaks were a problem, look for gouges and severe scoring of case sealing surfaces. Also make sure the front case mounting studs are in good condition.

Check the front case mounting studs and vent tube. The tube can be secured with Loctite™ 271 or 680 if loose. The stud threads can be cleaned up with a die if necessary. Also check condition of the fill/drain plug threads in the rear case. The threads can

CLEANING AND INSPECTION (Continued)

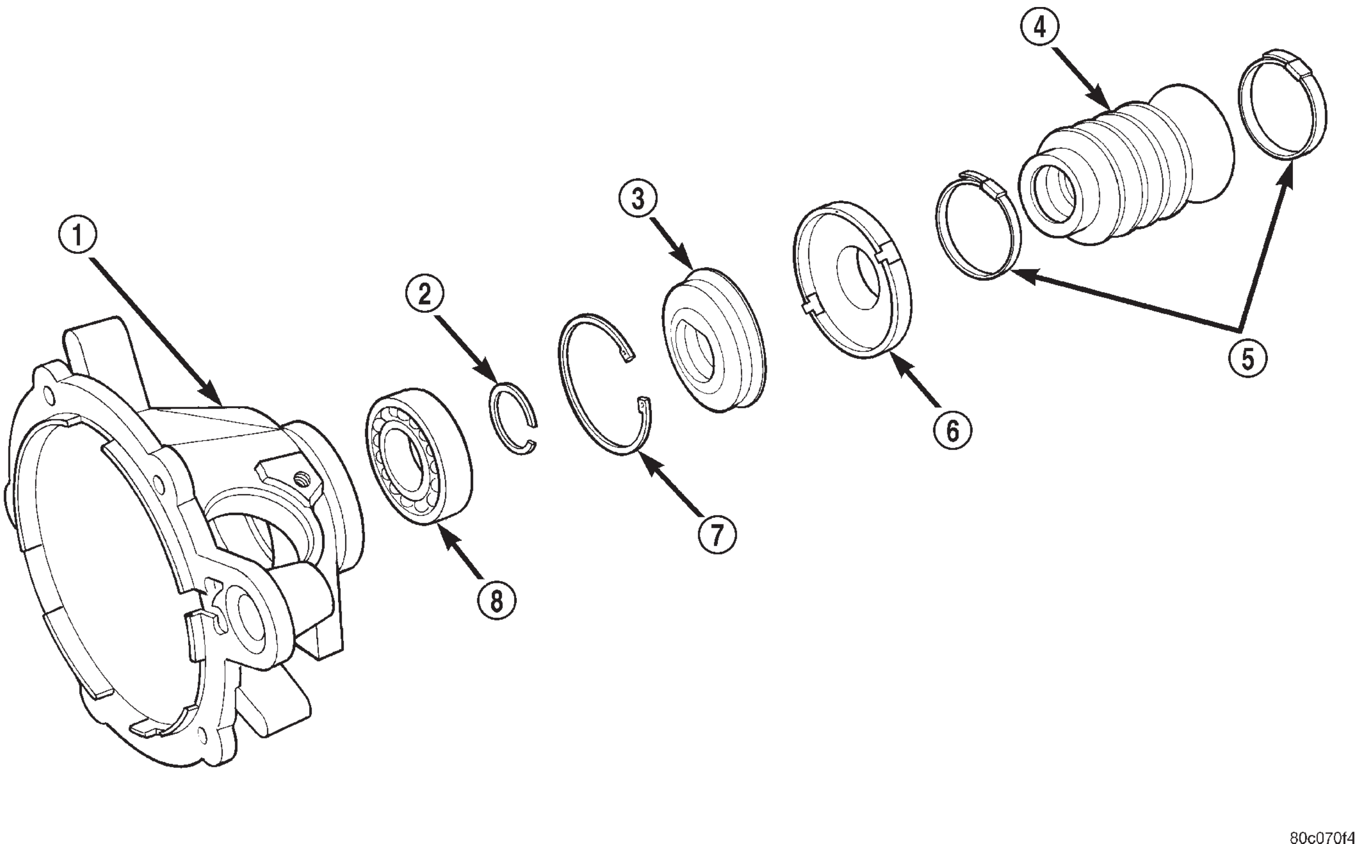


Fig. 105 Rear Retainer Components

1 – REAR RETAINER
2 – REAR BEARING I.D. RETAINING RING
3 – REAR SEAL
4 – BOOT
5 – BAND CLAMPS
6 – REAR SLINGER
7 – REAR BEARING O.D. RETAINING RING
8 – REAR BEARING

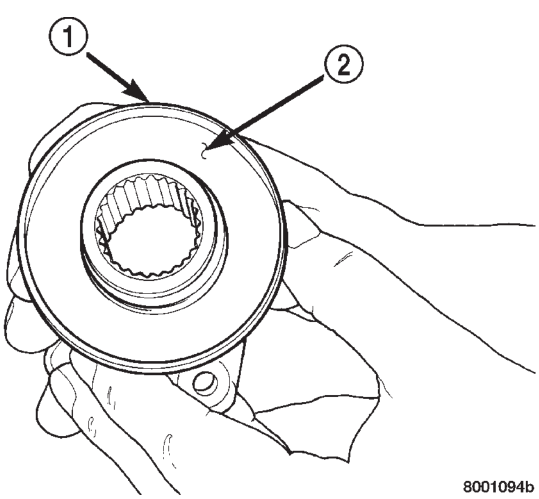


Fig. 106 Seal Contact Surface Of Yoke Slinger

1 – FRONT SLINGER (PART OF YOKE)
2 – SEAL CONTACT SURFACE MUST BE CLEAN AND SMOOTH

be repaired with a thread chaser or tap if necessary. Or the threads can be repaired with Helicoil stainless steel inserts if required.

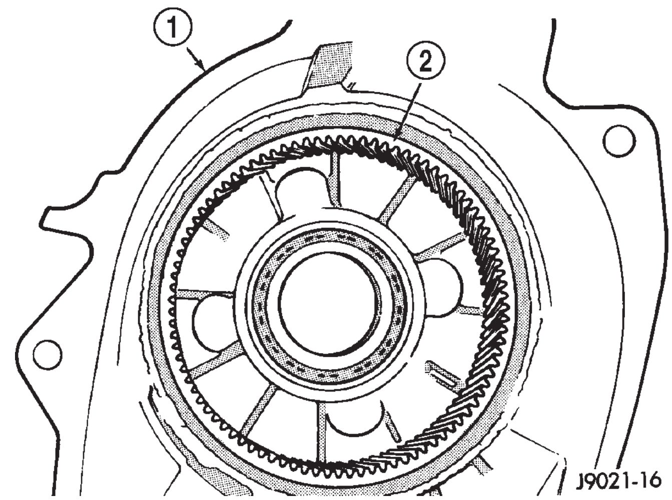


Fig. 107 Low Range Annulus Gear

1 – FRONT CASE
2 – LOW RANGE ANNULUS GEAR

OIL PUMP/OIL PICKUP

Examine the oil pump pickup parts. Replace the pump if any part appears to be worn or damaged. Do

CLEANING AND INSPECTION (Continued)

not disassemble the pump as individual parts are not available. The pump is only available as a complete assembly. The pickup screen, hose, and tube are the only serviceable parts and are available separately.

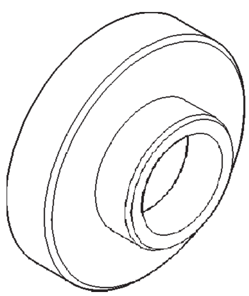
SPECIFICATIONS

TORQUE

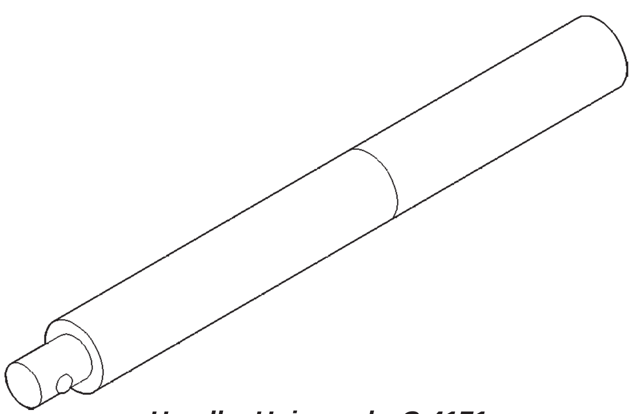
DESCRIPTION	TORQUE
Plug, Detent	16–24 N·m (12–18 ft. lbs.)
Bolt, Diff. Case	17–27 N·m (15–24 ft. lbs.)
Plug, Drain/Fill	20–25 N·m (15–25 ft. lbs.)
Bolt, Front Brg. Retainer	16–27 N·m (12–20 ft. lbs.)
Bolt, Case Half	35–46 N·m (26–34 ft. lbs.)
Nut, Front Yoke	122–176 N·m (90–130 ft. lbs.)
Screw, Oil Pump	1.2–1.8 N·m (12–15 in. lbs.)
Nut, Range Lever	27–34 N·m (20–25 ft. lbs.)
Bolt, Rear Retainer	35–46 N·m (26–34 ft. lbs.)
Nuts, Mounting	35 N·m (26 ft. lbs.)
Bolts, U-Joint	19 N·m (17 ft. lbs.)

SPECIAL TOOLS

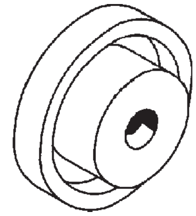
NV242



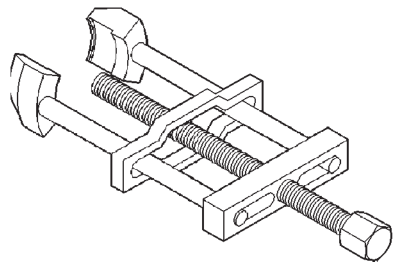
Installer—C-4076-B



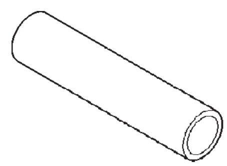
Handle, Universal—C-4171



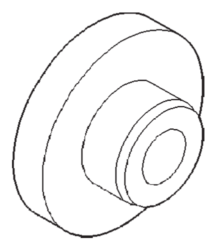
Remover—C-4210



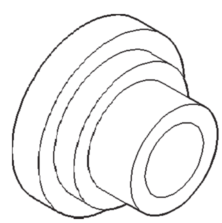
Puller, Slinger—MD-998056–A



Installer—MD-998323

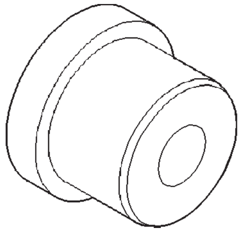


Installer, Bearing—5064

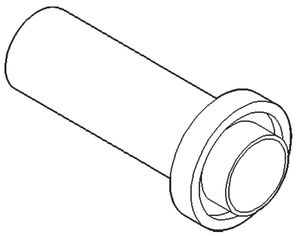


Installer—8128

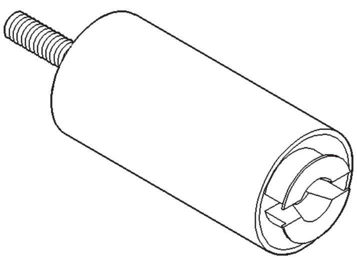
SPECIAL TOOLS (Continued)



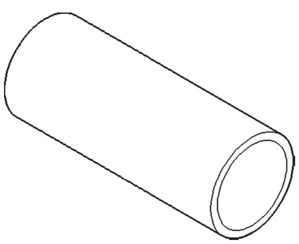
Installer—5066



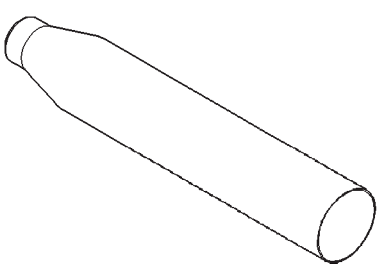
Installer—6952-A



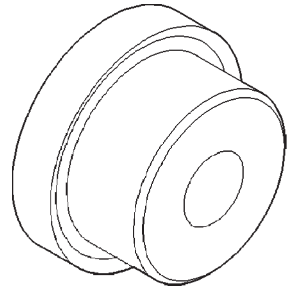
Remover—L-4454



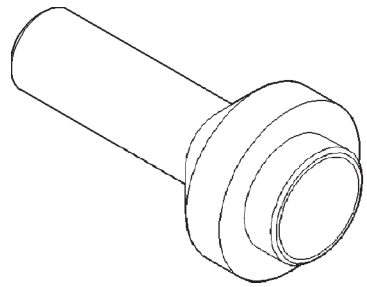
Cup—8148



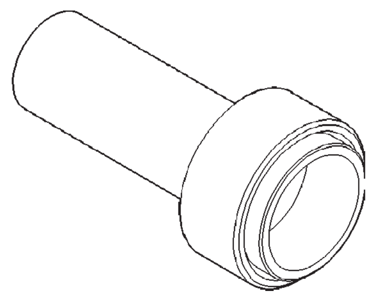
Seal Protector—6992



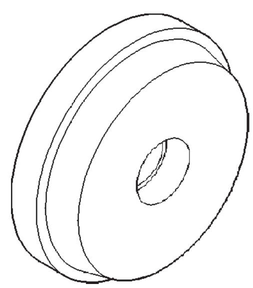
Installer, Input Gear Bearing—7829-A



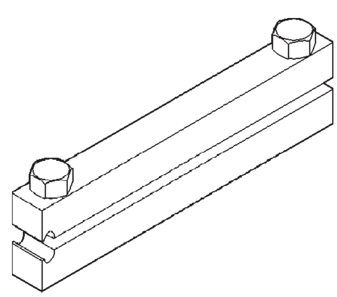
Installer, Seal—7884



Installer, Pump Housing Seal—7888



Installer, Bearing—8033-A



Installer, Boot Clamp—C-4975-A

NV247 TRANSFER CASE

TABLE OF CONTENTS

DESCRIPTION AND OPERATION

NV247 TRANSFER CASE

DESCRIPTION

The NV247 (Fig. 1) is an on-demand 4-wheel drive transfer case with two operating ranges and a neutral position. Operating ranges are 4-high and 4-low. The 4-low range is used for extra pulling power in off-road situations.

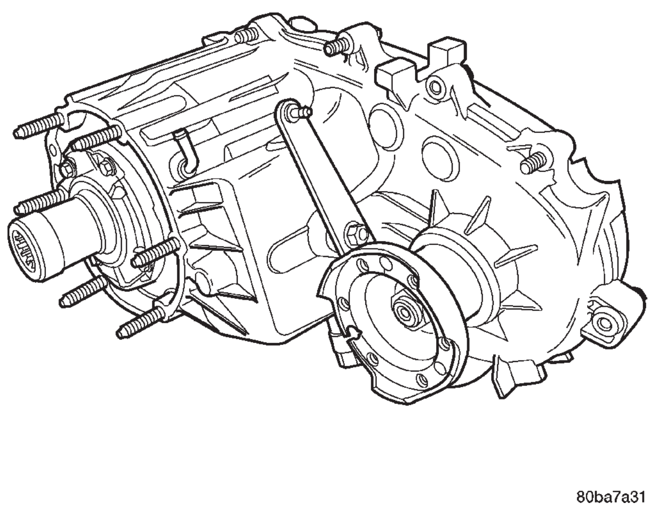


Fig. 1 NV247 Transfer Case

TRANSFER CASE IDENTIFICATION

A circular I.D. tag is attached to the rear case of each NV247 transfer case (Fig. 2). The tag indicates the following information:

- Model number
- Serial number
- Assembly number
- Gear ratio
- Location of manufacture

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

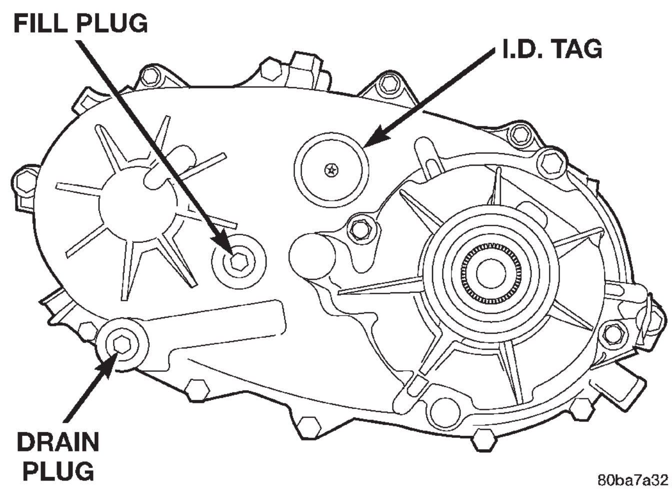


Fig. 2 Transfer Case I.D. Tag

OPERATION

Under normal driving conditions, the system operates conventionally, and the majority of available torque is applied to the rear wheels. However, when front-to-rear wheel speed variations exist, the progressive differential transfers torque to the axle with the better traction, thus minimizing wheel spin and maximizing control.

The key to this design is a progressive coupling (Fig. 3), which is supplied with pressurized oil by a gerotor style pump. The pump rotor and case are driven by the front and rear driveshafts respectively, and deliver pressurized oil flow to the coupling in proportion to their speed difference. The progressive coupling contains a multi-disc clutch pack that is alternately splined to the front and rear driveshafts, and controls torque variation between the front and rear driveshafts as dictated by the pump.

DESCRIPTION AND OPERATION (Continued)

A set of orifices and valves control the speed-differential starting point and rate of torque transfer rise in the clutch. This allows the system to disregard the normal speed differences between axles that result from variations in front-to-rear loading and typical cornering.

Transfer case operating ranges are selected with a floor mounted shift lever. The shift lever is connected to the transfer case range lever by an adjustable cable. Range positions are marked on the shifter bezel plate.

RECOMMENDED LUBRICANT AND FILL LEVEL

DESCRIPTION

Mopar® Transfer Case Lubricant is the only lubricant recommended for the NV247 transfer case. Approximate fluid refill capacity is approximately 1.6 liters (3.4 pints).

The fill and drain plugs are both in the rear case. Correct fill level is to the bottom edge of the fill plug hole. Be sure that the vehicle is level to ensure an accurate fluid level check.

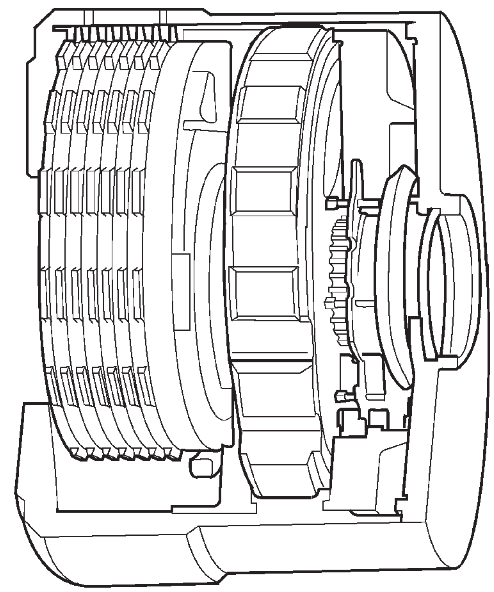


Fig. 3 Progressive Coupling

DIAGNOSIS AND TESTING

NV247 DIAGNOSIS

CONDITION	POSSIBLE CAUSE	CORRECTION
TRANSFER CASE DIFFICULT TO SHIFT OR WILL NOT SHIFT INTO DESIRED RANGE	1. Vehicle speed too great to permit shifting	1. Reduce speed to 3-4 km/h (2-3 mph) before attempting to shift
	2. Transfer case external shift cable binding	2. Lubricate, repair or replace cable, or thighten loose components as necessary
	3. Insufficient or incorrect lubricant	3. Drain and refill to edge of fill hole with correct lubricant
	4. Internal components binding, worn, or damaged	4. Disassemble unit and replace worn or damaged components as necessary
TRANSFER CASE NOISY IN ALL MODES	1. Insufficient or incorrect lubricant	1. Drain and refill to edge of fill hole with correct lubricant. **If unit is still noisy after drain and refill, disassembly and inspection may be required to locate source of noise**
NOISY IN—OR JUMPS OUT OF 4WD LOW RANGE	1. Transfer case not completely engaged in 4WD LOW (possibly from shift to 4L while rolling)	1. Stop vehicle, shift transfer case to neutral, then shift back to 4WD LOW
	2. Shift linkage loose, binding, or is misadjusted	2. Tighten, lubricate, or repair linkage as necessary. Adjust linkage if necessary
	3. Range fork cracked, inserts worn, or fork is binding on shift rail	3. Disassemble unit and repair as necessary
	4. Annulus gear or lockplate worn or damaged	4. Disassemble unit and repair as necessary
LUBRICANT LEAKING FROM OUTPUT SHAFT SEALS OR FROM VENT	1. Transfer case over filled	1. Drain to correct level
	2. Vent closed or restricted	2. Clear or replace vent if necessary
	3. Output shaft seals damaged or installed correctly	3. Replace seals. Be sure seal lip faces interior of case when installed. Also be sure yoke seal surfaces are not scored or nicked. Remove scores and nicks with fine sandpaper or replace yoke(s) if necessary.

REMOVAL AND INSTALLATION

TRANSFER CASE

REMOVAL

(1) Shift transfer case into Neutral.
(2) Raise vehicle.
(3) Remove transfer case drain plug and drain transfer case lubricant.
(4) Mark front and rear propeller shaft yokes for alignment reference.
(5) Support transmission with jack stand.
(6) Remove rear crossmember and skid plate, if equipped (Fig. 4).

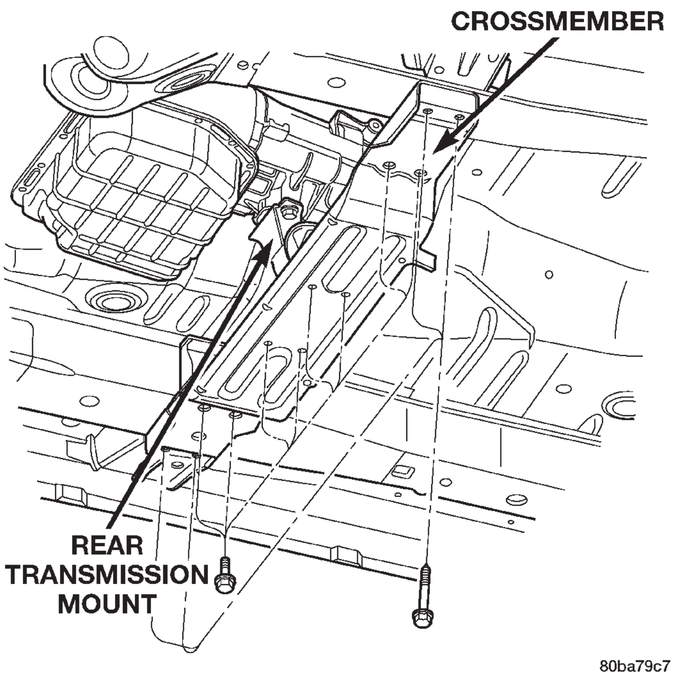


Fig. 4 Crossmember Removal/Installation

(7) Disconnect front propeller shaft from transfer case at companion flange. Remove rear propeller shaft from vehicle. Refer to Group 3, Differential and Driveline for the correct procedures.

CAUTION: Do not allow propshafts to hang at attached end. Damage to joint can result.

(8) Disconnect transfer case cable from range lever.
(9) Disconnect transfer case vent hose (Fig. 5).
(10) Support transfer case with transmission jack.
(11) Secure transfer case to jack with chains.
(12) Remove nuts attaching transfer case to transmission.
(13) Pull transfer case and jack rearward to disengage transfer case (Fig. 5).
(14) Remove transfer case from under vehicle.

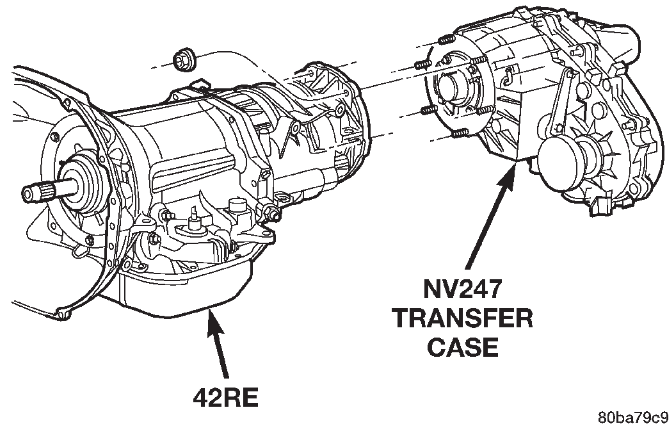


Fig. 5 Transfer Case Mounting

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. 5).
(6) Connect front propeller shaft and install rear propeller shaft. Refer to Group 3, Differential and Driveline, for proper procedures and torque specifications.
(7) Fill transfer case with correct fluid. Check transmission fluid level. Correct as necessary.
(8) Install rear crossmember (Fig. 4) and skid plate, if equipped. Tighten crossmember bolts to 41 N·m (30 ft. lbs.) torque.
(9) Remove transmission jack and support stand.
(10) Verify transfer case is in Neutral. Connect shift cable to transfer case range lever.
(11) Lower vehicle and verify transfer case shift operation.
(12) Adjust the transfer case shift cable, if necessary.

TRANSFER CASE SHIFT CABLE

REMOVAL

(1) Shift transfer case into neutral.
(2) Raise vehicle.
(3) Disconnect the shift cable eyelet from the transfer case shift lever (Fig. 6).
(4) Remove shift cable from the cable support bracket.
(5) Lower vehicle.
(6) Remove shift lever bezel and necessary console parts for access to shift lever assembly and shift cable.

REMOVAL AND INSTALLATION (Continued)

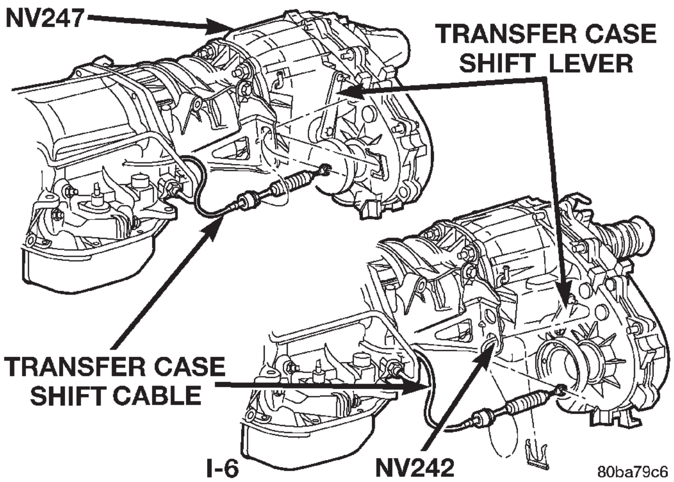


Fig. 6 Transfer Case Shift Cable at Transfer Case

(7) Disconnect cable at shift lever and shifter assembly bracket (Fig. 7).

(8) Remove the nuts holding the shift cable seal plate to the floor pan (Fig. 8).

(9) Pull cable through floor panel opening.

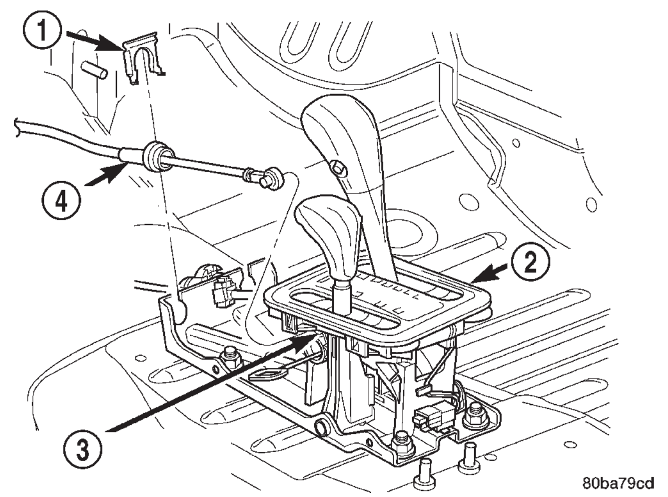


Fig. 7 Transfer Case Shift Cable at Shifter

1 – CLIP
2 – SHIFTER
3 – TRANSFER CASE SHIFT LEVER PIN
4 – TRANSFER CASE SHIFT CABLE

(10) Remove transfer case shift cable from vehicle.

INSTALLATION

(1) Route cable through hole in floor pan.

(2) Install seal plate to studs in floor pan.

(3) Install nuts to hold seal plate to floor pan (Fig. 8). Tighten nuts to 7 N·m (65 in. lbs.).

(4) Install the transfer case shift cable to the shifter assembly bracket. Seat cable in bracket and install clip (Fig. 7).

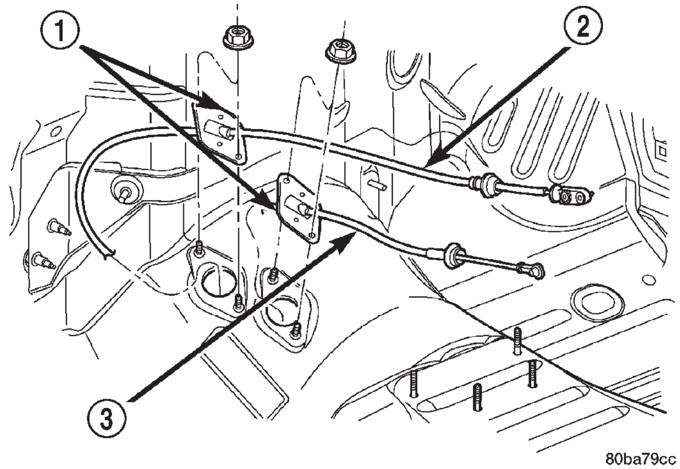


Fig. 8 Shift Cables at Floor Pan

1 – SEAL PLATES
2 – TRANSMISSION SHIFT CABLE
3 – TRANSFER CASE SHIFT CABLE

(5) Verify the transfer case shift lever (at console) is in the NEUTRAL position.

(6) Snap the cable onto the shift lever pin (Fig. 7).

(7) Raise the vehicle.

(8) Install the shift cable to the shift cable support bracket and install clip (Fig. 6).

(9) Verify that the transfer case is still in the NEUTRAL position.

(10) Snap the shift cable onto the transfer case shift lever (Fig. 6).

(11) Lower vehicle.

(12) Verify correct transfer case operation in all ranges.

(13) Install shift lever bezel and any console parts removed for access to transfer case shift cable.

FRONT OUTPUT SHAFT SEAL

REMOVAL

(1) Raise vehicle on hoist.

(2) Remove front propeller shaft. Refer to Group 3, Differential and Driveline, for proper procedure.

(3) Remove front output shaft companion shaft.

(4) Remove seal from front case with pry tool (Fig. 9).

INSTALLATION

(1) Install new front output seal in front case with Installer Tool 6952-A as follows:

(a) Place new seal on tool. Garter spring on seal goes toward interior of case.

(b) Start seal in bore with light taps from hammer (Fig. 10). Once seal is started, continue tapping seal into bore until installer tool seats against case.

REMOVAL AND INSTALLATION (Continued)

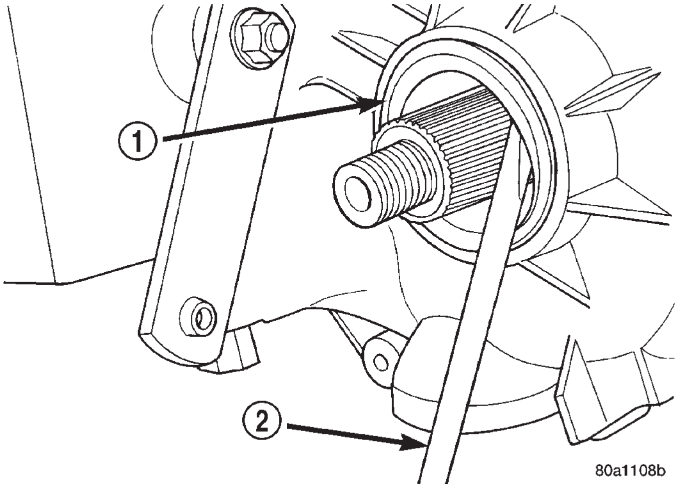


Fig. 9 Remove Front Output Shaft Seal

1 – OUTPUT SHAFT SEAL
2 – PRYBAR

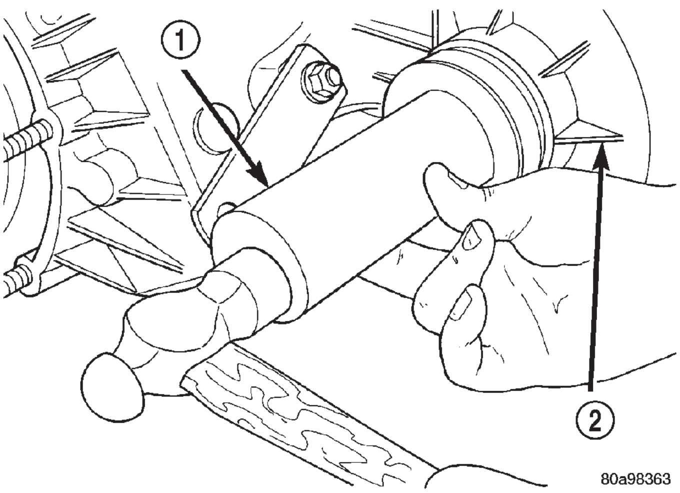


Fig. 10 Front Output Seal Installation

1 – INSTALLER 6952–A
2 – TRANSFER CASE

(2) Install companion flange and torque nut to 122–176 N·m (90–130 ft. lbs.).

(3) Install front propeller shaft. Refer to Group 3, Differential and Driveline for proper procedures and torque specifications.

REAR RETAINER BUSHING AND SEAL

REMOVAL

(1) Raise vehicle on hoist.

(2) Remove rear propeller shaft. Refer to Group 3, Differential and Driveline, for proper procedure.

(3) Using a suitable pry tool or slide-hammer mounted screw, remove the rear retainer seal.

(4) Using Remover 6957, remove bushing from rear retainer (Fig. 11).

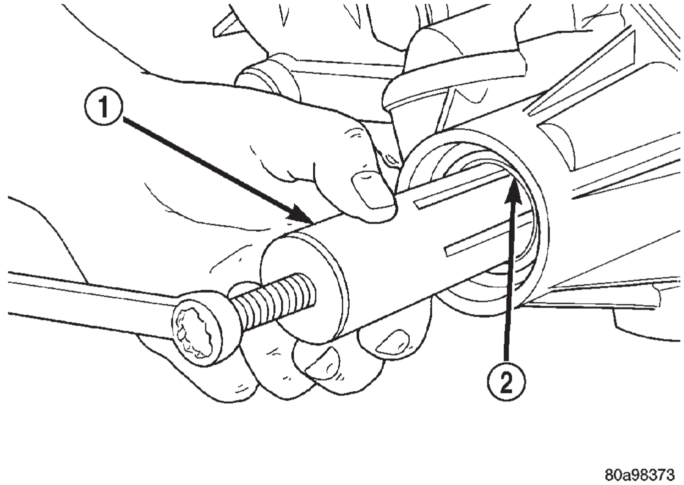


Fig. 11 Rear Retainer Bushing Removal

1 – REMOVER 6957
2 – REAR RETAINER BUSHING

INSTALLATION

(1) Clean fluid residue from sealing surface and inspect for defects.

(2) Position replacement bushing in rear retainer with fluid port in bushing aligned with slot in retainer.

(3) Using Installer 8145, drive bushing into retainer until installer seats against case (Fig. 12).

(4) Using Installer C-3995-A, install seal in rear retainer (Fig. 13).

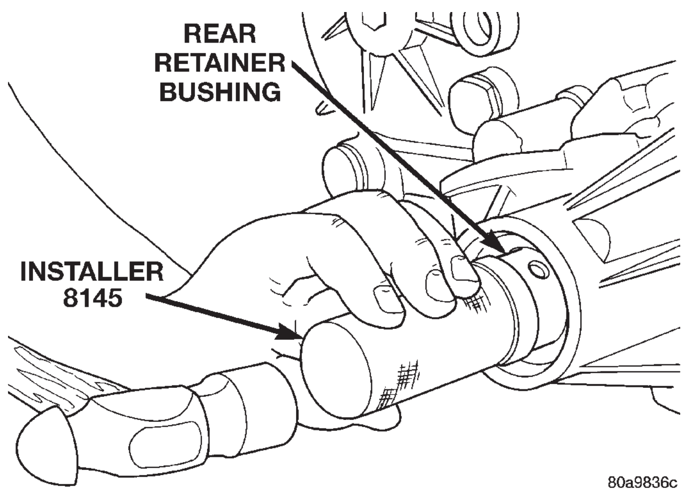


Fig. 12 Rear Retainer Bushing Install

(5) Install rear propeller shaft. Refer to Group 3, Differential and Driveline for proper procedures and specifications.

(6) Verify proper fluid level.

(7) Lower vehicle.

REMOVAL AND INSTALLATION (Continued)

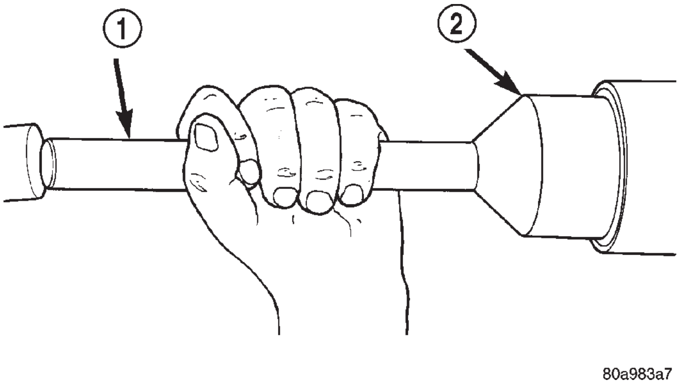


Fig. 13 Install Rear Retainer Seal

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL C-3995-A

DISASSEMBLY AND ASSEMBLY

NV247 TRANSFER CASE

DISASSEMBLY

Position transfer case on shallow drain pan. Remove drain plug and drain lubricant remaining in case.

REAR RETAINER AND OIL PUMP REMOVAL

(1) Remove rear retainer bolts (Fig. 14).

(2) Remove rear bearing locating ring access plug (Fig. 15).

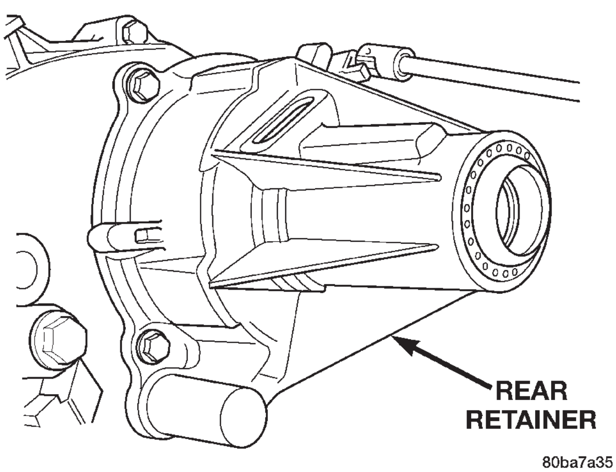


Fig. 14 Rear Retainer Bolt Removal

(3) Loosen rear retainer with pry tool to break sealer bead. Pry only against retainer boss as shown (Fig. 16).

(4) Remove rear retainer as follows:

(a) Spread rear bearing locating ring with snap ring pliers (Fig. 17).

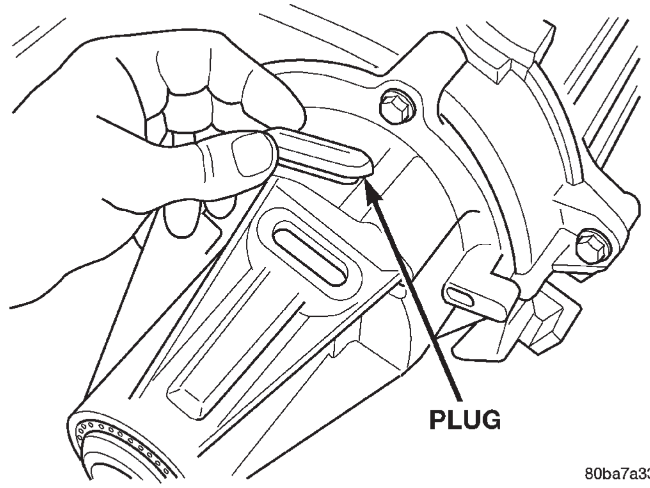


Fig. 15 Remove Rubber Access Plug

(b) Then slide retainer off mainshaft and rear bearing (Fig. 18).

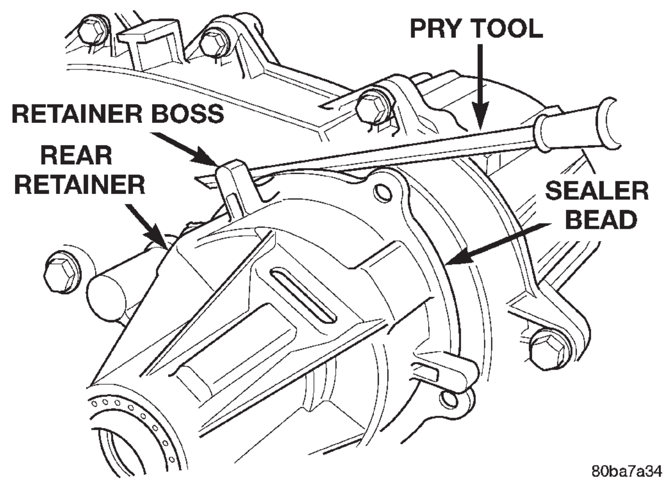


Fig. 16 Loosening Rear Retainer

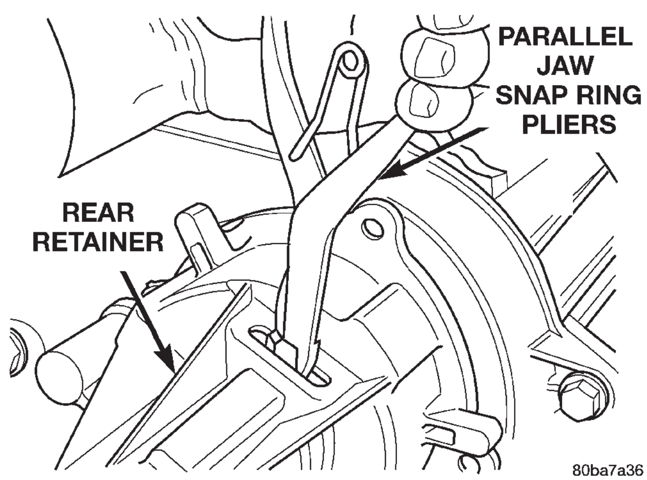


Fig. 17 Disengaging Rear Bearing Locating Ring

(5) Remove rear bearing snap-ring.

DISASSEMBLY AND ASSEMBLY (Continued)

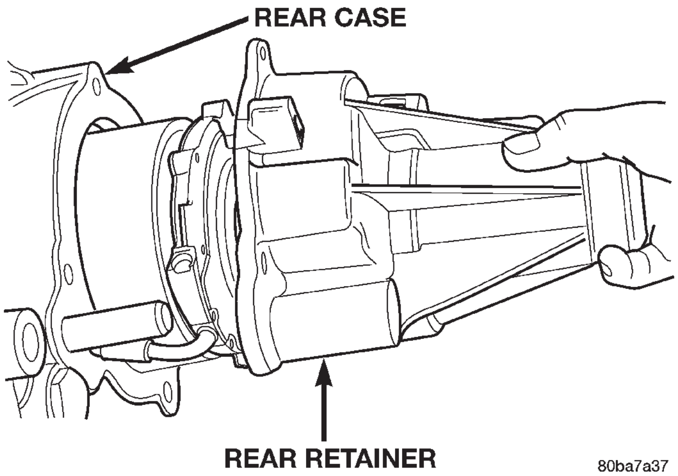


Fig. 18 Rear Retainer Removal

(6) Remove rear bearing. Note position of bearing locating ring groove for assembly reference.

(7) Disengage oil pickup tube from oil pump and remove oil pump assembly (Fig. 19).

(8) Remove pick-up tube o-ring from oil pump (Fig. 20), if necessary. Do not disassemble the oil pump, it is not serviceable.

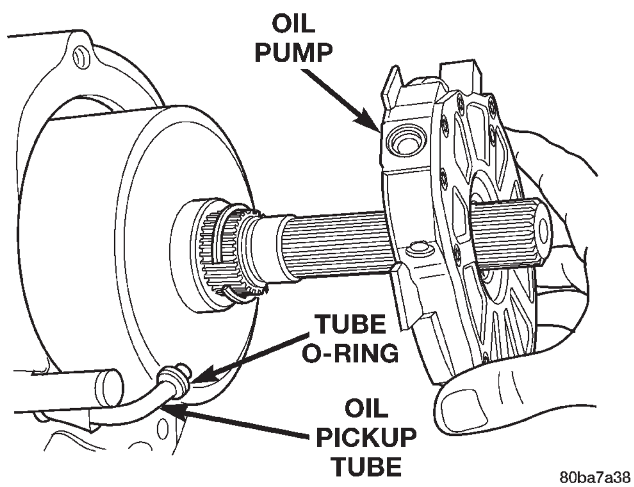


Fig. 19 Rear Bearing and Oil Pump Removal

PROGRESSIVE COUPLING REMOVAL

(1) Remove oil pump locating snap-ring and progressive coupling snap-ring from mainshaft (Fig. 21).

(2) Remove progressive coupling from mainshaft (Fig. 21).

COMPANION FLANGE AND RANGE LEVER REMOVAL

(1) Remove front companion flange nut as follows:

(a) Move range lever to 4L position.

(b) Remove nut with socket and impact wrench.

(2) Remove companion flange. If flange is difficult to remove by hand, remove it with bearing splitter, or with standard two jaw puller. Be sure puller tool is positioned on flange and not on slinger as slinger will be damaged.

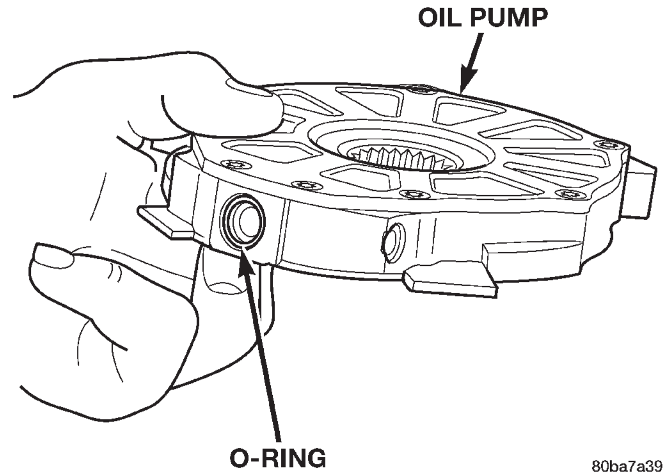


Fig. 20 Pick-up Tube O-ring Location

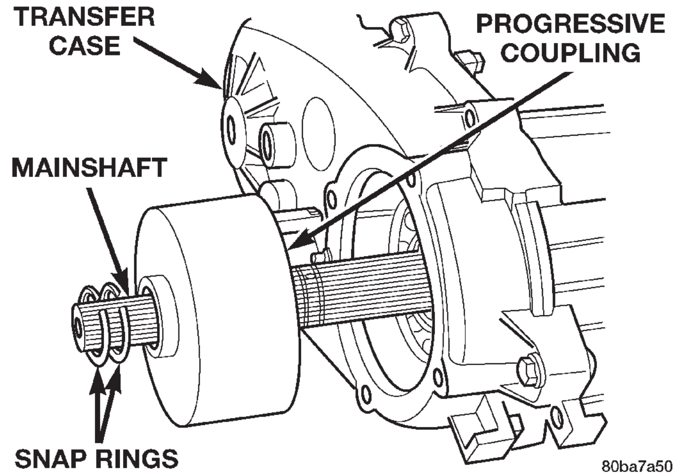


Fig. 21 Progressive Coupling Removal

(3) Remove seal washer from front output shaft. Discard washer as it should not be reused.

(4) Remove nut and washer that attach range lever to sector shaft. Then move sector to neutral position and remove range lever from shaft.

NOTE: Note position of range lever so it can be re-installed correctly.

FRONT OUTPUT SHAFT AND DRIVE CHAIN REMOVAL

(1) Support transfer case so rear case is facing upward.

(2) Remove bolts holding front case to rear case. The case alignment bolt require flat washers (Fig. 22).

(3) Loosen rear case with flat blade screwdriver to break sealer bead. Insert screwdriver blade only into notches provided at each end of case (Fig. 23).

(4) Remove rear case (Fig. 24).

DISASSEMBLY AND ASSEMBLY (Continued)

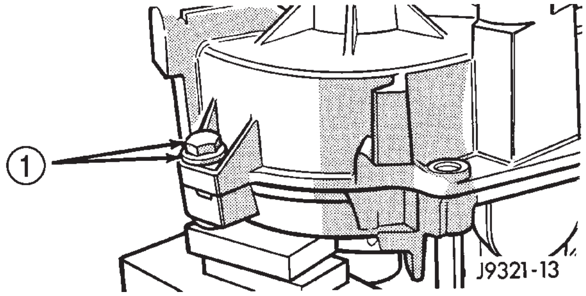


Fig. 22 Rear Case Alignment Bolt Locations

1 – ALIGNMENT BOLT AND WASHER (AT EACH END OF CASE)

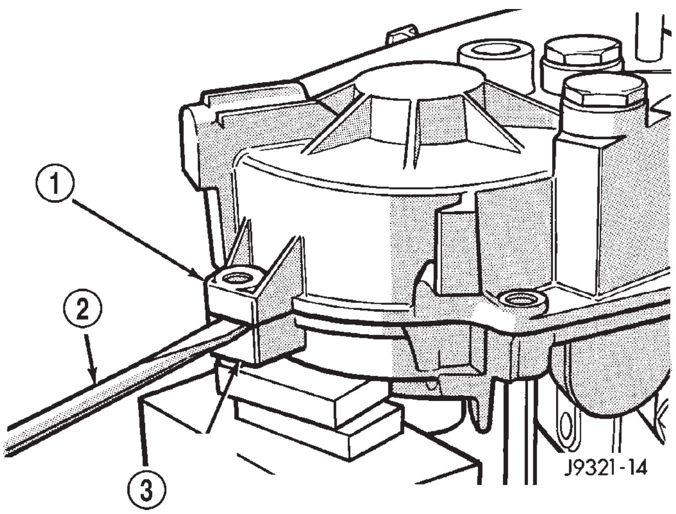


Fig. 23 Loosening Rear Case

1 – REAR CASE
2 – PRY TOOL (IN CASE SLOT)
3 – FRONT CASE

(5) Remove oil pickup tube from rear case (Fig. 25).

(6) Remove drive gear snap-ring (Fig. 26).

(7) Disengage drive gear (Fig. 26). Pry gear upward and off mainshaft as shown.

(8) Remove front output shaft, drive chain and drive gear as assembly (Fig. 26).

(9) Remove output shaft drive gear snap ring.

(10) Remove output shaft drive gear from output shaft.

SHIFT FORKS AND MAINSHAFT REMOVAL

(1) Remove detent plug, O-ring, detent spring and detent plunger (Fig. 27).

(2) Remove shift rail from shift fork and transfer case housing.

(3) Rotate range shift fork until it disengages from shift sector.

(4) Remove mainshaft and shift fork from input gear pilot bearing.

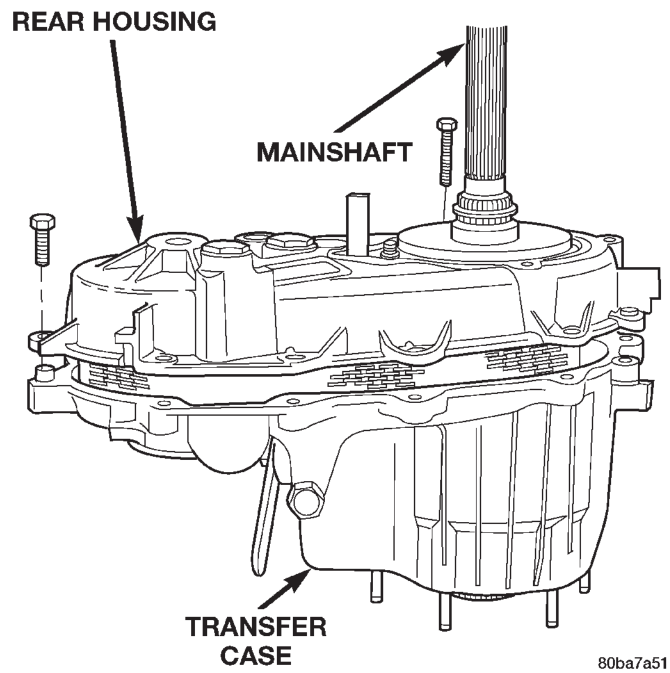


Fig. 24 Rear Case Removal

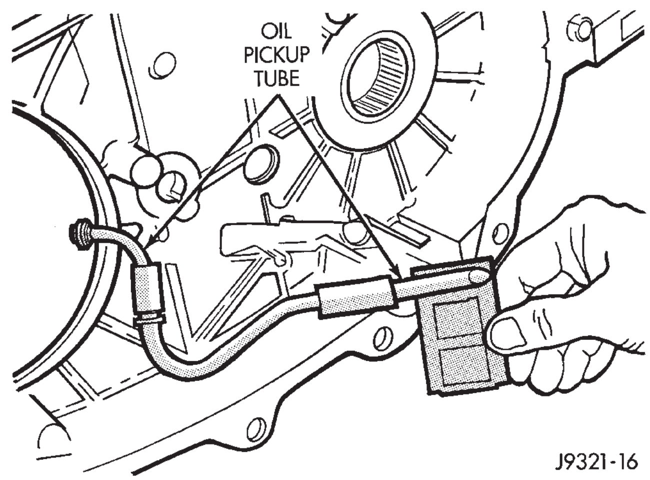


Fig. 25 Oil Pickup Tube Removal

NOTE: Loose needle bearings are used to support the drive sprocket hub on the mainshaft. Do not lift mainshaft by drive sprocket hub or needle bearings will become dislodged.

(5) Wrap rag around mainshaft underneath drive sprocket hub and remove drive sprocket hub from mainshaft. Be sure to retrieve all the drive sprocket hub needle bearings.

(6) Remove snap ring holding clutch sleeve onto mainshaft.

(7) Remove range clutch sleeve, blockout spring, locking clutch, and locking clutch spring from mainshaft (Fig. 28).

(8) Remove shift sector. Rotate and tilt sector as needed to remove it (Fig. 29).

DISASSEMBLY AND ASSEMBLY (Continued)

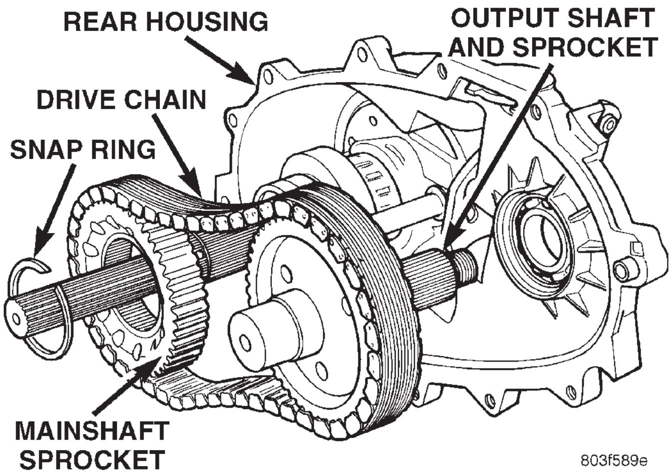


Fig. 26 Front Output Shaft, Drive Gear And Chain Removal

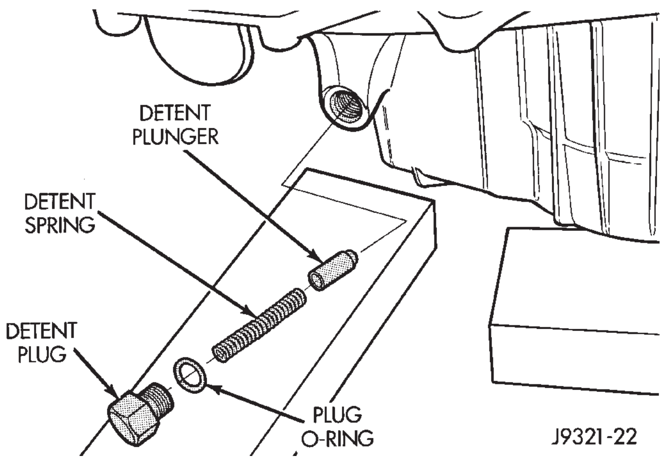


Fig. 27 Detent Plug, Spring And Plunger Removal

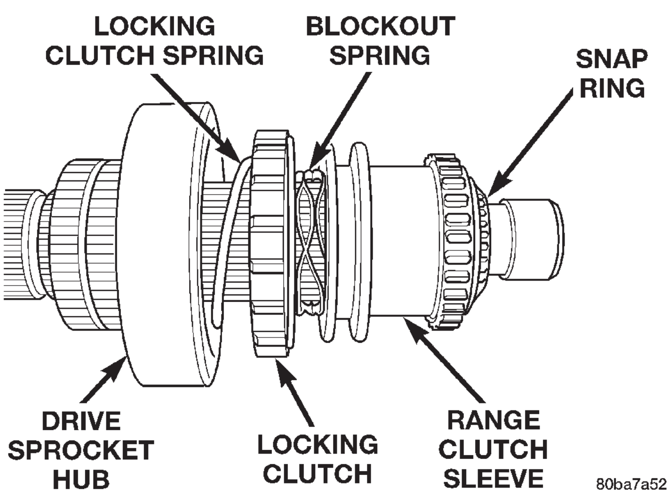


Fig. 28 Range Clutch Sleeve, Blockout Spring, Locking Clutch and Spring

(9) Remove shift sector bushing and O-ring (Fig. 30).

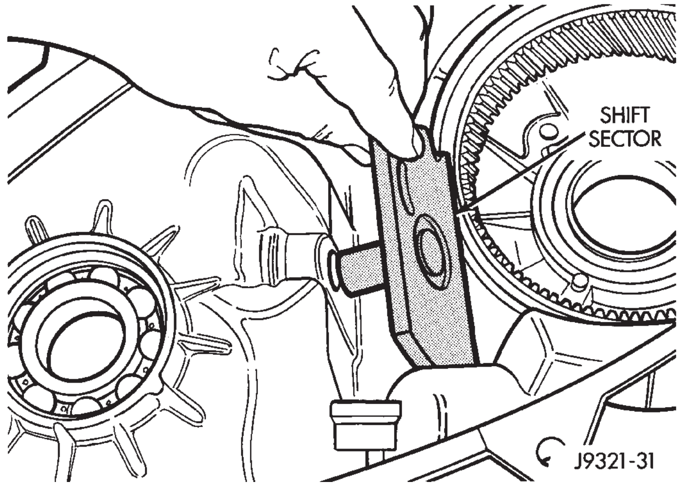


Fig. 29 Shift Sector Removal

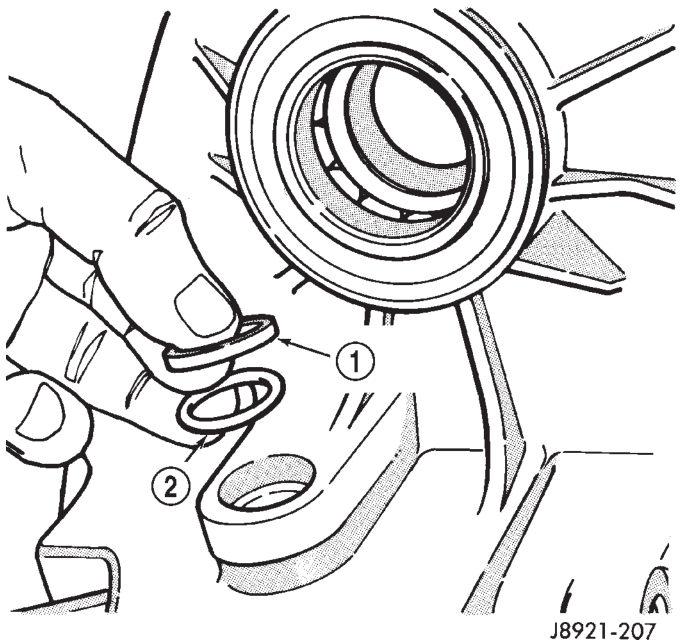


Fig. 30 Sector Bushing And O-Ring Removal

1 – SHIFT SECTOR BUSHING
2 – O-RING

DISASSEMBLY AND ASSEMBLY (Continued)

INPUT GEAR/LOW RANGE ASSEMBLY REMOVAL

(1) Turn front case on side so front bearing retainer is accessible.

(2) Remove front bearing retainer bolts (Fig. 31).

(3) Remove front bearing retainer as follows:

(a) Loosen retainer with flat blade screwdriver to break sealer bead. **To avoid damaging case and retainer, position screwdriver blade only in slots provided in retainer (Fig. 32).**

(b) Then remove retainer from case and gear.

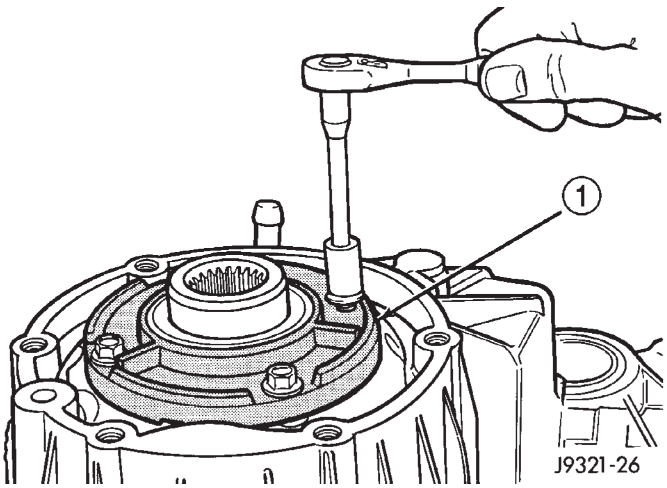


Fig. 31 Front Bearing Retainer Bolt Removal

1 – FRONT BEARING RETAINER

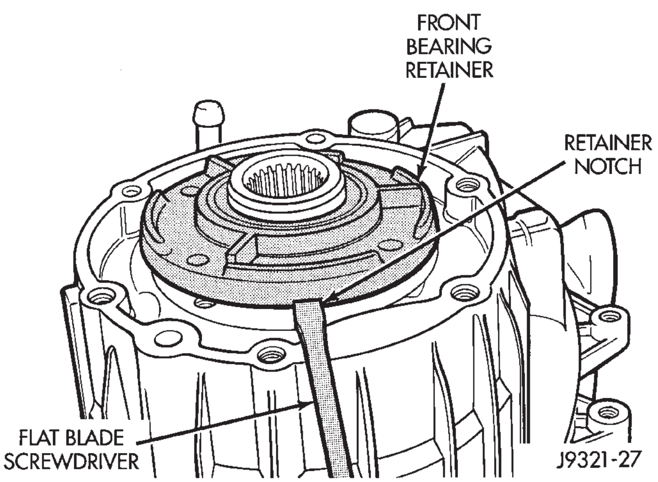


Fig. 32 Front Bearing Retainer Removal

(4) Remove snap-ring that retains input gear shaft in front bearing (Fig. 33).

(5) Remove input and low range gear assembly (Fig. 34).

(6) Remove oil seals from following components:
- front bearing retainer.
- rear retainer.
- case halves.

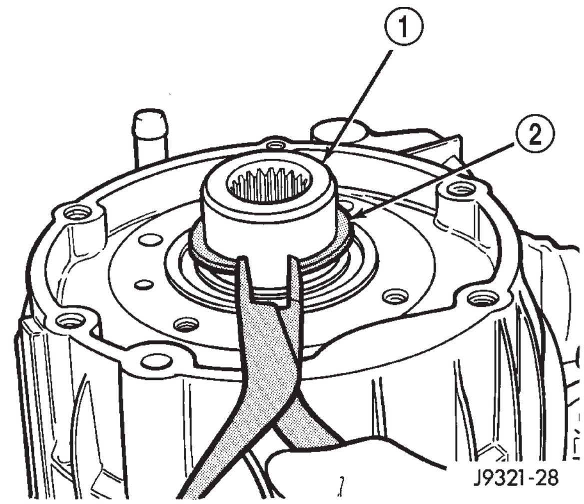


Fig. 33 Input Gear Snap-Ring Removal

1 – INPUT GEAR
2 – SNAP RING

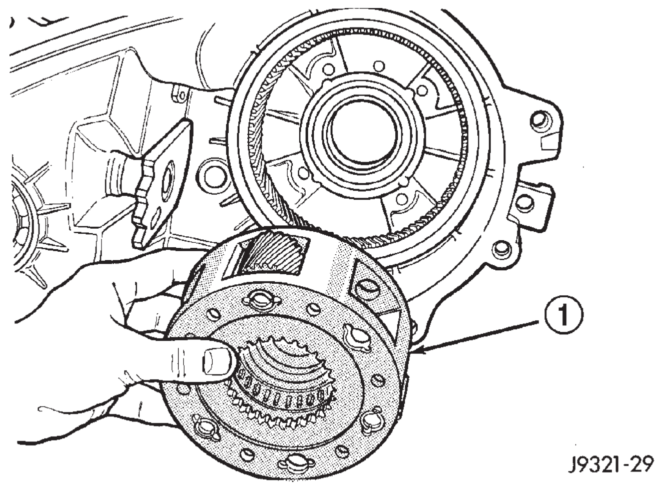


Fig. 34 Input And Low Range Gear Assembly Removal

1 – INPUT AND LOW RANGE GEAR ASSEMBLY

INPUT AND LOW RANGE GEAR DISASSEMBLY

(1) Remove snap-ring that retains input gear in low range gear (Fig. 35).

(2) Remove retainer (Fig. 36).

(3) Remove front tabbed thrust washer (Fig. 37).

(4) Remove input gear (Fig. 38).

(5) Remove rear tabbed thrust washer from low range gear (Fig. 39).

DISASSEMBLY AND ASSEMBLY (Continued)

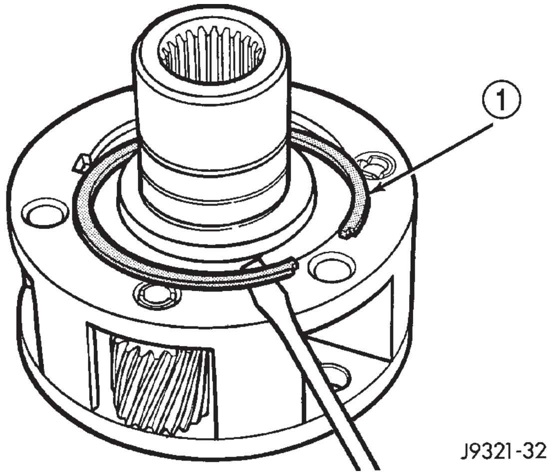


Fig. 35 Input Gear Snap-Ring Removal

1 – INPUT GEAR SNAP RING

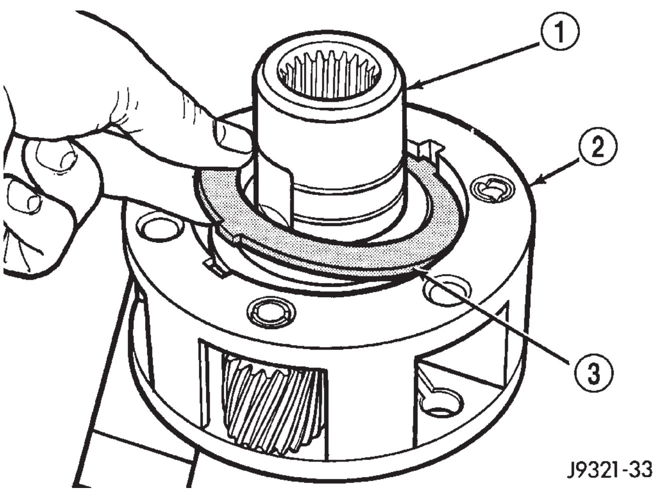


Fig. 36 Input Gear Retainer Removal

1 – INPUT GEAR
2 – LOW RANGE GEAR
3 – RETAINER

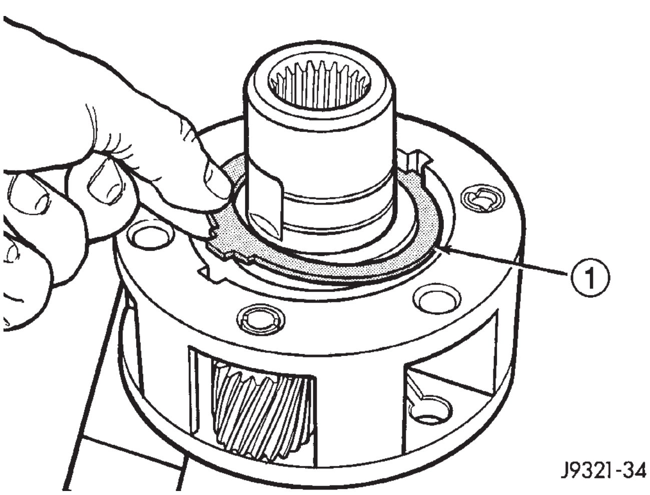


Fig. 37 Front Tabbed Thrust Washer Removal

1 – FRONT TABBED THRUST WASHER

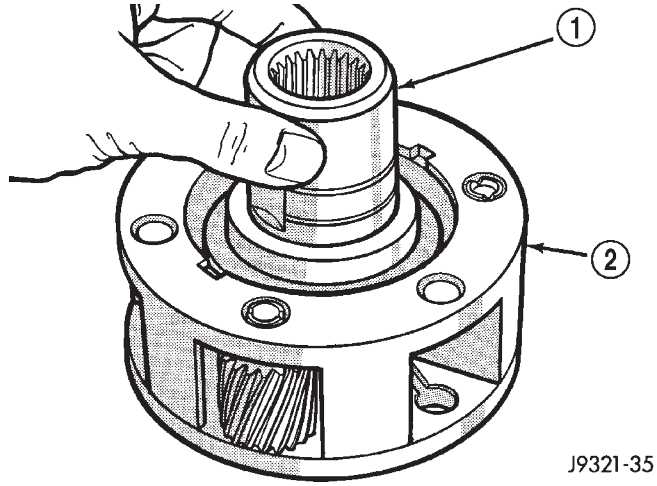


Fig. 38 Input Gear Removal

1 – INPUT GEAR
2 – LOW RANGE GEAR

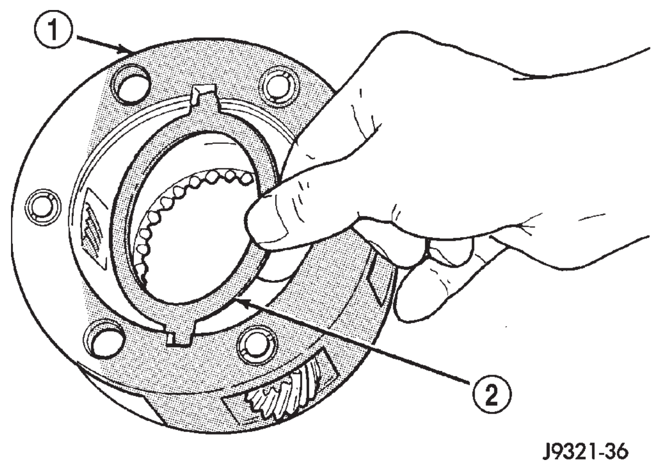


Fig. 39 Rear Tabbed Thrust Washer Removal

1 – LOW RANGE GEAR
2 – REAR TABBED THRUST WASHER

ASSEMBLY

Lubricate transfer case components with Mopar® Dexron II automatic transmission fluid or petroleum jelly (where indicated) during assembly.

CAUTION: The bearing bores in various transfer case components contain oil feed holes. Make sure replacement bearings do not block the holes.

BEARING AND SEAL INSTALLATION

(1) Remove front output shaft seal from front case with pry tool (Fig. 40).

(2) Remove snap-ring that retains front output shaft bearing in front case (Fig. 41).

(3) Using tool 6953, remove bearing from front case (Fig. 42).

DISASSEMBLY AND ASSEMBLY (Continued)

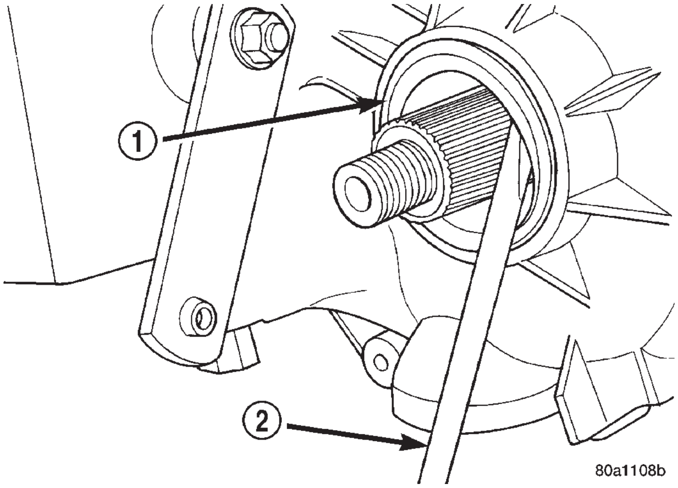


Fig. 40 Remove Front Output Shaft Seal

1 – OUTPUT SHAFT SEAL
2 – PRYBAR

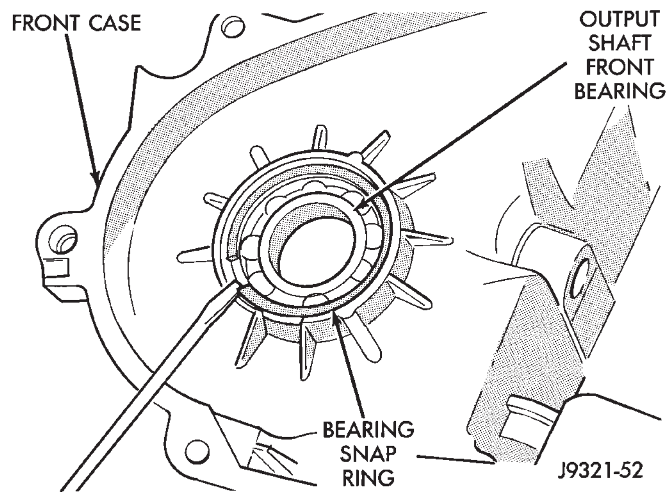


Fig. 41 Output Shaft Front Bearing Snap-Ring Removal

(4) Using tool 6953, install new bearing.

(5) Install snap-ring to hold bearing into case.

(6) Install new front output seal in front case with Installer Tool 6952-A as follows:

(a) Place new seal on tool. **Garter spring on seal goes toward interior of case.**

(b) Start seal in bore with light taps from hammer (Fig. 43). Once seal is started, continue tapping seal into bore until installer tool bottoms against case.

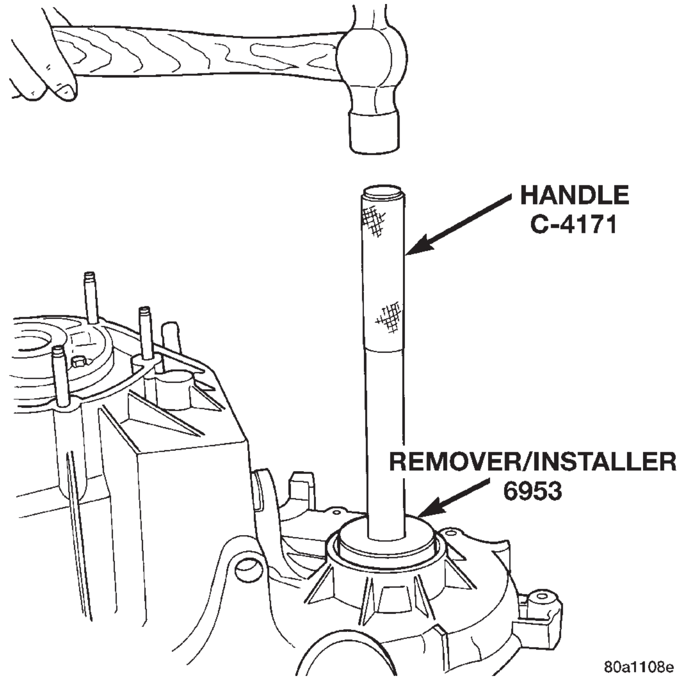


Fig. 42 Remove Output Shaft Front Bearing

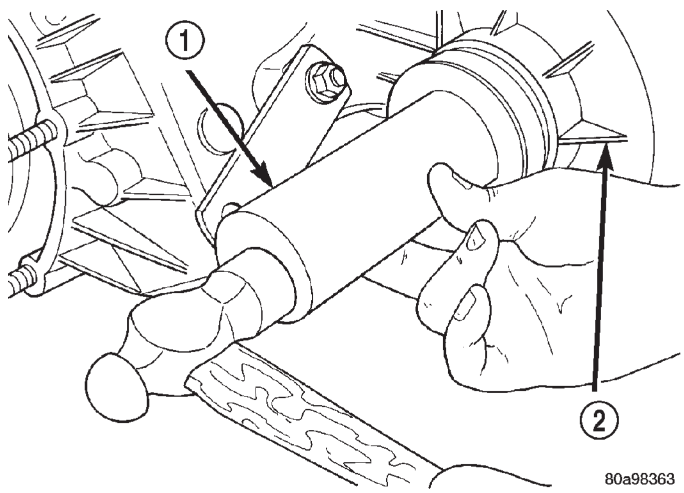


Fig. 43 Front Output Seal Installation

1 – INSTALLER 6952–A
2 – TRANSFER CASE

(7) Remove the output shaft rear bearing with the screw and jaws from Remover L-4454 and Cup 8148 (Fig. 44).

(8) Install new bearing with Tool Handle C-4171 and Installer 5066 (Fig. 45). **The bearing bore is chamfered at the top. Install the bearing so it is flush with the lower edge of this chamfer (Fig. 46).**

DISASSEMBLY AND ASSEMBLY (Continued)

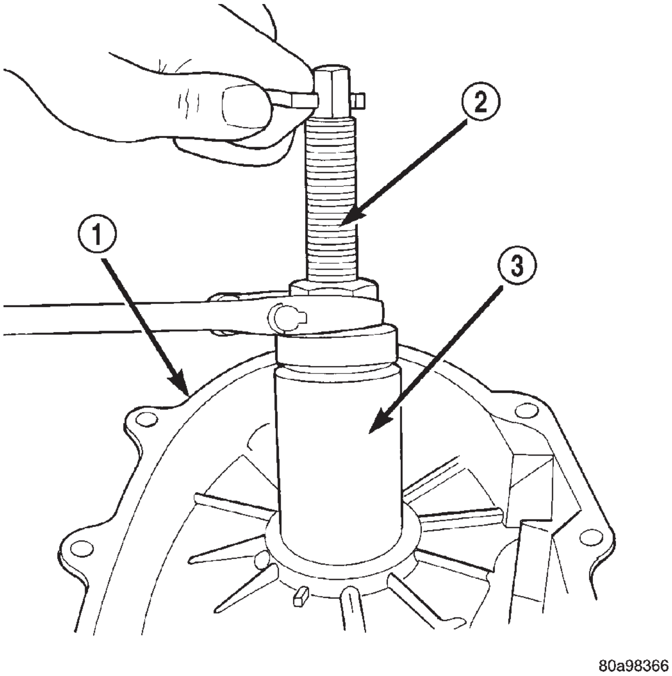


Fig. 44 Output Shaft Rear Bearing Removal

1 – REAR CASE
2 – SPECIAL TOOL L-4454–1 AND L-4454–3
3 – SPECIAL TOOL 8148

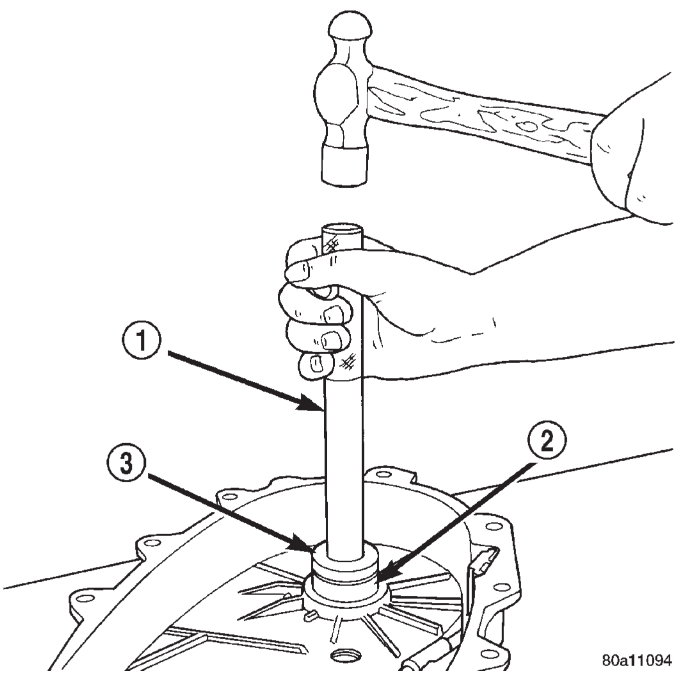


Fig. 45 Output Shaft Rear Bearing Installation

1 – HANDLE C-4171
2 – OUTPUT SHAFT INNER BEARING
3 – INSTALLER 5066

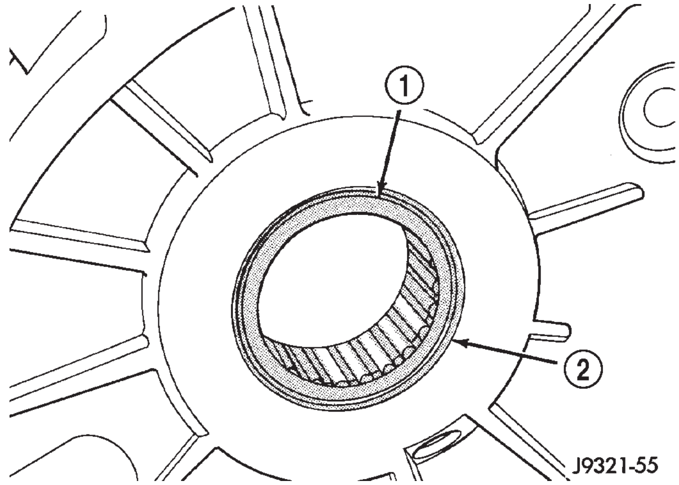


Fig. 46 Output Shaft Rear Bearing Installation Depth

1 – BEARING (SEATED) AT LOWER EDGE OF CHAMFER
2 – CHAMFER

(9) Using Remover C-4210 and Handle C-4171, drive input shaft bearing from inside the annulus gear opening in the case (Fig. 47).

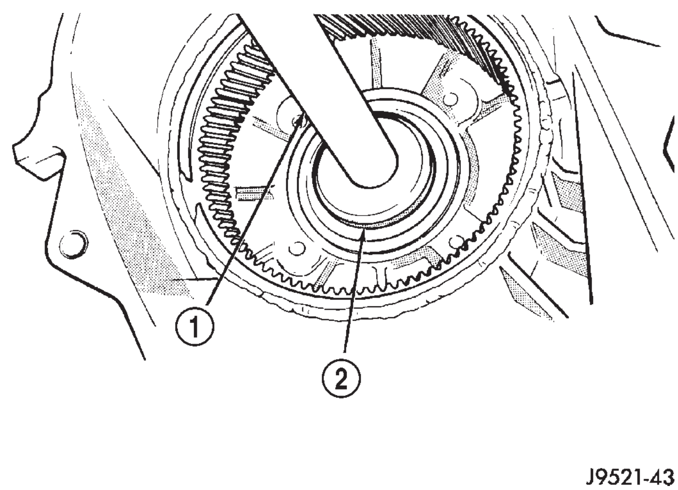


Fig. 47 Input Shaft Bearing Removal

1 – SPECIAL TOOL C-4171
2 – SPECIAL TOOL C-4210

(10) Install locating ring on new bearing.

(11) Position case so forward end is facing upward.

(12) Using Remover C-4210 and Handle C-4171, drive input shaft bearing into case. The bearing locating ring must be fully seated against case surface (Fig. 48).

(13) Remove input gear pilot bearing by inserting a suitably sized drift into the splined end of the input gear and driving the bearing out with the drift and a hammer (Fig. 49).

(14) Install new pilot bearing with Installer 8128 and Handle C-4171 (Fig. 50).

DISASSEMBLY AND ASSEMBLY (Continued)

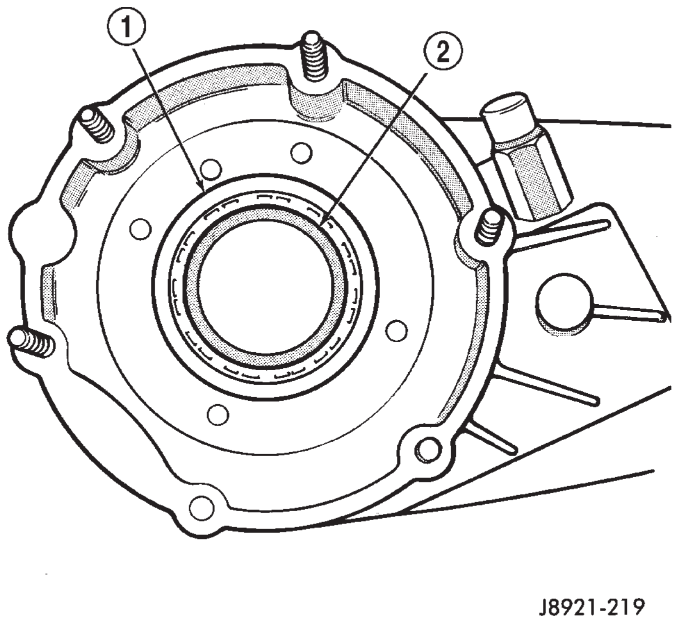


Fig. 48 Seating Input Shaft Bearing

1 – SNAP RING
2 – INPUT SHAFT BEARING

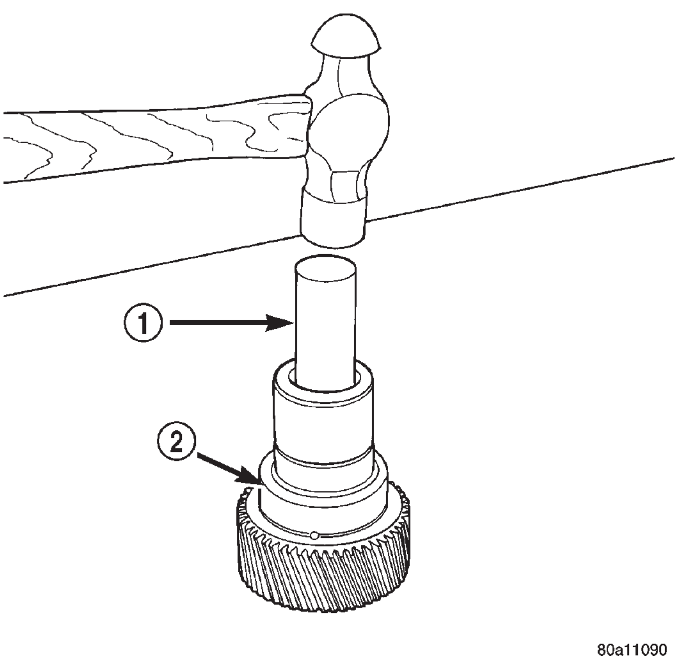


Fig. 49 Remove Input Gear Pilot Bearing

1 – DRIFT
2 – INPUT GEAR

(15) Remove front bearing retainer seal with suitable pry tool.

(16) Install new front bearing retainer with Installer 7884 (Fig. 51).

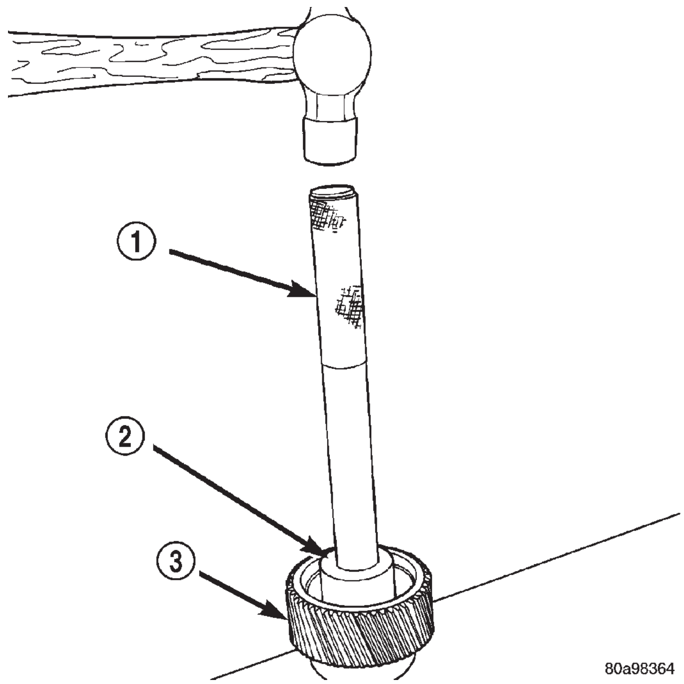


Fig. 50 Install Input Gear Pilot Bearing

1 – HANDLE C-4171
2 – INSTALLER 8128
3 – INPUT GEAR

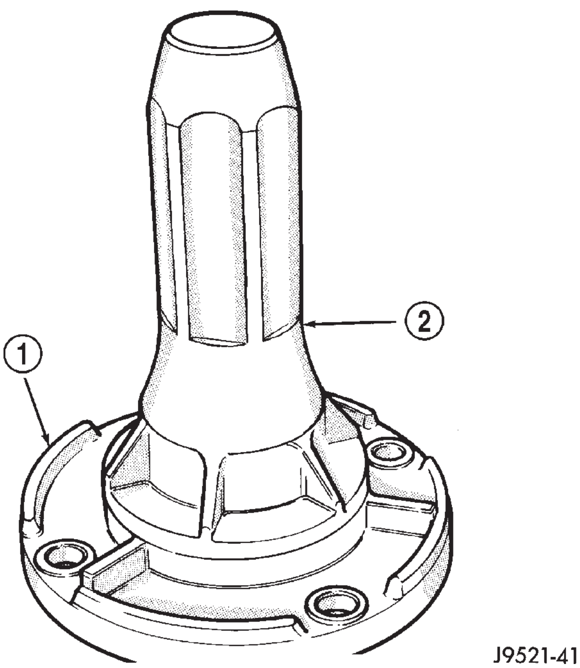


Fig. 51 Install Front Bearing Retainer Seal

1 – FRONT BEARING RETAINER
2 – SPECIAL TOOL 7884

INPUT AND LOW RANGE GEAR ASSEMBLY

(1) Lubricate gears and thrust washers (Fig. 52) with recommended transmission fluid.

DISASSEMBLY AND ASSEMBLY (Continued)

(2) Install first thrust washer in low range gear (Fig. 52). Be sure washer tabs are properly aligned in gear notches.

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

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

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

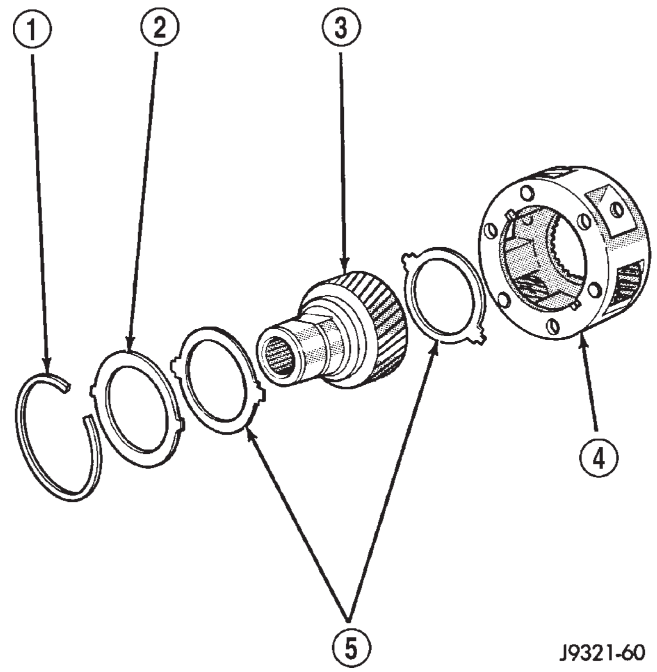


Fig. 52 Input/Low Range Gear Components

1 – SNAP RING
2 – RETAINER PLATE
3 – INPUT GEAR
4 – LOW RANGE GEAR
5 – THRUST WASHERS

INPUT GEAR/LOW RANGE INSTALLATION

(1) Align and install low range/input gear assembly in front case (Fig. 53). Be sure low range gear pinions are engaged in annulus gear and that input gear shaft is fully seated in front bearing.

(2) Install snap-ring to hold input/low range gear into front bearing (Fig. 54).

(3) Clean gasket sealer residue from retainer and inspect retainer for cracks or other damage.

(4) Apply a 3 mm (1/8 in.) bead of Mopar® gasket maker or silicone adhesive to sealing surface of retainer.

(5) Align cavity in seal retainer with fluid return hole in front of case.

CAUTION: Do not block fluid return cavity on sealing surface of retainer when applying Mopar® gasket maker or silicone adhesive sealer. Seal failure and fluid leak can result.

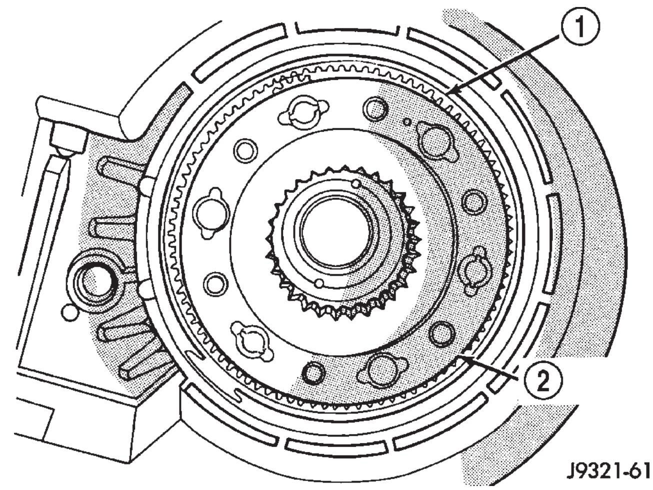


Fig. 53 Input/Low Range Gear Installation

1 – ANNULUS GEAR
2 – INPUT/LOW RANGE GEAR

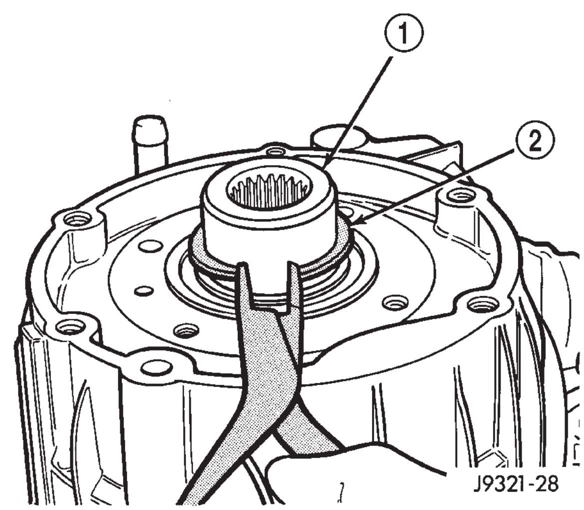


Fig. 54 Install Snap-Ring

1 – INPUT GEAR
2 – SNAP RING

(6) Install bolts to hold retainer to transfer case (Fig. 55). Tighten to 21 N·m (16 ft. lbs.) of torque.

SHIFT FORKS AND MAINSHAFT INSTALLATION

(1) Install new sector shaft O-ring and bushing (Fig. 56).

(2) Install shift sector (Fig. 57).

(3) Install locking clutch spring, locking clutch, blockout spring, and range clutch sleeve, to mainshaft as shown in (Fig. 58). Install snap ring.

(4) Install drive sprocket hub to mainshaft and manually load the needle bearings.

(5) Install new pads on range fork, if necessary.

DISASSEMBLY AND ASSEMBLY (Continued)

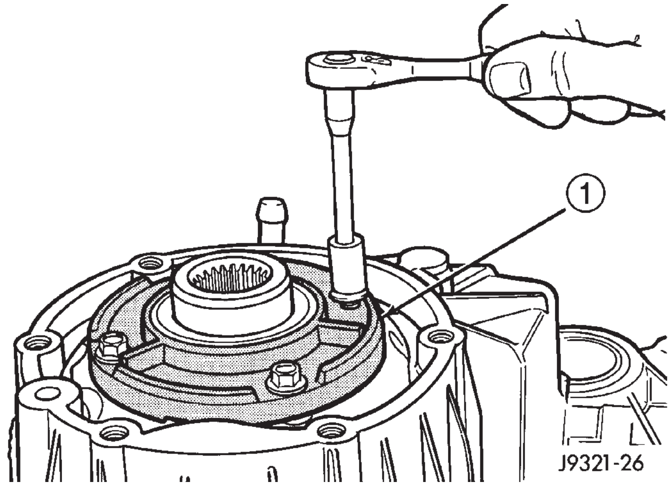


Fig. 55 Install Front Bearing Retainer

1 – FRONT BEARING RETAINER

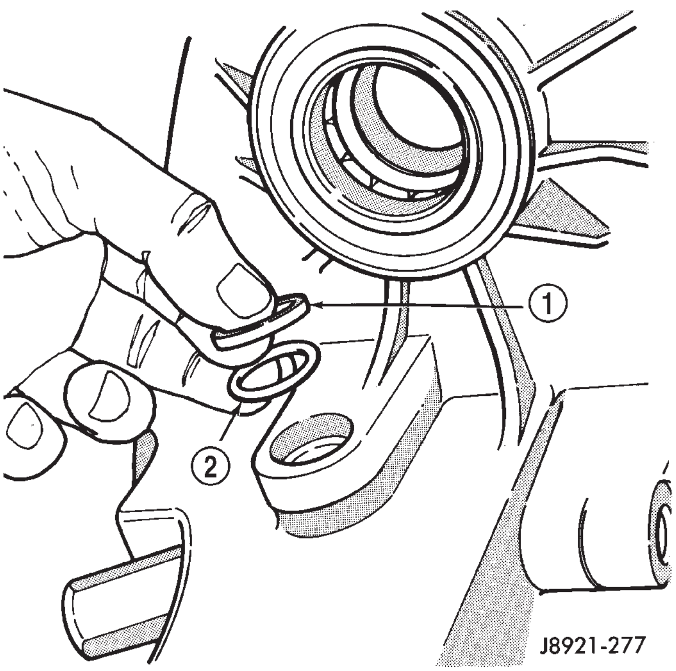


Fig. 56 Sector O-Ring And Bushing Installation

1 – SECTOR BUSHING

2 – O-RING

(6) Install range shift fork to range clutch sleeve. Install mainshaft/range shift fork assembly into transfer case and input planetary assembly. Rotate fork until it engages with slot in shift sector.

(7) Install shift rail to shift range fork and transfer case housing.

(8) Rotate shift sector to Neutral position.

(9) Install new O-ring on detent plug (Fig. 59).

(10) Lubricate detent plunger with transmission fluid or light coat of petroleum jelly.

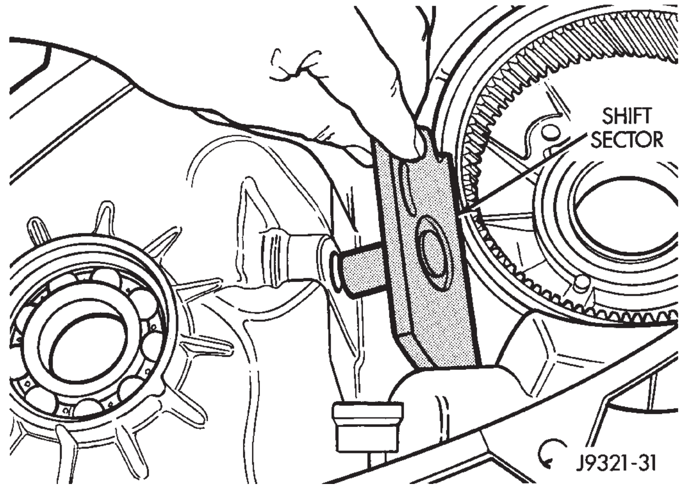


Fig. 57 Shift Sector Installation

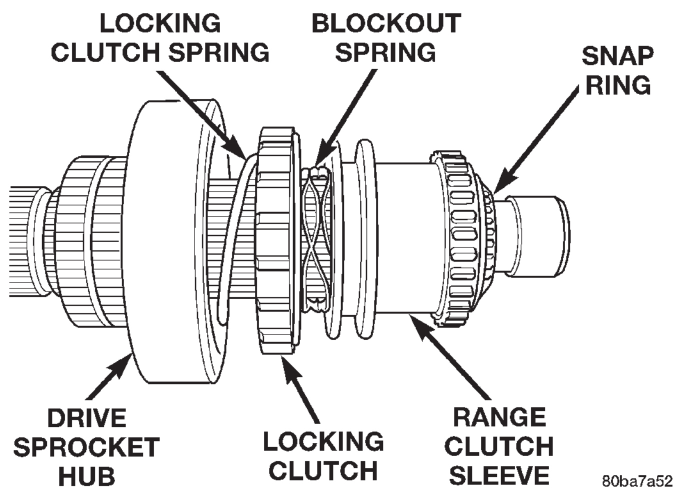


Fig. 58 Range Clutch Sleeve, Blockout Spring, Locking Clutch and Spring

(11) Install detent plunger, spring and plug (Fig. 59).

(12) Verify that plunger is properly engaged in sector.

FRONT OUTPUT SHAFT AND DRIVE CHAIN INSTALLATION

(1) Lubricate front output shaft-sprocket assembly, drive chain and drive sprocket with transmission fluid.

(2) Assemble drive chain, drive sprocket and front output shaft (Fig. 60).

(3) Start drive sprocket on mainshaft.

(4) Guide front shaft into bearing and drive sprocket onto mainshaft drive gear (Fig. 60).

(5) Install drive sprocket snap-ring (Fig. 61).

(6) Install roller bearings if removed.

(7) Install progressive coupling (Fig. 62).

(8) Install oil pickup tube in rear case. Be sure tube is seated in case notch as shown (Fig. 63).

(9) Install magnet in front case pocket (Fig. 64).

DISASSEMBLY AND ASSEMBLY (Continued)

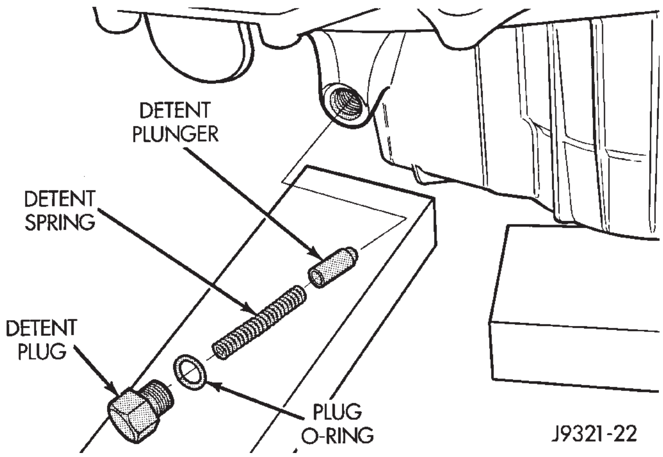


Fig. 59 Shift Detent Components

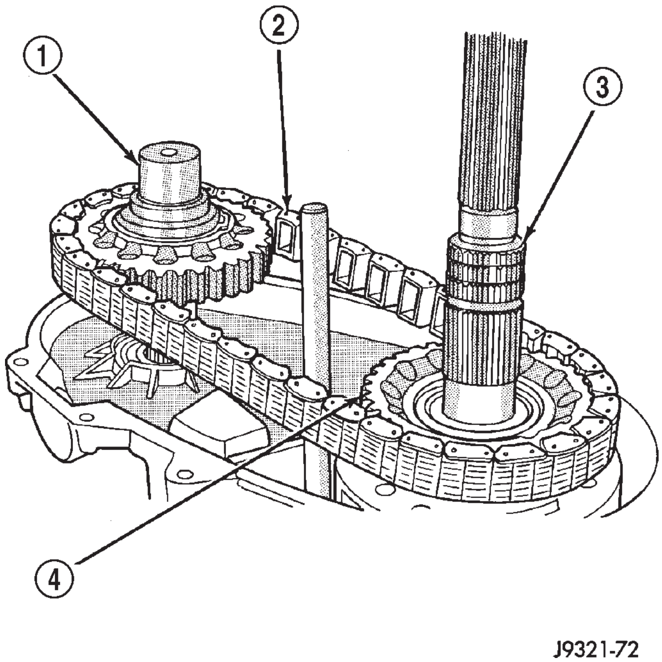


Fig. 60 Installing Drive Chain, Front Output Shaft And Drive Sprocket

1 – FRONT OUTPUT SHAFT
2 – DRIVE CHAIN
3 – MAINSHAFT
4 – DRIVE SPROCKET

(10) Clean sealing flanges of front case and rear case with a wax and grease remover.

(11) Apply 3 mm (1/8 in.) wide bead of Mopar® gasket maker or silicone adhesive sealer to mounting flange of front case. Work sealer bead around bolt holes as shown (Fig. 65).

(12) Align and install rear case on front case (Fig. 66).

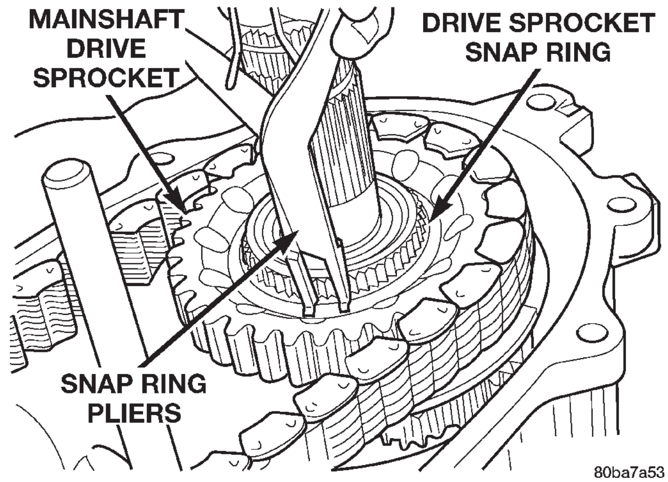


Fig. 61 Installing Drive Sprocket Snap-Ring

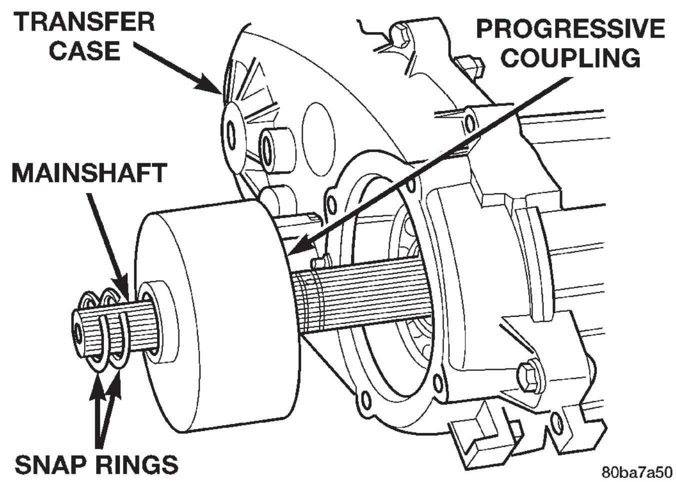


Fig. 62 Progressive Coupling Installation

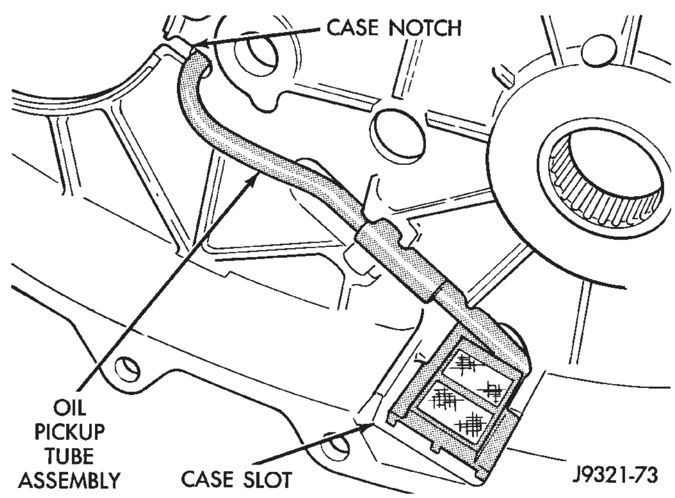


Fig. 63 Oil Pickup Tube Installation

(13) Verify that oil pickup tube is still seated in case notch and tube end is pointed toward mainshaft (Fig. 67).

DISASSEMBLY AND ASSEMBLY (Continued)

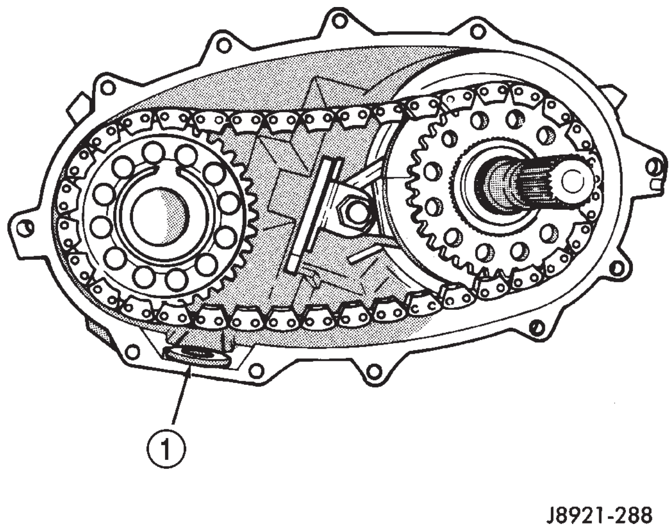


Fig. 64 Installing Case Magnet

1 – MAGNET

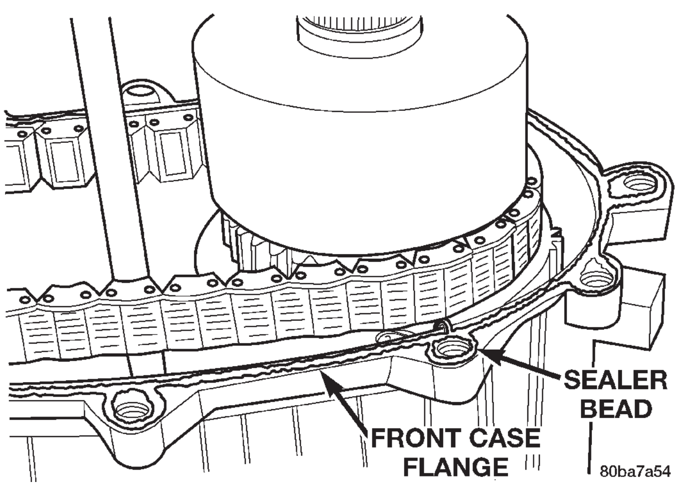


Fig. 65 Applying Sealer To Front Case Flange

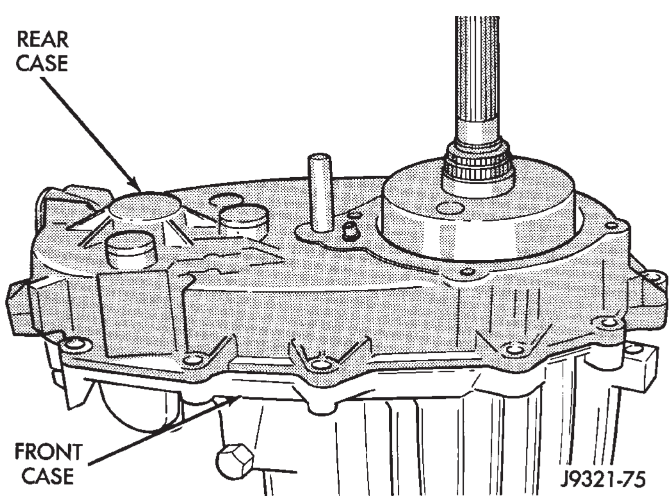


Fig. 66 Rear Case Installation

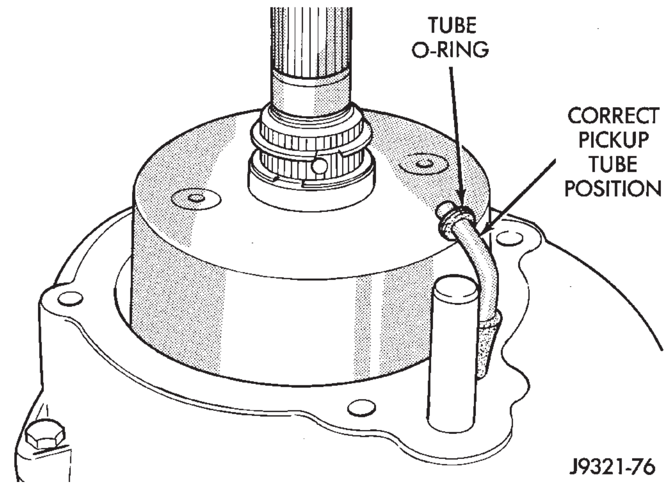


Fig. 67 Checking Position Of Oil Pickup Tube

(14) Install case attaching bolts. Alignment bolts at each end of case are only ones requiring washers (Fig. 68).

(15) Tighten case bolts to 27-34 N·m (20-25 ft. lbs.) torque.

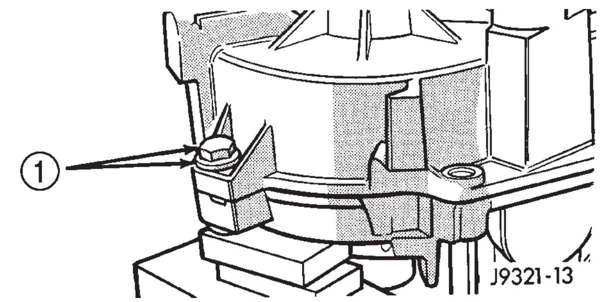


Fig. 68 Alignment Bolt Location

1 – ALIGNMENT BOLT AND WASHER (AT EACH END OF CASE)

COMPANION FLANGE AND RANGE LEVER INSTALLATION

(1) Install range lever, washer and locknut on sector shaft (Fig. 69). Tighten locknut to 27-34 N·m (20-25 ft. lbs.) torque.

(2) Install new seal washer on front output shaft (Fig. 70).

(3) Lubricate flange hub with transmission fluid and install flange on front shaft.

(4) Install new seal washer on front shaft.

(5) Install companion flange and new nut on front output shaft.

(6) Tighten flange nut to 122-176 N·m (90-130 ft. lbs.) torque. Use Tool C-3281, or similar tool to hold flange while tightening yoke nut.

PROGRESSIVE COUPLER

(1) Install coupling on mainshaft (Fig. 71).

(2) Install coupling retaining snap-ring first (Fig. 71). Be sure snap ring is fully seated before proceeding.

DISASSEMBLY AND ASSEMBLY (Continued)

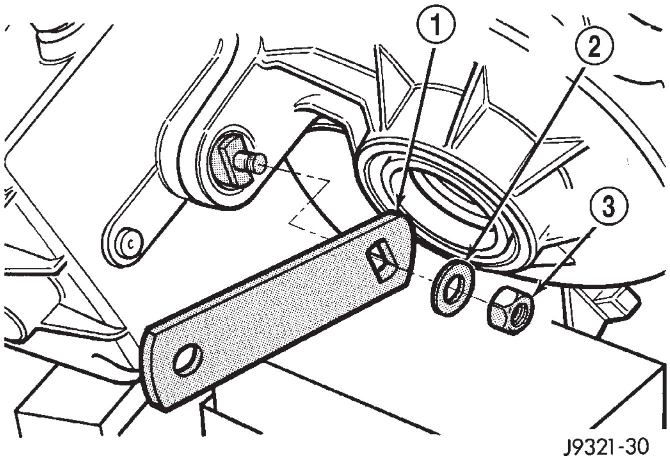


Fig. 69 Range Lever Installation (Typical)

1 – RANGE LEVER
2 – WASHER
3 – LOCKNUT

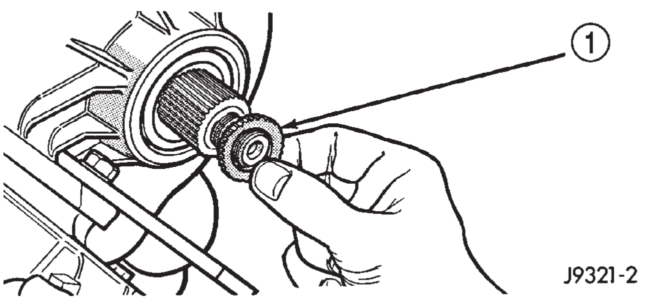


Fig. 70 Flange Seal Washer Installation

1 – YOKE SEAL WASHER

(3) Install oil pump locating snap-ring on mainshaft (Fig. 71).

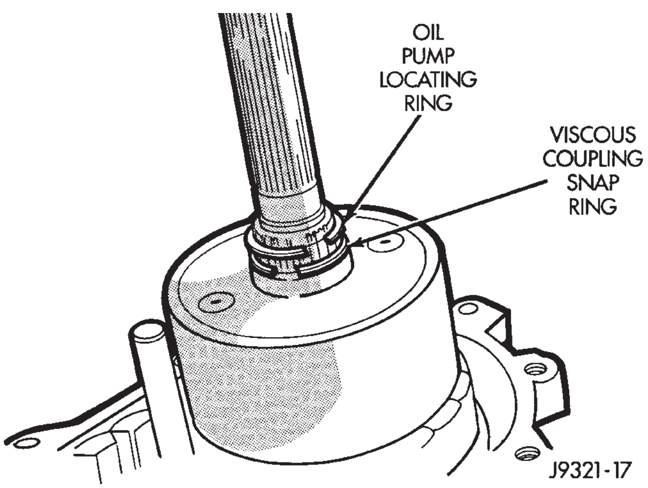


Fig. 71 Progressive Coupling And Oil Pump Snap-Ring Installation

REAR RETAINER AND OIL PUMP INSTALLATION

(1) Install new O-ring on flanged end of oil pickup tube.

(2) Install oil pump (Fig. 72).

(3) Insert oil pickup tube in pump (Fig. 73).

(4) Install rear bearing on mainshaft (Fig. 73). Locating ring groove in bearing goes toward end of mainshaft.

(5) Install rear bearing retaining snap-ring (Fig. 74).

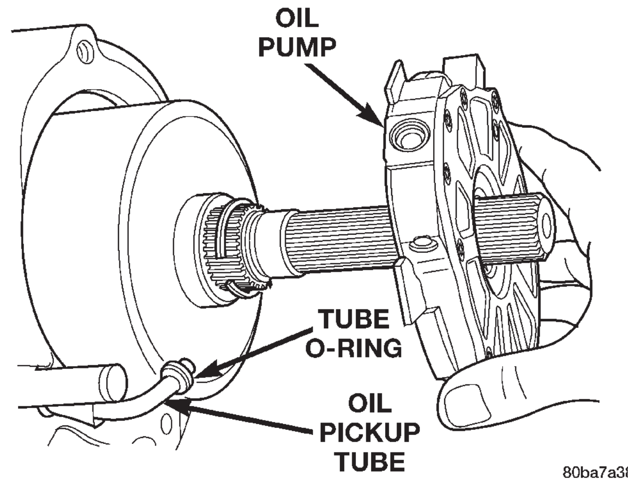


Fig. 72 Installing Oil Pump

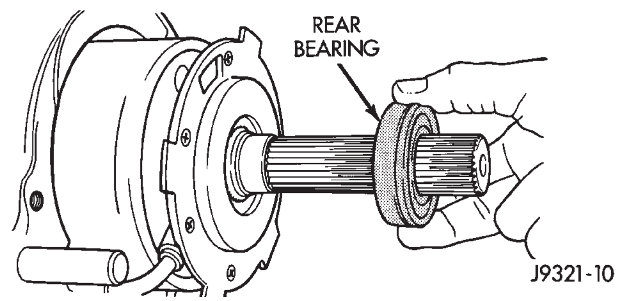


Fig. 73 Rear Bearing Installation

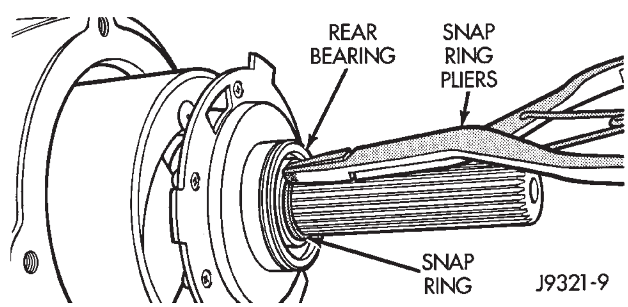


Fig. 74 Rear Bearing Snap-Ring Installation

(6) Install rear bearing locating ring in rear retainer, if ring was removed during overhaul.

(7) Apply 3 mm (1/8 in.) wide bead of Mopar® gasket maker or silicone adhesive sealer to mounting surface of rear retainer. Allow sealer to set-up slightly before proceeding.

DISASSEMBLY AND ASSEMBLY (Continued)

(8) Slide rear retainer onto mainshaft (Fig. 75).

(9) Spread rear bearing locating ring and slide rear retainer into place on rear case (Fig. 76).

(10) Install and tighten rear retainer bolts to 27-34 N·m (20-25 ft. lbs.).

(11) Install rubber access plug (Fig. 77).

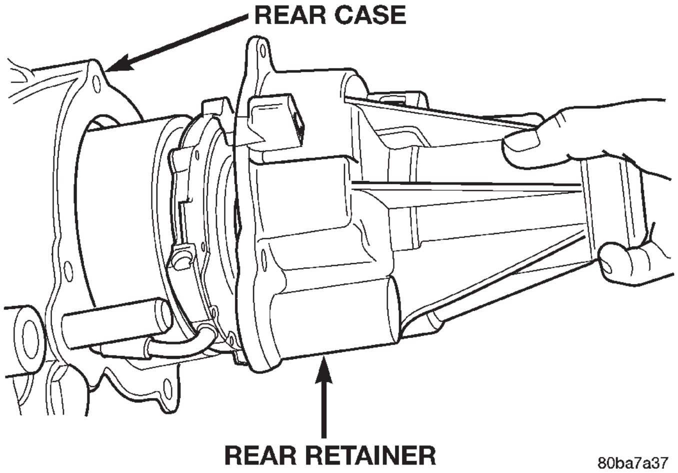


Fig. 75 Rear Retainer Installation

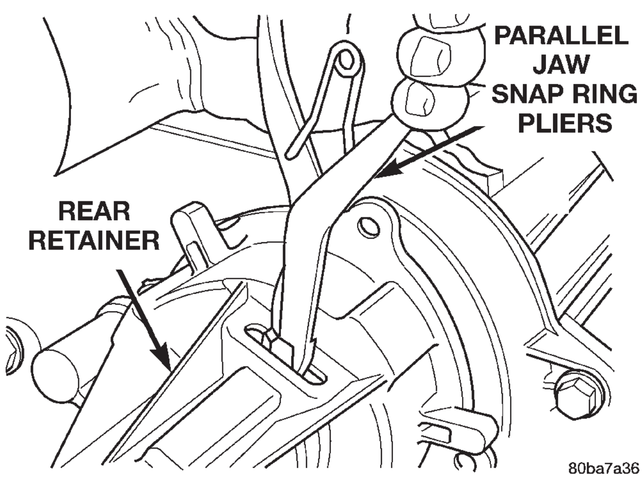


Fig. 76 Engaging Rear Bearing Locating Ring

FINAL ASSEMBLY

(1) Install drain plug. Tighten plug to 41-54 N·m (30-40 ft. lbs.) torque.

(2) Level transfer case and fill it with Mopar® Dexron II automatic transmission fluid. Correct fill level is to bottom edge of fill plug hole.

(3) Install and tighten fill plug to 41-54 N·m (30-40 ft. lbs.) torque.

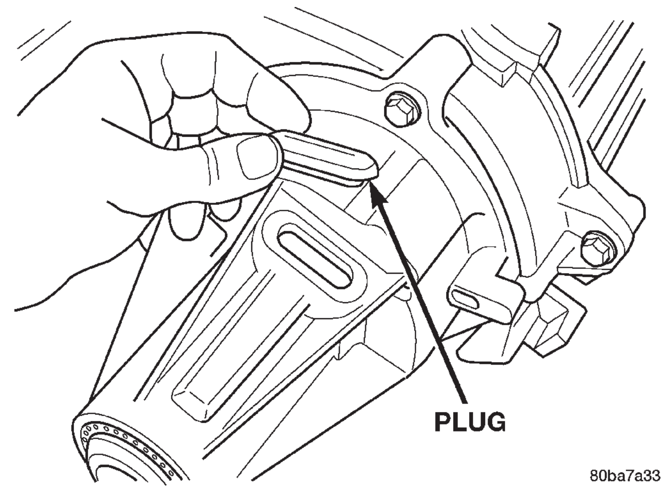


Fig. 77 Installing Rubber Access Plug

CLEANING AND INSPECTION

NV247 COMPONENTS

GENERAL

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

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

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

MAINSHAFT

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

Replace the thrust washers if worn or damaged.

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

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

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

INPUT AND LOW RANGE GEARS

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

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

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

Check the input gear pilot bearing. Rotate the bearing and check for roughness or noise. Also check bear-

CLEANING AND INSPECTION (Continued)

ing position in the bore. The bearing should be recessed approximately 2.5 mm (0.100 in.) below the top edge of the bore. The bearing should not be seated at the bottom of the bore. Replace the bearing if worn, or roughness is evident. Replace both the gear and bearing if the bearing is a loose fit in the bore.

GEAR CASE AND RETAINERS

Examine both case halves and retainers carefully. Replace any retainer or case half if wear, cracks, or other damage is evident.

Check condition of the low range annulus gear and the shift rail bushing in the front case (Fig. 78). The low range annulus gear is not a serviceable part. Replace the gear and case as an assembly if the gear is loose, worn, or damaged. The shift rail bushing is a serviceable part and can be replaced if necessary.

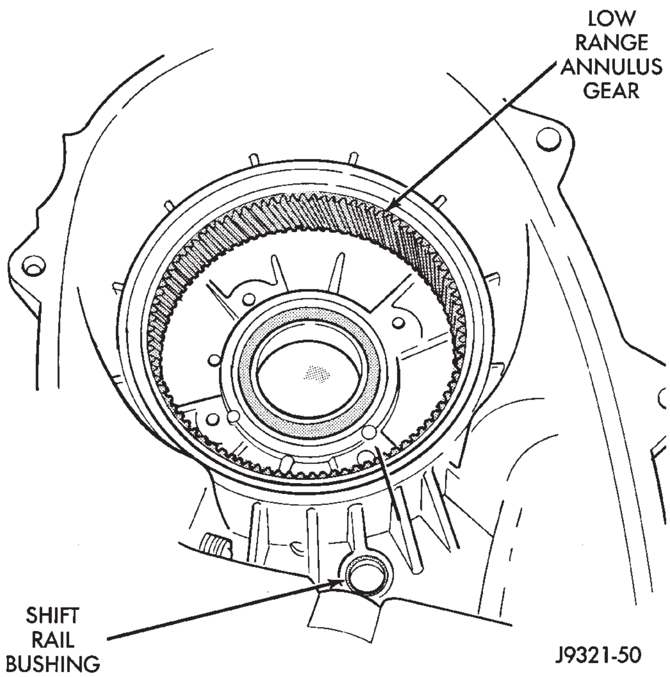


Fig. 78 Low Range Annulus Gear Location

Check the bushing in the rear retainer. Replace the bushing if worn or scored.

Examine the sealing surfaces of both case halves and retainers. Small burrs, or scratches on these surfaces can be reduced with crocus cloth or a fine tooth file.

Examine condition of the shift rail bushing in the front case. If the bushing is worn or damaged, it can be removed with a blind hole type puller. A replacement bushing can be installed with a suitable size driver. Recess the bushing slightly below the edge of the bore but do not seat it all the into the case.

GEARTRAIN

Inspect the mainshaft splines, gear teeth and bearing surfaces carefully for evidence of wear, or damage. Replace the shaft if necessary. do not attempt to salvage it if damaged.

The shift rail and range fork are an assembly. Replace both parts if either is damaged. However, the nylon pads in the fork can be replaced if worn, or cracked.

Inspect the transfer case snap rings closely. Do not attempt to salvage a distorted snap ring by straightening or reshaping it. Replace any snap ring that is distorted, or worn.

Inspect the low range gear, input gear and the gear thrust washers retainer, and snap ring. The low range gear is serviced as an assembly only. Replace the gear if the case or pinions are damaged.

During inspection, also make sure the seal surface of the input gear is in good condition. Minor nicks on this surface can be reduced with crocus cloth. However, replace the gear if the seal surface is severely scored or worn.

OIL PUMP AND PROGRESSIVE COUPLING

The oil pump and progressive coupling are not serviceable components. Replace the coupling as an assembly if it is leaking or damaged. Replace the oil pump as an assembly if the gear teeth are worn, or if the pump has become damaged.

BEARINGS AND SEALS

The transfer case seals should be replaced during overhaul. Use new seals in the input gear bearing retainer, front case and rear retainer. Also replace the yoke seal washer and the detent plug O-ring.

Check condition of each transfer case bearing. Replace any bearing exhibiting signs of roughness, wear, or damage.

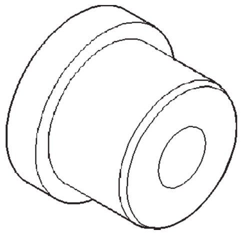
SPECIFICATIONS

TORQUE

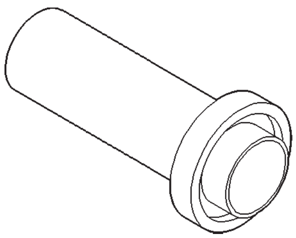
DESCRIPTION	TORQUE
Bolt, crossmember	41-47 N·m (30-35 ft. lbs.)
Plug, Detent	16-24 N·m (12-18 ft. lbs.)
Plugs, drain/fill	41-54 N·m (30-40 ft. lbs.)
Bolts, front brg. retainer	16-24 N·m (12-18 ft. lbs.)
Bolts, case half	27-34 N·m (20-25 ft. lbs.)
Nut, companion flange	122–176 N·m (90-130 ft. lbs.)
Bolts, rear extension	27-34 N·m (20-25 ft. lbs.)
Lock-nut, shift	27-34 N·m (20-25 ft. lbs.)
Nuts, T-case mount stud	33-41 N·m (24-30 ft. lbs.)

SPECIAL TOOLS

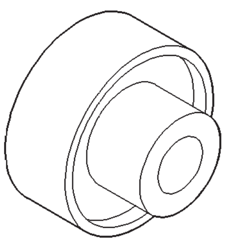
NV247 TRANSFER CASE



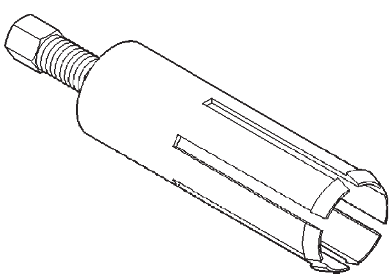
Installer—5066



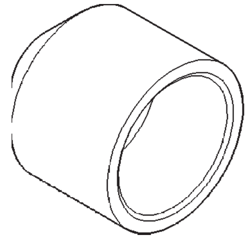
Installer—6952-A



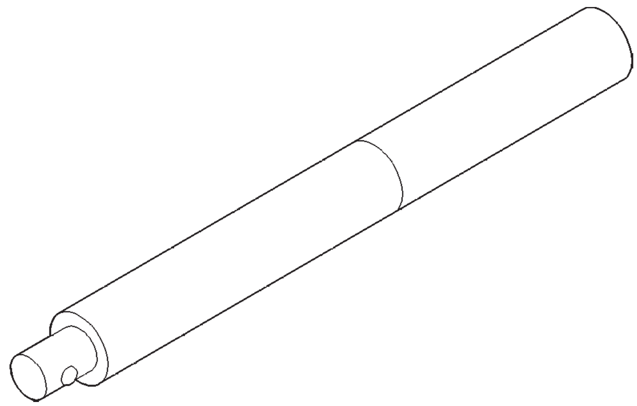
Installer—6953



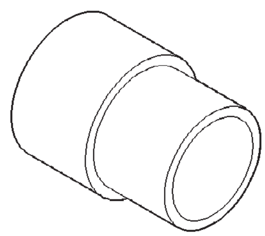
Remover—6957



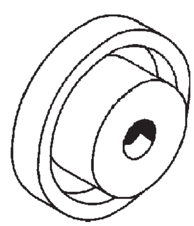
Installer—C-3995-A



Handle—C-4171

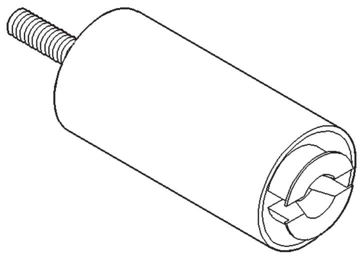


Installer—8145

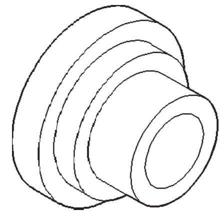


Remover—C-4210

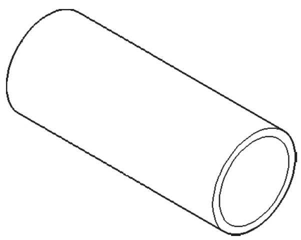
SPECIAL TOOLS (Continued)



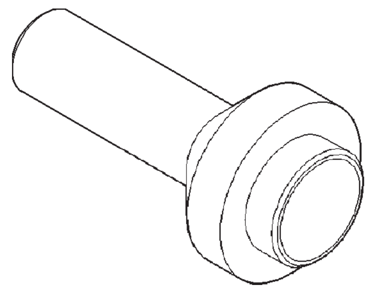
Remover—L-4454



Installer—8128



Cup—8148



Installer—7884