

TRANSMISSION AND TRANSFER CASE

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AX 4/5 MANUAL TRANSMISSION

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GENERAL INFORMATION

The AX 4 is a four speed manual transmission. The AX 5 is a five speed manual transmission. Fifth gear in the AX 5 is an overdrive range. The shift mechanism in both models is integral and mounted in the shift tower portion of the adapter housing (Fig. 1). The AX 4/5 is used for 2.5L engine applications.

TRANSMISSION IDENTIFICATION

The AX 4/5 identification code is on the bottom surface of the transmission case near the fill plug

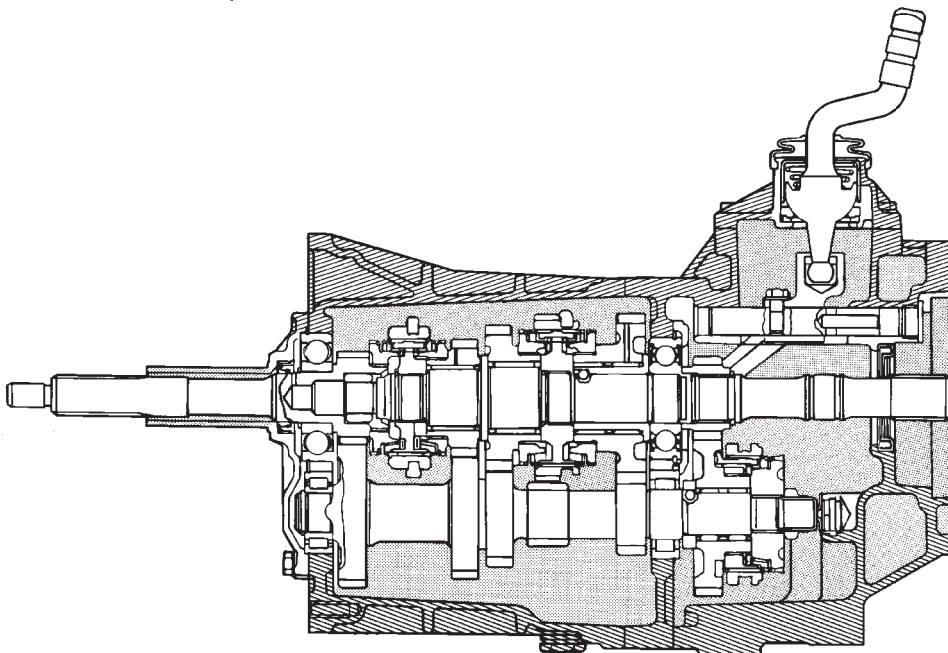
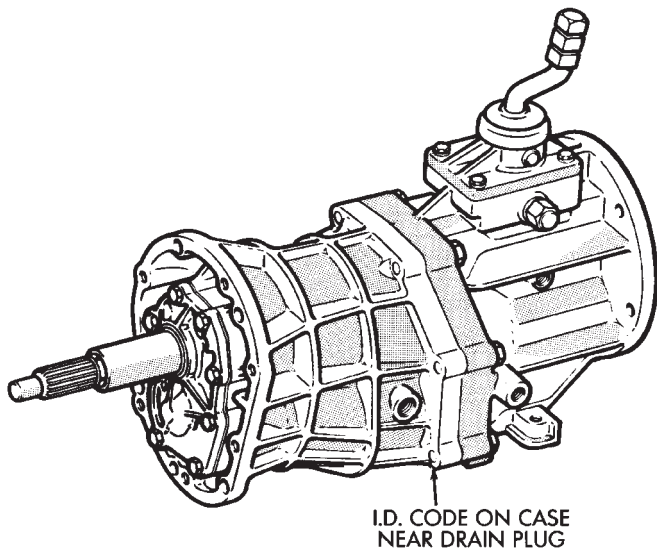


Fig. 1 AX 4/5 Manual Transmission

(Fig. 2). The first number is year of manufacture. The second and third numbers indicate month of manufacture. The next series of numbers is the transmission serial number.



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Fig. 2 Transmission Identification

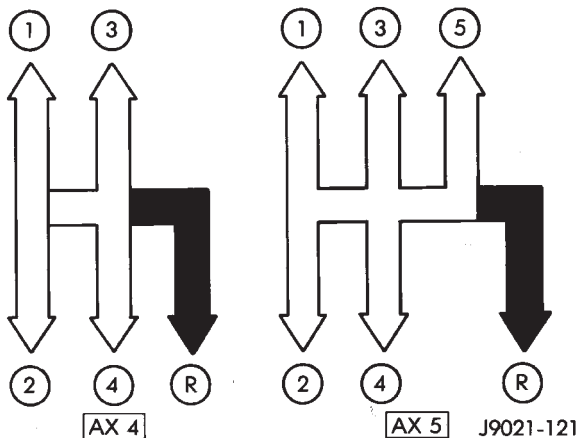
GEAR RATIOS

AX 4 and AX 5 gear ratios are as follows:

- First gear: 3.93:1
- Second gear: 2.33:1
- Third gear: 1.45:1
- Fourth gear: 1.00:1
- Fifth gear (AX 5): 0.85:1
- Reverse gear: 4.74:1

SHIFT PATTERN

The AX 4/5 first through fourth gear shift pattern is in a conventional H configuration. On the AX 5, fifth gear is up and to the right and reverse gear is down and to the right (Fig. 3).



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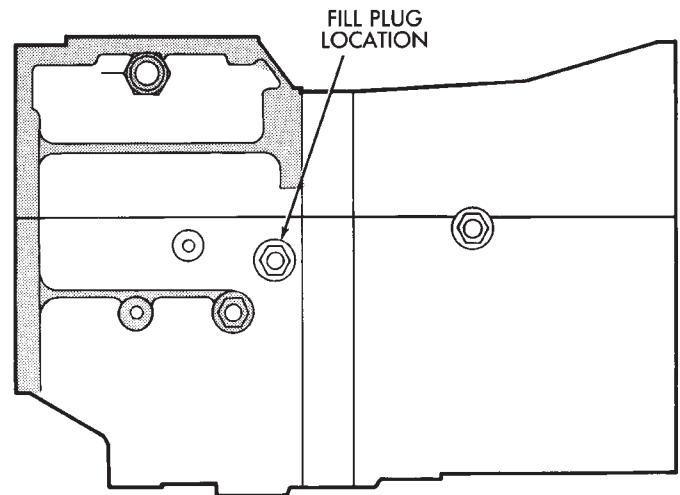
Fig. 3 Shift Pattern—AX 4/5 Transmission

RECOMMENDED LUBRICANT

Recommended lubricant for AX 4/5 transmissions is Mopar 75W-90, API Grade GL-5 gear lubricant, or equivalent SAE rated gear lubricant.

Correct lubricant fill level is to the bottom edge of the fill plug hole. The fill plug is at the passenger side of the adapter housing Fig. 4). The drain plug is at the bottom of the case.

Approximate dry fill lubricant capacity is 3.3 liters (3.5 qts.).



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Fig. 4 Fill Plug Location

SERVICE DIAGNOSIS

LOW LUBRICANT LEVEL

A low transmission lubricant level is generally the result of a leak, inadequate lubricant fill, or an incorrect lubricant level check.

Leaks can occur at the mating surfaces of the gear case, intermediate plate and adaptor or extension housing, or from the front/rear seals. A suspected leak could also be the result of an overfill condition.

Leaks at the rear of the extension or adapter housing will be from the housing oil seals. Leaks at component mating surfaces will probably be the result of inadequate sealer, gaps in the sealer, incorrect bolt tightening, or use of a non-recommended sealer.

A leak at the front of the transmission will be from either the front bearing retainer or retainer seal. Lubricant may be seen dripping from the clutch housing after extended operation. If the leak is severe, it may also contaminate the clutch disc causing slip, grab and chatter.

Transmissions filled from air or electrically powered lubricant containers can be underfilled. This generally happens when the container delivery mechanism is improperly calibrated. Always check the lubricant level after filling to avoid an under fill condition.

A correct lubricant level check can only be made when the vehicle is level; use a drive-on hoist to ensure this. Also allow the lubricant to settle for a minute or so before checking. These recommendations will ensure an accurate check and avoid an under-or-overfill condition.

HARD SHIFTING

Hard shifting is usually caused by a low lubricant level, improper or contaminated lubricants, component damage, incorrect clutch adjustment, or by a damaged clutch pressure plate or disc.

Substantial lubricant leaks can result in gear, shift rail, synchro and bearing damage. If a leak goes undetected for an extended period, the first indications of a problem are usually hard shifting and noise.

Incorrect or contaminated lubricants can also contribute to hard shifting. The consequence of using non-recommended lubricants is noise, excessive wear, internal bind and hard shifting.

Improper clutch release is a frequent cause of hard shifting. Incorrect adjustment or a worn, damaged pressure plate or disc can cause incorrect release. If the clutch problem is advanced, gear clash during shifts can result.

Worn or damaged synchro rings can cause gear clash when shifting into any forward gear. In some new or rebuilt transmissions, new synchro rings may

tend to stick slightly causing hard or noisy shifts. In most cases, this condition will decline as the rings wear-in.

TRANSMISSION NOISE

Most manual transmissions make some noise during normal operation. Rotating gears can generate a mild whine that may only be audible at extreme speeds.

Severe, obviously audible transmission noise is generally the result of a lubricant problem. Insufficient, improper, or contaminated lubricant can promote rapid wear of gears, synchros, shift rails, forks and bearings. The overheating caused by a lubricant problem, can also lead to gear breakage.

TRANSMISSION REMOVAL

- (1) Shift transmission into first or third gear. Then raise vehicle on hoist.
- (2) Support engine with adjustable jack stand. Be sure to position wood block between jack and oil pan.
- (3) Disconnect necessary exhaust system components.
- (4) Disconnect rear cushion and bracket from transmission (Fig. 5). Then remove skid plate, or rear crossmember.
- (5) Disconnect transfer case shift linkage, vehicle speed sensor wires, and vent hose.

ITEM	TORQUE
A	41-68 N·m (30-50 ft. lbs.)
B	27-47 N·m (20-35 ft. lbs.)

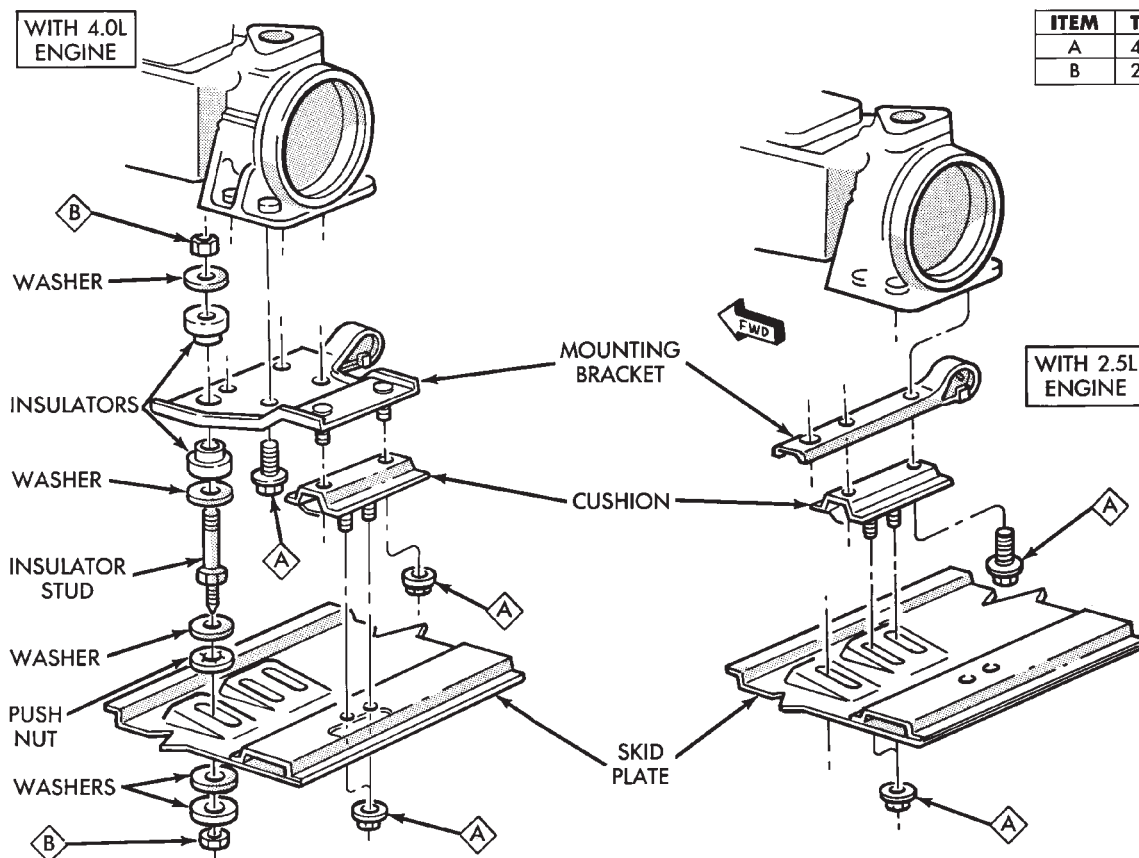


Fig. 5 Rear Mount Components (YJ Shown)

- (6) Remove slave cylinder from clutch housing.
- (7) Disconnect transmission shift lever as follows:
 - (a) Lower transmission-transfer case assembly approximately 7-8 cm (3 in.) for access to shift lever.
 - (b) Reach up and around transmission case and unseat shift lever dust boot from transmission shift tower (Fig. 6). Move boot upward on shift lever for access to retainer that secures lever in shift tower.
 - (c) Reach up and around transmission case and press shift lever retainer downward with your fingers. Turn retainer counterclockwise to release it.
 - (d) Lift lever and retainer out of shift tower (Fig. 6). **Do not remove the shift lever from the floorpan boots. Leave the lever in place for later transmission installation.**

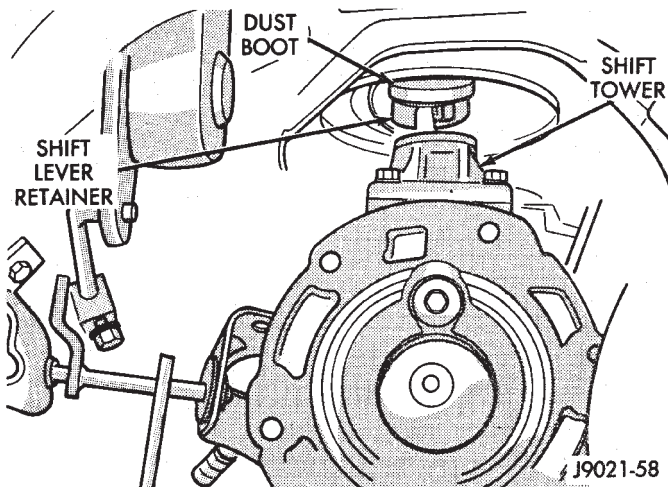


Fig. 6 Removing/Installing Shift Lever

- (8) Mark front and rear propeller shafts for installation alignment (Fig. 7). Then remove shafts.

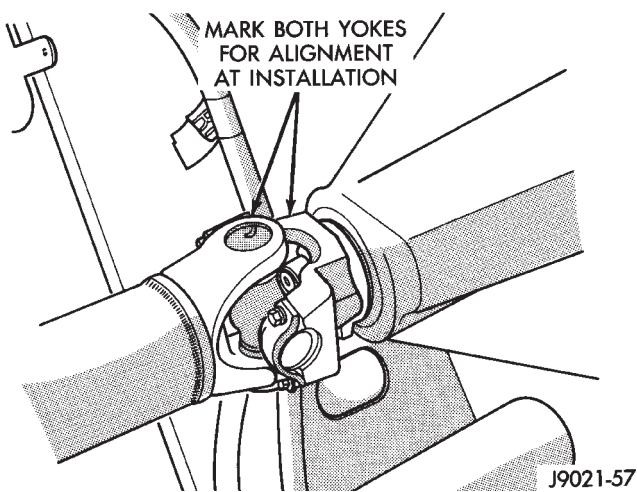


Fig. 7 Marking Propeller Shaft And Axle Yokes

- (9) Remove crankshaft position sensor (Fig. 8).
- (10) Disconnect vehicle speed sensor wires.
- (11) Disconnect transmission and transfer case vent hoses.

- (12) Disconnect clutch master cylinder hydraulic line from concentric bearing inlet line (Fig. 8).
- (13) Support transmission-transfer case assembly with a transmission jack. Secure assembly to jack with safety chains.
- (14) Remove clutch housing brace rod on 4-cylinder models.
- (15) Remove clutch housing-to-engine bolts and remove transmission-transfer case assembly.
- (16) Remove bolts attaching transmission to transfer case and separate components.
- (17) Remove release bearing, fork and retainer clip.
- (18) Remove clutch housing.

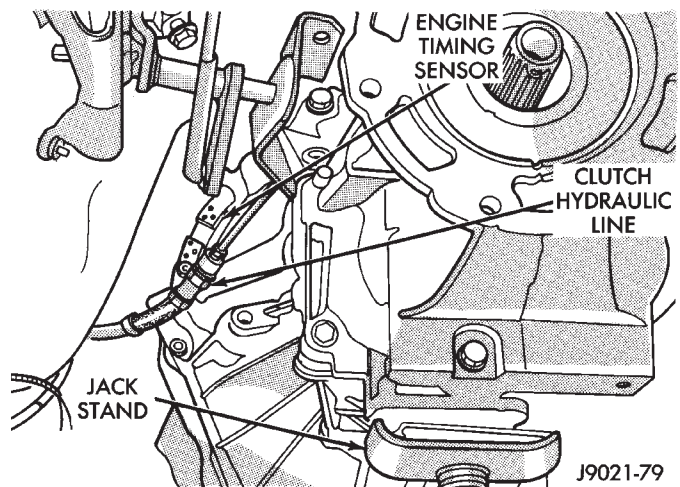


Fig. 8 Hydraulic Line And Timing Sensor Location

TRANSMISSION INSTALLATION

- (1) Install clutch housing on transmission. Tighten housing bolts to 37 N·m (27 ft. lbs.) torque.
- (2) Lubricate contact surfaces of release fork pivot ball stud and release fork with high temp grease. Then install release bearing, fork and retainer clip.
- (3) Mount transmission on transmission jack.
- (4) Lightly lubricate pilot bearing and transmission input shaft splines with Mopar high temperature grease.
- (5) Align transmission input shaft and clutch disc splines and install transmission.
- (6) Install and tighten clutch housing-to-engine bolts to 38 N·m (28 ft. lbs.) torque. **Be sure the housing is properly seated on engine block before tightening bolts.**
- (7) Lower transmission approximately 7-8 cm (3 in.) for access to shift tower. Be sure transmission is in first or third gear.
- (8) Reach up and around transmission and insert shift lever in shift tower. Press lever retainer downward and turn it clockwise to lock it in place. Then install lever dust boot on shift tower.
- (9) Install slave cylinder in clutch housing.
- (10) Connect engine timing sensor wires.
- (11) Remove jack from under transmission and mount transfer case on jack.

(12) Align transfer case and transmission shafts and install transfer case. Tighten transfer case-to-transmission nuts/bolts to 35 N·m (26 ft. lbs.) torque.

(13) Remove jack stand from under engine and reposition jack under transmission. Then remove transmission jack.

(14) Connect transfer case vent hose and shift linkage. Check and adjust linkage if necessary.

(15) Connect transmission and transfer case vent hoses.

(16) Connect backup light switch wires.

(17) Connect vehicle speed sensor wires.

(18) Install and connect crankshaft position sensor if equipped.

(19) Install rear crossmember, or skid plate (Fig. 5). On XJ, tighten crossmember-to-frame bolts to 41 N·m (31 ft. lbs.) torque. Then tighten transmission-to-rear support bolts/nuts to 45 N·m (33 ft. lbs.) torque. On YJ, tighten bolts/nuts to indicated torque (Fig. 5).

(20) Align and install front/rear propeller shafts. Tighten shaft U-joint clamp bolts to 19 N·m (170 in. lbs.) torque.

(21) On XJ, install skid plate, if removed. Tighten bolts to 42 N·m (31 ft. lbs.) torque. Tighten stud nuts to 17 N·m (150 in. lbs.) torque.

(22) Top off transmission and transfer case lubricant levels.

(23) Lower vehicle.

(5) Remove detent spring and ball. Remove detent plug (Fig. 10) and remove detent spring and ball with pencil magnet.

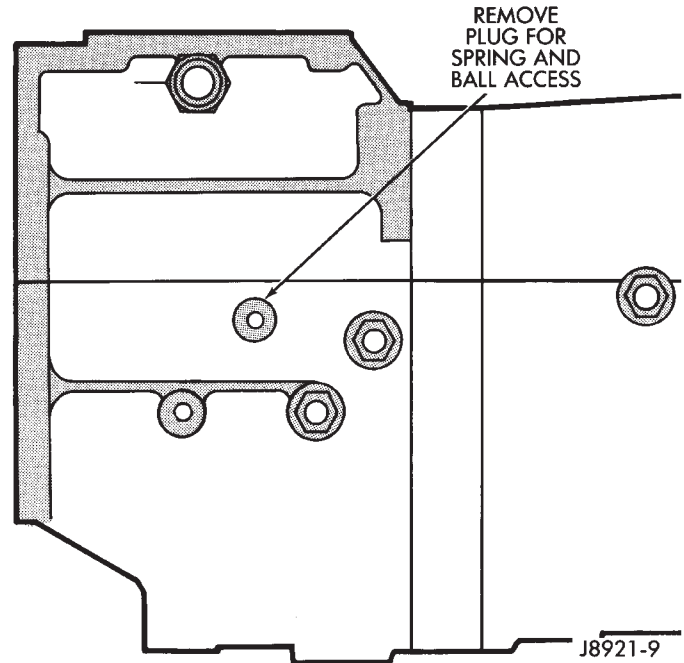


Fig. 10 Detent Ball Plug Location

(6) Remove shift arm set bolt (Fig. 11) and remove bolt and lockplate.

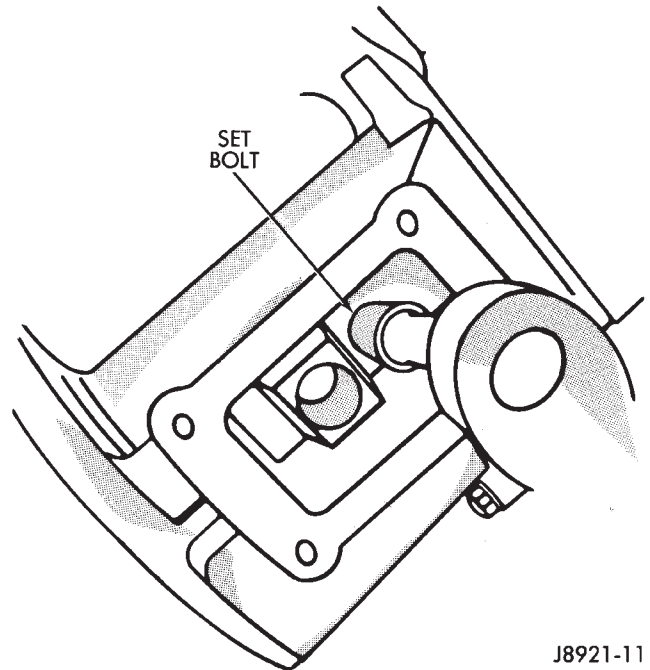


Fig. 11 Set Bolt Removal

TRANSMISSION DISASSEMBLY AND OVERHAUL

ADAPTER HOUSING AND FRONT BEARING RETAINER REMOVAL

(1) Drain transmission lubricant.

(2) Remove concentric bearing.

(3) Remove clutch housing bolts and remove housing.

(4) On 2-wheel drive models, remove vehicle speed sensor, speedometer adapter and speedometer driven gear. Then remove extension housing seal (Fig. 9).

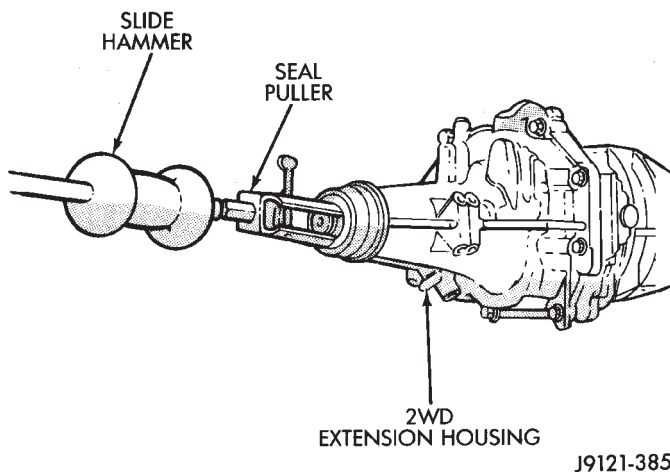
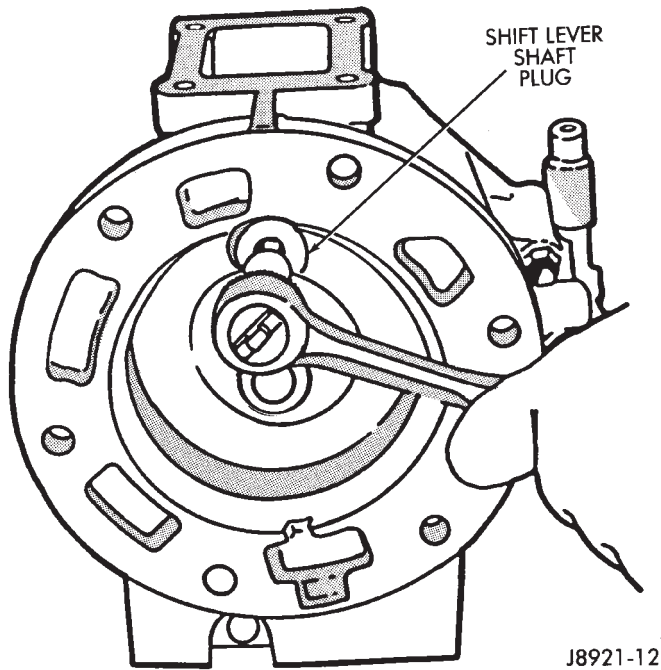


Fig. 9 Removing 2-Wheel Drive Extension Housing Seal

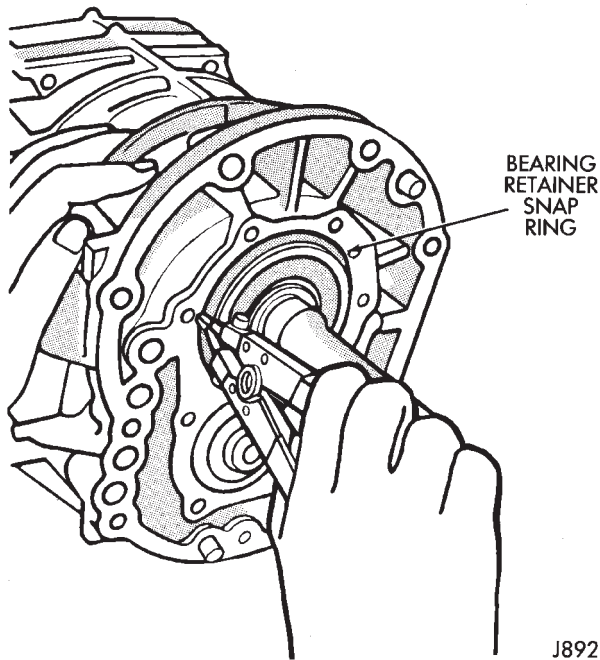
(7) Remove shift lever shaft plug (Fig. 12). Then pull shaft out with large magnet.



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Fig. 12 Removing Shift Lever Shaft Plug

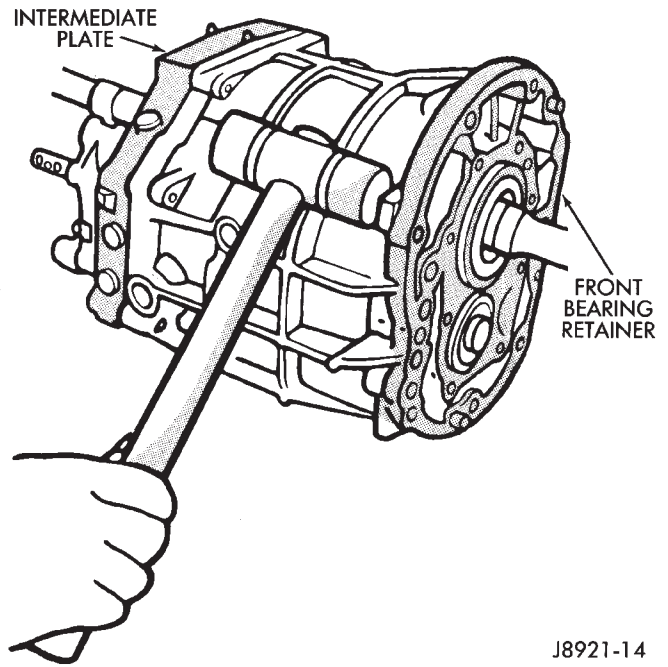
- (8) Remove adapter housing bolts.
- (9) Remove adapter housing by tapping it loose with plastic mallet.
- (10) Remove front bearing snap rings (Fig. 13).



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Fig. 13 Removing Bearing Retainer Snap Ring

(11) Remove front bearing retainer and intermediate plate by tapping them loose with plastic mallet (Fig. 14).

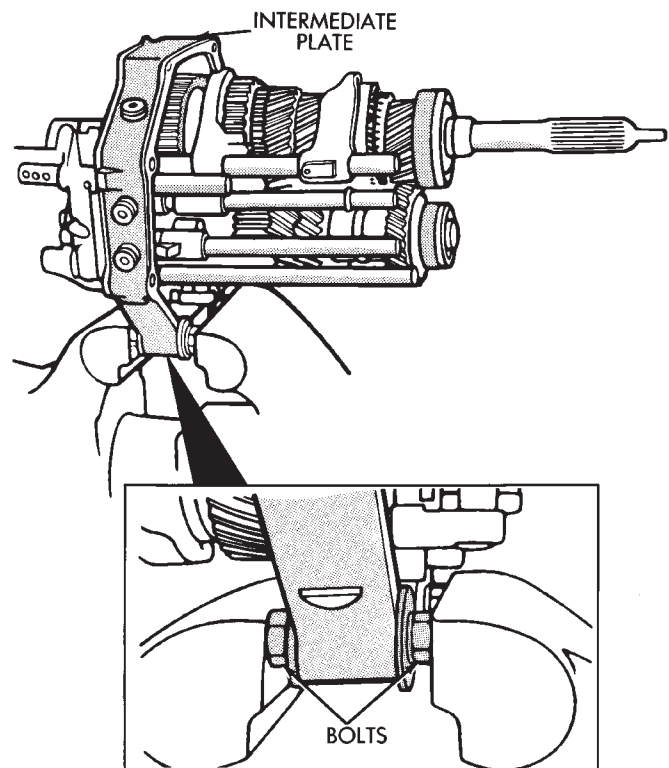


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Fig. 14 Removing Bearing Retainer And Intermediate Plate

SHIFT MECHANISM DISASSEMBLY

(1) Install two clutch housing bolts and spare washers in intermediate plate (Fig. 15). Then clamp plate and gear assembly in vise. **Use enough washers to prevent bolts from touching. Also be sure vise jaws are clamped on bolt heads (Fig. 15).**



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Fig. 15 Positioning Intermediate Plate In Vise

(2) Remove threaded plugs from intermediate plate. Then remove lock ball and spring from plug holes with pencil magnet (Fig. 16).

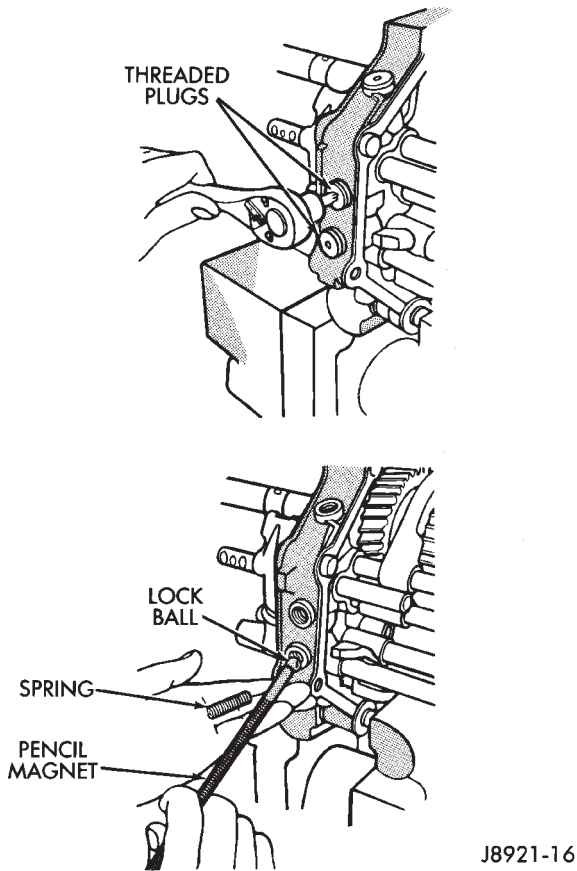


Fig. 16 Removing Lock Ball And Spring

(3) Remove shift fork pins with punch and hammer (Fig. 17).

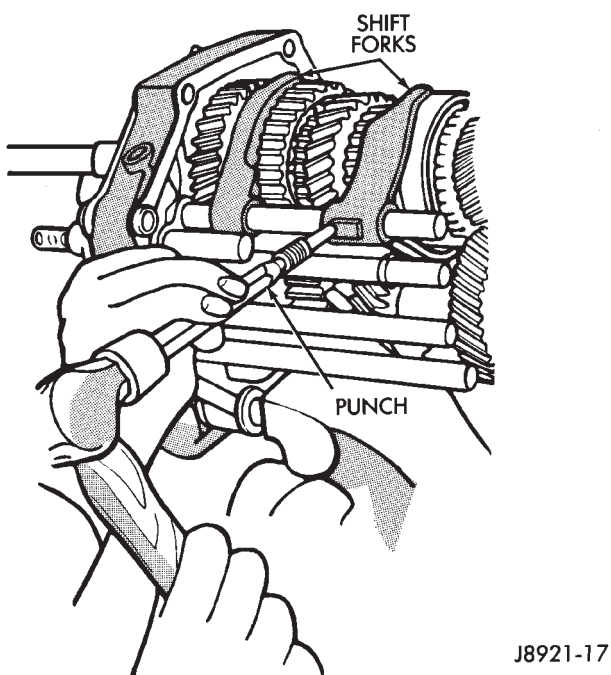


Fig. 17 Removing Shift Fork Pin

(4) Remove shift rail C-rings (Fig. 18).

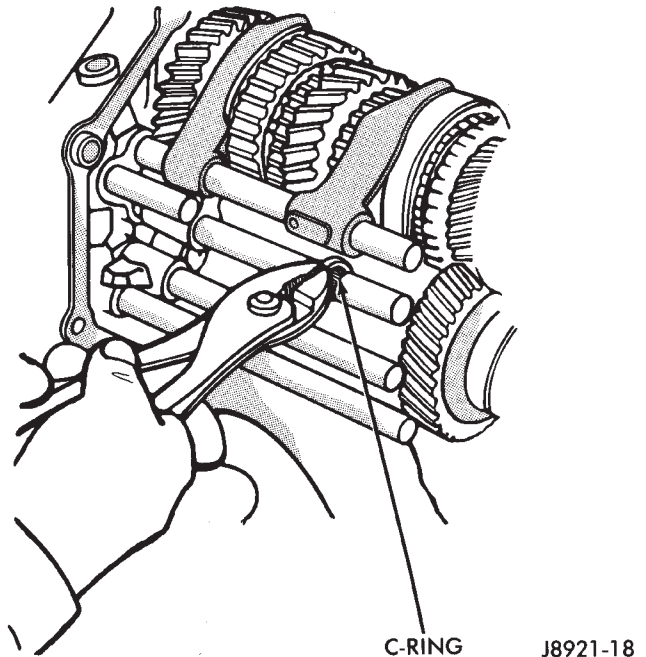


Fig. 18 Shift Rail C-Ring Removal

(5) Pull No. 4 shift rail outward and remove lock balls and pin (Fig. 19).

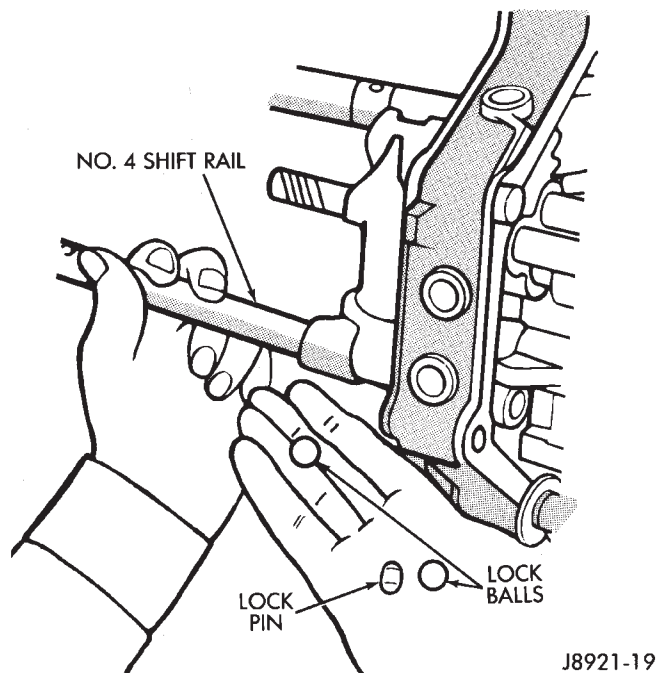
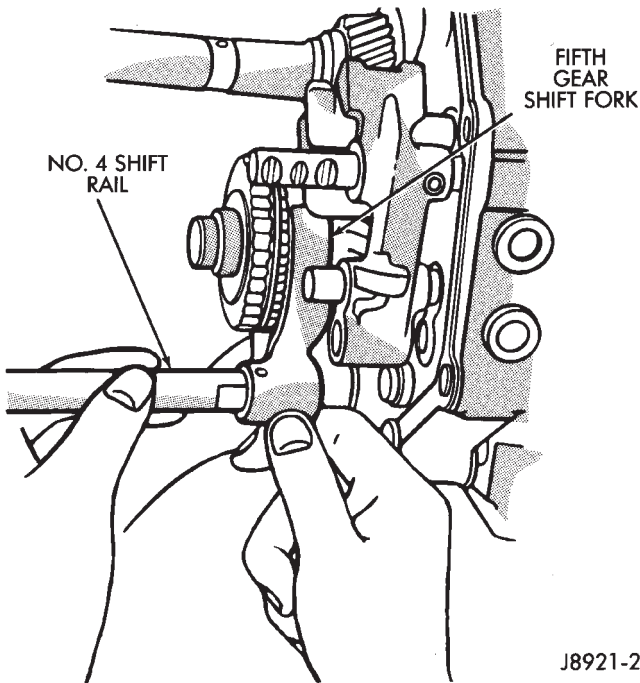


Fig. 19 Removing No. 4 Shift Rail, Lock Balls And Pin

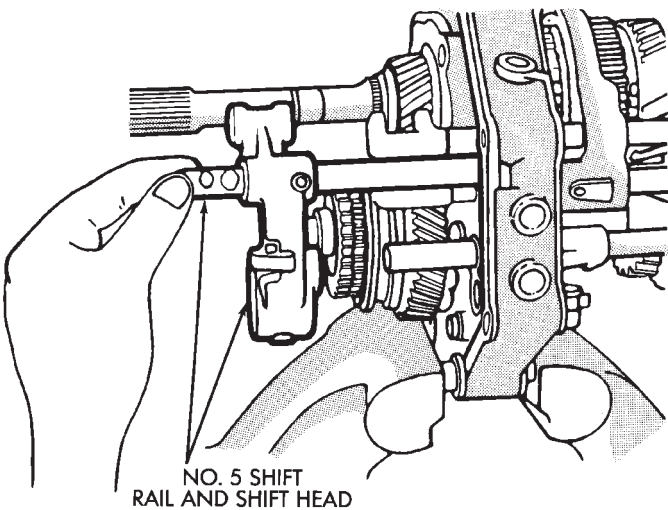
(6) Remove No. 4 shift rail, fifth gear and No. 3 shift fork (Fig. 20).



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Fig. 20 Removing No. 4 Shift Rail And Fifth Gear Shift Fork

(7) Pull No. 5 shift rail and shift head out of plate (Fig. 21).



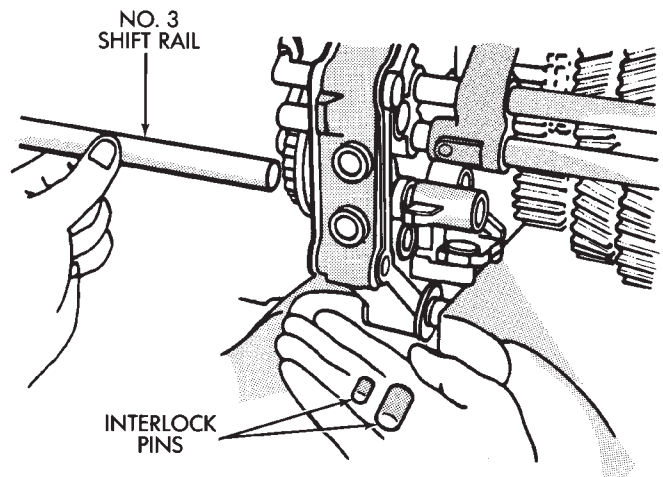
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Fig. 21 Removing No. 5 Shift Rail And Shift Head

(8) Remove shift rail No.3. **Catch interlock pins as rail is removed (Fig. 22).**

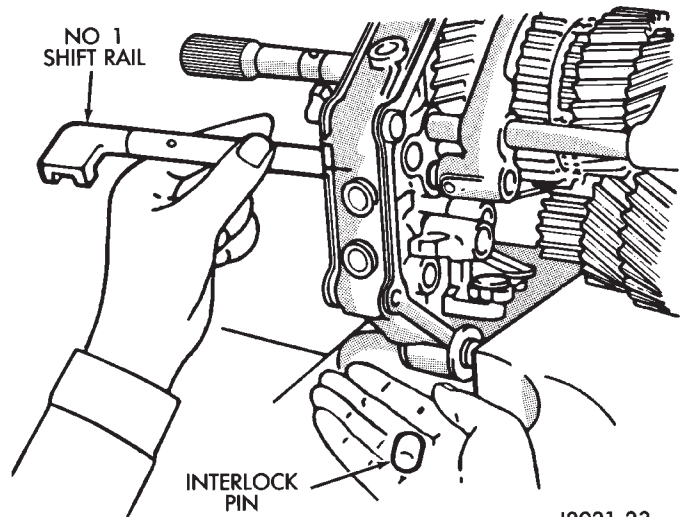
(9) Remove No. 1 shift rail and interlock pin (Fig. 23).

(10) Remove shift rail No. 2 and shift forks 1 and 2 (Fig. 24).



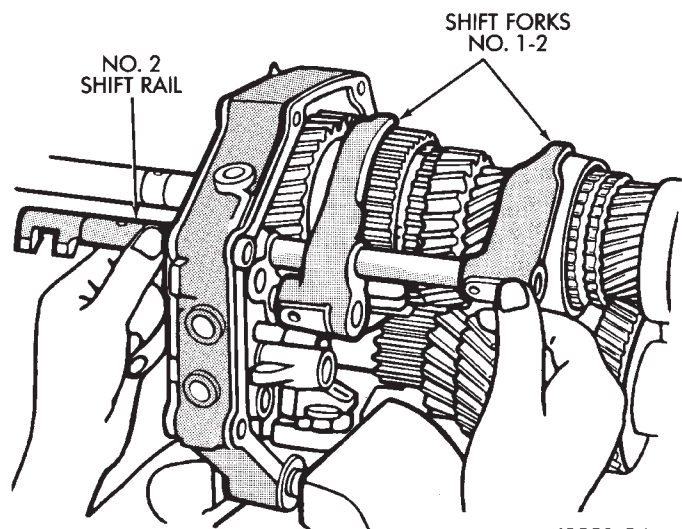
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Fig. 22 Removing No. 3 Shift Rail And Interlock Pin



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Fig. 23 Removing No. 1 Shift Rail And Interlock Pin



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Fig. 24 Removing Shift Forks And No. 2 Shift Rail

(11) Remove reverse idler gear and shaft (Fig. 25).

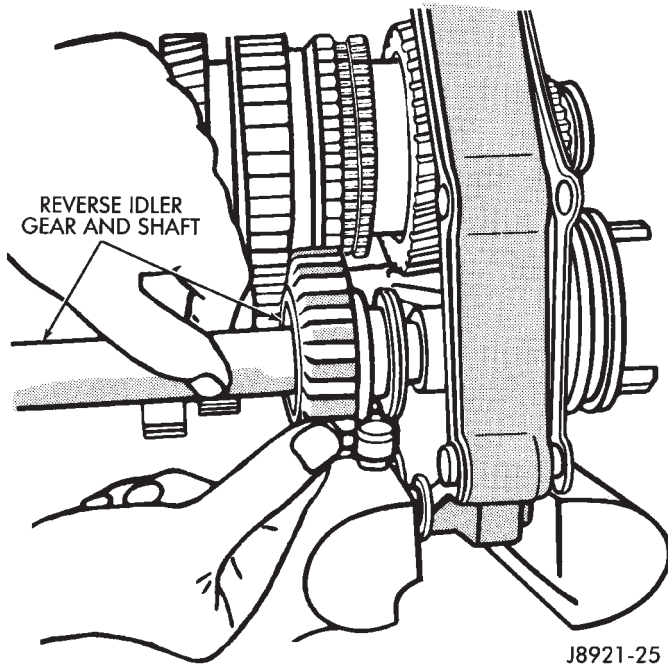


Fig. 25 Removing Reverse Idler Gear And Shaft

(12) Remove reverse shift arm and fork (Fig. 26).

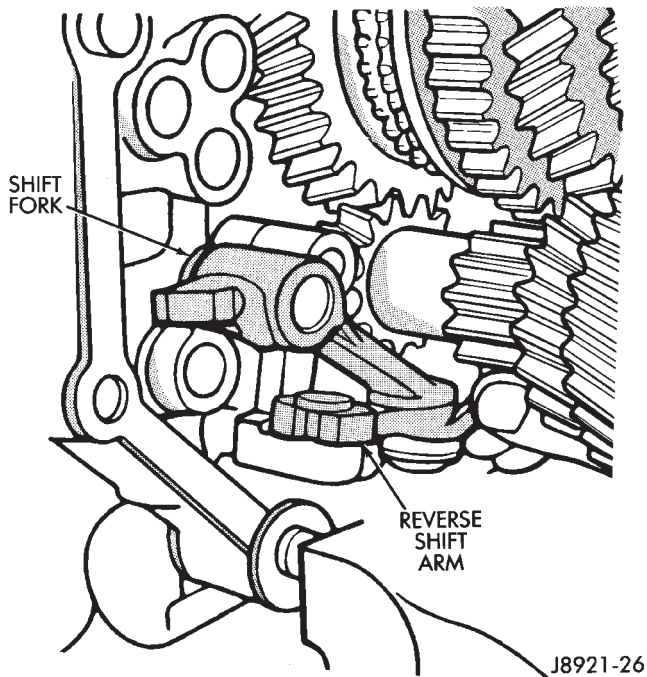


Fig. 26 Reverse Shift Arm Removal

MAINSHAFT DISASSEMBLY

(1) On AX 5, measure fifth counter gear thrust clearance with feeler gauge (Fig. 27). Clearance should be 0.10 - 0.30 mm (0.004 - 0.012 in.).

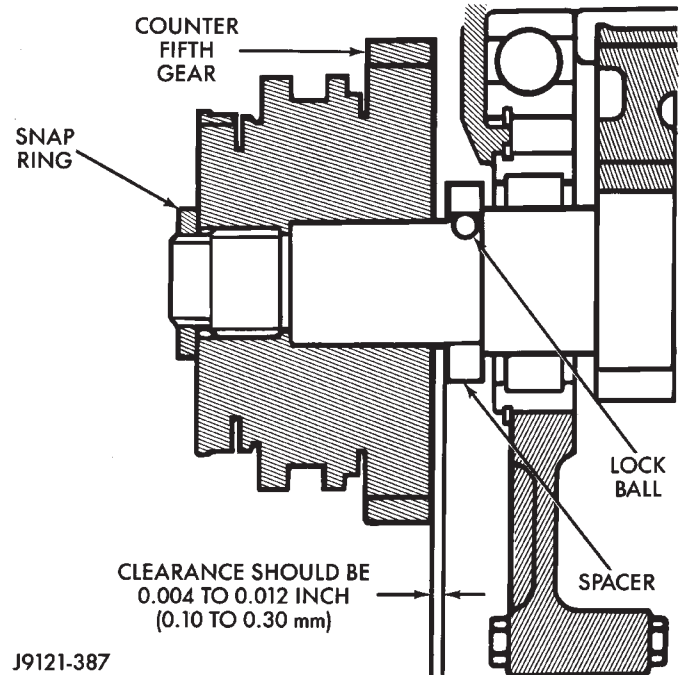


Fig. 27 Measuring Counter Fifth Gear Thrust Clearance

(2) Engage two synchro sleeves to lock mainshaft gears (Fig. 28).

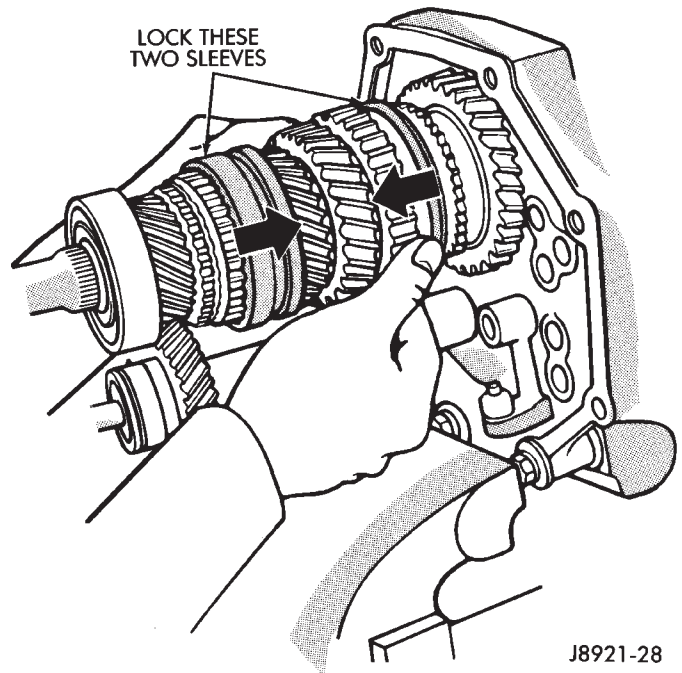


Fig. 28 Locking Mainshaft Gears

(3) On AX 4, remove counter gear nut and oil slinger. On AX 5, remove select fit snap ring that secures fifth spline gear and counter fifth gear on shaft (Fig. 29).

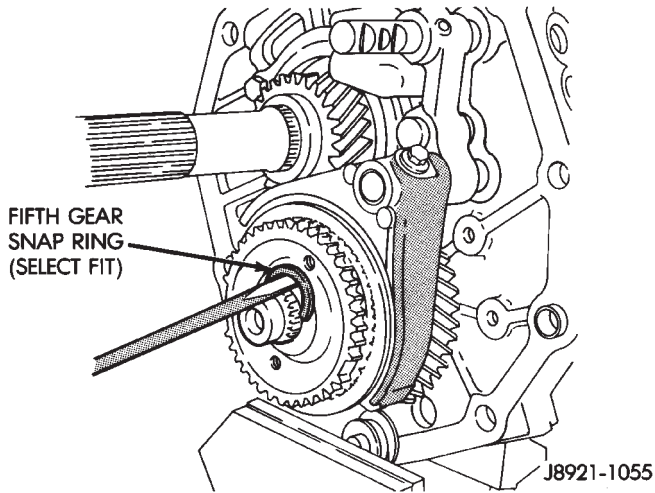


Fig. 29 Removing Fifth Gear Snap Ring

(4) Remove fifth spline gear, synchronizer and counter fifth gear with two-jaw puller (Fig. 30).

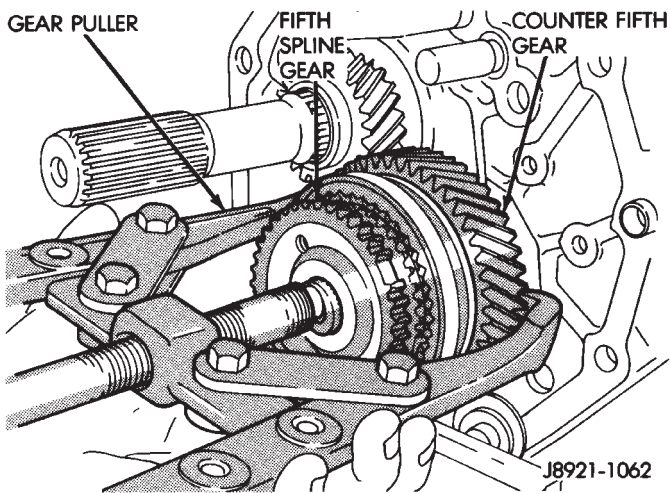


Fig. 30 Removing Fifth Gear Assembly

(5) Remove spacer and remove lock ball with pencil magnet (Fig. 31).

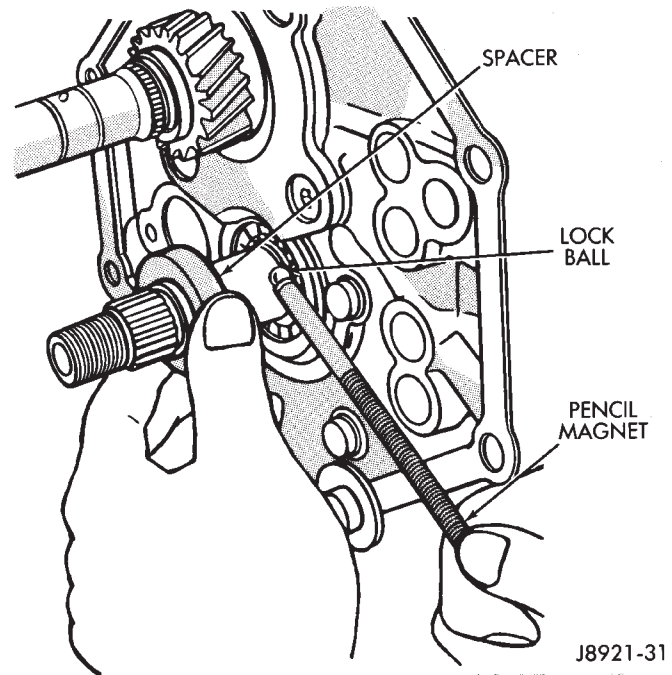


Fig. 31 Spacer And Lock Ball Removal

(6) Remove reverse shift arm bracket (Fig. 32).

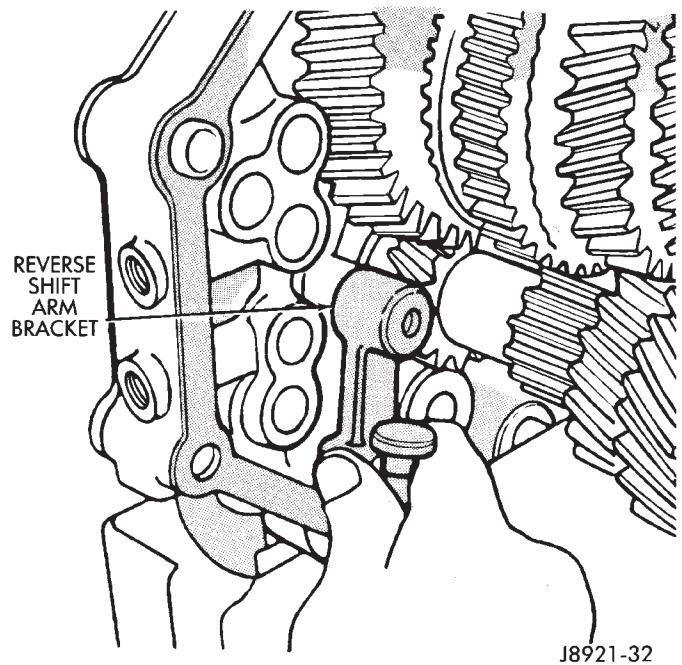


Fig. 32 Removing Reverse Shift Arm Bracket

(7) Remove rear bearing retainer bolts with appropriate size torx bit and remove retainer (Fig. 33).

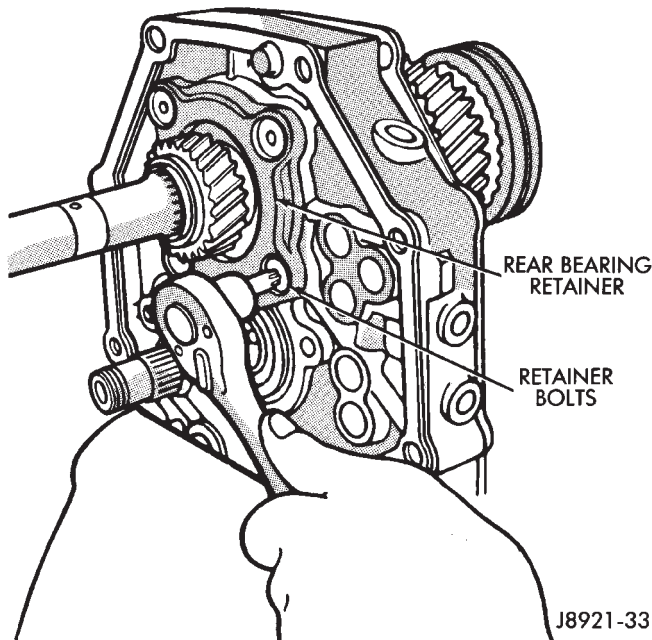


Fig. 33 Removing Rear Bearing Retainer

(8) Remove rear bearing snap ring (Fig. 34).

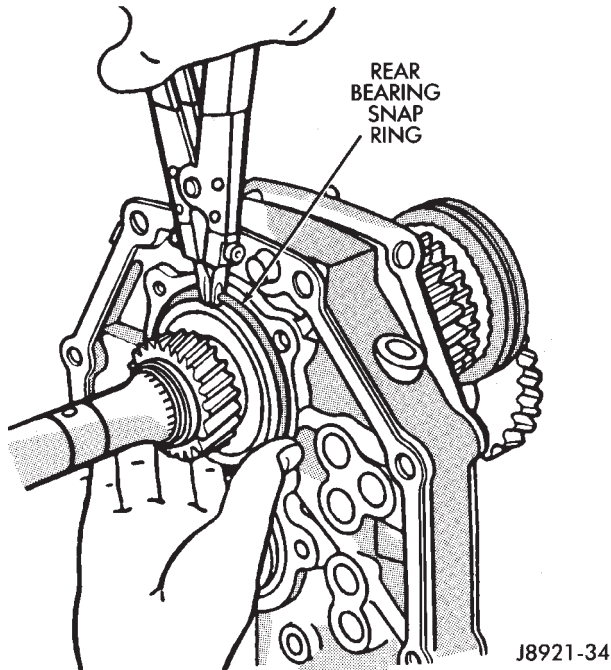


Fig. 34 Removing Rear Bearing Snap Ring

(9) Tap intermediate plate with plastic mallet and pull output shaft-counter gear assemblies out of plate (Fig. 35).

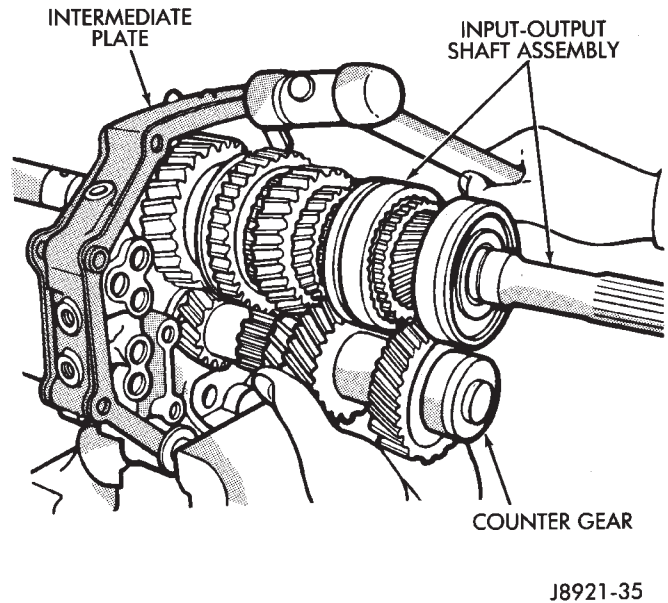


Fig. 35 Removing Counter Gear And Output Shaft

(10) Remove rear bearing from intermediate plate.
 (11) Remove input shaft and shaft roller bearings from output shaft.

(12) Measure thrust clearance of output shaft gears (Fig. 36). Clearance should be 0.10 - 0.25 mm (0.004 - 0.010 in.).

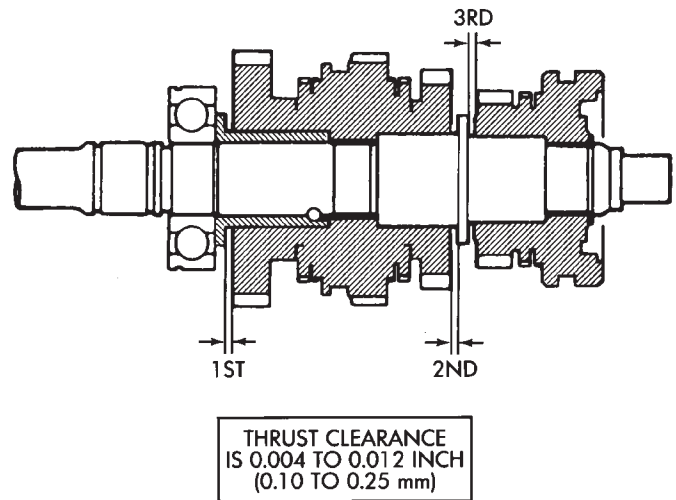
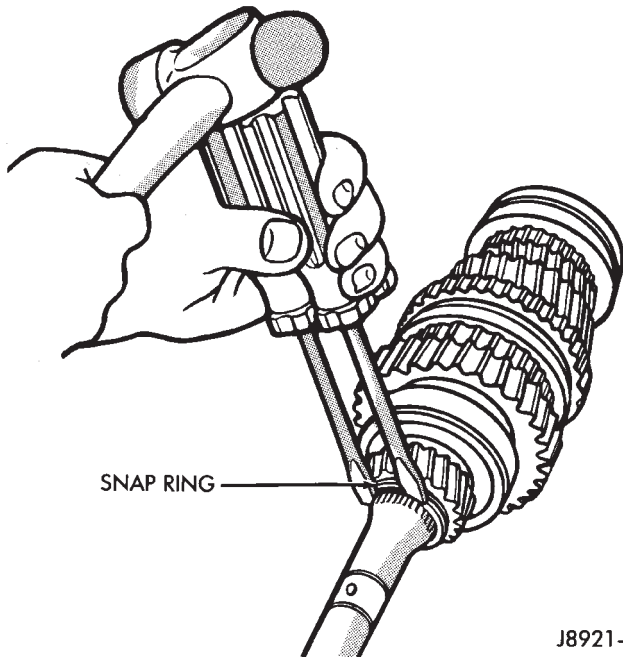


Fig. 36 Checking Output Shaft Gear Thrust Clearance

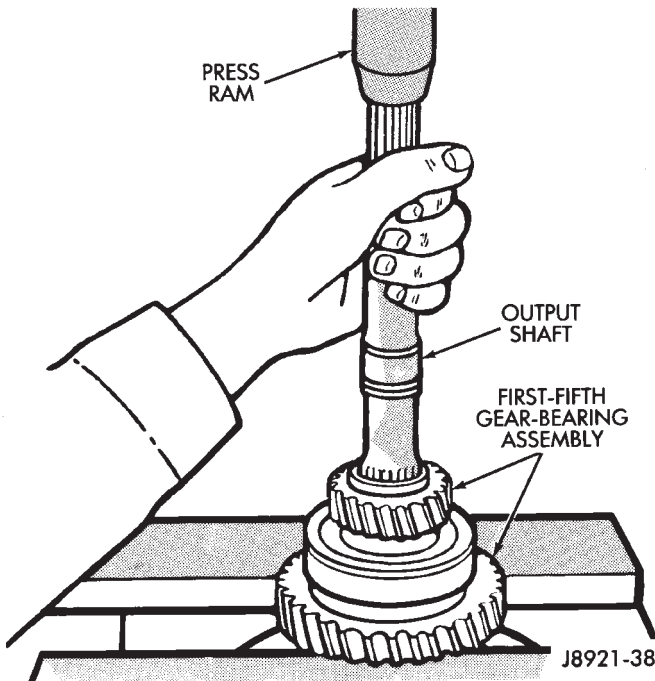
(13) Remove output shaft fifth gear snap ring with two screwdrivers (Fig. 37).



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Fig. 37 Removing Fifth Gear Snap Ring

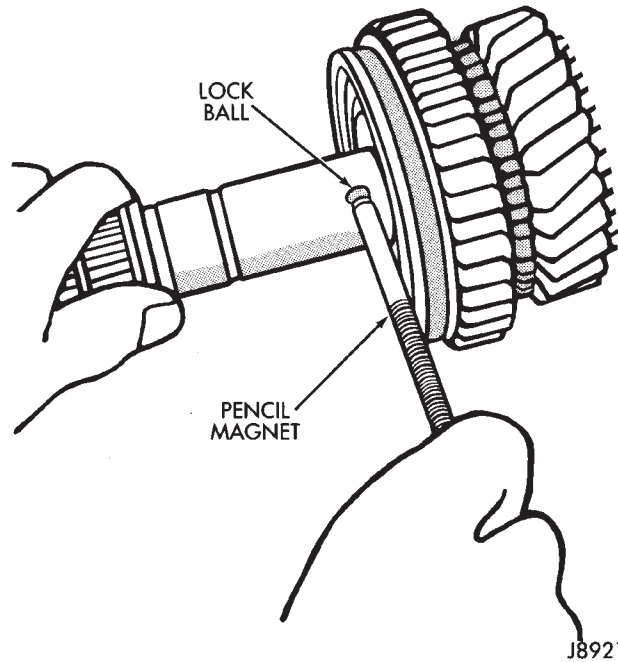
(14) Press fifth gear, rear bearing, first gear and inner race off output shaft (Fig. 38).



J8921-38

Fig. 38 Removing Fifth Gear And First Gear Bearing And Race

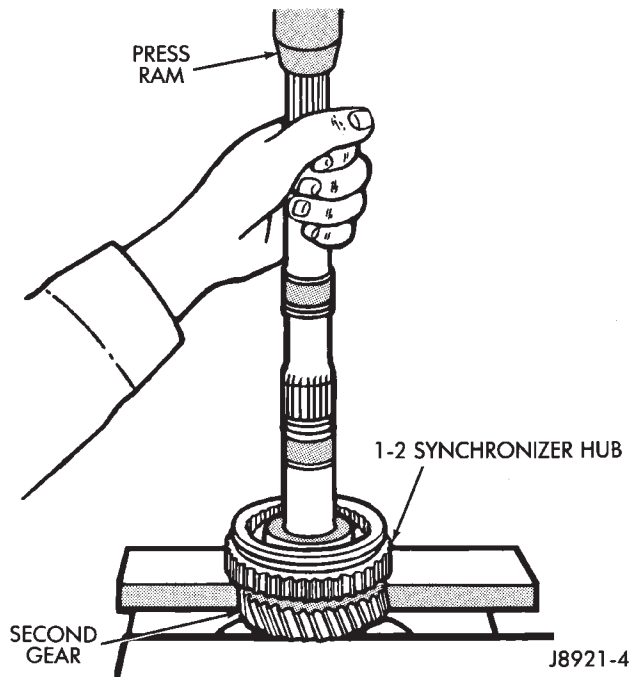
(15) Remove needle roller bearing.
 (16) Remove synchronizer ring.
 (17) Remove synchronizer lock ball with pencil magnet (Fig. 39).



J8921-39

Fig. 39 Synchronizer Lock Ball Removal

(18) Press 1-2 synchronizer and second gear off output shaft (Fig. 40).

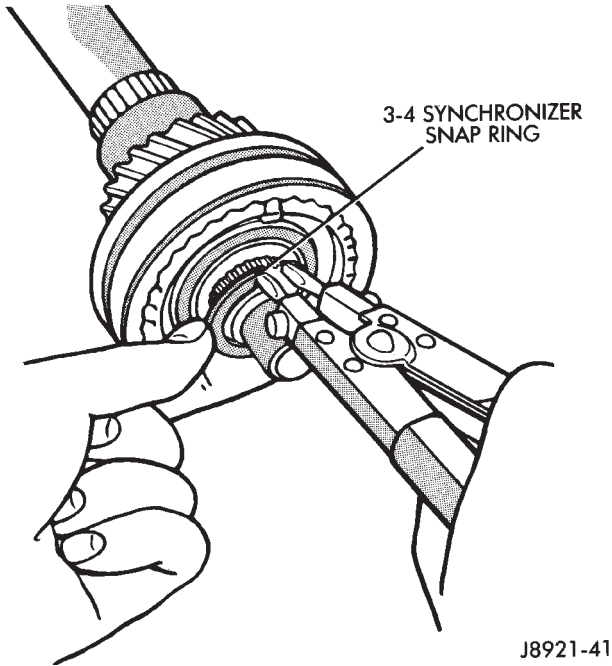


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Fig. 40 1-2 Synchronizer And Second Gear Removal

(19) Remove needle roller bearing from the shaft or second gear.

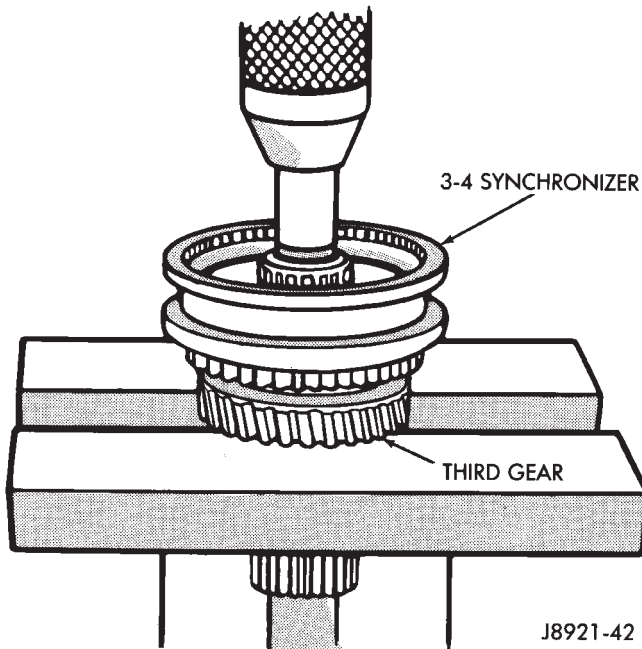
(20) Remove 3-4 synchronizer snap ring (Fig. 41).



J8921-41

Fig. 41 Removing 3-4 Synchronizer Snap Ring

(21) Press 3-4 synchronizer and third gear off shaft (Fig. 42).



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Fig. 42 Removing 3-4 Synchronizer And Third Gear

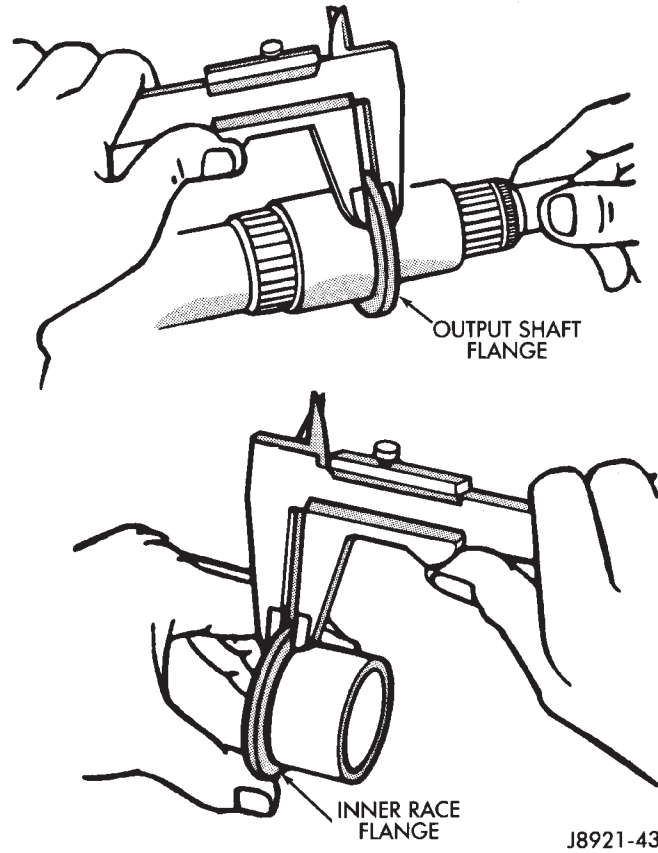
(22) Remove needle roller bearing from shaft or gear.

CLEANING AND INSPECTION

Clean the transmission components in solvent. Dry the cases, gears, shift mechanism and shafts with compressed air. **Dry the bearings with clean, dry shop towels only. Never use compressed air on the bearings. This could cause severe damage to the bearing roller and race surfaces.**

Inspect the transmission case. Replace the case if cracked, porous, or if any of the bearing and gear bores are damaged.

Check thickness of the output shaft and inner bearing race flanges with a micrometer or vernier calipers (Fig. 43). Minimum thickness for the shaft flange is 4.8 mm (0.189 in.). Minimum thickness for the bearing race flange is 3.99 mm (0.157 in.).



J8921-43

Fig. 43 Checking Flange Thickness

Measure diameter of the output shaft journal surfaces with a micrometer (Fig. 44). Second gear surface minimum diameter is 37.96 mm (1.495 in.). Third gear surface minimum diameter is 34.98 mm (1.377 in.). Replace the shaft if either of these surfaces are worn beyond specified limits.

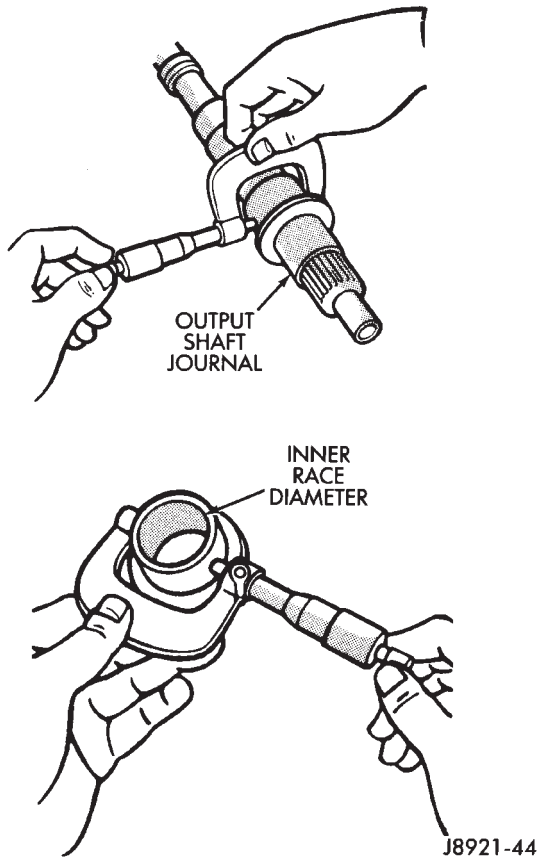


Fig. 44 Checking Shaft And Race Diameters

Measure output shaft runout with a dial indicator (Fig. 45). Runout should not exceed 0.05 mm (0.002 in.).

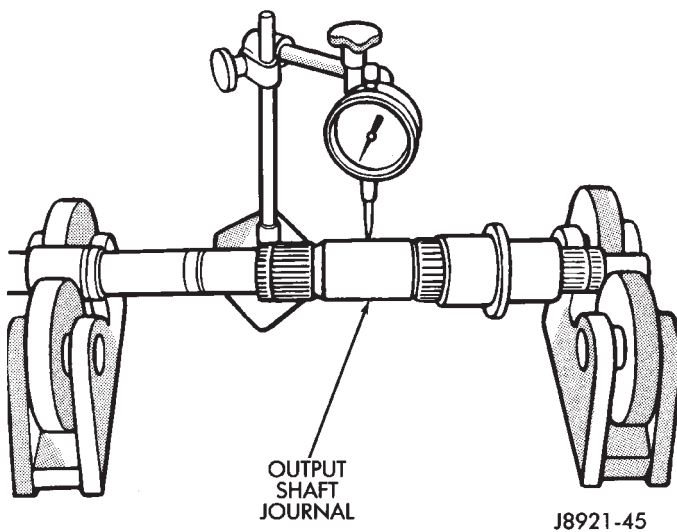


Fig. 45 Checking Output Shaft Runout

Install the needle bearing and inner race in the first gear. Then check oil clearance between the gear and inner race (Fig. 46). Clearance should be 0.009 - 0.032 mm (0.0004 - 0.0013 in.).

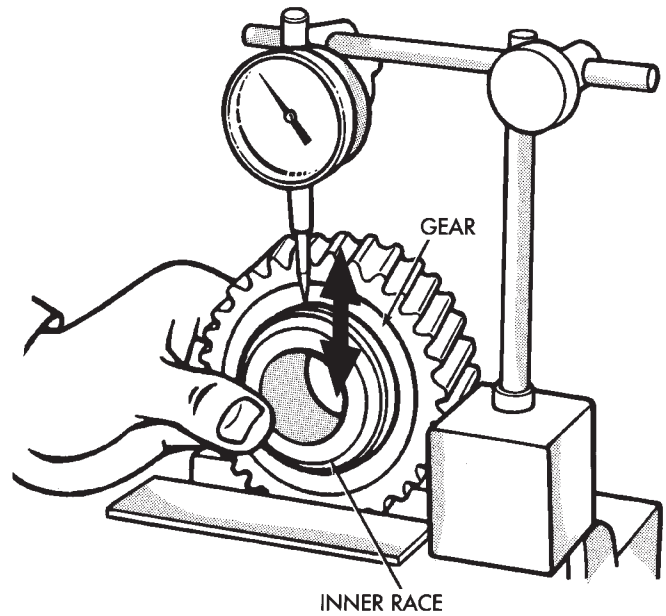


Fig. 46 Checking Gear-To-Race Clearance

Install the needle bearings and the second, third and counter fifth gears on the output shaft. Check oil clearance between the gears and shaft with a dial indicator (Fig. 47).

Oil clearance for all three gears is 0.009 - 0.0013 mm (0.0004 - 0.0013 in.).

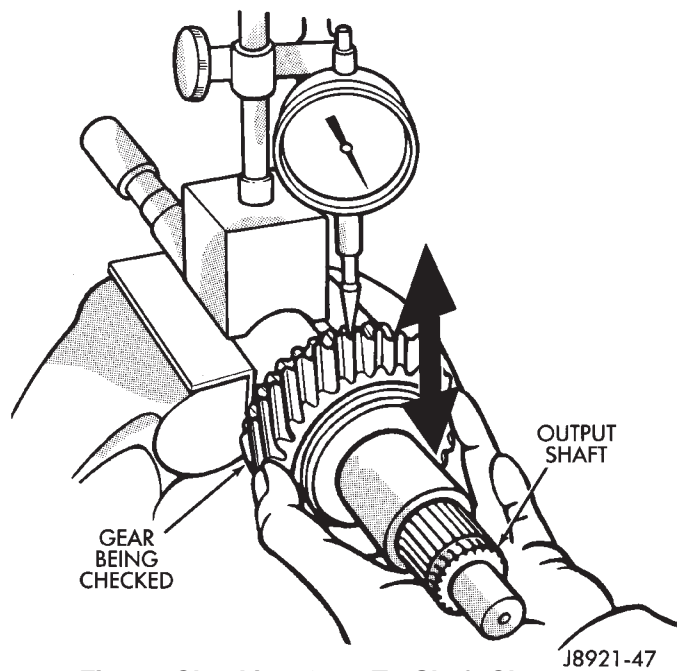
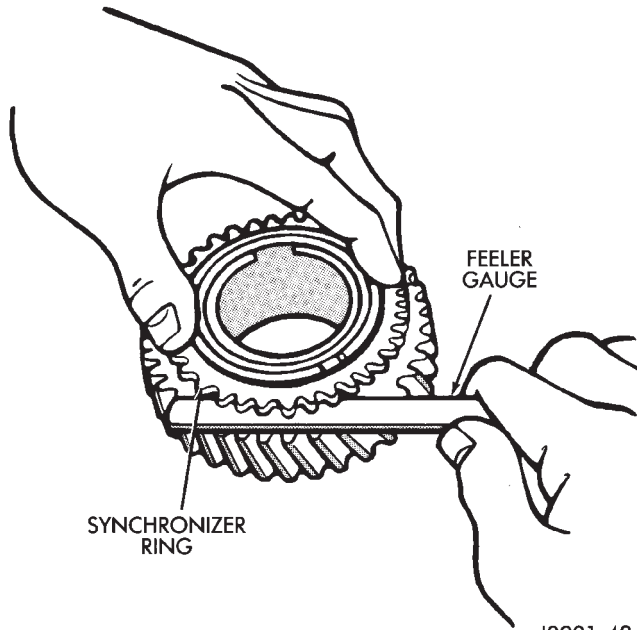


Fig. 47 Checking Gear-To-Shaft Clearance

Check synchronizer ring wear (Fig. 48). Insert each ring in matching gear. Measure clearance between

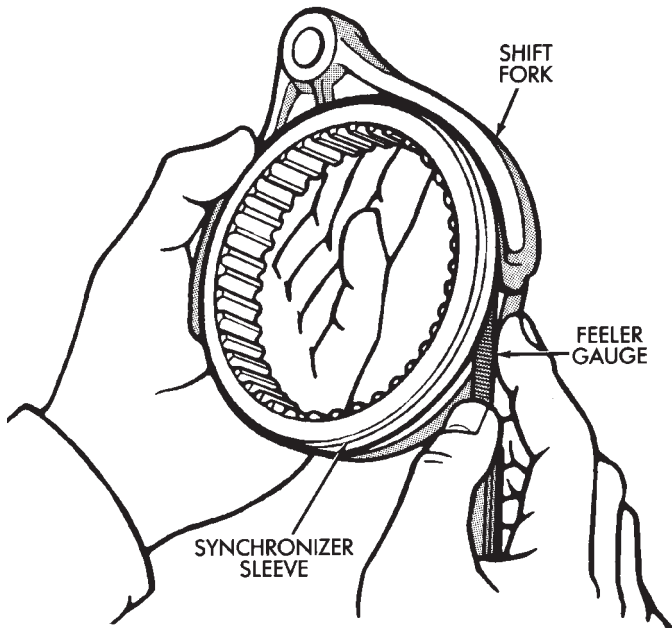
each ring and gear with feeler gauge. Replace ring if clearance exceeds 2.0 mm (0.078 in.).



J8921-48

Fig. 48 Checking Synchronizer Ring Wear

Check shift fork-to-synchronizer hub clearance with a feeler gauge (Fig. 49). Replace the fork if clearance exceeds 1.0 mm (0.039 in.).



J8921-49

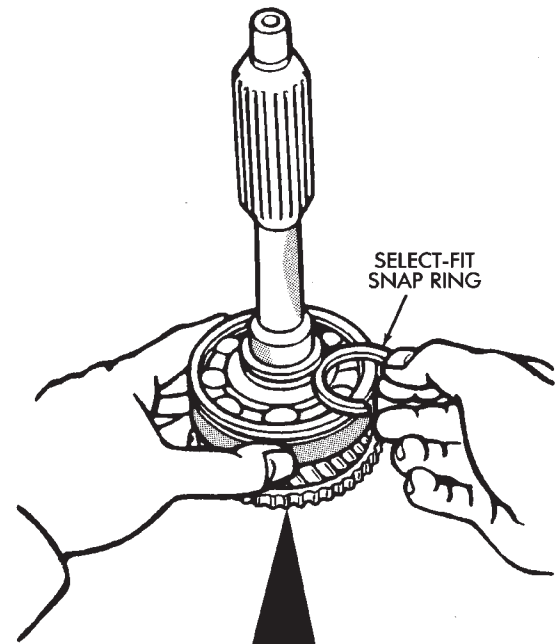
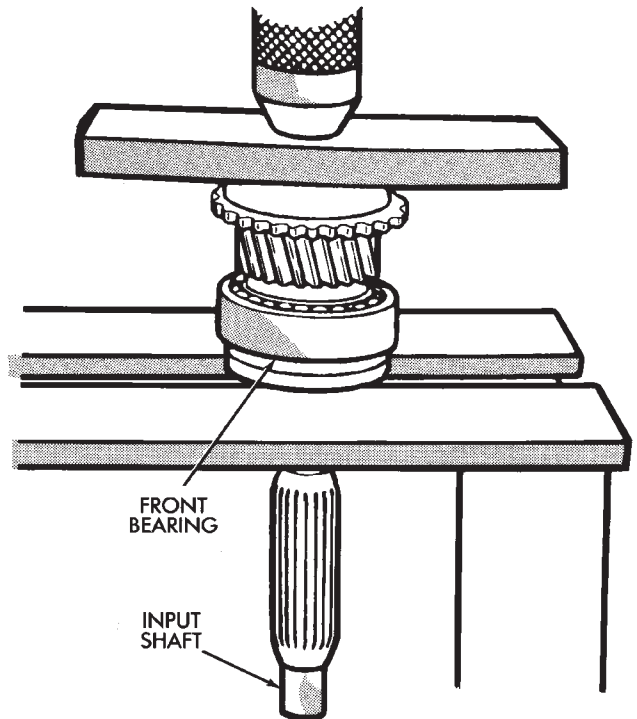
Fig. 49 Checking Fork-To-Hub Clearance

TRANSMISSION ASSEMBLY AND ADJUSTMENT

Lubricate the transmission components with Mopar 75W-90, GL 5 gear lubricant during assembly. Use petroleum jelly to lubricate seal lips and/or hold parts in place during installation. Refer to the Counter Gear Comparison Chart (Fig. 102) during assembly for AX 4/5 gear differences.

ASSEMBLING OUTPUT SHAFT, INPUT SHAFT AND COUNTER GEAR

(1) If front bearing was removed from input shaft, press new bearing on shaft (Fig. 50).



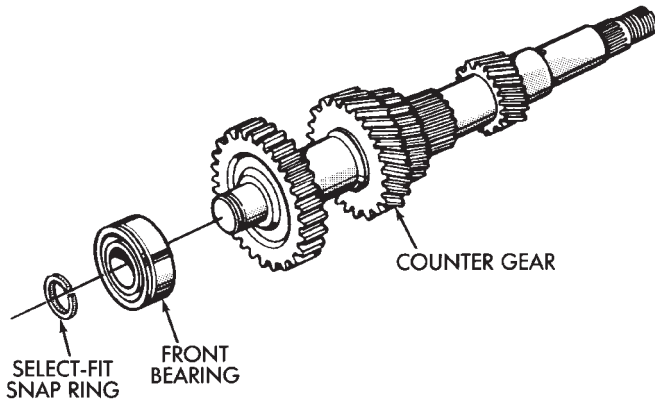
J8921-50

Fig. 50 Installing Front Bearing And Snap Ring

I.D. Mark	Snap Ring Thickness mm (in.)
0	2.05-2.10 (0.0807-0.0827)
1	2.10-2.15 (0.0827-0.0846)
2	2.15-2.20 (0.0846-0.0866)
3	2.20-2.25 (0.0866-0.0886)
4	2.25-2.30 (0.0886-0.0906)
5	2.30-2.35 (0.0906-0.0925)

(2) Secure front bearing with thickest snap ring that will fit in groove (Fig. 50).

(3) Press front bearing on counter gear. Secure bearing with thickest snap ring that will fit in ring groove (Fig. 51).

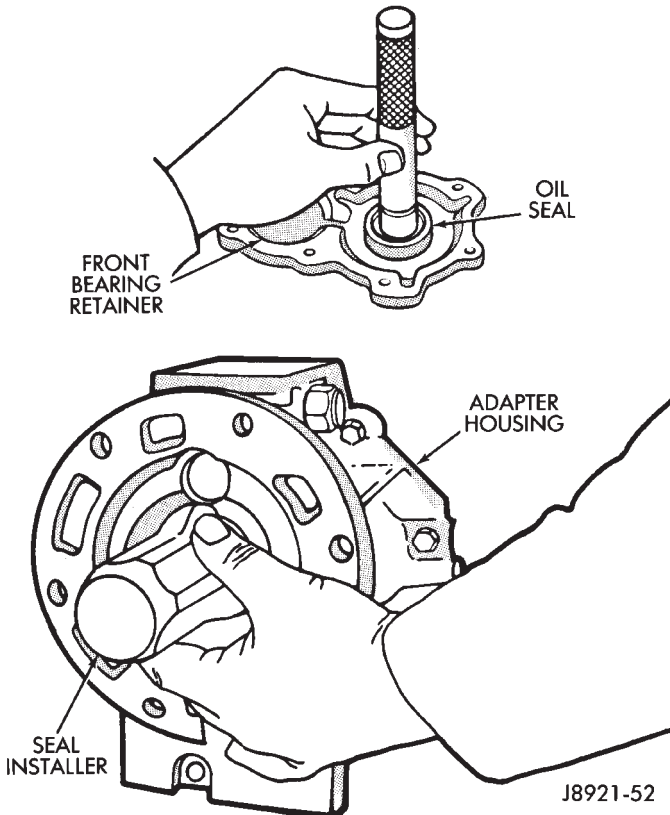


I.D. Mark	Snap Ring Thickness mm (in.)
1	2.05-2.10 (0.0807-0.0827)
2	2.10-2.15 (0.0827-0.0846)
3	2.15-2.20 (0.0846-0.0866)
4	2.20-2.25 (0.0866-0.0886)
5	2.25-2.30 (0.0886-0.0906)
6	2.30-2.35 (0.0906-0.0925)

J8921-51

Fig. 51 Installing Counter Gear Front Bearing And Snap Ring

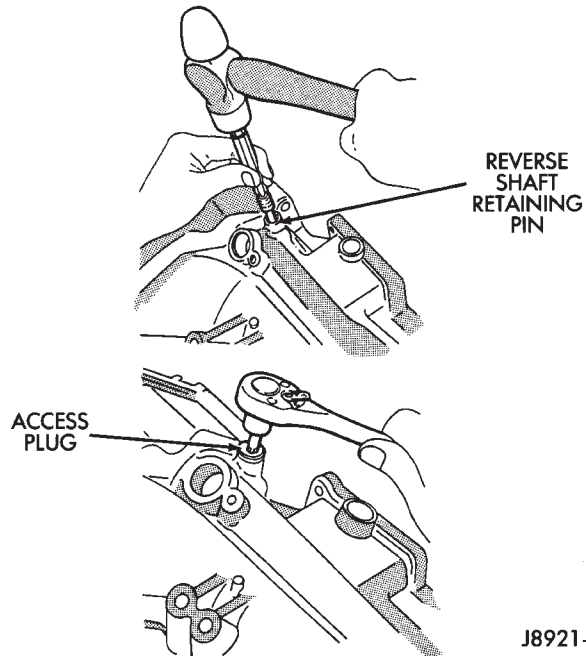
(4) Install new oil seals in front bearing retainer and adapter (Fig. 52). Bearing retainer seal depth is 11.2 - 12.1 mm (0.441 - 0.480 in.).



J8921-52

Fig. 52 Oil Seal Installation

(5) Install reverse shaft and shaft retaining pin in adapter. Then install access hole plug with torx bit (Fig. 53).

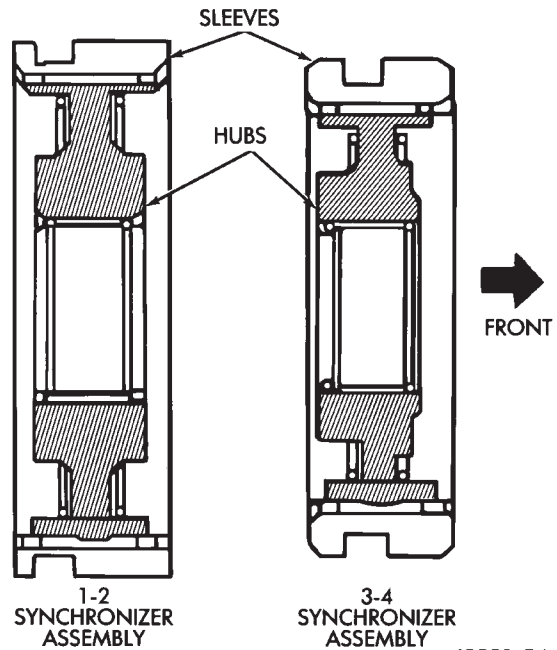


J8921-53

Fig. 53 Installing Reverse Shaft Pin

(6) Lubricate transmission components with specified gear lubricant.

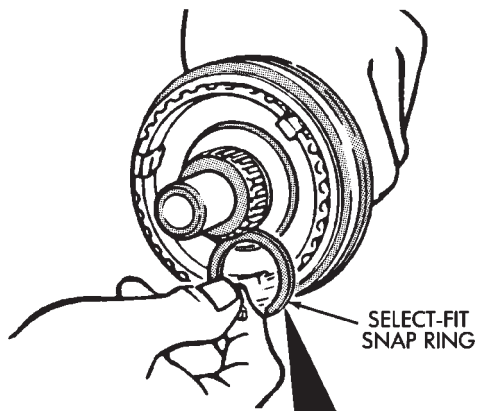
(7) Assemble 1-2 and 3-4 synchronizer hubs, sleeves, springs and key inserts (Fig. 54).



J8921-54

Fig. 54 Synchronizer Identification

(8) Assemble and install third gear, needle bearing, synchronizer ring, 3-4 synchronizer and snap ring on output shaft (Fig. 55). Use thickest snap ring that fits in shaft groove.

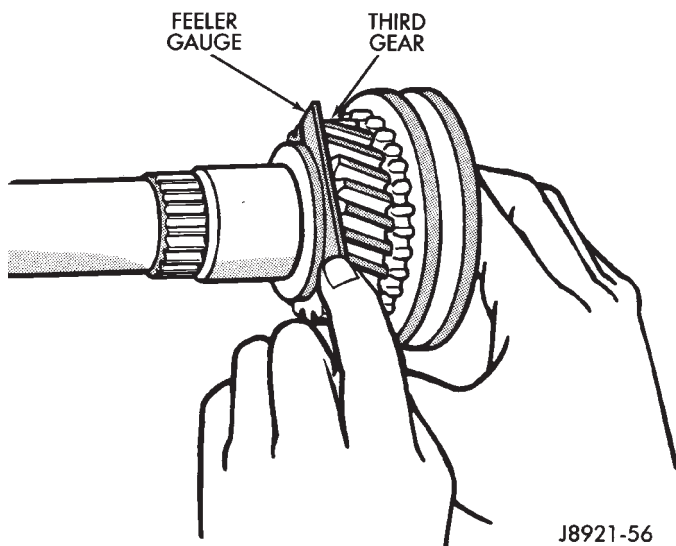


I.D. Mark	Snap Ring Thickness mm (in.)
C-1	1.75-1.80 (0.0689-0.0709)
D	1.80-1.85 (0.0709-0.0728)
D-1	1.85-1.90 (0.0728-0.0748)
E	1.90-1.95 (0.0748-0.0768)
E-1	1.95-2.00 (0.0768-0.0787)
F	2.00-2.05 (0.0788-0.0807)
F-1	2.05-2.10 (0.0807-0.0827)

J8921-55

Fig. 55 Installing Third Gear And 3-4 Synchronizer

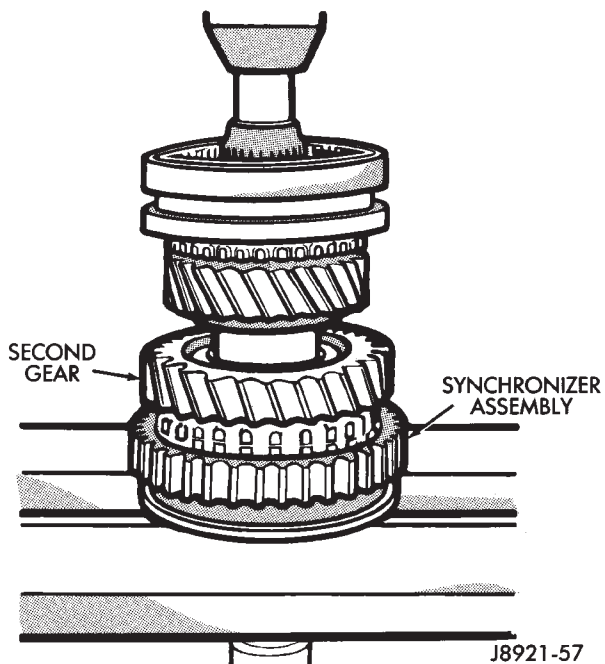
(9) Verify third gear thrust clearance with feeler gauge (Fig. 56). Clearance should be 0.10 - 0.25 mm (0.004 - 0.010 in.).



J8921-56

Fig. 56 Checking Third Gear Clearance

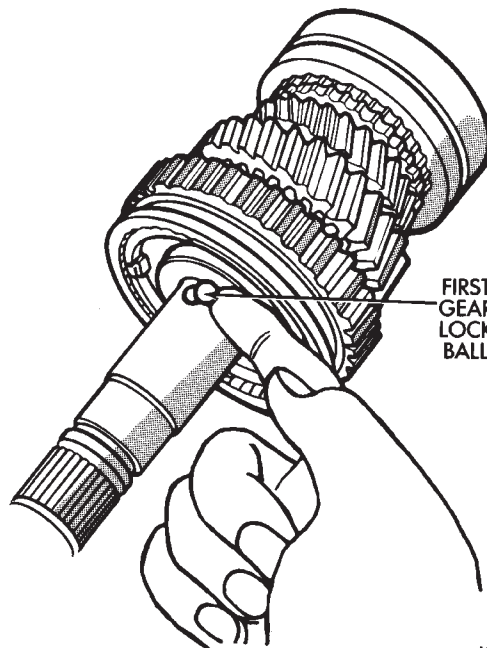
(10) Assemble second gear, gear needle bearing, synchronizer ring and 1-2 synchronizer. Then press assembly on output shaft (Fig. 57).



J8921-57

Fig. 57 Installing Second Gear And Synchronizer

(11) Install first gear lock ball in output shaft (Fig. 58).



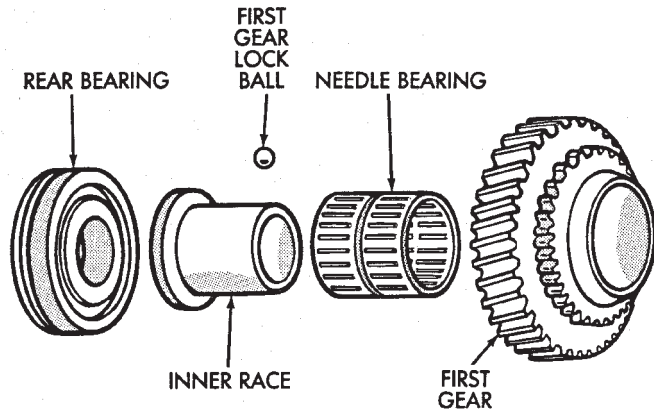
J8921-58

Fig. 58 Installing First Gear And Lock Ball

(12) Assemble first gear, synchronizer ring, gear needle bearing and inner race (Fig. 59). Then install assembly on output shaft. **Rotate inner race until aligned with locking ball.**

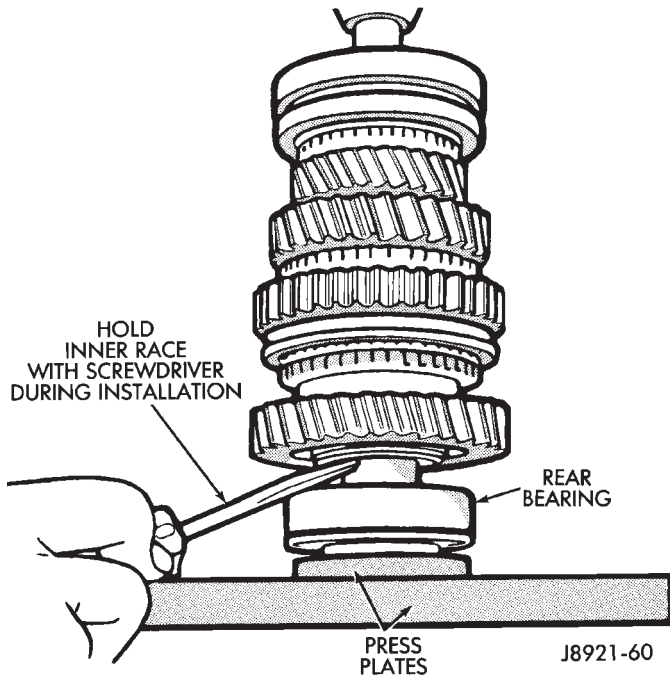
(13) Press rear bearing on shaft (Fig. 59). Snap ring groove in bearing goes toward rear. Use screwdriver to hold inner race in position when installing bearing (Fig. 60).

(14) Install snap ring on rear bearing.



J8921-59

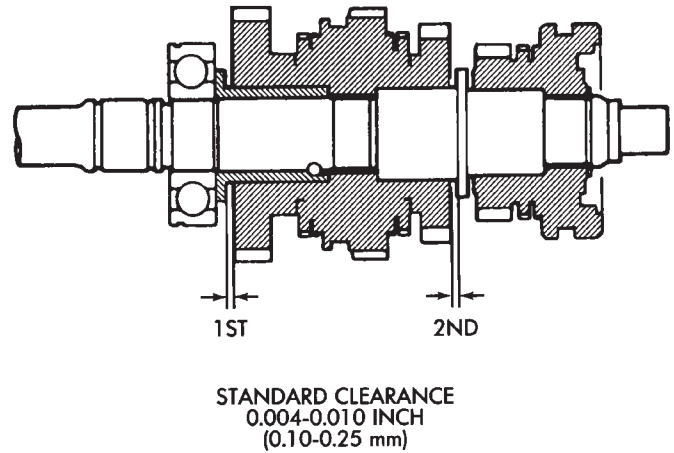
Fig. 59 First Gear Assembly



J8921-60

Fig. 60 Installing Output Shaft Rear Bearing

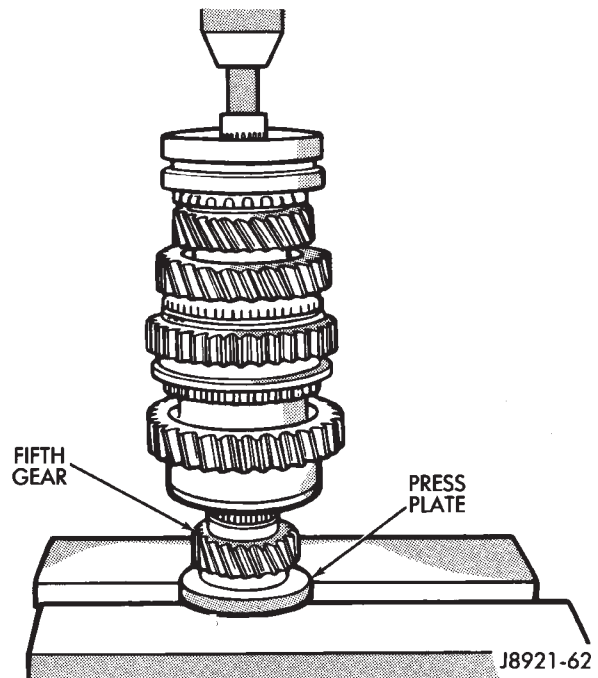
(15) Check first-second gear thrust clearance (Fig. 61). Standard clearance is 0.10 - 0.25 mm (0.004 - 0.010 in.).



J8921-61

Fig. 61 Checking First-Second Gear Clearance

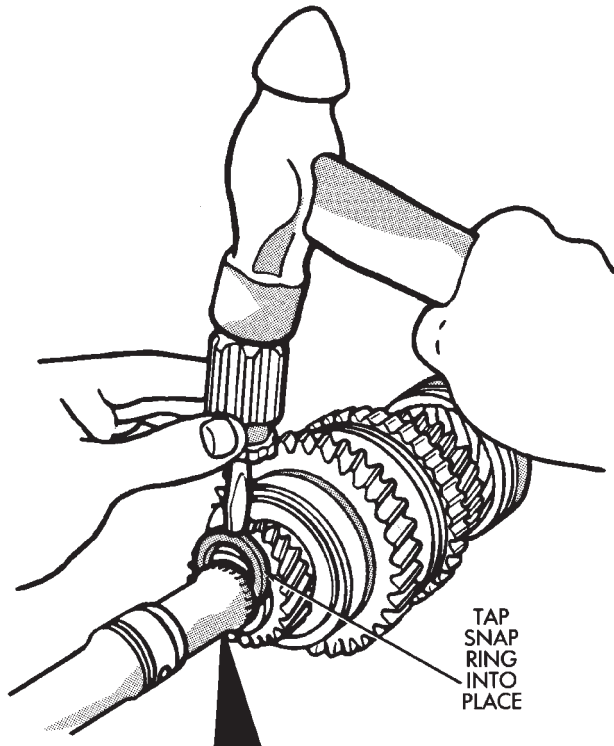
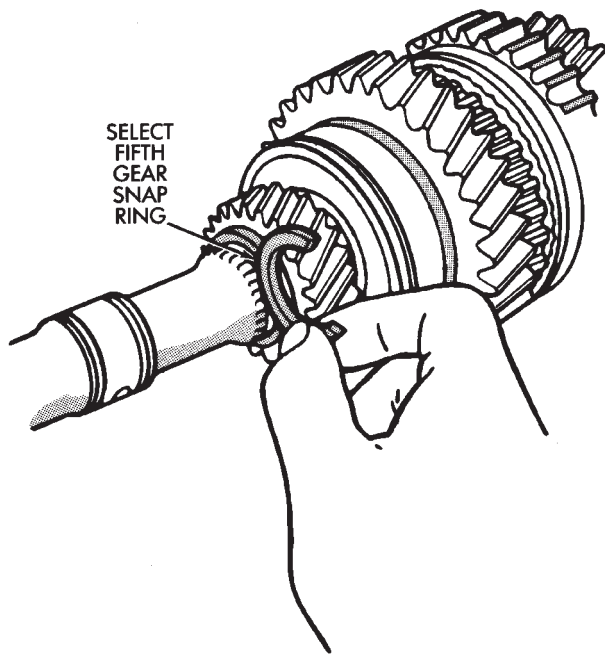
(16) Press fifth gear on output shaft (Fig. 62).



J8921-62

Fig. 62 Installing Output Shaft Fifth Gear

(17) Install fifth gear snap ring (Fig. 63). Use thickest snap ring that will fit in shaft groove.

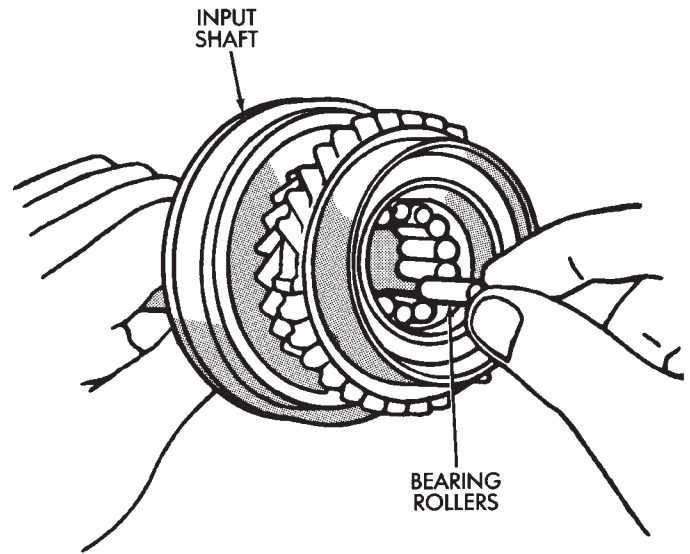


I.D. Mark	Snap Ring Thickness mm (in.)
A	2.67-2.72 (0.1051-0.1071)
B	2.73-2.78 (0.1075-0.1094)
C	2.79-2.84 (0.1098-0.1118)
D	2.85-2.90 (0.1122-0.1142)
E	2.91-2.96 (0.1146-0.1165)
F	2.97-3.02 (0.1169-0.1189)
G	3.03-3.08 (0.1193-0.1213)
H	3.09-3.14 (0.1217-0.1236)
J	3.15-3.20 (0.1240-0.1260)
K	3.21-3.26 (0.1264-0.1283)
L	3.27-3.32 (0.1287-0.1307)

J8921-63

Fig. 63 Selecting/Installing Fifth Gear Snap Ring

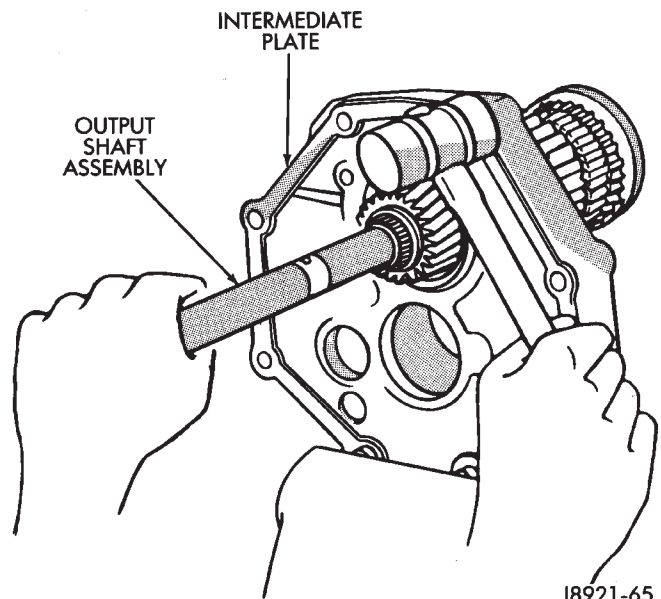
(18) Lubricate input shaft roller bearings with petroleum jelly and install rollers in shaft (Fig. 64).



J8921-64

Fig. 64 Installing Input Shaft Bearing Rollers

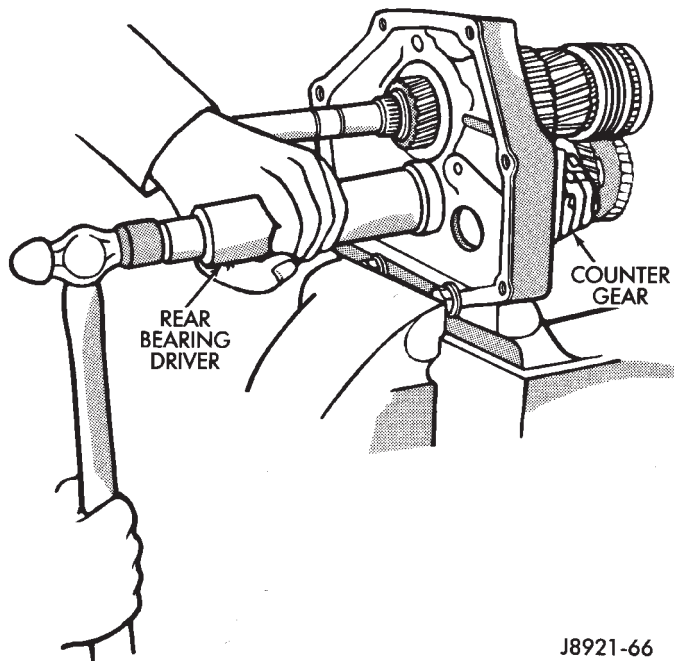
(19) Install output shaft assembly in intermediate plate (Fig. 65). Tap plate with mallet and pull on shaft to seat assembly.



J8921-65

Fig. 65 Installing Output Shaft In Intermediate Plate

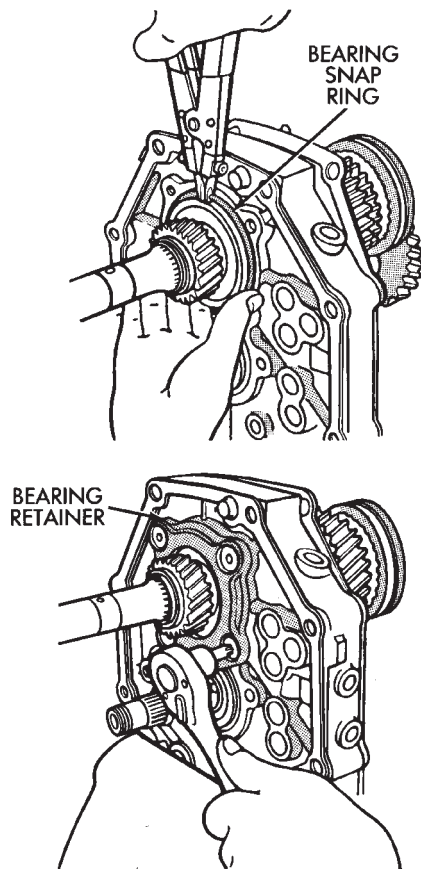
- (20) Install input shaft on output shaft.
- (21) Install counter gear in intermediate plate (Fig. 66).



J8921-66

Fig. 66 Installing Counter Gear

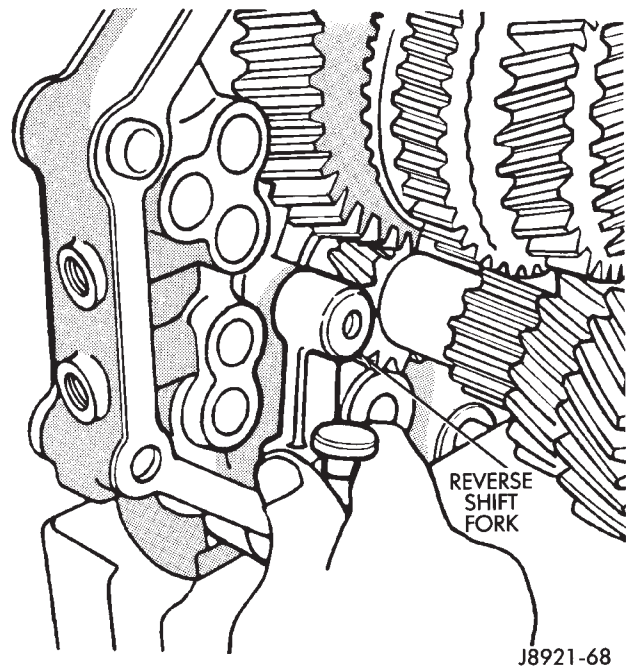
- (22) Install rear bearing snap ring and install bearing retainer (Fig. 67). Tighten retainer screws to 18 N·m (13 ft. lbs.) torque.



J8921-67

Fig. 67 Installing Bearing Retainer And Snap Ring

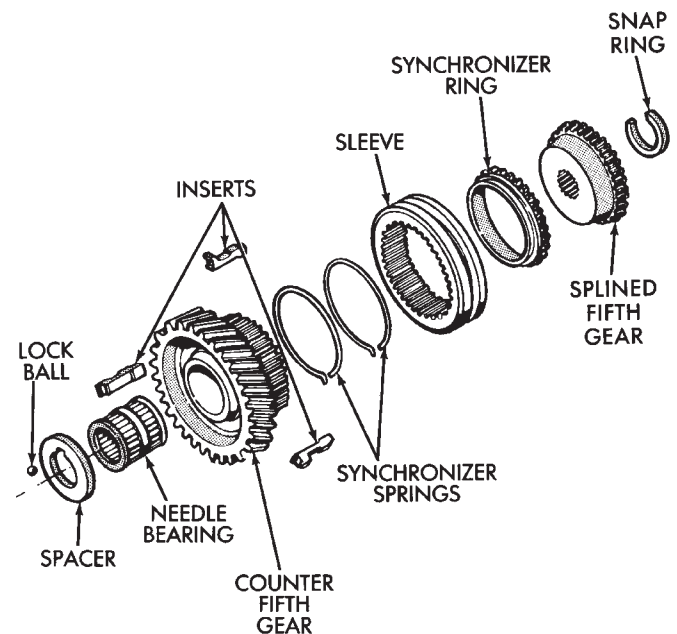
- (23) Install reverse shift arm (Fig. 68). Tighten attaching bolt to 18 N·m (13 ft. lbs.) torque.



J8921-68

Fig. 68 Installing Reverse Shift Fork

- (24) Install lock ball, spacer and needle bearing (Fig. 69) on counter shaft.
- (25) On AX 5, assemble counter fifth gear and synchro components (Figs. 69 and 104).



J9121-390

Fig. 69 Counter Fifth Gear And Synchronizer Assembly—AX 5

(26) On AX 5, install assembled gear and synchronizer on counter shaft (Fig. 70).

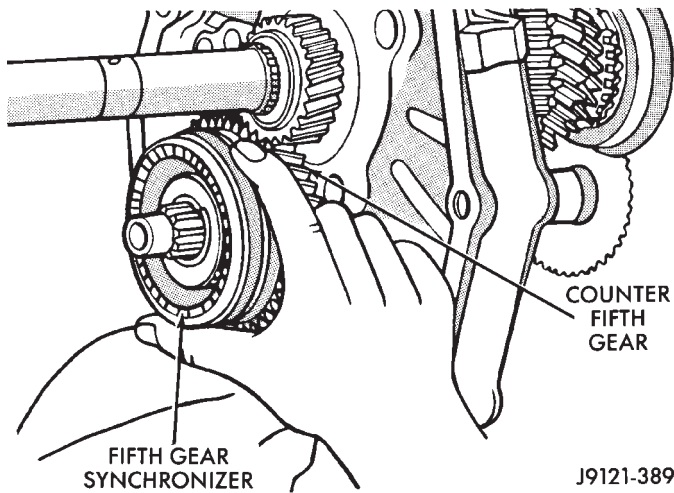


Fig. 70 Fifth Gear And Synchronizer Installation—AX 5

(27) Install remaining synchronizer ring and spline fifth gear (Fig. 71). Use length of pipe to tap gear into place.

(28) Shift 1-2 and 3-4 synchronizer sleeves into gear to lock output shaft and counter gear (Fig. 28).

(29) On AX 4, install oil slinger and lock nut on counter gear (Fig. 104).

(30) On AX 5, install fifth gear snap ring (Fig. 72).

(31) Disengage 1-2 and 3-4 synchronizer sleeves.

(32) On AX 5, check counter fifth gear thrust clearance (Fig. 72). Standard clearance is 0.10 - 0.30 mm (0.004 - 0.010 in.). Adjust clearance with different thickness snap ring if necessary.

SHIFT MECHANISM ASSEMBLY AND INSTALLATION

When assembling the shift mechanism, refer to Figure 73 for component details and location.

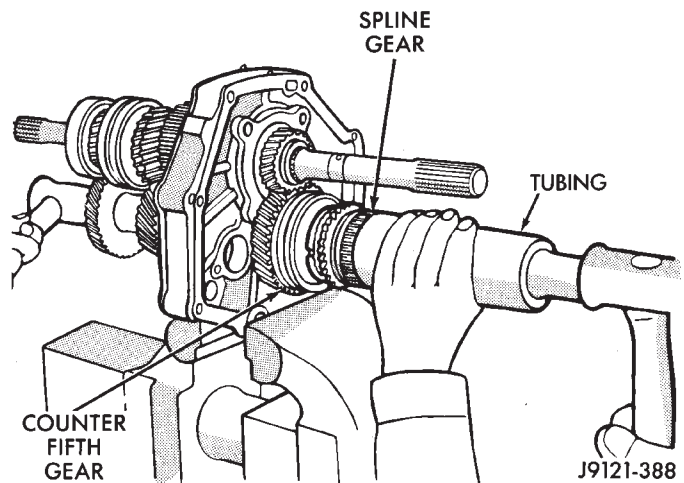


Fig. 71 Installing Fifth Gear—AX 5

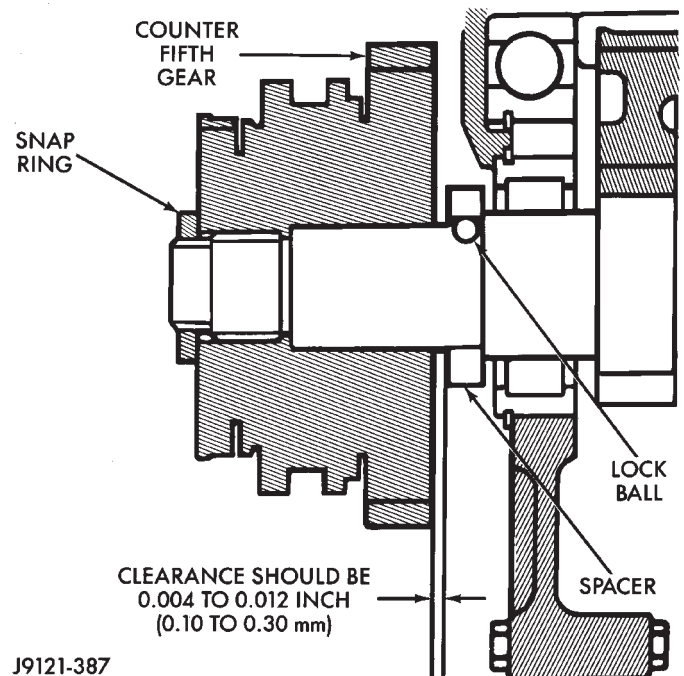
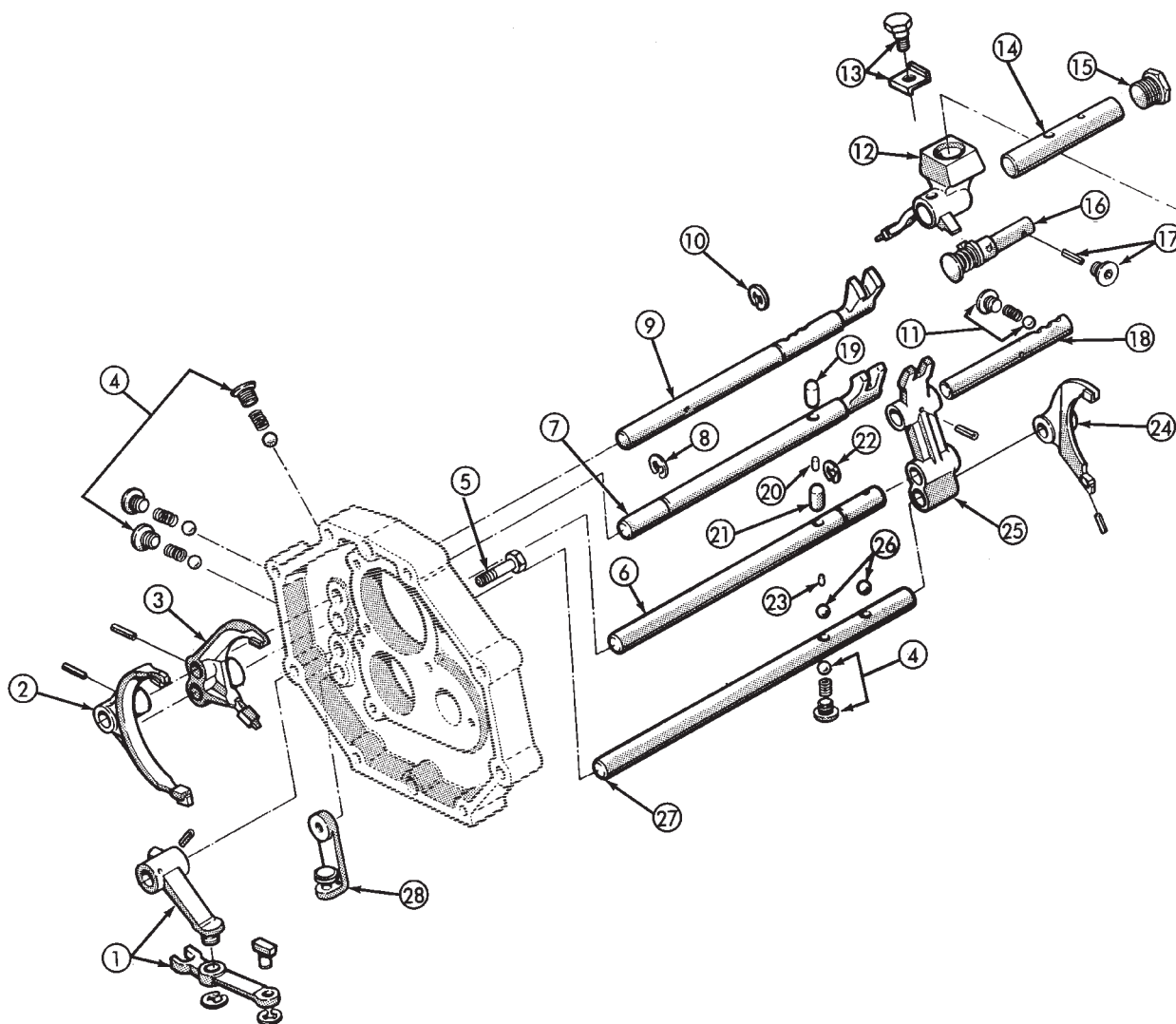


Fig. 72 Fifth Gear Thrust Clearance—AX 5



- | | |
|-------------------------------------|-----------------------------|
| ① REVERSE FORK AND SHIFT ARM | ⑮ SHAFT PLUG |
| ② 1-2 SHIFT FORK | ⑯ REVERSE PIN |
| ③ 3-4 SHIFT FORK | ⑰ RETAINING PIN AND PLUG |
| ④ LOCK BALL, SPRING AND PLUG (AX 5) | ⑱ NO. 5 SHIFT RAIL |
| ⑤ BRACKET BOLT | ⑲ INTERLOCK PIN |
| ⑥ NO. 3 SHIFT RAIL | ⑳ INTERLOCK PIN |
| ⑦ NO. 1 SHIFT RAIL | ㉑ INTERLOCK PIN |
| ⑧ C-RING | ㉒ C-RING |
| ⑨ NO. 2 SHIFT RAIL | ㉓ INTERLOCK PIN |
| ⑩ C-RING | ㉔ FIFTH-REVERSE FORK (AX 5) |
| ⑪ LOCK BALL, SPRING AND PLUG | ㉕ REVERSE SHIFT HEAD |
| ⑫ SHIFT ARM | ㉖ LOCK BALLS (AX 5) |
| ⑬ SET BOLT AND LOCK PLATE | ㉗ NO. 4 SHIFT RAIL (AX 5) |
| ⑭ SHIFT LEVER SHAFT | ㉘ REVERSE ARM BRACKET |

J9021-122

Fig. 73 Shift Components

(1) Install reverse shift arm. Then seat shift fork in bracket (Fig. 74).

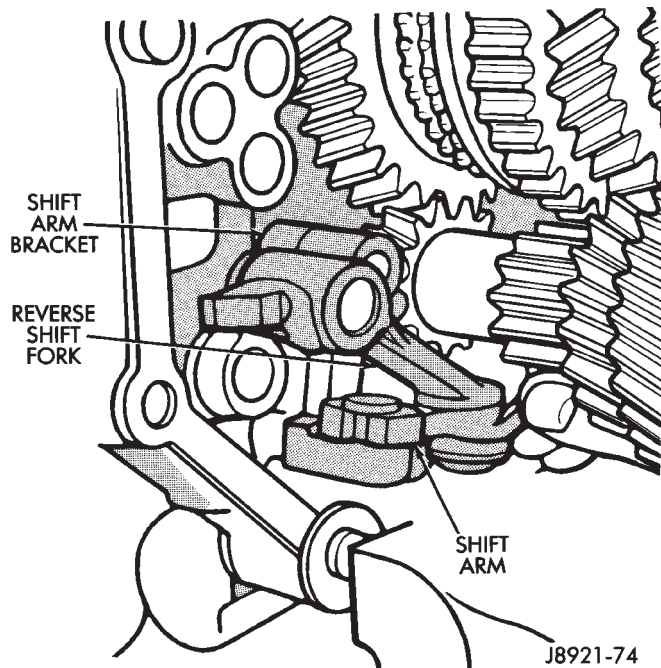


Fig. 74 Installing Reverse Shift Arm

(2) Install reverse idler gear on shaft. Then install shaft and gear in intermediate plate (Fig. 75). Install shaft lock plate and tighten attaching bolt to 18 N·m (13 ft. lbs.) torque.

(3) Install 1-2 and 3-4 shift forks in synchronizer sleeves. Then slide No. 2 shift rail through intermediate plate and into forks (Fig. 76).

(4) Coat shift rail interlock pins and balls with liberal quantity petroleum jelly to hold them in place.

(5) Refer to Figure 77 for interlock ball and pin positions during following assembly steps.

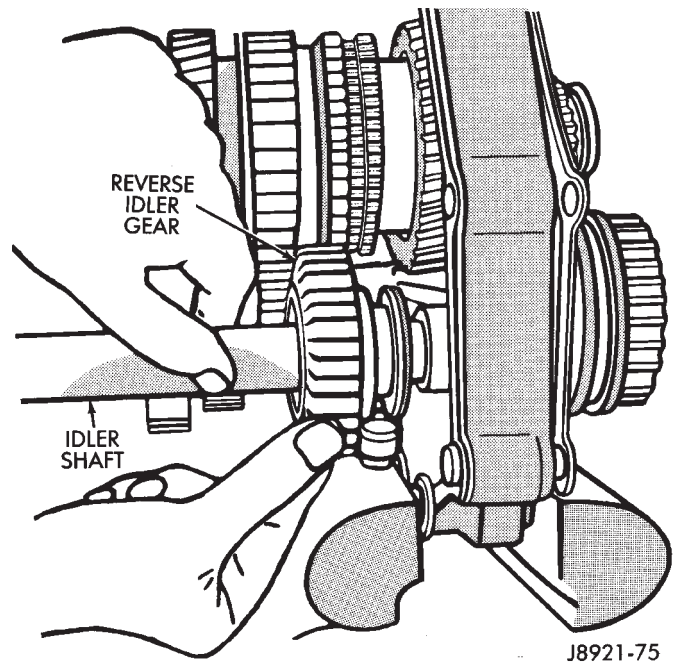


Fig. 75 Installing Reverse Idler Gear And Shaft

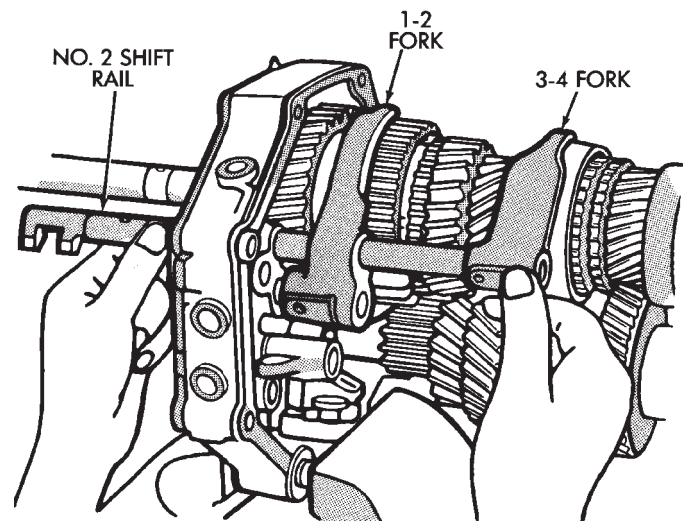
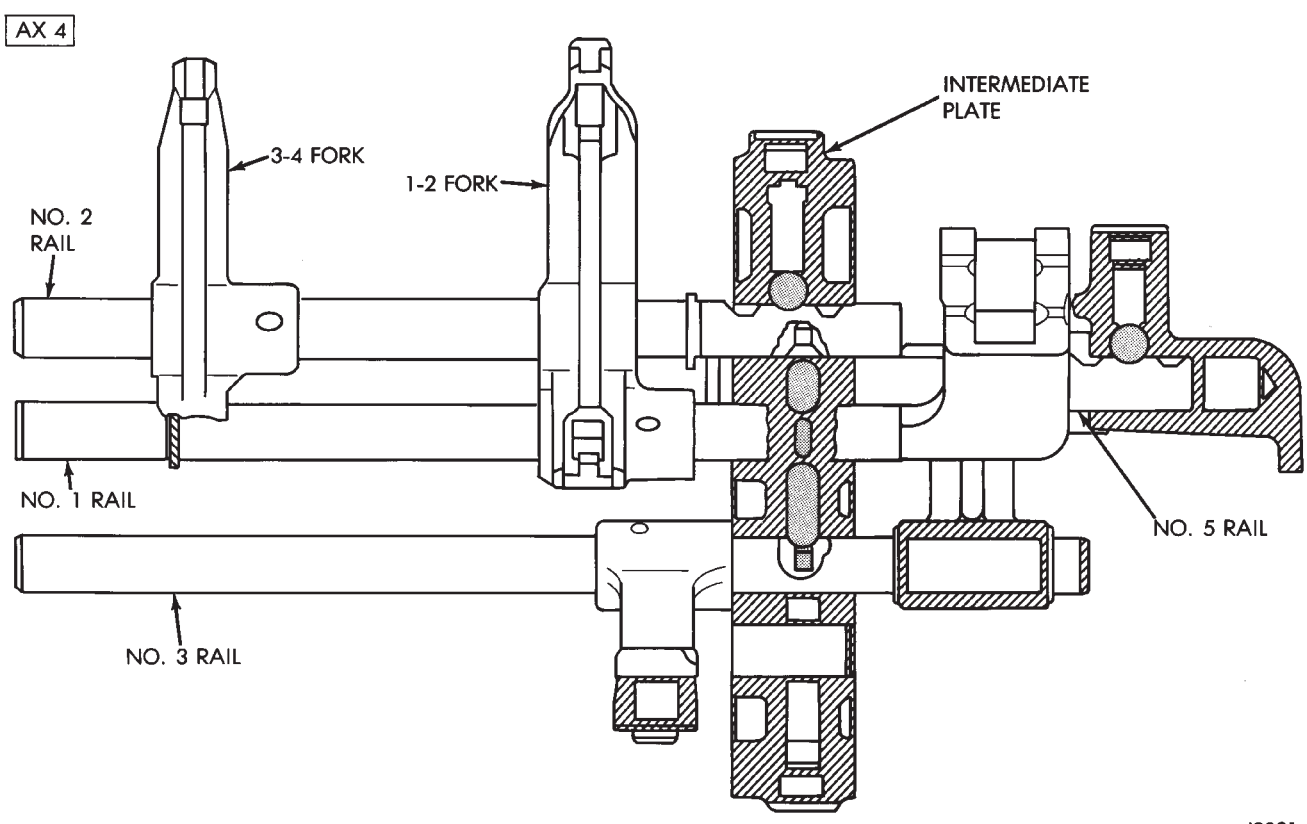
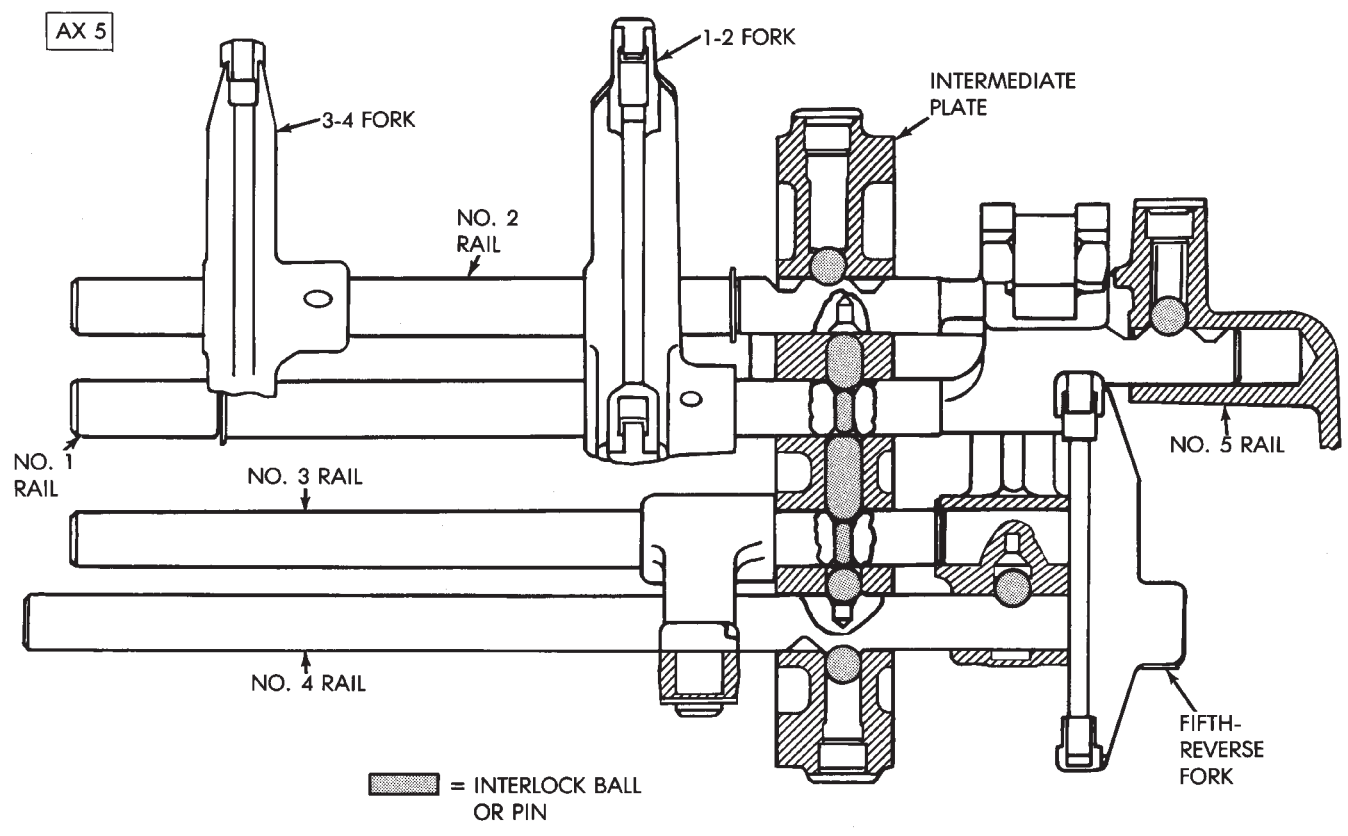


Fig. 76 Installing No. 2 Shift Rail and Shift Forks



J9021-123

Fig. 77 Interlock Ball And Pin Position

(6) Insert first interlock pin in intermediate plate (Fig. 78). Use pencil magnet and screwdriver to install pin.

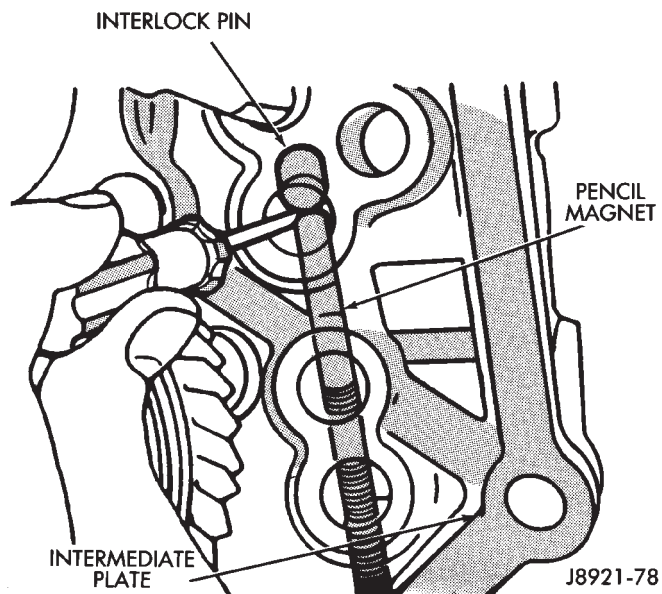


Fig. 78 Installing First Interlock Pin

(7) Install smaller diameter interlock pin in No. 1 rail (Fig. 79).

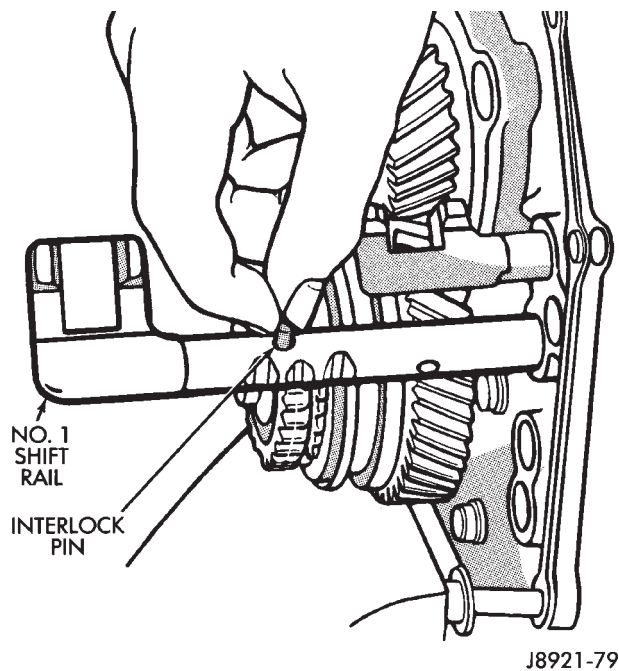


Fig. 79 Installing Interlock Pin In No. 1 Shift Rail

(8) Slide No. 1 rail through 1-2 shift fork (Fig. 80).

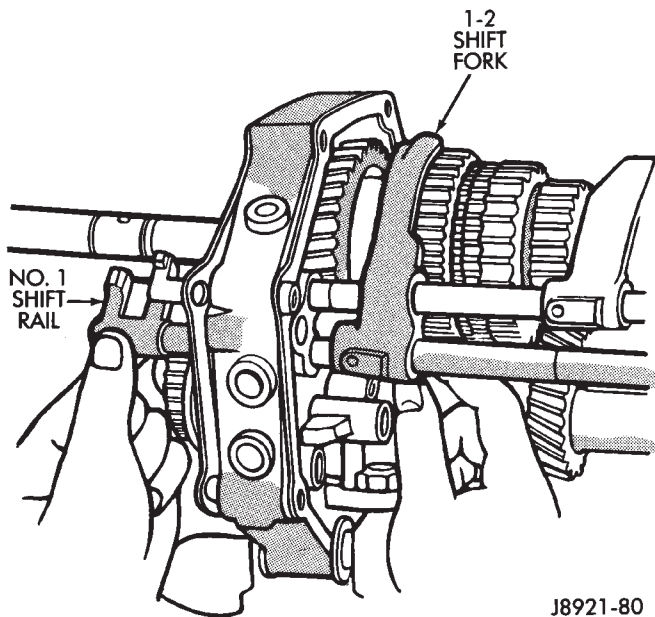


Fig. 80 Installing No. 1 Shift Rail

(9) Install largest interlock pin between Nos. 1 and 3 shift rails (Fig. 81).

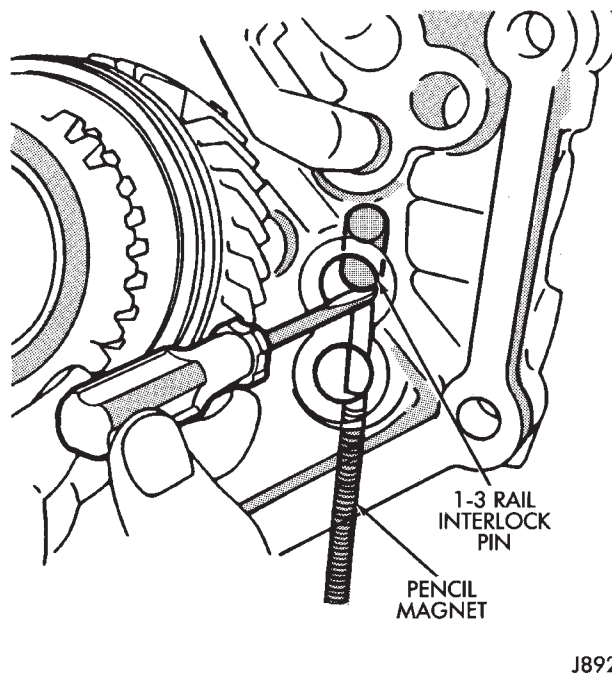


Fig. 81 Installing 1-3 Shift Rail Interlock Pin

(10) Install interlock pin in No. 3 shift rail (Fig. 82).

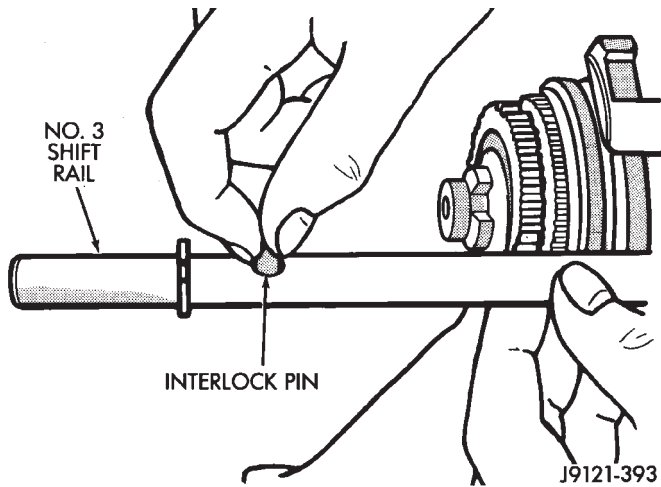


Fig. 82 Installing No. 3 Shift Rail Interlock Pin

(11) Slide No. 3 rail into reverse shift head (Fig. 83).

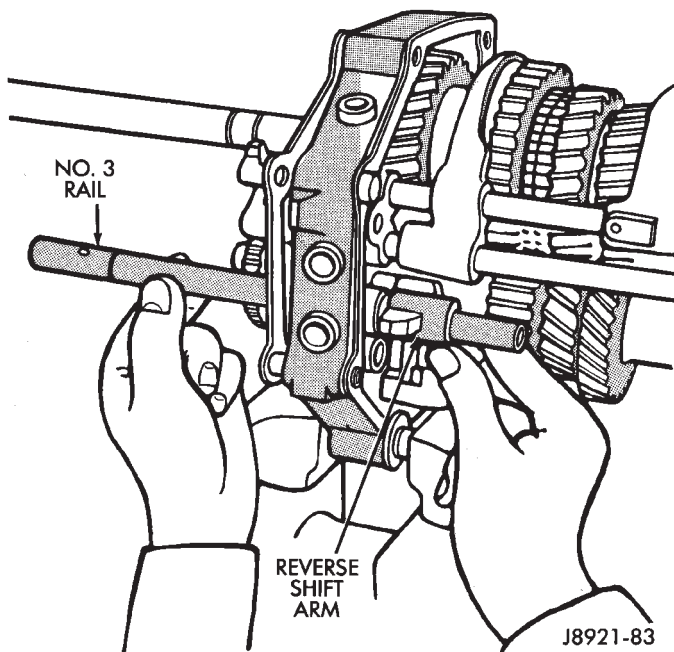


Fig. 83 Installing No. 3 Shift Rail

(12) Assemble reverse shift head and No. 5 shift rail.

(13) Install No. 5 shift rail in intermediate plate and engage shift head on No. 3 shift rail (Fig. 84).

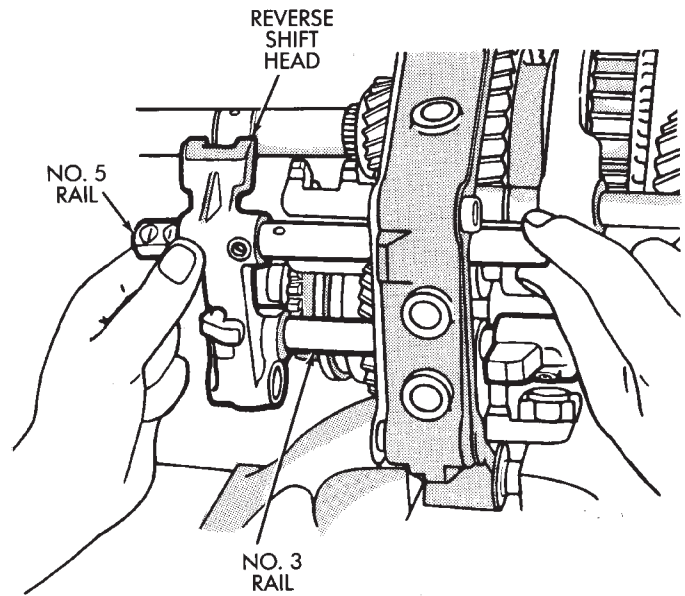


Fig. 84 Installing Reverse Shift Head

(14) Install reverse shift head lock ball with screwdriver and pencil magnet (Fig. 85).

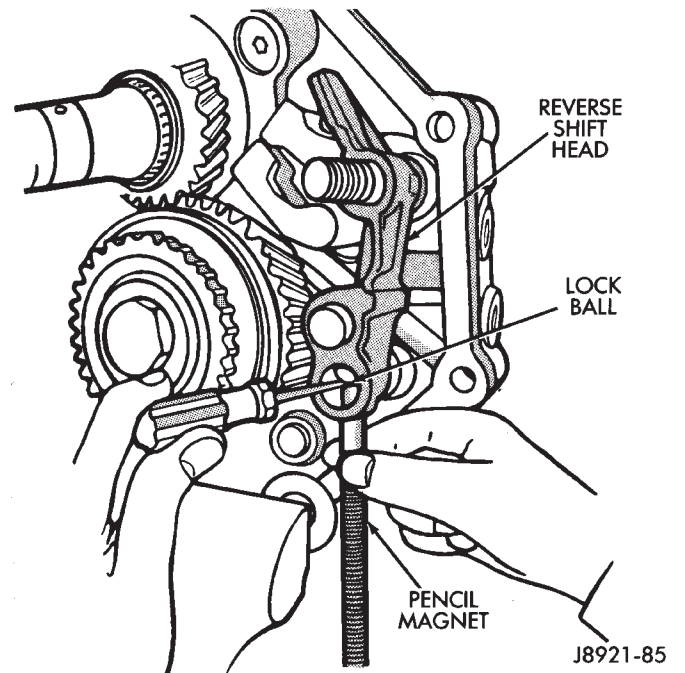


Fig. 85 Installing Reverse Shift Head Lock Ball

(15) Shift fifth gear synchronizer sleeve rearward to lock it (Fig. 86).

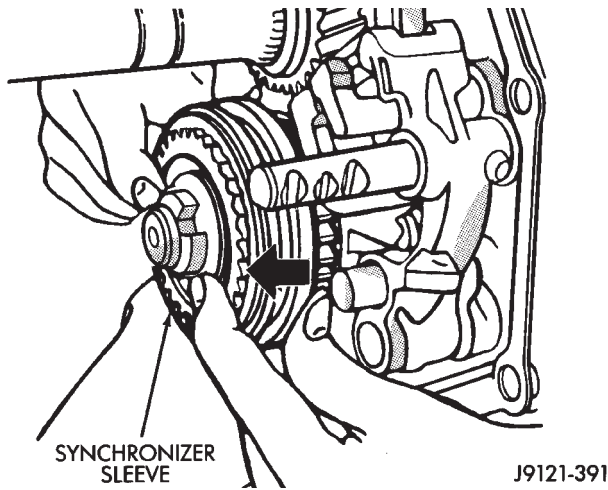


Fig. 86 Locking Fifth Synchronizer

(16) On AX 5, install fifth-reverse shift fork in synchronizer sleeve. Then slide No. 4 shift rail into fork (Fig. 87).

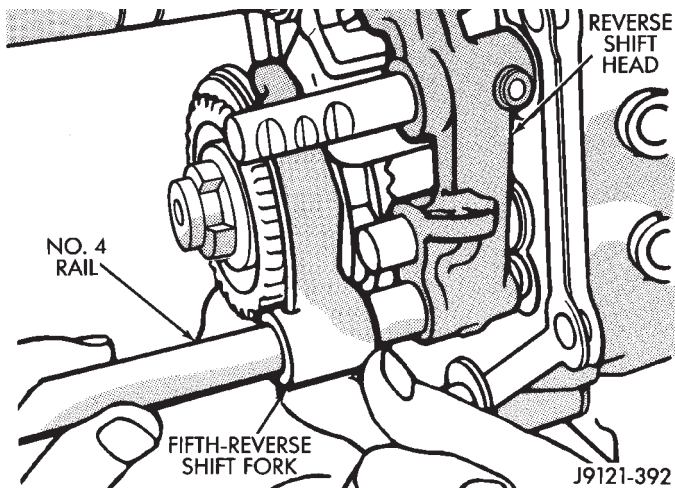


Fig. 87 Fifth-Reverse Shift Fork Installation

(17) Install shift rail lock ball with pencil magnet and screwdriver (Fig. 88).

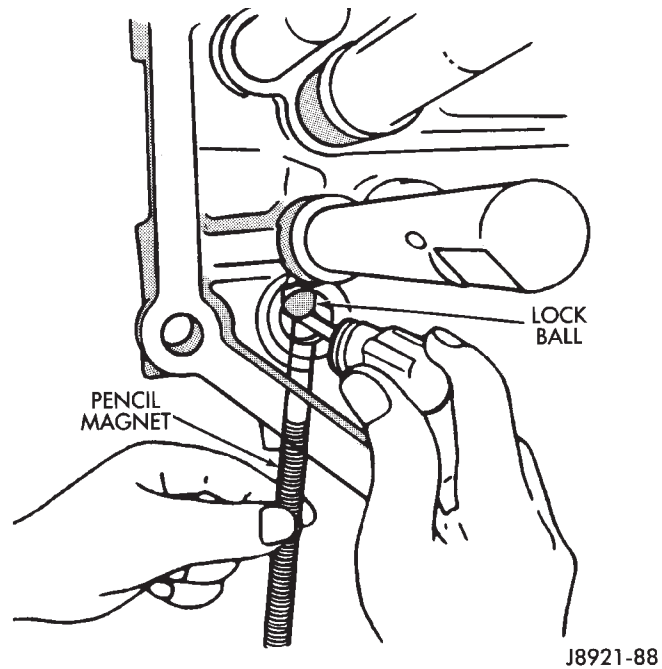


Fig. 88 Lock Ball Installation

(18) Check interlock operation as follows: Move No. 1 shift rail rearward to first gear position. Interlock operation is OK if remaining shift rails did not move.

(19) Install new shift fork pins (Fig. 89).

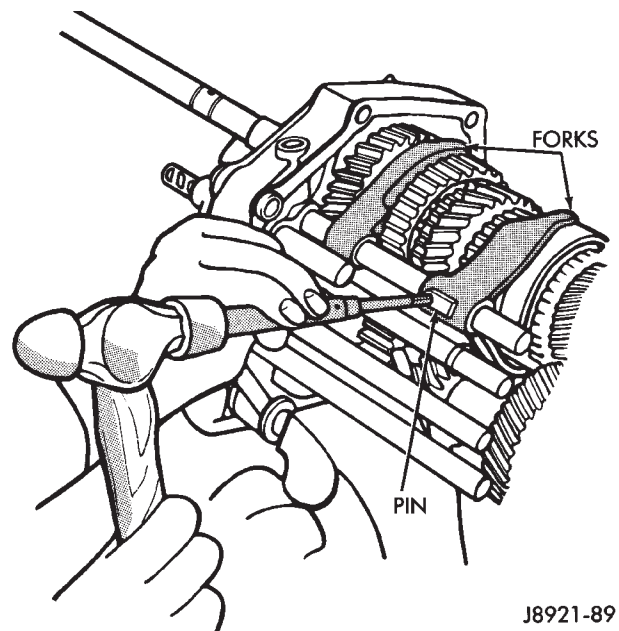


Fig. 89 Installing Shift Fork Pins

(20) Install new shift rail C-rings (Fig. 90).

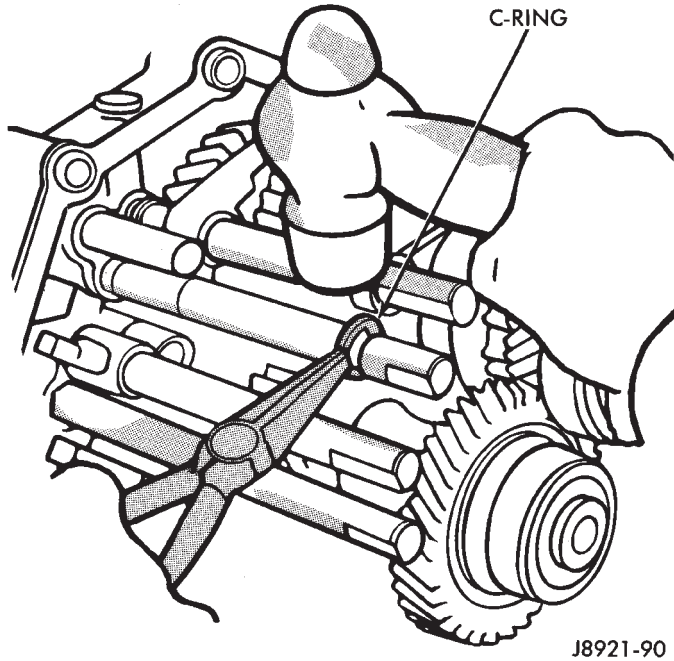


Fig. 90 Installing Shift Rail C-Rings

(21) Apply sealer to threads of lock ball plugs.

(22) Install lock balls and springs in intermediate plate. **Short spring goes in top hole of intermediate plate.**

(23) Install lock ball and spring plugs (Fig. 91). Tighten plugs to 19 N·m (14 ft. lbs.) torque.

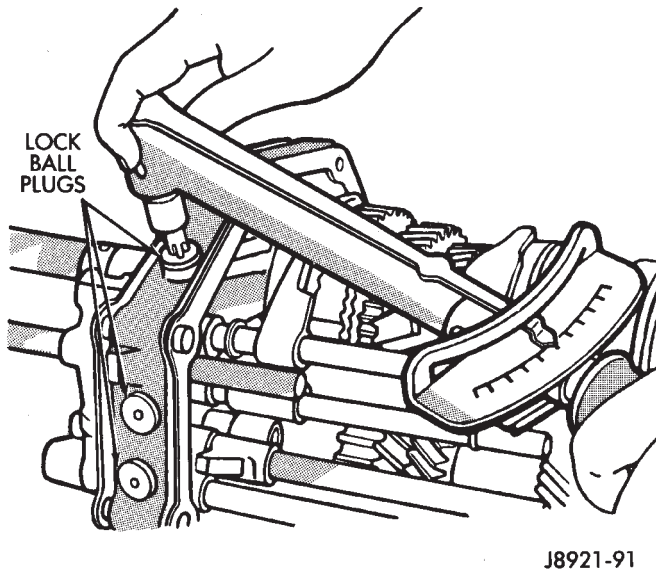


Fig. 91 Installing Lock Ball Plugs

ASSEMBLING GEARTRAIN AND TRANSMISSION CASE

- (1) Remove intermediate plate from vise.
- (2) Install new gaskets on intermediate plate.
- (3) Install transmission case on intermediate plate (Fig. 92).

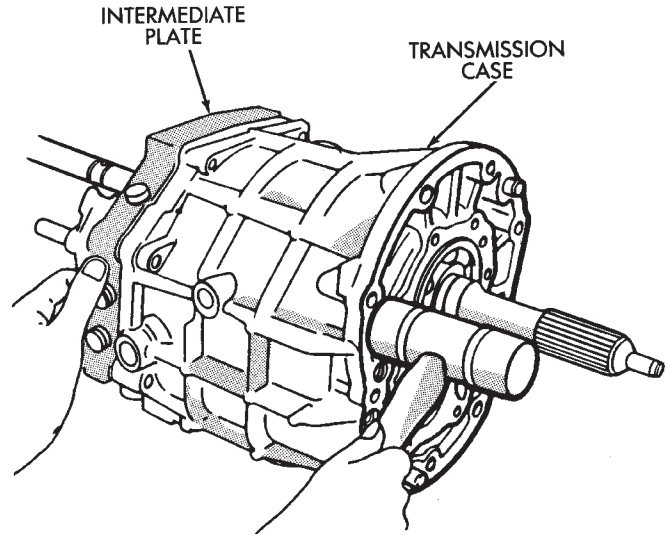


Fig. 92 Installing Transmission Case

(4) Install new front bearing snap ring (Fig. 93).

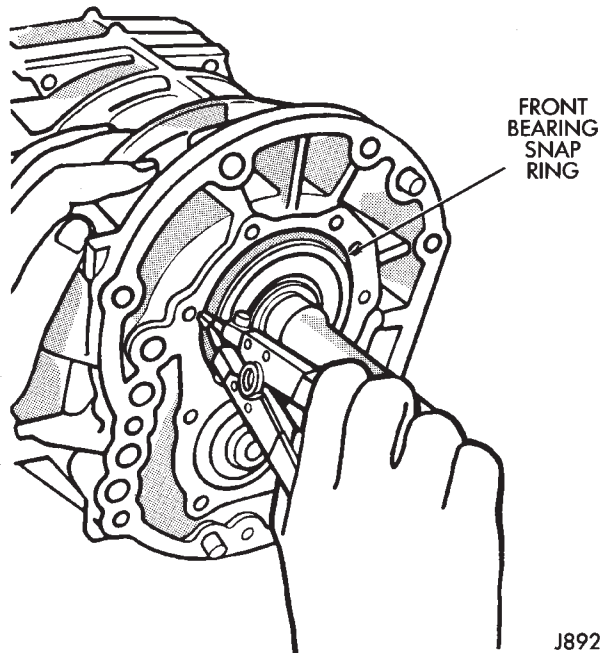


Fig. 93 Installing Front Bearing Snap Ring

(5) Install new gasket on front bearing retainer and install retainer on case (Fig. 94).

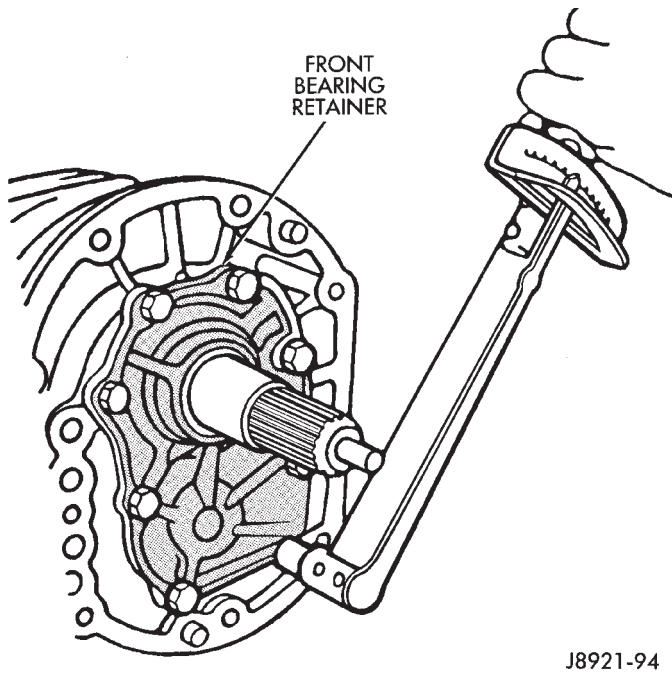


Fig. 94 Installing Front Bearing Retainer

(6) Install adapter or extension housing on intermediate plate (Fig. 95). Tighten housing bolts to 37 N·m (27 ft. lbs.) torque.

(7) Install shift arm (Fig. 95).

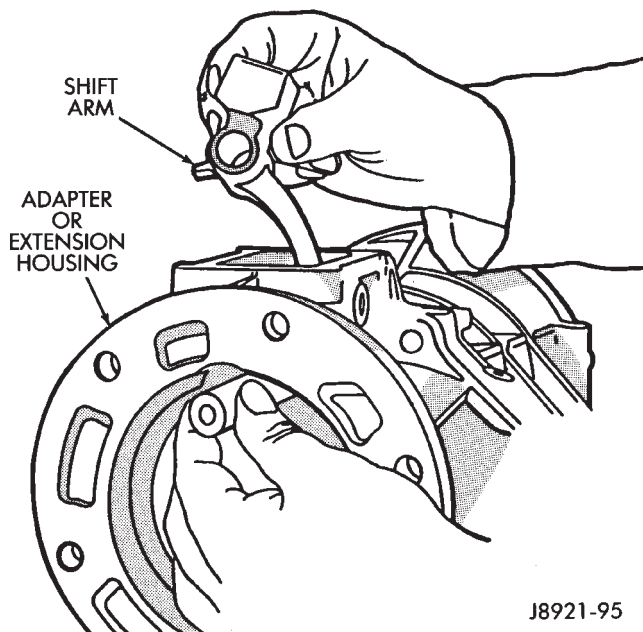


Fig. 95 Installing Adapter Housing And Shift Arm

(8) Install shift arm lock plate with pliers (Fig. 96). Then install and tighten lock plate set bolt to 38 N·m (28 ft. lbs.) torque.

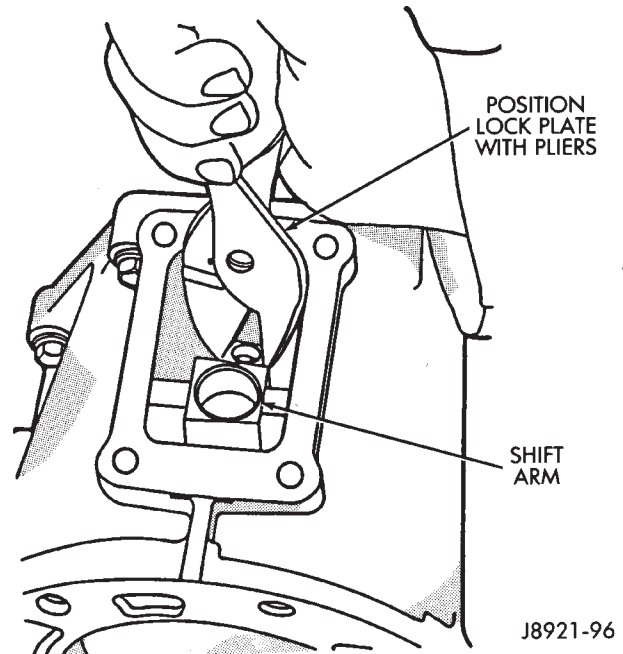


Fig. 96 Shift Arm Lock Plate Installation

(9) Install and tighten shaft plug to 18 N·m (13 ft. lbs.) torque (Fig. 97).

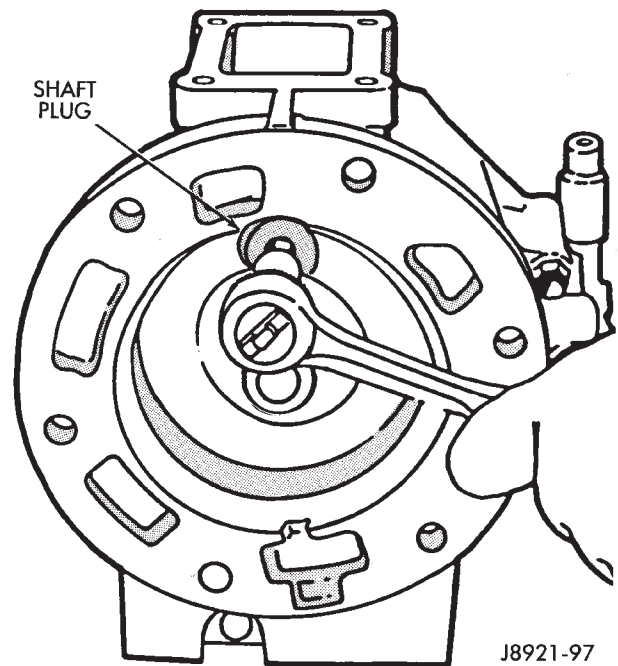
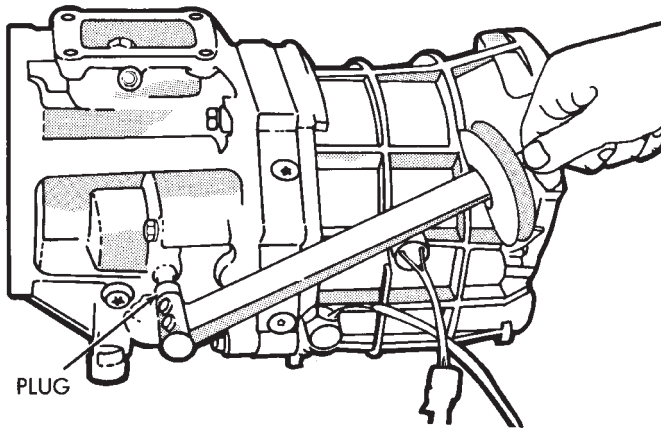


Fig. 97 Shaft Plug Installation

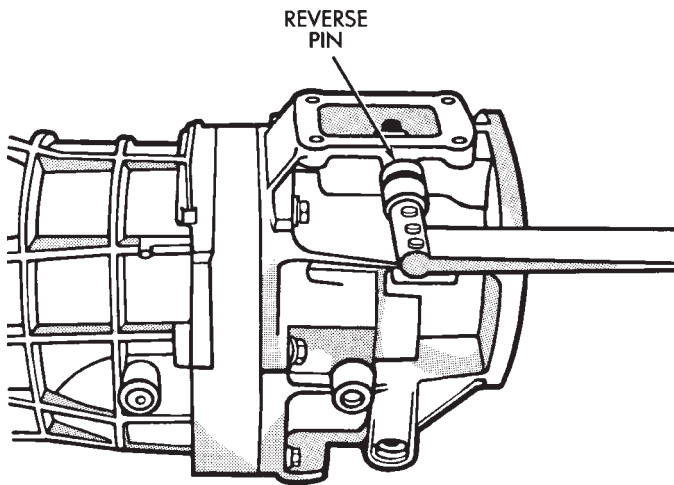
(10) Install lock ball and spring in housing. Then apply sealer to ball plug and install plug (Fig. 98). Tighten plug to 19 N·m (14 ft. lbs.) torque.



J8921-98

Fig. 98 Installing Ball Plug

(11) Install reverse pins in housing (Fig. 99). Tighten pins to 27 N·m (20 ft. lbs.) torque.

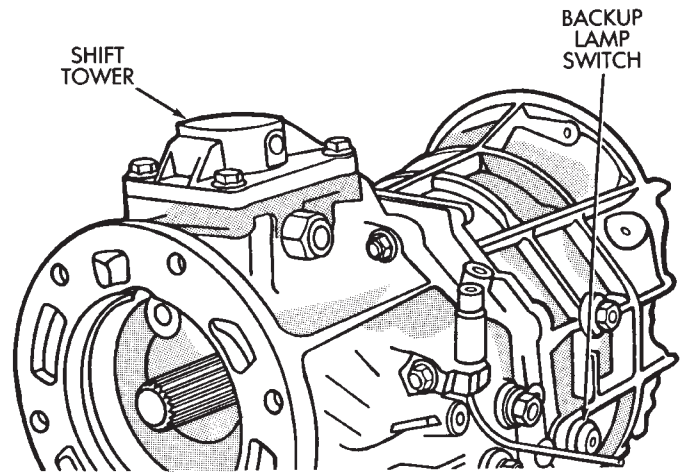


J8921-99

Fig. 99 Install Reverse Pins

(12) Install shift tower and new gasket on housing (Fig. 100). Tighten tower bolts to 18 N·m (13 ft. lbs.) torque.

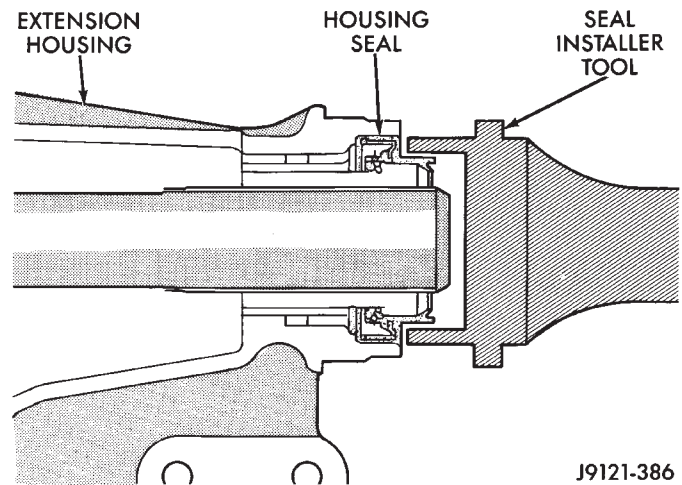
(13) Install backup lamp switch (Fig. 100). Tighten switch to 37 N·m (27 ft. lbs.) torque.



J8921-100

Fig. 100 Installing Shift Tower And Backup Lamp Switch

(14) On 2-wheel drive models, install new seal in extension housing (Fig. 101).



J9121-386

Fig. 101 Extension Housing Seal Installation—2WD Models

(15) Install vehicle speed sensor. Refer to procedure in In-Vehicle Service section.

(16) Install clutch housing, release bearing, fork and retainer clip.

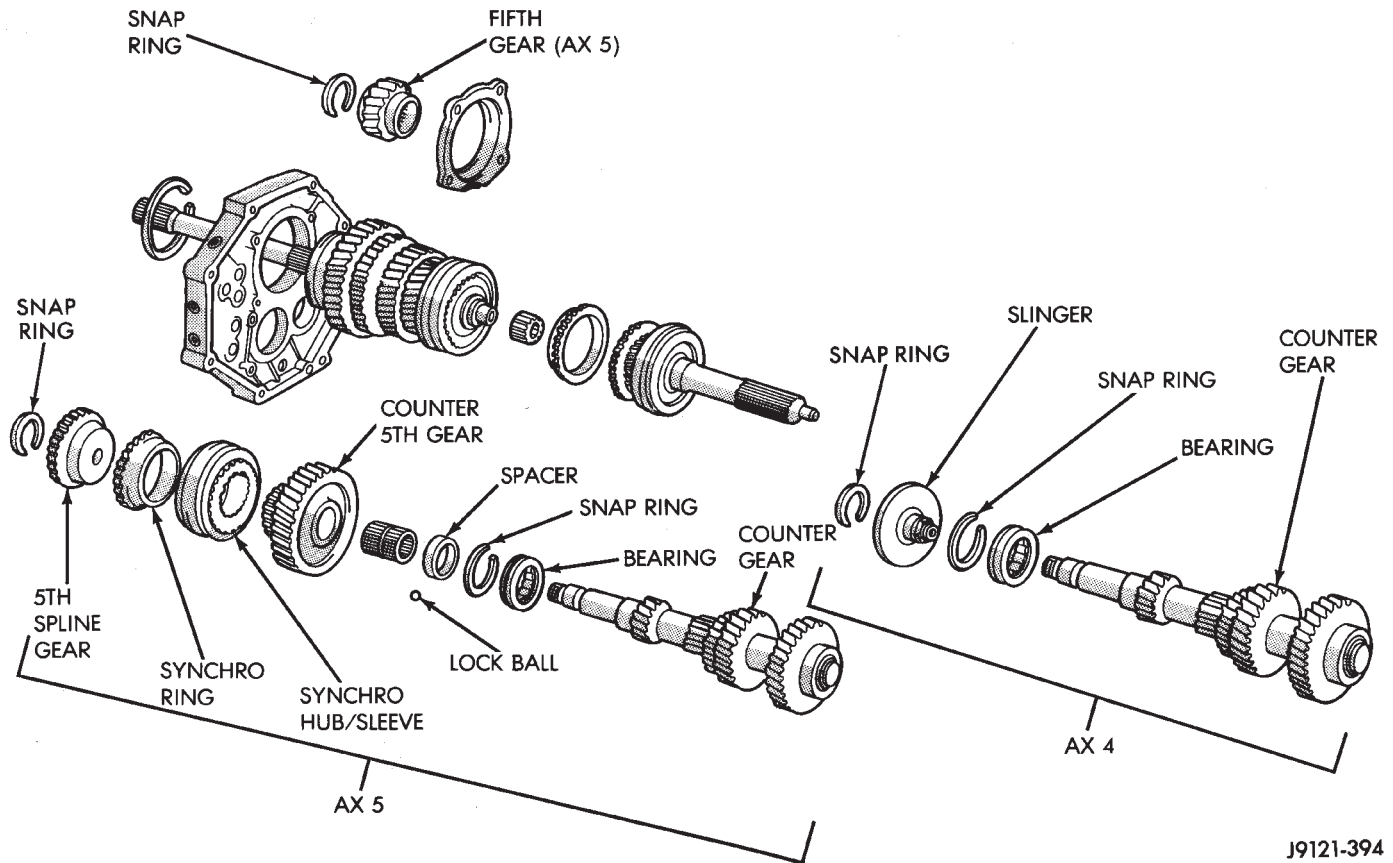


Fig. 102 Counter Gear Components

AX 15 MANUAL TRANSMISSION

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GENERAL INFORMATION

The AX 15 is a 5-speed, synchromesh, manual transmission. Fifth gear is an overdrive range with a ratio of 0.79:1. The shift mechanism is integral and mounted in the shift tower portion of the adapter housing (Fig. 1).

An adapter housing is used to attach the transmission to the transfer case on 4-wheel drive models. A standard extension housing is used on 2-wheel drive models.

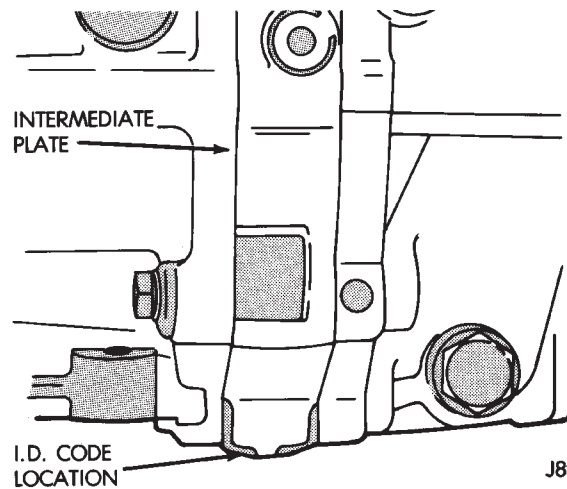
The AX 15 is used in XJ and YJ models with a 4.0L engine. The AX 15 is designed for use with either two-wheel drive or four-wheel drive applications.

TRANSMISSION IDENTIFICATION

The AX 15 identification code numbers are on the bottom surface of the transmission gear case (Fig. 2).

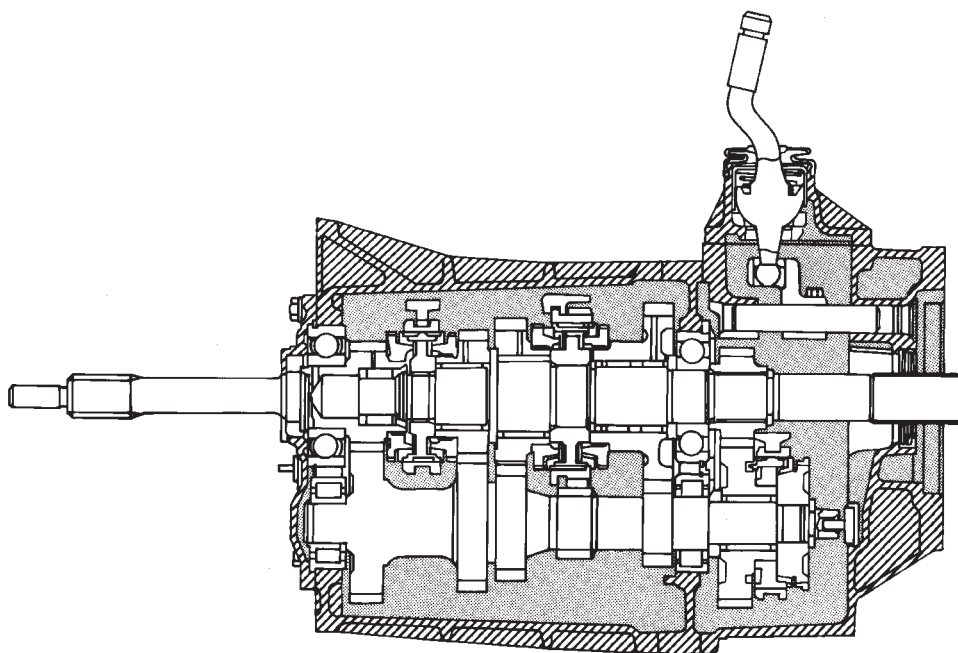
The first number is year of manufacture. The second and third numbers indicate month of manufac-

ture. The next series of numbers is the transmission serial number.



J8921-1024

Fig. 2 Identification Code Number Location



J8921-1023

Fig. 1 AX 15 Manual Transmission

TRANSMISSION SHIFT PATTERN

The AX 15 shift pattern is shown in Figure 3. First and second and third and fourth gear ranges are in line for improved shifting. Fifth and reverse gear ranges are also in line at the extreme right of the pattern (Fig. 3).

The AX 15 is equipped with a reverse lockout mechanism. The shift lever must be moved through the Neutral detent before making a shift to reverse.

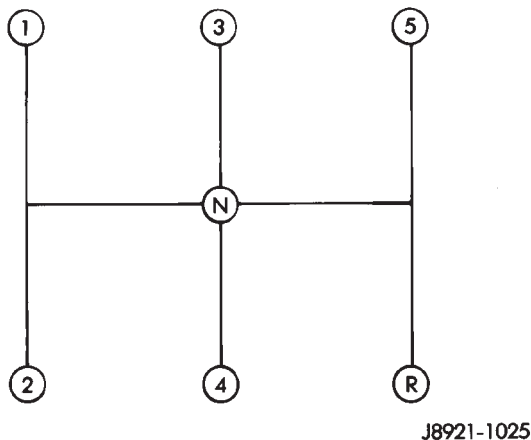


Fig. 3 AX 15 Shift Pattern

TRANSMISSION LUBRICANT

Recommended lubricant for AX 15 transmissions is Mopar 75W-90, API Grade GL-5 gear lubricant, or equivalent.

Correct lubricant refill or top-off level is to the bottom edge of the fill plug hole.

Lubricant capacity is:

- 3.10 liters (3.27 qts.) in 4-wheel drive models.
- 3.15 liters (3.32 qts.) in 2-wheel drive models.

TRANSMISSION SWITCH AND PLUG LOCATIONS

The fill plug is at the driver side of the gear case (Fig. 4).

The drain plug and backup light switch are on the passenger side of the gear case (Fig. 5).

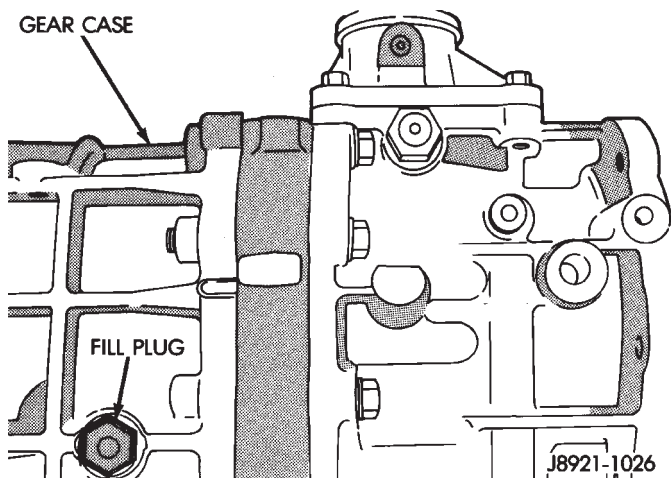


Fig. 4 Fill Plug Location

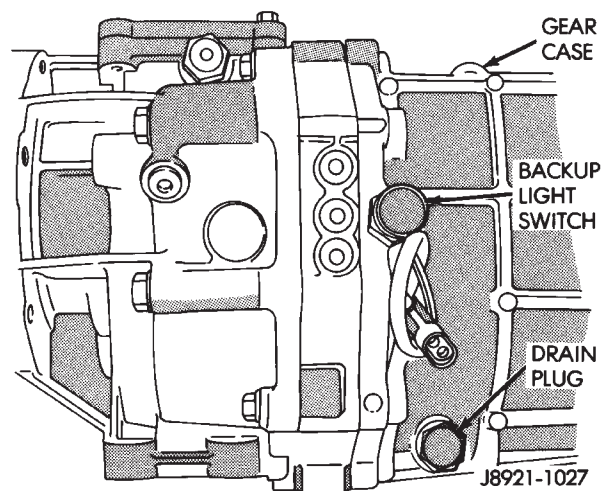


Fig. 5 Drain Plug And Backup Light Switch Location

TRANSMISSION GEAR RATIOS

The transmission gear ratios are as follows:

- First gear - 3.83:1
- Second gear - 2.33:1
- Third gear - 1.44:1
- Fourth gear - 1.00:1
- Fifth gear - 0.79:1
- Reverse - 4.22:1

SERVICE DIAGNOSIS

LOW LUBRICANT LEVEL

A low transmission lubricant level is generally the result of a leak, inadequate lubricant fill, or an incorrect lubricant level check.

Leaks can occur at the mating surfaces of the gear case, intermediate plate and adapter or extension housing, or from the front/rear seals. A suspected leak could also be the result of an overfill condition.

Leaks at the rear of the extension or adapter housing will be from the housing oil seals. Leaks at component mating surfaces will probably be the result of inadequate sealer, gaps in the sealer, incorrect bolt tightening, or use of a non-recommended sealer.

A leak at the front of the transmission will be from either the front bearing retainer or retainer seal. Lubricant may be seen dripping from the clutch housing after extended operation. If the leak is severe, it may also contaminate the clutch disc causing slip, grab and chatter.

Transmissions filled from air or electrically powered lubricant containers can be underfilled. This generally happens when the container delivery mechanism is improperly calibrated. Always check the lubricant level after filling to avoid an under fill condition.

A correct lubricant level check can only be made when the vehicle is level; use a drive-on hoist to ensure this. Also allow the lubricant to settle for a

minute or so before checking. These recommendations will ensure an accurate check and avoid an under-or-overfill condition.

HARD SHIFTING

Hard shifting is usually caused by a low lubricant level, improper or contaminated lubricants, component damage, incorrect clutch adjustment, or by a damaged clutch pressure plate or disc.

Substantial lubricant leaks can result in gear, shift rail, synchro and bearing damage. If a leak goes undetected for an extended period, the first indications of a problem are usually hard shifting and noise.

Incorrect or contaminated lubricants can also contribute to hard shifting. The consequence of using non-recommended lubricants is noise, excessive wear, internal bind and hard shifting.

Improper clutch release is a frequent cause of hard shifting. Incorrect adjustment or a worn, damaged pressure plate or disc can cause incorrect release. If the clutch problem is advanced, gear clash during shifts can result.

Worn or damaged synchro rings can cause gear clash when shifting into any forward gear. In some new or rebuilt transmissions, new synchro rings may tend to stick slightly causing hard or noisy shifts. In most cases, this condition will decline as the rings wear-in.

TRANSMISSION NOISE

Most manual transmissions make some noise during normal operation. Rotating gears can generate a mild whine that may only be audible at extreme speeds.

Severe, obviously audible transmission noise is generally the result of a lubricant problem. Insufficient, improper, or contaminated lubricant can promote rapid wear of gears, synchros, shift rails, forks and bearings. The overheating caused by a lubricant problem, can also lead to gear breakage.

TRANSMISSION REMOVAL—AX 15

- (1) Shift transmission into first or third gear.
- (2) Raise vehicle on a hoist.
- (3) Disconnect necessary exhaust system components.
- (4) Support transmission with adjustable jack stand.
- (5) Disconnect rear cushion and mounting bracket from transmission, or transfer case (Fig. 1).
- (6) On XJ, remove rear crossmember. On YJ, remove skid plate (Fig. 1).
- (7) Disconnect transmission shift linkage, speedometer cable, transfer case vacuum lines and clutch hydraulic lines.
- (8) Lower transmission-transfer case assembly no more than 7.6 cm (3 in.) for access to shift lever.

ITEM	TORQUE
A	41-68 N·m (30-50 ft. lbs.)
B	27-47 N·m (20-35 ft. lbs.)

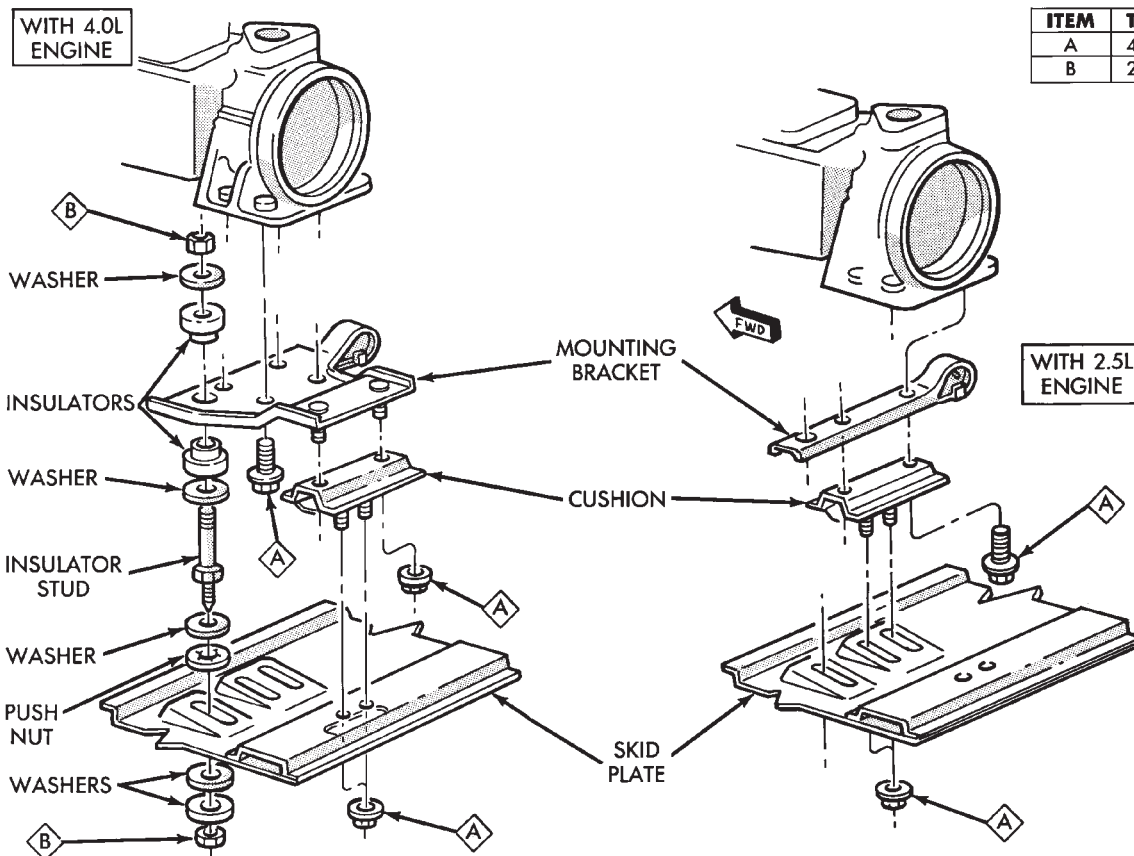


Fig. 1 Rear Mount Components (YJ Shown)

(9) Reach up and around transmission case and unseat shift lever dust boot from transmission shift tower (Fig. 2). Move boot upward on shift lever for access to lever retainer.

(10) Disengage shift lever as follows:

(a) Reach up and around transmission case and press shift lever retainer downward with your fingers.

(b) Turn retainer counterclockwise to release it.

(c) Lift lever and retainer out of shift tower (Fig. 2). **It is not necessary to remove shift lever from floorpan boot. Simply leave lever in place for later installation.**

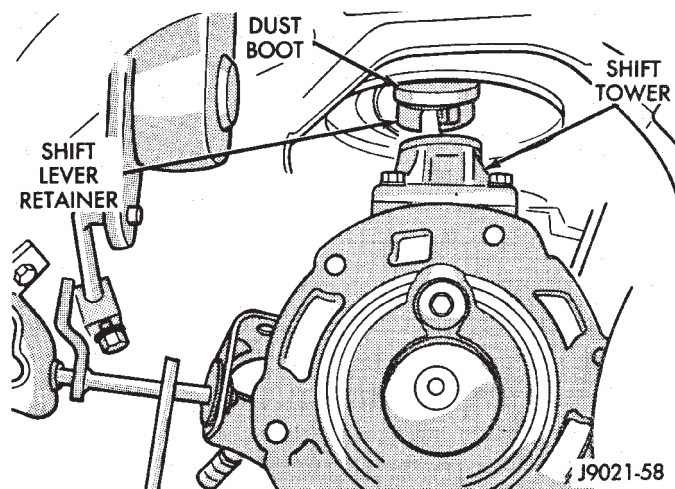


Fig. 2 Removing/Installing Shift Lever

(11) Mark front and rear propeller shafts for installation alignment (Fig. 3). Then remove both shafts.

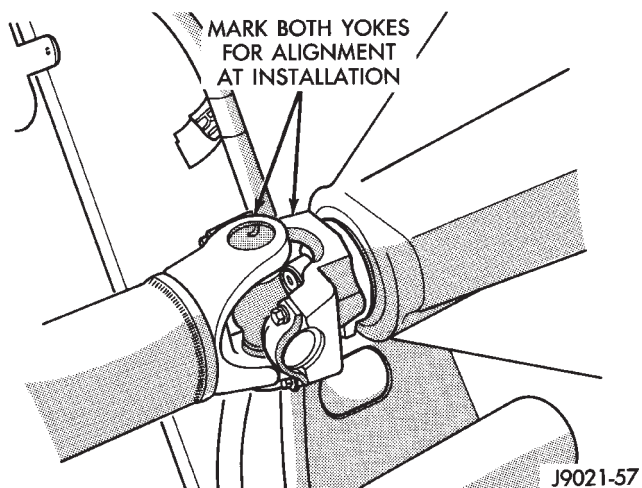


Fig. 3 Marking Propeller Shaft And Axle Yoke

(12) Remove crankshaft position/engine timing sensor (Fig. 4).

(13) Disconnect transmission and transfer case vent hoses.

(14) Remove slave cylinder from clutch housing.

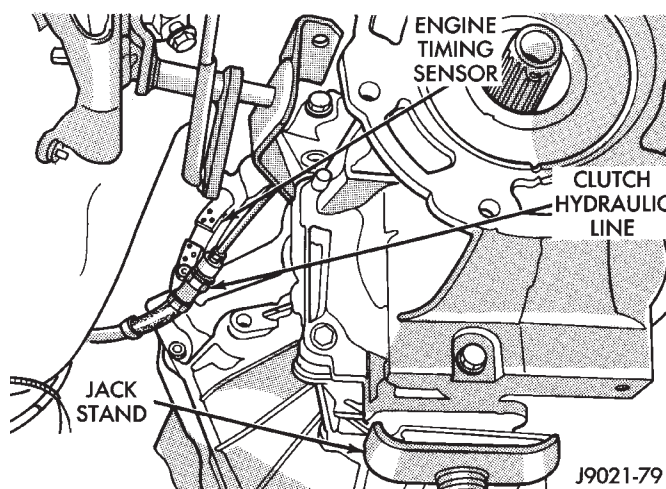


Fig. 4 Timing Sensor Location

(15) Support transmission-transfer case assembly with transmission jack. Secure assembly to jack with safety chains.

(16) Reposition adjustable jack stand under engine. Be sure to place wood block between jack and oil pan.

(17) Remove clutch housing brace rod.

(18) Remove clutch housing-to-engine bolts and remove transmission-transfer case assembly.

(19) Remove bolts attaching transmission to transfer case and separate components.

(20) Remove release bearing, fork and retainer clip.

(21) Remove clutch housing from transmission.

TRANSMISSION INSTALLATION—AX 15

(1) Install clutch housing on transmission. Tighten housing bolts to 37 N·m (27 ft-lbs) torque.

(2) Lubricate contact surfaces of release fork, lever and pivot ball stud. Then install bearing, fork and clip in clutch housing.

(3) Mount transmission on transmission jack. Secure transmission with safety chains.

(4) Lightly lubricate pilot bearing and transmission input shaft splines with Mopar high temperature grease.

(5) Align transmission input shaft and clutch disc splines and install transmission.

(6) Install and tighten clutch housing-to-engine bolts to 38 N·m (28 ft. lbs.) torque. **Be sure housing is properly seated on engine before tightening bolts.**

(7) Lower transmission no more than 7.6 cm (3 in.) for access to the shift tower.

(8) Reach up and around the transmission and insert shift lever in shift tower. Press lever retainer downward and turn it clockwise to lock it in place. Then install lever dust boot on shift tower.

(9) Connect engine timing sensor.

(10) Remove jack from under transmission and mount transfer case on jack.

(11) Align transfer case and transmission shafts and install transfer case. Tighten transfer case-to-transmission nuts/bolts to 35 N·m (26 ft. lbs.) torque.

(12) Move jack stand from under engine and reposition it under transmission. Then remove transmission jack.

(13) Connect transfer case vacuum hoses and linkage. Check and adjust linkage if necessary.

(14) Connect transmission and transfer case vent hoses and backup light switch wires.

(15) Install clutch sleeve cylinder.

(16) Connect vehicle speed sensor and wires.

(17) On XJ, install rear crossmember and attach cushion and bracket. Tighten crossmember-to-frame bolts to 41 N·m (30 ft. lbs.) torque. Tighten transmission-to-rear cushion and bracket bolts/nuts to 45 N·m (33 ft. lbs.) torque.

(18) On YJ, install rear cushion and bracket and skid plate. Tighten attaching bolts/nuts to indicated torque (Fig. 1).

(19) Align and install front/rear propeller shafts. Tighten shaft U-joint clamp bolts to 19 N·m (170 in. lbs.) torque.

(20) On XJ, install skid plate if removed. Tighten bolts to 42 N·m (31 ft. lbs.) torque. Tighten stud nuts to 17 N·m (150 in. lbs.) torque.

(21) Top off transmission and transfer lubricant levels.

(22) Remove supports and lower vehicle.

TRANSMISSION DISASSEMBLY AND OVERHAUL

ADAPTER/EXTENSION HOUSING REMOVAL

(1) Remove release bearing, fork, retainer clip and clutch housing from transmission. Also remove shift lever if not previously removed.

(2) On 2-wheel drive models, remove extension housing seal (Fig. 1).

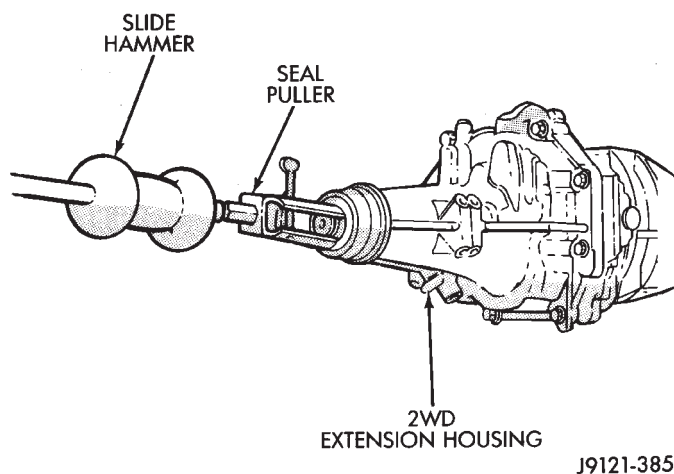


Fig. 1 Removing Extension Housing Seal

(3) Remove shift tower bolts and remove tower from adapter or extension housing (Fig. 2).

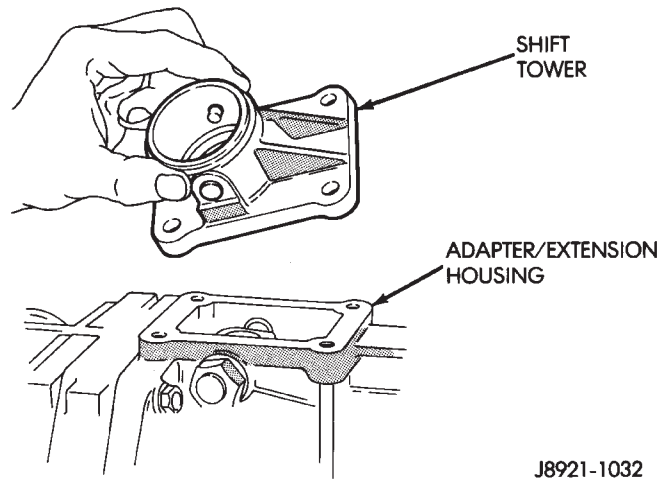


Fig. 2 Shift Tower Removal/Installation

(4) Remove gasket from shift tower (Fig. 3).

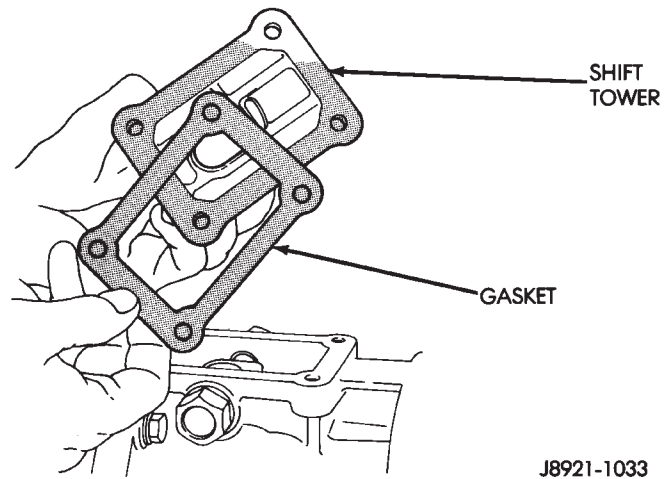


Fig. 3 Shift Tower Gasket Removal/Installation

(5) Remove shift arm retainer bolt (Fig. 4).

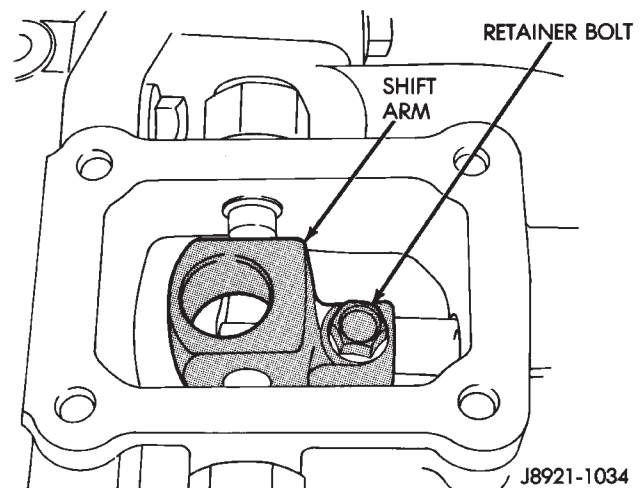


Fig. 4 Shift Arm Retainer Bolt Removal/Installation

(6) Loosen and remove restrictor pins (Fig. 5).

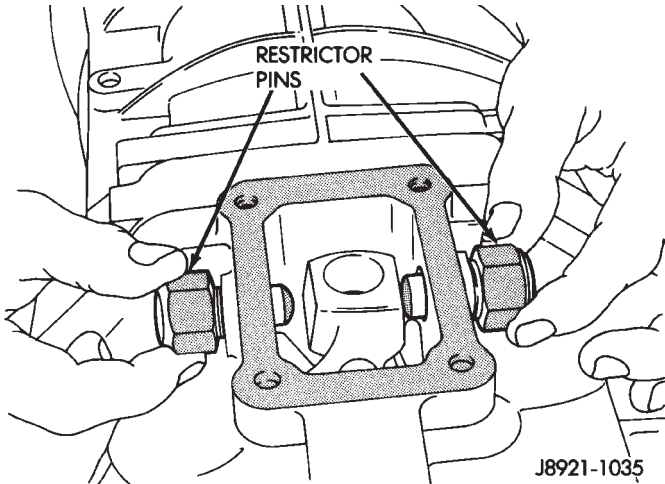


Fig. 5 Removing/Installing Restrictor Pins

(9) Remove shift arm (Fig. 8).

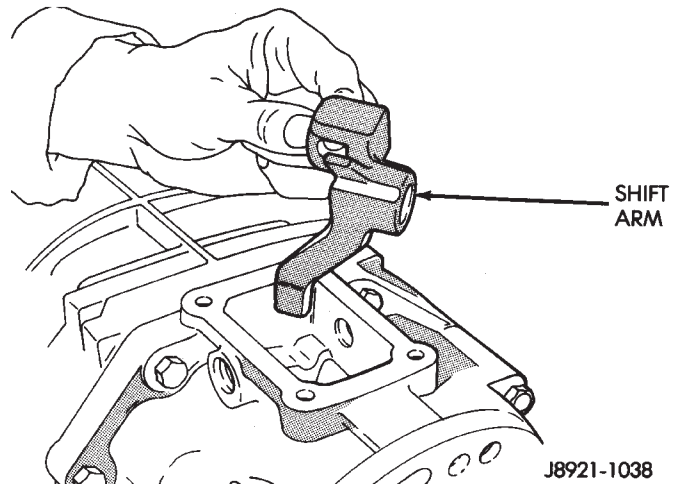


Fig. 8 Shift Arm Removal/Installation

(7) Remove shift arm shaft plug (Fig. 6).

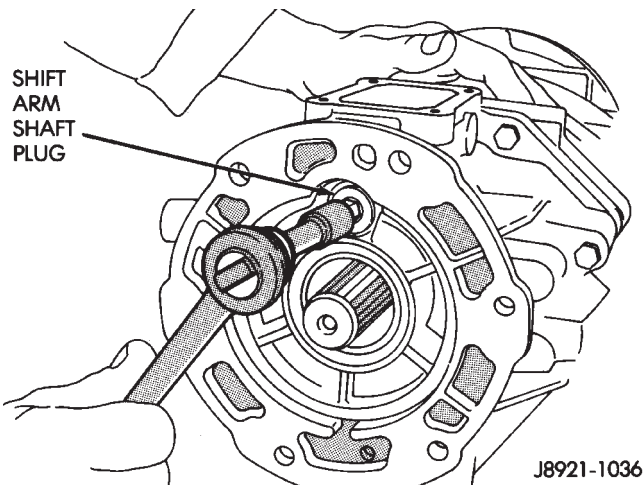


Fig. 6 Removing/Installing Shift Lever Shaft Plug

(10) Remove plug for reverse shift head lock ball. Plug is at right side of adapter housing near backup light switch (Fig. 9).

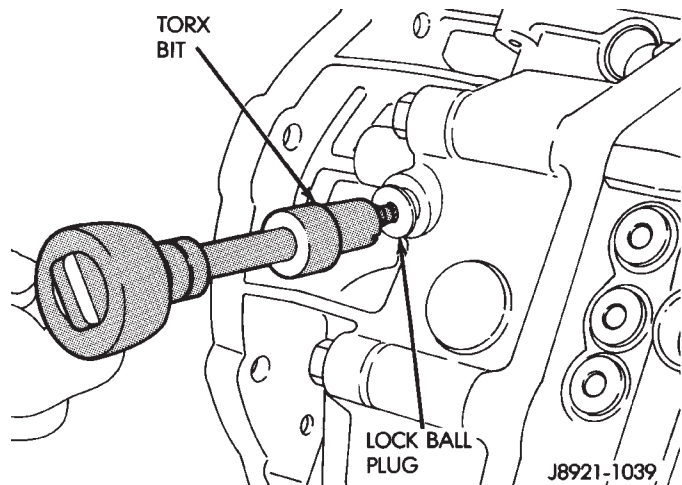


Fig. 9 Removing/Installing Lock Ball Plug

(8) Remove shift arm shaft with large magnet (Fig. 7).

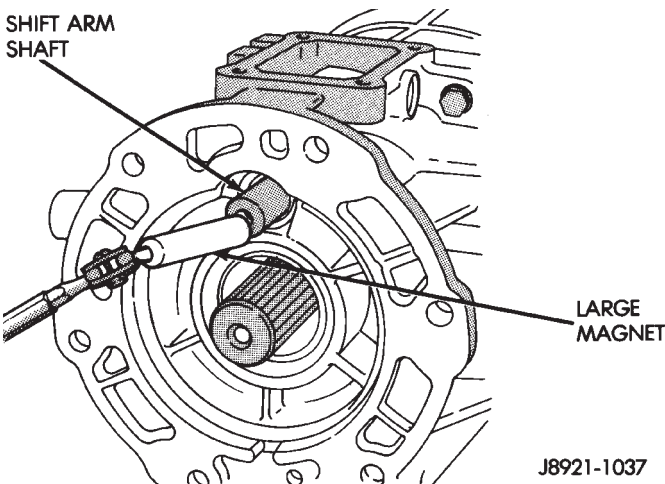


Fig. 7 Removing/Installing Shift Lever Shaft

(11) Remove lock ball spring with pencil magnet (Fig. 10).

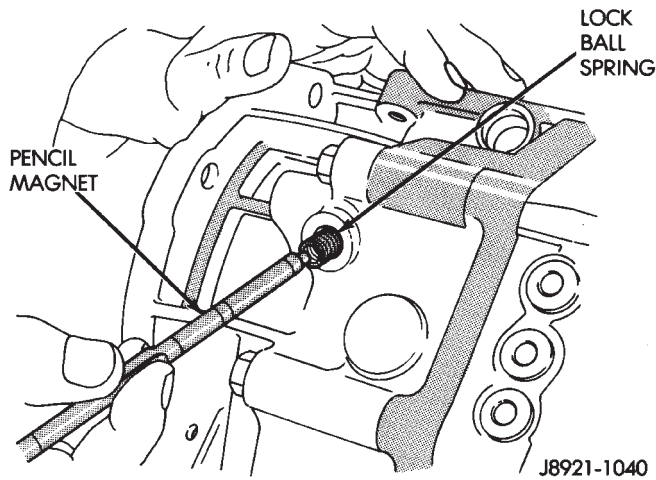


Fig. 10 Removing/Installing Lock Ball Spring

(12) Remove shift head lock ball with pencil magnet (Fig. 11).

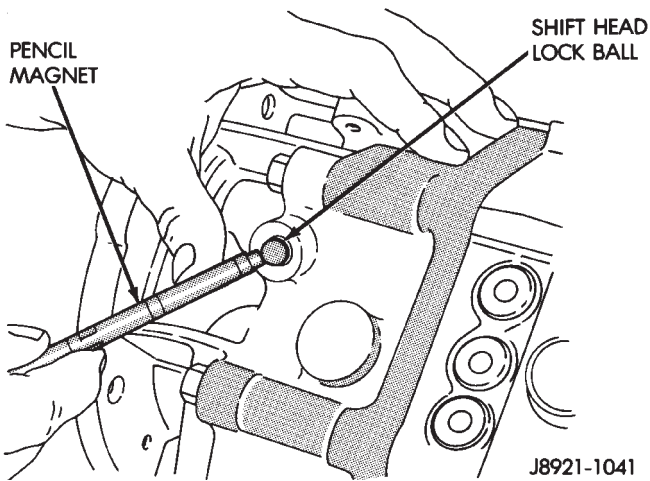
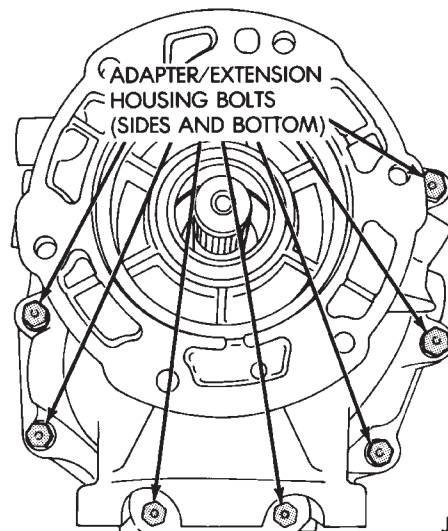
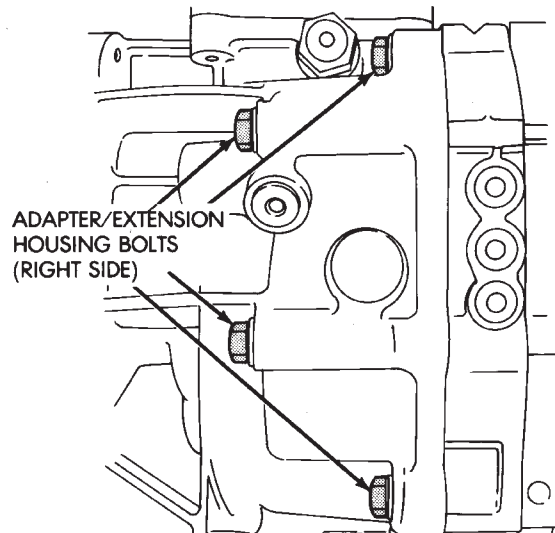
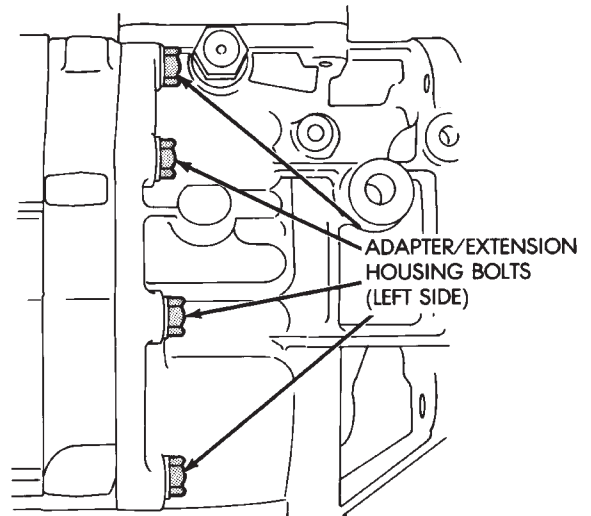


Fig. 11 Removing/Installing Shift Head Lock Ball

(13) Remove backup light switch from adapter/extension housing.

(14) On 2-wheel drive models, remove distance sensor, speedometer adapter and driven gear if not removed previously.

(15) Remove adapter/extension housing bolts (Fig. 12).



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Fig. 12 Adapter Housing Bolt Locations

(16) Loosen adapter/extension housing with rubber mallet (Fig. 13).

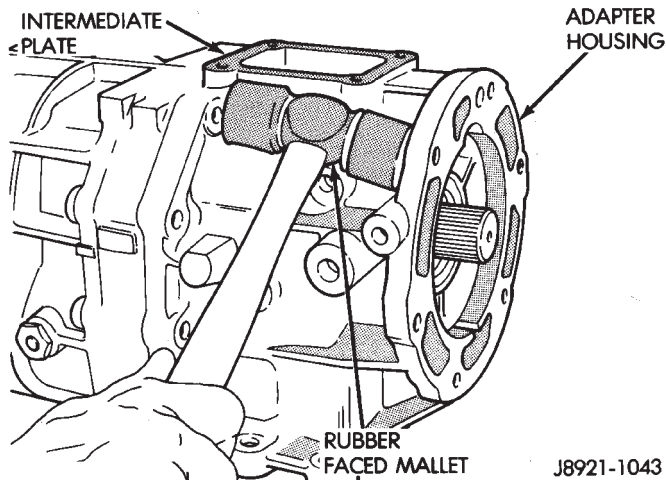


Fig. 13 Loosening Adapter Housing

(17) Remove housing after loosening it (Fig. 14)

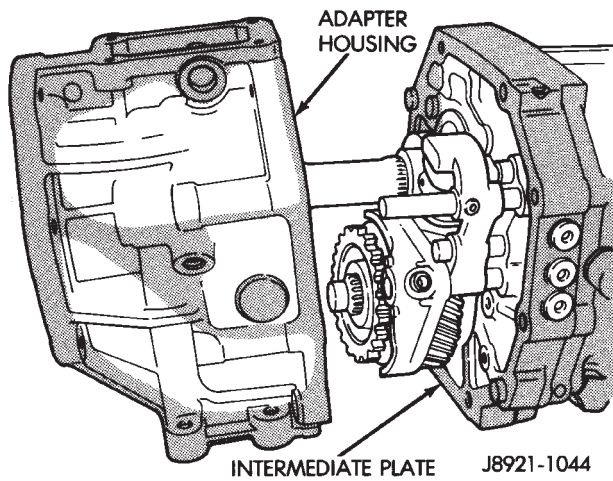


Fig. 14 Adapter Housing Removal

(18) Remove adapter housing oil seal with pry tool (Fig. 15).

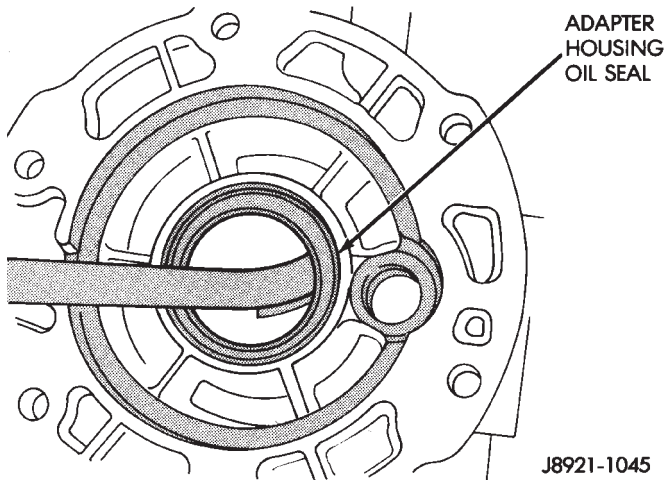


Fig. 15 Removing Adapter Housing Seal

GEAR CASE REMOVAL

(1) Remove bearing retainer bolts and remove retainer (Fig. 16).

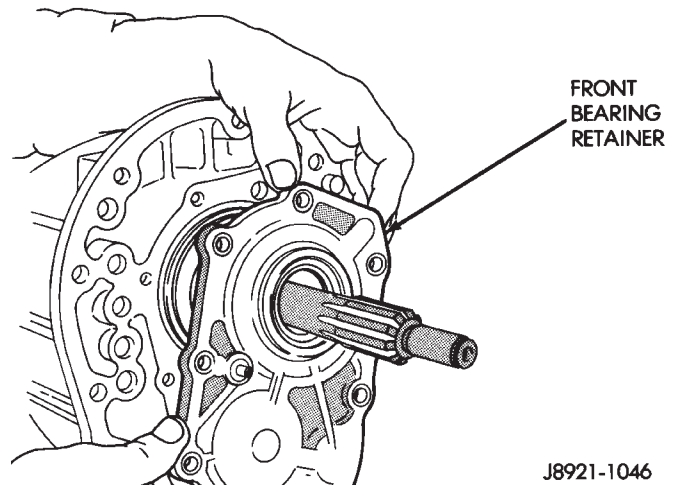


Fig. 16 Front Bearing Retainer Removal

(2) Remove retainer oil seal with pry tool (Fig. 17).

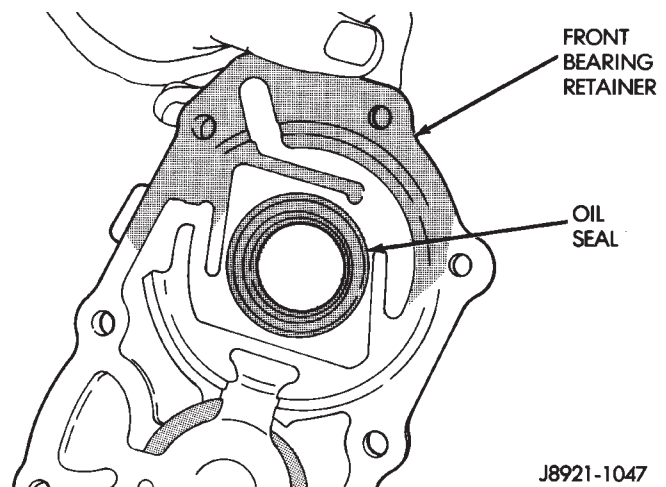


Fig. 17 Front Bearing Retainer Seal Location

(3) Remove input shaft bearing snap ring (Fig. 18).

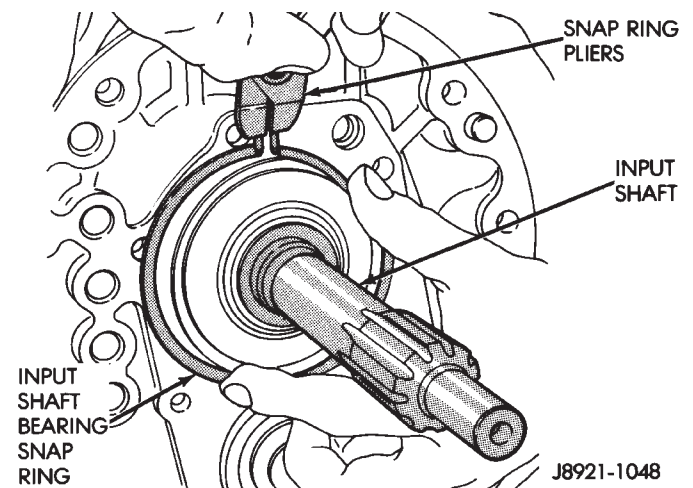


Fig. 18 Removing Input Shaft Bearing Snap Ring

(4) Remove cluster gear front bearing snap ring (Fig. 19).

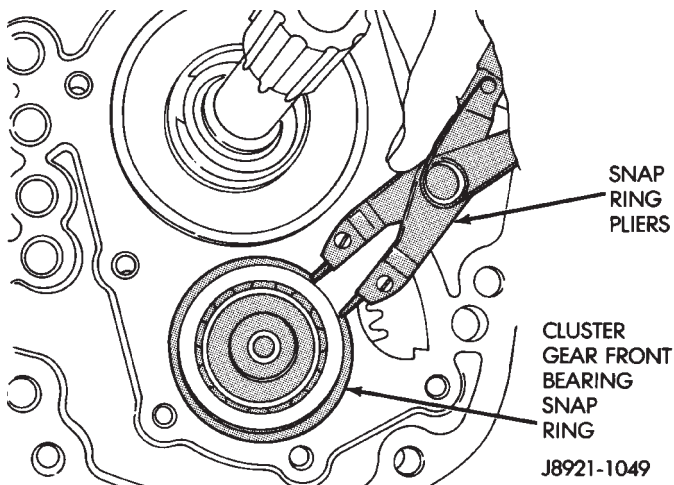


Fig. 19 Removing Cluster Gear Front Bearing Snap Ring

(5) Loosen gear case by tapping it away from intermediate plate with rubber mallet (Fig. 20).

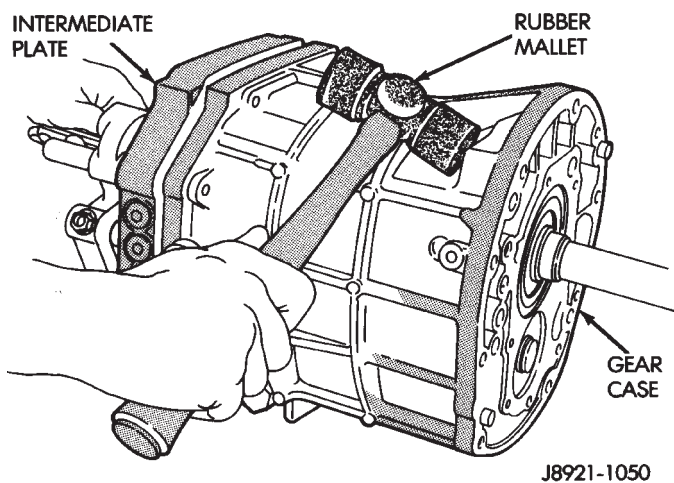


Fig. 20 Loosening Gear Case

(6) Remove gear case from geartrain and intermediate plate (Fig. 21).

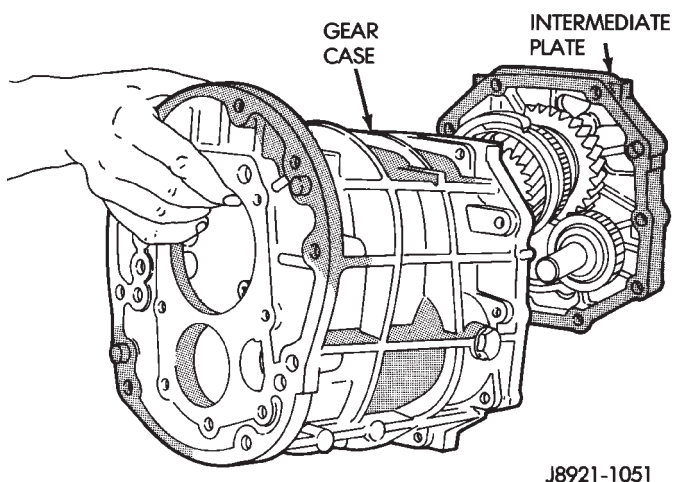


Fig. 21 Gear Case Removal

(7) On 2-wheel drive models, remove speedometer gear snap ring and remove speedometer gear and spacer from output shaft.

FIFTH GEAR AND SYNCHRO ASSEMBLY REMOVAL

(1) Remove three lock ball plugs from intermediate plate (Fig. 22).

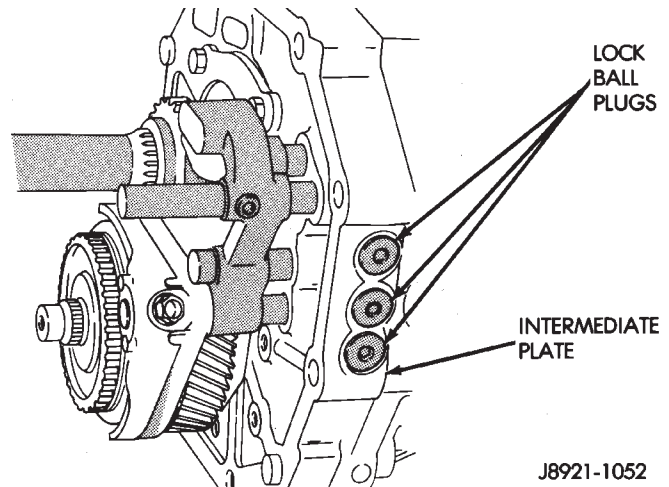


Fig. 22 Lock Ball Plug Locations

(2) Remove three lock ball springs and lock balls from intermediate plate with pencil magnet (Fig. 23).

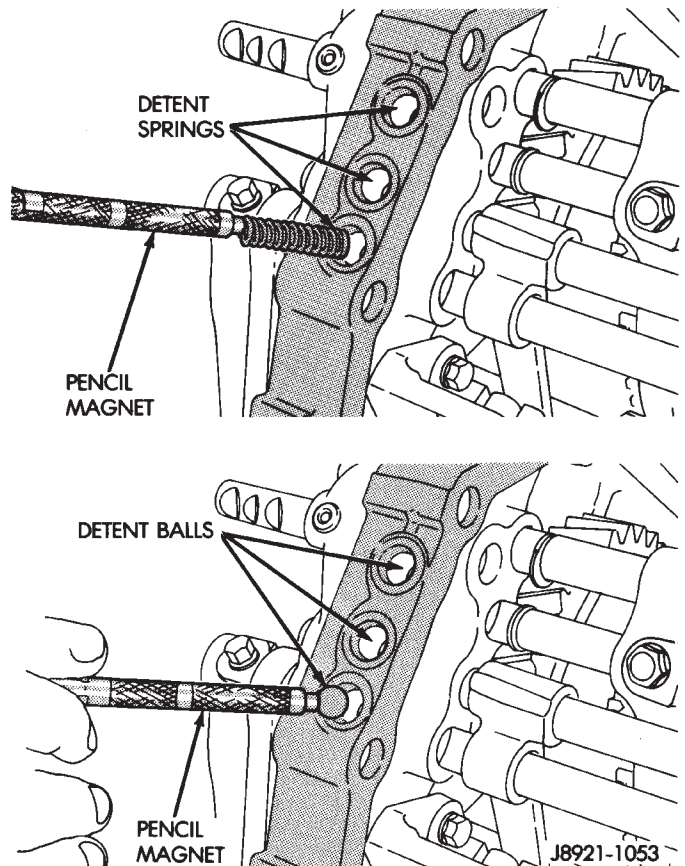
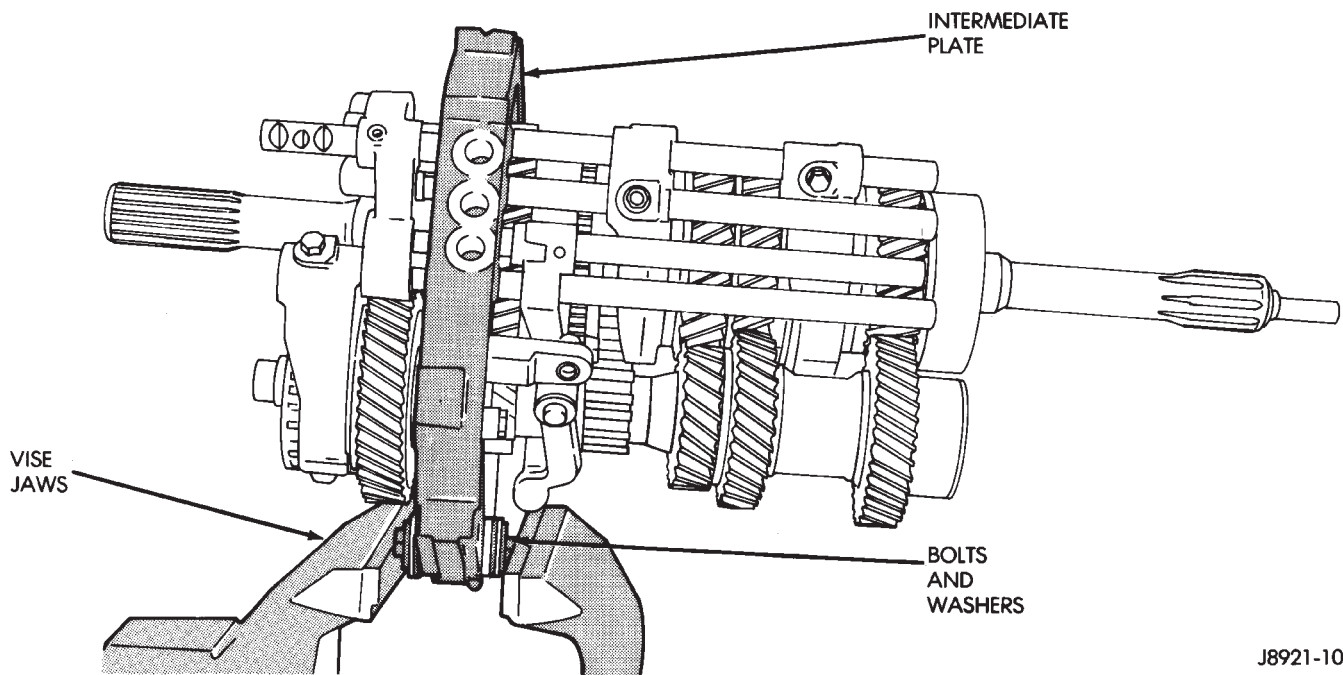


Fig. 23 Removing/Installing Lock Ball And Spring



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Fig. 24 Mounting Intermediate Plate And Geartrain In Vise

(3) Mount intermediate plate and geartrain assembly in vise as follows:

(a) Insert two spare bolts in one bottom bolt hole in intermediate plate. Insert bolts from opposite sides of plates (Fig. 24).

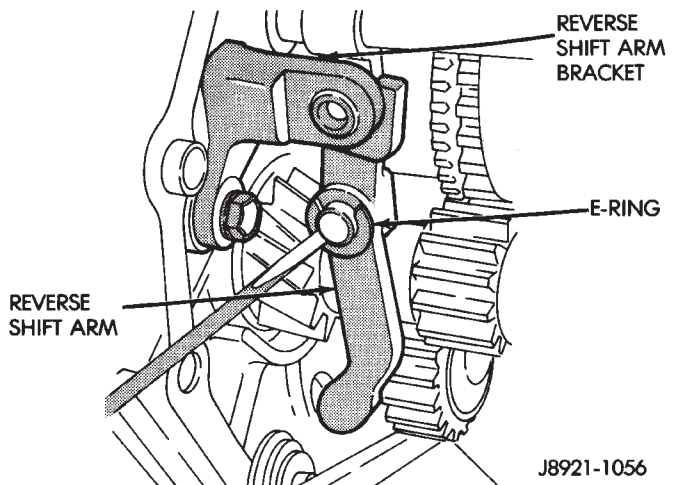
(b) Install enough flat washers under each bolt head to prevent bolts from touching (Fig. 24).

(c) Tape bolts and washers in place and mount intermediate plate in vise (Fig. 24).

(d) Clamp vise jaws securely against bolt heads (Fig. 24). **Do not clamp vise jaws on intermediate plate. Clamp only on bolt heads.**

(4) Remove fifth gear snap ring (Fig. 25). Retain snap ring for assembly reference. It is a select fit component.

(5) Remove E-ring that secures reverse shift arm to fork (Fig. 26).



J8921-1056

Fig. 26 Removing Reverse Shift Arm E-Ring

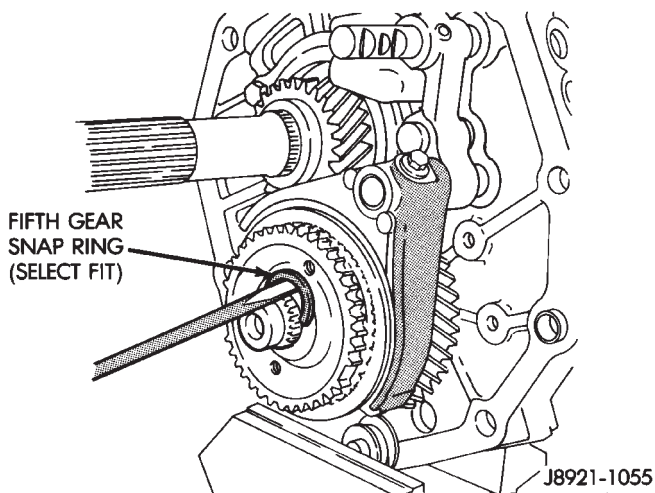


Fig. 25 Fifth Gear Snap Ring Removal

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

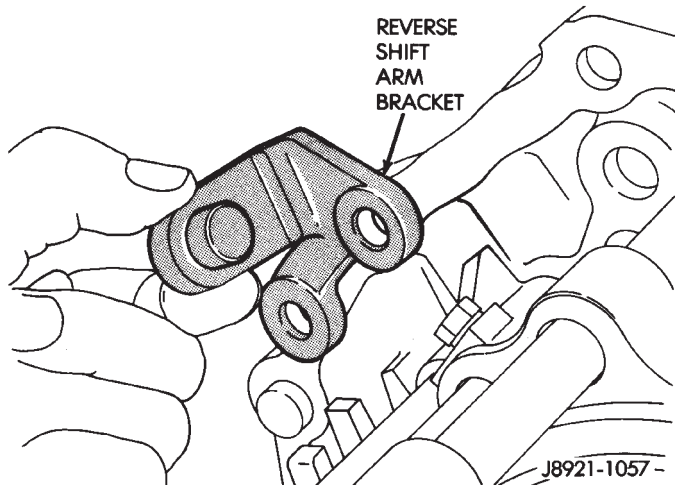


Fig. 27 Removing Reverse Shift Arm Bracket

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

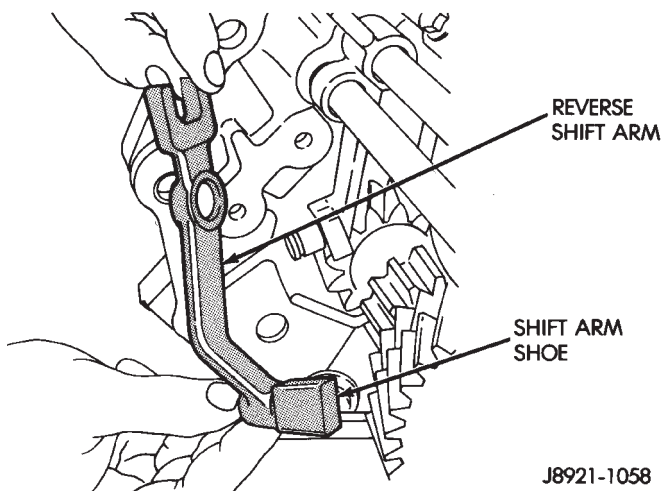


Fig. 28 Removing Reverse Shift Arm And Shoe

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

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

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

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

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

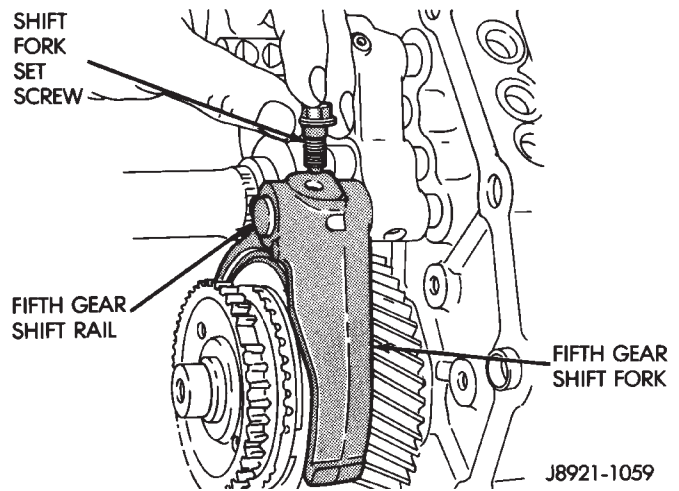


Fig. 29 Removing Fifth Gear Fork Set Screw

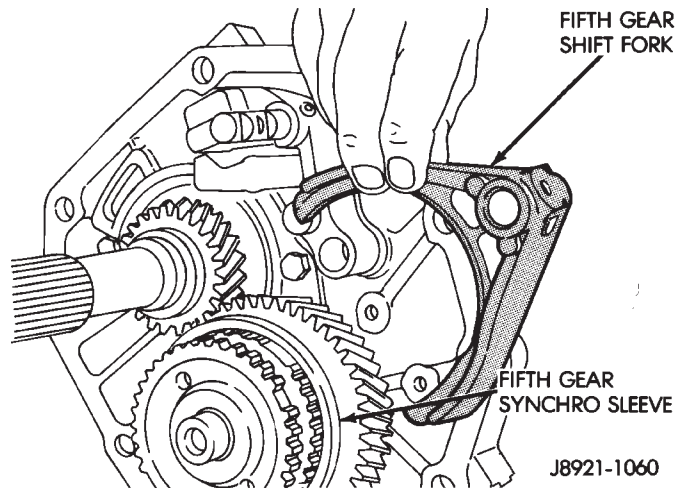


Fig. 30 Removing Fifth Gear Shift Fork

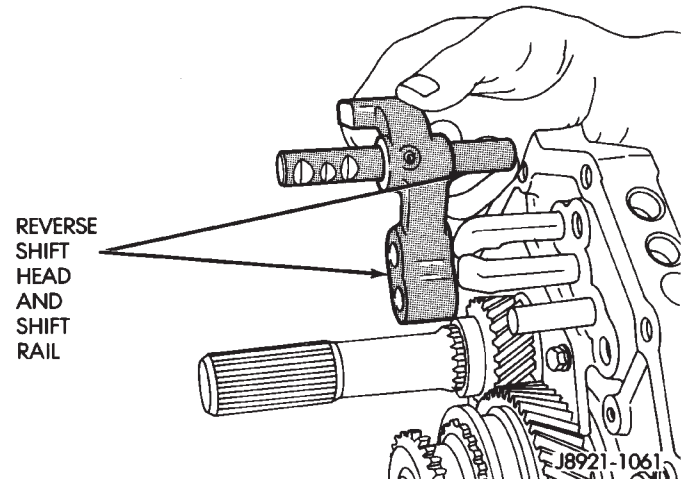


Fig. 31 Removing Reverse Shift Head And Rail

(13) Loosen fifth spline gear with standard two-jaw puller (Fig. 32). Position puller jaws **behind fifth counter gear** as shown.

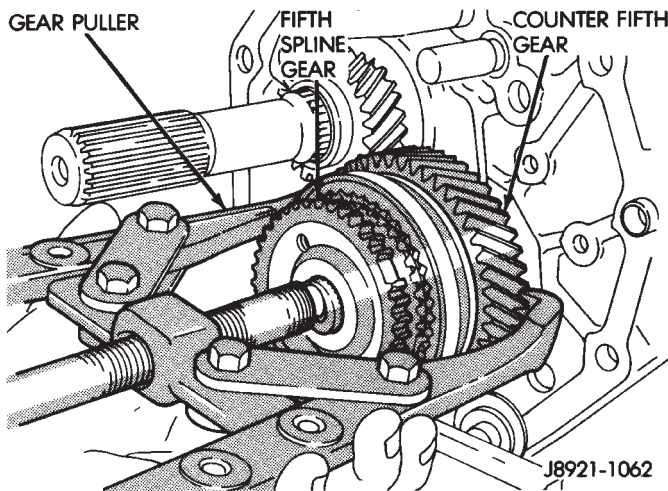


Fig. 32 Loosening Fifth Spline Gear

(14) Remove fifth spline gear (Fig. 33).

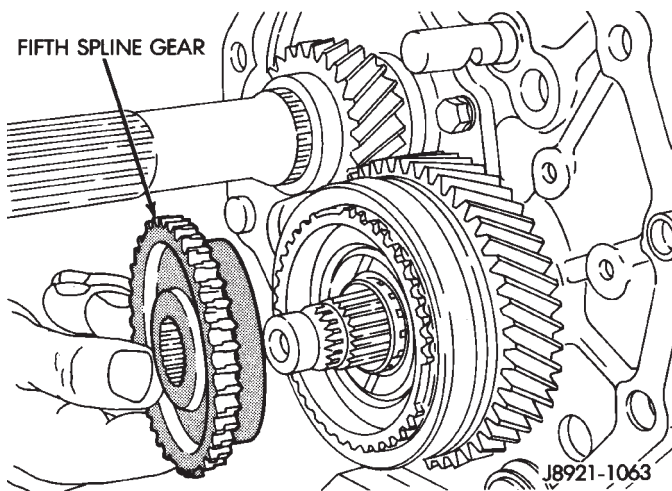


Fig. 33 Removing Fifth Spline Gear

(15) Remove fifth gear synchro ring (Fig. 34).

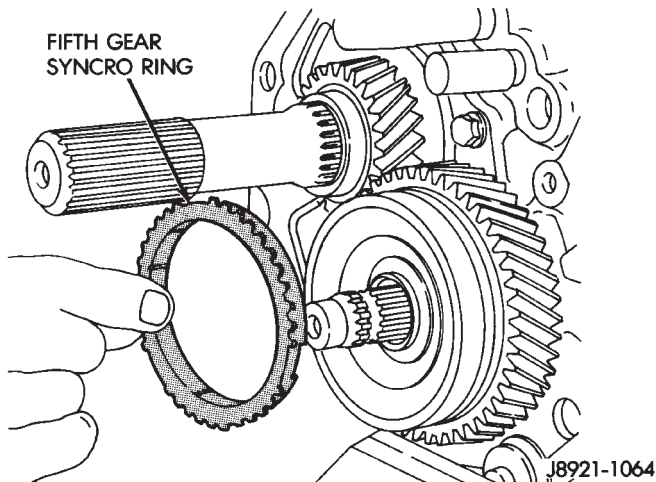


Fig. 34 Removing Fifth Gear Synchro Ring

(16) Remove fifth gear synchro and sleeve assembly (Fig. 35).

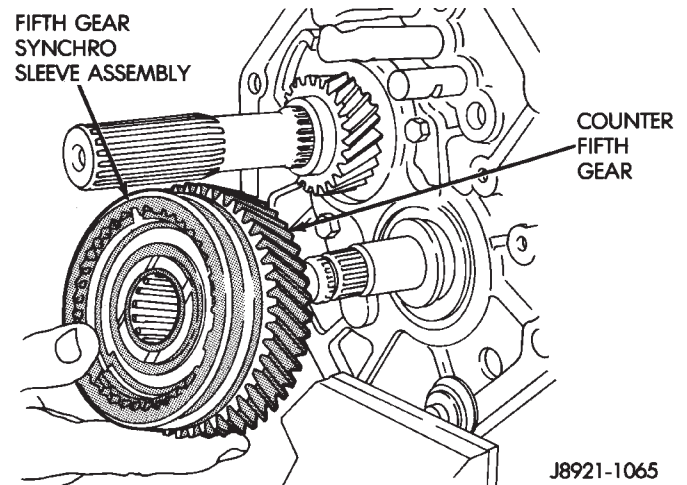


Fig. 35 Removing Counter Fifth Gear And Synchro Assembly

(17) Remove counter fifth gear thrust ring (Fig. 36).

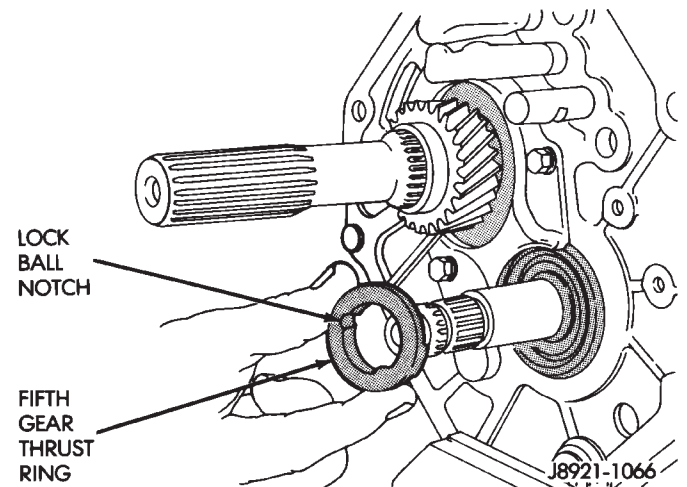


Fig. 36 Removing Fifth Gear Thrust Ring

(18) Remove thrust ring lock ball with pencil magnet (Fig. 37).

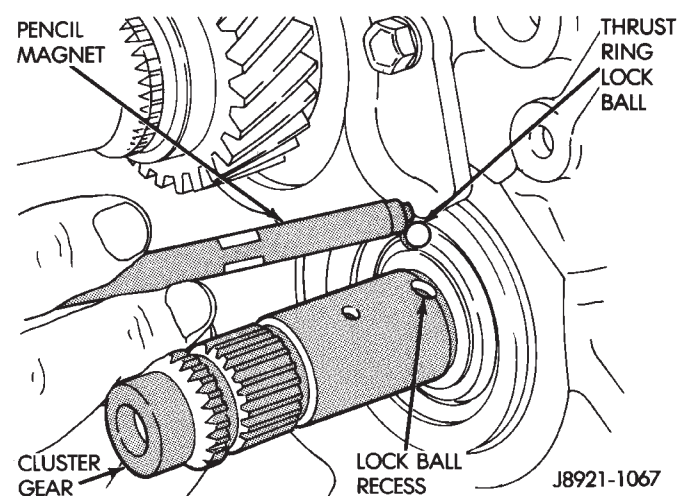


Fig. 37 Removing Thrust Ring Lock Ball

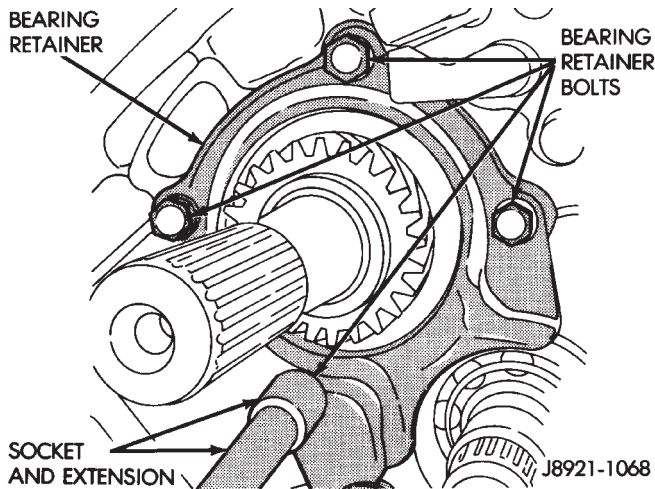


Fig. 38 Removing Output Shaft Rear Bearing Retainer Bolts

- (19) Remove bolts attaching output shaft rear bearing retainer to intermediate plate (Fig. 38).
- (20) Remove rear bearing retainer (Fig. 39).
- (21) Remove reverse gear and shaft (Fig. 40).

SHIFT RAIL AND FORK REMOVAL

There are a total of five shift rails in the AX 15 transmission. The 1-2, 3-4, fifth gear and front reverse shift rails are shown in Figure 41.

Two shift rails are used for reverse gear range. The front reverse rail is at the forward side of the intermediate plate (Fig. 41). The short rear reverse rail and reverse shift head are at the rear side of the intermediate plate.

It is not necessary to remove the shift rails if they do not require service during overhaul.

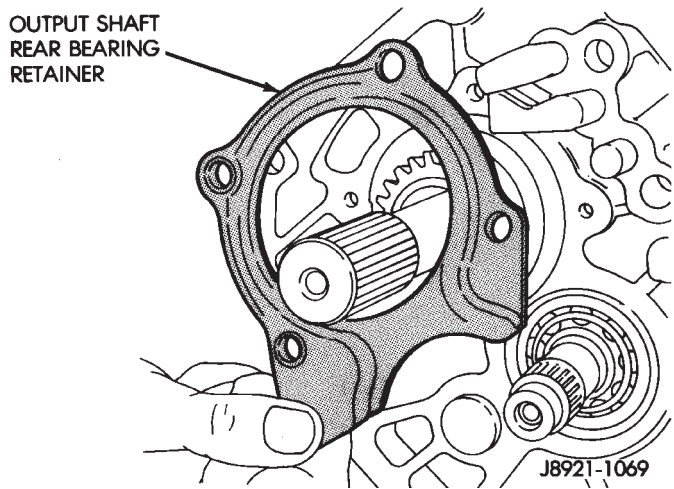


Fig. 39 Removing Output Shaft Rear Bearing Retainer

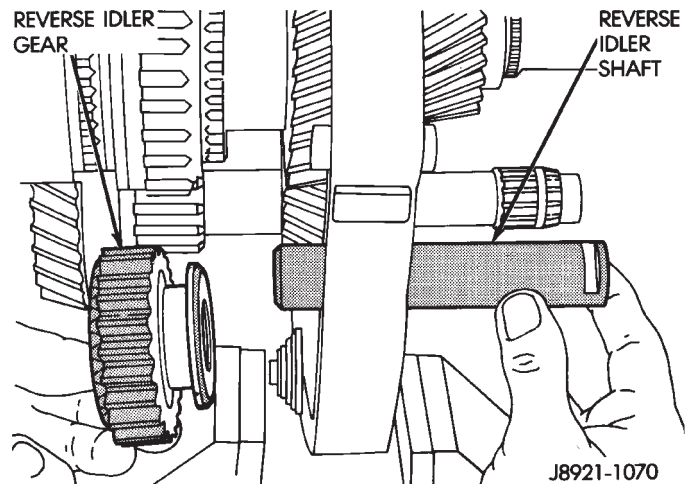


Fig. 40 Removing Reverse Idler Gear And Shaft

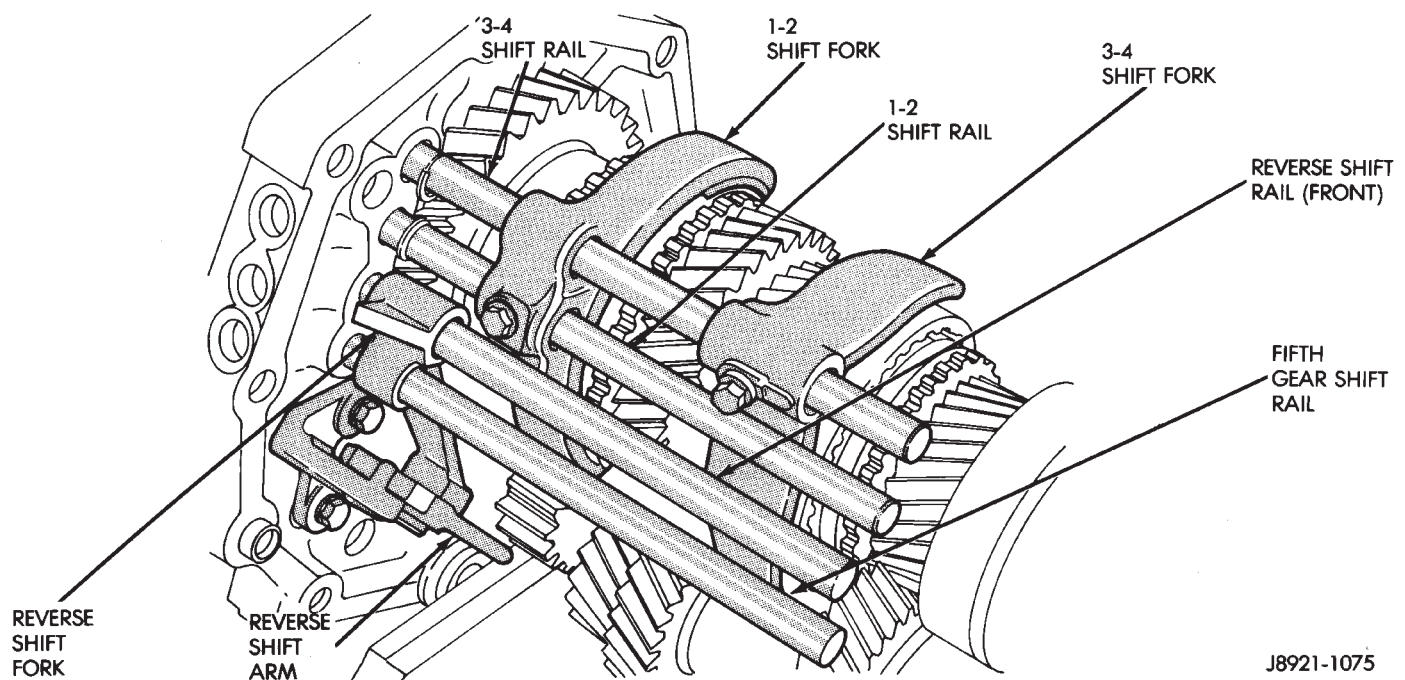


Fig. 41 Shift Rail Identification

Only the shift forks need be removed for access to the transmission shafts and gears.

(1) Remove fifth gear shift rail (Fig. 41). Catch lock ball in your hand as rail comes out of intermediate plate.

(2) Remove 1-2 and 3-4 shift rail C-rings with two screwdrivers of equal size and length (Fig. 42).

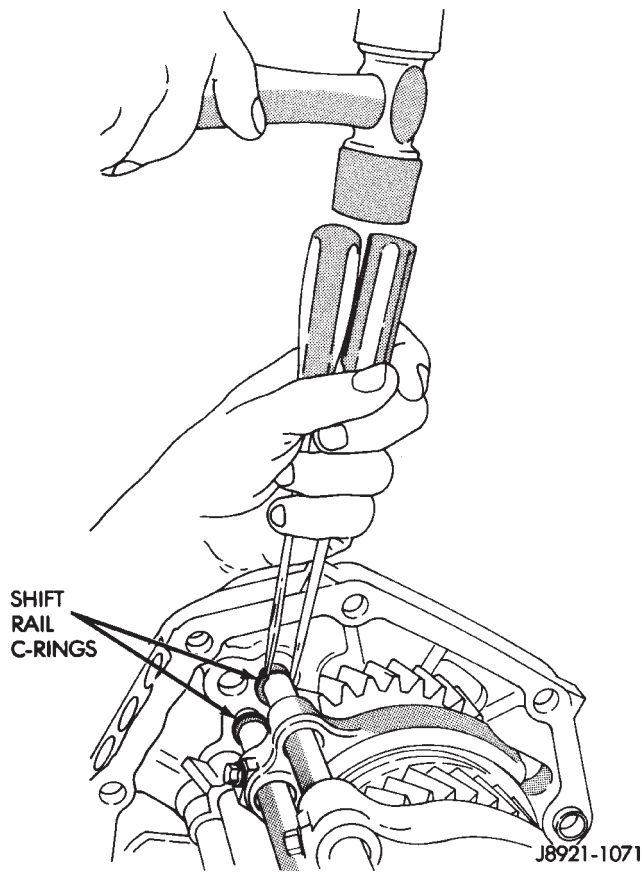


Fig. 42 Removing Shift Rail C-Rings

(3) Remove shift fork set screws (Fig. 43).

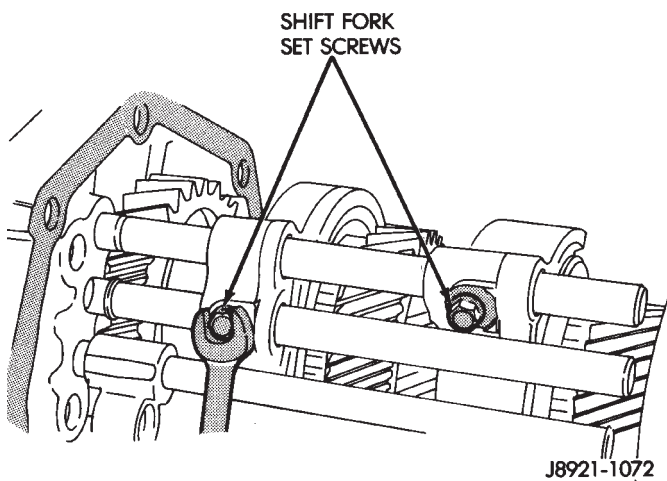


Fig. 43 Removing Shift Fork Set Screws

(4) Remove 3-4 shift rail from shift fork and intermediate plate (Fig. 44).

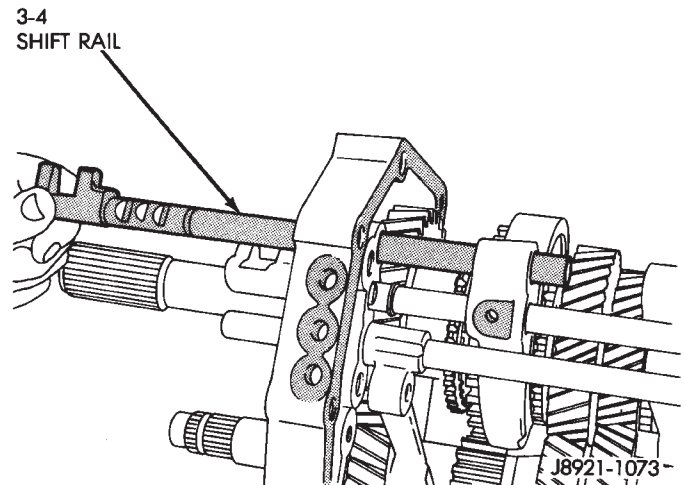


Fig. 44 Removing 3-4 Shift Rail

(5) Remove 3-4 shift rail interlock plug from intermediate plate with magnet (Fig. 45).

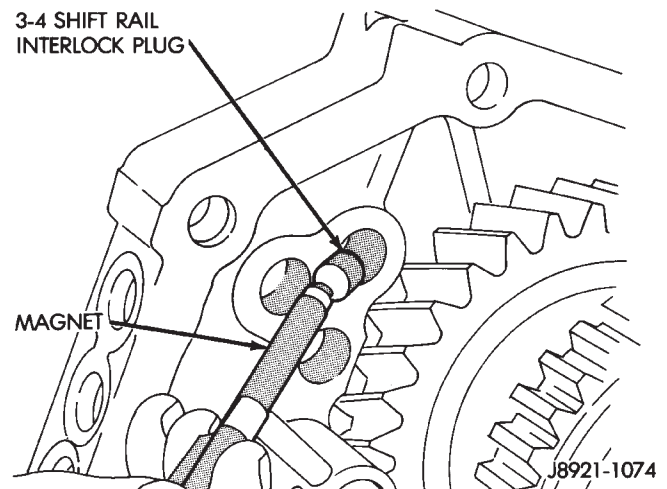


Fig. 45 Removing 3-4 Shift Rail Interlock Plug

(6) Remove 1-2 shift rail from shift fork and intermediate plate (Fig. 46).

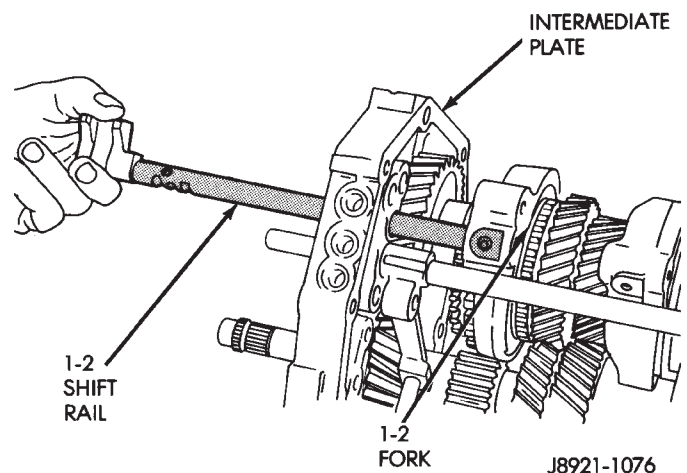


Fig. 46 Removing 1-2 Shift Rail

(7) Remove 1-2 shift rail interlock pin from shift rail (Fig. 47).

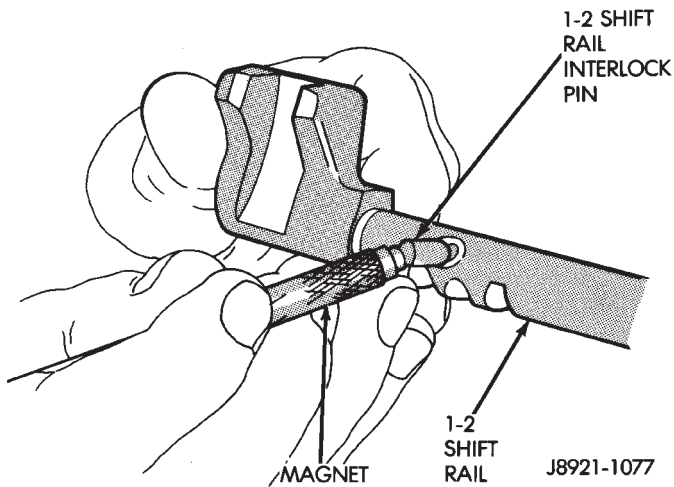


Fig. 47 Removing 1-2 Shift Rail Interlock Pin

(8) Remove 1-2 shift rail interlock plug from intermediate plate (Fig. 48).

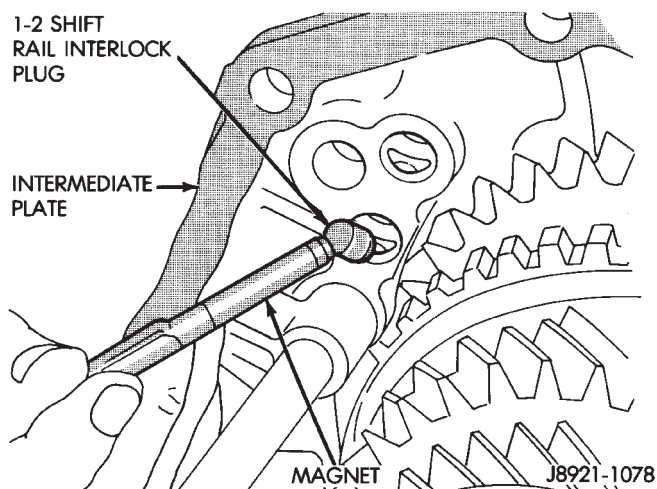


Fig. 48 Removing 1-2 Shift Rail Interlock Plug

(9) Lift reverse shift fork upward and remove fifth gear shift rail lock ball (Fig. 49).

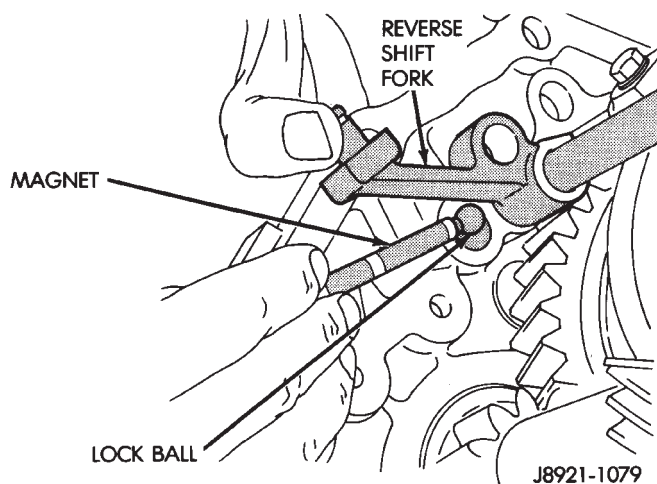


Fig. 49 Removing Fifth Gear Shift Rail Lock Ball

(10) Remove 3-4 shift fork (Fig. 50).

(11) Remove 1-2 shift fork (Fig. 50).

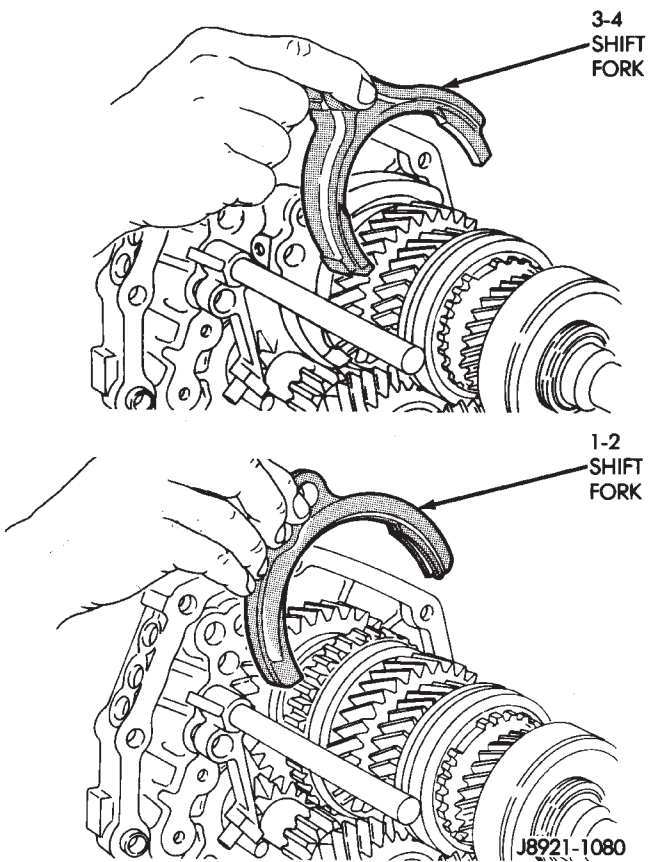


Fig. 50 Shift Fork Removal

(12) Remove reverse shift rail C-ring with two equal length and size screwdrivers (Fig. 51).

(13) Remove reverse shift rail and fork (Fig. 52).

(14) Remove interlock pin from reverse shift rail (Fig. 53).

(15) Position shift rails, shift forks, lock balls, interlock plugs and interlock pins on the workbench in order of removal. This will help in identifying components during inspection and assembly.

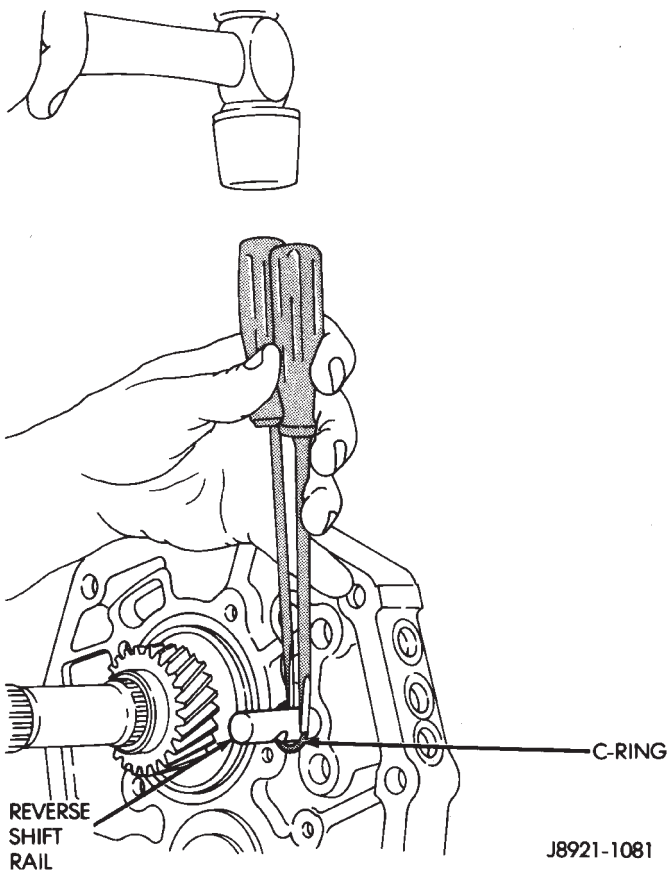


Fig. 51 Removing Reverse Shift Rail C-Ring

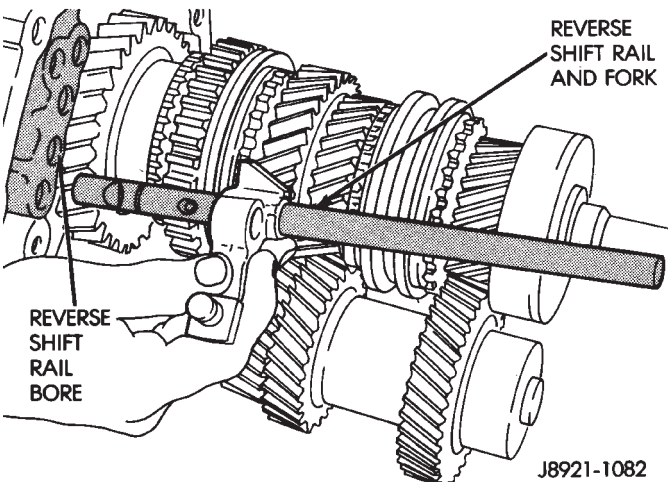


Fig. 52 Removing Reverse Shift Rail And Fork

OUTPUT SHAFT AND CLUSTER GEAR REMOVAL

- (1) Remove output shaft rear bearing snap ring (Fig. 54).
- (2) Remove cluster gear rear bearing snap ring (Fig. 54).
- (3) Tap end of output shaft with mallet to unseat and start rear bearing out of intermediate plate (Fig. 55).

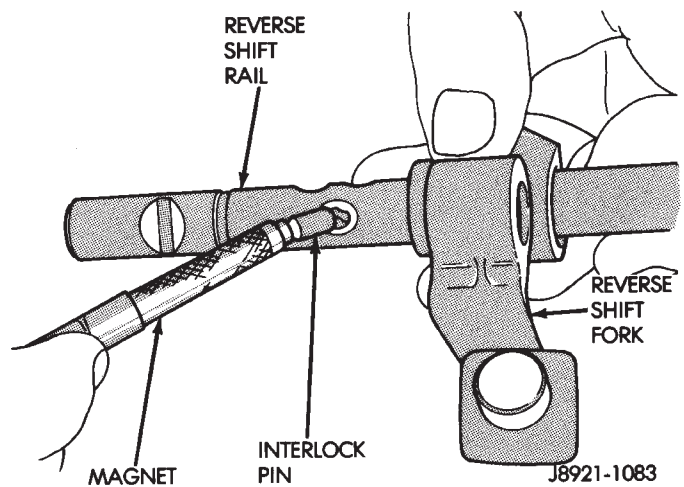


Fig. 53 Removing Reverse Shift Rail Interlock Pin

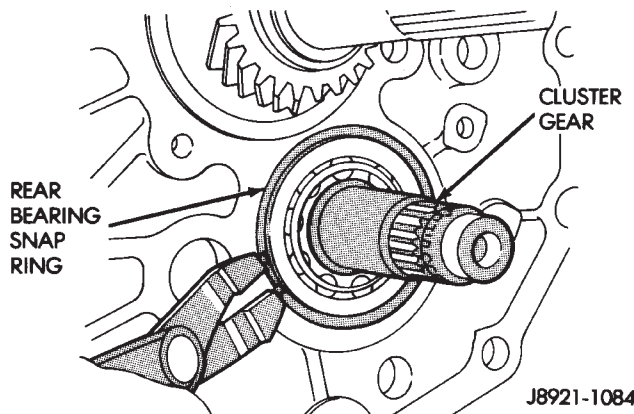
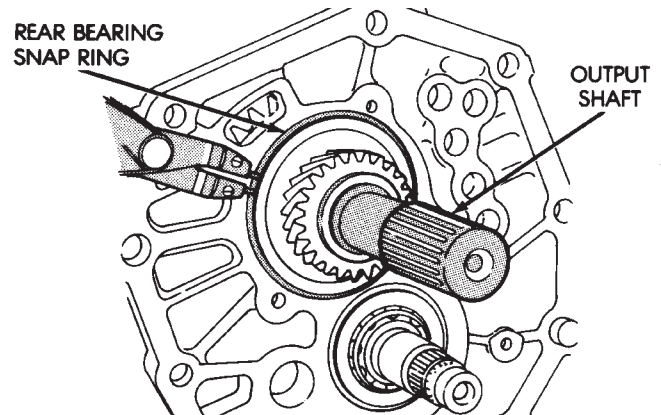


Fig. 54 Removing Bearing Snap Rings

- (4) Remove output shaft by rocking it lightly until rear bearing comes out of intermediate plate (Fig. 56).
- (5) Remove cluster gear by pulling it straight out of rear bearing (Fig. 57).
- (6) Remove cluster gear rear bearing from intermediate plate (Fig. 58).
- (7) Remove input shaft from output shaft (Fig. 59).
- (8) Remove output shaft pilot bearing from input shaft (Fig. 60).
- (9) Remove synchro ring from input shaft (Fig. 61).

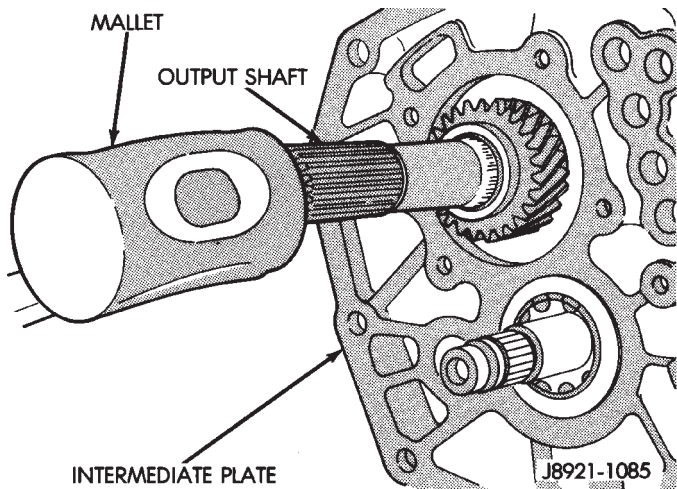


Fig. 55 Unseating Output Shaft Rear Bearing

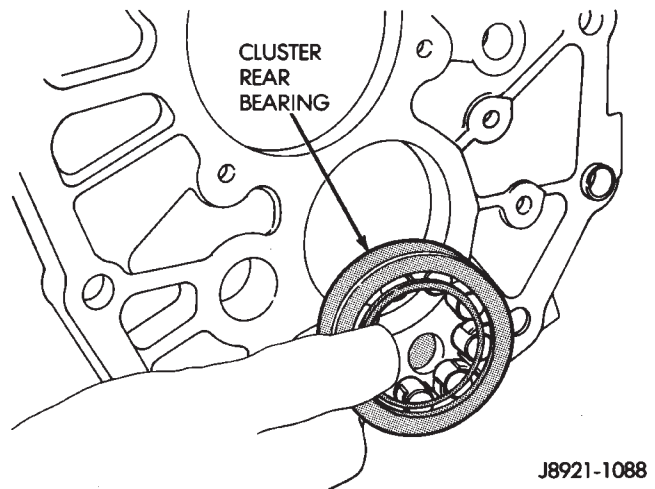


Fig. 58 Removing Cluster Gear Rear Bearing

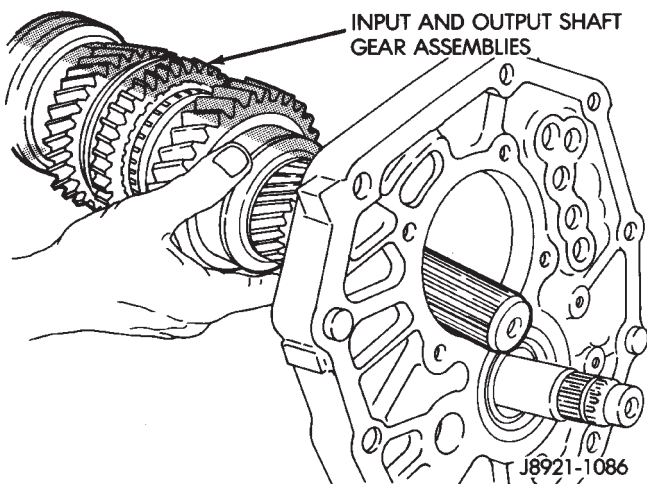


Fig. 56 Input/Output Shaft Assembly Removal

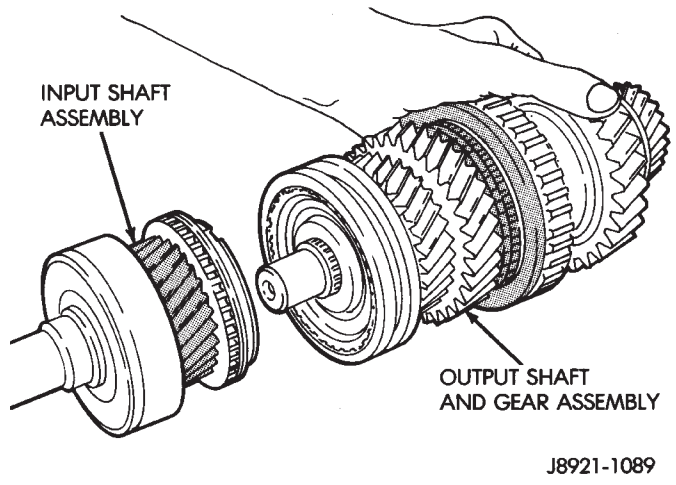


Fig. 59 Input Shaft Removal

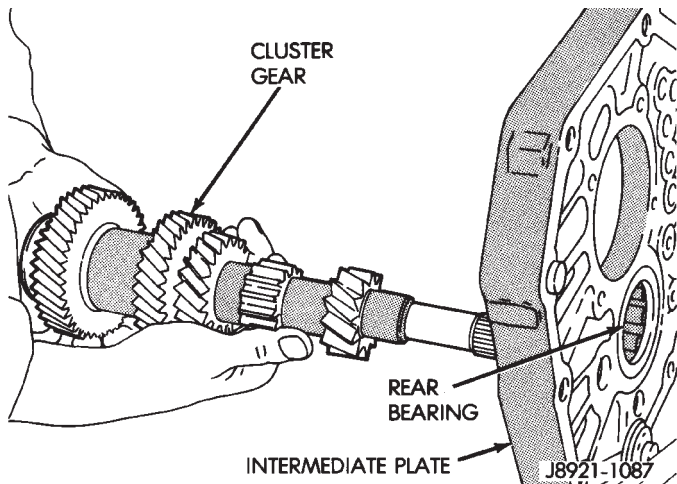


Fig. 57 Cluster Gear Removal

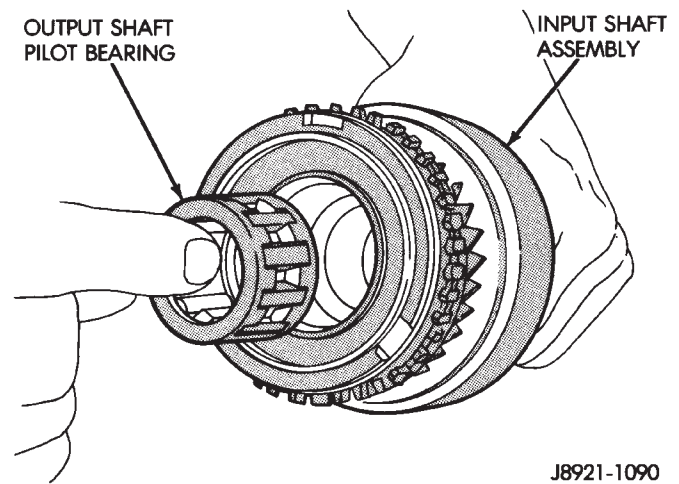


Fig. 60 Removing Input Shaft Pilot Bearing

(10) Remove bearing snap ring and press bearing off input shaft (Fig. 61).

OUTPUT SHAFT DISASSEMBLY

(1) Measure thrust clearance of output shaft first, second and third gears with feeler gauge (Fig. 62).

- First gear clearance should be 0.10 - 0.40 mm (0.003 - 0.0197 in.)
 - Second—third gear clearance should be 0.10 - 0.30 mm (0.003 - 0.0118 in.)
- (2) If first gear thrust clearance is incorrect, replace gear and thrust washer. **If second or third gear clearance is incorrect, either gear and bearing, or out-**

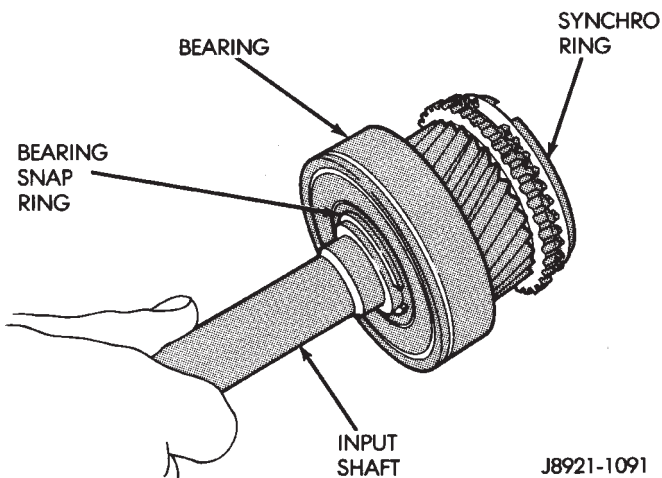


Fig. 61 Input Shaft Components

put shaft flange is worn. Refer to output shaft inspection in Cleaning and Inspection section.

- (3) Press fifth gear and rear bearing off rear of output shaft.
- (4) Remove thrust washer, pin, and first gear and bearing (Fig. 62).
- (5) Remove first/reverse hub snap ring (Fig. 63).
- (6) Remove synchro ring.
- (7) Press reverse gear and first/reverse hub off shaft as assembly.

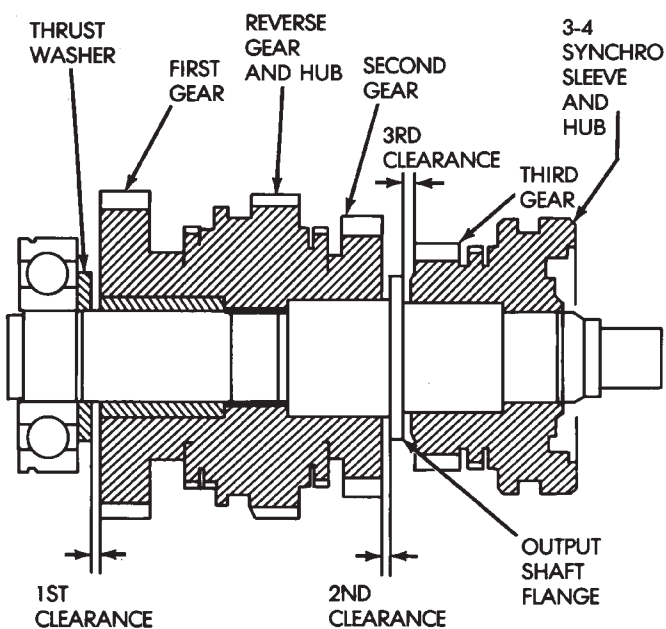


Fig. 62 Checking Output Shaft Gear Thrust Clearance

- (8) Remove remaining synchro ring and second gear and bearing (Fig. 63).
- (9) Remove snap ring at front of output shaft (Fig. 63).

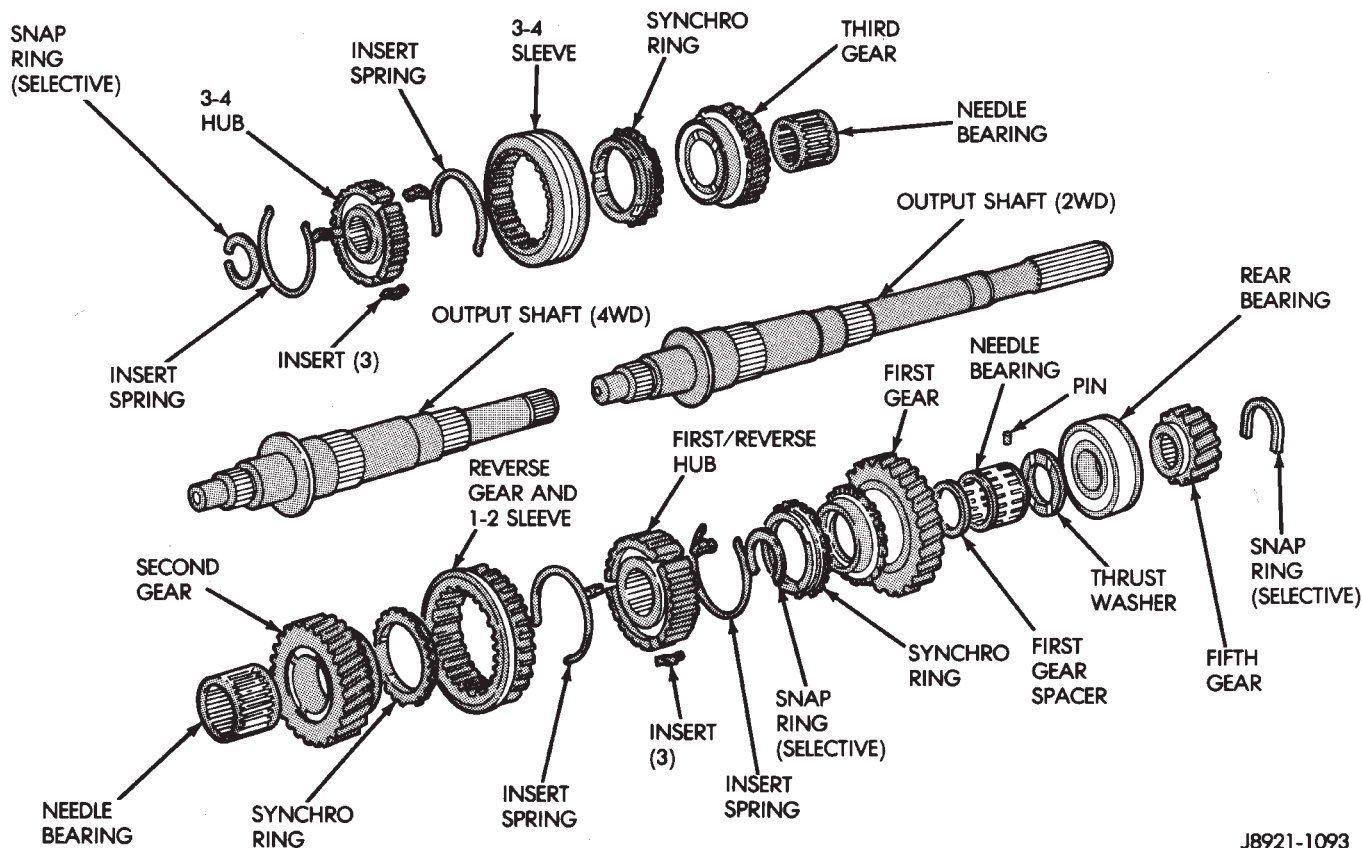


Fig. 63 Output Shaft And Gears

(10) Press 3-4 hub and sleeve off output shaft as assembly (Fig. 63).

(11) Remove synchro ring.

(12) Remove third gear and needle bearing (Fig. 63).

TRANSMISSION CLEANING AND INSPECTION

Clean the transmission components in solvent. Dry the cases, gears, shift mechanism and shafts with compressed air. **Dry the bearings with clean, dry shop towels only. Never use compressed air on the bearings. This could damage the bearing rollers.**

Replace components that are obviously worn, cracked, chipped or damaged in any way.

Inspect the transmission case. Replace the case if cracked or porous or if any of the bearing and gear bores are damaged.

Output Shaft Inspection

Measure thickness of the output shaft flange with a micrometer (Fig. 64). Minimum allowable flange thickness is 4.70 mm (0.185 in).

If shaft flange thickness is OK but previously measured second/third gear thrust clearance was incorrect (Fig. 62), replace the necessary gear and needle bearing as an assembly.

Check diameter of the first, second and third gear bearing surfaces of the output shaft (Fig. 64). Minimum allowable diameters are:

- 38.86 mm (1.529 in.) for first gear surface
- 46.86 mm (1.844 in.) for second gear surface
- 37.86 mm (1.490 in.) for third gear surface

Check output shaft runout with V-blocks and a dial indicator (Fig. 64). Maximum allowable runout is 0.06 mm (0.0024 in.).

Replace the output shaft if any surface measured fails to meet stated tolerance.

Cluster Gear Inspection

Inspect the cluster gear teeth. Replace the gear if any teeth are worn or damaged or if the bearing surfaces are damaged.

Check diameter of the cluster gear journal with a micrometer (Fig. 65). Minimum allowable diameter is 27.860 mm (1.096 in.).

Check condition of the cluster gear front bearing. Replace the bearing if worn, noisy, or damaged.

GEAR AND SYNCHRO INSPECTION

Install the synchro rings on their respective gears. Rotate each ring on the gear and note synchro action. Replace any synchro ring that exhibits a lack of braking action or binds on the gear. Also replace any ring that is worn or has chipped or broken teeth.

Measure end clearance between the synchro ring and the gear with a feeler gauge (Fig. 66). Clearance should be 0.06 mm - 1.6 mm (0.024 - 0.063 in.).

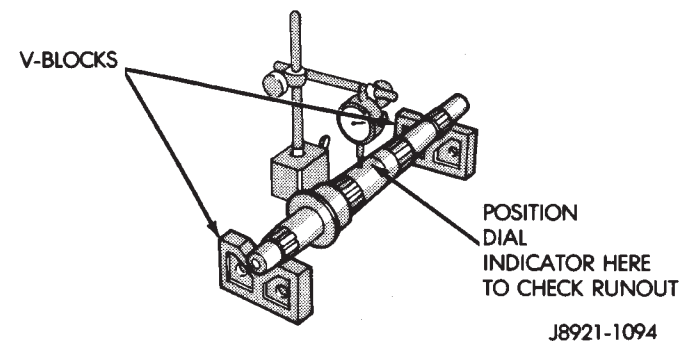
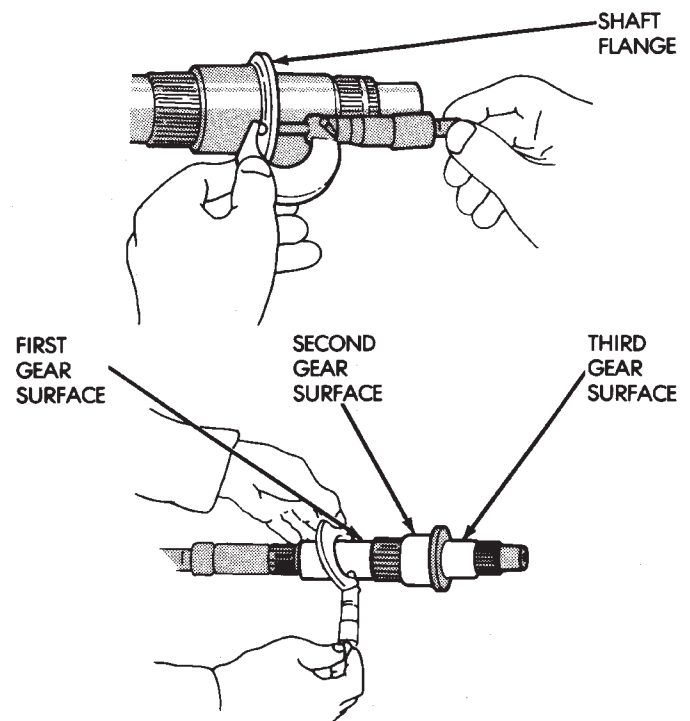


Fig. 64 Checking Output Shaft Tolerances

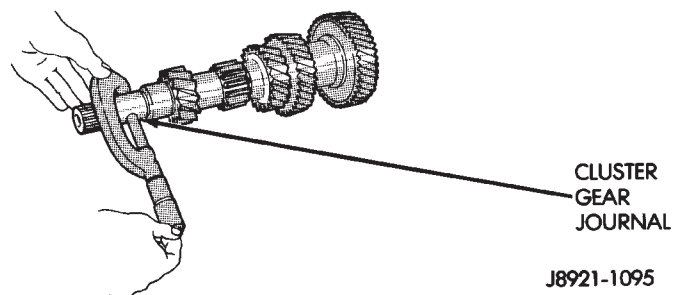


Fig. 65 Checking Cluster Gear Journal Diameter

Install the needle bearings in the first, second and third gears. Then install the gears on the output shaft and check shaft-to-gear clearance with a dial indicator (Fig. 67).

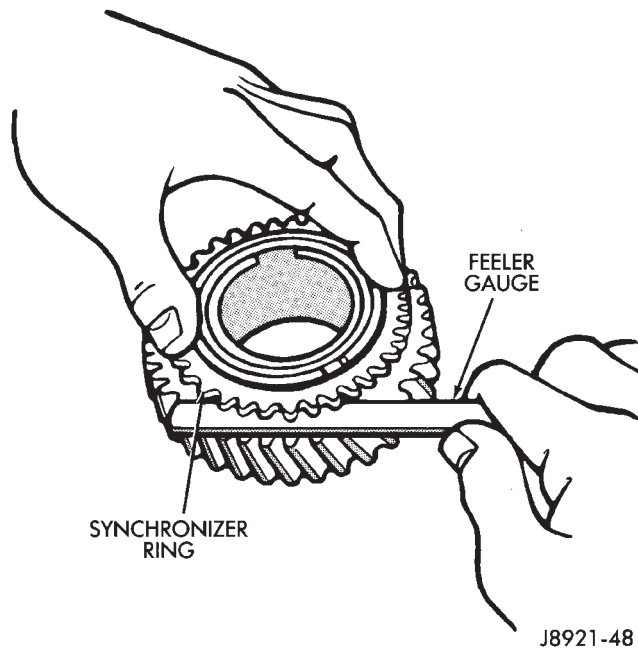


Fig. 66 Checking Synchro Ring End Clearance

Maximum allowable clearance is 0.16 mm (0.0063 in.). If any gear exhibits excessive clearance, replace the gear and needle bearing.

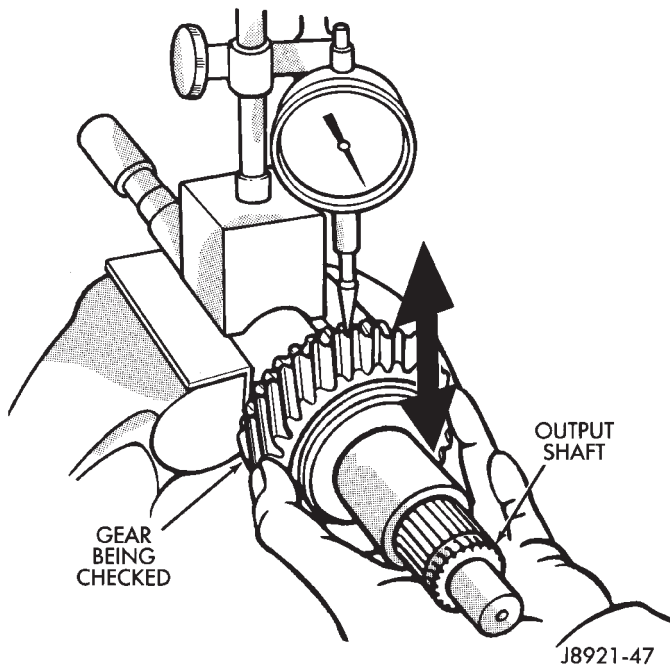


Fig. 67 Checking Gear-To-Shaft Clearance

Check clearance between the shift forks and synchro sleeves with a feeler gauge (Fig. 68). Clearance should not exceed 1.0 mm (0.039 in.). Replace the synchro sleeve (and matching hub) if clearance exceeds the stated limit.

Check condition of the reverse idler gear bushing (Fig. 69). Replace the gear if the bushing is damaged or worn.

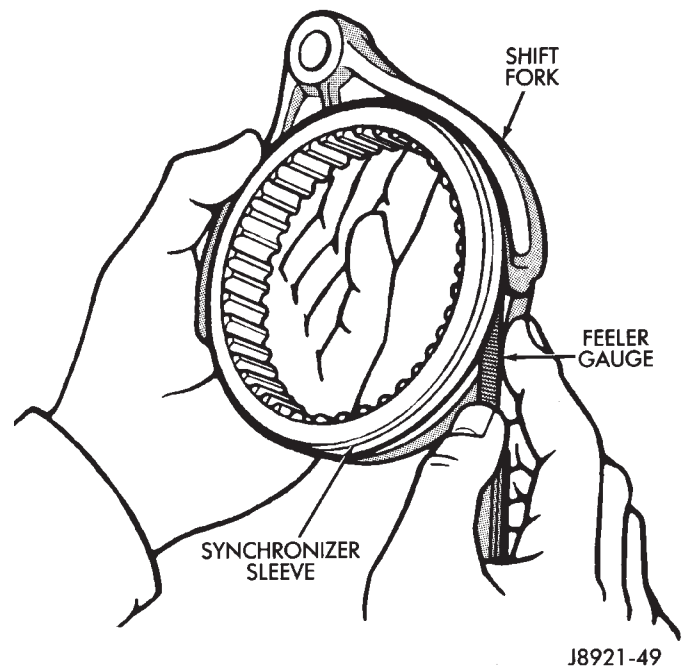


Fig. 68 Checking Shift Fork-To-Sleeve Clearance

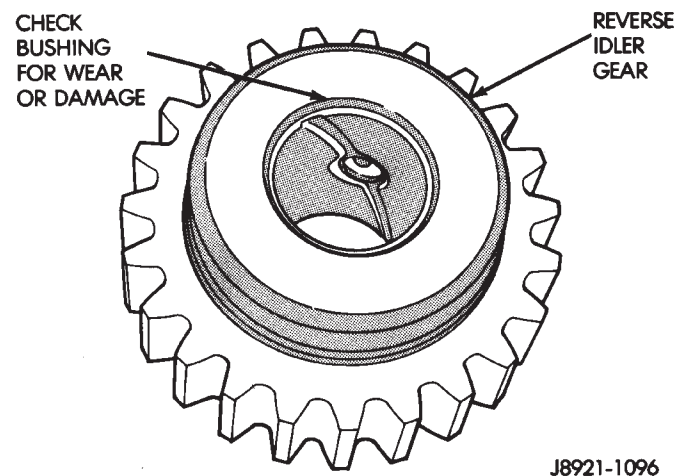


Fig. 69 Reverse Idler Gear Bushing

Gear Case, Housing And Intermediate Plate

Clean the case, housing and plate with solvent and dry with compressed air. Replace any component that is cracked, warped or damaged in any way.

Inspect the threads in the case, housing and plate. Minor thread damage can be repaired with steel thread inserts if necessary. However, do not attempt to repair if the cracks are evident around any threaded hole.

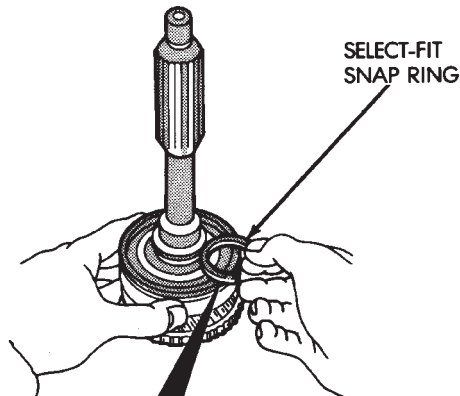
Inspect the reverse pin in the adapter/extension housing. Replace the pin if worn or damaged. Refer to the replacement procedure in the Transmission Assembly section.

TRANSMISSION ASSEMBLY AND ADJUSTMENT

Lubricate the transmission components with Mopar 75W-90 gear lubricant during assembly. Use petroleum jelly to lubricate seal lips and/or hold parts in place during installation.

FRONT BEARING, SEAL AND PIN INSTALLATION

(1) Press front bearing on input shaft. Then secure bearing with thickest snap ring that will fit in shaft groove (Fig. 70).

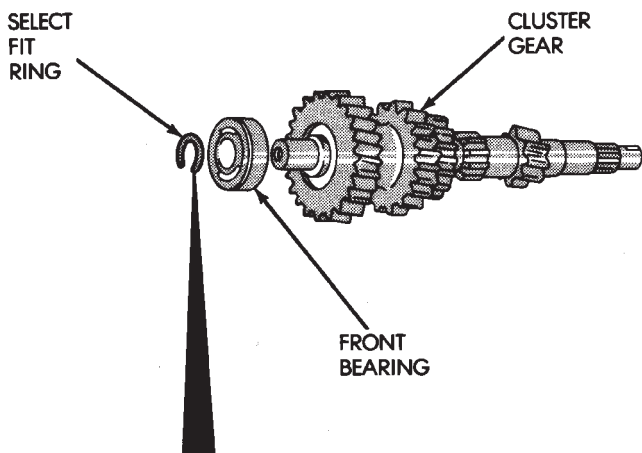


I.D. MARK	SNAP RING THICKNESS	MM (IN.)
A	2.10 - 2.15	(0.0827 - 0.0846)
B	2.15 - 2.20	(0.0846 - 0.0866)
C	2.20 - 2.25	(0.0866 - 0.0886)
D	2.25 - 2.30	(0.0886 - 0.0906)
E	2.30 - 2.35	(0.0906 - 0.0925)
F	2.35 - 2.40	(0.0925 - 0.0945)
G	2.40 - 2.45	(0.0945 - 0.0965)

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Fig. 70 Selecting Input Shaft Front Bearing Snap Ring

(2) Press front bearing on cluster gear. Then secure bearing with thickest snap ring that will fit in shaft groove on gear (Fig. 71).

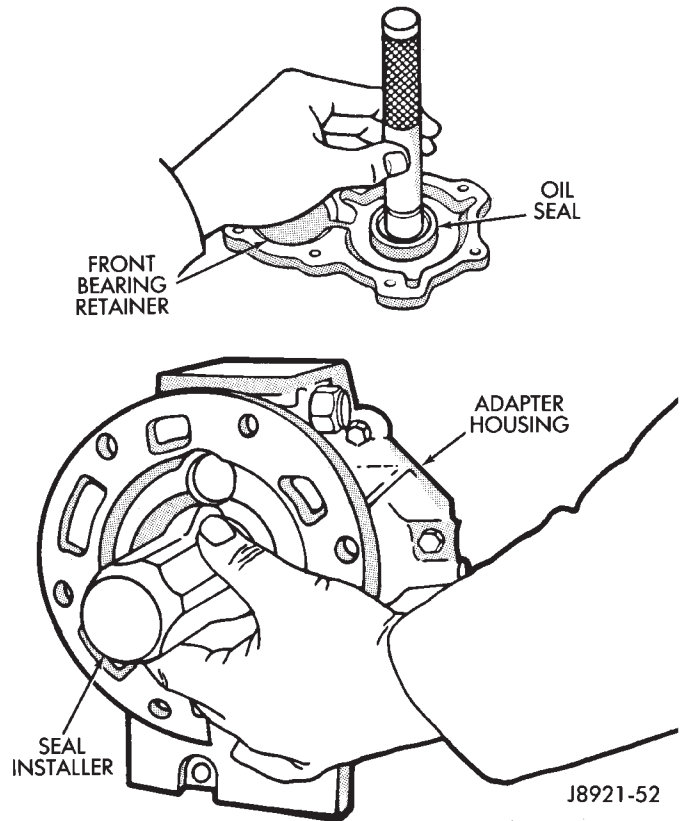


I.D. MARK	SNAP RING THICKNESS	MM (IN.)
A	2.00 - 2.05	(0.0787 - 0.0807)
B	2.05 - 2.10	(0.0807 - 0.0827)
C	2.10 - 2.15	(0.0827 - 0.0846)
D	2.15 - 2.20	(0.0846 - 0.0866)
E	2.20 - 2.25	(0.0866 - 0.0886)

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Fig. 71 Selecting Cluster Gear Front Bearing Snap Ring

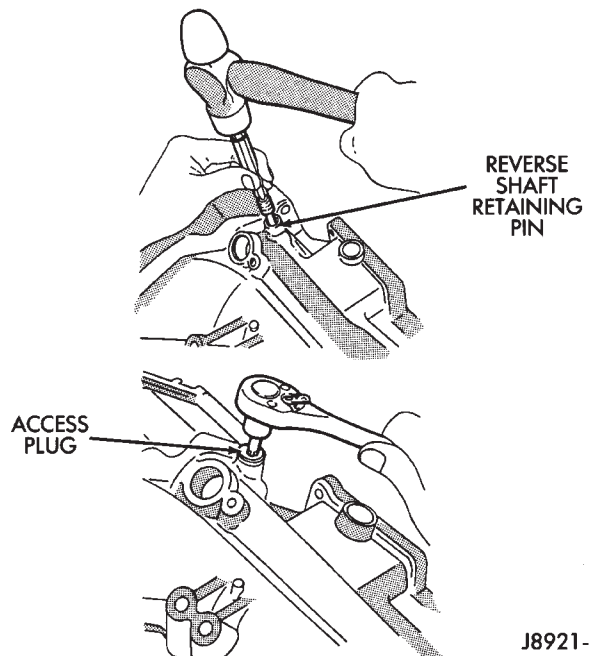
(3) Install new oil seals in front bearing retainer and adapter housing (Fig. 72). Installation depth for bearing retainer seal is 10.5 - 11.5 mm (0.414 - 0.453 in.).



J8921-52

Fig. 72 Oil Seal Installation

(4) Install reverse shaft and shaft retaining pin in adapter housing. Then install access hole plug with torx bit (Fig. 73).



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Fig. 73 Installing Reverse Shaft Pin

(5) Lubricate reverse shaft and gear components with Mopar 75W-90 gear lubricant.

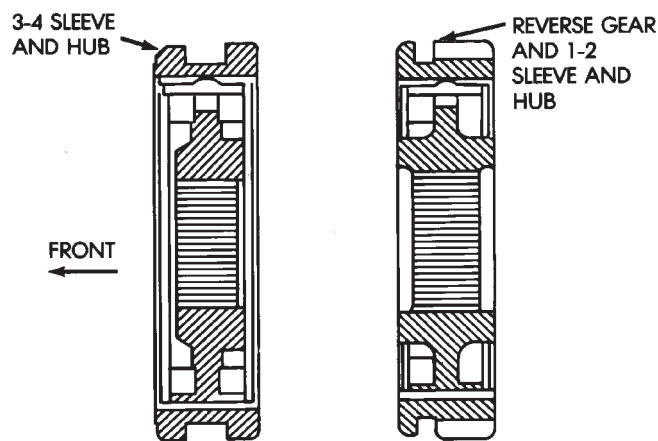
OUTPUT SHAFT ASSEMBLY

(1) Lubricate output shaft journals, gears and needle bearings with Mopar 75W-90 gear lubricant.

(2) Install third gear and needle bearing on shaft (Fig. 63)

(3) Install synchro ring on third gear (Fig. 63).

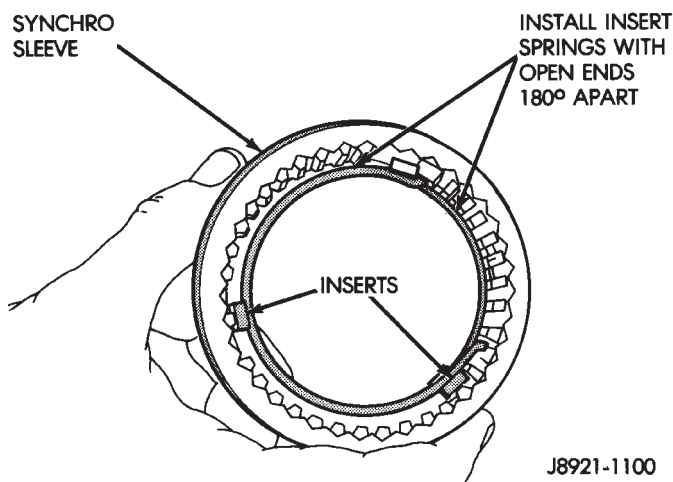
(4) Assemble 1-2 and 3-4 synchro hubs and sleeves (Fig. 74).



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Fig. 74 Synchro Sleeve And Hub Identification

(5) Install inserts and springs in synchro sleeves. Position open ends of springs 180° apart as shown (Fig. 75).



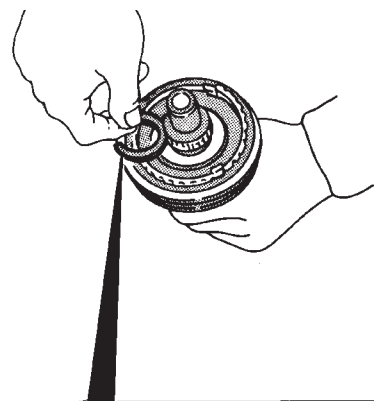
J8921-1100

Fig. 75 Insert Spring Position

(6) Install 3-4 synchro hub and sleeve on output shaft. Press hub onto shaft if necessary.

(7) Install 3-4 synchro hub snap ring (Fig. 76). Use thickest snap ring that will fit in shaft groove.

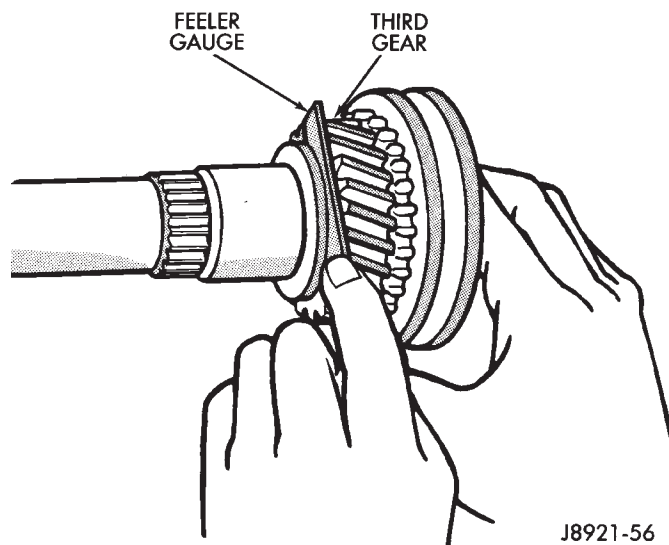
(8) Verify third gear thrust clearance with feeler gauge (Fig. 56). Clearance should be 0.10 - 0.25 mm (0.004 - 0.010 in.).



I.D. MARK	SNAP RING THICKNESS	MM (IN.)
A	1.80 - 1.85	(0.0709 - 0.0728)
B	1.85 - 1.90	(0.0728 - 0.0748)
C	1.90 - 1.95	(0.0748 - 0.0768)
D	1.95 - 2.00	(0.0768 - 0.0787)
E	2.00 - 2.05	(0.0787 - 0.0807)
F	2.05 - 2.10	(0.0807 - 0.0827)
G	2.10 - 2.15	(0.0827 - 0.0846)

J8921-1101

Fig. 76 Installing 3-4 Synchro Hub Snap Ring



J8921-56

Fig. 77 Checking Third Gear Clearance

(9) Lubricate remaining output shaft gears and bearings with gear lubricant.

(10) Install second gear and needle bearing on shaft (Fig. 78).

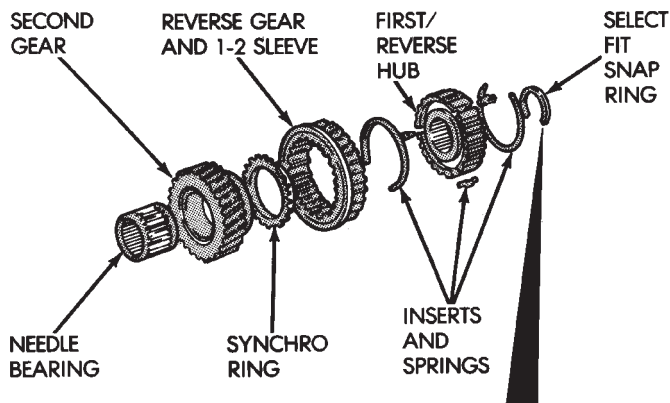
(11) Install synchro ring on second gear (Fig. 78).

(12) Assemble first/reverse hub, insert springs, inserts, reverse gear and 1-2 sleeve (Fig. 78). **Be sure spring ends are 180° apart. Note that splines in hub bore are chamfered on one side. Install hub so chamfered side faces front of output shaft.**

(13) Press assembled hub and sleeve on output shaft.

(14) Install selective snap ring (Fig. 78). Use thickest snap ring that will fit in output shaft groove.

(15) Install synchro ring on first gear (Fig. 79).



I.D. MARK	SNAP RING THICKNESS	MM (IN.)
B	2.35 - 2.40	(0.0925 - 0.0945)
C	2.40 - 2.45	(0.0945 - 0.0965)
D	2.45 - 2.50	(0.0965 - 0.0984)
E	2.50 - 2.55	(0.0984 - 0.1004)
F	2.55 - 2.60	(0.1004 - 0.1024)
G	2.60 - 2.65	(0.1024 - 0.1043)

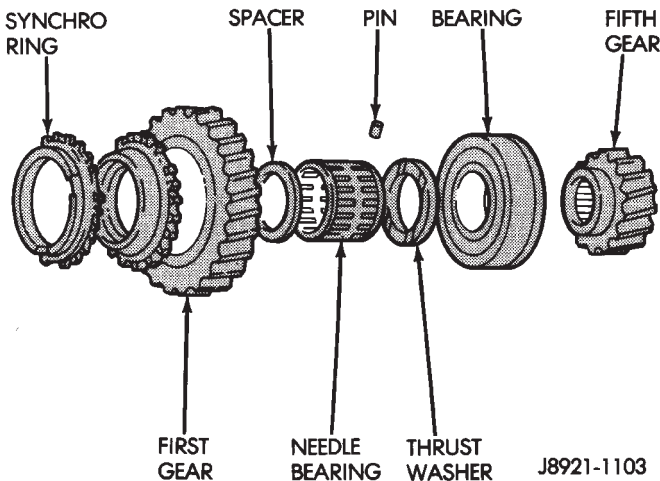
J8921-1102

Fig. 78 Second Gear And Synchro Assembly

(16) Install first gear spacer on shaft and against selective fit snap ring (Fig. 79).

(17) Install first gear and needle bearing (Fig. 79) on output shaft.

(18) Install locating pin and thrust washer on shaft (Fig. 79).



J8921-1103

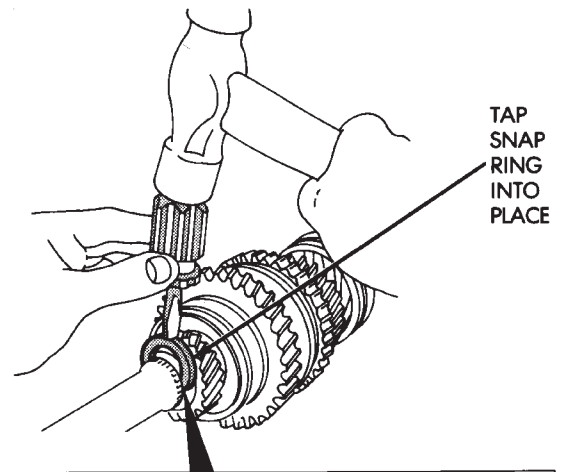
Fig. 79 First And Fifth Gear Components

(19) Press rear bearing on shaft. Position bearing snap ring groove so it is closest to end of output shaft.

(20) Check first and second gear thrust clearance with feeler gauge (Fig. 62).

- First gear clearance should be 0.10 - 0.40 mm (0.003 - 0.0197 in.)
- Second gear clearance should be 0.10 - 0.30 mm (0.003 - 0.0118 in.)

(21) Press fifth gear onto output shaft. Then install select fit snap ring (Fig. 80). Use thickest snap ring that will fit in shaft groove.



TAP SNAP RING INTO PLACE

I.D. MARK	SNAP RING THICKNESS	MM (IN.)
A	2.75 - 2.80	(0.1083 - 0.1102)
B	2.80 - 2.85	(0.1002 - 0.1122)
C	2.85 - 2.90	(0.1122 - 0.1142)
D	2.90 - 2.95	(0.1142 - 0.1161)
E	2.95 - 3.00	(0.1161 - 0.1181)
F	3.00 - 3.05	(0.1181 - 0.1201)
G	3.05 - 3.10	(0.1201 - 0.1220)
H	3.10 - 3.15	(0.1220 - 0.1240)
J	3.15 - 3.20	(0.1240 - 0.1260)
K	3.20 - 3.25	(0.1260 - 0.1280)
L	3.25 - 3.30	(0.1280 - 0.1299)
M	3.30 - 3.35	(0.1299 - 0.1319)

J8921-1104

Fig. 80 Selecting Fifth Gear Snap Ring

(22) Lubricate input shaft pilot bearing with petroleum jelly and install bearing in shaft (Fig. 60).

(23) Install input shaft on output shaft (Fig. 59). Be sure output shaft hub is fully seated in pilot bearing.

OUTPUT SHAFT AND CLUSTER GEAR INSTALLATION

- (1) Mount intermediate plate in vise (Fig. 24).
- (2) Lubricate cluster gear journal and rear bearing with petroleum jelly or gear lubricant.
- (3) Install cluster gear rear bearing in intermediate plate (Fig. 81). Be sure snap ring groove in bearing is rearward as shown.
- (4) Start cluster gear into bearing (Fig. 57). Then hold bearing and push gear into place. Use plastic or rawhide mallet to seat bearing if necessary.
- (5) Start output shaft rear bearing in intermediate plate. Push shaft rearward and tap intermediate plate with mallet to seat bearing.

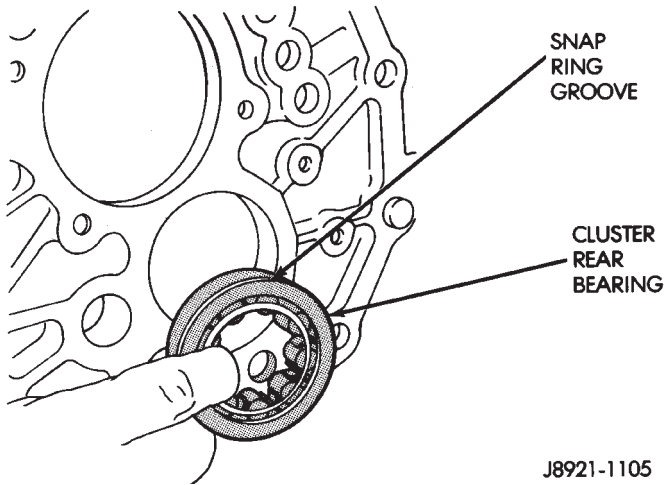


Fig. 81 Installing Cluster Gear Rear Bearing

(6) Install snap rings on cluster and output shaft rear bearings only (Fig. 82). Do not install front bearing snap rings at this time.

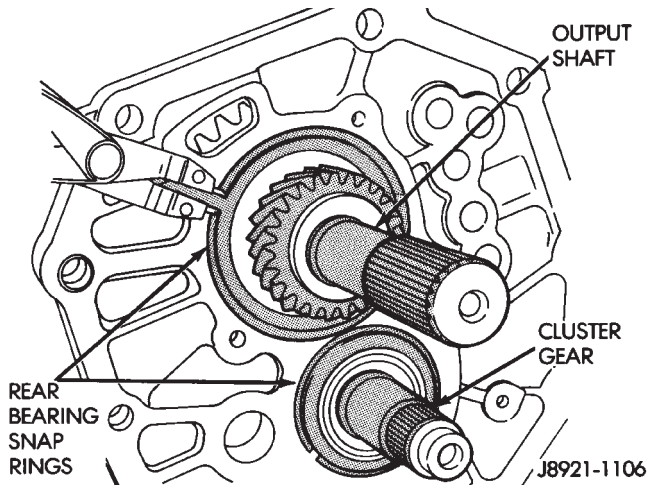


Fig. 82 Installing Rear Bearing Snap Rings

(7) Install reverse idler gear and shaft (Fig. 83).

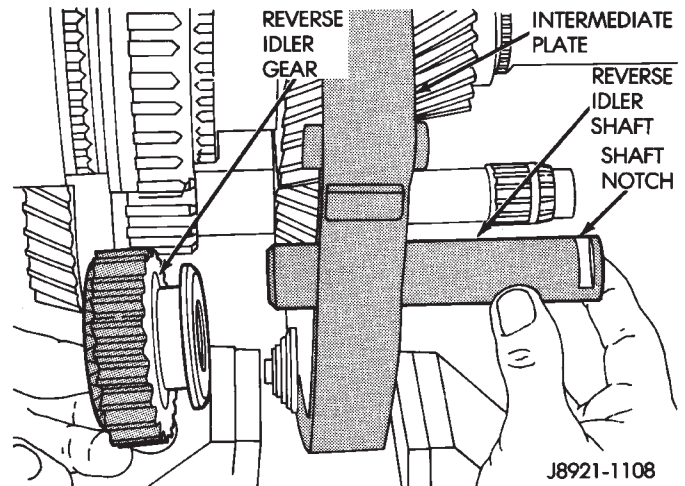


Fig. 83 Installing Reverse Idler Gear And Shaft

(8) Position rear bearing retainer over output shaft and rear bearing. **Be sure bearing retainer tab is engaged in reverse idler shaft notch (Fig. 84).**

(9) Install and tighten rear bearing retainer bolts to 18 N·m (13 ft-lbs).

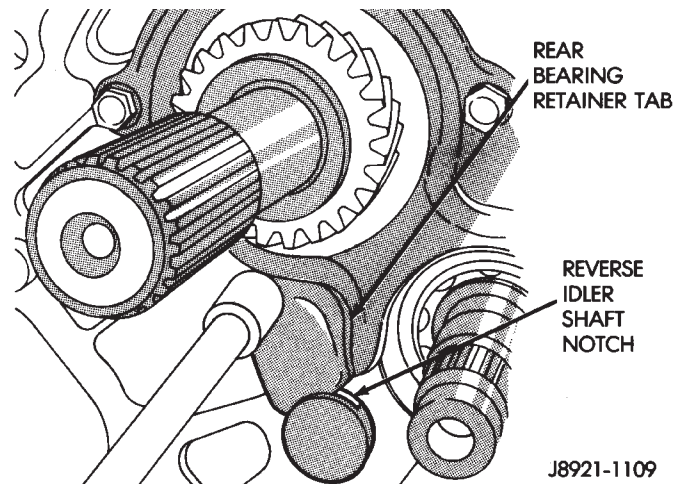


Fig. 84 Installing Rear Bearing Retainer

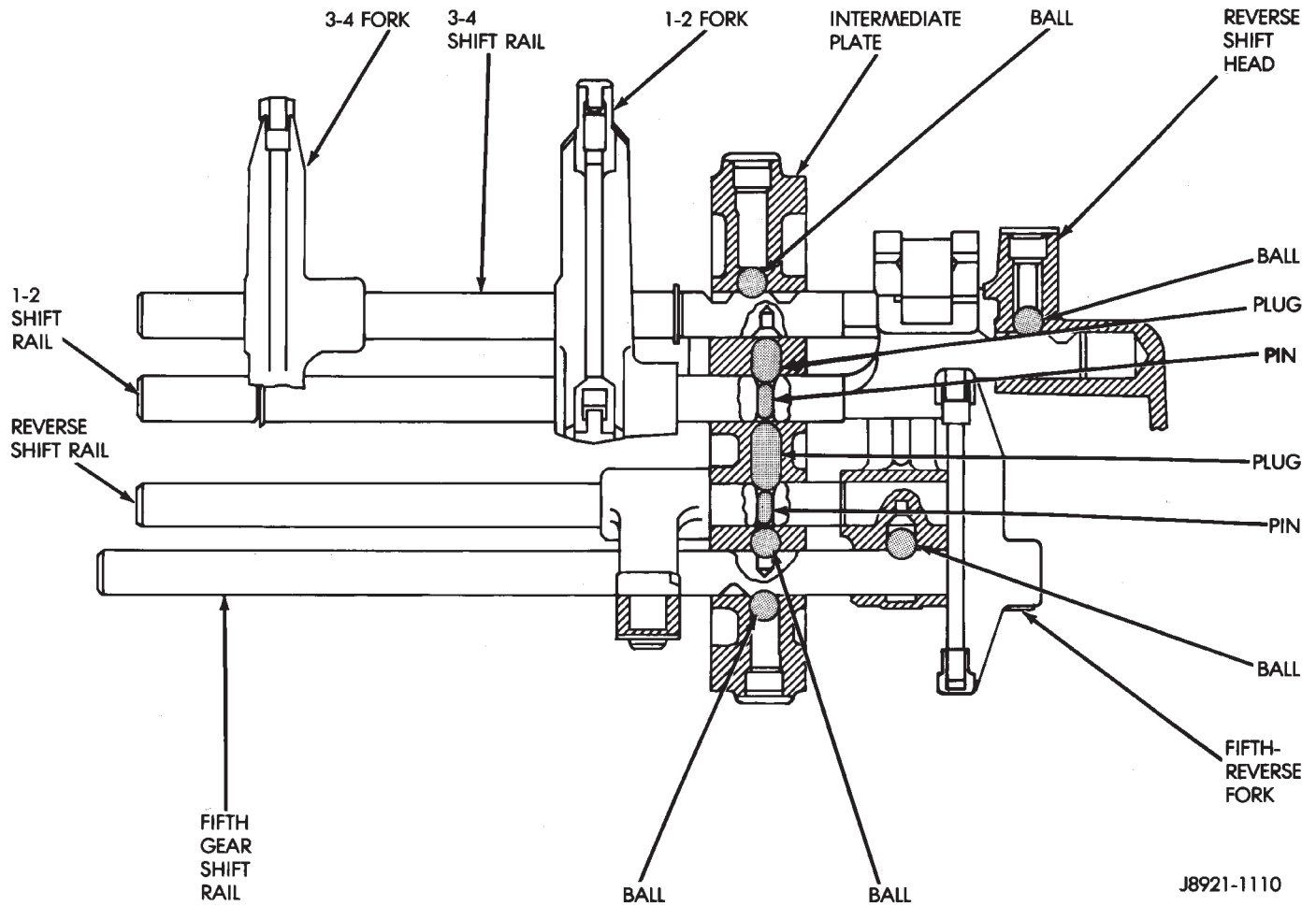


Fig. 85 Shift Rail Ball-Plug-Pin Position

SHIFT RAIL AND FORK INSTALLATION

The shift rail interlock pins, balls and plugs must be installed in the correct sequence for proper shifting. Refer to the installation diagram (Fig. 85) during assembly.

Coat the intermediate plate shift rail bores and the interlock balls, pins and plugs with a heavy coating of petroleum jelly before assembly. The jelly will hold the interlock components in place making installation easier. Use a pencil magnet to hold and insert the interlocks. Then use a small screwdriver to push the interlock components into place.

(1) Coat reverse rail interlock pin with petroleum jelly and install pin in rail (Fig. 86).

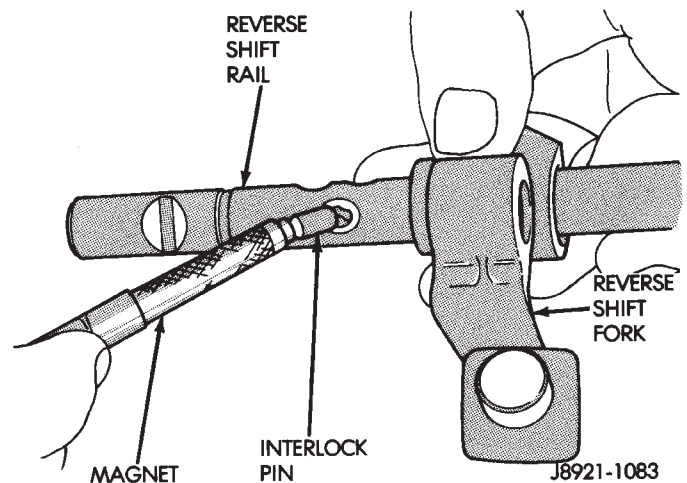


Fig. 86 Installing Reverse Shift Rail Interlock Pin

(2) Install reverse shift rail in intermediate plate (Fig. 87).

(3) Install reverse shift rail C-ring (Fig. 51).

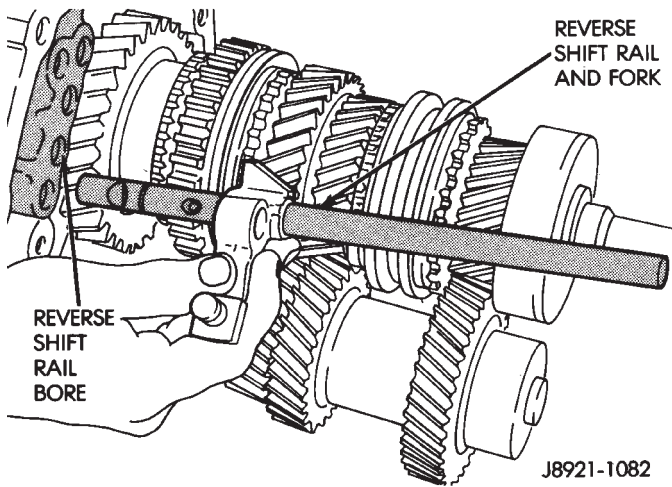


Fig. 87 Installing Reverse Shift Rail And Fork

(4) Position 1-2 and 3-4 shift forks in synchro sleeves (Fig. 88).

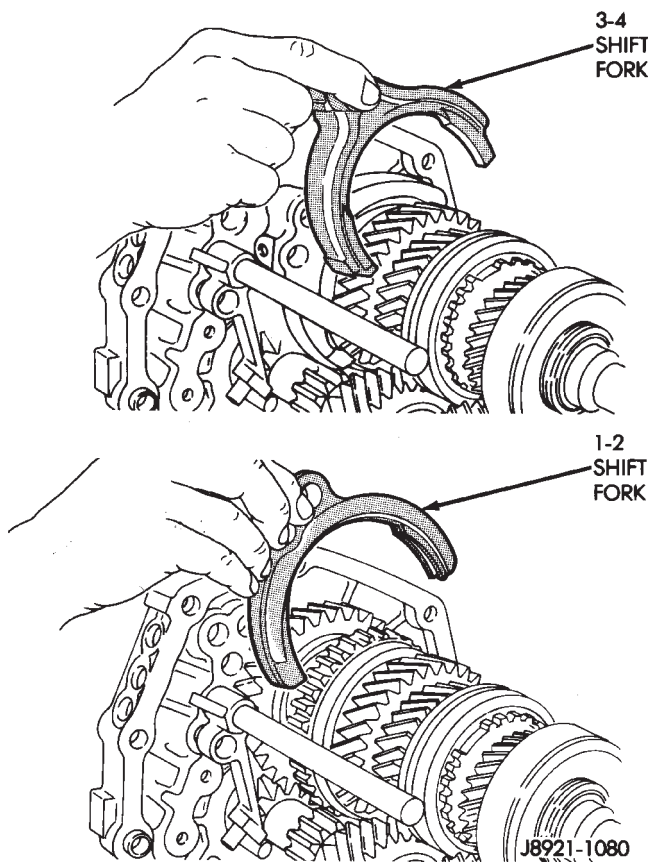


Fig. 88 Shift Fork Installation

(5) Coat reverse rail lock ball with petroleum jelly. Then tilt reverse shift fork upward and insert ball in intermediate plate (Fig. 89).

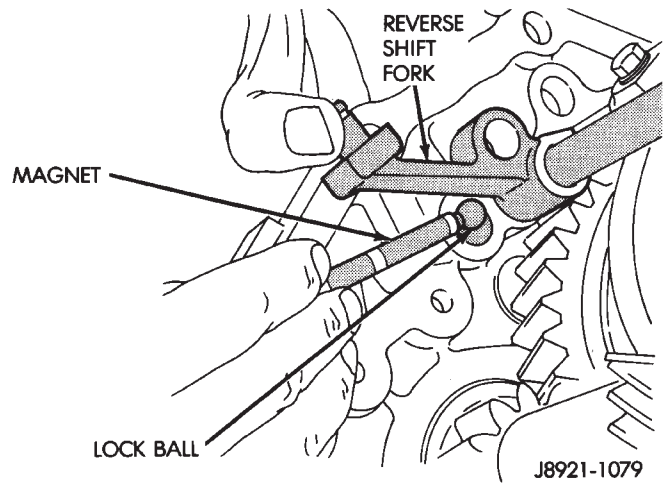


Fig. 89 Installing Reverse Shift Rail Lock Ball

(6) Coat 1-2 shift rail interlock plug with petroleum jelly and install it in intermediate plate bore (Fig. 90).

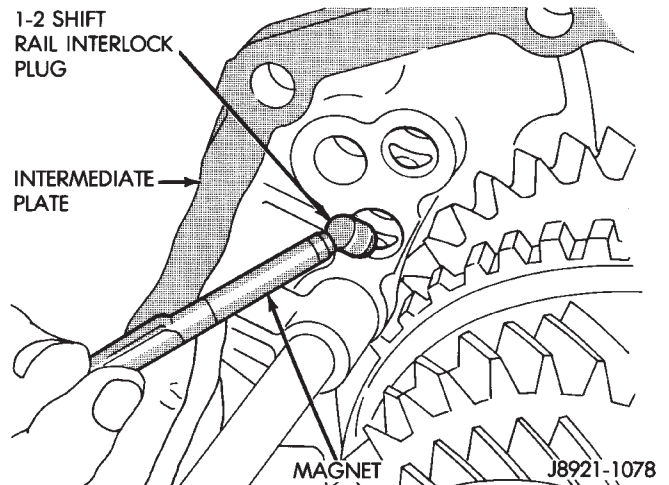


Fig. 90 Installing 1-2 Shift Rail Interlock Plug

(7) Coat 1-2 shift rail interlock pin with petroleum jelly and insert it in shift rail (Fig. 91).

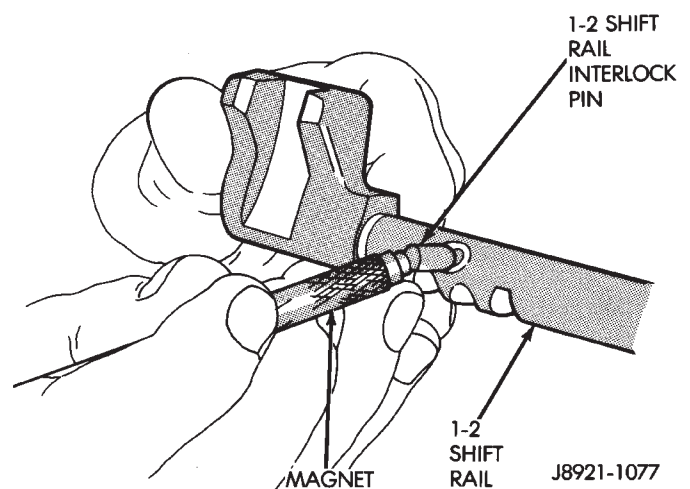


Fig. 91 Installing 1-2 Shift Rail Interlock Pin

(8) Install 1-2 shift rail in intermediate plate and 1-2 fork (Fig. 92).

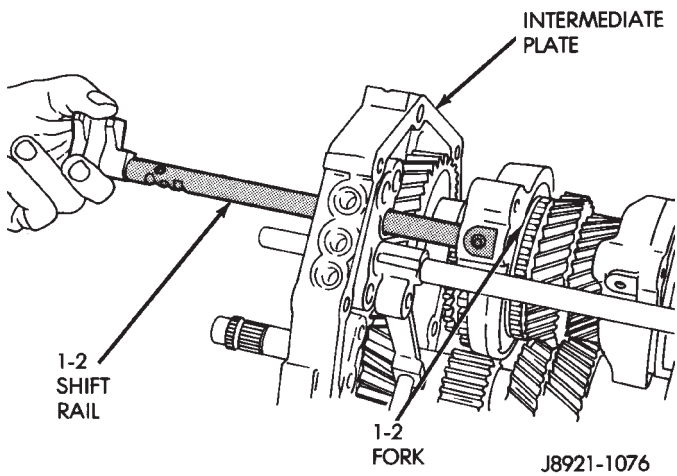


Fig. 92 Installing 1-2 Shift Rail

(9) Coat 3-4 shift rail interlock plug with petroleum jelly and install plug in intermediate plate (Fig. 93).

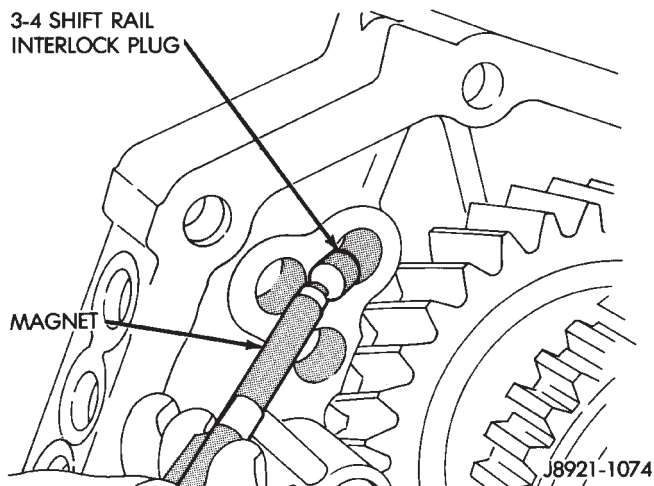


Fig. 93 Installing 3-4 Shift Rail Interlock Plug

(10) Install 3-4 shift rail in intermediate plate and in both shift forks (Fig. 94).

(11) Verify that none of interlock balls, plugs, or pins were displaced during shift rail installation.

(12) Install and tighten shift fork setscrews to 20 N·m (14 ft. lbs.) torque (Fig. 95).

(13) Install 1-2 and 3-4 shift rail C-rings (Fig. 96).

(14) Insert fifth gear shift rail through reverse shift fork. **Then slide rail into intermediate plate just far enough to secure interlock ball. Do not fully install shift rail at this time.**

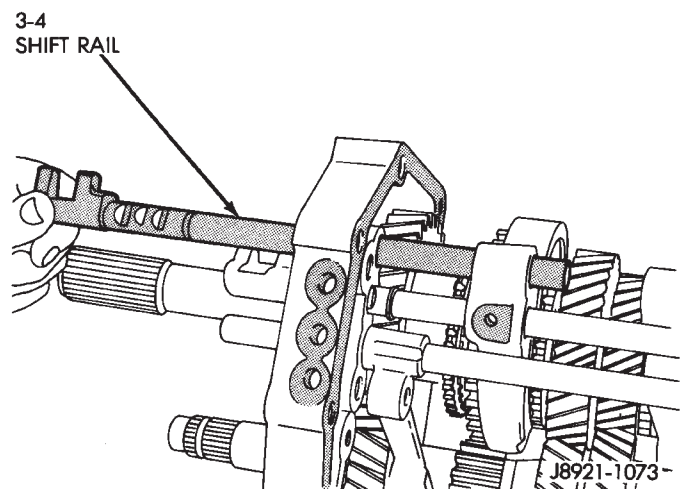


Fig. 94 Installing 3-4 Shift Rail

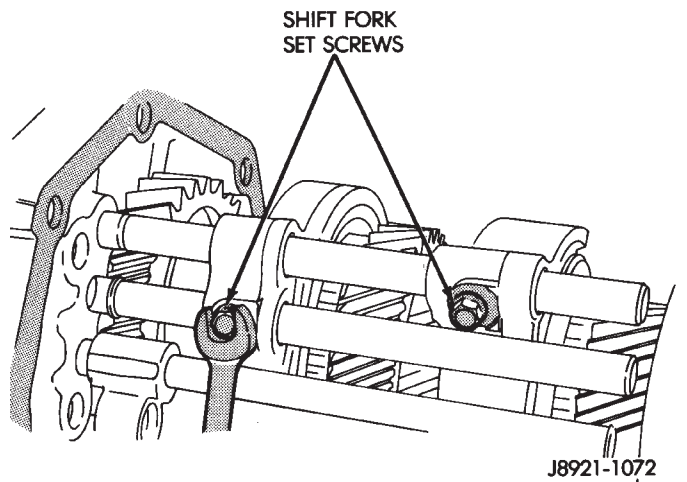


Fig. 95 Installing Shift Fork Set Screws

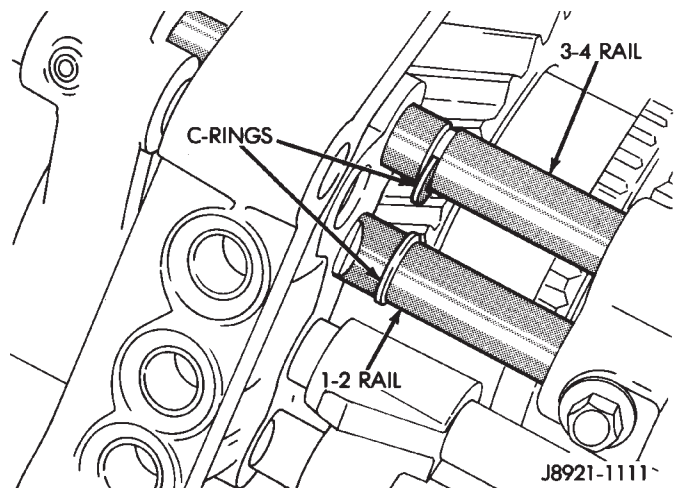


Fig. 96 Installing Shift Rail C-Rings

FIFTH-REVERSE GEAR AND SHIFT COMPONENT INSTALLATION

(1) Install thrust ring lock ball in cluster gear journal (Fig. 97). Use petroleum jelly to hold ball in place.

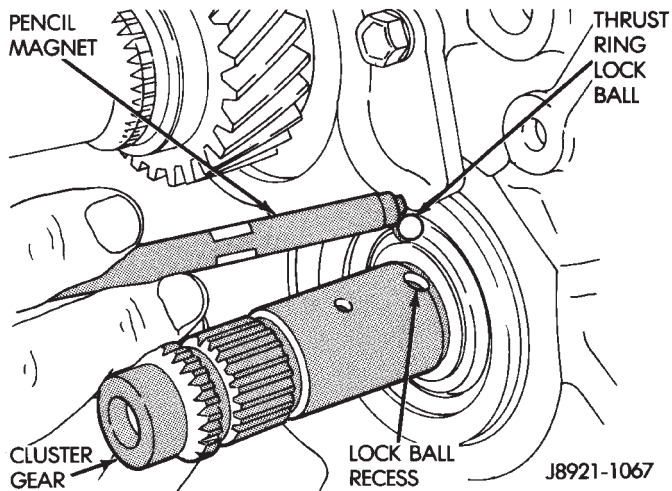


Fig. 97 Installing Thrust Ring Lock Ball

(2) Install fifth gear thrust ring (Fig. 98). Be sure thrust ring notch fits over lock ball.

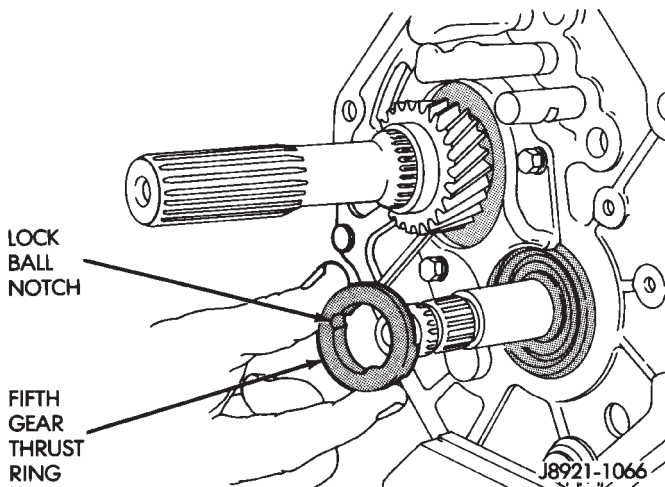


Fig. 98 Installing Fifth Gear Thrust Ring

(3) Assemble counter fifth gear, synchro sleeve, inserts and insert springs (Fig. 99).

(4) Lubricate two-piece bearing with petroleum jelly and install it in counter fifth gear (Fig. 100).

(5) Install counter fifth gear and synchro assembly on cluster gear journal (Fig. 101).

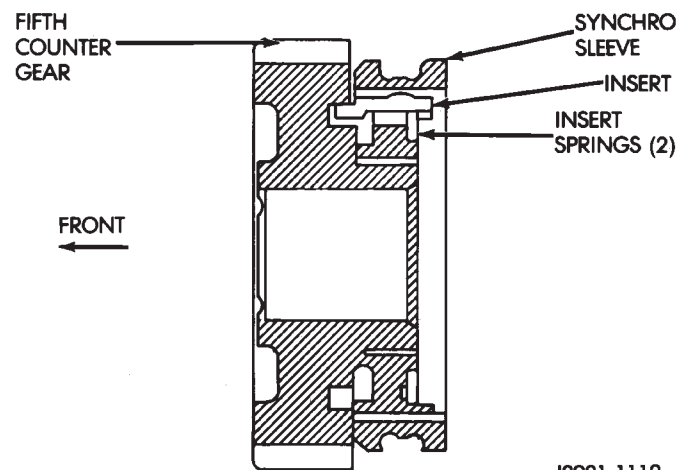


Fig. 99 Assembling Fifth Gear And Synchro Assembly

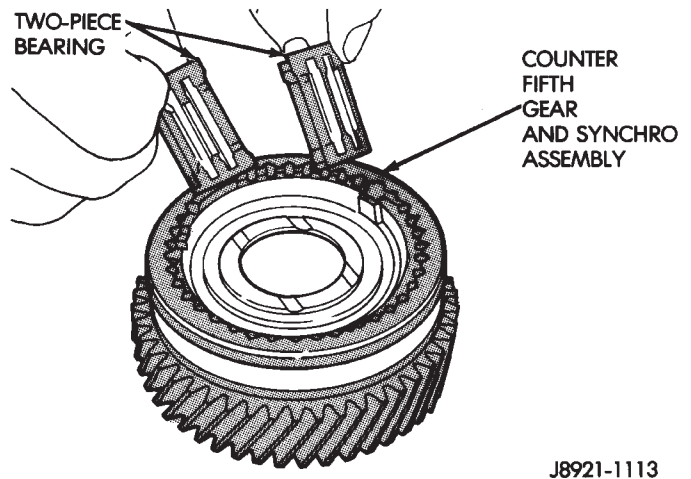


Fig. 100 Installing Counter Fifth Gear Bearing

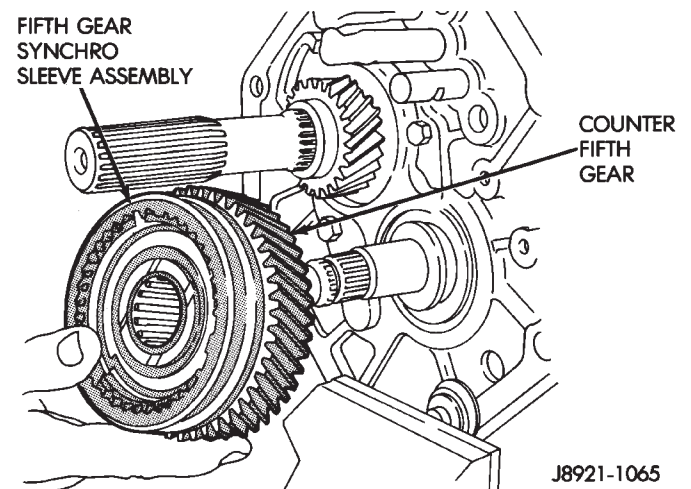


Fig. 101 Installing Counter Fifth Gear And Sleeve

(6) Install synchro ring in synchro sleeve (Fig. 102).

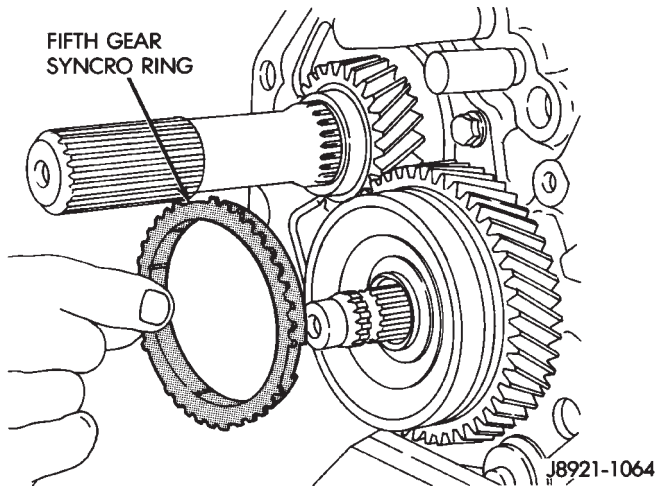


Fig. 102 Installing Fifth Gear Synchro Ring

(7) Install fifth spline gear on cluster journal (Fig. 103). Tap spline gear into place with plastic mallet if necessary.

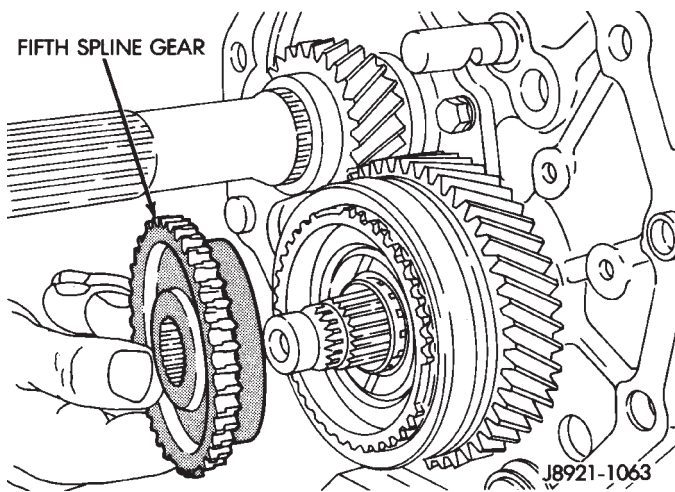


Fig. 103 Installing Fifth Spline Gear

(8) Install fifth gear selective snap ring (Fig. 104). Use thickest snap ring that will fit in shaft groove.

(9) Install reverse shift head and rail (Fig. 105). Then install lock ball in shift head.

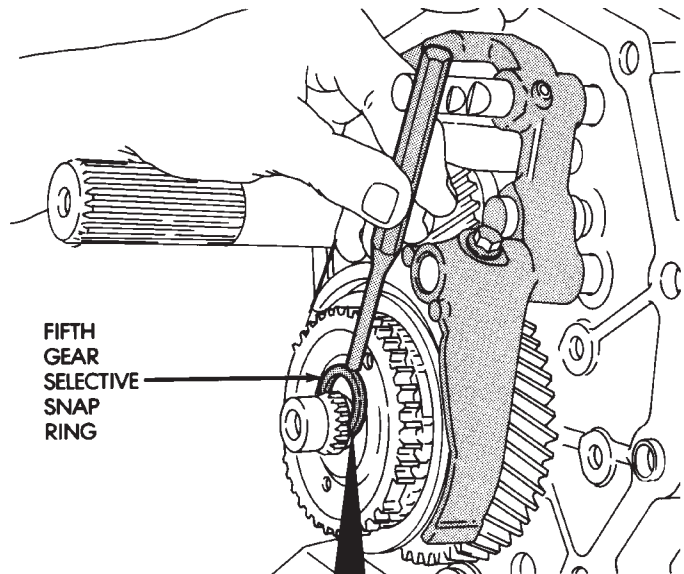
(10) Position fifth gear shift fork in synchro sleeve (Fig. 106).

(11) Install fifth gear shift rail (Fig. 107). Slide rail through fork, shift head, intermediate plate and reverse shift fork. Be sure interlock ball is not displaced during installation.

(12) Align screw holes in shift fork and rail and install set screw (Fig. 108). Tighten screw to 20 N·m (15 ft. lbs.) torque.

(13) Install lock balls and springs in intermediate plate (Fig. 109). Then install and tighten lock ball plugs to 19 N·m (14 ft. lbs.) torque.

(14) Install reverse shift arm bracket (Fig. 110). Tighten bracket bolts to 18 N·m (13 ft. lbs.) torque.



I.D. MARK	SNAP RING THICKNESS	MM (IN.)
A	2.85 - 2.90	(0.1122 - 0.1142)
B	2.90 - 2.95	(0.1142 - 0.1161)
C	2.95 - 3.00	(0.1161 - 0.1181)
D	3.00 - 3.05	(0.1181 - 0.1201)
E	3.05 - 3.10	(0.1201 - 0.1220)
F	3.10 - 3.15	(0.1220 - 0.1240)
G	3.15 - 3.20	(0.1240 - 0.1260)
H	3.20 - 3.25	(0.1260 - 0.1280)

J8921-1114

Fig. 104 Installing Fifth Gear Snap Ring

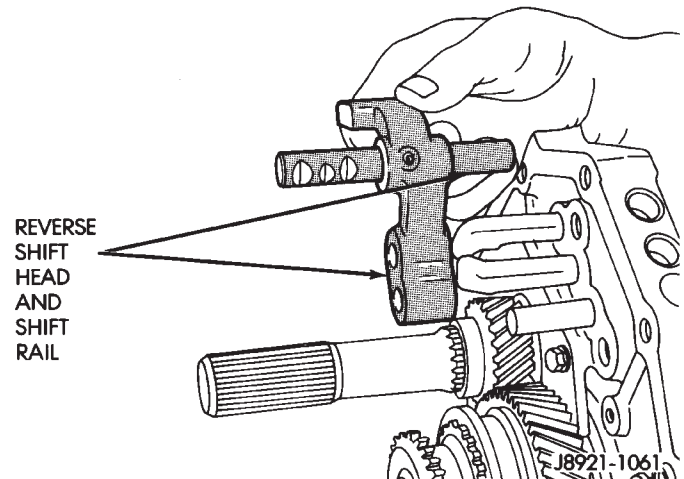


Fig. 105 Installing Reverse Shift Head And Rail

(15) Install reverse shift arm (Fig. 110). Position arm on reverse fork pin and engage it with pin on shift arm bracket.

(16) Verify that shift arm shoe is engaged in reverse idler gear. Then secure shift arm to pin on reverse fork with new E-clip.

GEAR CASE AND ADAPTER INSTALLATION

(1) Dismount intermediate and gear assemblies from vise.

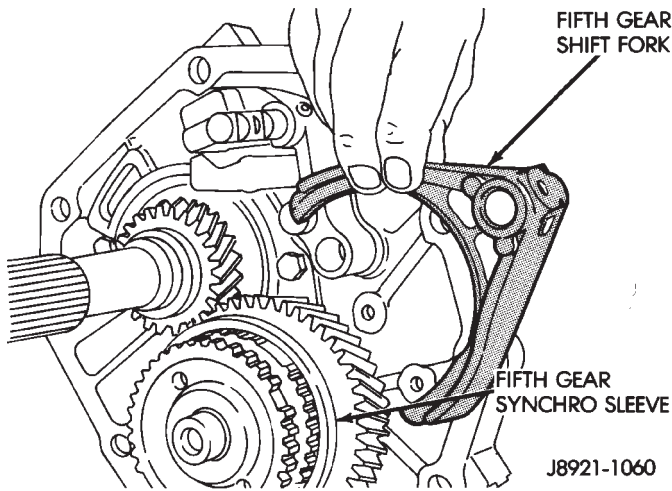


Fig. 106 Installing Fifth Gear Shift Fork

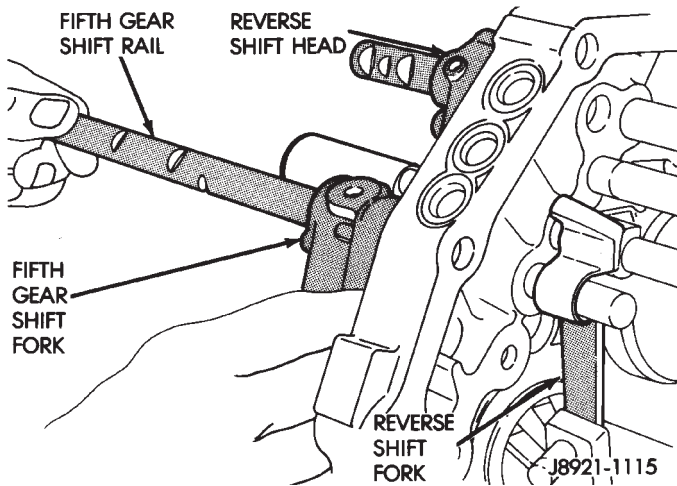


Fig. 107 Installing Fifth Gear Shift Rail

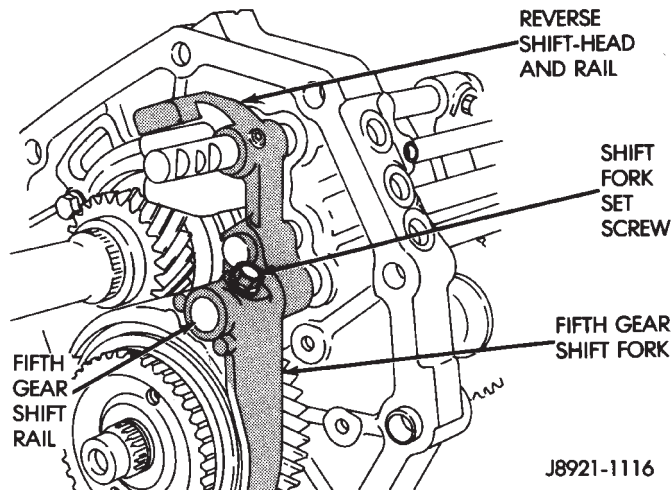


Fig. 108 Shift Fork Set Screw Installation

(2) Clean mating surfaces of intermediate plate and transmission gear case with wax and grease remover. Then wipe dry with a clean cloth.

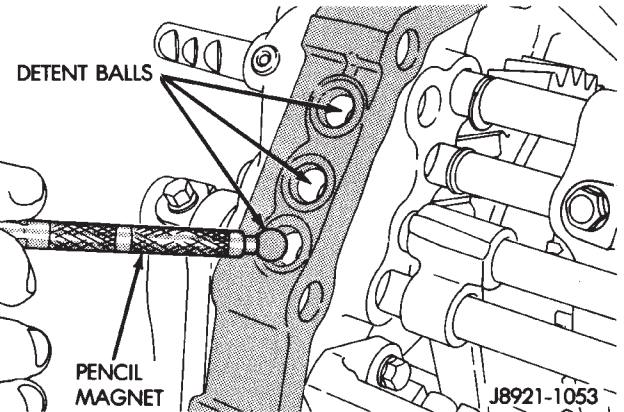
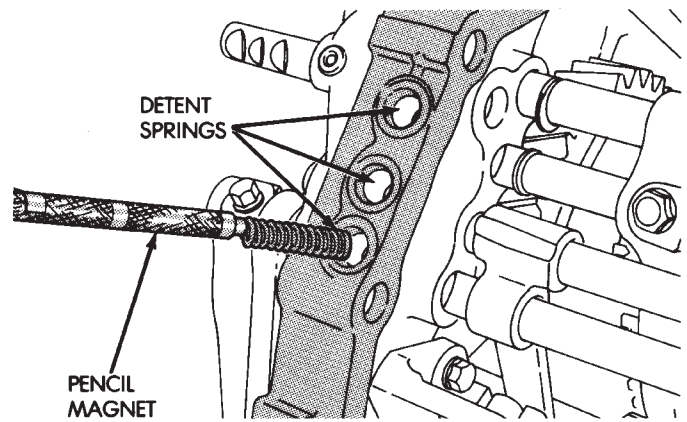


Fig. 109 Detent Ball And Spring Installation

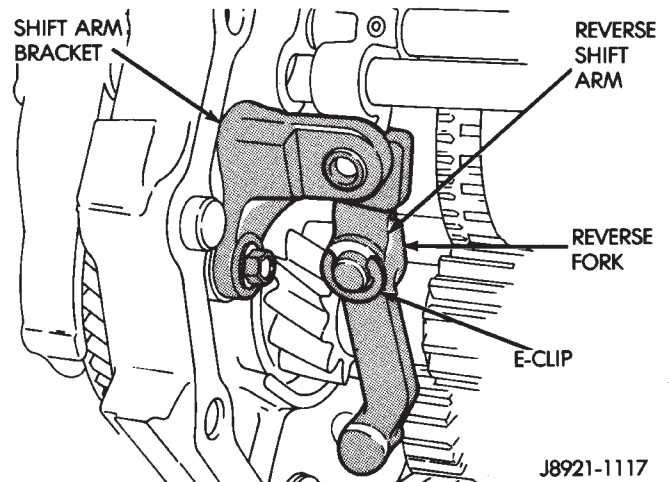
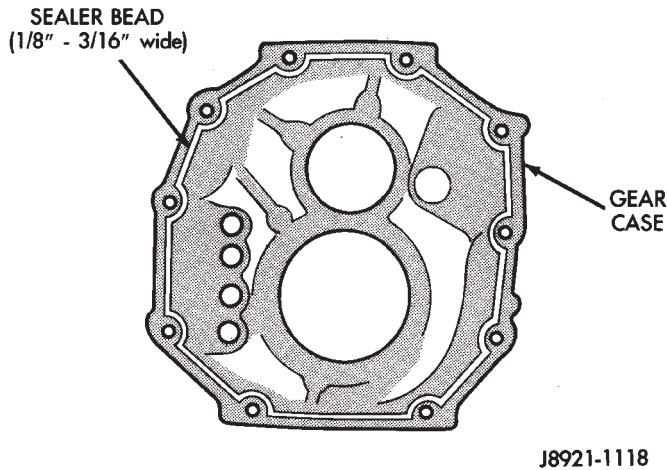


Fig. 110 Reverse Shift Arm And Bracket Installation

(3) Apply 3 mm (1/8 in.) wide bead of Mopar Gasket Maker to mating surface of gear case. Keep sealer bead inside bolt holes as shown (Fig. 111).

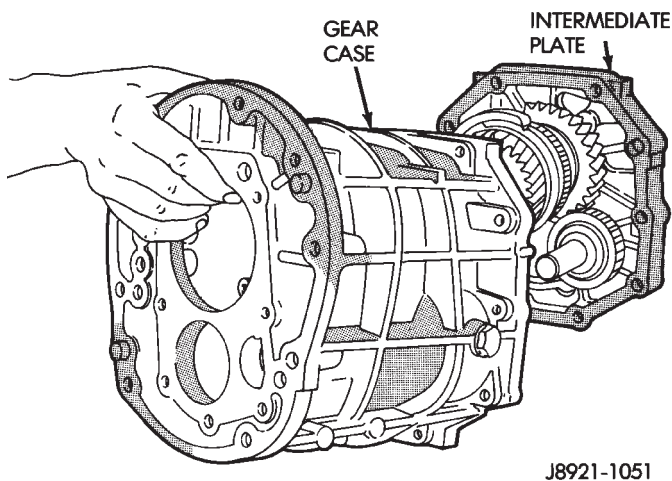


J8921-1118

Fig. 111 Applying Sealer To Gear Case

(4) Install gear case (Fig. 112). Align shift rails and bearings in case and tap case into position.

(5) Verify that gear case is seated on intermediate plate dowel pins.



J8921-1051

Fig. 112 Installing Gear Case

(6) Install front bearing snap rings (Fig. 113).

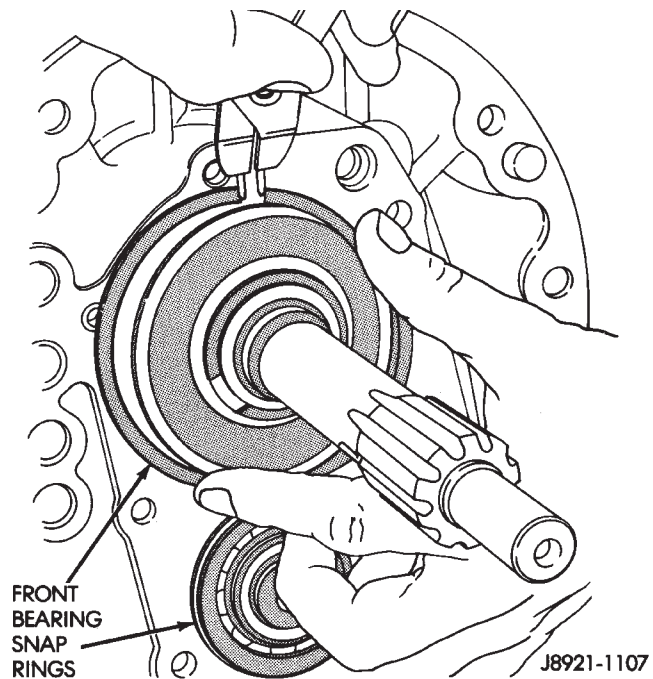
(7) Clean gear case and front bearing retainer sealing surfaces with wax and grease remover. Then wipe dry with a clean cloth.

(8) Install new seal in front bearing retainer. Then lubricate seal lip with petroleum jelly. **Installation depth for seal is 10.5 - 11.5 mm (0.413 - 0.453 in.).**

(9) Apply a 3 mm (1/8 in.) wide bead of Mopar Gasket Maker to front bearing retainer sealing surface.

(10) Align and install front bearing retainer (Fig. 114). Be sure retainer is properly seated on case and bearings.

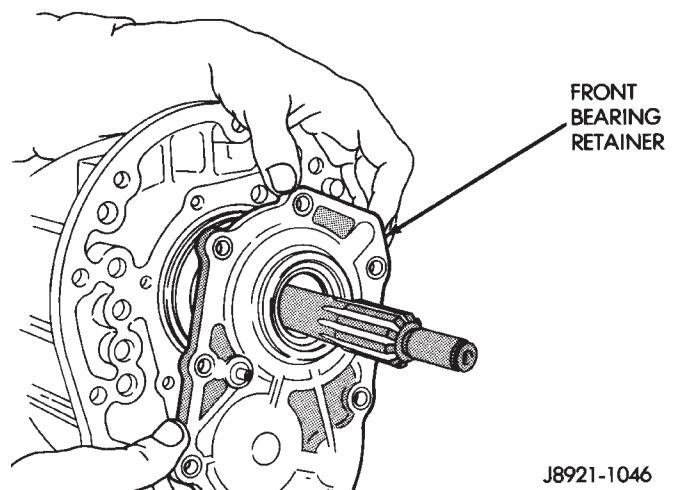
(11) Install and tighten front bearing retainer bolts to 17 N·m (12 ft. lbs.) torque.



J8921-1107

Fig. 113 Installing Front Bearing Snap Rings

(12) On 2-wheel drive models, install speedometer gear, lock ball and retaining rings (Fig. 115). Be sure lock ball is engaged in gear.



J8921-1046

Fig. 114 Installing Front Bearing Retainer

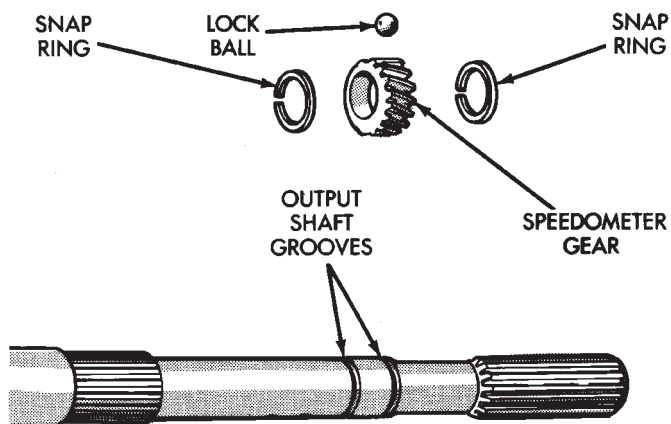
(13) Inspect condition of reverse pin in adapter/extension housing (Fig. 116). If pin is worn or damaged, replace it as follows:

(a) Remove roll pin access plug (Fig. 117).

(b) Tap roll pin out of housing with pin punch (Fig. 118). Then remove old reverse pin.

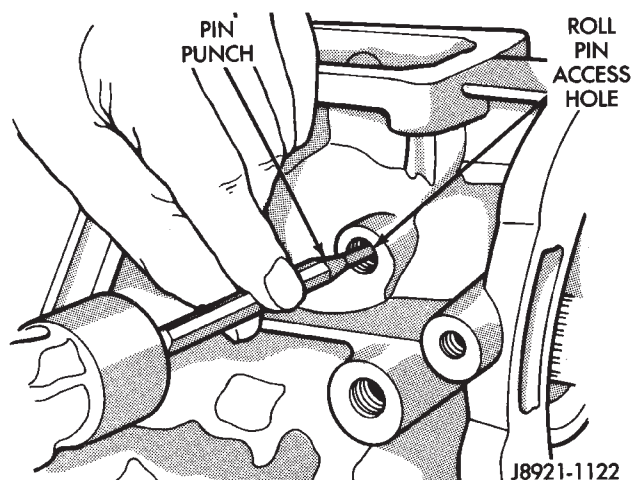
(c) Install new reverse pin and secure it with roll pin. Then install and tighten access plug to 19 N·m (14 ft. lbs.) torque.

(14) Clean sealing surfaces of adapter or extension housing and intermediate plate with wax and grease remover. Then wipe dry with a clean cloth.



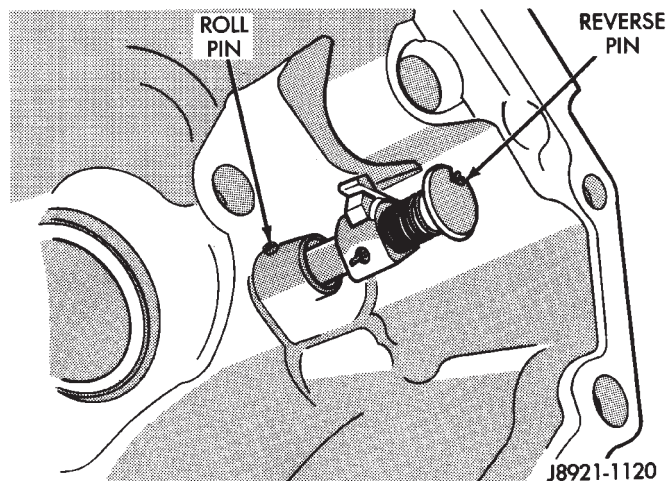
J8921-1119

Fig. 115 Speedometer Gear Installation (2WD Models)



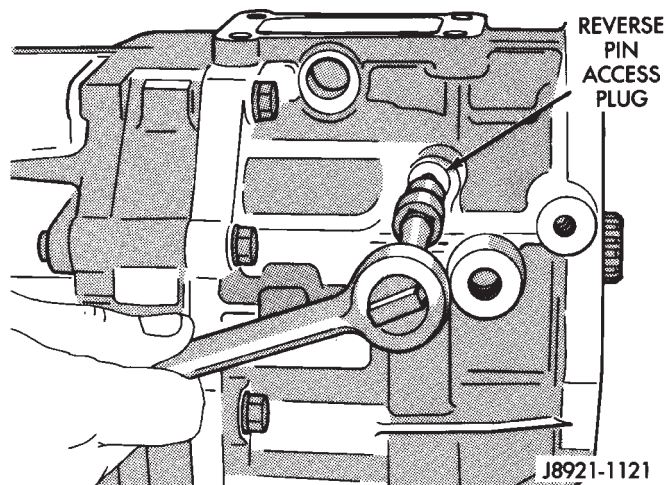
J8921-1122

Fig. 118 Roll Pin Removal/Installation



J8921-1120

Fig. 116 Reverse Pin Position



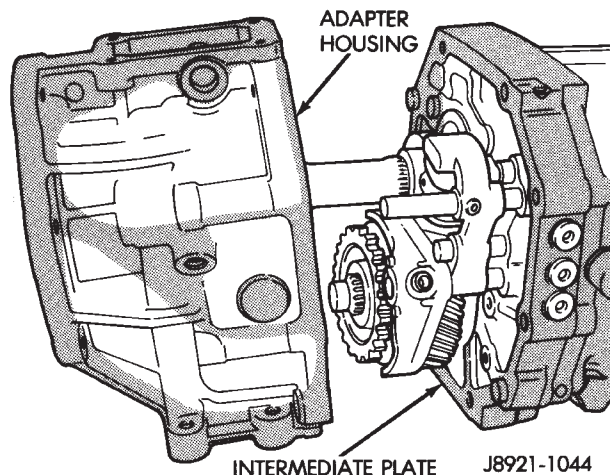
J8921-1121

Fig. 117 Access Plug Removal/Installation

(15) Apply 3 mm (1/8 in.) wide bead of Mopar Gasket Maker to sealing surface of adapter or extension housing. Keep sealer bead inside bolt holes as shown in Figure 111.

(16) Align and install adapter or extension housing on intermediate plate (Fig. 119). Be sure housing is seated on intermediate plate dowel pins.

(17) Coat threads of housing attaching bolts with silicone sealer. Then install and tighten bolts to 37 N·m (27 ft. lbs.) torque.



J8921-1044

Fig. 119 Adapter/Extension Housing Installation

(18) Install detent ball (Fig. 120).
 (19) Install detent spring (Fig. 121).
 (20) Install detent access plug (Fig. 122). Tighten plug to 19 N·m (14 ft. lbs.) torque.

(21) Lubricate shift arm shaft and install it in adapter housing (Fig. 123).

(22) Position shift arm in adapter housing (Fig. 124). Be sure arm is engaged in shift rails.

(23) Align shift arm with shaft and push shaft into arm.

(24) Rotate shift arm shaft until set screw holes in shaft and arm are aligned.

(25) Install and tighten shift arm set screw to 38 N·m (28 ft. lbs.) torque (Fig. 125).

(26) Install and tighten restrictor pins to 19 N·m (14 ft. lbs.) torque (Fig. 125).

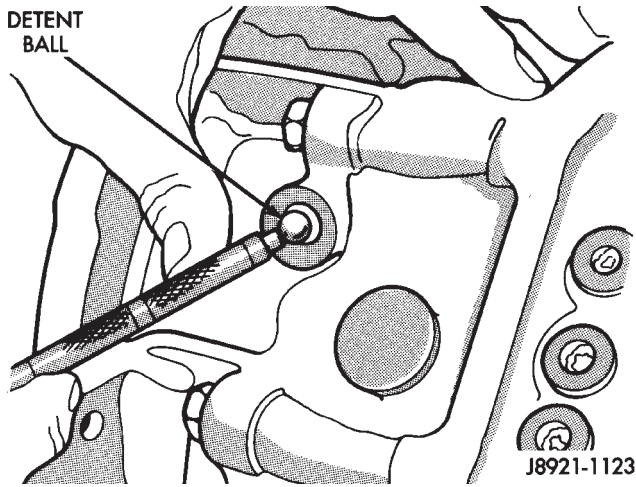


Fig. 120 Installing Detent Ball

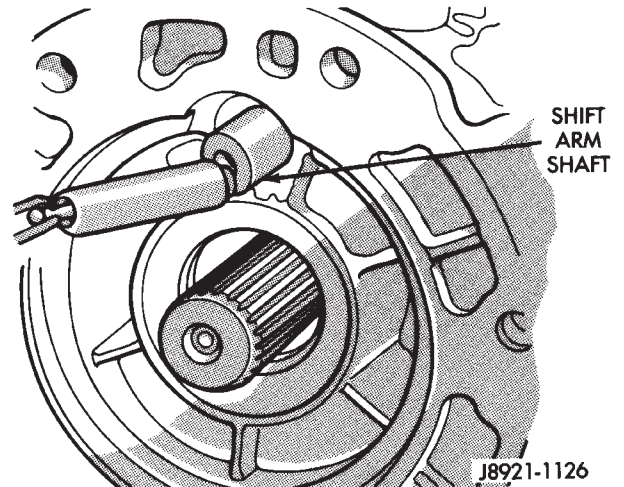


Fig. 123 Installing Shift Arm Shaft

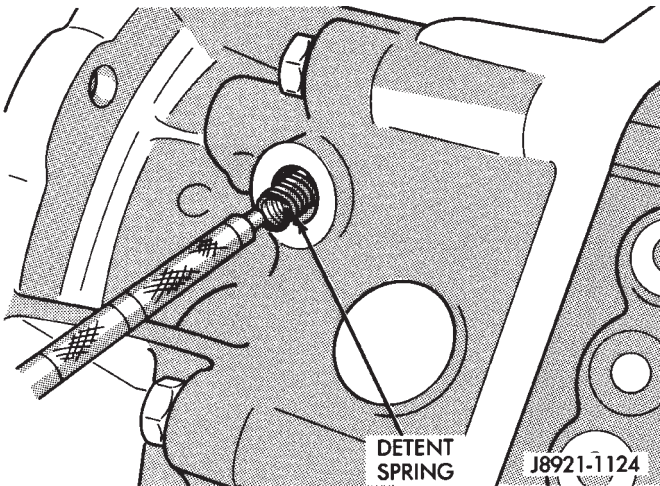


Fig. 121 Installing Detent Spring

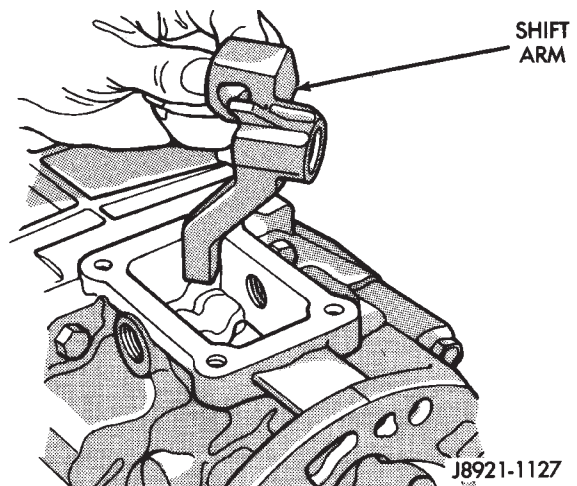


Fig. 124 Shift Arm Installation

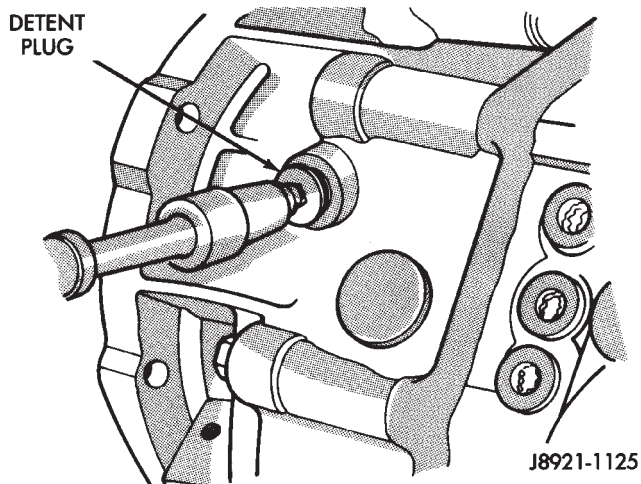


Fig. 122 Installing Detent Access Plug

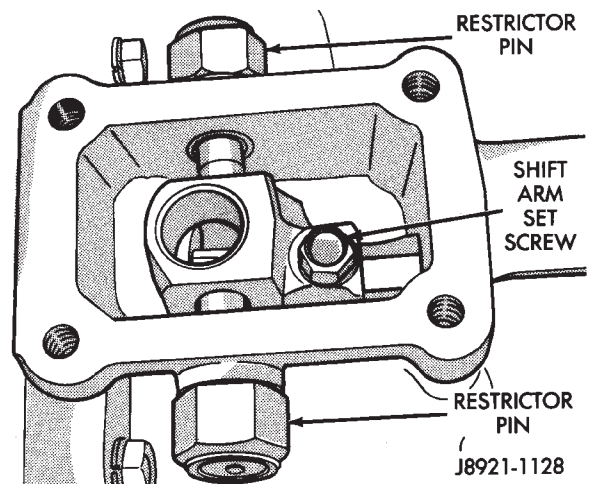


Fig. 125 Set Screw And Restrictor Pin Installation

(27) Install and tighten shift arm shaft access plug to 19 N·m (14 ft. lbs.) torque (Fig. 126).

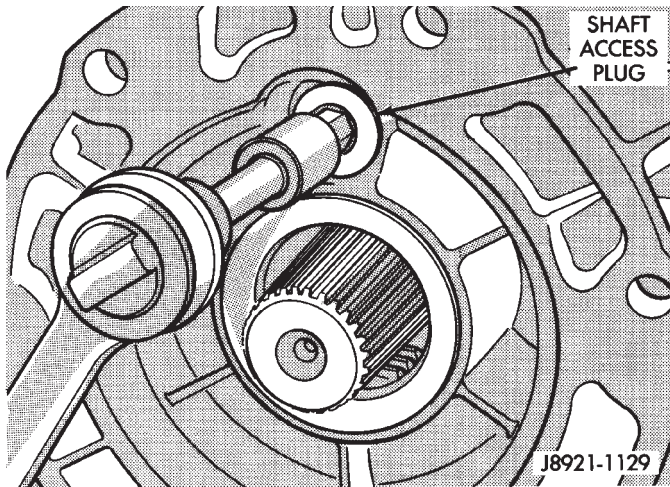


Fig. 126 Access Plug Installation

(28) Position new shift tower gasket on adapter housing (Fig 127).

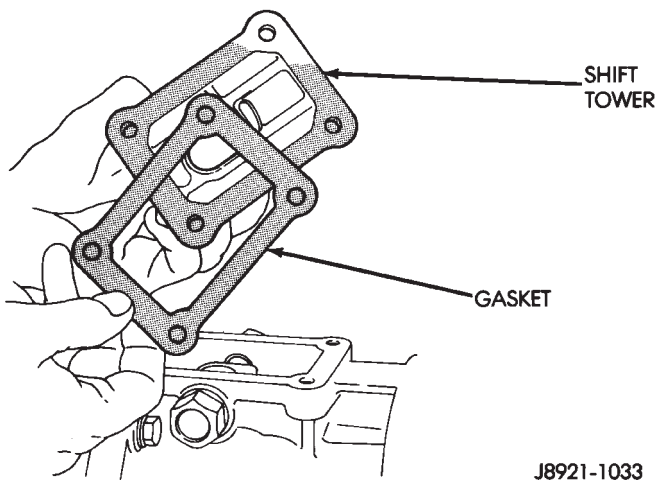


Fig. 127 Shift Tower Gasket Installation

(29) Install shift tower (Fig. 128). Tighten tower attaching bolts to 18 N·m (13 ft. lbs.) torque.

(30) Install new gasket on backup light switch and install switch. Tighten switch to 37 N·m (27 ft. lbs.) torque.

(31) Install new washer on drain plug. Then install and tighten plug to 37 N·m (27 ft. lbs.) torque.

(32) If transmission will be filled with gear lubricant before installation, place transmission in a level

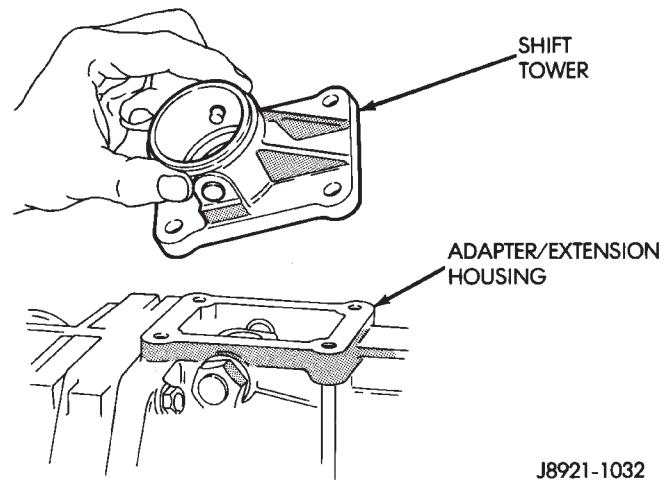


Fig. 128 Shift Tower Installation

position. Then fill with Mopar 75W-90, grade GL-5 gear lubricant. Correct fill level is to bottom edge of fill plug hole.

(33) Install new washer on fill plug. Then install and tighten plug to 37 N·m (27 ft. lbs.) torque.

(34) Install clutch housing and release bearing components.

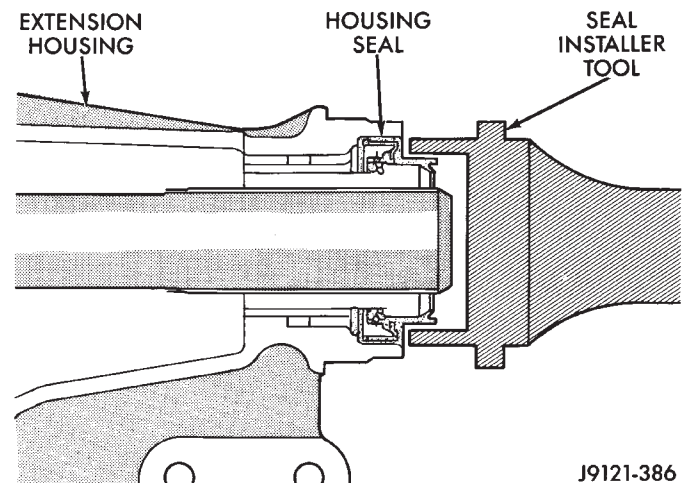


Fig. 129 Installing Extension Housing Seal—2WD Models

(35) On 2-wheel drive models, install new seal in extension housing with suitable size installer tool (Fig. 129). Lubricate seal lips with petroleum jelly before installation.

(36) On 2-wheel drive models, install speedometer driven gear (if removed), and vehicle speed sensor.

30RH/32RH AUTOMATIC TRANSMISSION

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GENERAL INFORMATION

TRANSMISSION APPLICATION

Chrysler 30RH and 32RH automatic transmissions are used in XJ/YJ models. Both transmissions are three speed, automatics with a gear-type oil pump, two clutches and bands and a planetary gear system (Fig. 1). The 30RH is used with 2.5L engines and the 32RH is used with 4.0L engines.

TORQUE CONVERTER

A three element, torque converter is used for all applications. The converter consists of the impeller, stator, and turbine.

The converter used with all 30RH/32RH transmissions is equipped with a converter clutch. The clutch is engaged by an electrical solenoid and mechanical clutch module on the valve body. The solenoid is operated by the powertrain control module.

The impeller is connected to the engine crankshaft through the front cover which is welded to the impeller. The turbine is splined to the transmission input shaft and the stator is splined to the transmission reaction shaft.

The torque converter is a welded assembly and is not a repairable component. The converter is serviced as an assembly.

RECOMMENDED FLUID

The recommended (and preferred) fluid for 30RH/32RH transmissions is Mopar ATF Plus, Type 7176.

Mopar Dexron II can be used but only if ATF Plus is not available.

Transmission fluid capacity is approximately 17 pints (7.9 liters). This is the approximate amount of fluid required to fill the transmission and torque converter after overhaul.

TRANSMISSION IDENTIFICATION

The transmission identification numbers are stamped on the left side of the case just above the oil pan gasket surface (Fig. 2). The first set of numbers is the transmission part number. The next set of code numbers set is the date of build. The final set of code numbers represents the transmission serial number.

SPECIFICATIONS AND BAND ADJUSTMENTS

Service specifications and torque values are located at the end of this group. Refer to the specifications during service operations.

The band adjustment specifications for 1994 transmissions are different. Refer to the front and rear band adjustment procedures in the In-Vehicle Service section for details.

PARTS INTERCHANGEABILITY

The 1994 version of the 30RH (A904) transmission is similar to previous models in appearance only. The current 30RH is quite different and interchanging new/old parts is definitely not recommended. Different component dimensions, fluid passages, input/output shafts, cases, bands, valve bodies and governor assemblies are just a few of the changed items. The 32RH transmission is also different from previous models and the same recommendations apply here as well.

CAUTION: On YJ models with a 2.5L engine and 30RH transmission, special bolts are used to attach the driveplate to the crankshaft. These bolts have a smaller hex head for torque converter clearance. DO NOT interchange these bolts with similar size bolts for any reason.

TRANSMISSION CONTROLS AND COMPONENTS

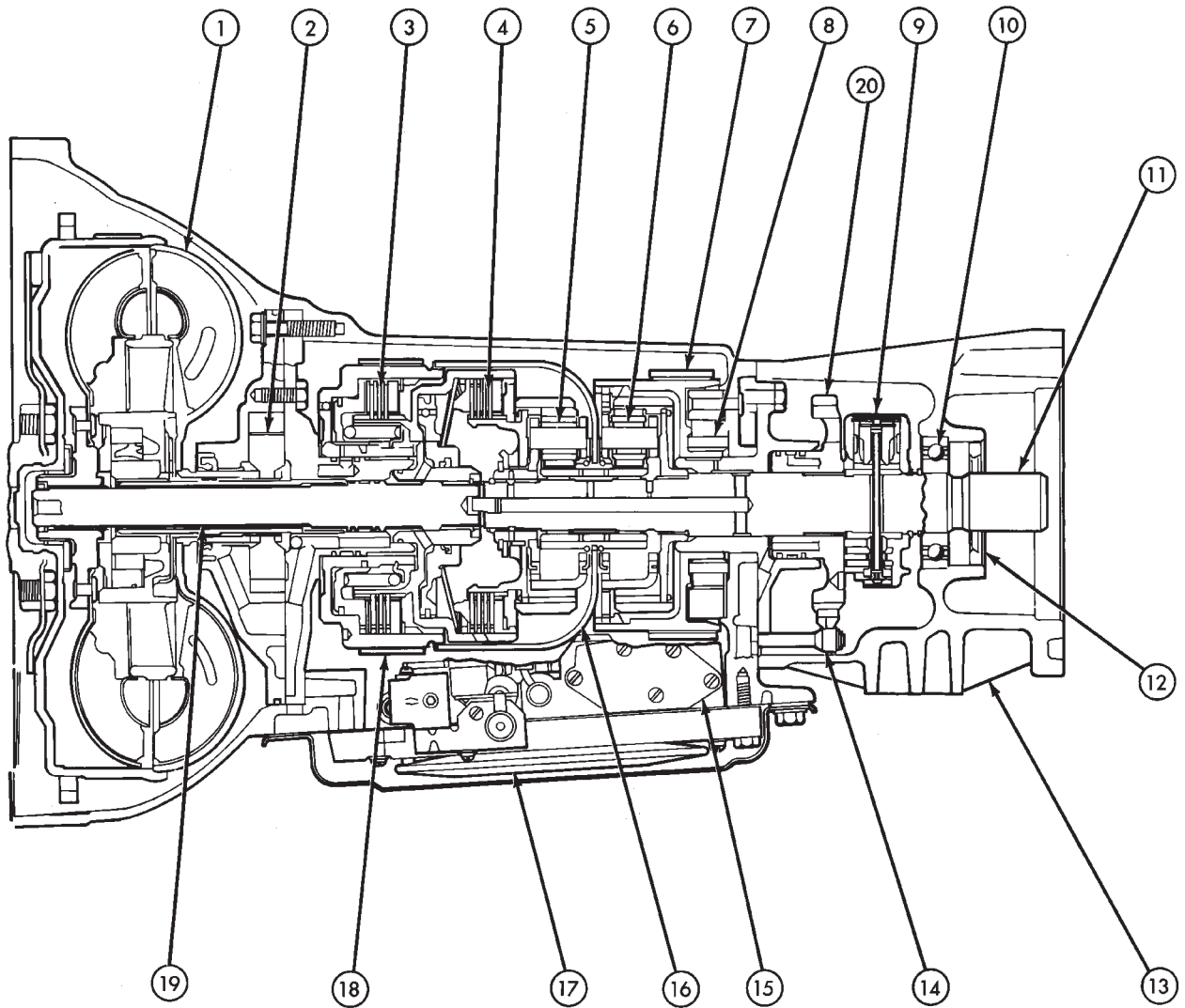
The transmission hydraulic control system performs five basic functions, which are:

- pressure supply
- pressure regulation
- flow control
- clutch/band apply and release
- lubrication

Pressure Supply And Regulation

The oil pump generates the fluid working pressure needed for operation and lubrication. The pump is driven by the torque converter. The converter is connected to the engine crankshaft through the driveplate.

The pressure regulator valve maintains operating (line) pressure. The regulator valve is located in the valve body. The amount of line pressure developed is



- | | |
|-------------------------------|--------------------------|
| ① CONVERTER | ⑪ OUTPUT SHAFT |
| ② OIL PUMP | ⑫ SEAL |
| ③ FRONT CLUTCH | ⑬ ADAPTER HOUSING |
| ④ REAR CLUTCH | ⑭ PARK LOCK ROD |
| ⑤ FRONT PLANETARY GEAR SET | ⑮ VALVE BODY |
| ⑥ REAR PLANETARY GEAR SET | ⑯ SUN GEAR DRIVING SHELL |
| ⑦ LOW AND REVERSE (REAR) BAND | ⑰ OIL FILTER |
| ⑧ OVERRUNNING CLUTCH | ⑱ KICK DOWN (FRONT) BAND |
| ⑨ GOVERNOR | ⑲ INPUT SHAFT |
| ⑩ BEARING | ⑳ PARK GEAR |

Fig. 1 30RH/32RH Automatic Transmission

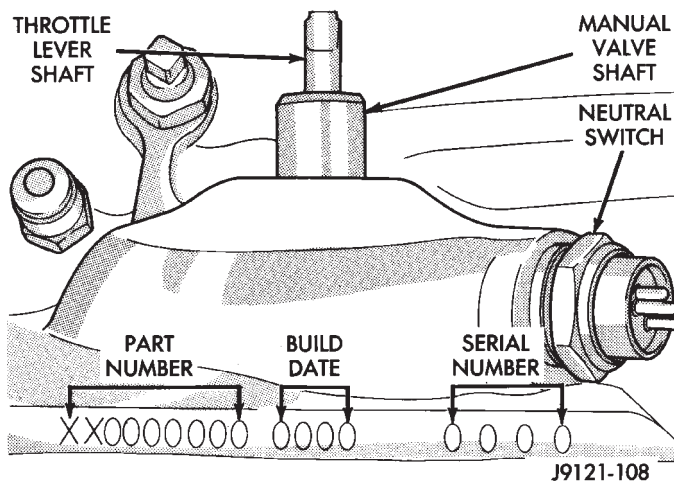


Fig. 2 Transmission Identification

controlled by throttle pressure, which is dependent on the degree of throttle opening.

The governor valve is operated by the transmission output shaft. Governor pressure increases in proportion to vehicle speed.

The throttle valve determines line pressure and shift speed. The throttle valve also controls upshift and downshift speeds by regulating pressure in conjunction with throttle position.

Shift Valves

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

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

The 2-3 valve throttle pressure plug provides 3-2 downshifts with varying throttle openings and depending on vehicle speed. The 1-2 shift control valve transmits 1-2 shift pressure to the accumulator piston to control kickdown band capacity on 1-2 upshifts and 3-2 downshifts.

The shuttle valve has two functions. First is fast front band release and smooth engagement during lift-foot 2-3 upshifts. The second is to regulate front clutch and band application during 3-2 downshifts.

Clutches-Bands-Servos-Accumulator

The front/rear clutch pistons and servo pistons are actuated by line pressure. When line pressure is removed, the pistons are released by spring tension.

On 2-3 upshifts, the front servo piston is released by spring tension and hydraulic pressure. The accumulator controls hydraulic pressure on the apply side of the front servo during 1-2 upshifts and at all throttle openings.

Converter Clutch Controls

Converter clutch operation is controlled by the power train control module, and by the solenoid and clutch module on the valve body. The solenoid is operated by a relay on the engine compartment side of the dash panel.

Activating the solenoid opens a vent allowing fluid to flow into the clutch module. When line pressure exceeds tension of the module valve springs, the module valves open. This allows fluid to be channeled to the converter clutch through the reaction shaft support and transmission shaft.

Gearshift And Parking Lock Controls

The gearshift lever provides six operating positions: Park (P), Reverse (R), Neutral (N), and the D, 2 and 1 forward drive ranges.

Manual 1 position provides first gear only. Overrun braking occurs in 1 range when the throttle is released. Upshifts are not provided in 1 range.

Manual 2 range provides first and second gear. A 1-2 upshift will take place but a 2-3 upshift will not occur.

D position provides 1-2, 2-3 upshifts and 3-2 and 3-1 downshifts.

Park position allows the park rod to move the park pawl into engagement with the park gear. This prevents rotation of the transmission output shaft. The park lock mechanism is only engaged when the shift lever is in the Park detent.

A park/neutral position switch controls engine starting. The switch is designed to allow engine starts only in park or neutral positions.

30RH/32RH TRANSMISSION DIAGNOSIS

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GENERAL INFORMATION

Automatic transmission problems are generally the result of:

- poor engine performance
- incorrect fluid level
- incorrect cable/linkage adjustment
- incorrect band adjustment
- incorrect hydraulic control pressure adjustments
- hydraulic component malfunctions
- mechanical component malfunctions.

Begin diagnosis by checking the easily accessible items such as fluid level, fluid condition and control linkage adjustment. A road test will determine if further diagnosis is necessary.

Procedures outlined in this section should be performed in the following sequence to realize the most accurate results:

- Preliminary diagnosis
- Check fluid Level and condition
- Check control linkage Adjustment
- Road test
- Stall test
- Hydraulic pressure test
- Air pressure tests
- Leak Tests
- Analyze test results and consult diagnosis charts

PRELIMINARY DIAGNOSIS

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

Vehicle Is Driveable

- (1) Check fluid level and condition.
- (2) Adjust throttle cable and gearshift linkage if complaint was based on delayed, erratic, or harsh shifts.
- (3) Road test vehicle and note transmission operating characteristics.
- (4) Perform stall test if complaint is based on sluggish, low speed acceleration or abnormal throttle opening needed to maintain normal speeds with properly tuned engine.
- (5) Perform hydraulic pressure tests.

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

Vehicle Is Disabled

- (1) Check fluid level and condition.
- (2) Check for broken, disconnected throttle linkage.
- (3) Check for cracked, leaking cooler lines, or loose, missing pressure port plugs.
- (4) Raise vehicle, start engine, shift transmission into gear and note following:
 - (a) If propeller shafts turn but wheels do not, problem is with differential or axle shafts.
 - (b) If propeller shafts do 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 shafts do not turn and transmission is not noisy, perform hydraulic pressure test to determine if problem is a hydraulic or mechanical.

FLUID LEVEL AND CONDITION

- (1) Position vehicle on level surface. This is important in obtaining an accurate fluid level check.
- (2) To avoid false readings, which could produce under or over fill condition, do not check level until fluid is at normal operating temperature.
- (3) Shift transmission into Neutral.
- (4) Apply parking brakes.
- (5) Operate engine at curb idle speed.

WARNING: WHEN PERFORMING UNDERHOOD OPERATIONS WITH THE ENGINE RUNNING, KEEP YOUR HANDS WELL AWAY FROM HOT OR ROTATING ENGINE COMPONENTS. DO NOT WEAR LOOSE ARTICLES OF CLOTHING WHICH COULD BECOME ENTANGLED IN ENGINE COMPONENTS OR ACCESSORIES.

- (6) Clean dipstick filler cap and tube before removing dipstick.
- (7) Remove dipstick and inspect fluid level.
 - Correct level is to FULL mark
 - Acceptable level is between ADD and FULL marks

(8) Check fluid condition. Fluid should be dark to light red in color and free of dirt or debris.

(9) If fluid is discolored or smells burned but transmission operation was OK, check cooler flow, flush cooler and lines and change fluid and filter. Then road test again to confirm proper operation.

(10) If fluid is black or dark brown, burned/turned to sludge, contains large quantities of metal or friction material particles, transmission will need overhaul. Especially if problems were evident during road test and preliminary diagnosis. Fluid cooler should also be flow tested and flushed if 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 causing the same conditions that occur 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 overflow can easily be mistaken for a leak if inspection is not careful.

TRANSMISSION THROTTLE VALVE CABLE ADJUSTMENT

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

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

GEARSHIFT LINKAGE

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

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

ROAD TEST

Before road testing, be sure the fluid level and all linkage adjustments have been checked and adjusted if necessary.

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

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

Watch closely for slippage or engine flare which usually indicates clutch, band or overrunning clutch problems. If the condition is advanced, an overhaul may be necessary to restore normal operation.

A slipping clutch or band can often be determined by comparing which internal units are applied in the various gear ranges. The Clutch and Band Application chart (Fig. 3) provides a basis for analyzing road test results.

DRIVE ELEMENTS	Gearshift Lever Position								
	P	R	N	D			2		1
				1	2	3	1	2	
FRONT CLUTCH		•				•			
FRONT BAND (KICKDOWN)					•			•	
REAR CLUTCH				•	•	•	•	•	•
REAR BAND (LOW-REV.)		•							•
OVER-RUNNING CLUTCH				•			•		•

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Fig. 3 Clutch And Band Application Chart

ANALYZING THE ROAD TEST

Refer to the Clutch and Band Application chart (Fig. 3) and note which elements are in use in the various gear ranges.

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

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

Applying the same method of analysis, note that both clutches are applied in D range third gear only. If the transmission slips in third gear, either the front clutch or the rear clutch is slipping. By selecting another gear which does not use one of these units, the slipping clutch can be determined.

Although road test analysis will help determine the slipping unit, the actual cause of a malfunction may not be determined until hydraulic and air pressure tests are performed. Practically any condition

can be caused by leaking hydraulic circuits or sticking valves. Unless the problem is an obvious one, do not remove and disassemble the transmission until hydraulic and air pressure tests have been performed.

HYDRAULIC PRESSURE TEST

Hydraulic test pressures range from a low of one psi (6.895 kPa) governor pressure, to 300 psi (2068.5 kPa) at the rear servo pressure port in reverse.

Use 100 psi Pressure Gauge C-3292 to check pressure at the accumulator, front servo, governor and fluid cooler line. Use 300 psi Gauge C-3293 to check pressure at the rear servo. The 300 psi gauge can be used at any other port when more than one gauge is required for testing.

PRESSURE TEST PORT LOCATIONS

There are pressure test ports at the accumulator, front servo, rear servo and governor.

Line pressure is checked at the accumulator port on the right side of the case (Fig. 4). The front servo release pressure port is at the right side of the case just behind the filler tube opening (Fig. 4).

The rear servo pressure port is at the right rear of the transmission case (Fig. 5).

On 4 x 2 models, the governor pressure port is at the left side of case at the transmission rear (Fig. 5). On 4 x 4 transmissions, the test port is in the driver side of the adapter housing (Fig. 6).

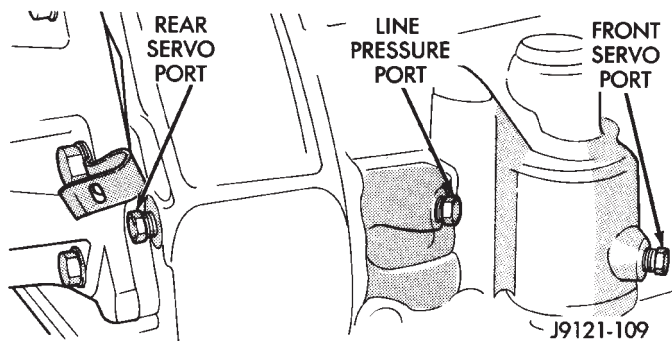


Fig. 4 Front Servo And Line Pressure Test Ports

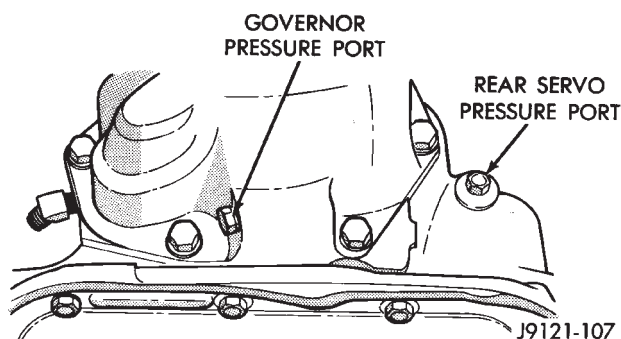


Fig. 5 Rear Servo And Governor Pressure Test Ports (4 x 2 Transmission)

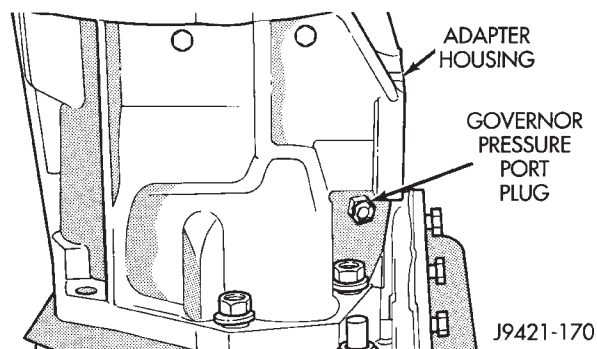


Fig. 6 Governor Pressure Test Port (4 x 4 Transmission)

PRESSURE TEST PROCEDURE

Connect a tachometer to the engine. Position the tachometer so it can be observed from under the vehicle. Raise the vehicle on hoist that will allow the wheels to rotate freely.

Test One-Transmission In 1 Range

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

(1) Connect test gauges to line pressure and rear servo ports (Figs. 4-6). **Be sure pressure test gauge is connected to rear servo port.**

(2) Disconnect throttle and gearshift rods at transmission.

(3) Start and run engine at 1000 rpm.

(4) Move valve body selector lever forward into 1 range.

(5) Read pressures on both gauges as transmission throttle lever is moved from full forward to full rearward position.

(6) Line pressure should be 54-60 psi (372-414 kPa) with throttle lever forward and gradually increase to 90-96 psi (620-662 kPa) as lever is moved rearward.

(7) Rear servo pressure should be same as line pressure within 3 psi.

Test Two-Transmission In 2 Range

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

(1) Connect test gauge to line pressure port (Fig. 4).

(2) Start and run engine at 1000 rpm.

(3) Move valve body selector 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 at both gauges.

(5) Line pressure should be 54-60 psi (372-414 kPa) with throttle lever forward and gradually increase to 90-96 psi (620-662 kPa) as lever is moved rearward.

Test Three-Transmission In D Range

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

(1) Connect one test gauge to line pressure port and other gauge to front servo pressure port (Fig. 4). Either gauge can be used at either port.

(2) Start and run engine at 1600 rpm.

(3) Move selector lever two detents rearward from full forward position. This is D range.

(4) Read pressures on both gauges as transmission throttle lever is moved from full forward to full rearward position.

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

(6) Front servo is pressurized only in D range and should be same as line pressure within 3 psi (21 kPa), up to downshift point.

Test Four-Transmission In Reverse

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

(1) Connect pressure test gauge to rear servo port (Fig. 5).

(2) Start and run engine at 1600 rpm for test.

(3) Move valve body selector lever four detents rearward from full forward position. This is Reverse range.

(4) Move throttle lever all way forward then all the way rearward and note gauge readings.

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

Test Five-Governor Pressure

This test checks governor operation by measuring governor pressure response to changes in engine speed. It is usually not necessary to check governor operation unless shift speeds are incorrect or if the transmission will not shift up or down. Use 100 psi Pressure Test Gauge C-3292 for this test.

(1) Connect test gauge to governor pressure port (Figs. 5 and 6).

(2) Move selector lever to D range.

(3) Apply service brakes. Start and run engine at curb idle speed and note pressure. At idle and with wheels stopped, pressure should be zero to 1-1/2 psi maximum. If pressure exceeds this figure, governor valve or weights are sticking open.

(4) Slowly increase engine speed and observe speedometer and pressure test gauge. Governor pressure should increase in proportion to vehicle speed (approximately 1 psi for every 1 mph shown on speedometer).

(5) Governor pressure rise should be smooth and drop back to 0 to 1-1/2 psi when throttle is closed and wheels are stopped.

(6) Compare results of pressure tests with analysis chart (Fig. 7).

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 (servo, clutch seals, governor support seal rings)
Pressure OK in 1, 2 but low in D3 and R	Leakage in front clutch area (servo, clutch seals, retainer bore, pump seal rings)
Pressure OK in 2 but low in R and 1	Leakage in rear servo
Front servo pressure in 2	Leakage in servo; broken servo ring or cracked servo piston
Pressure low in all positions	Clogged filter, stuck pressure regulator valve, worn or defective pump
Governor pressure too high at idle speed:	Governor valve sticking open
Governor pressure low at all mph figures	Governor valve sticking closed
Lubrication pressure low at all throttle positions	Clogged oil cooler or lines, seal rings leaking, output shaft plugged with debris, worn bushings in pump or clutch retainer

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Fig. 7 Pressure Test Analysis Chart

CONVERTER STALL TEST

Stall testing involves determining maximum engine rpm obtainable at full throttle with the rear wheels locked and the transmission in D range. This test checks the holding ability of the converter overrunning clutch and both of the transmission clutches. When stall testing is completed, refer to the Stall Speed Specifications chart and Stall Speed Diagnosis guides.

WARNING: NEVER ALLOW ANYONE TO STAND IN FRONT OF THE VEHICLE DURING A STALL TEST. ALWAYS BLOCK THE FRONT WHEELS AND APPLY THE SERVICE AND PARKING BRAKES DURING THE TEST.

STALL TEST PROCEDURE

- (1) Connect tachometer to engine.
- (2) Check and adjust transmission fluid level.
- (3) Start and run engine until transmission fluid reaches normal operating temperature.
- (4) Block front wheels.
- (5) Fully apply service and parking brakes.
- (6) Open throttle completely for no more than five seconds and record maximum engine rpm registered on tachometer.

CAUTION: Stall testing causes a rapid increase in transmission fluid temperature. Do not hold the throttle open any longer than five seconds. If more than one stall test is required, run the engine at 1000 rpm with the transmission in Neutral for at least 20 seconds to cool the fluid.

(7) If engine speed exceeds maximum shown in stall speed chart, release accelerator immediately. This indicates that transmission clutch slippage is occurring.

(8) Shift transmission into Neutral. Run engine for 20 seconds to cool fluid. Then stop engine, shift transmission into Park and release brakes.

- (9) Stall speeds should be in 1700-2000 rpm range.
- (10) Refer to Stall Test Diagnosis.

STALL TEST DIAGNOSIS

Stall Speed Too High

If the stall speed exceeds specifications by more than 200 rpm, transmission clutch slippage is indicated.

Stall Speed Too Low

Low stall speeds with a properly tuned engine indicate a torque converter overrunning clutch problem. The condition should be confirmed by road testing prior to converter replacement.

The converter overrunning clutch is slipping when stall speeds are 250 to 350 rpm below specified minimum. And when the vehicle operates properly at highway speeds but has poor low speed acceleration.

Stall Speed Normal

If stall speeds are normal but abnormal throttle opening is required to maintain highway speeds, the converter overrunning clutch is seized and the torque converter must be replaced.

Converter Noise During Test

A whining noise caused by fluid flow is normal during a stall test. However, loud metallic noises indicate a damaged converter. To confirm that noise is originating from the converter, operate the vehicle at light throttle in Drive and Neutral on a hoist and listen for noise coming from the converter housing.

AIR PRESSURE TEST

Air pressure testing can be used to check clutch and band operation 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 in Figure 8.

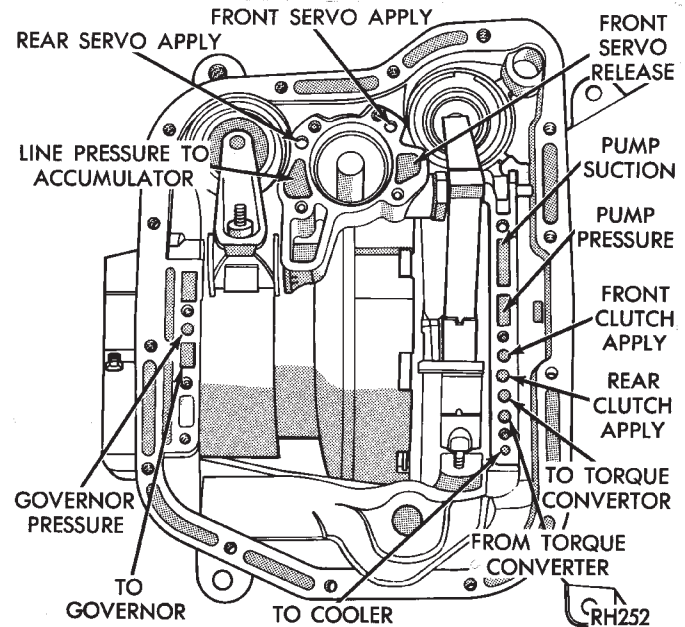


Fig. 8 Air Pressure Test Passages

Air Test Procedure

(1) Place one or two fingers on the clutch housing and apply air pressure through front clutch apply passage (Fig. 8). Piston movement can be felt and a soft thud heard as the clutch applies.

(2) Place one or two fingers on the clutch housing and apply air pressure through rear clutch apply passage (Fig. 8). Piston movement can be felt and a soft thud heard as the clutch applies.

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

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

CONVERTER HOUSING LEAK DIAGNOSIS

Two items must be established when diagnosing leaks from the converter housing area. First, it must be verified that a leak condition actually exists. And second, the true source of the leak must be determined.

Some suspected converter housing fluid leaks may not be leaks at all. Residual fluid in the housing, or excess fluid spilled during factory fill or refill after repair can be mistaken for a leak. In addition, a rear main seal leak can also be mistaken for a pump seal leak if care is exercised.

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. 9).

Pump vent or pump attaching bolt leaks are generally deposited on the inside of the converter housing and not on the converter itself (Fig. 9).

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.

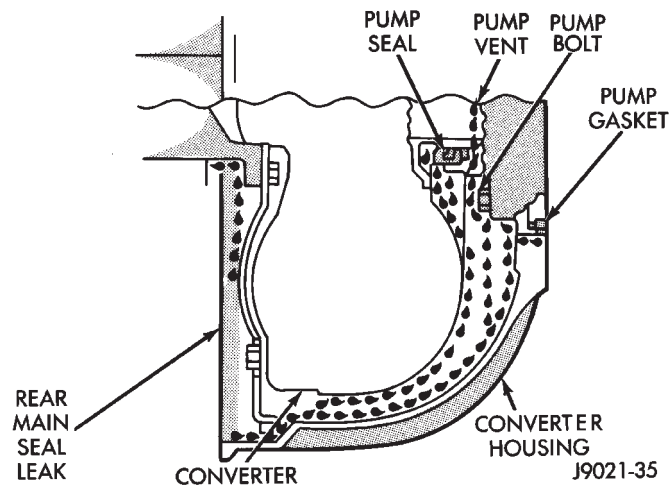


Fig. 9 Typical Converter Housing Leak Paths

LEAK DIAGNOSIS PROCEDURE

- (1) Raise the rear of the vehicle and allow accumulated fluid to drain out of the converter housing.
- (2) Check and adjust the transmission fluid level.
- (3) Raise the vehicle. Remove the converter housing dust cover and wipe as much fluid as possible from the converter housing.
- (4) Fabricate a test probe (Fig. 10). Then attach the probe to the converter housing with one of the dust shield bolts (Fig. 10).
- (5) Have a helper run the engine at 2500 rpm (with the transmission in Neutral) for two minutes; then stop the engine.
- (6) Inspect the test probe and converter housing. If a leak is evident, note the color of the fluid. Transmission fluid is red. Engine oil ranges in color from brown to green, or to black when the oil is dirty.

(7) If the probe upper surface is dry, the converter and seal are not at fault. A path of fluid across the probe upper surface indicates a converter or seal leak. Fluid leaking **under** the probe is coming from the pump housing area (Fig. 11).

(8) Fluid leaking under the probe could be from the: pump seal and/or bushing, pump vent, kickdown lever shaft access plug, pump bolts, or porous spots in the pump body or transmission case (Fig. 11).

(9) If porous spots in the transmission case or pump body are the suspected leak source, pressurize the transmission as described in Leak Testing With Air Pressure.

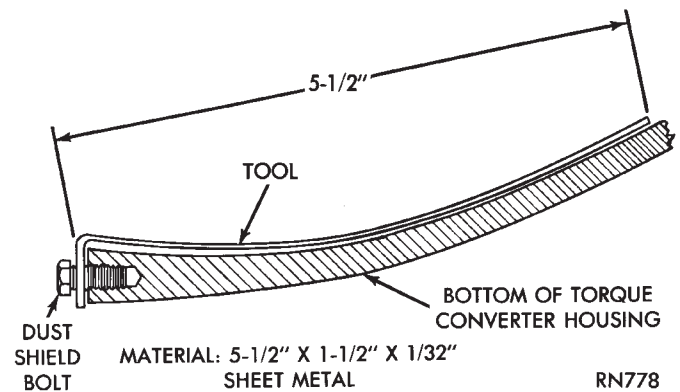


Fig. 10 Leak Test Probe

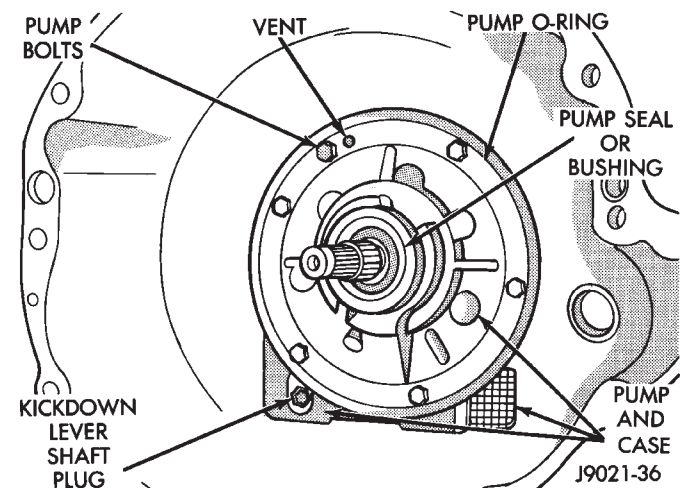


Fig. 11 Pump Area Inspection Points

LEAK TESTING WITH AIR PRESSURE

This test involves closing off the transmission openings and pressurizing the transmission to 8 psi with Air Pump Tool 7700. A soapy water solution is applied to suspected leak points before and during the pressure test. Leaks will be indicated by the presence of air bubbles coming through the solution.

Some transmission openings such as the fill tube and front cooler line fitting can be closed off with a rubber plug or similar device. Plugs can be secured with wire or duct tape.

The transmission rear output shaft opening is closed off simply by leaving the transfer case bolted in place. However, if the transfer case has been removed, a shipping plug can be used to close off this opening.

The torque converter hub opening in the pump and the pump vent require special tools to close them off. The converter hub seal cap is made from thin wall tube and a 3 mm (1/8 in.) thick disc (Fig. 12). A retaining strap is needed to secure the seal cup for testing. The strap can be made from 32 mm (1-1/4 in.) wide stock (Fig. 13). The strap attaching hole positions are approximate only. Measure hole position on the converter housing before drilling.

The pump vent tool is made from 6 mm (1/4 in.) rod and 5 mm (3/16 in.) plate (Fig. 14). The fabricated tools can all be made from mild steel or aluminum stock.

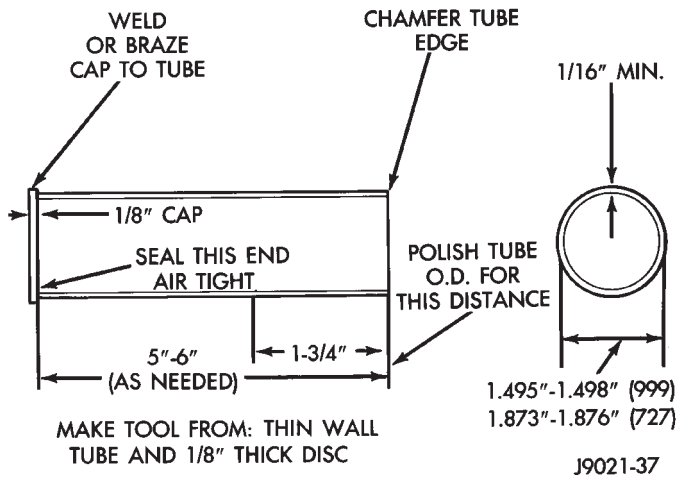


Fig. 12 Converter Hub Seal Cup

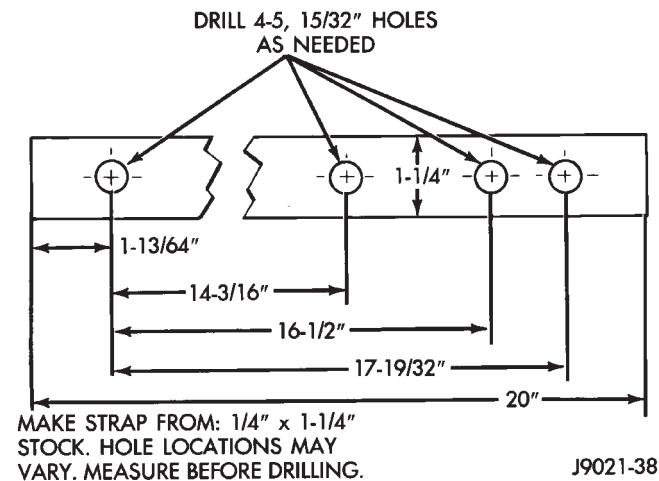


Fig. 13 Seal Cup Retaining Strap

AIR PRESSURE LEAK TEST PROCEDURE

(1) Install vent plug, converter hub seal cup and cup retaining strap (Fig. 15).

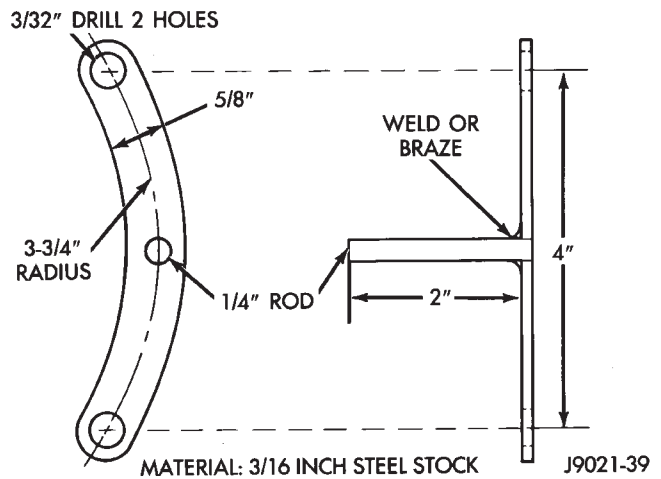


Fig. 14 Pump Vent Plug

(2) Close off remaining transmission openings with rubber plugs, or stoppers. **Do not close off rear cooler line fitting. Air pump will be attached to this fitting.**

(3) Attach Air Pump 7700 to rear cooler line fitting. Connect length of copper tube to fitting. Then attach air pump hose to tube with hose clamp (Fig. 16).

(4) Apply thick soapy water solution to suspected leak areas.

CAUTION: The recommended test pressure is 8 psi. The maximum allowable test pressure is 10 psi. Do not exceed specified test pressure.

(5) Pressurize transmission to 8 psi with air pump.
(6) Observe suspected leak areas. Air bubbles appearing in soapy water solution indicate leak points.

(7) Remove test tools and plugs after test completion and make necessary repairs as described in Leak Correction procedure.

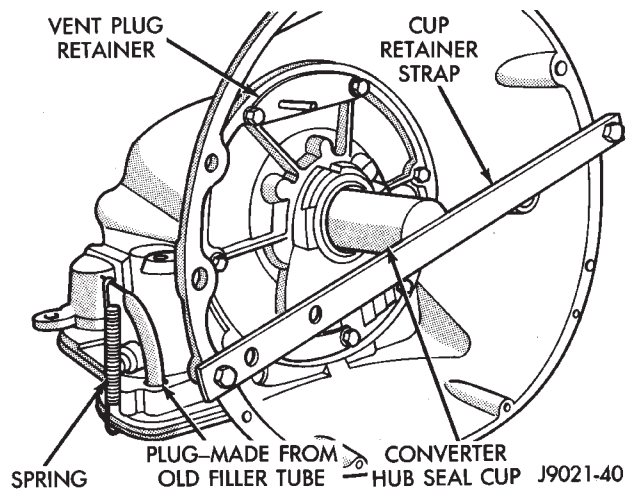


Fig. 15 Vent Plug And Hub Seal Cup Installation

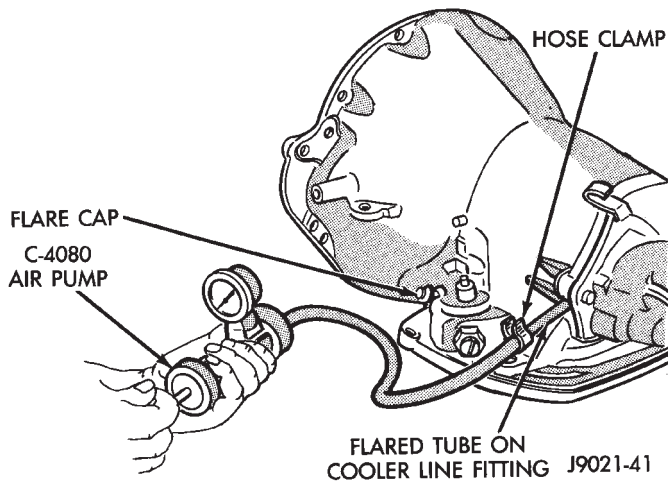


Fig. 16 Pressurizing Transmission

CONVERTER HOUSING AREA LEAK CORRECTION

- (1) Remove converter.
- (2) Tighten front band adjusting screw until band is tight around clutch retainer. This prevents clutches from coming out when oil pump is removed.
- (3) Remove oil pump and 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 if scoring is severe.

(5) Install new pump seal, O-ring, gasket, bushing. Replace oil pump if cracked, porous or damaged in any way.

(6) Loosen kickdown lever pin plug two turns. Apply Permatex No. 2 or equivalent 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.

(10) Install converter housing dust shield and lower vehicle.

DIAGNOSIS GUIDES AND CHARTS

The diagnosis charts provide additional reference for transmission diagnosis.

The hydraulic flow charts outline fluid flow and hydraulic circuitry. Circuit operation is provided for all gear ranges. Normal working pressures are also supplied for each of the various gear ranges.

30RH/32RH TRANSMISSION DIAGNOSIS

Condition	Possible Cause	Correction
<p>HARSH ENGAGEMENT (FROM NEUTRAL TO DRIVE OR REVERSE)</p> <p>Note: The shift from neutral to reverse is normally quite firm. Hydraulic pressure at the rear servo can approach 300 psi in reverse gear. Do not confuse a firm engagement with a truly harsh engagement</p>	<ol style="list-style-type: none"> 1. Engine idle speed too high 2. Driver "riding" accelerator pedal during shift 3. Throttle cable or linkage misadjusted 4. Band adjustment needed 5. Loose mounting bolts 6. Worn or damaged U-joints 7. Loose axle pinion nut 8. Hydraulic pressure is incorrect 9. Accumulator piston spring, or seal worn or damaged 10. Faulty converter clutch (if equipped) 11. Clutch, band, or planetary component is damaged 	<ol style="list-style-type: none"> 1. Check/adjust idle speed 2. Advise owner/operator 3. Adjust cable or linkage; setting is either too long or too short 4. Adjust front/rear bands 5. Check engine, transmission, propeller shaft, crossmember, and axle bolt torque; tighten loose bolts and replace missing bolts 6. Remove propeller shaft and replace U-joints 7. Replace nut and check pinion threads before installing new nut; replace pinion gear if threads are damaged 8. Check pressures; remove, overhaul, or adjust valve body as needed; repair oil pump if necessary 9. Remove valve body and replace piston, seal, or spring as needed 10. Replace converter and flush cooler and lines before installing new converter 11. Remove, disassemble, and repair transmission as necessary
<p>DELAYED ENGAGEMENT (FROM NEUTRAL TO DRIVE OR REVERSE)</p>	<ol style="list-style-type: none"> 1. Engine idle speed too low 2. Low fluid level 3. Gearshift linkage out of adjustment 4. Rear band out of adjustment 5. Valve body filter plugged 6. Oil pump gears worn or damaged or pump body or seal is damaged, allowing pump to take in air, causing fluid aeration 7. Reaction shaft seal rings worn or broken 8. Governor valve stuck or valve shaft is loose or damaged 9. Low hydraulic pressure 10. Clutch, band, or servo damage 	<ol style="list-style-type: none"> 1. Adjust idle speed 2. Correct level and check for leaks 3. Adjust cable or linkage and repair linkage if worn or damaged 4. Adjust band 5. Replace fluid and filter. If oil pan and old fluid were full of clutch disc material and/or metal particles, overhaul will be necessary 6. Remove transmission and replace oil pump 7. Remove transmission, remove oil pump, and replace seal rings 8. Remove and inspect governor components; replace worn or damaged parts 9. Perform pressure test, remove transmission, and repair as needed 10. Remove and disassemble transmission and repair as necessary

30RH/32RH TRANSMISSION DIAGNOSIS

Condition	Possible Cause	Correction
SHIFTS DELAYED OR ERRATIC (SHIFTS ALSO HARSH AT TIMES)	<ol style="list-style-type: none"> 1. Low fluid level 2. Throttle linkage out of adjustment 3. Throttle linkage is binding 4. Gearshift linkage out of adjustment 5. Fluid filter partially clogged 6. Air in fluid due to overfill condition or air leakage into pump suction passages 7. Clutch or servo problem 8. Front band out of adjustment (may cause harsh 1-2 shift) 	<ol style="list-style-type: none"> 1. Correct fluid level and check for leaks 2. Adjust linkage as described in service section 3. Disassemble, clean, and adjust linkage; replace linkage grommets if removed or if worn or cracked 4. Adjust linkage as described in service section 5. Replace filter. If filter and fluid contained clutch material or metal particles, an overhaul may be necessary 6. Drain fluid to correct level if overfilled. If fluid is highly aerated (full of bubbles and foamy), oil pump gasket or seal may have failed, or pump body is porous or cracked 7. Remove valve body and air test clutch, band and servo operation; disassemble and repair transmission as needed 8. Adjust band
NO REVERSE (D RANGES OK)	<ol style="list-style-type: none"> 1. Gearshift linkage is either out of adjustment or damaged 2. Rear band is out of adjustment 3. Valve body malfunction (stuck/damaged manual valve, regulator valve, or check ball) 4. Rear servo or front clutch malfunction 	<ol style="list-style-type: none"> 1. Repair or replace linkage parts as needed 2. Adjust band 3. Remove and service valve body; replace valve body if any valves or valve bores are worn or damaged 4. Remove and disassemble transmission; replace worn, damaged servo and clutch parts as necessary
HAS FIRST-REVERSE ONLY (NO 1-2 OR 2-3 UPSHIFT)	<ol style="list-style-type: none"> 1. Governor valve, shaft, weights, or body damaged 	<ol style="list-style-type: none"> 1. Remove governor assembly and repair as necessary

30RH/32RH TRANSMISSION DIAGNOSIS

Condition	Possible Cause	Correction
NO DRIVE RANGE (REVERSE OK)	<ol style="list-style-type: none"> 1. Gearshift linkage either loose, damaged or out of adjustment 2. Low fluid level 3. Valve body malfunction (manual valve or shaft damaged or 1-2 shift valve stuck) 4. Rear clutch failure 5. Transmission overrunning clutch failure 6. Input shaft seal rings worn or damaged 	<ol style="list-style-type: none"> 1. Repair or replace linkage components 2. Correct fluid level and check for leaks 3. Remove and disassemble valve body; replace as assembly if any valves or bores are damaged 4. Remove and disassemble transmission and rear clutch; repair/replace worn, damaged parts as needed 5. Remove and disassemble transmission; replace overrunning clutch 6. Remove and disassemble transmission; replace seal rings and any other worn or damaged parts
NO DRIVE OR REVERSE (VEHICLE WILL NOT MOVE)	<ol style="list-style-type: none"> 1. Low fluid level 2. Gearshift linkage loose, damaged, or misassembled 3. Failure of driveline component, such as U-joint, axle shaft, transfer case component, etc. 4. Low fluid pressure due to worn or damaged oil pump 5. Transmission internal component damaged 6. Valve body malfunction (seized valve, damaged manual lever, valve body screws loose or overtightened causing distortion and bind) 	<ol style="list-style-type: none"> 1. Add fluid and check for leaks if drive is restored 2. Inspect, adjust, and reassemble linkage as needed; replace worn, damaged parts 3. Perform preliminary inspection procedure for vehicle that will not move; refer to procedure in diagnosis section 4. Perform pressure test to confirm low pressure; replace pump body and/or gears if necessary 5. Remove and disassemble transmission; repair or replace failed components as needed 6. Remove, disassemble, 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

30RH/32RH TRANSMISSION DIAGNOSIS

Condition	Possible Cause	Correction
MOVES IN 2ND OR 3RD GEAR, ABRUPTLY DOWNSHIFTS TO LOW	<ol style="list-style-type: none"> 1. Governor valve sticking 2. Valve body malfunction 	<ol style="list-style-type: none"> 1. Remove, clean, and inspect; replace faulty parts 2. Remove, clean, and inspect; look for stuck 1-2 valve or governor plug
SLIPS IN LOW GEAR D ONLY, BUT NOT IN 1 POSITION	<ol style="list-style-type: none"> 1. Overrunning clutch faulty, not holding 	<ol style="list-style-type: none"> 1. Replace overrunning clutch
SLIPS IN FORWARD DRIVE RANGES	<ol style="list-style-type: none"> 1. Low fluid level 2. Air in fluid (fluid is foamy, full of bubbles), shifts are spongy, caused by air getting into pump suction passages 3. Gearshift or throttle linkage out of adjustment 4. Low hydraulic pressures due to worn pump, incorrect control pressure adjustments, valve body warpage or malfunction, sticking governor, leaking seal rings, clutch seals leaking, servo leaks, clogged filter, or cooler lines 5. Accumulator piston cracked, spring broken or seal worn 6. Clutch or servo malfunction, leaking seals or worn plates 7. Overrunning clutch worn, not holding (slips in 1 only) 	<ol style="list-style-type: none"> 1. Add fluid and check for leaks 2. Check for bad pump gasket or seals, dirt between pump halves, and loose pump bolts or defective O-ring at filler tube 3. Adjust linkage 4. Perform hydraulic and air pressure tests to determine cause 5. Inspect and repair as necessary 6. Air pressure check clutch-servo operation and repair as required 7. Replace clutch
SLIPS IN REVERSE ONLY	<ol style="list-style-type: none"> 1. Low fluid level 2. Aerated fluid; see Slips in Forward Drive Ranges 3. Gearshift linkage out of adjustment 4. Rear band out of adjustment 5. Hydraulic pressure too low due to worn pump, worn seal rings, clutch or servo seal leakage 6. Worn front clutch, leaking rear servo, or worn rear band 7. Band-linkage binding 	<ol style="list-style-type: none"> 1. Add fluid and check for leaks 2. See Slips in Forward Drive Ranges 3. Adjust linkage 4. Adjust band 5. Perform hydraulic pressure tests to determine cause 6. Air pressure check clutch-servo operation and repair as required 7. Inspect and repair as required

30RH/32RH TRANSMISSION DIAGNOSIS

Condition	Possible Cause	Correction
NO KICKDOWN OR NORMAL DOWNSHIFT	<ol style="list-style-type: none"> 1. Incorrect throttle linkage or cable adjustment 2. Incorrect gear shift linkage or cable adjustment 3. Front band out of adjustment 4. Hydraulic pressures too high or too low due to sticking governor, valve body malfunction, or incorrect hydraulic control pressure adjustments 5. Front servo, band, or linkage malfunction 6. Clutch or servo malfunction 	<ol style="list-style-type: none"> 1. Adjust linkage or cable 2. Adjust linkage or cable 3. Adjust band 4. Perform hydraulic pressure tests to determine cause and repair as required. Correct valve body pressure adjustments as required 5. Air pressure test operation and repair as necessary 6. Air pressure test operation and repair as necessary
STUCK IN LOW GEAR (WILL NOT UPSHIFT)	<ol style="list-style-type: none"> 1. Gearshift or throttle linkage or cable out of adjustment 2. Front band out of adjustment 3. Governor valve stuck closed; loose output shaft support or governor housing bolts, worn pump, leaking seal rings, or valve body problem (i.e., stuck 1-2 shift valve or governor plug) 4. Clutch or servo malfunction 	<ol style="list-style-type: none"> 1. Adjust linkage or cable. Repair linkage of worn or damaged. Replace damaged cable. 2. Adjust band 3. Check line and governor pressures to determine cause; correct as required 4. Air pressure check operation of clutches and bands; repair faulty component
NO LOW GEAR (MOVES IN 2ND OR 3RD GEAR ONLY)	<ol style="list-style-type: none"> 1. Governor valve sticking in partially open position 2. Valve body malfunction 3. Front servo piston cocked in bore 4. Front band linkage malfunction 5. Incorrect throttle or gearshift linkage or cable adjustment 	<ol style="list-style-type: none"> 1. Remove governor; clean, inspect, and repair as required 2. Remove, clean, and inspect. Look for sticking 1-2 valve, 2-3 valve, governor plug, or broken springs 3. Inspect servo and repair as required 4. Inspect linkage and look for bind in linkage 5. Adjust linkage or cable

30RH/32RH TRANSMISSION DIAGNOSIS

Condition	Possible Cause	Correction
CREEPS IN NEUTRAL	<ol style="list-style-type: none"> 1. Gearshift linkage out of adjustment 2. Valve body malfunction (warped body, cross leakage) 3. Clutch dragging 4. Converter lockup clutch dragging 	<ol style="list-style-type: none"> 1. Adjust linkage 2. Perform hydraulic pressure test to determine cause and repair as required 3. Air pressure check operation of clutches and repair as required 4. Oil pump worn; replace pump
DRAGS OR LOCKS UP	<ol style="list-style-type: none"> 1. Front or rear band out of adjustment 2. Servo band or linkage malfunction (i.e., binding linkage, warped band, servo piston stuck) 3. Dragging clutch (does not release fully) 4. Broken or seized planetary gears 5. Overrunning clutch worn, broken, or seized 	<ol style="list-style-type: none"> 1. Adjust bands 2. Air pressure check servo operation and repair as required 3. Air pressure check clutch operation and repair as required 4. Remove, inspect, and repair as required (look for debris in oil pan) 5. Remove and inspect clutch, repair as required
GROWLING, GRATING, OR SCRAPING NOISES	<ol style="list-style-type: none"> 1. Planetary gear set broken or seized 2. Overrunning clutch worn, seized, or broken 3. Oil pump components scored, binding, or broken 4. Output shaft bearing or bushing damaged 5. Faulty clutch operation 6. Governor support (park gear) binding or seal rings broken 7. Front and rear bands out of adjustment 	<ol style="list-style-type: none"> 1. Check for debris in oil pan and repair as required 2. Inspect and check for debris in oil pan; repair as required 3. Remove, inspect, and repair as required 4. Remove, inspect, and repair as required 5. Perform air pressure check and repair as required 6. Remove, inspect, and repair as required 7. Adjust bands
BUZZING NOISE	<ol style="list-style-type: none"> 1. Low fluid level 2. Air being drawn into pump suction passages 3. Overrunning clutch damaged 4. Valve body misassembled, bolts loose, weak spring, or mispositioned valve or check ball 	<ol style="list-style-type: none"> 1. Add fluid and check for leaks 2. Check pump for porous casting, scores on mating surfaces, and excess rotor clearance; repair as required 3. Replace clutch 4. Remove, disassemble, inspect valve body; reassemble correctly if necessary; replace assembly if valves or springs are damaged

30RH/32RH TRANSMISSION DIAGNOSIS

Condition	Possible Cause	Correction
OIL COMES OUT FILLER TUBE	<ol style="list-style-type: none"> 1. Transmission overfilled 2. Breather vent in oil pump blocked 3. Fluid cooler or cooler lines plugged 4. Air in fluid (aerated) 5. Oil filter clogged 6. Rear servo piston or seal failure 7. Valve body switch valve sticking 	<ol style="list-style-type: none"> 1. Drain fluid to correct level; remove neutral switch and drain through switch hole with suction gun 2. Inspect and clear blockage 3. Flush cooler and lines 4. See "Slips In Forward Drive Ranges" 5. Replace filter; determine the reason for clogged condition and repair 6. Check hydraulic pressure at servo in reverse (will register low or fluctuate rapidly) 7. Remove and clean valve
OIL LEAKS (ITEMS LISTED REPRESENT POSSIBLE LEAK POINTS AND SHOULD ALL BE CHECKED)	<ol style="list-style-type: none"> 1. Speedometer adapter 2. Pan gasket 3. Filler tube (where tube enters case) 4. Fluid lines and fittings 5. Valve body manual lever shaft seal 6. Pressure port plug loose 7. Rear bearing access plate 8. Gasket damaged or bolts are loose 9. Adapter/extension gasket damaged 10. Neutral switch 11. Converter housing area 12. Cooler line fittings and hoses 13. Pump seal 14. Torque converter 	<ol style="list-style-type: none"> 1. Replace both adapter seals 2. Tighten pan screws to 150 inch-pounds; if leaks persist, replace gasket; do not overtighten screws 3. Replace O-ring seal 4. Tighten fittings; if leaks persist, replace fittings and lines if necessary 5. Replace shaft seal 6. Tighten to correct torque; replace plug if leak persists 7. Replace gasket 8. Replace bolts or gasket or tighten bolts 9. Replace gasket 10. Replace switch and gasket 11. 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 12. Replace fittings and hoses 13. Replace seal 14. Replace converter

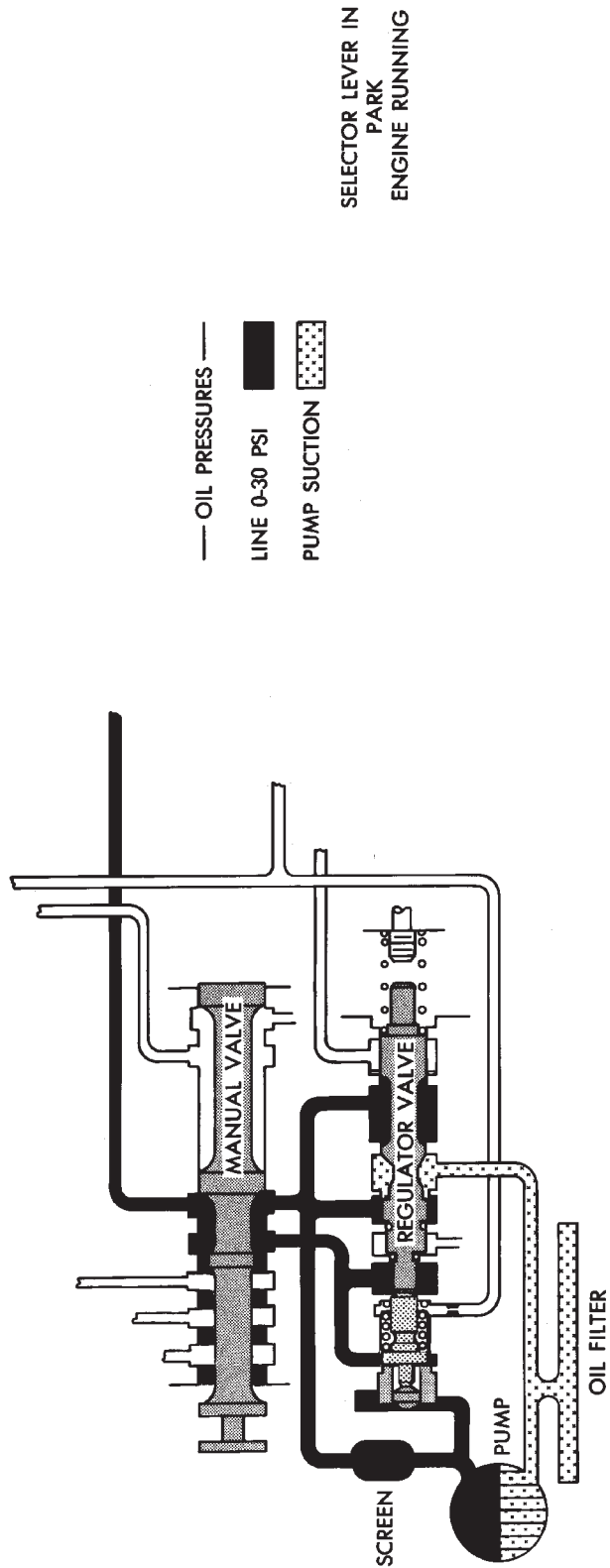
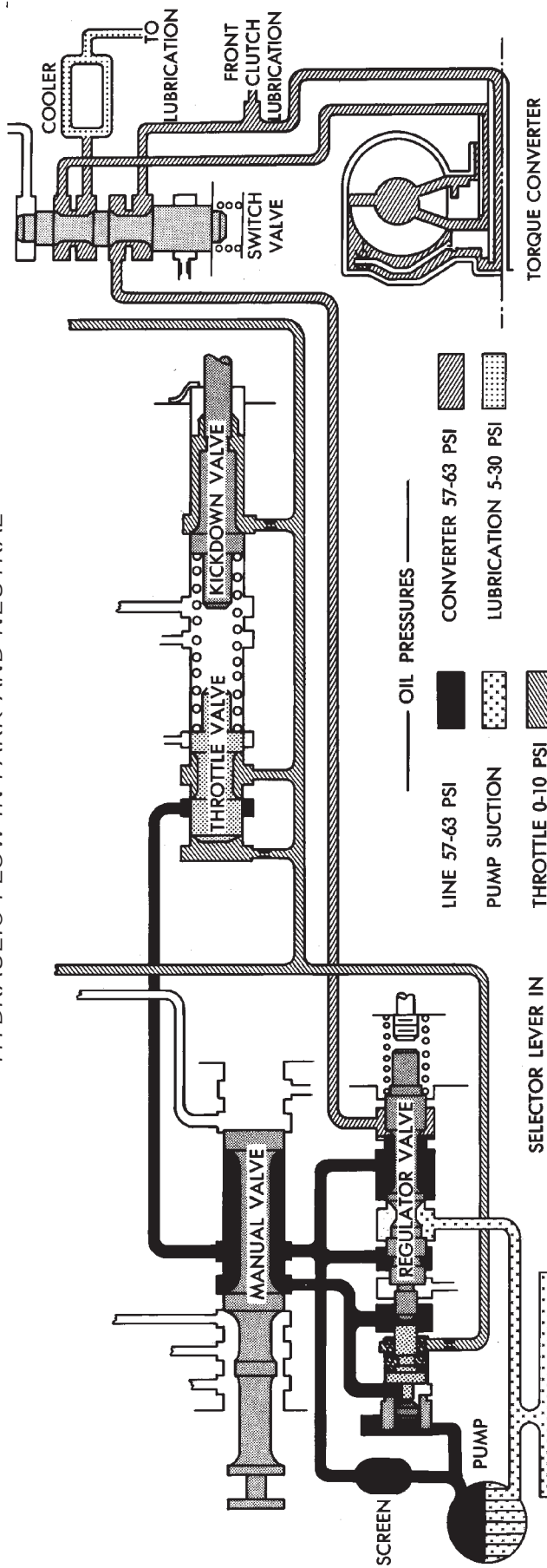
30RH/32RH TRANSMISSION DIAGNOSIS

Condition	Possible Cause	Correction
<p>OVERHEAT DURING COMMERCIAL OPERATION OR WHILE TRAILER TOWING (FLUID DARK AND BURNED WITH SOME SLUDGE FORMATION)</p>	<ol style="list-style-type: none"> 1. Vehicle not properly equipped for trailer towing or commercial use 2. Vehicle not equipped with auxiliary fluid cooler 3. Extensive idling time or operation in heavy traffic in hot weather 4. Tow vehicle overloaded (exceeding vehicle tow capacity) 5. Air flow to auxiliary cooler blocked by snow plow, front mounted spare tire, bug screen, or similar item 	<ol style="list-style-type: none"> 1. Be sure vehicle is equipped with recommended optional components (i.e., HD springs, transmission, axle, larger CID engine, auxiliary cooler, correct axle ratio, etc.). If vehicle is not so equipped, it should not be used for severe service operation 2. Drain fluid, change filter, and install auxiliary cooler 3. Cut down on idling time; shift into neutral every so often and run engine at 1000 rpm to help circulate fluid through cooler 4. Be sure vehicle is properly equipped to handle load; do not tow Class III-type loads with a vehicle that is only rated for Class I or II operation 5. Remove or reposition item causing air flow blockage
<p>OVERHEAT DURING NORMAL OPERATION (FLUID DISCOLORED, SMELLS BURNED)</p>	<ol style="list-style-type: none"> 1. Low fluid level 2. Fluid cooler, lines blocked, or cooler cracked (oil in engine coolant) 3. Switch valve sticking 4. Clutch pack clearance incorrect (too tight) 5. Bands too tight 	<ol style="list-style-type: none"> 1. Add fluid and check for leaks 2. Flush cooler and lines and replace radiator if transmission fluid has entered coolant 3. Remove, disassemble, clean valve body 4. Check and correct as required 5. Adjust bands

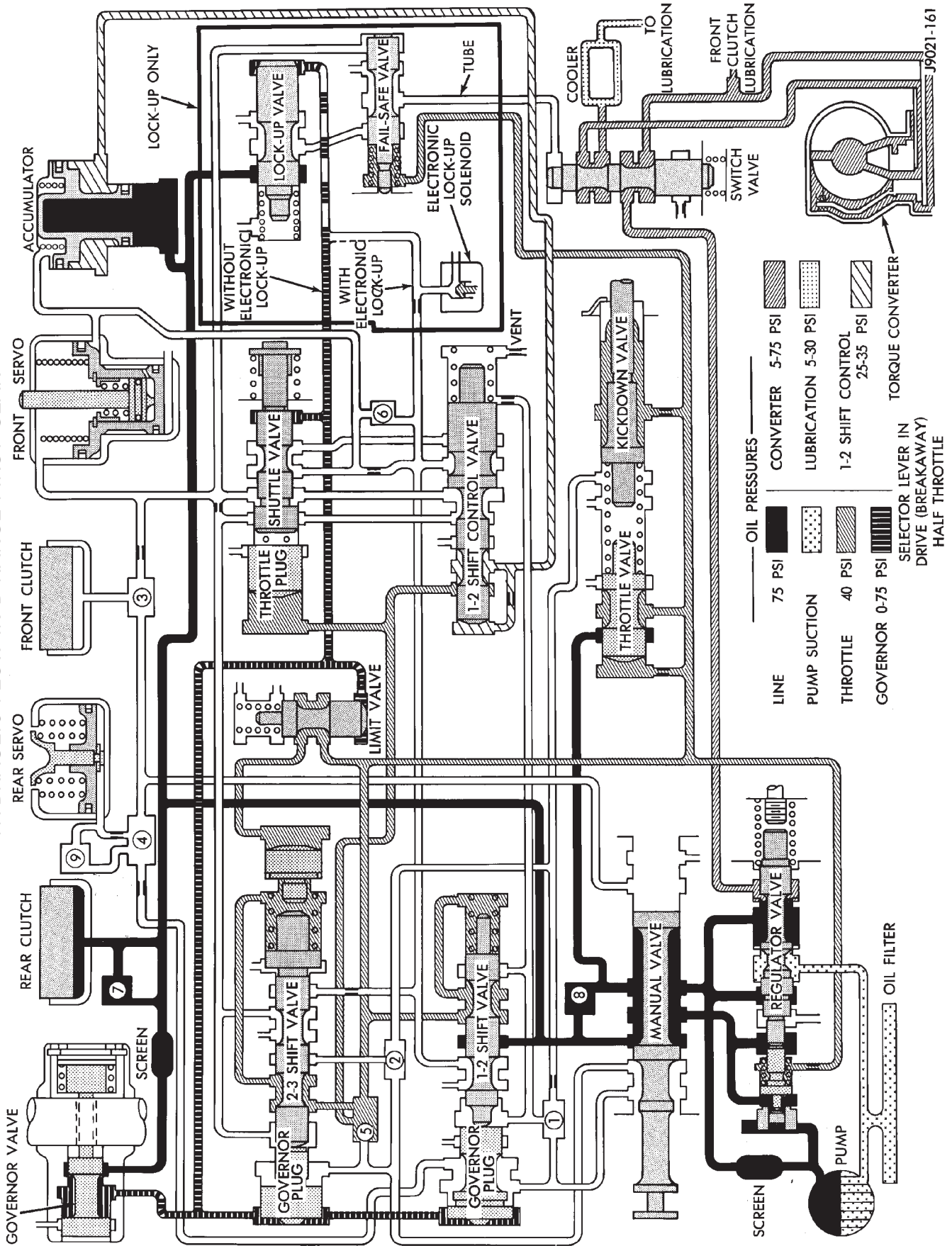
30RH/32RH TRANSMISSION DIAGNOSIS

Condition	Possible Cause	Correction
NO START IN PARK OR NEUTRAL	<ol style="list-style-type: none"> 1. Gearshift linkage out of adjustment 2. Neutral switch wire broken or open 3. Faulty neutral switch 4. Valve body manual lever assembly bent, worn, broken, or not aligned with switch 	<ol style="list-style-type: none"> 1. Adjust linkage 2. Check continuity with test lamp; repair as required 3. Refer to service section for test and replacement procedure 4. Inspect lever assembly and replace if damaged
SLUGGISH ACCELERATION AT LOW SPEEDS OR REQUIRES EXCESSIVE THROTTLE OPENING TO MAINTAIN HIGHWAY SPEEDS	<ol style="list-style-type: none"> 1. Poor engine performance 2. Gearshift or throttle linkage out of adjustment 3. Transmission clutches slipping 4. Overrunning clutch in converter not holding 5. Converter overrunning clutch stuck 	<ol style="list-style-type: none"> 1. Check engine and repair as required 2. Adjust linkage 3. Perform stall test and repair as required 4. Perform stall test and replace converter if clutch has failed 5. Replace converter
FLUID CONTAMINATED (DISCOLORED, FULL OF SLUDGE AND/OR METAL AND FRICTION MATERIAL PARTICULAR)	<ol style="list-style-type: none"> 1. If contamination occurred shortly after overhaul, fluid cooler and lines were not flushed and flow tested. This is especially true when original overhaul was to correct a problem that generated a large amount of debris, such as a gear failure or a clutch pack failure Note: Flushing the cooler and lines is mandatory after a failure of the converter lockup clutch 2. Incorrect fluid used in transmission 3. Main cooler in radiator is cracked, allowing engine coolant to enter transmission 4. Severe overload results in overheat, fluid breakdown, and accelerated wear, especially in high ambient temperatures. Most frequent causes are: <ul style="list-style-type: none"> • Vehicle is not properly equipped for heavy duty service • Tow vehicle and boat or trailer are both overloaded • Trailer or boat are too large for tow vehicle (load exceeds rated capacity of tow vehicle) 	<ol style="list-style-type: none"> 1. If contamination is severe, cooler flushing, converter replacement, and another overhaul may be necessary; particularly so if shift problems were also present 2. If transmission is operating properly, drain fluid, reverse flush cooler and lines, and change fluid and filter. However, if shift problem has developed, converter replacement and transmission overhaul may be required 3. Replace radiator (and cooler) and flush lines. If problem was diagnosed early enough, fluid and filter change may only be necessary. If contamination period was prolonged, overhaul and converter replacement may be required 4. Repair transmission, flush cooler, and lines. Replace converter if necessary. Install auxiliary cooler if needed. Also install HD cooling system if needed. If tow vehicle and unit being towed are both overloaded, the only repair is to reduce the load to rated limits. However, if trailer or boat is too large for tow vehicle, the only option is for the owner to move up to properly-equipped and load-rated tow vehicle

HYDRAULIC FLOW IN PARK AND NEUTRAL



HYDRAULIC FLOW IN D RANGE FIRST GEAR

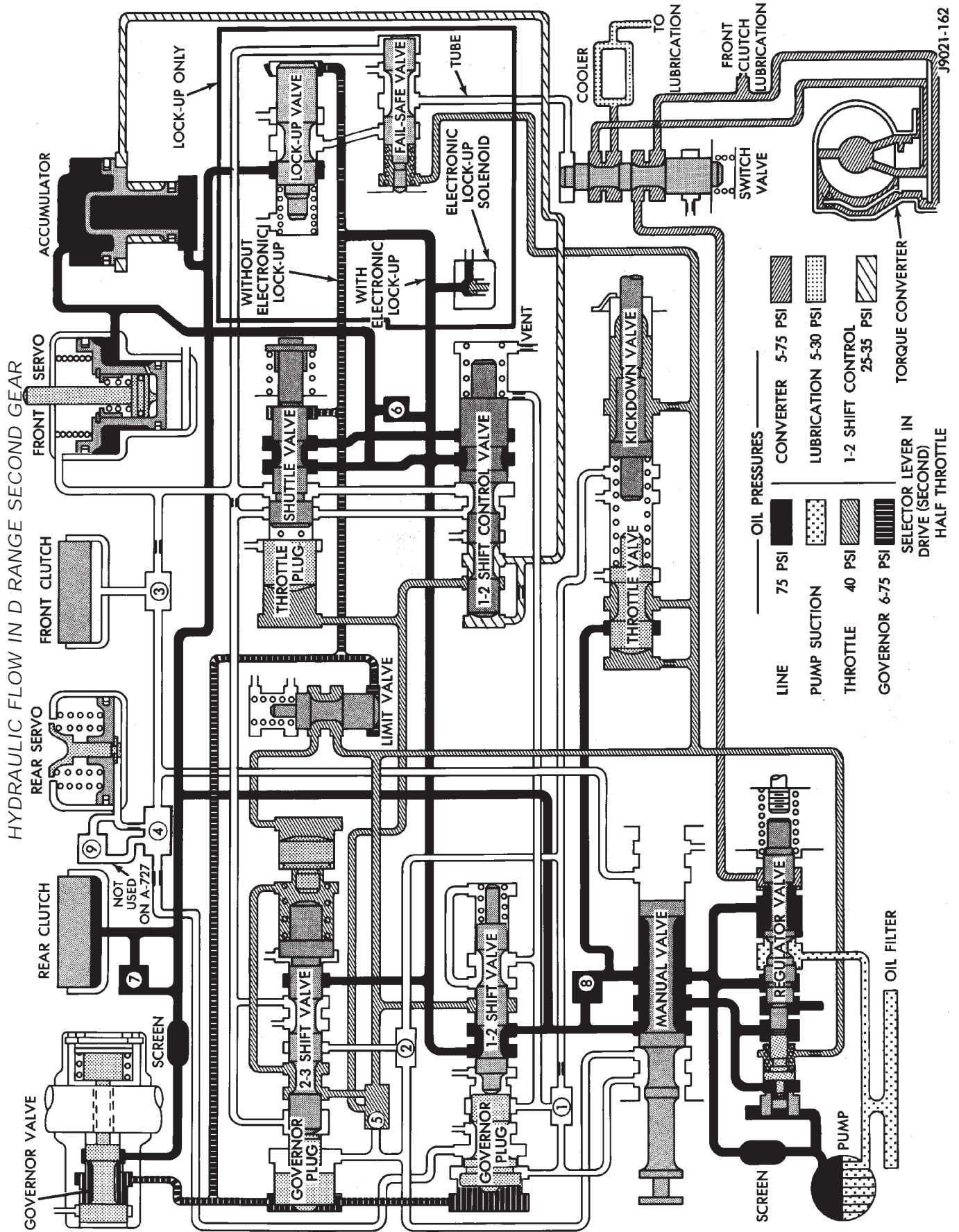


OIL PRESSURES

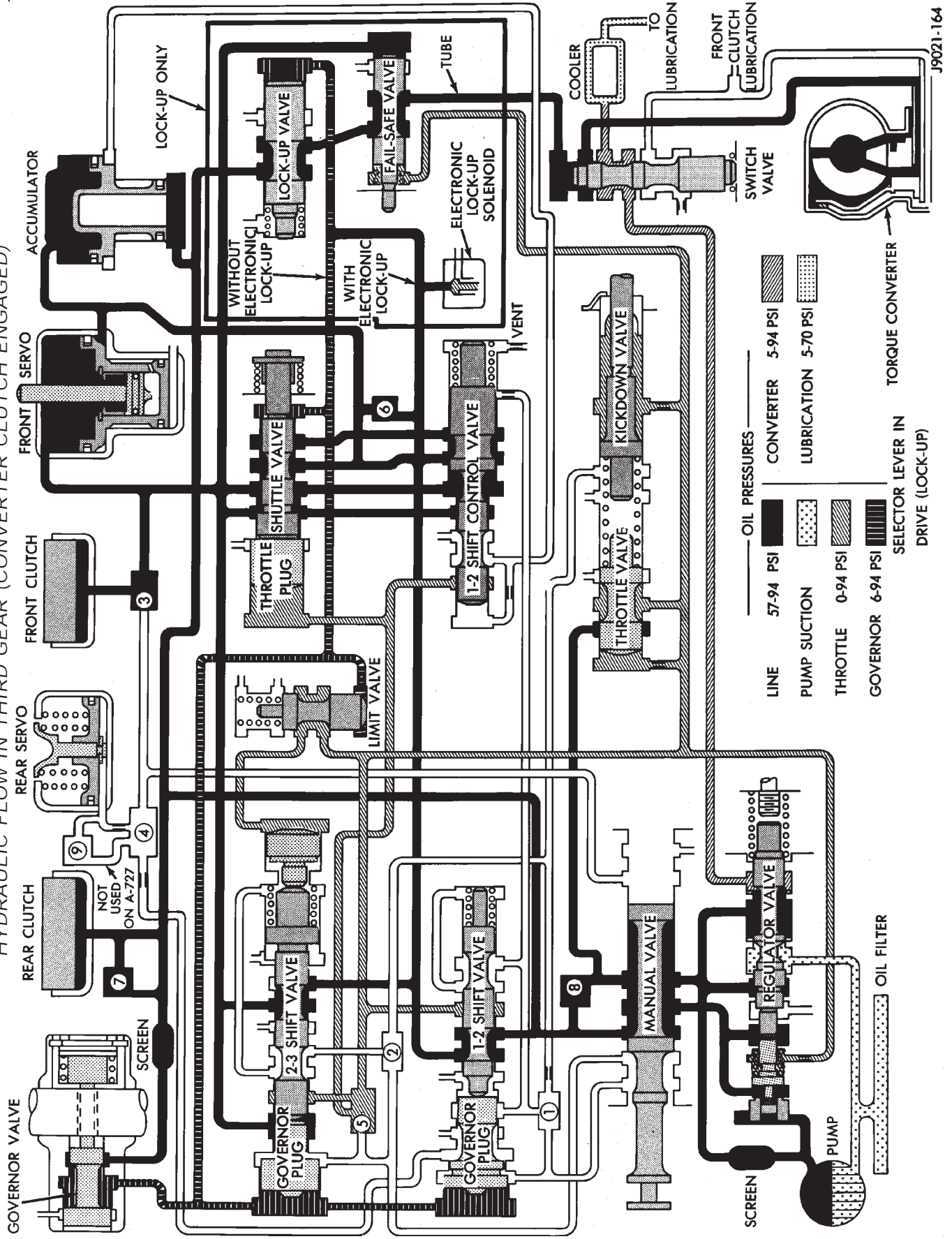
LINE	75 PSI	CONVERTER	5-75 PSI
PUMP SUCTION	40 PSI	LUBRICATION	5-30 PSI
THROTTLE	40 PSI	1-2 SHIFT CONTROL	25-35 PSI
GOVERNOR 0-75 PSI	0-75 PSI	TORQUE CONVERTER	5-75 PSI

SELECTOR LEVER IN DRIVE (BREAKAWAY)
HALF THROTTLE

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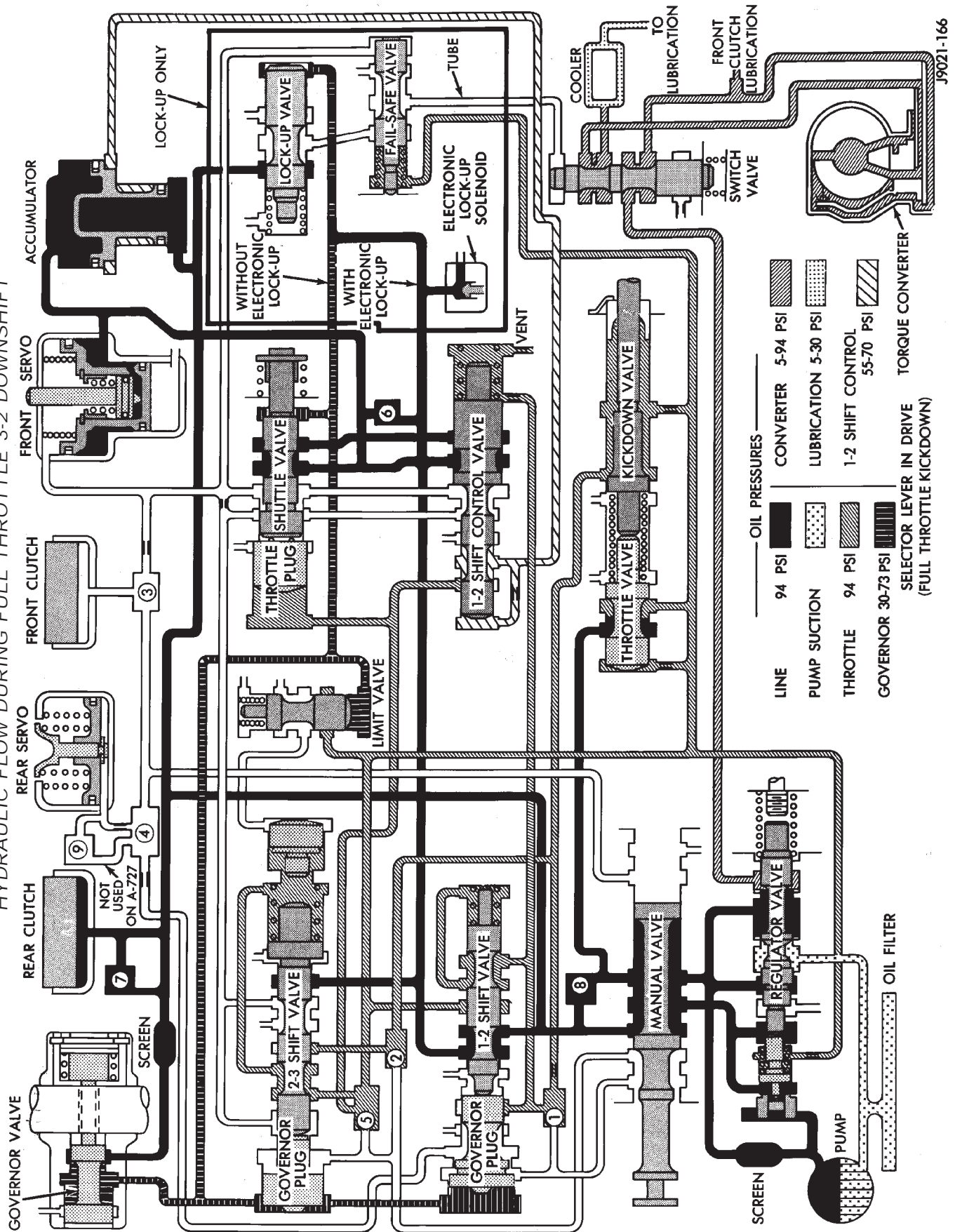


HYDRAULIC FLOW IN THIRD GEAR (CONVERTER CLUTCH ENGAGED)

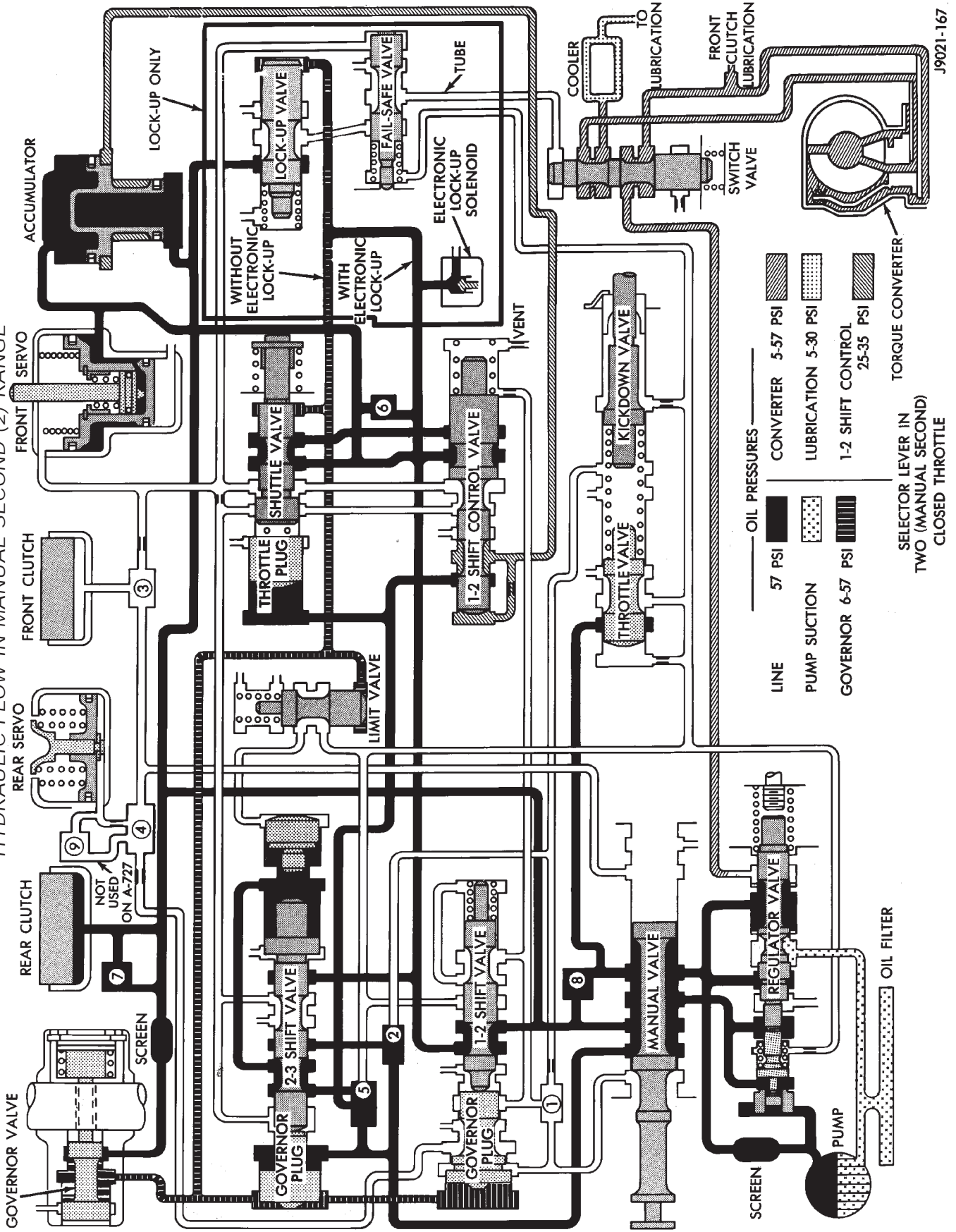


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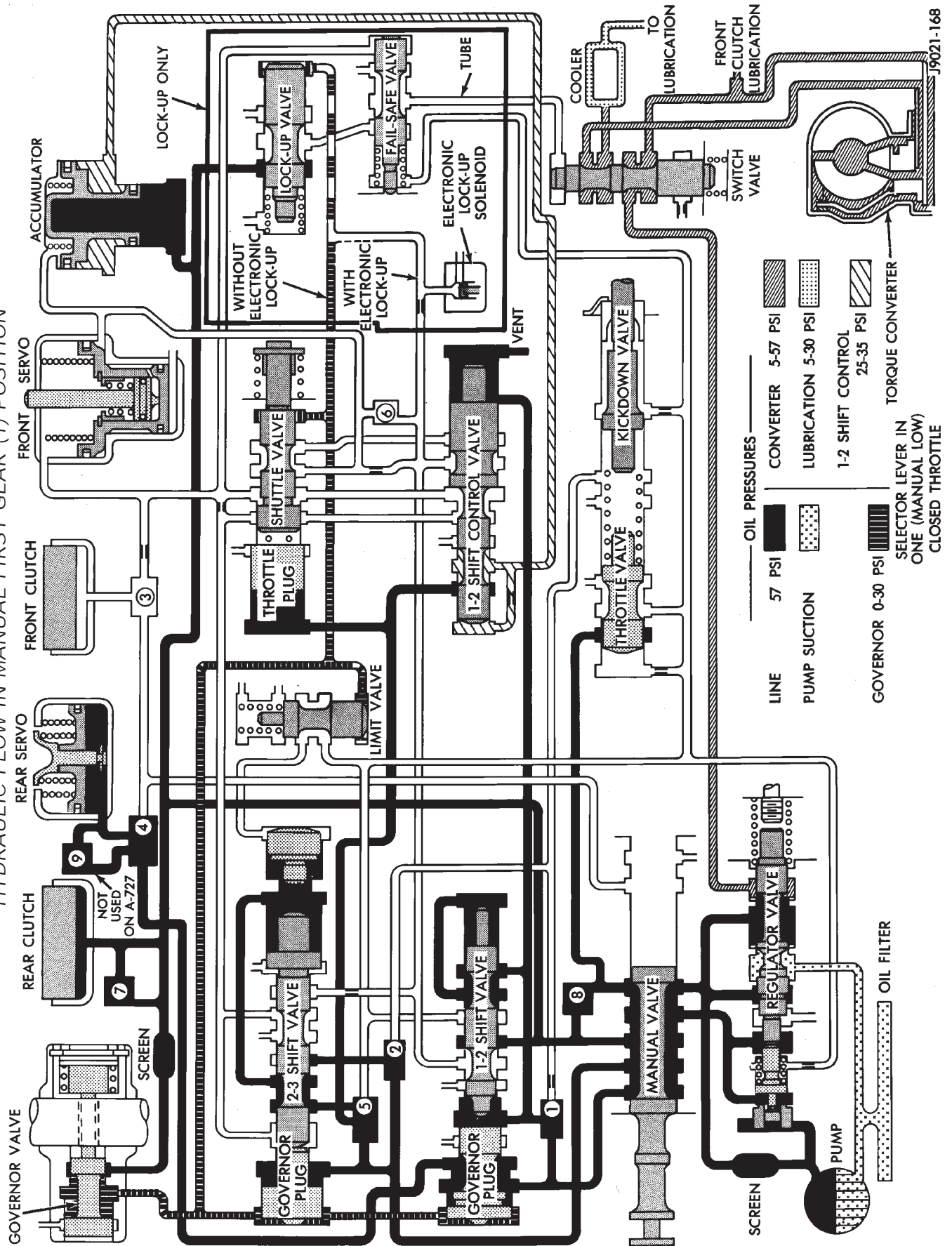
HYDRAULIC FLOW DURING FULL THROTTLE 3-2 DOWNSHIFT



HYDRAULIC FLOW IN MANUAL SECOND (2) RANGE



HYDRAULIC FLOW IN MANUAL FIRST GEAR (1) POSITION



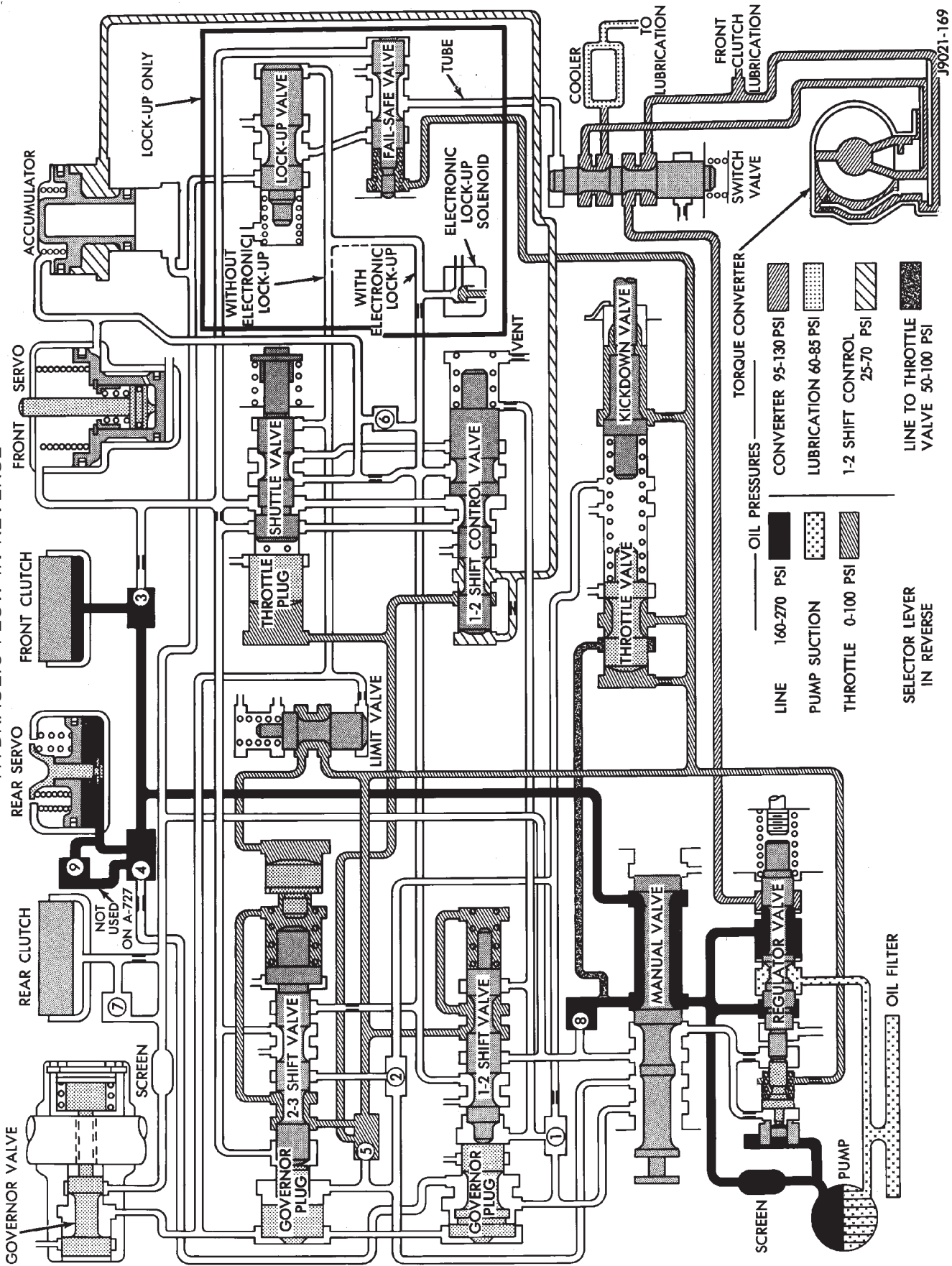
OIL PRESSURES

LINE	57 PSI	CONVERTER	5-57 PSI
PUMP SUCTION		LUBRICATION	5-30 PSI
		1-2 SHIFT CONTROL	25-35 PSI
		TORQUE CONVERTER	

SELECTOR LEVER IN ONE (MANUAL LOW) CLOSED THROTTLE

J9021-168

HYDRAULIC FLOW IN REVERSE



— OIL PRESSURES —

LINE 160-270 PSI	CONVERTER 95-130 PSI
PUMP SUCTION	LUBRICATION 60-85 PSI
THROTTLE 0-100 PSI	1-2 SHIFT CONTROL 25-70 PSI
SELECTOR LEVER IN REVERSE	LINE TO THROTTLE VALVE 50-100 PSI

J9021-169

30RH/32RH IN-VEHICLE SERVICE

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RECOMMENDED FLUID

The recommended and preferred fluid for 30RH/32RH transmissions is Mopar ATF Plus, Type 7176.

Mopar Dexron II is acceptable but should only be used when ATF Plus is not available.

Transmission fluid capacity is approximately 17 pints (7.9 liters). This is the approximate amount of fluid required to fill the transmission and torque converter after overhaul.

CHECKING FLUID LEVEL AND CONDITION

(1) Position vehicle on flat, level surface. This is important in obtaining an accurate fluid level check.

(2) To avoid false readings, which could produce under or over fill condition, do not check level until fluid is at normal operating temperature.

(3) Shift transmission into Neutral.

(4) Apply parking brakes.

(5) Operate engine at curb idle speed.

WARNING: WHEN PERFORMING UNDERHOOD OPERATIONS WITH THE ENGINE RUNNING, KEEP YOUR HANDS WELL AWAY FROM HOT OR ROTATING ENGINE COMPONENTS. DO NOT WEAR LOOSE ARTICLES OF CLOTHING WHICH COULD BECOME ENTANGLED IN ENGINE COMPONENTS OR ACCESSORIES.

(6) Shift transmission through all gear ranges and back to Neutral (leave engine running).

(7) Clean exterior of dipstick cap and fill tube before removing transmission dipstick.

(8) Remove dipstick and inspect fluid level.

- Correct level is to FULL mark
 - Acceptable level is between ADD and FULL marks
- (9) Check fluid condition. Fluid should be dark to light red in color and free of dirt or debris.

(10) If fluid is discolored or smells burned but transmission operation was OK, check cooler flow, flush cooler and lines and change fluid and filter. Then road test again to confirm proper operation.

(11) If fluid is black or dark brown, burned/turned to sludge, contains large quantities of metal or friction material particles, transmission will need overhaul. Especially if problems were evident during road test and preliminary diagnosis. Fluid cooler should also be flow tested and flushed if necessary.

GEARSHIFT LINKAGE ADJUSTMENT (YJ)

(1) Check linkage adjustment by starting engine in Park and Neutral.

(2) Adjustment is OK if engine starts only in park and Neutral. Adjustment is incorrect if engine starts in one but not both positions.

(3) If engine starts in any position other than Park or Neutral, or if engine will not start at all, park/neutral position switch may be faulty.

(4) Shift transmission into Park.

(5) Raise vehicle.

(6) Check condition of shift rods, bellcrank, bellcrank brackets and linkage bushings/grommets (Fig. 1). Tighten, repair, replace worn, damaged parts. Do not attempt adjustment if linkage components are worn or damaged.

(7) Loosen shift rod trunnion lock bolt or nut. Be sure upper shift rod slides freely in trunnion (Fig. 1). Also be sure shift rods and bellcrank rotate freely and do not bind at any point.

(8) Verify that manual lever is in Park detent (Fig. 1). Move lever all the way rearward to be sure it is in Park.

(9) Check for positive engagement of park lock by attempting to rotate propeller shaft. Shaft will not turn when park pawl is engaged.

(10) Adjust shift rod trunnion to obtain free pin fit in bellcrank arm and tighten trunnion lock bolt or nut. Prevent shift rod from turning while tightening bolt or nut. Gearshift linkage lash must be eliminated to obtain proper adjustment. Eliminate lash by pulling downward on shift rod and pressing upward on bellcrank.

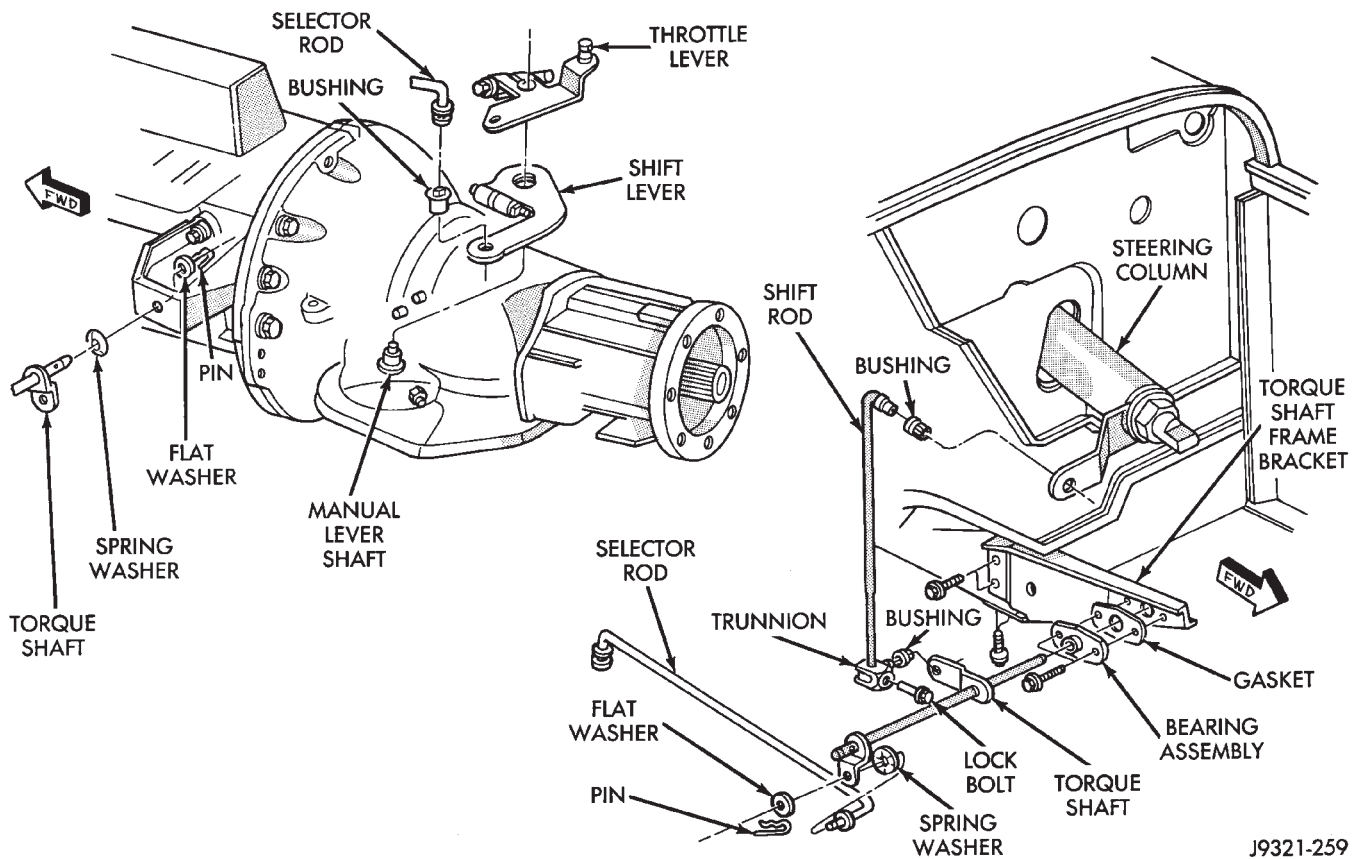


Fig. 1 Gearshift Linkage (YJ)

(11) Confirm proper adjustment by starting engine in Park and Neutral. Engine should start in these positions only. **If engine starts in any position other than Park or Neutral, adjustment is incorrect or neutral switch is faulty.**

(12) Lower vehicle and verify that steering lock operates correctly.

SHIFT CABLE ADJUSTMENT (XJ)

- (1) Shift transmission into Park.
- (2) Raise vehicle.
- (3) Release cable adjuster clamp to unlock cable (Figs. 2 and 3). Clamp is at transmission end of cable.
- (4) Unsnap cable from transmission cable bracket (Figs. 2 and 3).
- (5) Move transmission shift lever fully rearward to Park detent. Lever is on manual valve shaft at driver side of case.
- (6) Verify positive engagement of park lock by attempting to rotate propeller shaft. Shaft will not rotate when park lock is engaged.
- (7) Snap cable into cable bracket.
- (8) Lock shift cable by pressing cable adjuster clamp down until it snaps into place.
- (9) Check engine starting. Engine should start only in Park and Neutral.
- (10) Lower vehicle.

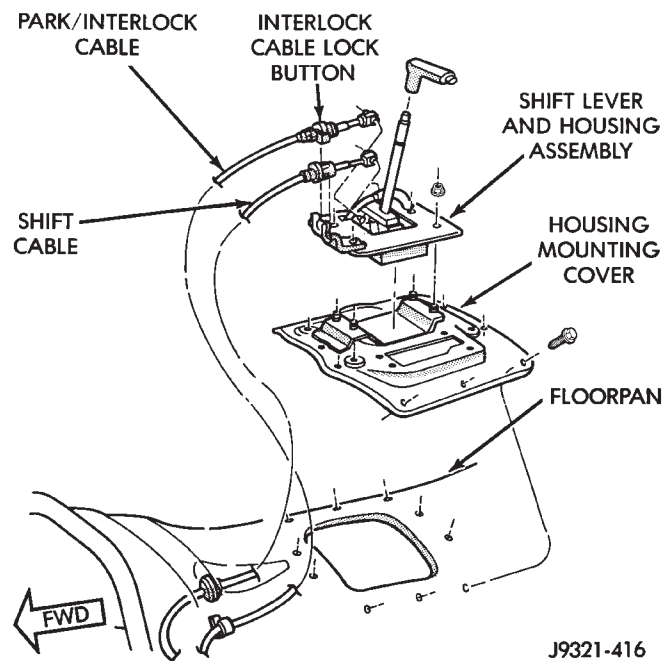


Fig. 2 Shift Cable (XJ)

PARK INTERLOCK CABLE ADJUSTMENT (XJ)

- (1) Shift transmission into Park.
- (2) Turn ignition switch to Lock position.
- (3) Remove shift lever bezel and console screws. Raise bezel and console for access to cable.

- (4) Pull cable lock button up to release cable (Fig. 3).
- (5) Pull cable forward. Then release cable and press cable lock button down until it snaps in place.
- (6) Check adjustment as follows:
 - (a) Check movement of release shift handle button (floor shift) or release lever (column shift). You should not be able to press button inward or move column lever.
 - (b) Turn ignition switch to On position.
 - (c) Press floor shift lever release button or move column lever. Then shift into Neutral. If cable adjustment is correct, ignition switch can not be turned to Lock position. Perform same check with transmission in D range.
- (7) Move shift lever back to Park and check ignition switch operation. You should be able to turn switch to Lock position and shift lever release button/lever should not move.

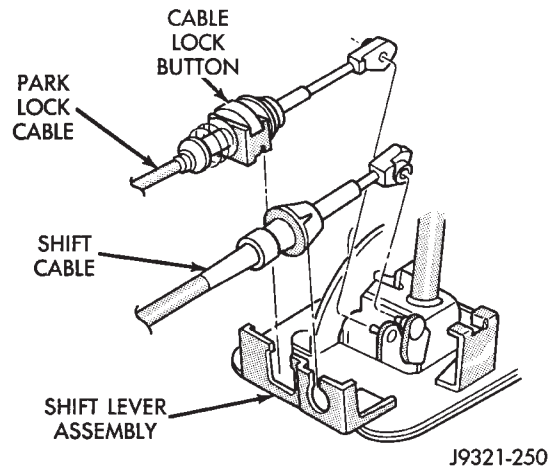


Fig. 3 Park Lock Cable Attachment (XJ)
quality and shift speeds will be unsatisfactory.

TRANSMISSION THROTTLE CABLE ADJUSTMENT (XJ/YJ)

A cable is used to control throttle pressure and kickdown on 30RH/32RH transmissions (Fig. 4).

Correct cable adjustment is important to proper operation. The cable positions the throttle valve which controls shift speed, shift quality and part throttle downshift sensitivity. If the setting is incorrect, shift

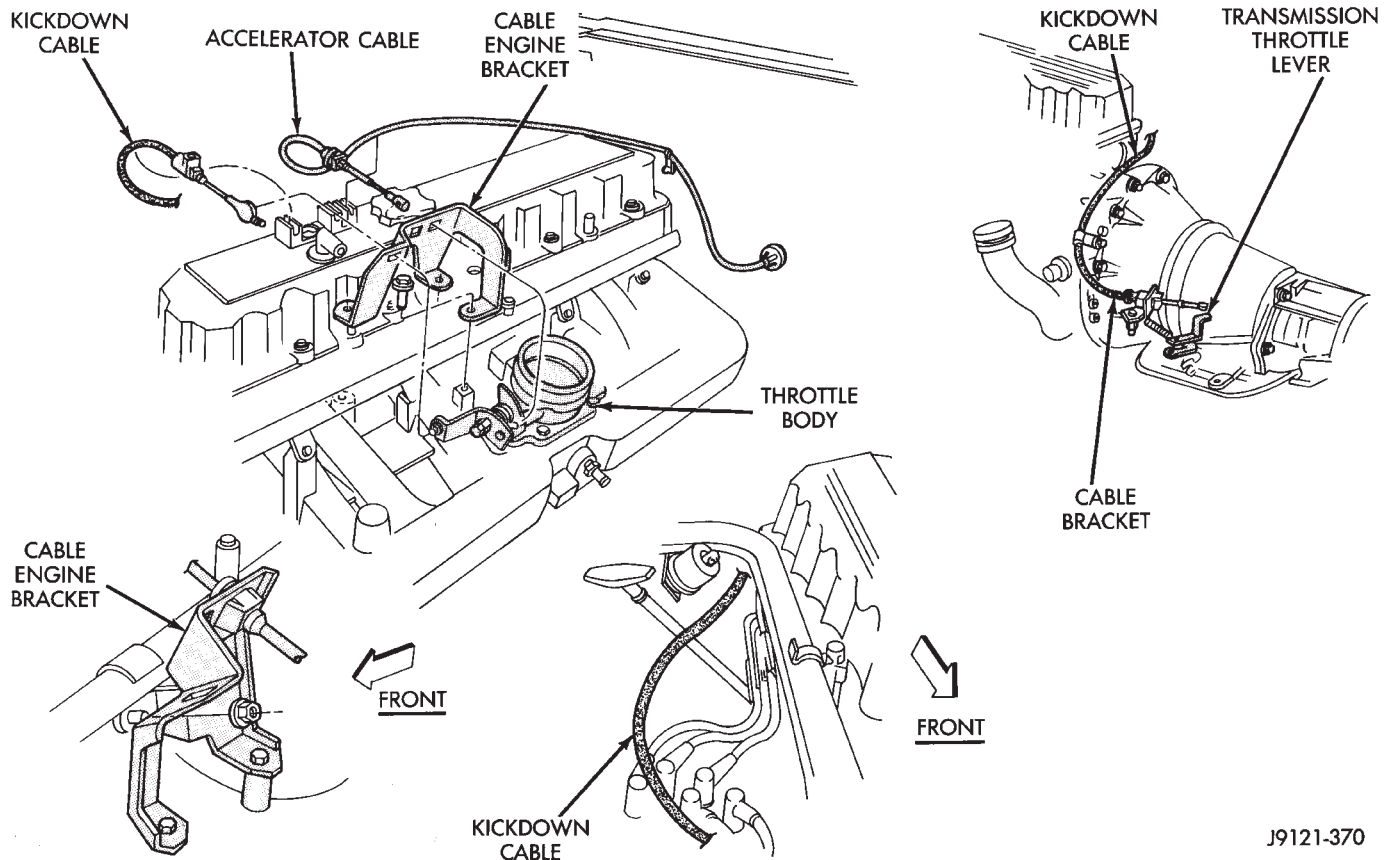


Fig. 4 Transmission Throttle Valve (Kickdown) Cable

THROTTLE CABLE ADJUSTMENT PROCEDURE

Cable adjustment is performed entirely in the engine compartment. It is not necessary to raise the vehicle for access to any other components.

(1) Shift transmission into Park and shut engine off.

(2) Press cable release button (Fig. 5).

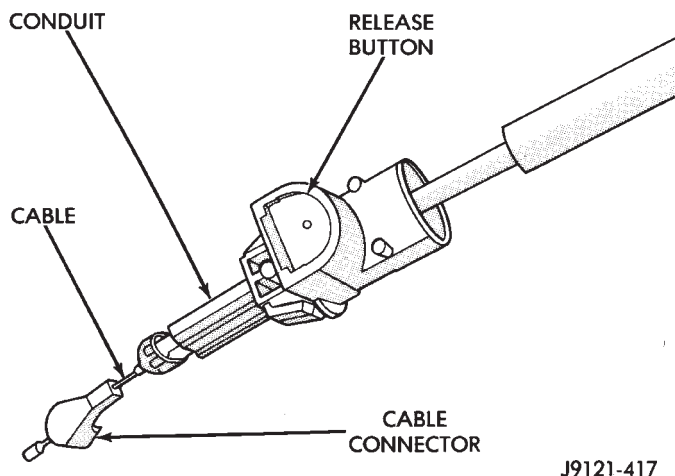


Fig. 5 Throttle Valve Cable Components

(3) Push cable conduit back into cable adjuster body as far as possible (Fig. 6).

(4) Rotate throttle body lever to wide open throttle position. Cable will ratchet to correct adjustment point as lever is rotated (Fig. 6).

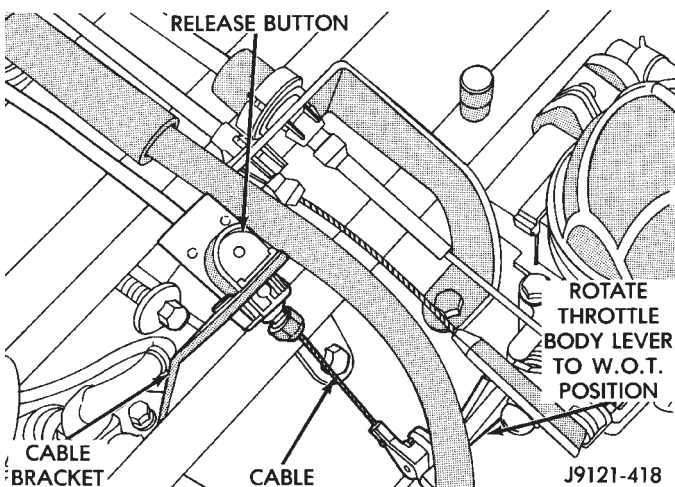


Fig. 6 Throttle Valve Cable Adjustment

FRONT BAND ADJUSTMENT

The front 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. Then back locknut off 4-5 turns.

(3) Clean adjusting screw threads with Mopar rust penetrant if necessary. Then lubricate threads with

Mopar spray lube or petroleum jelly. Be sure screw turns freely in case. This is necessary for accurate adjustment.

(4) Tighten band adjusting screw to 8 N·m (72 in. lbs.) torque with inch-pound torque wrench. **If Adapter Extension C-3705 is needed in order to reach adjusting screw, tighten screw to only 5-6 N·m (47-50 in. lbs.) torque (Fig. 7).**

(5) Back off front band adjusting screw as follows:

- On 30RH (2.5L), back adjusting screw off 2-1/2 turns
- On 32RH (4.0L), back adjusting screw off 2-1/4 turns

(6) Hold adjuster screw in position and tighten locknut to 41 N·m (30 ft. lbs.) torque.

(7) Lower vehicle.

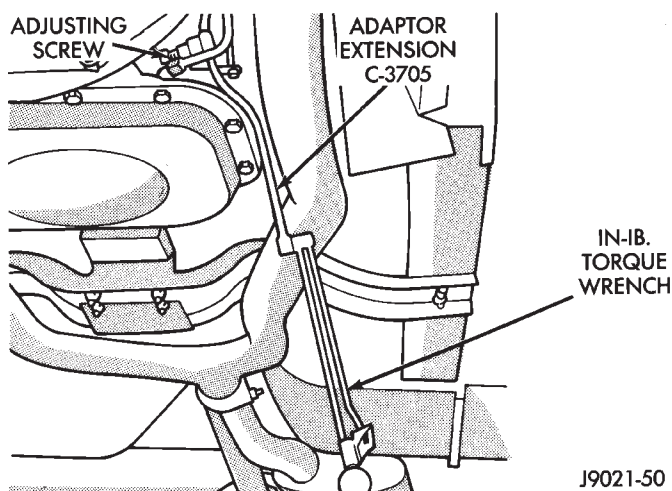


Fig. 7 Front Band Adjustment

REAR BAND ADJUSTMENT

The transmission oil pan must be removed for access to the rear (low-reverse) band adjusting screw.

(1) Raise vehicle.

(2) Remove transmission oil pan and drain fluid.

(3) Loosen band adjusting screw locknut 5-6 turns. Be sure adjusting screw turns freely in lever.

(4) Tighten adjusting screw as follows: On 32Rh transmission, tighten screw to 8 N·m (72 in. lbs.) torque. On 30RH transmission, tighten adjusting screw to 5 N·m (41 in. lbs.) torque (Fig. 8).

(5) Back off rear band adjusting screw as follows:

- On 30RH (2.5L), back adjusting screw off 7 turns
- On 32RH (4.0L), back adjusting screw off 4 turns

(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 (150 in. lbs.) torque.

(8) Lower vehicle and refill transmission with recommended fluid.

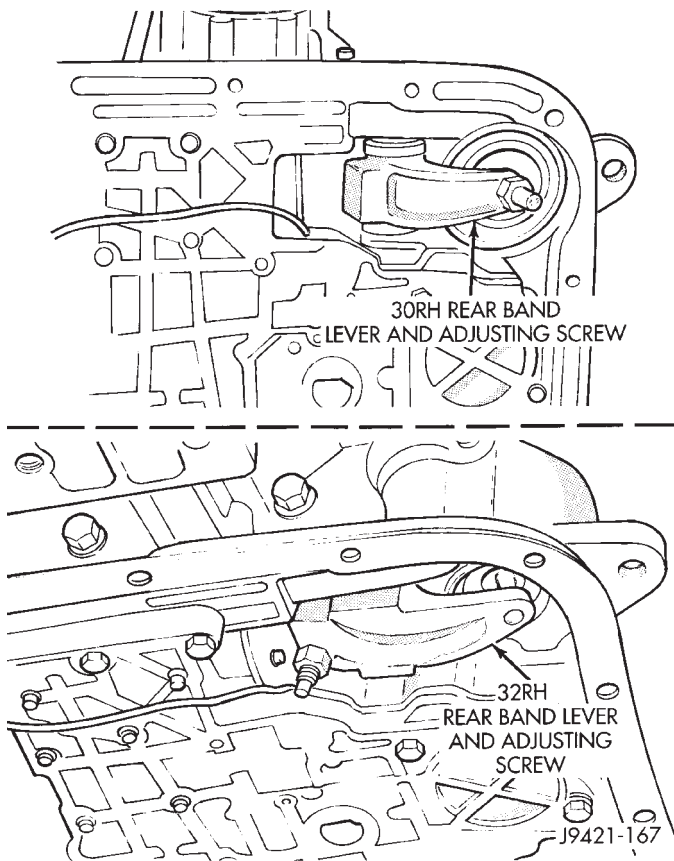


Fig. 8 Rear Band Lever And Adjusting Screw Location

OIL FILTER REPLACEMENT

- (1) Raise vehicle.
- (2) Remove oil pan and drain fluid.
- (3) Remove filter screws and remove oil filter (Fig. 9).
- (4) Position new filter on valve body and install filter screws finger tight.
- (5) Tighten filter screws to 4 N·m (35 in. lbs.) with inch pound torque wrench.
- (6) Position new gasket on oil pan and install pan on transmission. Tighten pan bolts to 17 N·m (150 in. lbs.) torque.
- (7) Lower vehicle.
- (8) Refill transmission with Mopar ATF Plus, Type 7176. Mopar Dexron II can be used if ATF Plus is not readily available.

VALVE BODY REMOVAL

- (1) Raise vehicle.
- (2) Remove oil pan and drain fluid.
- (3) Disconnect gearshift and throttle linkage at transmission levers.
- (4) Loosen clamp bolts and remove throttle and manual valve levers from manual valve shaft.
- (5) Disconnect park/neutral position switch wires and remove switch and switch seal.
- (6) Remove valve body oil filter.

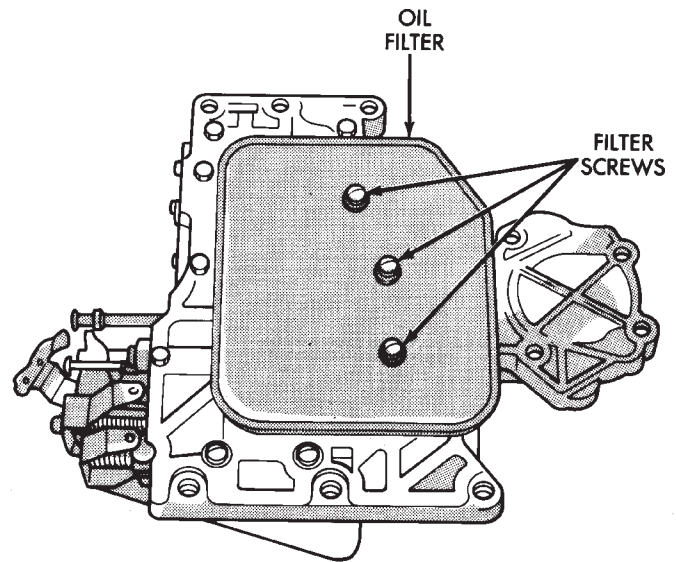


Fig. 9 Oil Filter Screw Locations

(7) Remove valve body attaching screws. Lower valve body slightly and remove accumulator piston and spring (Fig. 10). Rotate valve body down and away from case. Pull it forward to disengage park rod and remove valve body.

(8) Position valve body on bench or on repair stand for disassembly, cleaning and inspection (Fig. 11).

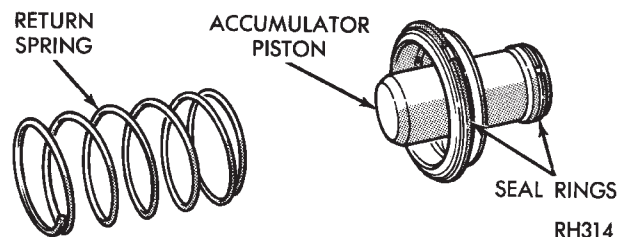


Fig. 10 Accumulator Piston And Spring

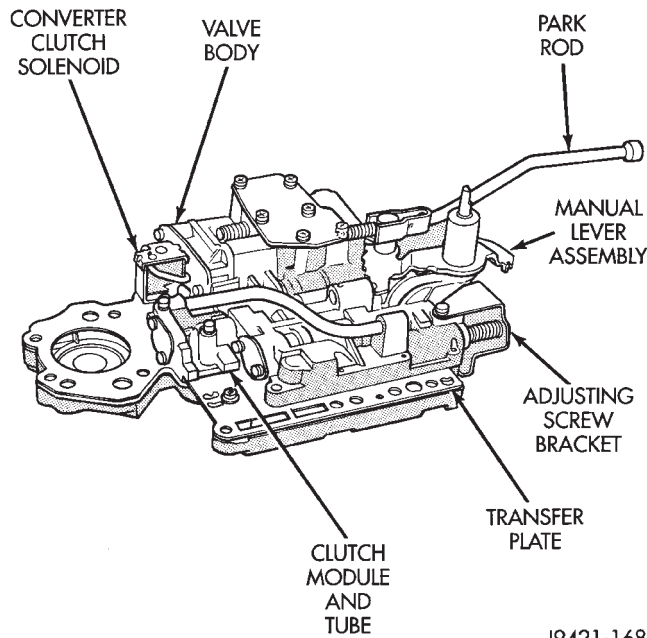
VALVE BODY SERVICE

The valve body can be disassembled for cleaning and inspection of the individual components. Valve body service procedures are detailed in the overhaul section.

The only serviceable valve body components are:

- park lock rod and E-clip
- switch valve and spring
- pressure adjusting screw bracket
- throttle valve lever
- manual lever
- manual lever shaft seal, washer, E-clip and detent ball
- fluid filter
- converter clutch solenoid

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



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Fig. 11 Valve Body Assembly

VALVE BODY INSTALLATION

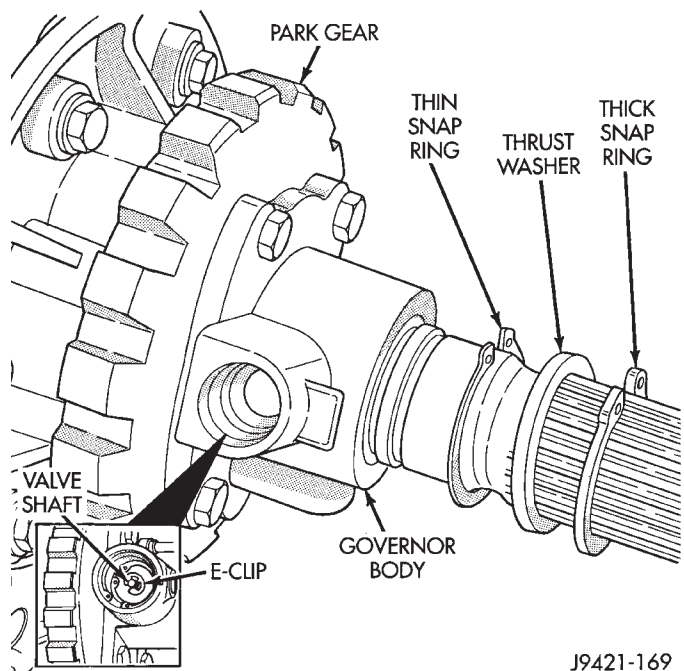
- (1) Place valve body manual lever in low (1 position) so park lock rod can be installed in sprag.
- (2) Position park sprag with screwdriver to ease lock rod installation and engagement.
- (3) Install new seals on accumulator piston if necessary and install piston in case. A small amount of petroleum jelly can be used to hold piston in place.
- (4) Lubricate shaft of manual lever and lip of shaft seal with petroleum jelly.
- (5) Raise valve body and align park rod with case opening and park sprag. Then push rod end through opening and past sprag. Rotate propeller shaft if necessary.
- (6) Position accumulator spring on transfer plate.
- (7) Align valve body and seat it on case. Be sure manual lever shaft and accumulator spring are properly seated.
- (8) Hold valve body in position and install one or two attaching bolts to hold valve body in place.
- (9) Install remaining valve body bolts. Tighten all bolts evenly in a diagonal pattern to 12 N·m (105 in-lbs) torque.
- (10) Install new oil filter and tighten filter screws to 4 N·m (35 in. lbs.) torque.
- (11) Connect converter solenoid wire to case connector.
- (12) Install manual and throttle levers on throttle lever shaft. Tighten lever clamp screws and check for free operation. Shaft and levers must operate freely without any bind.
- (13) Install oil pan and new gasket. Tighten pan bolts to 17 N·m (13 ft. lbs.) torque.
- (14) Install seal on neutral switch, install switch in case, and connect switch wires.

- (15) Lower vehicle.
- (16) Fill transmission with Mopar ATF Plus, Type 7176 fluid.
- (17) Adjust gearshift linkage and throttle valve (kickdown) cable if necessary.

GOVERNOR AND PARK GEAR SERVICE

GOVERNOR REMOVAL

- (1) Raise vehicle.
- (2) Mark both propeller shaft yokes for assembly reference and disconnect propeller shafts at transfer case.
- (3) Disconnect speedometer cable.
- (4) Position support stand under transmission converter housing.
- (5) Remove rear crossmember.
- (6) Disconnect parking brake cable at equalizer and disconnect exhaust pipe support brackets, if necessary.
- (7) Support transfer case with jack.
- (8) Remove bolts attaching transfer case to transmission adapter housing and remove transfer case.
- (9) Remove bolts attaching adapter, or extension housing to transmission and remove housing.
- (10) Rotate transmission output shaft until governor valve shaft E-clip faces downward (Fig. 12).
- (11) Remove E-clip from one end of governor valve shaft (Fig. 12).
- (12) Remove governor valve and shaft from governor body.
- (13) Remove snap ring that retains governor body-park gear assembly on output shaft (Fig. 12).
- (14) Remove governor body-park gear assembly from output shaft.



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Fig. 12 Governor E-clips And Attaching Bolts

GOVERNOR DISASSEMBLY

- (1) Remove governor weights and spring from body (Fig. 13).
- (2) Remove snap ring and separate inner weight and outer weight and spring (Fig 13).
- (3) Remove bolts attaching governor to park gear (Fig. 13).
- (4) Remove park gear from governor body.
- (5) Remove filter screen from park gear or governor body (Fig. 13).

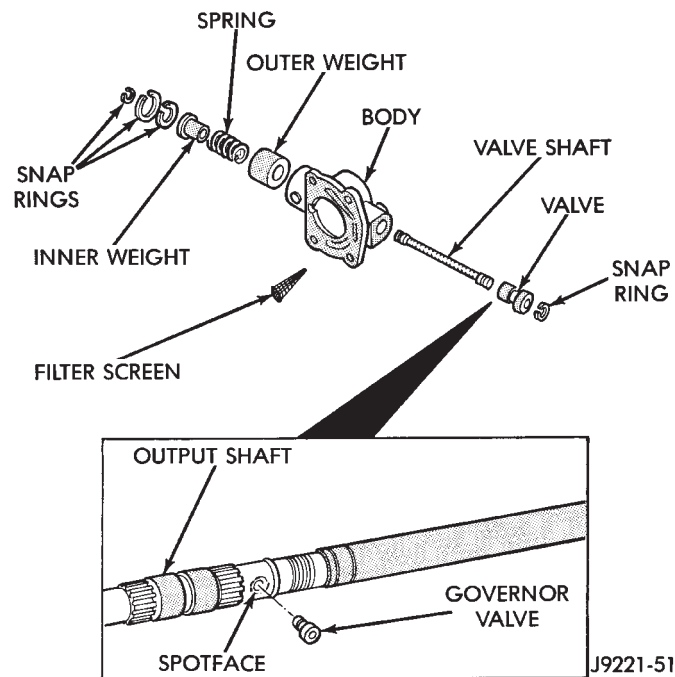


Fig. 13 Governor Components

CLEANING AND INSPECTION

Thoroughly clean all the governor parts in a suitable cleaning solution but do not use any type of caustic cleaning agents.

The weights and valves should fall freely in their bores when clean and dry. Minor surface scratches and burrs can be removed with crocus cloth.

Inspect the governor weight spring for distortion. Replace the spring, if damaged. Clean the filter in solvent and dry it with compressed air. Replace the filter, if damaged. Inspect the park gear for chipped or worn gear teeth or damaged ring grooves. Replace the gear, if damaged.

GOVERNOR ASSEMBLY

The governor valve used in 30RH/31RH/32RH transmissions built since the 1992 model year, is made of aluminum. In addition, the output shaft has been spotfaced to accept the new aluminum valve. The aluminum valve must not be used in previous transmissions. The valve can only be used with an output shaft that has been spotfaced for valve end clearance. In addition, the

governor body and output shaft must be properly indexed during reassembly. Be sure to index these components as described in the Transmission Assembly and Adjustment procedures.

- (1) Install filter screen in park gear.
- (2) Assemble governor body and park gear. Be sure oil passages in body and gear are aligned.
- (3) Install governor-to-park gear bolts finger tight only at this time.
- (4) Install governor weight snap ring in governor body. Then install governor weight and spring assembly in governor body.

GOVERNOR INSTALLATION

- (1) Align and install park gear/governor assembly on output shaft.
- (2) Align valve shaft bore in governor body with bore in output shaft. **Be sure hole in output shaft for governor valve shaft is aligned with governor valve bore in governor body. Valve shaft will bind if misalignment occurs. Remove and reposition governor body if necessary.**
- (3) Install governor valve and shaft. Be sure shaft slides freely in bore before installing E-clip on shaft.
- (4) Install governor valve on shaft and in governor body. Then install remaining shaft retaining snap ring.
- (5) Install components that retain governor body and park gear on output shaft as follows:

- (a) On models with single snap ring, install snap ring (Fig. 12). Be sure ring is seated in shaft.
- (b) On models with thrust washer and two snap rings, install thin snap ring first. Then install thrust washer second and thick snap ring last (Fig. 12).

16(c) Verify correct position of snap rings. **Be sure flat side of each snap ring is toward governor body.**

- (6) Tighten governor-to-park gear bolts to 11 N·m (95 in. lbs.).
- (7) Install adapter and gasket on transmission. Tighten adapter bolts to 32 N·m (24 ft. lbs.).
- (8) Install transfer case and rear crossmember.
- (9) Connect speedometer cable, or vehicle speed sensor wires exhaust pipe brackets and brake cable, if removed.
- (10) Align and connect propeller shafts. Tighten clamp bolts to 19 N·m (14 ft. lbs.) torque.
- (11) Remove supports and lower vehicle.
- (12) Check and adjust transmission fluid level.

PARK LOCK COMPONENT REPLACEMENT

COMPONENT REMOVAL

- (1) Raise vehicle and remove transfer case and adapter housing from transmission.

(2) Slide sprag shaft out of adapter housing and remove park sprag and spring (Fig. 14).

(3) Remove snap ring and slide plug and pin assembly out of housing (Fig. 14).

(4) If park rod must be serviced, remove valve body and remove rod.

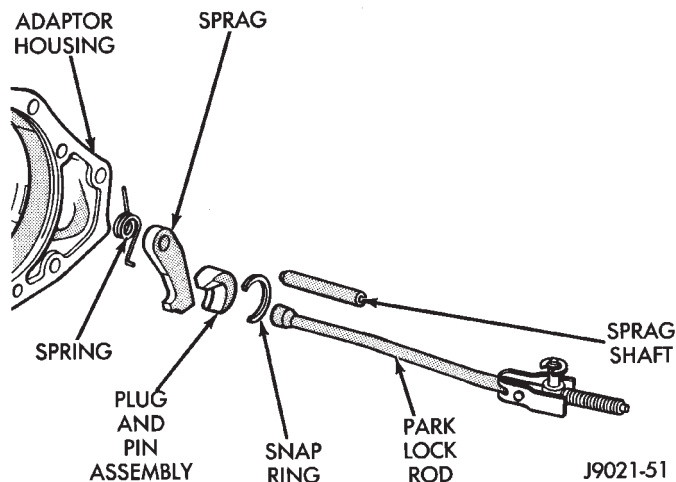


Fig. 14 Park Lock Components

Inspection

Check the sprag shaft for scores and for free movement in the housing and sprag.

Check the sprag and control rod springs for loss of tension or distortion. Check the square lug on the sprag for broken edges. Check the lugs on the governor support (park gear) for broken edges.

Check the knob on the end of the control rod for nicks, burrs and free turning.

Replace any park lock components that are worn or damaged.

The park lock rods used in Chrysler 3-speed transmissions are different lengths. If the rod must be replaced, be sure to install the correct length and shape rod.

COMPONENT INSTALLATION

- (1) Install park lock rod on valve body.
- (2) Install reaction plug and pin assembly in the housing and install the snap ring.
- (3) Position sprag and spring in housing and install sprag shaft. Be sure square lug on sprag is facing park gear and that spring is positioned so it moves sprag away from park gear.
- (4) Install valve body.
- (5) Install adaptor housing and transfer case.

PARK/NEUTRAL POSITION SWITCH SERVICE

The starter feed circuit of the switch is through the switch center terminal (Fig. 15). It provides a ground for the starter solenoid circuit through the gearshift lever in park and neutral only.

The two outer terminals of the park/neutral position switch are for the backup lamp switch circuit.

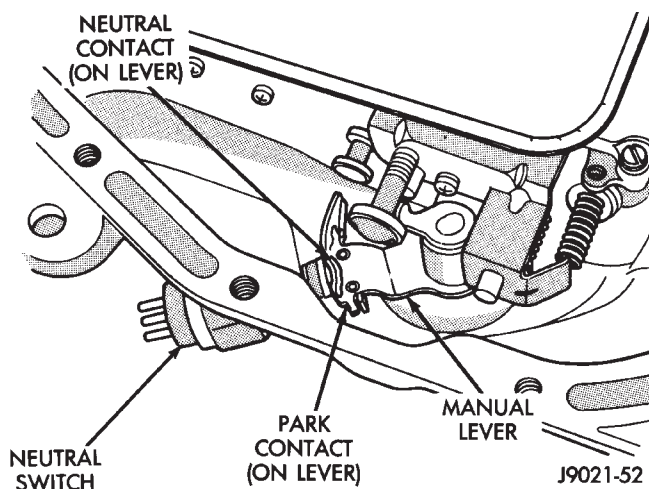


Fig. 15 Park/Neutral Position Switch And Manual Lever

SWITCH TEST PROCEDURE

- (1) Remove wiring connector from switch.
- (2) Test continuity between switch center terminal and transmission case. Continuity should exist only when transmission is in Park or Neutral. Replace switch if continuity occurs in any gear other than Park or Neutral.
- (3) Shift into reverse and test continuity between two outside terminals on switch. Continuity should exist only when transmission is in reverse.
- (4) Leave transmission in reverse and test continuity between each switch outer terminal and transmission case. Continuity should not exist between either pin and case in reverse.
- (5) If switch tests OK, check gearshift linkage adjustment or backup light circuit. Replace switch if it fails continuity tests.

SWITCH REPLACEMENT

- (1) Position drain pan under neutral switch.
- (2) Disconnect switch wires.
- (3) Remove switch from transmission.
- (4) Move shift lever to Park and Neutral positions. Inspect manual lever fingers, lever and shaft for proper alignment with switch opening in case. Replace lever if worn or bent. Do not attempt to straighten the lever.
- (5) Install new switch and seal in case. Tighten switch to 33 N·m (24 ft. lbs.) torque.
- (6) Adjust transmission fluid level as required.
- (7) Verify switch operation.

SPEEDOMETER SERVICE

Rear axle gear ratio and tire size determine speedometer pinion requirements. If the pinion must be replaced, refer to the parts catalogue information for the correct part. It is important for speedometer accuracy that the pinion have the correct number of teeth.

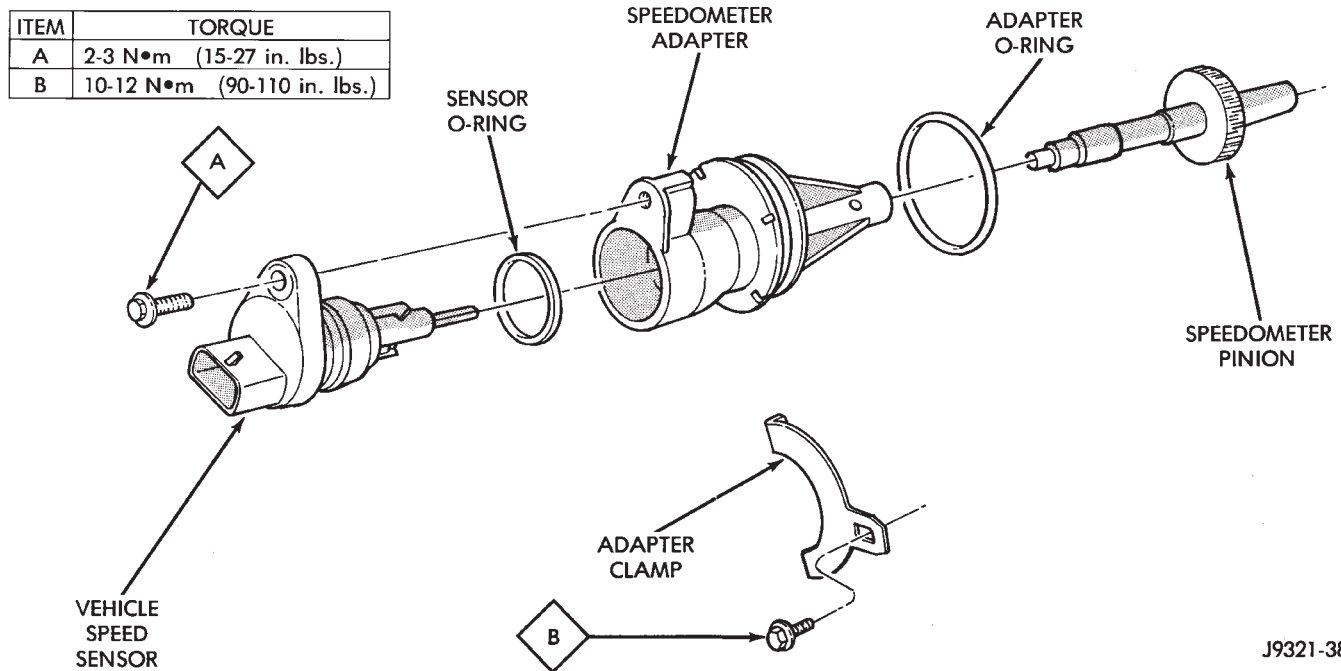


Fig. 16 Speedometer Components (With Unit Style Sensor)

The speedometer assembly used in XJ models is the new unit type (one-piece) speed sensor (Fig. 16). However, YJ models may be equipped with either the new unit style, or the older style that has a two-piece speed sensor and a metal adapter (Fig. 16). Service procedures for both styles are described in the following procedures.

SPEEDOMETER ASSEMBLY REMOVAL (WITH UNIT STYLE SENSOR)

- (1) Raise vehicle.
- (2) Disconnect wires from vehicle speed sensor.
- (3) Remove adapter clamp and screw (Fig. 16).
- (4) Remove speed sensor and speedometer adapter as assembly.
- (5) Remove speed sensor retaining screw and remove sensor from adapter.
- (6) Remove speedometer pinion from adapter.
- (7) Inspect sensor and adapter O-rings (Fig. 16). Remove and discard O-rings if worn or damaged.
- (8) Inspect terminal pins in vehicle speed sensor. Clean pins with Mopar electrical spray cleaner if dirty or oxidized. Replace sensor if faulty, or pins are loose, severely corroded, or damaged.

SPEEDOMETER INSTALLATION AND INDEXING (UNIT STYLE)

- (1) Thoroughly clean adapter flange and adapter mounting surface in housing. Surfaces must be clean for proper adapter alignment and speedometer operation.
- (2) Install new O-rings on speed sensor and speedometer adapter if necessary (Fig. 17).
- (3) Lubricate sensor and adapter O-rings with transmission fluid.

- (4) Install vehicle speed sensor in speedometer adapter. Tighten sensor attaching screw to 2-3 N•m (15-27 in. lbs.) torque.

- (5) Install speedometer pinion in adapter.

- (6) Count number of teeth on speedometer pinion. Do this before installing assembly in housing. Then lubricate pinion teeth with transmission fluid.

- (7) Note index numbers on adapter body (Fig. 17). These numbers will correspond to number of teeth on pinion.

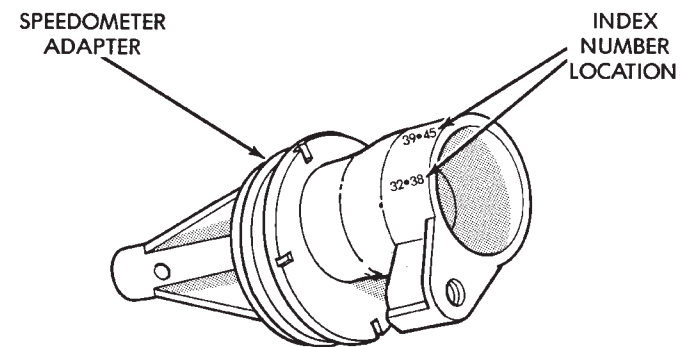


Fig. 17 Location Of Index Numbers On Speedometer Adapter (Unit Style Sensor)

- (8) Install speedometer assembly in housing.

- (9) Rotate adapter until required **range numbers** are at 6 o'clock position. Be sure range index numbers correspond to number of teeth on pinion gear.

(10) Install speedometer adapter clamp and retaining screw. Tighten clamp screw to 10-12 N·m (90-110 in. lbs.) torque.

(11) Connect wires to vehicle speed sensor.

(12) Lower vehicle and top off transmission fluid level if necessary.

SPEEDOMETER COMPONENT REMOVAL (TWO-PIECE SENSOR)

- (1) Raise vehicle.
- (2) Disconnect speed sensor wires.
- (3) Remove bolt attaching vehicle speed sensor to sensor adapter. Then slide sensor out of adapter.
- (4) Inspect speed sensor mounting area in sensor adapter. If transmission fluid is found in this area, oil seal in metal speedometer adapter is leaking and will have to be replaced.
- (5) Remove speedometer adapter clamp bolt and remove clamp (Fig. 18).
- (6) Remove speedometer adapter, sensor adapter and speedometer pinion as assembly.

SPEEDOMETER COMPONENT INSTALLATION AND INDEXING (TWO-PIECE SENSOR)

- (1) Replace speedometer O-ring if cut, torn, or worn.
- (2) If oil seal in metal speedometer adapter needs replacement, remove old seal with pointed tool. Then install new seal with Special Tool C-4004. Push seal into place with tool until tool bottoms (Fig. 19).

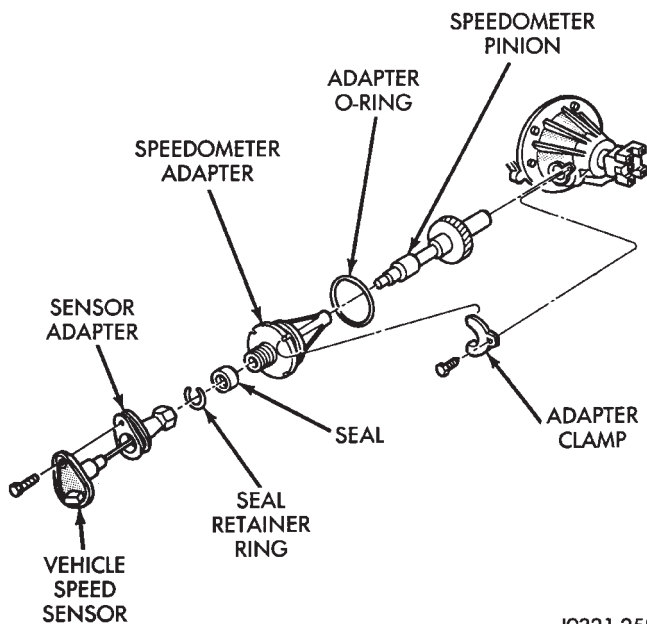


Fig. 18 Speedometer Components (With Two-Piece Sensor)

- (3) Clean speedometer adapter mounting surface of transmission, or transfer case thoroughly.
- (4) Lubricate adapter seals with transmission fluid.

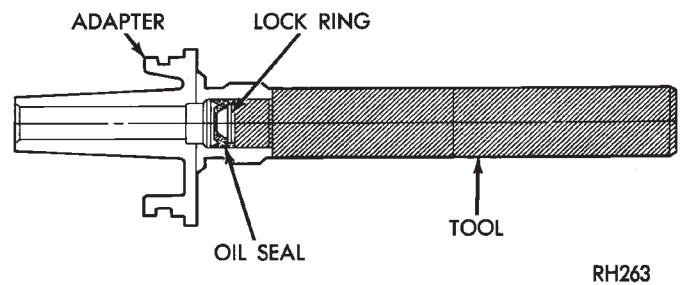


Fig. 19 Installing Speedometer Adapter Seal (With Two-Piece Sensor And Metal Adapter)

- (5) Count number of teeth on speedometer pinion. Do this before installing pinion and adapter.
- (6) Note range numbers on face of speedometer adapter (Fig. 20). These numbers correspond to number of teeth on speedometer pinion.
- (7) Install pinion in adapter and install assembled pinion and adapter in transmission or transfer case.
- (8) Rotate speedometer adapter until required range numbers are at 6 o'clock position (Fig. 20). **Verify that range numbers correspond to number of teeth on pinion.**
- (9) Push speedometer adapter into place until seated.
- (10) Install speedometer adapter clamp and bolt. Tighten bolt to 11 N·m (100 in. lbs.) torque.
- (11) Install sensor adapter on speedometer adapter (Fig. 18). Tighten sensor adapter coupling nut to 17 N·m (150 in. lbs.) torque.
- (12) Carefully align and insert vehicle speed sensor into sensor adapter.
- (13) Install bolt that attaches speed sensor to adapter. Tighten bolt to 5-8 N·m (48-72 in. lbs.)
- (14) Connect wires to speed sensor.
- (15) Lower vehicle.
- (16) Check top off transmission fluid level if necessary.

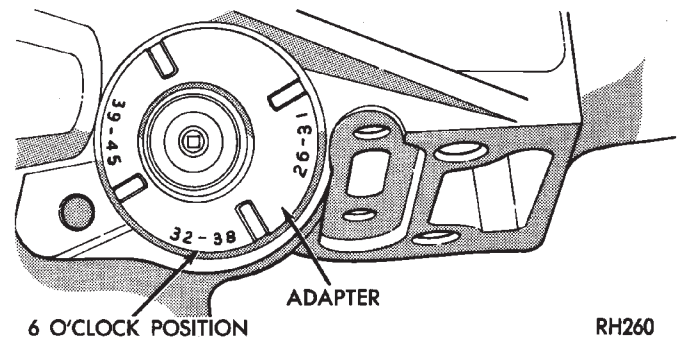


Fig. 20 Indexing Speedometer Adapter (With Two-Piece Sensor)

TRANSMISSION COOLER REVERSE FLUSHING

The transmission main cooler is located in the radiator lower tank. The cooler is not a serviceable component. If the cooler is damaged in any way, the radiator will have to be replaced.

On models with an auxiliary cooler, the cooler is mounted in front of the radiator or air conditioning

condenser. The auxiliary cooler is a serviceable component and can be repaired if necessary.

The main and auxiliary coolers should be thoroughly reverse flushed if a transmission failure contaminates the fluid. Reverse flushing the cooler and lines will prevent sludge and particles from flowing back into the transmission after repair.

The same flushing procedure is used for main and auxiliary coolers. Pressure equipment is preferred for reverse flushing. However, reverse flushing can be performed using hand operated equipment as described in the following procedure.

REVERSE FLUSHING PROCEDURE

(1) Disconnect cooler lines at transmission. Refer to Figure 21 for cooler line fitting identification. Front fitting is outlet to cooler and rear fitting is inlet from cooler.

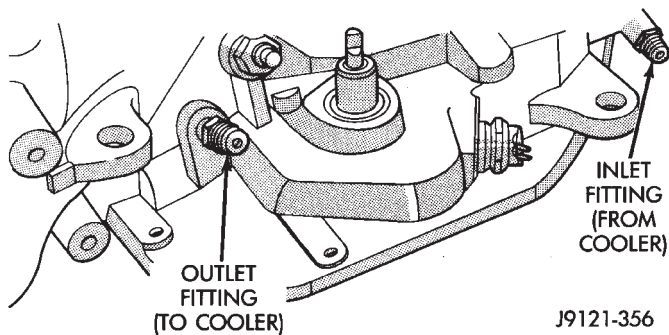


Fig. 21 Identifying Transmission Cooler Lines

(2) Position drain pan under cooler outlet line to material flushed through cooler and lines.

(3) Reverse flush cooler using hand operated suction gun filled with mineral spirits. Insert gun nozzle (or hose) into cooler inlet (return) line. Then force mineral spirits through Line and cooler.

(4) Continue reverse flushing until fluid exiting inlet (pressure) line is clear and free of debris/residue. **Replace radiator if fluid cannot be pumped through cooler.**

(5) Clear flushing materials from cooler and lines with short pulses of compressed air. Insert air gun nozzle into cooler inlet (return) line and continue short pulses of air until all fluid is cleared from cooler and lines.

(6) Pump one quart of fresh automatic transmission fluid through cooler and lines before reconnecting cooler lines.

TRANSMISSION COOLER FLOW TESTING

The transmission main and auxiliary coolers should be flow tested whenever a fluid overheat condition is suspected. An overheat condition is indicated when the fluid changes from the normal red, to a dark orange, or brown color.

The same method of flow testing is used for both coolers.

Cooler flow is checked by measuring the amount of fluid flow through the cooler in a 20 second time period. The test is performed with the engine running and transmission in neutral. Fluid is then pumped through the cooler by the transmission oil pump.

- (1) Disconnect cooler inlet line at transmission fitting.
- (2) Securely attach hose to end of inlet line and position line in a one quart test container.
- (3) Add extra quart of fluid to transmission.
- (4) Use stopwatch to check flow test time.
- (5) Shift transmission into neutral and set parking brake.
- (6) Start and run engine at curb idle speed and immediately note cooler flow. Approximately one quart of fluid should flow into test container in 20 second period.
- (7) If cooler flow is intermittent, flows less than one quart in 20 seconds, or does not flow at all, cooler is faulty and must be replaced.

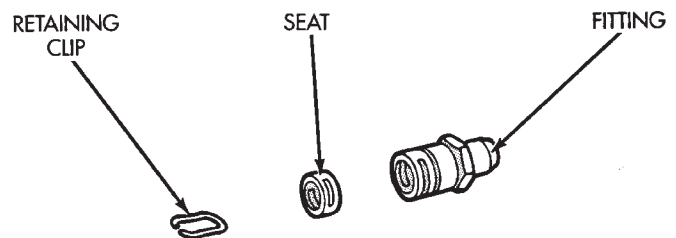
SERVICING TRANSMISSION COOLER LINES AND FITTINGS

Fitting Types

The transmission cooler lines are attached with quick disconnect fittings.

A flange on the cooler line serves as the sealing mechanism. The wire retainer clip (Fig. 22), secures the cooler line in the fitting by this flange. The clip fits behind the flange to hold the line in place.

Three different fitting styles may be used. Type 1 fittings have the retainer clip exposed (Fig. 22). Type 2 fittings have the retainer clip and fitting body encased in a shrink wrap material (Fig. 23). Type 3 fittings have the retainer clip encased in a metal sleeve crimped onto the fitting body (Fig. 24).

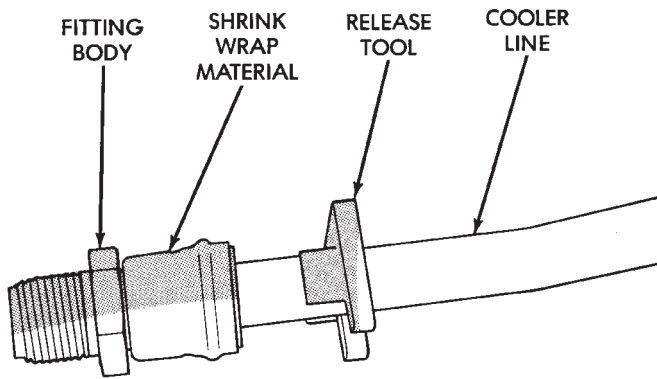


J9321-245

Fig. 22 Type 1 Quick Disconnect Fitting

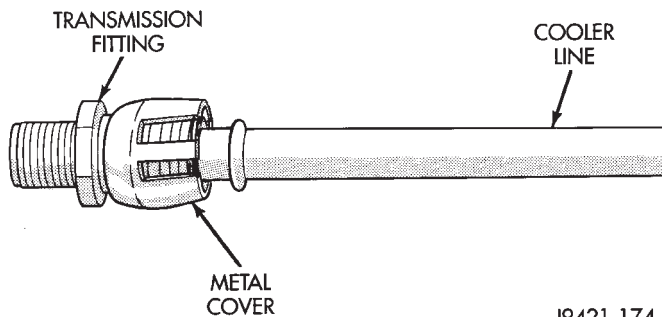
Fitting Release Tool

A release tool is **required** to disconnect each of the fitting types. A plastic tool is clipped directly to one of the cooler lines on models with the type 2 and 3 fittings. This tool can also be used to disconnect type 1 fittings. The tool is needed to spread the wire retainer clip in each fitting. The clip must be opened in order to release the cooler line from the fitting.



J9321-452

Fig. 23 Type 2 Quick Disconnect fitting



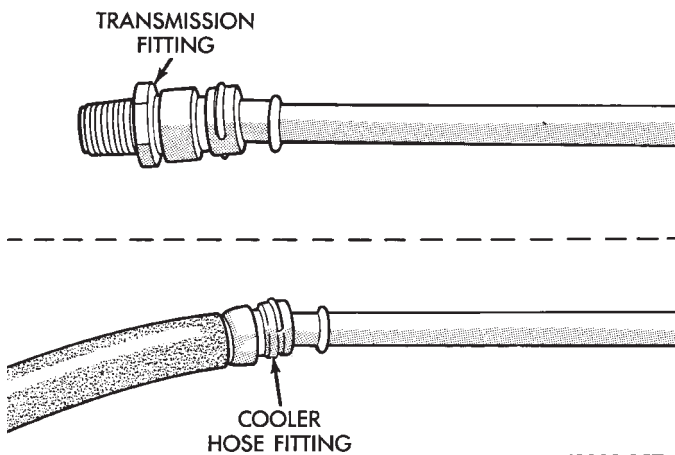
J9421-174

Fig. 24 Type 3 Quick Disconnect fitting

Fitting And Cooler Line Service

The cooler lines and quick disconnect fittings are NOT serviceable. Damaged fittings or cooler lines are to be replaced as assemblies.

Fittings swedged into cooler line hoses (Fig. 25) are serviced only as part of the entire cooler line.



J9321-257

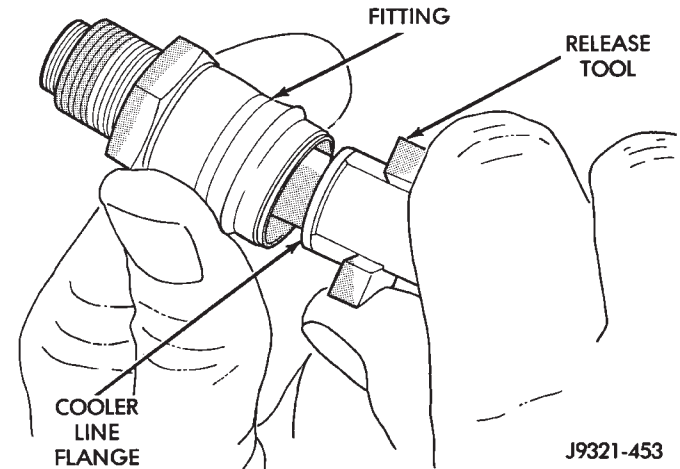
Fig. 25 Transmission And Cooler Line Fitting Placement

DISCONNECTING COOLER LINES WITH QUICK DISCONNECT FITTINGS

(1) If fitting and cooler line are encrusted with dirt, mud, or grease, clean fitting and cooler line with Mopar spray type carburetor or brake cleaner. Plastic release tool will not fit into retainer clip if fitting is full of foreign material.

(2) Slide small plastic release tool into fitting until tool bottoms against flange on cooler line (Fig. 26).

(3) Push and turn tool to spread retainer clip and pull cooler line out of fitting (Fig. 26).



J9321-453

Fig. 26 Disconnecting Cooler Line With Release Tool (Type 2 Fitting Shown)

(4) Cover open ends of cooler lines and fittings to prevent dirt entry.

(5) Inspect condition of fitting. Replace transmission fitting as an assembly if fitting body or retainer clip is damaged. Replace cooler line as assembly, if fitting swedged into cooler line hose, is damaged.

REATTACHING COOLER LINES WITH QUICK DISCONNECT FITTINGS

(1) If transmission or radiator fittings require replacement, apply Mopar Lock N' Seal, or Loctite 242 to fitting threads before installation.

(2) Wipe off cooler line and fitting with clean, dry cloth.

(3) Insert cooler line into fitting. Then push line inward until retainer clip secures line. A snap or click sound will be heard and felt through the line when the retainer clip seats behind the cooler line flange.

(4) **Pull outward on cooler lines to verify that they are properly secured.**

CAUTION: The wire retainer clips must secure the cooler lines in the fittings. If the clips are deformed, or distorted, normal fluid pressure could unseat the cooler lines resulting in fluid loss and transmission damage. Be very sure the cooler lines are firmly secured by the retainer clip as described in step (4) above.

30RH/32RH TRANSMISSION REMOVAL AND INSTALLATION

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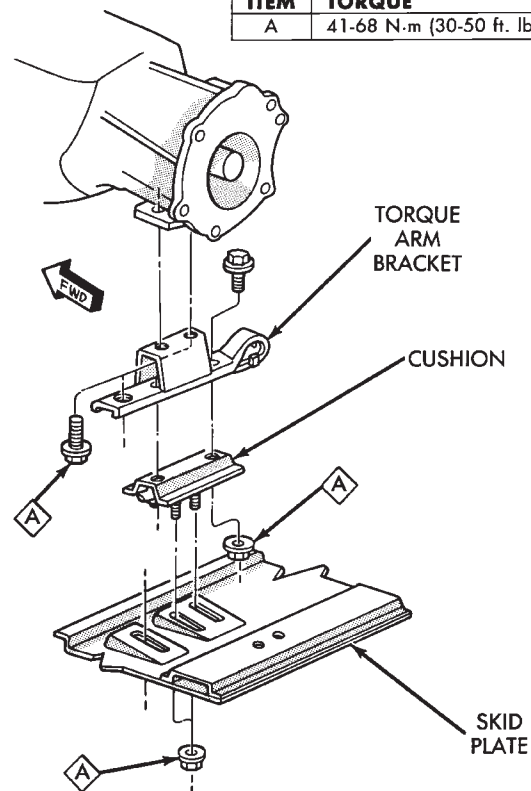
TRANSMISSION AND CONVERTER REMOVAL

- (1) Remove fan shroud attaching bolts.
- (2) Disconnect transmission fill tube at upper bracket.
- (3) Raise vehicle.
- (4) Remove inspection cover from converter housing and remove skid plate for access, if necessary.
- (5) Remove transmission fill tube and fill tube O-ring.
- (6) Remove starter motor.
- (7) Mark propeller shafts and axle yokes for alignment reference.
- (8) Disconnect propeller shafts at yokes. Secure shafts to frame rails with wire.
- (9) Disconnect exhaust pipes at exhaust manifolds, if necessary.
- (10) Drain transfer case lubricant.
- (11) Disconnect vehicle speed sensor wires.
- (12) Disconnect transfer case shift linkage.
- (13) Disconnect gearshift linkage and throttle cable at transmission levers.
- (14) Disconnect park/neutral position switch wires.
- (15) Disconnect and remove crankshaft position sensor. Retain sensor bolt for reinstallation.

CAUTION: The crankshaft position sensor can be damaged during transmission removal (or installation) if the sensor is still bolted to the engine block. To avoid damage, remove the sensor before removing the transmission.

- (16) Remove converter housing access cover and mark drive plate and converter for alignment reference.
- (17) Remove bolts attaching converter to drive plate.
- (18) Support engine with support stand.
- (19) Support transmission-transfer case assembly with transmission jack. Secure transmission to jack with safety chain.
- (20) Remove bolts/nuts attaching cushion and torque arm bracket to skid plate (Fig. 1).
- (21) Remove skid plate, or rear crossmember, if equipped.
- (22) Lower transmission slightly and disconnect cooler lines at transmission. **Refer to In-Vehicle Service section for procedures.**

ITEM	TORQUE
A	41-68 N·m (30-50 ft. lbs.)



J9321-260

Fig. 1 Transmission Rear Mount

- (23) Remove bolts attaching transmission to engine.
- (24) Move transmission and converter rearward until clear of crankshaft.
- (25) Hold converter in position and lower transmission until converter housing clears engine.
- (26) Remove converter from transmission.
- (27) Remove transfer case from transmission.
- (28) If necessary, following components can now be serviced:
 - torque converter
 - torque converter drive plate
 - oil pump seal
 - engine rear core hole plugs
 - engine rear oil galley plugs

CONVERTER—PUMP SEAL—DRIVE PLATE SERVICE

Drive Plate

The drive plate can be replaced or removed for service access after the transmission is out of the vehicle (Fig. 2).

CAUTION: On YJ models with a 2.5L engine and 30RH transmission, special bolts are used to attach the driveplate to the crankshaft. These bolts have a smaller hex head for torque converter clearance. **DO NOT** interchange these bolts with similar size bolts for any reason.

Torque Converter

The torque converter can be replaced or removed for service access after the transmission has been removed (Fig. 2).

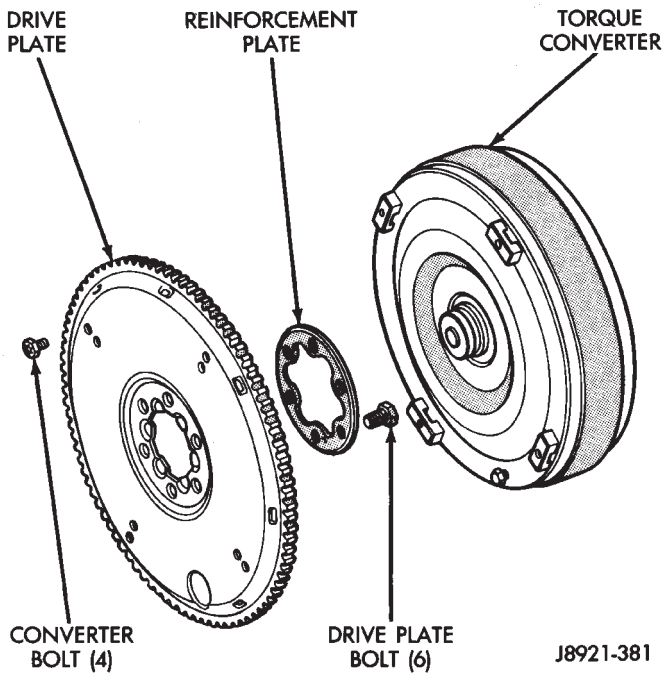


Fig. 2 Typical Converter And Drive Plate

The torque converter is not a serviceable part. If the converter is contaminated or damaged in any way, it must be replaced as an assembly. **Do not attempt to flush a converter contaminated by metal or clutch facing particles. Flushing will not remove these contaminants.**

A new torque converter and oil pump are used in 30RH/32RH transmissions built after the 1993 model year. The new converter has a different style drive hub. The hub was changed to accept the new design drive flats on the oil pump inner gear. The drive flats replace the square lugs used previously. If converter replacement should become necessary, be sure to use the new style converter. The new converter and oil pump are not interchangeable with previous style parts.

The oil pump seal is accessible and can be replaced after the transmission and torque converter are removed.

Use Remover Tool C-3981B to remove the seal (Fig. 3). To use the tool, first start the tool into the seal by hand. Next, thread the tool into the seal as far as it will go. Use a wrench on the tool hex to turn the tool. Continue tightening until all the tool threads firmly grip the metal part of the seal. Then tighten the tool puller screw to withdraw the seal from the pump body.

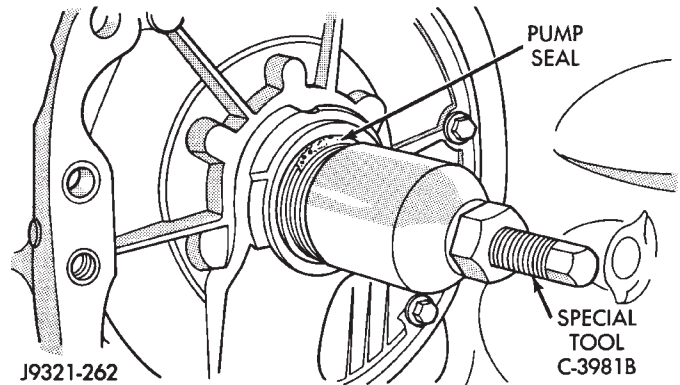


Fig. 3 Pump Seal Removal

Use Installer Tool C-4193 to install and seat the seal (Fig. 4).

Be sure to lubricate the pump seal and converter hub with transmission fluid before installation.

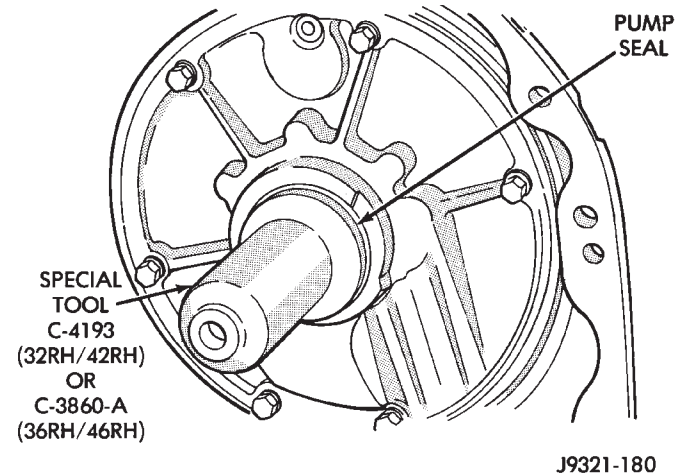


Fig. 4 Pump Seal Installation

TRANSMISSION AND CONVERTER INSTALLATION

CAUTION: The transmission oil cooler and lines must be reverse flushed if repair corrected a problem that generated sludge and/or debris. Sludge and metal or friction particles from a gear or clutch pack failure must be removed before reinstalling the transmission. This is necessary to avoid re-contaminating the repaired transmission. Failure to remove sludge or debris from the cooler and lines will result in a repeat failure and shop comeback.

(1) Lubricate converter drive hub and pump seal with Mopar ATF Plus, or Dexron II transmission fluid. Then install converter. Turn converter back and forth to align drive slots in converter hub with pump gear lugs. Be sure converter is fully seated in pump (Fig. 5).

(2) Temporarily secure converter with C-clamp or metal strap attached across converter housing.

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

(4) Raise transmission and align converter with drive plate.

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

(6) Install two converter housing lower attaching bolts and tighten bolts to draw housing toward engine.

(7) Install and tighten converter attaching bolts.

(8) Install and tighten bolts that attach transmission to engine (Fig. 6).

(9) Install crankshaft position sensor as follows:

CAUTION: Clearance between the sensor pickup face and driveplate ring gear must be correctly established before engine startup. A cardboard spacer, attached to the sensor face, is used for this

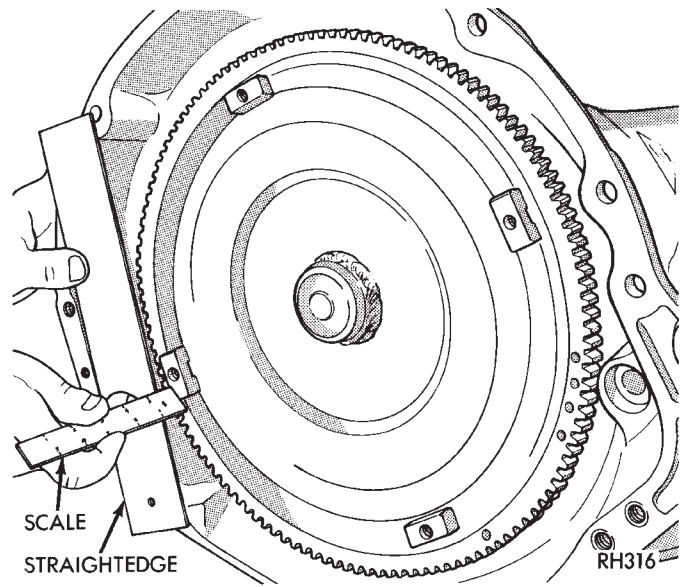


Fig. 5 Checking Torque Converter Seating
purpose. Failure to establish correct clearance will result in sensor breakage.

(a) Remove any remaining fragments of original cardboard spacer from sensor pickup face.

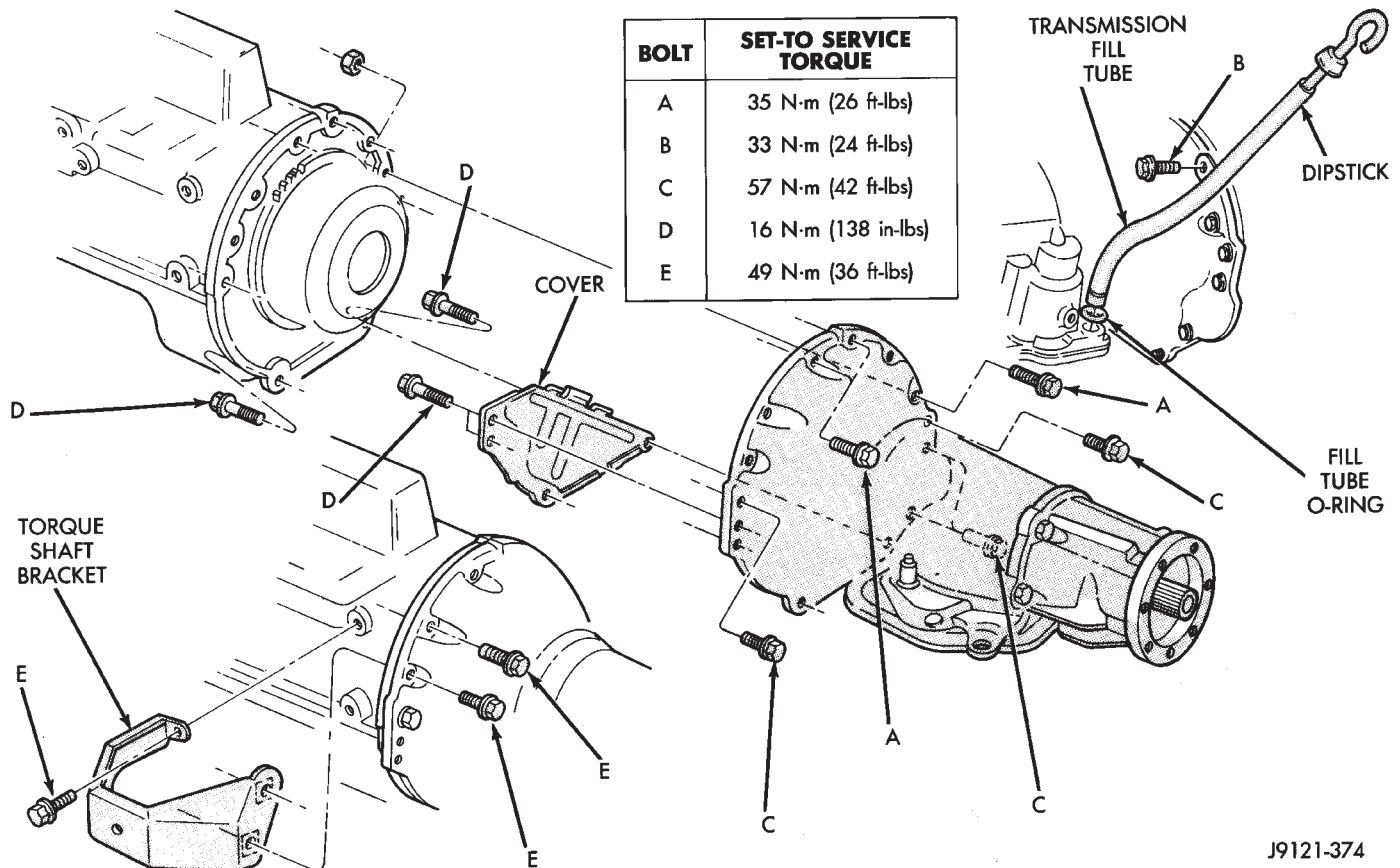


Fig. 6 Transmission Attachment

(b) Align and install new spacer on sensor pickup face. Spacer has adhesive backing so it will adhere to sensor face.

(c) Insert sensor into housing until it just touches ring gear teeth. Then install and tighten sensor attaching bolt. Correct clearance is established when spacer is peeled off by ring gear during engine startup.

(10) Install transmission fill tube and O-ring (Fig. 6).

(11) Connect transmission cooler lines to fittings. Refer to Figure 7 for cooler line identification.

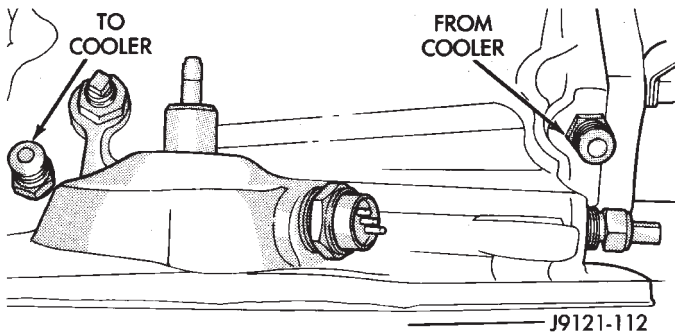


Fig. 7 Transmission Cooler Line Location And Identification

(12) Position support stand under transmission and remove transmission jack.

(13) Install transfer case on transmission adapter. Tighten attaching nuts to 41 N·m (30 ft. lbs.) torque.

(14) Install rear crossmember and attach transmission rear support to crossmember.

(15) Connect vehicle speed sensor wires.

(16) Install inspection cover on converter housing.

(17) Install exhaust pipes and support brackets, if removed.

(18) Install starter motor.

(19) Connect wires to park/neutral position switch.

(20) Connect gearshift and linkage and throttle cable.

(21) Connect transfer case shift linkage.

(22) Connect propeller shafts to transfer case yokes.

(23) Connect front exhaust pipes and catalytic converter support bracket bolts (if removed).

(24) Install skid plate, rear cushion and bracket, if removed.

(25) Fill transfer case to bottom edge of fill plug hole with Mopar Dexron II.

(26) Lower vehicle and fill transmission to correct level with ATF Plus, type 7176 fluid.

(27) Install fan shroud and bolts (if removed).

(28) Check and adjust gearshift linkage if necessary. Then check and adjust throttle cable if necessary.

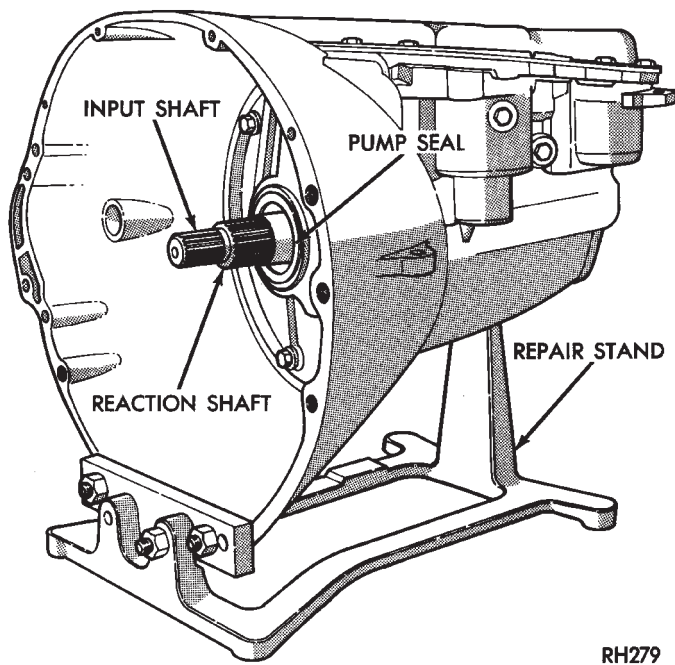
30RH/32RH TRANSMISSION OVERHAUL

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TRANSMISSION DISASSEMBLY

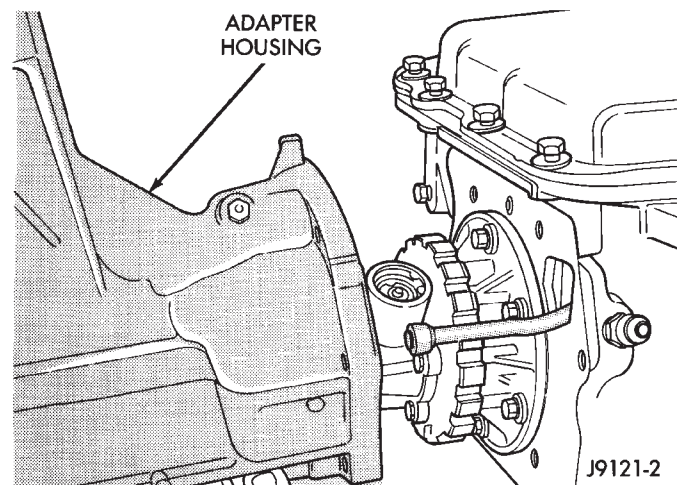
- (1) Clean transmission exterior with steam gun or with solvent. Wear eye protection during cleaning process.
- (2) Remove throttle and shift levers from valve body manual shaft and throttle lever shaft.
- (3) Mount transmission in repair stand C-3750-B (Fig. 1).



RH279

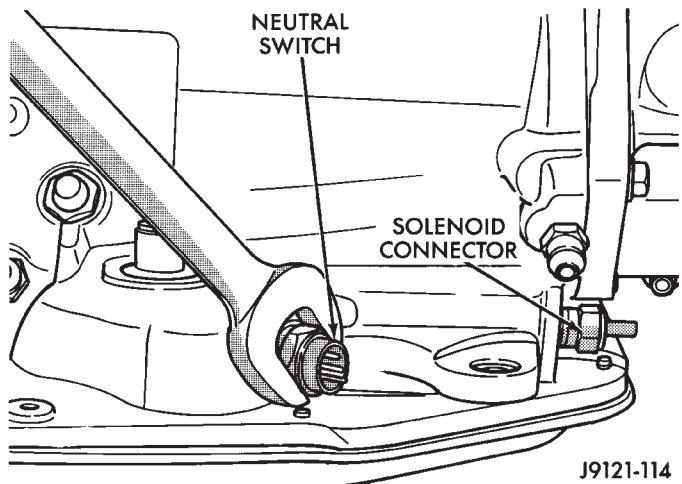
Fig. 1 Transmission Mounted On Typical Repair Stand

- (4) Remove nuts attaching adapter, or extension housing to transmission case.
- (5) Remove adapter/extension housing and gasket (Fig. 2).
- (6) Remove rear bearing and snap ring, if equipped.
- (7) Remove park/neutral position switch and seal (Fig. 3).



J9121-2

Fig. 2 Adapter Housing Removal/Installation (4 x 4 Models)



J9121-114

Fig. 3 Park/Neutral Position Switch Removal/Installation

(8) Remove oil pan bolts and remove pan and gasket (Fig. 4).

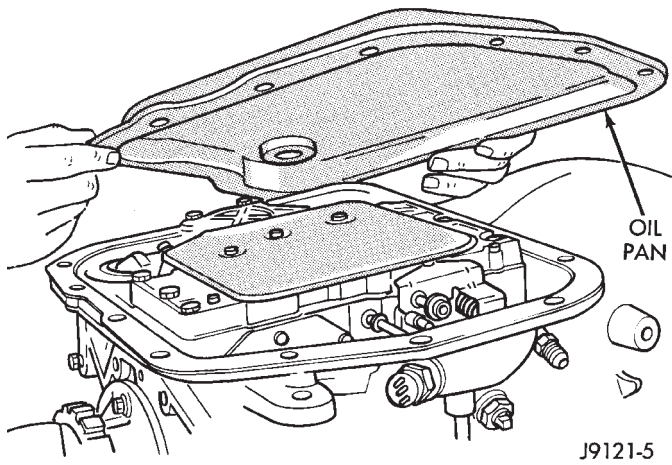


Fig. 4 Oil Pan Removal/Installation

(9) Remove hex head valve body attaching bolts (Fig. 5).

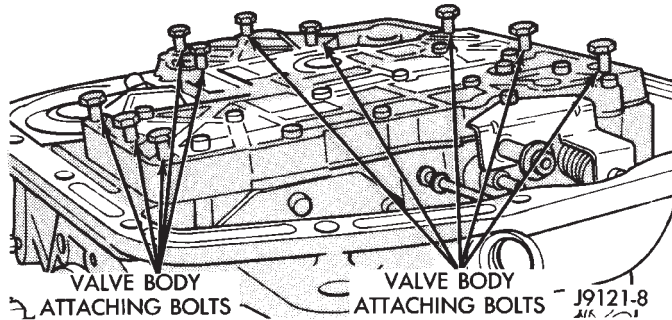


Fig. 5 Valve Body Attaching Bolt Locations (Typical)

(10) Disconnect solenoid wire from case connector (Fig. 6).

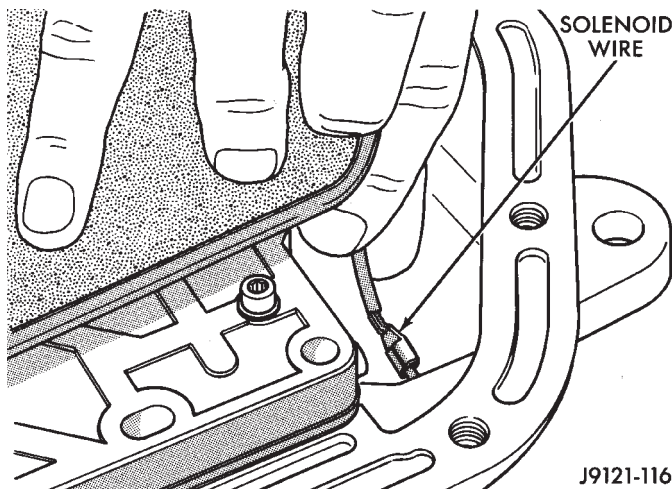


Fig. 6 Solenoid Wire Connection

(11) Lift valve body upward, guide park rod out of case opening and remove valve body (Fig. 7).

(12) Remove accumulator spring and piston (Fig. 8).

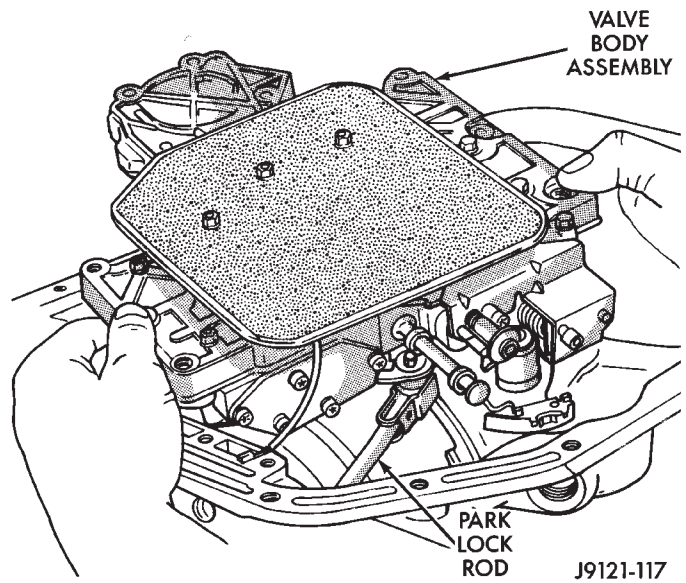


Fig. 7 Valve Body Removal/Installation

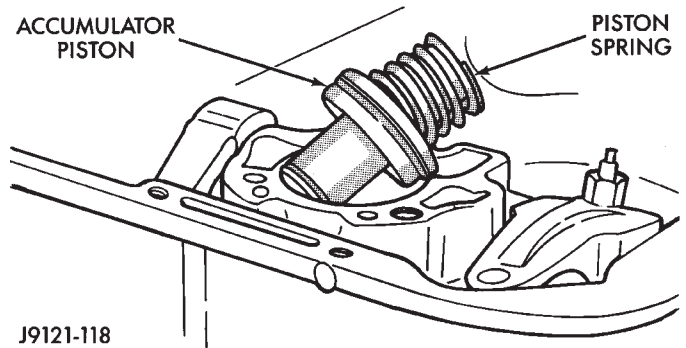


Fig. 8 Removing/Installing Accumulator Piston And Spring

(13) Remove front band pivot pin access plug (Fig. 9). Plug is accessible through converter housing. Use 1/4 inch drive extension to remove plug as shown.

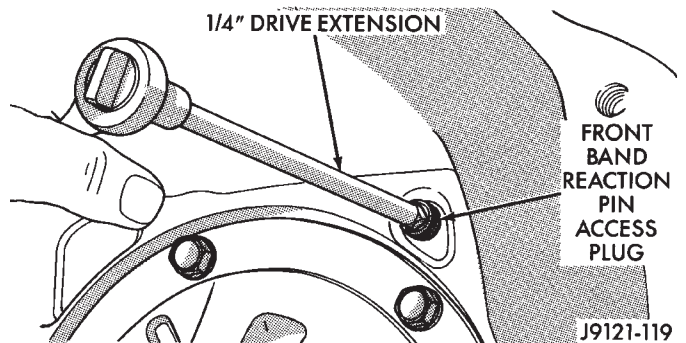


Fig. 9 Removing/Installing Front Band Pivot Pin Access Plug

(14) 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.

- (15) Remove oil pump bolts.
- (16) Thread bolts of Slide Hammer Tools C-3752 into threaded holes in pump body flange (Fig. 10).
- (17) Bump slide hammer weights outward to remove pump and reaction shaft support assembly from case (Fig. 10).

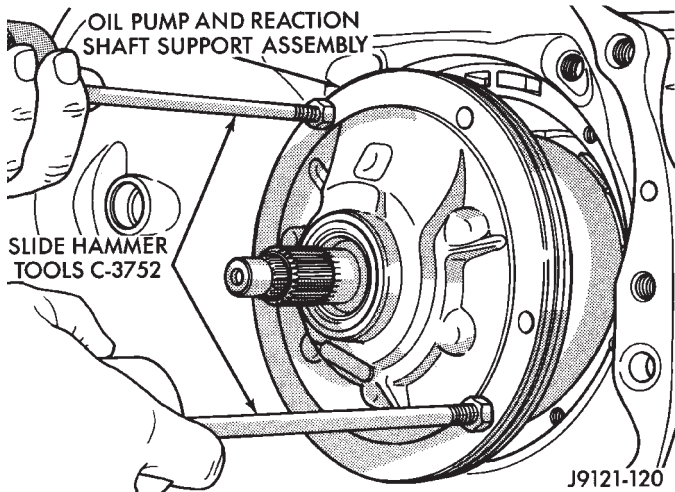


Fig. 10 Removing Oil Pump/Reaction Shaft Support

- (18) Loosen front band adjusting screw until band is completely loose.
- (19) Squeeze front band together and remove band strut (Fig. 11).

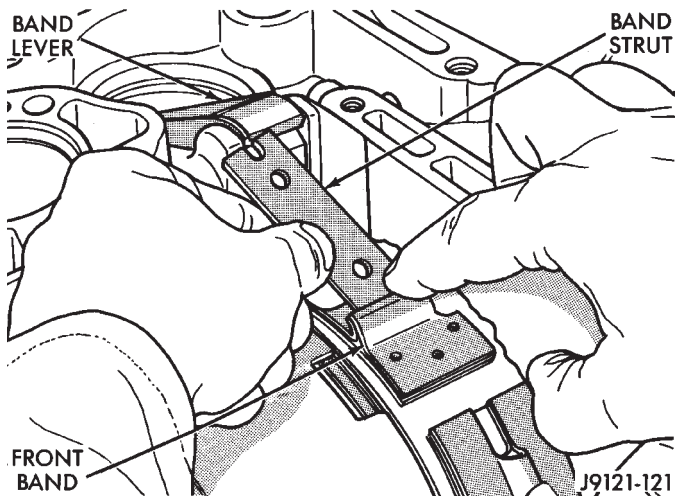


Fig. 11 Removing/Installing Front Band Strut

- (20) Remove front band reaction pin with pencil magnet. Pin is accessible from converter housing side of case (Fig. 12).
- (21) Remove front band lever (Fig. 13)
- (22) Slide front band rearward and onto driving shell. Band will not be removed until after front/rear clutch removal.
- (23) Remove front and rear clutch units as assembly. Grasp input shaft, hold clutch units together and remove them from case (Fig. 14).

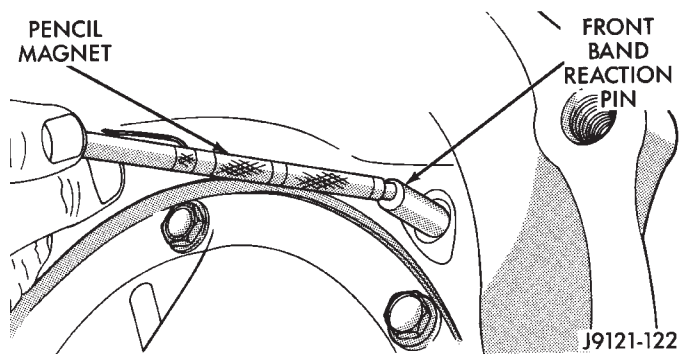


Fig. 12 Removing Front Band Reaction Pin

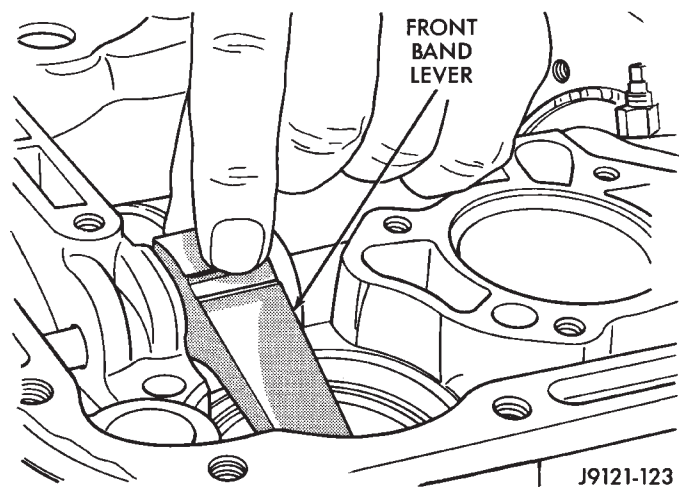


Fig. 13 Removing/Installing Front Band Lever

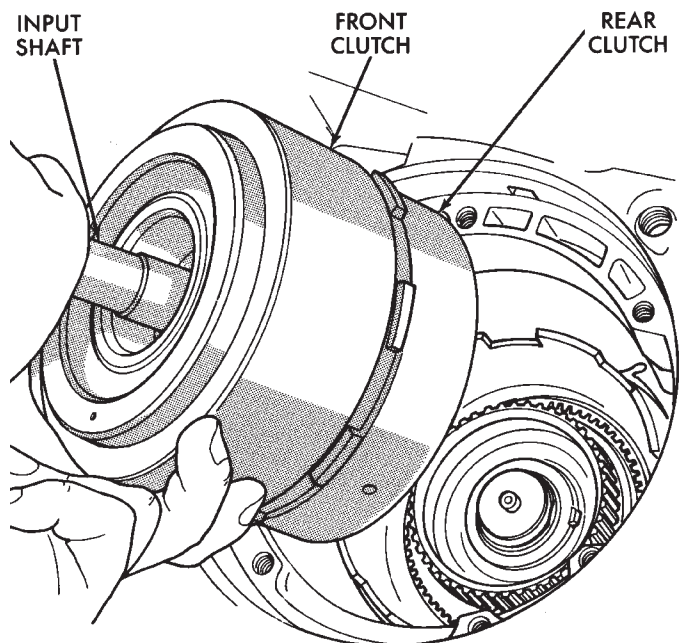


Fig. 14 Removing Front/Rear Clutch Assemblies

- (24) Lift front clutch off rear clutch (Fig. 15). Set clutch units aside for disassembly, cleaning and overhaul.

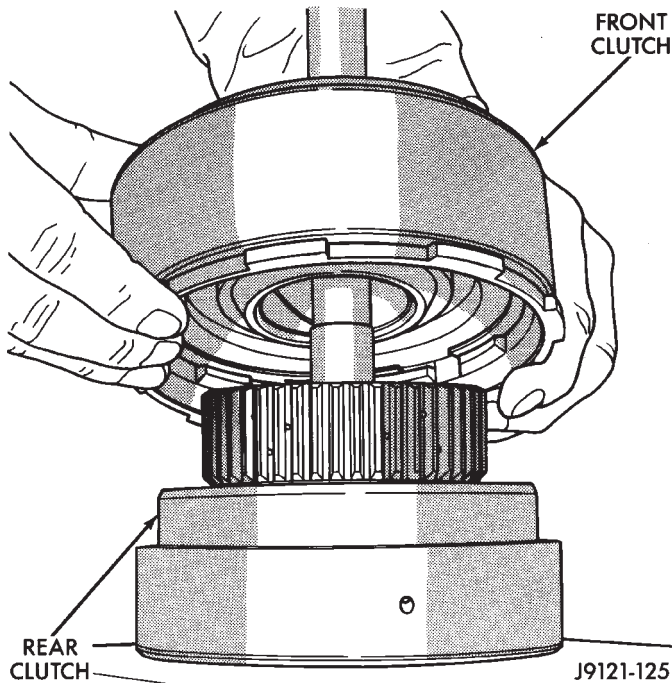


Fig. 15 Separating Front/Rear Clutch Assemblies

(25) Remove output shaft thrust washer from output shaft (or from rear clutch hub).

(26) Remove output shaft thrust plate from output shaft hub (Fig. 16).

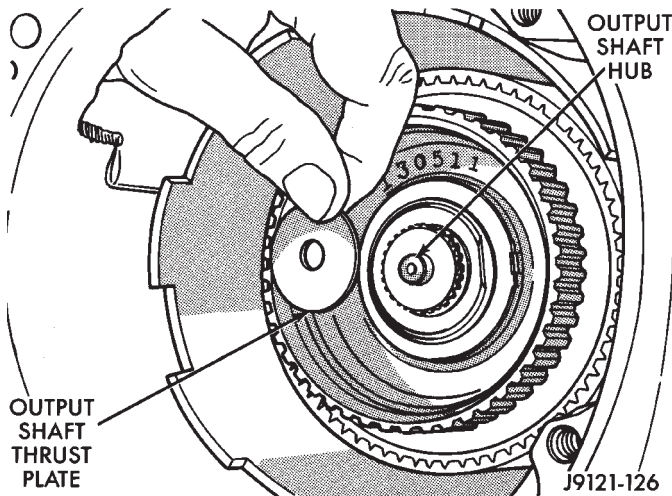


Fig. 16 Removing/Installing Output Shaft Thrust Plate

(27) Slide front band off driving shell (Fig. 17) and remove band from case.

(28) Remove E-clip from one end of governor valve shaft and remove valve and shaft from governor body (Fig. 19). Reinstall E-clip on shaft to avoid losing it.

(29) Remove thick snap, thrust washer and thin snap ring that retain governor body and park gear on shaft (Fig. 19).

(30) Loosen bolts attaching governor body to park gear.

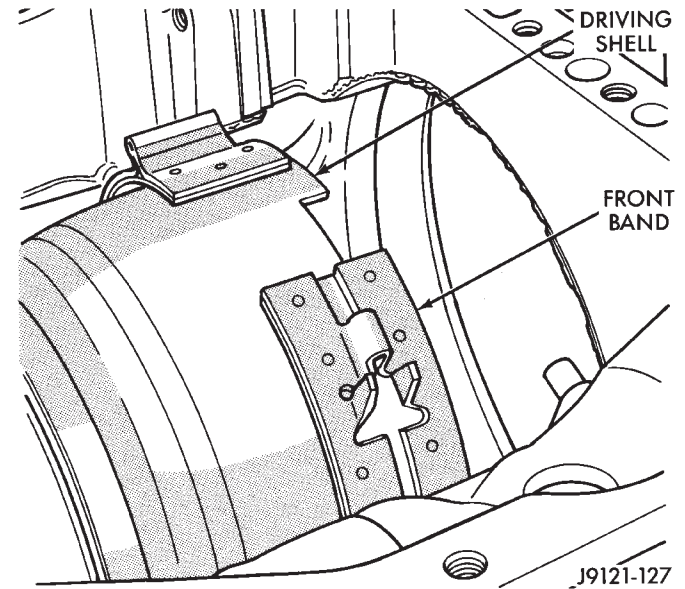


Fig. 17 Front Band Removal/Installation

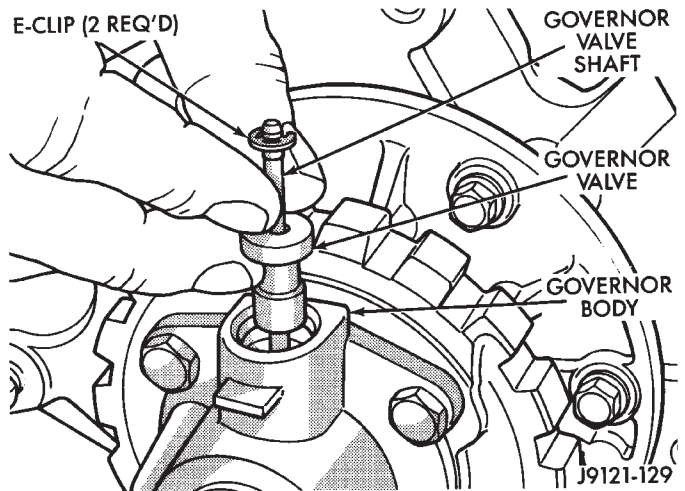


Fig. 18 Removing Governor Valve And Shaft

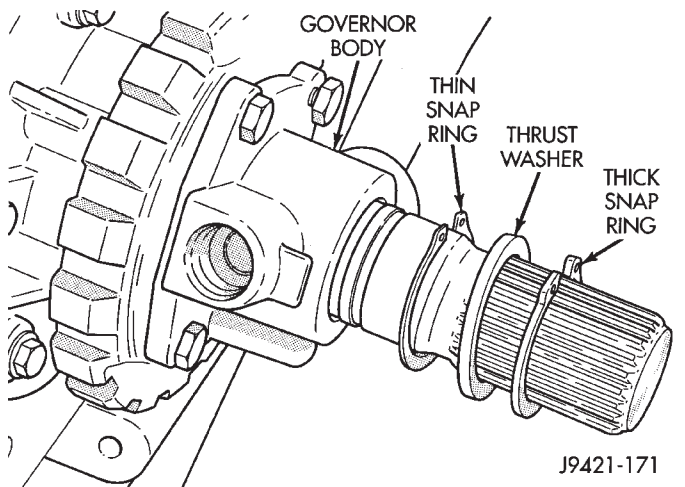


Fig. 19 Governor Body/Park Gear Attachment

(31) Mark position of governor body on park gear with center punch or scribe.

(32) Remove governor body and park gear as assembly (Fig. 20). Work park gear out of rear support and slide assembly off output shaft.

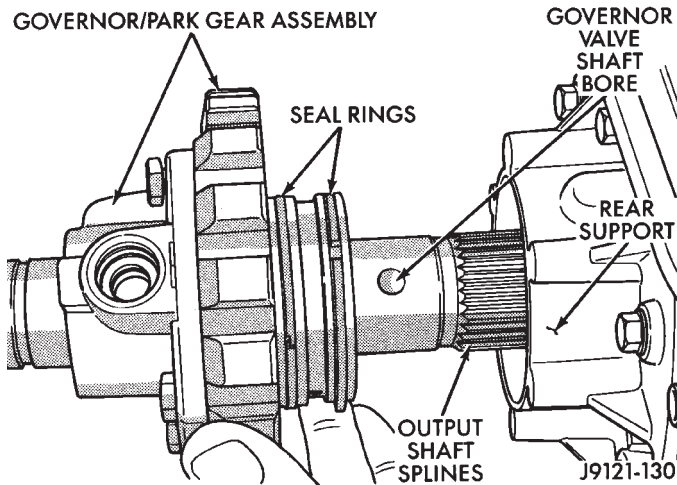


Fig. 20 Removing/Installing Governor Body And Park Gear

(33) Remove planetary geartrain as assembly (Fig. 21). Support geartrain with both hands during removal. Do not allow machined surfaces on output shaft to become nicked or scratched.

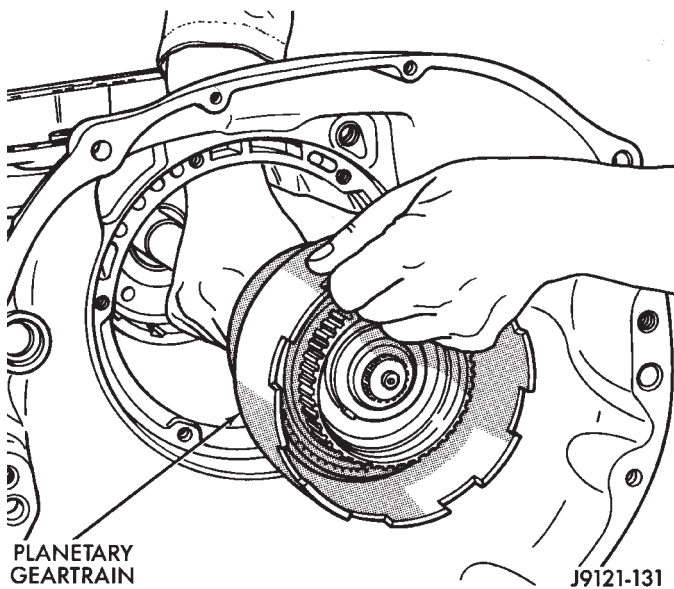


Fig. 21 Planetary Geartrain Removal

(34) Loosen rear band adjusting screw until band is fully released and does not grip low reverse drum.

(35) Remove snap ring that secures low-reverse drum to rear support (Fig. 22).

(36) Remove rear band lever pins as follows:

(a) On 30RH transmission, rear band has only one pivot pin. Remove pin with parallel jaw snap ring pliers (Fig. 23). Spread plier jaws in pin bore to grip pin. Then remove pin with a twist and pull motion.

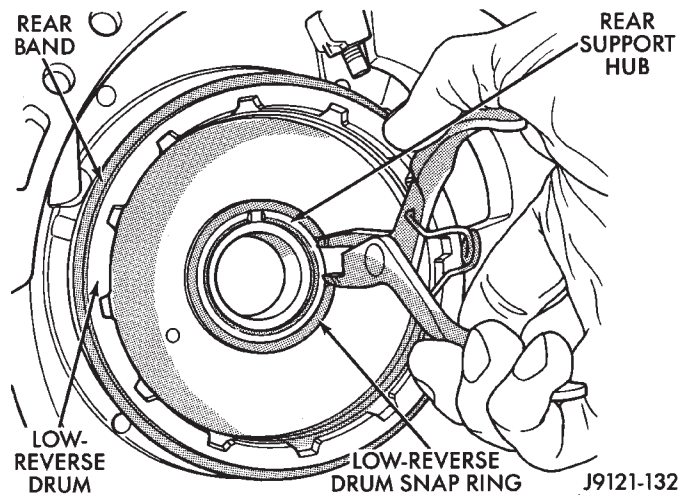


Fig. 22 Removing Low-Reverse Drum Snap Ring

(b) On 32RH transmission, rear band has two pins. Remove pivot pin and reaction pin with parallel jaw snap ring pliers (Fig. 24).

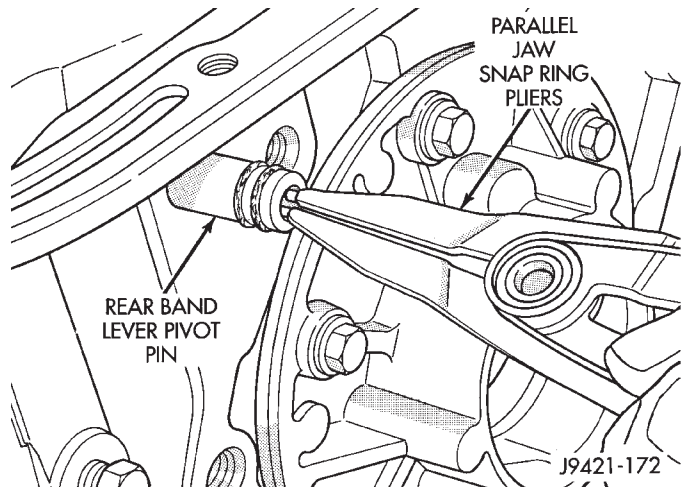


Fig. 23 Removing Rear Band Lever Pivot Pin (30RH)

(37) Remove rear band lever, link and strut.

(38) Mark position of rear support for assembly reference (Fig. 25). Use scribe or center punch to mark case and support.

(39) Remove rear support bolts and remove support from low-reverse drum and case (Fig. 26). Keep rear support bolts together for assembly reference.

(40) Remove bolts attaching overrunning clutch cam to case (Fig. 27).

(41) Remove low-reverse drum and overrunning clutch as assembly. Slide drum and clutch through rear band and out of case. Set drum and clutch assembly aside for cleaning and inspection.

(42) Remove rear band and link from case.

(43) Compress front servo rod guide about 3 mm (1/8 in.) with Valve Spring Compressor Tool C-3422-B (Fig. 28). A C-clamp and tool C-4470 can also be used to compress rod guide.

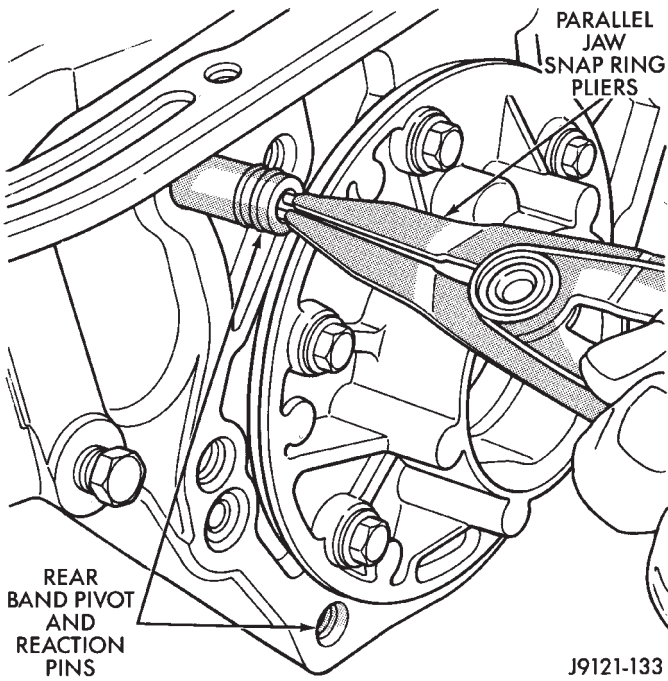


Fig. 24 Removing Rear Band Pivot And Reaction Pins (32RH)

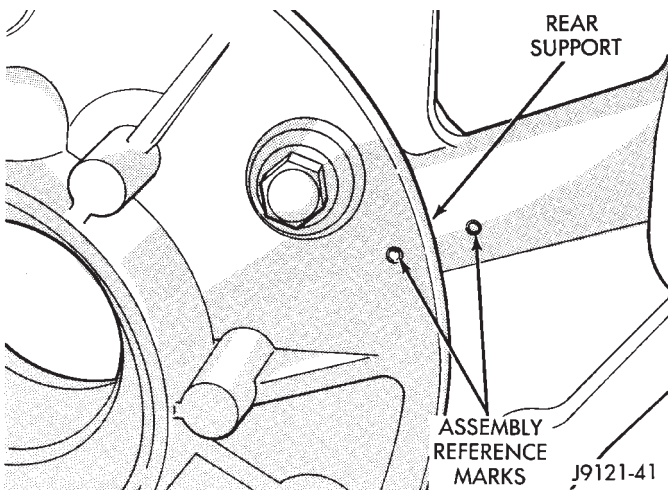


Fig. 25 Marking Rear Support For Assembly Reference

(44) Remove front servo rod guide snap ring (Fig. 28). **Exercise caution when removing snap ring. Servo bore can be scratched or nicked if care is not exercised.**

(45) Remove compressor tools and remove front servo rod guide, spring and servo piston.

(46) Compress rear servo spring retainer about 1.5 mm (1/16 in.) with C-clamp and Tool C-4470 or SP-5560 (Fig. 29). Valve Spring Compressor C-3422-B can also be used to compress spring retainer.

(47) Remove rear servo spring retainer snap ring. Then remove compressor tools and remove rear servo spring and piston.

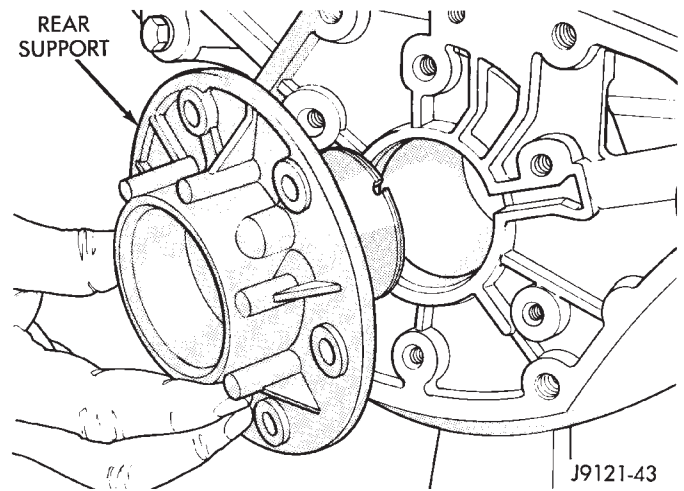


Fig. 26 Removing Rear Support

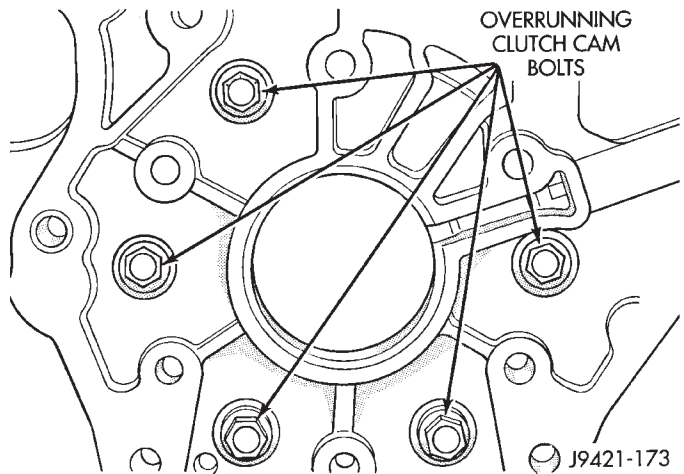


Fig. 27 Overrunning Clutch Cam Bolt Locations

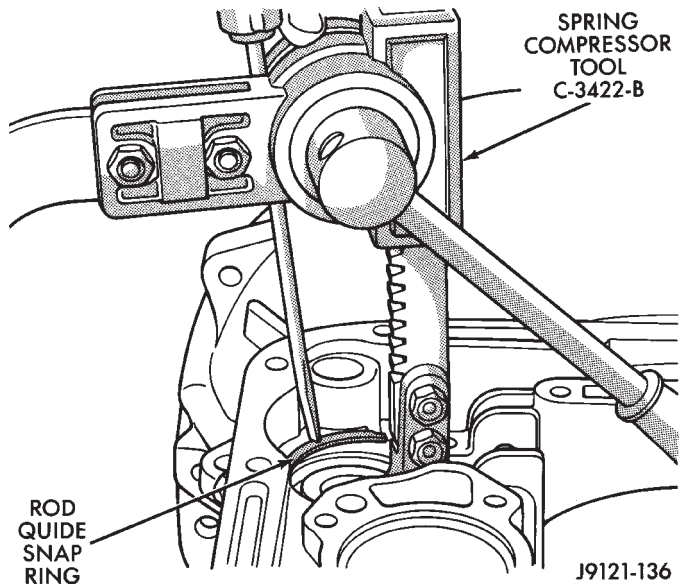


Fig. 28 Compressing Front Servo Rod Guide

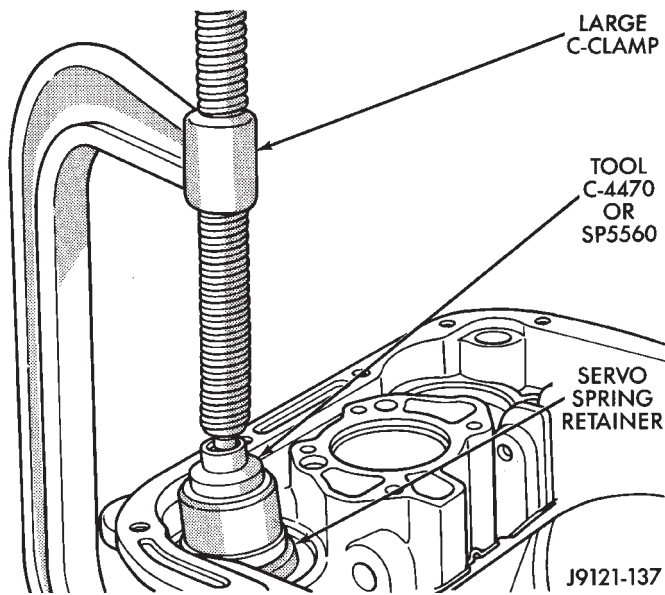


Fig. 29 Compressing Rear Servo Spring

OVERHAUL SERVICE INFORMATION

Inspect the transmission bushings during overhaul. Bushing condition is important as severely worn, or 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. The tool set is manufactured by Miller Tool Co. and is available through the dealer tool program.

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 are recommended for repairing damaged, stripped or worn threads in aluminum parts. These inserts are available from most automotive jobbers. Stainless steel inserts are preferred.

The use of crocus cloth is permissible where necessary. When used on valves, use 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, Type 7176 transmission fluid during overhaul and assembly.

Use petroleum jelly to hold parts like thrust washers in place during assembly. Use Ru-Glyde, Door Eze, or similar products to lubricate piston seals and O-rings to ease installation. Petroleum jelly can also be used to prelubricate parts during reassembly if desired.

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.

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 readily adhere to case surfaces and transmission components and will 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 Heli-Coil 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.

Remount the case in a repair stand after cleaning and inspection.

OVERRUNNING CLUTCH—LOW-REVERSE DRUM—REAR SUPPORT OVERHAUL

DISASSEMBLING OVERRUNNING CLUTCH/LOW-REVERSE DRUM

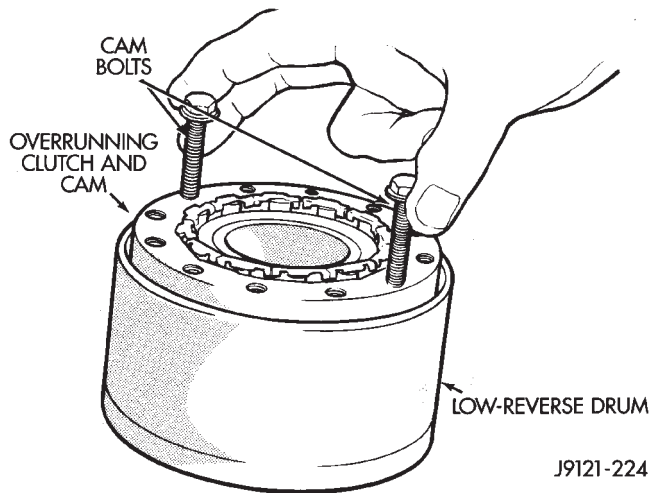
If the clutch assembly came out with the low-reverse drum, thread two clutch cam bolts into the cam. Then lift the cam out of the drum with the bolts (Fig. 30). Rotate the cam back and forth to ease removal if necessary. Remove the clutch roller and spring assembly from the race afterward.

CLEANING AND INSPECTION

Clean the overrunning clutch assembly, clutch cam, low-reverse drum and rear support 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**



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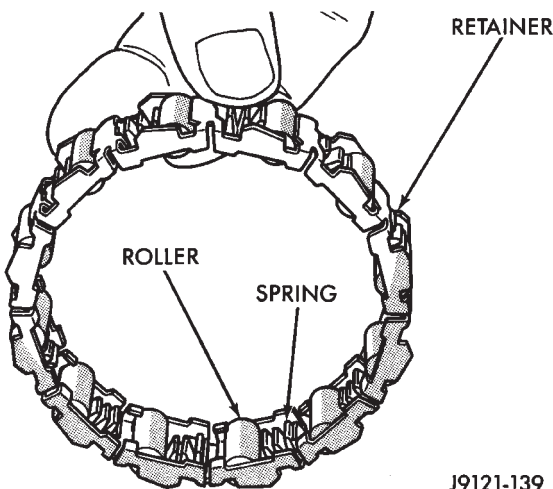
Fig. 30 Removing Overrunning Clutch From Low-Reverse Drum

low-reverse drum under any circumstances. Replace the drum and race as an assembly if either component is damaged.

Examine the rear support carefully for wear, cracks, scoring or other damage. Be sure the support hub is a snug fit in the case and drum. Replace the support if worn or damaged.

ASSEMBLING OVERRUNNING CLUTCH/LOW-REVERSE DRUM

(1) Assemble clutch rollers and springs in retainer if necessary (Fig. 31).



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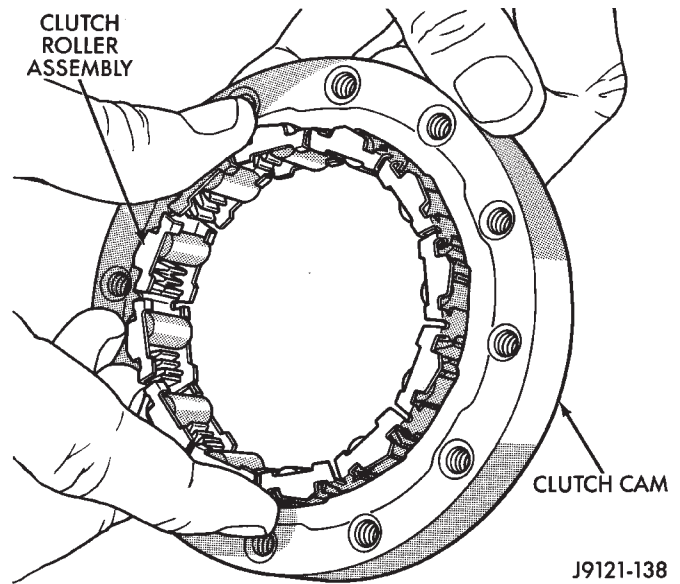
Fig. 31 Overrunning Clutch Rollers, Springs, Retainer

(2) Install overrunning clutch roller, spring and retainer assembly in clutch cam (Fig. 32).

(3) Temporarily assemble and check overrunning clutch operation as follows:

(a) Assemble cam and clutch.

(b) Install clutch assembly on low-reverse drum with twisting motion (Fig. 33).



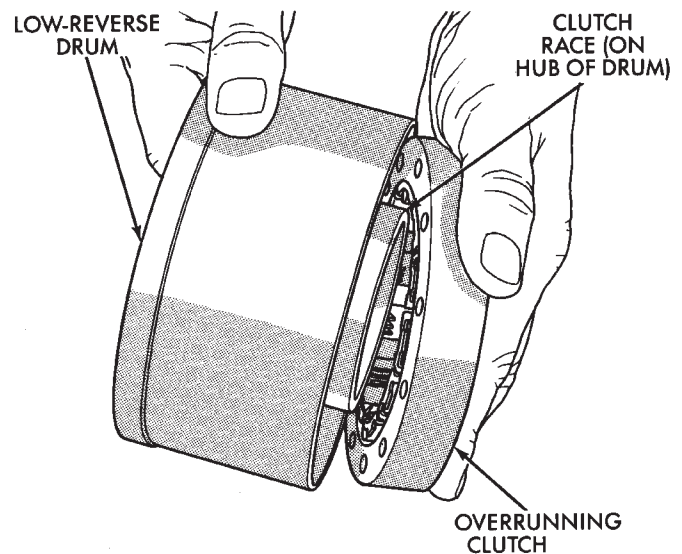
J9121-138

Fig. 32 Assembling Overrunning Clutch And Cam

(c) Install drum-clutch assembly in case and install clutch cam bolts.

(d) Install rear support and support attaching bolts.

(e) Check low-reverse drum rotation. **Drum should rotate freely in clockwise direction and lock when turned in counterclockwise direction (as viewed from front of case).**



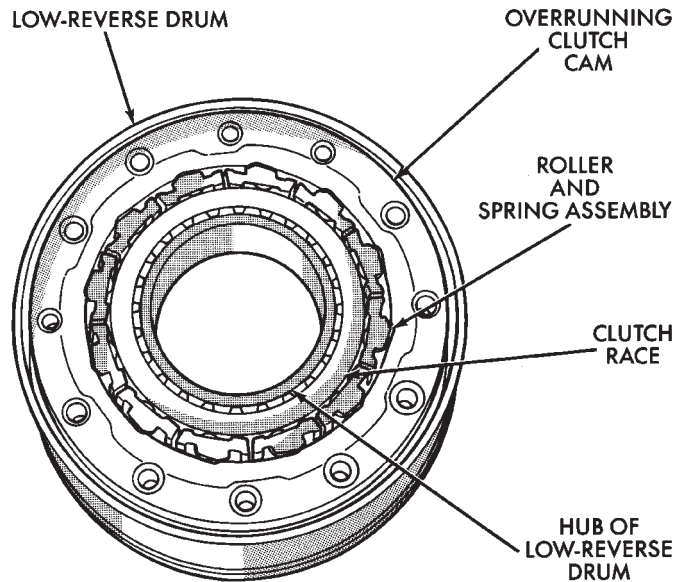
J9121-135

Fig. 33 Temporary Assembly Of Clutch And Drum To Check Operation

(4) Note component position for assembly reference. Bolt holes in clutch cam are countersunk on one side, Be sure this side of cam will face rearward when installed (Fig. 34).

(5) Remove rear support, overrunning clutch and low-reverse drum. Set components aside for final assembly. **If overrunning clutch will be installed**

before final assembly, install cam only as described in Transmission Assembly And Adjustment section. Clutch cam must be properly indexed in case to fit and operate properly.



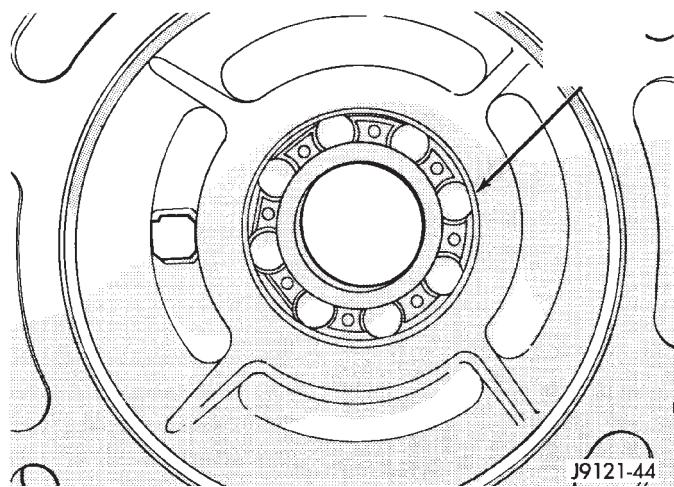
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Fig. 34 Assembled Overrunning Clutch Components

ADAPTER HOUSING AND PARK LOCK COMPONENT OVERHAUL

Clean the housing and park lock components in solvent and dry them with compressed air.

Inspect the output shaft bearing in the housing (Fig. 35). Replace the bearing if worn, damaged, or noisy.



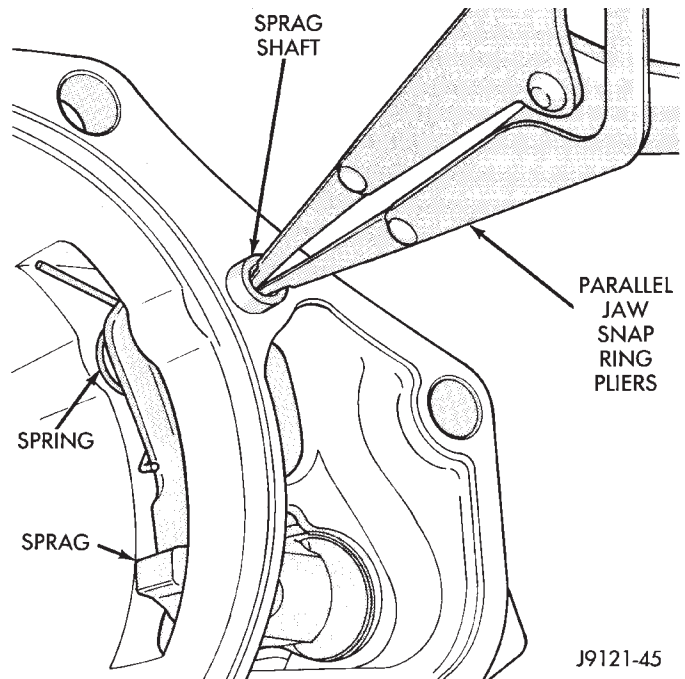
J9121-44

Fig. 35 Adapter Housing Bearing (4 x 4 Models)

Examine the park lock components in the housing. If replacement is necessary, remove the shaft with parallel jaw snap ring pliers (Fig. 36) and remove the sprag and spring. Then remove the spring clip and reaction plug (Fig. 37).

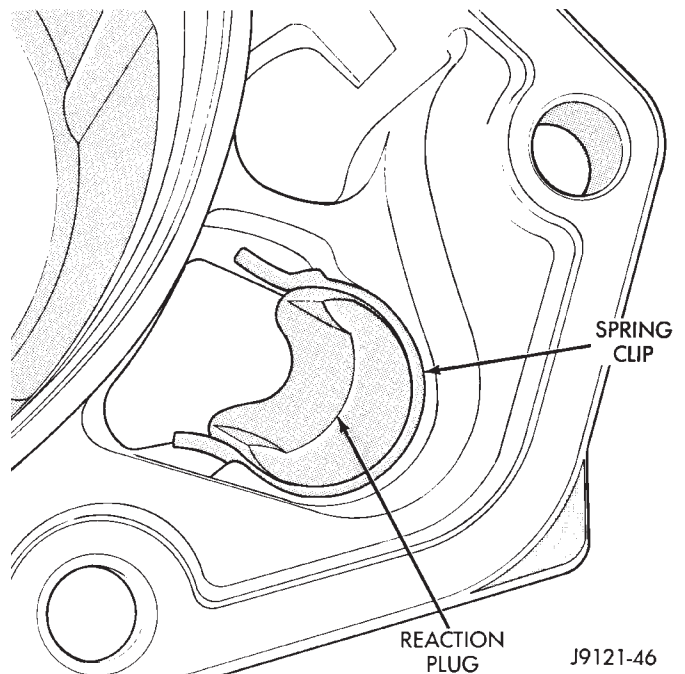
Compress the reaction plug spring clip only enough to remove or install it. The clip is easily distorted if overcompressed. Replace the clip if it becomes bent or distorted. Do not straighten and reuse the clip if this occurs.

Be sure a replacement sprag is installed so the sprag locking lug will face the park gear. Also be sure the spring is correctly positioned as shown (Fig. 38). The sprag may not retract if the spring is improperly installed.



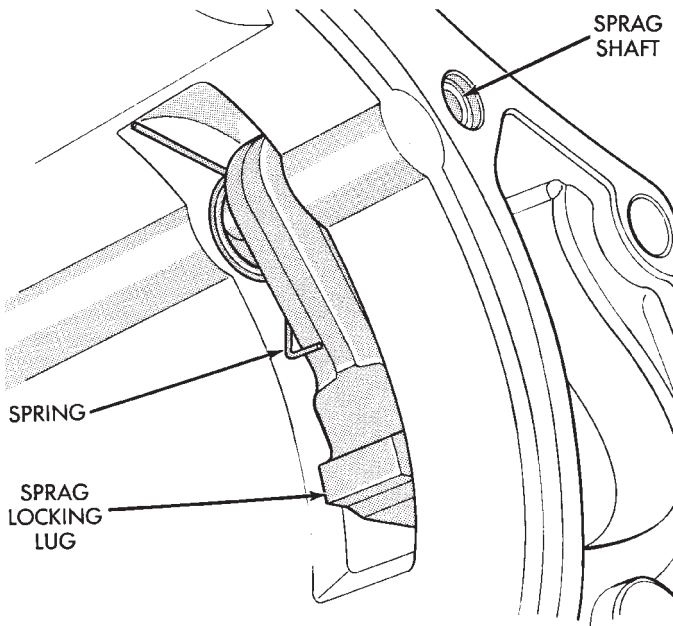
J9121-45

Fig. 36 Park Sprag, Shaft And Spring Removal



J9121-46

Fig. 37 Park Sprag Reaction Plug And Spring Location



J9121-47

Fig. 38 Correct Position Of Sprag And Spring
GOVERNOR AND PARK GEAR OVERHAUL

GOVERNOR/PARK GEAR DISASSEMBLY

- (1) Loosen bolts attaching governor to park gear.
- (2) Remove governor snap ring and locating snap ring from output shaft (Fig. 39).
- (3) Remove E-clip securing governor valve shaft and remove shaft and valve from governor body.
- (4) Slide governor and park gear off output shaft.
- (5) Remove governor retaining bolts and separate governor from park gear.
- (6) Remove governor filter from park gear. Keep filter with governor body.
- (7) Remove governor weight snap ring and remove weight assembly from governor body. Remove inner snap ring and separate governor weights.

GOVERNOR/PARK GEAR CLEANING AND INSPECTION

Clean the governor and park gear components in solvent and dry with compressed air.

Examine the governor components carefully (Fig. 39). Discard any snap rings or E-clips if distorted, or worn. Be sure the governor weights operate freely in the bores and do not bind. Also verify that the governor valve slides freely on the shaft and in the bore.

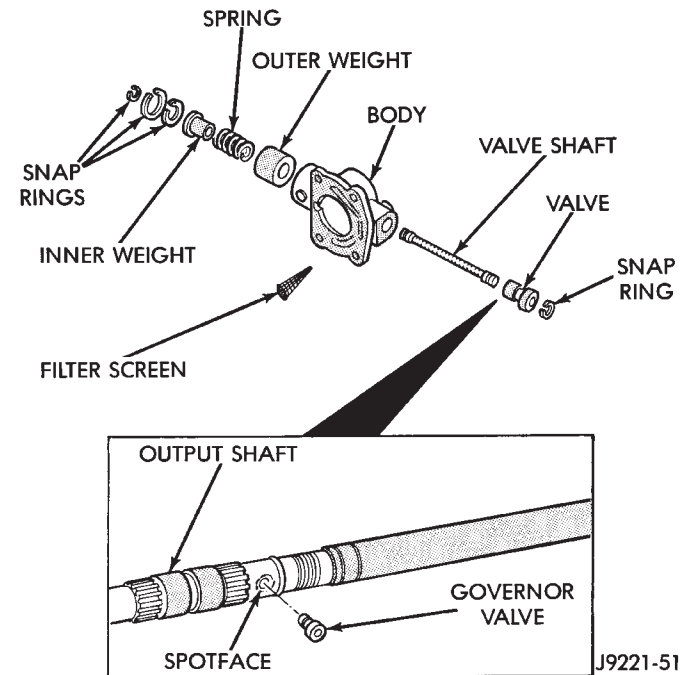
Minor scratches, or burrs on governor components can be cleaned up with oil-soaked crocus cloth. However, do not attempt to salvage components that are severely worn or scored.

The governor valve used in 30RH/32RH transmissions built starting with the 1992 model year, is now made of aluminum. In addition, the output shaft has been spotfaced to accept the new

aluminum valve (Fig. 39). The aluminum valve must not be used in prior transmissions. The valve can only be used with an output shaft that has been spotfaced for valve end clearance. In addition, the governor body and output shaft must be properly indexed during reassembly. Be sure to index these components as described in the Transmission Assembly and Adjustment procedures.

Check condition of the park gear seal rings, ring grooves and gear teeth (Fig. 40). Replace the gear as an assembly if the teeth or ring grooves are worn, or damaged.

Replace the park gear front and rear seal rings if cracked, or worn. The production style front ring is a plain type and the rear ring is a hook style. If replacement rings are both hook-style, be sure the ring ends are properly hooked together.



J9221-51

Fig. 39 Governor Components

ASSEMBLING GOVERNOR AND PARK GEAR

- (1) Coat governor body bores and valves with transmission fluid.
- (2) Assemble governor weights and springs. Then install weight assembly in governor body but do not install valve and shaft at this time. These parts are not installed until after governor and park gear are in place on output shaft.
- (3) Install new seal rings on park gear if necessary.
- (4) Insert filter screen in park gear and position governor body on park gear.

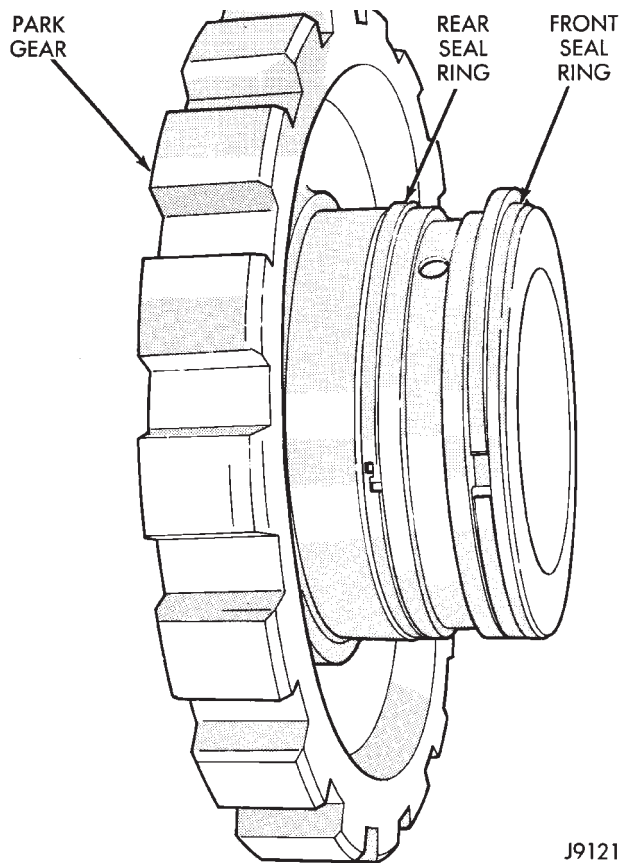


Fig. 40 Park Gear And Seal Rings

(5) Tighten governor body attaching bolts finger tight only. Bolts will not be final tightened until after governor and park gear are mounted on output shaft.

OIL PUMP OVERHAUL

PUMP AND REACTION SHAFT SUPPORT DISASSEMBLY

(1) Remove seal ring from housing and reaction shaft support (Fig. 41).

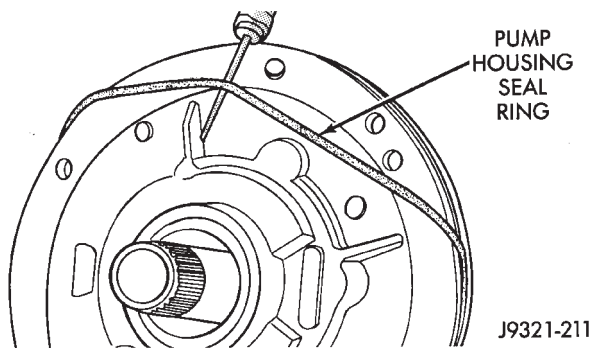


Fig. 41 Removing Pump Seal Ring

(2) Mark pump housing and support assembly for alignment reference.

(3) Loosen bolts that attach pump body to support (Fig. 42).

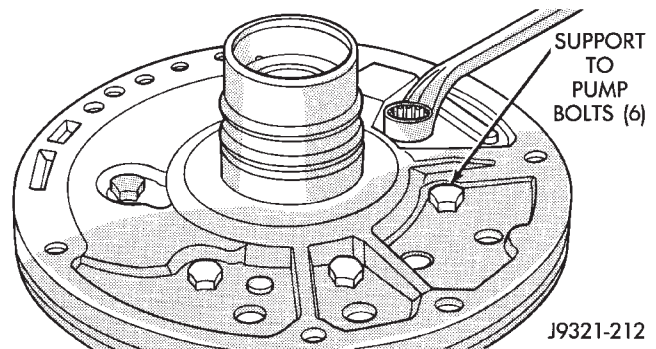


Fig. 42 Loosening Pump Support Bolts

(4) Remove pump-to-support bolts and separate support from pump housing (Fig. 43).

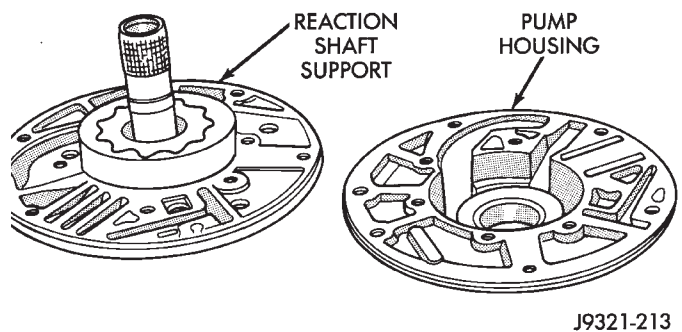


Fig. 43 Separating Pump Housing From Reaction Shaft Support

(5) Remove inner and outer gears from reaction shaft support (Fig. 44).

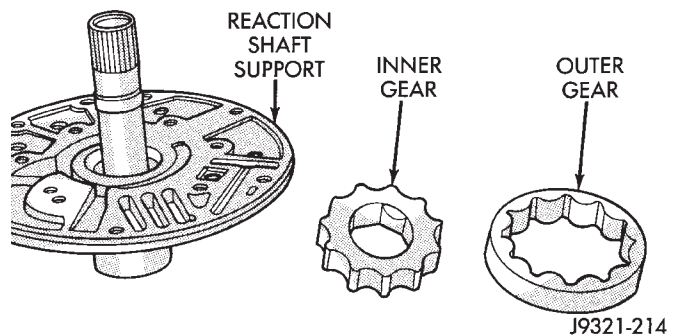


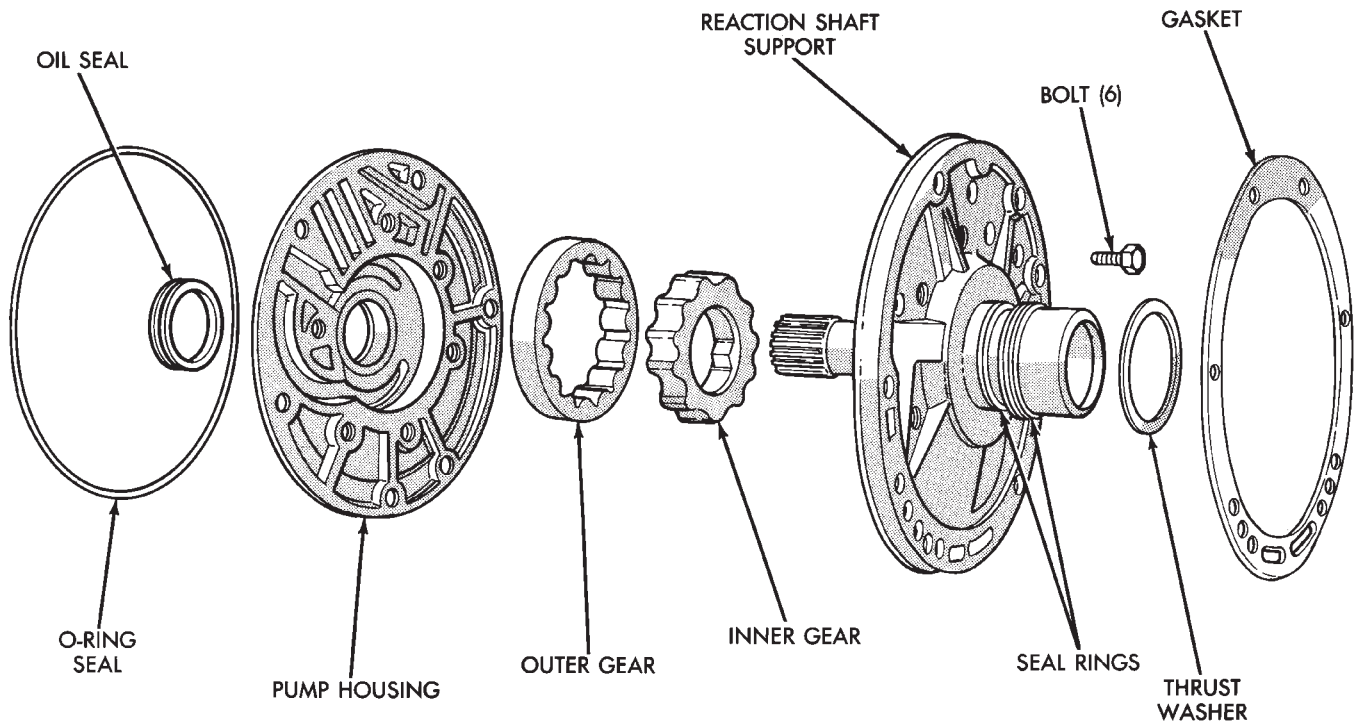
Fig. 44 Pump Gear Removal

(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. 45).

OIL PUMP AND REACTION SHAFT SUPPORT CLEANING AND INSPECTION

Clean pump and reaction shaft support components with solvent and dry them with compressed air.



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Fig. 45 Oil Pump And Reaction Shaft Support Components (All)

Inspect the pump housing and support components. Replace the housing or support if the seal ring grooves or machined surfaces are worn, scored, pitted, or damaged.

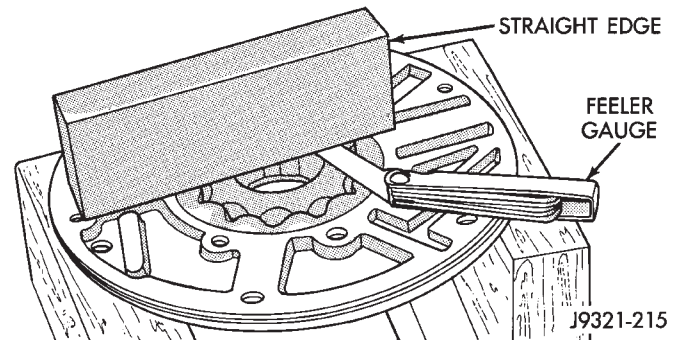
Replace the pump gears if pitted, worn chipped, or damaged. Inspect the thrust washer for wear or damage. Replace the washer if necessary. **Note that the inner gear used in 1993 and later 30RH/32RH oil pumps has a new design drive lug. The new design incorporates tapered drive flats instead of the square lug used previously. The torque converter hub has also been redesigned to accept the new drive flats. If pump gear replacement is necessary, be very sure to order and install the correct style gears.**

Inspect the pump and reaction shaft support bushings. Minor bushing wear is acceptable. Replace the bushings only if scored, or severely worn.

Install the gears in the pump housing and measure end clearance with a feeler gauge and straightedge (Fig. 46). Clearance should be 0.010 - 0.06 mm (0.0004 - 0.0025 in.).

Measure clearance between the outer gear and the pump body (Fig. 47). Clearance should be 0.08 - 0.19 mm (0.0035 - 0.0075 in.).

Measure gear tooth clearance with a feeler gauge. Align one tooth of the outer gear in inner gear and



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Fig. 46 Measuring Pump Gear End Clearance

measure clearance (Fig. 48). Clearance should be 0.08 - 0.19 mm (0.0035 - 0.0075 in.).

OIL PUMP BUSHING REPLACEMENT

(1) Remove pump bushing with Tool Handle C-4171 and Bushing Remover SP-3551 (Fig. 49).

(2) Install new pump bushing with Tool Handle C-4171 and Bushing Installer SP-5117 (Fig. 49). Bushing should be flush with pump housing bore.

(3) Stake new pump bushing in two places with blunt punch (Fig. 50). Remove burrs from stake points with knife blade afterward.

REACTION SHAFT SUPPORT BUSHING REPLACEMENT

(1) Assemble Bushing Remover Tools SP-1191,

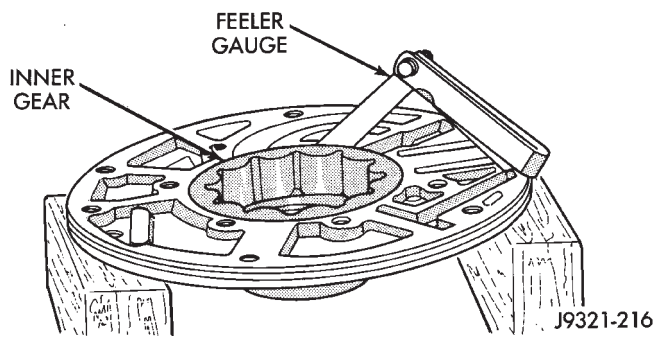


Fig. 47 Measuring Pump Housing-To-Inner Gear Clearances

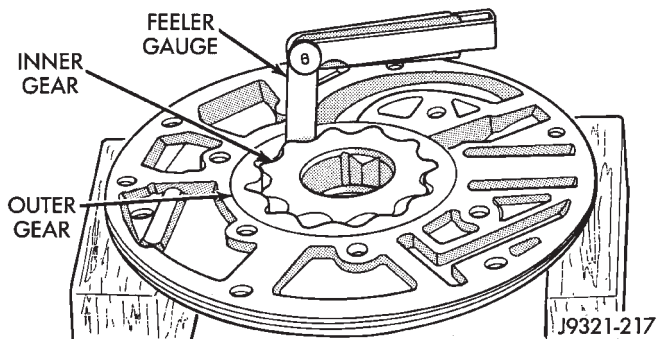


Fig. 48 Measuring Pump Gear Tooth Clearance

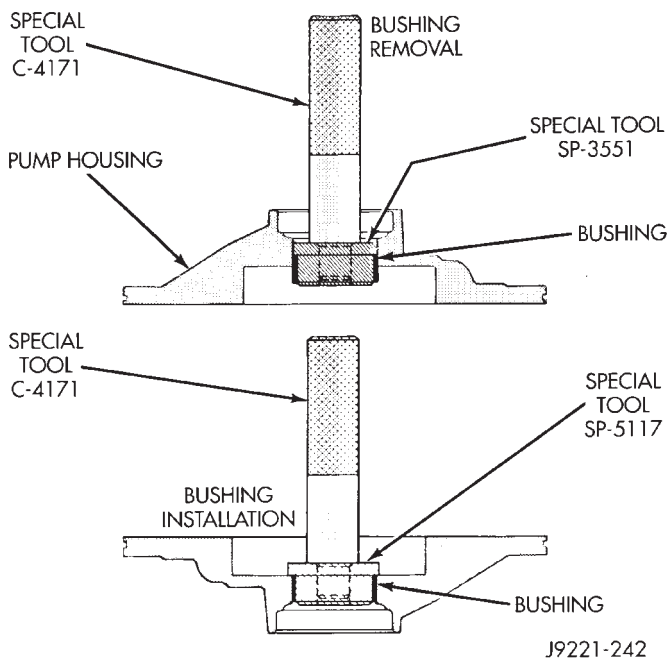


Fig. 49 Removing Oil Pump Bushing

3633 and 5324 (Fig. 51). **Do not clamp any part of reaction shaft or support in vise.**

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

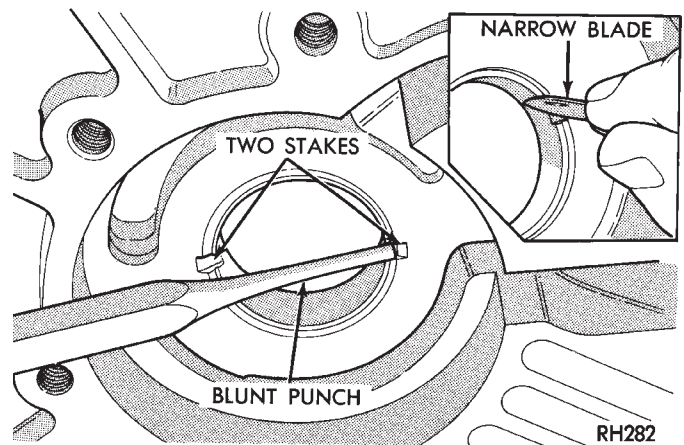


Fig. 50 Staking Oil Pump Bushing

(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. 51).

(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.

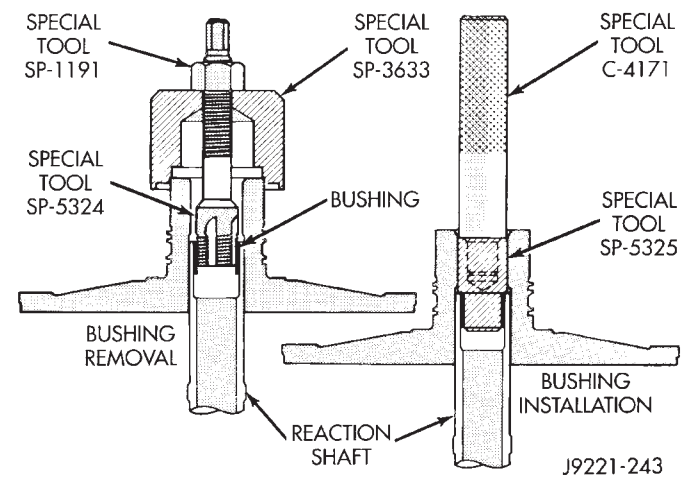


Fig. 51 Replacing Reaction Shaft Support Bushing

ASSEMBLING OIL PUMP AND REACTION SHAFT SUPPORT

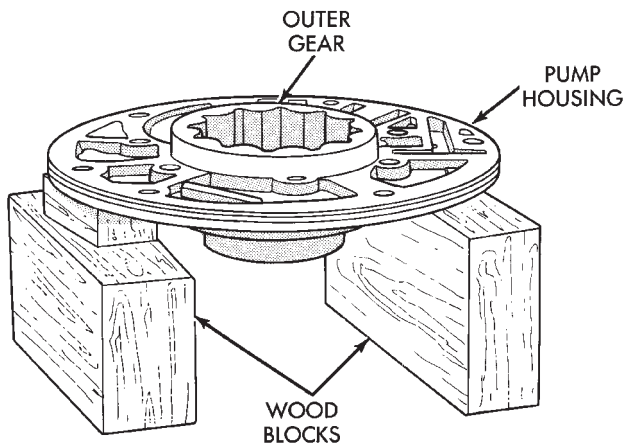
(1) Lubricate gear bore in pump housing with transmission fluid.

(2) Lubricate pump gears with transmission fluid.

(3) Support pump housing on wood blocks (Fig. 52).

(4) Install outer gear in pump housing (Fig. 52). Gear can be installed either way (it is not a one-way fit).

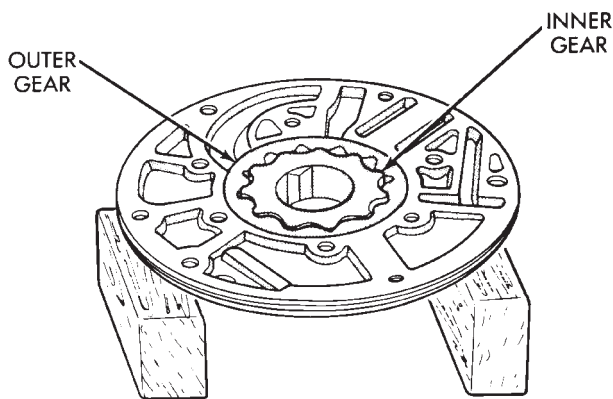
(5) Install pump inner gear (Fig. 53).



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Fig. 52 Supporting Pump And Installing Outer Gear

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).



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Fig. 53 Pump Inner Gear Installation

(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. 54). 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.

(8) Install reaction shaft support on pump housing (Fig. 55).

(9) Align reaction support on pump housing. Use alignment marks made at disassembly. Or, rotate

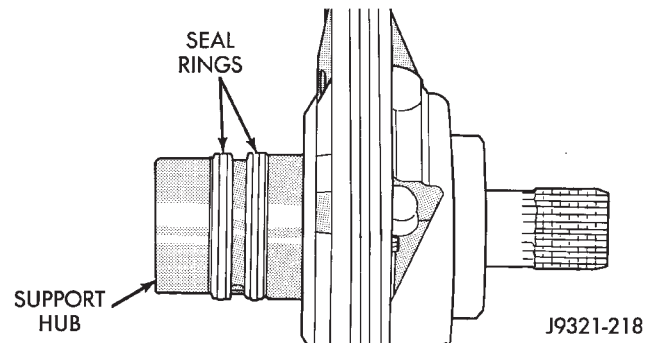


Fig. 54 Hub Seal Ring Position

support until bolt holes in support and pump housing are all aligned (holes are offset for one-way fit).

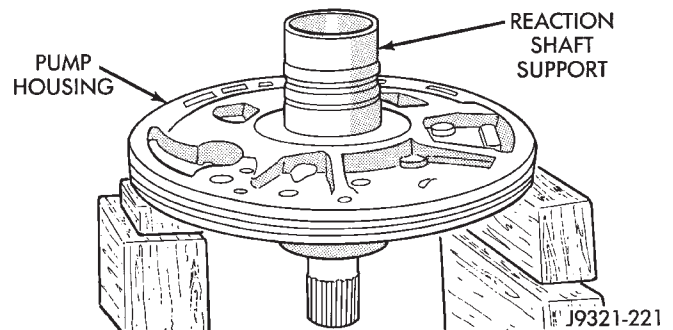


Fig. 55 Assembling Reaction Shaft Support And Pump Housing

(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. 56). 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.

FRONT CLUTCH OVERHAUL

FRONT CLUTCH DISASSEMBLY

(1) Remove waved snap ring and remove pressure plate, clutch plates and clutch discs (Fig. 57).

(2) Compress clutch piston spring with Compressor Tool C-3575-A (Fig. 58). Be sure legs of tool are seated squarely on spring retainer before compressing spring.

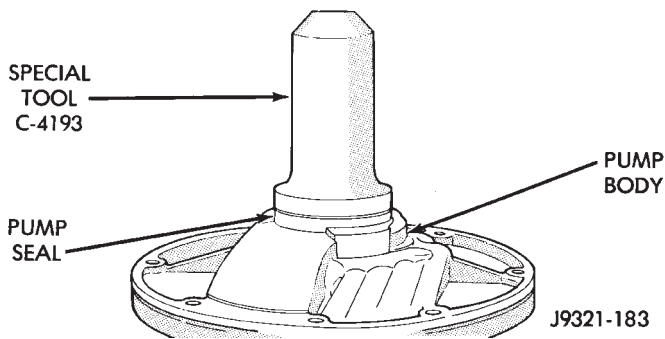


Fig. 56 Pump Oil Seal Installation

- (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.

FRONT CLUTCH INSPECTION

Clean the front clutch components in solvent and dry them with compressed air only. Do not use rags or shop towels to dry any of the clutch parts. Lint from such materials will adhere to the component surfaces and could restrict or block fluid passages after assembly.

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

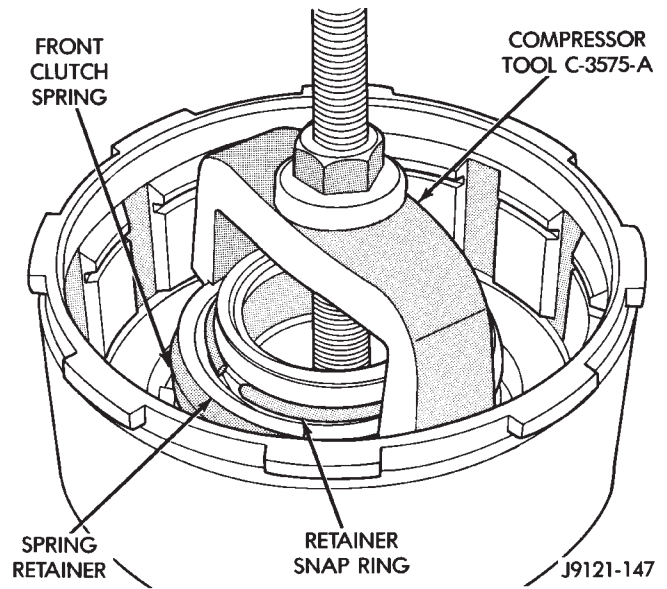


Fig. 58 Compressing Front Clutch Piston Spring

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. 59). The ball must move freely and not stick.

Inspect the clutch retainer bushings carefully (Fig. 60). The retainer bushings are not service-

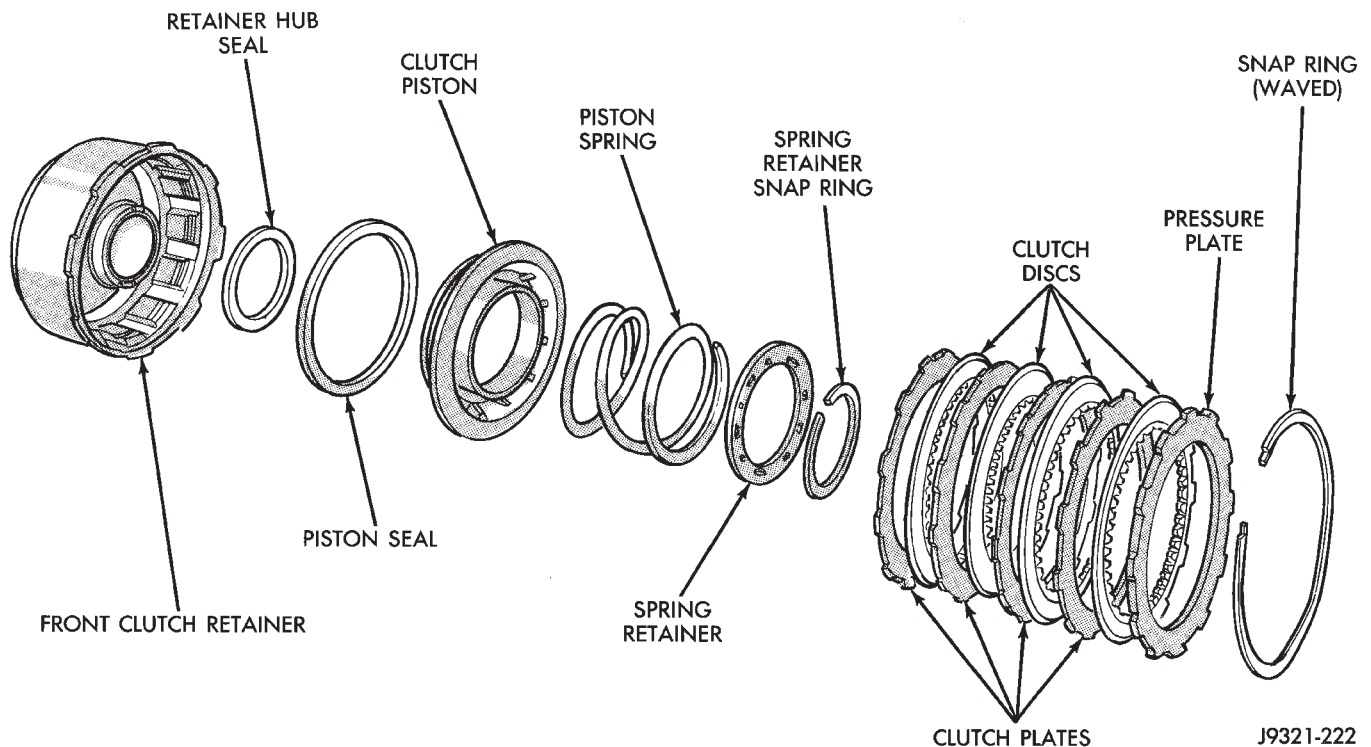


Fig. 57 Front Clutch Components (30RH/32RH)

able. 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.

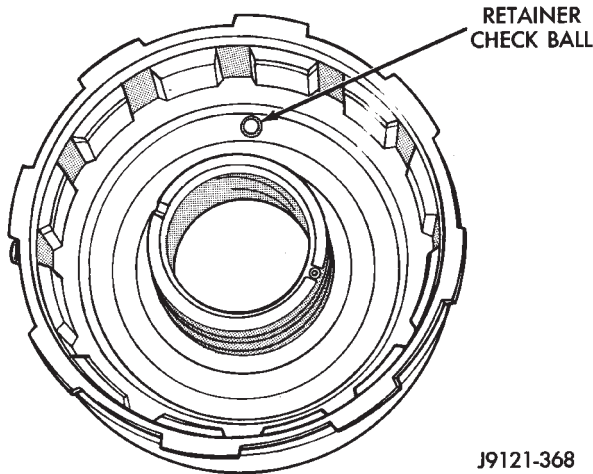


Fig. 59 Front Clutch Piston Retainer Check Ball Location

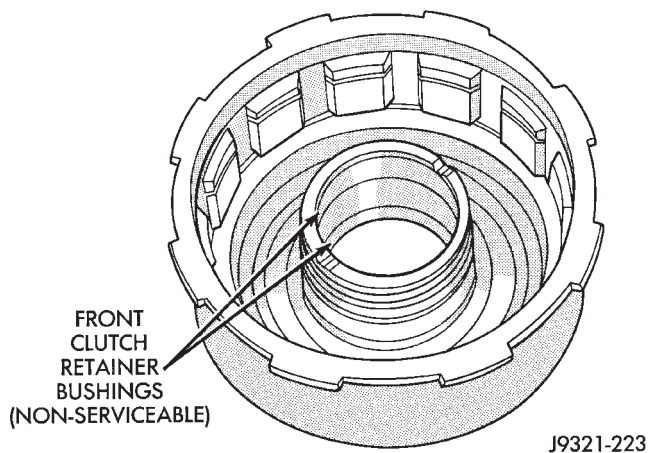


Fig. 60 Retainer Bushing Locations

FRONT CLUTCH 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 Door Eze, or petroleum jelly. Then lubricate retainer hub, bore and piston with transmission fluid.

(4) Install clutch piston in retainer (Fig. 61). Use twisting motion to seat piston in bottom of retainer. **Do not attempt to push the piston straight in. This could fold the seals over causing leakage and clutch slip.**

(5) Position spring in clutch piston (Fig. 62).

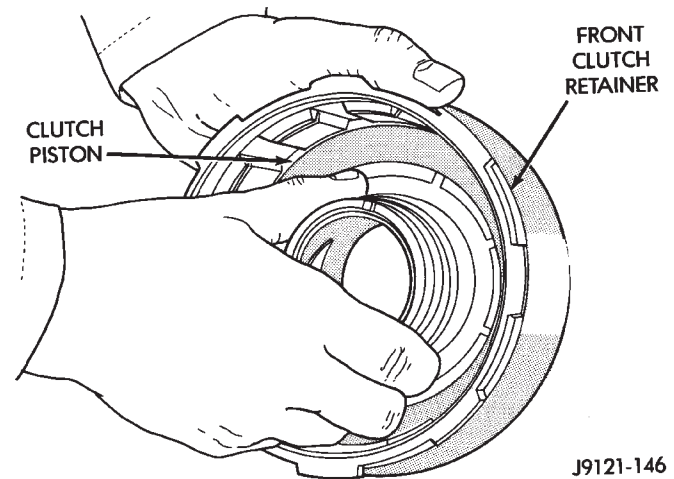


Fig. 61 Front Clutch Piston Installation

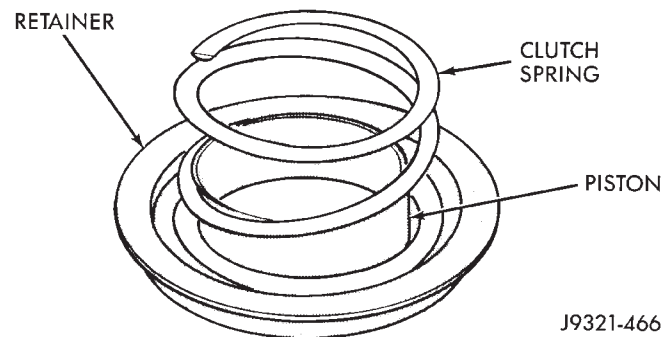


Fig. 62 Clutch Piston Spring Installation

(6) Position spring retainer on top of piston spring (Fig. 63). **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.**

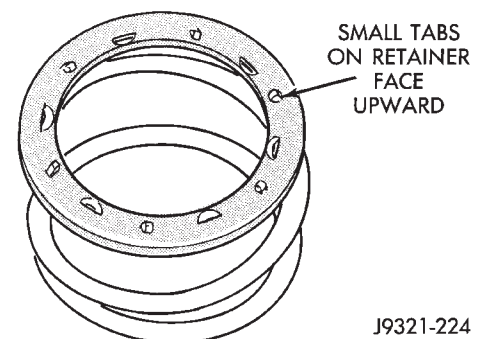


Fig. 63 Correct Spring Retainer Installed Position

(7) Compress piston spring and retainer with Compressor Tool C-3575-A (Fig. 64). Then install new snap ring to secure spring retainer and spring.

(8) Install clutch plates and discs (Fig. 57). Install steel plate then disc until all plates and discs are installed.

(9) Install pressure plate and waved snap ring (Fig. 57).

(10) Check clutch plate clearance (Fig. 64). 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 OVERHAUL

REAR CLUTCH DISASSEMBLY

- (1) Remove fiber thrust washer from forward side of clutch retainer.
- (2) Remove selective clutch pack snap ring (Figs. 65 and 66).
- (3) Remove top pressure plate, clutch discs, steel plates, bottom pressure plate and wave spring (Figs. 65 and 66).
- (4) Remove clutch piston with rotating motion.
- (5) Remove and discard piston seals.
- (6) Remove input shaft snap ring (Fig. 67).
- (7) Press input shaft out of retainer with shop press and suitable size press tool (Fig. 68).
- (8) Remove input shaft front/rear seal rings.

REAR CLUTCH INSPECTION

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

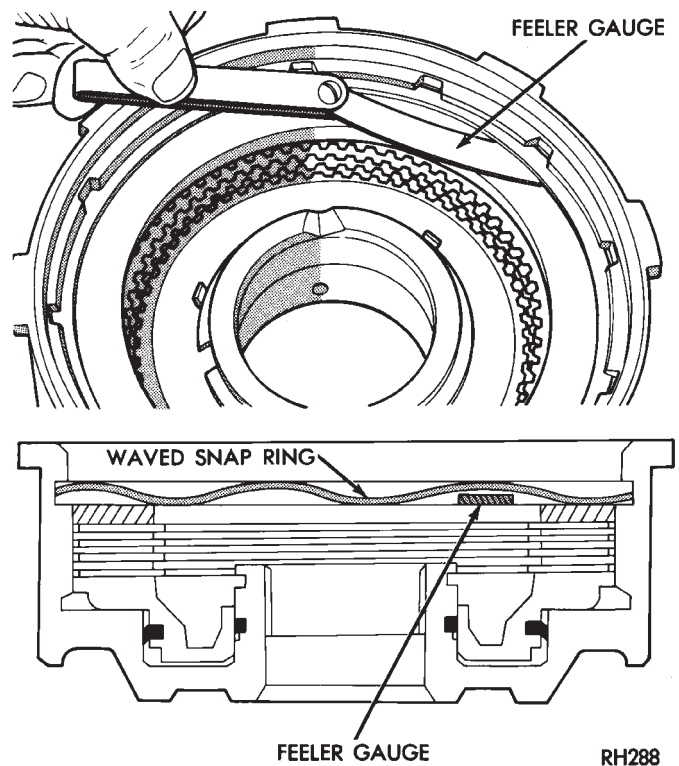


Fig. 64 Measuring Front Clutch Pack Clearance

also in good condition. The lugs must not be bent, cracked or damaged in any way.

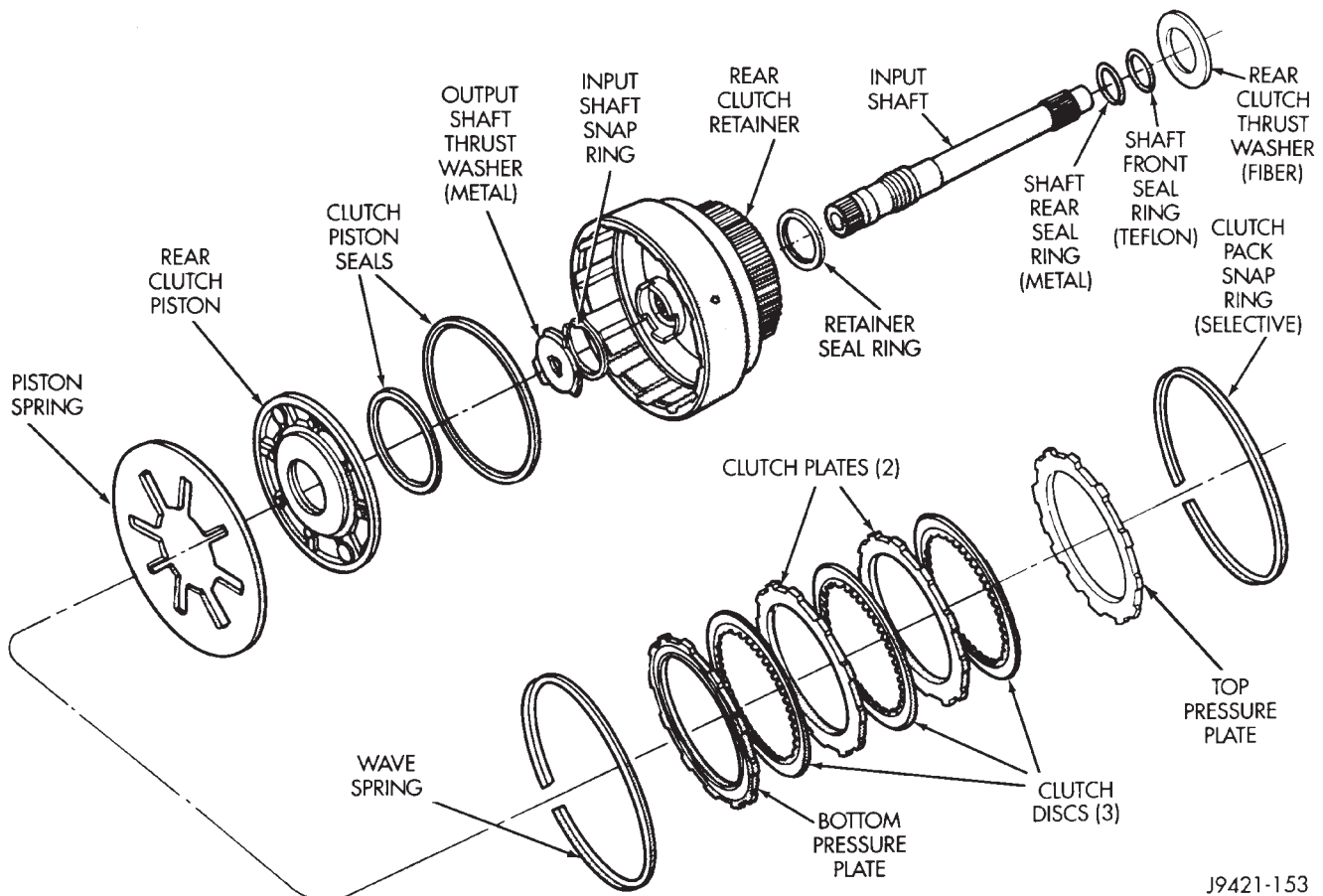
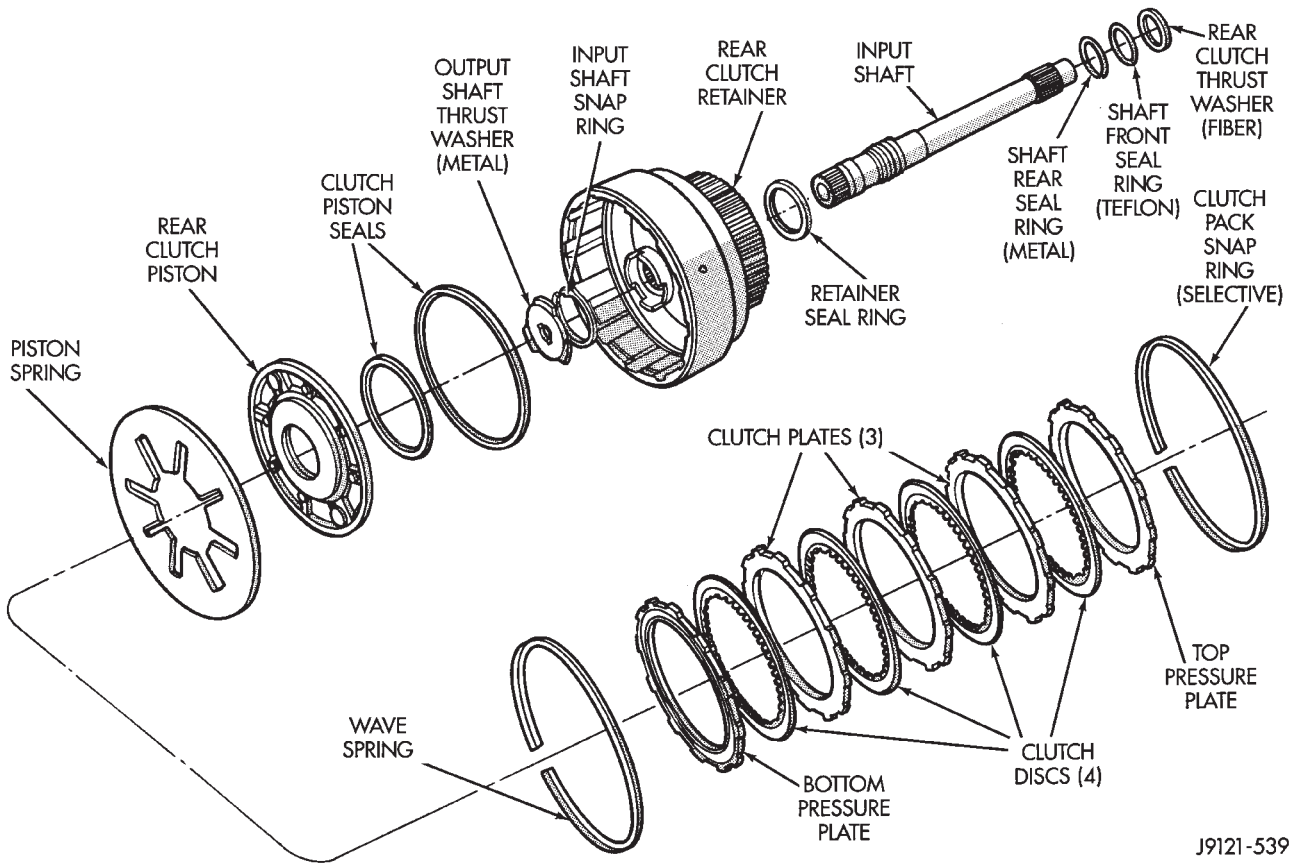
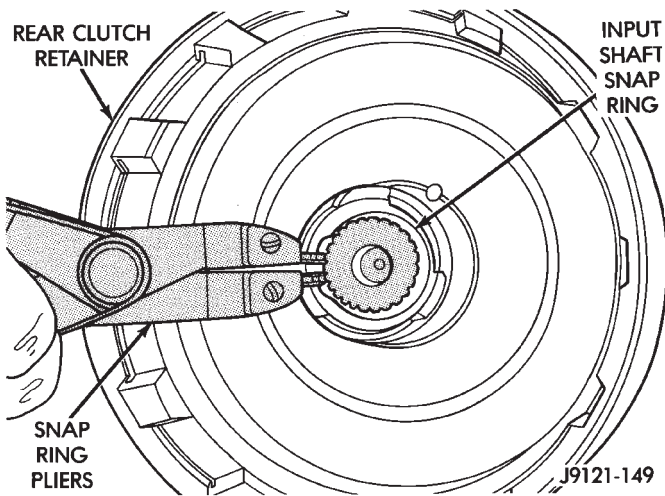


Fig. 65 Rear Clutch Components (30RH)



J9121-539

Fig. 66 Rear Clutch Components (32RH)



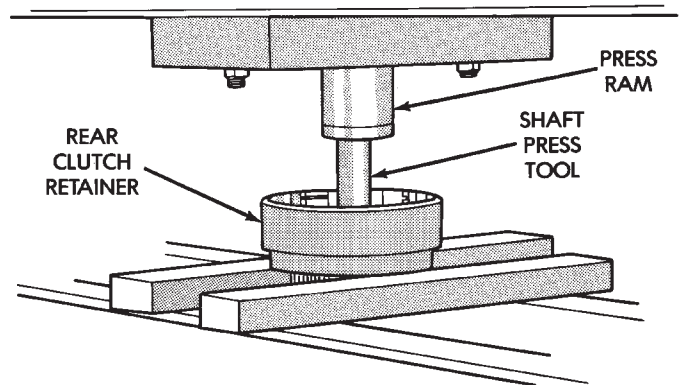
J9121-149

Fig. 67 Removing/Installing Input Shaft Snap Ring

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 in doubt exists about bushing condition.



J9121-150

Fig. 68 Pressing Input Shaft Out Of Rear Clutch Retainer

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.

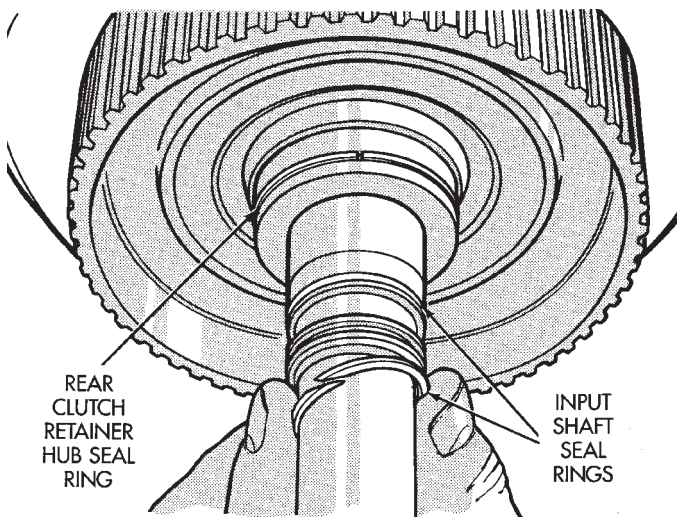
ASSEMBLING REAR CLUTCH

(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. 69).

(a) Be sure clutch hub seal ring is fully seated in groove and is not twisted.

(b) Note that input shaft front seal ring is teflon and rear seal ring is metal (Fig. 70). Be sure chamfered ends of teflon ring are properly joined and that ends of rear ring are securely hooked together. Lubricate both rings with transmission fluid after installation.



J9121-538

Fig. 69 Rear Clutch Retainer And Input Shaft Seal Ring Installation

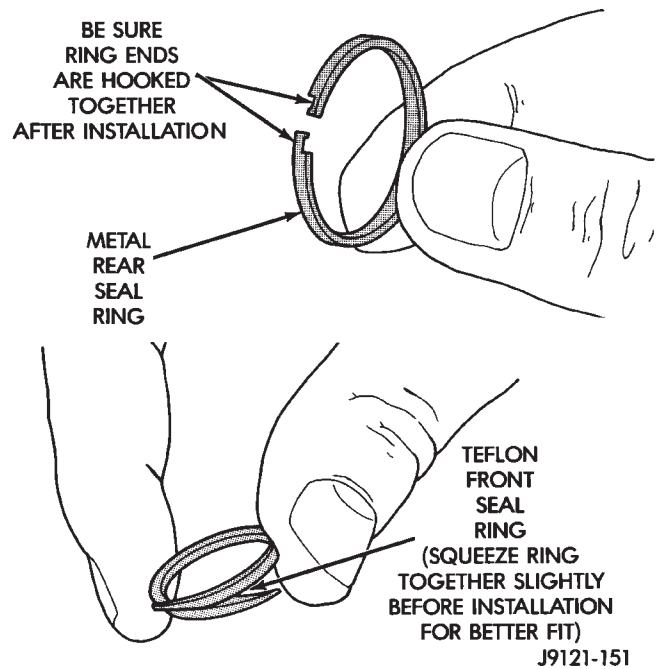
(3) Lubricate splined end of input shaft and clutch retainer with transmission fluid. Then press input shaft into retainer (Fig. 71).

(4) Install input shaft snap ring (Figs. 65-66).

(5) Install new seals on clutch piston. Be sure lip of each seal faces interior of clutch retainer.

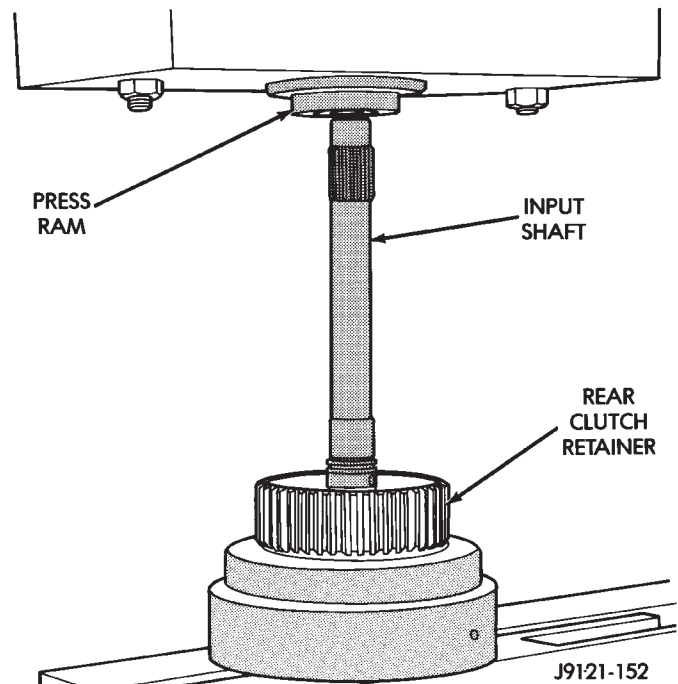
(6) Lubricate lip of piston seals with Ru-Glyde, Door Eze, or petroleum jelly. Then lubricate retainer hub and bore with transmission fluid.

(7) Install clutch piston in retainer. Use twisting motion to seat piston in bottom of retainer. **Do not attempt to push the piston straight in. This could fold the seals over causing leakage and clutch slip.**



J9121-151

Fig. 70 Input Shaft Seal Ring Identification



J9121-152

Fig. 71 Pressing Input Shaft Into Rear Clutch Retainer

(8) Install piston spring in retainer and on top of piston (Fig. 72). Concave side of spring faces downward (toward piston).

(9) Install wave spring in retainer (Fig. 72). Be sure spring is completely seated in retainer groove.

(10) Install bottom pressure plate (Fig. 65). Ridged side of plate faces downward (toward piston) and flat side toward clutch pack.

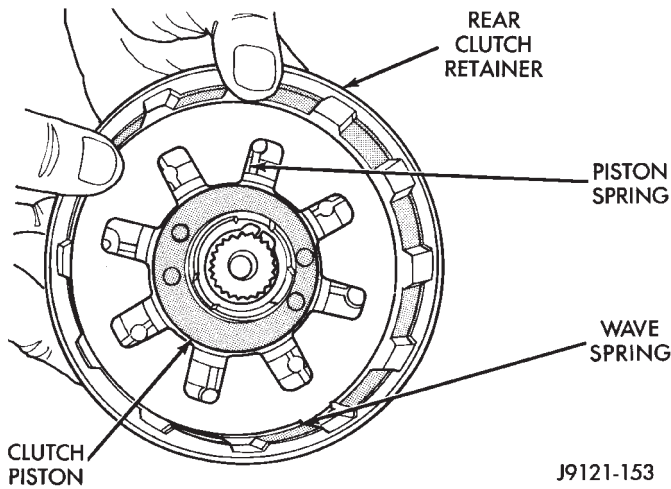


Fig. 72 Piston And Wave Spring Position

(11) 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.

- 3 discs and 2 plates are used in 30RH (Fig. 65)
- 4 discs and 3 plates are required in 32RH (Fig. 66).

(12) Install top pressure plate (Figs. 65-66).

(13) Install selective snap ring (Figs. 65-66). Be sure snap ring is fully seated in retainer groove.

(14) Measure clutch pack clearance (Fig. 73). Clearance should be 0.64 - 1.14 mm (0.025 - 0.045 in.). If clearance is incorrect, steel plates, discs, snap ring and pressure plates may have to be changed.

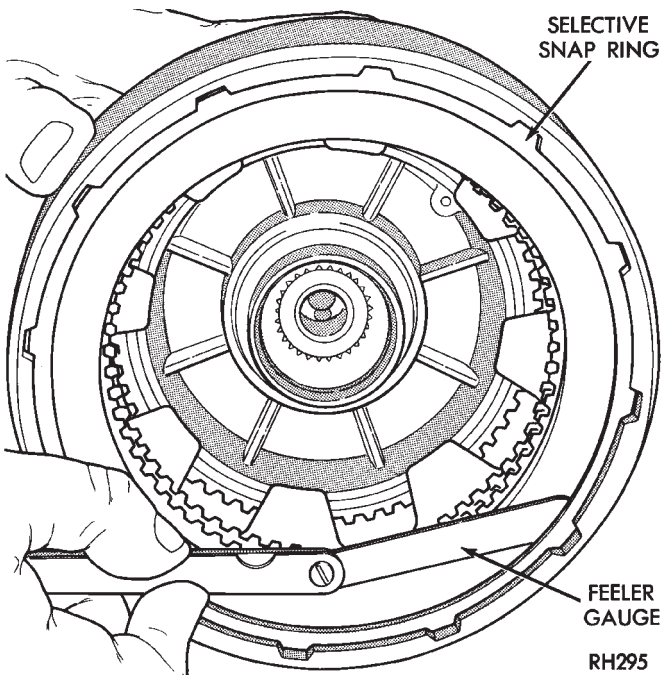


Fig. 73 Typical Method Of Checking Rear Clutch Pack Clearance

(15) Coat rear clutch fiber thrust washer with petroleum jelly and install washer over input shaft and into clutch retainer (Fig. 74). Use enough petroleum jelly to hold washer in place.

(16) Set rear clutch aside for installation during final assembly.

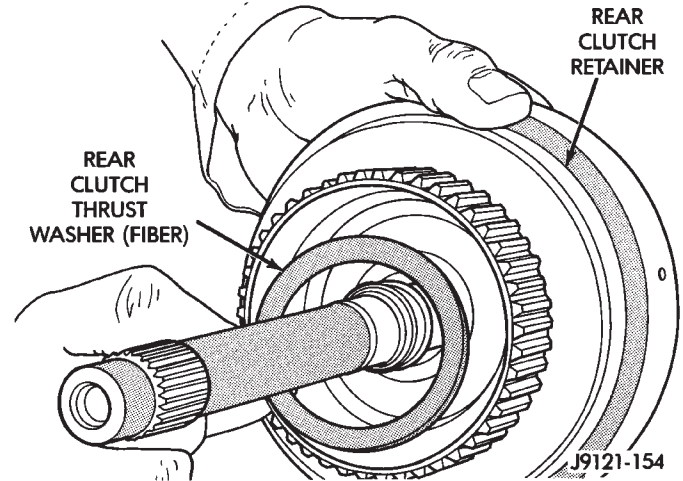


Fig. 74 Installing Rear Clutch Thrust Washer

PLANETARY GEAR TRAIN OVERHAUL

PLANETARY GEARTRAIN DISASSEMBLY

- (1) Remove planetary snap ring (Fig. 75).
- (2) Remove front annulus and planetary assembly from driving shell (Fig. 75).

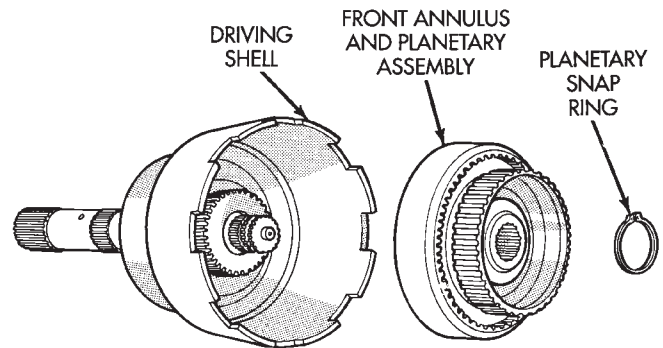


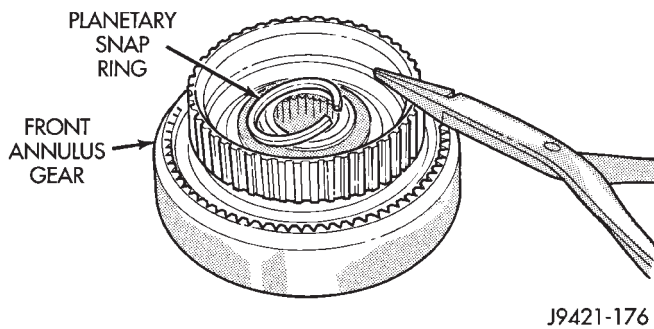
Fig. 75 Front Annulus And Planetary Assembly Removal

(3) Remove snap ring that retains front planetary gear in annulus gear (Fig. 76).

(4) Remove tabbed thrust washer and tabbed thrust plate from hub of front annulus (Fig. 77).

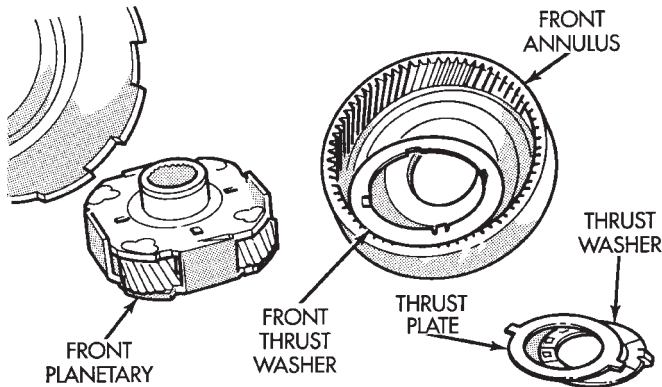
(5) Separate front annulus and planetary gears (Fig. 77).

(6) Remove front planetary gear front thrust washer from annulus gear hub (Fig. 77).



J9421-176

Fig. 76 Front Planetary Snap Ring Removal

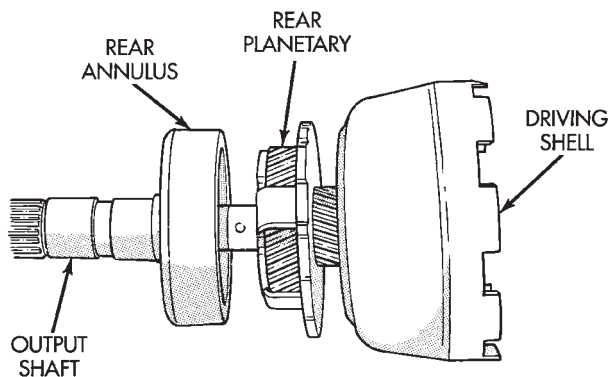


J9421-177

Fig. 77 Front Planetary And Annulus Gear Disassembly

(7) Remove front planetary rear thrust washer from driving shell.

(8) Separate and remove driving shell, rear planetary and rear annulus from output shaft (Fig. 78).



J9421-178

Fig. 78 Removing Driving Shell, Rear Planetary And Rear Annulus

(9) Remove tabbed thrust washers from rear planetary gear.

(10) Remove snap ring that retains sun gear in driving shell. Then remove sun gear, spacer and thrust plates.

PLANETARY GEARTRAIN INSPECTION

Clean the planetary components in solvent and dry them with compressed air.

Check sun gear and driving shell condition (Fig. 79). 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 (Fig. 79). 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.

ASSEMBLING PLANETARY GEARTRAIN

(1) Lubricate output shaft and planetary components with transmission fluid. Use petroleum jelly to lubricate and hold thrust washers and plates in position.

(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. 80).

(3) Install rear thrust washer on rear planetary gear (Fig. 79). Use enough petroleum jelly to hold washer in place. Also be sure all four washer tabs are properly engaged in gear slots.

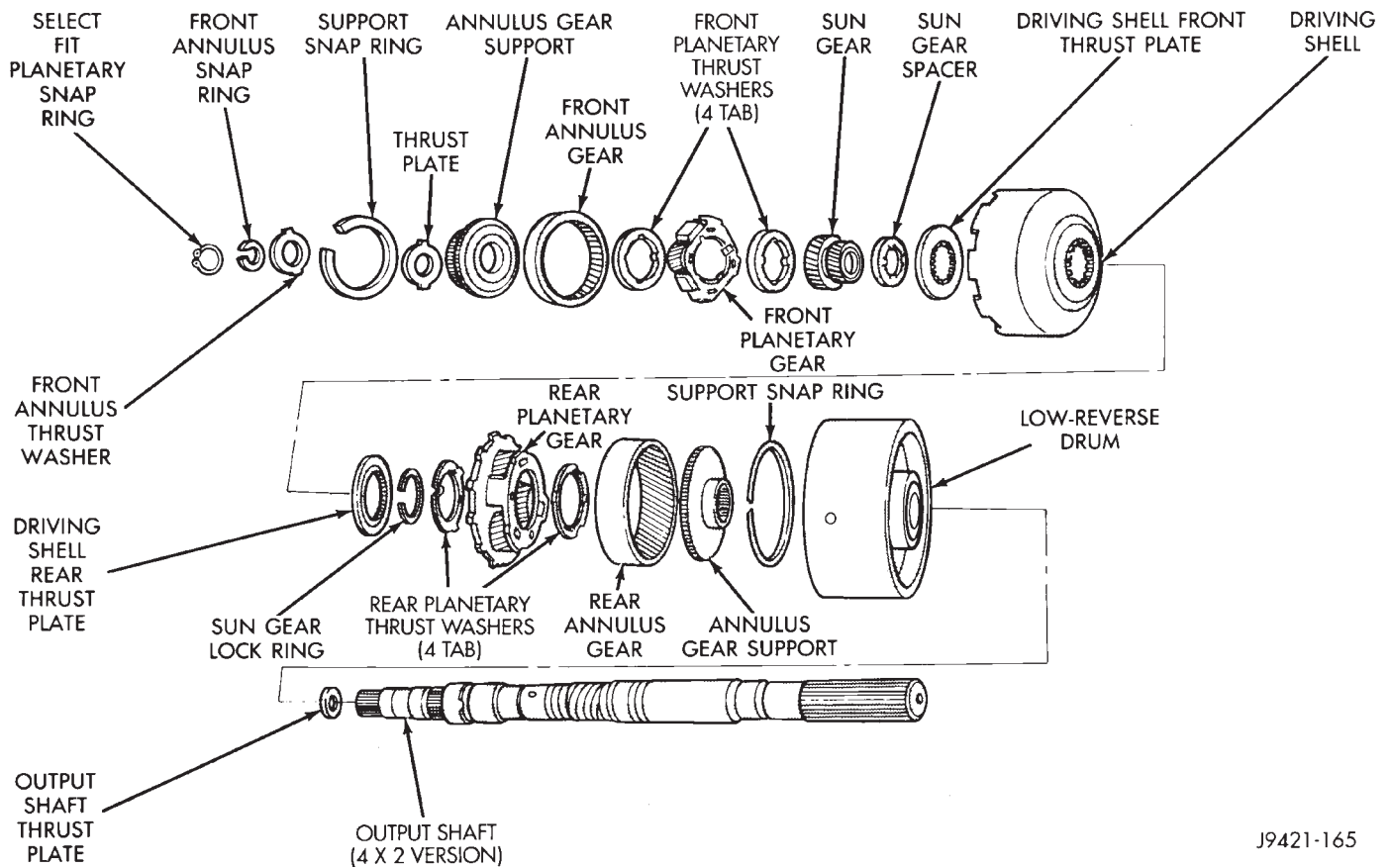


Fig. 79 Planetary Geartrain Components (30RH/32RH)

(4) Install rear annulus over and onto rear planetary gear (Fig. 80).

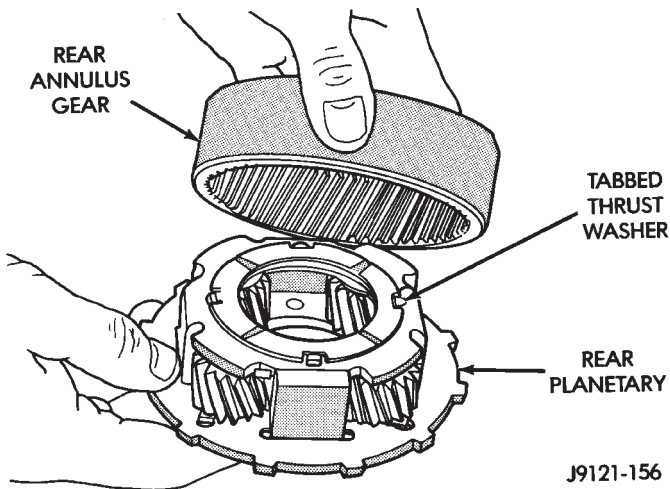


Fig. 80 Assembling Rear Annulus And Planetary Gear

(5) Install assembled rear planetary and annulus gear on output shaft (Fig. 81). Verify that assembly is fully seated on shaft.

(6) Install front thrust washer on rear planetary gear (Fig. 82). Use enough petroleum jelly to hold washer on gear. Be sure all four washer tabs are seated in slots.

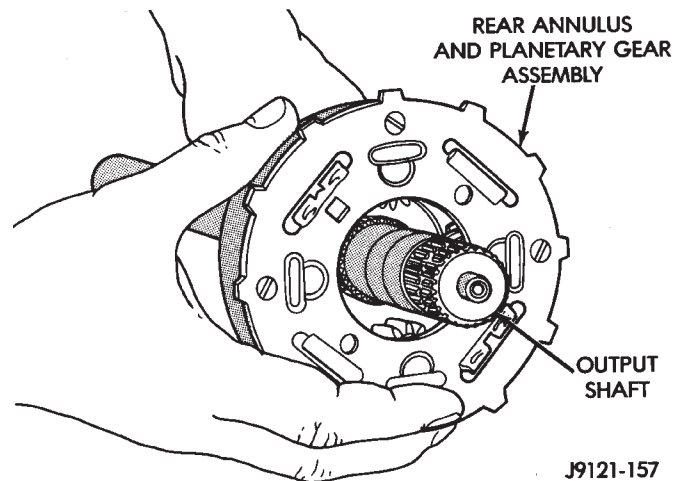


Fig. 81 Installing Rear Annulus And Planetary On Output Shaft

(7) Install spacer on sun gear (Fig. 83).

(8) Install thrust plate on sun gear (Fig. 84). Note that driving shell thrust plates are interchangeable. Use either plate on sun gear and at front/rear of shell.

(9) Hold sun gear in place and install thrust plate over sun gear at rear of driving shell (Fig. 85).

(10) Position wood block on bench and support sun gear on block (Fig. 86). This makes it easier to align

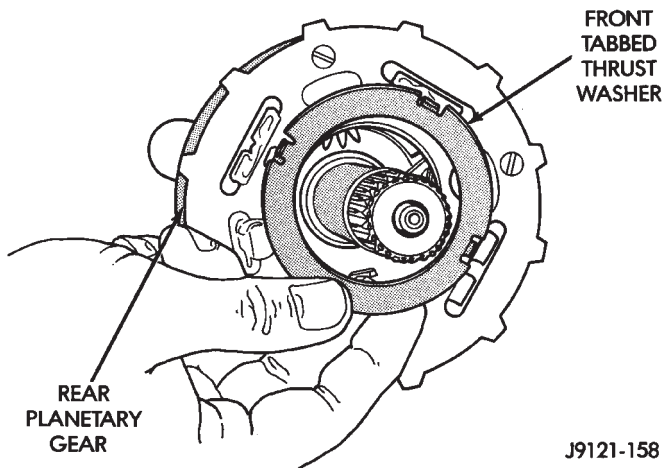


Fig. 82 Installing Rear Planetary Front Thrust Washer

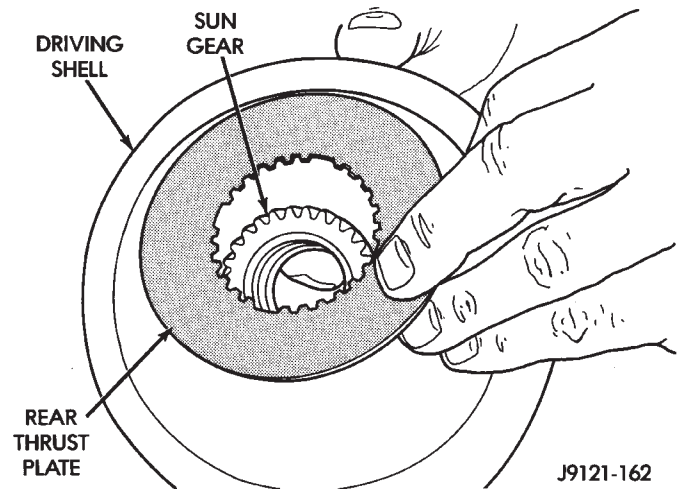


Fig. 85 Installing Driving Shell Rear Thrust Plate

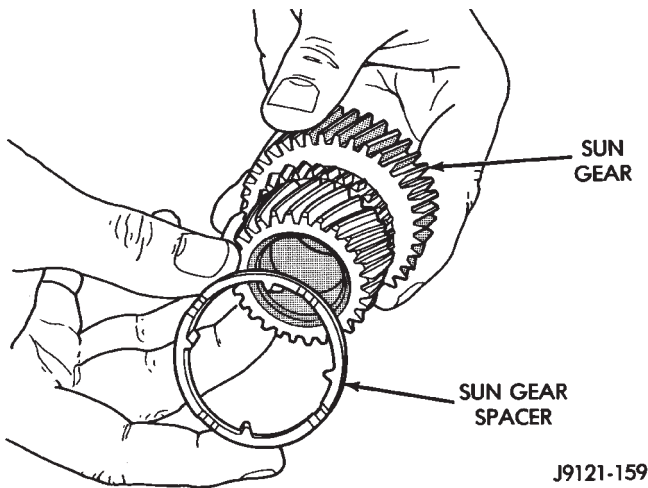


Fig. 83 Installing Spacer On Sun Gear

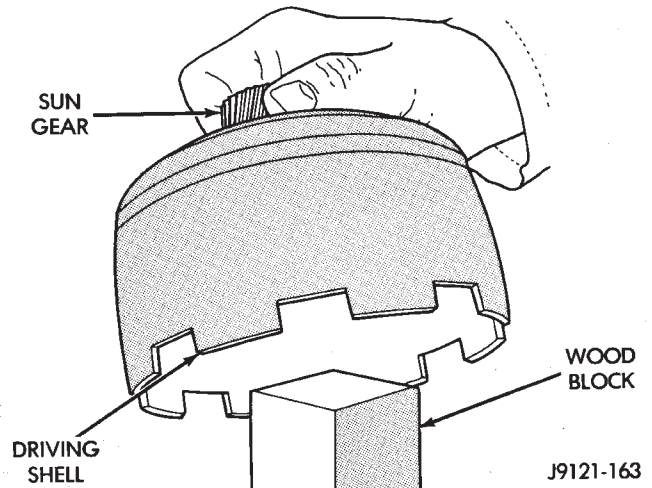


Fig. 86 Supporting Sun Gear On Wood Block

(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. 87).

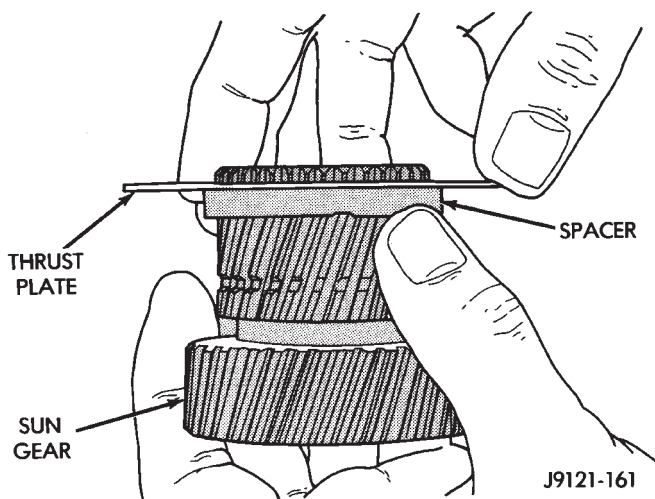


Fig. 84 Installing Driving Shell Front Thrust Plate On Sun Gear

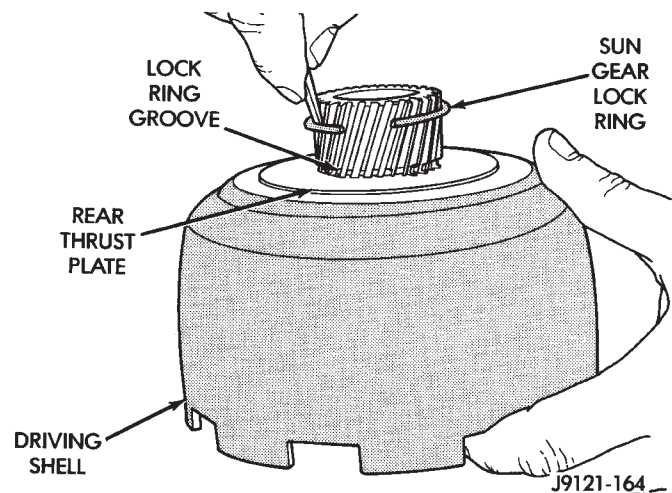


Fig. 87 Installing Sun Gear Lock Ring

and install sun gear lock ring. Keep wood block handy as it will also be used for geartrain end play check.

(12) Install assembled driving shell and sun gear on output shaft (Fig. 88).

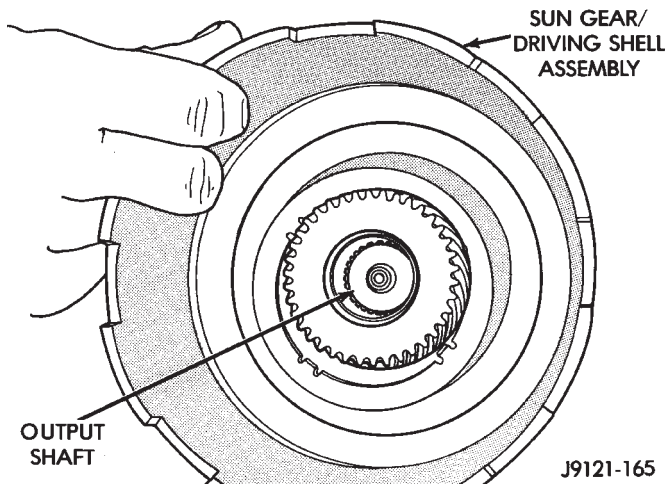


Fig. 88 Installing Assembled Sun Gear And Driving Shell On Output Shaft

(13) Install rear thrust washer on front planetary gear (Fig. 89). Use enough petroleum jelly to hold washer in place and be sure all four washer tabs are seated.

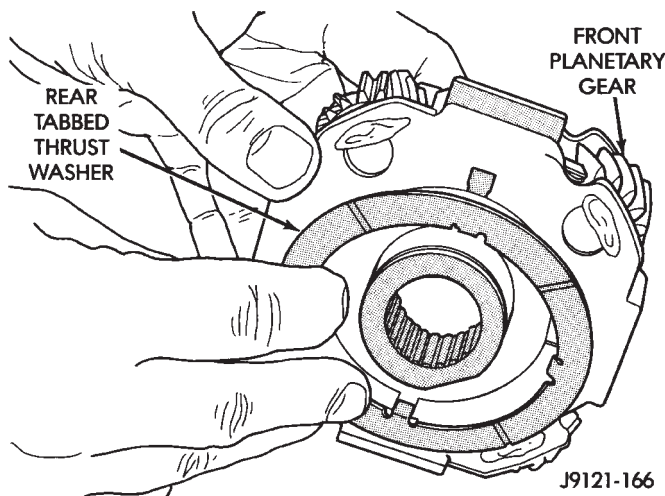


Fig. 89 Installing Rear Thrust Washer On Front Planetary Gear

(14) Install front planetary gear on output shaft and in driving shell (Fig. 90).

(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. 90).

(18) Position thrust plate on front annulus gear support (Fig. 91). **Note that plate has two tabs on it. These tabs fit in notches of annulus hub.**

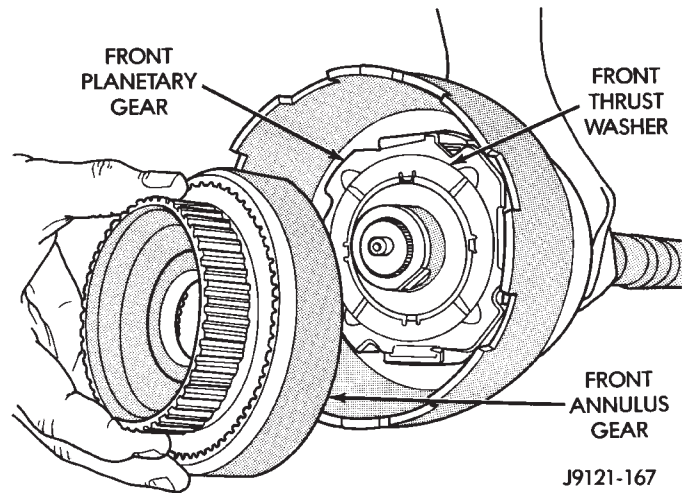


Fig. 90 Installing Front Planetary And Annulus Gears

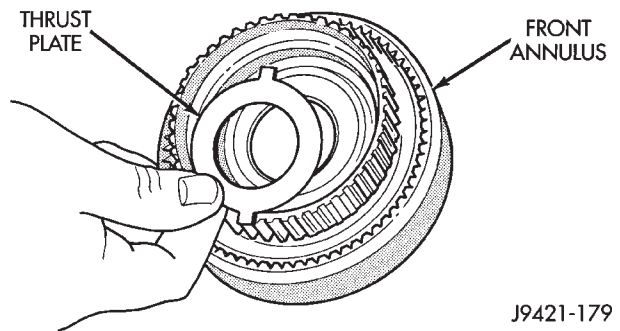


Fig. 91 Positioning Thrust Plate On Annulus Support

(19) Install thrust washer in front annulus (Fig. 92). **Align flat on washer with flat on planetary hub. Also be sure washer tab is facing up.**

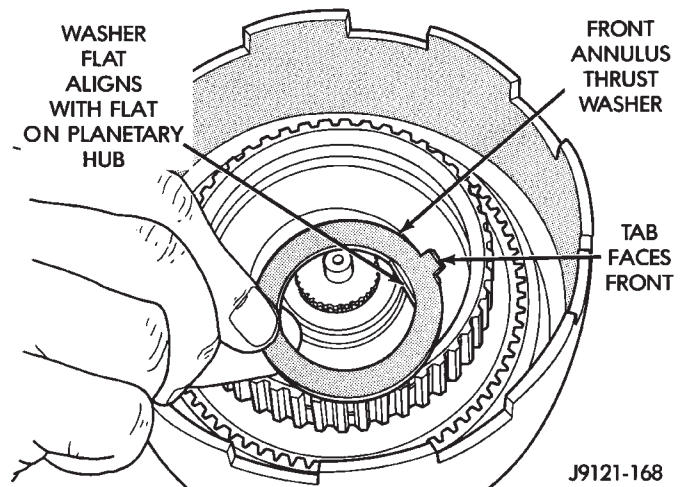


Fig. 92 Installing Front Annulus Thrust Washer

(20) Install front annulus snap ring (Fig. 93). Use snap ring pliers to avoid distorting ring during installation. Also be sure ring is fully seated.

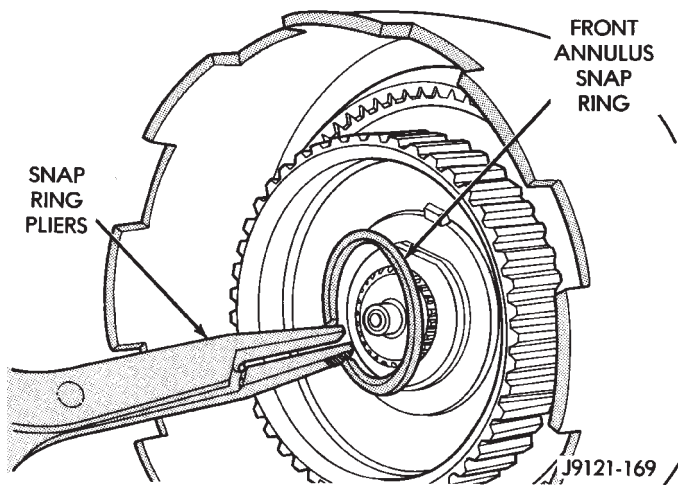


Fig. 93 Installing Front Annulus Snap Ring

(21) Install planetary selective snap ring with snap ring pliers (Fig. 94). Be sure ring is fully seated.

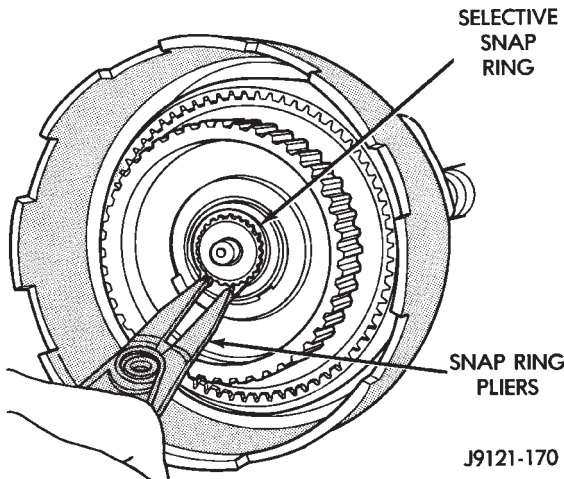


Fig. 94 Installing Planetary Selective Snap Ring

(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 allow geartrain components to move forward for accurate end play check.

(23) Check planetary geartrain end play with feeler gauge (Fig. 95). 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.

FRONT SERVO AND BAND OVERHAUL

FRONT SERVO DISASSEMBLY (FIG. 96)

- (1) Remove small snap ring from servo piston.
- (2) Remove piston, rod, springs and guide.
- (3) Remove and discard servo piston rings and O-ring.

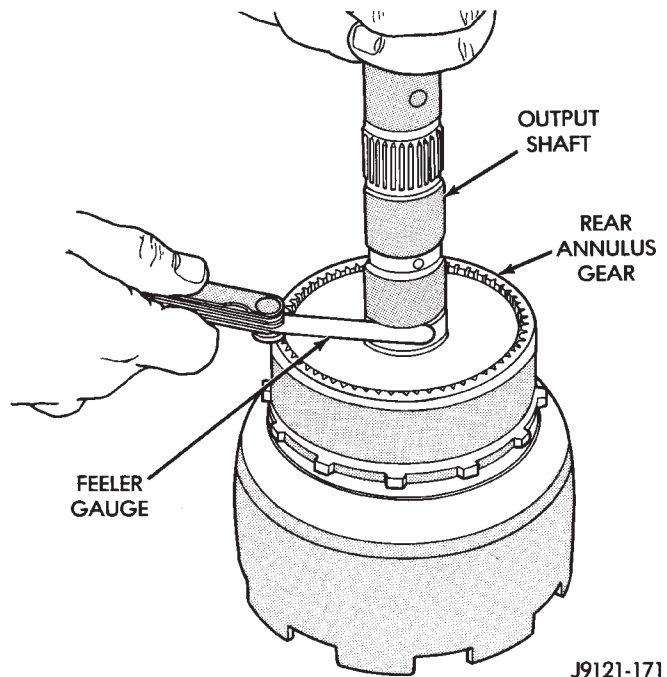


Fig. 95 Checking Planetary Geartrain End Play

FRONT SERVO AND BAND INSPECTION

Clean the servo components with solvent and dry them with compressed air.

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.

Replace the front band if distorted, the lining is burned or flaking off, or excessively worn.

Check the servo piston bore for wear. Replace the piston and rod as an assembly if either part is worn or damaged.

Replace any servo component if doubt exists about its condition. Do not reuse suspect parts.

ASSEMBLING FRONT SERVO PISTON

- (1) Lubricate servo parts with transmission fluid.
- (2) Install new O-ring on servo piston rod.
- (3) Install new seal on piston rod guide and install new seal rings on piston.
- (4) Assemble rod, piston, servo springs and snap ring (Fig. 96).

REAR SERVO AND BAND OVERHAUL

REAR SERVO PISTON DISASSEMBLY

(1) Remove seal from servo piston. Note which way seal lip faces for assembly reference.

(2) Compress cushion spring in vise only enough to allow piston plug snap ring removal (Fig. 97). Use wood block between vise jaws and end of piston plug to keep plug aligned and in position.

(3) Remove snap ring from end of piston plug (Fig. 97).

(4) Open vise and remove wood block, piston plug, cushion spring and servo piston.

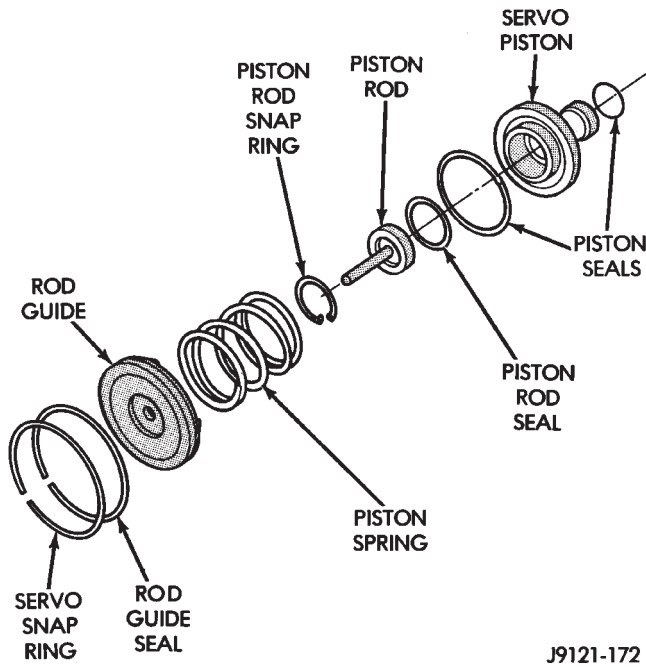


Fig. 96 Front Servo Components

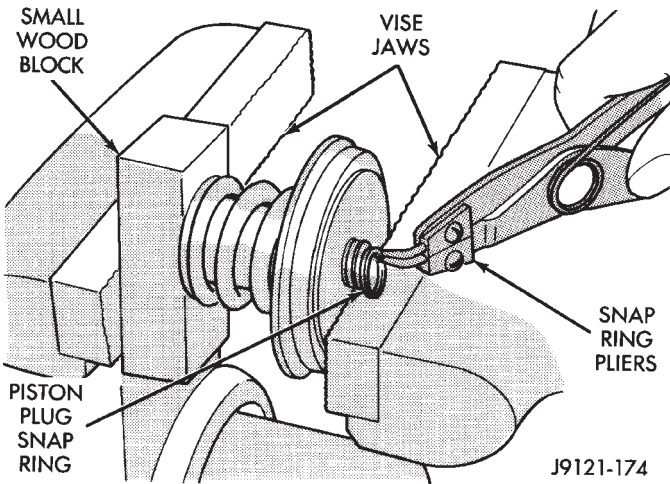


Fig. 97 Removing/Installing Servo Piston Plug Snap Ring

REAR SERVO INSPECTION

Clean the servo components with solvent and dry them with compressed air.

Check rear band condition. Replace the band if distorted, the lining is burned or flaking off, or the lining is excessively worn.

On 30RH models, inspect the rear band link (Fig. 98). Replace the link if bent, or damaged. Check the band reaction pin. Replace the O-rings if they are cut, or torn. Minor pin scoring can be cleaned up with crocus cloth. However, replace the pin if worn, severely scored, or cracked.

Inspect the servo components (Fig. 99). Replace the servo and cushion springs if collapsed, distorted or broken. Replace the plug or piston if cracked, bent,

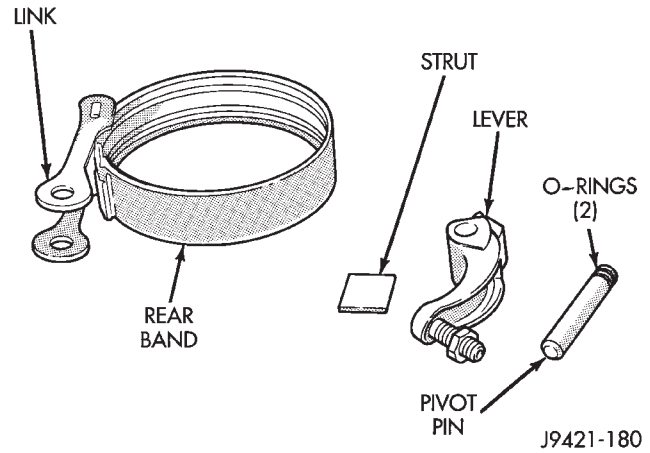


Fig. 98 Rear Band Components (30RH Shown)

or worn. Discard the servo snap ring and spring retainer if distorted or warped.

If doubt exists about the condition of any servo component, replace it. Do not reuse suspect parts.

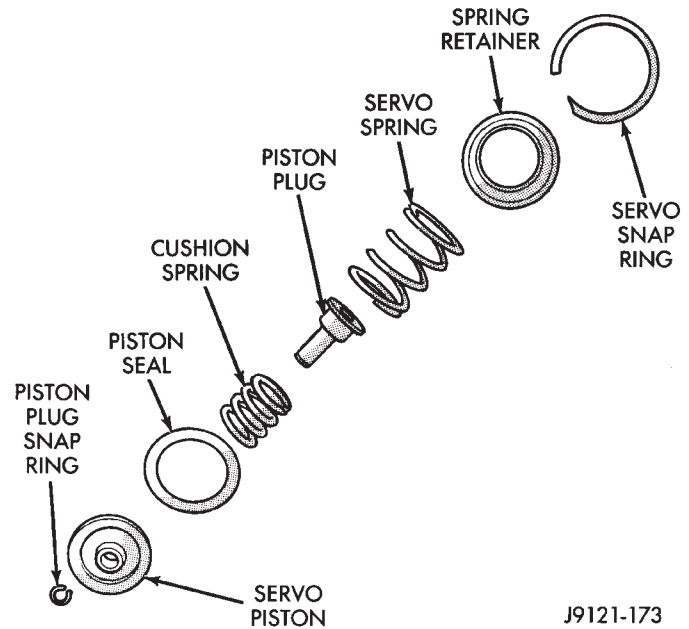


Fig. 99 Rear Servo Components

ASSEMBLING REAR SERVO PISTON

- (1) Assemble piston plug, cushion spring and piston (Fig. 99).
- (2) Compress cushion spring in vise and install piston plug snap ring.
- (3) Install new seal on piston. Be sure seal lip is toward servo bore (Fig. 100).
- (4) Lubricate piston seal with petroleum jelly. Lubricate other servo parts with transmission fluid.

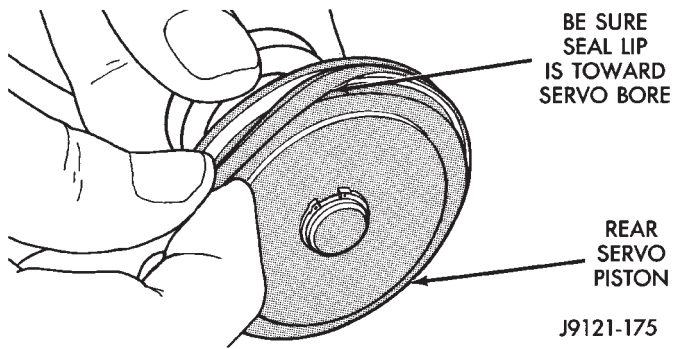


Fig. 100 Installing Rear Servo Piston Seal
VALVE BODY DISASSEMBLY AND INSPECTION

CAUTION: Do not clamp any part of the valve body assembly (Fig. 101) in a vise. This practice will distort the valve body and transfer plate resulting in valve bind. Slide valves and plugs out carefully. Do not use force at any time. The valves and valve body will be damaged if force is used. Also tag or mark the valve body springs for reference as they are removed. Do not allow them to become intermixed.

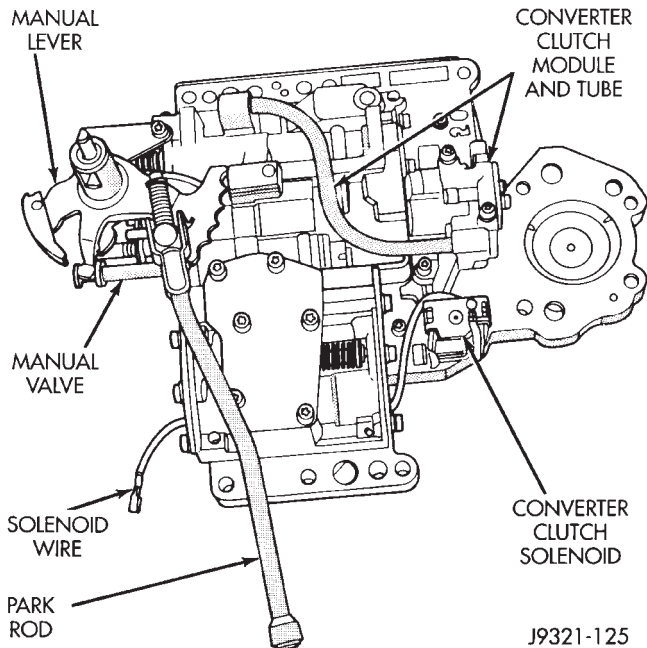


Fig. 101 Valve Body Assembly

- (1) Remove screws attaching adjusting screw bracket to valve body and transfer plate. Hold bracket firmly against spring force while removing last screw.
- (2) Remove adjusting screw bracket, line pressure adjusting screw, pressure regulator spring and switch valve spring (Fig. 102). **Do not remove throttle pressure adjusting screw from bracket and do not disturb adjusting screw settings during removal.**
- (3) Secure detent ball and spring in housing with retainer tool 6583 (Fig. 103).
- (4) Remove manual shaft E-clip and washer (Fig. 104).

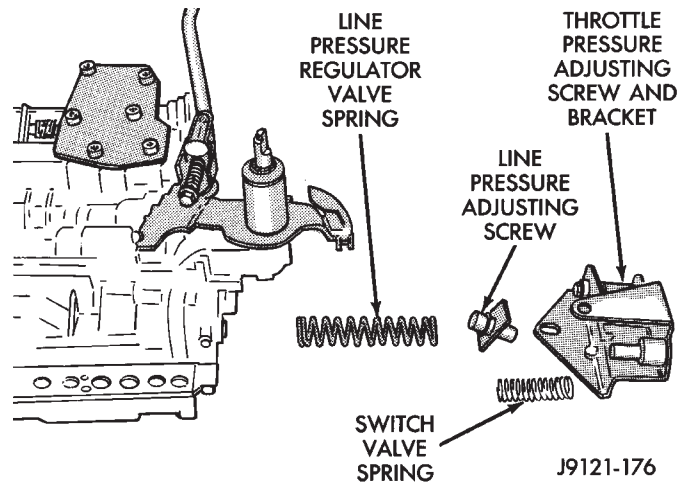


Fig. 102 Adjusting Screw Bracket And Spring Removal

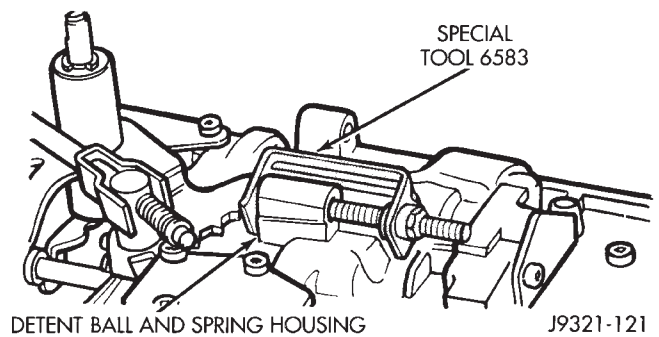


Fig. 103 Securing Detent Ball And Spring With Retainer Tool

- (5) Pull manual shaft and park rod assembly upward out of valve body and off throttle lever (Fig. 104).
- (6) Remove Retainer Tool 6583. Then remove and retain detent ball and spring.
- (7) Remove throttle lever (Fig. 104).

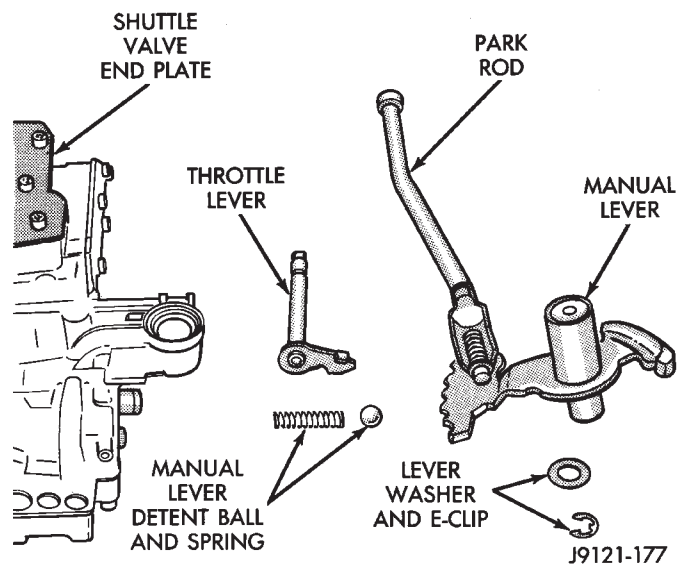


Fig. 104 Removing Manual And Throttle Levers

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

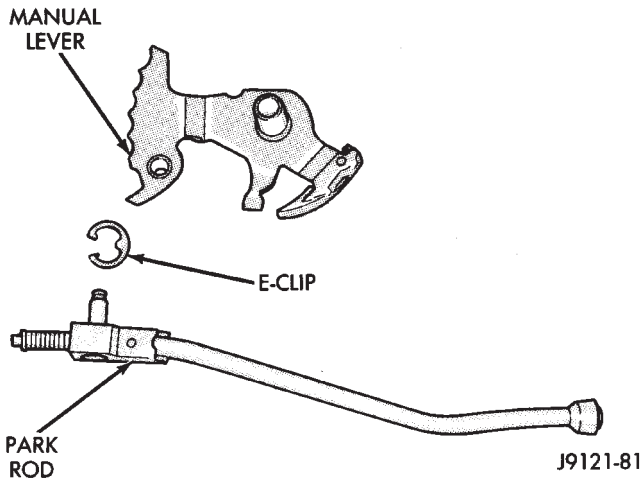


Fig. 105 Park Rod Removal

(9) Remove screws attaching converter clutch module to valve body and remove module and connecting tube (Fig. 106).

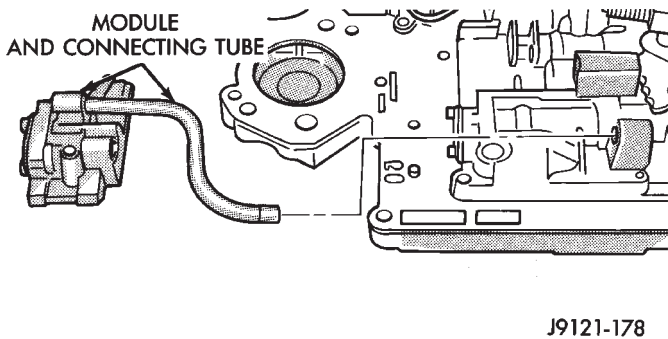


Fig. 106 Clutch Module And Connecting Tube Removal/Installation

(10) Turn valve body over so transfer plate is facing upward (Fig. 107). With valve body in this position, valve body check balls will remain in place and not fall out when transfer plate is removed.

(11) Remove screws attaching transfer plate to valve body (Fig. 107).

(12) Remove transfer plate and separator plate from valve body. Note position of filter and clutch solenoid for reference (Fig. 108).

(13) Position transfer plate on bench so separator plate, filter and lockup solenoid are facing up. This will avoid having rear clutch and rear servo check balls fall out when plates are separated.

(14) Remove screws attaching separator plate to transfer plate.

(15) Remove converter clutch solenoid from separator plate (Fig. 109). A T25 torx bit is required to remove solenoid attaching screw.

(16) Note position of filter, solenoid and rear clutch/rear servo check balls for assembly reference (Fig. 110).

(17) Remove shuttle valve end plate (Fig. 111).

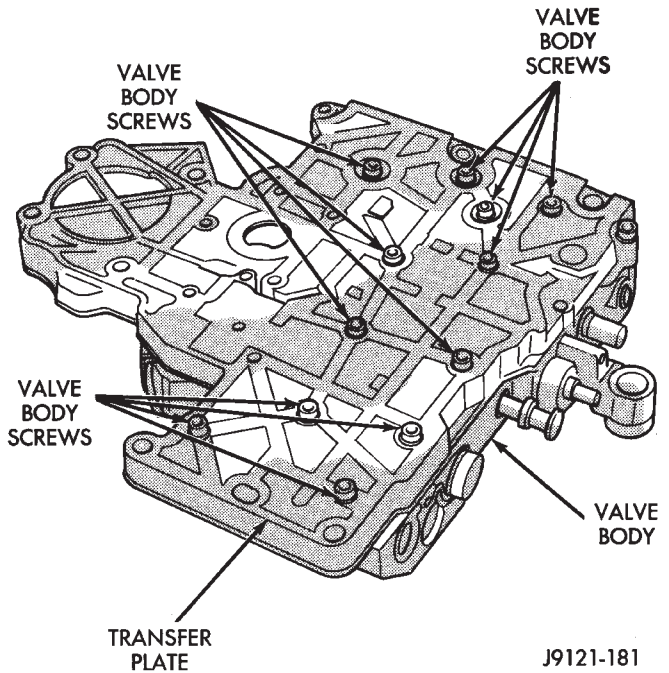


Fig. 107 Valve Body-To-Transfer Plate Screw Locations

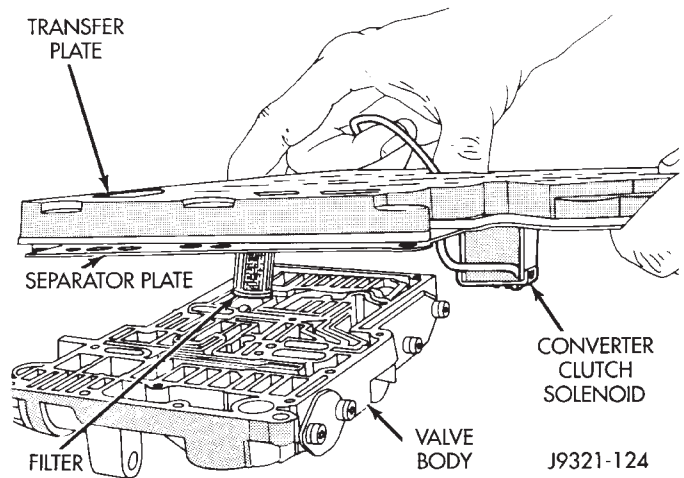


Fig. 108 Transfer Plate Removal/Installation

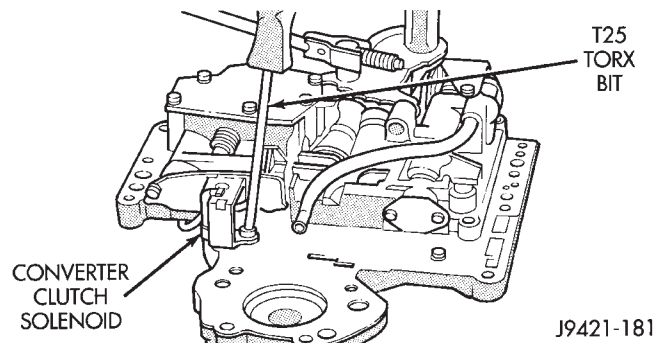


Fig. 109 Converter Clutch Solenoid Removal

(18) Remove shuttle valve E-clip and remove secondary spring and spring guides from end of valve (Fig. 111).

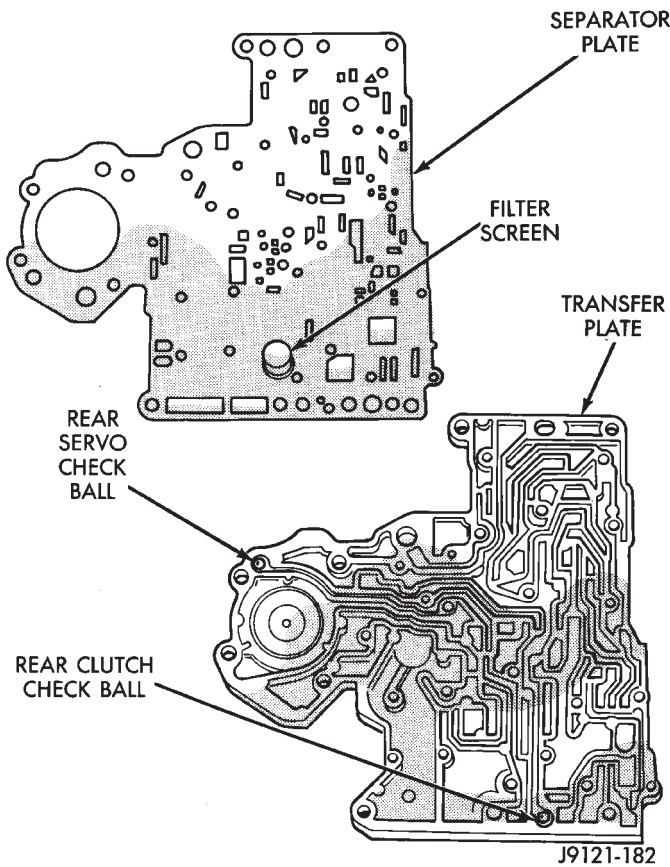


Fig. 110 Transfer And Separator Plates

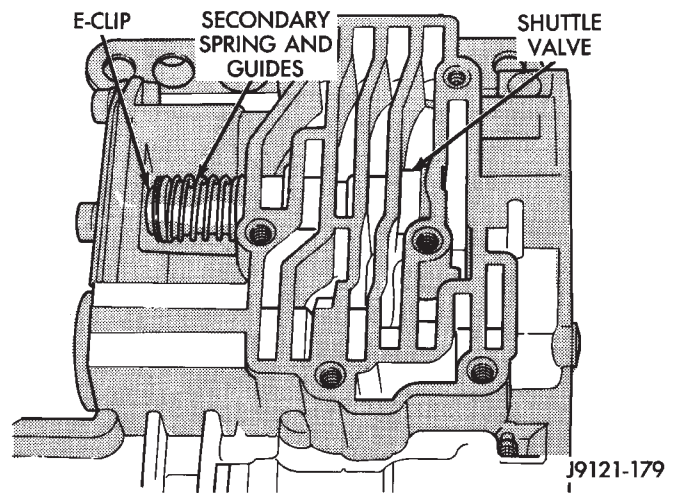


Fig. 111 Shuttle Valve E-Clip And Secondary Spring Location

- (19) Remove governor valve end plate (Fig. 112).
- (20) Remove switch valve and pressure regulator valve from valve body (Fig. 112).
- (21) Remove throttle valve and spring, kickdown valve and detent and manual valve from valve body (Fig. 112).
- (22) Remove 1-2 and 2-3 shift valve governor plugs from valve body (Fig. 112).
- (23) Remove shuttle valve throttle plug, primary spring and shuttle valve from valve body (Fig. 112).

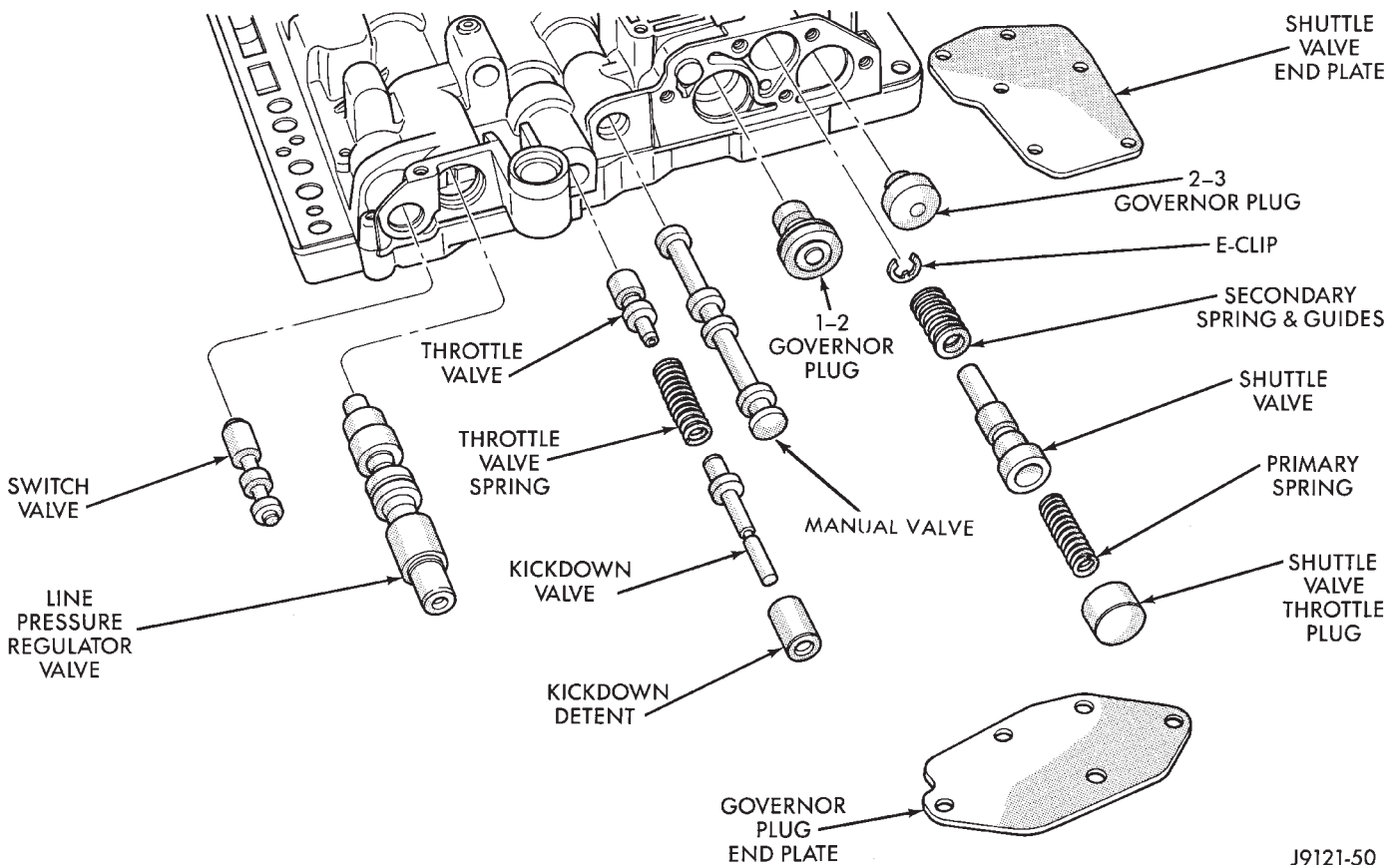
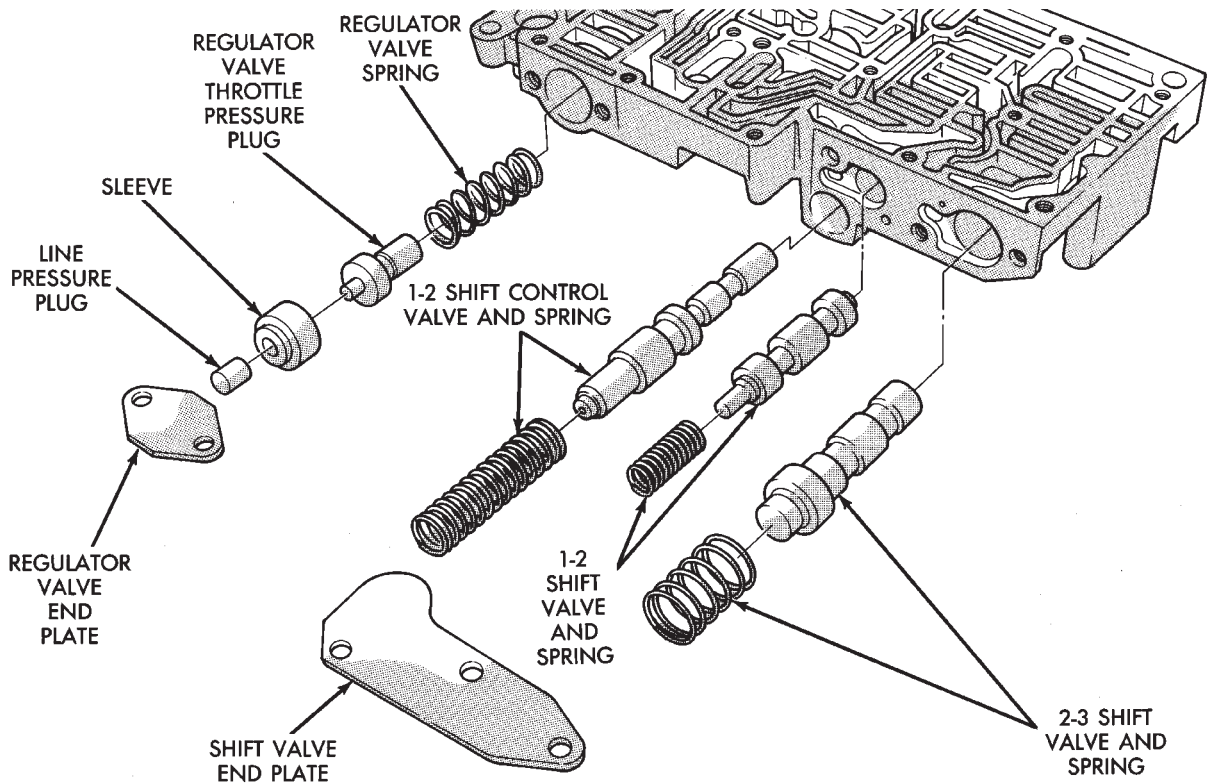


Fig. 112 Control Valves And Governor Plugs



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Fig. 113 Shift Valves And Pressure Regulator Plugs

(24) Remove 1-2 shift control valve and spring from valve body (Fig. 113).

(25) Remove 2-3 shift valve and spring from valve body (Fig. 113).

(26) Remove 1-2 shift valve and spring from valve body (Fig. 113).

(27) Remove regulator valve end plate (Fig. 113).

(28) Remove regulator valve line pressure plug, pressure plug sleeve, throttle pressure plug and spring (Fig. 113).

VALVE BODY CLEANING AND INSPECTION

The only serviceable valve body components are:

- park lock rod and E-clip
- switch valve and spring
- pressure adjusting screw bracket
- throttle valve lever
- manual lever
- manual lever shaft seal, washer, E-clip and detent ball
- fluid filter
- converter clutch solenoid

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

Clean the valve body components in a parts cleaning solution only. Do not use gasoline, kerosene, or any type of caustic solution. Dry the parts with compressed air. Make sure all passages are clean and free from obstructions.

Do not use rags or shop towels to wipe off valve body components. Lint from these materi-

als will adhere to the valve body components. Lint will interfere with valve operation and may clog filters and fluid passages.

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 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 crocus cloth. The cloth should be in sheet form and be positioned on a surface plate, sheet of plate glass, or equally flat surface. However, if distortion is severe or any surfaces are heavily scored, the valve body will have to be replaced.

CAUTION: The throttle valve, shuttle valve plug, 1-2 shift valve and 1-2 governor plug are made of coated aluminum. These components are identified in Figure 114 with the abbreviation (Alum.). Aluminum components can be identified by the dark color of the special coating applied to the surface (or by testing with a magnet). **DO NOT** polish or sand aluminum valves or plugs with any type of material, or under any circumstances. This practice might damage the special coating and cause the valves and plugs to stick and bind.

Inspect the valves and plugs for scratches, burrs, nicks, or scores. Also inspect the coating on the aluminum valves and plugs (Fig. 114). If the coating is damaged or worn through, the valve (or valve body) should be replaced.

Aluminum valves and plugs should not be sanded or polished under any circumstances. However, minor burrs or scratches on steel valves and plugs can be removed with crocus cloth but do not round off the valve or plug edges. Squareness of these edges is vitally important. These edges prevent foreign matter from lodging between the valves, plugs and bore.

Inspect all the valve and plug bores in the valve body. Use a penlight to view the bore interiors. Re-

place 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 valve body assembly unless it is damaged in handling.

VALVE BODY ASSEMBLY AND ADJUSTMENT

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 valve body resulting in valve sticking, cross leakage and unsatisfactory operation. Tighten valve body screws to recommended torque only.

(1) Lubricate valve body bores, valves and plugs with ATF Plus, or Dexron II™ transmission fluid.

(2) Insert rear clutch and rear servo check balls in transfer plate (Fig. 110).

(3) Install filter screen in separator plate (Fig. 110).

(4) Align and install separator plate on transfer plate. Verify check ball position before installing separator plate on transfer plate.

(5) Install new O-ring on converter clutch solenoid and insert solenoid in separator plate (Fig. 115). Then secure solenoid in position with attaching screw. Tighten screw to 4 N·m (35 in. lbs.) torque.

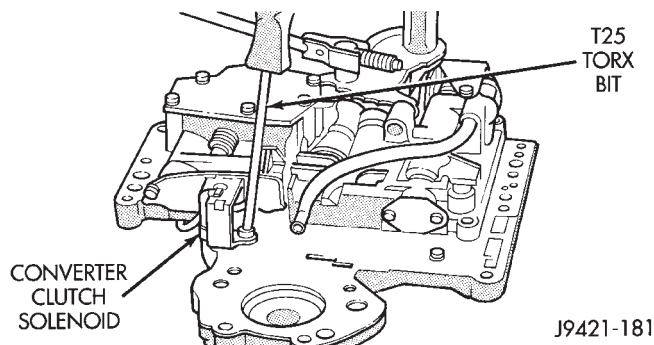


Fig. 115 Installing Converter Clutch Solenoid

(6) Position valve body so internal passages and check ball seats are facing upward. Then install steel/plastic check balls in valve body (Fig. 116). The one large check ball is approximately 11/32 inch in diameter. The remaining check balls are approximately 1/4 inch in diameter.

(7) Align and install assembled transfer and separator plates on valve body. Install and tighten valve body screws alternately in a diagonal pattern to 4 N·m (35 in. lbs.) torque.

(8) Assemble and install clutch module and components on valve body (Fig. 117).

(9) Assemble regulator valve line pressure plug, sleeve, throttle plug and spring (Fig. 108). Insert assembly in valve body and install end plate. Tighten end plate screws to 4 N·m (35 in. lbs.) torque.

(10) Install 1-2 and 2-3 shift valves and springs (Fig. 113).

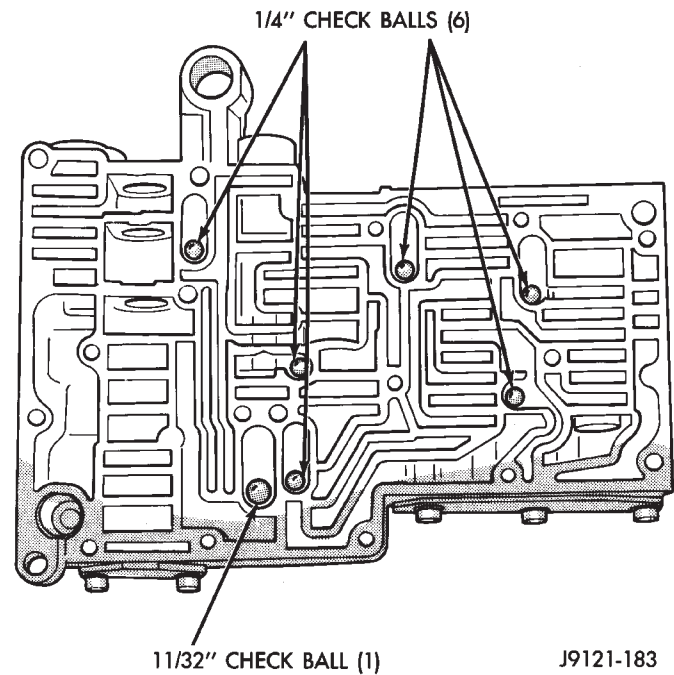


Fig. 116 Correct Position Of Valve Body Check Balls

(11) Install 1-2 shift control valve and spring (Fig. 113)

(12) Install shuttle valve as follows:

(a) Insert shuttle valve in bore.

(b) Insert plastic guides in shuttle valve secondary spring.

(c) Install spring on end of valve.

(d) Hold shuttle valve in place. Then compress secondary spring and install E-clip in groove at end of valve.

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

(13) Install shuttle valve cover plate (Fig. 113). Tighten end plate screws to 4 N·m (35 in. lbs.) torque.

(14) Install 1-2 and 2-3 valve governor plugs in valve body (Fig. 113). Then install shuttle valve primary spring and throttle plug.

(15) Align and install governor plug end plate on valve body and install end plate screws. Tighten screws to 4 N·m (35 in. lbs.) torque.

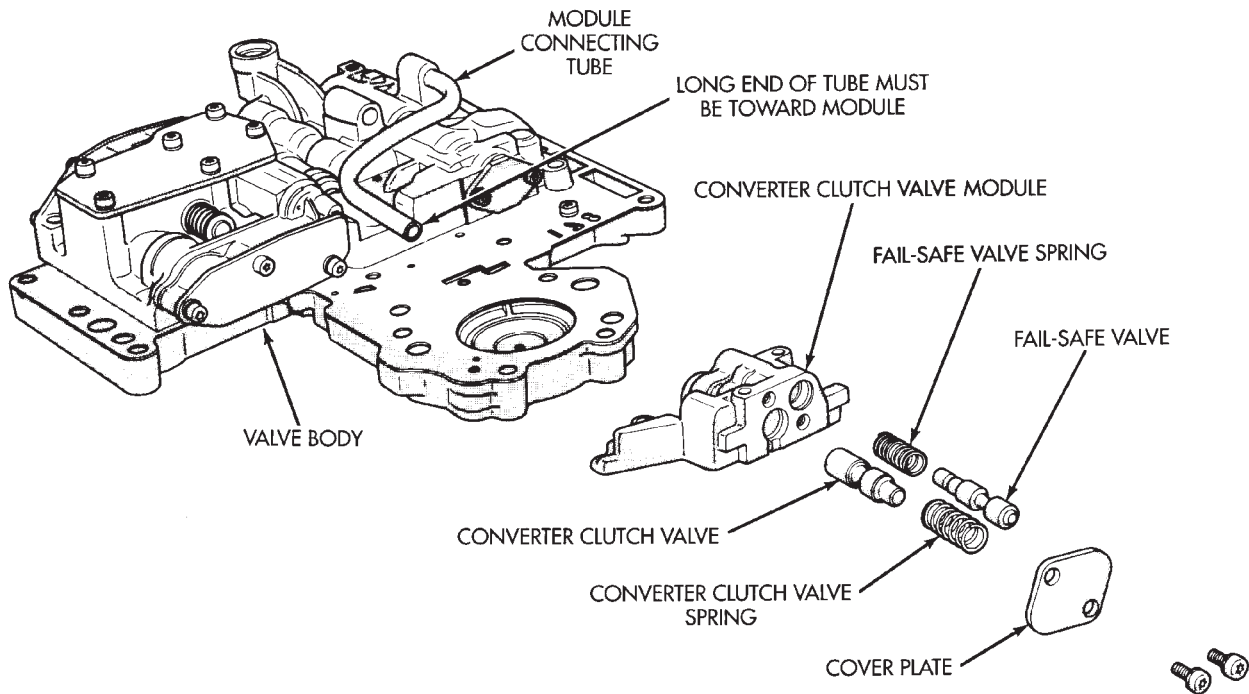
(16) Install manual valve (Fig. 112).

(17) Install throttle valve and spring. Then install kickdown valve and detent (Fig. 112).

(18) Install pressure regulator valve and switch valve in valve body.

(19) Install manual lever detent spring in housing. Place detent ball on end of spring and push ball and spring into housing. Secure ball and spring with Detent Retainer 6583 (Fig. 103).

(20) Insert line pressure adjusting screw in adjusting screw bracket (Fig. 102).



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Fig. 117 Converter Clutch Module Components

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

(22) Install switch valve spring on tang at end of adjusting screw bracket (Fig. 102).

(23) 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.

(24) Install module and connecting tube. Be sure long end of tube goes to module (Fig. 106). Tighten module screws to 4 N·m (35 in. lbs.) torque.

(25) Install throttle lever in valve body. Then install manual lever over throttle lever and start manual lever into valve body.

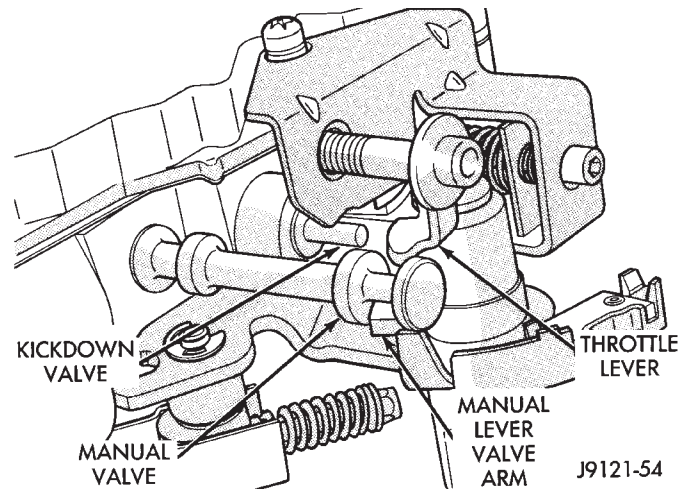
(26) Align manual lever detent with detent ball and align lever arm with manual valve. Hold throttle lever upward. Then press down on manual lever until lever is fully seated.

(27) Install manual lever seal, washer and retaining E-clip.

(28) Lubricate shaft of manual lever with light coat of petroleum jelly. This will help protect seal lip when manual shaft seal is installed.

(29) Verify that throttle lever is aligned with end of kickdown valve stem and that manual lever arm is engaged in manual valve (Fig. 118).

(30) If line pressure and/or throttle pressure adjustment screw settings were not disturbed, continue with overhaul or reassembly. However, if adjustment



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Fig. 118 Manual And Throttle Lever Alignment

screw settings were moved or changed, readjust as described in Valve Body Control Pressure Adjustment procedure.

VALVE BODY CONTROL PRESSURE ADJUSTMENTS

There are two control pressure adjustments on the valve body which are, line pressure and throttle pressure.

The two pressures are interdependent because each affects shift quality and timing. Each pressure adjustment must be performed properly and in the cor-

rect sequence. The correct sequence is line pressure adjustment first and throttle pressure adjustment last.

Line Pressure Adjustment

Measure distance from the valve body to the inner edge of the adjusting screw with an accurate steel scale (Fig. 119).

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.

The 33.4 mm (1-5/16 in.) setting is an approximate setting. Because of manufacturing tolerances, it may be 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). Turning the adjusting screw counterclockwise increases pressure while turning the screw clockwise decreases pressure.

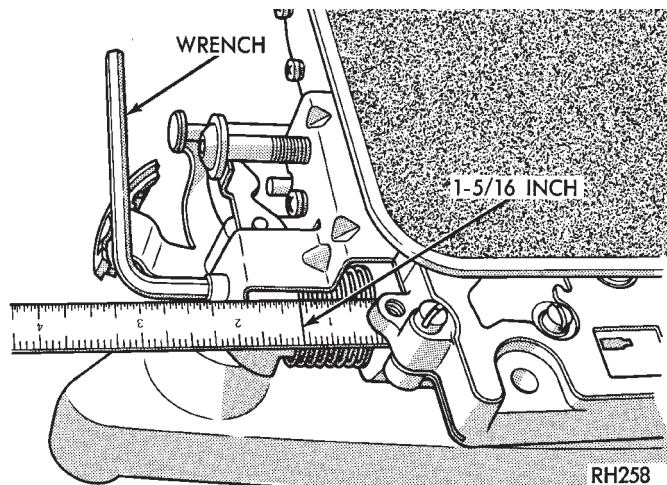


Fig. 119 Line Pressure Adjustment

Throttle Pressure Adjustment

Insert Gauge Tool C-3763 between the throttle lever cam and the kickdown valve stem (Fig. 120).

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.

The kickdown valve spring must be fully compressed and the kickdown valve completely bottomed to obtain correct adjustment.

TRANSMISSION ASSEMBLY TIPS

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 are equally clean.

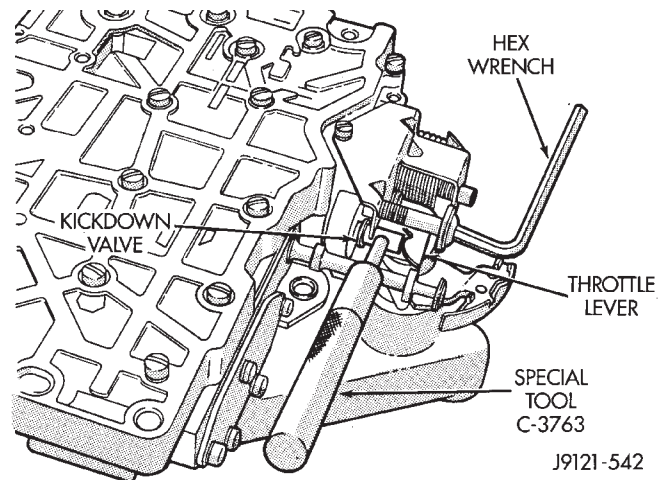


Fig. 120 Throttle Pressure Adjustment

Shop towels used for wiping off your hands and service tools must be made of **lint free** materials. Lint will adhere to transmission parts and could interfere with valve operation, or even restrict fluid passages.

Lubricate the transmission components with ATF Plus, or Dexron II™ during reassembly. Use petroleum jelly, Door Eze, or Ru-Glyde on seals and O-rings to ease installation.

Petroleum jelly can also be used to hold thrust washers and plates in position during assembly operations. 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 valve operation. Use petroleum jelly only.

Do not force parts into place. Most of the transmission components 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 mispositioned or "left out" by accident.

TRANSMISSION ASSEMBLY AND ADJUSTMENT PROCEDURES

SERVO INSTALLATION

(1) Install rear servo piston, spring and spring retainer. Compress rear servo spring and retainer with Compressor Tool C-3422-B or a large C-clamp.

(2) Install front servo piston, spring and rod guide. Compress front servo rod guide with Valve Spring Compressor C-3422-B and install servo snap ring.

OVERRUNNING CLUTCH INSTALLATION

(1) Examine bolt holes in overrunning clutch cam. Note that one hole is **not threaded** (Fig. 121). This hole must align with blank area in clutch cam bolt circle (Fig. 122).

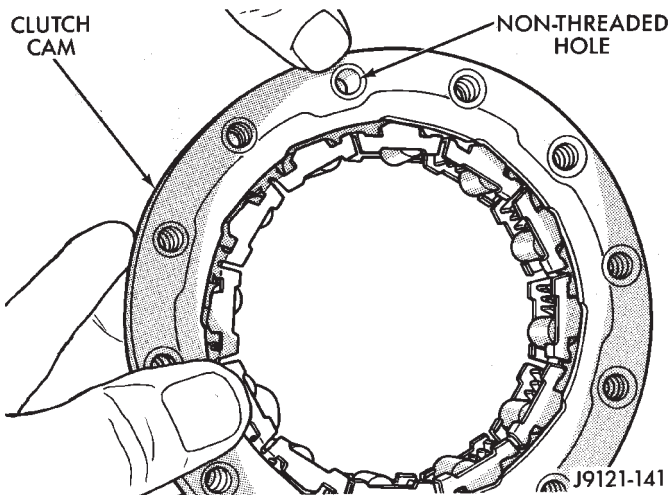


Fig. 121 Location Of Non-Threaded Hole In Clutch Cam

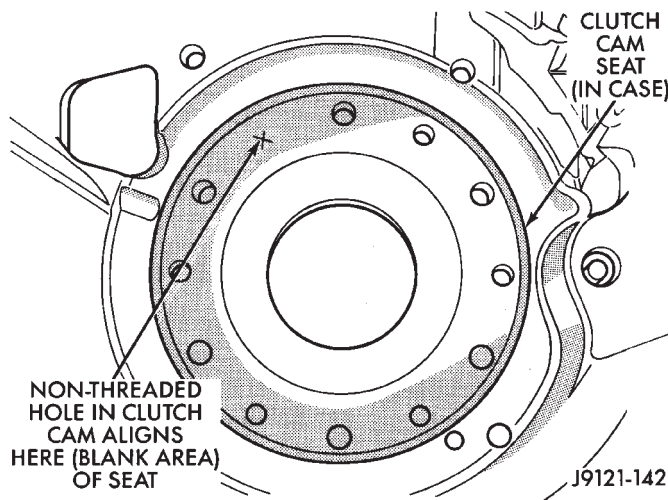


Fig. 122 Location Of Blank Area In Clutch Cam Seat Of Case

(2) Mark location of non threaded hole in clutch cam and blank area of case with paint stripe (Fig. 123).

(3) Align and install overrunning clutch cam in case (Fig. 123). **Be sure cam is correctly installed. Bolt holes in cam are slightly countersunk on one side. This side of cam faces rearward (toward rear support).**

(4) Partially install overrunning clutch in cam (Fig. 123).

(5) Verify that non threaded hole in clutch cam is properly aligned (Fig. 123). Check alignment by threading a clutch cam bolt into each hole. Adjust cam position if necessary before proceeding.

(6) Seat overrunning clutch in clutch cam after verifying correct cam alignment.

(7) Install overrunning clutch cam bolts. **Clutch cam bolts are shorter than rear support bolts.** Tighten cam bolts to 17 N·m (150 in. lbs. or 13 ft. lbs.) torque.

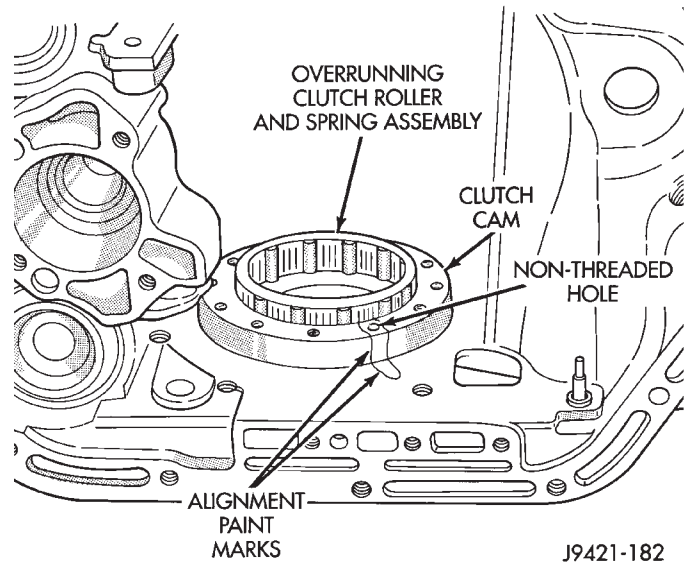


Fig. 123 Overrunning Clutch Cam Alignment

(8) Lubricate overrunning clutch rollers, springs and cam with ATF Plus transmission fluid.

REAR BAND, LOW-REVERSE DRUM AND REAR SUPPORT INSTALLATION

A different rear band and linkage is used in 30RH and 32RH transmissions.

The 30RH transmission has a single wrap band, one pivot pin and a band link to connect the lever (Fig. 124). The lever adjusting screw is in direct contact with the servo piston. A strut is used to connect the lever to the band lug.

The 32RH transmission has a double wrap band, a pivot pin, and a reaction pin (Fig. 125). The band lever pivots against a lug on the band. A strut is not used. The reaction pin functions as the stop, or locating mechanism for the band lower lug.

Rear Band Installation Procedure

(1) On 32RH transmission, install band components and low-reverse drum as follows:

(a) Install reaction pin in case (Fig. 126).

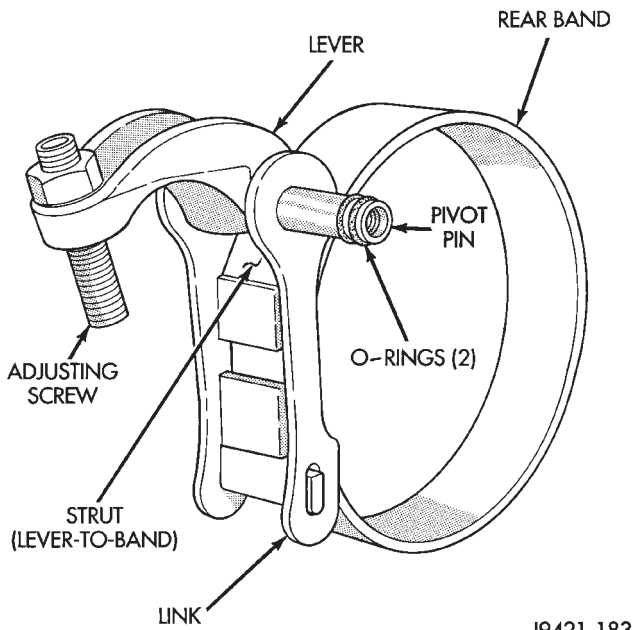
(b) Position band in case and seat band lug against reaction pin.

(c) Slide low-reverse drum through band (Fig. 127). Then tilt drum slightly and start clutch race into overrunning clutch rollers.

(d) Rotate drum in clockwise direction and push drum inward until race is seated in overrunning clutch.

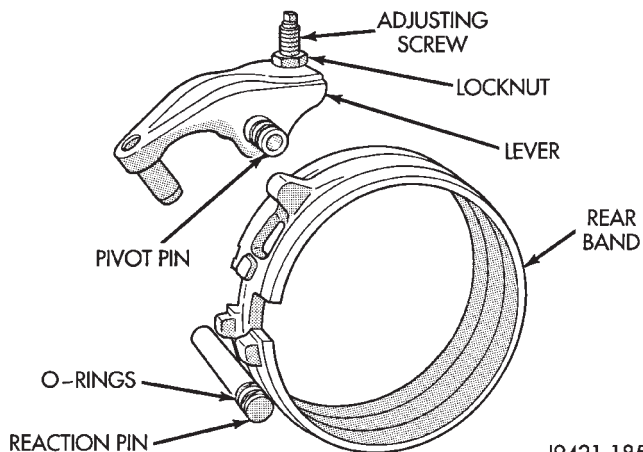
(e) Install rear band lever (Fig. 128). Be sure lever pivot pin is fully seated in case afterward.

(2) On 30RH transmission, install band components and low-reverse drum as follows:



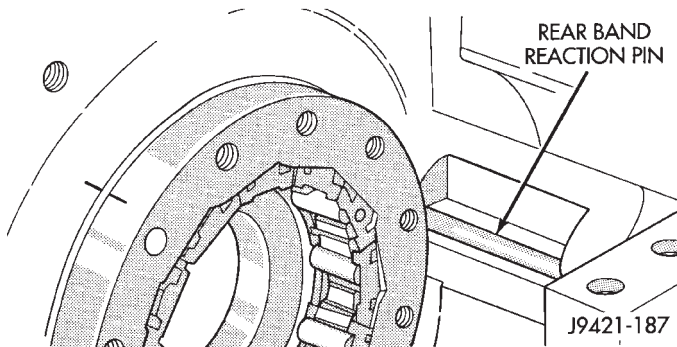
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Fig. 124 Rear Band Components (30RH)



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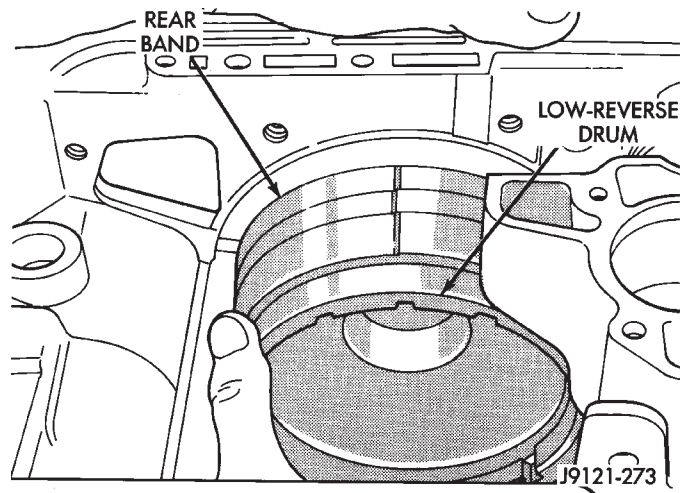
Fig. 125 Rear Band Components (32RH)



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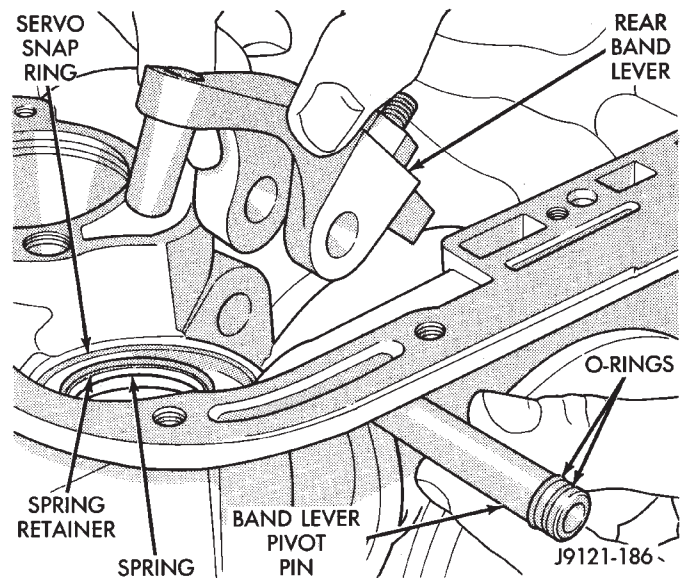
Fig. 126 Rear Band Reaction Pin Installation (32RH)

- (a) Assemble band and link. Be sure that notch in one side of link is facing band (Fig. 129).
- (b) Position band and link in case (Fig. 130).
- (c) Slide low-reverse drum through band (Fig.



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Fig. 127 Rear Band And Low-Reverse Drum Installation (32RH)



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Fig. 128 Rear Band Lever And Pivot Pin Installation (32RH)

131). Then tilt drum slightly and start clutch race into overrunning clutch rollers.

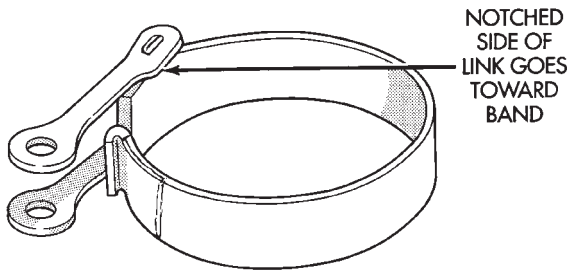
(d) Rotate drum in clockwise direction and push drum inward until race is seated in overrunning clutch.

(e) Install rear band lever and pivot pin. Be sure lever pivot pin is fully seated in case afterward.

(3) Hold low-reverse drum in position and install rear support (Fig. 132)

(4) Align support with punch marks made during disassembly.

(5) Install and tighten rear support bolts to 17 N·m (150 in. lbs.) torque.



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Fig. 129 Assembling Rear Band And Link (30RH)

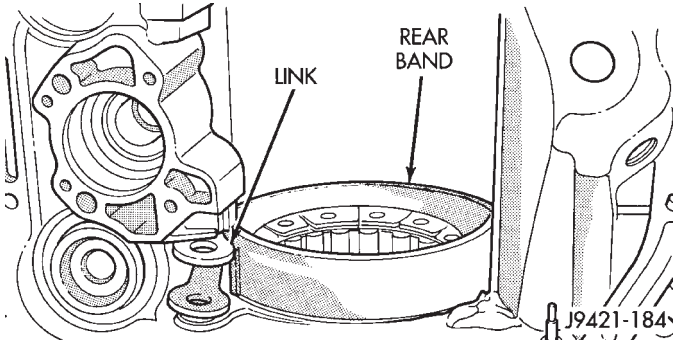


Fig. 130 Rear Band Positioned In Case (30RH)

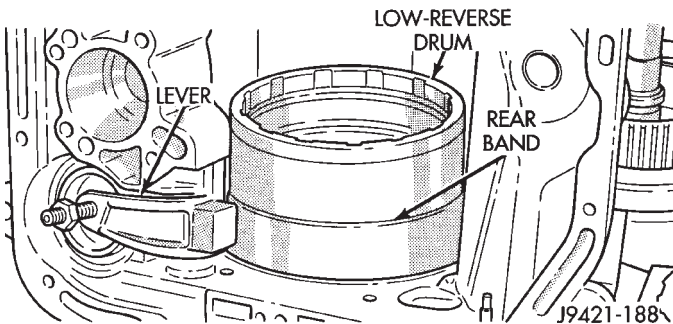


Fig. 131 Low-Reverse Drum And Band Lever Installation (30RH)

(6) Install snap ring that retains low-reverse drum to hub of rear support (Fig. 133).

PLANETARY GEARTRAIN AND OUTPUT SHAFT INSTALLATION

(1) Lubricate output shaft, rear support bore and low-reverse drum hub with transmission fluid.

(2) Install assembled output shaft and planetary geartrain in case (Fig. 134).

(3) Align drive lugs on rear planetary gear with slots in low-reverse drum (Fig. 135). Then seat planetary assembly in drum.

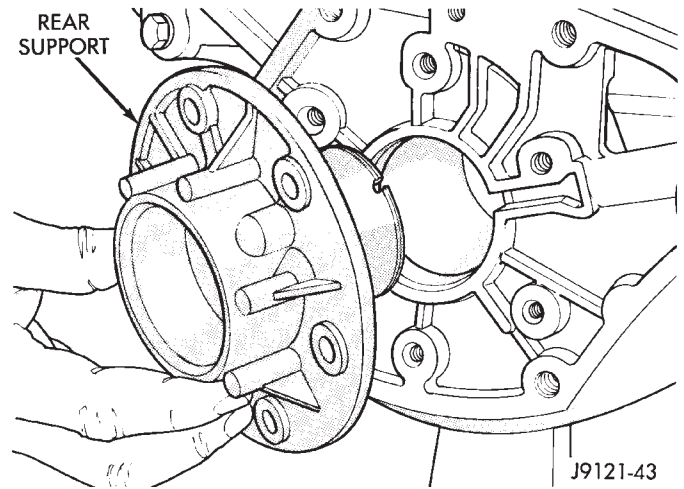


Fig. 132 Rear Support Installation

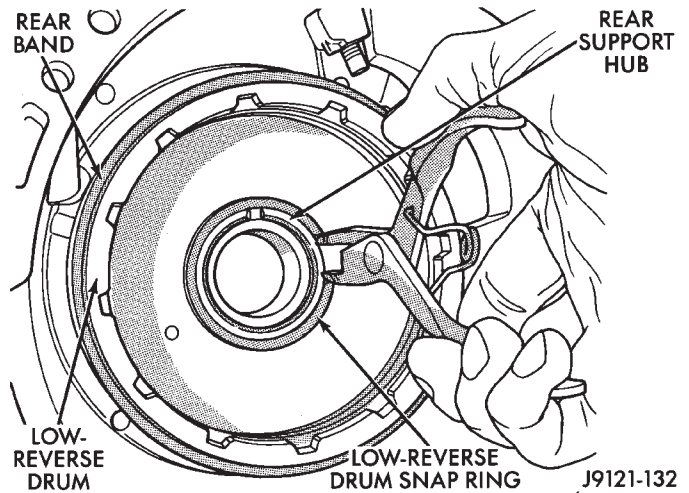


Fig. 133 Installing Low-Reverse Drum Snap Ring

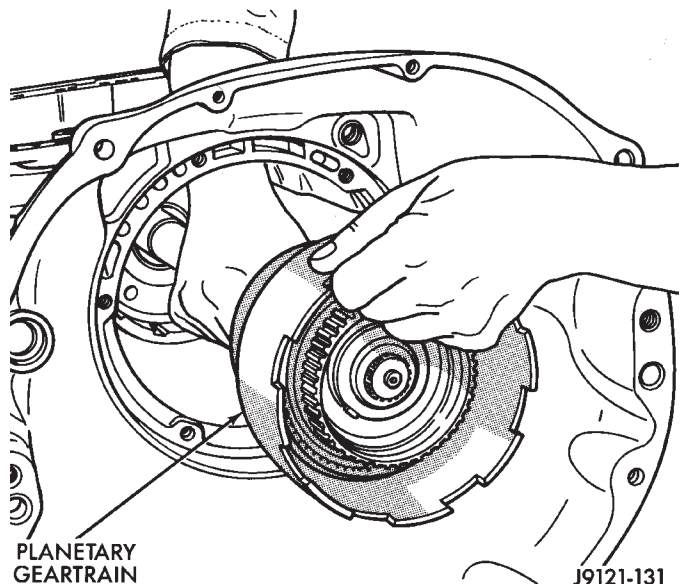


Fig. 134 Installing Output Shaft And Planetary Geartrain

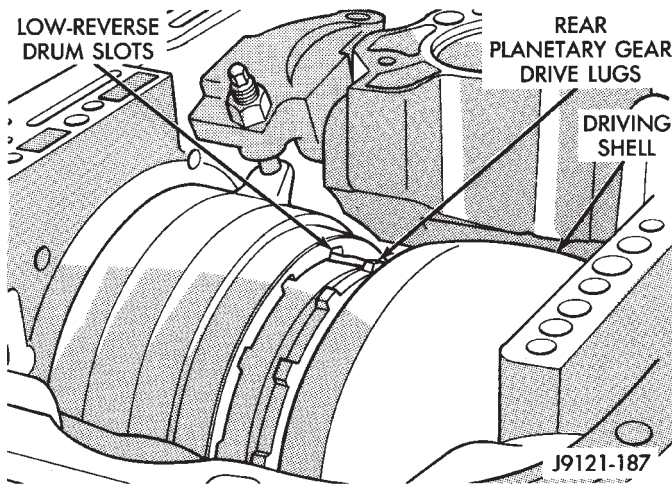


Fig. 135 Aligning/Seating Rear Planetary In Low-Reverse Drum

GOVERNOR AND PARK GEAR INSTALLATION

- (1) Lubricate governor components and park gear seal rings with transmission fluid.
- (2) Install governor filter in park gear and install governor body on gear. Align governor body on gear using marks made at disassembly.
- (3) Install new seal rings on hub of park gear if necessary. Be sure ring (or rings) with hooked ends are properly connected.
- (4) Install governor weight assembly in governor body. Be sure governor weight snap rings are securely seated.
- (5) Align and install governor/park gear assembly on output shaft as follows:
 - (a) **Note that output shaft in current transmission is spotfaced for governor valve end clearance (Fig. 136). Shaft must be indexed so that small end of governor valve will seat in this spotface. Install governor body and park gear as follows to ensure proper alignment and operation.**

(b) Rotate output shaft until spotface (at governor valve shaft hole) is facing upward (Fig. 136).

(c) Position valve bore in governor body over spotface on output shaft. Then align valve shaft holes in governor body and output shaft.

(d) Align splines in output shaft and park gear hub.

(e) Carefully push assembly into place in rear support (Fig. 137).

(f) Verify that governor valve shaft holes in output shaft and governor body are still in alignment. Reposition governor body and park gear if alignment is not correct.

(g) Tighten bolts attaching governor body to park gear to 11 N·m (95 in. lbs.) torque.

(6) Install first E-clip on governor valve shaft. Then install governor valve and shaft in governor body (Fig. 138). **Be sure valve shaft moves freely**

(7) Install second E-clip on governor valve shaft. Then install governor valve and shaft in governor body (Fig. 138). **Be sure valve shaft moves freely**

(8) Install governor valve and shaft in governor body (Fig. 138). **Be sure valve shaft moves freely**

(9) Tighten bolts attaching governor body to park gear to 11 N·m (95 in. lbs.) torque.

(10) Install first E-clip on governor valve shaft. Then install governor valve and shaft in governor body (Fig. 138). **Be sure valve shaft moves freely**

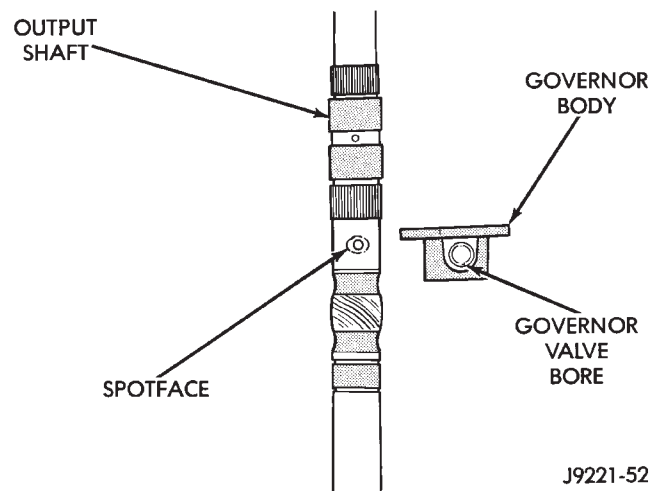


Fig. 136 Governor Valve And Output Shaft Spotface Alignment

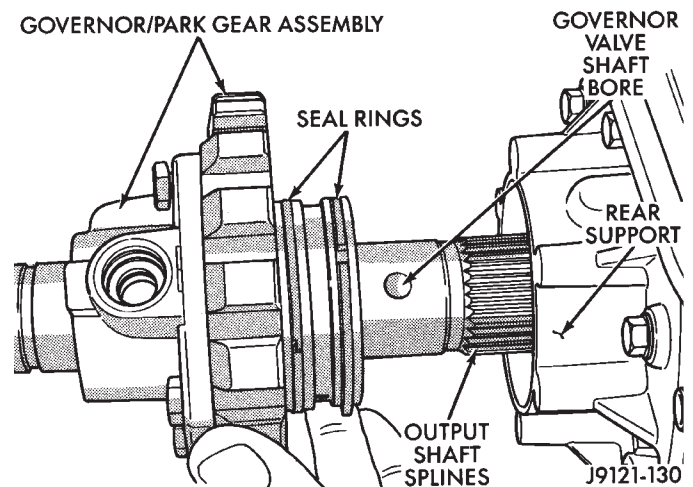


Fig. 137 Installing Governor Body And Park Gear in valve and in output shaft. If valve shaft binds, governor/park gear is misaligned.

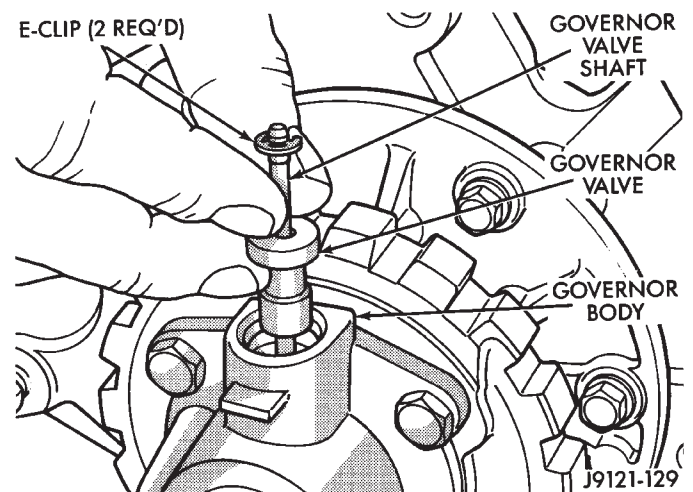


Fig. 138 Installing Governor Valve And Shaft

(7) Rotate output shaft until opposite end of governor valve shaft is facing upward. Then install remaining E-clip on governor valve shaft (Fig. 139). **Be very sure both E-clips are firmly seated on shaft.**

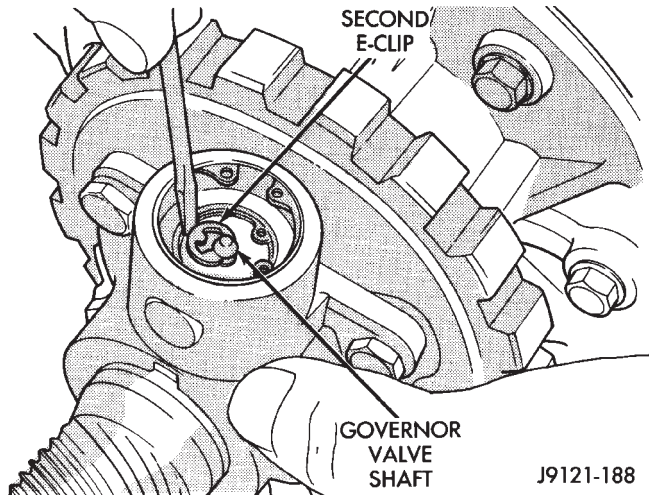


Fig. 139 Securing Governor Valve Shaft With New E-Clip

(8) Install snap ring that retains governor body on output shaft (Fig. 140).

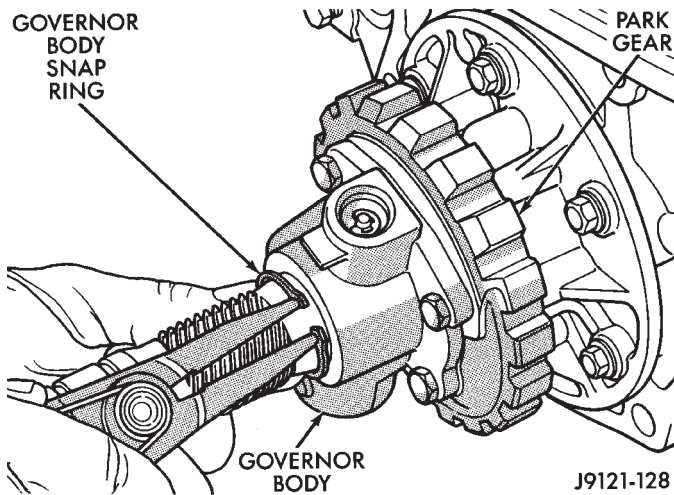


Fig. 140 Installing Governor Body Snap Ring

FRONT/REAR CLUTCH INSTALLATION

(1) Install output shaft thrust plate on shaft hub (Fig. 141). Use petroleum jelly to hold thrust plate in place.

(2) Check input shaft seal rings (Fig. 142). Verify that diagonal-cut ends of teflon seal ring are properly joined and ends of metal ring are correctly hooked together. Also be sure rings are installed sequence shown.

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

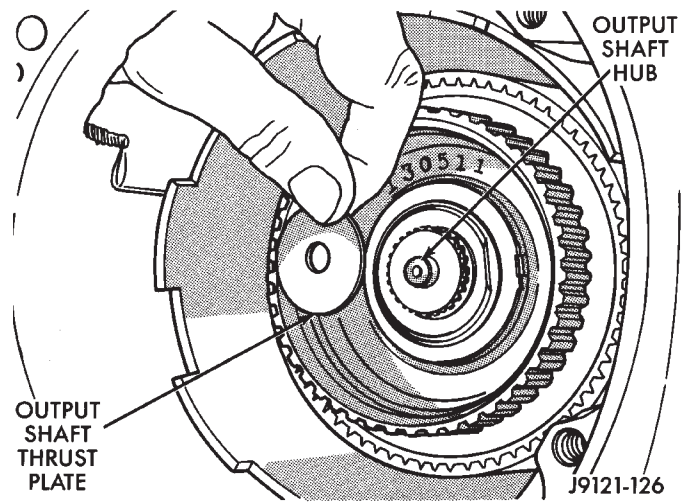


Fig. 141 Installing Output Shaft Thrust Plate

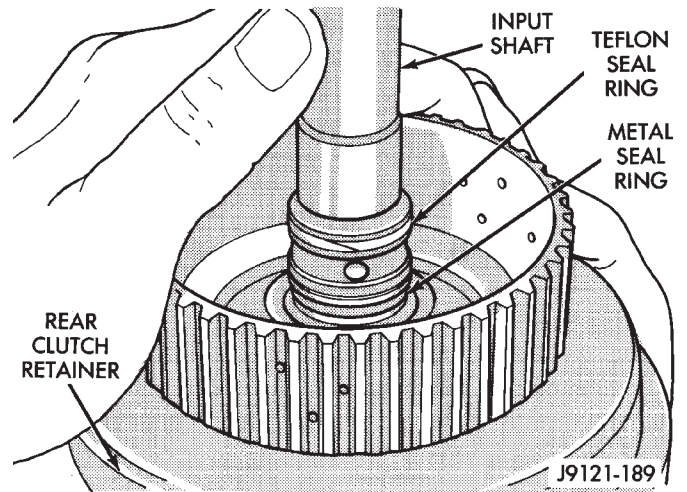


Fig. 142 Input Shaft Seal Ring Location

(4) Align clutch discs in front clutch and install front clutch on rear clutch (Fig. 143). Rotate front clutch retainer back and forth until completely seated on rear clutch.

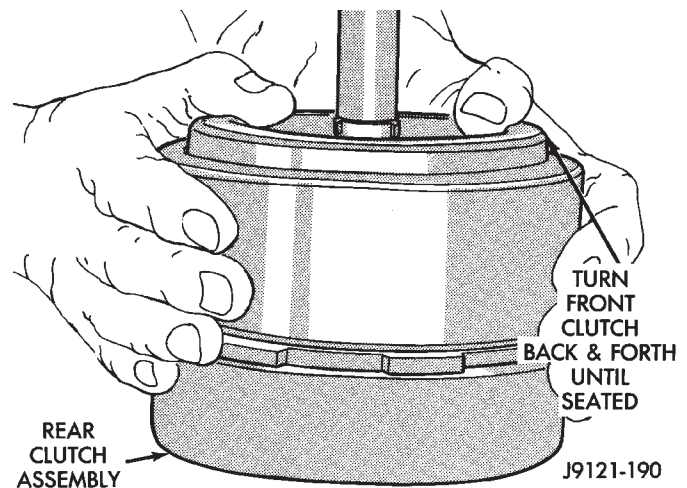


Fig. 143 Assembling Front And Rear Clutch Units

(5) Coat output shaft thrust washer with petroleum jelly. Then install washer in rear clutch hub (Fig. 144). 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.**

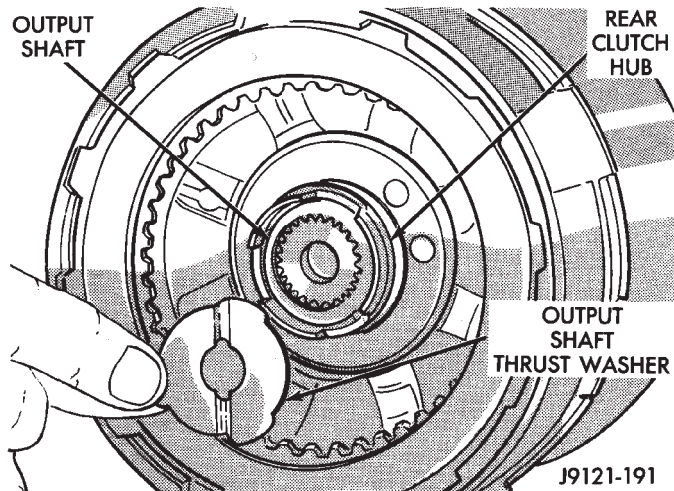


Fig. 144 Installing Output Shaft Thrust Washer

(6) Align drive teeth on rear clutch discs with small screwdriver (Fig. 145). This will make installation on front planetary easier.

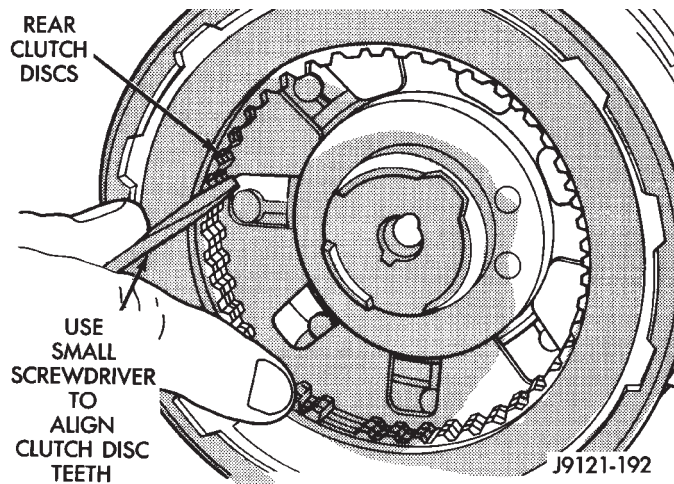


Fig. 145 Aligning Rear Clutch Disc Lugs

(7) 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.

(8) Install front and rear clutch units as assembly (Fig. 146). 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.**

(9) Carefully work assembled clutches back and forth to engage and seat rear clutch discs on front

annulus gear. Verify that front clutch drive lugs are fully engaged in slots of driving shell after installation.

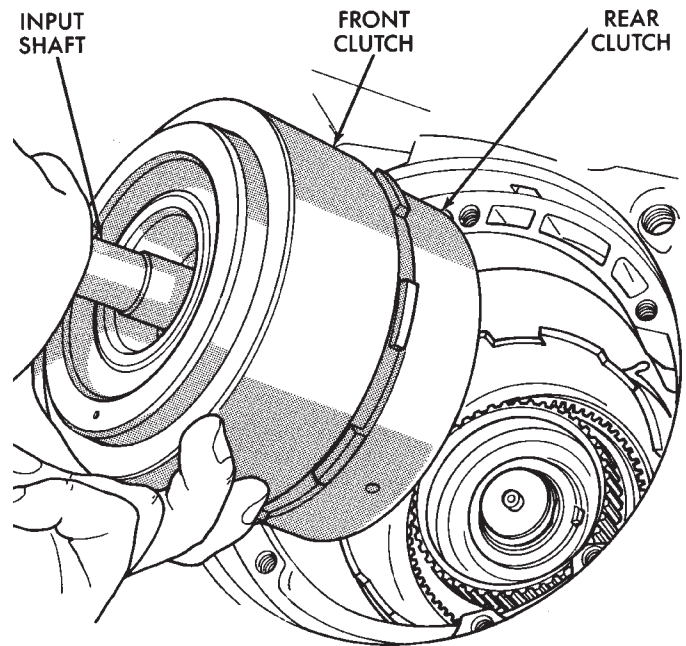


Fig. 146 Installing Front/Rear Clutch Assemblies

FRONT BAND AND OIL PUMP INSTALLATION

- (1) Slide front band over front clutch retainer (Fig. 147).
- (2) Insert front band reaction pin part way into case (Fig. 147).

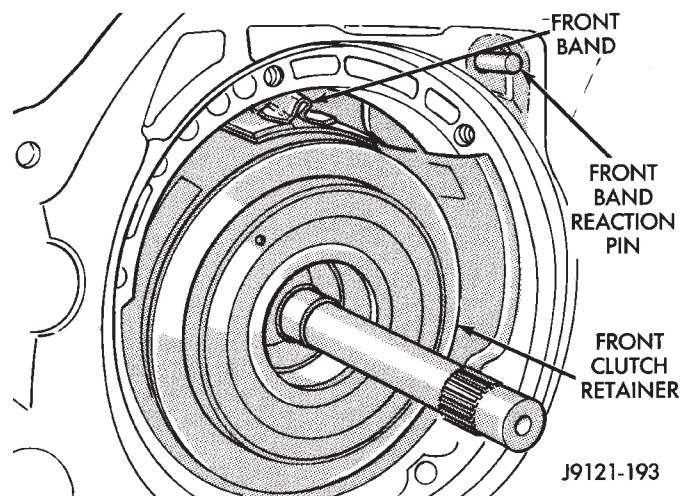


Fig. 147 Installing Front Band And Reaction Pin

(3) Install front band lever, strut, lever pin and adjusting screw (Fig. 148).

(4) Tighten front band adjusting screw until band just grips clutch retainer. Verify that front/rear clutches are still seated before continuing.

(5) Coat band lever pin access plug with sealer and install plug in converter housing (Fig. 149).

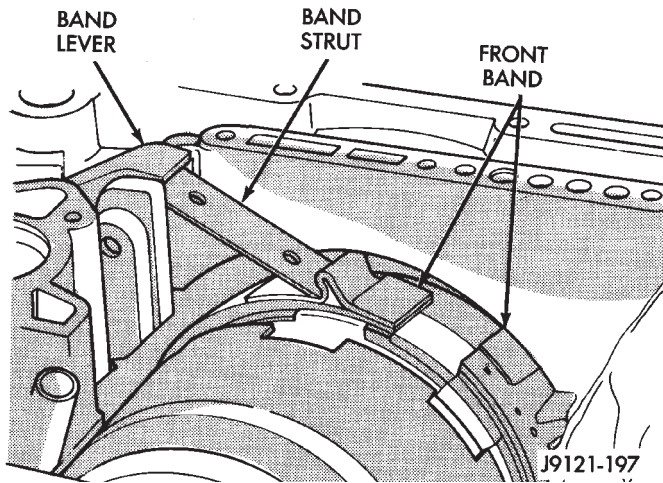


Fig. 148 Front Band Linkage Installation

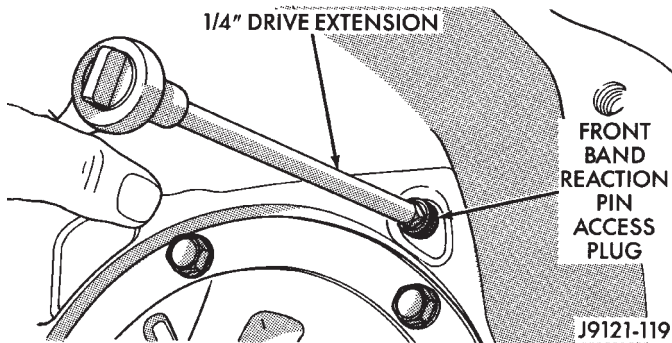


Fig. 149 Installing Front Band Pivot Pin Access Plug

(6) Verify that reaction shaft support hub seal rings are hooked together (Fig. 150).

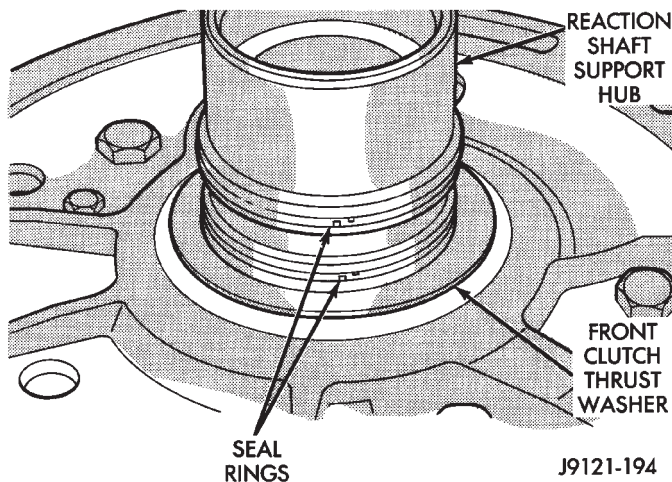


Fig. 150 Reaction Shaft Support Seal Rings

(7) Coat front clutch thrust washer with petroleum jelly to hold it in place. Then install washer over reaction shaft hub and seat it on pump (Fig. 151).

CAUTION: The thrust washer bore (I.D.), is chamfered on one side. Make sure the chamfered side is installed so it faces the pump.

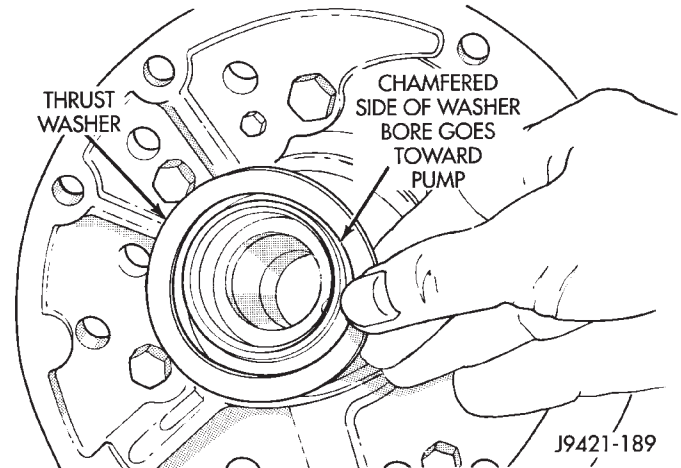


Fig. 151 Front Clutch Thrust Washer Installation

(8) Thread two Pilot Stud Tools C-3288-B into bolt holes in oil pump flange (Fig. 152).

(9) Align and install oil pump gasket (Fig. 152).

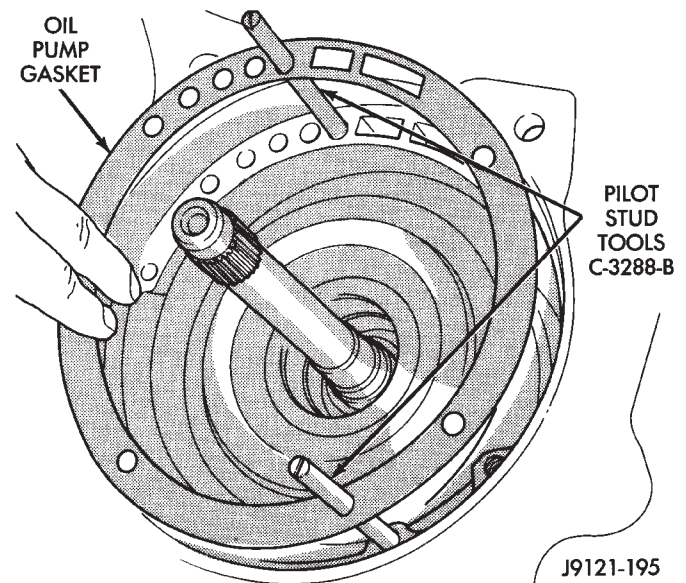


Fig. 152 Installing Pilot Studs And Oil Pump Gasket

(10) Lubricate oil pump seals with Ru-Glyde, Door Eze, or transmission fluid.

(11) Install oil pump (Fig. 153). Align and position pump on pilot studs. Slide pump down studs and work it into front clutch hub and case by hand. Then install two or three pump bolts to hold pump in place.

(12) Remove pilot stud tools and install remaining oil pump bolts. Tighten bolts alternately in diagonal pattern to 20 N·m (15 ft-lbs).

CHECKING INPUT SHAFT END PLAY

(1) Measure input shaft end play (Fig. 154).

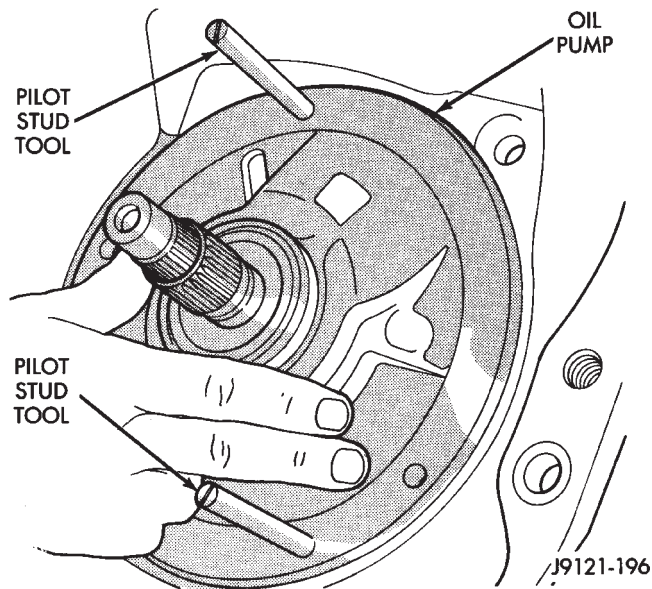


Fig. 153 Installing Oil Pump And Reaction Shaft Support

(2) Attach dial indicator to converter housing. Position indicator plunger against input shaft and zero indicator.

(3) Move input shaft in and out and record reading. End play should be 0.56 - 2.31 mm (0.022 - 0.091 in.).

(4) If end play is incorrect, transmission is incorrectly assembled, or output shaft thrust washer and/or thrust plate are worn and need to be changed.

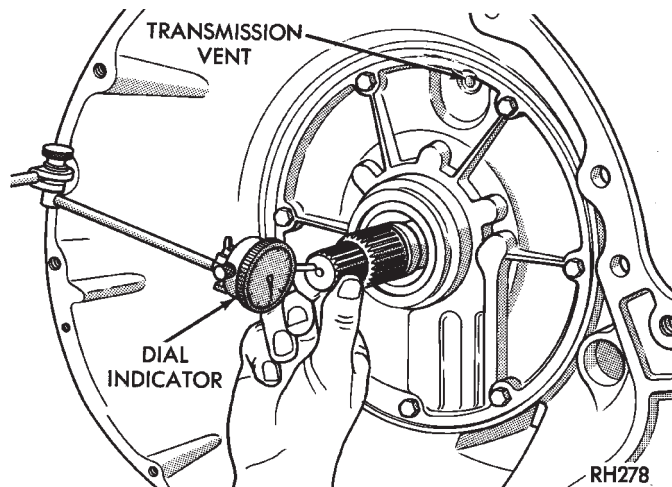


Fig. 154 Checking Input Shaft End Play

VALVE BODY INSTALLATION

(1) Install new manual lever shaft seal in case. Use 15/16 deep well socket to install seal.

(2) Make sure neutral switch has **not** been installed in case. Remove switch if necessary as it will interfere with valve body installation.

(3) Install new seal rings on accumulator piston (Fig. 155). Lubricate accumulator piston, seals and accumulator bore with transmission fluid.

(4) Install accumulator piston and spring (Fig. 155) in case.

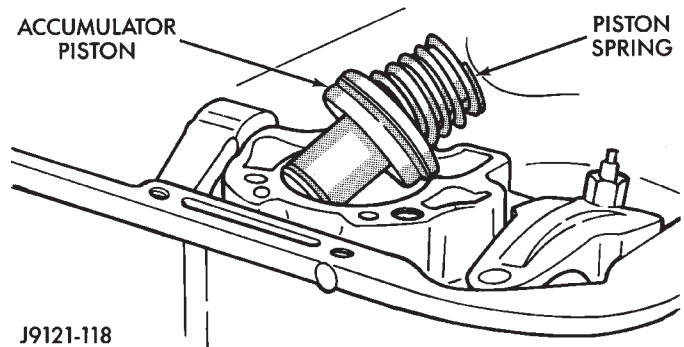


Fig. 155 Installing Accumulator Piston And Spring

(5) Place valve body manual lever in low to move park lock rod rearward.

(6) Position valve body on case. Work park rod past sprag and install valve body-to-case bolts finger tight.

(7) Install park/neutral position switch in case. Tighten switch to 34 N·m (25 ft. lbs.) torque.

(8) Align valve body on case (Fig. 156).

(9) Install and tighten valve body-to-case bolts alternately and evenly to 12 N·m (105 in. lbs.) torque. Start at center and work outward when tightening bolts. **Do not overtighten valve body bolts. This could result in distortion and cross leakage after installation.**

(10) Connect converter clutch solenoid wire to case connector (Fig. 156).

(11) Install new filter on valve body (Fig. 157). Tighten filter screws to 4 N·m (35 in. lbs.).

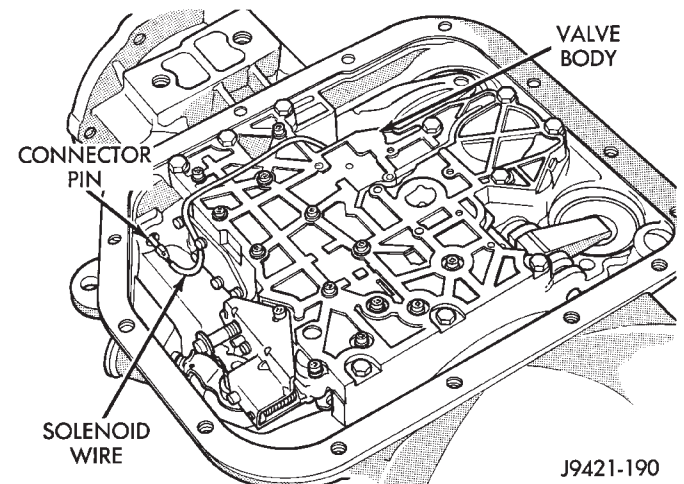


Fig. 156 Valve Body Installation

BAND ADJUSTMENT AND OIL PAN INSTALLATION

(1) Adjust **front band** as follows:

(a) Loosen locknut.

(b) Tighten adjusting screw to 72 in. lbs. torque.

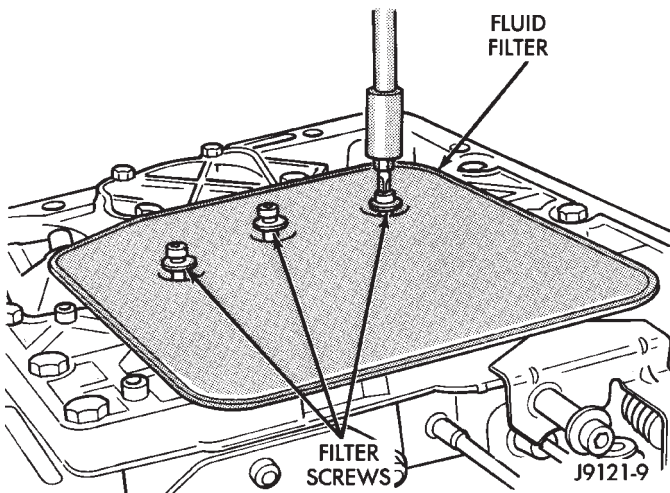


Fig. 157 Fluid Filter Installation

- (c) Back off front band adjusting screw as follows:
- **On 30RH (2.5L), back adjusting screw off 2 1/2 turns**
 - **On 32RH (4.0L), back adjusting screw off 2 1/4 turns**
- (d) Hold adjusting screw in position and tighten locknut to 34 N·m (25 ft. lbs.).
- (2) Adjust **rear band** as follows:
- (a) Loosen locknut.
 - (b) Tighten adjusting screw as follows: On 32RH transmission, tighten screw to 8 N·m (72 in. lbs.) torque. On 30RH transmission. Tighten screw to 5 N·m (41 in. lbs.) torque.
 - (c) Back off rear band adjusting screw as follows:
 - **On 30RH (2.5L), back adjusting screw off 7 turns**
 - **On 32RH (4.0L), back adjusting screw off 4 turns**
 - (d) Hold adjusting screw in place and tighten locknut to 34 N·m (25 ft. lbs.) torque.

- (3) Install new pan gasket on transmission and install oil pan. Tighten pan bolts to 17 N·m (13 ft. lbs.).
- (4) Turn transmission over.

EXTENSION HOUSING, CONTROL LEVER AND CONVERTER INSTALLATION

- (1) Install throttle valve and manual valve levers on shaft.
- (2) Position new extension adapter housing gasket on transmission case. Use petroleum jelly to hold gasket in place.
- (3) Install new rear seal in extension housing if required.
- (4) Install extension/adaptor housing on transmission case. Tighten housing fasteners to 33 N·m (24 ft. lbs.). Be sure park lock rod is properly engaged in sprag before tightening fasteners.
- (5) Lubricate converter hub with transmission fluid and carefully install converter. Turn converter back and forth until seated. Be sure converter hub slots are fully seated in oil pump gear lugs.
- (6) Secure converter in oil pump before mounting transmission on jack and before moving transmission back under vehicle. Use metal strapping, C-clamp, or locking pliers to hold converter in place. Attach holding tool to converter housing.

CAUTION: The transmission cooler and lines must be reverse flushed if overhaul corrected a malfunction that generated sludge, metal particles, or clutch friction material. The torque converter should also be replaced if contaminated by the same malfunction. Debris and residue not flushed from the cooler and lines will flow back into the transmission and converter. The result could be a repeat failure and shop comeback.

AW-4 AUTOMATIC TRANSMISSION

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GENERAL INFORMATION

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DESCRIPTION

The AW-4 is a 4-speed, electronically controlled automatic transmission (Fig. 1). Running gear consists of a torque converter, oil pump, three planetary gear sets, clutch and brake units, hydraulic accumulators, a valve body with electrical solenoids and a transmis-

sion control module (TCM). The AW-4 is used in XJ models with a 4.0L engine.

Cables are used for shifting and transmission throttle pressure control. A park/neutral position switch permits engine starting in Park and Neutral range only.

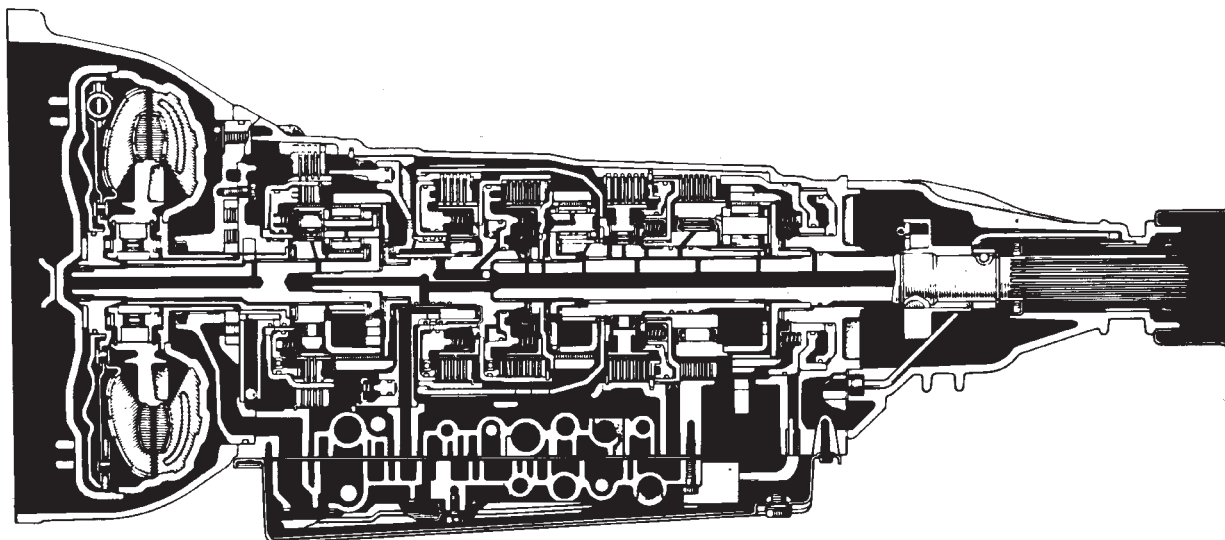


Fig. 1 AW-4 Automatic Transmission

The valve body solenoids are controlled by signals from the transmission control module (TCM). Signal sequence is determined by vehicle speed and throttle position.

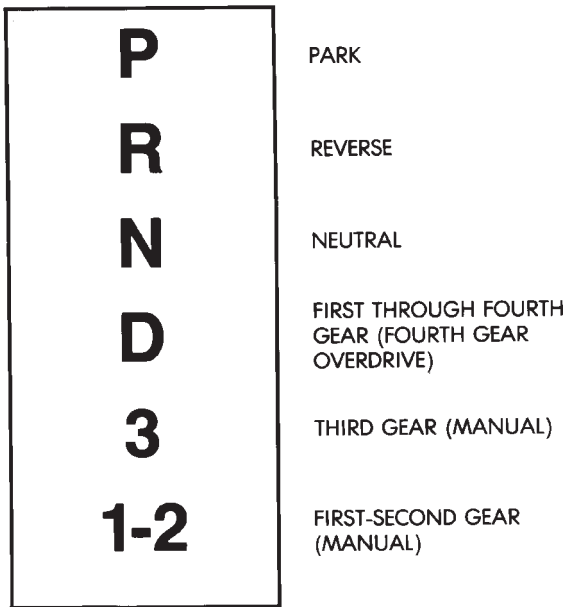
Fourth gear is an 0.75:1 ratio overdrive range. First, second, third and reverse gear are conventional ranges. Third gear ratio is 1:1. A separate planetary gear set provides overdrive operation in fourth gear.

TRANSMISSION RANGES AND SHIFT LEVER POSITIONS

The AW-4 transmission has six ranges and shift lever positions. Park, Reverse and Neutral are conventional and mechanically operated. The 1-2, 3 and D ranges provide electronically controlled shifting.

The 1-2 position provides first and second gear only. The 3 position provides first, second and third gear.

The D range provides first through fourth gear. Overdrive fourth gear range is available only when the shift lever is in D position (Fig. 2).



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Fig. 2 AW-4 Shift Lever Positions And Transmission Ranges

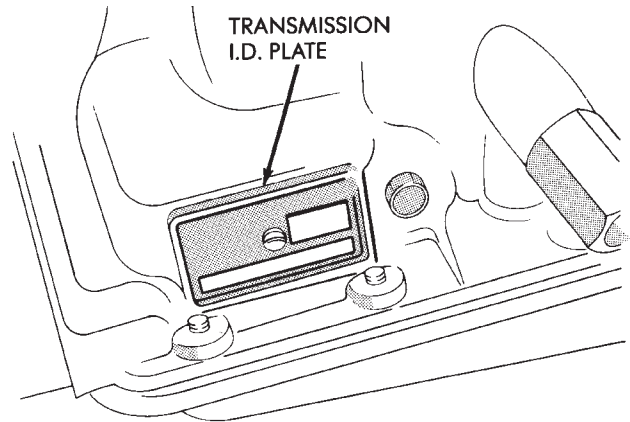
TRANSMISSION IDENTIFICATION

The transmission I.D. plate is attached to the case (Fig. 3). The plate contains the transmission serial and model numbers. Refer to the information on this plate when ordering service parts.

COMPONENTS AND OPERATION

ELECTRONIC CONTROLS

The AW-4 is electronically controlled in the 1, 2, 3 and D ranges. Controls consist of the transmission control module (TCM), valve body solenoids and var-



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Fig. 3 Transmission Identification

ious sensors. The sensors monitor vehicle speed, throttle opening, shift lever position and brake pedal application.

TRANSMISSION CONTROL MODULE (TCM)

The module determines shift and converter clutch engagement timing based on signals from the sensors. The valve body solenoids are activated, or deactivated accordingly.

The module has a self diagnostic program. Component and circuitry malfunctions can be diagnosed with the DRB II scan tool. Once a malfunction is noted and stored in control module memory, it is retained even after the problem has been corrected. To cancel a stored malfunction, simply disconnect and reconnect the "Trans." fuse in the module harness.

TRANSMISSION VALVE BODY SOLENOIDS

The solenoids are mounted on the valve body and operated by the transmission control module. The solenoids control operation of the converter clutch and shift valves in response to input signals from the module.

SENSORS

The sensors include the throttle position sensor (TPS), transmission output speed sensor, vehicle speed sensor, park/neutral position switch and brake switch.

The throttle position sensor is mounted on the throttle body. It electronically determines throttle position and relays this information to the transmission control module to determine shift points and converter clutch engagement.

The transmission speed sensor consists of a rotor and magnet on the transmission output shaft and a switch in the extension housing or adapter. The sensor switch is activated each time the rotor and mag-

net complete one revolution. Sensor signals are sent to the transmission control module.

The park/neutral position switch is mounted on the valve body manual shaft. The switch signals shift linkage and manual valve position to the transmission control module through an interconnecting harness. The switch prevents engine starting in all gears other than Park or Neutral.

The brake switch is in circuit with the torque converter clutch solenoid. The switch disengages the converter clutch whenever the brakes are applied. The switch is mounted on the brake pedal bracket and signals the transmission control module when the pedal is pressed or released.

TORQUE CONVERTER

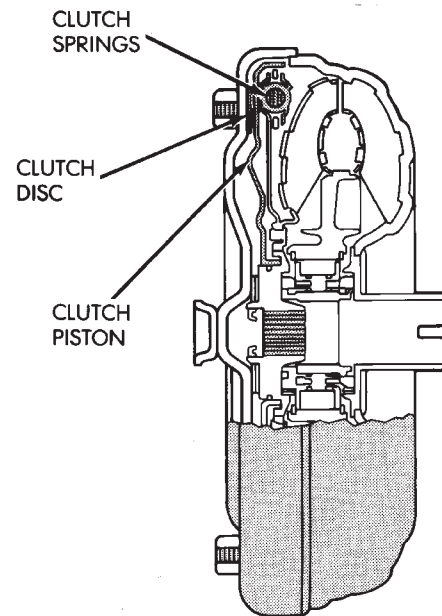
A four element torque converter is used for all applications. The converter consists of the front cover and pump, stator, turbine, and an electronic modulated converter clutch mechanism.

The converter clutch mechanism consists of a sliding clutch piston, clutch springs and the clutch disc material (Fig. 4). The clutch provides optimum torque transfer and economy when engaged.

The clutch disc is attached to the converter front cover. The clutch piston and clutch springs are attached to the turbine hub. The springs dampen engine firing impulses and loads during the initial phase of converter clutch engagement.

Clutch engagement is controlled by transmission valve body solenoid number three and by the converter clutch relay valve. The solenoid channels line pressure to the clutch through the relay valve at clutch engagement speeds.

Torque converter clutch engagement occurs in second gear in 1-2 position; third gear in 3 position and third and fourth gear in D position.



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Fig. 4 Torque Converter With Modulated Clutch

FOURTH GEAR OVERDRIVE COMPONENTS

The overdrive system consists of the input shaft, one-way clutch, planetary sun gear, ring gear, planetary carrier, direct clutch and overdrive brake (Fig. 5). The overdrive elements are controlled and applied through transmission valve body solenoid number two.

In overdrive fourth gear, the brake prevents the overdrive sun gear from turning. During operation, the overdrive elements operate as follows:

The overdrive input shaft and planetary carrier rotate as a unit. The sun gear and overdrive direct clutch drum are in mesh and operate as a single unit. The direct clutch splines function as the hub for the overdrive brake. The one-way clutch outer race is in mesh with the planetary carrier. The inner race is fixed to the sun gear shaft.

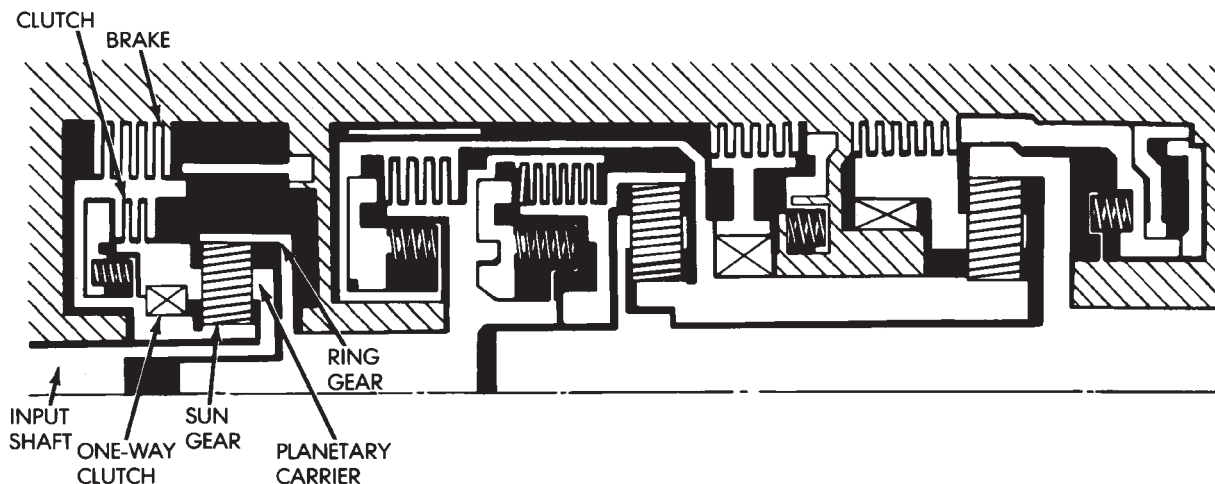
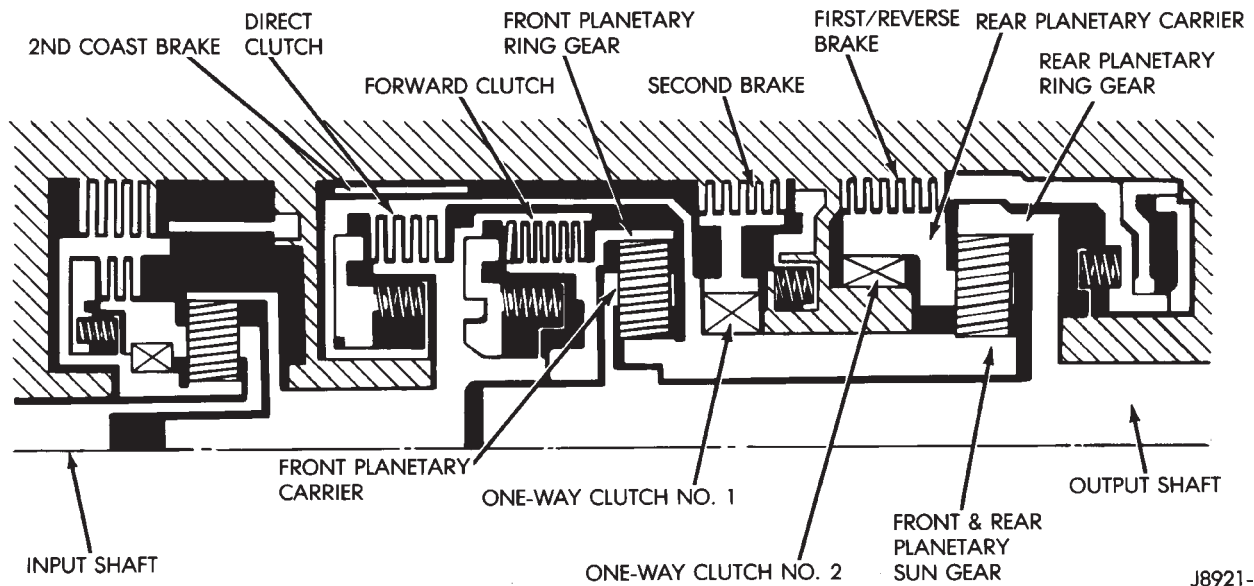


Fig. 5 Fourth Gear Overdrive Components

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Fig. 6 First, Third And Reverse Gear Components

FIRST—THIRD—REVERSE GEAR COMPONENTS

First, third and reverse gear components are outlined in Figure 6.

The input shaft is meshed with the direct clutch hub and the forward clutch drum. These elements rotate as a unit. The forward clutch hub rotates as a unit with the front planetary ring gear. The direct clutch drum is meshed with the forward end of the planetary sun gear.

The second brake hub serves as the outer race of one-way clutch No. 1. The clutch inner race is locked with the front/rear sun gear. The inner race of one-

way clutch No. 2 is splined to the transmission case and is locked. The outer race rotates as a unit with the rear planetary carrier.

The rear planetary ring gear is splined to the output shaft. The front planetary carrier and rear carrier ring gear are meshed and rotate as a unit with the output shaft.

GEARTRAIN OPERATION AND APPLICATION CHARTS

Operation and application of the first through fourth and reverse gear elements are outlined in the function and application charts.

NOMENCLATURE	FUNCTION
Overdrive Direct Clutch	Connects overdrive sun gear and overdrive carrier
Overdrive Brake	Prevents overdrive sun gear from turning either clockwise or counterclockwise
Overdrive One-Way Clutch	When transmission is driven by engine, connects overdrive sun gear and overdrive carrier
Forward Clutch	Connects input shaft and front ring gear
Direct Clutch	Connects input shaft and front and rear sun gear
Second Coast Brake	Prevents front and rear sun gear from turning either clockwise or counterclockwise
Second Brake	Prevents outer race of No. 1 one-way clutch from turning either clockwise or counterclockwise, thus preventing front and rear sun gear from turning counterclockwise
First/Reverse Brake	Prevents rear planetary carrier from turning either clockwise or counterclockwise
One-Way Clutch No. 1	When second brake is operating, prevents front and rear sun gear from turning counterclockwise
One-Way Clutch No. 2	Prevents rear planetary carrier from turning counterclockwise

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Fig. 7 Component Function Chart

Shift Lever Position	Gear	Valve Body Solenoid No. 1	Valve Body Solenoid No. 2	OVERDRIVE CLUTCH	FORWARD CLUTCH	DIRECT CLUTCH	OVERDRIVE BRAKE	SECOND COAST BRAKE	SECOND BRAKE	FIRST/ REVERSE BRAKE	OVERDRIVE ONE-WAY CLUTCH	NO.1 ONE-WAY CLUTCH	NO.2 ONE-WAY CLUTCH
P	Park	ON	OFF	•									
R	Reverse	ON	OFF	•		•				•	•		
N	Neutral	ON	OFF	•									
D	First	ON	OFF	•	•						•		•
	Second	ON	ON	•	•				•		•	•	
	Third	OFF	ON	•	•	•			•		•		
	OD	OFF	OFF		•	•	•		•				
3	First	ON	OFF	•	•						•		•
	Second	ON	ON	•	•			•	•		•	•	
	Third	OFF	ON	•	•	•			•		•		
1-2	First	ON	OFF	•	•					•	•		•
	Second	ON	ON	•	•			•	•		•	•	

• = Applied

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Fig. 8 Component Application Chart

The Component Function Chart (Fig. 7) describes basic function of various geartrain elements. The Component Application Chart (Fig. 8) indicates which elements (including valve body solenoids), are applied in the various gear ranges.

HYDRAULIC SYSTEM

The basic hydraulic system consists of the oil pump, valve body and solenoids and four hydraulic accumulators. The oil pump provides the necessary system lubrication and operating pressure.

The valve body controls application of the clutches, brakes, second coast band and the torque converter clutch. The valve body solenoids control sequencing of the 1-2, 2-3 and 3-4 shift valves within the valve body. The solenoids are activated by signals from the transmission control module.

The accumulators are used in the clutch and brake feed circuits to control initial apply pressure. Spring loaded accumulator pistons modulate the initial surge of apply pressure for smooth engagement.

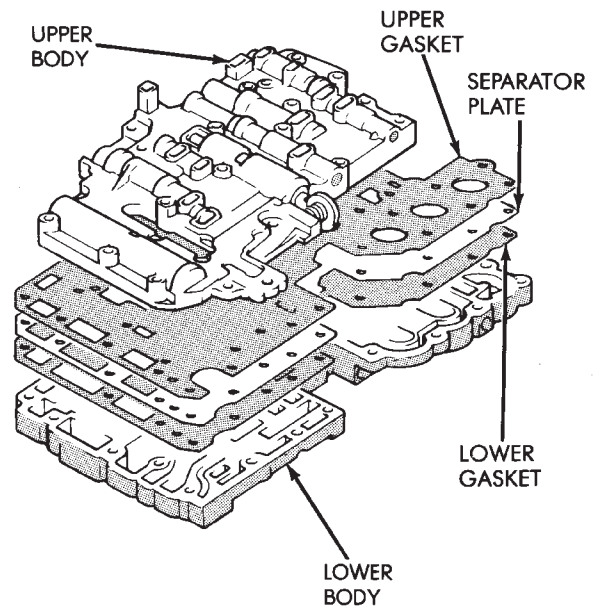
OIL PUMP

A gear-type oil pump is used. The pump gears are mounted in the pump body. The pump drive gear is operated by the torque converter hub. Drive tangs on the hub engage in drive slots in the drive gear.

TRANSMISSION VALVE BODY COMPONENTS

Transmission operating pressure is supplied to the clutch and brake apply circuits through the transmission valve body. The valve body consists of an upper body, lower body, separator plate and upper and

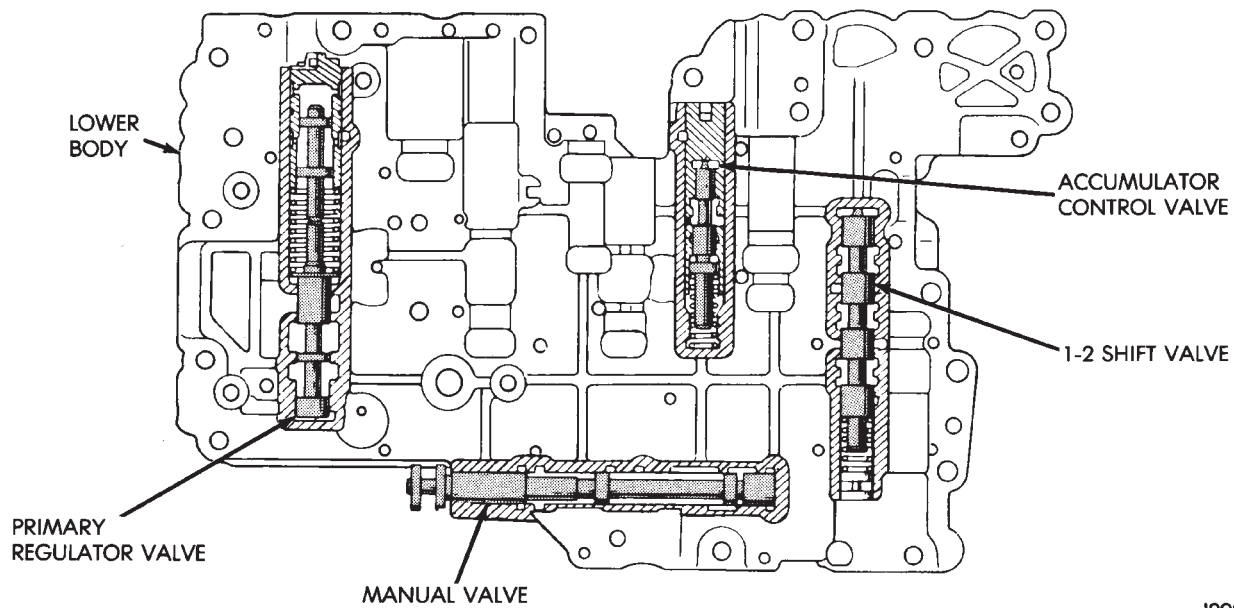
lower gaskets (Fig. 9). The various spool valves, sleeves, plugs and springs are located within the two body sections.



J8921-406

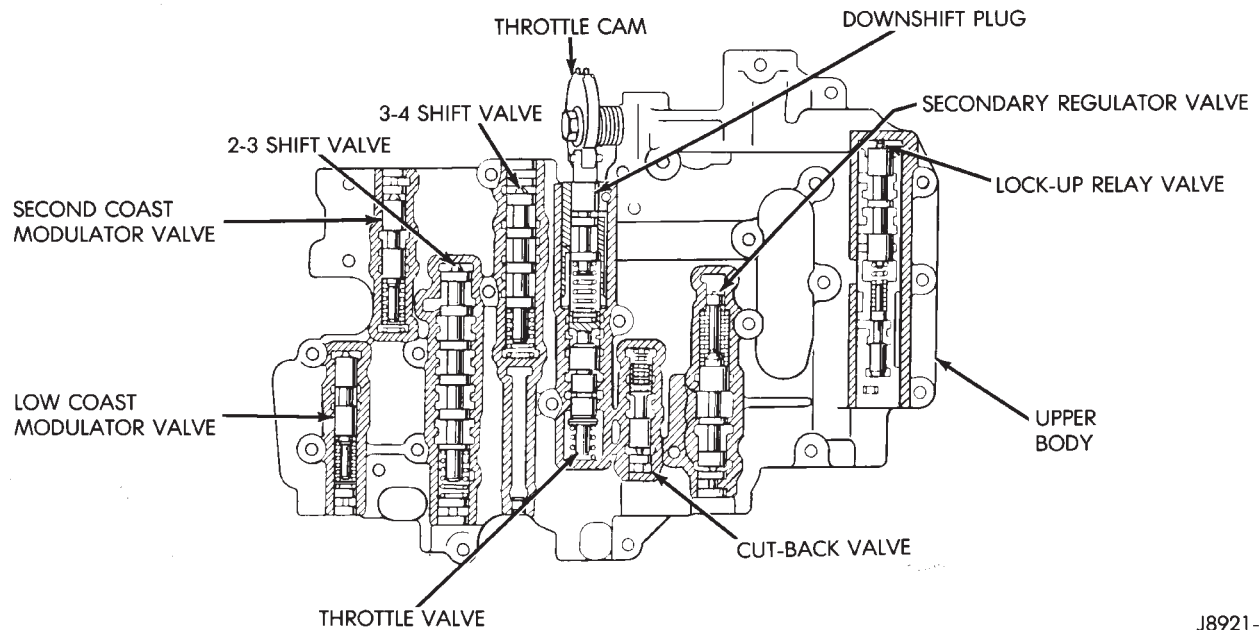
Fig. 9 Two-Section Transmission Valve Body

The manual valve, 1-2 shift valve, primary regulator valve, accumulator control valve, check balls, solenoids and oil strainers are located in the lower body section (Fig. 10). The remaining control and shift valves plus check balls and one additional oil strainer are located in the upper body section (Fig. 11).



J8921-407

Fig. 10 Upper Body Components



J8921-408

Fig. 11 Lower Body Components

Manual Valve

The manual valve is operated by the gearshift linkage. The valve diverts fluid to the apply circuits according to shift lever position.

Primary Regulator Valve

The primary regulator valve (Fig. 13) modulates line pressure to the clutches and brakes according to engine load. The valve is actuated by throttle valve pressure.

During high load operation, the valve increases line pressure to maintain positive clutch and brake en-

gagement. At light load, the valve decreases line pressure just enough to maintain smooth engagement.

Throttle Valve and Downshift Plug

The throttle valve and downshift plug (Fig. 14) control throttle pressure to the primary regulator valve.

The downshift plug and throttle valve are operated by the throttle valve cam and throttle cable in response to engine throttle position. Throttle valve pressure is also modulated by the cut-back valve in second, third and fourth gear ranges.

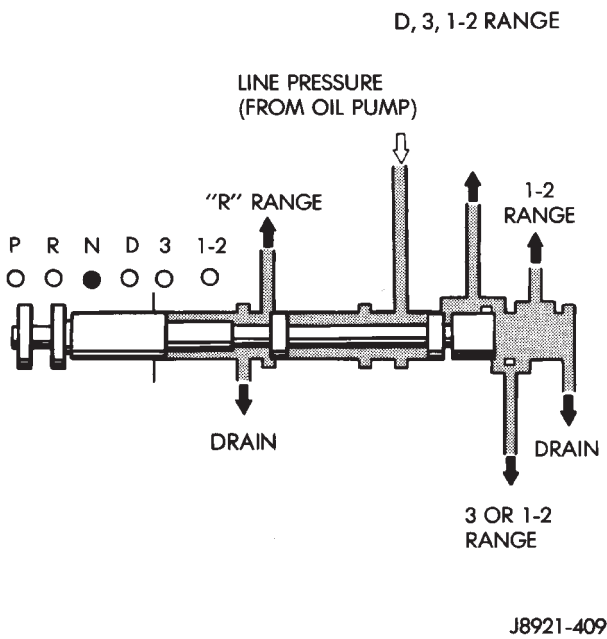


Fig. 12 Manual Valve

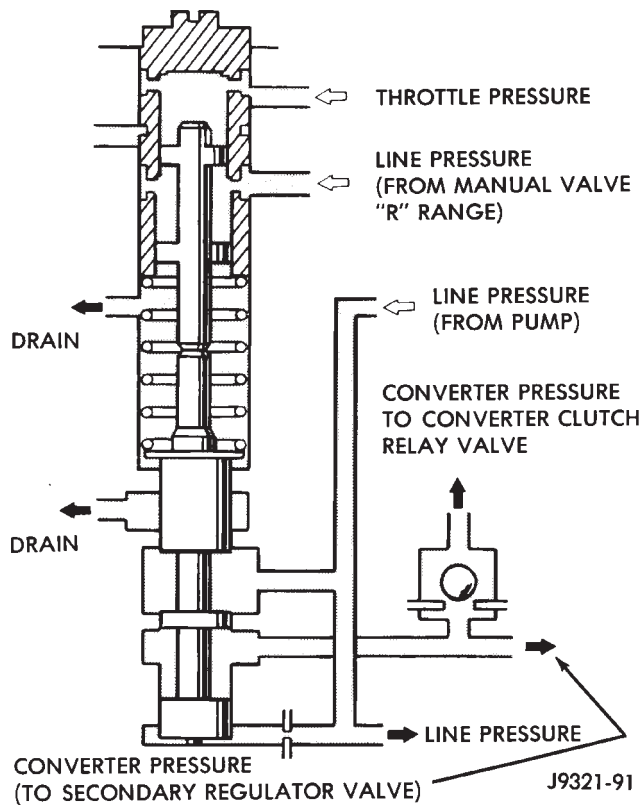


Fig. 13 Primary Regulator Valve

Cut-Back Valve

The cut-back valve (Fig. 15) helps prevent excessive pump pressure buildup in second, third and fourth gear. The valve is actuated by throttle pressure and by line pressure from the second brake. The valve also helps regulate line pressure by controlling the amount of cut-back pressure to the throttle valve.

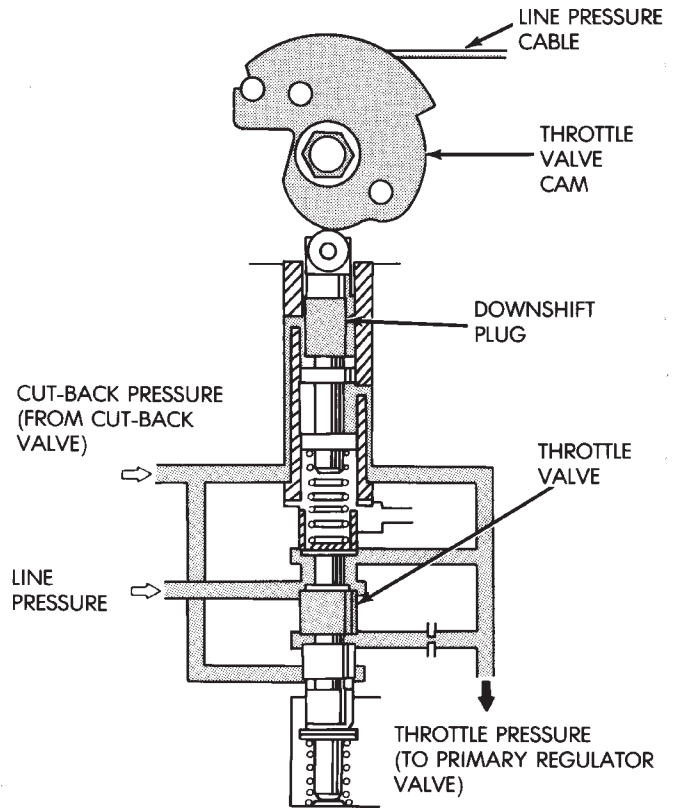


Fig. 14 Throttle Valve And Downshift Plug

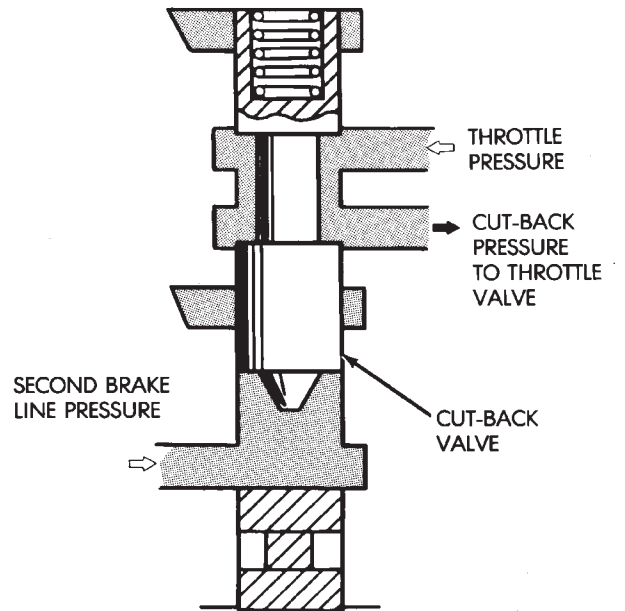


Fig. 15 Cut-Back Valve

Secondary Regulator Valve

The secondary regulator valve (Fig. 16) regulates converter clutch and transmission lubrication pressure. When primary regulator valve pressure exceeds requirements for clutch engagement or transmission lubrication, the secondary regulator valve is moved

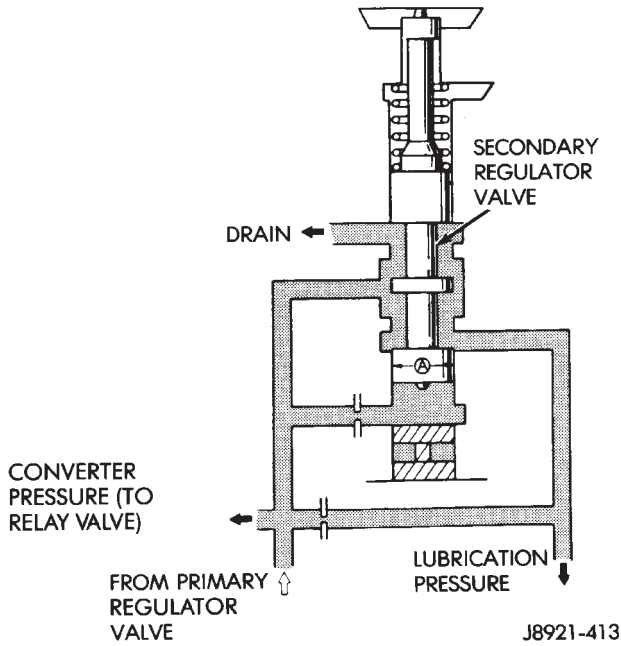


Fig. 16 Secondary Regulator Valve

upward exposing the drain port. Excess pressure then bleeds off as needed. As pressure drops, spring tension moves the valve downward closing the drain port.

Converter Clutch Relay Valve

The relay valve (Fig. 17) controls fluid flow to the converter clutch. The valve is operated by line pressure from the 1-2 shift valve and is controlled by solenoid valve number three.

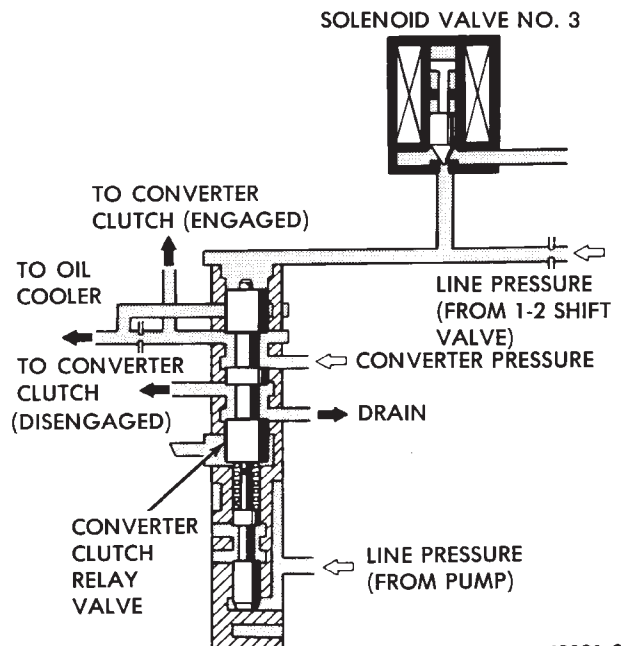


Fig. 17 Converter Clutch Relay Valve

1-2 Shift Valve

The 1-2 shift valve (Fig. 18) controls 1-2 upshifts and downshifts. The valve is operated by the No. 2 valve body solenoid and line pressure from the manual valve, second coast modulator valve and the 2-3 shift valve.

When the transmission control module deactivates the solenoid, line pressure at the top of the valve moves the valve down closing the second brake accumulator feed port. As the solenoid is activated and

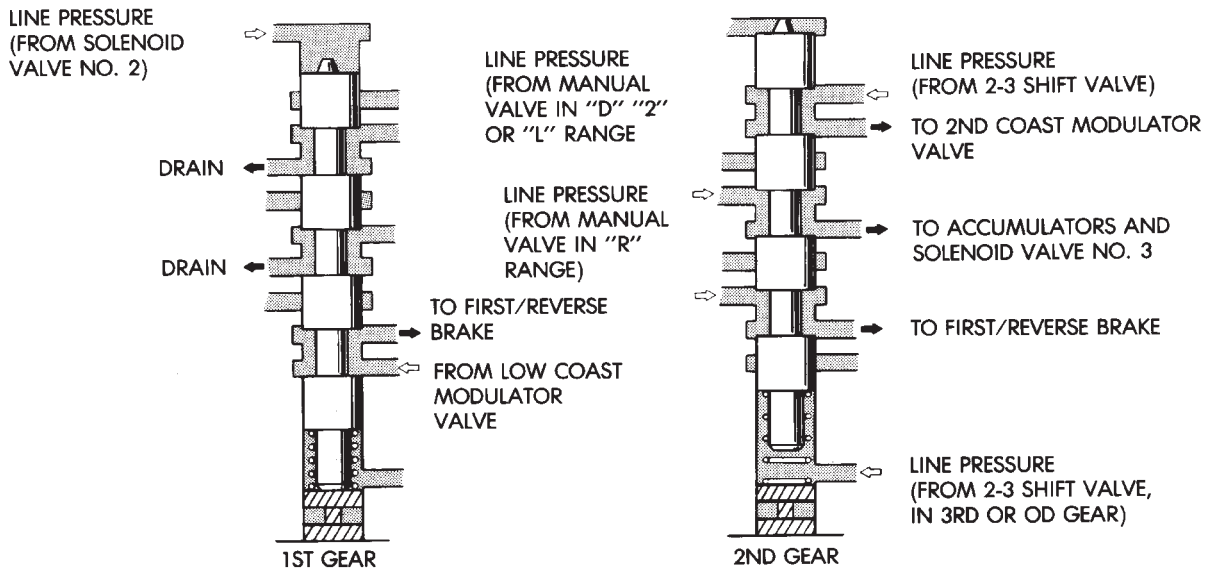
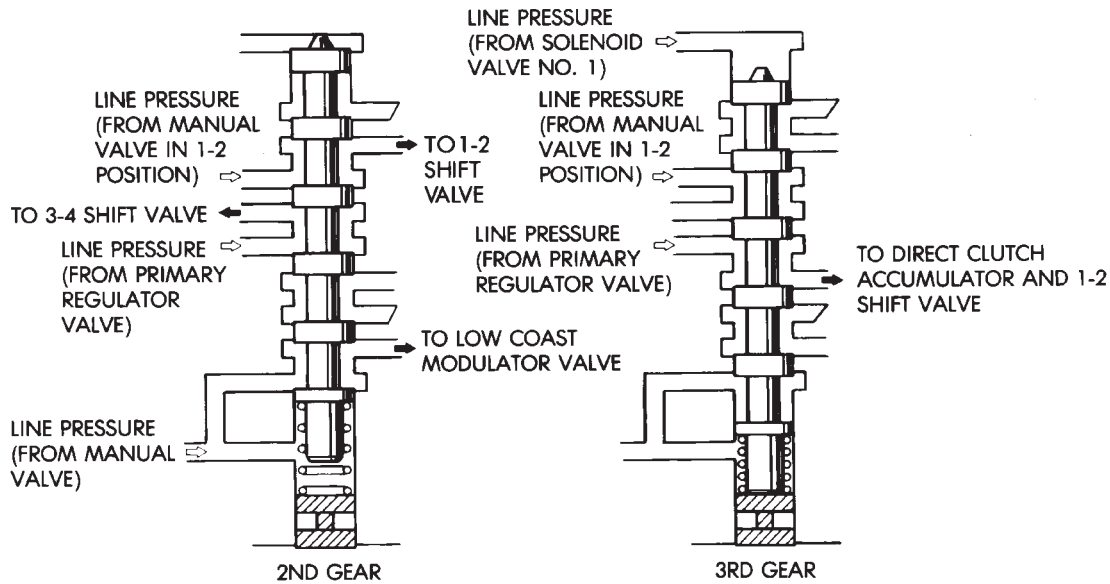


Fig. 18 1-2 Shift Valve



J8921-416

Fig. 19 2-3 Shift Valve

the drain port opens, spring force moves the valve up exposing the second brake feed port for the shift to second gear.

2-3 Shift Valve

The 2-3 shift valve (Fig. 19) controls 2-3 upshifts and downshifts. The valve is actuated by the No. 1 valve body solenoid and by line pressure from the manual valve and primary regulator valve.

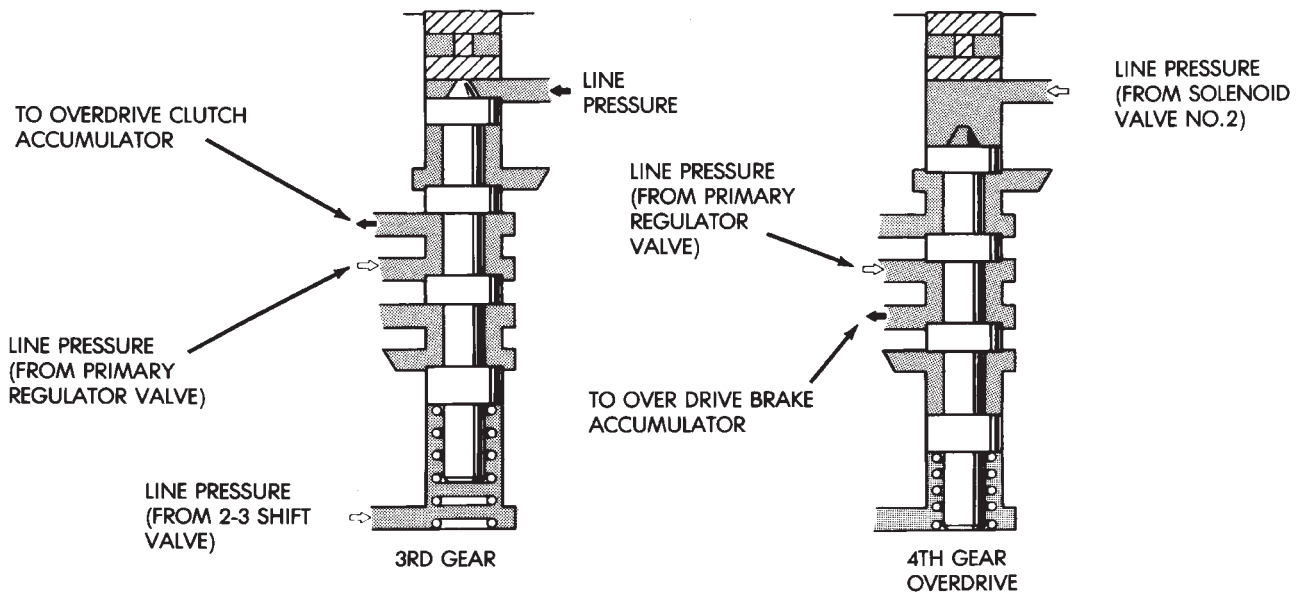
When the transmission control module activates solenoid No. 1, line pressure at the top of the 2-3 valve is released through the solenoid drain port. Spring tension moves the valve up to hold the valve in sec-

ond gear position. As the solenoid is deactivated, line pressure then moves the valve down exposing the direct clutch feed port for the shift to third gear.

3-4 Shift Valve

The 3-4 shift valve (Fig. 20) is operated by the No. 2 solenoid and by line pressure from the manual valve, 2-3 valve and primary regulator valve.

Energizing the No. 2 solenoid causes line pressure at the top of the 3-4 valve to be released through the solenoid valve drain port. Spring tension moves the valve up exposing the overdrive clutch accumulator feed port to apply the clutch.



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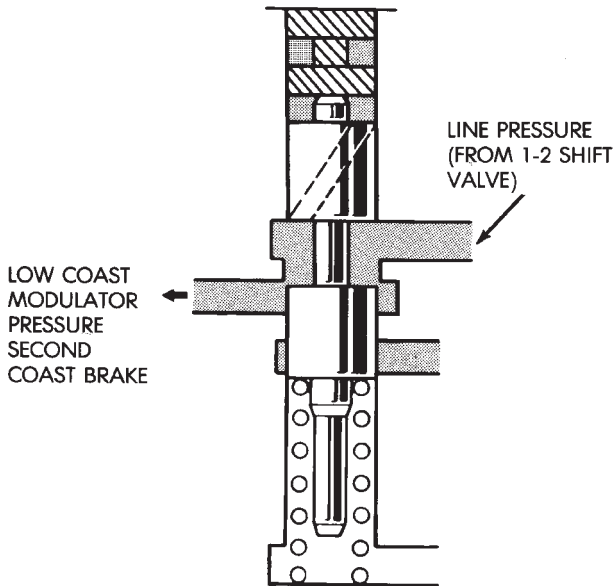
Fig. 20 3-4 Shift Valve

De-energizing the solenoid causes the drain port to close. Line pressure then moves the valve down exposing the overdrive brake accumulator feed port for the shift to fourth gear.

In the 1-2 or 3 gearshift lever positions, line pressure from the 2-3 shift valve is applied to the lower end of the 3-4 valve. This holds the valve upward, closing off the overdrive brake feed port preventing a shift into fourth gear.

Second Coast Modulator Valve

The second coast modulator valve (Fig. 21) momentarily reduces line pressure from the 1-2 shift valve. This cushions application of the second coast brake. The valve is operative when the shift lever and manual valve are in the 3 position.



J8921-418

Fig. 21 Second Coast Modulator Valve

Low Coast Modulator Valve

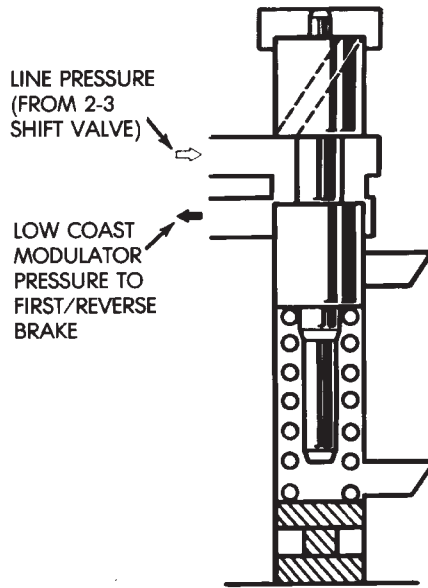
The low coast modulator valve (Fig. 22) momentarily reduces line pressure from the 2-3 shift valve to cushion application of the first/reverse brake. The valve operates when the shift lever and manual valve are in the 1-2 position.

Accumulator Control Valve

The accumulator control valve (Fig. 23) cushions clutch and brake application by reducing back pressure to the accumulators when throttle opening is small. The valve is operated by oil pump (line) pressure and by throttle pressure.

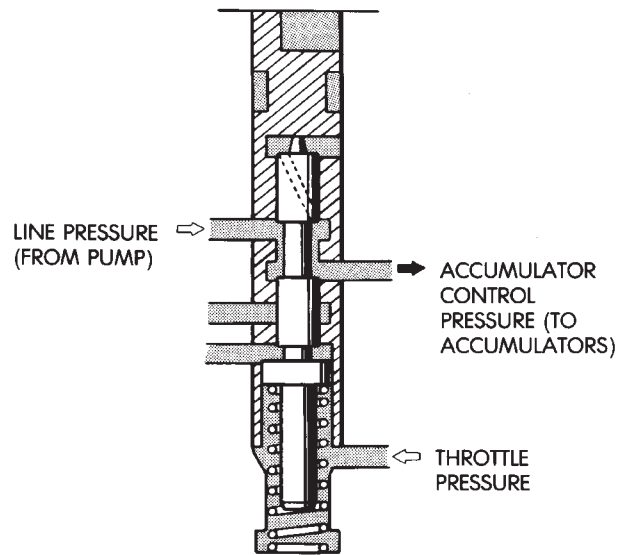
Accumulators

Four accumulators are used to cushion application of the clutches and brakes (Fig. 24). The accumula-



J8921-419

Fig. 22 Low Coast Modulator Valve

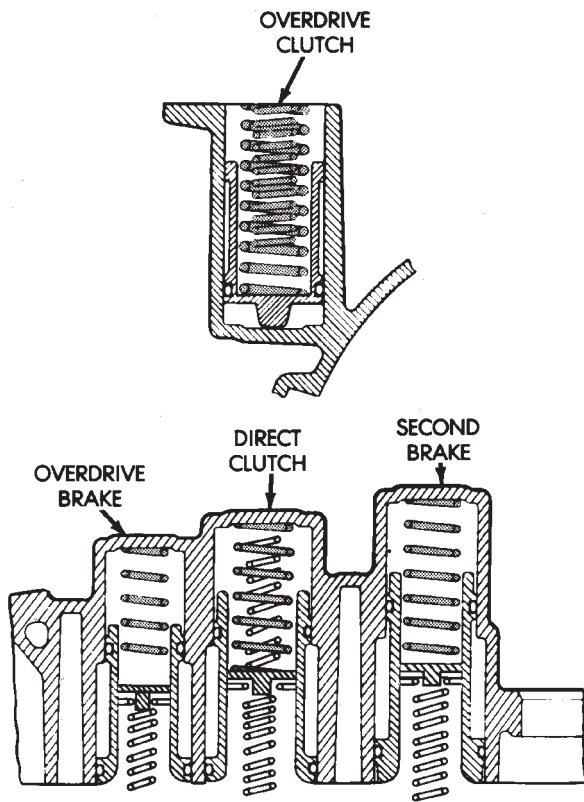


J8921-420

Fig. 23 Accumulator Control Valve

tors consist of spring loaded pistons which dampen the initial surge of apply pressure to provide smooth engagement during shifts.

Control pressure from the accumulator control valve is continuously applied to the back pressure side of the accumulator pistons. This pressure plus spring tension holds the pistons down. As line pressure from the shift valves enters the opposite end of the piston bore, control pressure and spring tension momentarily delay application of full line pressure to cushion engagement. The accumulators are all located in the transmission case (Fig. 24).



J9121-375

Fig. 24 Accumulators

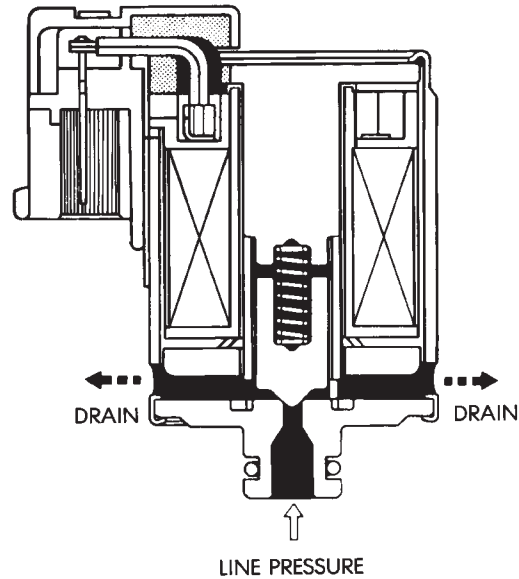
Transmission Valve Body Solenoids

Three solenoids are used (Fig. 25). The No. 1 and 2 solenoids control shift valve operation by applying or releasing line pressure. The signal to apply or release pressure is provided by the transmission control module.

The No. 3 solenoid controls operation of the torque converter clutch. The solenoid operates in response to signals from the transmission control module.

When the No. 1 and 2 solenoids are activated, the solenoid plunger is moved off its seat opening the drain port to release line pressure. When either solenoid is deactivated, the plunger closes the drain port.

The No. 3 solenoid operates in reverse. When the solenoid is deactivated, the solenoid plunger is moved off its seat opening the drain port to release line pressure. When the solenoid is activated, the plunger closes the drain port.



J8921-422

Fig. 25 Transmission Valve Body Solenoids

AW-4 TRANSMISSION DIAGNOSIS

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GENERAL DIAGNOSIS INFORMATION

Shift points are controlled by the transmission control module (TCM). Before attempting repair, determine if a malfunction is electrical or mechanical.

The TCM used with the AW-4 transmission has a self-diagnostic program compatible with the DRB II scan tool. The tester will identify faults in the electrical control system.

Diagnosis should begin with the Preliminary Inspection And Adjustment procedure. It will help determine if a problem is mechanical or electrical. The first procedure step is Initial Inspection and Adjustment.

PRELIMINARY INSPECTION AND ADJUSTMENT

- (1) Check and adjust transmission shift cable if necessary.

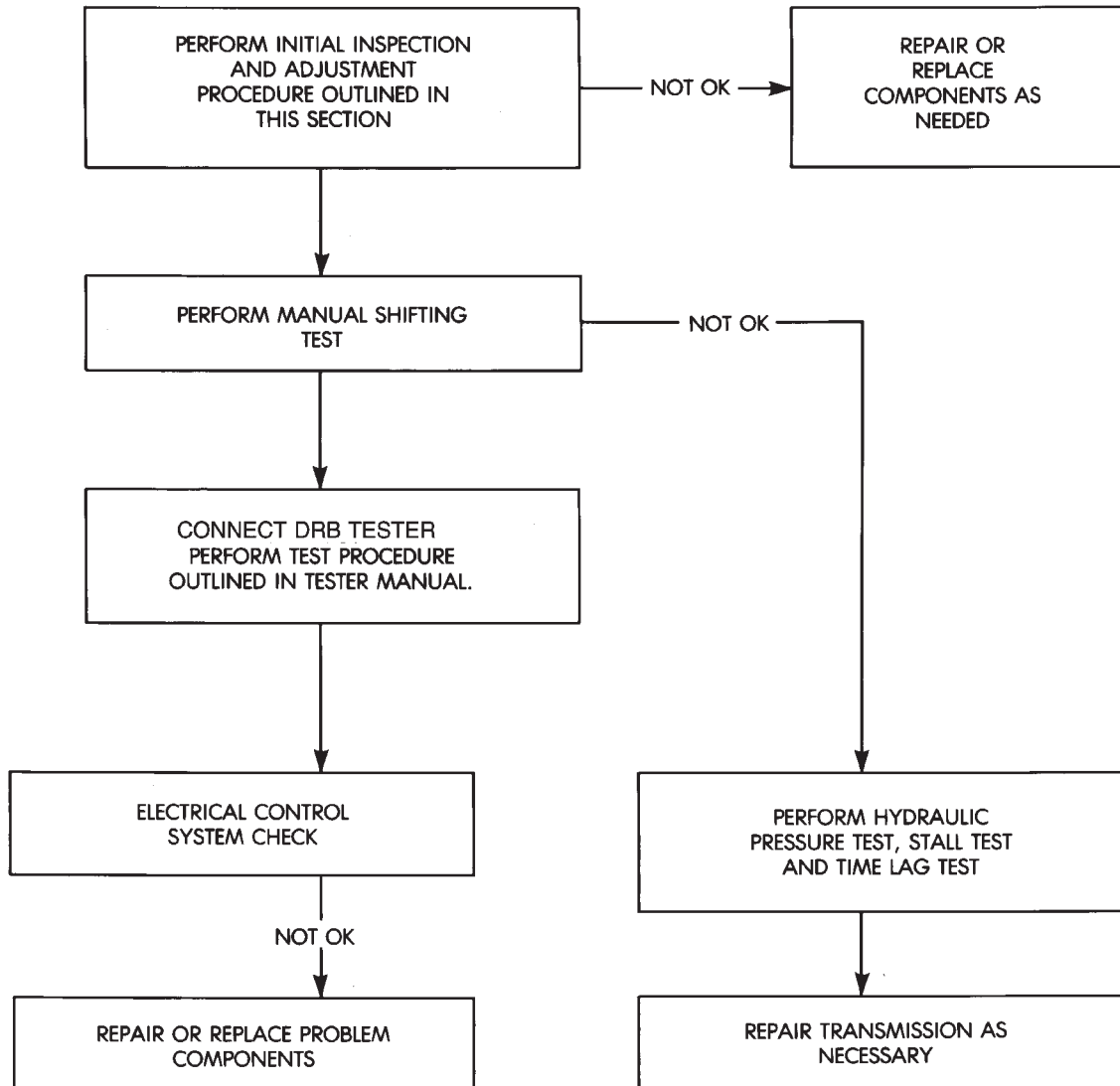


Fig. 26 Preliminary Diagnosis Check Procedure

(2) Verify transmission throttle cable operation. Repair or replace cable if necessary.

(3) Check engine throttle operation. Operate accelerator pedal and observe injector throttle plate movement. Adjust linkage if throttle plate does not reach wide open position.

(4) Check transmission fluid level when fluid is at normal operating temperature. Start engine. Shift transmission through all gear ranges then back to Neutral. Correct level is to Full or Add mark on dipstick with engine at curb idle speed.

(5) Check and adjust park/neutral position switch if necessary.

(6) Check throttle position sensor adjustment and operation. Adjust the sensor if necessary.

MANUAL SHIFTING TEST

(1) This test determines if problem is related to mechanical or electrical component.

(2) Stop engine and disconnect transmission control module or module fuse.

(3) Road test vehicle. Shift transmission into each gear range. Transmission should operate as follows:

- lock in Park
- back up in Reverse
- not move in Neutral
- provide first gear only with shift lever in 1-2 position
- operate in third gear only with shift lever in 3 position
- operate in overdrive fourth gear in D position

(4) If transmission operates as described, proceed to next step. However, if forward gear ranges were difficult to distinguish (all feel the same), or vehicle would not back up, refer to diagnosis charts. Do not perform stall or time lag tests.

CAUTION: Do not overspeed the engine during the next test step. Ease off the throttle and allow the vehicle to slow before downshifting.

(5) Continue road test. Manually downshift transmission from D to 3, and from 3 to 1-2 position. Then manually upshift transmission through forward ranges again.

(6) If transmission operation is OK, perform stall, time lag and pressure tests. If transmission shifting problem is encountered, refer to diagnosis charts.

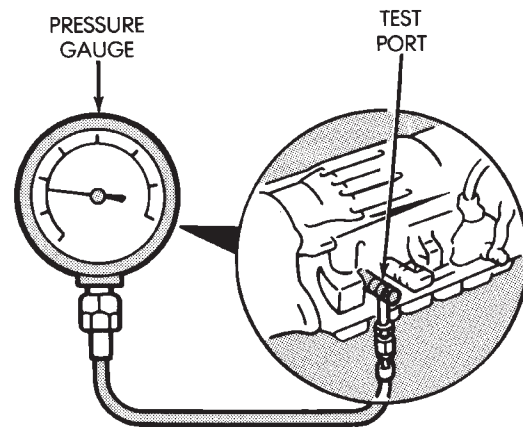
(7) If a problem still exists, continue testing with DRB II scan tool.

HYDRAULIC PRESSURE TEST

PRESSURE TEST PROCEDURE

(1) Connect pressure test gauge to test port on passenger side of transmission. Use Adapter 7554 to connect gauge. Be sure test gauge has minimum capacity of 300 psi (2100 kPa).

(2) Be sure transmission fluid is at normal operating temperature.



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Fig. 27 Pressure Test Gauge Connection

(3) Apply parking brakes and block wheels.

WARNING: DO NOT ALLOW ANYONE TO STAND AT THE FRONT OR REAR OF THE VEHICLE WHILE PERFORMING THE FOLLOWING STEPS IN THE PRESSURE TEST.

(4) Check and adjust engine curb idle speed.

(5) Apply service brakes.

(6) Shift transmission into D range and note line pressure with engine at curb idle speed. Pressure should be 61-to-70 psi (421-to-481 kPa).

(7) Press accelerator pedal to wide open throttle position and note line pressure. Pressure should be 173-to-209 psi (1196-to-1442 kPa).

CAUTION: Do not maintain wide open throttle for more than three or four seconds at a time.

(8) Shift transmission into Reverse and note line pressure with engine at curb idle speed. Pressure should be 75-to-90 psi (519-to-618 kPa).

(9) Press accelerator to wide open throttle position and note line pressure in Reverse. Pressure should be 213-to-263 psi (1471-to-1814 kPa).

CAUTION: Do not maintain wide open throttle for more than three or four seconds at a time.

(10) If line pressure is not within specifications, adjust transmission throttle cable and repeat pressure test.

PRESSURE TEST ANALYSIS

If pressures in D and Reverse are higher than specified, check for the following:

- throttle cable loose, worn, binding or out of adjustment
- throttle valve, downshift plug, throttle cam, or primary regulator valve are sticking, worn or damaged

If pressures in D and Reverse are lower than specified, check for following:

- throttle cable loose, worn, binding or out of adjustment
- throttle valve, downshift plug, throttle cam sticking, worn or damaged
- primary regulator valve sticking, worn, or damaged
- oil pump gears or housing worn or damaged
- overdrive clutch worn or damaged

If pressures are low in D range only, check for following:

- forward clutch worn or damaged
- fluid leakage in D range circuit (component seal and O-rings)

If pressures are low in Reverse only, check for following:

- shift cable and manual valve out of adjustment
- fluid leakage in reverse circuit (component seal and O-rings)
- direct clutch worn or damaged
- first/reverse brake worn or damaged

TORQUE CONVERTER STALL TEST

Stall testing checks the holding ability of the transmission clutches and brakes and of the torque converter stator overrunning clutch.

- (1) Be sure transmission fluid is at normal operating temperature.
- (2) Connect tachometer to engine. Position tachometer so it can be viewed from drivers seat.
- (3) Apply parking brakes and block wheels.
- (4) Apply and hold service brakes.
- (5) Shift transfer case into 2H position. On models with NP249 transfer case, leave transfer case in 4H position.
- (6) Start engine.

WARNING: DO NOT ALLOW ANYONE TO STAND AT THE FRONT OR REAR OF THE VEHICLE DURING THE TEST.

- (7) Shift transmission into D range.
- (8) Press accelerator pedal to wide open throttle position and note maximum engine rpm. Stall speed should be 2100 to 2400 rpm in D range.

CAUTION: Do not maintain wide open throttle for more than 3-4 seconds at a time.

(9) Release throttle and shift transmission into Neutral. Allow transmission fluid to cool for 15-20 seconds.

(10) Shift transmission into Reverse.

(11) Press accelerator down to wide open throttle position and note maximum engine rpm. Stall speed should be 2100-to-2400 rpm in Reverse.

STALL SPEED TEST ANALYSIS

If engine rpm is lower than specified in D and Reverse, check for the following:

- engine output/performance insufficient
- stator overrunning clutch in torque converter not holding if engine speed was 1500 rpm or less.

If stall speed in D range is higher than specified, check for the following:

- line pressure low
- forward clutch slipping
- No. 2 one-way clutch not holding
- overdrive one-way clutch not holding

If stall speed in Reverse was higher than specified, check for the following:

- line pressure low
- direct clutch slipping
- first/ reverse brake slipping
- overdrive one-way clutch not holding

If stall speeds were higher than specified in both D and Reverse, check for the following:

- low fluid level
- line pressure low
- overdrive one-way clutch not holding

TIME LAG TEST

This test checks general condition of the overdrive clutch, forward clutch, rear clutch and first/reverse brake. Condition is indicated by the amount of time required for clutch/brake engagement with the engine at curb idle speed. Engagement time is measured for D and Reverse positions. A stop watch is recommended for test accuracy.

TEST PROCEDURE

- (1) Check and adjust transmission fluid level if necessary.
- (2) Bring transmission to normal operating temperature.
- (3) Apply parking brakes and turn off air conditioning unit.
- (4) Shift transfer case into 2H range. On models with NP249 transfer case, leave transfer case in 4H range.
- (5) Start engine and check curb idle speed. Adjust speed if necessary. Curb idle must be correct to ensure accurate test results.
- (6) Shift transmission into Neutral and set stop watch.
- (7) During following test steps, start stop watch as soon as shift lever reaches D and Reverse ranges.

(8) Shift transmission into D range and record time it takes for engagement. Repeat test two more times.

(9) Reset stop watch and shift transmission back to Neutral.

(10) Shift transmission into Reverse and record time it takes for engagement. Repeat test two more times.

(11) Engagement time in D range should be a maximum of 1.2 seconds. Engagement time for Reverse should be a maximum of 1.5 seconds.

TIME LAG TEST ANALYSIS

If engagement time is longer than specified for D range, check for the following:

- shift cable misadjusted
- line pressure low
- forward clutch worn
- overdrive clutch worn or damaged

If engagement time is longer than specified for Reverse, check for the following:

- shift cable misadjusted
- line pressure low
- direct clutch worn
- first/reverse brake worn
- overdrive clutch worn or damaged

SERVICE DIAGNOSIS

CONDITION	POSSIBLE CAUSE	CORRECTION
VEHICLE WILL NOT BACK UP OR MOVE FORWARD	Shift cable out of adjustment or damaged Valve body or primary regulator faulty Park lock pawl faulty Torque converter faulty Converter drive plate broken Oil pump intake screen blocked Transmission faulty	Adjust cable or replace cable Inspect/repair valve body Repair park pawl Replace torque converter Replace drive plate Clean screen Disassemble and repair transmission
SHIFT LEVER POSITION INCORRECT	Shift cable out of adjustment Manual valve and lever faulty	Adjust cable Repair valve body
HARSH ENGAGEMENT	Throttle cable out of adjustment Valve body or primary regulator faulty Accumulator pistons faulty Transmission faulty	Adjust throttle cable Repair valve body Repair pistons Disassemble and repair transmission
DELAYED 1-2, 2-3 OR 3-4 UP-SHIFT, OR DOWN-SHIFTS FROM 4-3 OR 3-2 AND SHIFTS BACK TO 4 OR 3	Electronic control problem Valve body faulty Solenoid faulty	Locate problem with DRB II Tester Repair valve body Repair solenoid
SLIPS ON 1-2, 2-3 OR 3-4 UP-SHIFT, OR SLIPS OR SHUDDERS DURING ACCELERATION	Shift cable out of adjustment Throttle cable out of adjustment Valve body faulty Solenoid faulty Transmission faulty	Adjust cable Adjust cable Repair valve body Replace solenoid Disassemble and repair transmission
DRAG OR BIND ON 1-2, 2-3 OR 3-4 UP-SHIFT	Shift cable out of adjustment Valve body faulty Transmission faulty	Adjust cable Repair valve body Disassemble and repair transmission
CONVERTER CLUTCH DOES NOT ENGAGE IN 2ND, 3RD OR 4TH	Electronic control problem Valve body faulty Solenoid faulty Transmission faulty	Check with DRB II Tester Repair valve body Replace solenoid Disassemble and repair transmission
HARSH DOWN-SHIFT	Throttle cable out of adjustment Throttle cable and cam faulty Accumulator pistons faulty Valve body faulty Transmission faulty	Adjust cable Replace cable and cam Repair pistons Repair valve body Disassemble and repair transmission
NO DOWN-SHIFT WHEN COASTING	Valve body faulty Solenoid faulty Electronic control problem	Repair valve body Replace solenoid Locate problem with DRB II Tester

SERVICE DIAGNOSIS

CONDITION	POSSIBLE CAUSE	CORRECTION
DOWN-SHIFT LATE OR EARLY DURING COAST	Throttle cable faulty Valve body faulty Transmission faulty Solenoid faulty Electronic control problem	Replace cable Repair valve body Disassemble and repair transmission Replace solenoid Locate problem with DRB II Tester
NO 4-3, 3-2 OR 2-1 KICKDOWN	Solenoid faulty Electronic control problem Valve body faulty	Replace solenoid Locate problem with DRB II Tester Repair valve body
NO ENGINE BRAKING IN 1-2 POSITION	Solenoid faulty Electronic control problem Valve body faulty Transmission faulty	Replace solenoid Locate problem with DRB II Tester Repair valve body Disassemble and repair transmission
VEHICLE DOES NOT HOLD IN PARK	Shift cable out of adjustment Parking lock pawl cam and spring faulty	Adjust cable Replace cam and spring
OVERHEAT DURING NORMAL OPERATION (FLUID DISCOLORED, SMELLS BURNED)	Low fluid level Fluid cooler, lines blocked, or cooler cracked (oil in engine coolant)	Add fluid and check for leaks Flush cooler and lines and replace radiator if transmission fluid has entered coolant
OVERHEAT DURING COMMERCIAL OPERATION OR WHILE TRAILER TOWING (FLUID DARK AND BURNED WITH SOME SLUDGE FORMATION)	Vehicle not properly equipped for trailer towing or commercial use Vehicle not equipped with auxiliary fluid cooler Extensive idling time or operation in heavy traffic in hot weather Tow vehicle overloaded (exceeding vehicle tow capacity) Air flow to auxiliary cooler blocked by snow plow, front mounted spare tire, bug screen, or similar item	Be sure vehicle is equipped with recommended optional components (i.e., HD springs, transmission, axle, larger CID engine, auxiliary cooler, correct axle ratio, etc.). If vehicle is not so equipped, it should not be used for severe service operation Drain fluid, change filter, and install auxiliary cooler Cut down on idling time; shift into neutral every so often and run engine at 1000 rpm to help circulate fluid through cooler Be sure vehicle is properly equipped to handle load; do not tow Class III-type loads with a vehicle that is only rated for Class I or II operation Remove or reposition item causing air flow blockage
OIL COMES OUT FILLER TUBE	Transmission overfilled Breather vent in oil pump blocked Fluid cooler or cooler lines plugged	Drain fluid to correct level; remove neutral switch and drain through switch hole with suction gun Inspect and clear blockage Flush cooler and lines

AW-4 IN-VEHICLE SERVICE

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CHECKING FLUID LEVEL AND CONDITION

Recommended fluid for AW-4 transmissions is Mopar Dexron IIE/Mercon. Mopar Dexron II may be used if Mercon fluid is not readily available.

CHECKING FLUID LEVEL

- (1) Be sure transmission fluid is at normal operating temperature. Normal operating temperature is reached after approximately 15 miles (25 km) of operation.
- (2) Position vehicle on level surface. This is important for an accurate fluid level check.
- (3) Shift transmission through all gear ranges and back to Park.
- (4) Apply parking brakes.
- (5) Verify that transmission is in Park.
- (6) Wipe off dipstick handle to prevent dirt from entering fill tube. Then remove dipstick and check fluid level and condition.
- (7) Correct fluid level is **to FULL mark on dipstick when fluid is at normal operating temperature** (Fig. 1).
- (8) If fluid level is low, top off level with Mopar Dexron IIE/Mercon. Mopar Dexron II may also be used if Mercon is not available. **Do not overfill transmission. Add only enough fluid to bring level to Full mark.**

eign material or particles. If the fluid is dark brown or black in color and smells burnt, the fluid has been overheated and should be replaced.

Transmission operation should also be checked if the fluid is severely discolored and contains quantities of foreign material, metal particles, or clutch disc friction material.

A small quantity of friction material or metal particles in the oil pan is normal. The particles are usually generated during the break-in period and indicate normal seating of the various transmission components.

TRANSMISSION CONTROL MODULE (TCM) SERVICE

Use the DRB II scan tool to diagnose transmission control module function whenever a fault is suspected. Replace the module only when actually faulty.

TRANSMISSION CONTROL MODULE REPLACEMENT

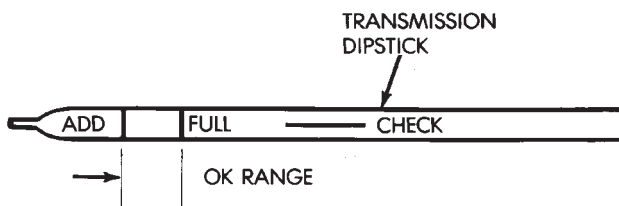
The transmission control module is mounted under the instrument panel. On left hand drive models, it is at the driver side of the lower finish panel (Fig. 2). On right hand drive models, it is at the passenger side of the lower finish panel (Fig. 3).

To remove the module, disconnect the wire harness, remove the mounting screws and remove the module from the finish panel. Tighten the module mounting screws securely after installation. Also be sure the wire harness is not twisted, kinked or touching any body panels.

PARK/NEUTRAL POSITION SWITCH

SWITCH TESTING

Test switch continuity with an ohmmeter. Disconnect the switch and check continuity at the connector terminal positions and in the gear ranges indicated in Figure 3. Switch continuity should be as follows:



J8921-427

Fig. 1 Transmission Fluid Level

CHECKING FLUID CONDITION

Inspect the appearance of the fluid during the fluid level check. The fluid should be clear and free of for-

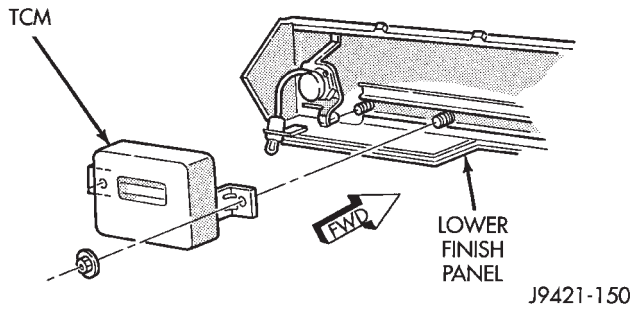


Fig. 2 Transmission Control Module Location And Mounting (Left Hand Drive)

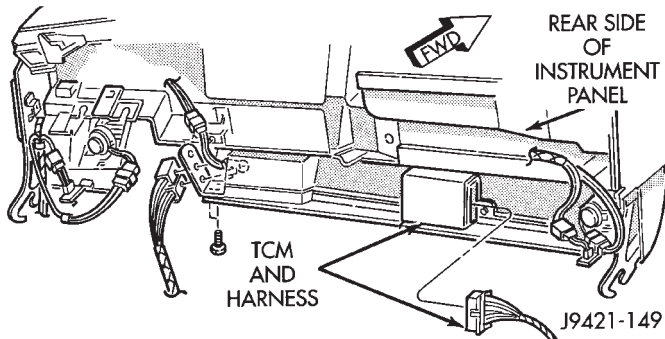


Fig. 3 Transmission Control Module Location And Mounting (Right Hand Drive)

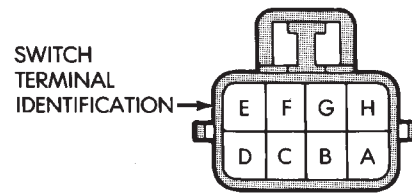
- Continuity should exist between terminals B and C with the transmission in Park and Neutral only (Fig. 4).
- Continuity should exist between terminals A and E with the transmission in Reverse (Fig. 4).
- Continuity should exist between terminals A and G with the transmission in third gear (Fig. 4).
- Continuity should exist between terminals A and H with the transmission in first and/or second gear (Fig. 4).
- Continuity should not exist in D position.

PARK/NEUTRAL POSITION SWITCH REMOVAL

- (1) Raise vehicle.
- (2) Disconnect switch wire harness connector.
- (3) Pry washer lock tabs upward and remove switch attaching nut and tabbed washer (Fig. 5).
- (4) Remove switch adjusting bolt (Fig. 5).
- (5) Slide switch off manual valve shaft.

PARK/NEUTRAL POSITION SWITCH INSTALLATION AND ADJUSTMENT

- (1) Disconnect shift linkage rod from shift lever on left side of transmission.
- (2) Rotate manual shift lever all the way rearward. Then rotate lever forward two detent positions to Neutral.
- (3) Install switch on manual valve shaft and install switch adjusting bolt finger tight. Do not tighten bolt at this time.



	B	C	A	E	G	H
P	○	○				
R			○	○		
N	○	○				
D						
3			○	○	○	
1-2			○		○	○

J8921-429

Fig. 4 Park/Neutral Position Switch Terminals And Testing

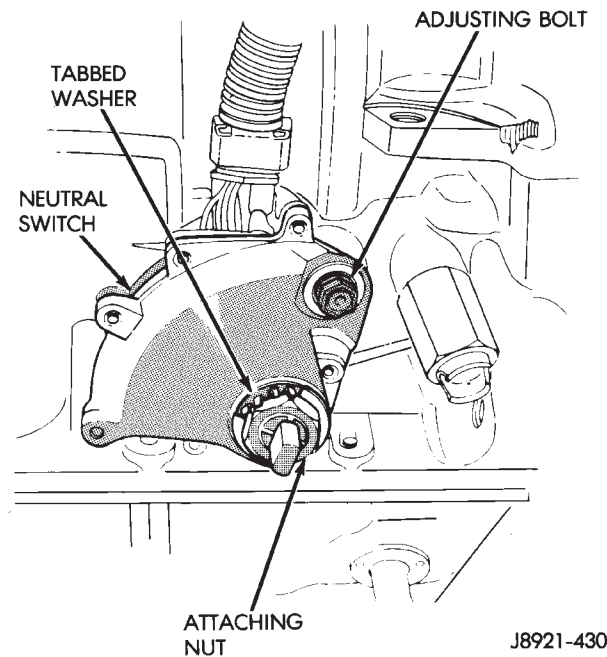
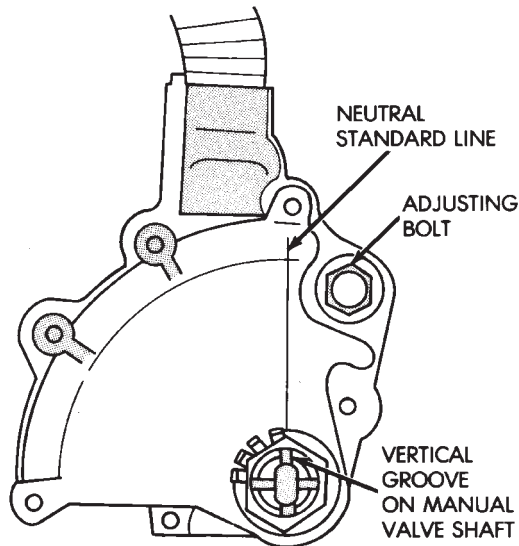


Fig. 5 Park/Neutral Position Switch Removal/ Installation

- (4) Install tabbed washer on manual valve shaft and install switch attaching nut. Tighten nut to 6.9 N·m (61 in. lbs.) torque but do not bend washer lock tabs over nut at this time.
- (5) Verify that transmission is in Neutral.
- (6) Rotate switch to align neutral standard line with vertical groove on manual valve shaft (Fig. 6).
- (7) Align switch standard line with groove or flat on manual valve shaft.

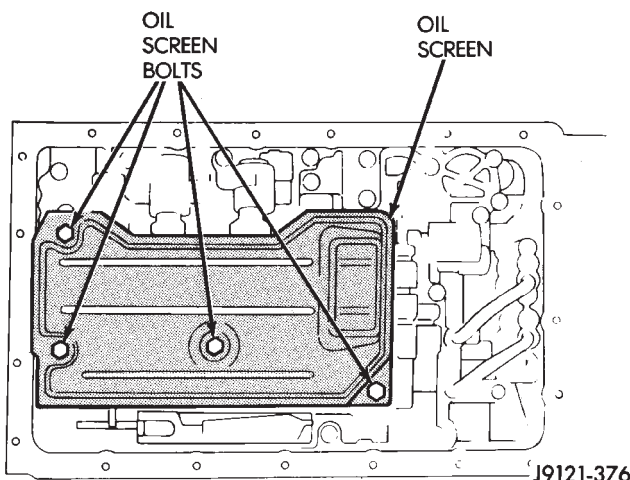
- (8) Tighten switch adjusting bolt to 13 N·m (9 ft. lbs.) torque.
- (9) Bend at least two washer lock tabs over switch attaching nut to secure it.
- (10) Connect shift linkage rod to shift lever on left side of case.
- (11) Connect switch wires to harness and lower vehicle.
- (12) Check switch operation. Engine should start in Park and Neutral only.



J8921-431

Fig. 6 Park/Neutral Position Switch Adjustment**TRANSMISSION VALVE BODY SOLENOIDS****SOLENOID REMOVAL**

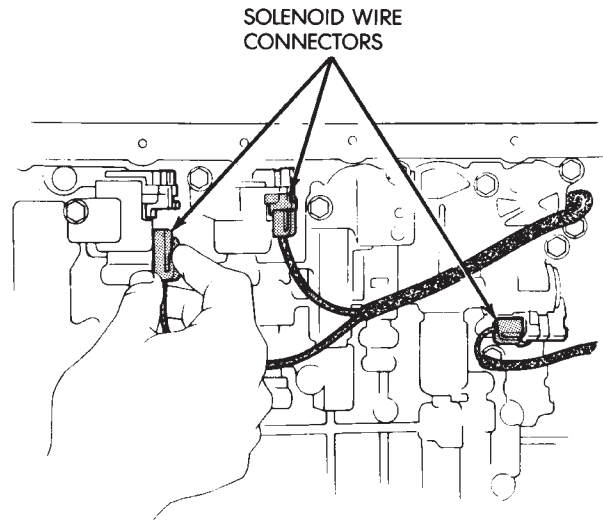
- (1) Remove transmission oil pan drain plug and drain fluid.
- (2) Remove pan bolts and remove oil pan.
- (3) Remove oil screen bolts and remove screen (Fig. 7) and gasket. Discard the gasket.



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Fig. 7 Oil Screen Removal/Installation

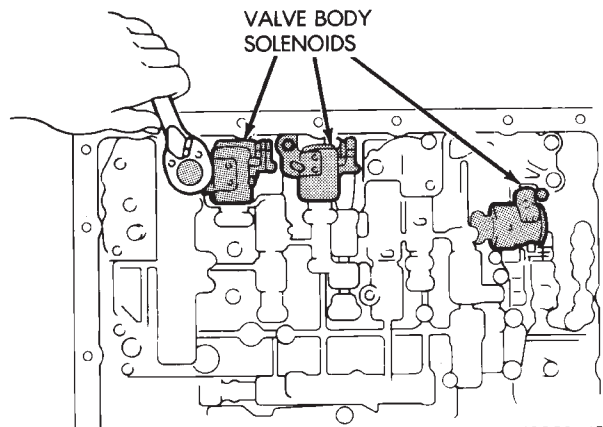
- (4) Disconnect solenoid wire connector (Fig. 8).
- (5) If all solenoids are being removed, mark or tag wires for assembly reference before disconnecting them.



J8921-433

Fig. 8 Solenoid Wire Connectors

- (6) Remove bolt attaching solenoids to valve body and remove solenoids (Fig. 9). Do not allow any valve body components to fall out when solenoids are removed.



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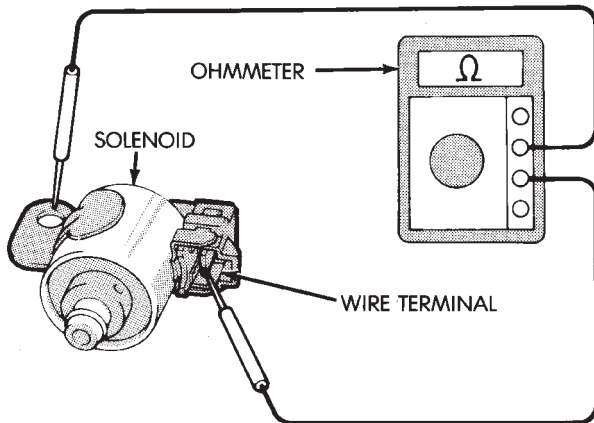
Fig. 9 Transmission Valve Body Solenoids

- (7) Clean oil filter and pan with solvent and dry with compressed air.
- (8) Remove old sealer material from oil pan and transmission case.

Solenoid Testing

Test solenoid resistance with an ohmmeter. Connect the ohmmeter leads to the solenoid mounting bracket and to the solenoid wire terminal (Fig. 10).

Solenoid resistance should be 11-15 ohms. Replace the solenoid if resistance is above or below the specified range.



J8921-435

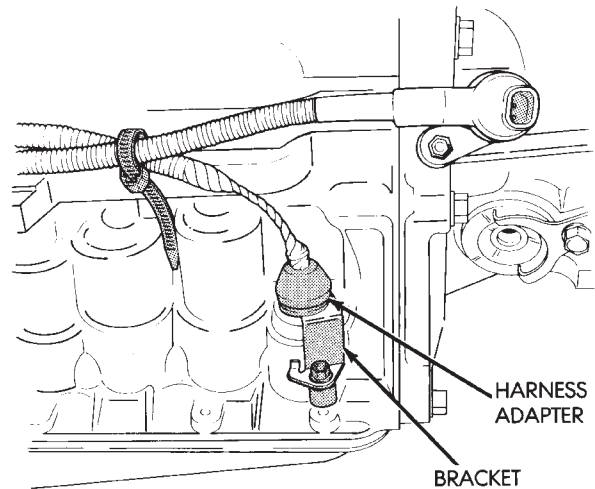
Fig. 10 Testing Transmission Valve Body Solenoid

SOLENOID INSTALLATION

- (1) Position solenoids on valve body and install solenoid bolts. Tighten bolts to 10 N·m (7 ft. lbs.) torque.
- (2) Connect feed wires to solenoids.
- (3) Install new gaskets on oil screen and install screen. Tighten screen bolts to 10 N·m (7 ft. lbs.) torque.
- (4) Apply bead of Three-Bond TB 1281 or equivalent sealer to oil pan sealing surface. Sealer bead should be at least 3.0 mm (1/8 in.) wide.
- (5) Install oil pan on transmission. Tighten pan bolts to 7 N·m (65 in. lbs.) torque.
- (6) Install and tighten oil pan drain plug to 20 N·m (15 ft. lbs.) torque.
- (7) Fill transmission with Mopar Mercon or Dexron II.

SOLENOID HARNESS ADAPTER SEAL REPLACEMENT

- (1) Remove oil pan and oil screen. Refer to Solenoid Removal procedure.
- (2) Disconnect solenoid wire connectors (Fig. 8).
- (3) Remove bracket securing solenoid harness adaptor (Fig. 11) to case.
- (4) Pull harness adapter and wires out of case.
- (5) Remove and discard adapter O-ring.
- (6) Lubricate new O-ring and install it on adapter.
- (7) Install solenoid wire harness and adapter in case.
- (8) Install adapter bracket and bracket bolt.
- (9) Connect wires to solenoids.
- (10) Install oil screen and oil pan.



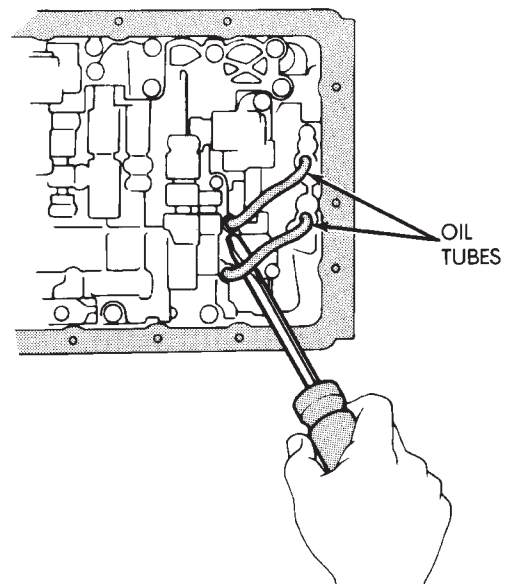
J8921-436

Fig. 11 Harness Adapter Removal/Installation

TRANSMISSION VALVE BODY REMOVAL

Removal and installation are the only valve body service procedures covered in this section. Refer to the transmission overhaul section for valve body disassembly, cleaning, inspection and reassembly.

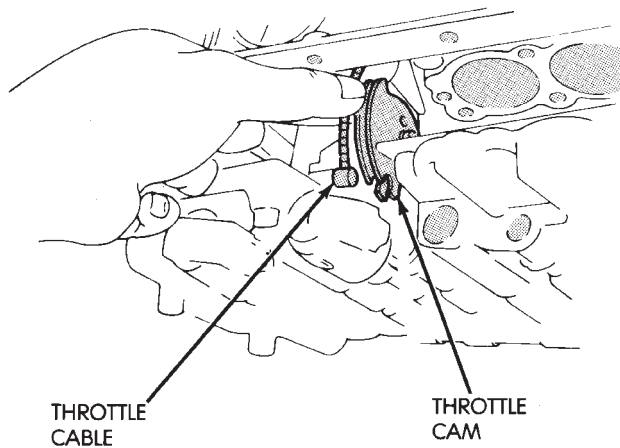
- (1) Remove oil pan plug and drain transmission fluid.
- (2) Remove oil pan and oil screen. Clean pan and screen in solvent and dry them with compressed air.
- (3) Disconnect solenoid wire connectors (Fig. 8). Mark wires for assembly reference.
- (4) Remove valve body oil tubes (Fig. 12). Carefully pry tubes out of valve body with screwdriver.



J8921-437

Fig. 12 Removing Transmission Valve Body Oil Tubes

- (5) Disconnect throttle cable from throttle cam (Fig. 13).

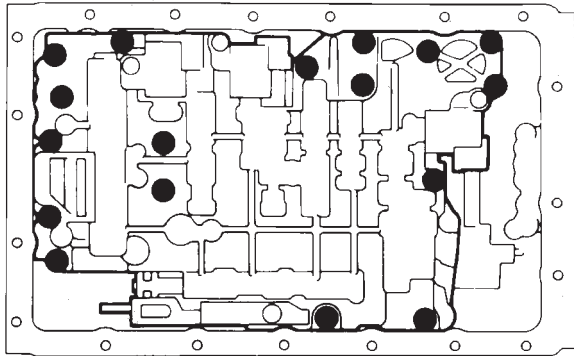


J8921-438

Fig. 13 Removing/Installing Throttle Cable

- (6) Remove valve body bolts. Bolt locations are outlined in Figure 14.

● = BOLT LOCATIONS



J8921-439

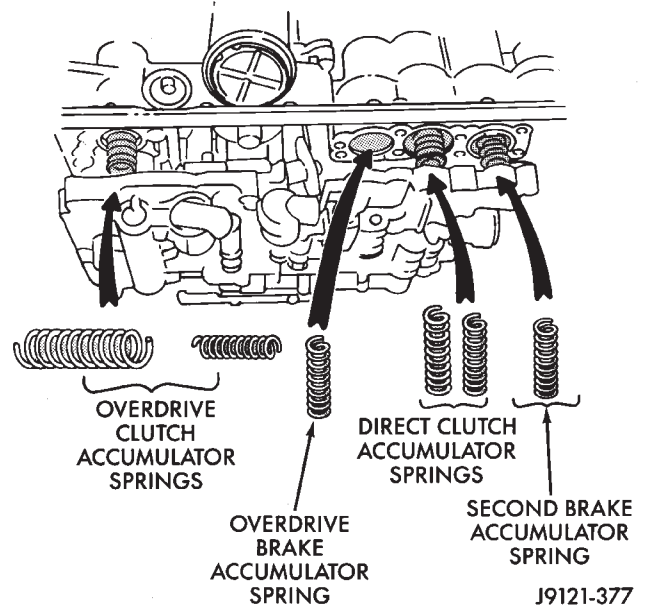
Fig. 14 Transmission Valve Body Bolt Locations

- (7) Lower valve body and remove overdrive clutch accumulator springs, direct clutch accumulator springs and second brake accumulator spring (Fig. 15)

- (8) Remove valve body and check ball and spring (Fig. 16).

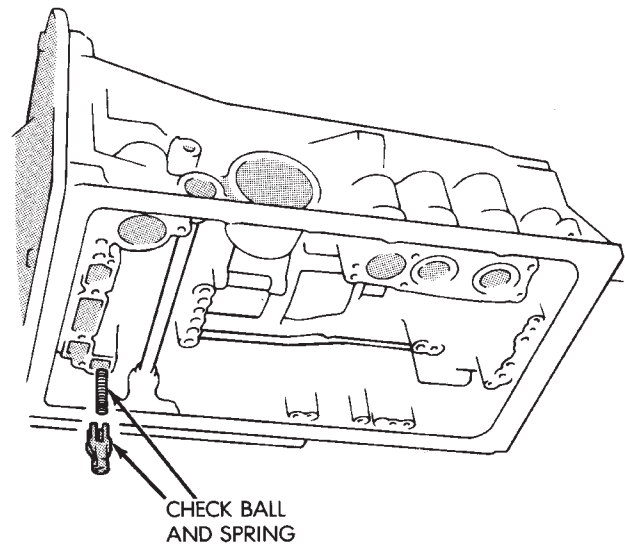
TRANSMISSION VALVE BODY INSTALLATION

- (1) Connect cable to throttle cam (Fig. 13).
- (2) Install check ball and spring (Fig. 16).
- (3) Position accumulator springs and spacers on valve body.



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Fig. 15 Accumulator Springs



J8921-441

Fig. 16 Removing/Installing Check Ball And Spring

- (4) Align valve body manual valve with shift sector (Fig. 17) and carefully position valve body on case.

- (5) Install valve body bolts (Fig. 14). Tighten bolts evenly to 10 N·m (7 ft. lbs.) torque.

- (6) Install valve body oil tubes. Be sure tube ends (L) and (M) are installed as shown in Figure 18.

- (7) Remove old sealer material from oil pan and transmission case.

- (8) Clean oil screen and oil pan with solvent (if not done previously). Dry both components with compressed air only. Do not use shop towels.

- (9) Install new gaskets on oil screen and install screen on case. Tighten screen attaching bolts to 10 N·m (7 ft. lbs.) torque.

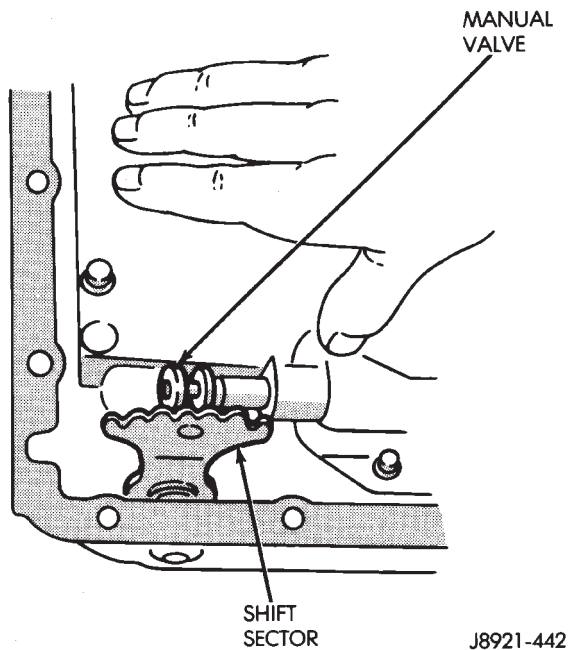


Fig. 17 Shift Sector And Manual Valve Alignment

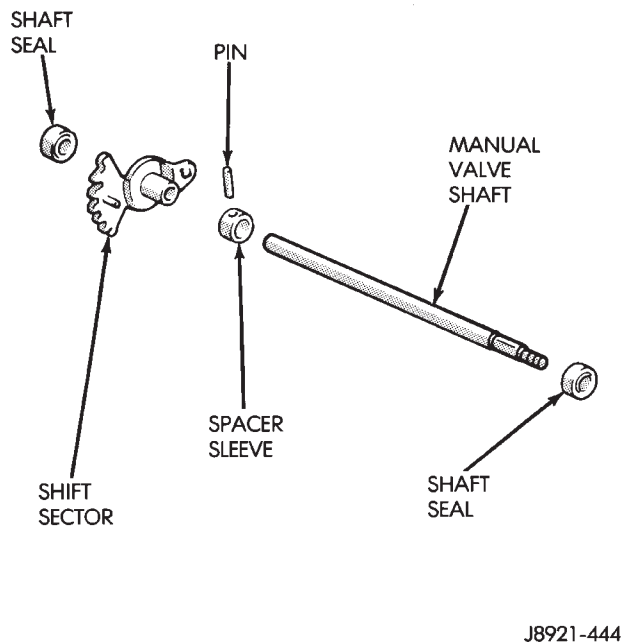


Fig. 19 Manual Valve Shaft And Seals

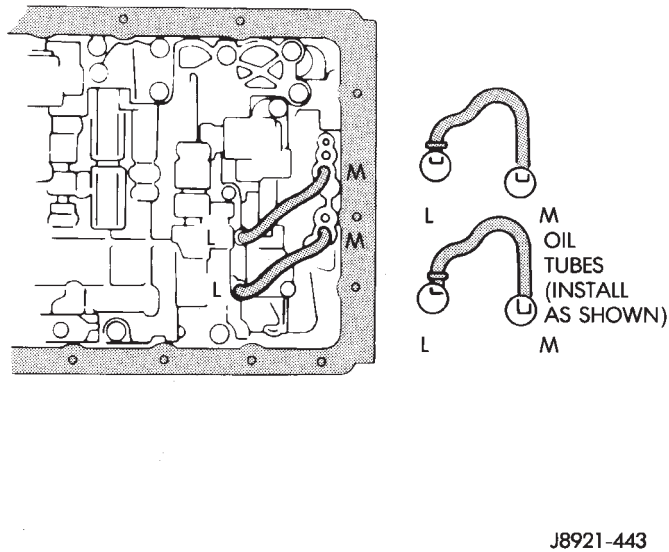


Fig. 18 Installing Transmission Valve Body Oil Tubes

(10) Apply bead of Mopar or Loctite 599 sealer to sealing surface of oil pan. Sealer bead should be at least 3 mm (1/8 in.) wide. Then install oil pan and tighten pan bolts to 7.4 N·m (65 in. lbs.) torque.

(11) Install new gasket on oil pan drain plug and install plug in pan. Tighten plug to 20 N·m (15 ft. lbs.) torque.

(12) Fill transmission with Mopar Mercon™ fluid.

MANUAL VALVE SHAFT SEAL REPLACEMENT

- (1) Remove park/neutral position switch and disconnect transmission shift lever.
- (2) Remove oil pan and valve body.

- (3) Remove bolts attaching park rod bracket to case (Fig. 20).

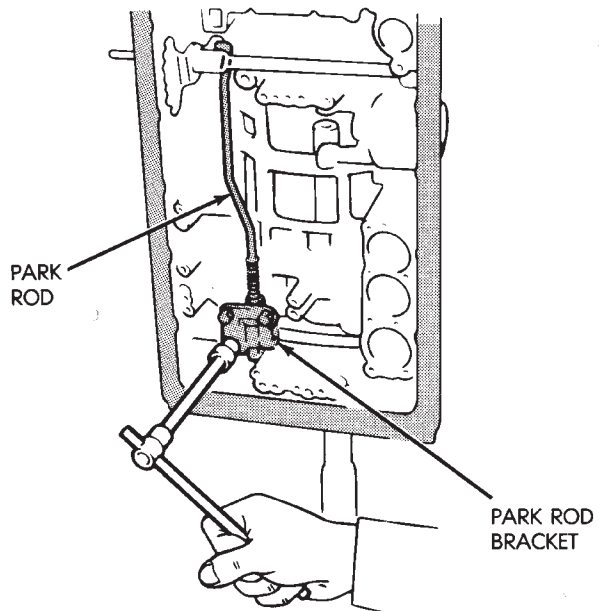


Fig. 20 Removing/Installing Park Rod Bracket

- (4) Remove park rod from shift sector (Fig. 21).
- (5) Cut spacer sleeve with chisel and remove it from manual valve shaft (Fig. 22).
- (6) Remove pin from shaft and sector with pin punch.
- (7) Remove shaft and sector from case.
- (8) Pry shaft seals out of case (Fig. 23).
- (9) Inspect the manual valve shaft and sector. Replace either component if worn or damaged.

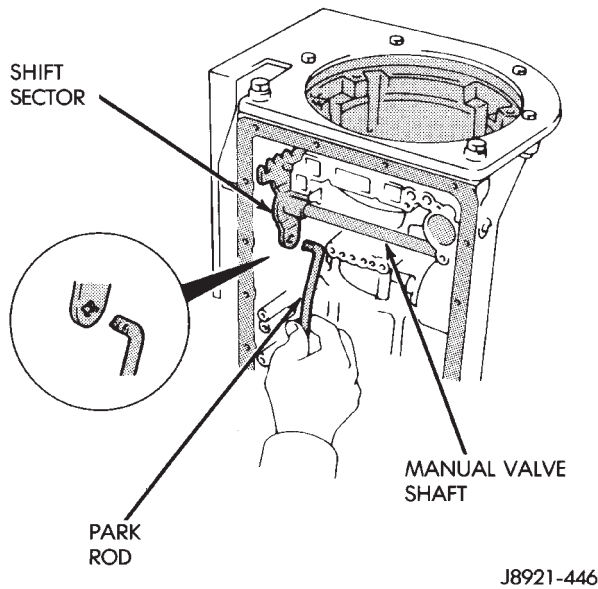


Fig. 21 Removing/Installing Park Rod

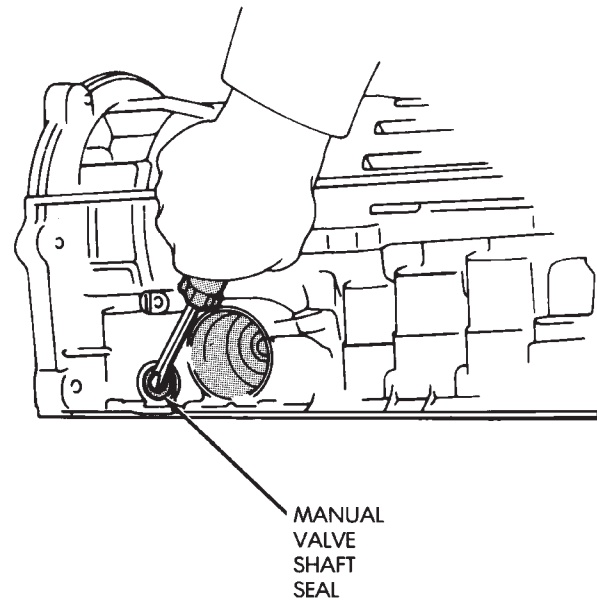


Fig. 23 Removing Manual Valve Shaft Seals

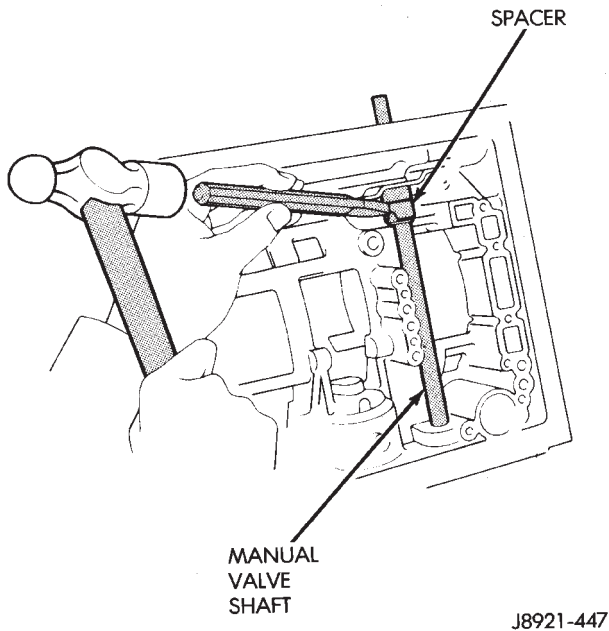


Fig. 22 Cutting Spacer Sleeve

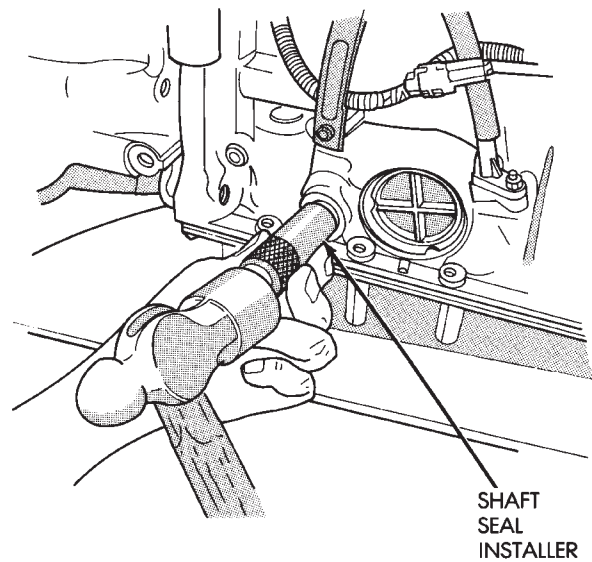


Fig. 24 Installing Manual Valve Shaft Seals

(10) Coat replacement shaft seals with petroleum jelly and seat them in the case (Fig. 24).

(11) Install new spacer sleeve on sector (Fig. 25).

(12) Lubricate manual valve shaft with petroleum jelly and install it in case.

(13) Lubricate sector and sleeve with petroleum jelly and install them on shaft.

(14) Align hole in spacer sleeve with notch in sector. Then install shift sector roll pin. Tap pin into sector and shaft and stake sleeve to sector and shaft securely.

(15) Connect park rod to sector (Fig. 21).

(16) Install park rod bracket (Fig. 26). Tighten bracket bolts to 10 N·m (7 ft. lbs.) torque.

(17) Install valve body, oil screen and oil pan. Use Mopar or Loctite 599 sealer on oil pan seal surface.

(18) Install park/neutral position switch.

ACCUMULATOR PISTONS AND SPRINGS

ACCUMULATOR PISTON AND SPRING REMOVAL

(1) Remove valve body. Refer to procedure in this section.

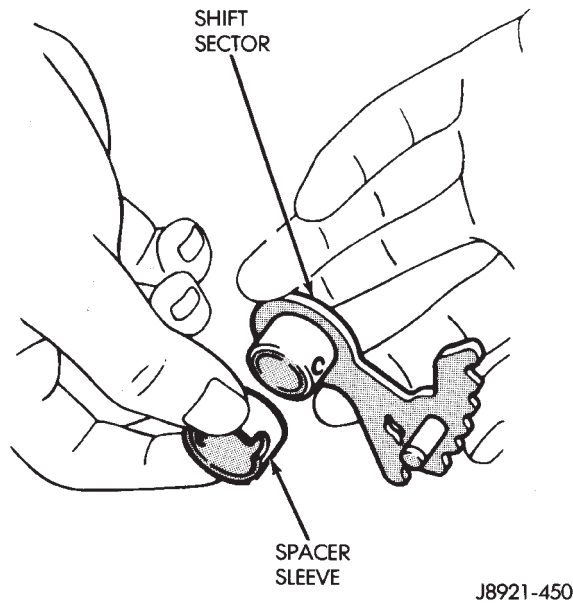


Fig. 25 Installing Spacer Sleeve On Sector

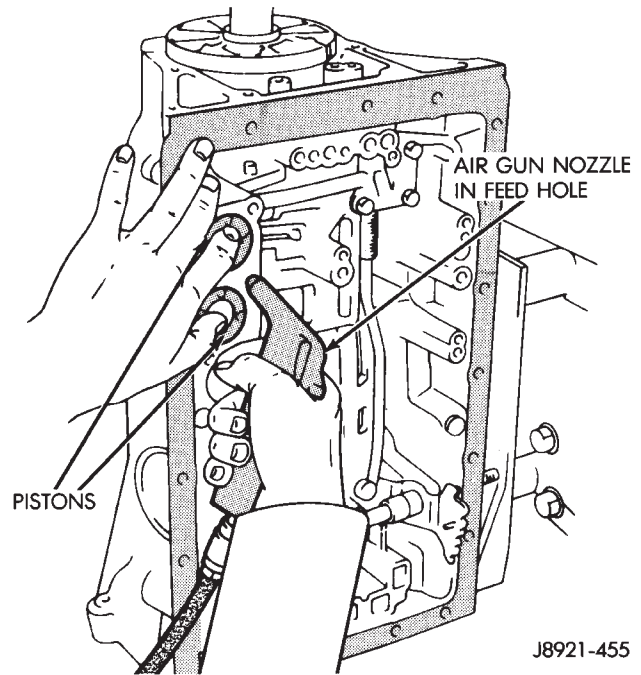


Fig. 27 Accumulator Piston Removal

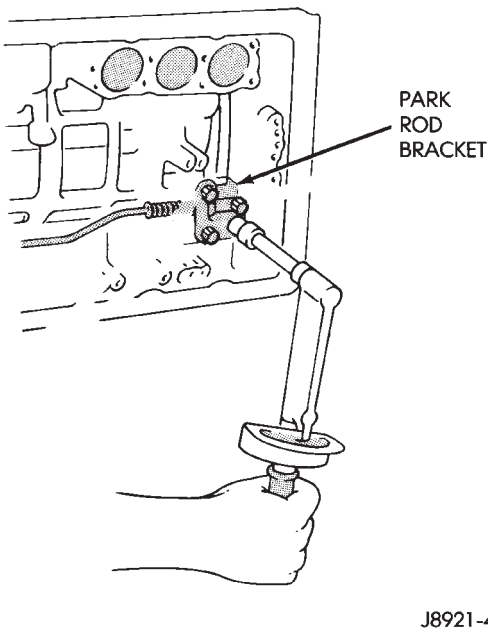


Fig. 26 Installing Park Rod Bracket

(2) Remove accumulator pistons with compressed air (Fig. 27). Apply air through small feed hole next to each piston bore. Catch each piston in a shop towel as it exits bore.

CAUTION: Use only enough air pressure to ease each piston out of the bore. In addition, remove the pistons one at a time and tag the pistons and springs for assembly reference. Do not intermix them.

(3) Remove and discard piston O-ring seals. Then clean pistons and springs with solvent.

(4) Inspect pistons, springs and piston bores. Replace worn damaged pistons. Replace broken, collapsed or distorted springs. Replace case if piston bores are damaged.

(5) If small cushion spring in any piston must be replaced, remove spring retainer clip and remove spring from piston (Fig. 28). A small hooked tool or small thin blade screwdriver can be used to remove clip. A thin wall, deep socket, or pin punch can be used to reseal clip after spring replacement.

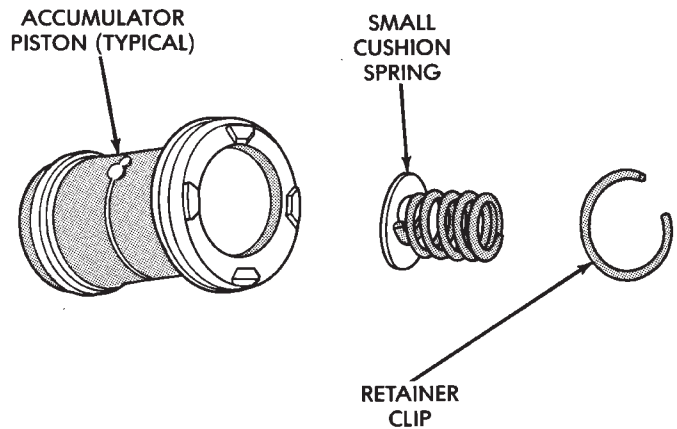
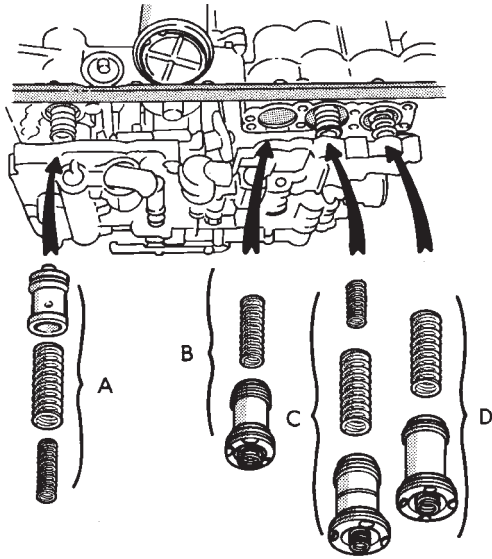


Fig. 28 Small Cushion Spring Retention

(6) Install new O-ring seals on pistons. Lubricate seals and pistons and piston bores with transmission fluid.

(7) Install pistons and springs (Fig. 29).

(8) Install valve body, oil screen and oil pan. Use Mopar or Loctite 599 on oil pan sealing surface.



A. OVERDRIVE CLUTCH ACCUMULATOR PISTON AND SPRINGS
 B. OVERDRIVE BRAKE ACCUMULATOR PISTON AND SPRINGS
 C. DIRECT CLUTCH ACCUMULATOR PISTON AND SPRINGS
 D. SECOND BRAKE ACCUMULATOR PISTON AND SPRINGS

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Fig. 29 Accumulator Pistons, Springs And Spacers

SECOND COAST BRAKE SERVO

SERVO OVERHAUL

- (1) Remove valve body as outlined in this section.
- (2) Remove servo piston cover snap ring with snap ring pliers (Fig. 30).
- (3) Remove servo piston and cover with compressed air. Apply compressed air through oil hole in servo boss to ease piston out of bore (Fig. 31).
- (4) Remove and discard seal and O-rings from cover and piston (Fig. 32). Inspect E-ring, piston, spring and retainer, piston rod and piston spring. Replace worn or damaged parts.
- (5) Install new seals on cover and piston.
- (6) Lubricate servo components with transmission fluid.
- (7) Assemble and install servo components in case. Be sure servo piston rod is properly engaged in the second coast brake band.
- (8) Compress cover and piston and install cover snap ring.
- (9) Install valve body, oil screen and oil pan. Use Mopar or Loctite 599 on oil pan sealing surface.

PARK ROD AND PAWL SERVICE

- (1) Remove valve body as outlined in this section.
- (2) Remove bolts attaching park rod bracket to case (Fig. 33).

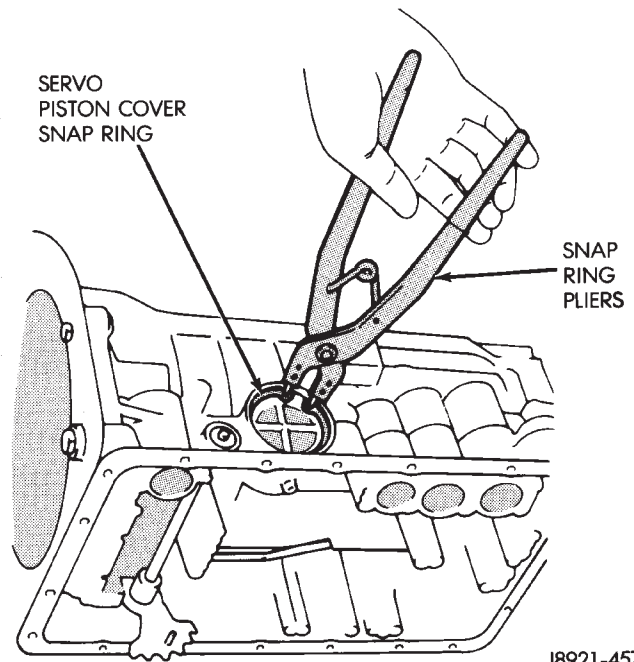


Fig. 30 Removing/Installing Servo Piston Cover Snap Ring

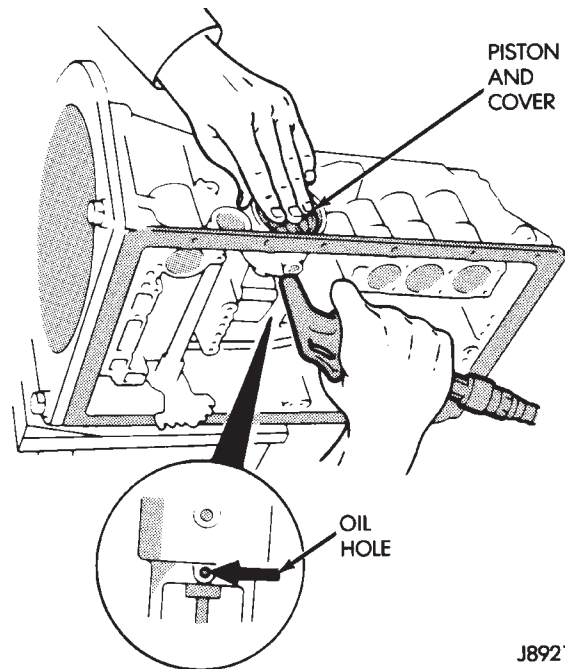


Fig. 31 Removing Servo Cover And Piston

- (3) Remove park rod from manual valve shaft sector (Fig. 34).
- (4) Remove park rod.
- (5) Remove park pawl, pin and spring (Fig. 35).
- (6) Examine park rod, pawl, pin and spring. Replace any component that is worn or damaged.
- (7) Install pawl in case. Insert pin and install spring. Be sure spring is positioned as shown in Figure 35.

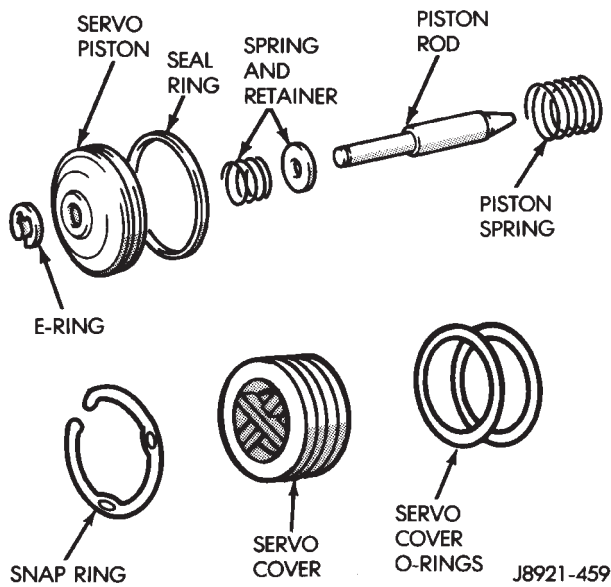


Fig. 32 Second Coast Brake Servo Components

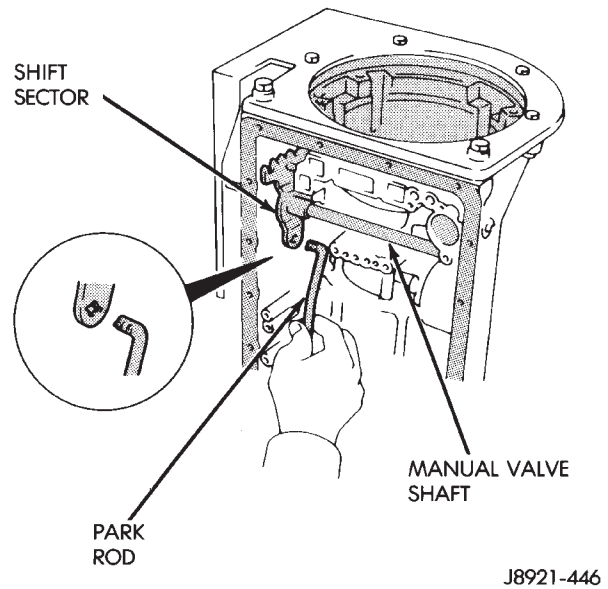


Fig. 34 Removing/Installing Park Rod

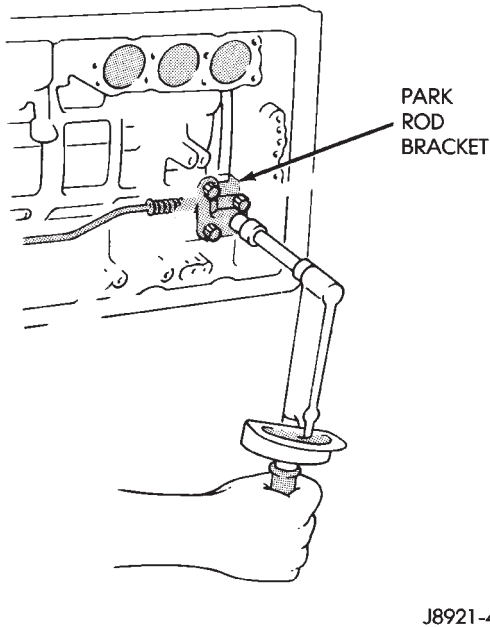


Fig. 33 Removing/Installing Park Rod Bracket

(8) Install park rod and bracket (Fig. 33). Tighten bracket bolts to 10 N·m (7 ft. lbs.) torque.

(9) Install valve body, oil screen and oil pan as outlined in this section.

ADAPTER HOUSING SEAL REPLACEMENT

- (1) Raise vehicle.
- (2) Disconnect or remove components necessary to gain access to seal (e.g. propeller shaft, crossmember, shift linkage, transfer case, exhaust components, hoses, wires).
- (3) Remove dust shield and remove seal from adapter housing (Fig. 36).
- (4) Install new seal with appropriate size seal installer and install dust shield.

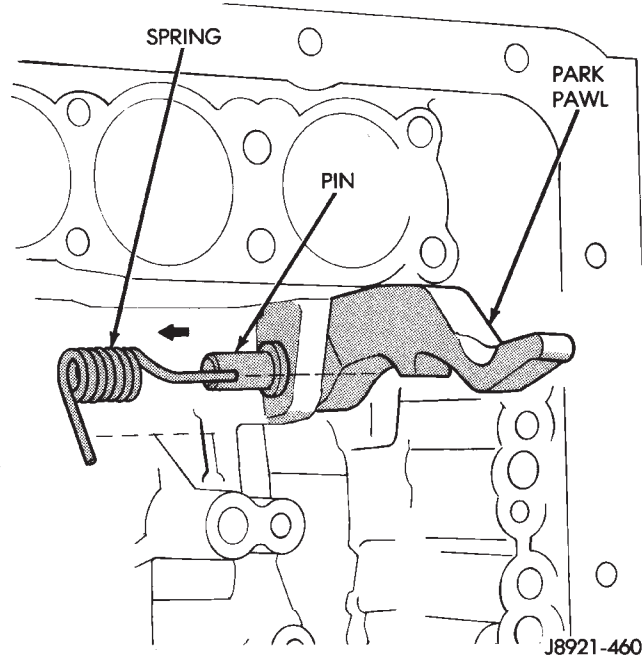


Fig. 35 Removing/Installing Park Pawl, Pin And Spring

(5) Reinstall components removed to gain access to seal.

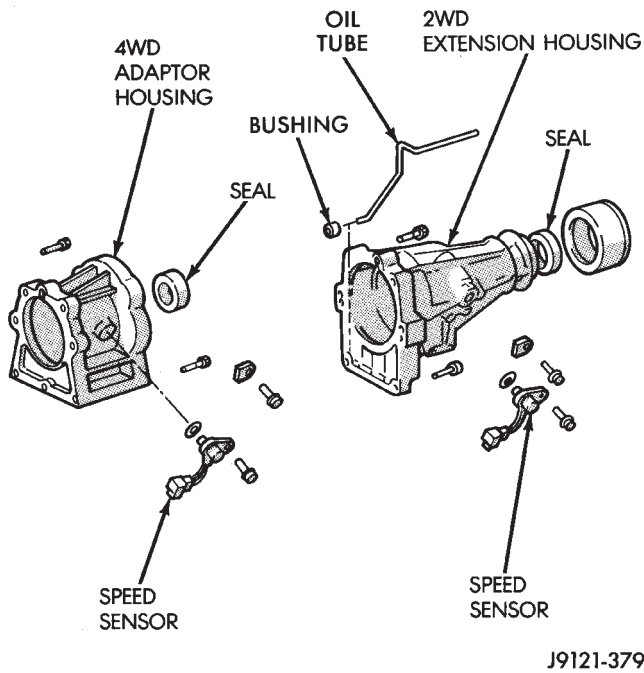
(6) Top off transmission fluid if necessary.

SPEED SENSOR

SPEED SENSOR TESTING

Test the speed sensor with an ohmmeter. Place the ohmmeter leads on the terminals in the sensor connector (Fig. 37).

Rotate the transmission output shaft and observe the ohmmeter needle. The needle should deflect indicating the switch is opening/closing as the rotor

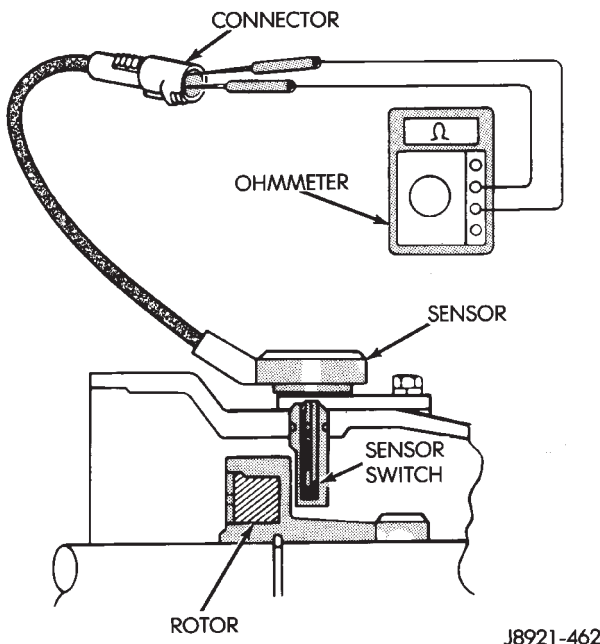


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Fig. 36 Adapter Housing Seals

moves past the sensor (Fig. 37). Replace the sensor if the ohmmeter does not display any kind of reading.

If a digital ohmmeter is being used, the sensor should generate an ohmmeter readout each time the switch opens and closes.

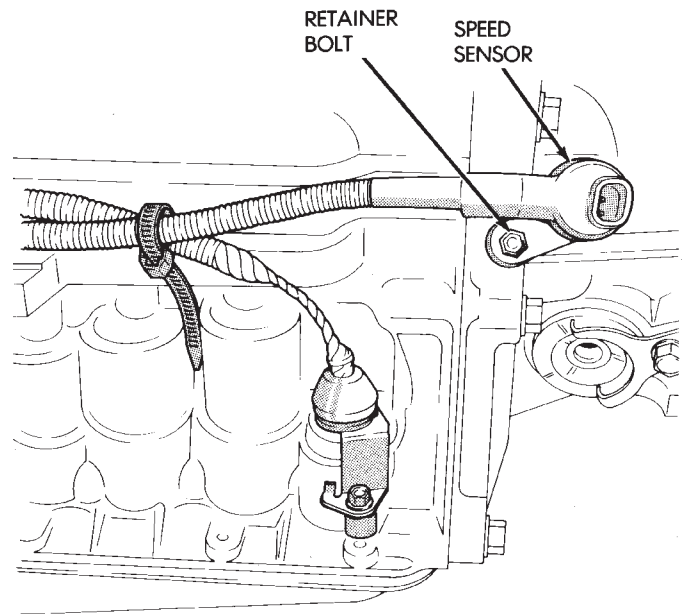


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Fig. 37 Speed Sensor Testing

SPEED SENSOR REPLACEMENT

- (1) Disconnect sensor wire harness connector.
- (2) Remove sensor retainer bolt and remove sensor (Fig. 38).
- (3) Remove and discard speed sensor O-ring.



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Fig. 38 Transmission Speed Sensor Removal/Installation

(4) Install new O-ring on speed sensor and install sensor in transmission case.

(5) Install sensor bracket and retainer bolt. Tighten bolt to 7.4 N·m (65 in. lbs.) torque.

(6) Connect sensor wire harness connector.

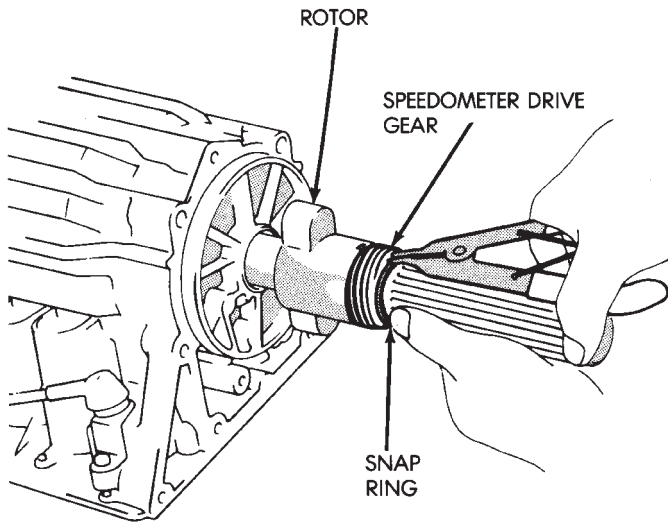
SPEED SENSOR ROTOR—SPEEDOMETER DRIVE GEAR

ROTOR—DRIVE GEAR REMOVAL

- (1) Raise vehicle.
- (2) Remove components necessary to gain access to rotor and drive gear such as propeller shaft, transfer case, crossmember, and shift linkage.
- (3) Disconnect speedometer cable and/or speed sensor.
- (4) Remove adaptor housing.
- (5) Remove speedometer drive gear snap ring (Fig. 39).
- (6) Remove the speedometer drive gear and spacer (if equipped).
- (7) Remove rotor by carefully prying it off output shaft with wood dowel or hammer handle (Fig. 40).
- (8) Clean sealing surfaces of transmission case and extension/adaptor housing.

ROTOR AND DRIVE GEAR INSTALLATION

- (1) Install rotor, spacer (if equipped) and drive gear on output shaft. Then install drive gear snap ring (Fig. 39).
- (2) Apply bead of Mopar or Loctite 599 sealer, to transmission case sealing surface and install extension/adaptor housing on case.



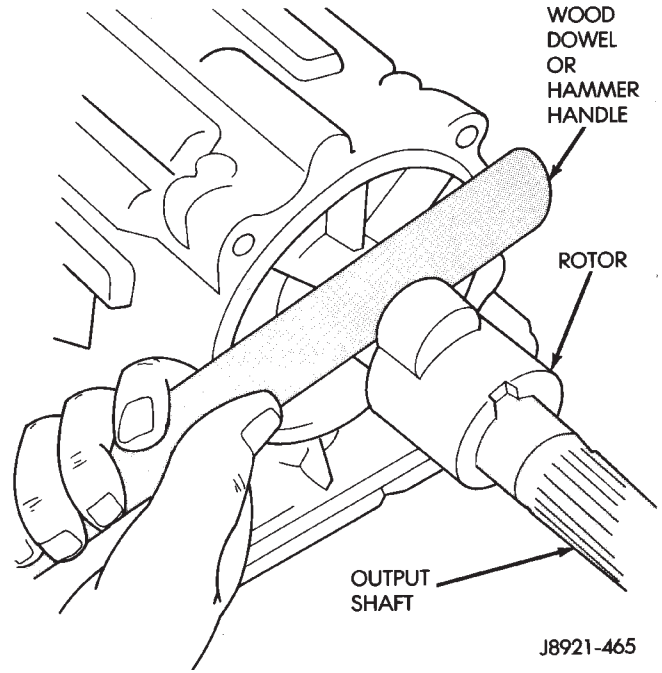
J8921-464

Fig. 39 Removing/Installation Speedometer Drive Gear

- (3) Tighten adaptor housing bolts to 34 N·m (25 ft. lbs.) torque.
- (4) Install components removed to gain access to rotor and drive gear.

THROTTLE POSITION SENSOR (TPS) SERVICE

A separate throttle position sensor is used for automatic transmission applications. The sensor is attached to the base of the throttle body. Refer to Group 14 for TPS service and adjustment.



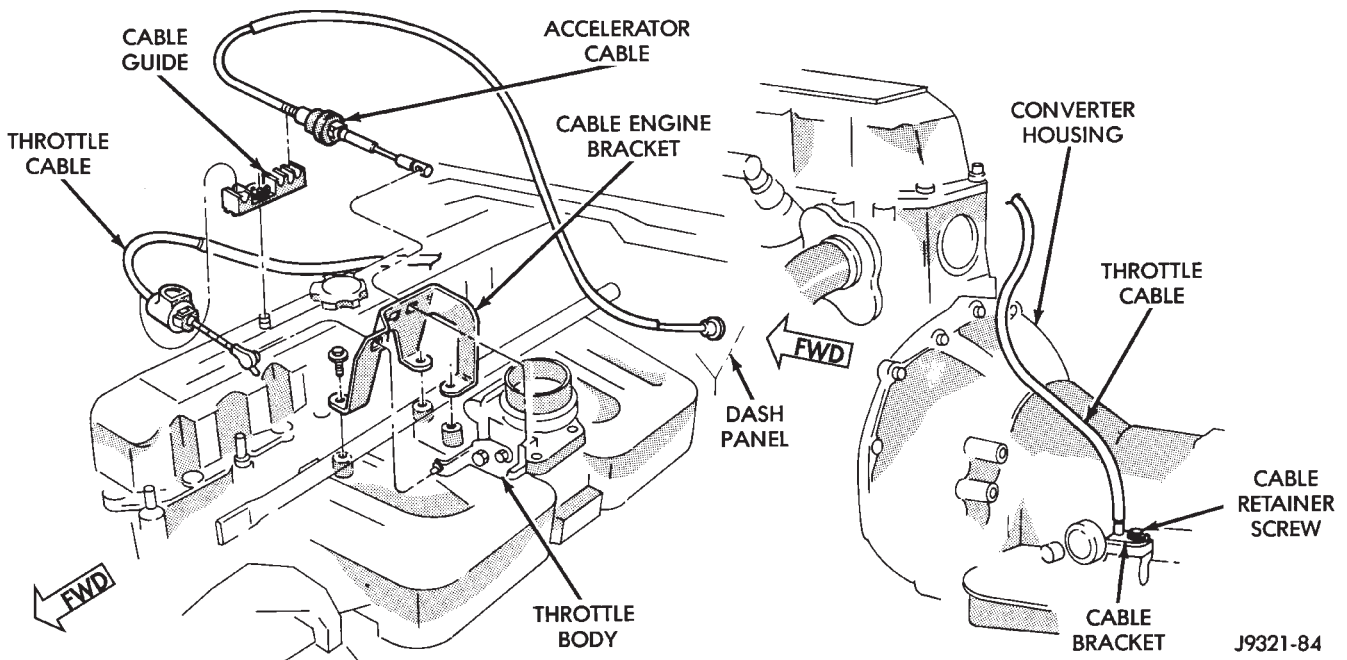
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Fig. 40 Removing Speed Sensor Rotor

TRANSMISSION THROTTLE CABLE REPLACEMENT

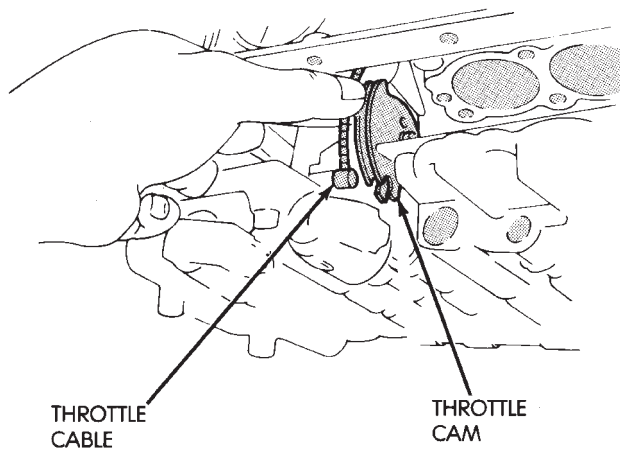
THROTTLE CABLE REMOVAL

- (1) In engine compartment, disconnect cable from throttle linkage. Then compress cable mounting ears and remove cable from engine bracket (Fig. 41).
- (2) Raise vehicle.
- (3) Remove transmission oil pan.
- (4) Disengage cable from throttle valve cam (Fig. 42).



J9321-84

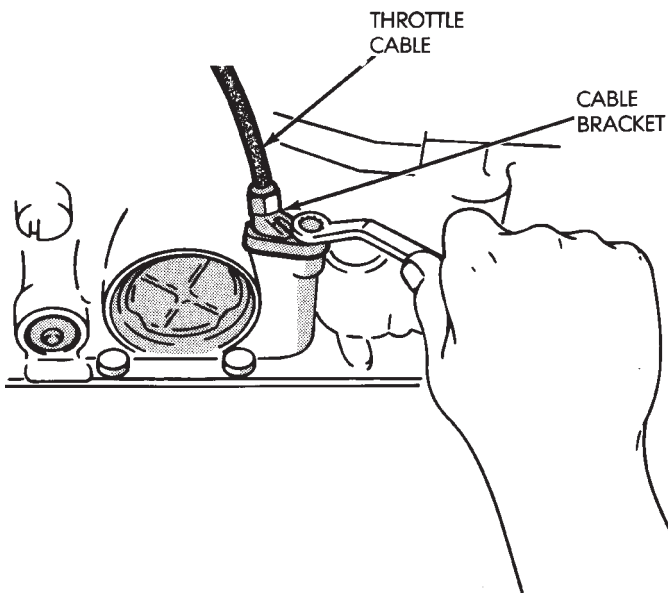
Fig. 41 Transmission Throttle Cable Attachment



J8921-438

Fig. 42 Removing/Installing Transmission Throttle Cable

(5) Remove cable bracket bolt and remove cable and bracket from case (Fig. 43).



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Fig. 43 Removing/Installing Transmission Throttle Cable And Bracket

(6) Remove and discard cable seal.

THROTTLE CABLE INSTALLATION

- (1) Lubricate and install new seal on cable.
- (2) Insert cable in transmission case.
- (3) Attach cable to throttle cam (Fig. 42).
- (4) Install cable bracket on case and tighten attaching bolt to 10 N·m (7 ft-lbs) torque (Fig. 43).
- (5) Remove old sealer material from oil pan and transmission case. Clean oil pan with solvent and dry it with compressed air.

(6) Apply bead of Mopar or Loctite 599 sealer to oil pan sealing surface. Sealer bead should be at least 3 mm (1/8 in.) wide. Then install pan and tighten pan bolts to 7 N·m (65 in. lbs.) torque.

(7) Install new gasket on oil pan drain plug. Install and tighten plug to 20 N·m (15 ft. lbs.) torque.

(8) Connect cable to engine bracket and throttle linkage.

(9) Fill transmission with Mopar Mercon.

(10) Adjust the cable as described in cable adjustment procedure.

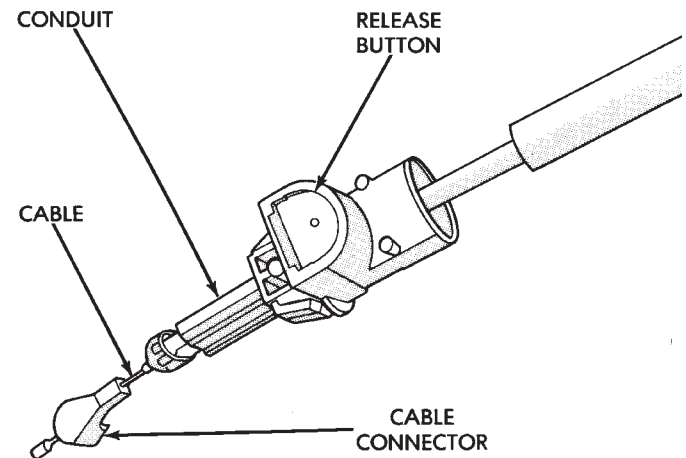
TRANSMISSION THROTTLE CABLE ADJUSTMENT

(1) Shift transmission into Park, shut engine off and raise hood.

(2) Press cable release button (Fig. 44).

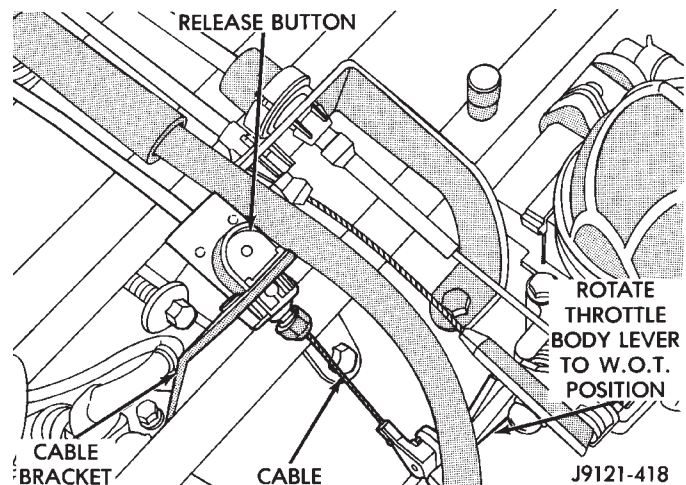
(3) Push cable conduit back into cable sheath as far as possible (Fig. 45).

(4) Rotate lever on throttle body to wide open throttle position. Cable will ratchet to correct adjustment point as lever is rotated (Fig. 45).



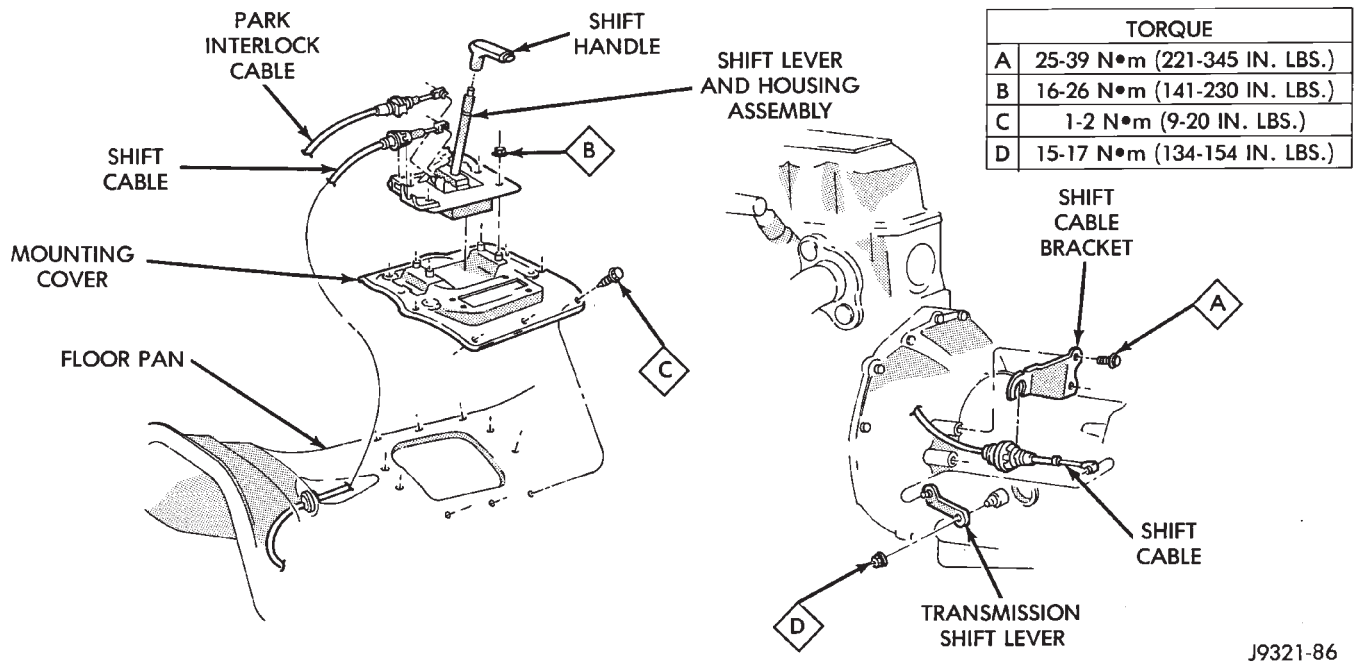
J9121-417

Fig. 44 Throttle Cable Components



J9121-418

Fig. 45 Throttle Cable Adjustment



J9321-86

Fig. 46 Shift Cable

SHIFT CABLE ADJUSTMENT

- (1) Shift transmission into Park.
- (2) Raise vehicle.
- (3) Release cable adjuster clamp to unlock cable (Figs. 46 and 47). Clamp is at transmission end of cable.
- (4) Unsnap cable from transmission cable bracket (Figs. 46 and 47).
- (5) Move transmission shift lever fully rearward to Park detent. Lever is on manual valve shaft at driver side of case.
- (6) Verify positive engagement of park lock by attempting to rotate propeller shaft. Shaft will not rotate when park lock is engaged.
- (7) Snap cable into cable bracket.
- (8) Lock shift cable by pressing cable adjuster clamp down until it snaps into place.
- (9) Check engine starting. Engine should start only in Park and Neutral.
- (10) Lower vehicle.

PARK INTERLOCK CABLE ADJUSTMENT

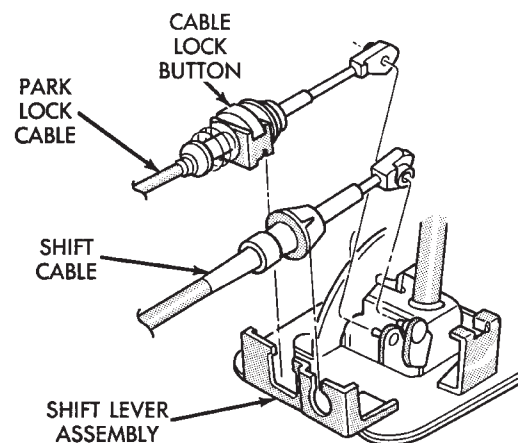
- (1) Shift transmission into Park.
- (2) Turn ignition switch to Lock position.
- (3) Remove shift lever bezel and console screws. Raise bezel and console for access to cable.
- (4) Pull cable lock button up to release cable (Fig. 47).
- (5) Pull cable forward. Then release cable and press cable lock button down until it snaps in place.
- (6) Check adjustment as follows:

(a) Check movement of release shift handle button (floor shift) or release lever (column shift). You should not be able to press button inward or move column lever.

(b) Turn ignition switch to On position.

(c) Press floor shift lever release button or move column lever. Then shift into Neutral. If cable adjustment is correct, ignition switch can not be turned to Lock position. Perform same check with transmission in D range.

(7) Move shift lever back to Park and check ignition switch operation. You should be able to turn switch to Lock position and shift lever release button/lever should not move.



J9321-250

Fig. 47 Park Lock Cable Attachment (XJ)

TRANSMISSION COOLER SERVICE

Main Cooler

The transmission main cooler is located in the radiator. The main cooler can be flushed when necessary, however, the cooler is not a repairable component. If the cooler is damaged, plugged, or leaking, the radiator will have to be replaced.

Auxiliary Cooler

The auxiliary cooler is mounted in front of the radiator at the driver side of the vehicle (Fig. 48). The cooler can be flushed when necessary, while mounted in the vehicle. The cooler can also be removed for access, repair, or replacement as needed.

The main and auxiliary coolers should both be flushed whenever a transmission or converter clutch malfunction generates sludge, debris, or particles of clutch friction material.

Cooler Service

The main cooler (and radiator) and the auxiliary cooler can be removed for service or access to other components. Auxiliary cooler removal requires that the front bumper and radiator support be removed for access to the cooler lines and attaching bracket.

REVERSE FLUSHING MAIN AND AUXILIARY COOLERS AND COOLER LINES

Reverse flushing the cooler and lines will prevent sludge and particles from flowing back into the transmission after repair. The flushing procedure applies to standard (in-radiator) coolers and auxiliary coolers equally.

Pressure equipment is preferred for reverse flushing. However, reverse flushing can be performed using hand operated equipment as described in the following procedure.

- (1) Disconnect cooler lines at transmission and at auxiliary cooler (Figs. 48 and 49).
- (2) Position drain pan under cooler line to catch material flushed through coolers and lines.
- (3) Reverse flush each cooler using hand operated suction gun filled with mineral spirits. Insert gun nozzle (or hose) into cooler inlet (return) line. Then force mineral spirits through into line and through cooler.

(4) Continue reverse flushing until fluid exiting inlet (pressure) line is clear and free of debris/residue.

(5) Replace radiator if fluid cannot be pumped through main cooler. Replace auxiliary cooler if leaks are evident, or if fluid cannot be pumped through it.

(6) Clear flushing materials from coolers and lines with short pulses of compressed air. Insert air gun nozzle into cooler inlet (return) line and continue short pulses of air until all fluid is cleared from cooler and lines.

(7) Pump one quart of fresh automatic transmission fluid through cooler and lines before reconnecting cooler lines.

FLOW TESTING TRANSMISSION MAIN COOLER

Cooler flow is checked by measuring the amount of fluid flow through the cooler in a 20 second time period. The test is performed with the engine running and transmission in neutral. Fluid is then pumped through the cooler by the transmission oil pump.

- (1) Disconnect cooler inlet line at transmission fitting.
- (2) Securely attach hose to end of inlet line and position line in a one quart test container.
- (3) Add extra quart of fluid to transmission.
- (4) Use stopwatch to check flow test time.
- (5) Shift transmission into neutral and set parking brake.
- (6) Start and run engine at curb idle speed and immediately note cooler flow. Approximately one quart of fluid should flow into test container in 20 second period.
- (7) If cooler flow is intermittent, flows less than one quart in 20 seconds, or does not flow at all, cooler is faulty and must be replaced.

TRANSMISSION COOLER LINE FITTINGS

Quick disconnect fittings are used at the transmission cooler line connections. The fitting seals and guides are serviceable.

Replace the seals and guides whenever the fittings exhibit leakage, or will not properly snap into place.

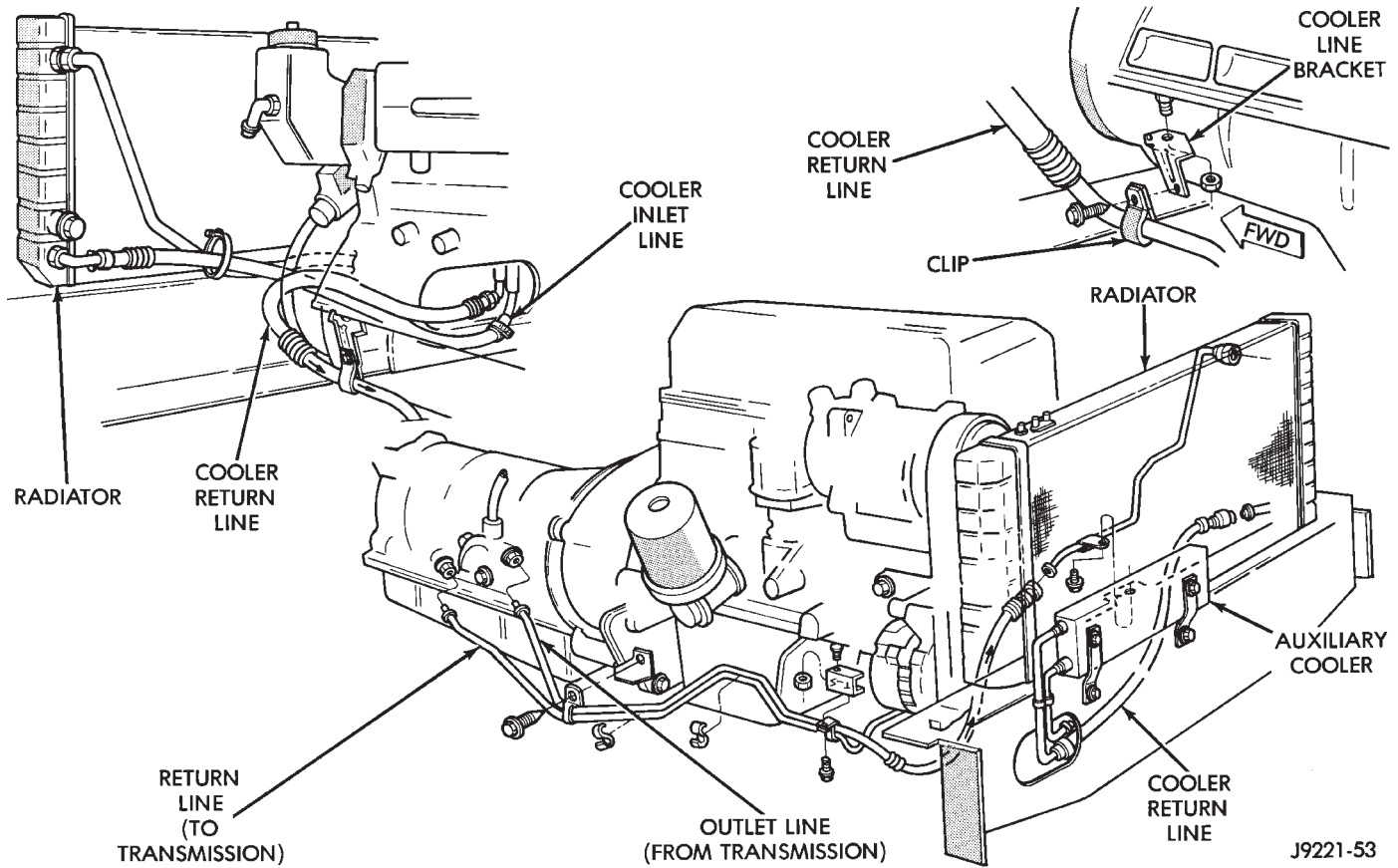


Fig. 48 Auxiliary Cooler Mounting (Left Hand Drive)

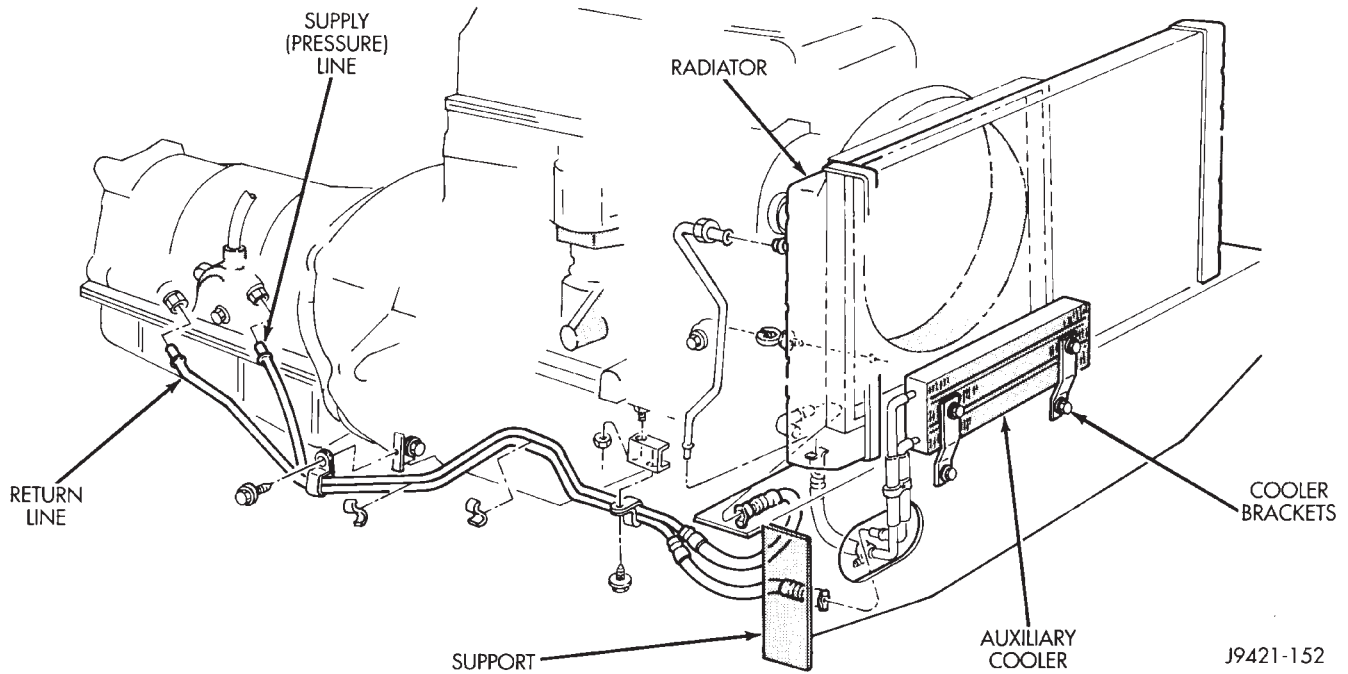


Fig. 49 Auxiliary Cooler Mounting (Right Hand Drive)

AW-4 TRANSMISSION REMOVAL AND INSTALLATION

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Torque Converter Stator Clutch Inspection	189	Transmission and Torque Converter Removal . .	189

TRANSMISSION AND TORQUE CONVERTER REMOVAL

- (1) Raise vehicle.
- (2) Drain transmission fluid and reinstall oil pan drain plug.
- (3) Remove upper half of transmission fill tube (Fig. 50).

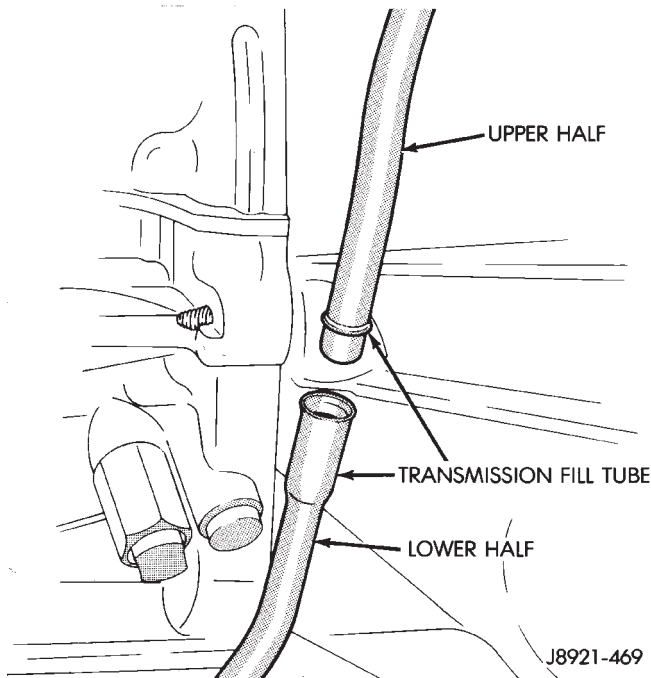


Fig. 50 Two-Piece Transmission Fill Tube

- (4) Disconnect cooler lines at transmission. Cooler lines have quick-disconnect fittings. Press fitting release tabs and pull cooler lines and fittings out of case or use Special Tool 7555 to disconnect them.
- (5) Support engine with safety stand and support transmission with jack.
- (6) Disconnect transmission and transfer case shift linkage.
- (7) Remove necessary exhaust components.
- (8) Disconnect vehicle speed sensor wires
- (9) Mark position of front and rear propeller shafts for alignment reference. Then remove shafts from vehicle.
- (10) Remove rear crossmember.
- (11) Disconnect transmission shift cable at transmission. Then disconnect transmission throttle valve cable at engine.

- (12) Disconnect necessary vacuum and fluid hoses.
- (13) Remove transfer case from transmission.
- (14) Disconnect and remove crankshaft position sensor.

CAUTION: The crankshaft position sensor can be damaged if the sensor is still in place when the transmission is removed. To avoid damage, remove the sensor before transmission removal.

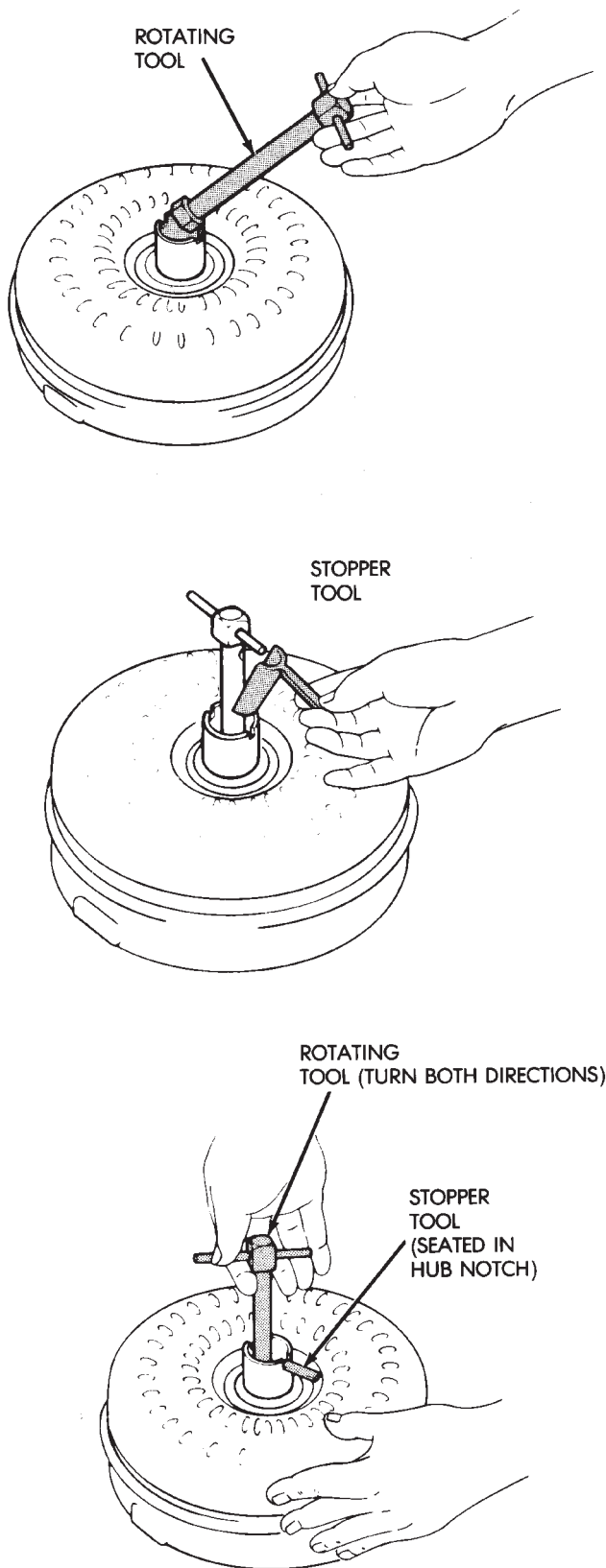
- (15) Remove starter motor.
- (16) Remove bolts attaching converter to drive plate.
- (17) Remove bolts attaching converter housing to engine.
- (18) Secure transmission to jack with safety chains.
- (19) Pull transmission rearward for access to converter. Then secure converter in pump with C-clamp or strap bolted to converter housing.
- (20) Remove transmission from under vehicle.
- (21) Remove torque converter if converter or oil pump seal are to be serviced.

TORQUE CONVERTER STATOR CLUTCH INSPECTION

- (1) Insert Rotating Tool 7547 into converter hub and seat tool in one-way clutch (Fig. 51).
- (2) Insert Stopper Tool 7548 in one converter hub notch and into outer race of rotating tool.
- (3) Turn rotating tool clockwise. Converter clutch should rotate freely and smoothly. Less than 2.5 N·m (22 in. lbs.) of torque should be required to rotate clutch in clockwise direction.
- (4) Turn rotating tool in counterclockwise direction. Converter clutch should lock.
- (5) Replace converter if clutch binds or will not lock.

OIL PUMP SEAL REPLACEMENT

- (1) Remove converter.
- (2) Remove old seal. Use blunt punch to collapse seal and pry seal out of pump housing. Do not scratch or damage seal bore.
- (3) Lubricate lip of new seal with Mopar Mercon transmission fluid and install seal in pump with tool 7549 (Fig. 52).
- (4) Lubricate converter drive hub with Mopar Mercon transmission fluid.



J8921-470

Fig. 51 Checking Operation Of Torque Converter Stator One-Way Clutch

(5) Align and install converter in oil pump.

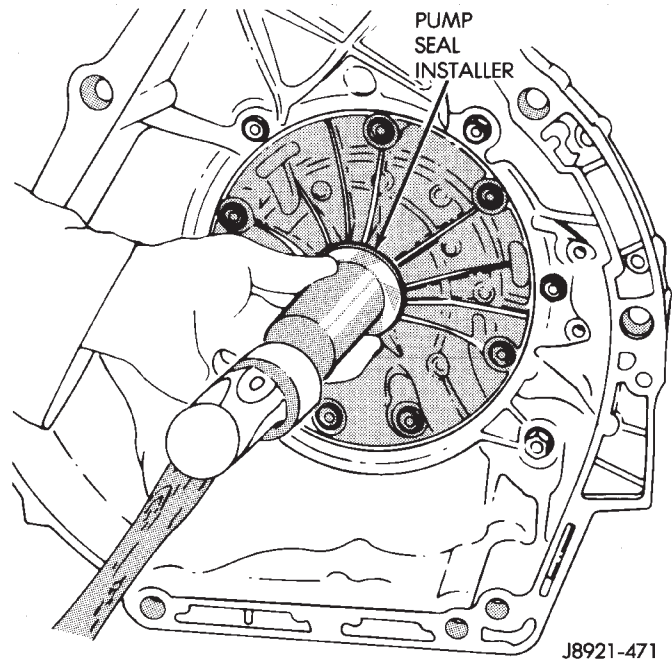


Fig. 52 Installing Oil Pump Seal

TRANSMISSION AND TORQUE CONVERTER INSTALLATION

(1) Mount transmission on transmission jack. Then secure transmission to jack with safety chains.

(2) Lubricate converter drive hub and oil pump seal lip with Mopar Mercon transmission fluid. Then install converter. Be sure converter is fully seated in oil pump gears before proceeding. Hold converter in place with C-clamp or strap attached to converter housing.

(3) Align and position transmission and converter on engine.

(4) Remove clamp or strap used to hold torque converter in place.

(5) Move transmission forward seat and it on engine. Be sure torque converter hub is fully seated.

(6) Install converter housing-to-engine bolts (Fig. 53).

(7) Install converter-to-drive plate bolts.

(8) Install and connect starter motor.

(9) Install and connect crankshaft position sensor.

(10) Install transfer case on transmission. Tighten transfer case attaching nuts to 41 N·m (30 ft. lbs.) torque

(11) Connect transfer case shift linkage and vacuum hoses.

(12) Connect exhaust components.

(13) Install rear crossmember and remove jack used to support transmission assembly.

(14) Connect speed sensor wire harness to sensor.

(15) Connect wire harness to park/neutral position switch.

(16) Align and connect front and rear propeller shafts.

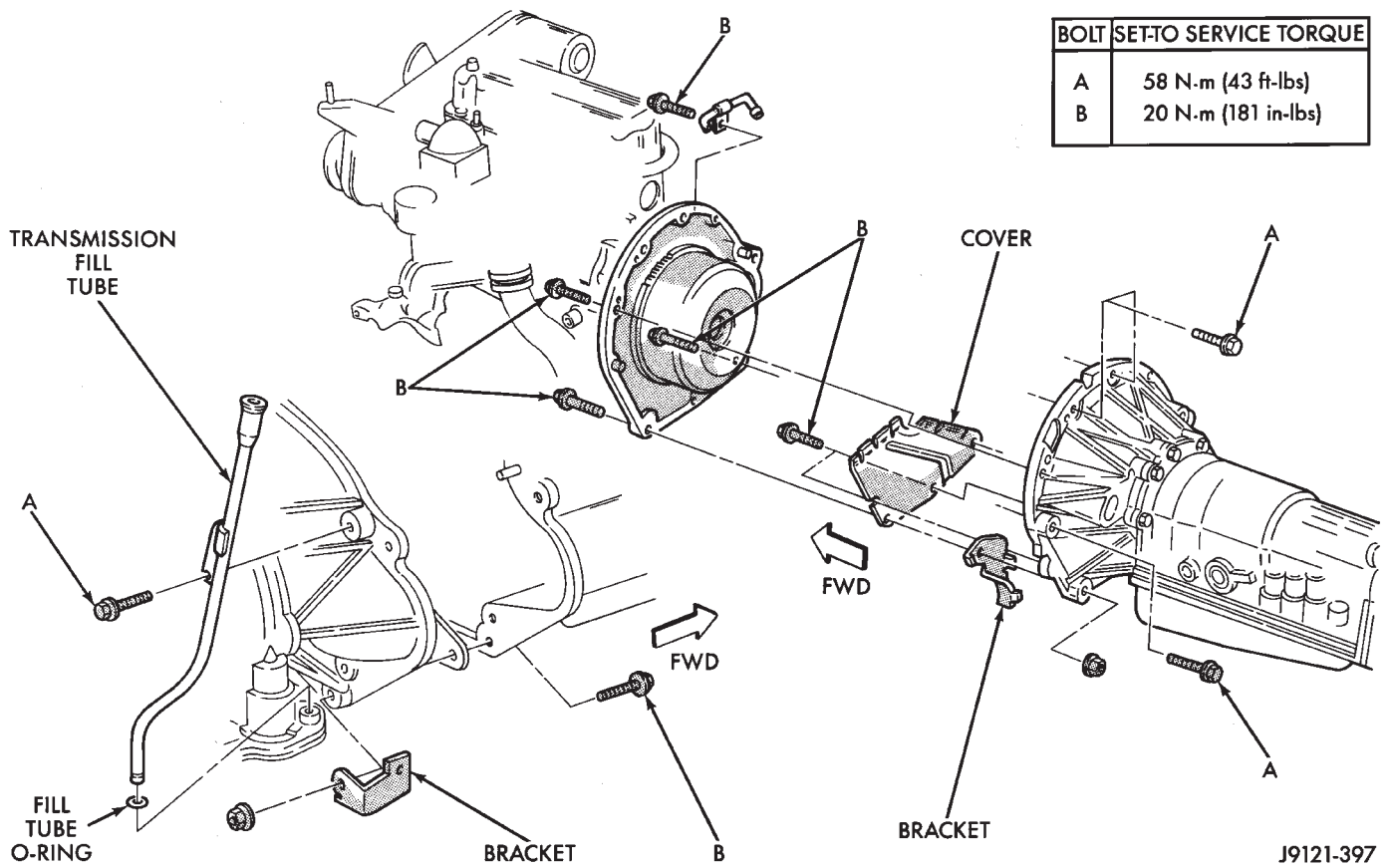


Fig. 53 AW-4 Transmission Attachment

- (17) Connect transmission wire harnesses and transfer case vacuum and wire harnesses.
- (18) Connect transmission cooler lines.
- (19) Connect transmission throttle cable at engine.

- (20) Install new O-ring seal on upper half of transmission fill tube. Then connect upper and lower tube halves.
- (21) Lower vehicle.
- (22) Fill transmission with Mopar Mercon automatic transmission fluid. Mopar Dexron II can be used if Mercon is not readily available.

AW-4 TRANSMISSION OVERHAUL

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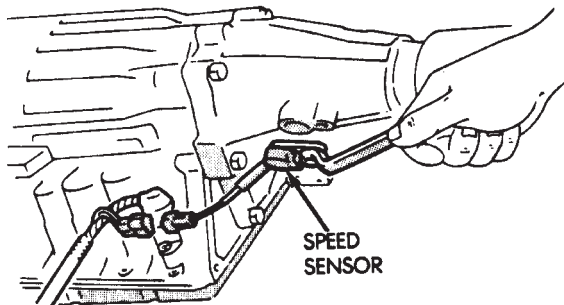
OVERHAUL SERVICE TOOLS

The special tools needed to overhaul the AW-4 transmission are provided in Tool Kit 6294. However, Pressure Test Port Adapter 7554 is not included in this kit and must be ordered separately. The overhaul tool kit and test port adapter are available through the parts division and dealer special tool program.

TRANSMISSION DISASSEMBLY

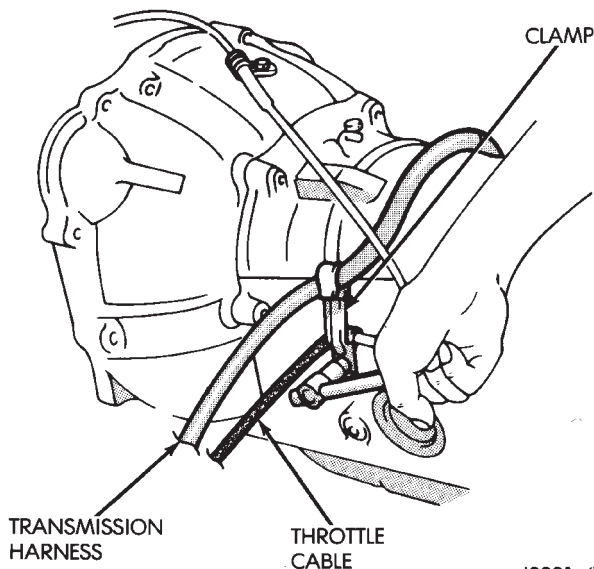
- (1) Remove torque converter.
- (2) Remove lower half of filler tube if not previously removed.
- (3) Remove clamps attaching wire harness and throttle cable (Fig. 1) to transmission.

- (4) Remove shift lever from manual valve shaft at left side of transmission.
- (5) Remove park/neutral position switch.
- (6) Remove speed sensor (Fig. 2).



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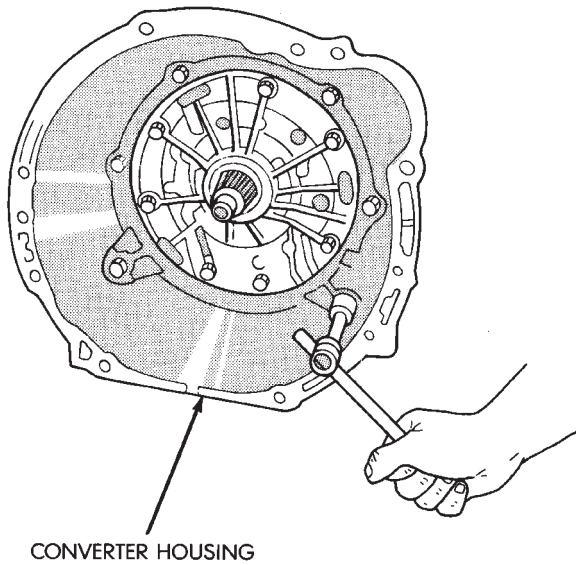
Fig. 2 Speed Sensor Removal



J8921-474

Fig. 1 Typical Harness And Cable Clamp Attachment

(7) Remove converter housing bolts and remove housing (Fig. 3) from case.

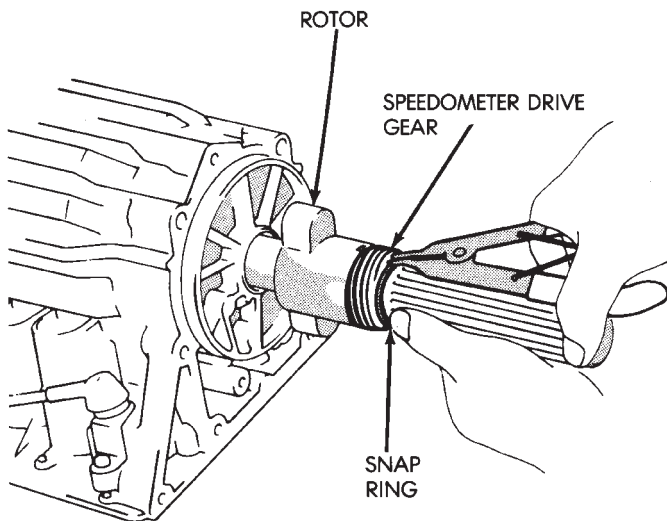


J8921-476

Fig. 3 Removing/Installing Converter Housing

(8) Remove adapter housing.

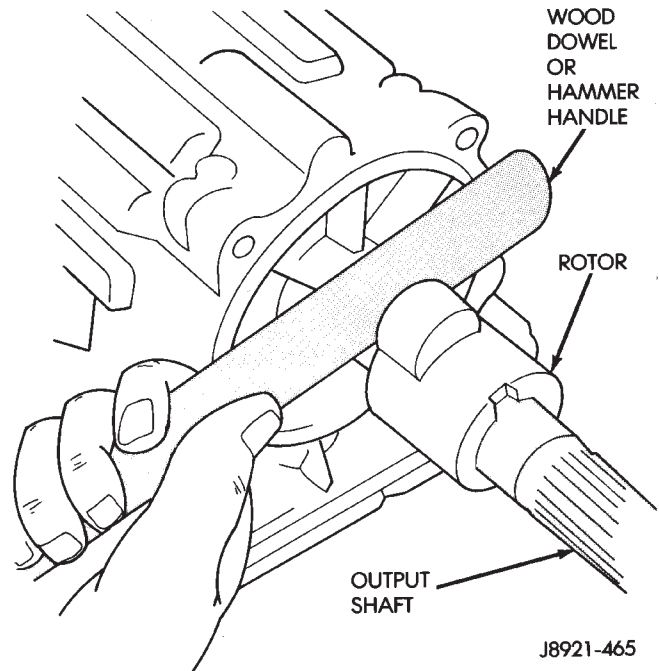
(9) Remove speedometer drive gear snap ring and remove gear and gear spacer if equipped (Fig. 4).



J8921-464

Fig. 4 Removing Speed Sensor And Speedometer Drive Gear

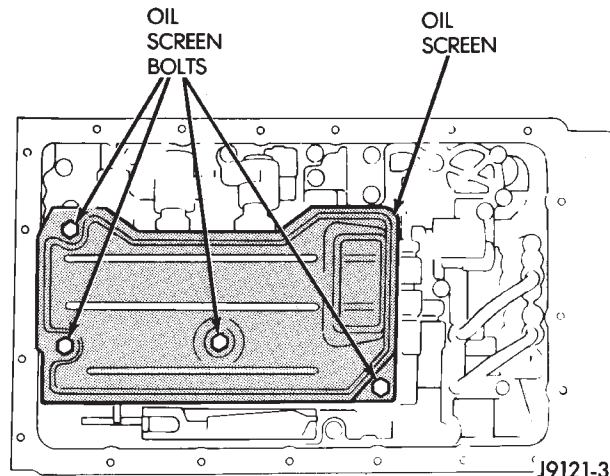
(10) Remove speed sensor rotor and key. Use wood dowel or hammer handle to loosen and remove rotor (Fig. 5).



J8921-465

Fig. 5 Removing Transmission Speed Sensor Rotor

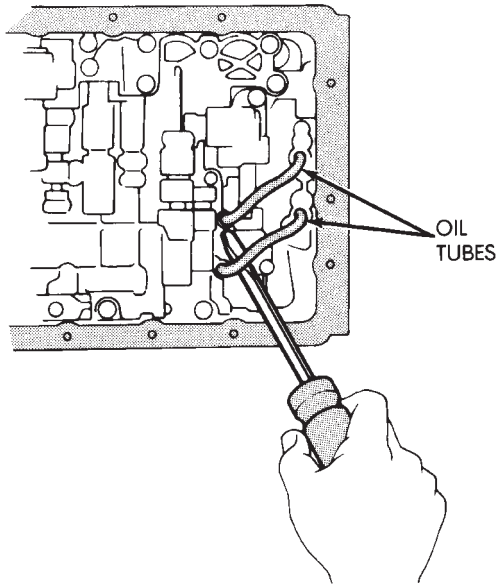
(11) Remove transmission oil pan, oil screen and screen gaskets (Fig. 6). Then mount transmission in holding fixture.



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Fig. 6 Removing Oil Screen

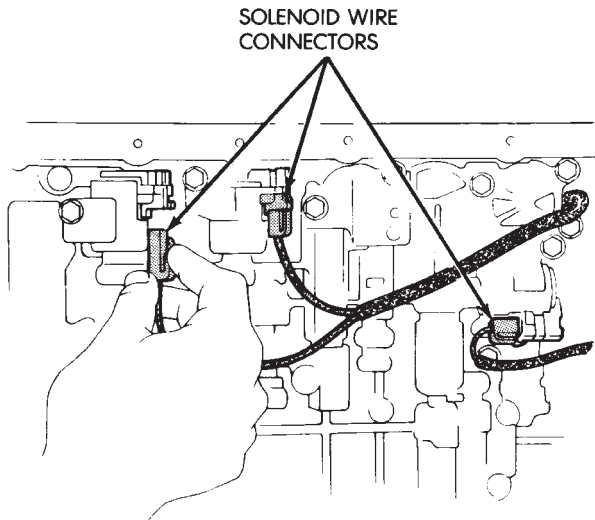
(12) Remove valve body oil feed tubes (Fig. 7).



J8921-437

Fig. 7 Removing Valve Body Oil Tubes

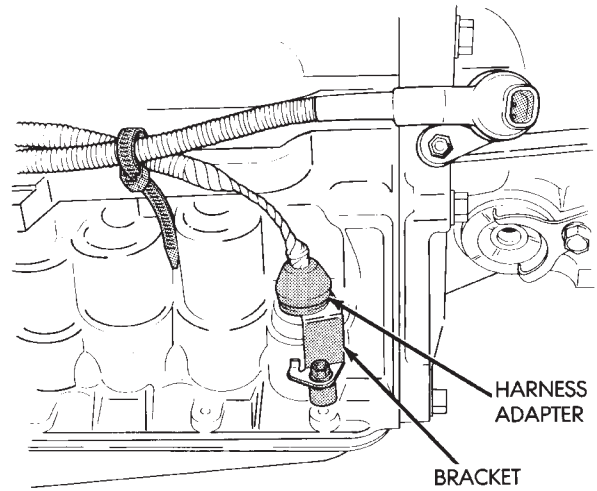
(13) Disconnect valve body solenoid wires (Fig. 8).



J8921-433

Fig. 8 Solenoid Wire Location

(14) Remove harness bracket bolt and remove harness and bracket Fig. 9).

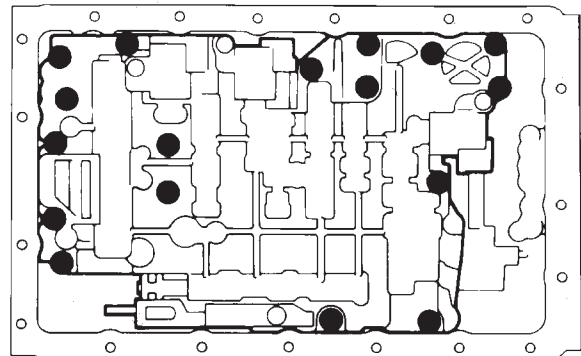


J8921-436

Fig. 9 Removing Bracket And Harness

(15) Remove valve body bolts (Fig. 10).

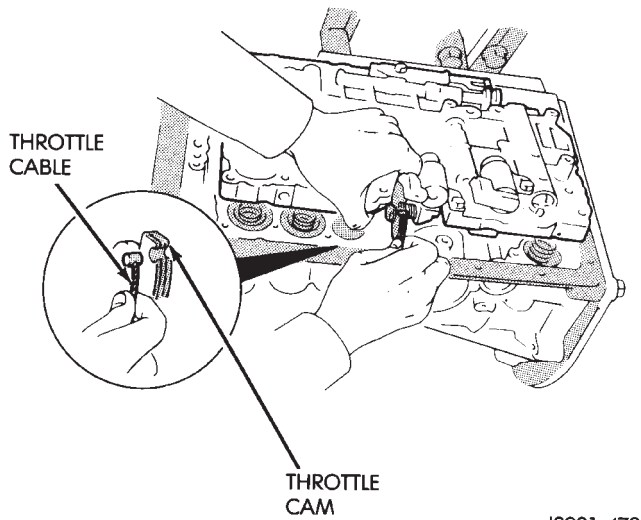
● = BOLT LOCATIONS



J8921-439

Fig. 10 Valve Body Bolt Locations

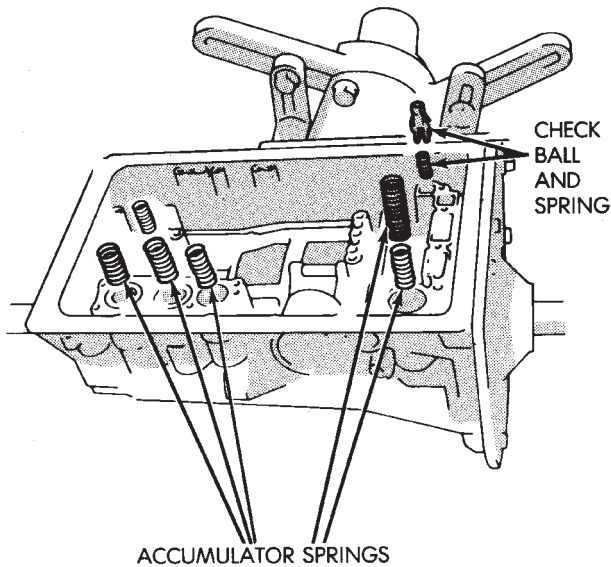
(16) Disconnect throttle cable from throttle cam (Fig. 11).



J8921-478

Fig. 11 Disconnecting Throttle Cable

(17) Remove valve body from case. Then remove accumulator springs, spacers and check ball and spring (Fig. 12).



J9121-381

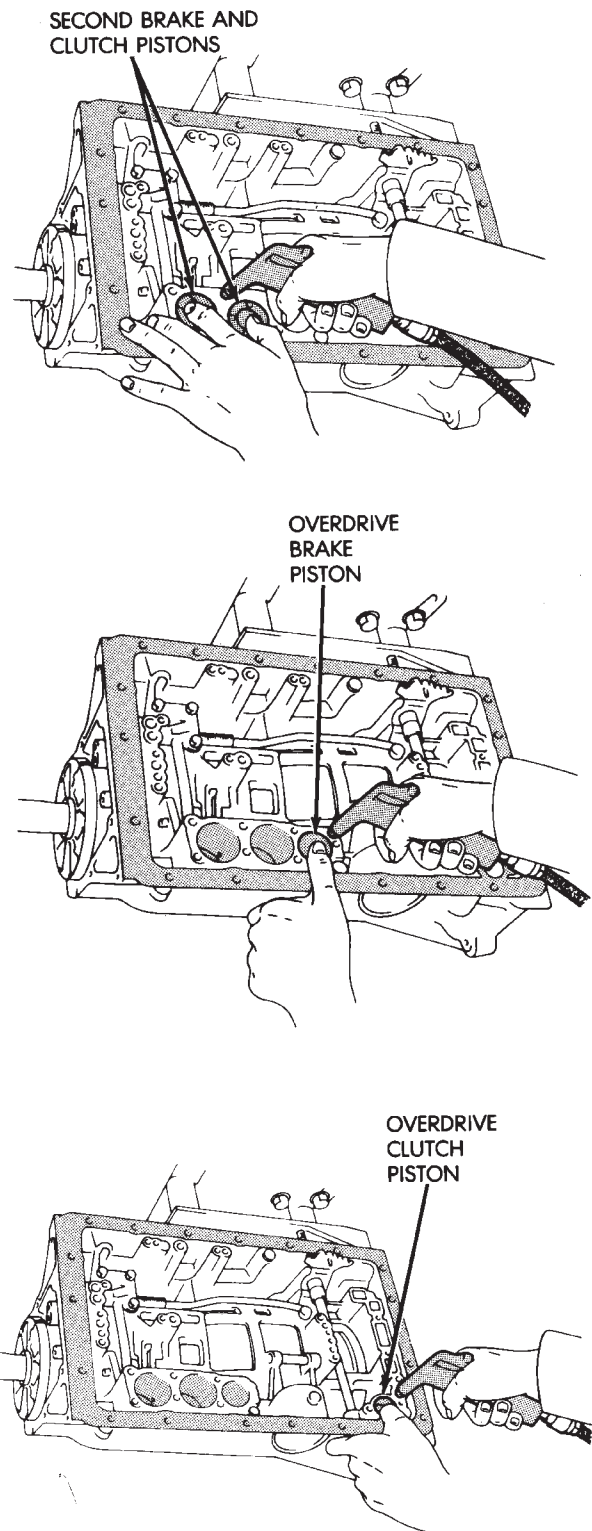
Fig. 12 Removing Accumulator Springs, Spacers And Check Ball

(18) Remove second brake and clutch accumulator pistons with compressed air (Fig. 13). Apply air pressure through feed port and ease the pistons out of the bore.

(19) Remove overdrive brake accumulator piston with compressed air (Fig. 13).

(20) Remove overdrive clutch accumulator piston with compressed air (Fig. 13).

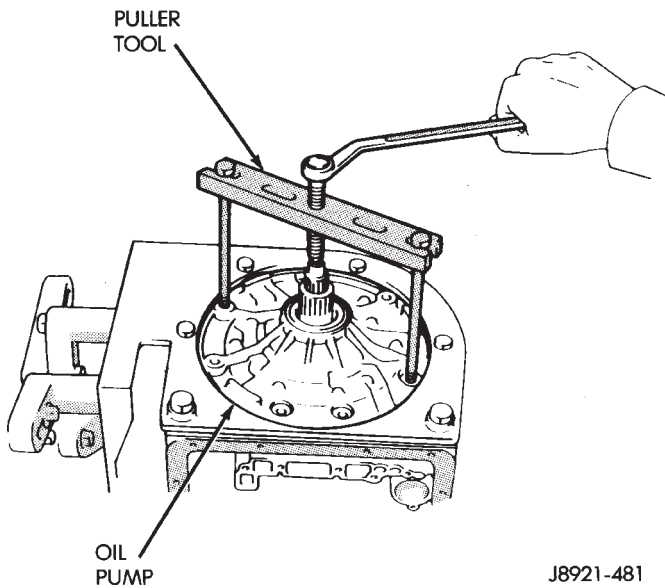
(21) Remove throttle cable.



J8921-480

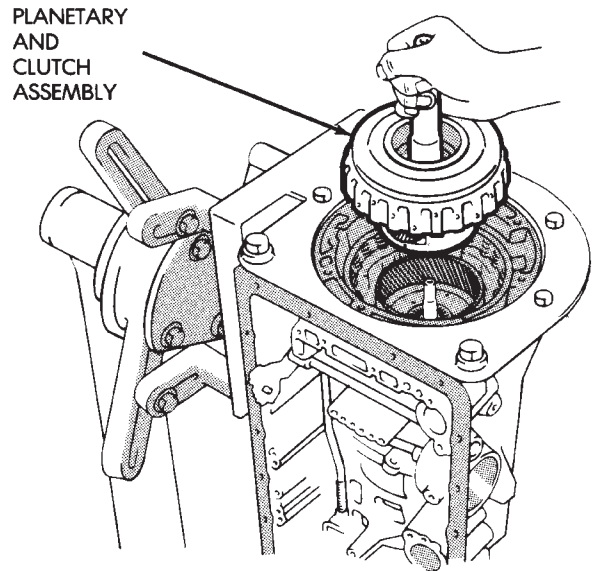
Fig. 13 Removing Accumulator Pistons

(22) Remove oil pump bolts and remove pump with bridge-type Puller 7536 (Fig. 14).



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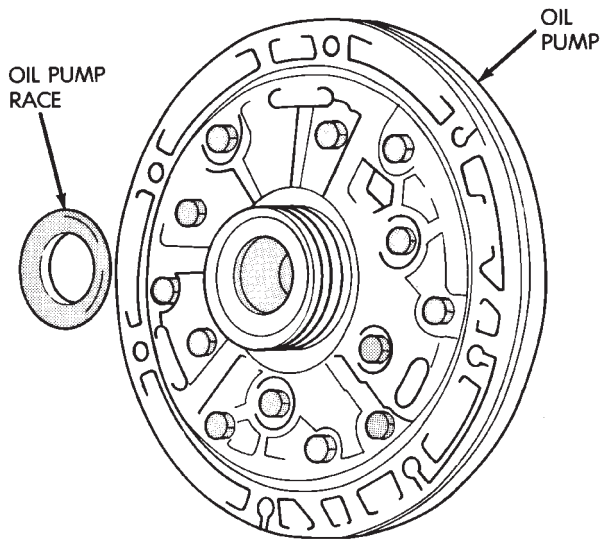
Fig. 14 Oil Pump Removal



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Fig. 16 Removing Fourth Gear Planetary And Direct Clutch Assembly

(23) Remove race from oil pump (Fig. 15).



J8921-482

Fig. 15 Oil Pump Race Removal

(24) Remove fourth gear overdrive planetary gear and overdrive direct clutch assembly (Fig. 16).

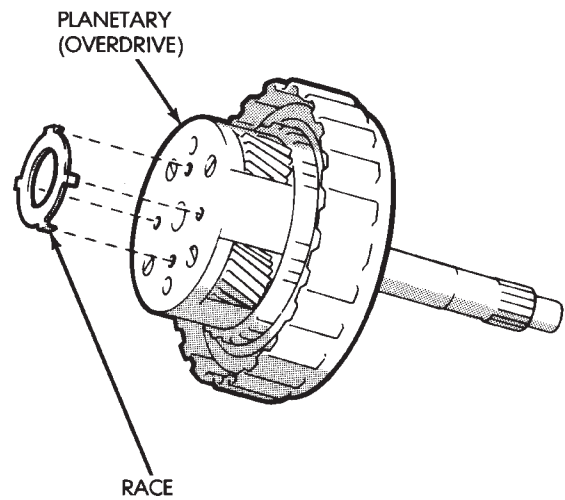
(25) Remove race from fourth gear overdrive planetary (Fig. 17).

(26) Remove thrust bearing, race and overdrive planetary ring gear (Fig. 18).

(27) Measure stroke length of overdrive brake piston as follows:

(a) Mount dial indicator on case (Fig. 19).

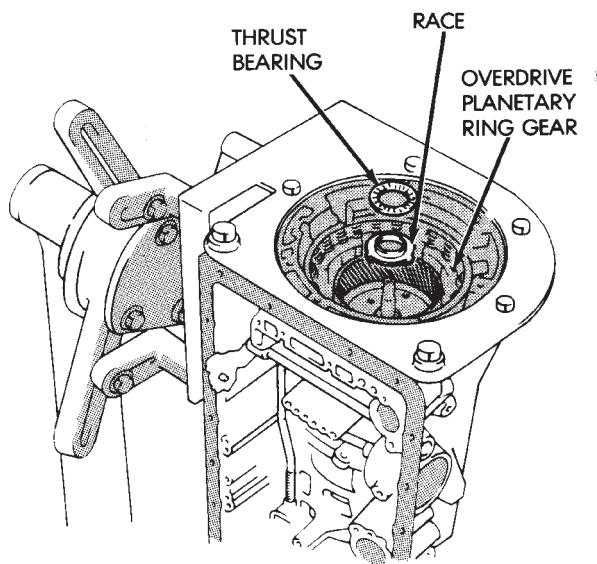
(b) Mount Gauge Tool 7546 so it contacts piston (Fig. 19).



J8921-484

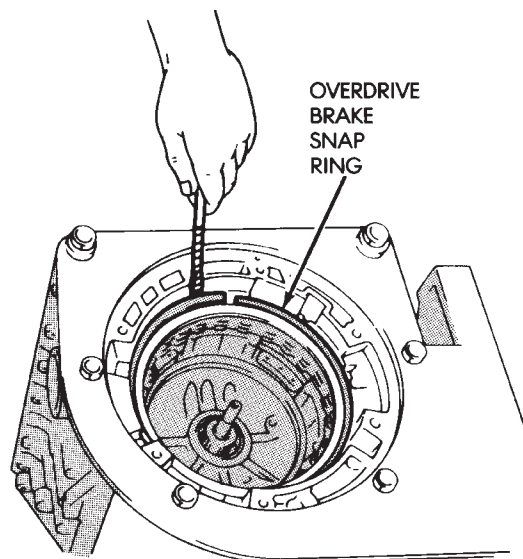
Fig. 17 Fourth Gear Planetary Race Removal

(c) Apply 57-114 psi air pressure through piston apply port and note piston stroke on dial indicator. Stroke length should be: 1.40 - 1.70 mm (0.055 - 0.0699 in.).



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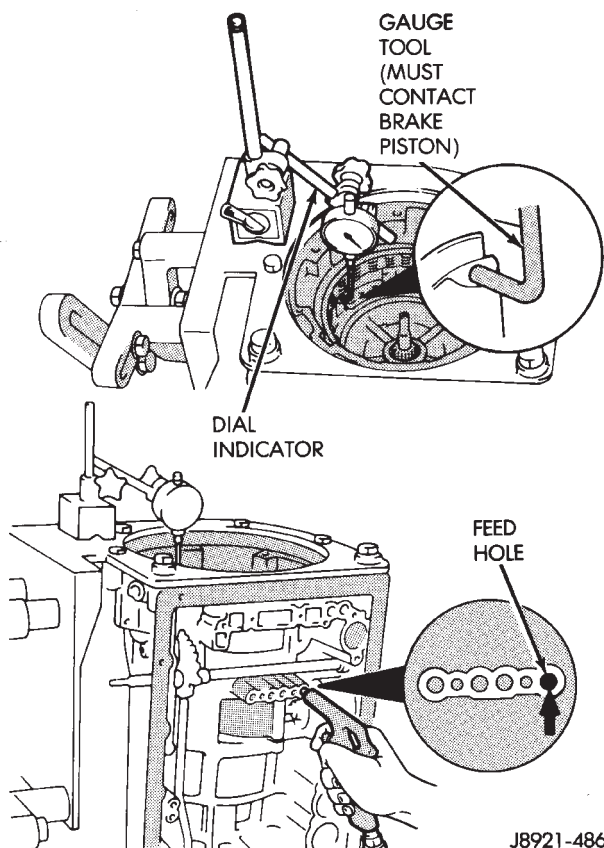
Fig. 18 Removing Bearing, Race And Planetary Ring Gear



J8921-487

Fig. 20 Removing Overdrive Brake Snap Ring

(29) Remove overdrive brake discs and plates (Fig. 21). Then measure disc thickness with a micrometer. Minimum disc thickness is 1.84 mm (0.0724 in.). Replace discs if thickness is less than specified.

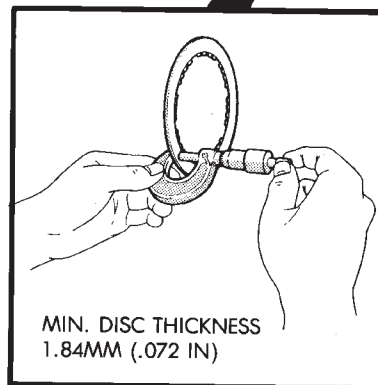
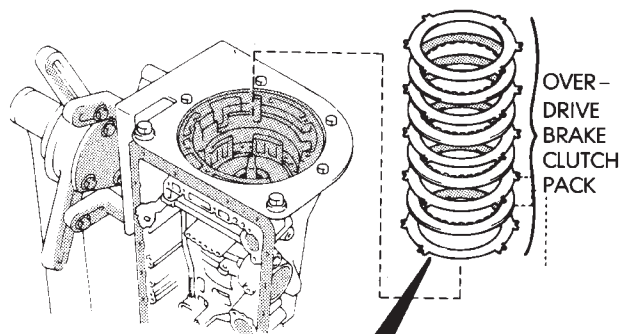


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Fig. 19 Measuring Overdrive Brake Piston Stroke

(d) If stroke is not within limits, replace brake pack retainer. Select required retainer from Overdrive Brake Retainer Selection chart in Specifications section.

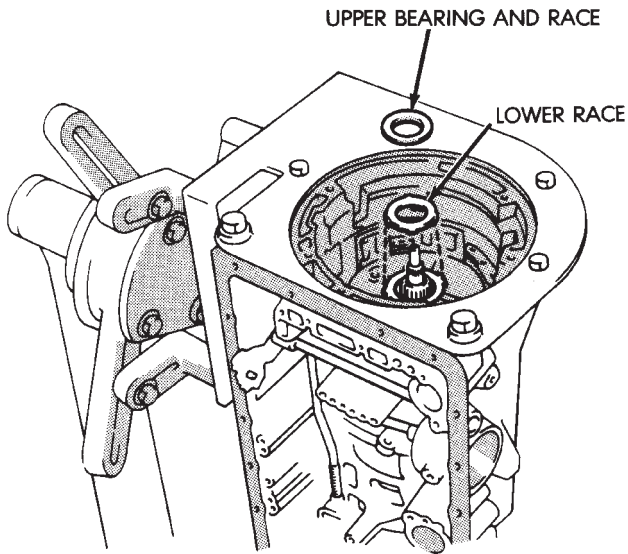
(28) Remove overdrive brake snap ring (Fig. 20).



J8921-488

Fig. 21 Removing/Measuring Overdrive Brake Disc Thickness

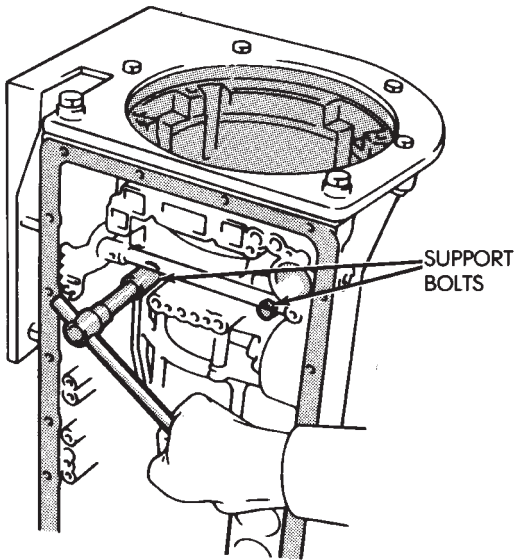
(30) Remove overdrive support lower race and upper bearing and race assembly (Fig. 22).



J8921-489

Fig. 22 Overdrive Support Bearing/Race Removal

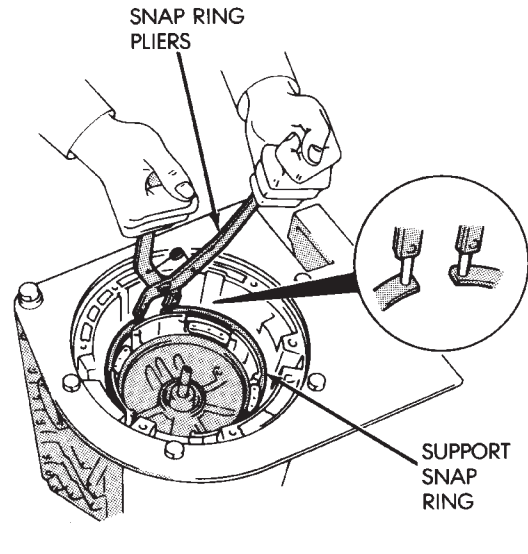
(31) Remove overdrive support bolts (Fig. 23).



J8921-490

Fig. 23 Overdrive Support Bolt Removal

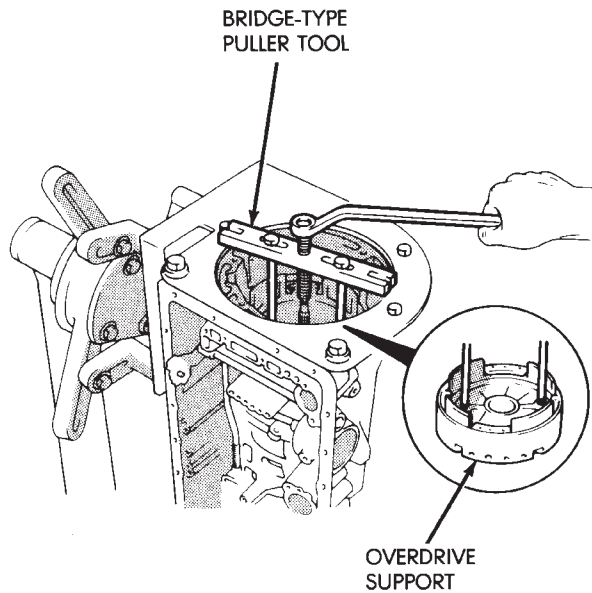
(32) Remove overdrive support snap ring with Snap Ring Plier Tool 7540 (Fig. 24).



J8921-491

Fig. 24 Removing/Installing Overdrive Support Snap Ring

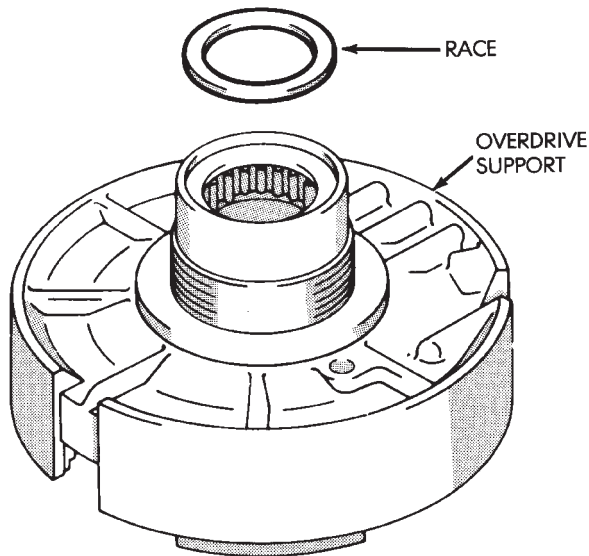
(33) Remove overdrive support (Fig. 25) with bridge-type Puller 7536.



J8921-492

Fig. 25 Removing Overdrive Support

(34) Remove race from hub of overdrive support (Fig. 26).

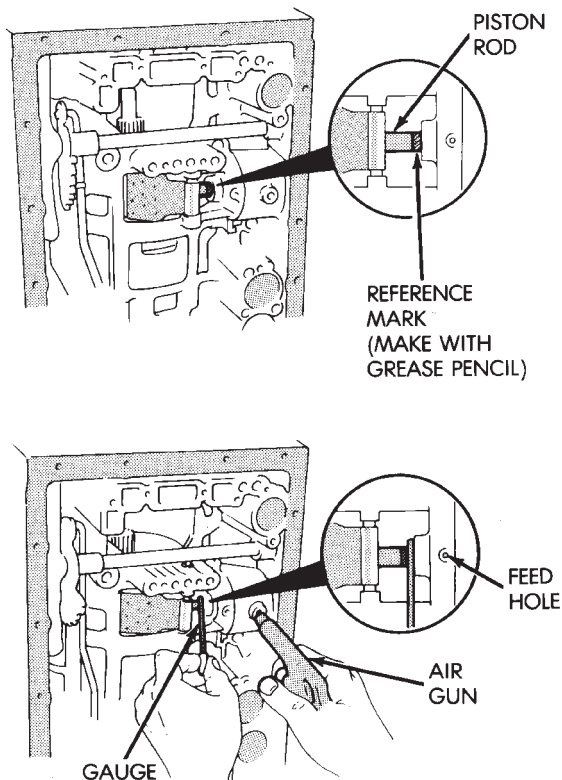


J8921-493

Fig. 26 Remove Overdrive Support Race

(35) Measure stroke length of second coast brake piston rod as follows:

(a) Make reference mark on piston rod (Fig. 27) as shown.



J8921-494

Fig. 27 Measuring Second Coast Brake Piston Rod Stroke

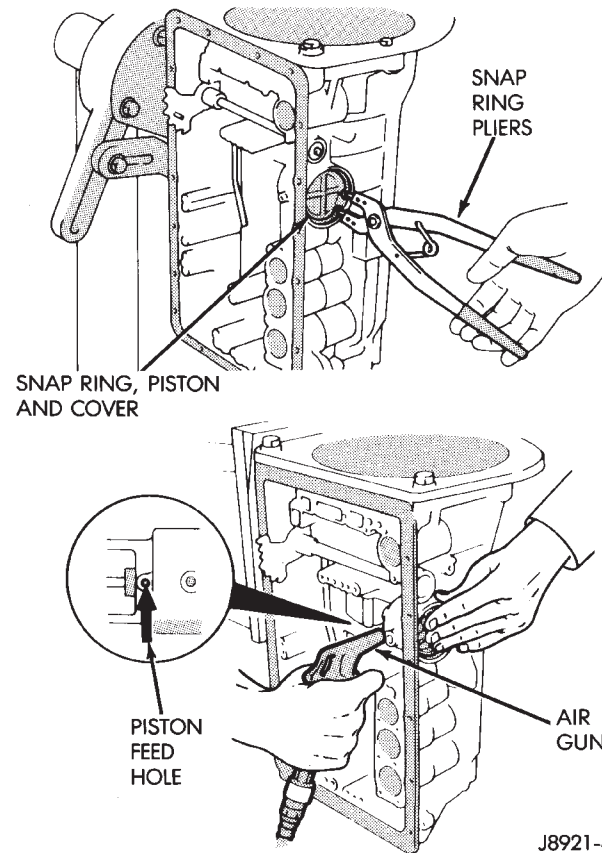
(b) Apply 57-114 psi air pressure through piston feed hole and check stroke length with Gauge Tool 7552 (Fig. 27).

(c) Stroke length should be 1.5 - 3.0 mm (0.059 - 0.118 in.).

(d) If stroke length is incorrect, install new piston rod and recheck stroke. If stroke is still incorrect, replace second coast brake band.

(e) Replacement piston rods are available in two different lengths which are: 71.4 mm (2.811 in.) and 72.9 mm (2.870 in.).

(36) Remove second coast brake piston snap ring with Snap Ring Plier Tool 7540. Then remove piston cover and piston assembly with compressed air applied through piston feed hole (Fig. 28).



J8921-495

Fig. 28 Removing Second Coast Brake Cover And Piston

(37) Disassemble second coast brake piston (Fig. 29).

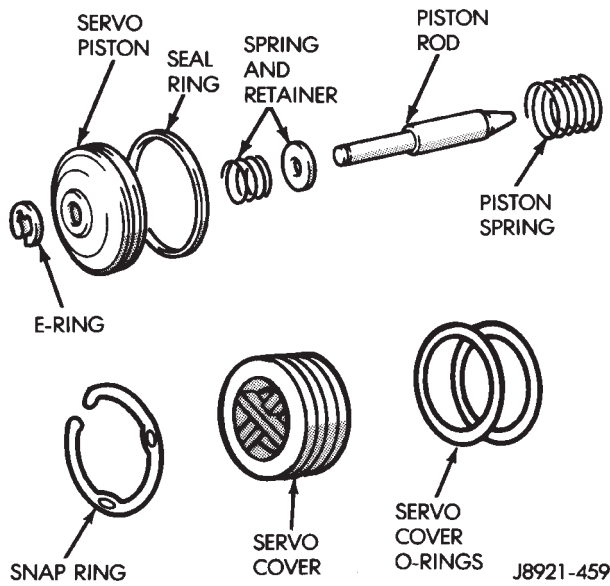


Fig. 29 Second Coast Brake Piston Components

(38) Remove direct and forward clutch assembly (Fig. 30).

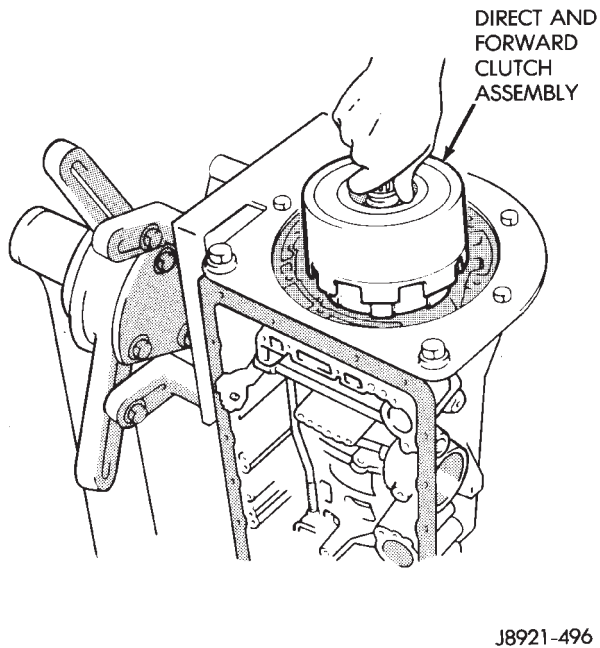


Fig. 30 Removing Direct And Forward Clutch Assembly

(39) Remove thrust bearing and race from clutch hub (Fig. 31).

(40) Remove second coast brake band E-ring from band pin and remove brake band (Fig. 32).

(41) Remove front planetary ring gear front bearing race and remove front planetary ring gear (Fig. 33).

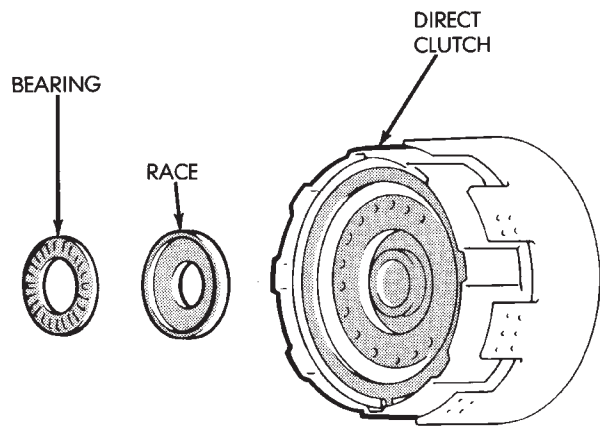


Fig. 31 Remove Bearing And Race From Clutch Hub

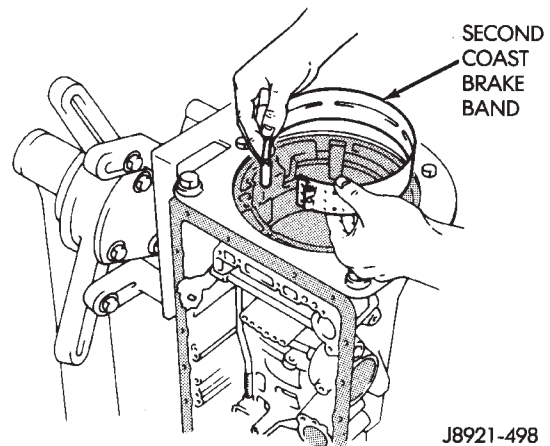
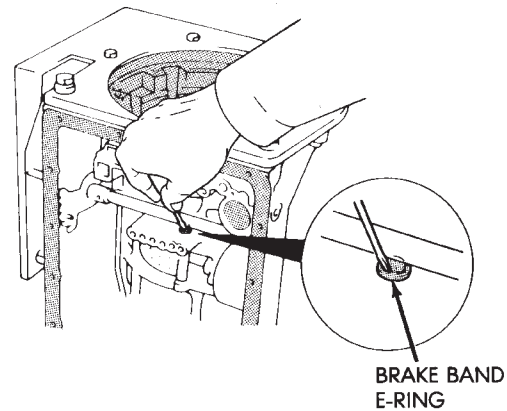
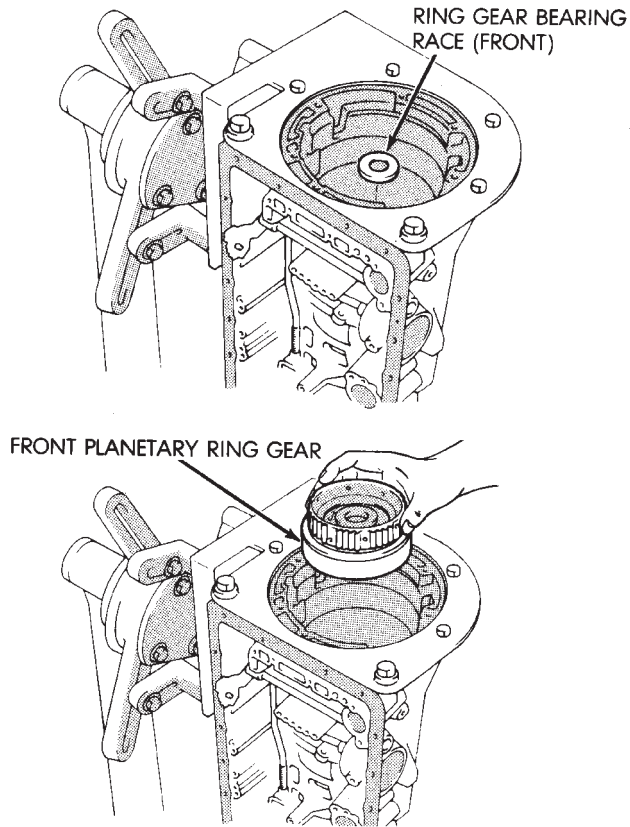


Fig. 32 Removing Second Coast Brake Band

(42) Remove thrust bearing and rear race from ring gear (Fig. 34).

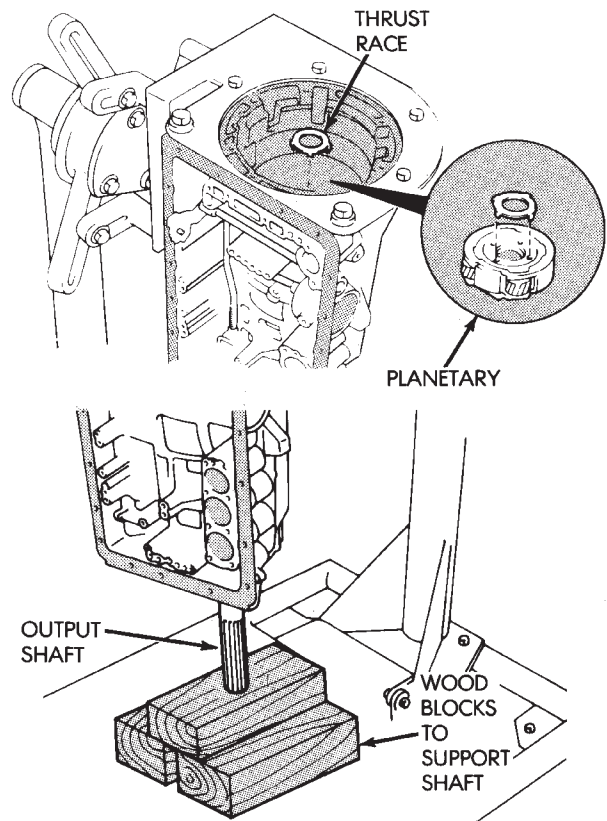
(43) Remove planetary thrust race (Fig. 35).

(44) Relieve load on planetary snap ring as follows: Loosen transmission holding fixture. Turn transmis-



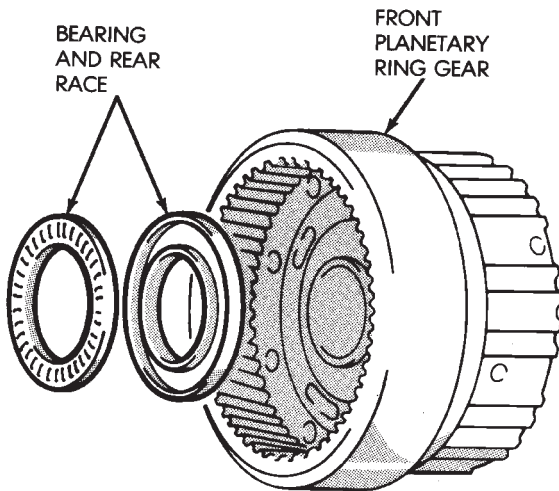
J8921-499

Fig. 33 Removing Front Planetary Ring Gear



J8921-501

Fig. 35 Relieving Load On Planetary Snap Ring



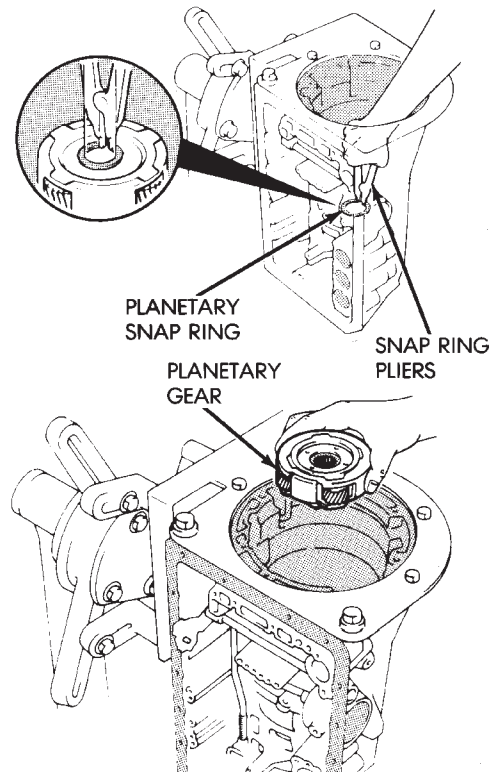
J8921-500

Fig. 34 Removing Ring Gear Bearing And Rear Race

tion over and allow output shaft to support transmission weight. Place wood blocks under shaft to protect splines (Fig. 35).

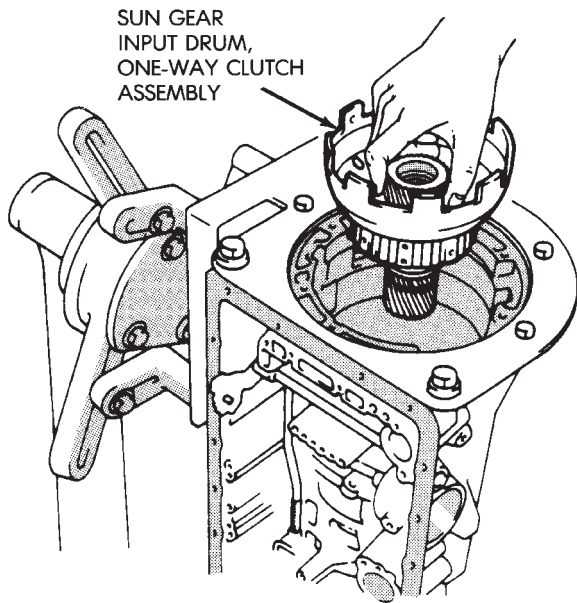
(45) Remove planetary snap ring and remove planetary gear (Fig. 36).

(46) Remove sun gear, input drum and one-way



J8921-502

Fig. 36 Removing Planetary Snap Ring And Gear

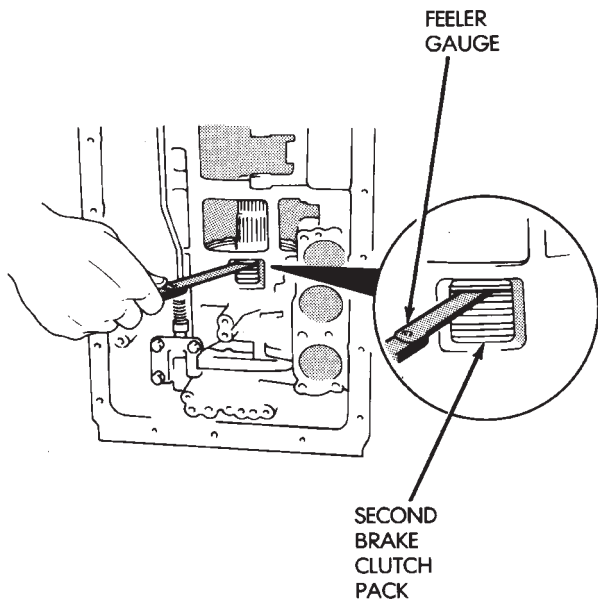


J8921-503

Fig. 37 Removing Sun Gear, Input Drum And One-Way Clutch

clutch as assembly (Fig. 37).

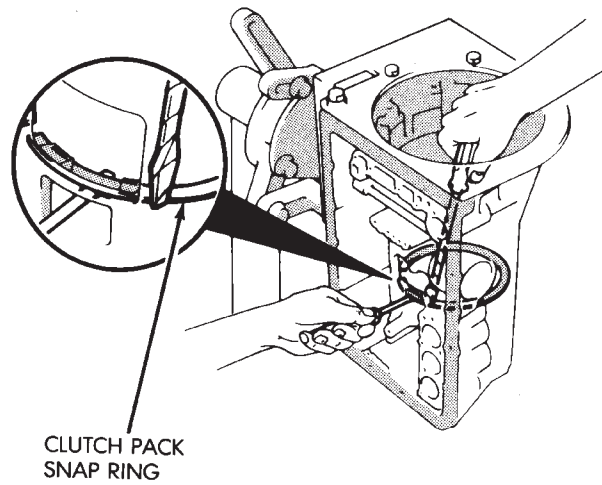
(47) Measure second brake clutch pack clearance (Fig. 38). Clearance should be 0.62 - 1.98 mm (0.0244 - 0.0780 in.). Replace discs if clearance is not within specifications.



J8921-504

Fig. 38 Checking Second Brake Clutch Pack Clearance

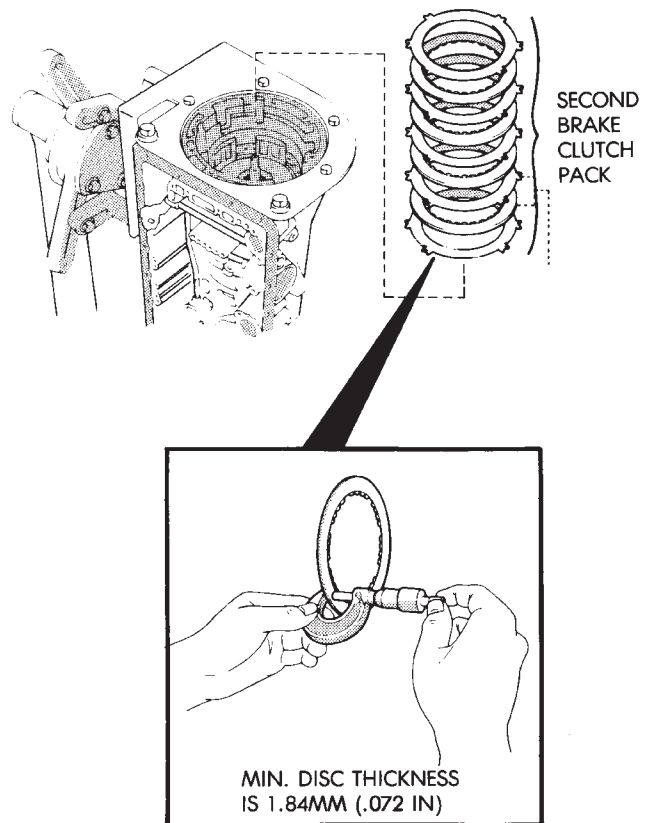
(48) Remove second brake clutch pack snap ring (Fig. 39).



J8921-505

Fig. 39 Removing Second Brake Clutch Pack Snap Ring

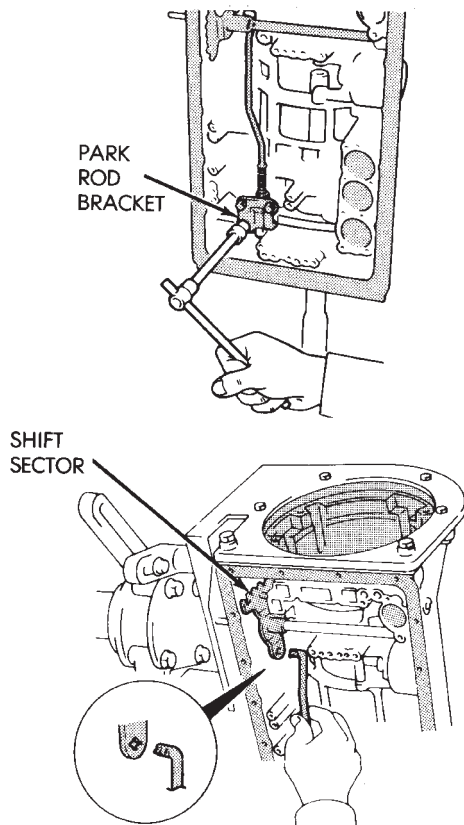
(49) Remove second brake clutch pack (Fig. 40). Measure disc thickness with micrometer. Minimum thickness should be 1.84 mm (0.0724 in.). Replace discs if not within specifications.



J8921-506

Fig. 40 Remove/Measure Second Brake Clutch Disc Thickness

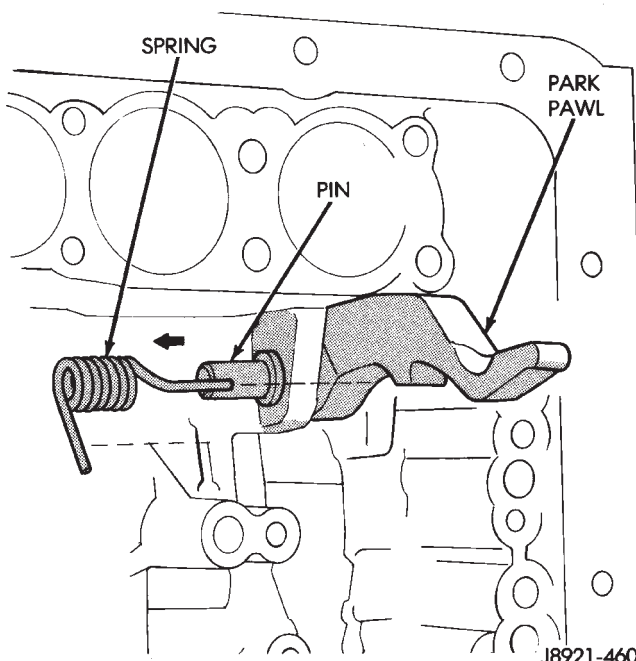
(50) Remove bolts attaching park rod bracket to case. Then disconnect park rod from manual shaft lever and remove rod and bracket (Fig. 41).



J8921-507

Fig. 41 Removing Park Rod And Bracket

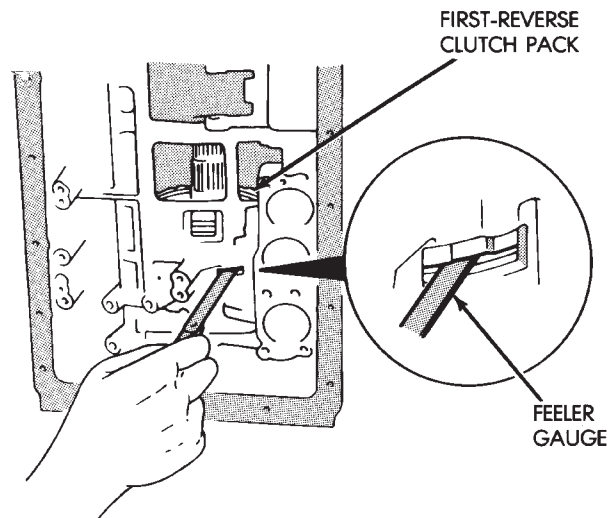
(51) Remove park pawl spring, pin and pawl (Fig. 42).



J8921-460

Fig. 42 Removing Park Pawl, Pin And Spring

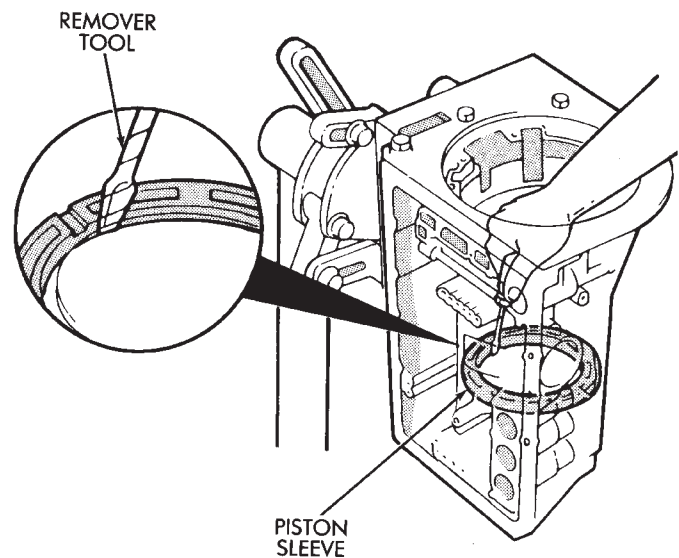
(52) Measure clearance of first-reverse brake clutch pack (Fig. 43). Clearance should be: 0.70 - 1.2 mm (0.028 - 0.047 in.). Replace discs if clearance is not as specified.



J8921-508

Fig. 43 Checking First-Reverse Brake Clutch Pack Clearance

(53) Remove second brake piston sleeve (Fig. 44). Cover remover tool with tape to avoid damaging case.



J8921-509

Fig. 44 Removing Second Brake Piston Sleeve

(54) Remove rear planetary gear, second brake drum and output shaft as an assembly (Fig. 45).

(55) Remove planetary and brake drum thrust bearing and race assembly (Fig. 46).

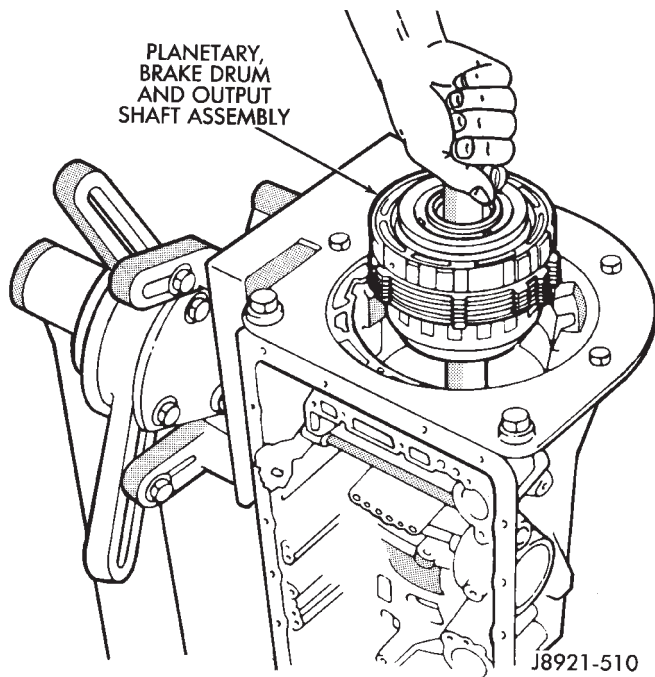


Fig. 45 Removing Rear Planetary, Second Brake Drum And Output Shaft

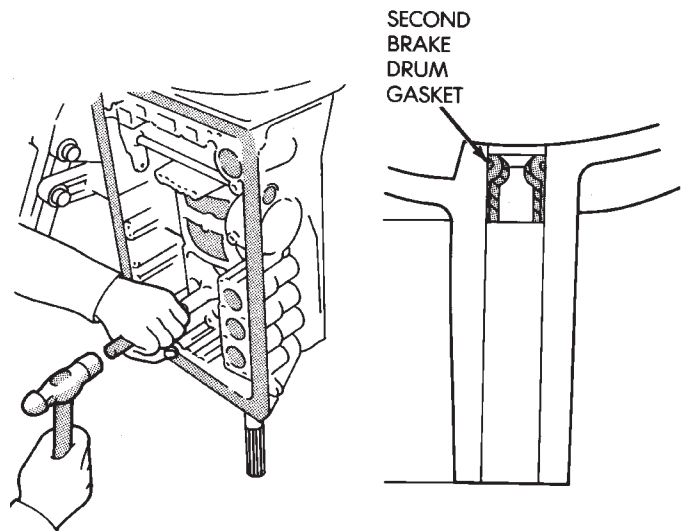


Fig. 47 Removing Brake Drum Gasket

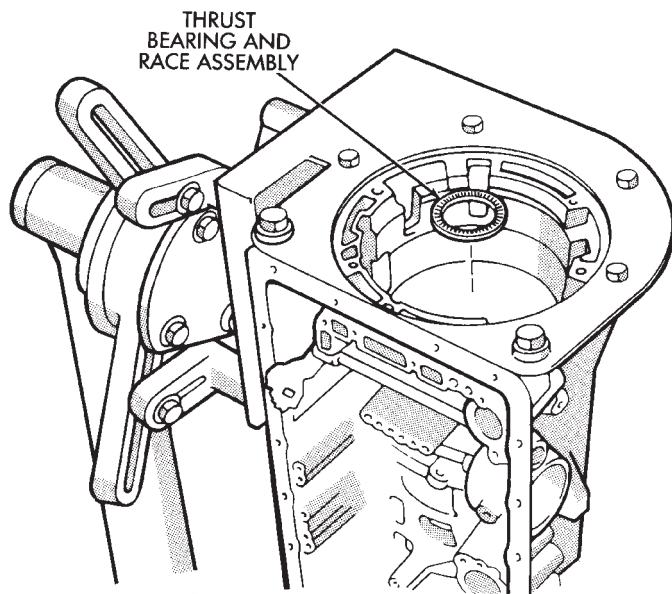


Fig. 46 Removing Planetary And Brake Drum Thrust Bearing And Race Assembly

(56) Remove second brake drum gasket from case with gasket scraper or screwdriver (Fig. 47). Retain tube shaped gasket if condition is OK.

(57) Measure inside diameter of transmission case rear bushing with bore gauge or inside micrometer (Fig. 48). Maximum allowable diameter is 38.18 mm (1.5031 in.). **Replace transmission case if bushing I.D. is greater than specified. Bushing is not serviceable.**

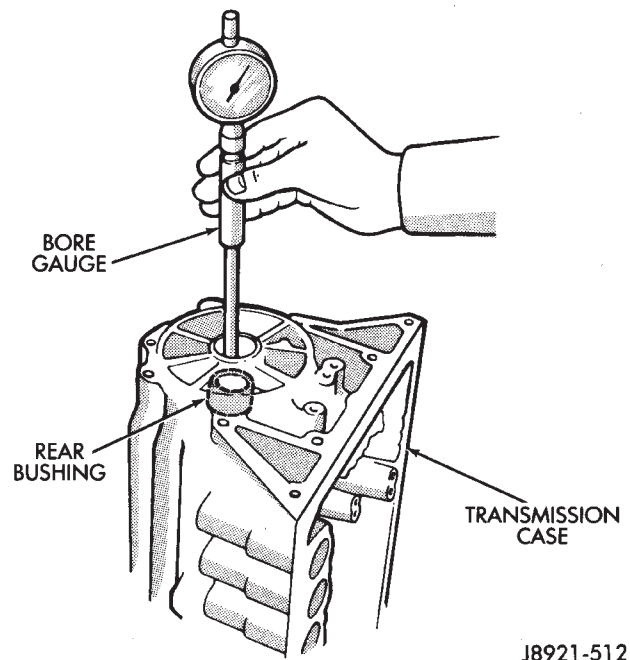


Fig. 48 Checking Rear Bushing Inside Diameter
CLEANING AND INSPECTION

Clean the transmission components with solvent and dry them with compressed air only. Do not use shop towels or rags.

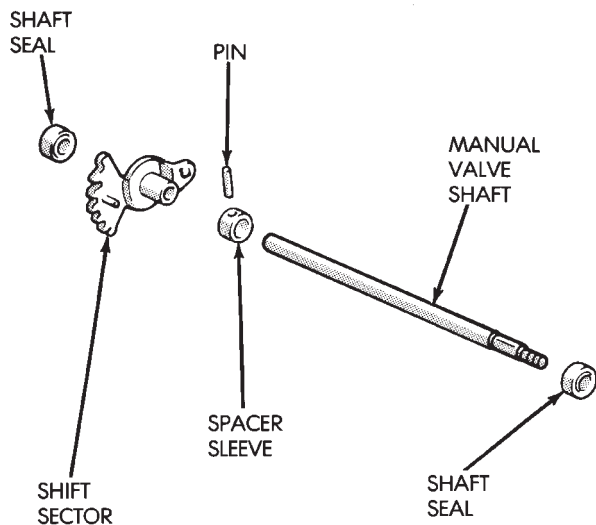
Blow compressed air through all oil feed passages and channels to be sure they are clear. Inspect the transmission components for wear and damage. Replace components that are damaged or worn beyond the limits specified in the individual overhaul procedures.

Replace all O-rings, gaskets and seals. These components are not reusable. Also replace any snap ring that is distorted or damaged.

During overhaul assembly operations, lubricate the transmission components with Jeep or Mopar Mercon™ automatic transmission fluid or petroleum jelly as indicated. Petroleum jelly should be used to pre-lubricate thrust bearings, washers and races. It can also be used to hold parts in position during assembly.

Soak replacement clutch and brake pack components in transmission fluid for at least 30 minutes before installation.

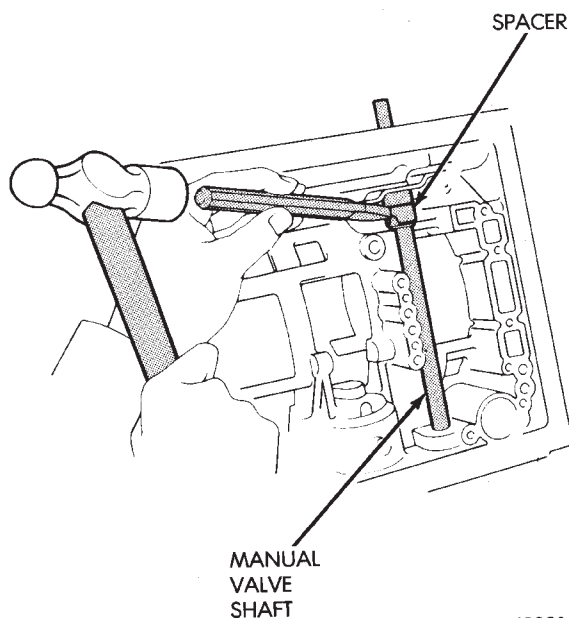
MANUAL VALVE SHAFT OVERHAUL



J8921-444

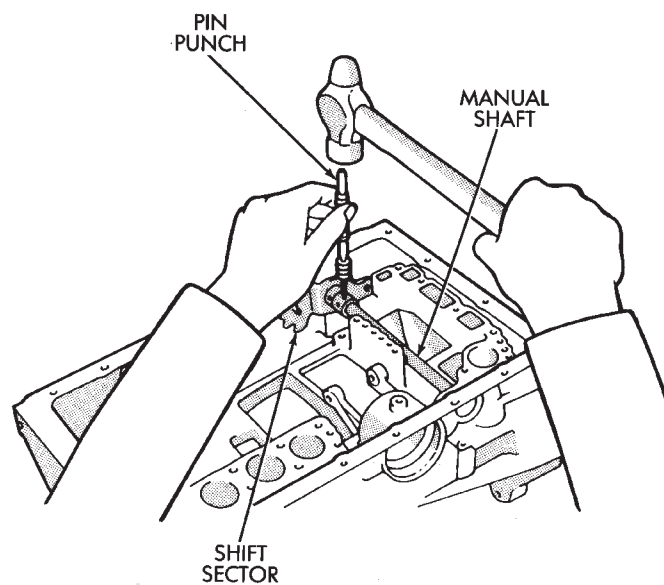
Fig. 1 Manual Valve Shaft Components

- (1) Cut shaft spacer sleeve in half with chisel and remove it from lever and shaft (Fig. 2).
- (2) Remove shift sector retaining pin with pin punch (Fig. 3).
- (3) Pull shaft out of case and remove manual lever.
- (4) Carefully pry shaft seals from case.
- (5) Lubricate new seals with petroleum jelly and install them in case (Fig. 4).
- (6) Install new spacer sleeve on shift sector (Fig. 5).
- (7) Install sector and sleeve on shaft and install shaft in case.
- (8) Align sector and sleeve and install new retaining pin.
- (9) Align notch in sleeve with depression in sector and stake sleeve in two places. Be sure lever and shaft rotate smoothly.



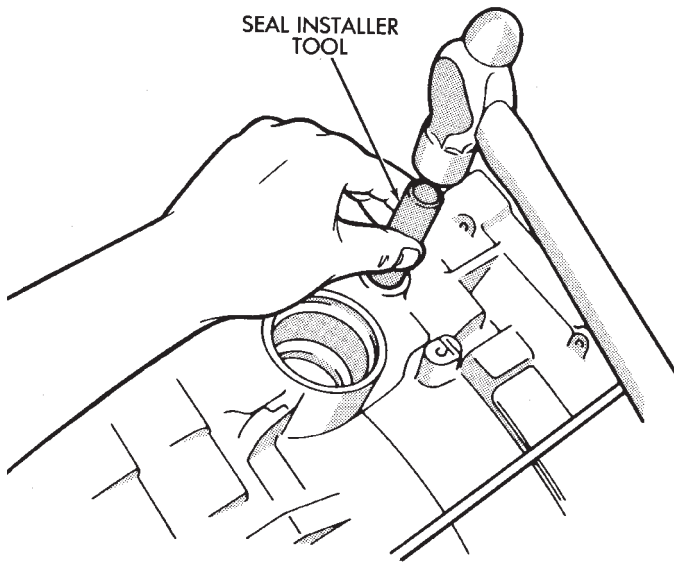
J8921-447

Fig. 2 Cutting Shaft Spacer Sleeve



J8921-513

Fig. 3 Removing/Installing Sector Retaining Pin

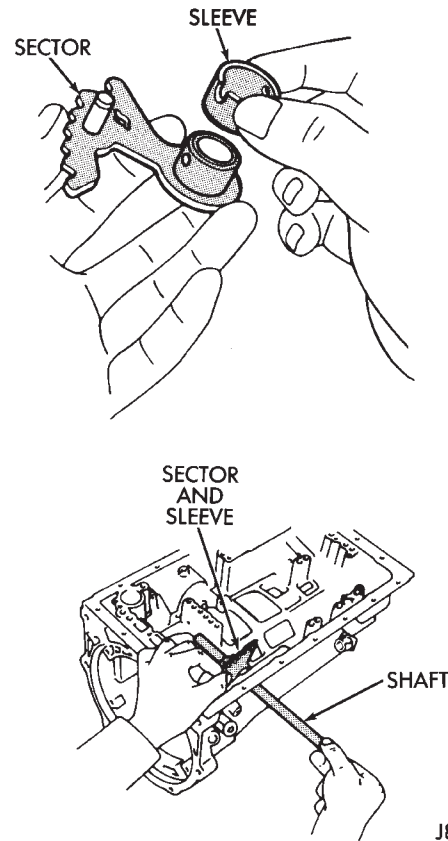


J8921-514

Fig. 4 Installing Manual Shaft Seals

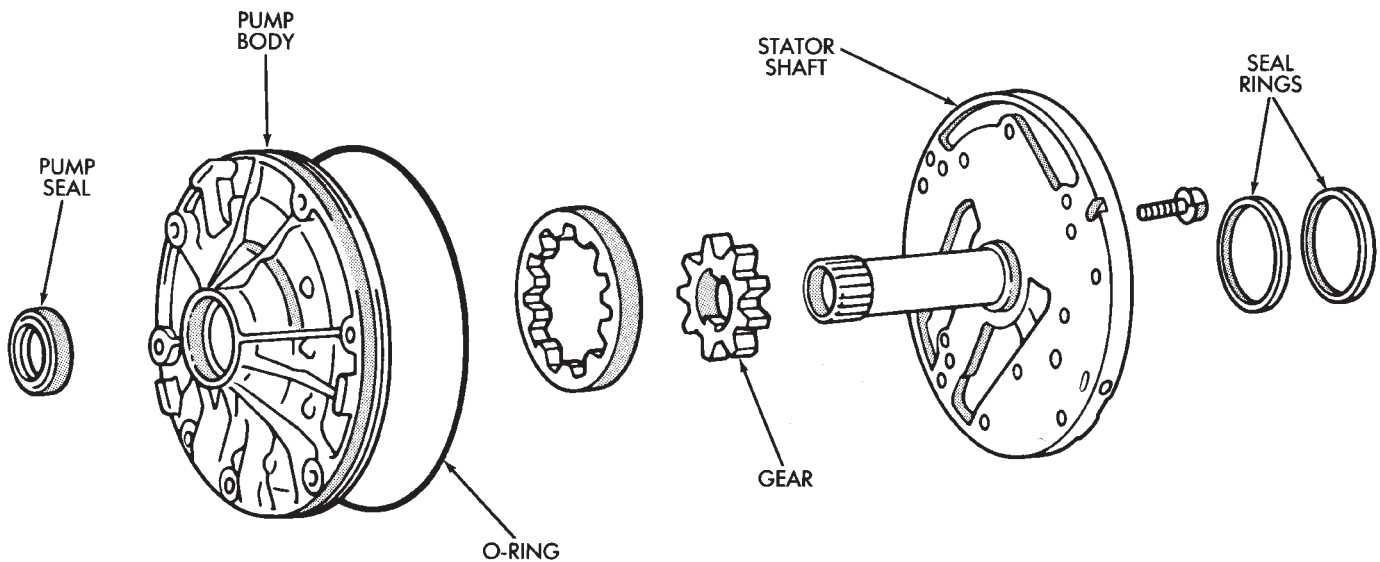
OIL PUMP OVERHAUL

- (1) Remove pump body O-ring (Fig. 1).
- (2) Remove pump seal rings (Fig. 1).
- (3) Remove bolts attaching stator shaft to pump body and separate components.
- (4) Remove drive gear and driven gear from pump body (Fig. 1).
- (5) Measure inside diameter of pump body bushing with bore gauge or inside micrometer (Fig. 2). Diameter should be maximum of 38.19 mm (1.5035 in.). Replace pump body if bushing I.D. is greater than specified.



J8921-515

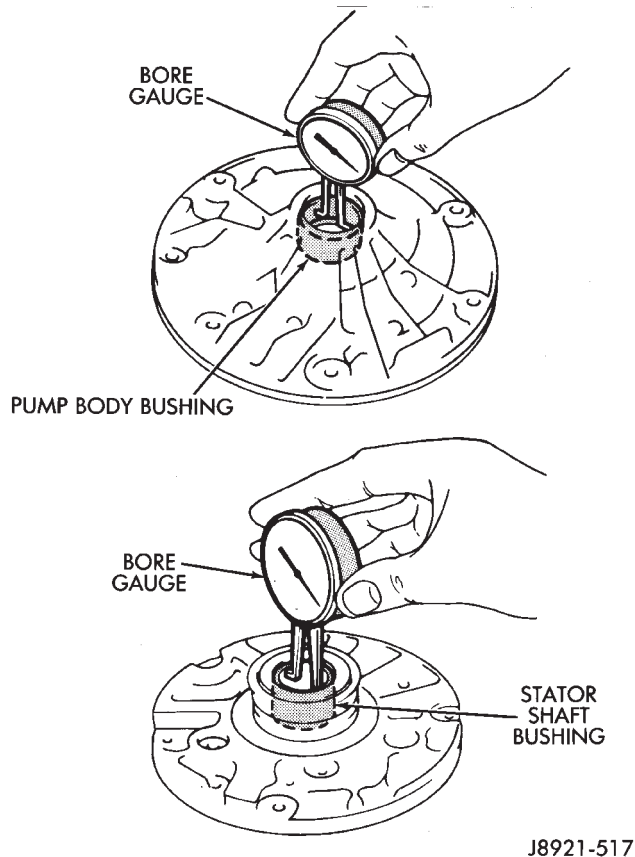
Fig. 5 Installing Manual Shaft And Sector



J8921-516

Fig. 1 Oil Pump Components

(6) Measure inside diameter of stator shaft bushing (Fig. 2). Take measurements at front and rear of bushing. Diameter should be maximum of 21.58 mm (0.08496 in.) at front and 27.08 mm (1.0661 in.) at rear. Replace stator shaft if bushing diameter is greater than specified.



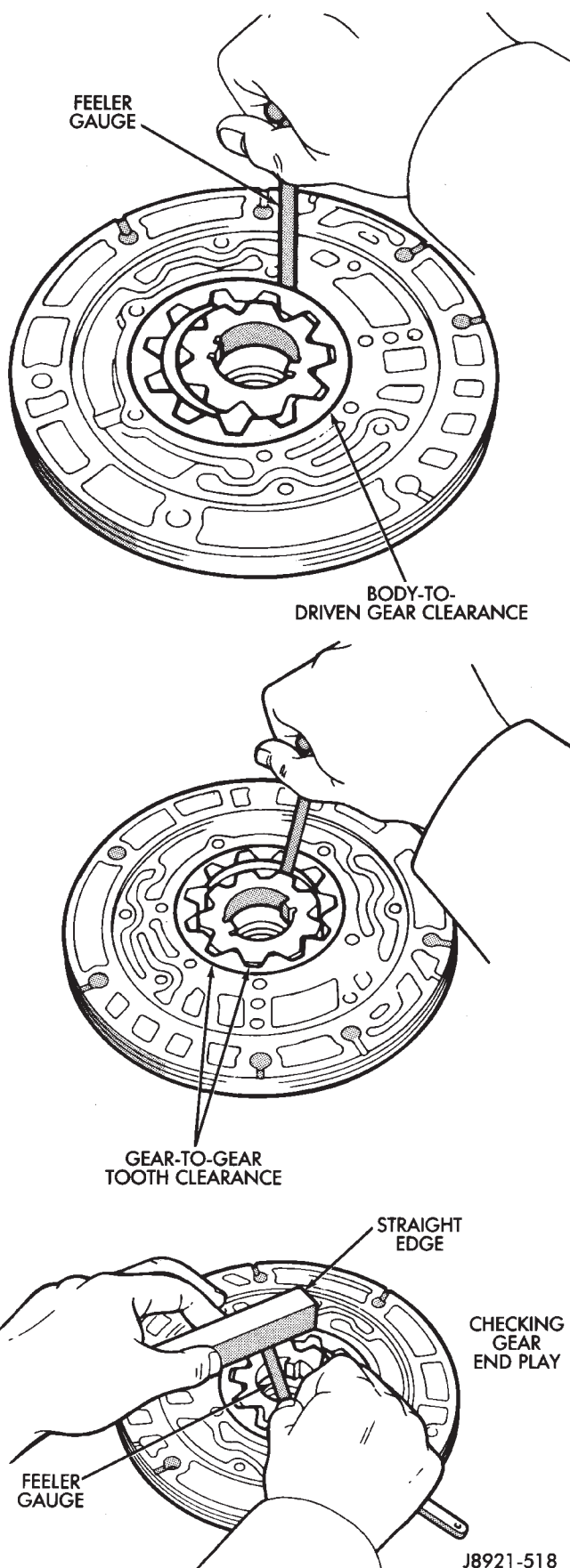
J8921-517

Fig. 2 Checking Pump/Stator Shaft Bushings

(7) Measure oil pump clearances (Fig. 3).

- Clearance between pump driven gear and pump body should be maximum of 0.3 mm (0.012 in).
- Clearance between tips of pump gear teeth should be maximum of 0.3 mm (0.012 in).
- Clearance between rear surface of pump housing and pump gears should be maximum of 0.1 mm (0.004 in).

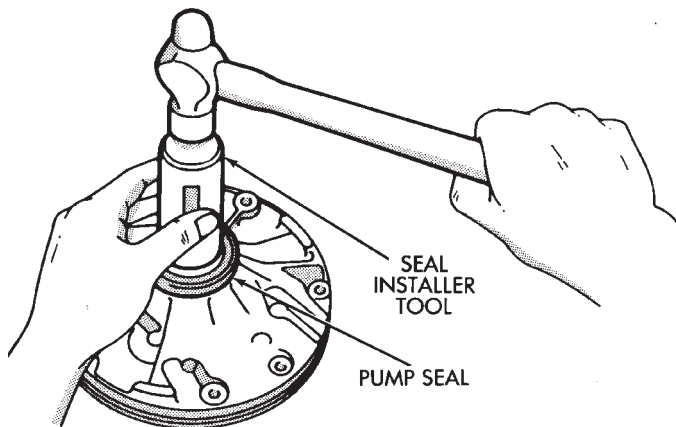
(8) Replace pump body and gears if any clearance is greater than specified.



J8921-518

Fig. 3 Checking Pump Gear Clearances

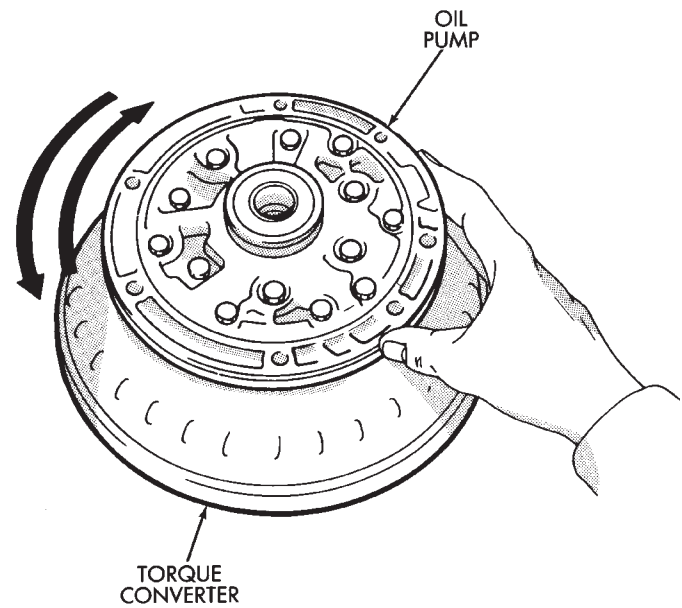
(9) Remove old pump seal. Install new seal with Seal Installer 7549 (Fig. 4).



J8921-519

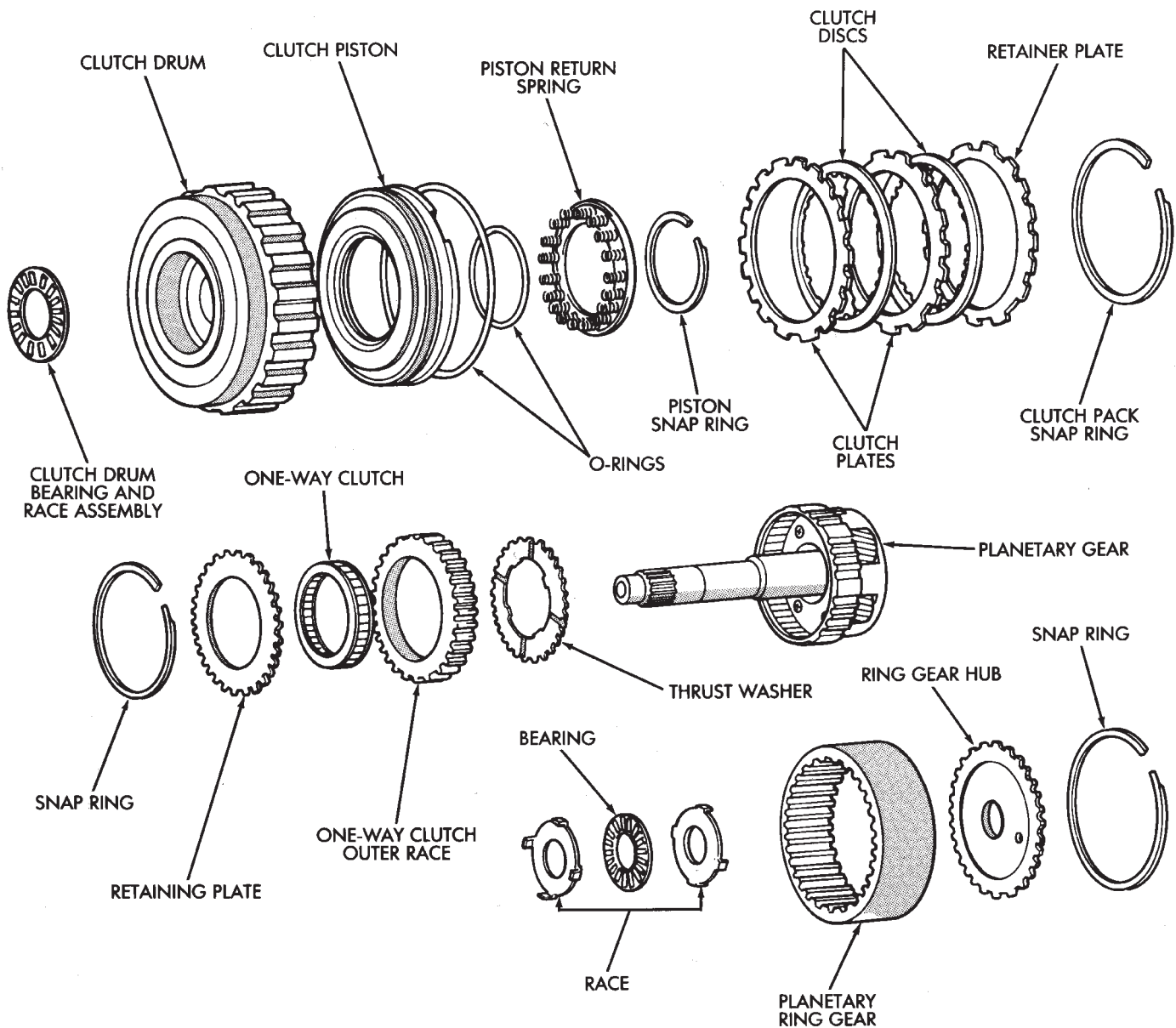
Fig. 4 Installing Pump Seal

- (10) Lubricate and install gears in pump body.
- (11) Assemble stator shaft and pump body. Tighten shaft-to-body bolts to 10 N·m (7 ft. lbs.) torque.
- (12) Install new O-ring on pump body and new seal rings on stator shaft.
- (13) Install pump in torque converter and check pump gear rotation. Gears must rotate smoothly when turned clockwise and counterclockwise.
- (14) Lubricate pump O-ring and seal rings with petroleum jelly.



J8921-520

Fig. 5 Checking Pump Gear Rotation



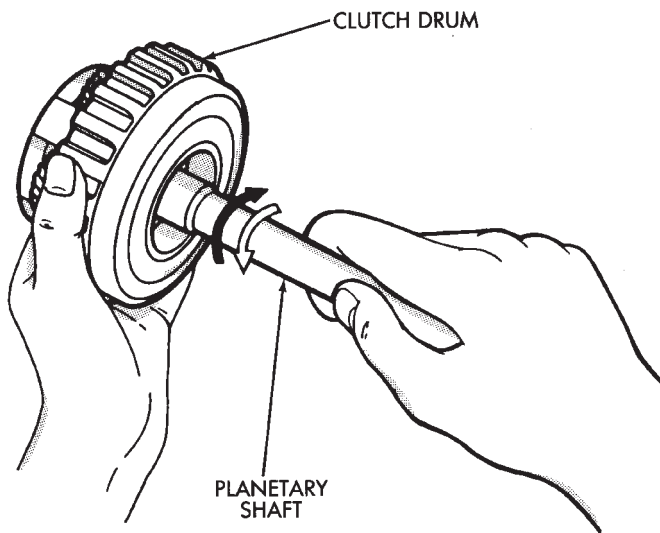
J8921-521

Fig. 1 Overdrive Planetary Gear And Clutch Components

OVERDRIVE PLANETARY GEAR AND CLUTCH OVERHAUL

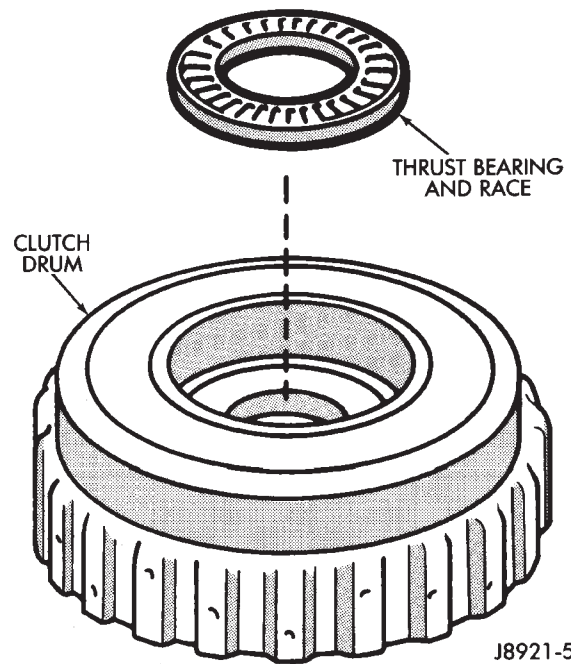
GEAR AND CLUTCH DISASSEMBLY

- (1) Check operation of one-way clutch in clutch drum. Hold drum and turn planetary shaft clockwise and counterclockwise. Shaft should turn clockwise freely but lock when turned counterclockwise. Replace one-way clutch if necessary.
- (2) Remove overdrive clutch from planetary gear (Fig. 3).
- (3) Remove thrust bearing and race assembly from clutch drum (Fig. 4).



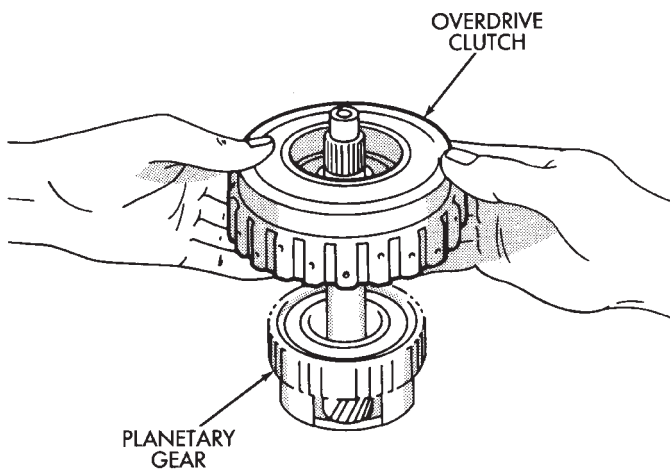
J8921-522

Fig. 2 Checking One-Way Clutch



J8921-524

Fig. 4 Removing Clutch Drum Bearing And Race



J8921-523

Fig. 3 Removing Overdrive Clutch From Gear

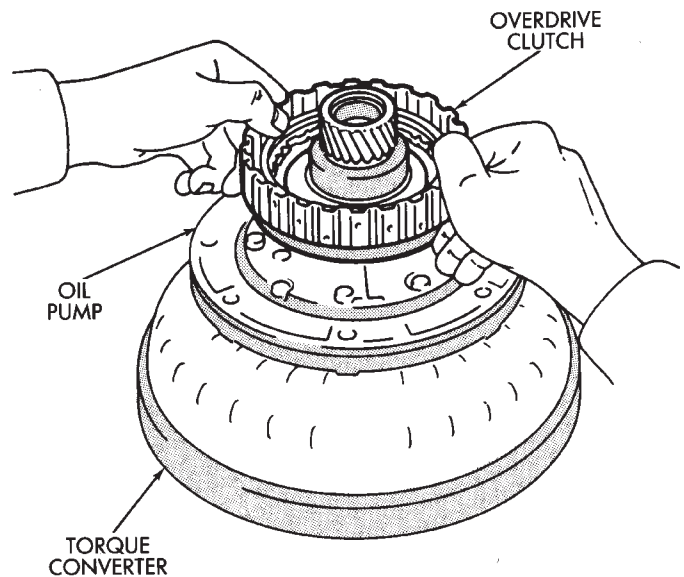
(4) Measure stroke length of clutch piston as follows:

(a) Mount oil pump on torque converter. Then mount clutch on oil pump (Fig. 5).

(b) Mount dial indicator on clutch and position indicator stylus on clutch piston (Fig. 6).

(c) Apply compressed air through clutch feed hole in oil pump and note piston stroke length. Stroke length should be 1.85 - 2.15 mm (0.0728 - 0.0846 in.).

(5) Replace clutch pack retainer if stroke length is incorrect. Refer to chart in Specifications section for replacement retainer thicknesses.



J8921-525

Fig. 5 Assembling Converter, Pump And Clutch For Test

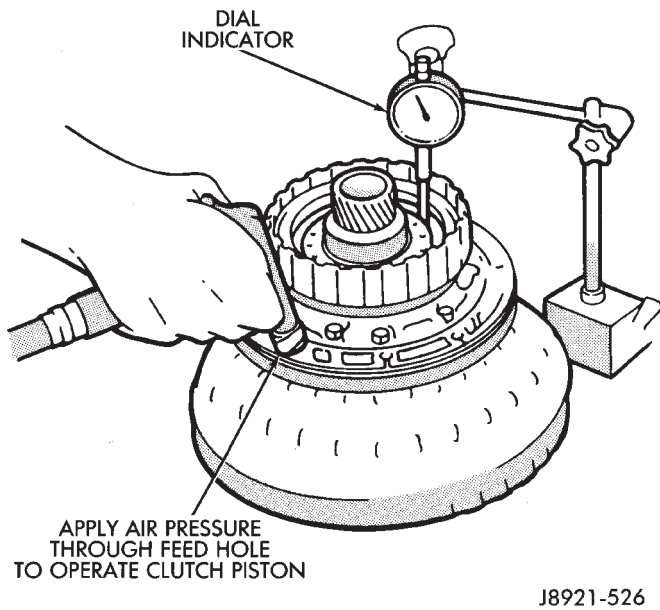


Fig. 6 Checking Overdrive Clutch Piston Stroke

(6) Remove clutch pack snap ring and remove the clutch pack.

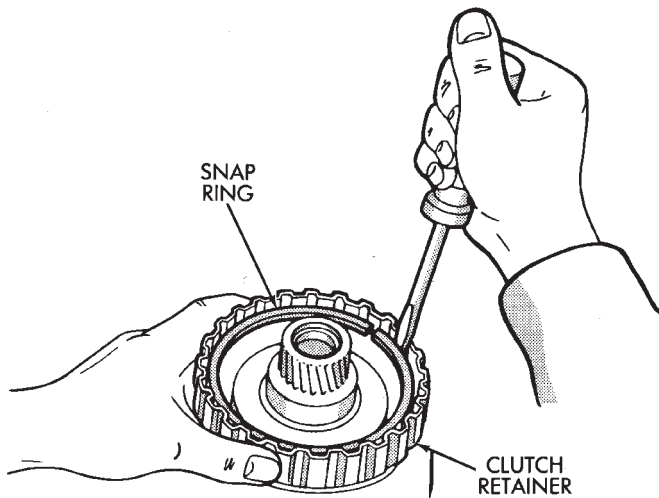


Fig. 7 Removing Clutch Pack Snap Ring

(7) Compress piston return spring with Tool 7538 (Fig. 8). Remove snap ring and remove compressor tool.

(8) Remove compressor tool and piston return springs.

(9) Mount oil pump on converter. Then mount clutch on oil pump (Fig. 9).

(10) Hold clutch piston by hand and apply compressed air through oil pump feed hole to ease piston out (Fig. 9). Apply only enough air pressure to remove piston.

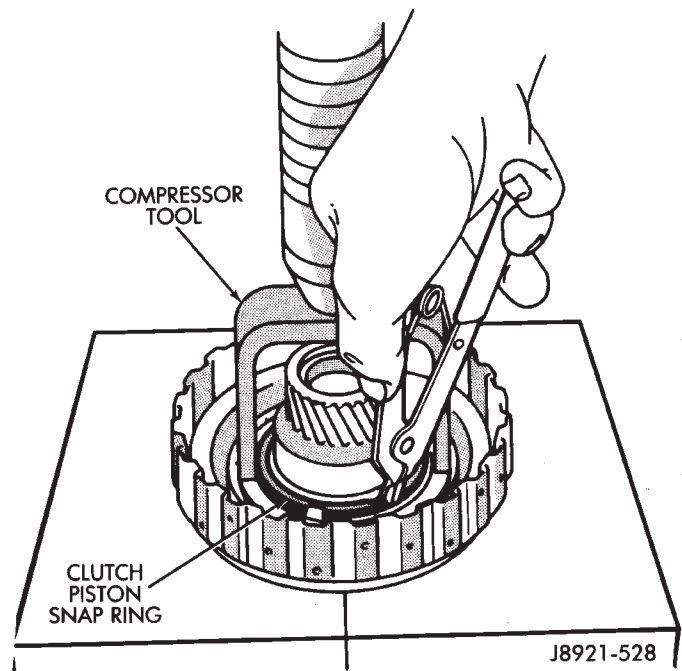


Fig. 8 Removing Clutch Piston Snap Ring

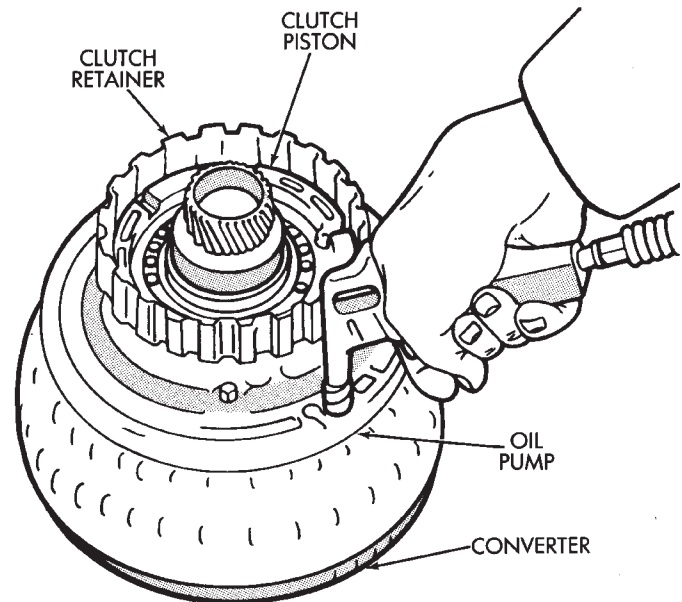


Fig. 9 Removing Overdrive Clutch Piston

(11) Remove bearing and race from ring gear (Fig. 10).

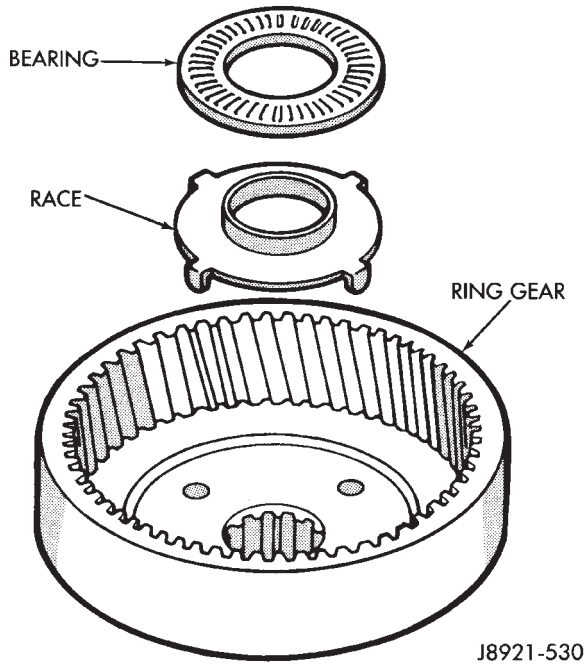


Fig. 10 Removing Ring Gear Bearing And Race

(12) Remove snap ring from ring gear and remove ring gear hub (Fig. 11).

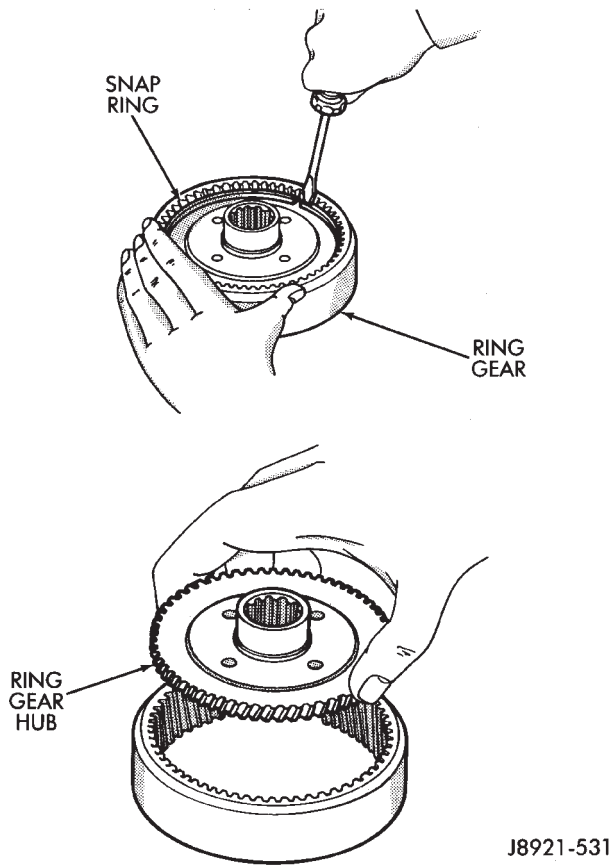


Fig. 11 Removing Ring Gear Hub

(13) Remove race from planetary gear (Fig. 12).

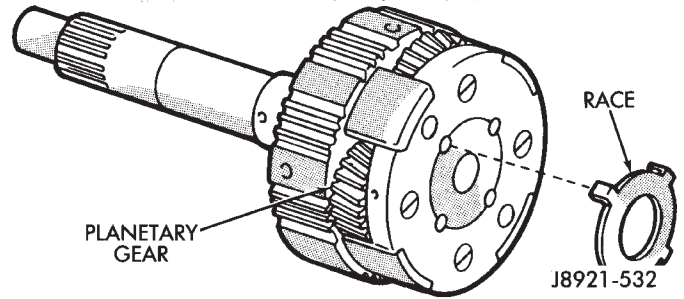


Fig. 12 Remove Planetary Gear Race

(14) Remove snap ring and remove retaining plate (Fig. 13).

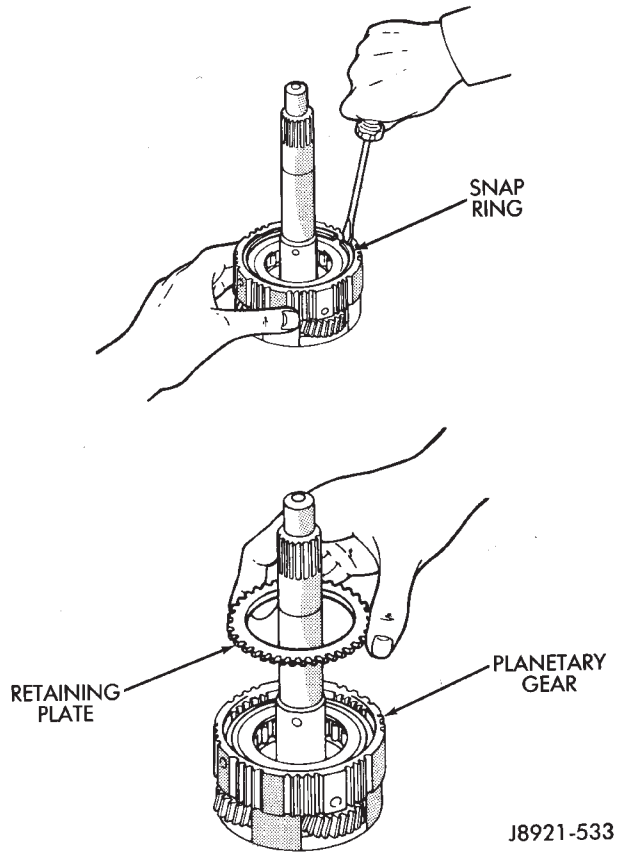
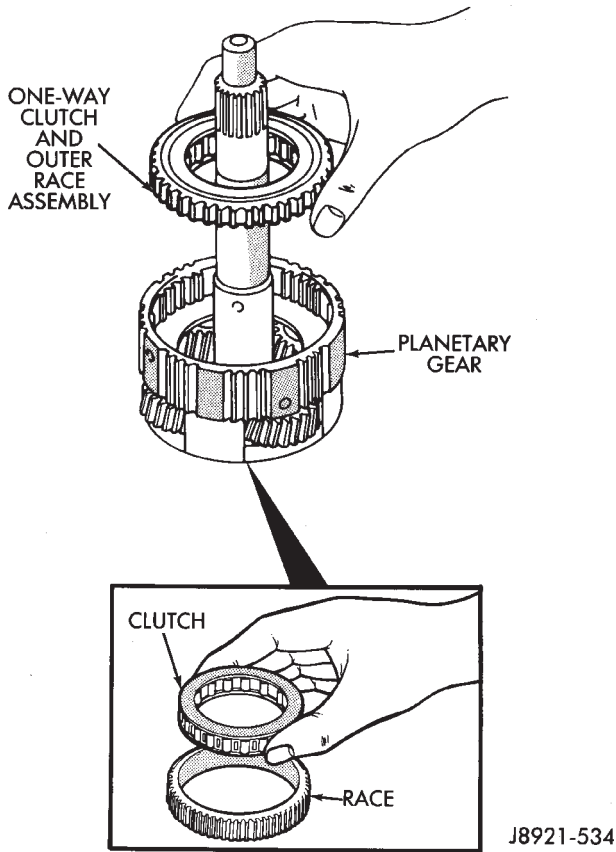


Fig. 13 Removing Snap Ring And Retaining Plate

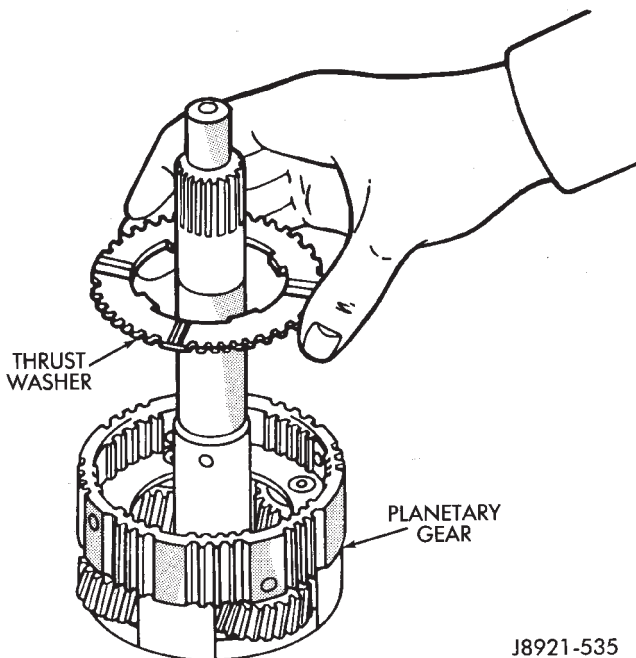
(15) Remove one-way clutch and outer race as assembly. Then separate race from clutch (Fig. 14).



J8921-534

Fig. 14 Removing One-Way Clutch

(16) Remove thrust washer (Fig. 15).

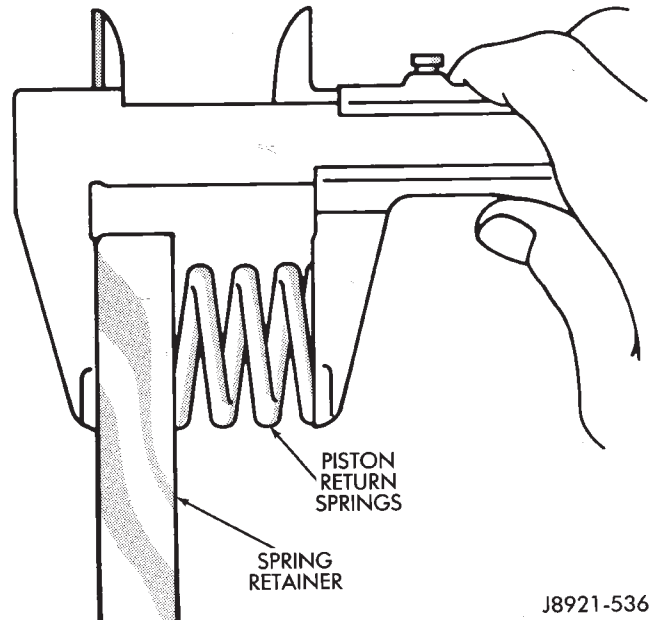


J8921-535

Fig. 15 Removing Planetary Thrust Washer

(17) Measure clutch disc thickness. Minimum allowable thickness is 1.84 mm (0.0724 in.).

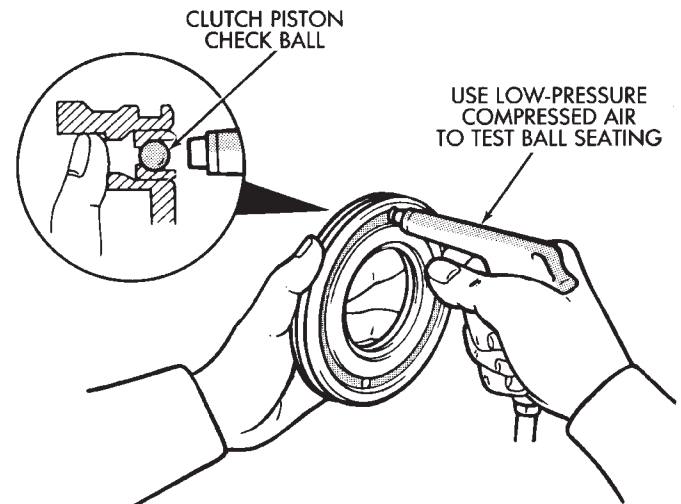
(18) Measure free length of piston return springs with springs in retainer (Fig. 16). Length should be 16.8 mm (0.661 in.).



J8921-536

Fig. 16 Checking Piston Return Spring Length

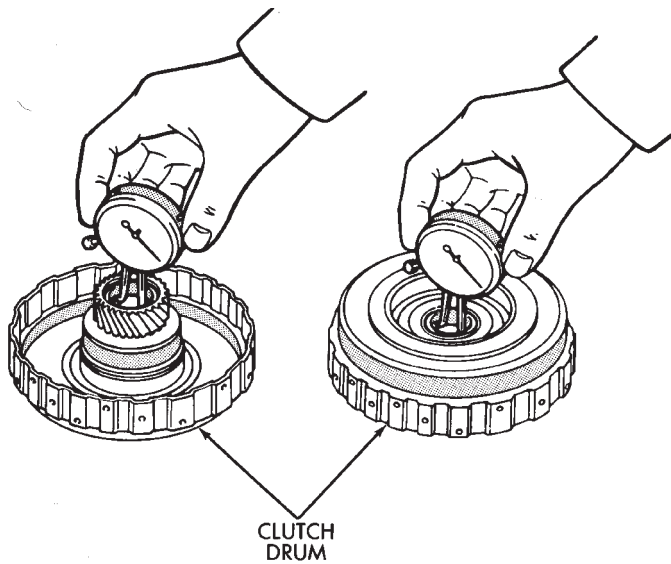
(19) Check clutch piston check ball (Fig. 17). Shake piston to see if ball moves freely. Then check ball sealing by applying low pressure compressed air to ball inlet as shown. Air should not leak past check ball.



J8921-537

Fig. 17 Testing Clutch Piston Check Ball

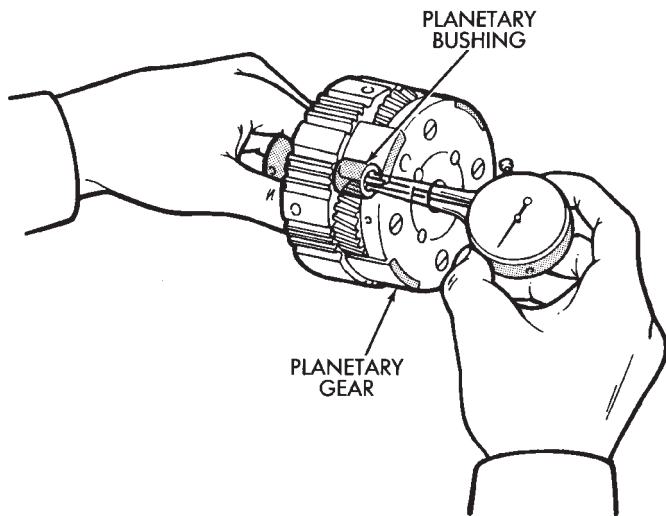
(20) Check inside diameter of clutch drum bushings with bore gauge or inside micrometer (Fig. 18). Maximum inside diameter is 27.11 mm (1.0673 in.). Replace drum if bushing inside diameter is greater than specified.



J8921-538

Fig. 18 Checking Clutch Drum Bushings

(21) Check inside diameter of planetary gear bushing (Fig. 19). Maximum inside diameter is 11.27 mm (0.4437 in.). Replace planetary gear if bushing inside diameter is greater than specified.

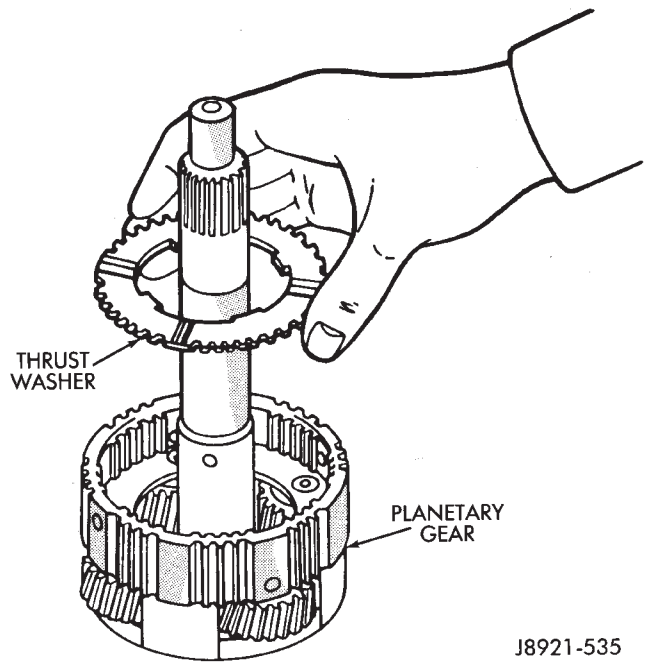


J8921-539

Fig. 19 Checking Planetary Bushing

Assembling Gear And Clutch

(1) Install thrust washer in planetary gear (Fig. 20). **Grooved side of washer faces up and toward front.**

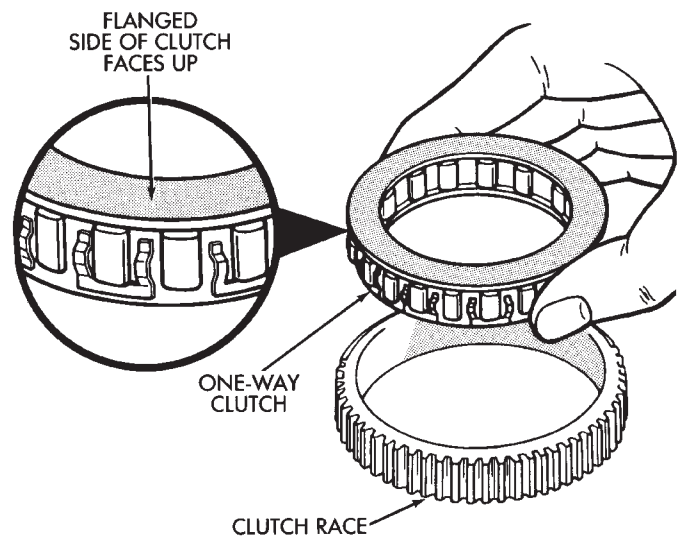


J8921-535

Fig. 20 Install Planetary Thrust Washer

(2) Install one-way clutch in race (Fig. 21). Flanged side of clutch must face upward as shown.

(3) Install assembled one-way clutch and outer race in planetary gear. Be sure flanged side of clutch is facing upward.



J8921-540

Fig. 21 Assembling One-Way Clutch And Race

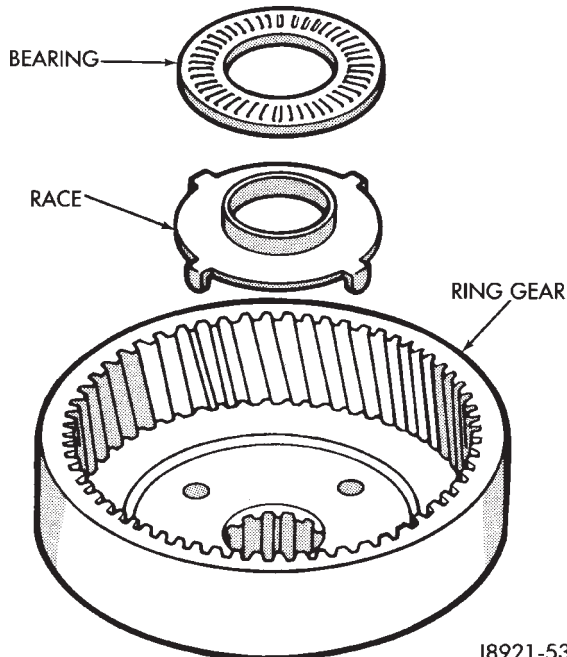
(4) Install clutch pack retaining plate and snap ring in planetary gear.

(5) Coat planetary race with petroleum jelly and install it on planetary gear. Outside diameter of race is 41.8 mm (1.646 in.); inside diameter is 27.1 mm (1.067 in.).

(6) Install hub in planetary ring gear and install snap ring.

(7) Coat race and bearing with petroleum jelly and install in planetary ring gear (Fig. 22).

(8) Verify bearing/race size. Outside diameter of race is 47.8 mm (1.882 in.) and inside diameter is 24.2 mm (0.953 in.). Outside diameter of bearing is 46.8 mm (1.843 in.) and inside diameter is 26 mm (1.024 in.).

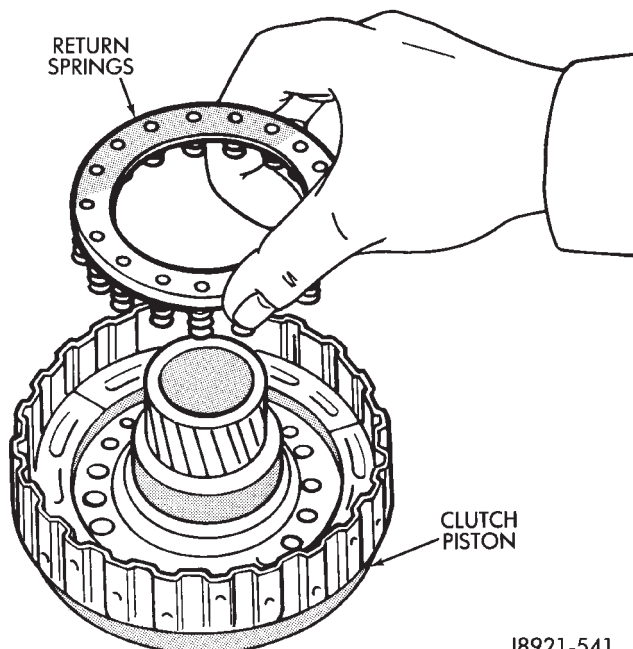


J8921-530

Fig. 22 Install Ring Gear Bearing And Race

(9) Lubricate and install new O-rings on clutch piston. Then install piston in clutch drum.

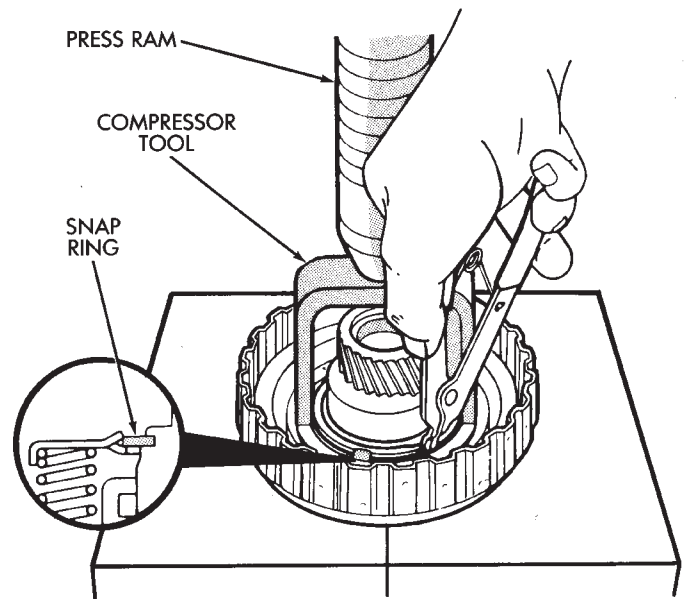
(10) Install piston return springs in clutch piston (Fig. 23).



J8921-541

Fig. 23 Installing Piston Return Springs

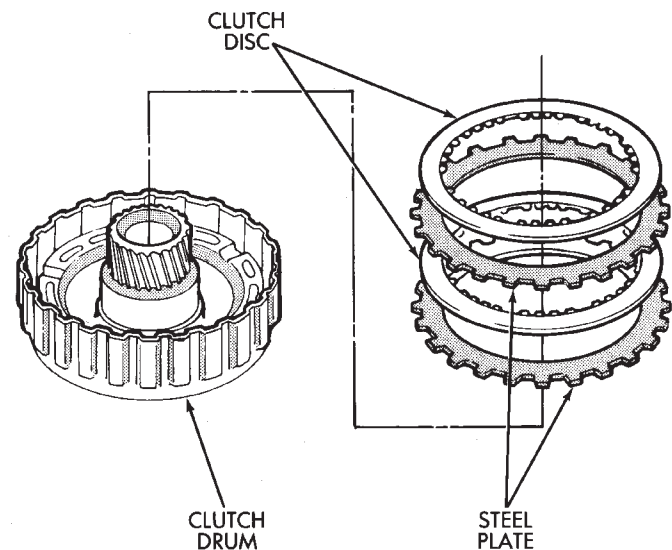
(11) Install piston snap ring. Compress piston return springs with Tool 7538 and shop press (Fig. 24).



J8921-542

Fig. 24 Installing Clutch Piston Snap Ring

(12) Install clutch pack in drum. Install steel plate first, then a disc (Fig. 25). Continue installation sequence until required number of discs and plates have been installed.



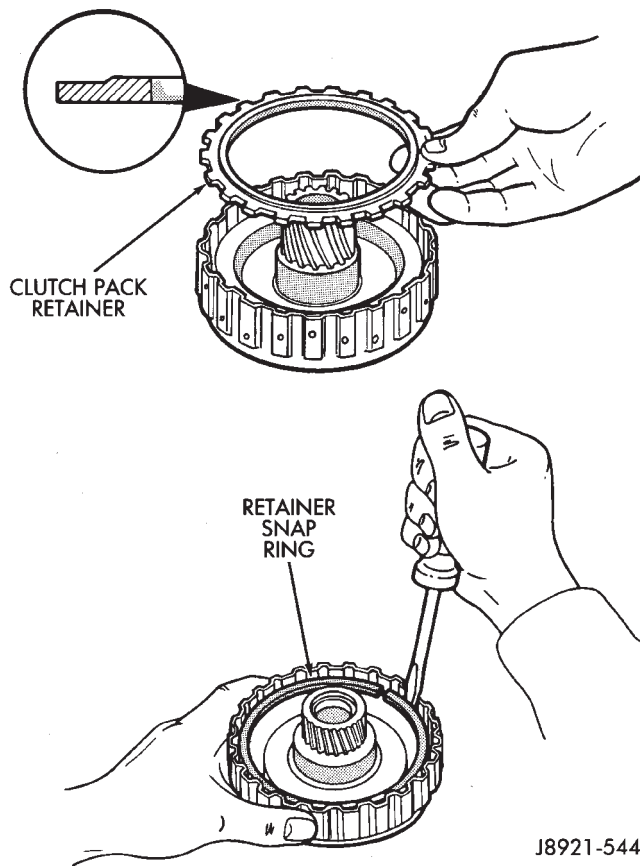
J8921-543

Fig. 25 Installing Clutch Discs And Plates

(13) Install clutch pack retainer with flat side facing downward. Then install retainer snap ring (Fig. 26). Compress springs with suitable tool.

(14) Measure clutch piston stroke length again (refer to procedure outlined in disassembly procedure). If stroke length is incorrect, install new clutch discs or select fit retainer. Retainer thicknesses are outlined in the Specifications section.

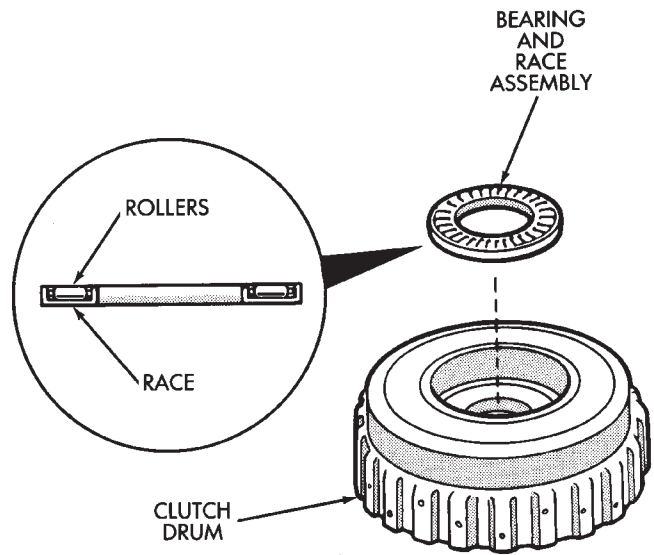
(15) Install clutch drum bearing and race assembly (Fig. 27). Be sure bearing rollers face upward as shown. Outside diameter of assembled bearing and race is 50.2



J8921-544

Fig. 26 Installing Retainer And Snap Ring

mm (1.976 in.). Inside diameter is 28.9 mm (1.138 in.).
 (16) Install clutch on planetary gear.
 (17) Verify one-way clutch operation. Hold drum and turn planetary shaft clockwise and counterclock-



J8921-545

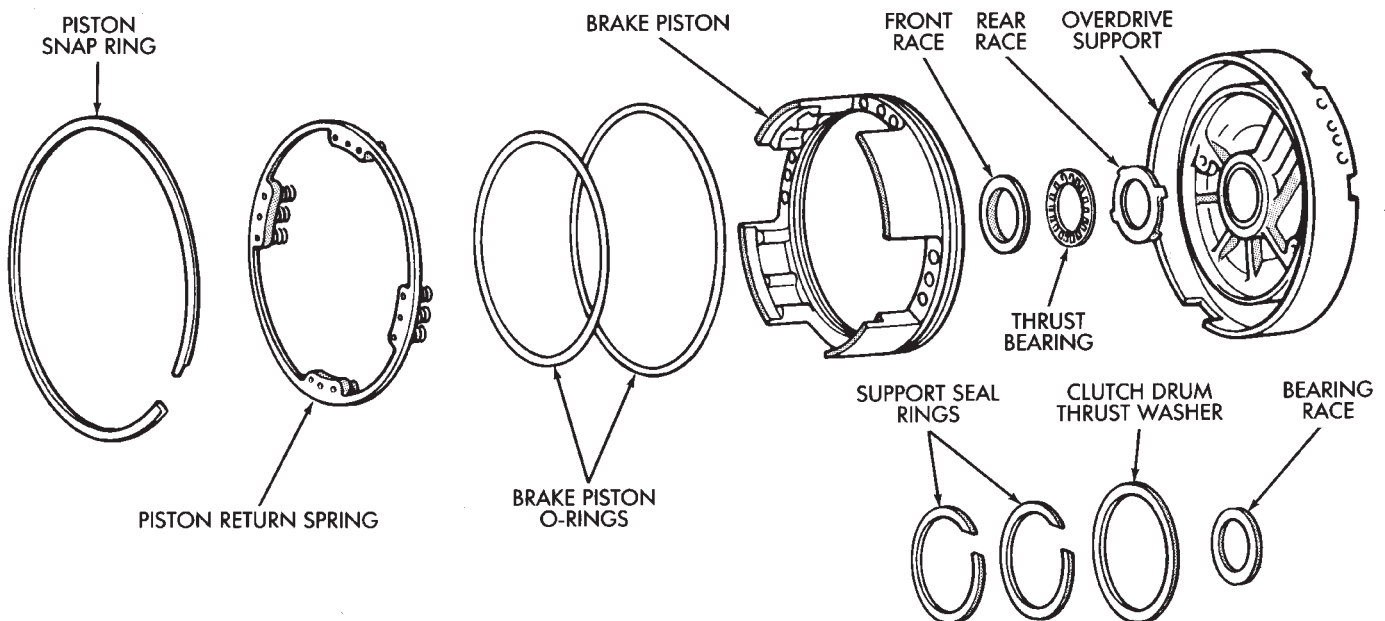
Fig. 27 Installing Clutch Drum Bearing And Race Assembly

wise. Shaft should turn clockwise freely but lock when turned counterclockwise.

OVERDRIVE SUPPORT OVERHAUL

SUPPORT DISASSEMBLY

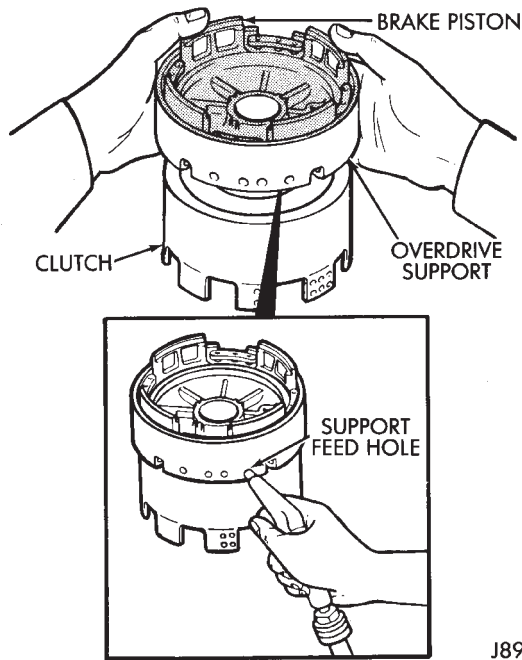
- (1) Check brake piston operation. Mount support on clutch (Fig. 2).
- (2) Apply compressed air through support feed hole and observe brake piston movement (Fig. 2). Piston



J8921-546

Fig. 1 Overdrive Support Components

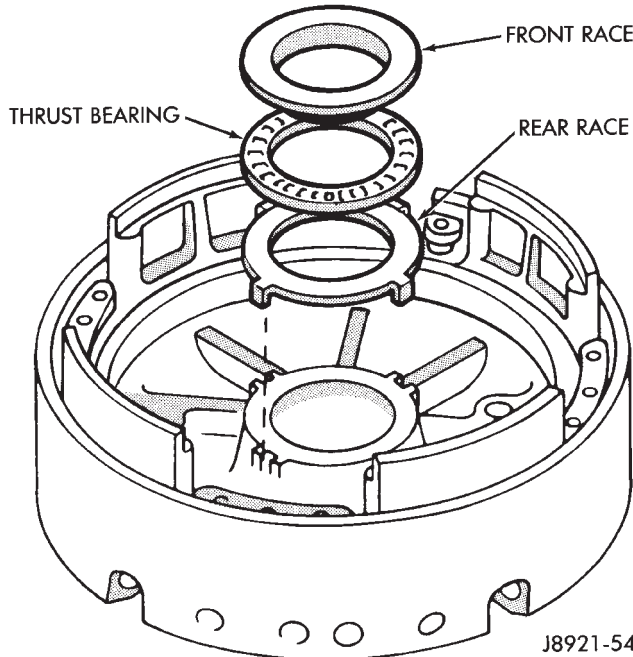
should move smoothly and not bind or stick. If operation is incorrect, replace piston and support.



J8921-547

Fig. 2 Checking Brake Piston Movement

(3) Remove thrust bearing front race, thrust bearing and rear race (Fig. 3).

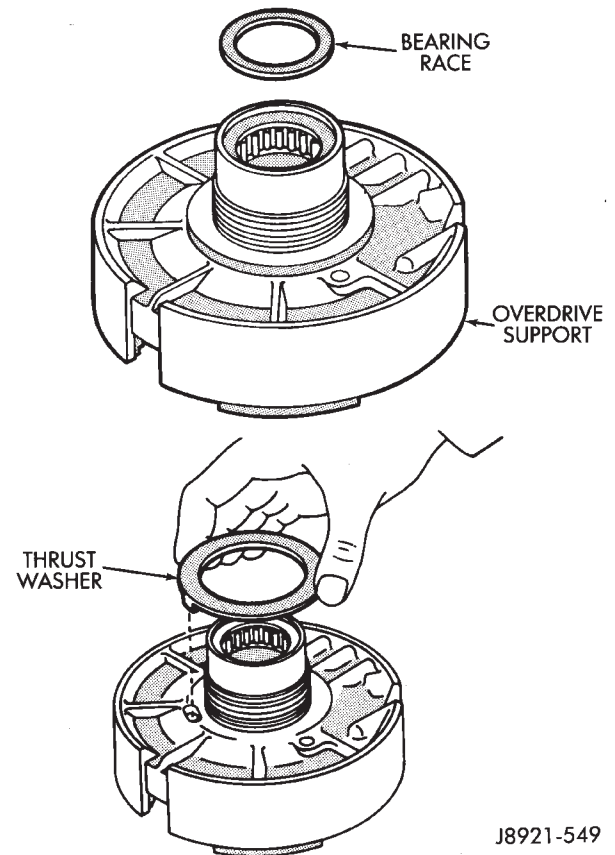


J8921-548

Fig. 3 Removing Support Thrust Bearing And Races

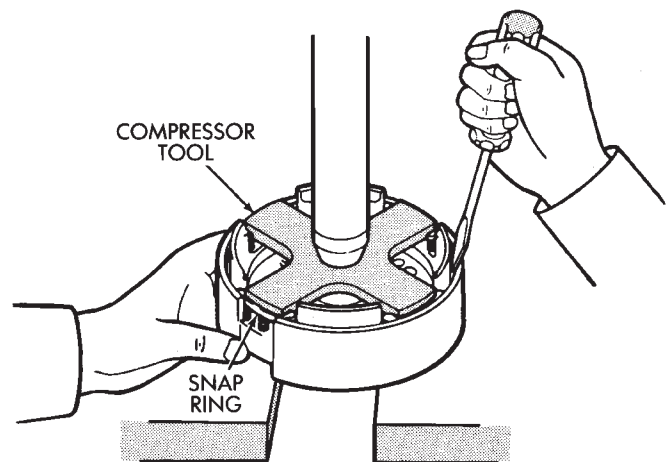
(4) Turn overdrive support over and remove bearing race and clutch drum thrust washer (Fig. 4).

(5) Compress piston return spring with Spring Compressor 7537 and remove piston snap ring (Fig. 5).



J8921-549

Fig. 4 Removing Clutch Drum Thrust Washer And Race



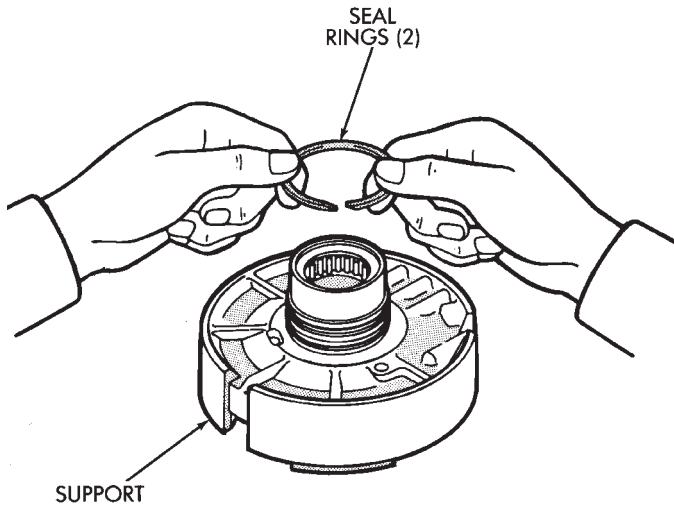
J8921-550

Fig. 5 Removing/Installing Piston Snap Ring

(6) Mount support in direct clutch and remove brake piston with compressed air. Apply air to same feed hole used when checking piston operation.

(7) Remove and discard support O-rings (Fig. 1).

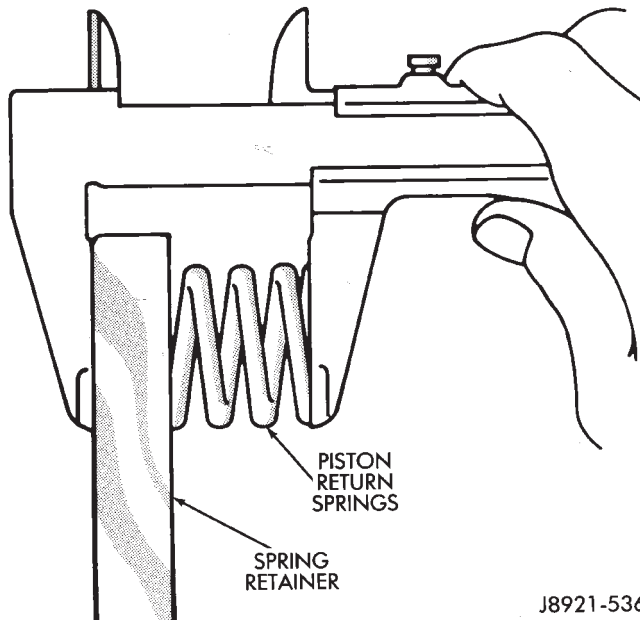
(8) Remove support seal rings (Fig. 6).



J8921-551

Fig. 6 Removing Support Seal Rings

(9) Measure free length of piston return springs with springs mounted in retainer (Fig. 7). Length should be 17.23 mm (0.678 in.).



J8921-536

Fig. 7 Checking Piston Return Spring Length

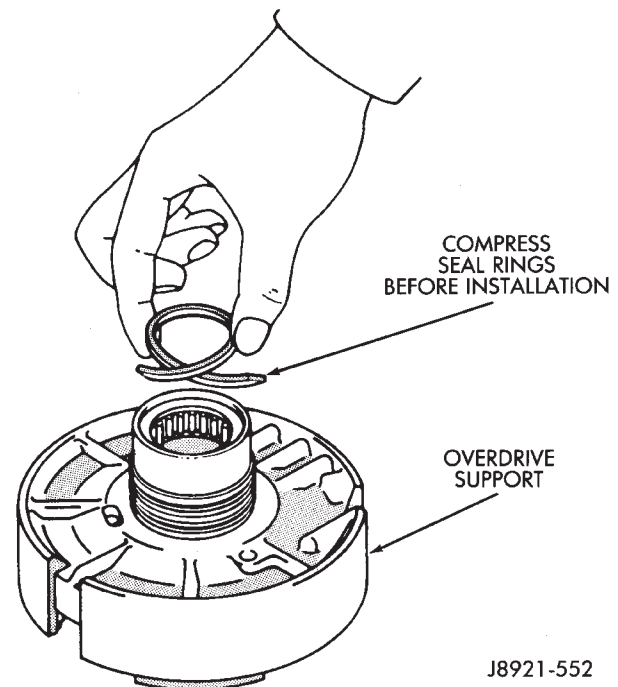
(10) Clean support components and dry them with compressed air.

(11) Inspect overdrive support and brake piston. Replace support and piston if either part is worn or damaged.

ASSEMBLING OVERDRIVE SUPPORT

(1) Lubricate new support seal rings. Then compress rings and install them on support (Fig. 8).

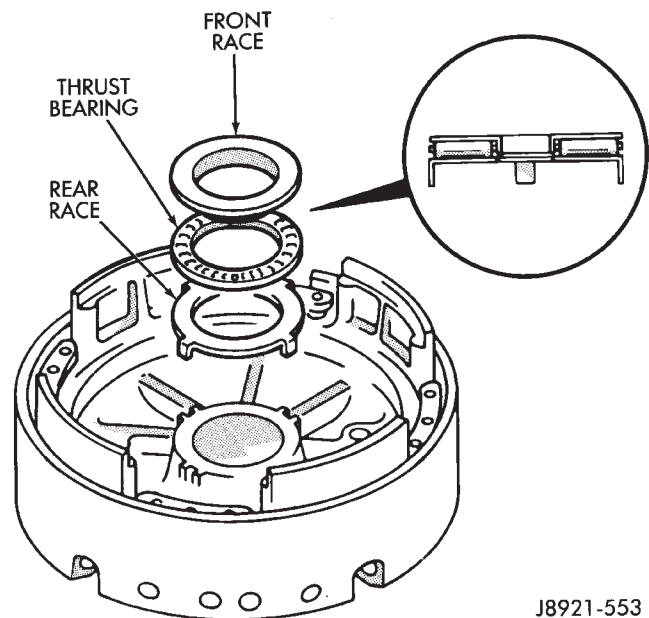
(2) Lubricate and install new O-rings on brake piston. Then carefully seat piston in support.



J8921-552

Fig. 8 Installing Support Seal Rings

- (3) Install return springs on brake piston.
- (4) Compress return springs with Spring Compressor 7537 (Fig. 5) and install piston snap ring.
- (5) Install support bearing race and clutch drum thrust washer (Fig. 4).
- (6) Install thrust bearing and front and rear bearing races. Thrust bearing rollers should face upward as shown (Fig. 9).
- (7) Verify thrust bearing/race sizes (Fig. 9).
 - Front race outer diameter is 47.8 mm (1.882 in.) and inside diameter is 30.7 mm (1.209 in.).



J8921-553

Fig. 9 Installing Support Thrust Bearing And Races

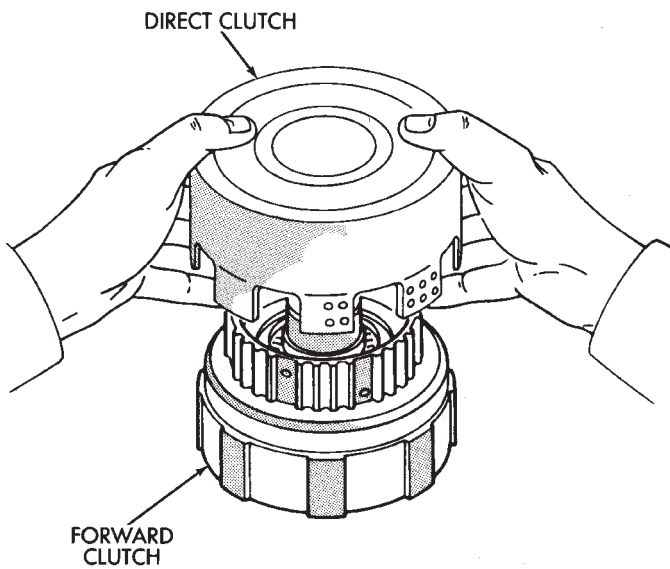
- Rear race outer diameter is 47.8 mm (1.882 in.) and inside diameter is 34.3 mm (1.350 in.).
- Bearing outer diameter is 47.7 mm (1.878 in.) and inside diameter is 32.7 mm (1.287 in.).

(8) Verify brake piston operation. Use same procedure described at beginning of disassembly. Piston should operate smoothly and not bind or stick.

DIRECT CLUTCH OVERHAUL

CLUTCH DISASSEMBLY

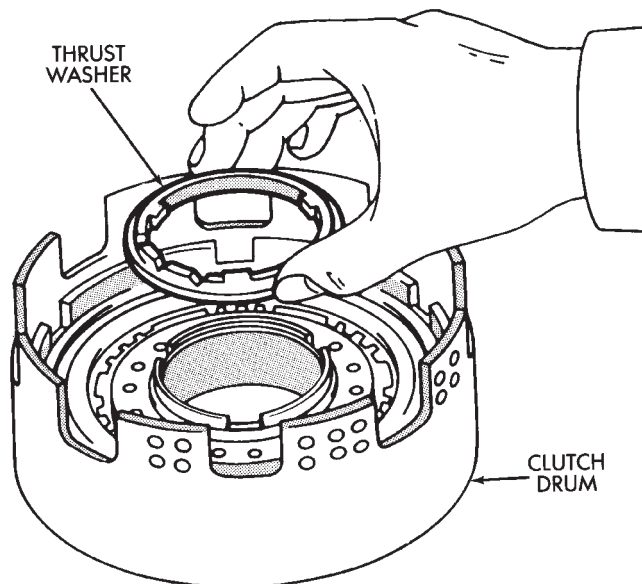
(1) Remove direct clutch from forward clutch (Fig. 1).



J8921-555

Fig. 1 Separate Direct Clutch From Forward Clutch

(2) Remove clutch drum thrust washer (Fig. 2).

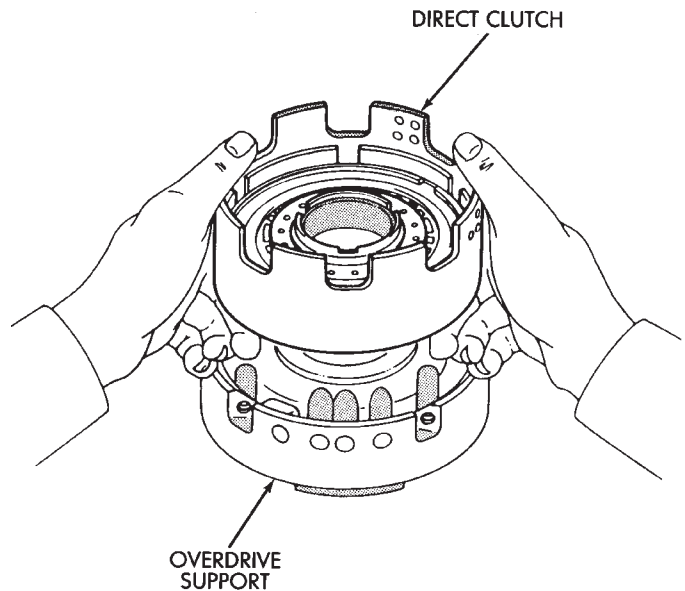


J8921-556

Fig. 2 Removing Clutch Drum Thrust Washer

(3) Check clutch piston stroke length as outlined in following steps.

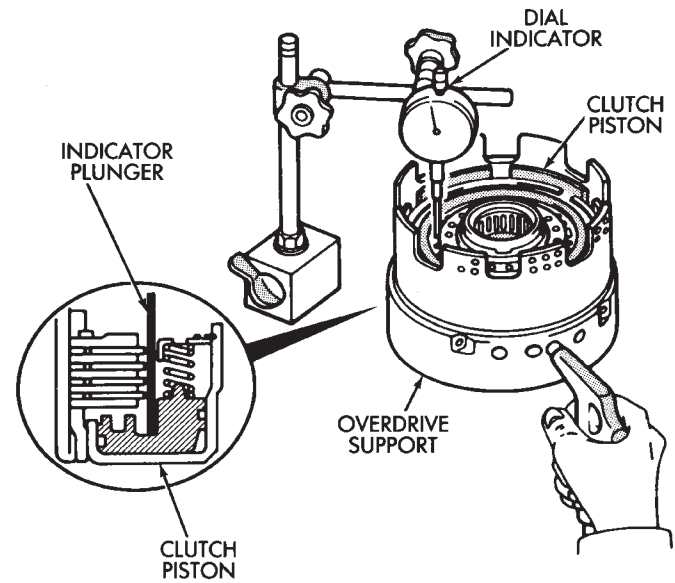
(4) Mount direct clutch on overdrive support assembly (Fig. 3).



J8921-557

Fig. 3 Mount Direct Clutch On Overdrive Support

(5) Mount dial indicator on clutch and position indicator plunger on clutch piston (Fig. 4).



J8921-558

Fig. 4 Checking Direct Clutch Piston Stroke Length

(6) Apply 57-114 psi air pressure through feed hole in overdrive support and note piston stroke length (Fig. 4). Check stroke at least twice.

(7) Piston stroke length should be 1.37 mm - 1.67 mm (0.054 - 0.065 in.). If stroke length is incorrect, either the clutch pack retainer or clutch discs will have to be replaced.

(8) Remove clutch pack snap ring and remove retainer and clutch pack from drum (Fig. 5).

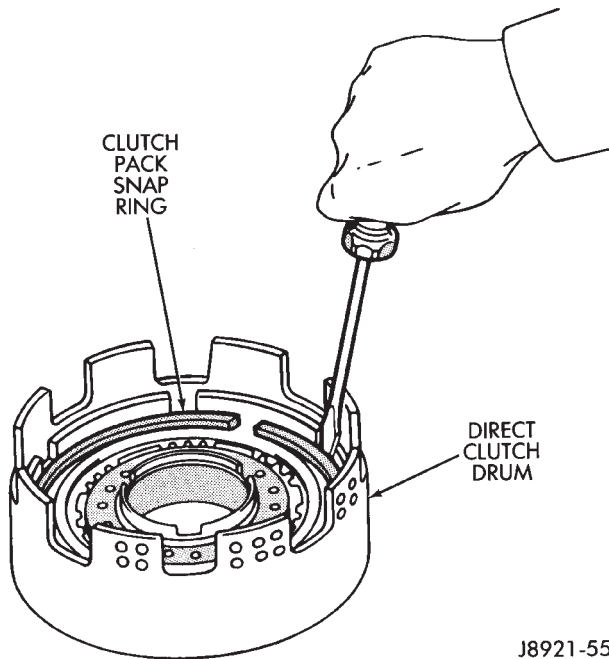


Fig. 5 Removing Clutch Pack Snap Ring

(9) Compress clutch piston return springs with tool 7538 and remove clutch piston snap ring (Fig. 6).

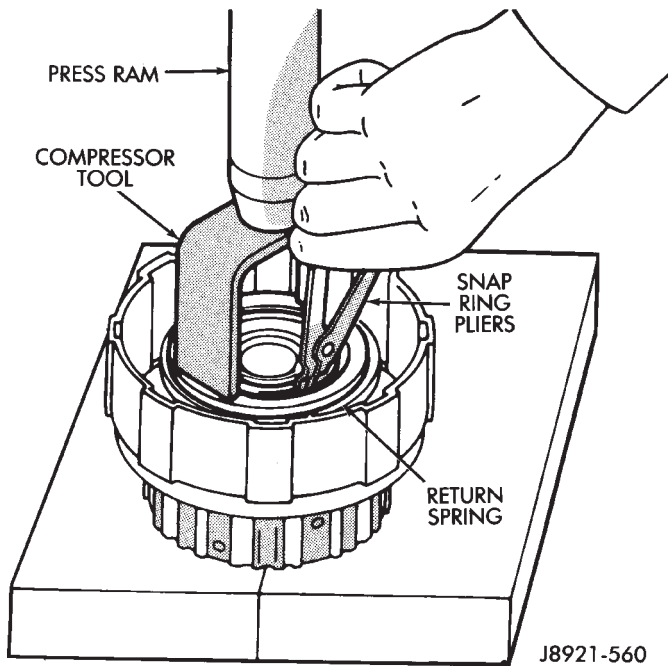


Fig. 6 Removing Piston Return Spring

(10) Remove compressor tool and return spring.

(11) Remove clutch piston. Remount clutch on overdrive support (Fig. 7). Apply compressed air through piston feed hole in support to remove piston. Use only enough air to ease piston out.

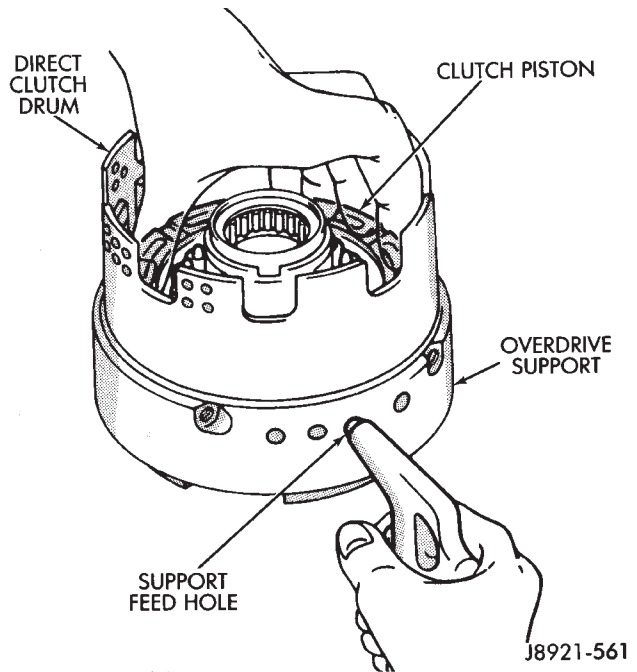


Fig. 7 Removing Direct Clutch Piston

(12) Remove and discard clutch piston O-rings.

(13) Measure clutch disc thickness. Minimum allowable thickness is 1.84 mm (0.0724 in.). Replace discs if below minimum thickness.

(14) Measure free length of piston return springs with springs in retainer (Fig. 8). Length should be 21.32 mm (0.839 in.). Replace return springs if not within specification.

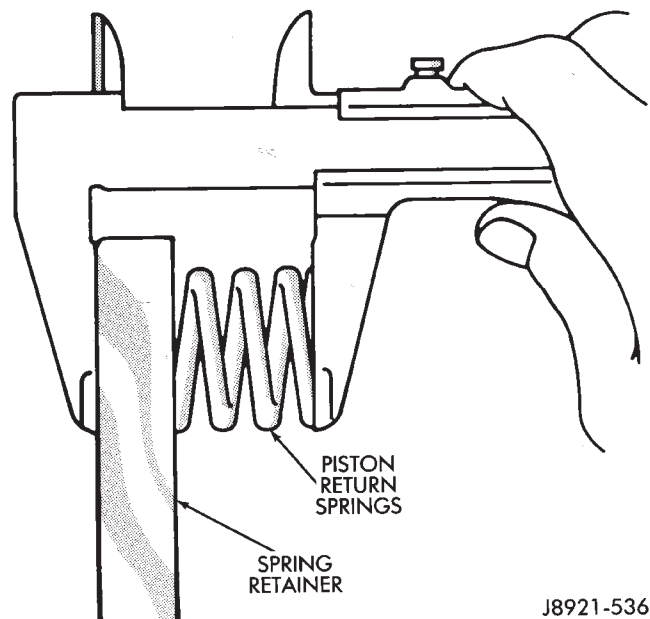


Fig. 8 Checking Piston Return Spring Length

(15) Check clutch piston check ball (Fig. 9). Shake piston to see if ball moves freely. Then check ball seating by applying low pressure compressed air to ball inlet as shown. Air should not leak past check ball.

(16) Measure inside diameter of clutch drum bushing. Inside diameter should be no more than 53.97 mm (2.1248 in.). Replace drum if bushing inside diameter is greater than specified.

DIRECT CLUTCH ASSEMBLY

(1) Lubricate and install replacement O-rings on clutch piston (Fig. 10).

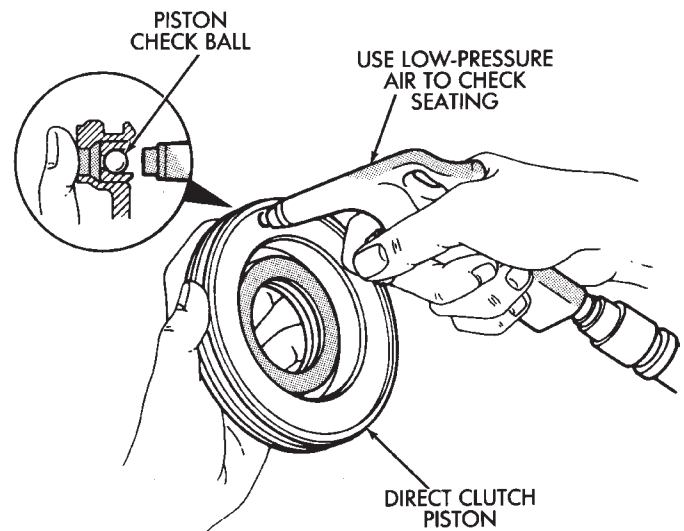
(2) Install clutch piston in drum and install return springs on piston.

(3) Compress piston return springs with Tool 7538 and install snap ring (Fig. 6). Be sure snap ring end gap is not aligned with spring retainer tab.

(4) Install clutch discs and plates (Fig. 11). Install plate then disc until all plates and discs are installed. Four plates and discs are required.

(5) Install clutch pack retainer in drum (Fig. 12).

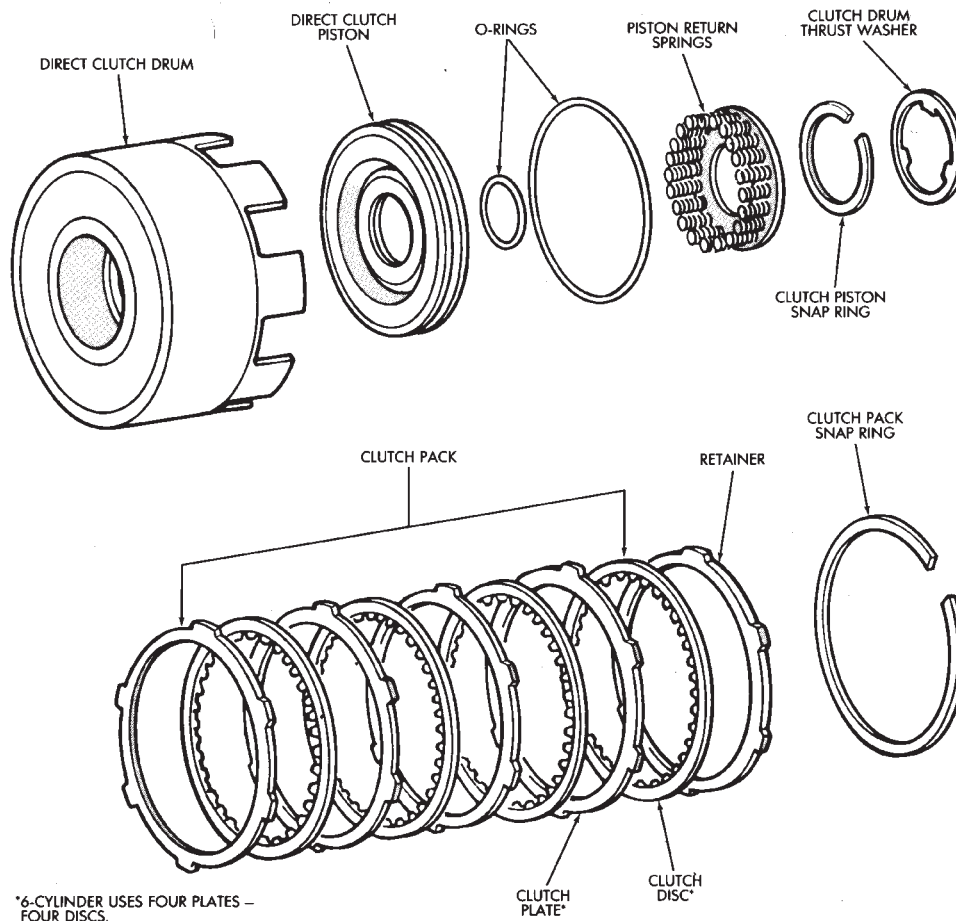
(6) Install clutch pack snap ring (Fig. 12).



J8921-562

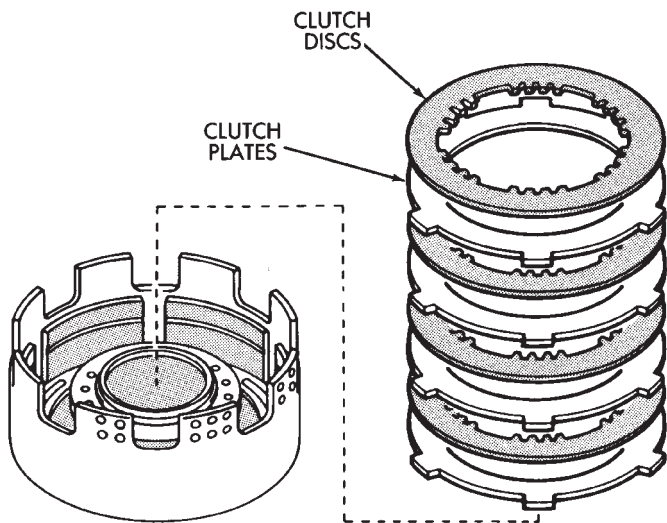
Fig. 9 Testing Piston Check Ball Seating

(7) Check snap ring position. If necessary, shift snap ring until end gap is **not** aligned with any notches in clutch drum (Fig. 12).



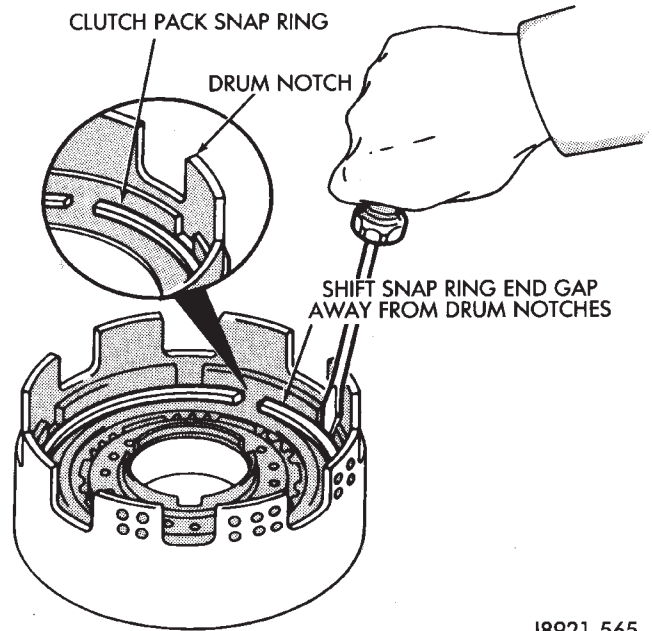
J8921-554

Fig. 10 Direct Clutch Components



J8921-563

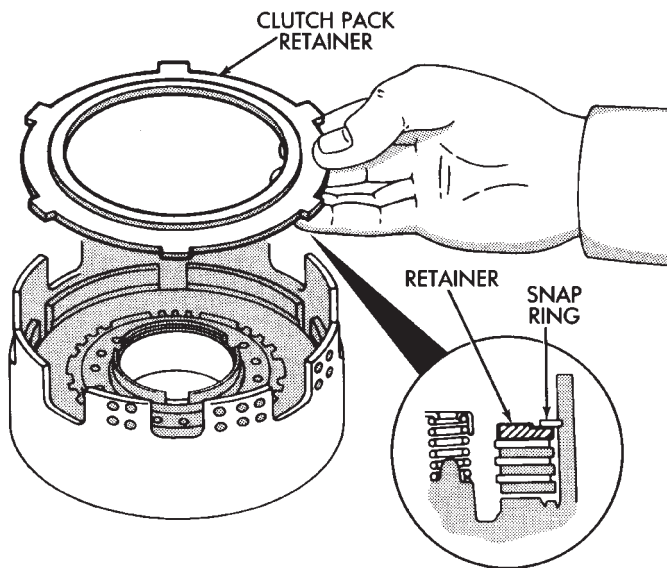
Fig. 11 Installing Direct Clutch Discs And Plates



J8921-565

Fig. 13 Adjusting Clutch Pack Snap Ring Position

(12) If clutch height is OK, remove direct clutch from forward clutch and proceed to forward clutch overhaul.



J8921-564

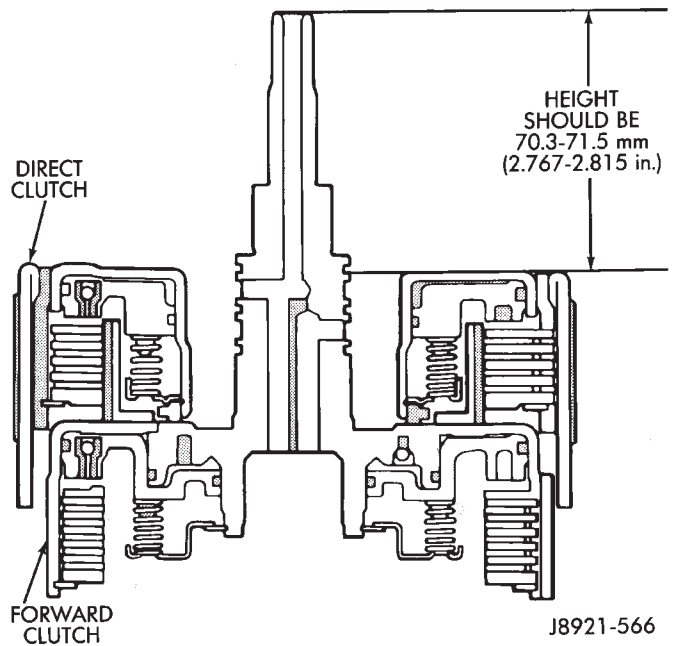
Fig. 12 Install Clutch Pack Retainer

(8) Check clutch piston stroke length a second time. If length is OK, continue with assembly. If stroke length is incorrect, replace clutch discs or use different thickness clutch pack retainer (Fig. 12). See Specifications section for retainer thicknesses.

(9) Lubricate clutch drum thrust washer with petroleum jelly and install it in drum (Fig. 3).

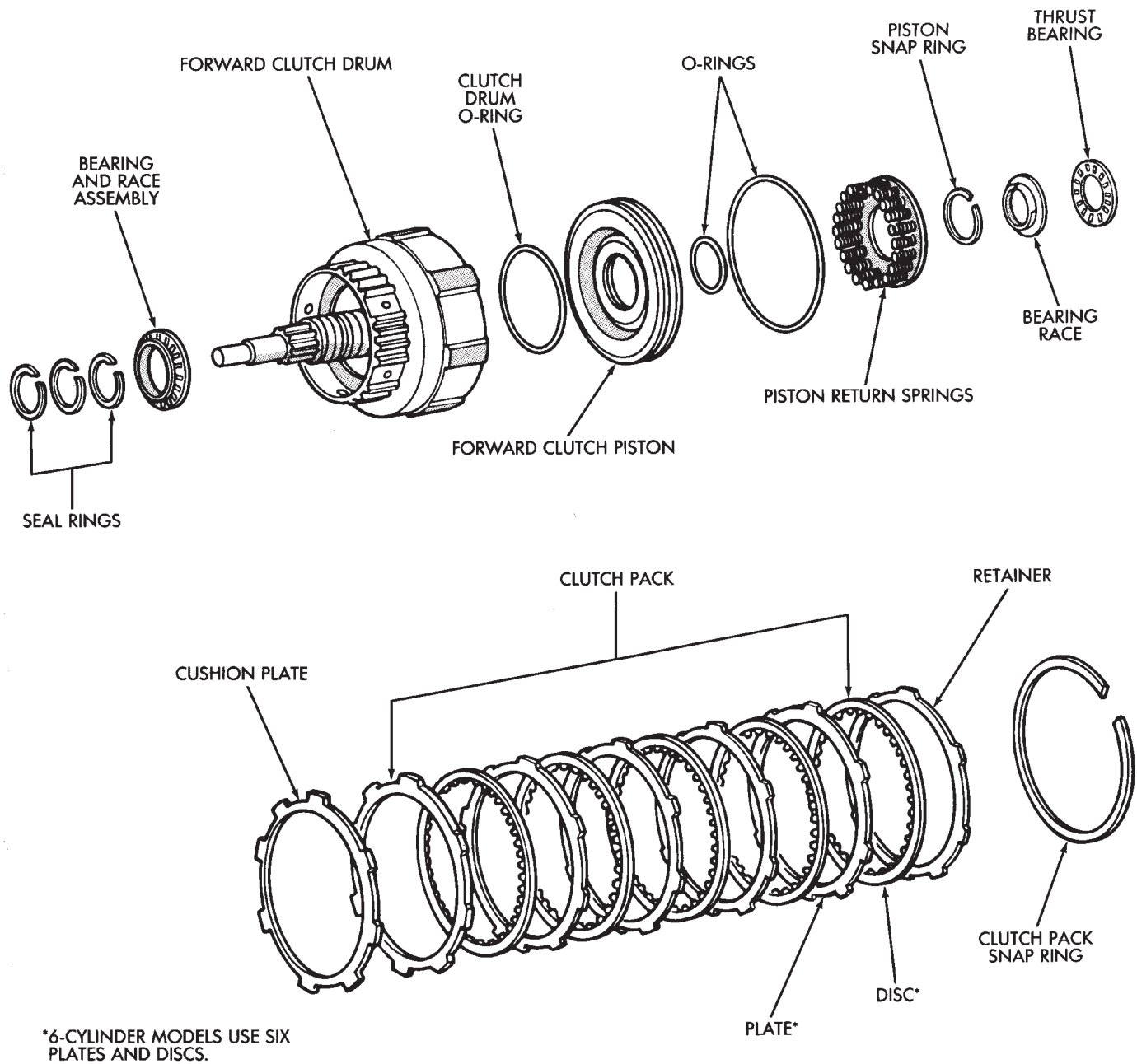
(10) Mount direct clutch assembly on forward clutch assembly and check assembled height (Fig. 14). Height should be 70.3 to 71.5 mm (2.767 to 2.815 in.).

(11) If assembled height is incorrect, clutches are not seated.



J8921-566

Fig. 14 Checking Direct Clutch Assembled Height



J8921-567

Fig. 1 Forward Clutch Components

FORWARD CLUTCH OVERHAUL

FORWARD CLUTCH DISASSEMBLY (FIG. 1)

- (1) Check clutch piston stroke as outlined in following steps.
- (2) Position overdrive support on wood blocks and mount forward clutch drum on support (Fig. 2).
- (3) Remove bearing and race from forward clutch drum (Fig. 2).
- (4) Mount dial indicator on clutch drum. Position dial indicator plunger against clutch piston (Fig. 3).

- (5) Apply compressed air through right side feed hole in support and note piston stroke length on dial indicator.

(6) Stroke length should be 3.55 - 3.73 mm (0.1348 - 0.1469 in.).

- (7) Replace clutch discs if stroke length is incorrect.

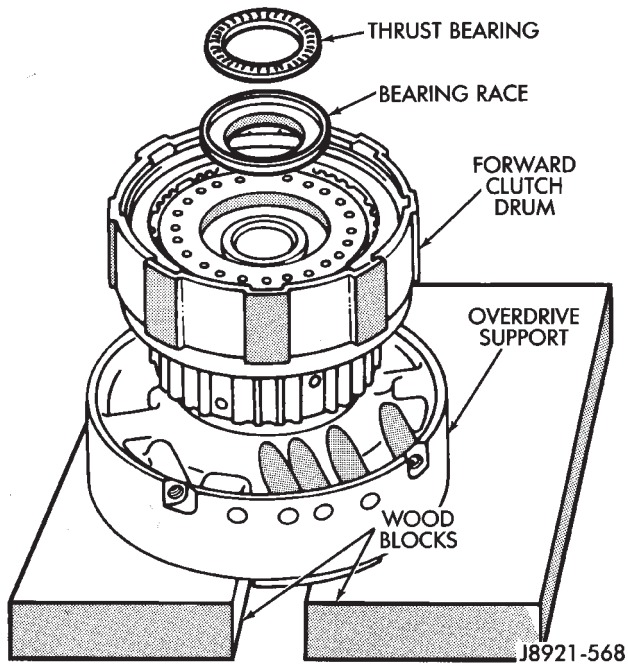


Fig. 2 Positioning Drum And Support On Wood Blocks

(8) Remove clutch pack snap ring and remove retainer and clutch pack (Fig. 4).

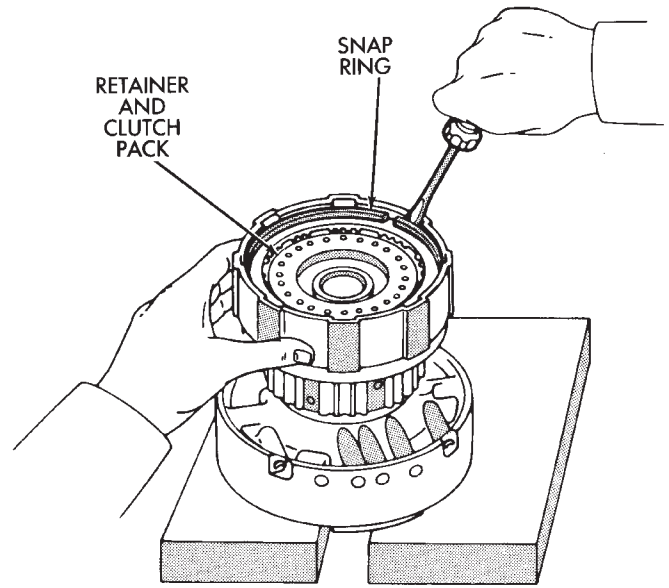


Fig. 4 Removing Retainer And Clutch Pack

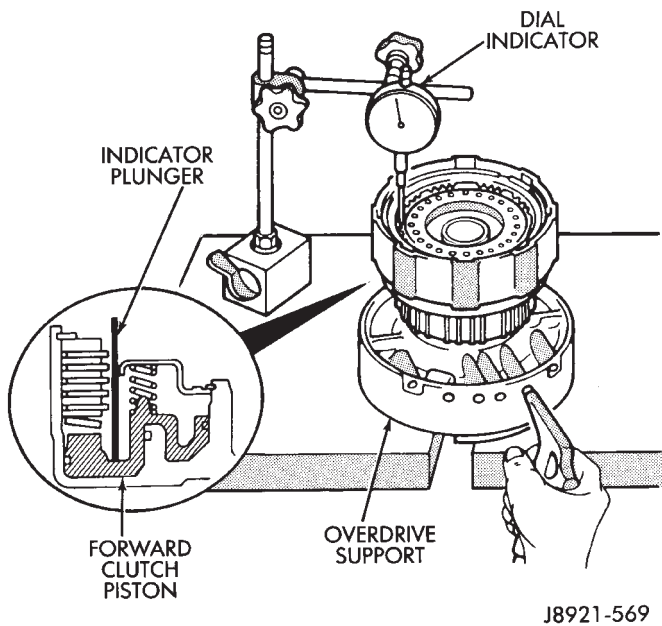


Fig. 3 Checking Forward Clutch Piston Stroke Length

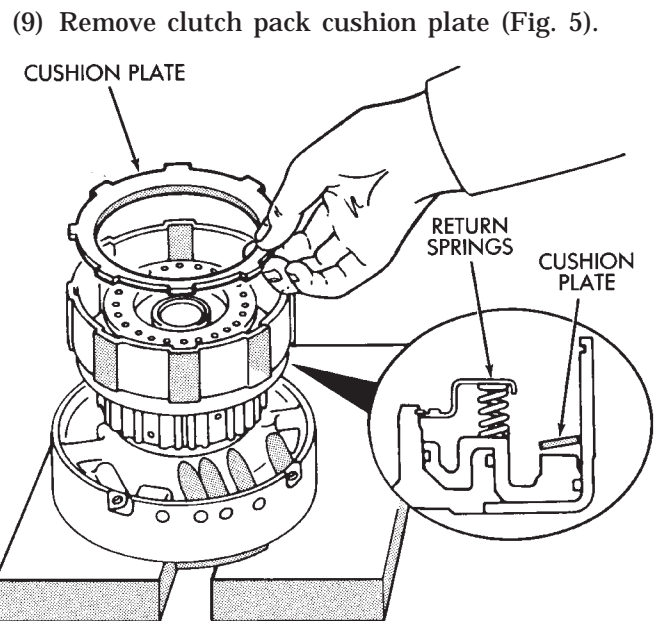


Fig. 5 Removing Cushion Plate

(10) Compress clutch springs with Tool 7538 and remove piston snap ring.

(11) Remove spring compressor tool and piston return springs.

(12) Remount forward clutch drum on overdrive support (Fig. 6).

(13) Apply compressed air through feed hole in support to remove piston (Fig. 6). Use only enough air pressure to ease piston out of drum.

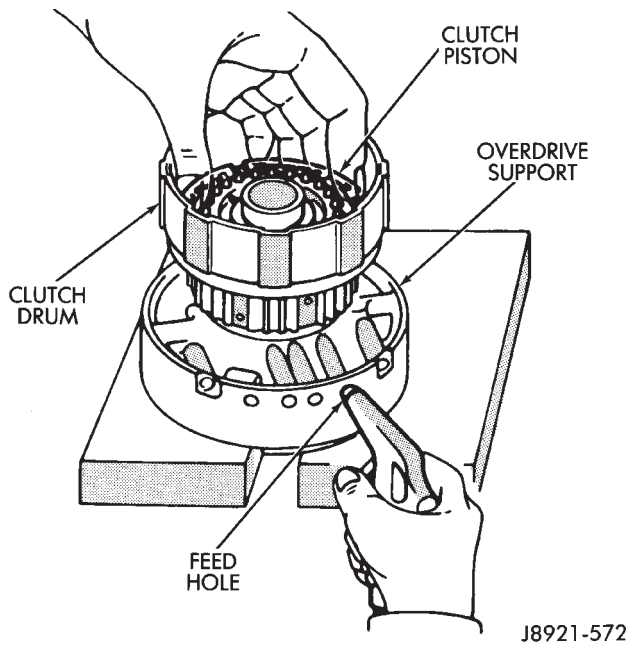


Fig. 6 Removing Forward Clutch Piston

(14) Remove and discard clutch piston O-rings.
 (15) Remove clutch drum O-ring from rear hub of drum.

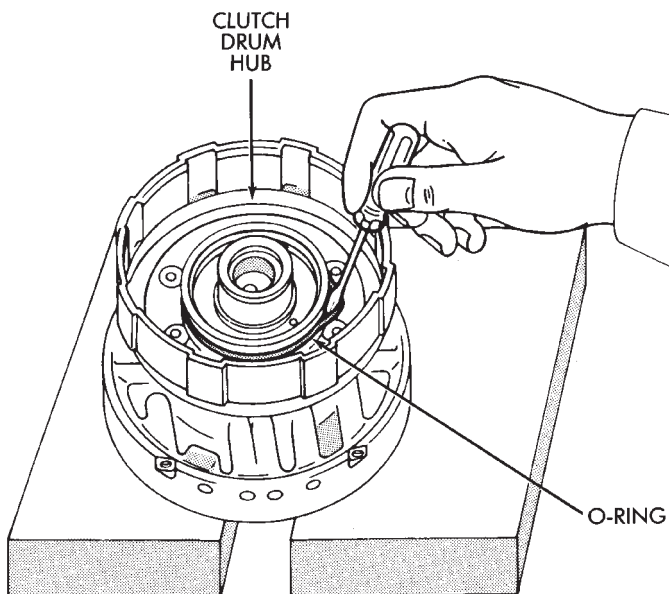


Fig. 7 Removing/Installing Clutch Drum O-Ring

(16) Remove three seal rings from clutch drum shaft (Fig. 8).

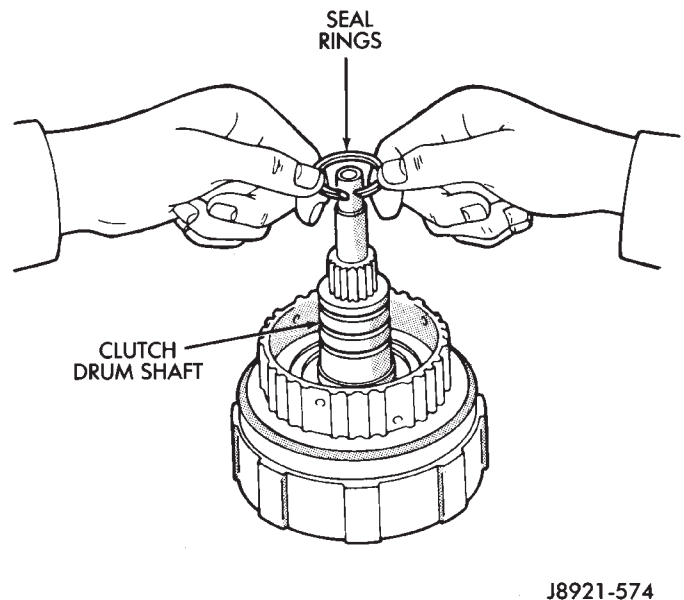


Fig. 8 Removing Clutch Drum Seal Rings

(17) Remove thrust bearing and race assembly from clutch drum (Fig. 9).

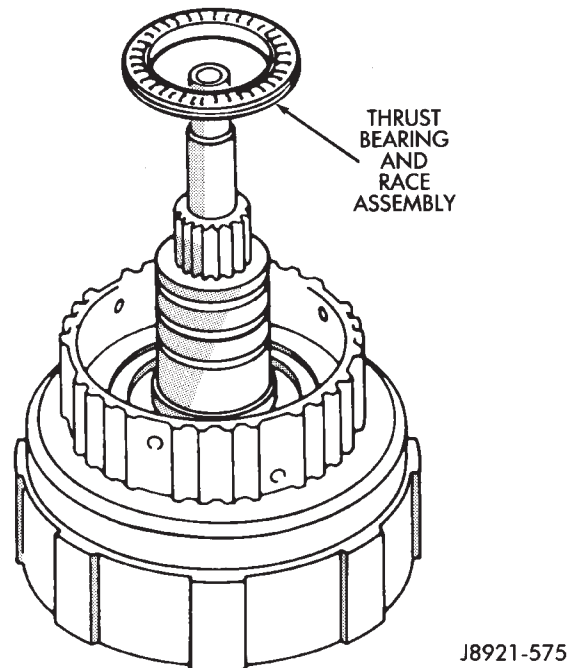
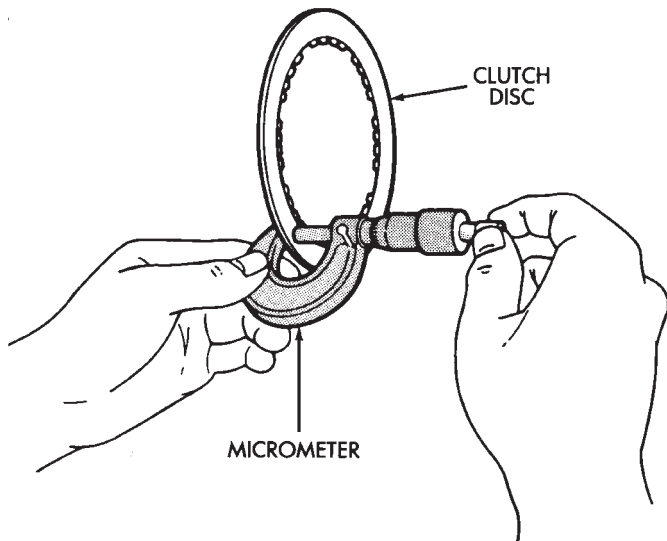


Fig. 9 Removing Clutch Drum Thrust Bearing Assembly

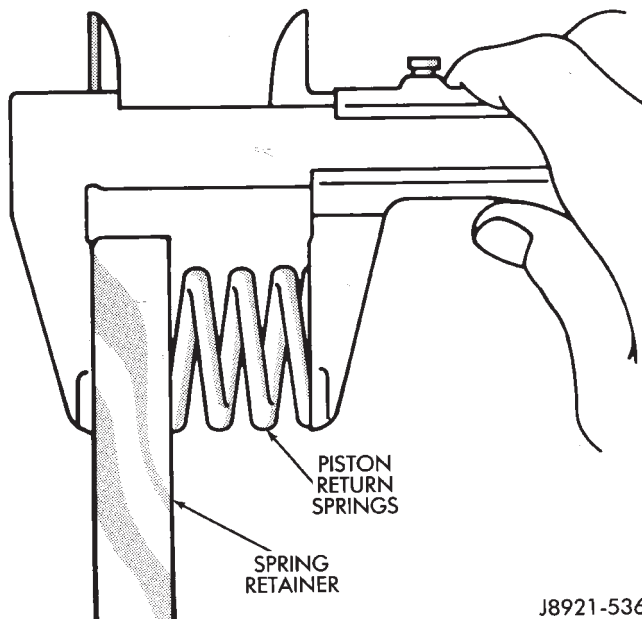
(18) Measure clutch disc thickness (Fig. 10). Minimum allowable thickness is 1.51 mm (0.0595 in.).



J8921-576

Fig. 10 Measuring Clutch Disc Thickness

(19) Measure free length of piston return springs with springs mounted in retainer (Fig. 11). Length should be 19.47 mm (0.767 in.). Replace springs and retainer if length is incorrect.

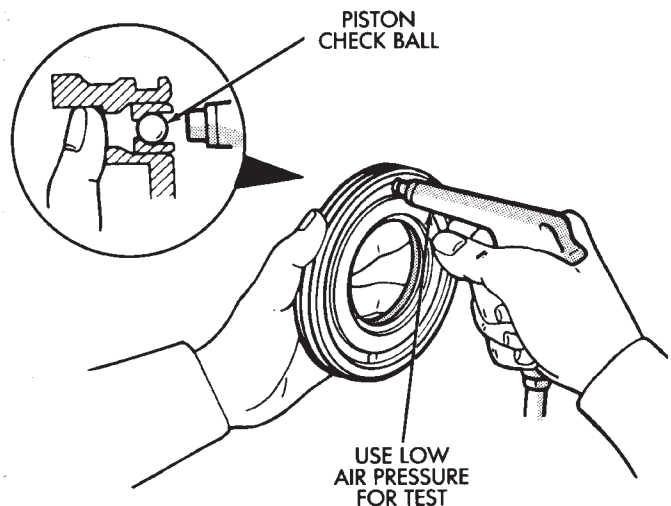


J8921-536

Fig. 11 Checking Return Spring Length

(20) Inspect clutch piston check ball (Fig. 12). Ball should move freely within piston. Check ball seating by applying low pressure compressed air to ball feed hole. Ball should seat firmly and not leak air.

(21) Measure inside diameter of bushing in clutch drum hub. Maximum allowable diameter is 24.08 mm (0.9480 in.). Replace clutch drum if bushing inside diameter is greater than specified.

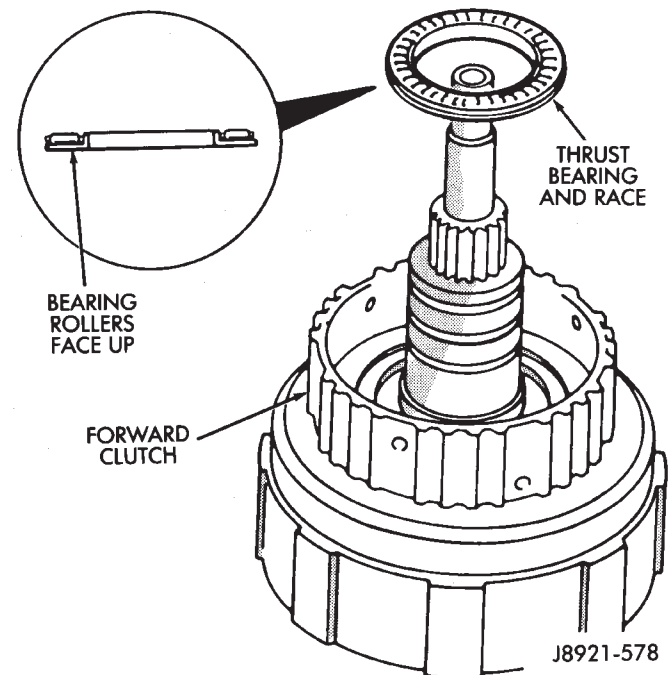


J8921-577

Fig. 12 Testing Piston Check Ball

FORWARD CLUTCH ASSEMBLY

(1) Lubricate bearing and race assembly with petroleum jelly and install it in clutch drum (Fig. 13). Race side of assembly faces downward and toward drum. Bearing rollers face up (Fig. 13)



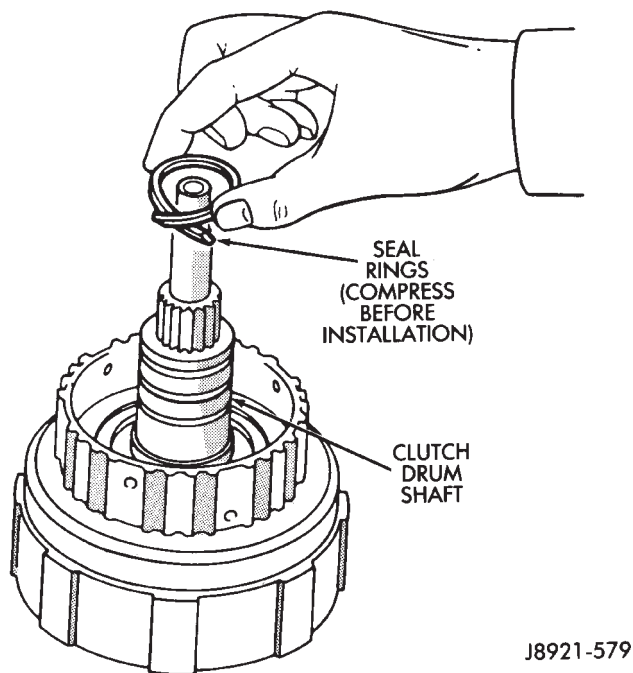
J8921-578

Fig. 13 Installing Thrust Bearing And Race

(2) Coat new clutch drum shaft seal rings with petroleum jelly. Before installing drum shaft seal rings, squeeze each ring so ring ends overlap (Fig. 14). This tightens ring making clutch installation easier.

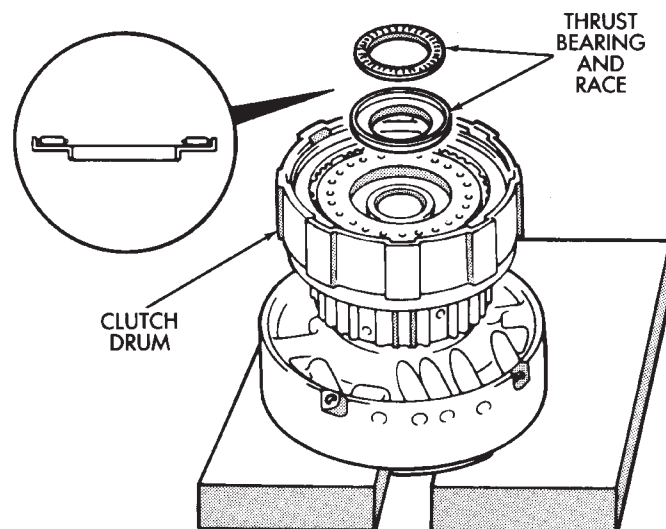
(3) Install seal rings on shaft. Keep rings closed as tightly as possible during installation. Avoid over-spreading them.

(4) Mount clutch drum on overdrive support.



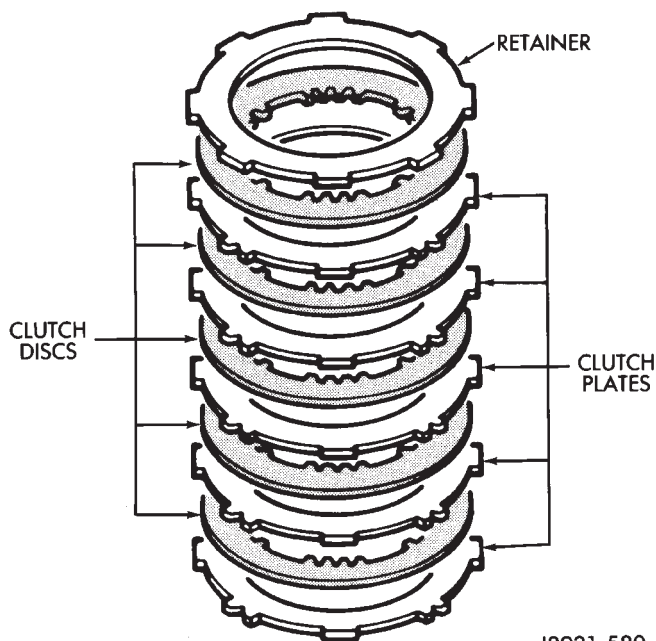
J8921-579

Fig. 14 Installing Clutch Drum Shaft Seal Rings



J8921-581

Fig. 16 Installing Thrust Bearing And Race



J8921-580

Fig. 15 Installing Forward Clutch Discs And Plates

(5) Lubricate and install new O-ring on clutch drum hub (Fig. 7).

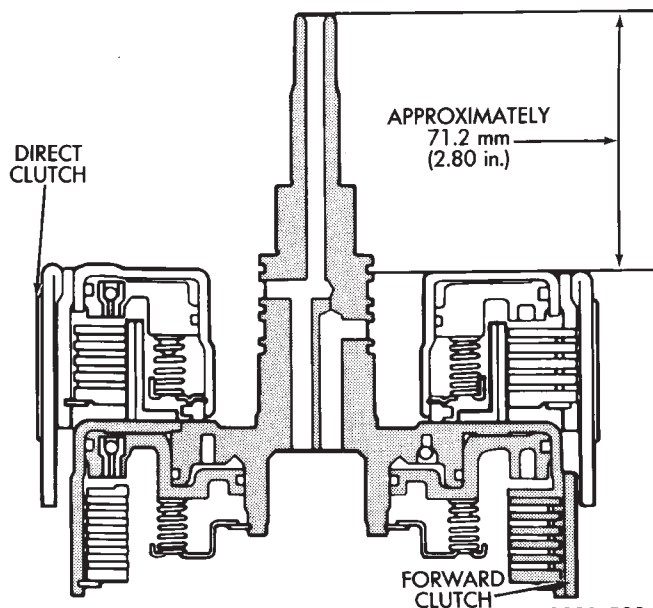
(6) Lubricate and install new O-rings on clutch piston and install piston in drum.

(7) Install piston return springs.

(8) Compress piston return springs with Tool 7538 and shop press and install piston snap ring. Be sure snap ring end gap is not aligned with any notches in drum.

(9) Install cushion plate in drum. Concave side of plate faces downward (Fig. 5).

(10) Install clutch discs, plates and retainer (Fig. 15). Install tabbed plate followed by disc until required number of plates and discs are installed. Use six plates and discs.



J8921-582

Fig. 17 Checking Forward Clutch Assembled Height

(11) Install clutch pack snap ring.

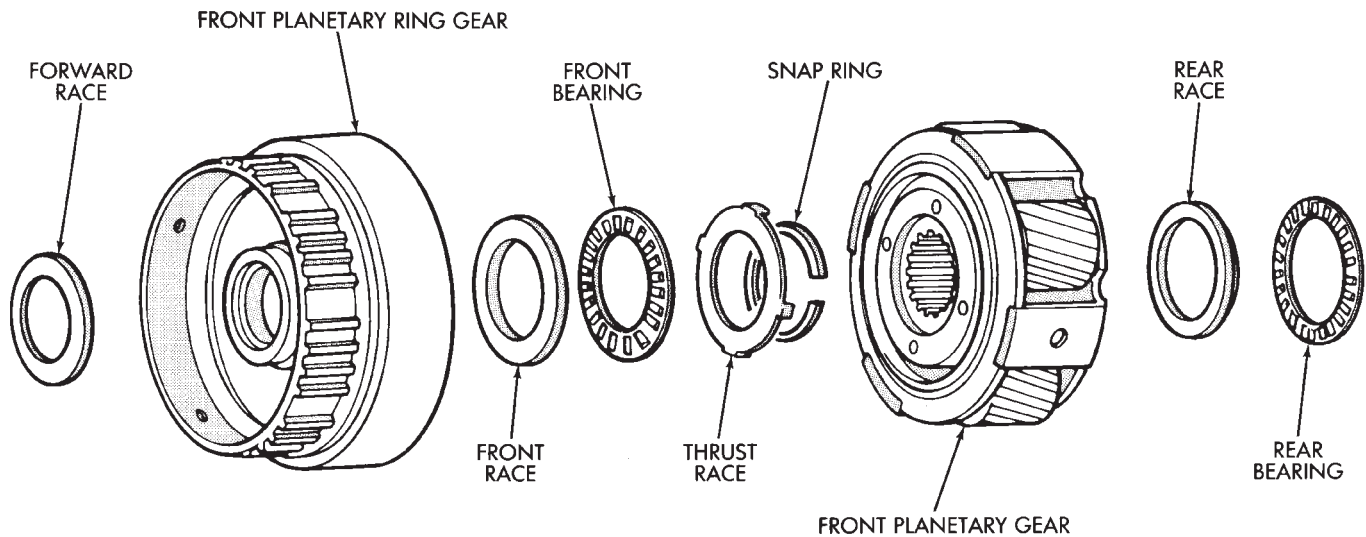
(12) Recheck clutch piston stroke length using same method outlined at beginning of disassembly procedure. If stroke length is not within specified limits, replace clutch discs.

(13) Lubricate race and bearing with petroleum jelly and install them in clutch drum (Fig. 16). Be sure bearing rollers face up and race lip seats in drum as shown.

(14) Verify bearing and race size.

- Outer diameter of bearing is 46.7 mm (1.839 in.).
- Outer diameter of race is 48.9 mm (1.925 in.).
- Inner diameter of bearing and race is 26.0 mm (1.024 in.).

(15) Mount forward clutch on direct clutch and check assembled height (Fig. 17). Height should be 70.3 - 71.5 mm (2.767 - 2.815 in.).



J8921-583

Fig. 1 Front Planetary Gear Components

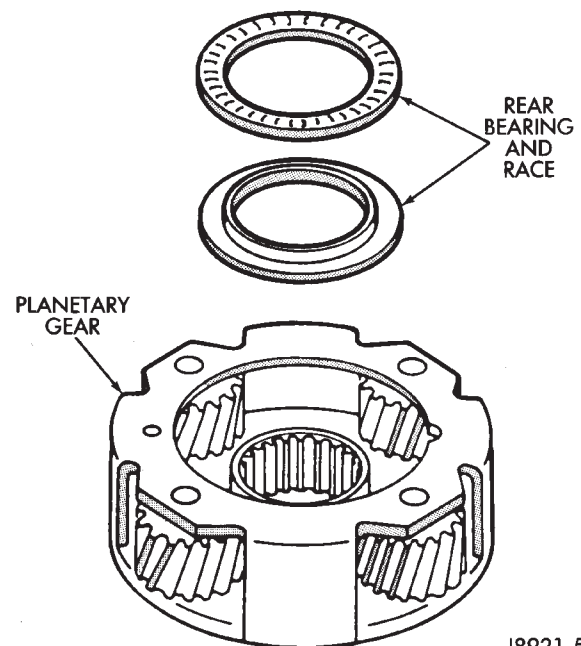
FRONT PLANETARY GEAR OVERHAUL

FRONT PLANETARY DISASSEMBLY

- (1) Remove ring gear from planetary gear (Fig. 1).
- (2) Remove front bearing and the two races from ring gear (Fig. 1).
- (3) Remove tabbed thrust race from planetary gear (Fig. 1).
- (4) Remove snap ring attaching planetary gear to shaft and remove gear.
- (5) Remove rear bearing and race from planetary gear.
- (6) Measure inside diameter of ring gear bushing. Maximum allowable diameter is 24.08 mm (0.9480 in.). Replace ring gear if bushing inside diameter is greater than specified.

FRONT PLANETARY ASSEMBLY

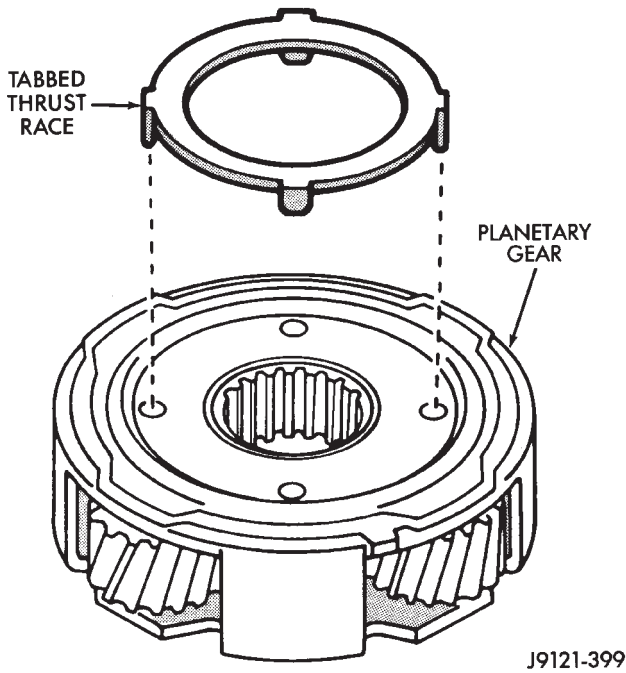
- (1) Lubricate planetary and ring gear bearings and races with petroleum jelly.
- (2) Identify planetary bearings and races before installation. (Fig. 1). Bearings and races can be identified by following dimensions:
 - Outer diameter of rear bearing is 47.7 mm (1.878 in.). Inner diameter is 35.5 mm (1.398 in.).
 - Outer diameter of rear race 47.6 mm (1.874 in.). Inner diameter is 33.7 mm (1.327 in.).
 - Outer diameter of front race is 53.6 mm (2.110 in.). Inner diameter is 30.5 mm (1.201 in.).
 - Outer diameter of front bearing is 47.7 mm (1.878 in.). Inner diameter is 32.6 (1.283 in.).
 - Outer diameter of forward race is 47.0 mm (1.850 in.). Inner diameter is 26.5 mm 1.043 in.).
- (3) Install rear race and bearing in gear (Fig. 2).



J8921-584

Fig. 2 Installing Front Planetary Rear Bearing and Race

(4) Turn planetary over and install race thrust race (Fig. 3).

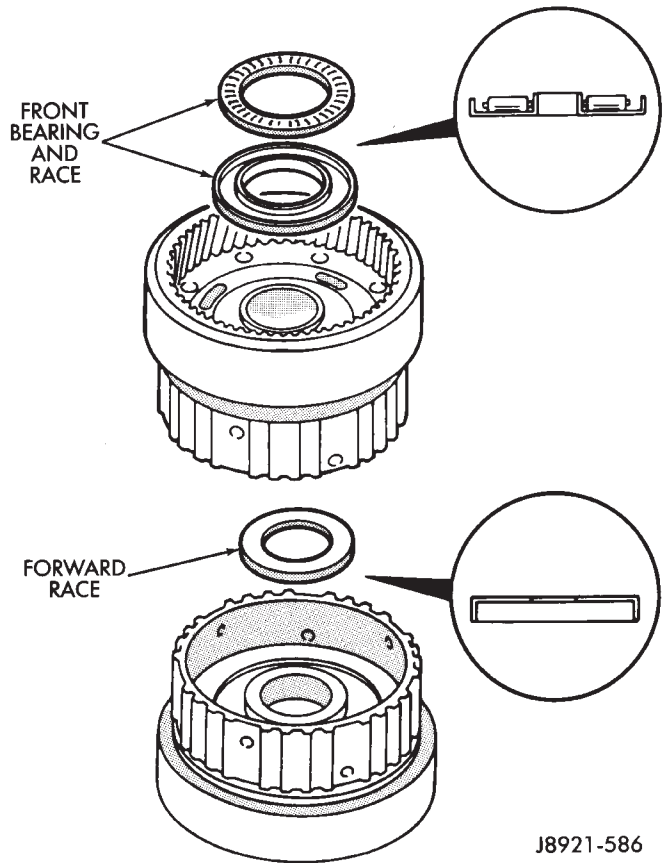


J9121-399

Fig. 3 Installing Front Planetary Thrust Race

(5) Install front race and bearing and forward race in ring gear (Fig. 4).

(6) Set planetary gear assembly aside for final assembly.



J8921-586

Fig. 4 Installing Front Planetary Front Bearing And Races

SUN GEAR AND NO. 1 ONE-WAY CLUTCH OVERHAUL

SUN GEAR AND CLUTCH DISASSEMBLY

(1) Hold sun gear and turn second brake hub clockwise and counterclockwise (Fig. 2). Hub should rotate freely clockwise but lock when turned counter-

clockwise. Replace one-way clutch and hub if they do not operate properly.

(2) Remove one-way clutch/second brake hub assembly from drum (Fig. 3).

(3) Remove thrust washer from drum (Fig. 4).

(4) Remove two seal rings from sun gear (Fig. 5).

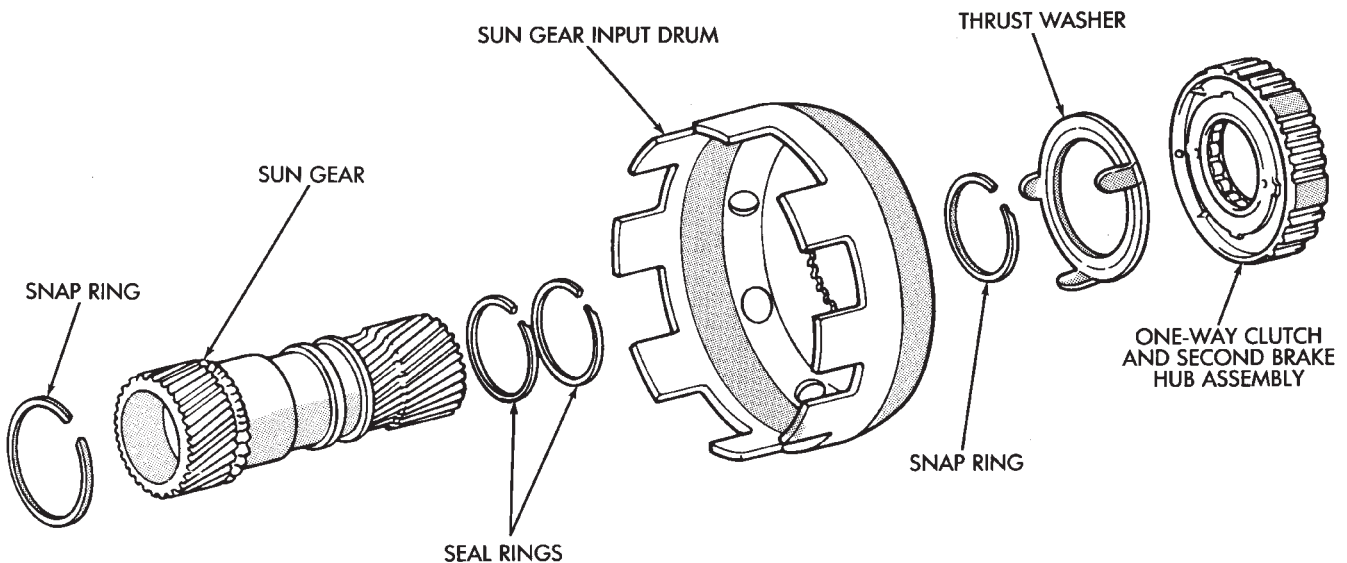


Fig. 1 Sun Gear And One-Way Clutch Components

J9121-400

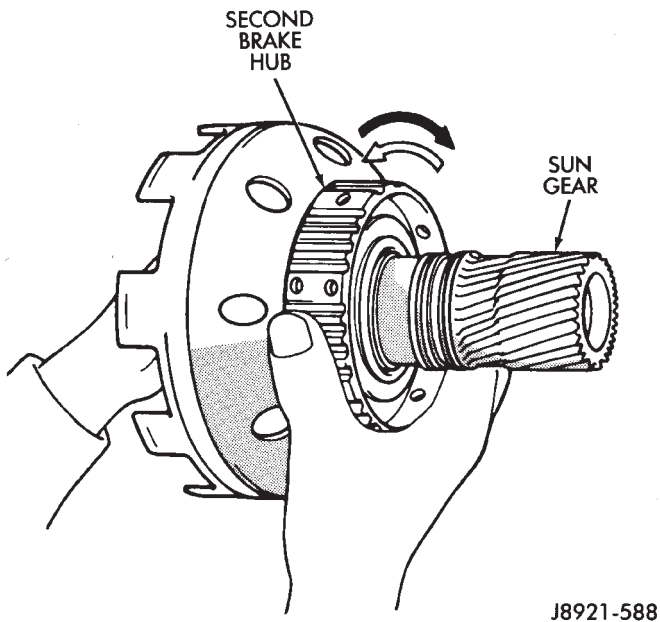


Fig. 2 Checking One-Way Clutch Operation

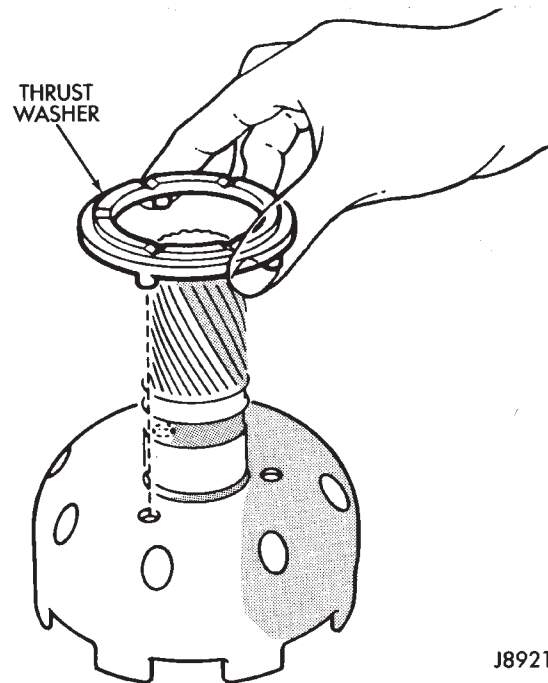


Fig. 4 Removing/Installing Thrust Washer

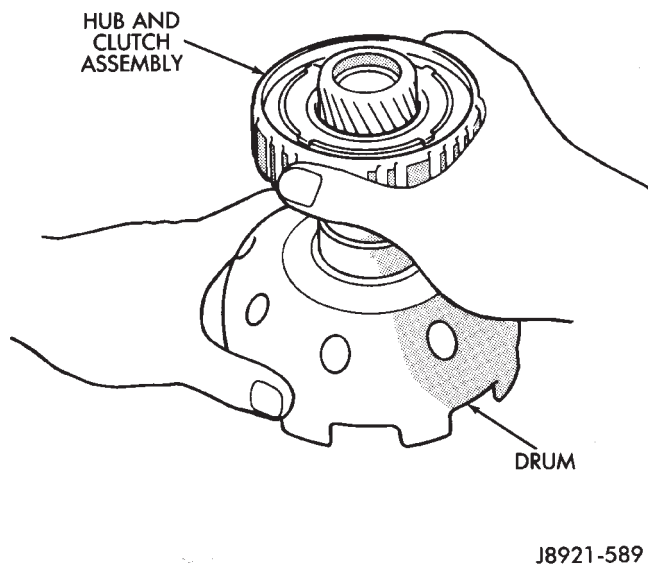


Fig. 3 Removing/Installing Brake Hub And Clutch Assembly

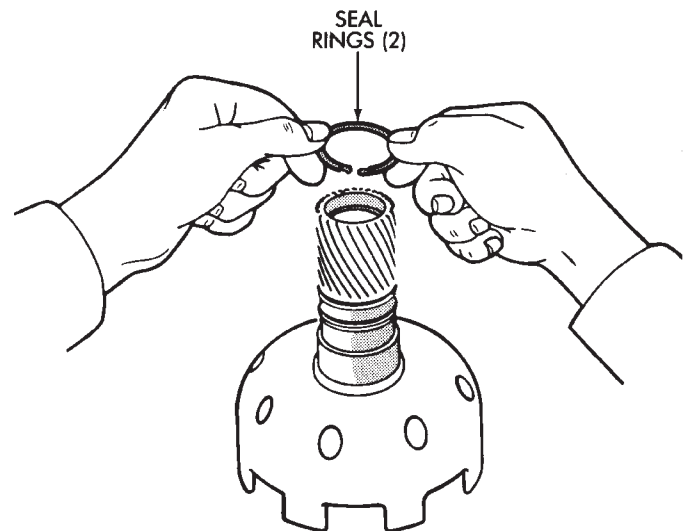


Fig. 5 Removing/Installing Sun Gear Seal Rings

(5) Support sun gear on wood block (Fig. 6). Then remove first sun gear snap ring and separate drum from gear.

(6) Remove remaining snap ring from sun gear (Fig. 7).

(7) Measure inside diameter of sun gear bushings with bore gauge or inside micrometer (Fig. 8). Maximum allowable diameter is 27.08 mm (1.0661 in.). Replace sun gear if bushing inside diameter is greater than specified.

SUN GEAR AND CLUTCH ASSEMBLY

- (1) Install first snap ring on sun gear.
- (2) Install sun gear in drum and install remaining snap ring.

(3) Coat replacement seal rings with petroleum jelly and install them on sun gear. **Be sure seal ring ends are interlocked.**

(4) Install thrust washer. Be sure washer tabs are seated in drum slots.

(5) Install one-way clutch/second brake hub assembly on sun gear. Deep side of hub flange faces upward (Fig. 9).

(6) Check one-way clutch operation again (Fig. 2). Hold sun gear and turn second brake hub clockwise and counterclockwise. Hub should turn clockwise freely, but lock when turned counterclockwise.

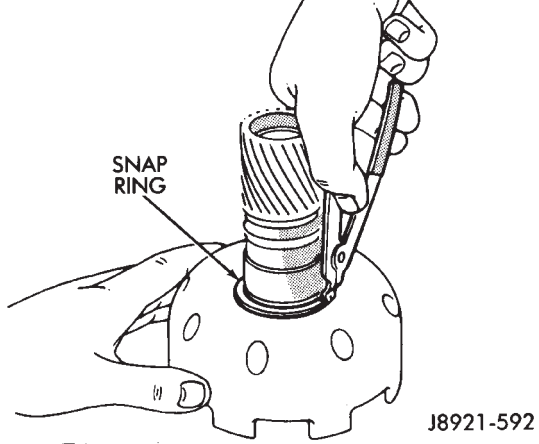
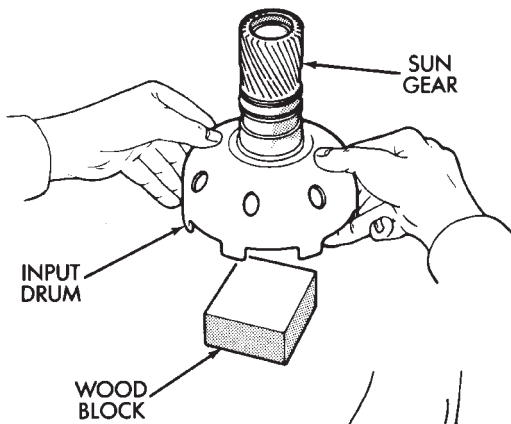


Fig. 6 Removing/Installing Sun Gear

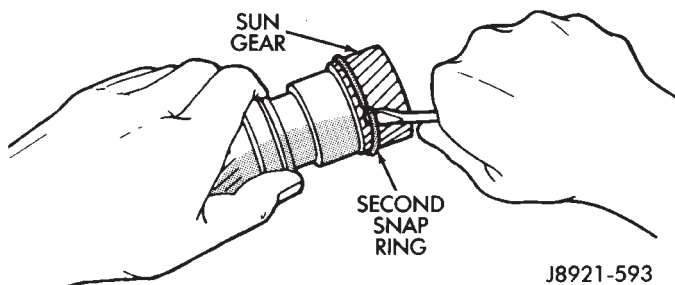


Fig. 7 Removing/Installing Second Snap Ring

(7) Set sun gear/clutch assembly aside for final assembly.

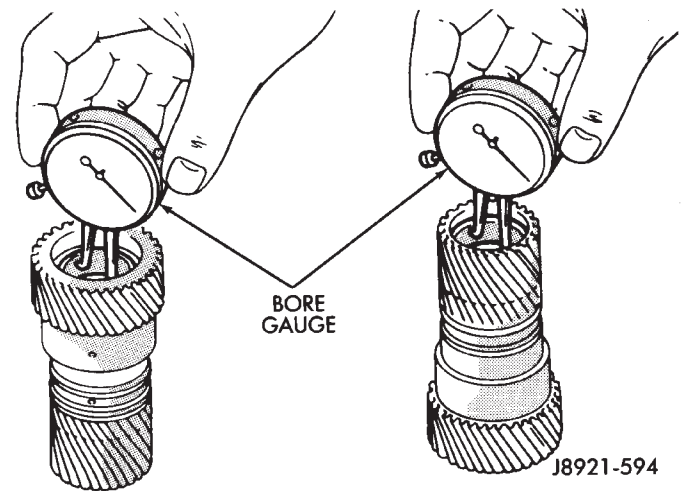


Fig. 8 Checking Sun Gear Bushings

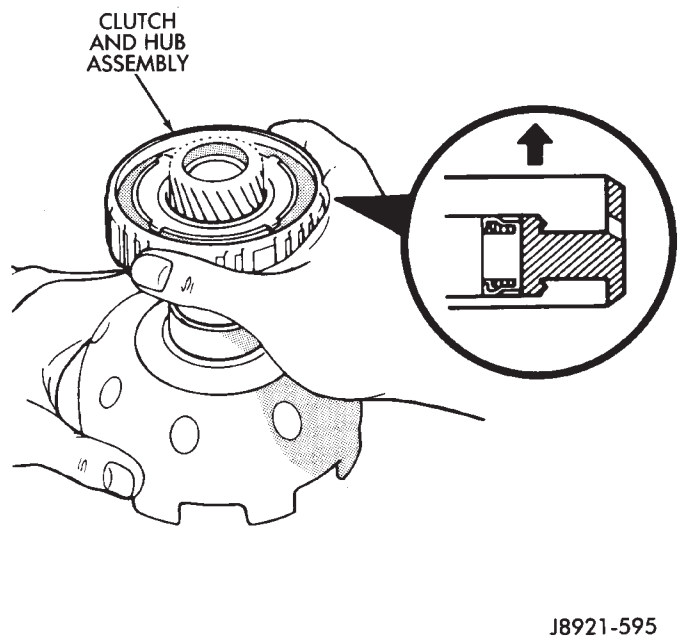
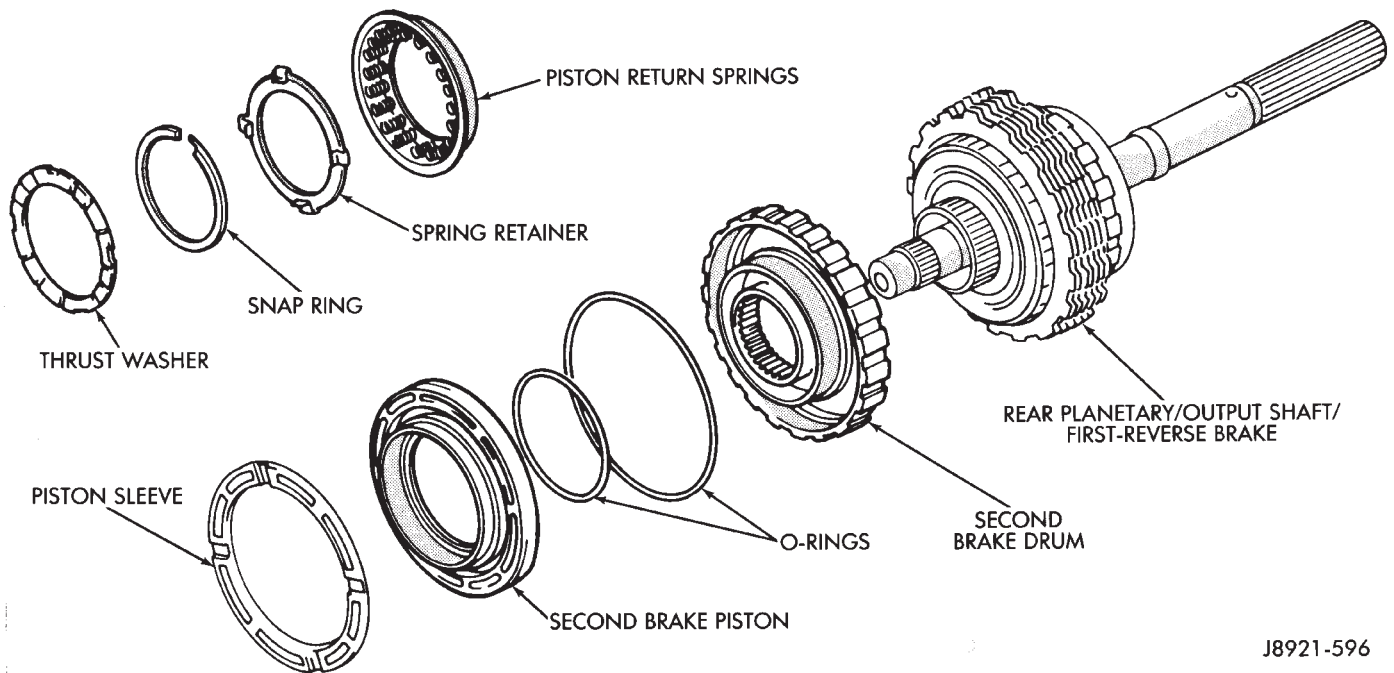


Fig. 9 Installing Clutch And Hub Assembly On Sun Gear



J8921-596

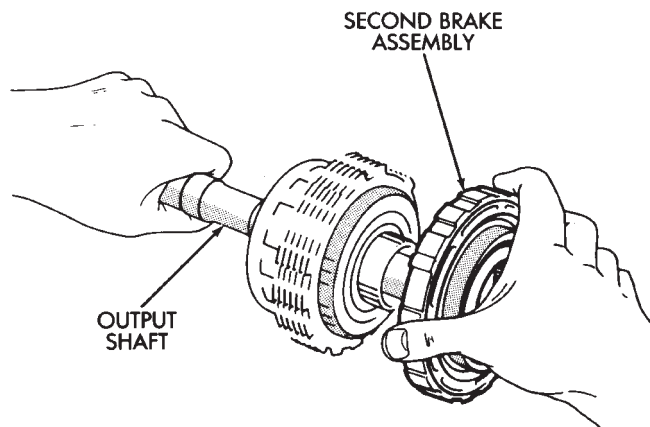
Fig. 1 Second Brake Components

SECOND BRAKE OVERHAUL

BRAKE DISASSEMBLY

(1) Remove second brake drum from output shaft (Fig. 2).

(2) Set output shaft assembly aside for overhaul. Refer to Rear Planetary Gear and Output Shaft Overhaul procedures.



J8921-597

Fig. 2 Removing/Installing Second Brake Assembly

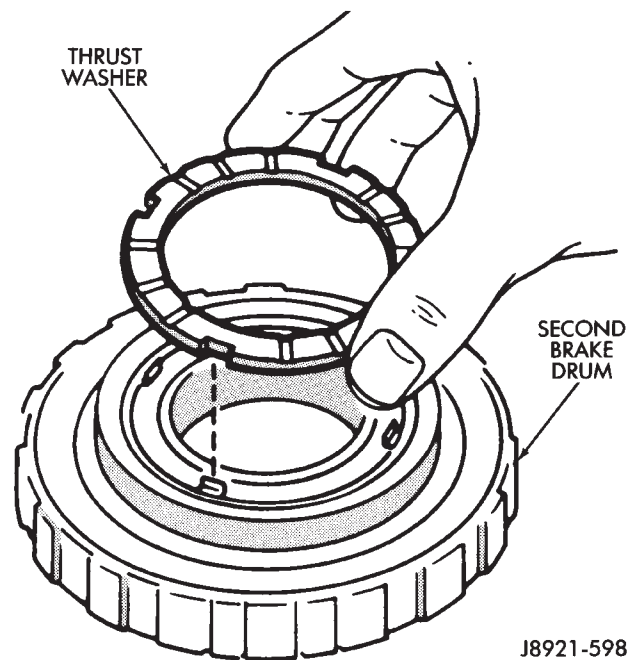
(3) Remove thrust washer from second brake drum (Fig. 3).

(4) Compress piston return springs with shop press and tool 7538. Then remove piston snap ring (Fig. 4).

(5) Remove compressor tool and remove spring retainer and return springs.

(6) Remove second brake piston and sleeve from drum with compressed air (Fig. 5). Use only enough air pressure to ease piston out of drum.

(7) Remove and discard brake piston O-rings.



J8921-598

Fig. 3 Removing/Installing Second Brake Drum Thrust Washer

(8) Measure free length of piston return springs with springs mounted in retainer (Fig. 6). Length should be approximately 16.05 mm (0.632 in.). Replace return springs if length is less than specified.

SECOND BRAKE ASSEMBLY

(1) Lubricate and install new O-rings on brake piston. Then install brake piston in drum.

(2) Install return springs and retainer on brake piston.

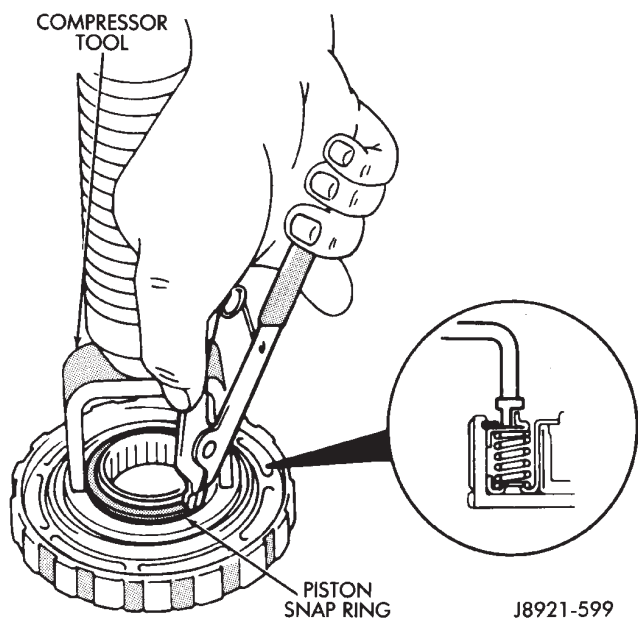


Fig. 4 Removing/Installing Second Brake Piston Snap Ring

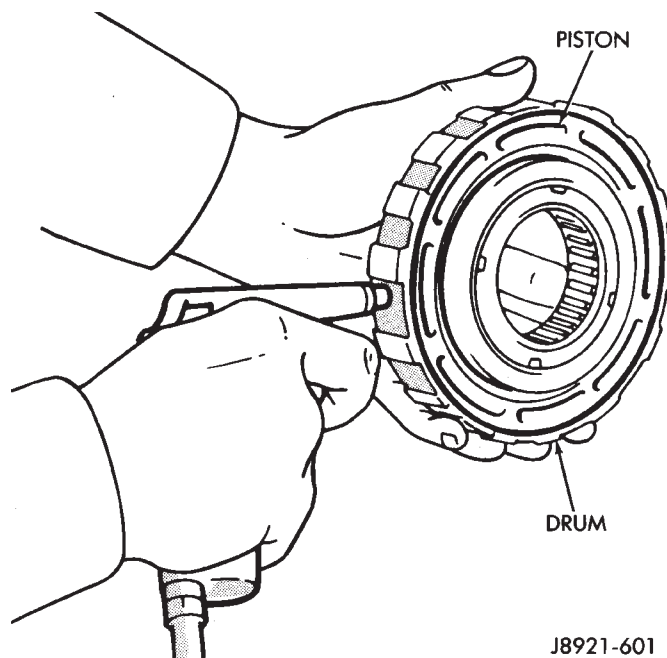


Fig. 7 Checking Second Brake Piston Operation

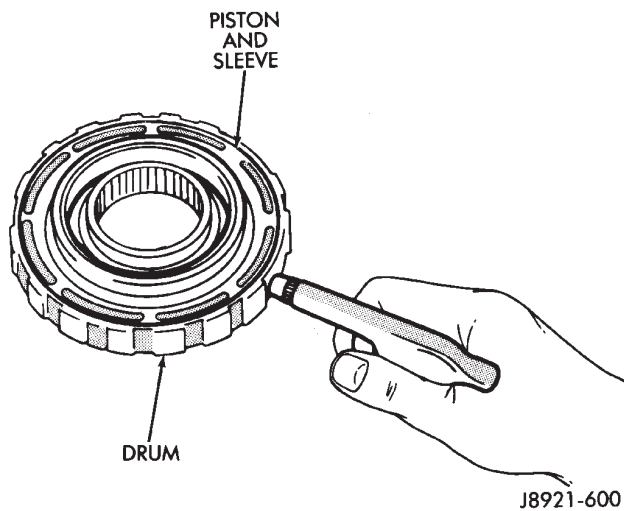


Fig. 5 Removing/Installing Piston And Sleeve

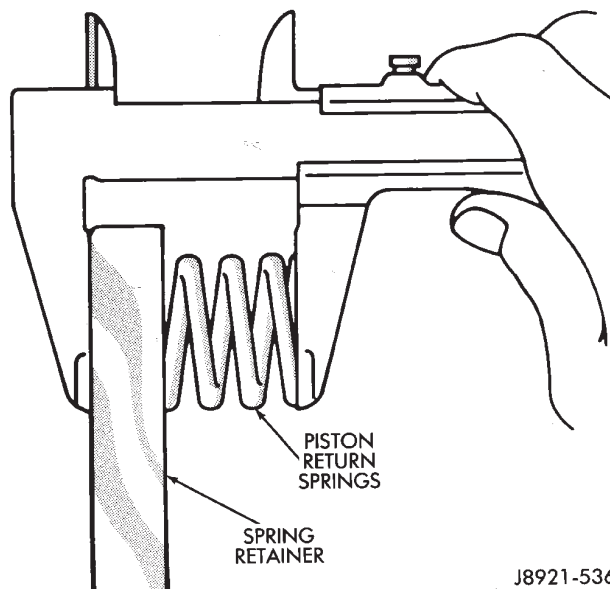


Fig. 6 Measuring Second Brake Piston Return Springs

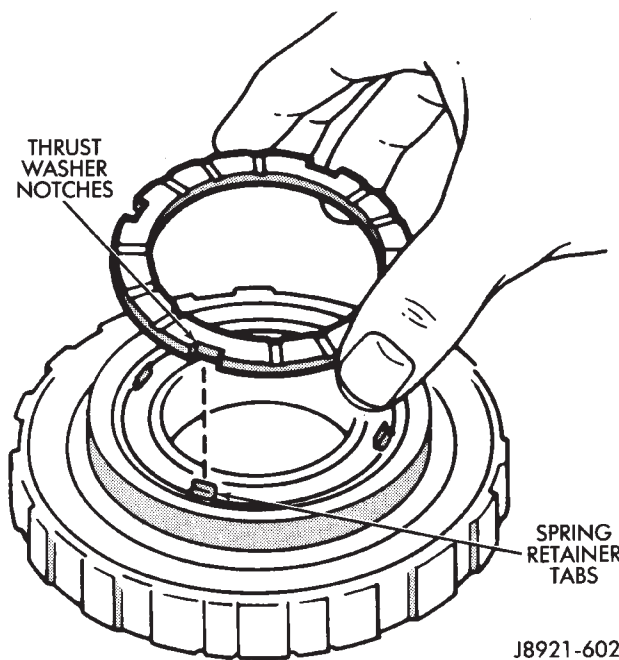


Fig. 8 Installing Second Brake Thrust Washer

(3) Compress return springs with shop press and Compressor Tool 7538. Install piston snap ring and remove brake assembly from press.

(4) Check brake piston operation with low pressure compressed air (Fig. 7). Apply air pressure through feed hole in drum. Piston should move smoothly when applying-releasing air pressure.

(5) Coat thrust washer with petroleum jelly and install it in drum. Be sure washer notches are aligned with tabs on spring retainer (Fig. 8).

(6) Set brake components aside for final assembly.

REAR PLANETARY, NO. 2 ONE-WAY CLUTCH AND OUTPUT SHAFT OVERHAUL

PLANETARY/BRAKE PACK/OUTPUT SHAFT DISASSEMBLY

- (1) Remove output shaft from gear assembly (Fig. 2).
- (2) Remove and discard shaft seal ring (Fig. 4).
- (3) Remove brake pack from planetary gear (Fig. 4).
- (4) Measure thickness of each brake pack disc. Minimum thickness is 1.51 mm (0.0594 in.). Replace all discs if any disc is thinner than specified.
- (5) Remove planetary gear from ring gear (Fig. 5).
- (6) Check No. 2 one-way clutch. Hold planetary gear and turn clutch inner race in both directions.

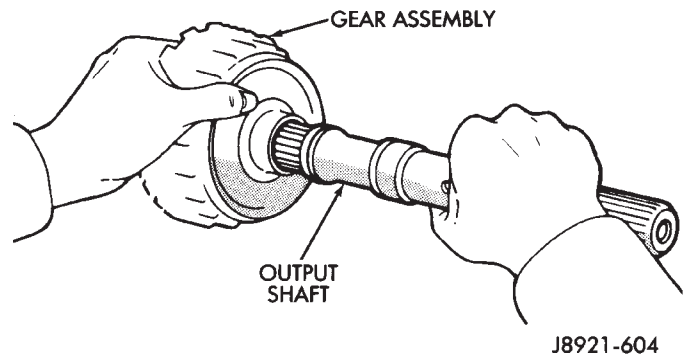
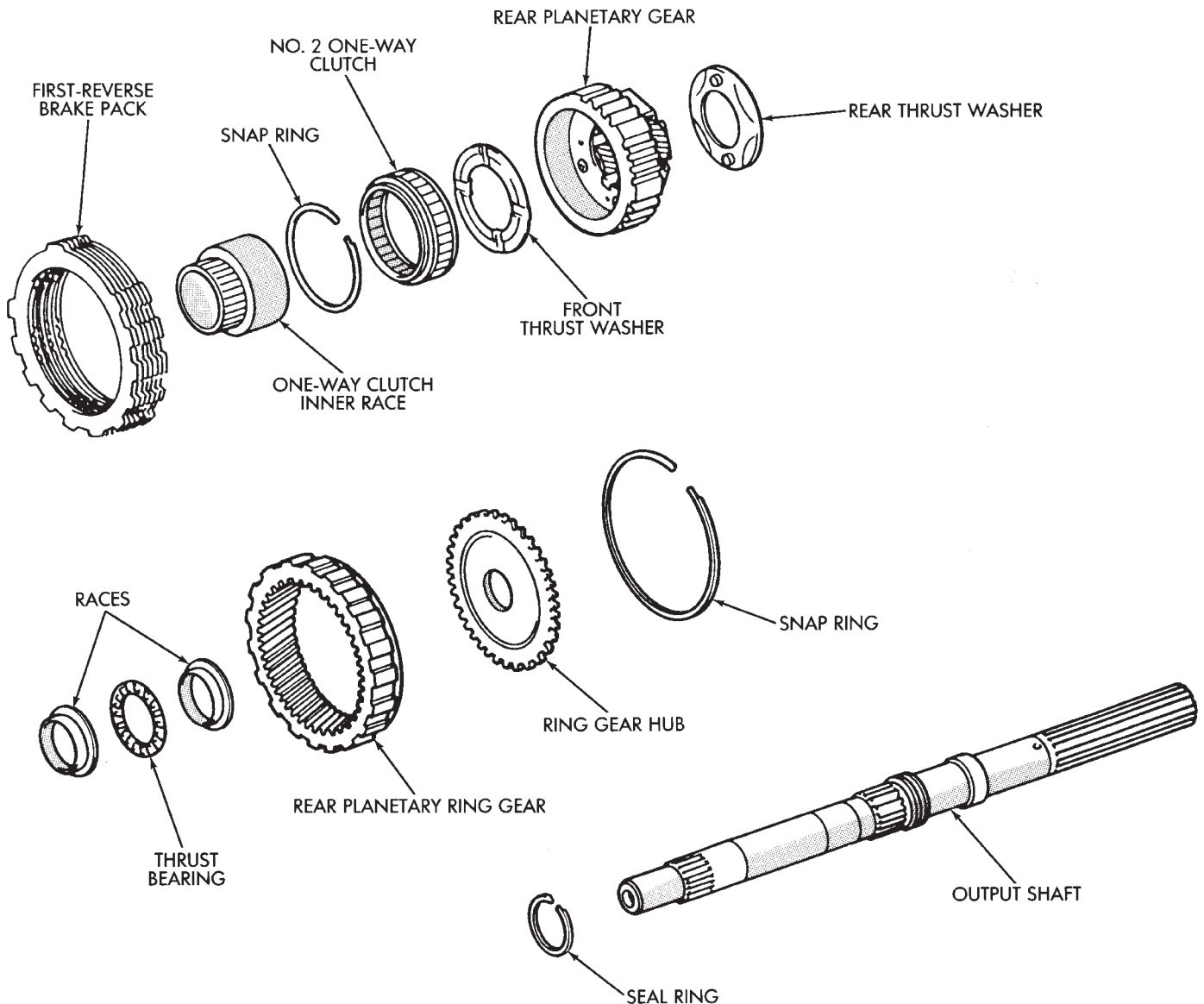


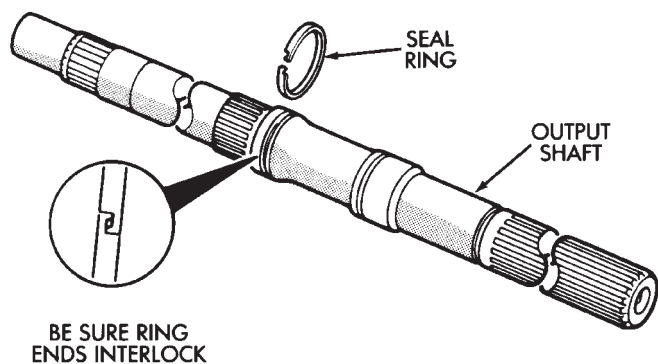
Fig. 2 Removing/Installing Output Shaft

Race should turn freely counterclockwise, but lock when turned clockwise. Replace one-way clutch if necessary.

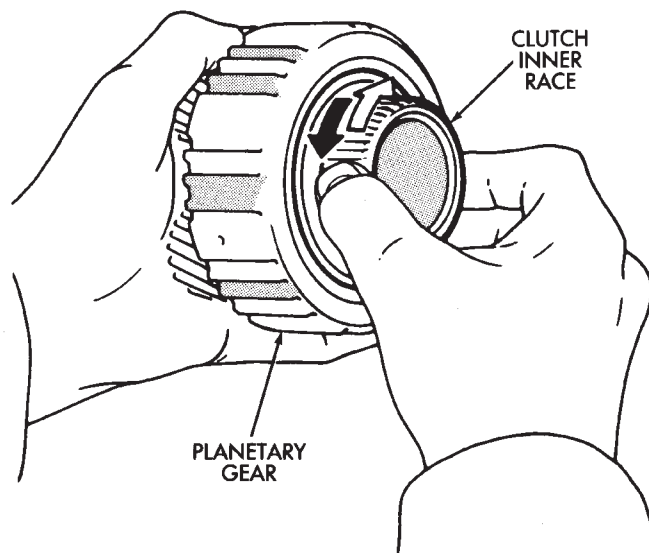


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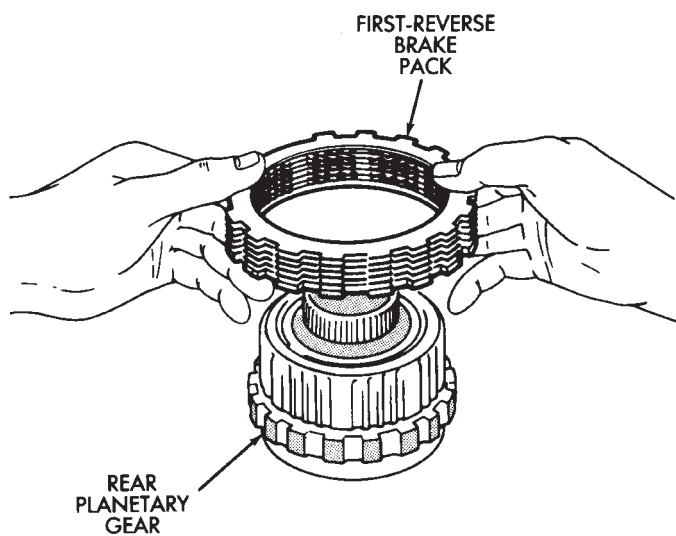
Fig. 1 Rear Planetary, Brake Pack, Clutch And Output Shaft Components



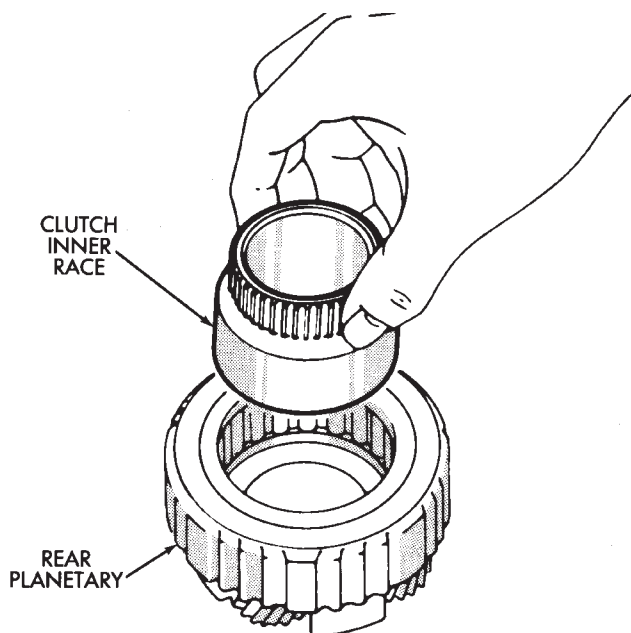
J8921-605

Fig. 3 Removing/Installing Shaft Seal Ring

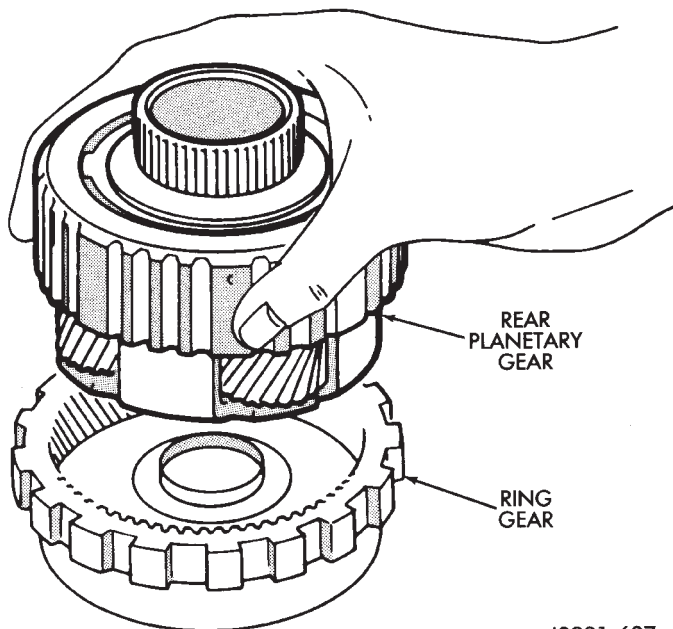
J8921-608

Fig. 6 Checking No. 2 One-Way Clutch Operation

J8921-606

Fig. 4 Removing/Installing First-Reverse Brake Pack

J8921-609

Fig. 7 Removing/Installing Clutch Inner Race

J8921-607

Fig. 5 Removing/Installing Rear Planetary

(7) Remove clutch inner race from planetary gear (Fig. 7).

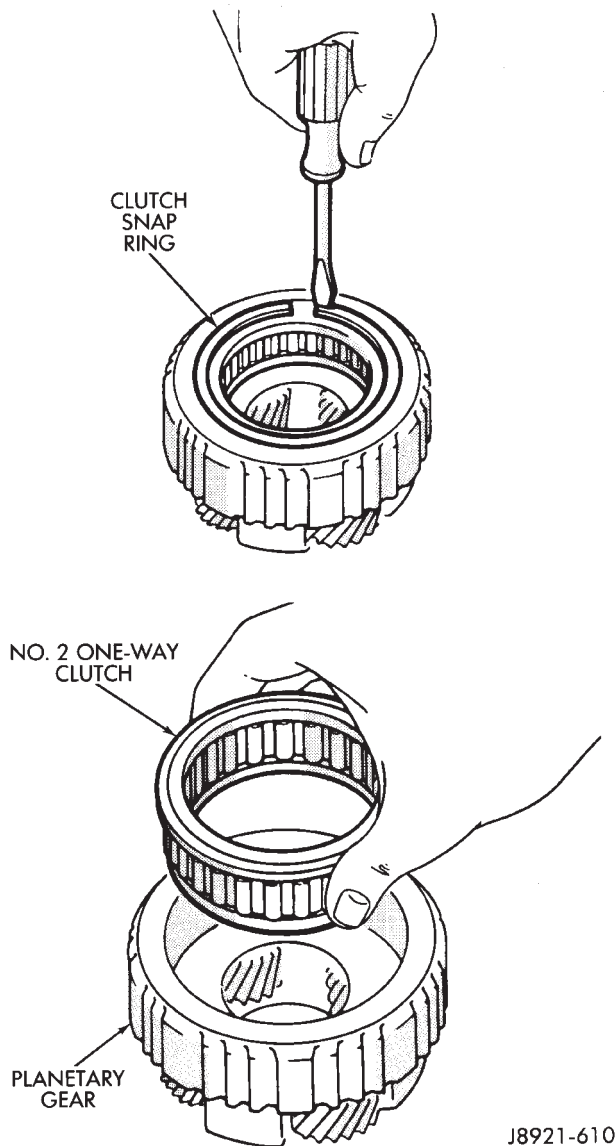
(8) Remove clutch snap ring and remove No. 2 one-way clutch from planetary (Fig. 8).

(9) Remove front and rear thrust washers from planetary gear (Fig. 9).

(10) Remove thrust bearing and washers from ring gear (Fig. 10).

(11) Remove ring gear snap ring and remove ring gear hub (Fig. 11).

(12) Inspect and replace any worn or damaged planetary gear components.

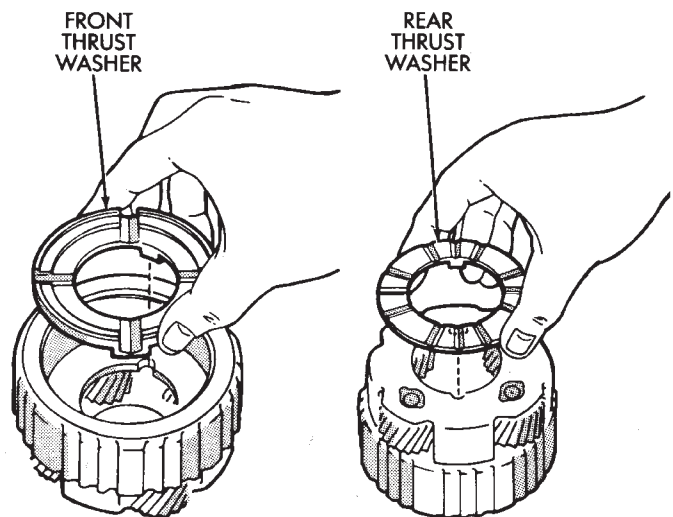


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Fig. 8 Removing/Installing One-Way Clutch

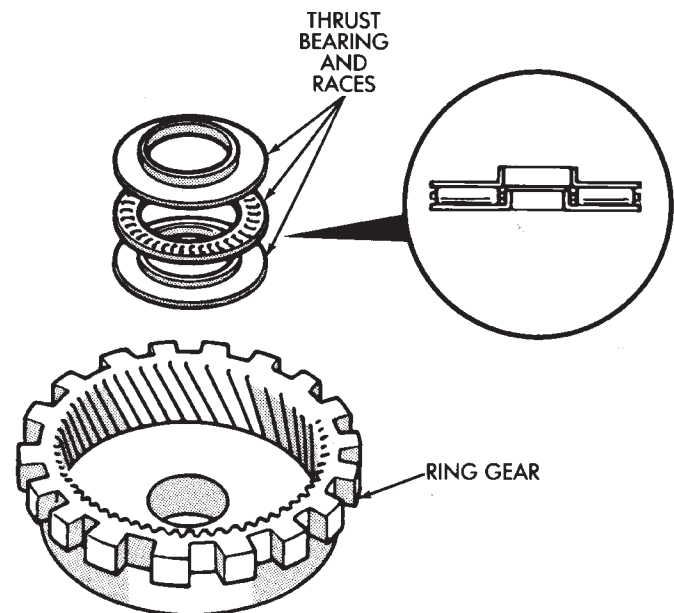
ASSEMBLING REAR PLANETARY, BRAKE PACK, CLUTCH AND SHAFT

- (1) Install hub and snap ring in ring gear (Fig. 11)
- (2) Identify ring gear thrust bearing and races by following dimensions (Fig. 10):
 - Outer diameter of bottom race is 44.8 mm (1.764 in.) and inner diameter is 27.6 mm (1.087 in.).
 - Outer diameter of bearing is 44.7 mm (1.760 in.) and inner diameter is 30.1 mm (1.185 in.).
 - Outer diameter of upper race is 44.8 mm (1.764 in.) and inner diameter is 28.8 mm (1.134 in.).
- (3) Lubricate ring gear thrust bearing and races with petroleum jelly and install them in ring gear (Fig. 10).
- (4) Coat planetary thrust washers with petroleum jelly and install them in gear (Fig. 9).
- (5) Install No. 2 one-way clutch in planetary gear. Be sure flanged side of clutch faces upward (Fig. 12).



J8921-611

Fig. 9 Removing/Installing Rear Planetary Thrust Washers



J8921-612

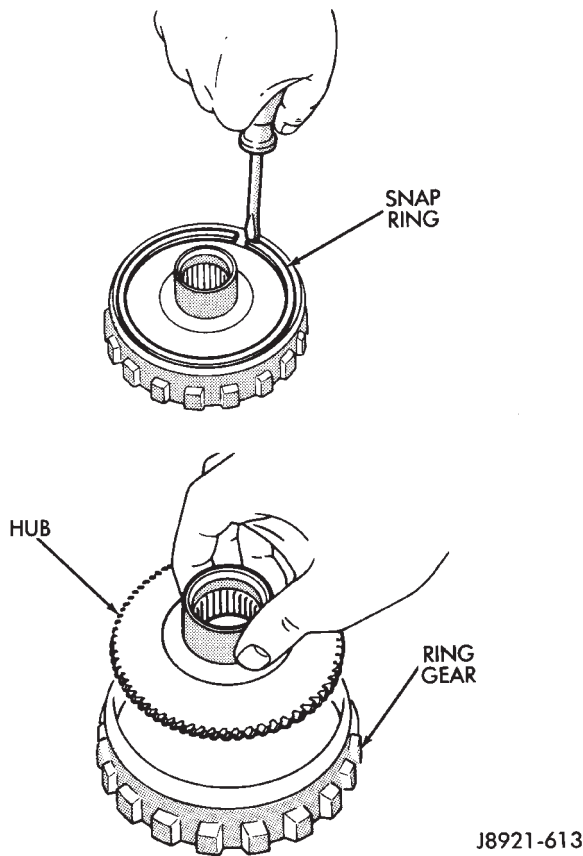
Fig. 10 Removing/Installing Ring Gear Thrust Bearing And Races

- (6) Install clutch retaining snap ring and install clutch inner race (Fig. 7). Turn race counterclockwise to ease installation.

- (7) Verify one-way clutch operation. Hold gear and turn inner race in both directions. Race should turn freely counterclockwise, but lock when turned clockwise.

- (8) Install planetary gear in ring gear.

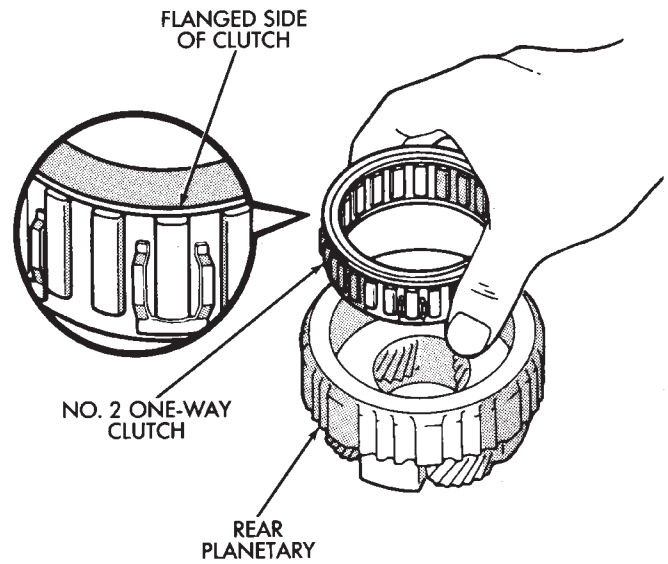
- (9) Assemble clutch discs and clutch plates (Fig. 4). Sequence is disc first, then a plate. Use seven discs and plates in a 6-cyl. transmission.



J8921-613

Fig. 11 Removing/Installing Ring Gear Hub

- (10) Install brake pack on planetary gear (Fig. 4).
- (11) Install new seal ring on output shaft (Fig. 3). Be sure ring ends are interlocked as shown.
- (12) Set assembled components aside for final assembly.



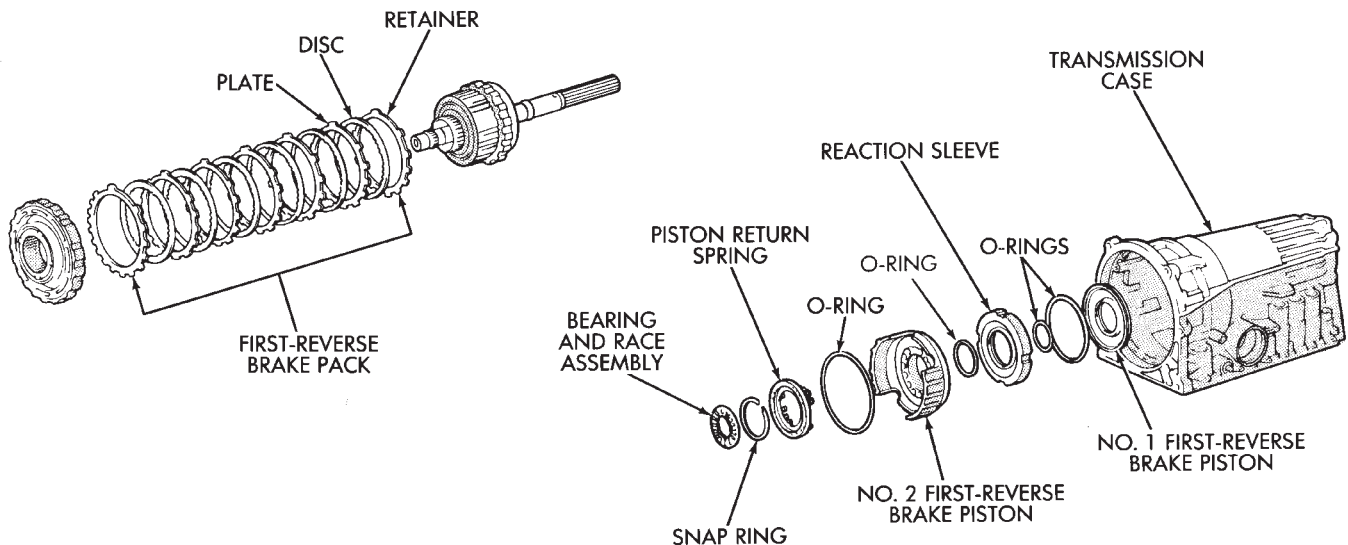
J8921-614

Fig. 12 Installing No. 2 One-Way Clutch

FIRST-REVERSE BRAKE PISTON AND TRANSMISSION CASE OVERHAUL

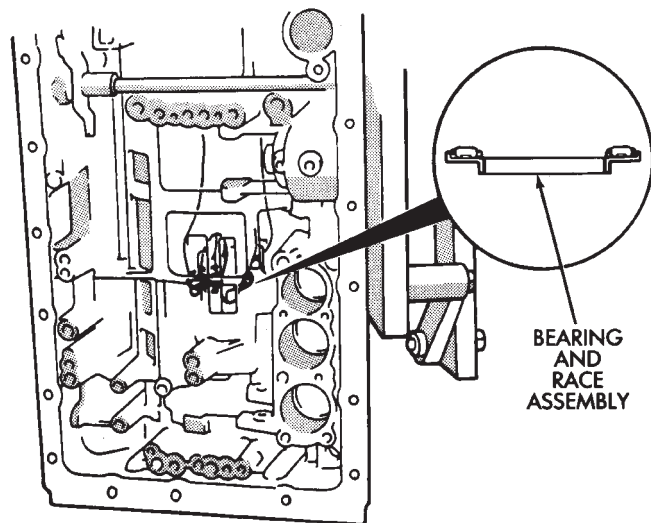
BRAKE DISASSEMBLY AND INSPECTION

- (1) Remove bearing and race assembly from transmission case (Fig. 2).
- (2) Check first/reverse brake piston operation with compressed air (Fig. 3). Piston should move smoothly and not bind or stick. If piston operation is incorrect, case or piston may require replacement.
- (3) Compress piston return springs with Tool 7539 and remove piston snap ring (Fig. 4).
- (4) Remove Tool 7539 and remove piston return springs.
- (5) Remove No. 2 first-reverse brake piston with compressed air. Apply air through same transmission



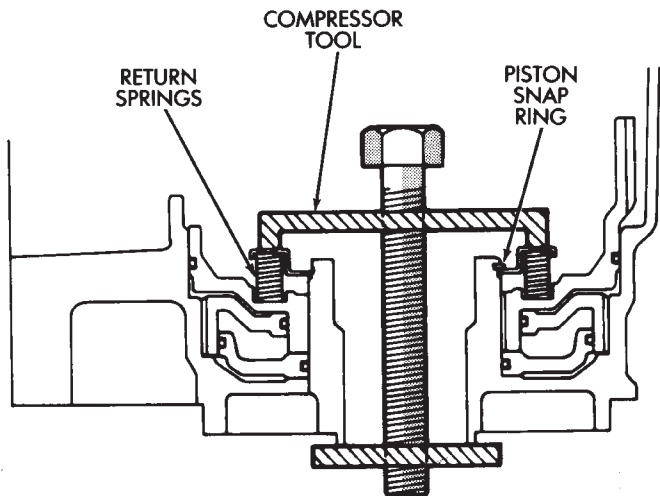
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Fig. 1 First-Reverse Brake Pistons And Transmission Case



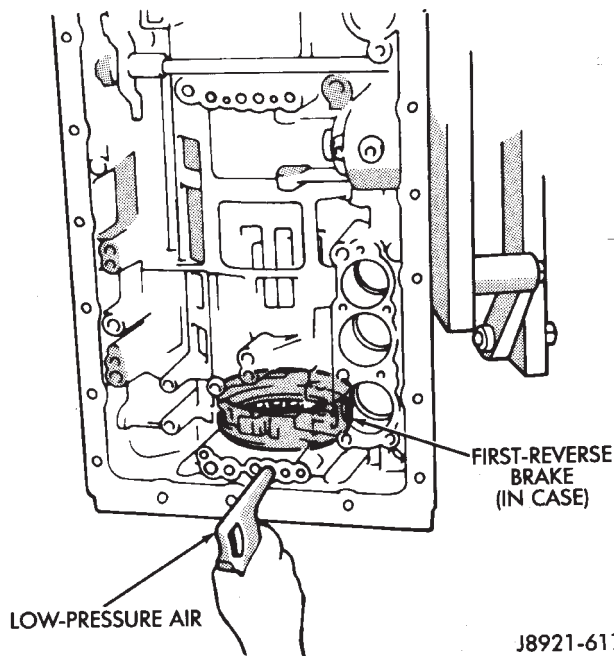
J8921-616

Fig. 2 Removing/Installing Bearing And Race Assembly



J8921-618

Fig. 4 Removing/Installing Piston Snap Ring



J8921-617

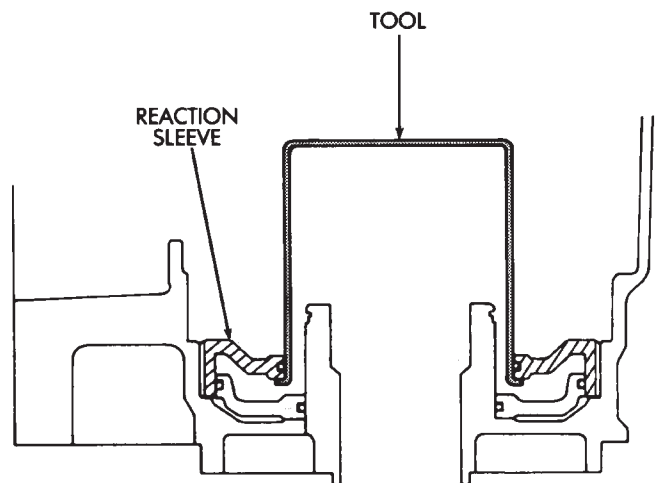
Fig. 3 Checking First-Reverse Brake Piston Operation

feed hole used for checking piston operation.

(6) Remove reaction sleeve with Sleeve Remover Tool 7542 (Fig. 5). Insert tool flanges under sleeve and lift tool and sleeve out of case.

(7) Remove No. 1 first/reverse brake piston with Piston Puller 7543 (Fig. 6). Slip tool under piston and lift tool and piston out of case.

(8) Measure free length of piston return springs with springs mounted in retainer. Length should be 18.382 mm (0.724 in.). Replace springs if length is less than this.



J8921-619

Fig. 5 Removing/Installing Reaction Sleeve

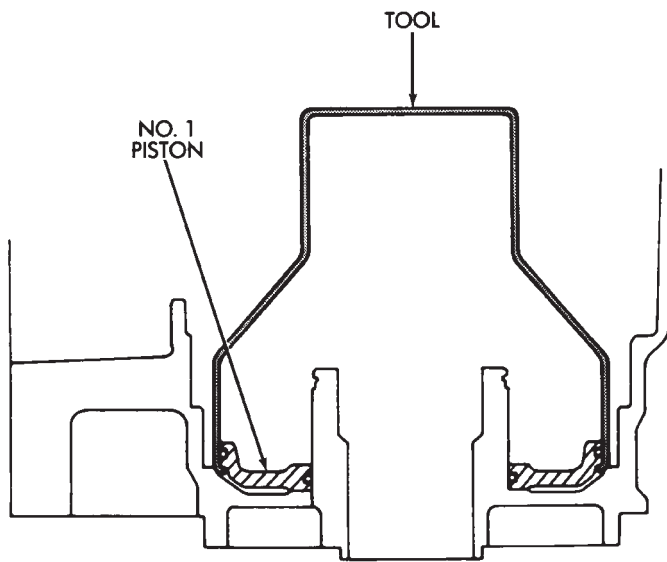
(9) Clean transmission case thoroughly with solvent and dry it with compressed air. Blow compressed air through oil feed passages to remove solvent residue and ensure that passages are clear. Inspect the case for wear or damage. Replace case if necessary.

ASSEMBLING FIRST/REVERSE BRAKE PISTON

(1) Lubricate and install new O-rings on No. 1 first/reverse brake piston and on reaction sleeve (Fig. 7). Then install piston in sleeve.

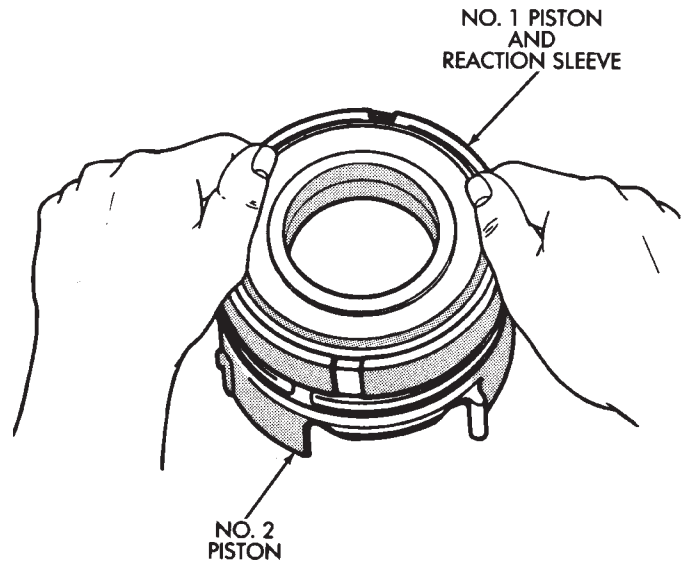
(2) Lubricate and install new O-ring on No. 2 brake piston.

(3) Install assembled No. 1 piston and reaction sleeve on No. 2 piston (Fig. 8).



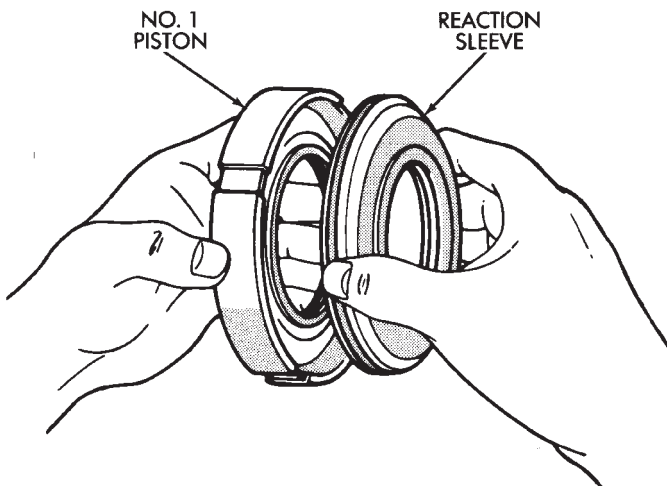
J8921-620

Fig. 6 Removing/Installing First-Reverse Brake No.1 Piston



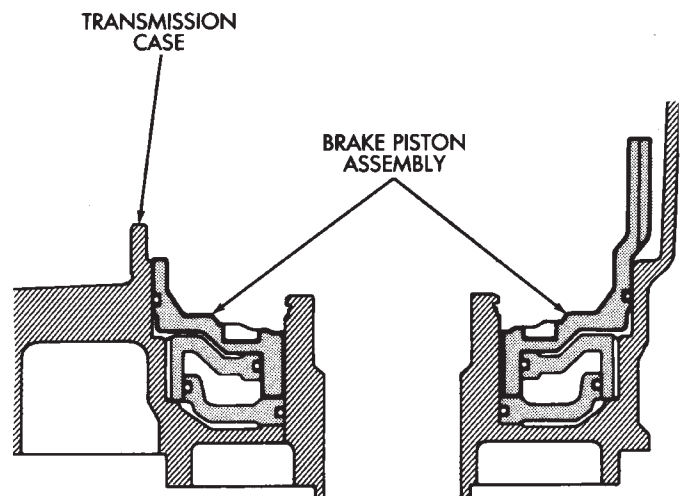
J8921-622

Fig. 8 Assembling First-Reverse Brake Pistons



J8921-621

Fig. 7 Assembling No. 1 Piston And Sleeve



J8921-623

Fig. 9 Installing First-Reverse Brake Piston Assembly

(4) Lubricate and install piston assembly in case (Fig. 9). Align piston and case slots and press piston assembly into case with hand pressure.

(5) Position piston return springs on No. 2 piston.

(6) Compress piston return springs with Tool 7539 and install piston snap ring (Fig. 4). Be sure snap ring end gap is not aligned with any tangs on return spring retainer.

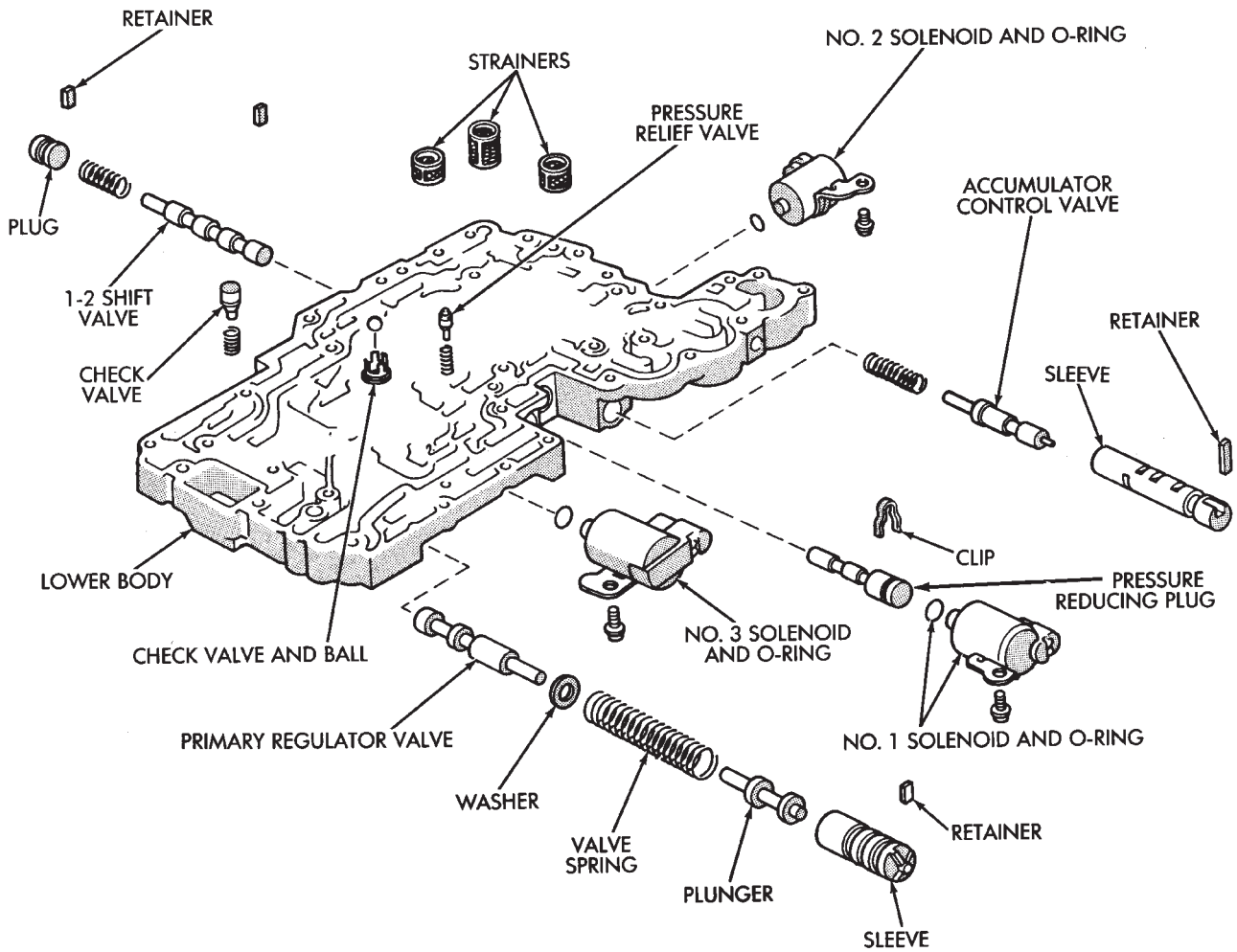
(7) Verify piston operation with compressed air as outlined in disassembly procedure.

(8) Coat bearing and race assembly with petroleum jelly and install it in piston assembly (Fig. 2). Bearing and race assembly outer diameter is 57.7 mm (2.272 in.) and inner diameter is 39.2 mm (1.543 in.).

TRANSMISSION VALVE BODY OVERHAUL

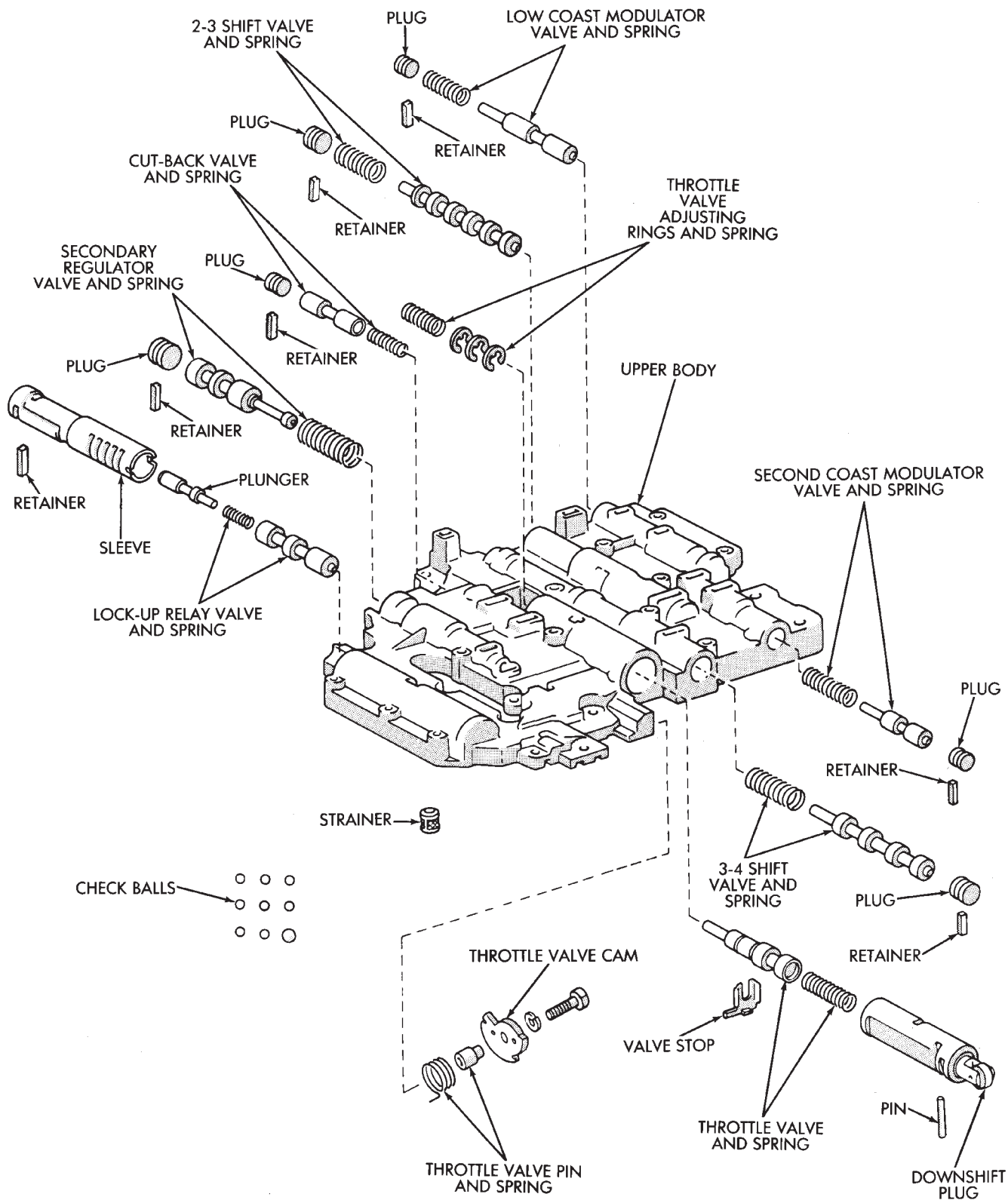
The valve body assembly consists of two sections which are the upper body and lower body (Figures 1

and 2). Disassembly, inspection and overhaul procedures for each section are outlined separately. Refer to the appropriate procedure as needed.



J9121-384

Fig. 1 Lower Body Components

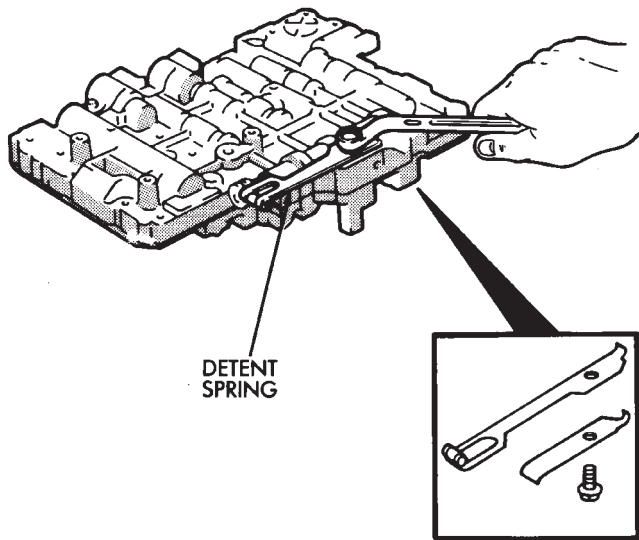


J8921-625

Fig. 2 Upper Body Components

REMOVING UPPER BODY FROM LOWER BODY

(1) Remove two-piece detent spring (Fig. 3). Note position of spring sections for assembly reference.

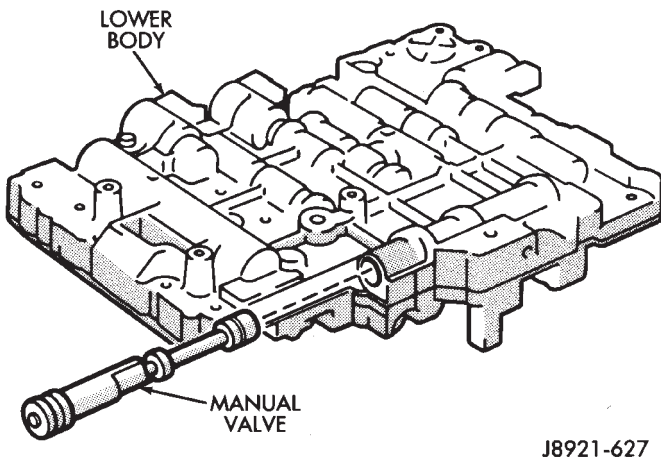


DETENT SPRING

J8921-626

Fig. 3 Removing/Installing Detent Spring

(2) Remove manual valve from lower body (Fig. 4).



LOWER BODY

MANUAL VALVE

J8921-627

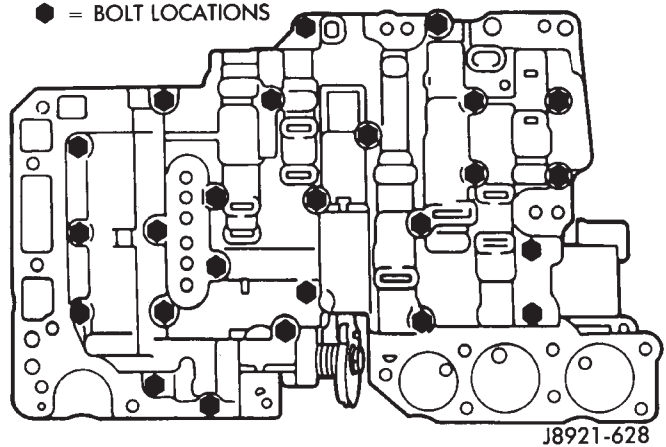
Fig. 4 Removing/Installing Manual Valve

(3) Remove bolts attaching upper body to lower body (Fig. 5).

(4) Carefully lift and remove upper body, plate and gaskets from lower body (Fig. 6).

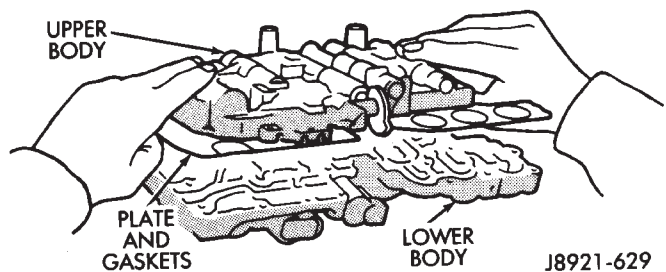
(5) Disassemble and overhaul upper and lower body sections as outlined in following procedures.

● = BOLT LOCATIONS



J8921-628

Fig. 5 Valve Body Bolt Locations



UPPER BODY

PLATE AND GASKETS

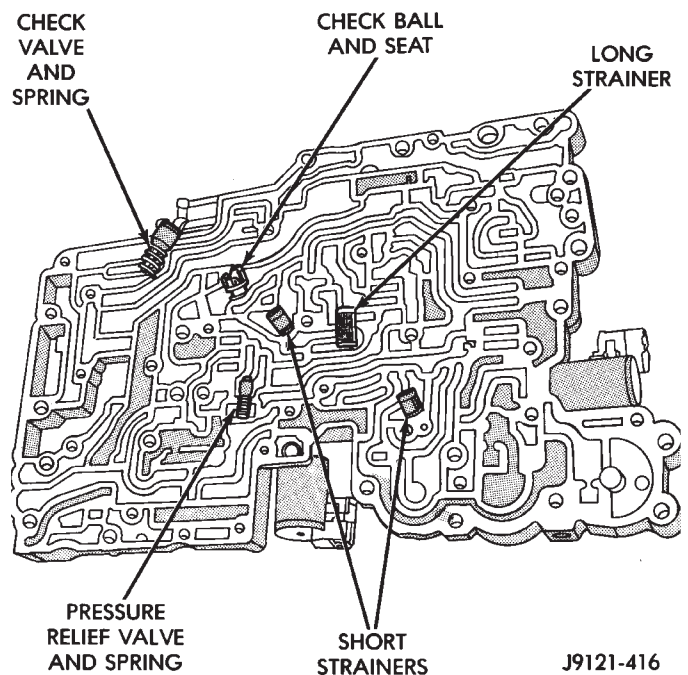
LOWER BODY

J8921-629

Fig. 6 Upper Body, Plate And Gaskets

LOWER BODY DISASSEMBLY

(1) Remove check valve and spring, pressure relief valve and spring and ball check and seat from lower body. Note location of each valve for assembly reference (Fig. 1).



CHECK VALVE AND SPRING

CHECK BALL AND SEAT

LONG STRAINER

PRESSURE RELIEF VALVE AND SPRING

SHORT STRAINERS

J9121-416

Fig. 1 Lower Body Check Valve And Strainer Location

- (2) Remove oil strainers (Fig. 2).
- (3) Note or mark position of valve retainers and pressure reducing plug clip for assembly reference (Fig. 2). Do not remove the retainers at this time.

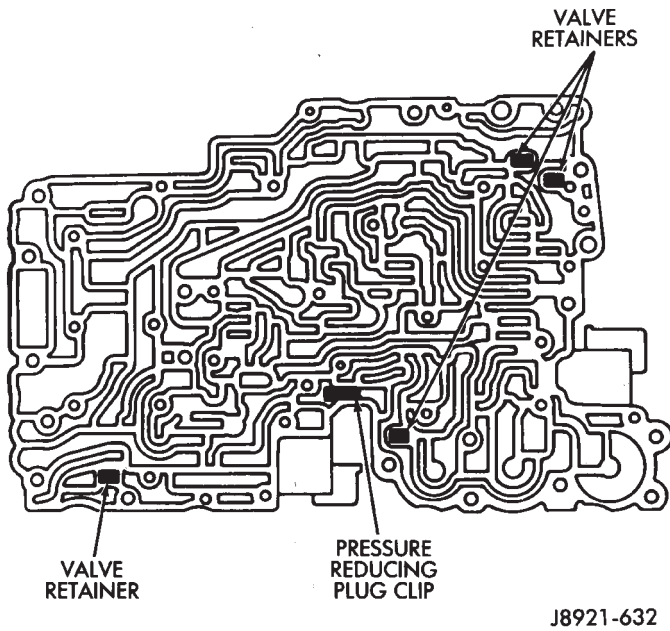


Fig. 2 Valve Retainer And Clip Location

- (4) Remove solenoid No. 1, 2 and 3. Discard solenoid O-rings.
- (5) Remove 1-2 shift valve retainer (Fig. 3).

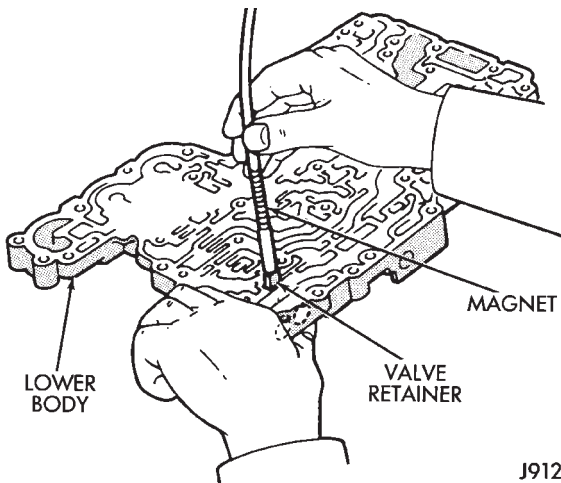


Fig. 3 Removing 1-2 Shift Valve Retainer

- (6) Remove 1-2 shift valve plug, valve spring and valve (Fig. 4).
- (7) Remove primary regulator valve as follows:

WARNING: THE PRIMARY REGULATOR VALVE SLEEVE AND PLUNGER ARE UNDER TENSION FROM THE VALVE SPRING. EXERT COUNTER-PRESSURE ON THE SPRING WHILE REMOVING THE VALVE RETAINER TO PREVENT COMPONENTS FROM FLYING OUT.

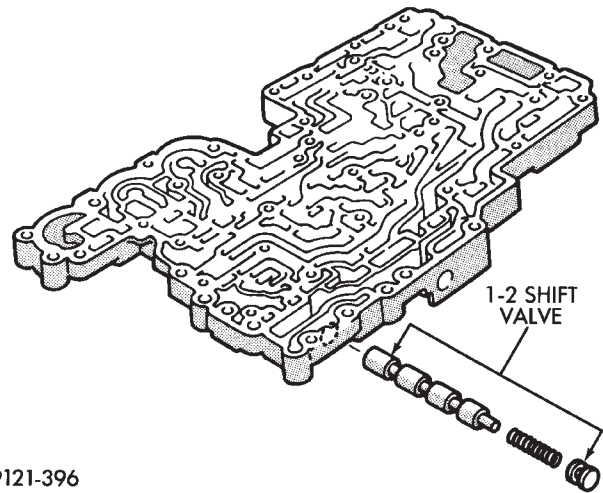


Fig. 4 Removing/Installing 1-2 Shift Valve

- (a) Note position of valve retainer for assembly reference (Fig. 5). Then press valve sleeve inward with your thumb and remove retainer with magnet.

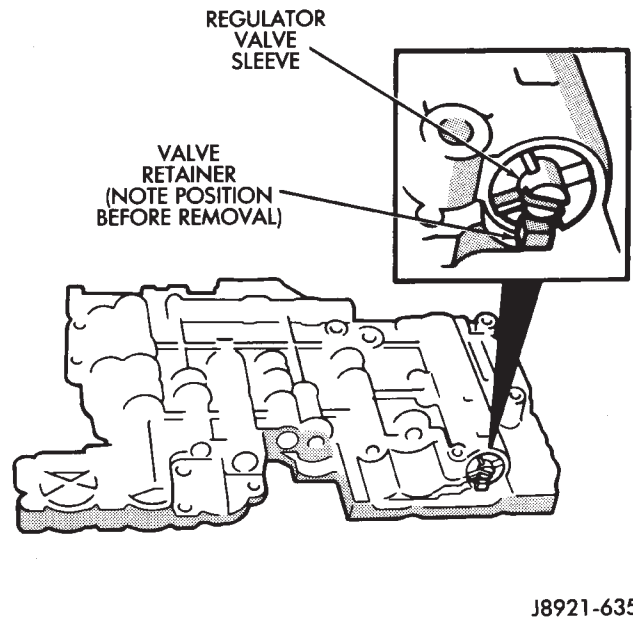


Fig. 5 Regulator Valve Retainer Position

(b) Slowly release thumb pressure on sleeve and remove sleeve, spring and washer and valve (Fig. 6). Use magnet to remove valve if necessary.

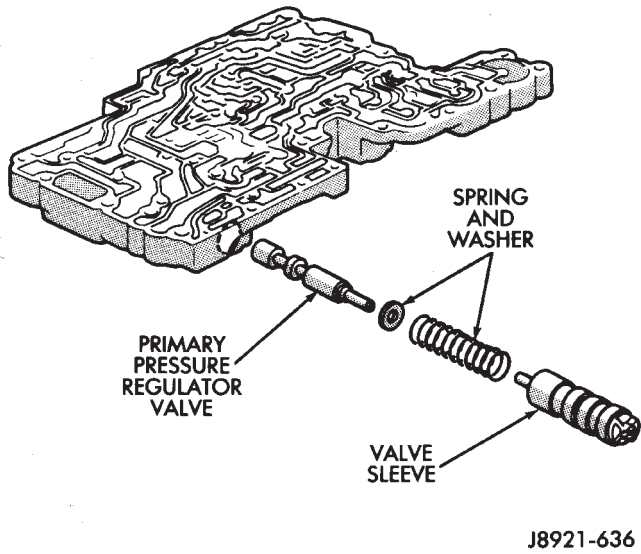


Fig. 6 Removing/Installing Primary Pressure Regulator Valve

(8) Remove regulator valve plunger from sleeve (Fig. 7).

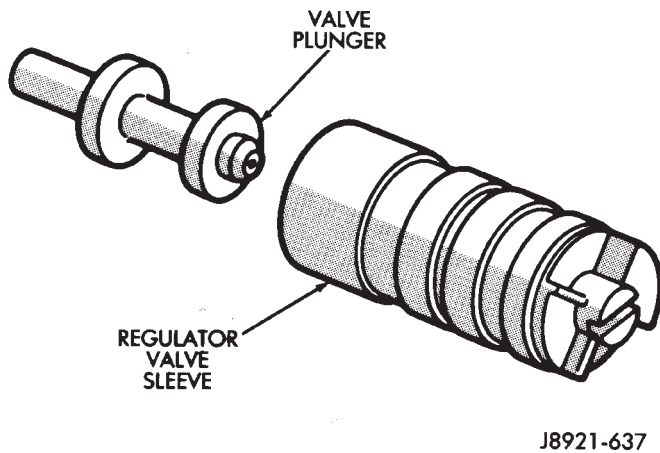


Fig. 7 Removing/Installing Regulator Valve Plunger

(9) Remove retaining clip and remove pressure reducing plug (Fig. 8). Cover screwdriver blade with tape to avoid scratching valve body surface.

(10) Remove accumulator control valve retainer and remove control valve assembly (Fig. 9).

(11) Remove spring and control valve from valve sleeve (Fig. 10).

(12) Clean lower body valve components with solvent and dry them with compressed air only. Do not use shop towels or rags. Lint or foreign material from towels or rags can interfere with valve operation.

(13) Inspect condition of lower body components. Replace lower body if any bores are scored or cor-

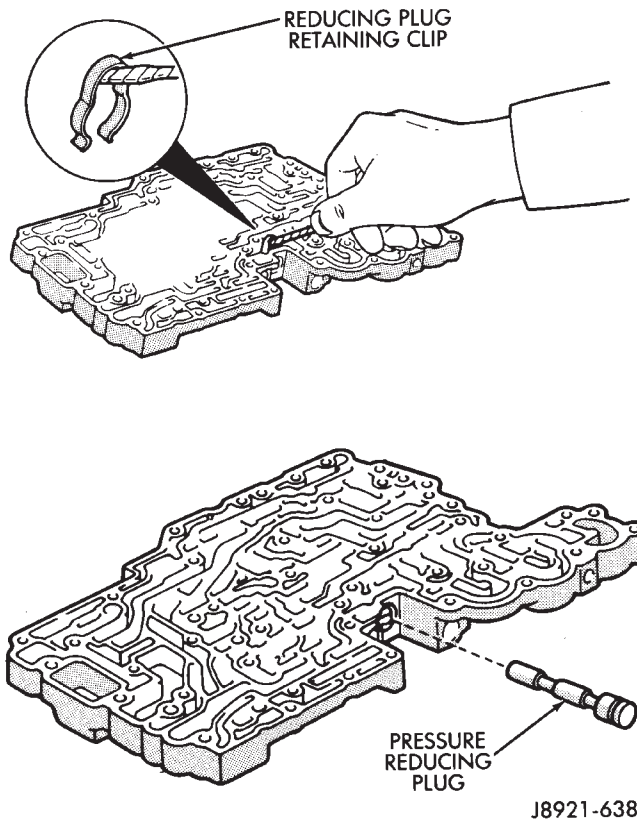


Fig. 8 Removing/Installing Pressure Reducing Plug

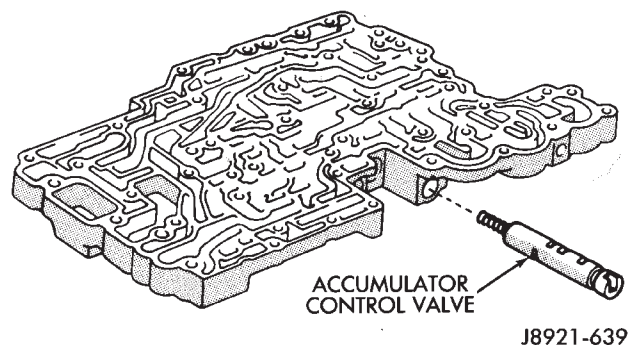
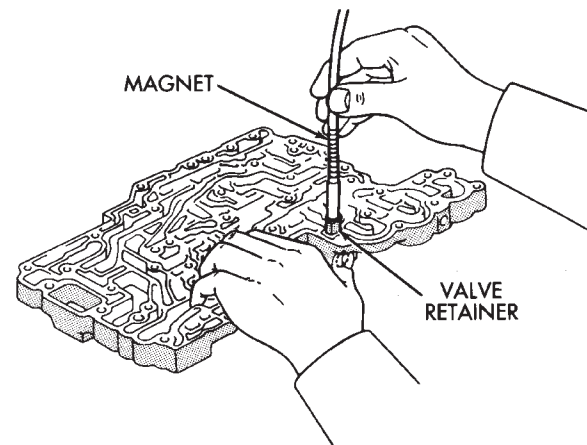


Fig. 9 Removing/Installing Accumulator Control Valve Assembly

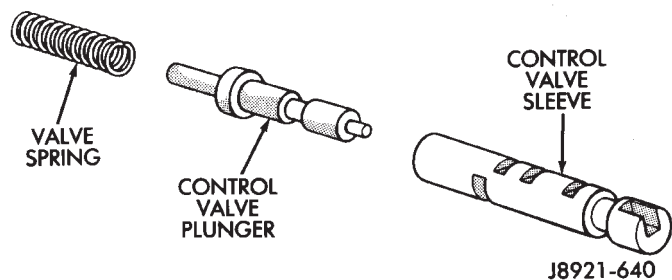


Fig. 10 Accumulator Control Valve Components

roded. Replace valves, plugs or sleeves that are scored or worn. Replace oil strainers if cut, torn or damaged in any way.

(14) Inspect valve body springs. Replace any spring having rusted, distorted, or collapsed coils. Measure length of each valve body spring. Replace any spring if free length is less than length specified in following chart (Fig. 11).

LOWER BODY ASSEMBLY

(1) Lubricate lower body components with automatic transmission fluid.

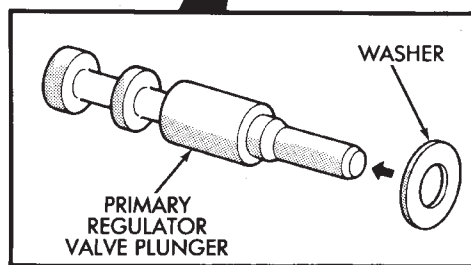
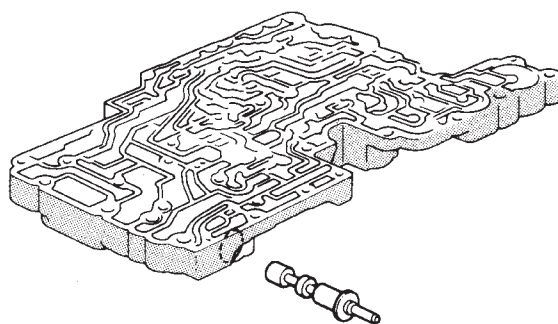
(2) Install spring and accumulator control valve in sleeve (Fig. 11). Then install assembled components in lower body (Fig. 9).

(3) Press accumulator control valve assembly into valve bore and install retainer (Fig. 9).

(4) Install pressure reducing plug in plug bore. Then secure plug with retaining clip (Fig. 8).

(5) Install washer on primary regulator valve plunger (Fig. 12).

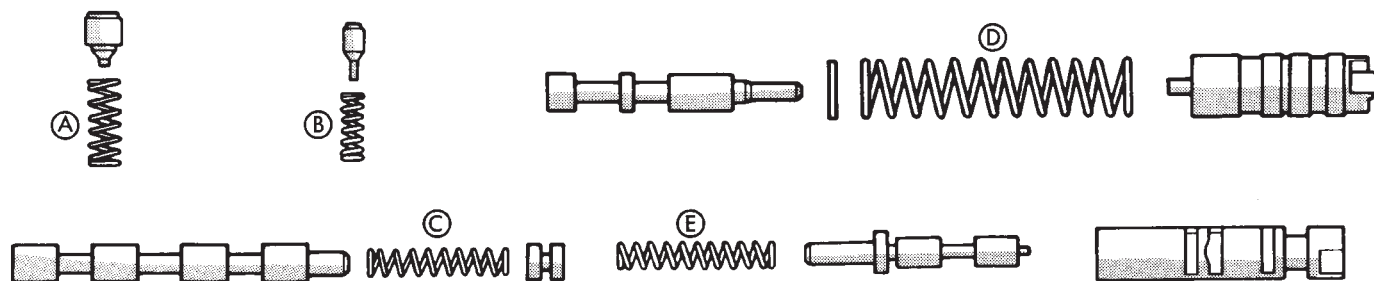
(6) Install primary regulator valve plunger in valve sleeve (Fig. 7).



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Fig. 12 Installing Washer On Regulator Valve Plunger

(7) Install valve spring and regulator valve sleeve and plunger.



Spring	Free Length
(A) Check Valve	20.2 mm (0.801 in.)
(B) Pressure Relief Valve	11.2 mm (0.441 in.)
(C) 1-2 Shift Valve	30.8 mm (1.213 in.)
(D) Primary Regulator Valve	62.3 mm (2.453 in.)
(E) Accumulator Control Valve	29.8 mm (1.173 in.)

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Fig. 11 Lower Body Valve Spring Dimensions

(8) Press regulator valve sleeve into bore and install retainer (Fig. 5 and 6). Be sure retainer is positioned in sleeve lugs as shown.

(9) Install 1-2 shift valve, spring and plug (Fig. 4). Then press valve assembly into bore and install retainer.

(10) Install replacement O-rings on solenoids and install solenoids on valve body. Tighten solenoid attaching bolts to 10 N·m (7 ft-lbs) torque.

(11) Install oil strainers (Fig. 13). **Identify strainers before installation. The three strainers are all the same diameter but are different lengths. Two strainers are 11.0 mm (0.443 in.) long while one strainer is 19.5 mm (0.76 in.) long (Fig. 14).**

(12) Install check valve and spring (Fig. 13).

(13) Install check ball and seat (Fig. 13).

(14) Install pressure relief valve and spring (Fig. 13).

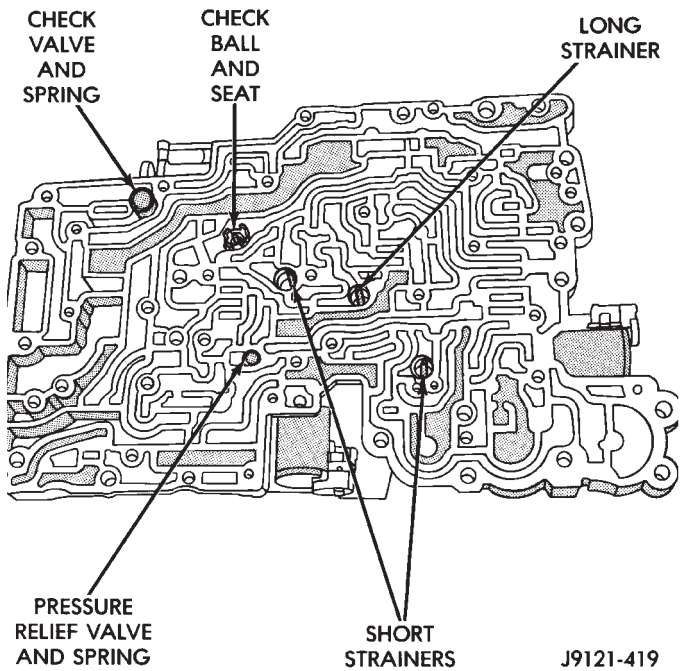
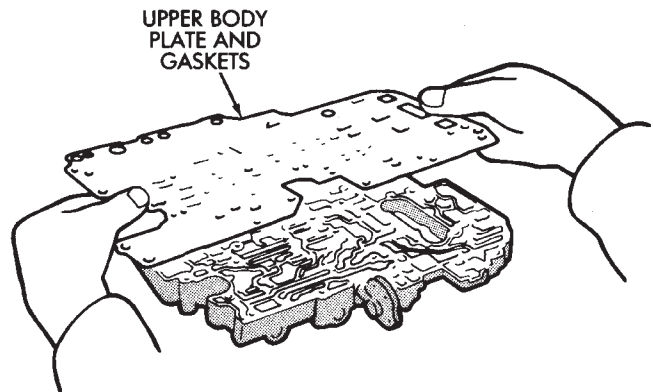


Fig. 13 Oil Strainer And Check Valve Installation

UPPER BODY DISASSEMBLY AND INSPECTION

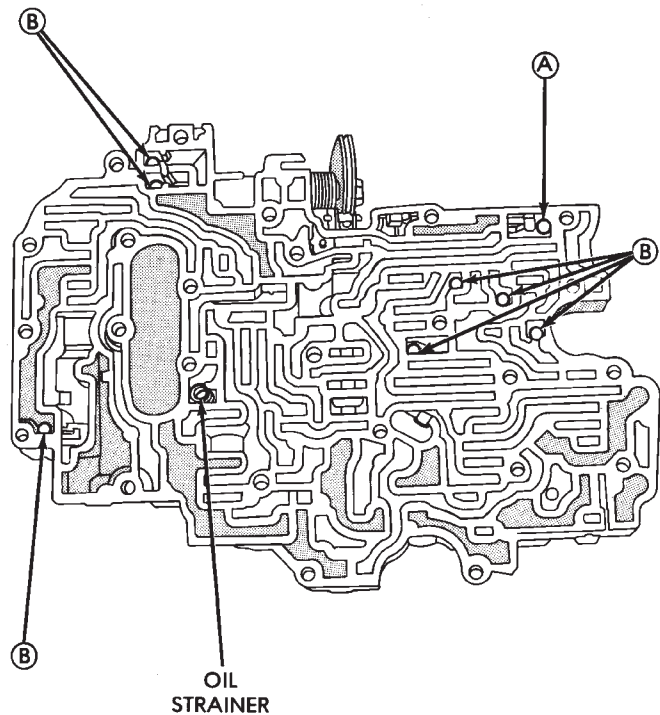
(1) Remove valve body plate and gaskets (Fig. 1). Discard gaskets.



J8921-644

Fig. 1 Removing/Installing Upper Body Plate And Gaskets

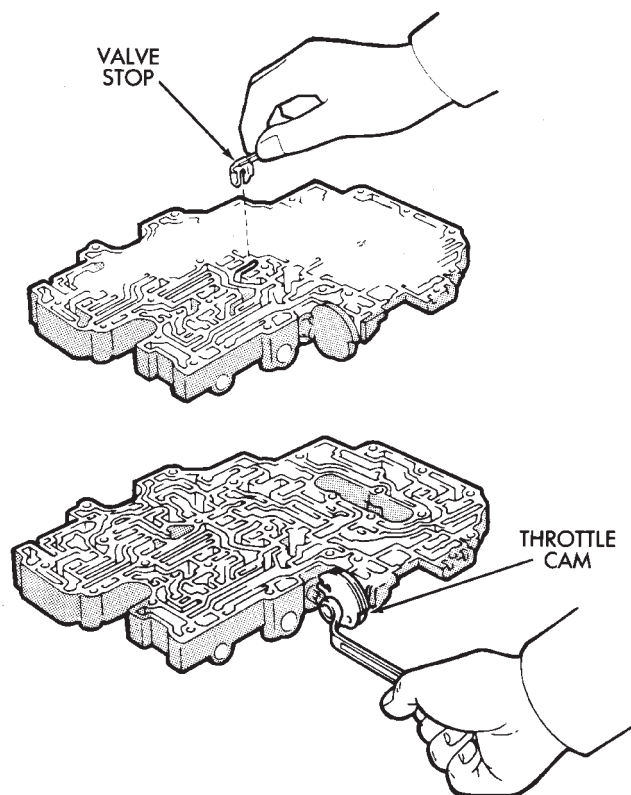
(2) Remove strainer and eight check balls (Fig. 2). Note check ball and strainer position for assembly reference.



CHECK BALL	DIAMETER
A	6.35 mm (.250 in.)
B	5.535 mm (.218 in.)

J9121-415

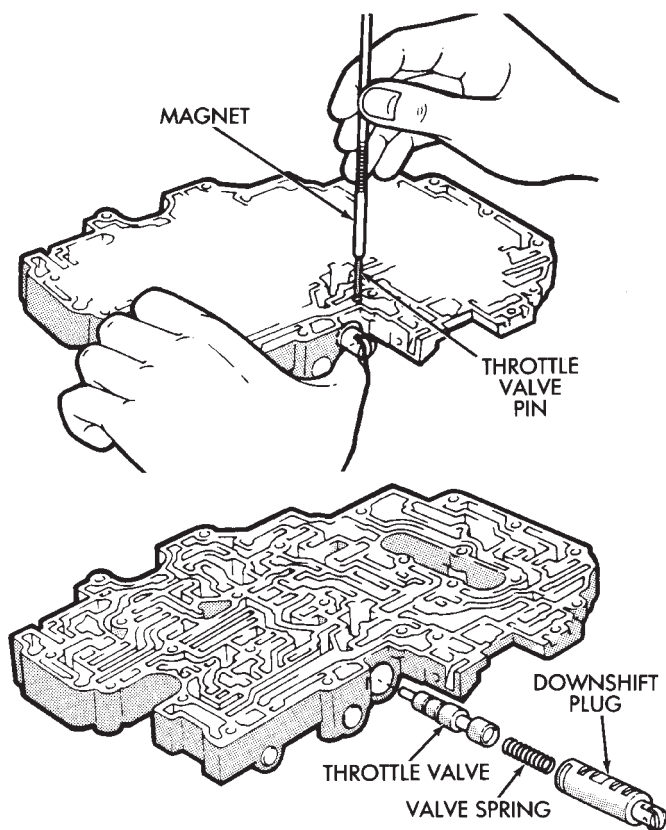
Fig. 2 Check Ball And Strainer Location/Identification



J8921-646

Fig. 3 Removing/Installing Valve Stop And Throttle Cam

(3) Remove valve stop and throttle cam (Fig. 3).

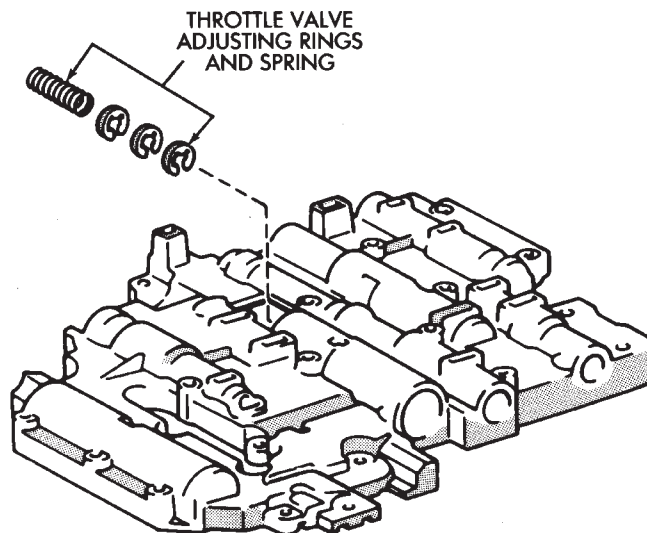


J8921-647

Fig. 4 Removing/Installing Throttle Valve

(4) Remove throttle valve pin with magnet and remove downshift plug, valve spring and throttle valve (Fig. 4).

(5) Turn upper body over and remove throttle valve adjusting rings and spring (Fig. 5). Note number of adjusting rings if valve is equipped with them.



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Fig. 5 Throttle Valve Adjusting Ring Location (If Equipped)

(6) Remove 3-4 shift valve retainer with magnet and remove valve plug, spring and 3-4 shift valve (Fig. 6).

(7) Remove second coast modulator valve retainer and remove valve plug, spring and valve.

(8) Remove lock-up relay valve retainer and remove relay valve and sleeve assembly (Fig. 8).

(9) Remove relay valve, spring and plunger from valve sleeve (Fig. 9).

(10) Remove secondary pressure regulator valve retainer and remove plug, regulator valve and spring (Fig. 10).

(11) Remove cut-back valve retainer and remove plug, cut-back valve and spring (Fig. 11).

(12) Remove 2-3 shift valve retainer and remove plug, spring and 2-3 shift valve (Fig. 12).

(13) Remove low coast modulator valve retainer and remove valve plug, spring and low coast modulator valve (Fig. 13).

(14) Clean the upper body components with solvent and dry them with compressed air only. Do not use shop towels or rags. Lint or foreign material from towels or rags can interfere with valve operation.

(15) Inspect condition of the upper body components. Replace the upper body if any of the bores are scored or corroded. Replace any valves, plugs or sleeves if scored or worn. Replace the oil strainer if cut, torn or damaged in any way.

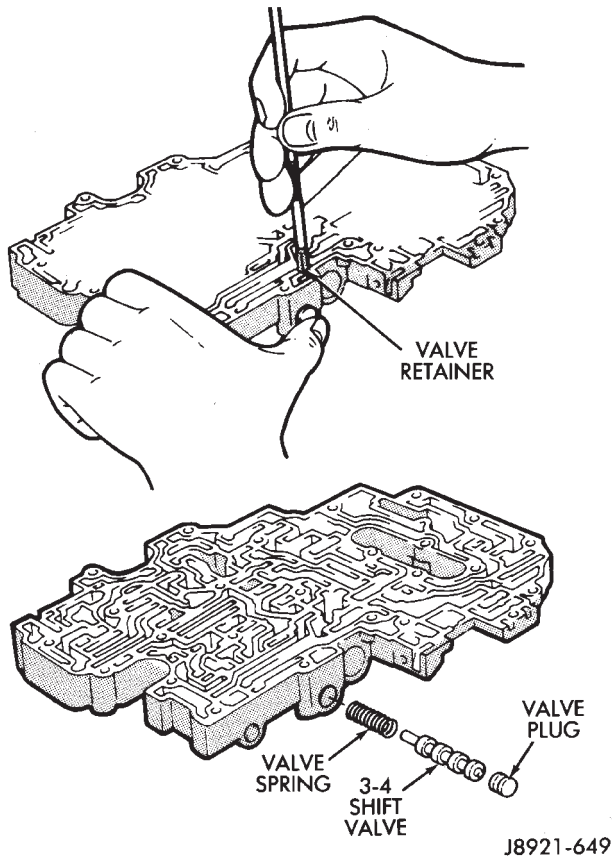


Fig. 6 Removing/Installing 3-4 Shift Valve

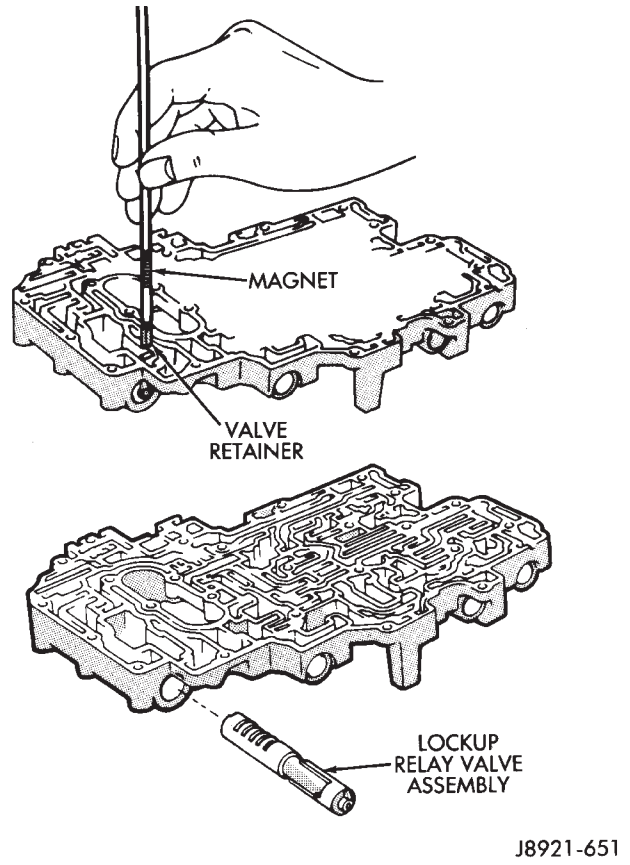


Fig. 8 Removing/Installing Converter Clutch Relay Valve

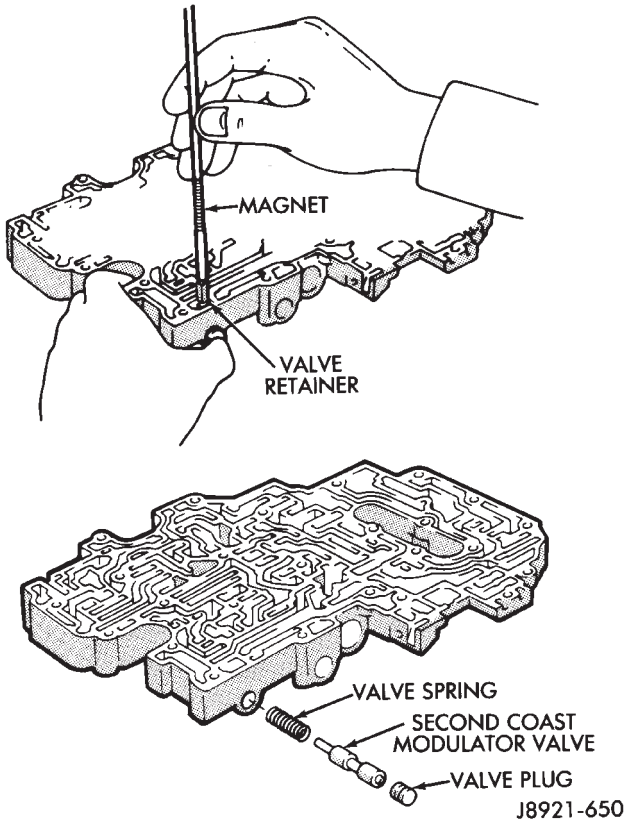


Fig. 7 Removing/Installing Second Coast Modulator Valve

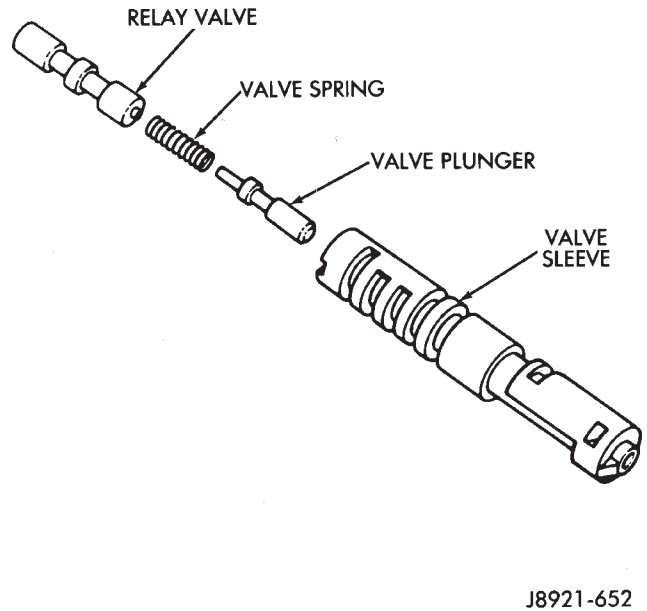


Fig. 9 Relay Valve Components

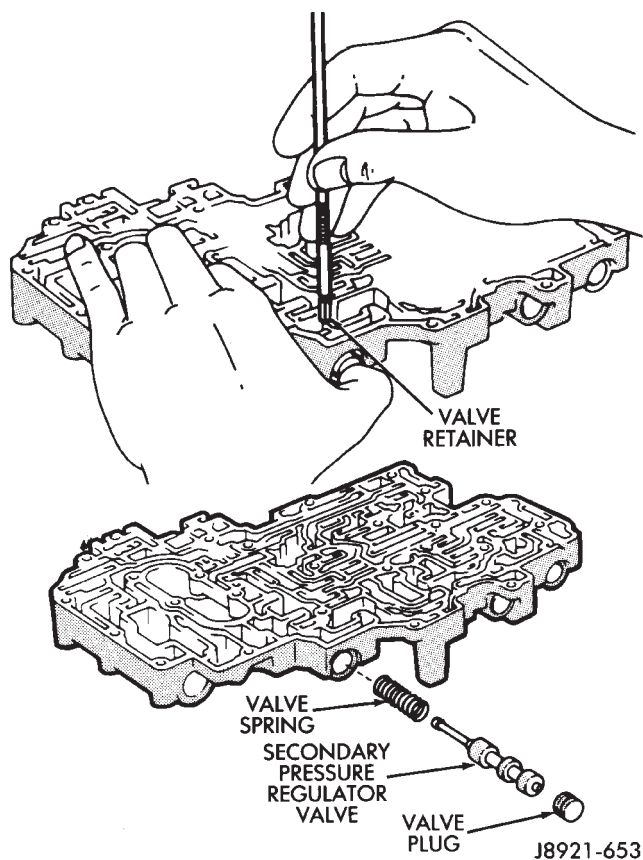


Fig. 10 Removing/Installing Secondary Pressure Regulator Valve

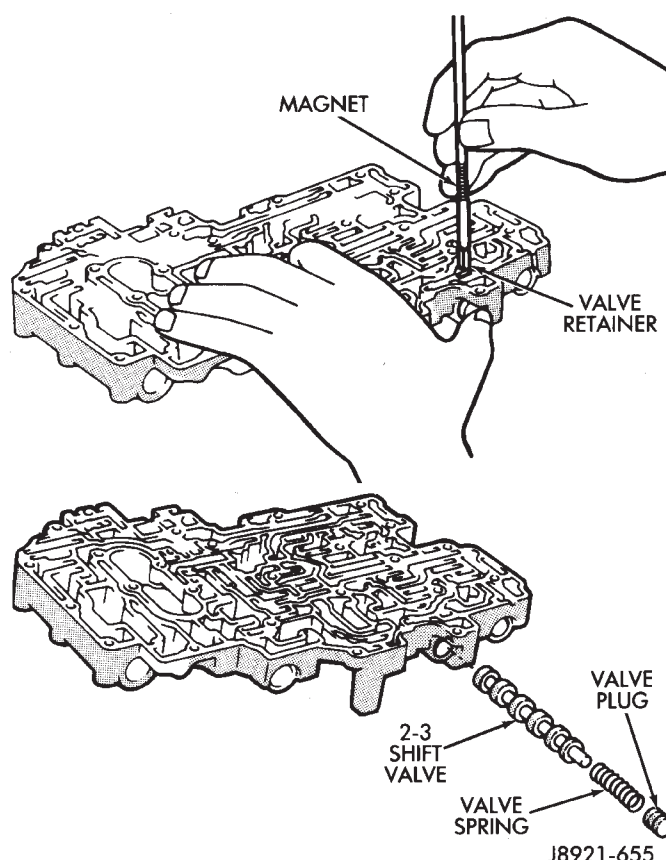


Fig. 12 Removing/Installing 2-3 Shift Valve

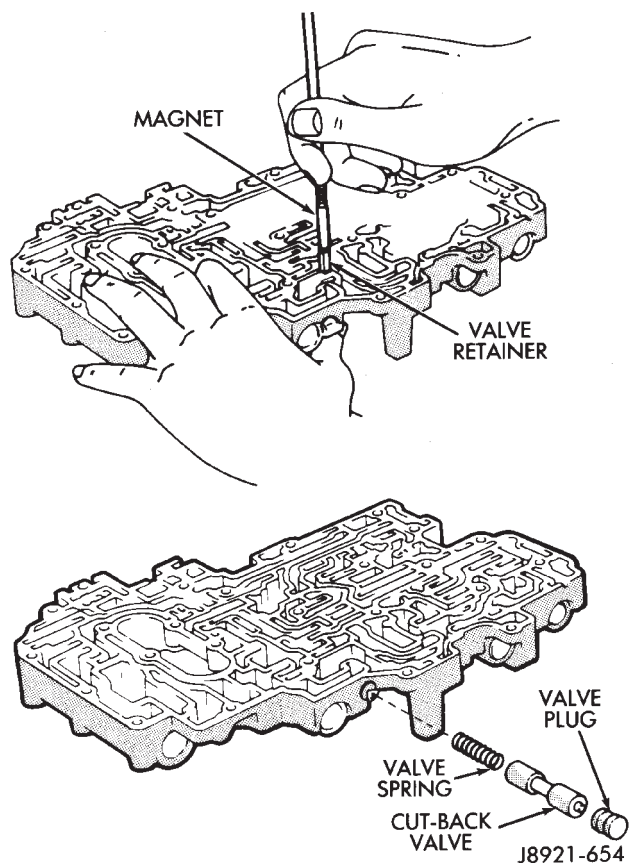


Fig. 11 Removing/Installing Cut-Back Valve

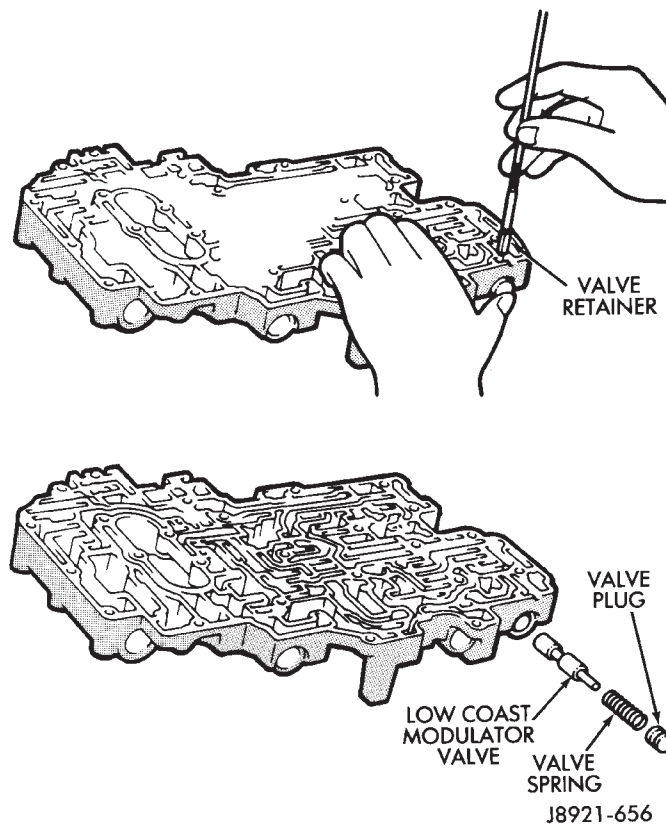


Fig. 13 Removing/Installing Low Coast Modulator Valve

(16) Inspect the valve body springs. Replace any spring having rusted, distorted, or collapsed coils. Measure length of each spring. Replace any spring if free length is less than specified in the chart (Fig. 14).

UPPER BODY ASSEMBLY

(1) Lubricate the valves, springs, plugs, sleeves and the valve bores in the upper body with automatic transmission fluid.

(2) Note position of the valve retainers (A) and stop (B) for assembly reference (Fig. 15).

(3) Install low coast modulator valve, spring and plug in valve bore. Press valve plug inward and install retainer (Fig. 13).

(4) Install 2-3 shift valve, spring and plug in valve bore. Press plug inward and install retainer (Fig. 12).

(5) Install cut-back valve spring, valve and plug (Fig. 11). Press plug inward and install retainer.

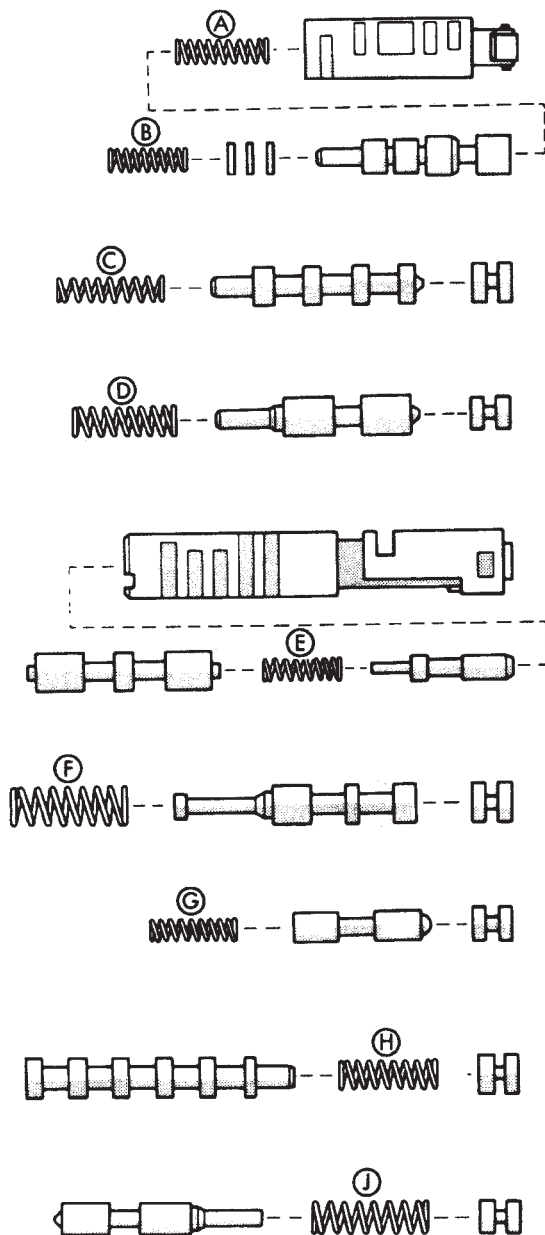
(6) Install secondary regulator valve spring, valve and plug in valve bore. Press plug inward and install retainer (Fig. 10).

(7) Assemble lock-up relay valve. Install spring and plunger in valve sleeve (Fig. 9). Then install assembled valve in sleeve.

(8) Install assembled lock-up relay valve in valve bore and install retainer (Fig. 8).

(9) Install second coast modulator valve, spring and plug in valve bore. Press plug inward and install retainer (Fig. 7).

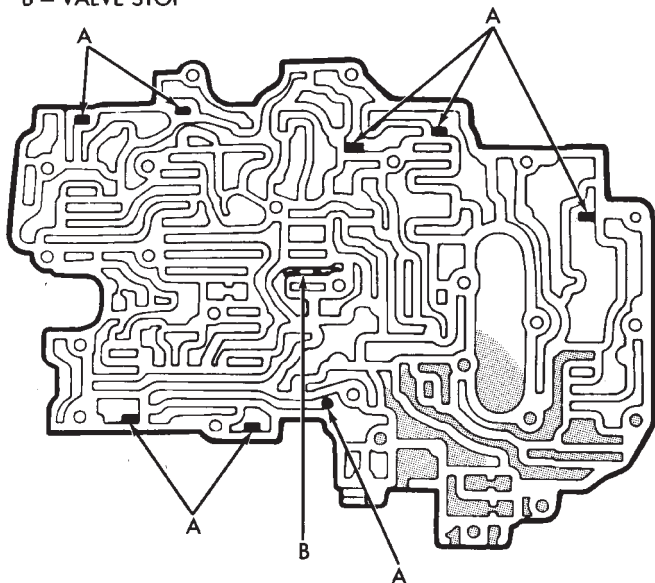
(10) Install 3-4 shift valve, spring and plug in bore. Press plug inward and install retainer (Fig. 6).



Spring	Free Length
(A) Downshift Plug	27.3 mm (1.074 in.)
(B) Throttle Valve	20.6 mm (0.811 in.)
(C) 3-4 Shift Valve	30.8 mm (1.212 in.)
(D) Second Coast Modulator Valve	25.3 mm (0.996 in.)
(E) Lockup Relay Valve	21.4 mm (0.843 in.)
(F) Second Regulator Valve	30.9 mm (1.217 in.)
(G) Cut-Back Valve	21.8 mm (0.858 in.)
(H) 2-3 Shift Valve	30.8 mm (1.212 in.)
(J) Low Coast Modulator Valve	27.8 mm (1.094 in.)

Fig. 14 Upper Body Spring/Valve Identification

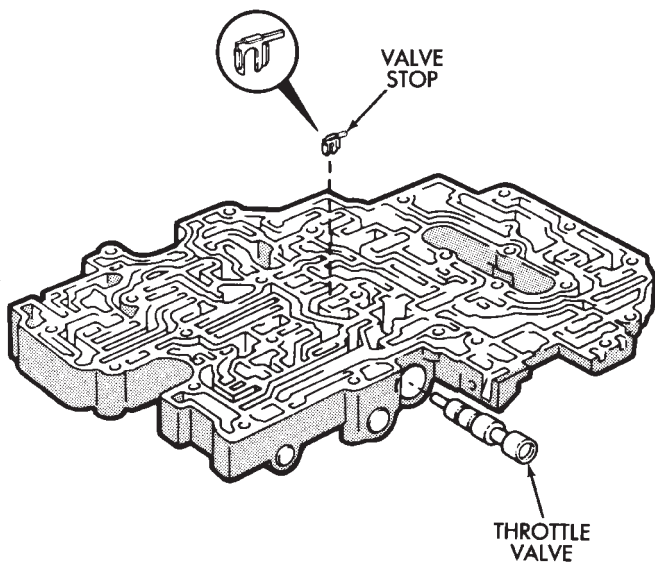
A - VALVE RETAINERS
B - VALVE STOP



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Fig. 15 Valve Retainer And Stop Locations

(11) Install throttle valve in valve bore. Push valve into place and install valve stop (Fig. 16).



J8921-659

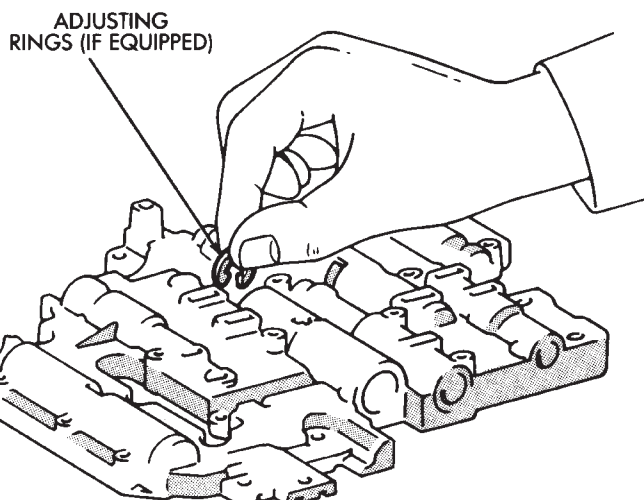
Fig. 16 Installing Throttle Valve And Stop

(12) On models with adjusting rings, turn upper body over and install adjusting rings (Fig. 17). Be sure to install same number of rings as were removed.

(13) Install throttle valve adjusting spring in bore and onto end of throttle valve (Fig. 18).

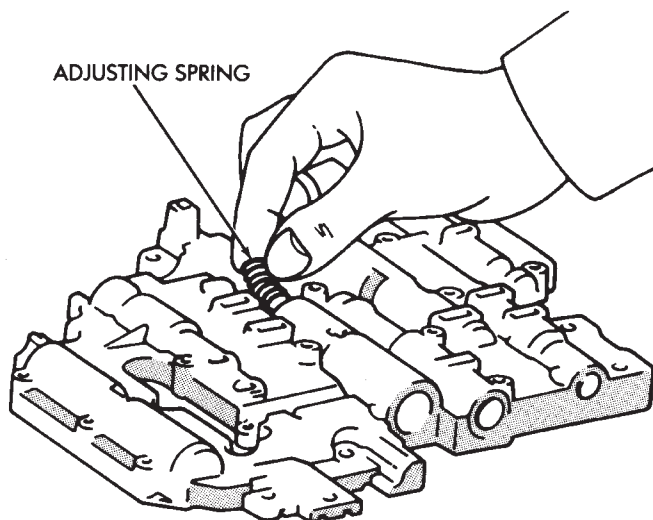
(14) Install downshift spring and plug in throttle valve bore. Press plug inward against throttle valve and spring and install retainer pin (Fig. 19).

(15) Install sleeve in throttle cam (Fig. 20).



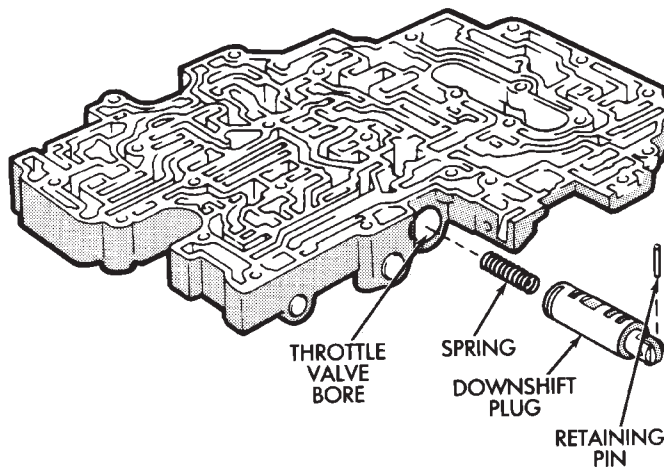
J8921-660

Fig. 17 Install Throttle Valve Adjusting Rings (If Equipped)



J8921-661

Fig. 18 Installing Throttle Valve Adjusting Spring



J8921-662

Fig. 19 Installing Downshift Plug

(16) Install spring on cam (Fig. 20). Hook curved end of spring through hole in cam as shown.

(17) Mount cam on upper body and install cam attaching bolt and spacer (Fig. 20). Tighten bolt to 10 N·m (7 ft. lbs.) torque.

(18) Be sure straight end of spring is seated in upper body slot as shown (Fig. 20).

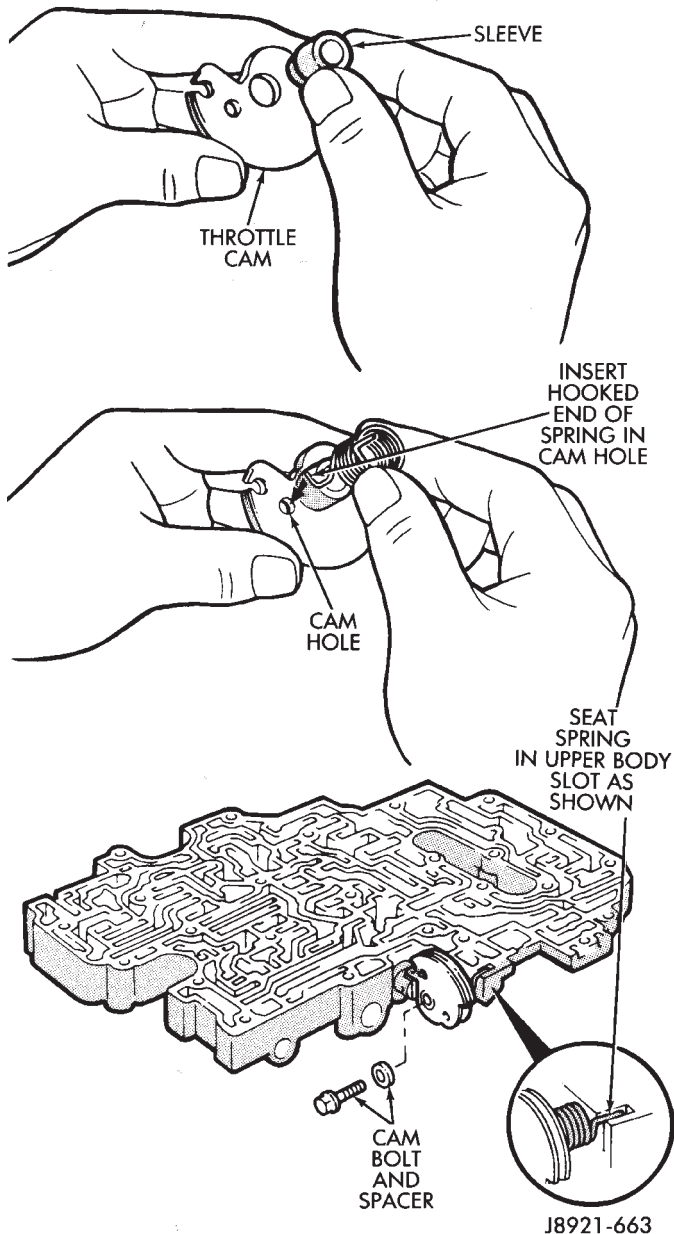


Fig. 20 Installing Throttle Cam

(19) Install check balls in upper body (Fig. 2).

(20) Install oil strainer (Fig. 2).

INSTALLING UPPER BODY ON LOWER BODY

If valve body was equipped with gaskets, start at step (1). However, if valve body is not equipped with gaskets, start at step (4).

(1) Position new No. 1 gasket (Fig. 1) on upper body.

(2) Position valve body plate on No. 1 gasket.

(3) Position new No. 2 gasket (Fig. 2) on valve body plate and align gaskets and plate using bolt holes as guides.

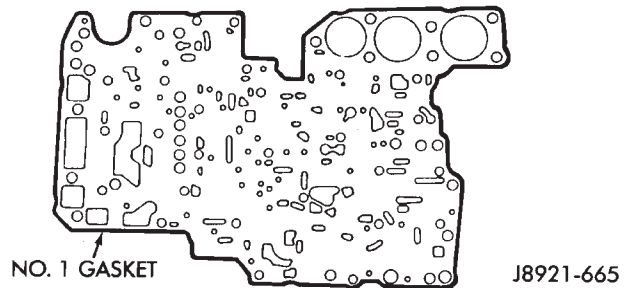


Fig. 1 Valve Body Gasket No. 1

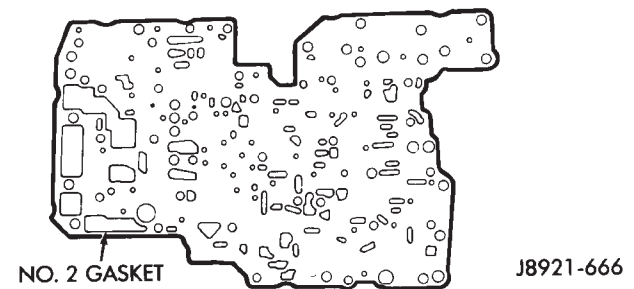
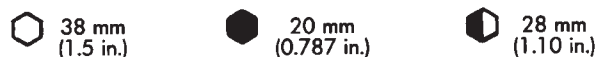
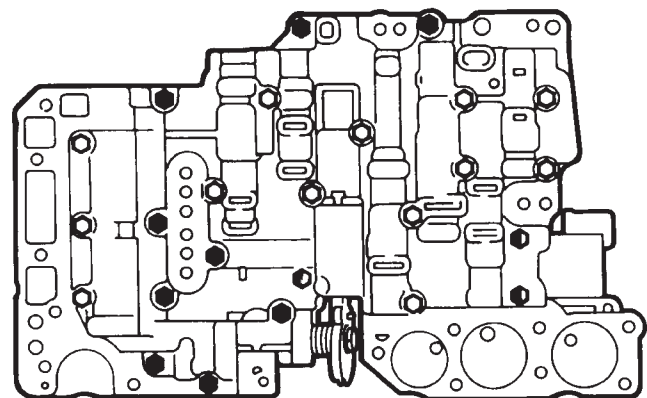


Fig. 2 Valve Body Gasket No. 2

(4) Install valve body bolts. **Three different length bolts are used. Refer to the Figure 3 for bolt locations. Chart symbols indicate bolt location and length in millimeters.**

(5) Tighten valve body bolts to 6.4 N·m (56 in. lbs.) torque.

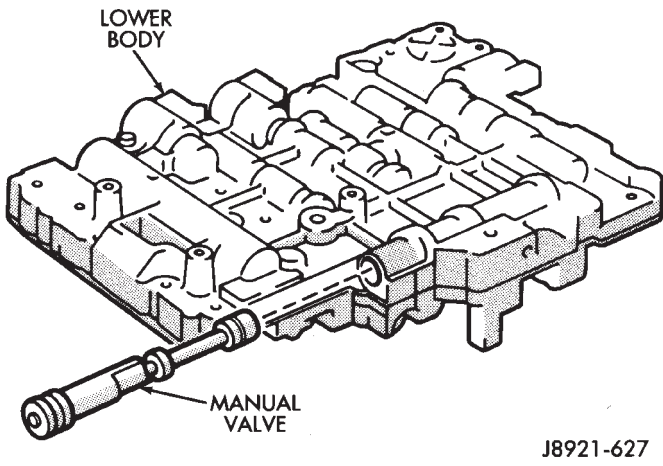


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Fig. 3 Valve Body Bolt Location/Size

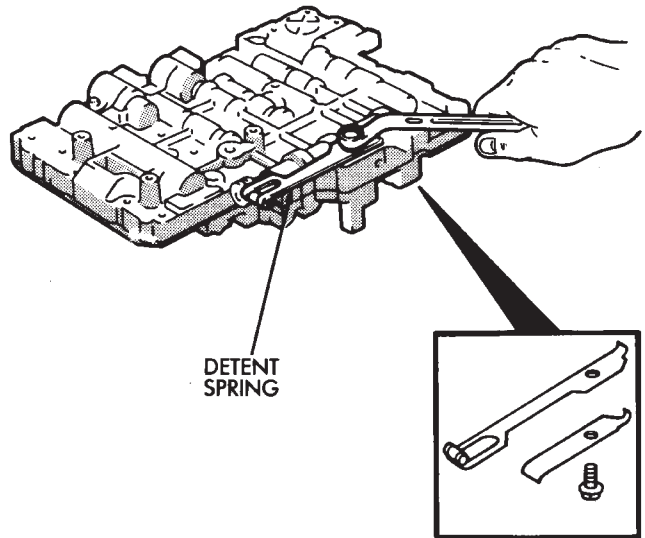
(6) Install manual valve (Fig. 4).

(7) Install two-piece detent spring (Fig. 5). Tighten spring attaching bolt to 10 N·m (7 ft. lbs.) torque.



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Fig. 4 Installing Manual Valve



J8921-626

Fig. 5 Installing Detent Spring

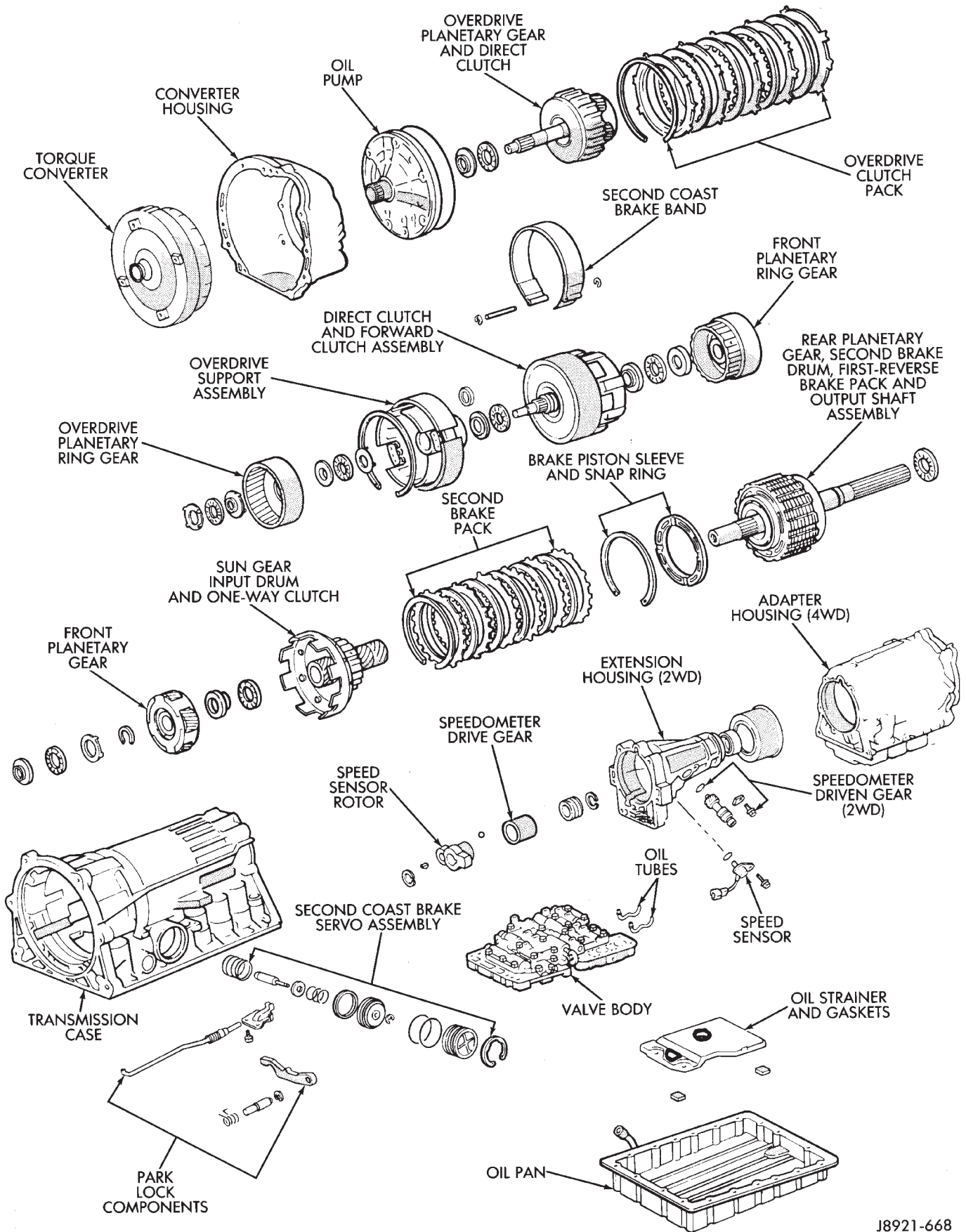


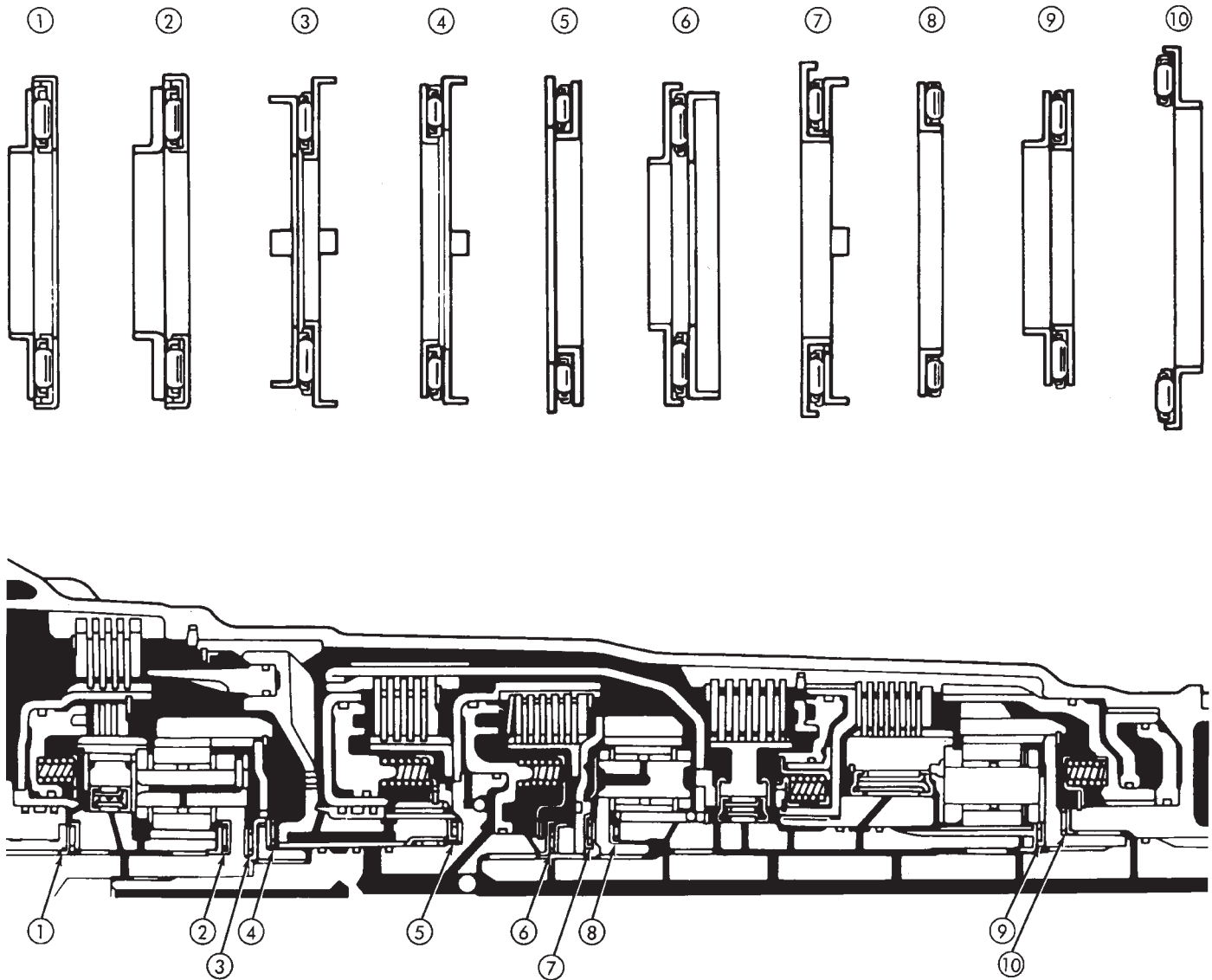
Fig. 1 AW-4 Transmission Components

TRANSMISSION ASSEMBLY AND ADJUSTMENT

(1) During assembly, lubricate components with transmission fluid or petroleum jelly as indicated.

(2) If any of the transmission components are still assembled after overhaul checking procedures, disassemble as necessary in preparation for transmission assembly.

(3) Verify thrust bearing and race installation during assembly. Refer to the Thrust Bearing Chart (Fig. 2) for bearing and race location and correct positioning.



J8921-669

Fig. 2 Thrust Bearing Chart

(4) Install rear planetary gear, second brake drum and output shaft as outlined in following steps:

(5) Verify No. 10 thrust bearing and race (Fig. 2). Bearing and race outer diameter is 57.7 mm (2.272 in.) and inside diameter is 39.2 mm (1.543 in.).

(6) Coat thrust bearing and race assembly with petroleum jelly and install in case (Fig. 3). Race faces down. Bearing rollers face up.

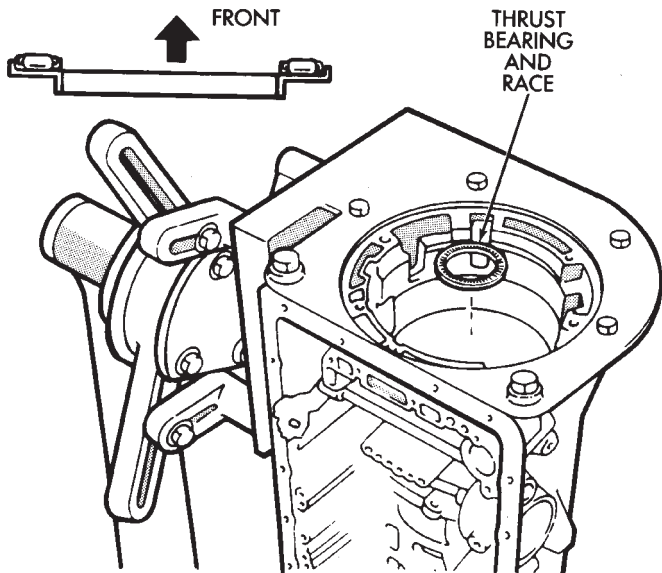


Fig. 3 Installing Thrust Bearing And Race (No. 10)

(7) Align teeth of second brake drum and clutch pack (Fig. 4).

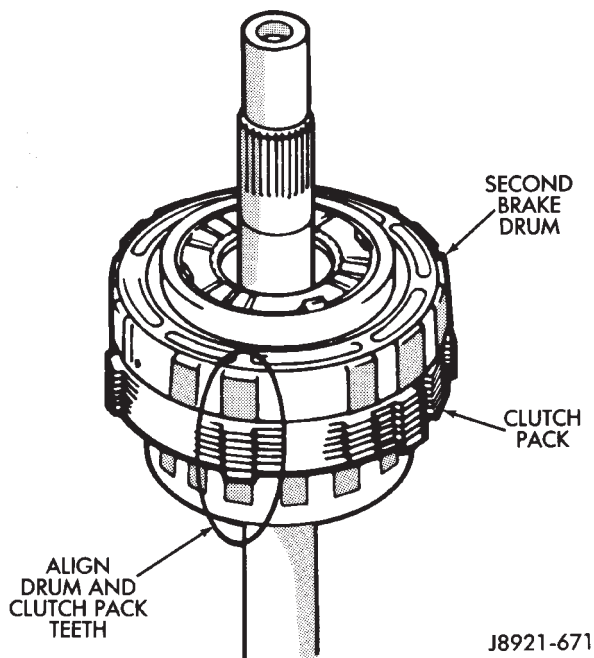


Fig. 4 Aligning Second Brake Drum And Clutch Pack Teeth

(8) Align rear planetary-output shaft assembly teeth with case slots and install assembly in case (Fig. 5).

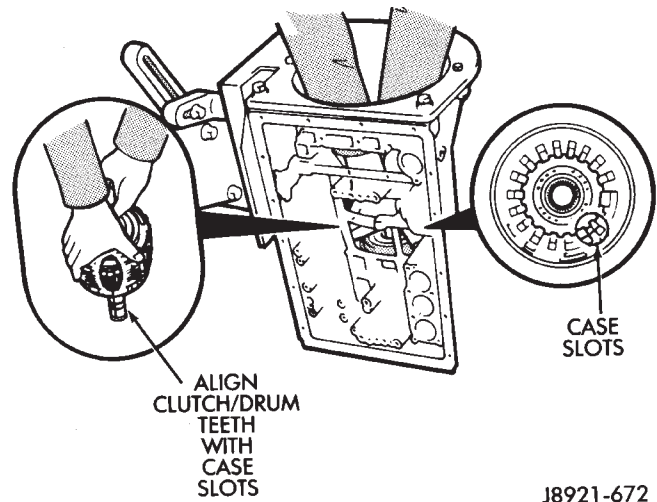


Fig. 5 Installing Output Shaft And Rear Planetary Assembly

(9) Install rear planetary snap ring with snap ring pliers. Chamfered side of snap ring faces up and toward case front (Fig. 6).

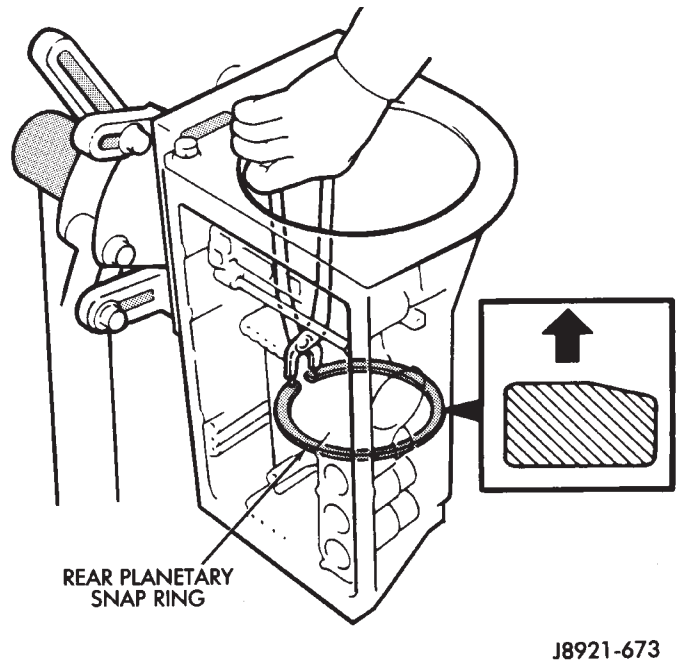
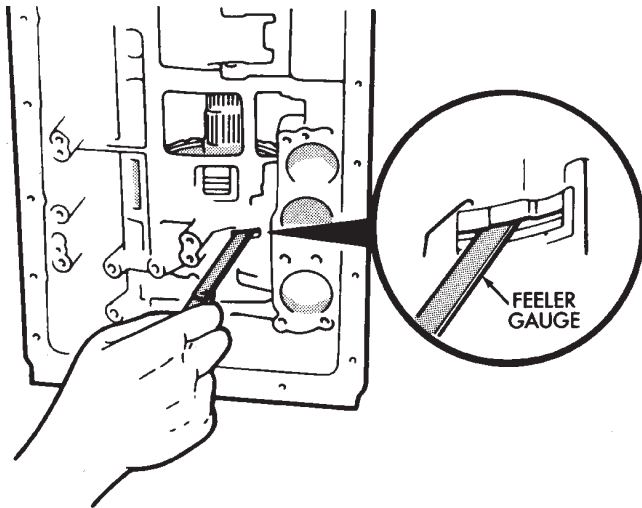


Fig. 6 Installing Planetary Snap Ring

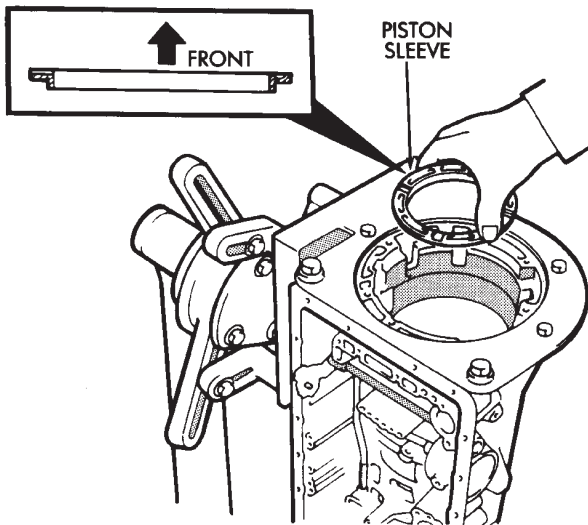
(10) Check first-reverse brake pack clearance with feeler gauge. Clearance should be 0.70 - 1.20 mm (0.028 - 0.047 in.). If clearance is incorrect, planetary assembly, thrust bearing or snap ring is not properly seated in case. Remove and reinstall components if necessary.

(11) Install second brake piston sleeve (Fig. 8). Sleeve lip faces up and toward case front as shown.



J8921-674

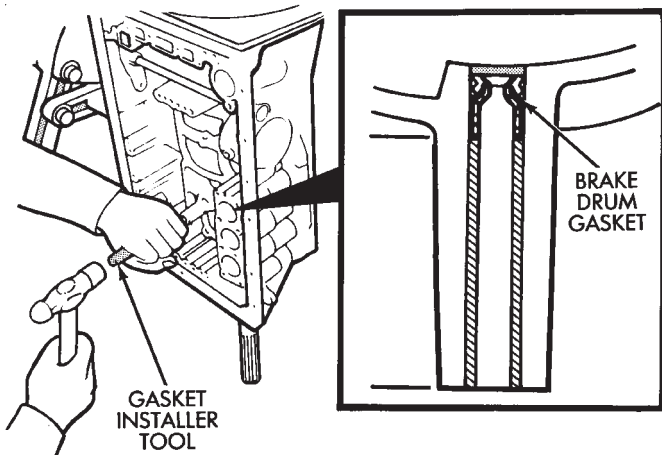
Fig. 7 Checking First-Reverse Brake Pack Clearance



J8921-675

Fig. 8 Installing Second Brake piston Sleeve

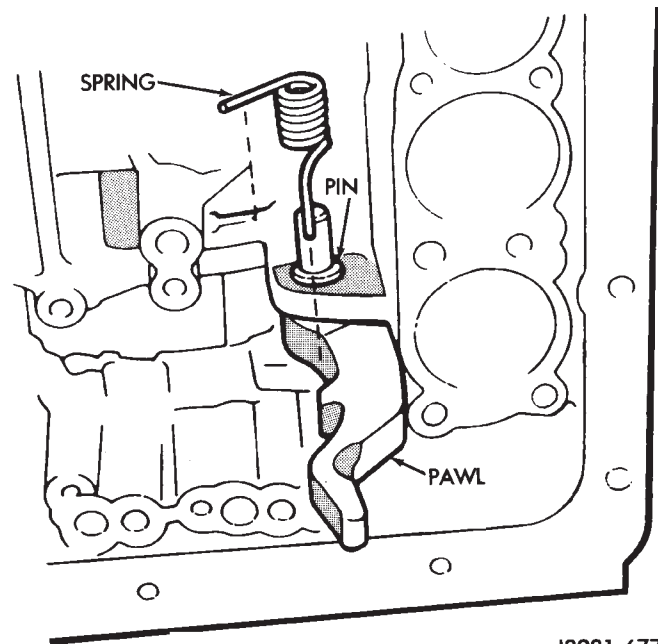
(12) Install second brake drum gasket with Installer Tool 7544 (Fig. 9). Gasket depth is 43.7 mm (1.720 in.).



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Fig. 9 Installing Second Brake Drum Gasket

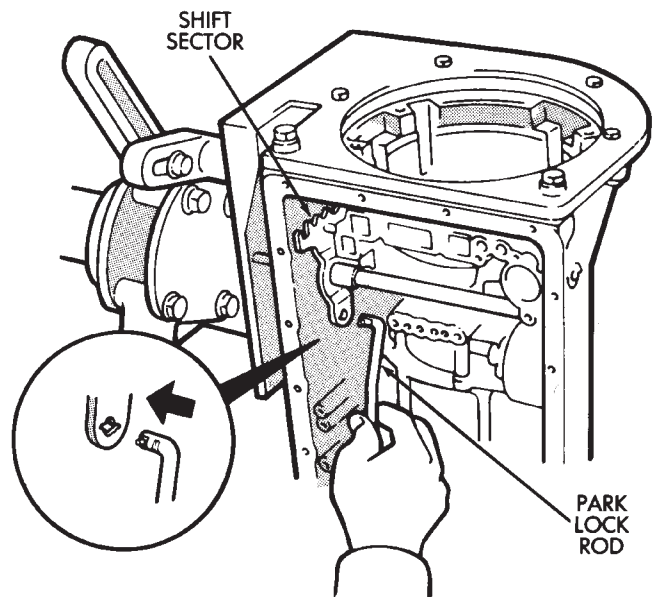
(13) Install park lock pawl, spring and pin (Fig. 10).



J8921-677

Fig. 10 Installing Park Lock Pin, Spring And Pawl

(14) Connect park lock rod to manual valve shift sector (Fig. 11).



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Fig. 11 Installing Park Lock Rod

(15) Position park lock rod bracket on case and tighten bracket attaching bolts to 10 N·m (7 ft. lbs.) torque (Fig. 12).

(16) Verify park lock operation. Move shift sector to Park position. Park pawl should be firmly engaged (locked) in planetary ring gear (Fig. 13).

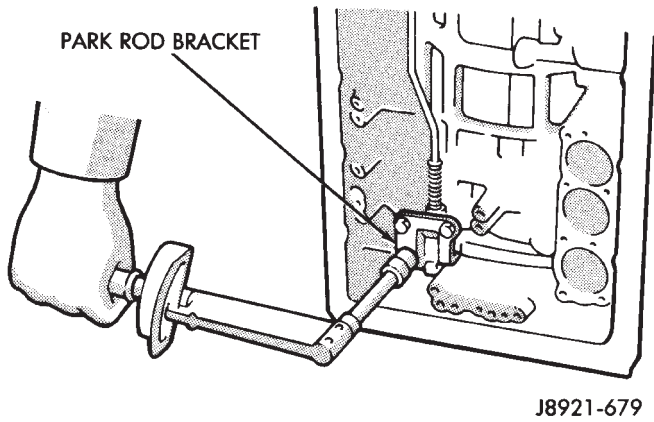


Fig. 12 Installing Park Rod Bracket

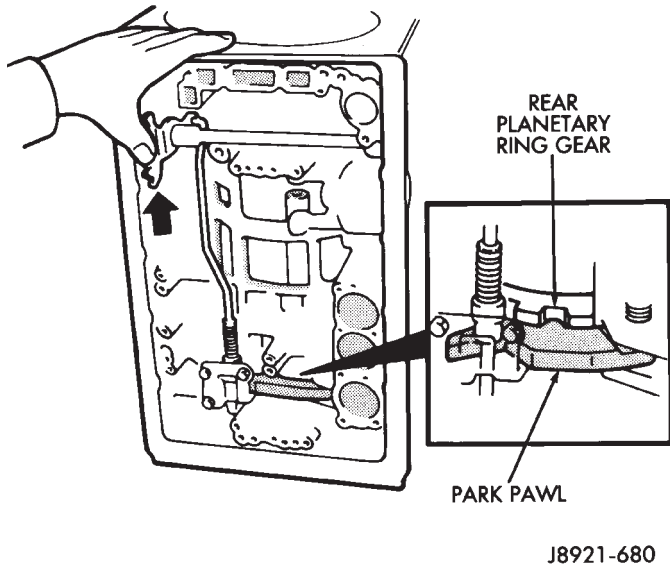


Fig. 13 Checking Park Pawl Engagement

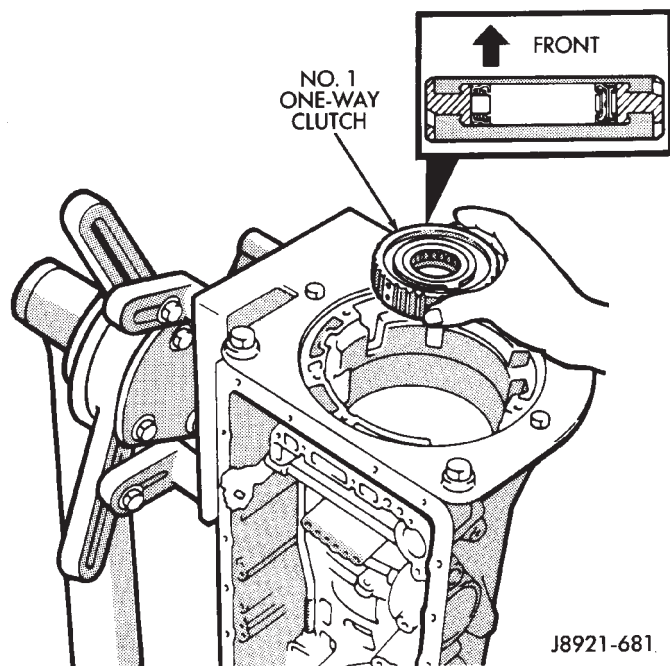


Fig. 14 Installing No. 1 One-Way Clutch

(17) Install No. 1 one-way clutch (Fig. 14). Short flanged side of clutch faces up and toward case front.

(18) Install second brake pack (Fig. 15). Install disc then plate. Continue installation sequence until correct number of discs-plates are installed. Use five discs and five plates.

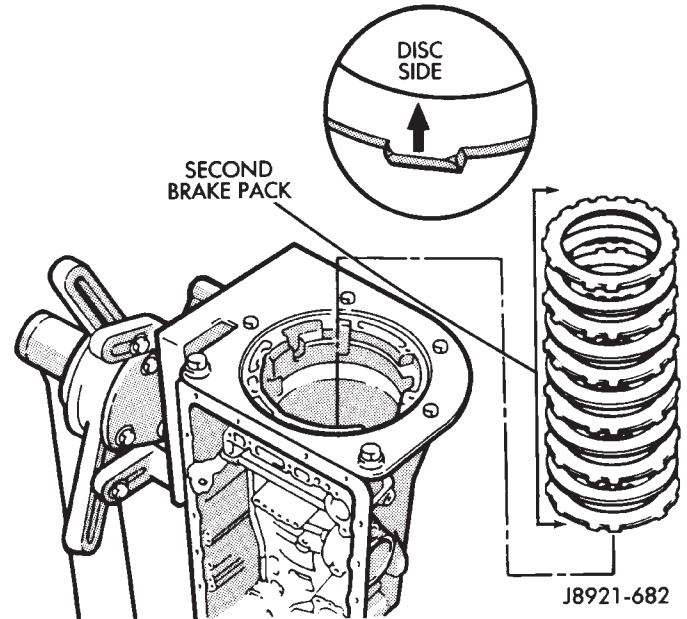


Fig. 15 Installing Second Brake Pack

(19) Install second brake pack retainer with rounded edge of retainer facing disc.

(20) Install second brake pack snap ring.

(21) Check brake pack clearance with feeler gauge (Fig. 16). Clearance should be 0.062 - 1.98 mm (0.024 - 0.078 in.). If brake pack clearance is not correct, brake pack components are not seated. Reassemble brake pack if necessary.

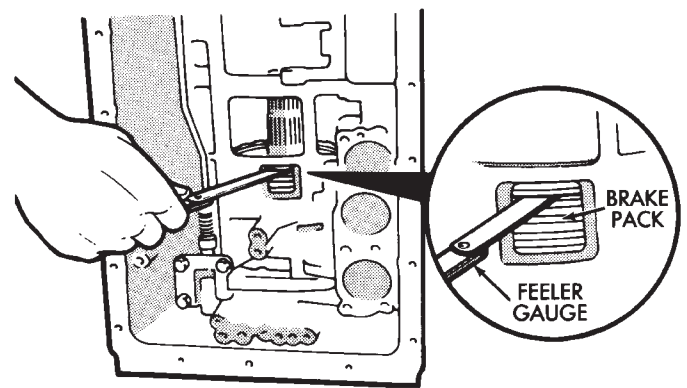


Fig. 16 Checking Second Brake Pack Clearance

J8921-683

(22) Install planetary sun gear and input drum (Fig. 17). Be sure drum thrust washer tabs are seated in drum. Use petroleum jelly to hold thrust washer in position if necessary.

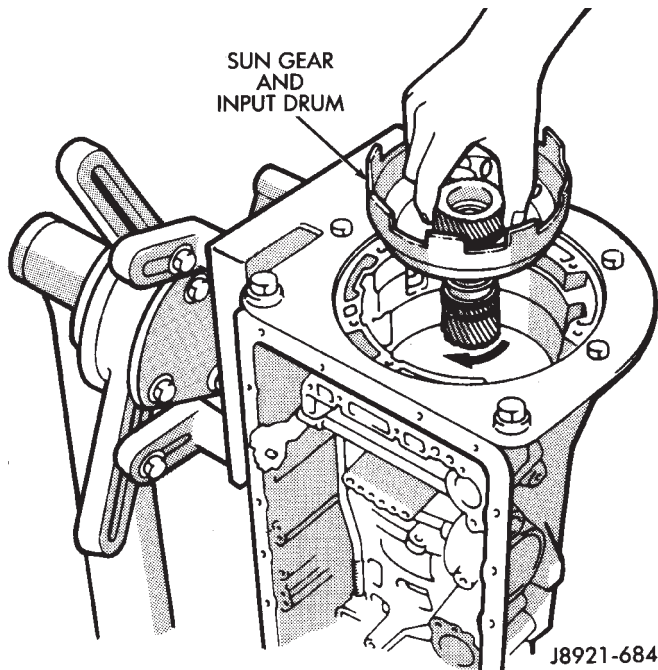


Fig. 17 Installing Sun Gear And Input Drum

(23) Install front planetary gear on sun gear (Fig. 18).

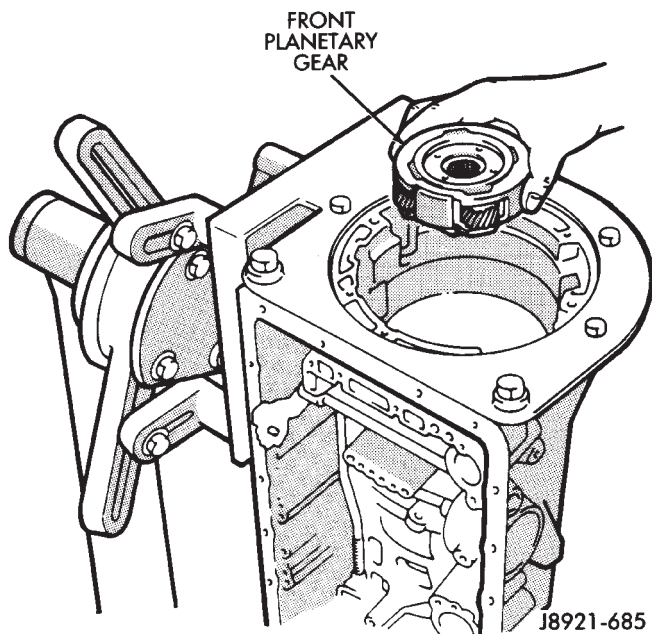
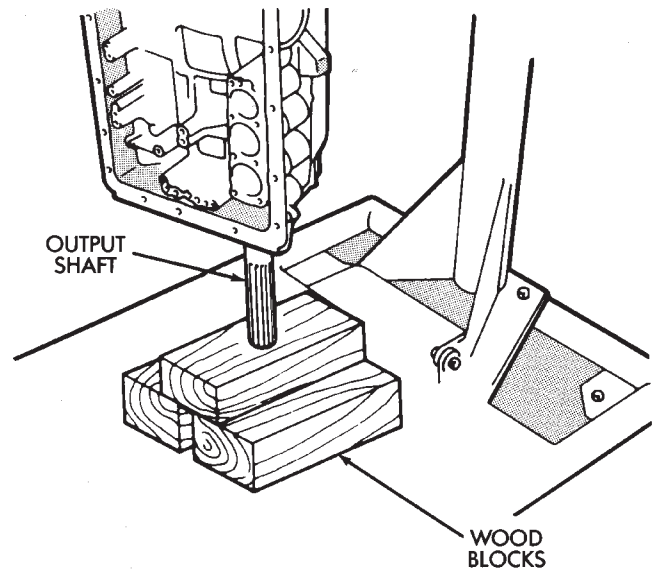


Fig. 18 Installing Front Planetary Gear

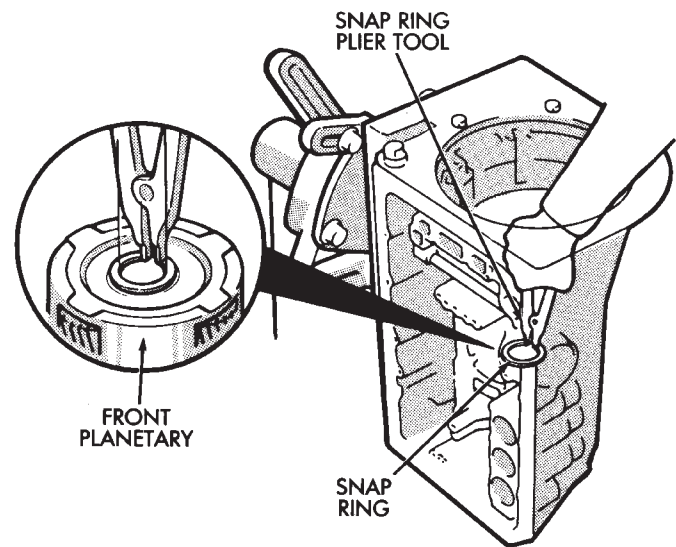
(24) Support output shaft with wood blocks (Fig. 19).

(25) Install planetary snap ring on sun gear with snap ring plier tool 7541 (Fig. 20).



J8921-686

Fig. 19 Supporting Output Shaft



J8921-687

Fig. 20 Installing Front Planetary Snap Ring

(26) Install tabbed thrust race on front planetary gear (Fig. 21). Washer tabs face down and toward gear. Race outer diameter is 47.8 mm (1.882 in.). Inside diameter is 34.3 mm (1.350 in.).

(27) Install second coast brake band (Fig. 22).

(28) Install pin in second coast brake band. Then install retaining ring on pin (Fig. 23).

(29) Install thrust bearing and race in forward-direct clutch (Fig. 24). Coat bearing/race with petroleum jelly to hold them in place.

(30) Verify forward-direct clutch thrust bearing size.

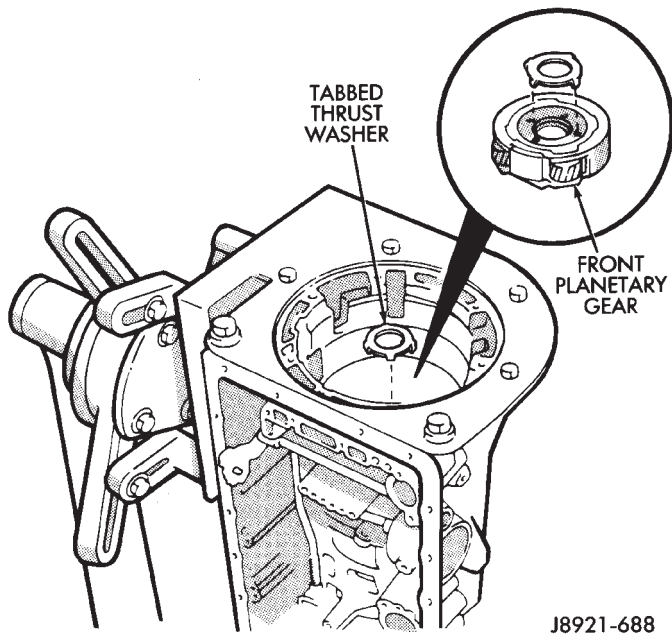


Fig. 21 Installing Planetary Thrust Race

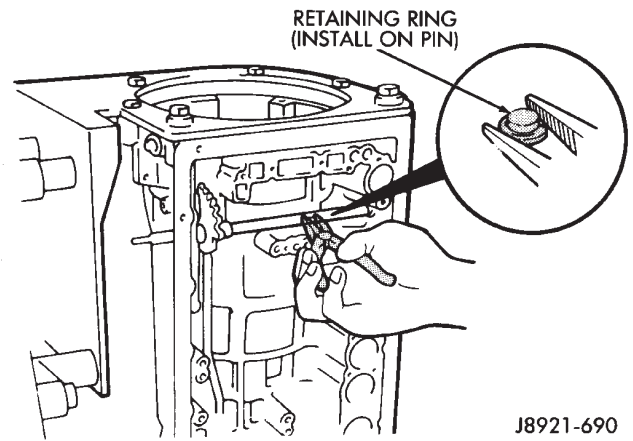
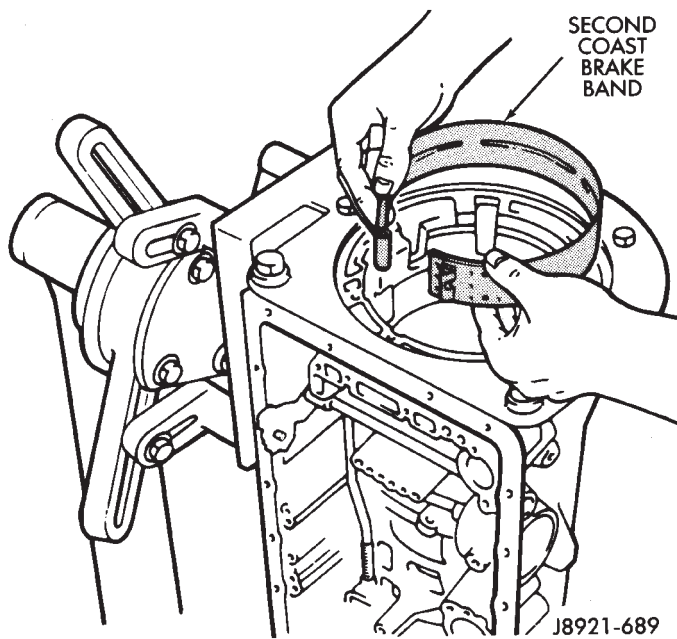
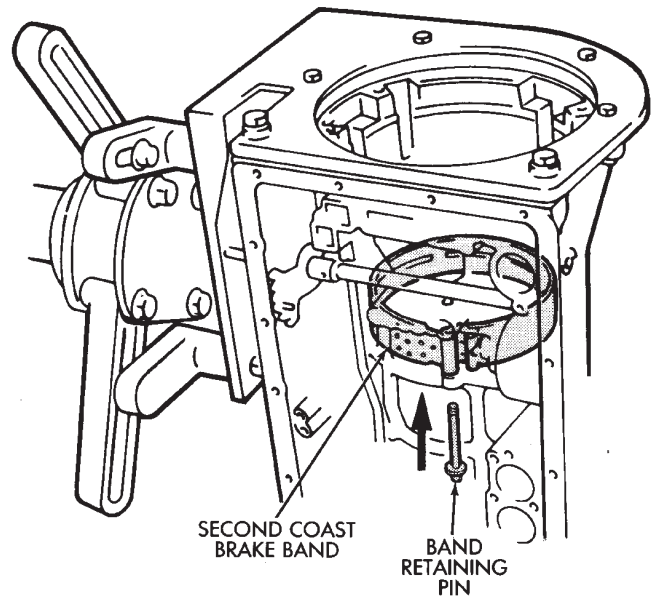


Fig. 23 Installing Second Coast Brake Band Retaining Pin

Fig. 22 Installing Second Coast Brake Band

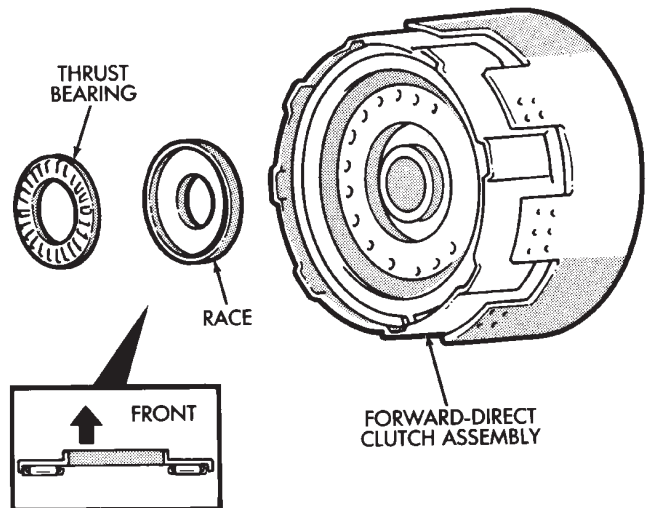
- Race outer diameter is 48.9 mm (1.925 in.) and inside diameter is 26.0 mm (1.024 in.).
- Bearing outer diameter is 46.7 mm (1.839 in.) and inside diameter is 26.0 mm (1.024 in.).

(31) Coat front planetary ring gear race with petroleum jelly and install it in ring gear (Fig. 25).

(32) Verify ring gear race size. Outer diameter is 47.0 mm (1.850 in.) and inside diameter is 26.5 mm (1.045 in.).

(33) Align forward-direct clutch disc splines with screwdriver (Fig. 26).

(34) Align and install front planetary ring gear in forward-direct clutch (Fig. 27).



J8921-691

Fig. 24 Installing Forward-Direct Clutch Thrust Bearing And Race

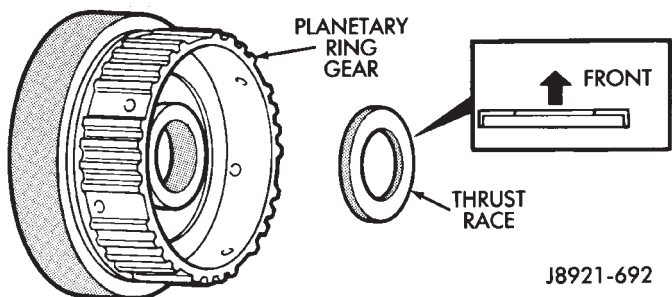


Fig. 25 Installing Planetary Ring Gear Race

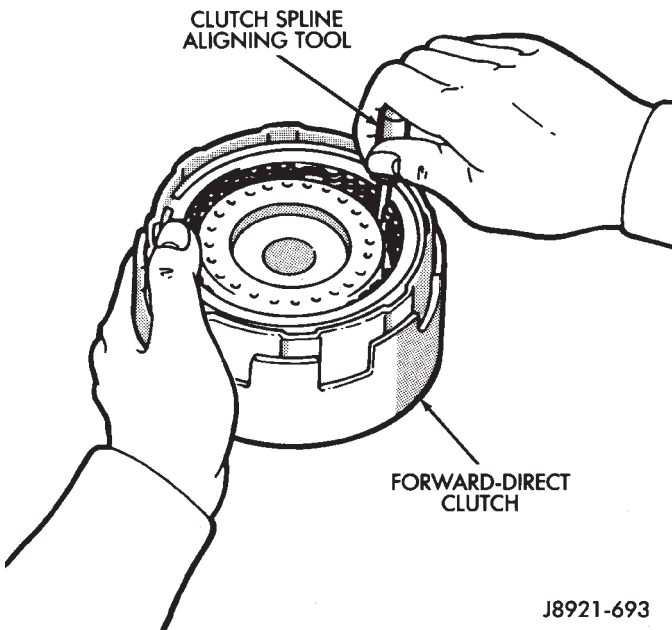


Fig. 26 Aligning Forward-Direct Clutch Splines

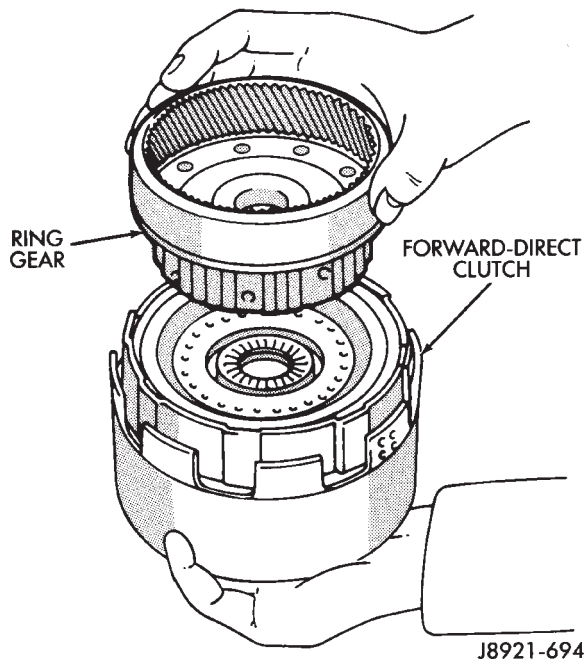


Fig. 27 Installing Front Planetary Ring Gear

(35) Coat bearing and race with petroleum jelly and install them in ring gear (Fig. 28). Verify bearing/race size.

- Bearing outer diameter is 47.7 mm (1.878 in.) and inside diameter is 32.6 mm (1.283 in.).
- Race outer diameter is 53.6 mm (2.110 in.) and inside diameter is 30.6 mm (1.205 in.).

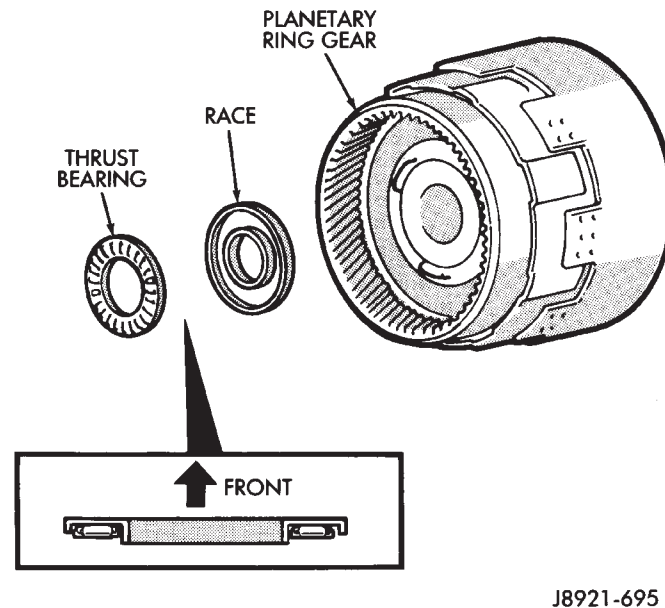


Fig. 28 Installing Ring Gear Bearing And Race

(36) Rotate front of transmission case downward and install assembled planetary gear/forward-direct clutch (Fig. 29).

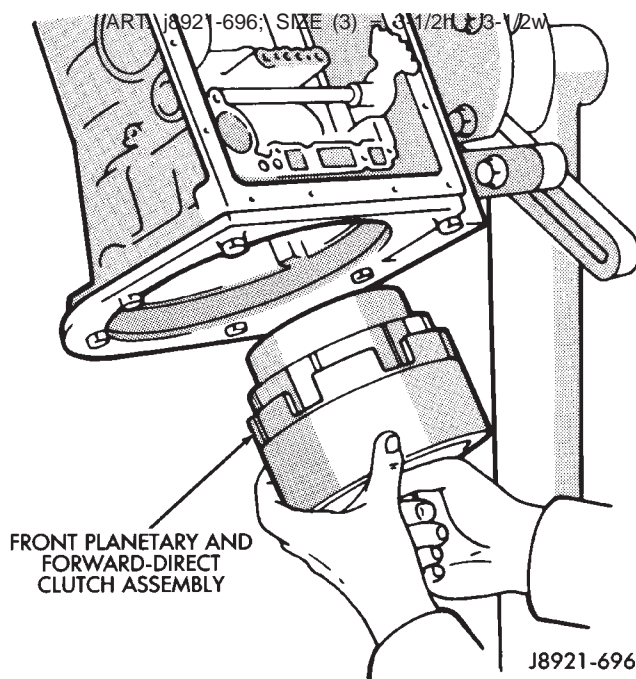
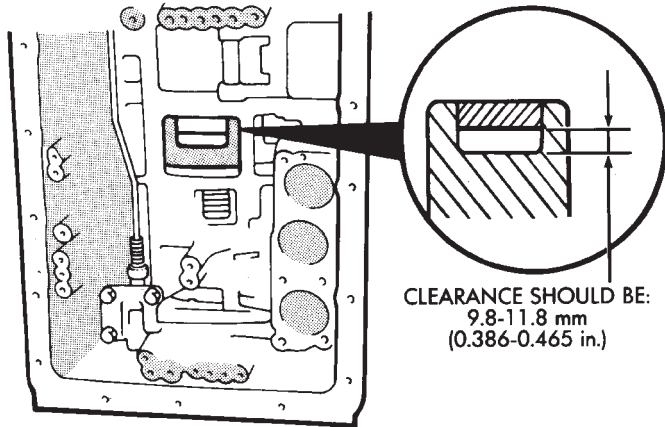


Fig. 29 Installing Front Planetary And Forward-Direct Clutch Assembly

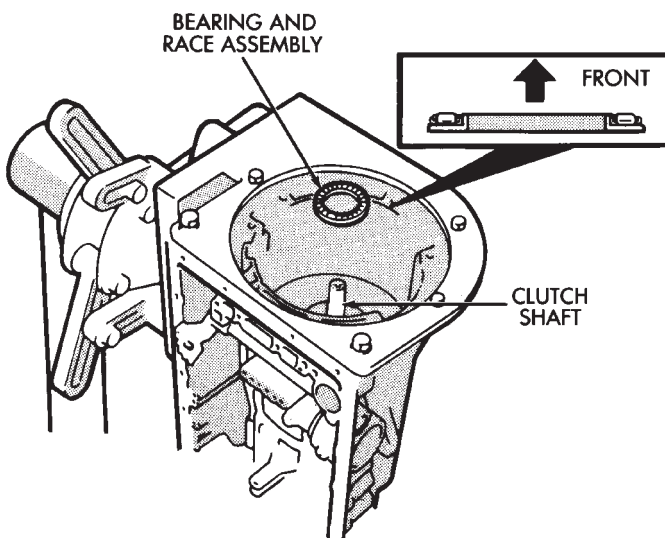
(37) Check clearance between sun gear input drum and direct clutch drum (Fig. 30). Clearance should be 9.8 - 11.8 mm (0.386 - 0.465 in.). If clearance is incorrect, planetary gear/forward-direct clutch assembly is not seated or is improperly assembled. Remove, and correct if necessary.



J8921-697

Fig. 30 Checking Input Drum-To-Direct Clutch Drum Clearance

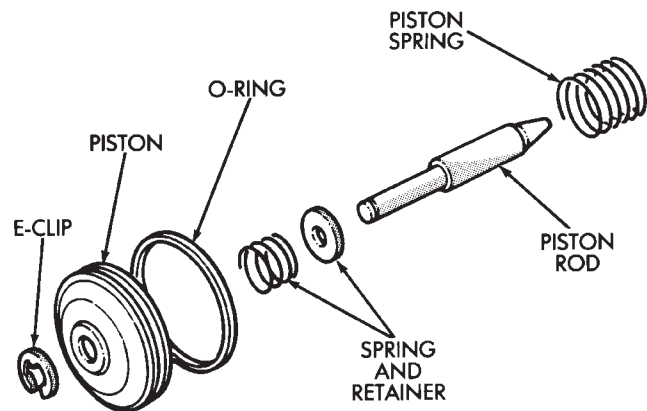
(38) Coat thrust bearing and race assembly with petroleum jelly and install it on clutch shaft. Bearing faces up and toward case front as shown (Fig. 31). Verify bearing/race size. Bearing and race outer diameter is 47.8 mm (1.882 in.) and inside diameter is 33.6 mm (1.301 in.).



J8921-698

Fig. 31 Installing Clutch Shaft Thrust Bearing And Race Assembly

(39) Assemble second coast brake piston components (Fig. 32).



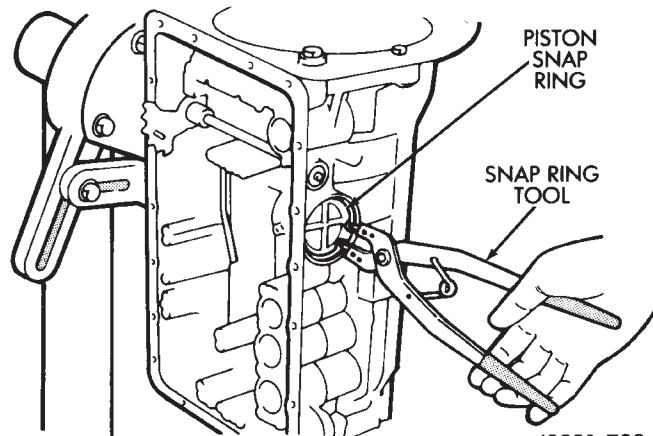
J8921-699

Fig. 32 Assembling Second Coast Brake Piston

(40) Install assembled second coast brake piston in case.

(41) Install replacement seals on second coast brake piston cover and install cover in case.

(42) Install second coast brake piston snap ring with snap ring plier tool (Fig. 33).



J8921-700

Fig. 33 Installing Second Coast Brake Piston Snap Ring

(43) Check second coast brake piston stroke as follows:

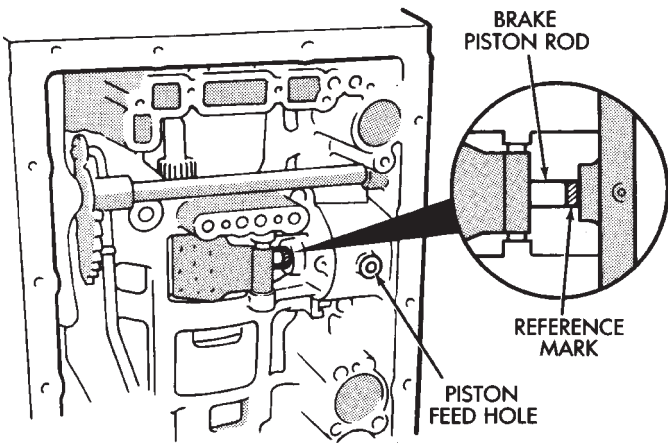
(a) Make reference mark on brake piston rod (Fig. 34).

(b) Apply 57-114 psi air pressure through feed hole (Fig. 34). Alternately apply and release air pressure to operate piston.

(c) Check stroke with gauge 7552 (Fig. 35).

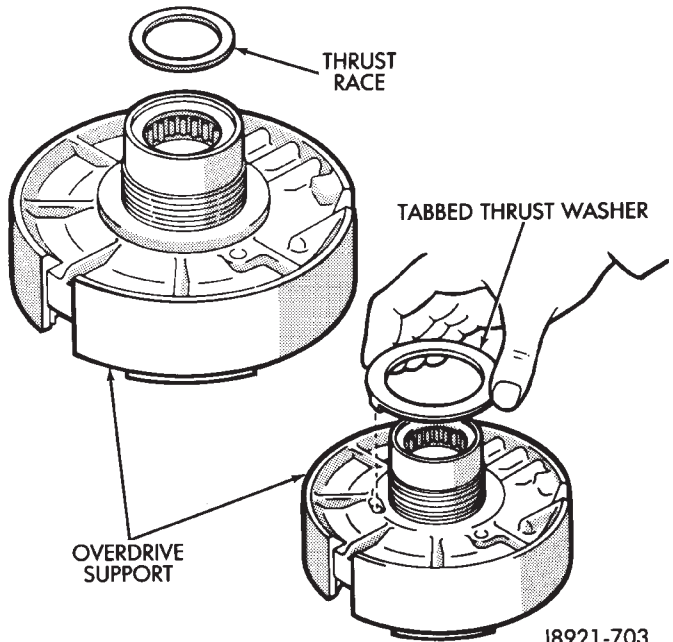
(d) If stroke length is incorrect, piston, cover or snap ring is not seated. Reassemble and check stroke again if necessary.

(44) Coat thrust race and tabbed washer with petroleum jelly and install them on overdrive support (Fig. 36). Verify race size. Race outer diameter is 50.9 mm (2.004 in.) and inside diameter is 36.2 mm (1.426 in.).



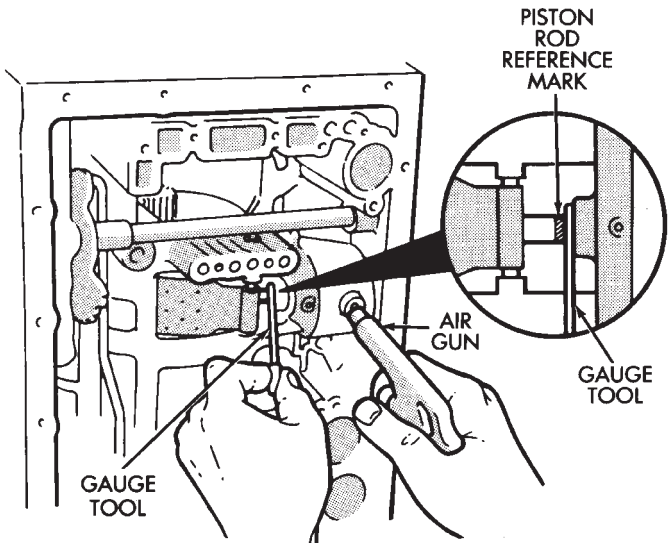
J8921-701

Fig. 34 Marking Brake Piston Rod



J8921-703

Fig. 36 Installing Overdrive Support Thrust Race And Washer



J8921-702

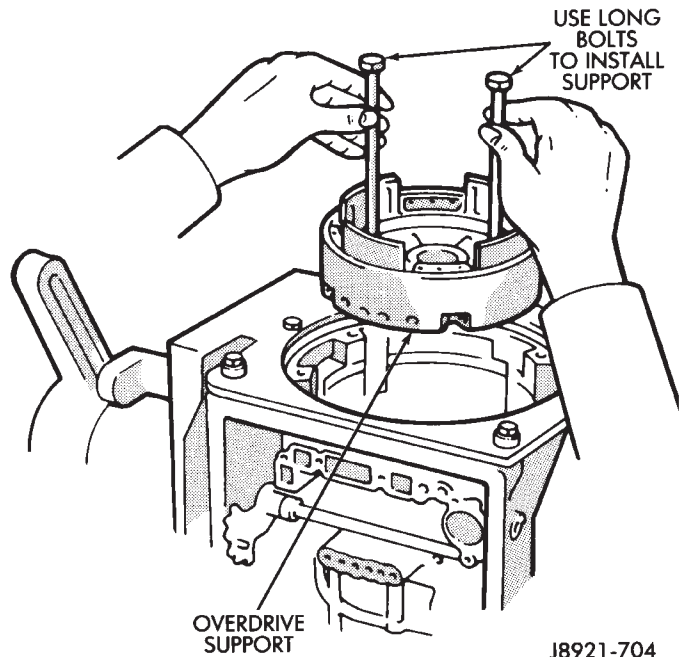
Fig. 35 Checking Second Coast Brake Piston Stroke

(45) Install overdrive support in case. Use two long bolts to help align and guide support into position (Fig. 37).

(46) Install overdrive support snap ring with Snap Ring Plier Tool 7540 (Fig. 38). Chamfered side of snap ring faces up and toward case front. **Snap ring ends must be aligned with case opening with ring ends approximately 24 mm (0.94 in.) from centerline of case opening.**

(47) Install and tighten overdrive support bolts to 25 N·m (19 ft-lbs) torque (Fig. 39).

(48) Check output shaft end play with dial indicator (Fig. 40). End play should be 0.27 - 0.86 mm (0.0106 - 0.0339 in.).



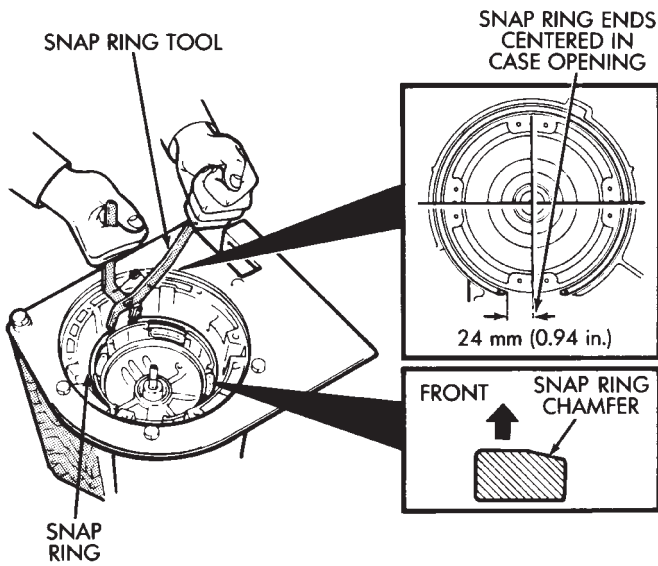
J8921-704

Fig. 37 Installing Overdrive Support

(49) If output shaft end play is incorrect, one or more of installed components is not seated. Reassemble as necessary and check end play again.

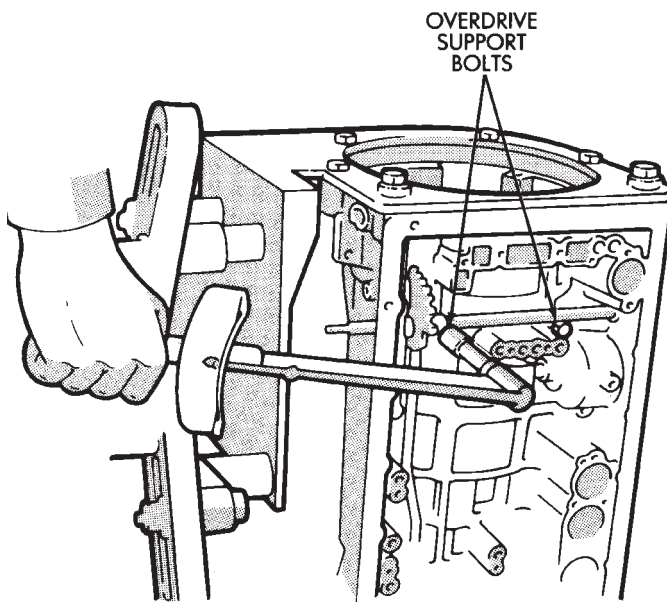
(50) Install overdrive clutch pack (Fig. 41). Install thickest clutch plate first. Rounded edge of plate faces up. Install first disc followed by another plate until correct number of discs-plates are installed. Install four discs and three plates.

(51) Install stepped ring retainer plate with flat side facing disc. Then install brake pack snap ring (Fig. 42).



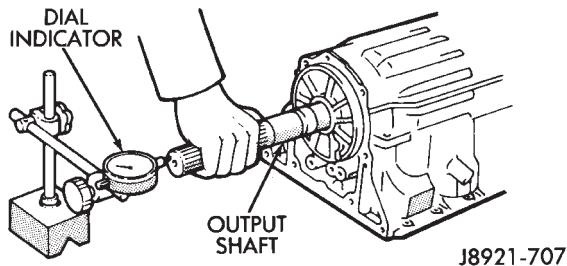
J8921-705

Fig. 38 Installing Overdrive Support Snap Ring



J8921-706

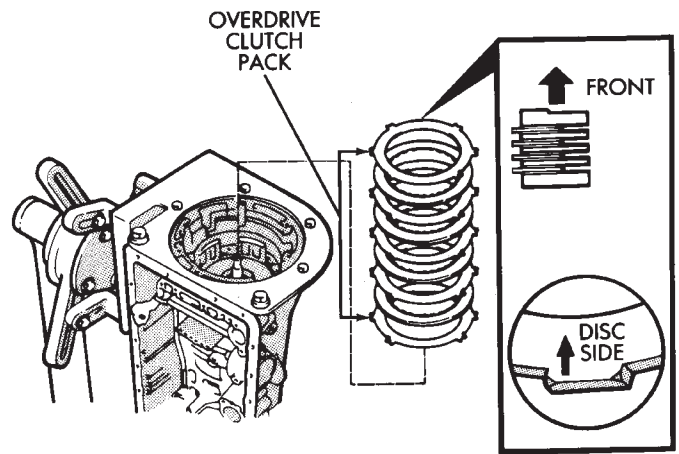
Fig. 39 Installing Overdrive Support Bolts



J8921-707

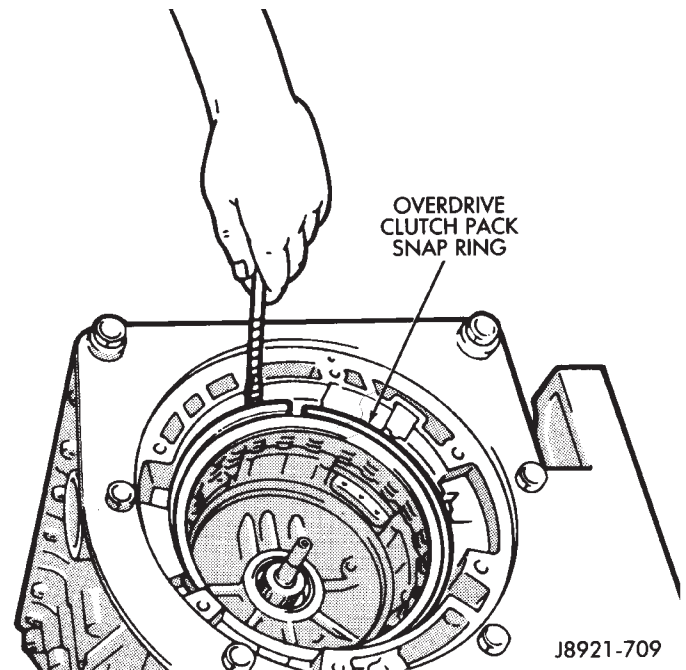
Fig. 40 Checking Output Shaft End Play

(52) Check overdrive brake piston stroke as follows:



J8921-708

Fig. 41 Install Overdrive Clutch Pack



J8921-709

Fig. 42 installing Overdrive Brake Snap Ring

(a) Mount Gauge 7546 in dial indicator and position gauge tool against overdrive brake piston (Fig. 43).

(b) Apply and release overdrive brake piston with compressed air and note piston stroke length on dial indicator. Apply air pressure through feed hole in case (Fig. 44).

(c) Piston stroke length should be 1.40 - 1.70 mm (0.55 - 0.66 in.).

(d) If stroke is incorrect, brake pack or piston is installed incorrectly. Check and correct as necessary and measure piston stroke again.

(53) Remove dial indicator and gauge tool.

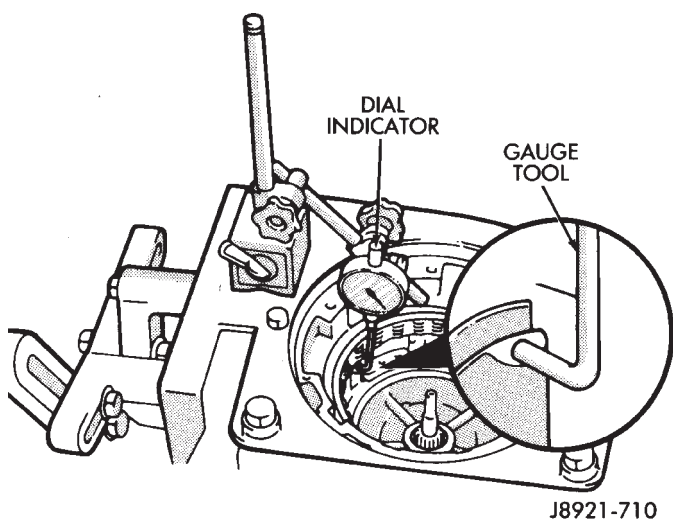


Fig. 43 Positioning Gauge Tool And Dial Indicator

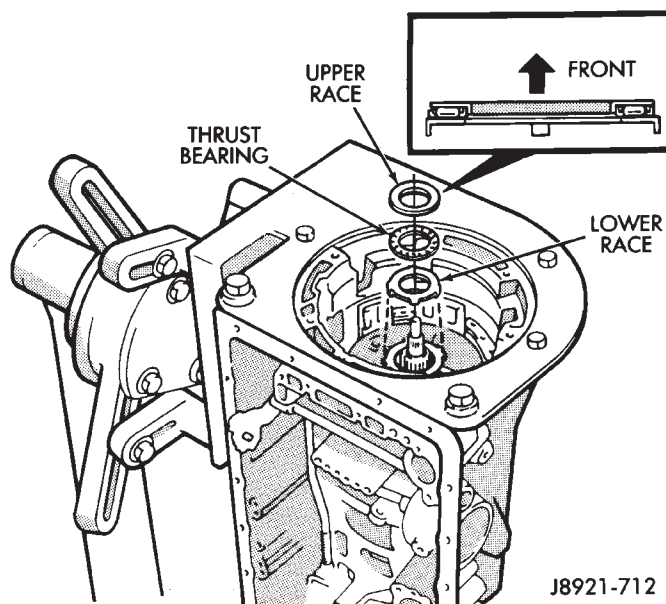


Fig. 45 Installing Overdrive Support Thrust Bearing And Races

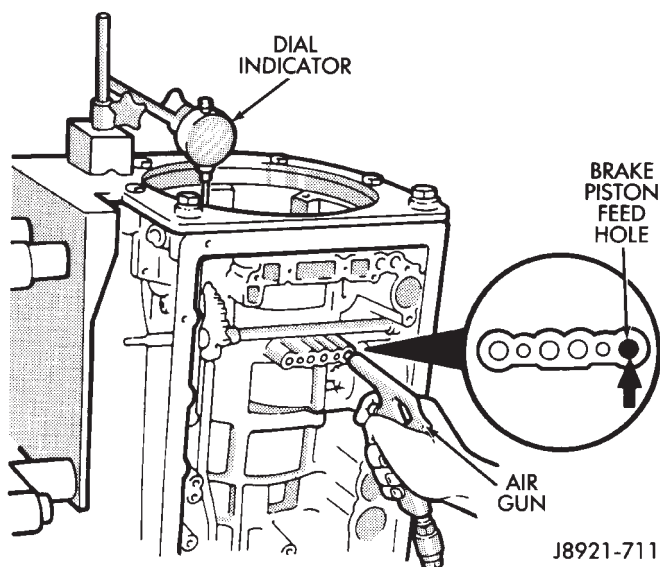


Fig. 44 Checking Overdrive Brake Piston Stroke

(54) Remove overdrive brake piston snap ring and remove overdrive clutch pack components.

(55) Coat overdrive lower race, thrust bearing and upper race with petroleum jelly and install them in overdrive support (Fig. 45). Be sure races and bearing are assembled and installed as shown.

(56) Verify bearing/race sizes before proceeding. Bearing-race sizes are:

- Outer diameter of lower race is 47.8 mm (1.882 in.) and inside diameter is 34.3 mm (1.350 in.).
- Outer diameter of bearing is 47.7 mm (1.878 in.) and inside diameter is 32.7 mm (1.287 in.).
- Outer diameter of upper race is 47.8 mm (1.882 in.) and inside diameter is 30.7 mm (1.209 in.).

(57) Install overdrive planetary ring gear in support (Fig. 46).

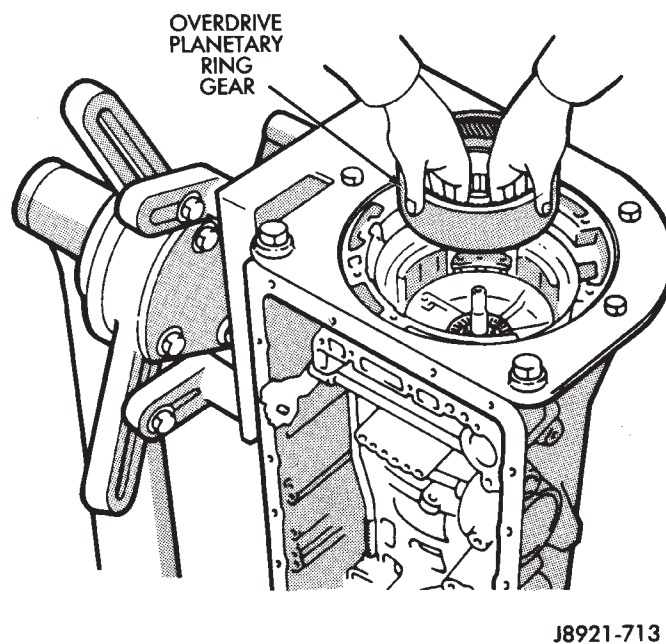


Fig. 46 Installing Overdrive Planetary Ring Gear

(58) Coat ring gear thrust race and thrust bearing assembly with petroleum jelly and install them in gear (Fig. 47).

(59) Verify bearing/race size before proceeding.

- Outer diameter of ring gear race-bearing is 47.8 mm (1.882 in.) and inside diameter is 24.2 mm (0.953 in.).

- Outer diameter of bearing is 46.8 mm (1.844 in.) and inside diameter is 26.0 mm (1.024 in.).

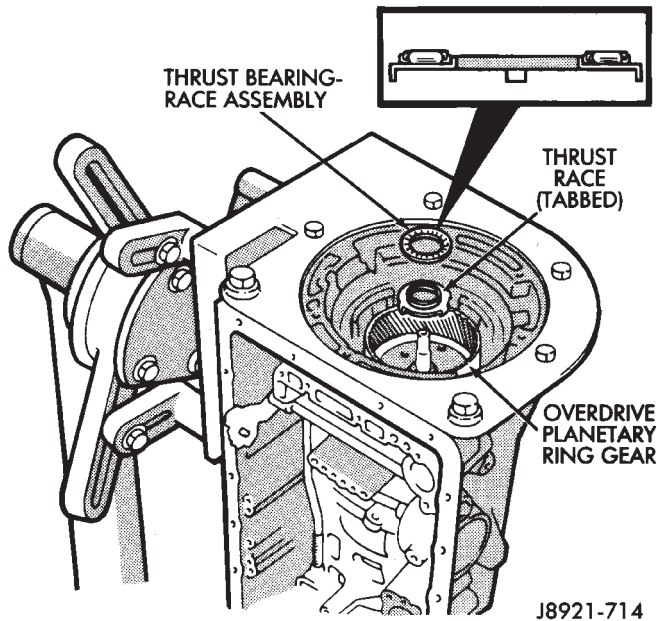


Fig. 47 Installing Ring Gear Thrust Bearing And Race

- (60) Coat tabbed thrust race with petroleum jelly and install it on planetary gear (Fig. 48). Race outer diameter is 41.8 mm (1.646 in.) and inside diameter is 27.1 mm (1.067 in.).

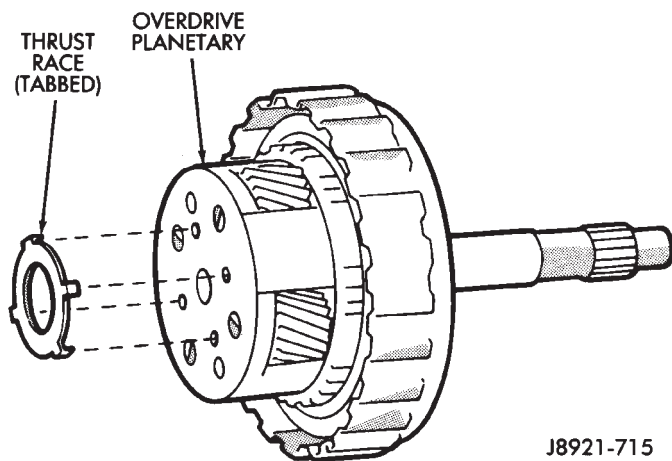


Fig. 48 Installing Planetary thrust Race

- (61) Install assembled overdrive planetary gear and clutch (Fig. 49).

- (62) Coat thrust bearing and race assembly with petroleum jelly and install it on clutch input shaft (Fig. 50). Bearing and race outer diameter is 50.2 mm (1.976 in.) and inside diameter is 28.9 mm (1.138 in.).

- (63) Install overdrive brake pack as follows:

- (a) Install 4.0 mm (0.157 in.) thick plate first. Rounded edge of plate must face upward.

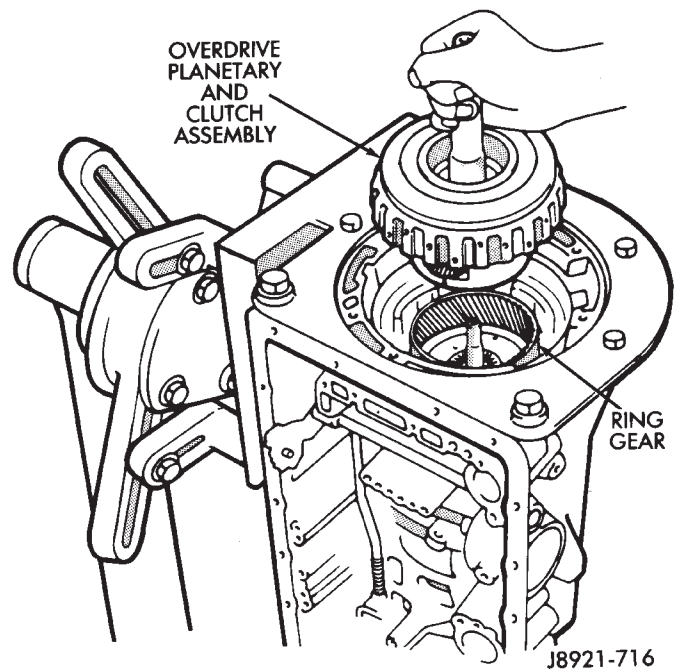


Fig. 49 Installing Overdrive Planetary And Clutch Assembly

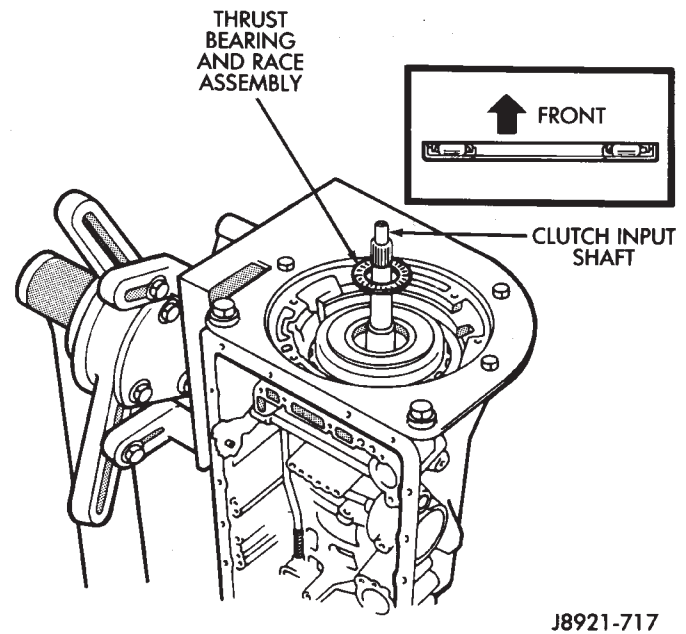


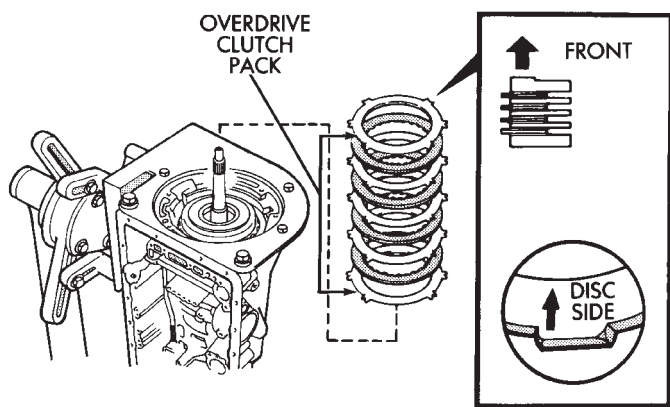
Fig. 50 Installing Input Shaft Thrust Bearing And Race Assembly

- (b) Install a disc followed by a plate until the required number of discs and plates are installed. Be sure to install the stepped plate last with the flat side of the plate facing the disc (Fig. 51).

- (c) Confirm that four discs and three plates have been installed.

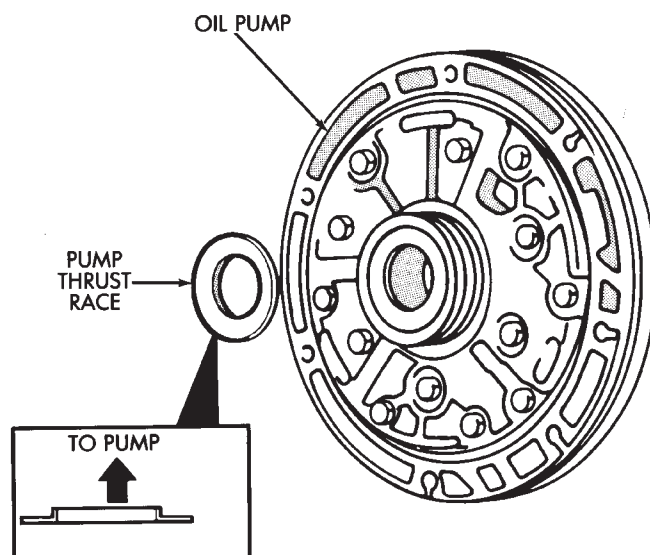
- (64) Install clutch pack snap ring (Fig. 52).

- (65) Coat thrust bearing race with petroleum jelly and install it in oil pump (Fig. 53). Bearing race



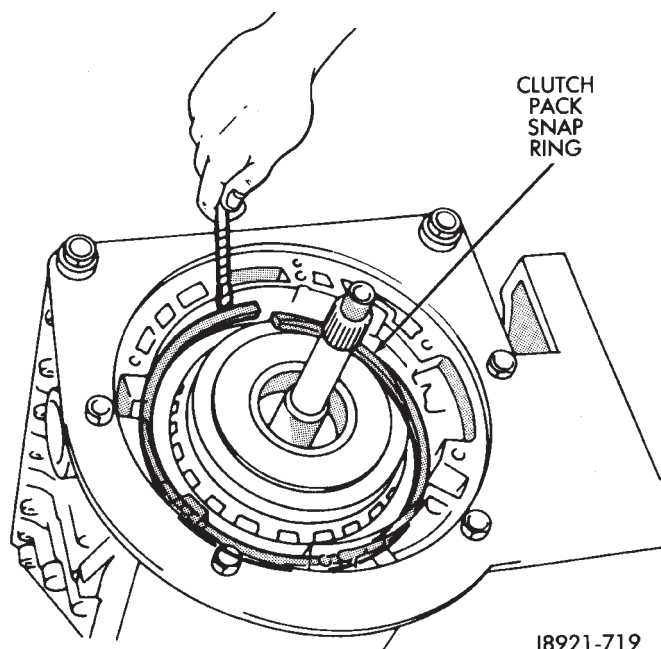
J8921-718

Fig. 51 Installing Overdrive Clutch Pack



J8921-720

Fig. 53 Installing Oil Pump Thrust Race



J8921-719

Fig. 52 Installing Clutch Pack Snap Ring

outer diameter is 47.2 mm (1.858 in.) and inside diameter is 28.1 mm (1.106 in.).

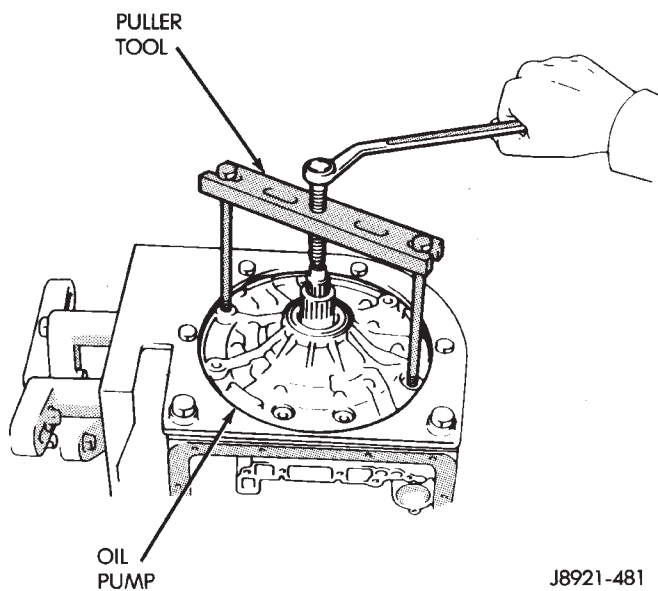
(66) Lubricate and install replacement O-ring on oil pump body.

(67) Install oil pump in case. Align pump and case bolt holes and carefully ease pump into place (Fig. 54).

CAUTION: Do not use force to seat the pump. The seal rings on the stator shaft could be damaged if they bind or stick to the direct clutch drum.

(68) Tighten oil pump bolts to 22 N·m (16 ft. lbs.) torque.

(69) Verify input shaft rotation. Shaft should rotate smoothly and not bind.



J8921-481

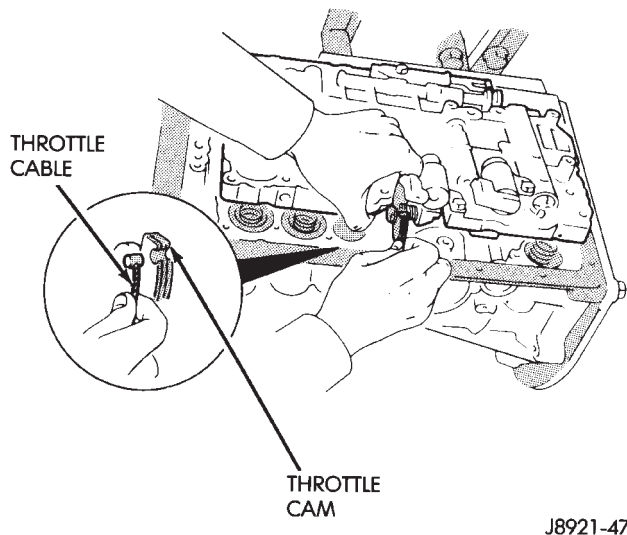
Fig. 54 Installing Oil Pump

(70) Lubricate and install new O-ring on transmission throttle cable adapter and install cable in case (Fig. 55).

(71) Check clutch and brake operation. Operate clutches and brakes with compressed air applied through feed holes in case (Fig. 56). Listen for clutch and brake application. If you do not hear a clutch or brake apply, disassemble transmission and repair fault before proceeding. **It is necessary to block the overdrive clutch accumulator feed hole No. 8 (Fig. 56) in order to check direct clutch operation.**

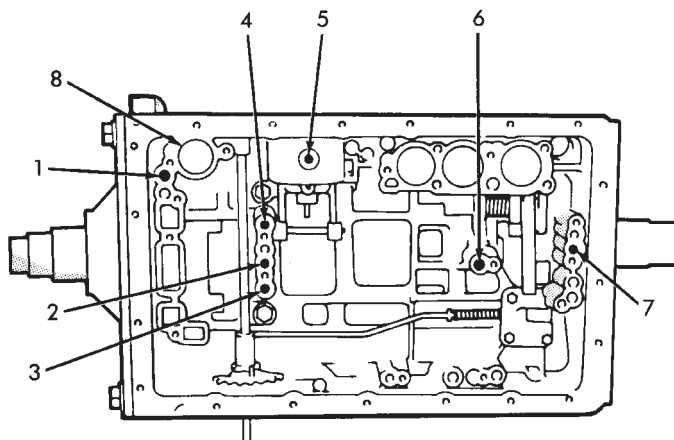
(72) Lubricate and install new O-rings on accumulator pistons (Fig. 57).

(73) Assemble and install accumulator pistons and springs (Fig. 57).



J8921-478

Fig. 55 Installing Transmission Throttle Cable



1. OVERDRIVE DIRECT CLUTCH FEED
2. DIRECT CLUTCH FEED
3. FORWARD CLUTCH FEED
4. OVERDRIVE BRAKE FEED
5. SECOND COAST BRAKE FEED
6. SECOND BRAKE FEED
7. FIRST-REVERSE BRAKE FEED
8. OVERDRIVE CLUTCH ACCUMULATOR PISTON HOLE (BLOCK THIS HOLE WHEN CHECKING DIRECT CLUTCH OPERATION)

J8921-721

Fig. 56 Clutch And Brake Feed Hole Locations

- (74) Install new check ball body and spring (Fig. 58).
- (75) Position valve body on case (Fig. 59).
- (76) Install detent spring (Fig. 59).
- (77) Align manual valve, detent spring and shift sector (Fig. 59).
- (78) Connect transmission throttle cable to throttle valve cam (Fig. 60).
- (79) Install and tighten valve body-to-case bolts to 10 N·m (7 ft. lbs.) torque.

- (A) SECOND BRAKE ACCUMULATOR PISTON
- (B) DIRECT CLUTCH ACCUMULATOR PISTON
- (C) OVERDRIVE BRAKE ACCUMULATOR PISTON
- (D) OVERDRIVE CLUTCH ACCUMULATOR PISTON

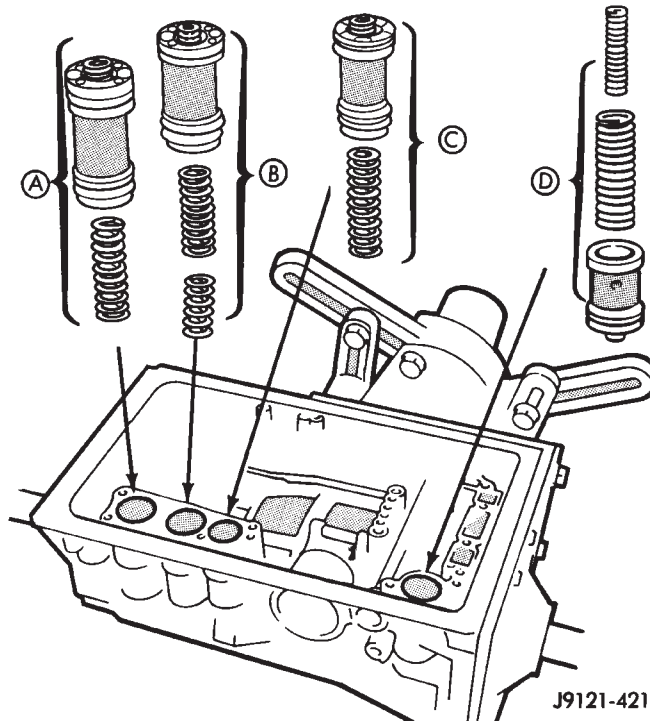


Fig. 57 Accumulator Piston And Spring Installation

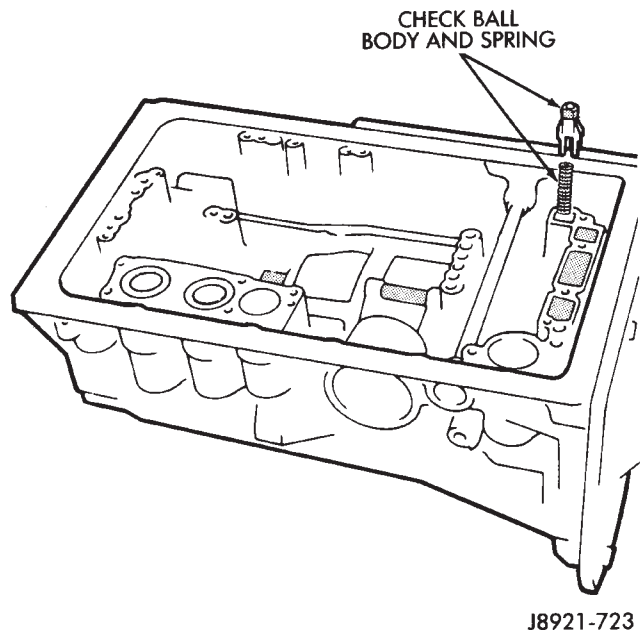
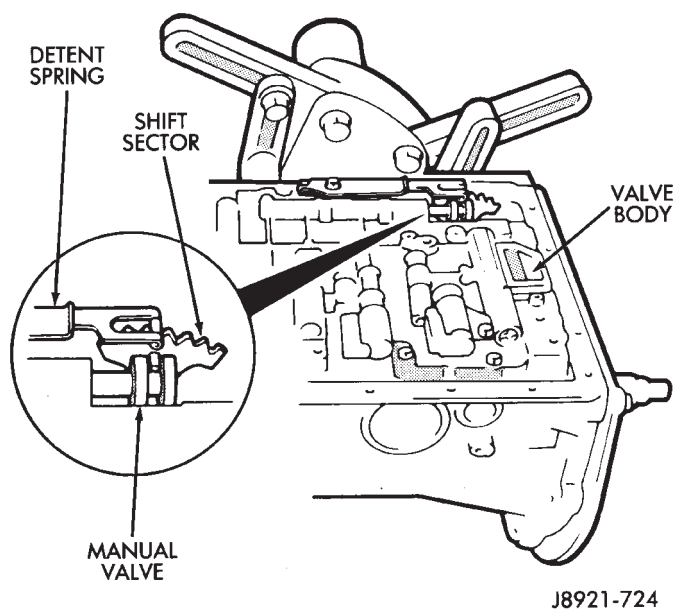


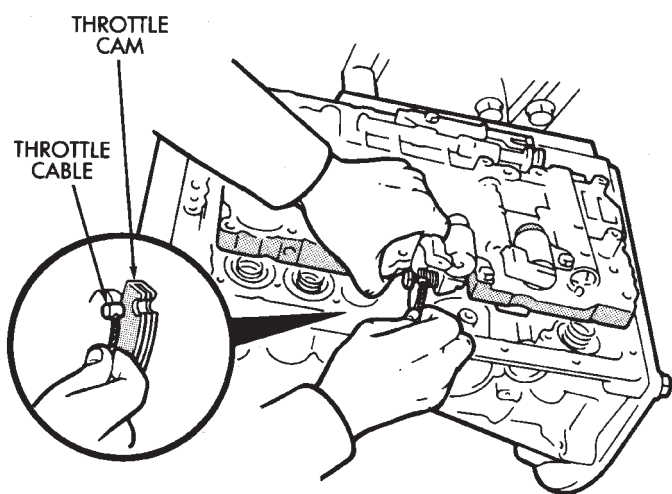
Fig. 58 Installing Check Ball Body And Spring

- (80) Connect valve body solenoid wires to solenoids (Fig. 61).
- (81) Install new O-ring on solenoid harness adapter and secure adapter to case.



J8921-724

Fig. 59 Aligning Manual Valve, Shift Sector And Detent Spring



J8921-725

Fig. 60 Connecting Transmission Throttle Cable

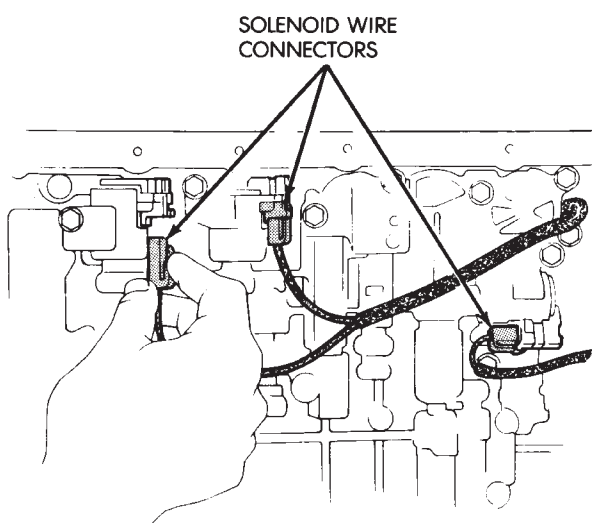
(82) Install valve body oil tubes (Fig. 62). Tap tubes into place with a plastic mallet. Be sure the flanged tube ends and straight tube ends are installed as shown.

(83) Install new gaskets on oil screen and install screen on valve body. Tighten screen bolts to 10 N·m (7 ft. lbs.) torque.

(84) Install magnet in oil pan. Be sure magnet does not interfere with valve body oil tubes.

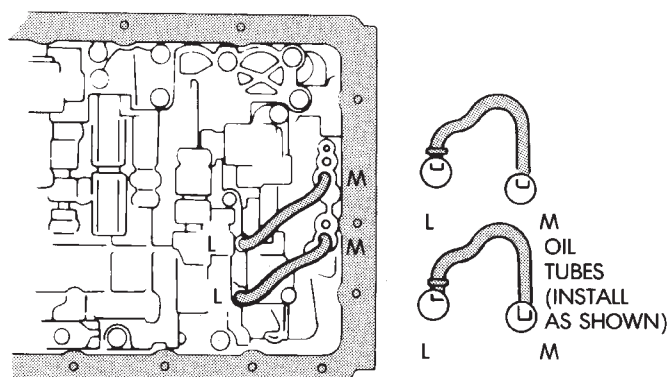
(85) Apply Mopar or Loctite 599 to sealing surface of oil pan. Sealer bead should be at least 3 mm (1/8 in.) wide. Install pan on case and tighten pan bolts to 7 N·m (65 in. lbs.) torque.

(86) Install transmission speed sensor rotor and key on output shaft (Fig. 63).



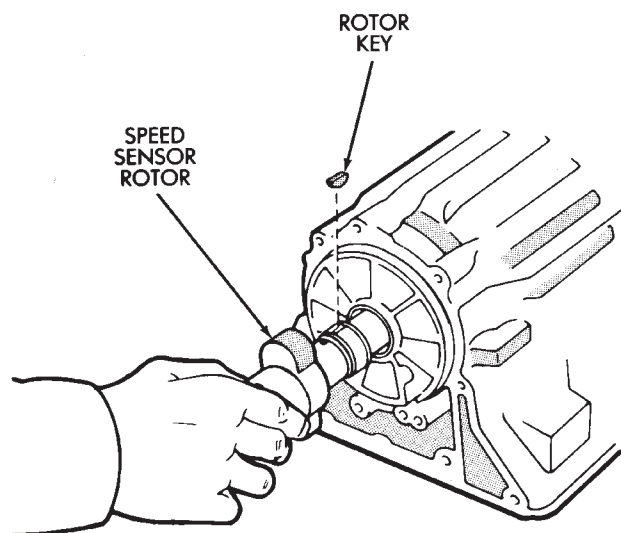
J8921-433

Fig. 61 Connecting Valve Body Solenoid Wires



J8921-443

Fig. 62 Installing Valve Body Oil Tubes



J8921-726

Fig. 63 Installing Transmission Speed Sensor Rotor And Key

(87) Install spacer and speedometer drive gear on output shaft. Then install retaining snap ring (Fig. 64).

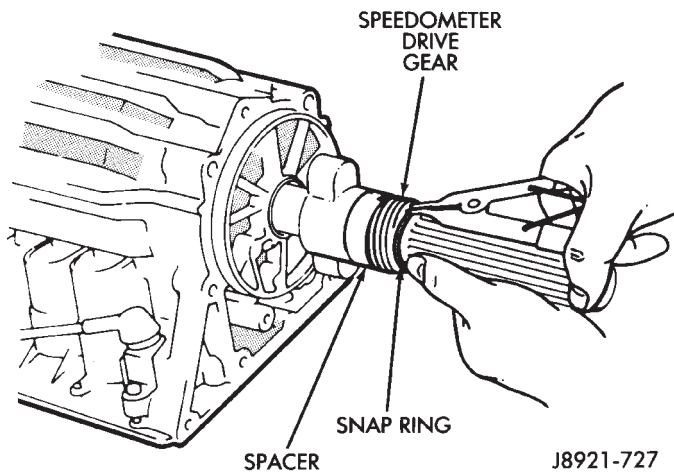


Fig. 64 Installing Spacer And Speedometer Drive Gear

(88) Apply bead of Mopar or Loctite 599 sealer to sealing surface at rear of case (Fig. 65).

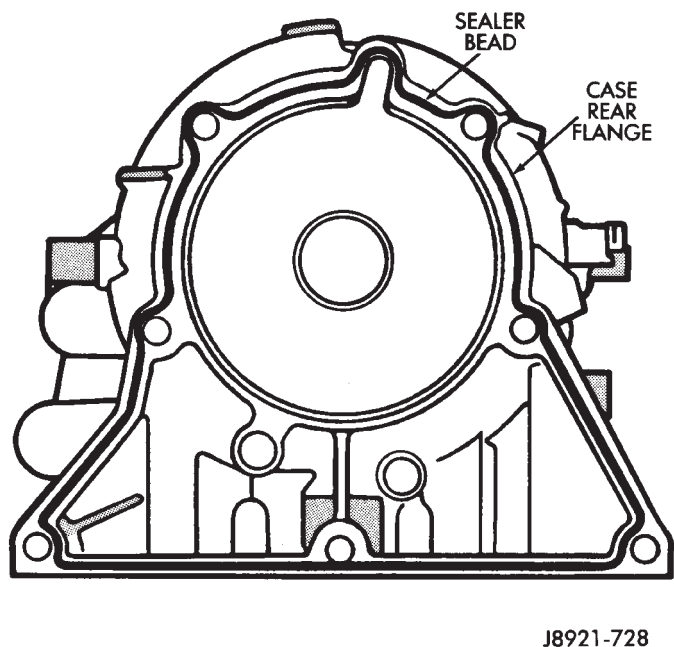


Fig. 65 Applying Sealer To Case Rear Flange

(89) Install adapter housing on transmission. Tighten adapter bolts to 34 N·m (25 ft. lbs.) torque.

(90) Install transmission speed sensor (Fig. 66). Tighten sensor bolt to 7.4 N·m (65 in. lbs.) torque and connect sensor wire harness connector.

(91) Install converter housing (Fig. 67). Tighten 12 mm diameter housing bolts to 57 N·m (42 ft. lbs.) torque. Tighten 10 mm diameter housing bolts to 34 N·m (25 ft. lbs.) torque.

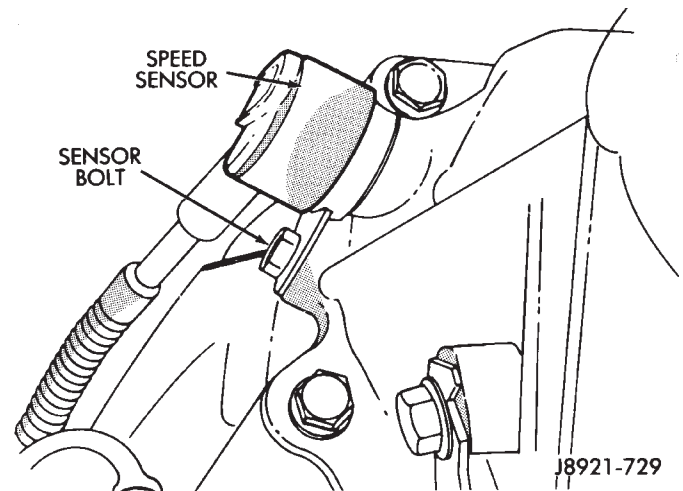


Fig. 66 Installing Transmission Speed Sensor

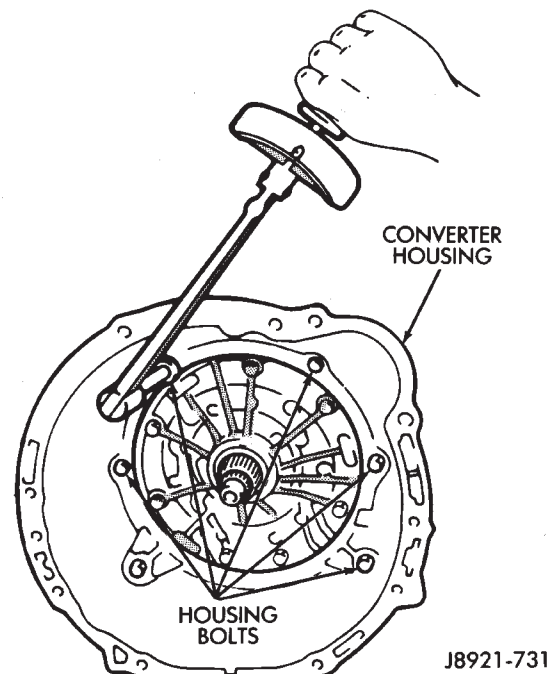


Fig. 67 Installing Converter Housing

(92) Install transmission shift lever on manual valve shaft. Do not install lever attaching nut at this time.

(93) Move transmission shift lever fully rearward. Then move lever two detent positions forward.

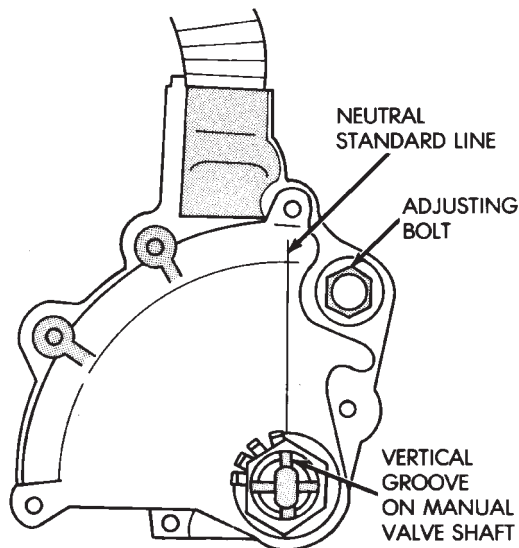
(94) Mount park/neutral position switch on manual valve shaft and tighten switch adjusting bolt just enough to keep switch from moving (Fig. 68).

(95) Install park/neutral position switch tabbed washer and retaining nut (Fig. 68). Tighten nut to 6.9 N·m (61 in. lbs.) torque, but do not bend any of the washer tabs against the nut at this time.

(96) Align park/neutral position switch standard line with groove or flat on manual shaft (Fig. 68).

(97) Tighten park/neutral position switch adjusting bolt to 13 N·m (9 ft. lbs.) torque.

(98) Install transmission shift lever on manual



J8921-431

Fig. 68 Park/Neutral Position Switch Installation/Adjustment

valve shaft. Tighten lever attaching nut to 16 N·m (12 ft. lbs.) torque.

(99) Install retaining clamp for wire harness and throttle cable (Fig. 69).

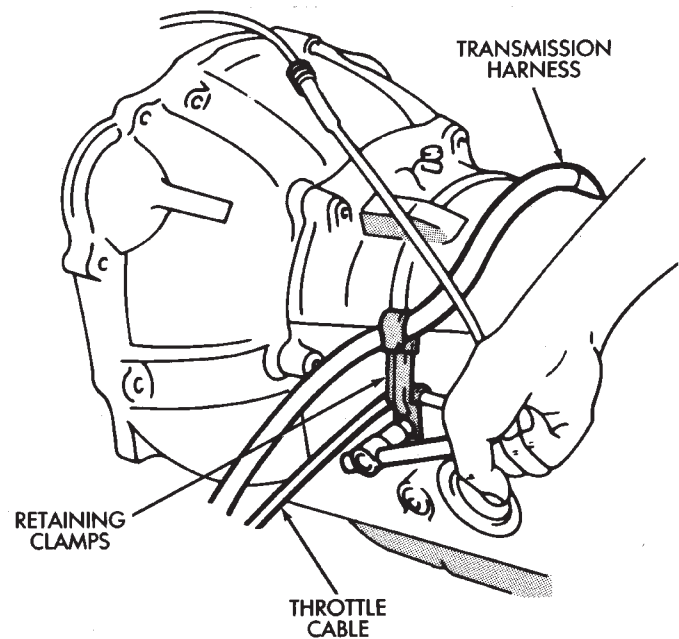
(100) Install torque converter.

(101) Verify that converter is seated by measuring distance between converter housing flange and one of the converter mounting pads (Fig. 70). Use straight-edge and vernier calipers to measure distance. On 6-cyl. transmissions, distance should be 16.5 mm (0.650 in.).

(102) Secure converter in transmission with C-clamp or metal strapping. Do this before mounting transmission on jack or moving transmission under vehicle.

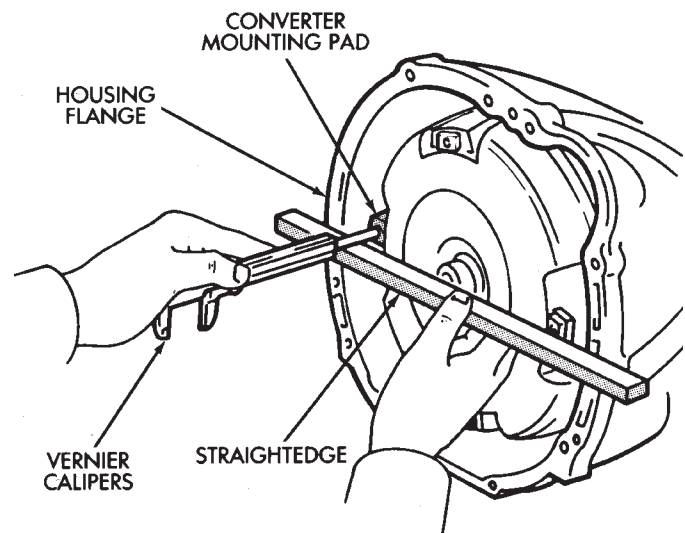
(103) Install lower half of transmission fill tube (install upper half after transmission is in vehicle).

CAUTION: The transmission cooler and lines must be reverse flushed if overhaul corrected a malfunction that generated sludge, metal particles, or clutch friction material. The torque converter should also be replaced if contaminated by the same malfunction. Debris and residue not flushed from the cooler and lines will flow back into the transmission



J8921-732

Fig. 69 Installing Cable/Harness Clamps



J8921-733

Fig. 70 Checking Converter Installation and converter. The result will be a repeat failure and shop comeback.

NP231 TRANSFER CASE

INDEX

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General Information	272	Transfer Case Identification	273
Shift Linkage Adjustment	275	Transfer Case Installation	276
Speedometer Service	275	Transfer Case Lubricant	273
Transfer Case Assembly	282	Transfer Case Removal	276
Transfer Case Disassembly and Overhaul	277		

GENERAL INFORMATION

The NP231 is a part-time transfer case with a low range reduction gear system (Fig. 1). The NP231 has three operating ranges plus a Neutral position. A low range system provides a reduction ratio for increased low speed torque capability.

The NP231 is the Command Trac transfer case. It is used in XJ and YJ models.

Two versions of the NP231 are used. One version retains the synchronizer components used in previous models. A newly introduced version is not equipped with synchro components.

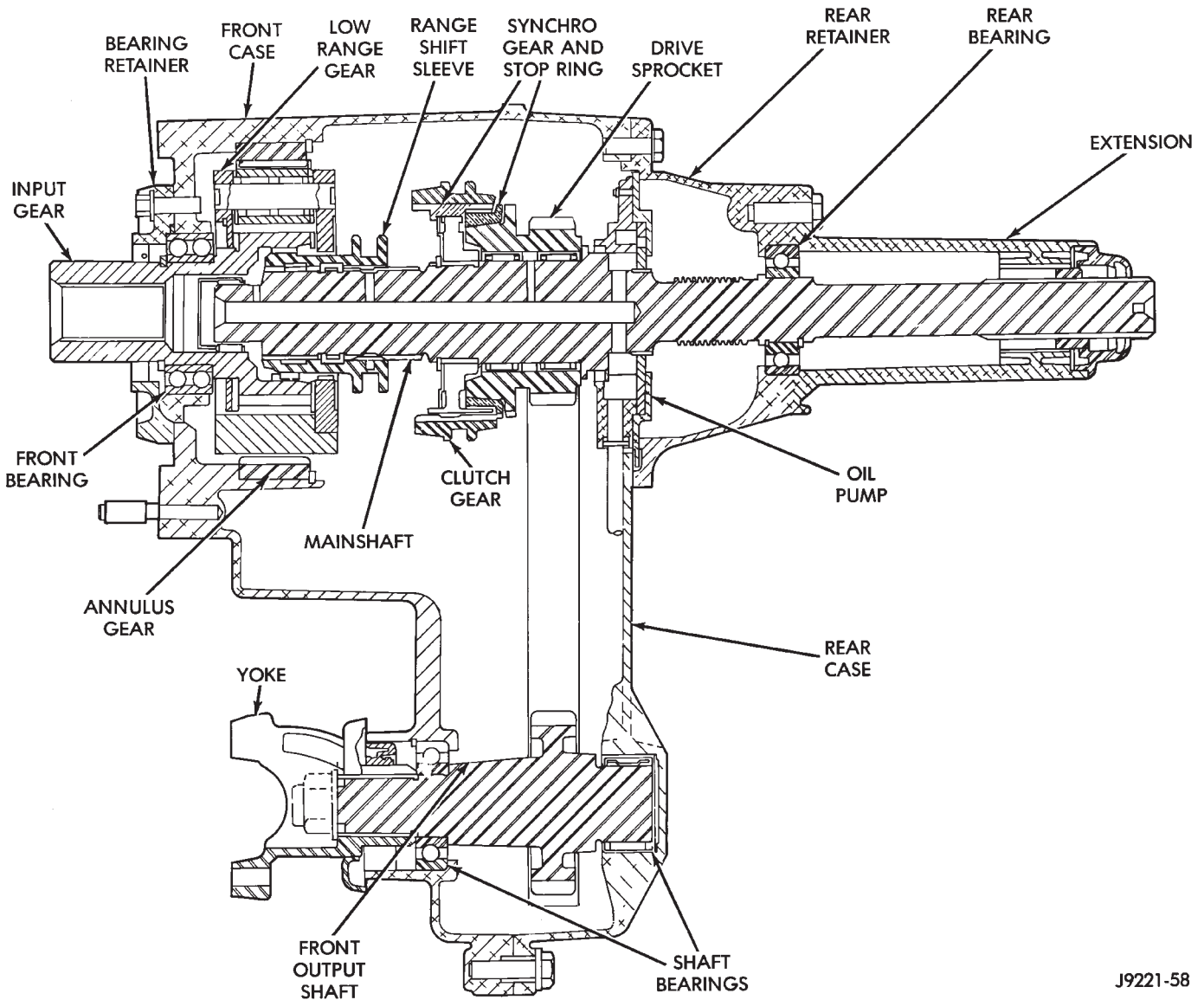


Fig. 1 NP231 Transfer Case

OPERATING RANGES

NP231 operating ranges are: 2-wheel drive high; 4-wheel drive high and 4-wheel drive low (Fig. 2).

2-wheel drive range is for use on all surfaces. The 4-wheel drive high and low ranges are undifferentiated and should only be used on unpaved, low traction surfaces only.

SHIFT MECHANISM

Operating ranges are selected with a floor mounted shift lever. The shift lever is connected to the transfer case range lever by an adjustable linkage rod. A straight line shift pattern is used (Fig. 2). Range positions are marked on the shifter bezel cover plate. A front axle disconnect mechanism is only used on certain models.

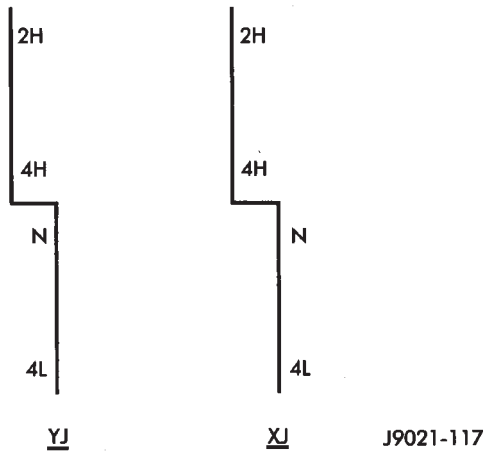


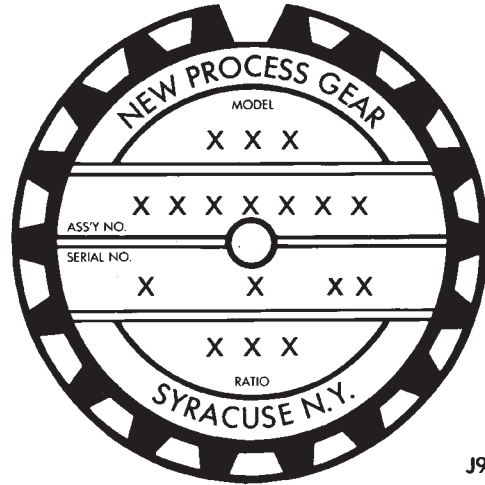
Fig. 2 NP231 Shift Pattern

TRANSFER CASE IDENTIFICATION

A circular ID tag is attached to the rear case of each NP231 transfer case (Fig. 3). The ID tag pro-

vides the transfer case model number, assembly number, serial number and low range ratio.

The transfer case serial number also represents the date of build. For example, a serial number of 8-10-92 would represent August 10, 1992.



J9121-434

Fig. 3 Transfer Case Identification Tag

TRANSFER CASE LUBRICANT

Recommended Lubricant

Use Mopar Dexron II, or ATF Plus, type 7176 automatic transmission fluid in the NP231 transfer case.

Lubricant Capacity

Approximate refill lubricant capacity is 1.54 liters (3.25 pints) for YJ and 1.04 liters (2.2 pints) for XJ.

Fill Level

The correct fill level is to the bottom edge of the fill plug hole. The vehicle must be level in order to ensure an accurate fluid level check.

NP231 SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
TRANSFER CASE DIFFICULT TO SHIFT OR WILL NOT SHIFT INTO DESIRED RANGE	<ul style="list-style-type: none"> (1) Vehicle speed too great to permit shifting. (2) If vehicle was operated for extended period in 4H mode on dry paved surface, driveline torque load may cause difficulty. (3) Transfer case external shift linkage binding. (4) Insufficient or incorrect lubricant. (5) Internal components binding, worn or damaged. 	<ul style="list-style-type: none"> (1) Stop vehicle and shift into desired range. Or reduce speed to 3-4 km/h (2-3 mph) before attempting to shift. (2) Stop vehicle, shift transmission to Neutral, shift transfer case to 2H mode and operate vehicle in 2H on dry paved surfaces. (3) Lubricate, repair or replace linkage bushings or tighten loose components as necessary. (4) Drain and refill to edge of fill hole with DEXRON II® or MOPAR-MERCON® Automatic Transmission Fluid. (5) Disassemble unit and replace worn or damaged components as necessary.
TRANSFER CASE NOISY IN ALL DRIVE MODES	<ul style="list-style-type: none"> (1) Insufficient or incorrect lubricant. 	<ul style="list-style-type: none"> (1) Drain and refill to edge of fill hole with DEXRON II® or MOPAR-MERCON® Automatic Transmission Fluid. Check for leaks and repair if necessary. Note: 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 – FOUR WHEEL DRIVE LOW RANGE	<ul style="list-style-type: none"> (1) Transfer case not completely engaged in 4L position. (2) Shift linkage out of adjustment. (3) Shift linkage loose or binding. (4) Range fork damaged, inserts worn, or fork is binding on shift rail. (5) Low range gear worn or damaged. 	<ul style="list-style-type: none"> (1) Stop vehicle, shift transfer case to Neutral, then shift back into 4L position. (2) Adjust linkage. (3) Tighten, lubricate or repair linkage as necessary. (4) Disassemble unit and repair as necessary. (5) Disassemble and repair as necessary.
LUBRICANT LEAKING FROM OUTPUT SHAFT SEALS OR FROM VENT	<ul style="list-style-type: none"> (1) Transfer case overfilled. (2) Vent closed or restricted. (3) Output shaft seals damaged or installed incorrectly. 	<ul style="list-style-type: none"> (1) Drain to correct level. (2) Clear or replace vent if necessary. (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.
ABNORMAL TIRE WEAR	<ul style="list-style-type: none"> (1) Extended operation on dry hard surface (paved) roads in 4H range. 	<ul style="list-style-type: none"> (1) Operate in 2H on hard surface (paved) roads.

SHIFT LINKAGE ADJUSTMENT

LINKAGE ADJUSTMENT—YJ

- (1) Remove transfer case shift knob locknut and remove knob (Fig. 4).
- (2) Remove outer boot attaching screws and remove boot (Fig. 4).
- (3) Remove inner boot attaching screws and remove boot (Fig. 4).
- (4) Move shift lever into 4L position.

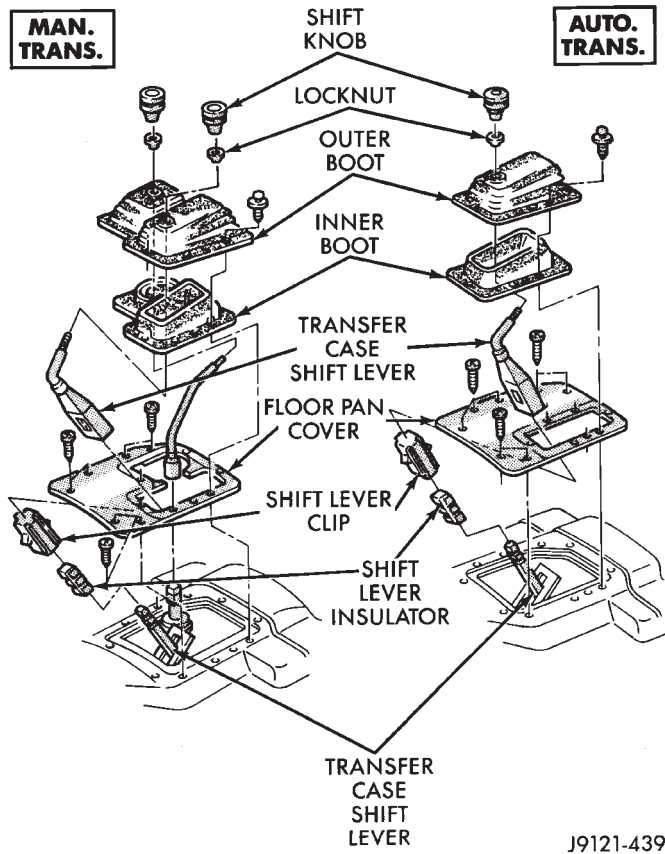


Fig. 4 Transfer Case Shift Lever And Boots—YJ

- (5) Insert 3 mm (1/8 in.) spacer between shift lever and forward edge of shift lever gate (Fig. 5). Secure lever and spacer in place with tape or wire.
- (6) Secure shift lever and spacer with tape or wire.
- (7) Raise vehicle.
- (8) Loosen lock bolt on adjusting trunnion (Fig. 6). Linkage rod should now slide freely in trunnion.
- (9) Verify that range lever is in 4L position (Fig. 6).
- (10) Position linkage rod so it is a free fit in range lever. Then tighten trunnion lock bolt (Fig. 6).
- (11) Lower vehicle.
- (12) Remove shift lever spacer and install inner and outer boots and shift knob (Fig. 4).

LINKAGE ADJUSTMENT—XJ

- (1) Remove shift lever bezel.
- (2) Move shift lever into 4L position.
- (3) Insert 3 mm (1/8 in.) spacer between shift lever and forward edge of shift lever gate (Fig. 7). Secure

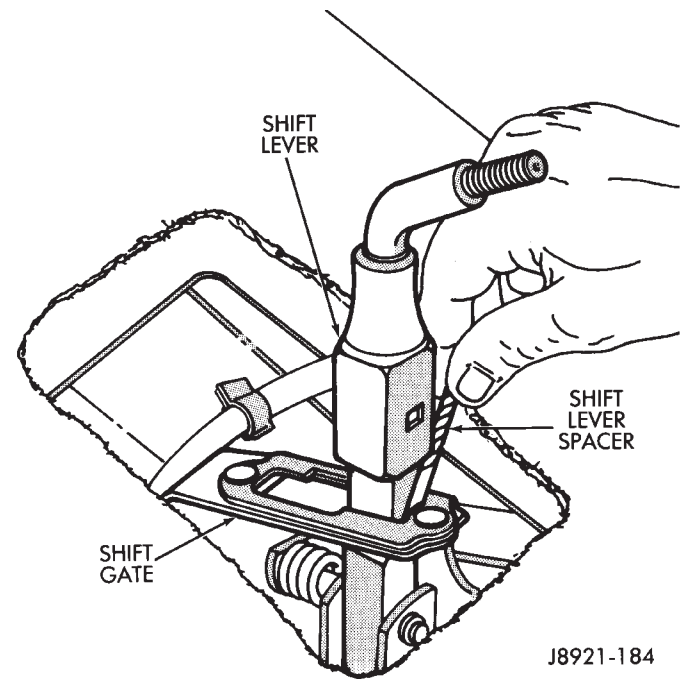


Fig. 5 Installing Shift Lever Spacer—YJ

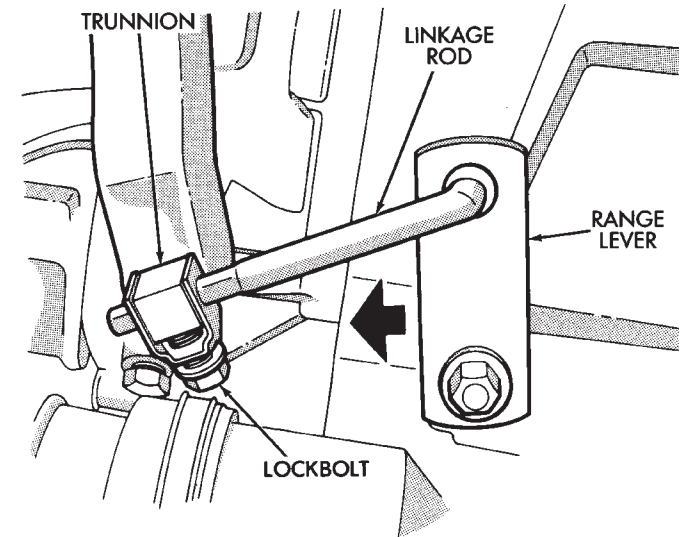


Fig. 6 Shift Trunnion Lock Bolt Position—YJ

- lever and spacer in place with tape or wire.
- (4) Raise vehicle.
- (5) Loosen trunnion lock bolt (Figs. 8 and 9). Linkage rod should now slide freely in trunnion.
- (6) Verify that transfer case range lever is in 4L position.
- (7) Position linkage rod so it is a free fit in range lever (Figs. 8 and 9). Then tighten trunnion locknut.
- (8) Lower vehicle.
- (9) Remove shift lever spacer and install bezel.

SPEEDOMETER SERVICE

Speedometer service is covered in the automatic transmission sections in this group. Refer to the appropriate section as needed.

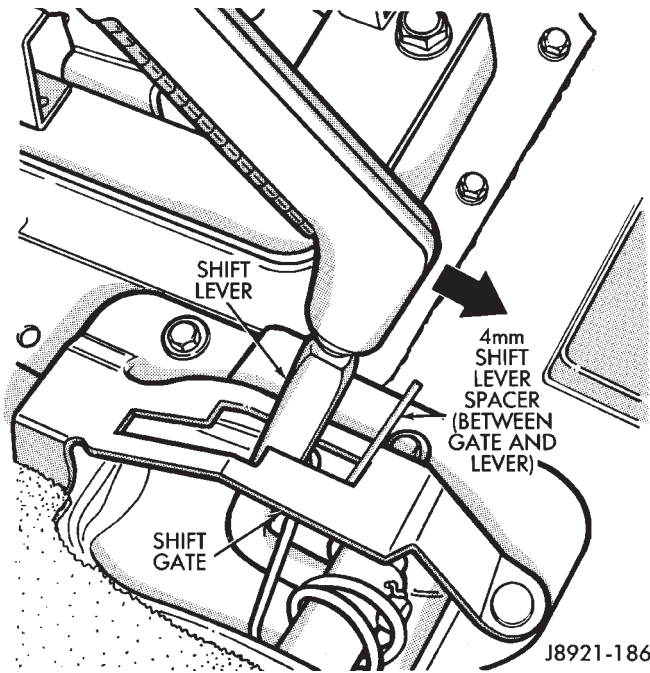


Fig. 7 Installing Shift Lever Spacer—XJ

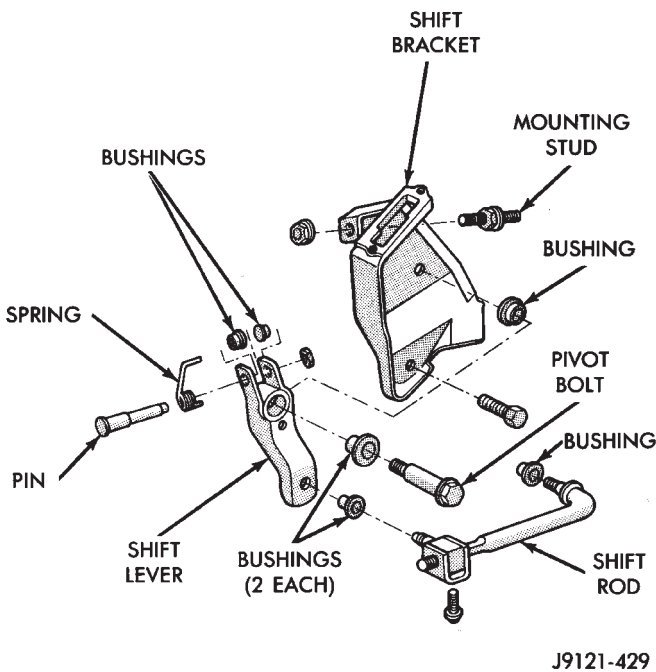


Fig. 8 Shift Linkage—YJ

TRANSFER CASE REMOVAL

- (1) Shift transfer case into Neutral.
- (2) Raise vehicle.
- (3) 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, or skid plate.
- (7) Disconnect front/rear propeller shafts at transfer case.
- (8) Disconnect vehicle speed sensor wires.

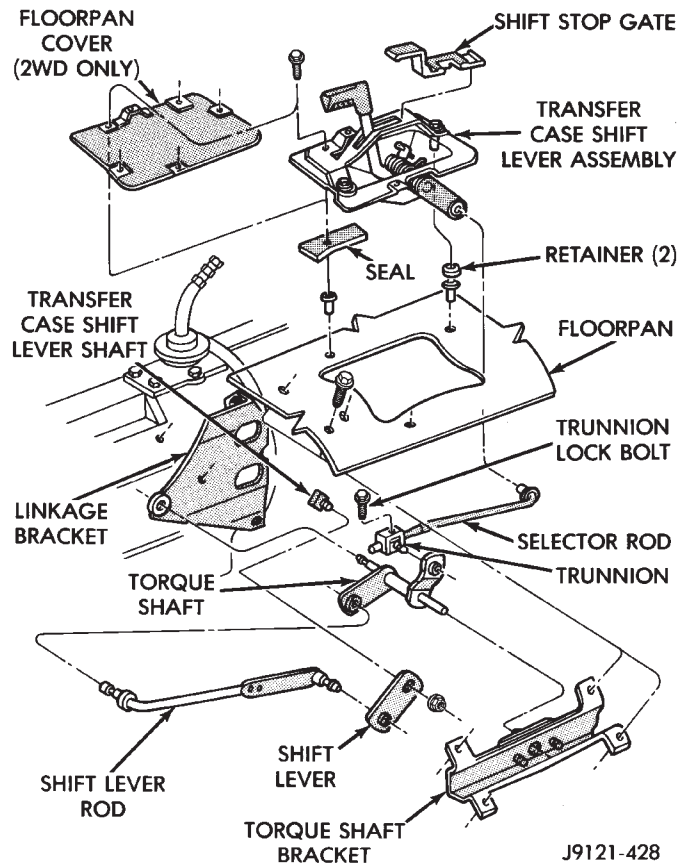


Fig. 9 Shift Linkage—XJ

- (9) Disconnect transfer case linkage rod from range lever.
- (10) Disconnect transfer case vent hose.
- (11) Support transfer case with transmission jack.
- (12) Remove nuts attaching transfer case to transmission.
- (13) Secure transfer case to jack with chains.
- (14) Pull transfer case and jack rearward to disengage transfer case.
- (15) Remove transfer case from under vehicle.

TRANSFER CASE INSTALLATION

- (1) Mount transfer case on a transmission jack. Secure transfer case to jack with chains.
- (2) Position transfer case under vehicle.
- (3) Align transfer case and transmission shafts and install transfer case on transmission.
- (4) Install and tighten transfer case attaching nuts to 35 N·m (26 ft. lbs.) torque.
- (5) Connect vehicle speed sensor wires, and vent hose.
- (6) Align and connect propeller shafts. Tighten shaft attaching bolts to 19 N·m (170 in. lbs.) torque.
- (7) Fill transfer case with Mopar ATF Plus, or Dexron II automatic transmission fluid.
- (8) Install rear crossmember, or skid plate. Tighten crossmember bolts to 41 N·m (30 ft. lbs.) torque.
- (9) Remove transmission jack and transmission support stand.
- (10) Connect transfer case range lever to linkage rod.

- (11) Adjust transfer case shift linkage.
- (12) Lower vehicle.

TRANSFER CASE DISASSEMBLY AND OVERHAUL

Two versions of the NP231 are used in current models. One version retains the synchronizer components used in previous years. A newly introduced version does not have synchro components. The non-synchro version does not have a synchro gear, struts, spring and stop ring. During overhaul, note which version is being serviced and order needed parts accordingly.

- (1) Remove fill and drain plugs.
- (2) Remove front yoke. Discard yoke seal washer and nut. They should not be reused.
- (3) Move transfer case range lever rearward to 4L position.
- (4) Remove extension housing attaching bolts.
- (5) Tap extension housing in clockwise direction to break sealer bead and remove housing (Fig. 1).

CAUTION: To avoid damaging the sealing surfaces of the extension housing and rear retainer, do not pry or wedge the housing off the retainer.

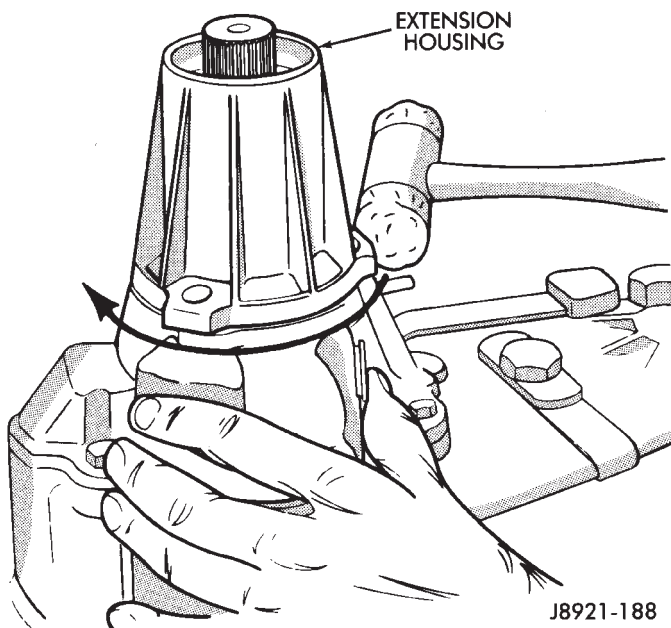


Fig. 1 Extension Housing Removal

- (6) Remove rear bearing snap ring (Fig. 2).
- (7) Remove rear retainer attaching bolts.
- (8) Remove rear retainer. Position screwdriver under each tab on retainer housing (Fig. 3). Then carefully pry retainer upward and off rear case.

CAUTION: Do not pry against the sealing surfaces of the retainer or rear case. The surfaces could be damaged.

- (9) Remove bolts attaching rear case to front case. Retain bolts and washers.

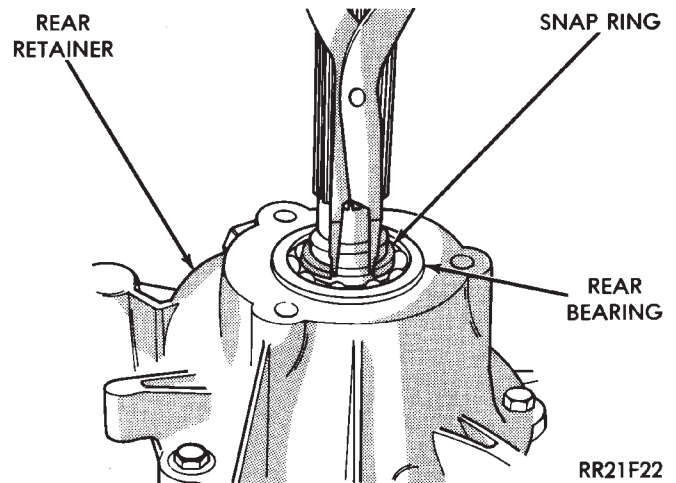


Fig. 2 Rear Bearing Snap Ring Removal

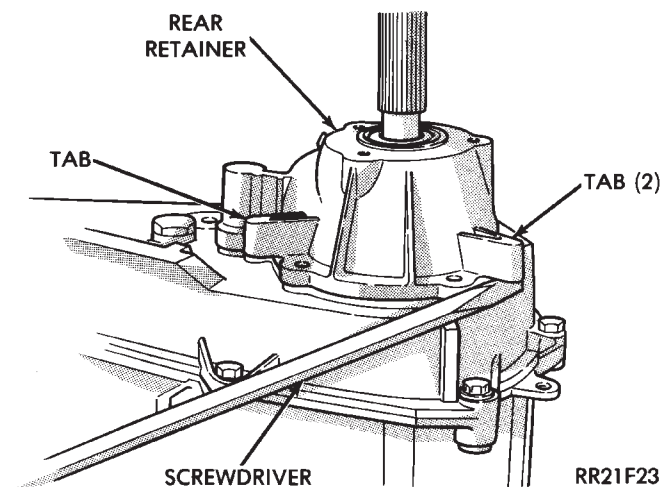


Fig. 3 Rear Retainer Removal

- (10) Separate rear case from front case (Fig. 4) Insert screwdrivers into slots cast in case ends. Then gently pry upward to break sealer bead and loosen rear case.

CAUTION: Do not pry against the sealing surfaces of the retainer or rear case. The surfaces could be damaged.

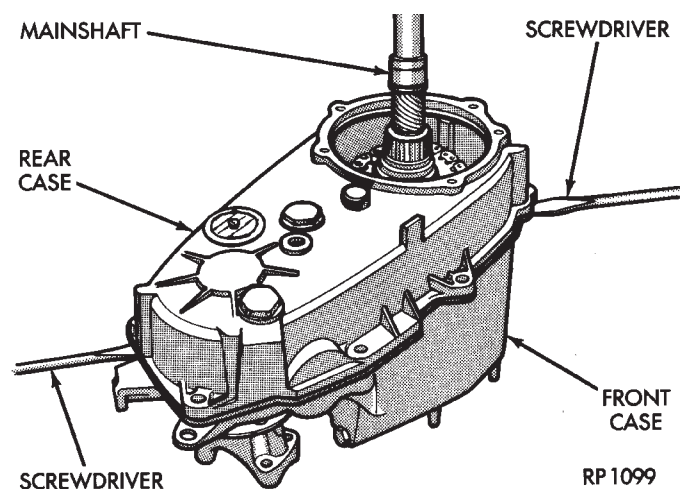


Fig. 4 Loosening Rear Case

(11) Remove oil pump and rear case as an assembly (Fig. 5).

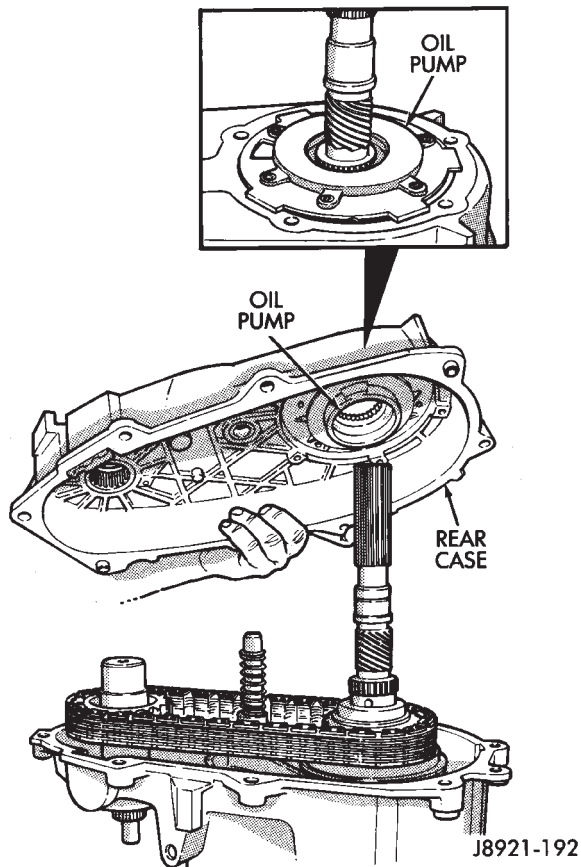


Fig. 5 Rear Case And Oil Pump Removal

(12) Slide oil screen out of case pocket. Disconnect screen from pickup tube and remove screen (Fig. 6).

(13) Remove pickup tube from oil pump (Fig. 6).

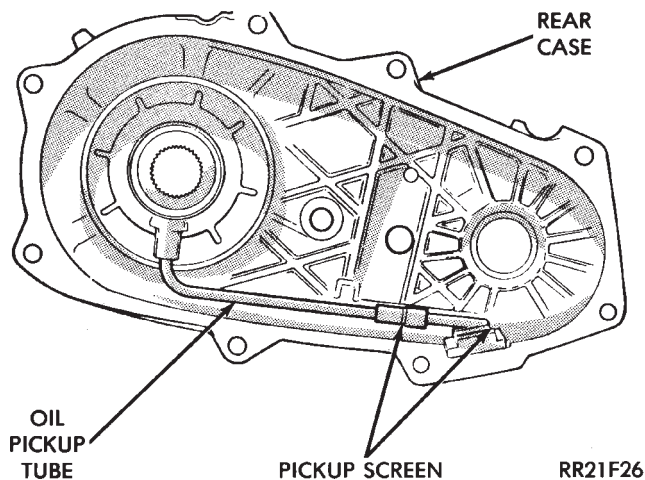


Fig. 6 Removing Oil Screen And Pickup Tube 16

(14) Remove oil pump from rear case.

(15) Remove pickup tube O-ring from oil pump (Fig. 7).

(16) The oil pump can be disassembled for cleaning and inspection as described in steps

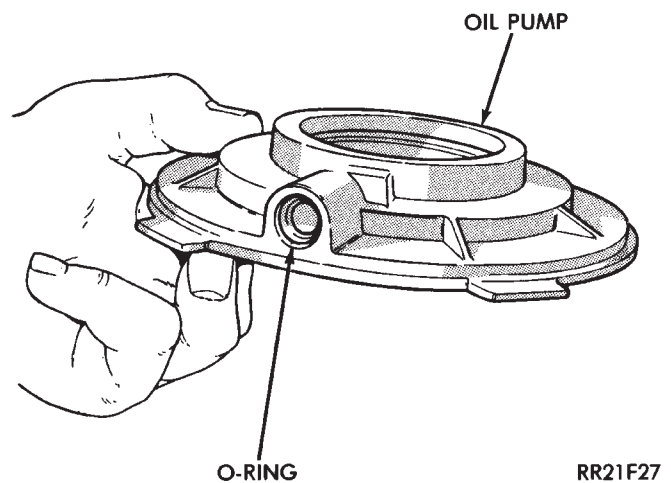


Fig. 7 Pickup Tube O-Ring Location

(17) and (18). However, the pump parts are NOT serviceable separately. If any pump component is worn, or damaged, the pump must be replaced as an assembly.

(17) If oil pump will be disassembled for inspection, mark position of oil pump housings for reference (Fig. 8). Remove screws that attach two halves of the pump. Then remove feed housing from gear housing (Fig. 8).

(18) Mark position of pump gears and remove them from housing (Fig. 8).

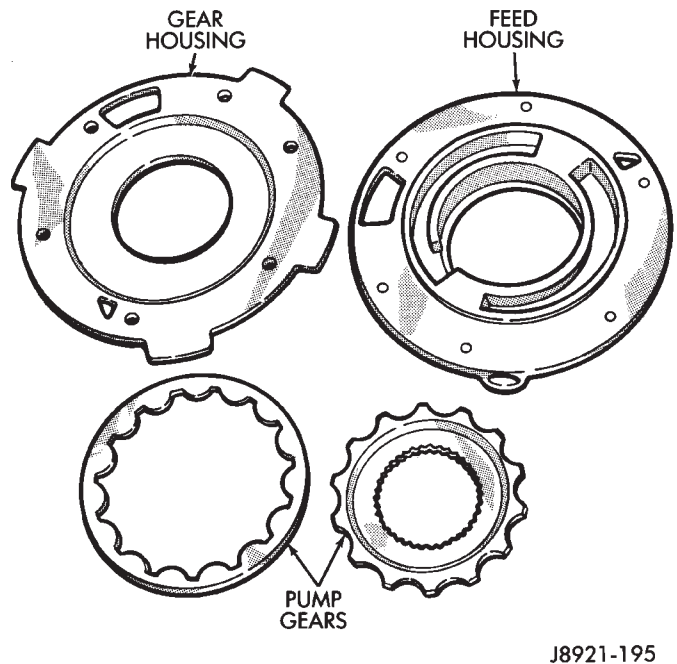
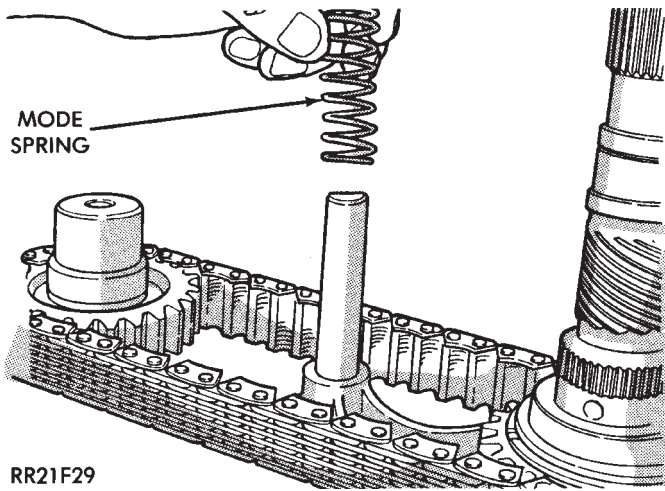


Fig. 8 Oil Pump Components

(19) Remove mode spring (Fig. 9).

(20) Tap front output shaft upward with a rawhide mallet to free it from shaft bearing.

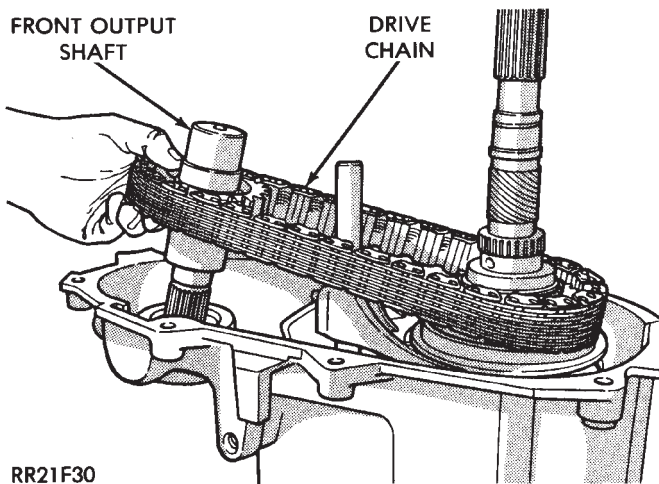
(21) Remove front output shaft and drive chain as assembly (Fig. 10).



MODE SPRING

RR21F29

Fig. 9 Mode Spring Removal



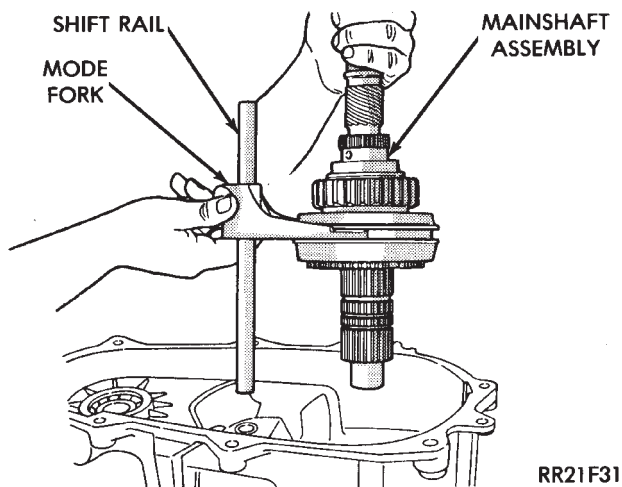
FRONT OUTPUT SHAFT

DRIVE CHAIN

RR21F30

Fig. 10 Front Output Shaft And Drive Chain Removal

(22) Remove mainshaft, mode fork and shift rail as assembly (Fig. 11).



SHIFT RAIL

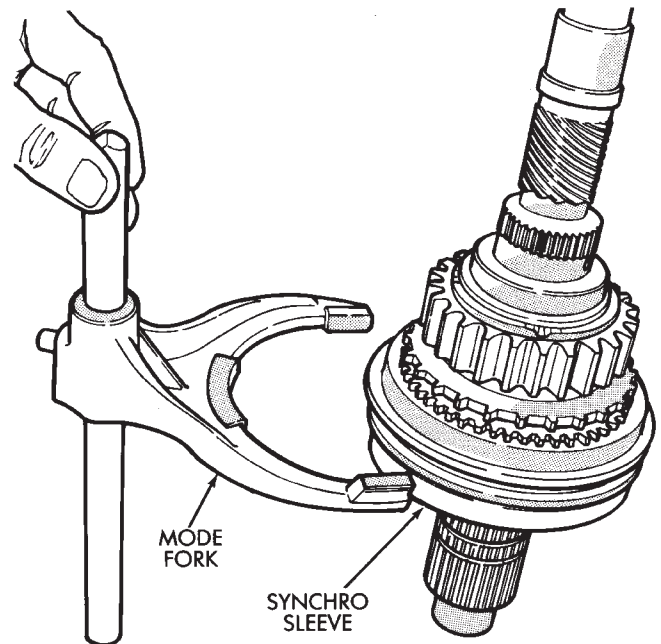
MODE FORK

MAINSHAFT ASSEMBLY

RR21F31

Fig. 11 Removing Mainshaft, Mode Fork And Shift Rail

(23) Remove mode fork and shift rail from synchro sleeve (Fig. 12).



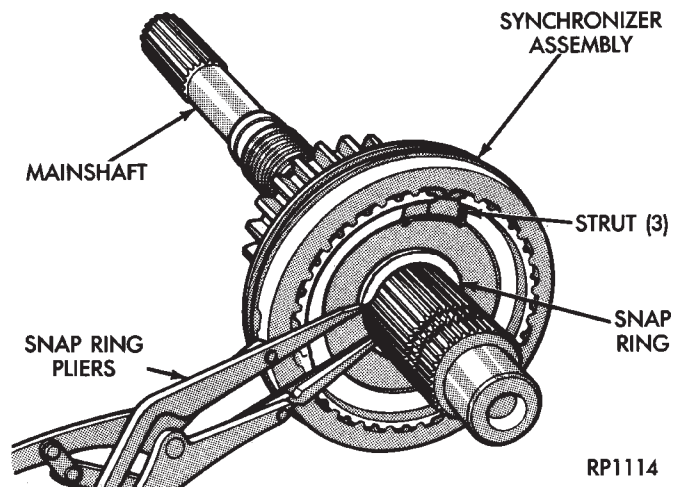
MODE FORK

SYNCHRO SLEEVE

J8921-199

Fig. 12 Removing Mode Fork From Sleeve

(24) Remove synchro hub snap ring (Fig. 13).



MAINSHAFT

SYNCHRONIZER ASSEMBLY

STRUT (3)

SNAP RING

SNAP RING PLIERS

RP1114

Fig. 13 Synchro Hub Snap Ring Removal/Installation

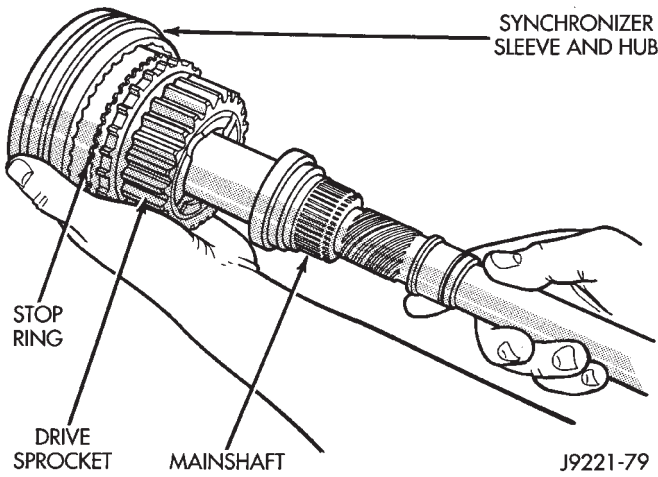


Fig. 14 Removing Synchro Sleeve, Hub And Struts

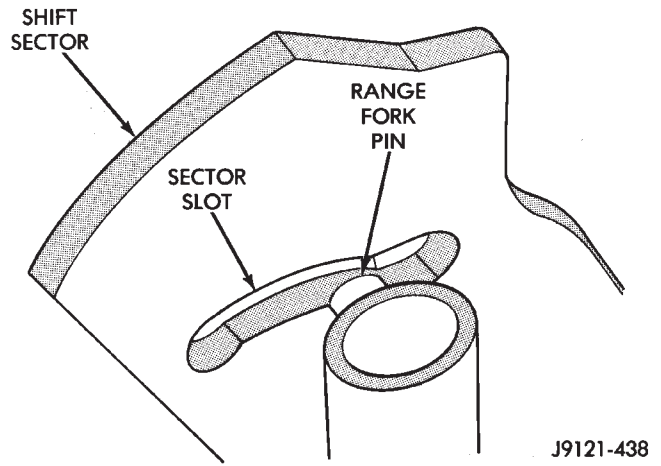


Fig. 17 Disengaging Range Fork

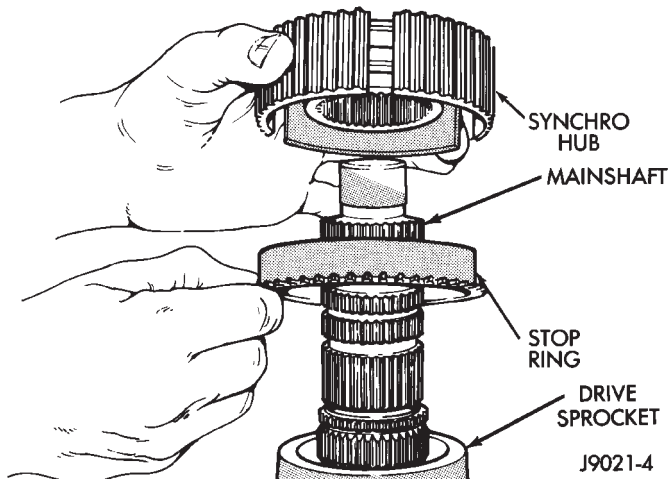


Fig. 15 Removing Synchro Hub And Stop Ring

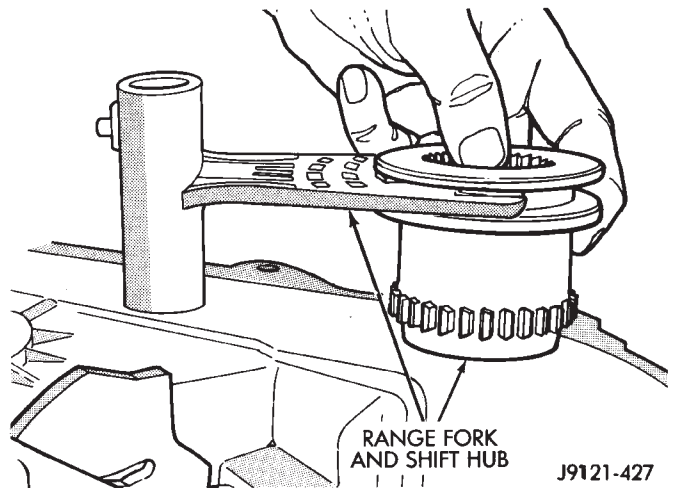


Fig. 18 Range Fork And Hub Removal/Installation

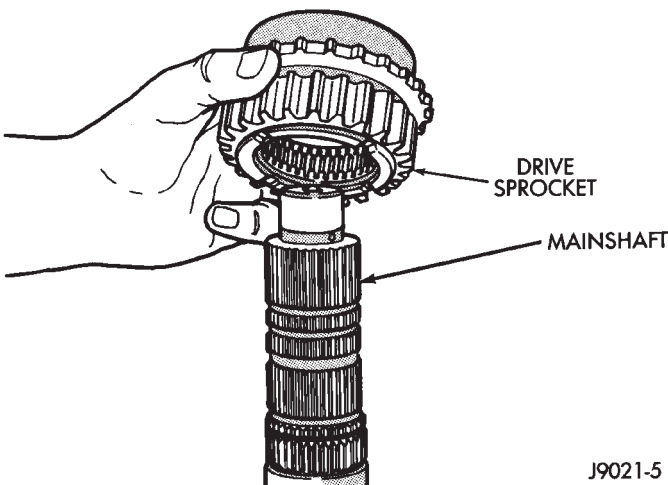


Fig. 16 Drive Sprocket Removal/Installation

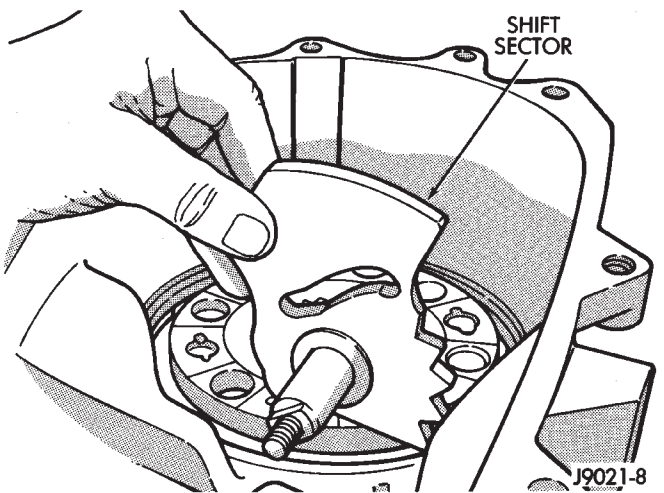


Fig. 19 Shift Sector Removal/Installation

- (25) Remove synchro sleeve, hub and struts (Fig. 14).
- (26) Remove synchro hub and stop ring (Fig. 15).
- (27) Remove drive sprocket (Fig. 16).
- (28) Slide range fork pin out of shift sector (Fig. 17).
- (29) Remove range fork and shift hub (Fig. 18).

- (30) Remove range lever from sector shaft.
- (31) Remove shift sector (Fig. 19).

(32) Remove sector shaft bushing and O-ring (Fig. 20).

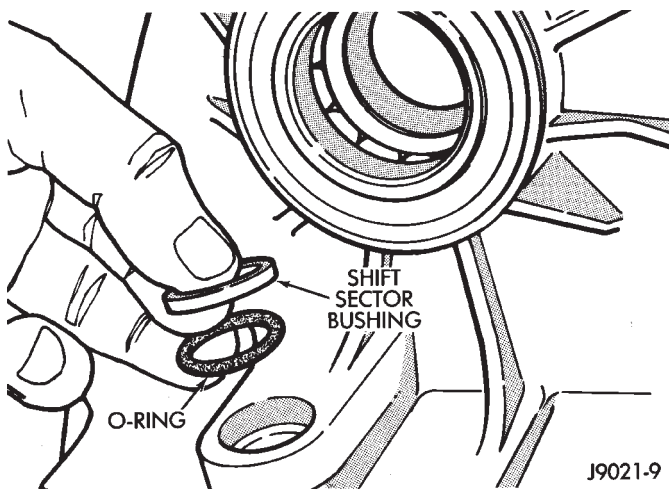


Fig. 20 Removing/Installing Sector Shaft Bushing And O-Ring

(33) Remove shift detent plunger, spring and plug (Fig. 21). Remove O-ring from plug after removal.

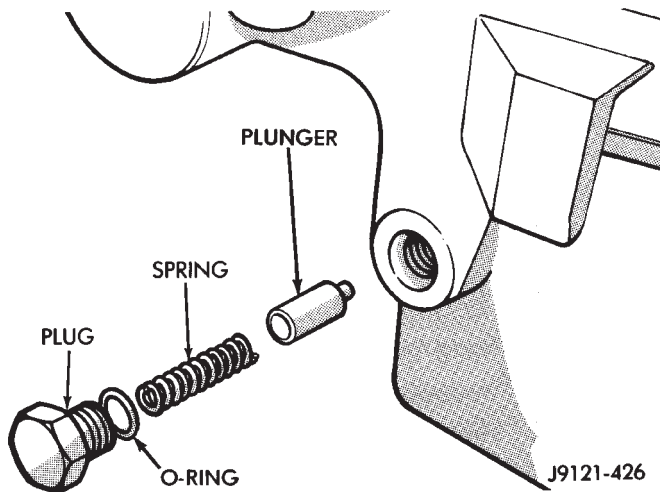


Fig. 21 Detent Component Removal

(34) Turn front case over and remove front bearing retainer bolts (Fig. 22).

(35) Remove front bearing retainer. Position screwdrivers in retainer slots and lift upward to loosen and remove retainer (Fig. 23).

(36) Remove input gear snap ring (Fig. 24).

(37) Press input and low range gear assembly out of input gear bearing with shop press (Fig. 25).

(38) Remove low range gear snap ring (Fig. 26).

(39) Remove retainer, thrust washers and input gear from low range gear (Fig. 27).

(40) Remove oil seals from rear retainer, rear extension housing, oil pump feed housing and case halves.

(41) Remove magnet from front case.

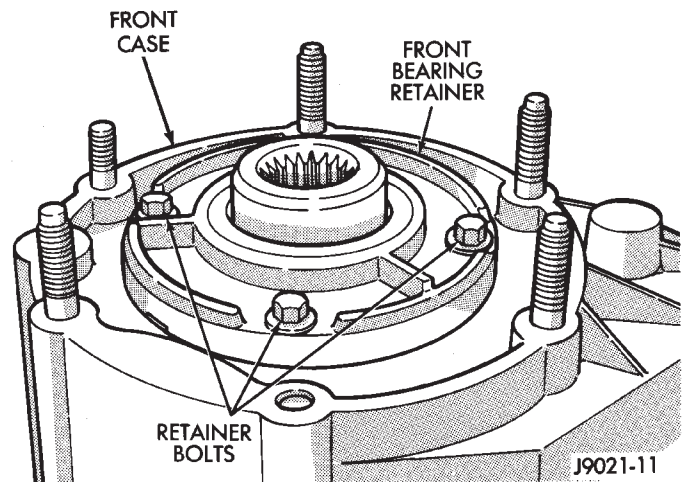


Fig. 22 Front Bearing Retainer Bolt Locations

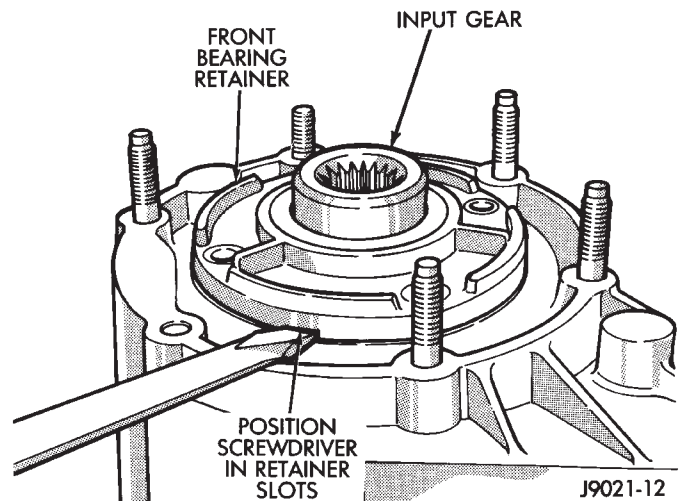


Fig. 23 Removing Front Bearing Retainer

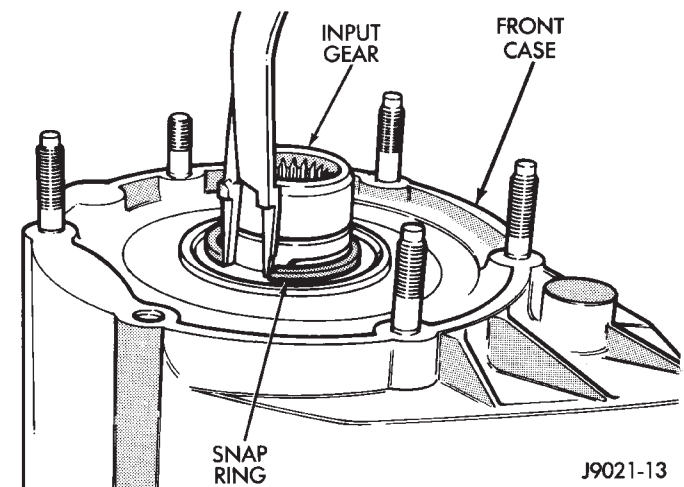


Fig. 24 Removing Input Gear Snap Ring

(42) Remove the speedometer driven gear, seals and adapter.

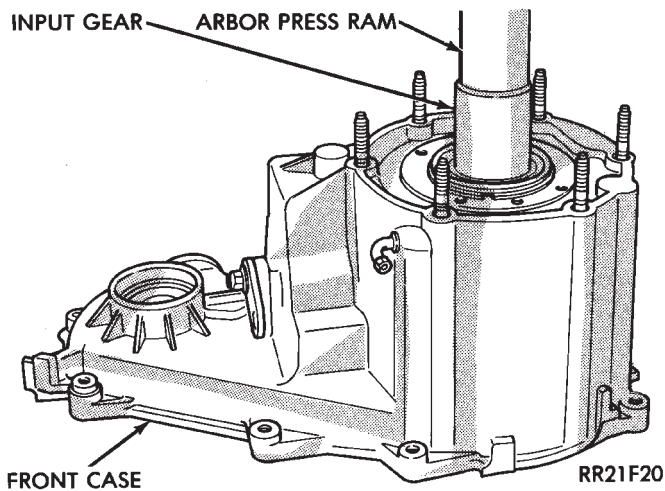


Fig. 25 Removing Input And Low Range Gear Assembly

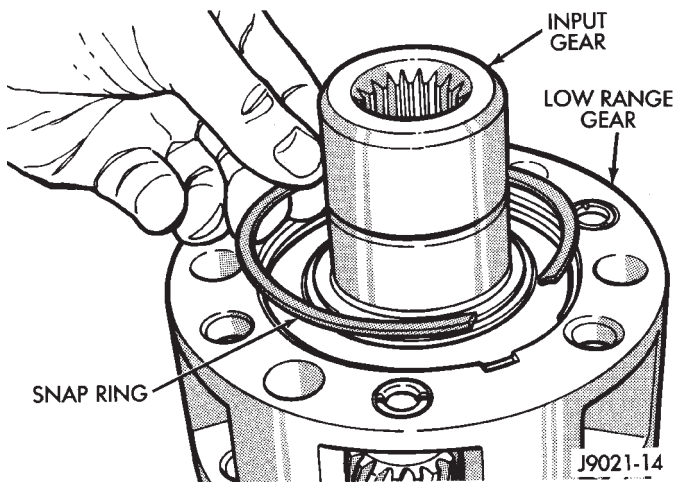


Fig. 26 Removing Low Range Gear Snap Ring

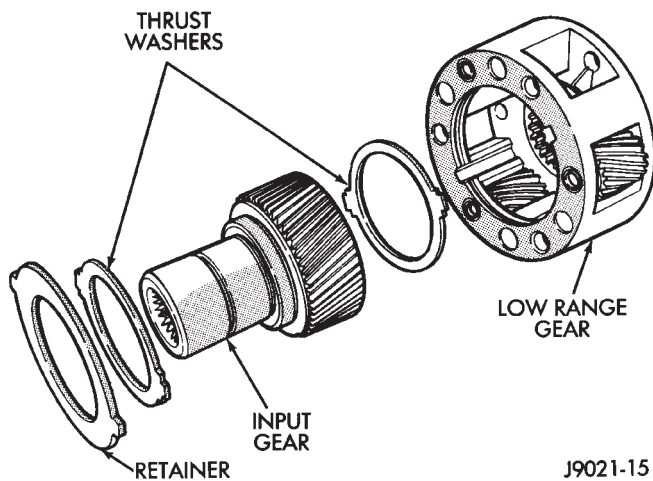


Fig. 27 Input And Low Range Gear Components

CLEANING AND INSPECTION

Clean the transfer case components thoroughly with solvent. Remove all traces of sealer from the case and retainer seal surfaces.

Clean the oil pickup screen with solvent and dry it with compressed air. Also use compressed air to remove solvent residue from all oil feed passages and channels.

Inspect the low range annulus gear (Fig. 28). **If the gear is damaged, replace the gear and front case as an assembly. Do not attempt to remove the gear.**

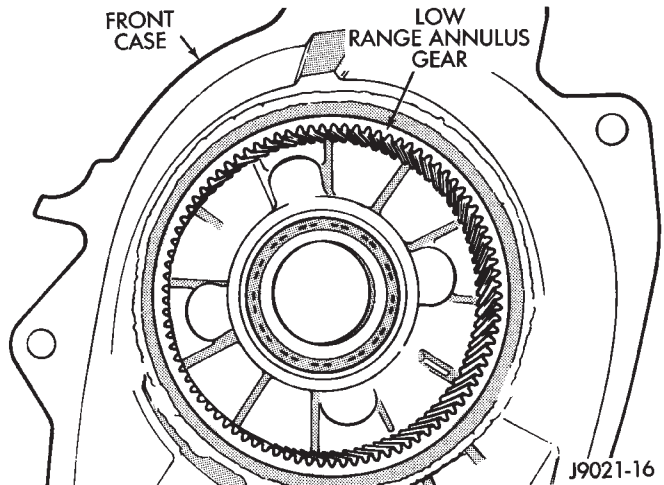


Fig. 28 Low Range Annulus Gear Location

Inspect the case halves, extension housing and retainers for cracks, porosity, or damaged sealing surfaces. Inspect the shafts, gears, chain and shift components for wear or damage. Replace the oil pump as an assembly if any pump part is worn or damaged.

Inspect all of the transfer case bearings for wear, roughness, pitting, or galling. Replace worn or damaged bearings as outlined in the assembly section.

TRANSFER CASE ASSEMBLY

CAUTION: The bearing bores in various transfer case components contain oil feed holes. Be sure replacement bearings do not block these feed holes.

(1) Lubricate components with automatic transmission fluid (or petroleum jelly where indicated) during assembly.

(2) Remove front output shaft seal from front case.

(3) Remove front output shaft bearing snap ring (Fig. 29).

(4) Tap old front output shaft bearing out of front case with plastic mallet. Install new bearing with Tool Handle C-4171 and Installer Tool 5064 (Fig. 30).

(5) Secure front output shaft bearing in front case with new snap ring (Fig. 29).

(6) Install new front output shaft seal in front case.

(7) Press input gear bearing from the front case with Tool Handle C-4171 and Installer Tool C-4210 (Fig. 31). Then turn front case over.

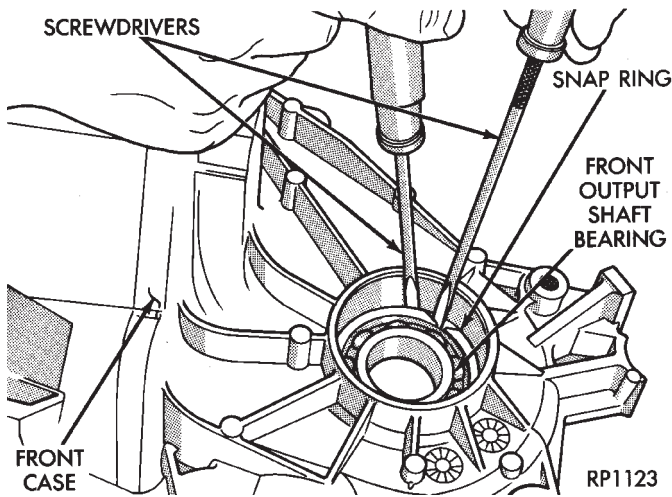


Fig. 29 Removing/Installing Front Output Shaft Bearing Snap Ring

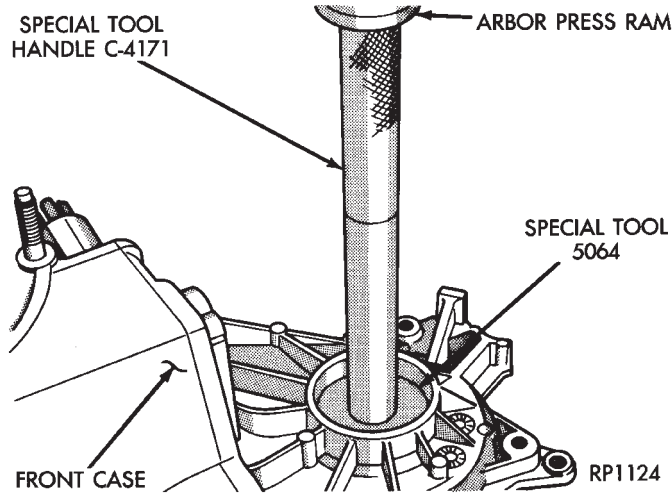


Fig. 30 Installing Output Shaft Front Bearing

(8) Install snap ring on new input gear bearing and start bearing in case.

(9) Carefully press input gear bearing into case until bearing snap ring seats against case (Fig. 32).

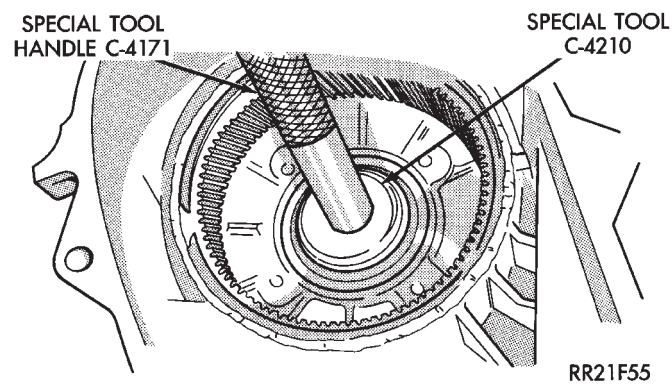


Fig. 31 Removing Input Gear Bearing

(10) Remove mainshaft pilot bearing from input gear with Tool MD-998346 and two suitable size open end wrenches (Fig. 33).

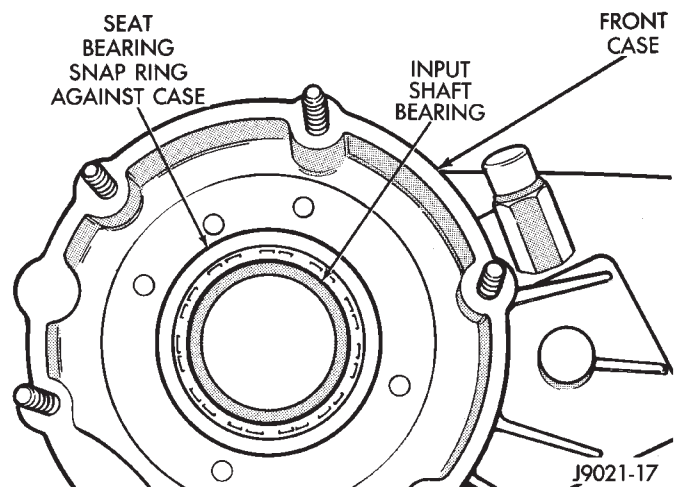


Fig. 32 Input Gear Bearing Installation

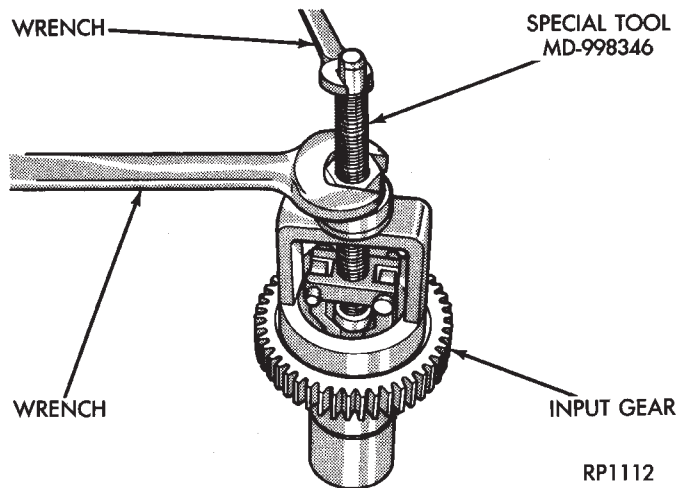


Fig. 33 Removing Mainshaft Pilot Bearing From Input Gear

(11) Install new pilot bearing in input gear with shop press, Tool Handle C-4171 and Installer 5065 (Fig. 34).

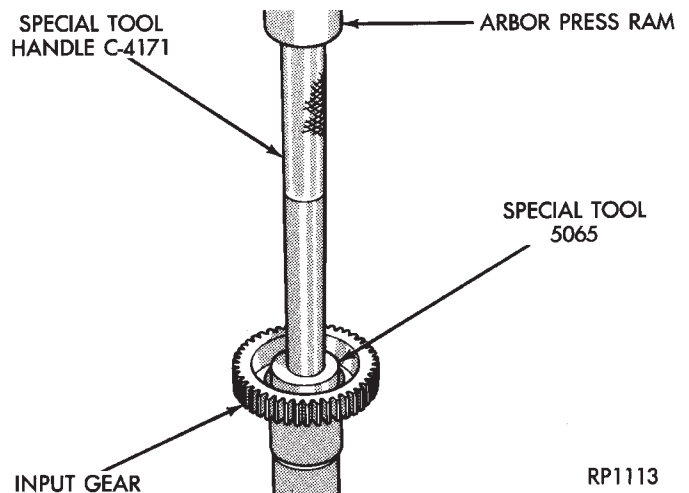


Fig. 34 Installing Mainshaft Pilot Bearing In Input Gear

(12) Assemble low range gear, input gear thrust washers, input gear and input gear retainer (Fig. 35).

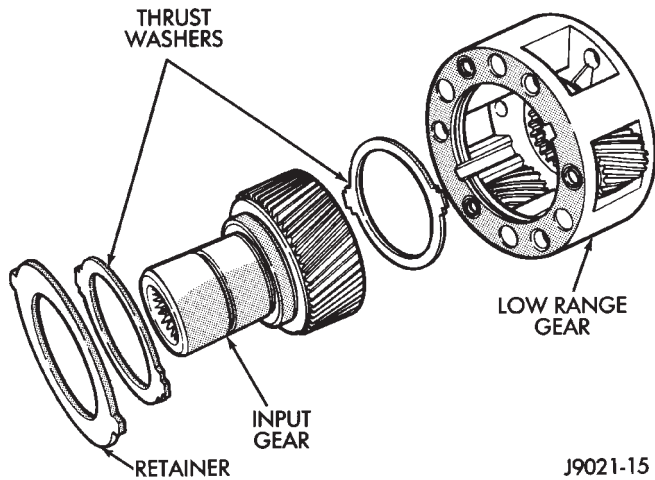


Fig. 35 Input And Low Range Gear Assembly

- (13) Install input gear snap ring (Fig. 36).
- (14) Lubricate input gear with automatic transmission fluid.
- (15) Start input gear in front bearing.
- (16) Press input gear into front bearing (Fig. 36).

CAUTION: Use a proper size tool to press the input gear into the front bearing. An incorrect tool could push the input gear pilot bearing too far into the gear bore (Fig. 45). Also, do not press against the end surfaces of the low range gear. The gear case and thrust washers could be damaged.

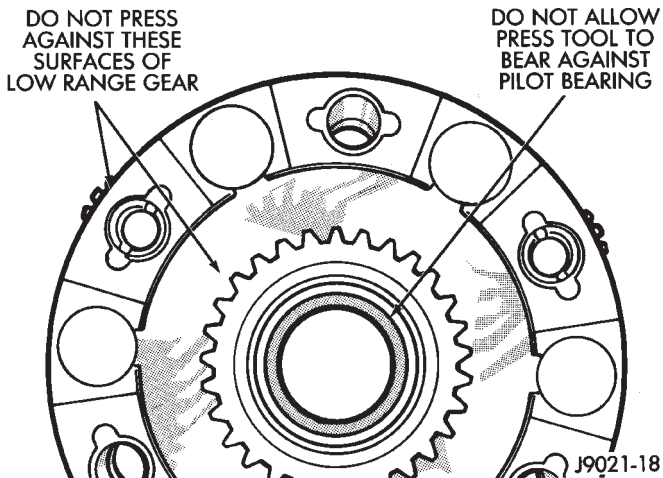


Fig. 36 Input And Low Range Gear Installation

- (17) Install input gear snap ring (Fig. 37).
- (18) Install new oil seal in front bearing retainer.
- (19) Apply 3 mm (1/8 in.) wide bead of Mopar Gasket Maker, silicone adhesive/sealer, or Loctite 518 to front bearing retainer seal surface (Fig. 38).
- (20) Install front bearing retainer on front case (Fig. 22). Tighten retainer bolts to 21 N·m (16 ft. lbs.) torque.
- (21) Install new sector shaft O-ring and bushing (Fig. 39).

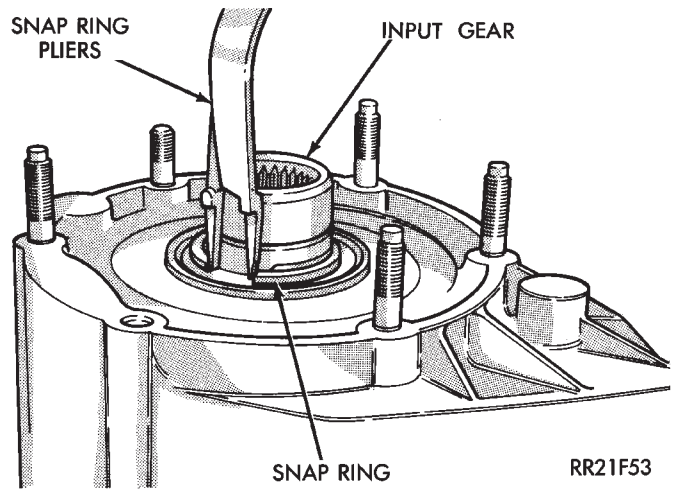


Fig. 37 Installing Input Gear Snap Ring

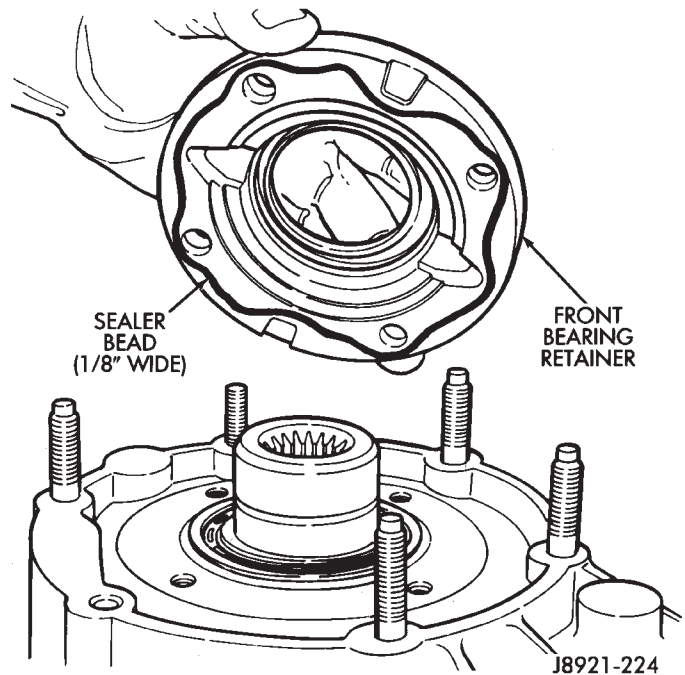


Fig. 38 Applying Sealer To Front Bearing Retainer

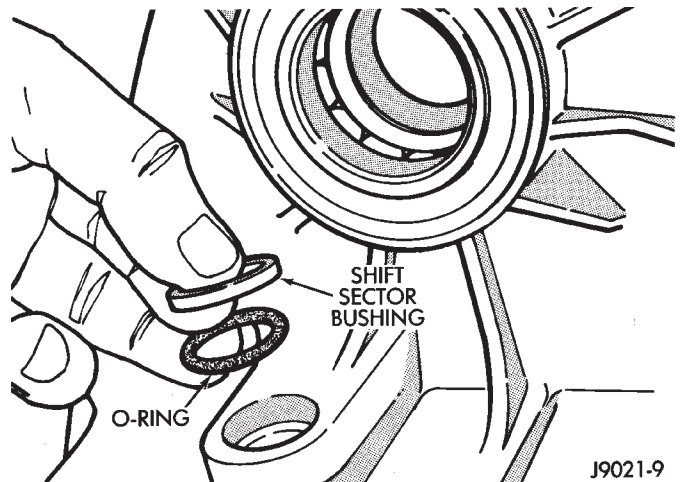


Fig. 39 Installing Sector O-Ring And Bushing

(22) Install shift sector in the case (Fig. 40).

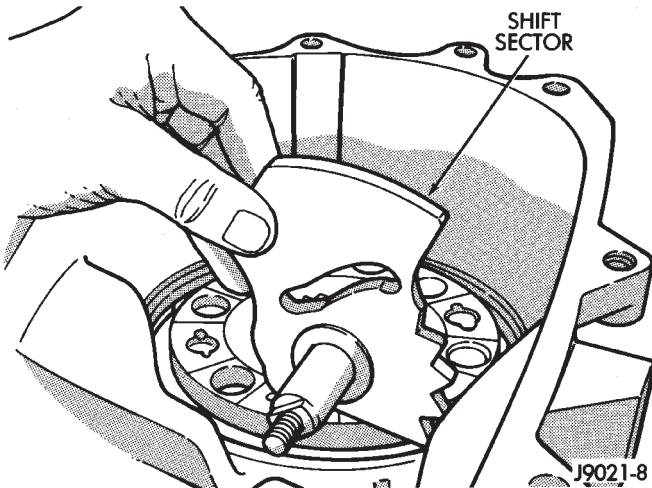


Fig. 40 Installing Shift Sector

(23) Install range lever and lever attaching nut on shift sector. Tighten attaching nut to 30 N·m (22 ft. lbs.) torque.

(24) Install detent plunger, spring and plug (Fig. 41). Tighten plug to 20 N·m (15 ft. lbs.) torque.

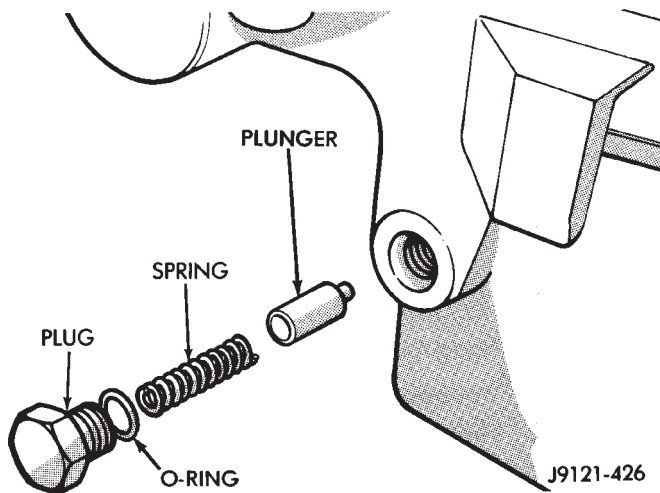


Fig. 41 Installing Detent Plunger, Spring And Plug

(25) Inspect range fork pads (Fig. 42). Be sure pads are secure and in position.

(26) Assemble range fork and shift hub (Fig. 43).

(27) Engage range fork pin in sector slot (Fig. 44).

(28) If drive sprocket bearings are to be replaced, remove and install them as follows:

(a) Press both bearings out of sprocket simultaneously with Remover Tool C-4667, or 5066 and Tool Handle C-4171 (Fig. 45).

(b) Before installing new bearings, refer to Figure 46 and note correct bearing position in sprocket. Bearings must be also be installed in proper sequence. Install front bearing first and rear bearing last.

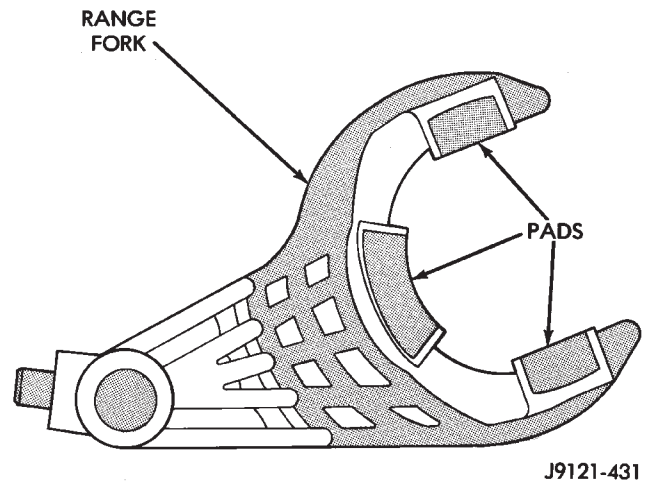


Fig. 42 Range Fork Pads

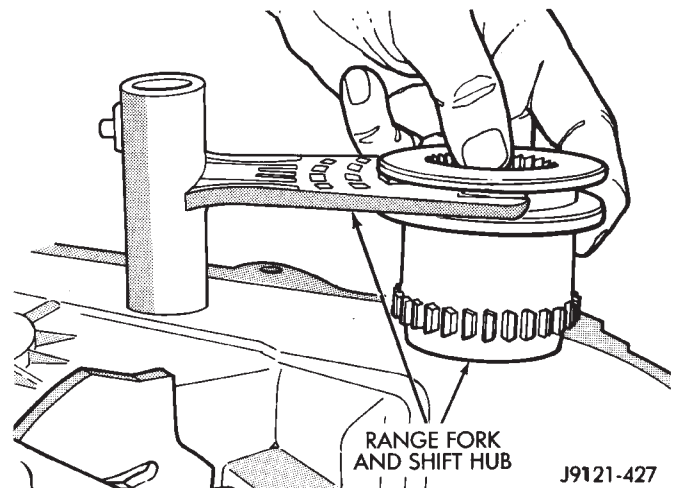


Fig. 43 Assembling Range Fork And Shift Hub

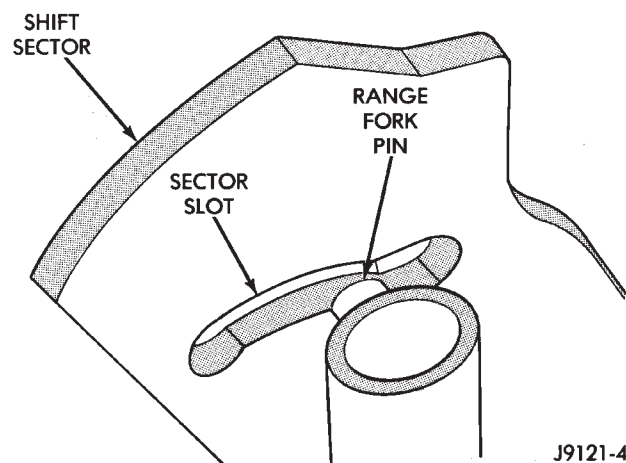


Fig. 44 Seating Range Fork In Sector

CAUTION: Do not press the bearings any farther into the sprocket than indicated in Figure 46. The bearings could block the mainshaft oil feed hole if pressed too deeply into the sprocket.

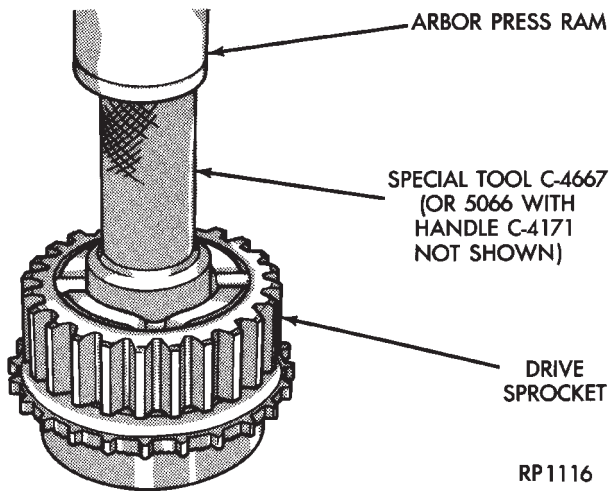


Fig. 45 Removing Drive Sprocket Bearings

(c) Install new **front** bearing first. Press bearing flush with edge of sprocket bore (Fig. 47).

(d) Install new **rear** bearing (Fig. 48). Press bearing in until 4.6 mm (3/16 in.) below edge of bore as shown in Figure 46.

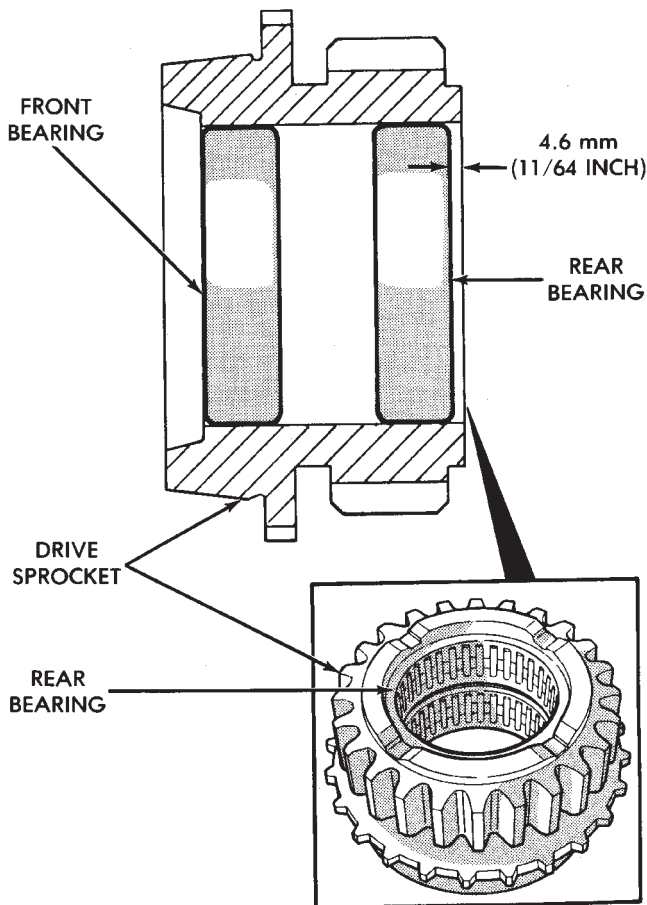


Fig. 46 Correct Position Of Bearings In Sprocket

(29) Install spring and three struts in synchro hub (Fig. 49).

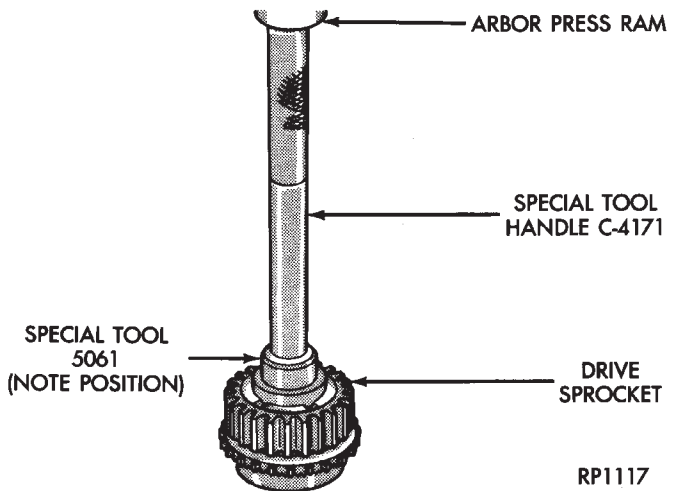


Fig. 47 Installing Drive Sprocket Front Bearing

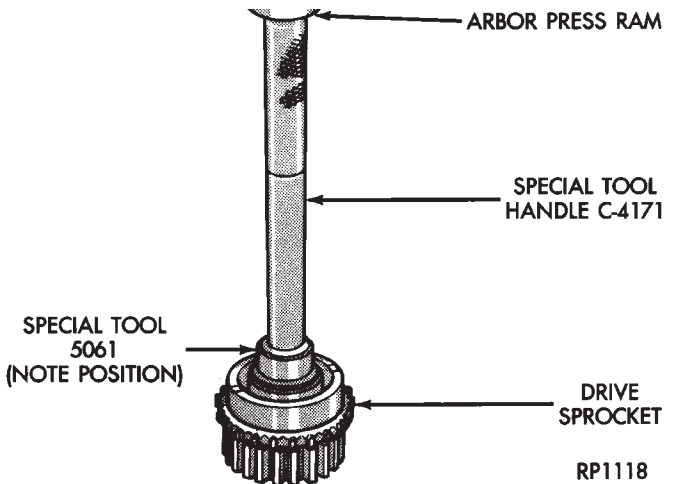


Fig. 48 Installing Drive Sprocket Rear Bearing

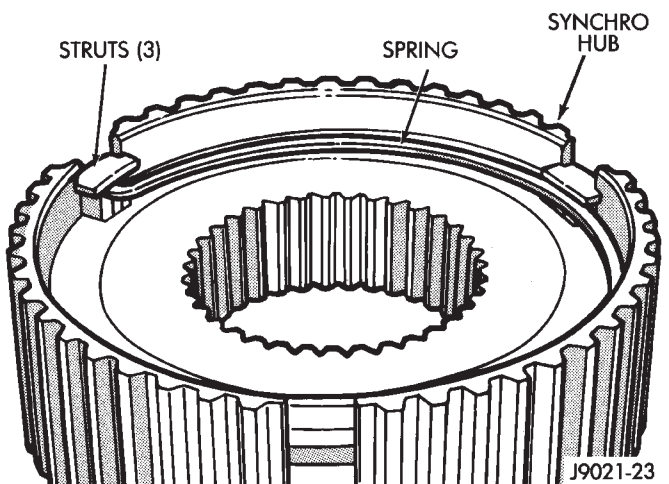


Fig. 49 Installing Synchro Hub Spring And Struts

(30) Lubricate drive sprocket bearings, stop ring and synchro hub with automatic transmission fluid.

(31) Install sprocket, stop ring and synchro hub on mainshaft (Fig. 50). **Be sure to seat hub struts on stop ring lugs.**

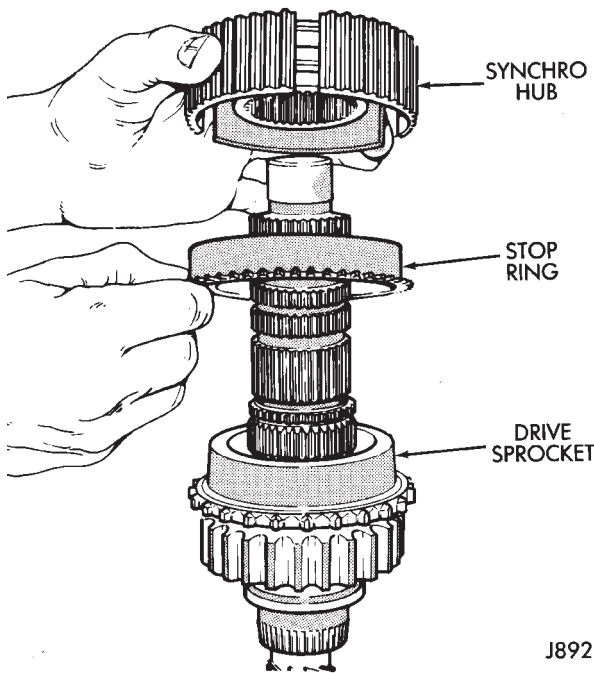


Fig. 50 Drive Sprocket, Stop Ring And Synchro Hub Installation

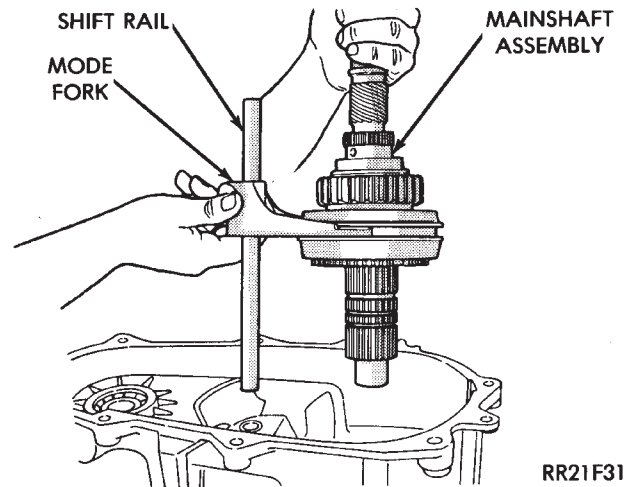


Fig. 52 Installing Mainshaft And Mode Fork Assembly

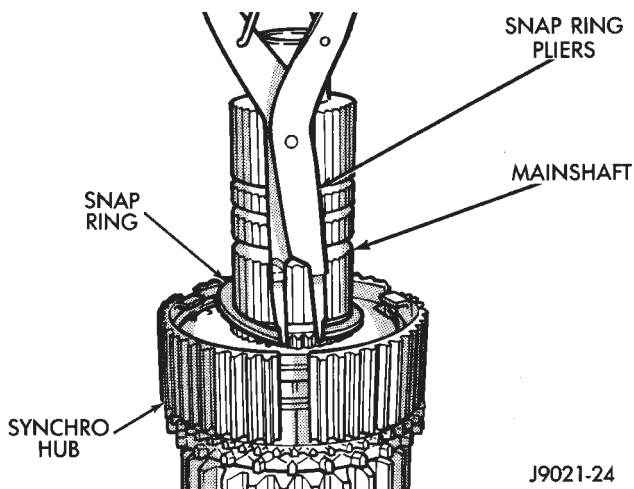


Fig. 51 Installing Synchro Hub Snap Ring

- (32) Install new synchro hub snap ring (Fig. 51).
- (33) Install sleeve on synchro hub. Be sure sleeve is installed with beveled spline ends facing stop ring.
- (34) Install new pads on mode fork and install shift rail in fork.
- (35) Engage mode fork in synchro sleeve (Fig. 52).
- (36) Install mode fork-mainshaft assembly in case (Fig. 52). Be sure the mode fork rail is seated in both range fork bushings.
- (37) Assemble and install output shaft and drive chain (Fig. 53). Lift mainshaft slightly to ease chain and shaft installation.
- (38) Install mode spring on shift rail (Fig. 54).
- (39) If front output shaft rear bearing is to be replaced, install new bearing as follows:

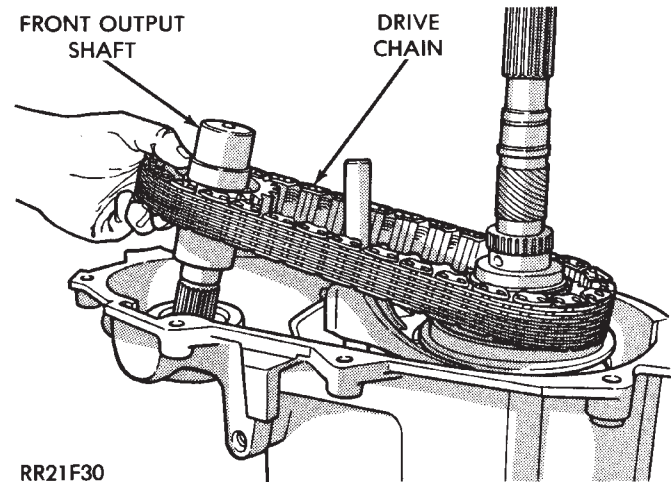


Fig. 53 Drive Chain And Front Output Shaft Installation

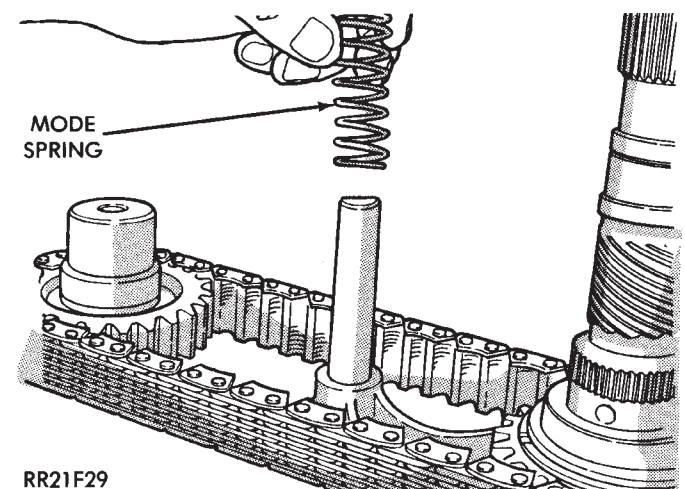


Fig. 54 Installing Mode Spring

- (a) Remove bearing from rear case with Bearing Remover MD-998346 and two suitable size wrenches (Fig. 55).

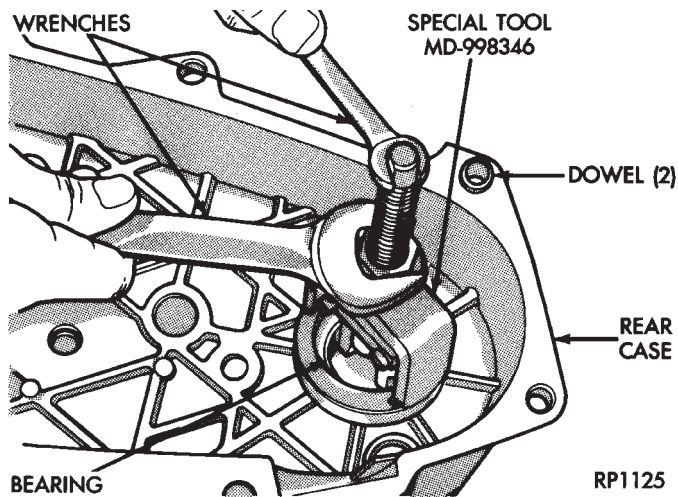


Fig. 55 Removing Front Output Shaft Rear Bearing

(b) Seat new bearing in rear case with Tool Handle C-4171 and Bearing Installer 5063 (Fig. 56).

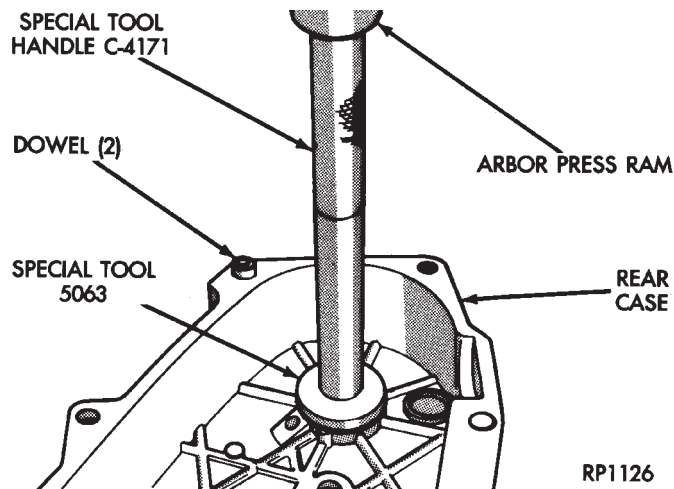


Fig. 56 Installing Front Output Shaft Rear Bearing

(40) Install new seal in oil pump feed housing (Fig. 57).

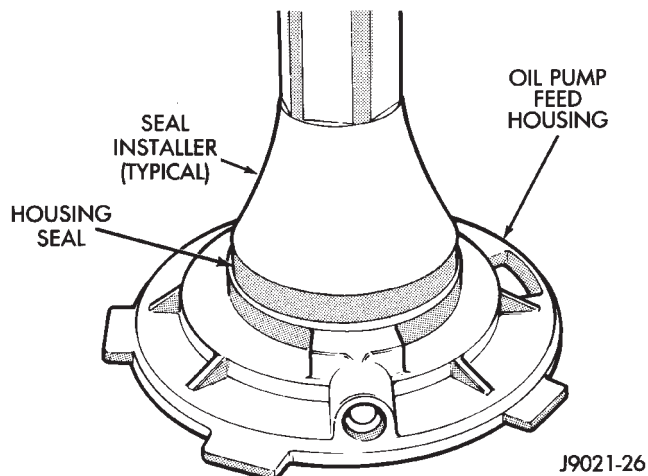


Fig. 57 Installing Oil Pump Feed Housing Seal

(41) If new oil pump is being installed, proceed to step (43). If original pump was only disassembled for cleaning and inspection, proceed to step (42).

(42) Assemble oil pump. Lubricate and install two gears in gear housing. Align and install feed housing on gear housing (Fig. 58). Install and tighten oil pump screws to 2 N·m (14 in. lbs.) torque.

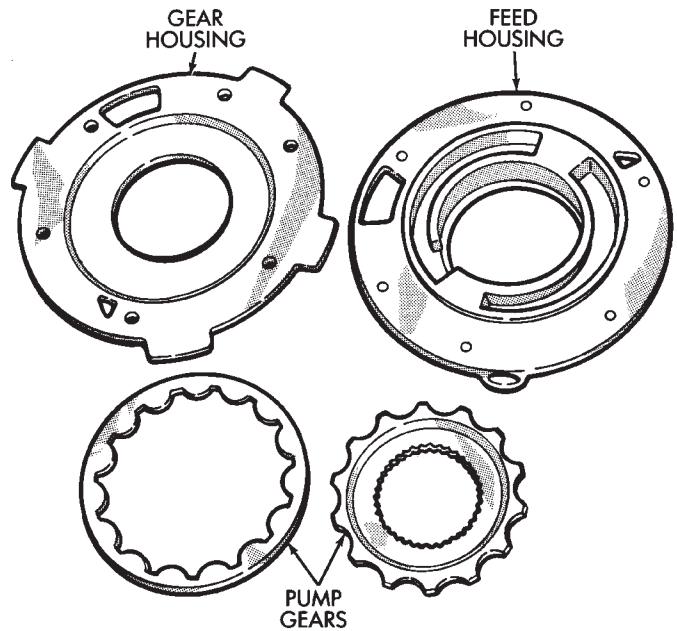


Fig. 58 Oil Pump Components

(43) Install new pickup tube O-ring in oil pump (Fig. 59).

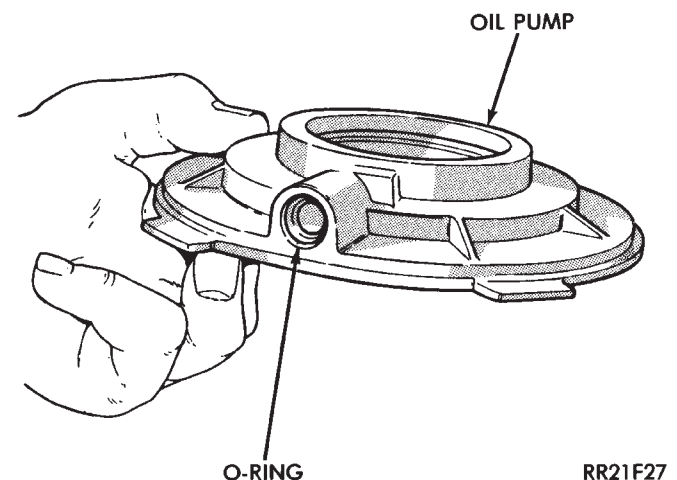


Fig. 59 Pickup Tube O-Ring Installation

(44) Insert oil pickup tube in oil pump. Then attach oil screen and connecting hose to pickup tube (Fig. 60).

(45) Install assembled oil pump, pickup tube and screen in rear case. Be sure screen is seated in case slot as shown (Fig. 60).

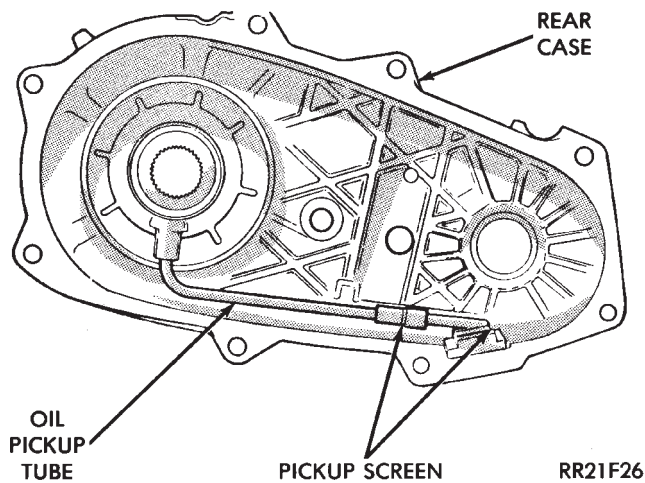


Fig. 60 Pickup Tube, Oil Screen And Pump Installation

(46) Install magnet in front case.

(47) Apply 3 mm (1/8 in.) wide bead of Mopar gasket maker, silicone adhesive sealer, or Loctite 518 to seal surface of front case.

(48) Align and install rear case on front case (Fig. 61). Be sure case locating dowels are in place and that mainshaft splines are engaged in oil pump inner gear.

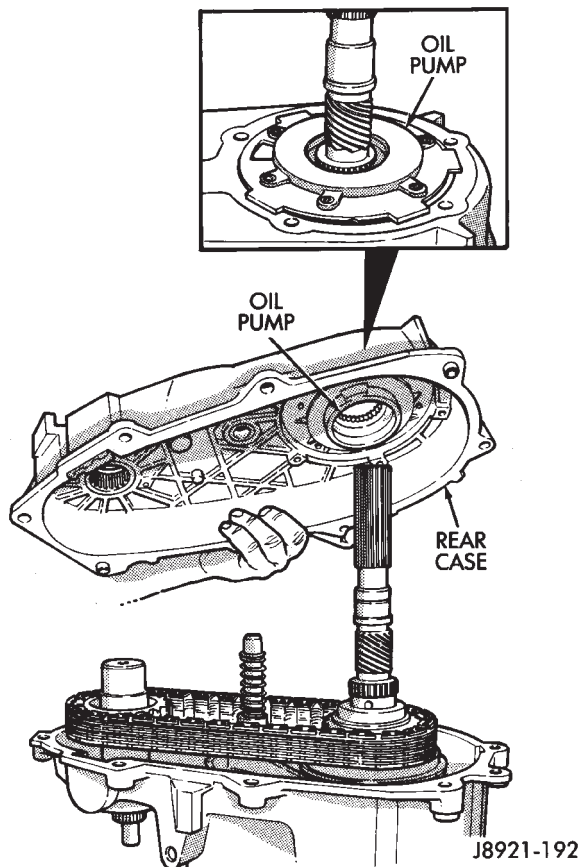


Fig. 61 Installing Rear Case On Front Case

(49) Install and tighten front case-to-rear case attaching bolts to 41 N·m (30 ft. lbs.) torque. **Be sure to install a washer under each bolt used at case dowel locations.**

(50) Install mainshaft rear bearing in rear retainer (Fig. 62). Tap old bearing out of retainer with hammer and brass drift. Then install new bearing with Tool Handle C-4171 and Installer 5064.

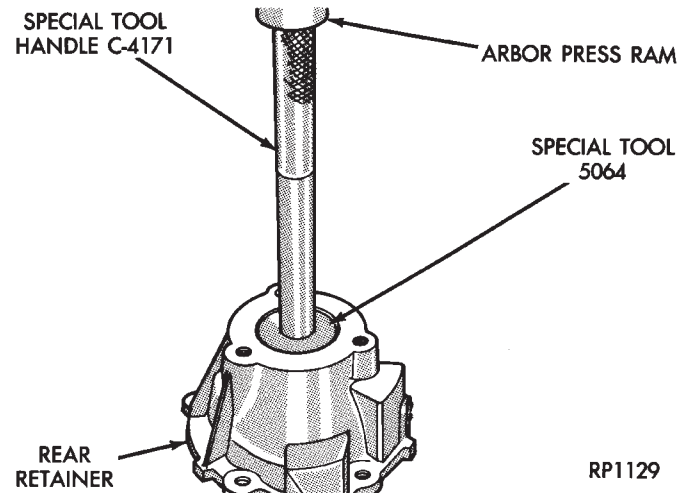


Fig. 62 Installing Mainshaft Rear Bearing In Rear Retainer

(51) Apply 3 mm (1/8 in.) wide bead of Mopar gasket maker, silicone adhesive sealer, or Loctite 518 to flange surface of rear retainer.

(52) Install locating dowel in rear retainer and install retainer on case. Tighten retainer bolts to 24 N·m (18 ft. lbs.) torque.

(53) Install new rear bearing snap ring (Fig. 63). Lift mainshaft slightly to seat snap ring in shaft groove.

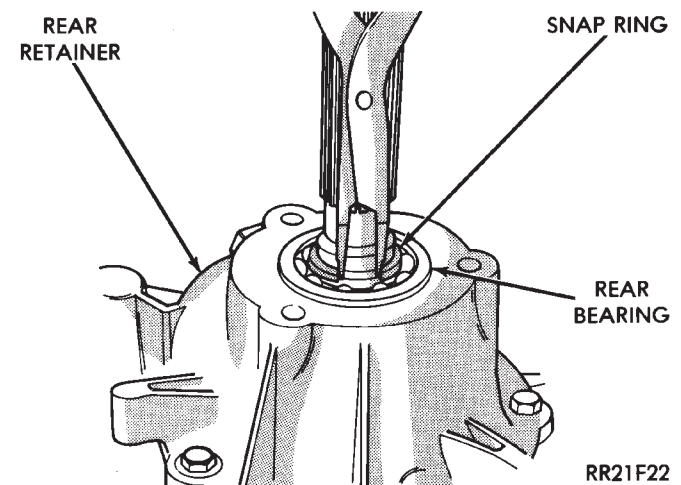


Fig. 63 Installing Rear Bearing Snap Ring

(54) Remove extension housing seal if not removed previously.

(55) Remove extension housing bushing with Bushing Installer Tools C-4171 and C-4338-A (Fig. 64).

(56) Install new extension housing bushing with Installer Tools C-4171 and 5066 (Fig. 65).

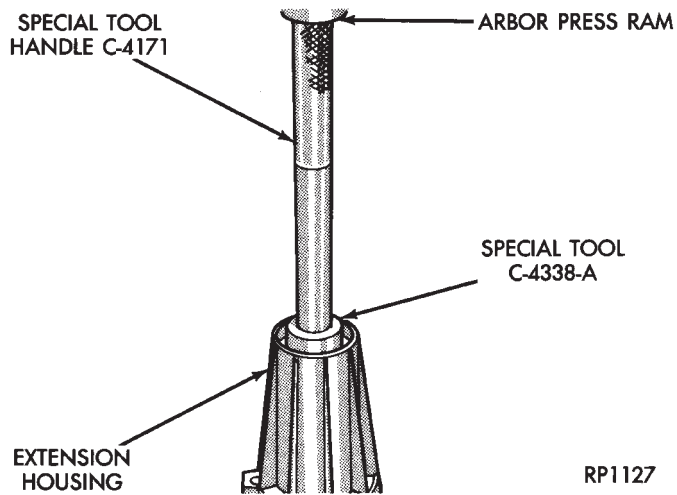


Fig. 64 Removing Extension Housing Bushing

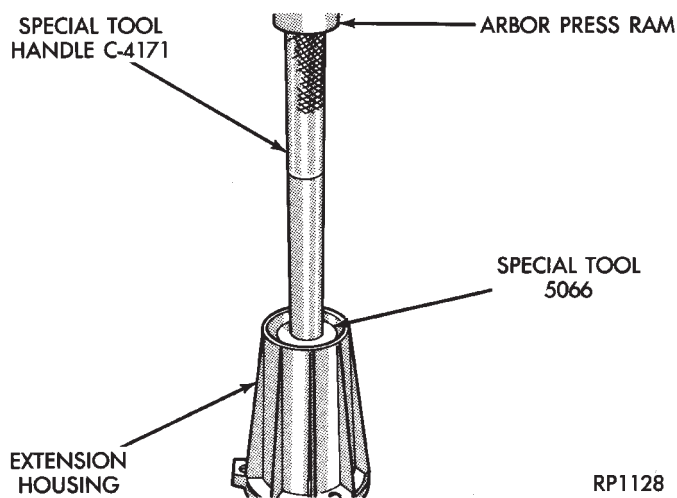


Fig. 65 Installing Extension Housing Bushing

(57) Install new seal in extension housing.

(58) Apply 3 mm (1/8 in.) wide bead of Mopar gasket maker, silicone adhesive sealer, or Loctite 518 to mounting surface of extension housing.

(59) Install extension housing on case and tighten housing bolts to 41 N·m (30 ft. lbs.) torque.

(60) Install front yoke. Secure yoke with replacement seal washer and nut. Tighten nut to 149 N·m (110 ft. lbs.) torque.

(61) Install replacement gasket on vacuum switch and install switch in case.

(62) Install tighten drain plug to 47 N·m (35 ft. lbs.) torque.

(63) Install vacuum switch in case. Tighten switch to 47 N·m (35 ft. lbs.) torque.

(64) Install speedometer pinion and adapter (Fig. 66).

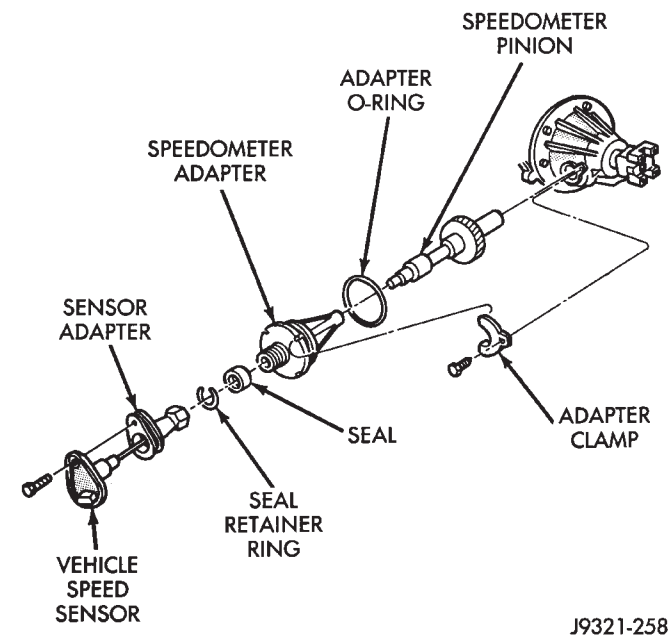
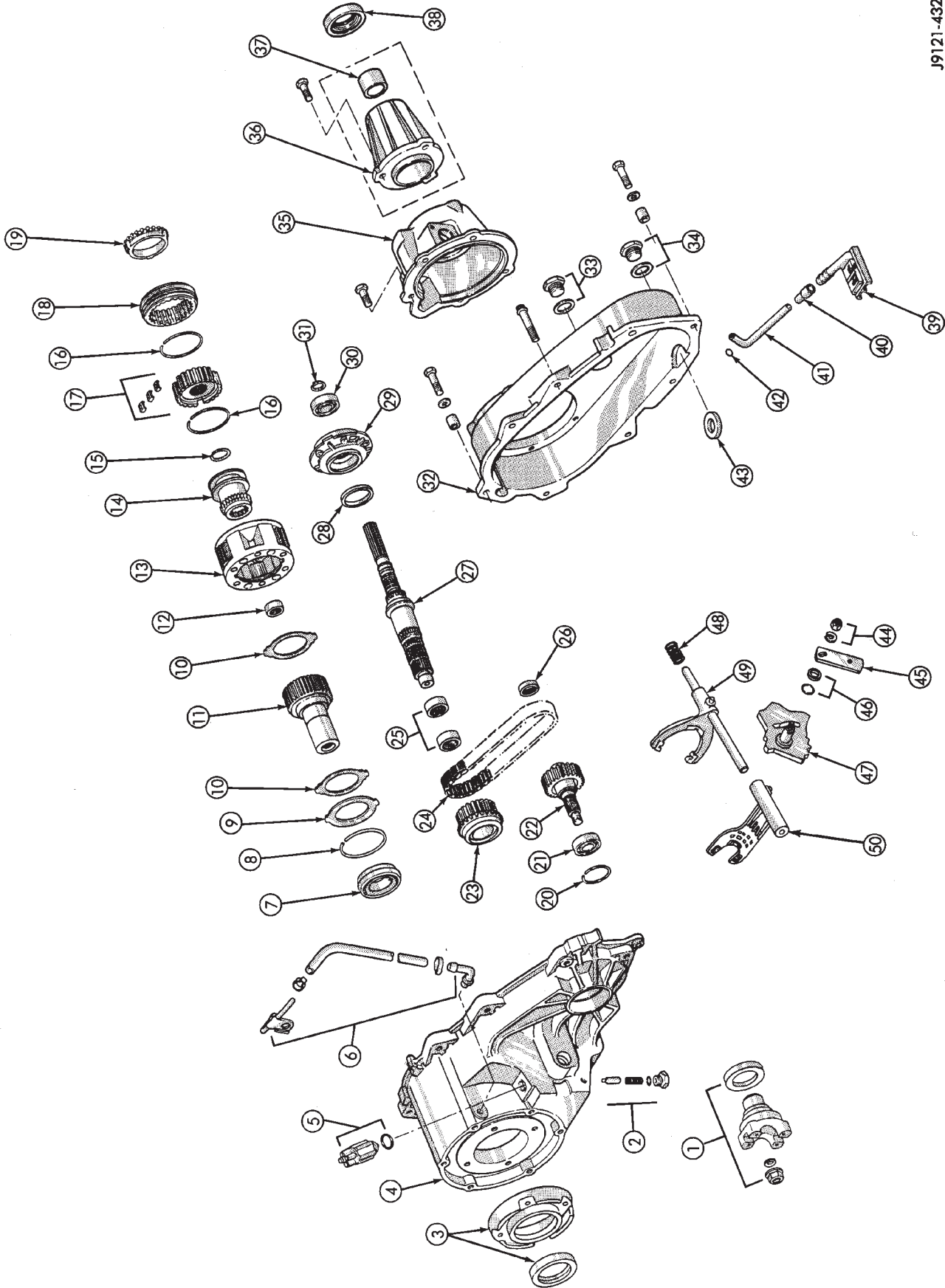


Fig. 66 Speedometer Components (YJ Shown)

(65) Fill transfer case with Mopar ATF Plus or Dexron II automatic transmission fluid after installation.

(66) Install and tighten fill plug to 41 N·m (35 ft. lbs.) torque.

J9121-432



NP231 TRANSFER CASE

LEGEND FOR NP231 TRANSFER CASE

1. Front Yoke, Nut, Seal Washer, and Oil Seal	18. Synchro Sleeve*	35. Rear Retainer
2. Shift Detent Plug, Spring and Pin	19. Stop Ring*	36. Extension Housing
3. Front Retainer and Seal	20. Snap Ring	37. Bushing
4. Front Case	21. Output Shaft Front Bearing	38. Oil Seal
5. Vacuum Switch and Seal	22. Front Output Shaft	39. Oil Pickup Screen
6. Vent Assembly	23. Drive Sprocket	40. Tube Connector
7. Input Gear Bearing and Snap Ring	24. Drive Chain	41. Oil Pickup Tube
8. Low Range Gear Snap Ring	25. Drive Sprocket Bearings	42. Pickup Tube O-Ring
9. Input Gear Retainer	26. Output Shaft Rear Bearing	43. Magnet
10. Low Range Gear Thrust Washers	27. Mainshaft	44. Range Lever Nut and Washer
11. Input Gear	28. Oil Seal	45. Range Lever
12. Input Gear Pilot Bearing	29. Oil Pump Assembly	46. Sector O-Ring and Seal
13. Low Range Gear	30. Mainshaft Rear Bearing	47. Sector
14. Range Fork Shift Hub	31. Snap Ring	48. Mode Spring
15. Synchro Hub Snap Ring*	32. Rear Case	49. Mode Fork
16. Synchro Hub Springs*	33. Fill Plug and Gasket	50. Range Fork
17. Synchro Hub and Struts*	34. Drain Plug and Gasket	

*Synchro equipped models only.

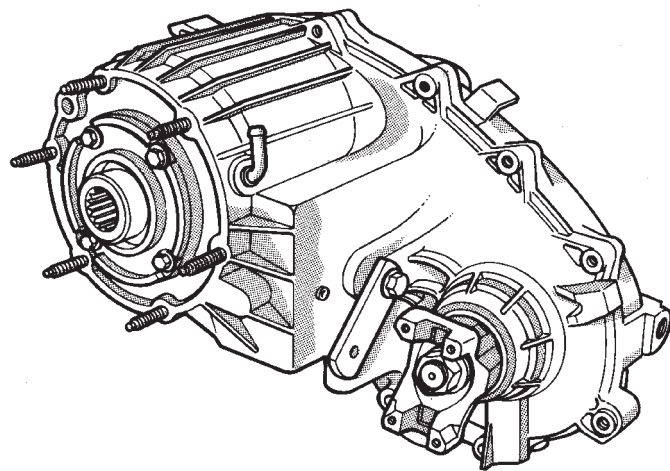
NP242 TRANSFER CASE

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GENERAL INFORMATION

The NP242 is a both a full and part time transfer case with four operating ranges (Fig. 1). The NP242 provides either 2-wheel drive or full time 4-wheel drive operation. An interaxle differential is used to control torque transfer to the front and rear axles. A low range gear reduction system provides increased low speed torque capability.



J8921-243

Fig. 1 NP242 Transfer Case

OPERATING RANGES

The NP242 transfer case operating ranges are: 2-wheel drive, part-time 4-wheel drive, full time 4-wheel drive and 4-wheel drive low.

The 2H and 4 x 4 full time ranges are for all road surfaces. The 2H range provides 2-wheel drive. The 4 x 4 full time range provides differentiated, 4-wheel drive. The vehicle can be operated on any road surface in either of these ranges if desired.

The transfer case differential also has a locking mechanism for undifferentiated operation in: 4 x 4 part time and, 4 x 4 low ranges. These ranges are only for use on low traction surfaces.

The 4 x 4 full time range is fully differentiated and can be used at any time and on any road surface. The 4

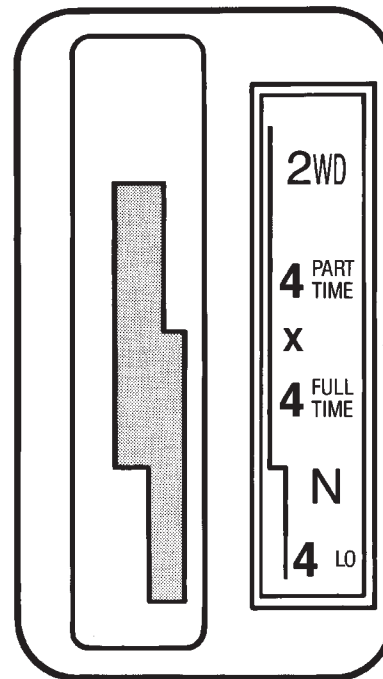
x 4 part time and low ranges are not differentiated. They are for off road use only.

The low range reduction gear system is operative in 4-low range only. Low range reduction ratio is 2.72:1.

In summary, 2H and 4 x 4 full time ranges are for normal on-road, highway operation. The 4 x 4 part-time and low ranges are for off road operation exclusively. Or, or when the vehicle is driven on surfaces covered by snow, ice or similar low traction elements.

SHIFT MECHANISM

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 linkage rod. Range positions are marked on the shifter bezel plate (Fig. 2).



J9021-113

Fig. 2 NP242 Shift Pattern

TRANSFER CASE IDENTIFICATION

A circular I.D. tag is attached to the rear case of each NP242 transfer case (Fig. 3). The 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. For example, a serial number of 10-5-91 would represent October 5, 1991.

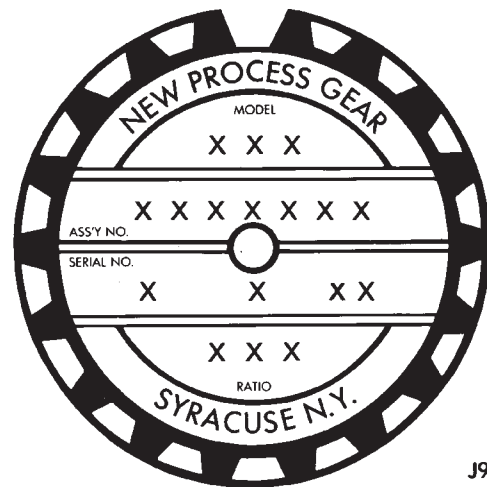
TRANSFER CASE LUBRICANT

Recommended fluid for the NP242 transfer case is Mopar Dexron II, or ATF Plus, Type 7176 automatic transmission fluid.

Lubricant capacity of the Model 242 transfer case is: 1.4 liters (1.48 qts.).

TRANSFER CASE FILL LEVEL

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



J9121-434

Fig. 3 Transfer Case I.D. Tag

NP242 SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
TRANSFER CASE DIFFICULT TO SHIFT OR WILL NOT SHIFT INTO DESIRED RANGE	(1) Transfer case external shift linkage binding. (2) Insufficient or incorrect lubricant. (3) Internal components binding, worn or damaged.	(1) Lubricate, repair or replace linkage, or tighten loose components as necessary. (2) Drain and refill to edge of fill hole with DEXRON II® or MOPAR-MERCON® Automatic Transmission Fluid. (3) Disassemble unit and replace worn or damaged components as necessary.
TRANSFER CASE NOISY IN ALL DRIVE POSITIONS	(1) Insufficient or incorrect lubricant.	(1) Drain and refill to edge of fill hole with DEXRON II® or MOPAR-MERCON® Automatic Transmission Fluid. Check for leaks and repair if necessary Note: If unit is still noisy after drain and refill, disassembly and inspection may be required to locate source of noise.
LUBRICANT LEAKING FROM OUTPUT SHAFT SEALS OR FROM VENT	(1) Transfer case overfilled. (2) Vent closed or restricted. (3) Output shaft seals damaged or installed incorrectly.	(1) Drain to correct level. (2) Clear or replace vent if necessary. (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.
TRANSFER CASE WILL NOT SHIFT THROUGH 4 X 4 PART-TIME RANGE (Light Remains On).	(1) Incomplete shift due to drivetrain torque load. (2) Incorrect tire pressure(s). (3) Excessive tire wear. (4) Excessive vehicle loading.	(1) Driver must momentarily release the accelerator pedal to complete the shift. (2) Inflate all tires equally to correct pressure. (3) Switch tires — Install the two tires with the most wear (one on the front axle and one on the rear axle). (4) Check vehicle loading — Do not exceed the vehicle's GVW.

SHIFT LINKAGE ADJUSTMENT

- (1) Remove shift lever bezel.
- (2) Move shift lever into 4L position.
- (3) Insert 3 mm (1/8 in.) spacer between shift lever and forward edge of shift lever gate (Fig. 4). Secure lever and spacer in place with tape or wire.

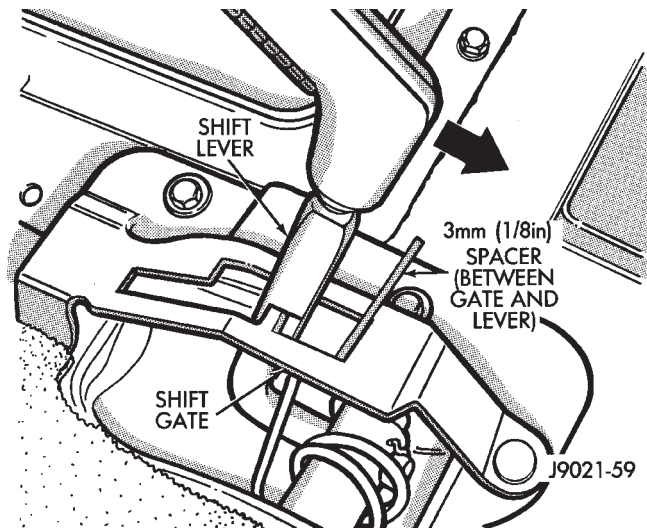


Fig. 4 Installing Shift Lever Spacer

- (4) Raise vehicle.
- (5) Loosen trunnion lock bolt (Fig. 5). Linkage rod should now slide freely in trunnion.
- (6) Verify that transfer case range lever is in 4L position.
- (7) Position linkage rod so it is free fit in range lever (Fig. 5). Then tighten trunnion lock bolt.
- (8) Lower vehicle.
- (9) Remove shift lever spacer and install bezel.

SPEEDOMETER SERVICE

Speedometer service is covered in the automatic transmission sections within this group.

TRANSFER CASE REMOVAL

- (1) Shift transfer case into Neutral.
- (2) Raise vehicle.
- (3) Drain transfer case lubricant.
- (4) Mark front and rear propeller shaft yokes for alignment reference.
- (5) Place support stand under transmission.
- (6) Remove rear crossmember.
- (7) Disconnect front/rear propeller shafts at transfer case.
- (8) Disconnect vehicle speed sensor wires and remove sensor and adapter assembly if necessary.
- (9) Disconnect transfer case shift rod from range lever.
- (10) Disconnect transfer case vent hoses and electrical switch connector.
- (11) Support transfer case with transmission jack.
- (12) Remove bolts attaching the transfer case to transmission.
- (13) Secure transfer case to jack with chains.

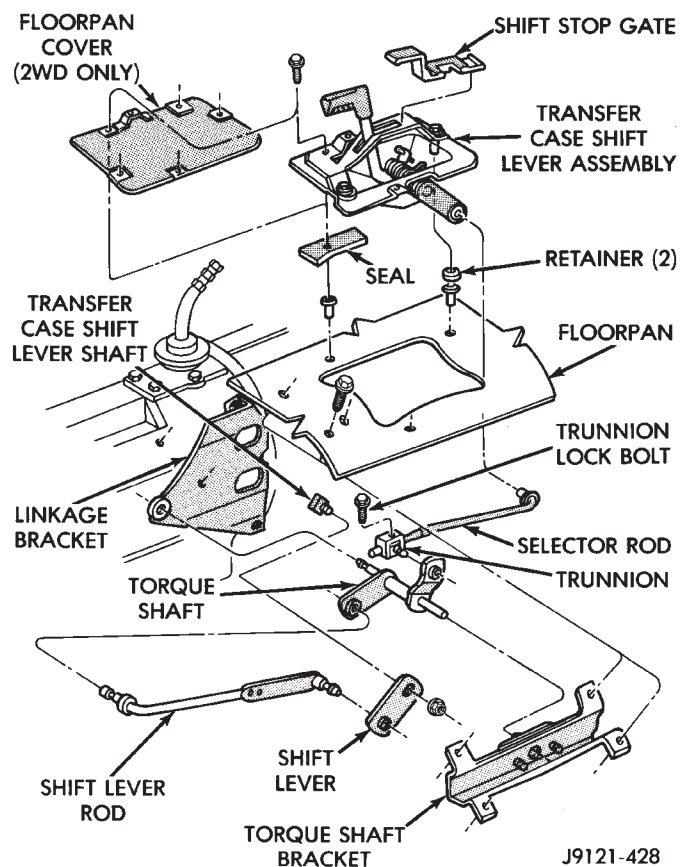


Fig. 5 Transfer Case Shift Linkage

- (14) Pull transfer case and jack rearward to disengage transfer case.
- (15) Remove transfer case from under vehicle.

TRANSFER CASE INSTALLATION

- (1) Mount transfer case on transmission jack. Secure transfer case to jack with safety chains.
- (2) Position transfer case under vehicle.
- (3) Align transfer case and transmission shafts and install transfer case on transmission.
- (4) Install and tighten transfer case attaching nuts to 35 N·m (26 ft. lbs.) torque.
- (5) Install vehicle speed sensor and adapter, if removed. Then connect vehicle speed sensor wires, vent hoses and electrical switch connector.
- (6) Align and connect propeller shafts. Tighten shaft U-joint clamp bolts to 19 N·m (14 ft. lbs.) torque.
- (7) Fill transfer case with recommended automatic transmission fluid.
- (8) Install rear crossmember. Tighten crossmember bolts to 41 N·m (30 ft. lbs.) torque.
- (9) Remove transmission jack and transmission support stand.
- (10) Connect transfer case range lever to shift rod.
- (11) Check and adjust transfer case shift linkage if necessary.
- (12) Lower vehicle.

TRANSFER CASE DISASSEMBLY AND OVERHAUL

- (1) Remove fill and drain plugs.
- (2) Remove front yoke. Discard yoke seal washer and nut.
- (3) Move range lever rearward to 4L position.
- (4) Remove extension housing attaching bolts.
- (5) Tap extension housing in a clockwise direction to break sealer bead and remove housing (Fig. 6).

CAUTION: To avoid damaging the sealing surfaces of the extension housing and rear retainer, do not attempt to pry or wedge the housing off the retainer.

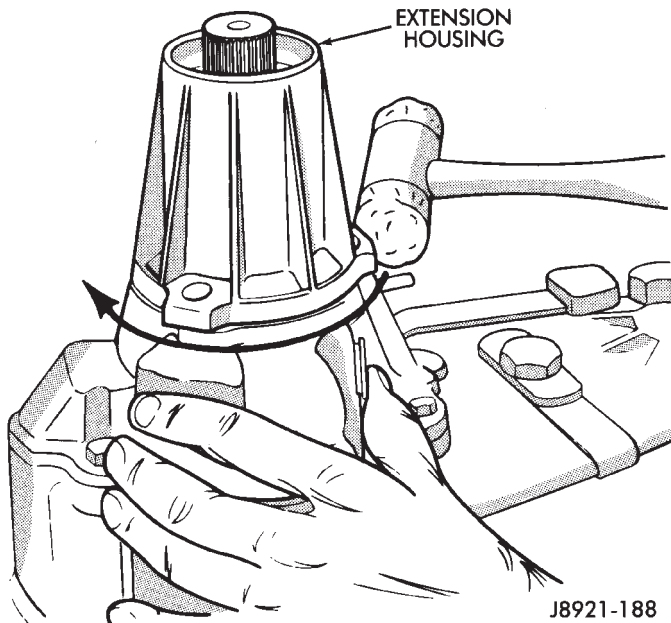


Fig. 6 Extension Housing Removal

- (6) Remove rear bearing snap ring from mainshaft (Fig. 7). Discard snap ring.

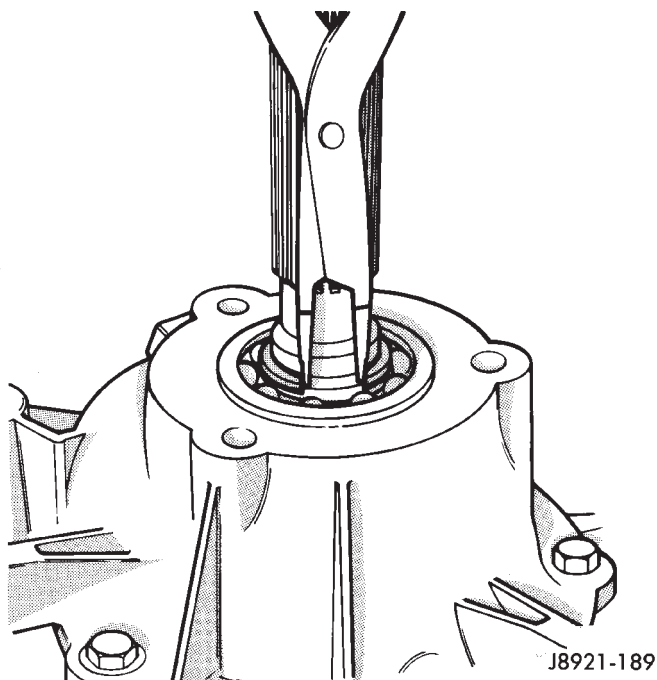


Fig. 7 Removing Rear Bearing Snap Ring

- (7) Remove rear retainer attaching bolts.
- (8) Loosen rear retainer (Fig. 8). Position long screwdriver under each tab at ends of retainer housing and pry retainer upward.

CAUTION: Do not pry against the sealing surfaces of the retainer or rear case. The surfaces could be damaged.

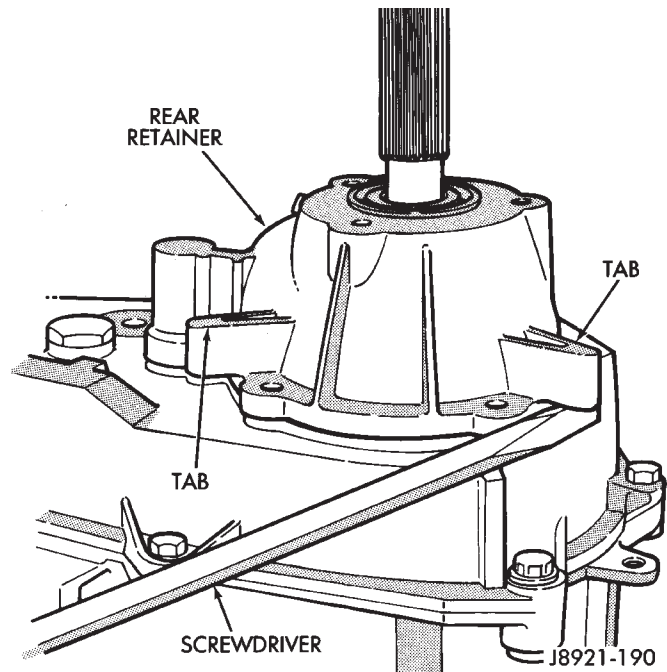


Fig. 8 Loosening Rear Retainer

- (9) Lift rear retainer up and off case and mainshaft (Fig. 9).

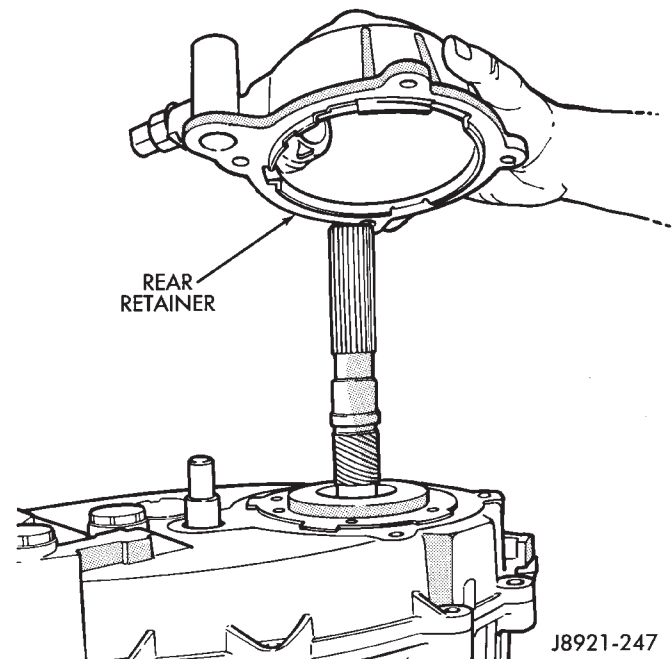


Fig. 9 Remove Rear retainer

(10) Remove bolts attaching rear case to front case. Retain bolts and the washers.

(11) Loosen rear case with two screwdrivers (Fig. 10). Insert screwdrivers into slots cast in case ends. Then gently pry upward to break sealer bead.

CAUTION: Do not pry against the sealing surfaces of the front case or rear case. The surfaces could be damaged.

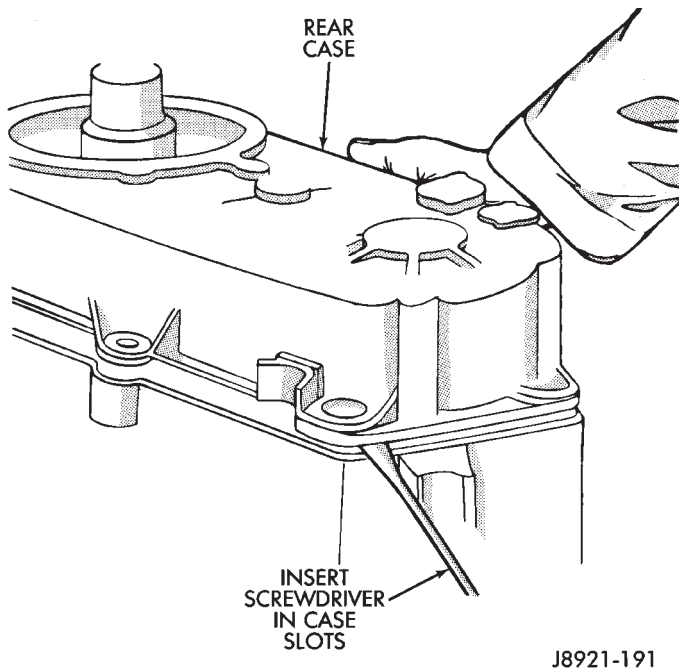


Fig. 10 Loosening Rear Case

(12) Remove rear case and oil pump as assembly (Fig. 11).

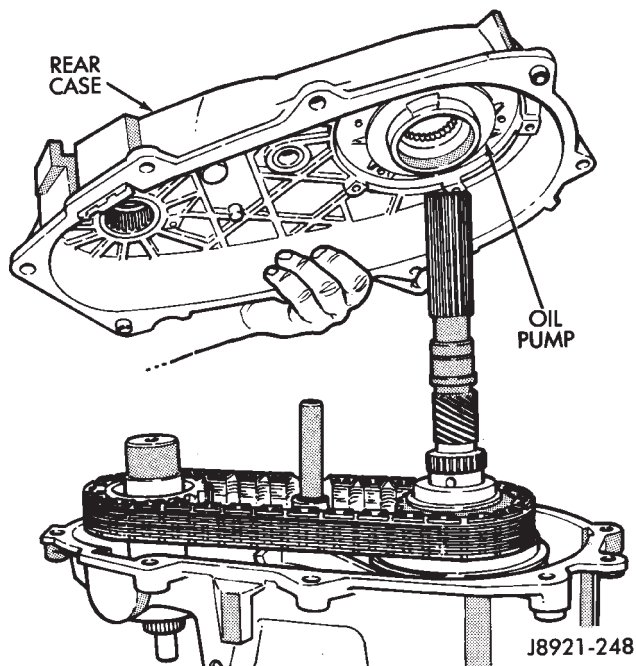
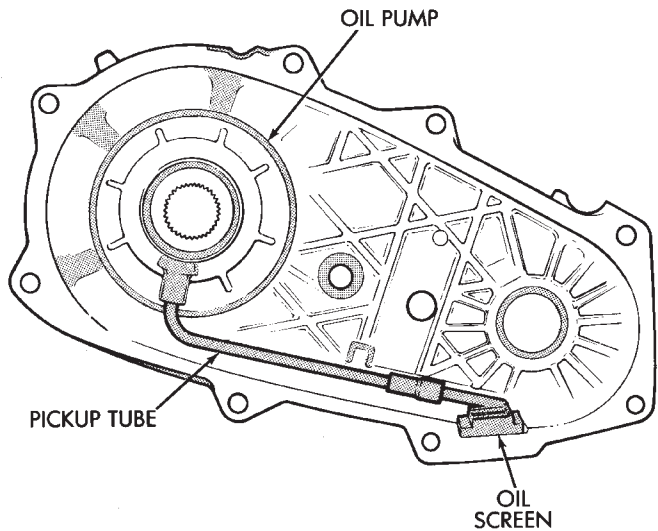


Fig. 11 Removing Rear Case And Oil Pump

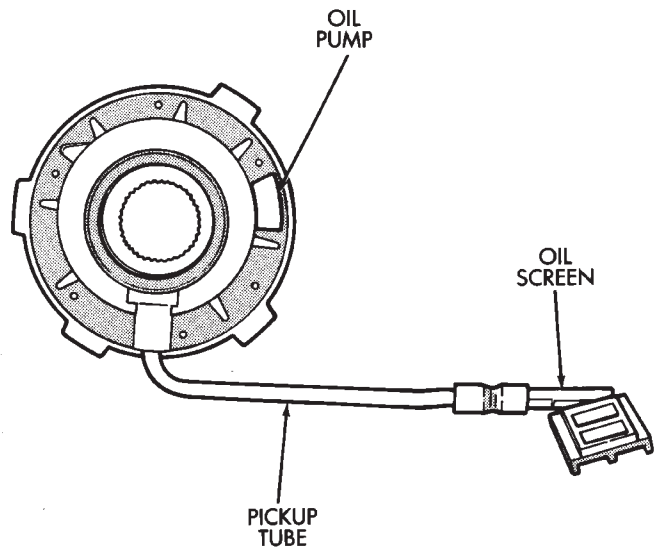
(13) Slide oil screen (Fig. 12) out of case pocket.



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Fig. 12 Unseating Oil Screen

(14) Remove oil pump, pickup tube and oil screen from rear case (Fig. 13).



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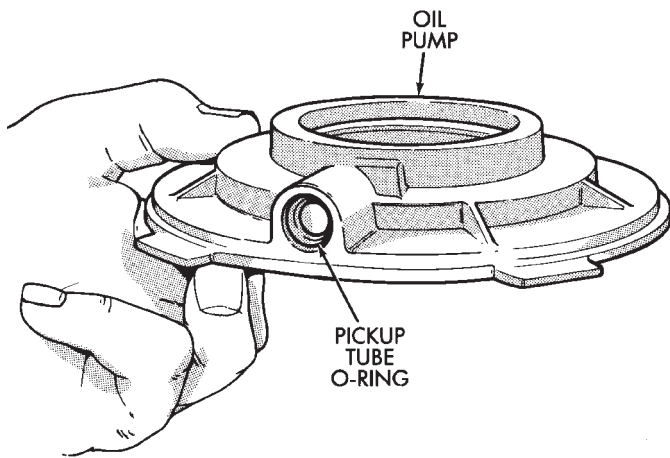
Fig. 13 Removing Oil Pump, Tube And Screen

(15) Remove pickup tube and screen from pump.
 (16) Remove pickup tube O-ring from oil pump (Fig. 14).

(17) Remove and discard oil pump seal.

(18) The oil pump can be disassembled for cleaning and inspection as described in step (19). **However, pump parts are not serviceable separately. If any pump component is worn, or damaged, pump must be replaced as an assembly.**

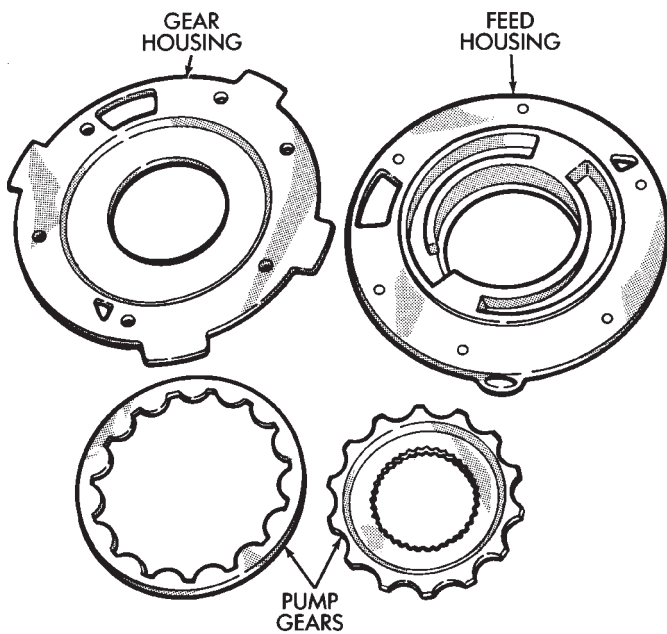
(19) If oil pump will be disassembled for inspection, mark position of oil pump housings for refer-



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Fig. 14 Removing Pickup Tube O-Ring

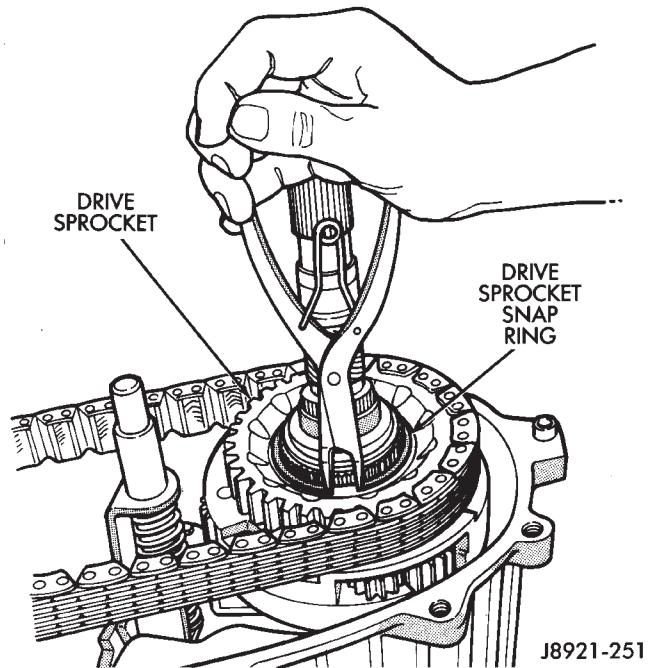
ence (Fig. 15). Remove screws that attach two halves of the pump. Remove feed housing from gear housing (Fig. 15). Then mark position of pump gears and remove them from housing (Fig. 15).



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Fig. 15 Oil Pump Components

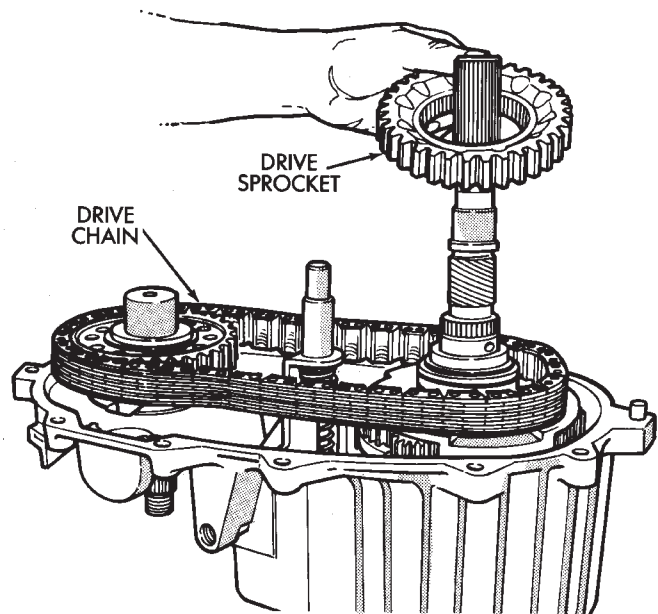
- (20) Remove magnet from front case.
- (21) Remove drive sprocket snap ring (Fig. 16).



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Fig. 16 Removing Drive Sprocket Snap Ring

- (22) Remove drive sprocket and chain (Fig. 17).



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fig. 17 Removing Drive Sprocket And Chain

(23) Remove front output shaft (Fig. 18).

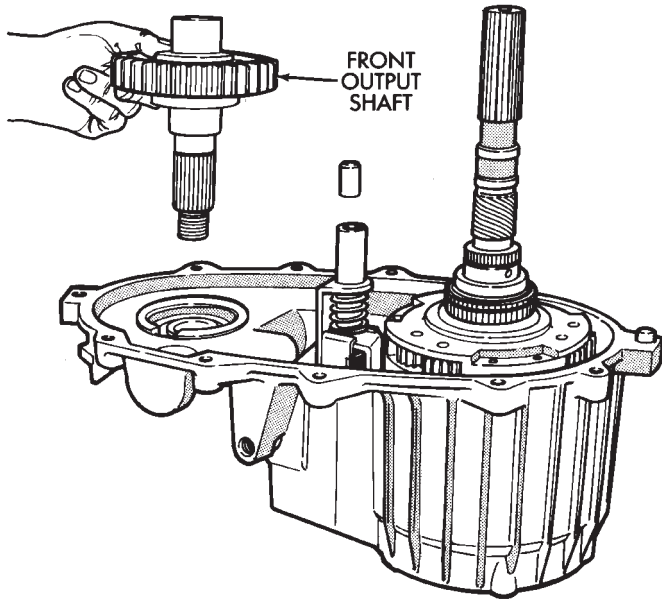


Fig. 18 Removing Front Output Shaft

(24) Remove transfer case shift lever nut and lever.

(25) Remove shift detent plug, spring and pin (Fig. 19).

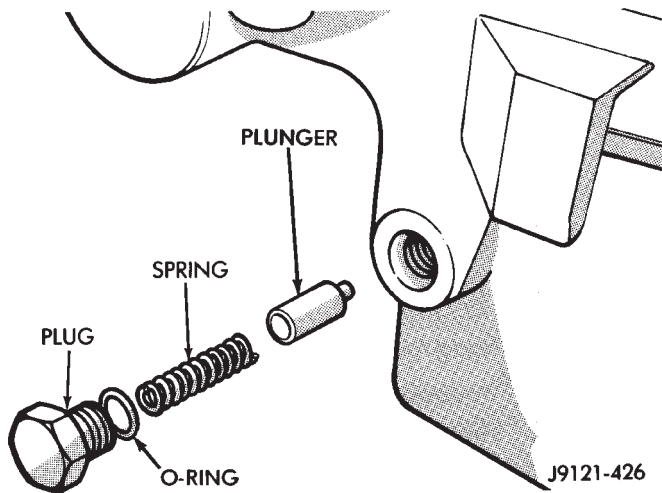


Fig. 19 Removing Detent Components

(26) Remove seal plug from low range fork lockpin access hole. Then move shift sector to align low range fork lockpin with access hole (Fig. 20).

(27) Remove range fork lockpin with size number one easy-out tool. Grip easy-out tool with locking pliers and remove pin with counterclockwise, twist and pull motion (Fig. 20).

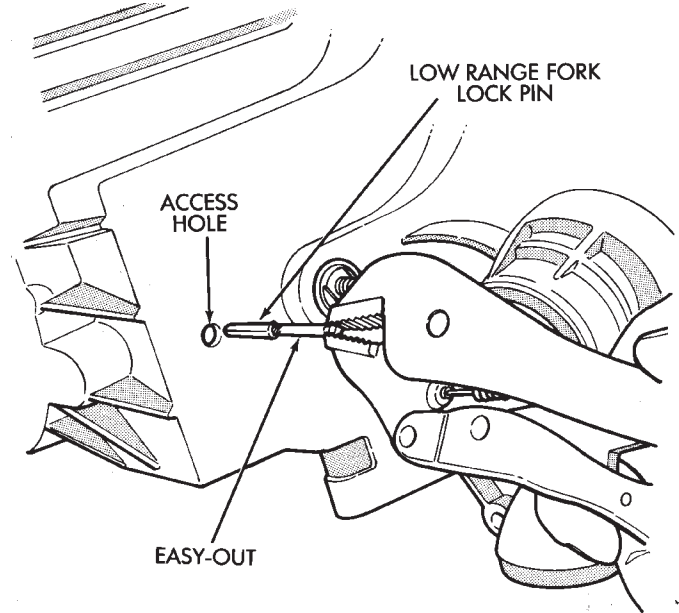


Fig. 20 Removing Low Range Fork Lockpin

(28) Remove shift rail by pulling it straight up and out of fork (Fig. 21).

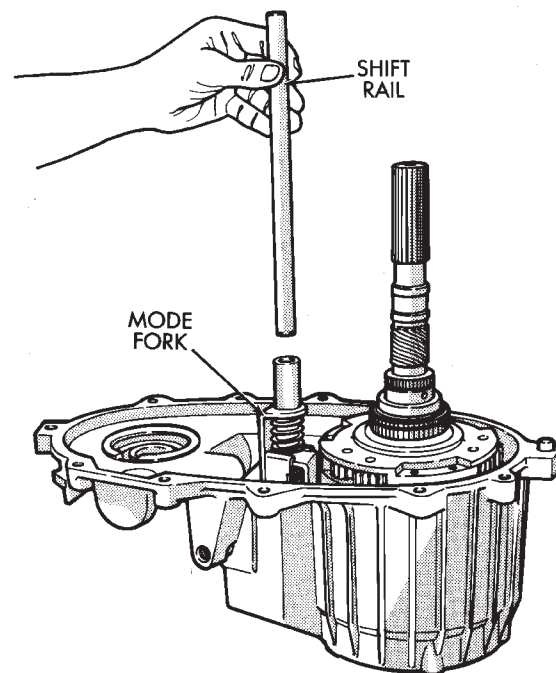


Fig. 21 Removing Shift Rail

(29) Remove mode fork and mainshaft as assembly (Fig. 22).

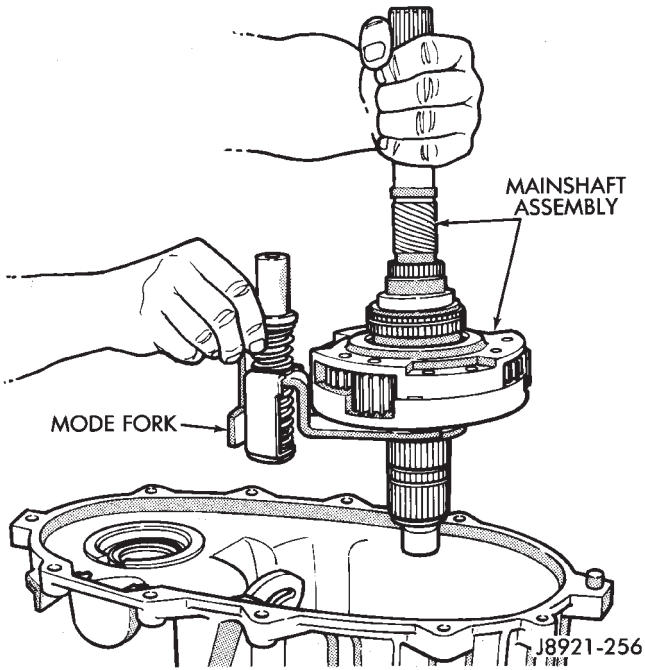


Fig. 22 Removing Mode Fork And Mainshaft

(30) Remove mode shift sleeve and mode fork assembly from mainshaft (Fig. 23). Note position of mode sleeve in fork and remove sleeve.

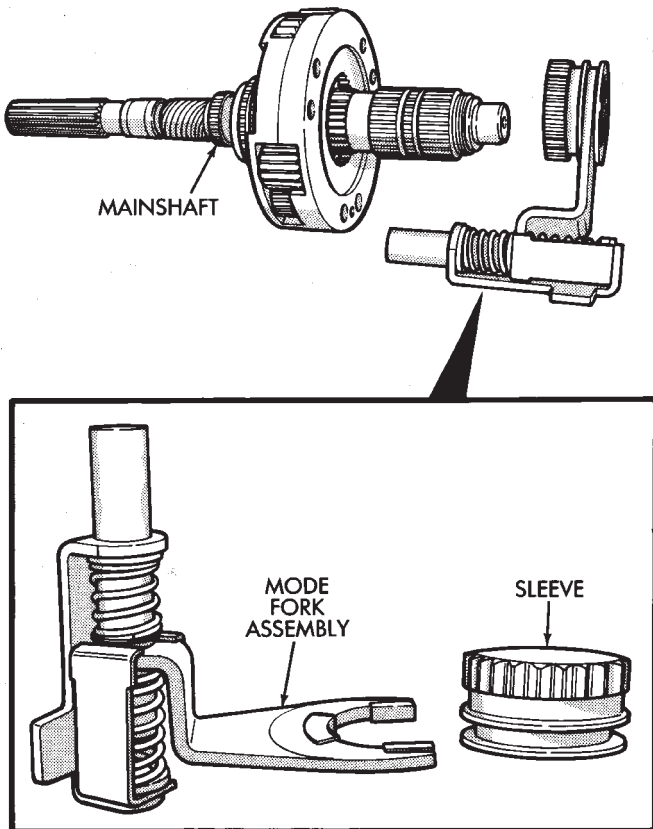


Fig. 23 Removing Mode Fork And Sleeve

(31) Remove intermediate clutch shaft snap ring (Fig. 24).

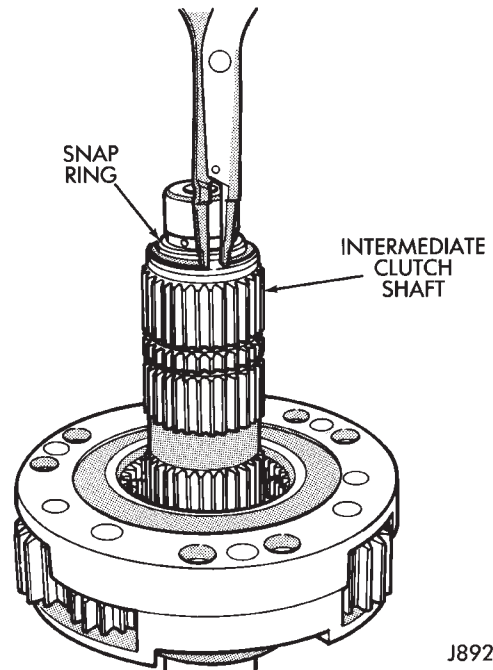


Fig. 24 Removing Intermediate Clutch Shaft Snap Ring

(32) Remove clutch shaft thrust ring (Fig. 25).

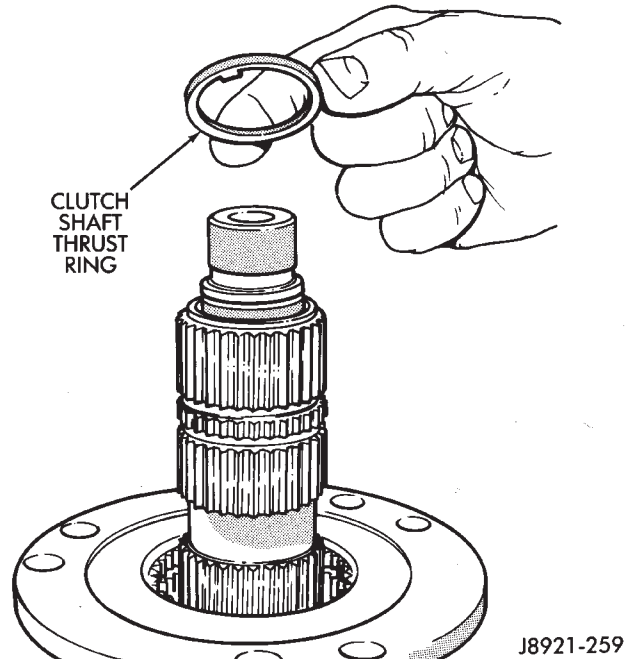


Fig. 25 Removing Clutch Shaft Thrust Ring

(33) Remove intermediate clutch shaft (Fig. 26).

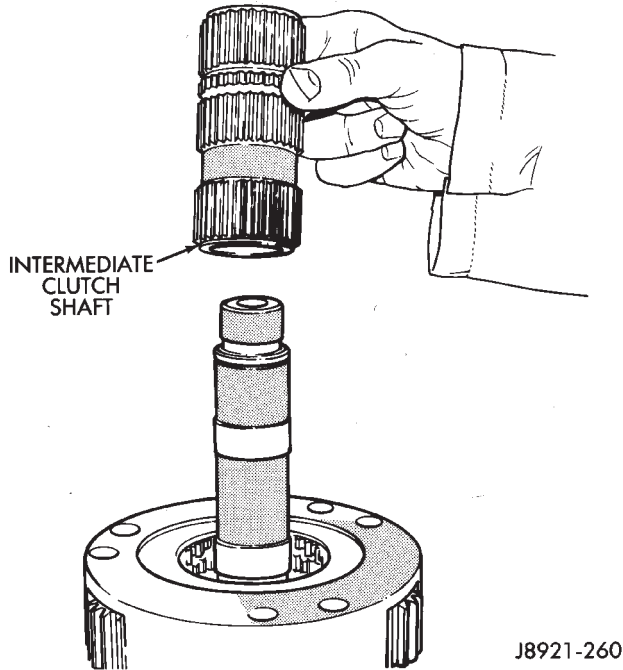


Fig. 26 Removing Intermediate Clutch Shaft

(34) Remove differential snap ring (Fig. 27).

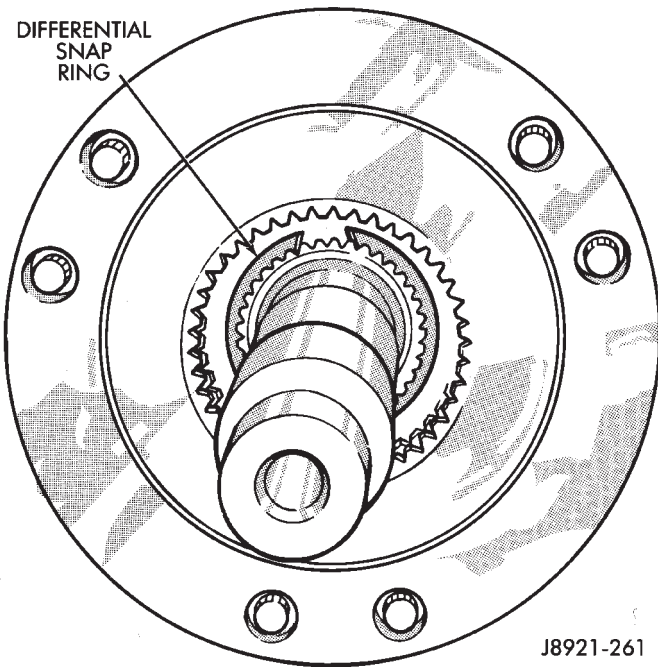


Fig. 27 Removing Differential Snap Ring

(35) Remove differential (Fig. 28).

(36) Remove differential needle bearings and both needle bearing thrust washers from mainshaft.

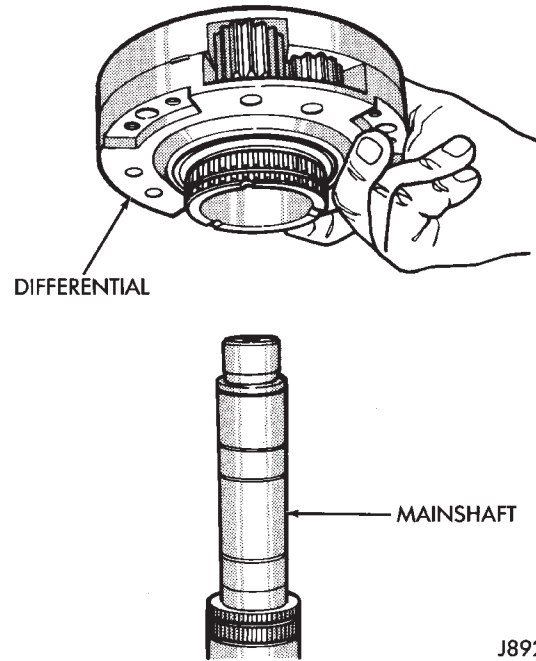


Fig. 28 Differential Removal

(37) Slide low range fork pin out of shift sector slot (Fig. 29)

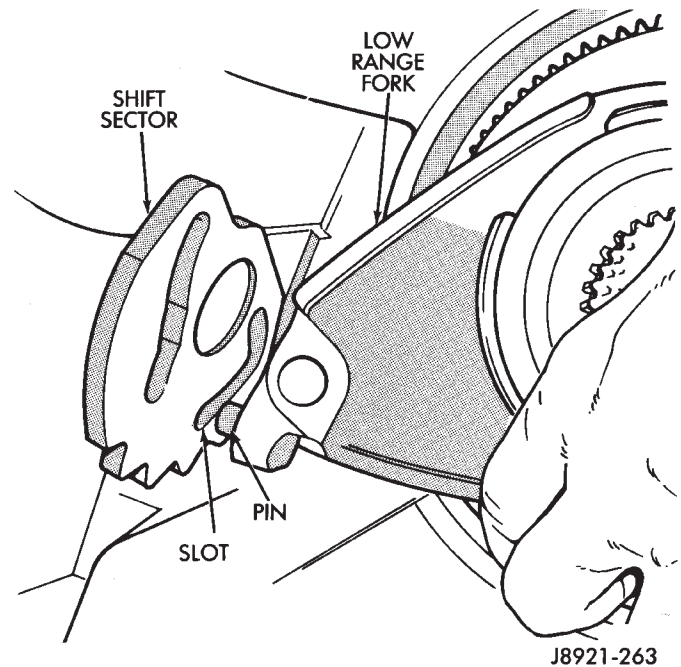


Fig. 29 Disengage Low Range Fork

(38) Remove low range fork and hub (Fig. 30).

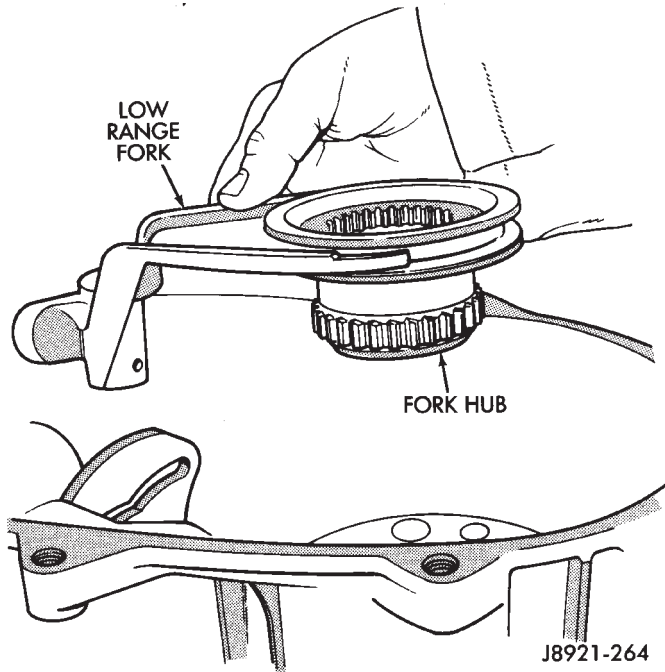


Fig. 30 Removing Low Range Fork And Hub

(39) Remove the shift sector (Fig. 31).

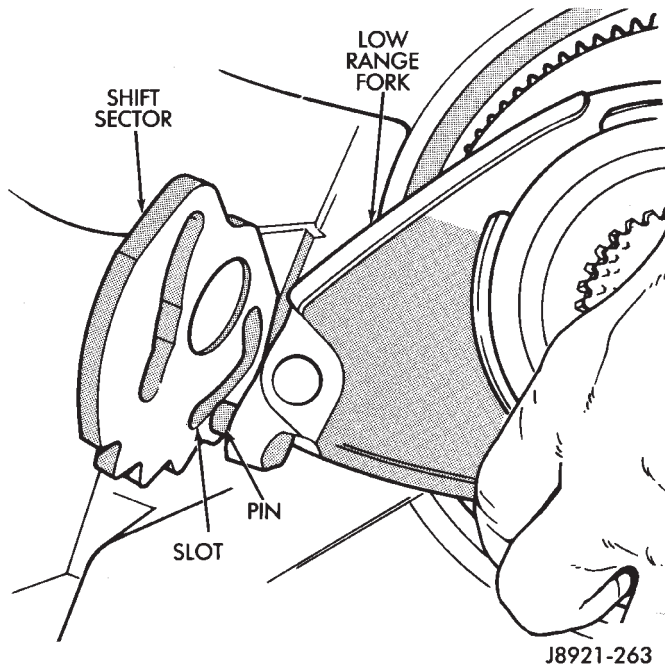


Fig. 31 Shift Sector Position

(40) Remove shift sector bushing and O-ring (Fig. 32).

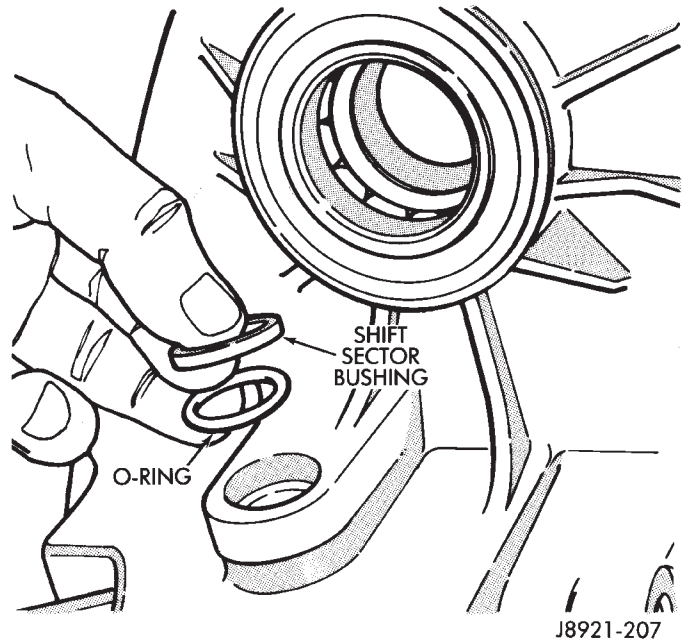


Fig. 32 Removing Sector Bushing And O-Ring

(41) Remove front bearing retainer bolts.

(42) Remove front bearing retainer. Carefully pry retainer loose with screwdriver (Fig. 33). Position the screwdriver in the slots cast into retainer.

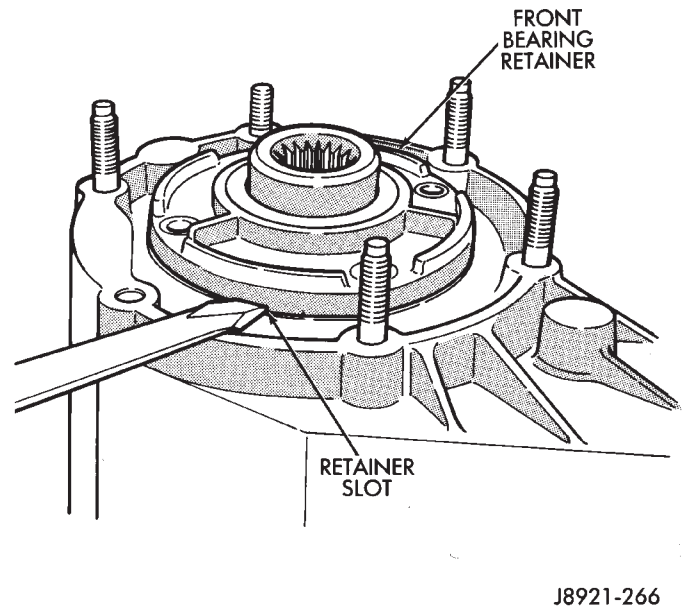
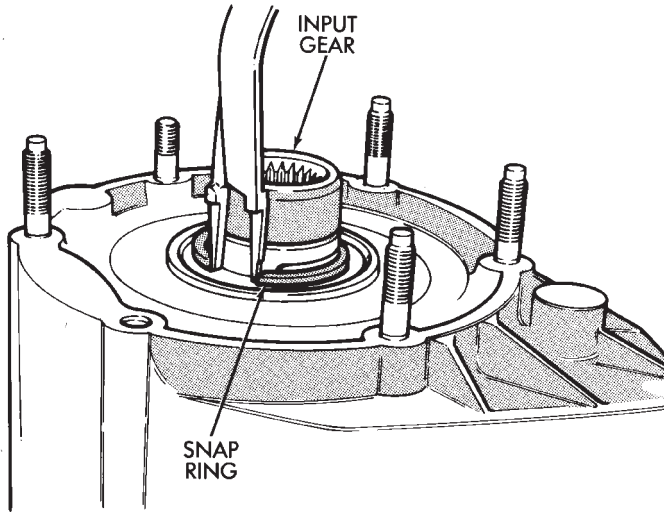


Fig. 33 Removing Front Bearing Retainer

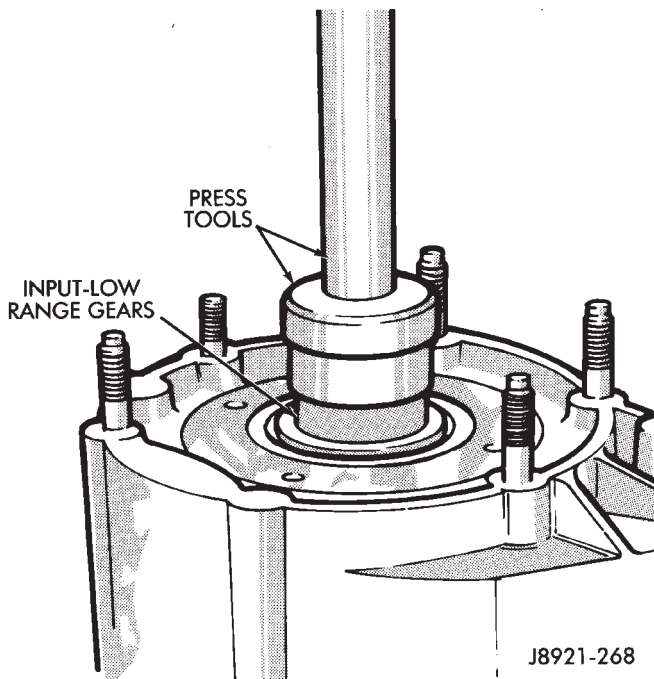
(43) Remove the input gear snap ring (Fig. 34).



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Fig. 34 Removing Input Gear Snap Ring

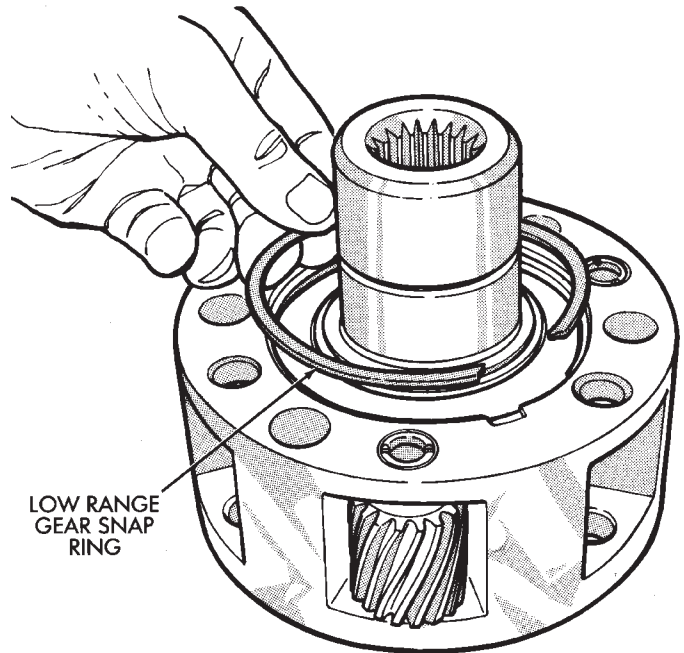
(44) Press input and low range gears out of input gear bearing and case (Fig. 35).



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Fig. 35 Removing Input And Low Range Gears

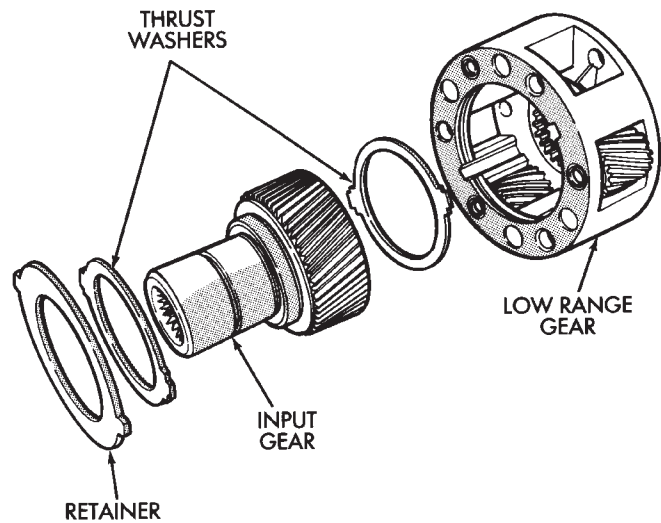
(45) Remove the low range gear snap ring (Fig. 36).



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Fig. 36 Removing/Installing Low Range Gear Snap Ring

(46) Remove input gear retainer, thrust washers and input gear from low range gear (Fig. 37).



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Fig. 37 Low Range Gear Disassembly

(47) Inspect the low range annulus gear (Fig. 38). **The gear is not a serviceable component. If damaged, replace the gear and front case as an assembly.**

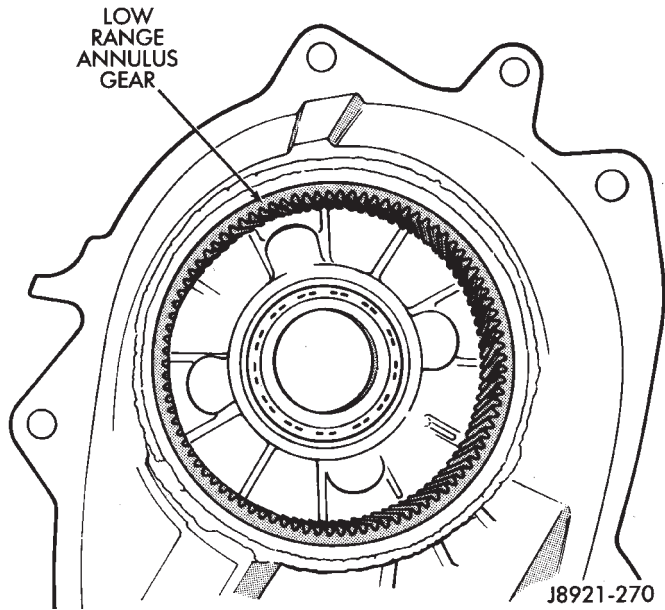


Fig. 38 Inspecting Low Range Annulus Gear

- (48) Remove the oil seals from the rear retainer, extension housing, oil pump and case halves.
- (49) Mark differential case halves for reference.
- (50) Remove differential case bolts and separate top case from bottom case. Use slots in case halves to pry them apart (Fig. 39).

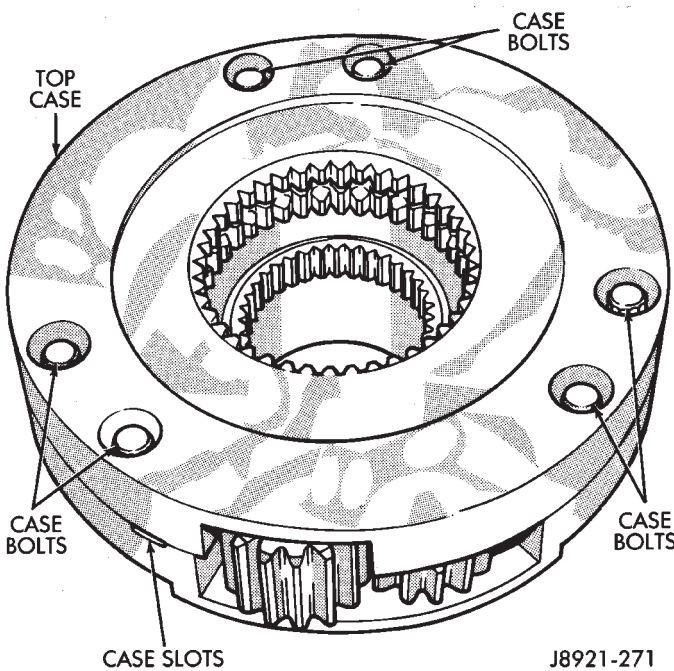


Fig. 39 Separating Differential Case Halves

(51) Remove thrust washers and planet gears from case pins (Fig. 40).

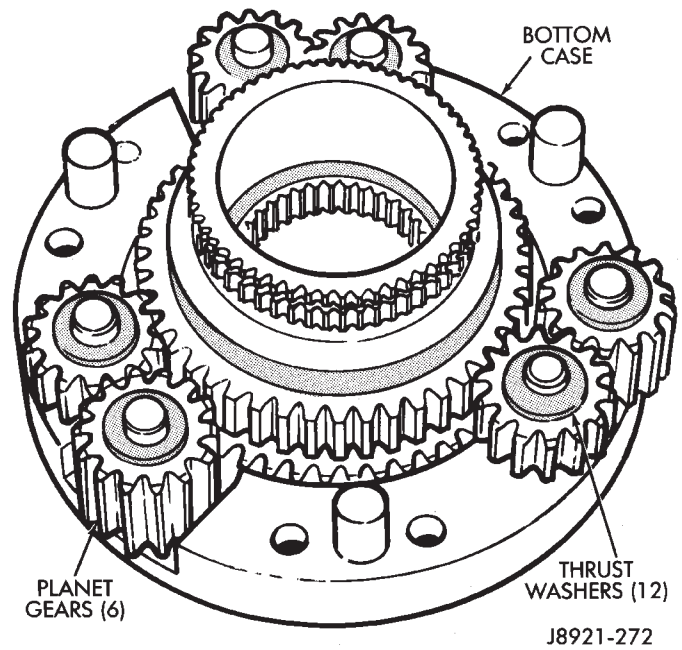


Fig. 40 Removing Planet Gears And Thrust Washers

(52) Remove mainshaft and sprocket gears from bottom case (Fig. 41). Note gear position for reference before separating them.

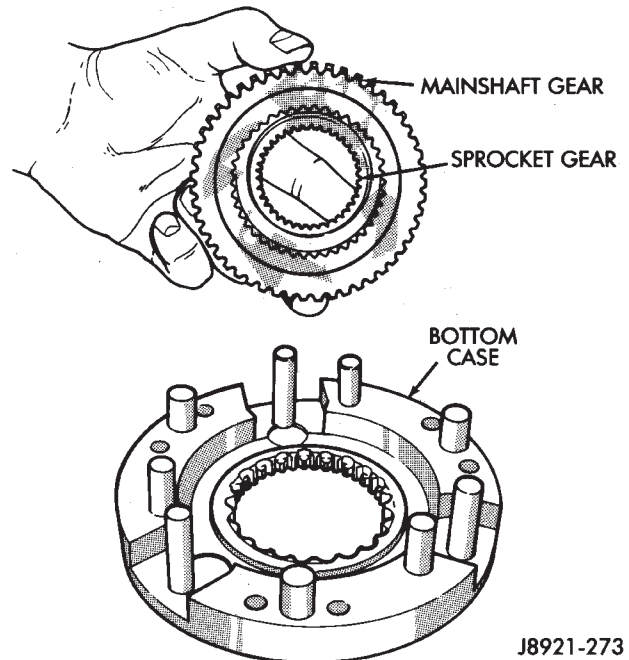


Fig. 41 Removing Mainshaft And Sprocket Gears

CLEANING AND INSPECTION

Clean the transfer case components thoroughly with solvent. Remove all traces of sealer from the case and retainer seal surfaces.

Clean the oil pickup screen with solvent and dry it with compressed air. Also use compressed air to remove solvent residue from all oil feed passages and channels.

Inspect the differential gears, thrust washers and case halves. Replace the mainshaft gear if the gear teeth or the brass ring on the underside of the gear are damaged. Replace the differential as an assembly if the gears, case halves, or the pins in the lower case half are damaged.

Inspect the case halves, extension housing and retainers for cracks, porosity, or damaged sealing surfaces. Inspect the shafts, gears, chain and shift components for wear or damage.

Inspect all of the transfer case bearings for wear, roughness, pitting, or galling. Replace worn or damaged bearings as outlined in the assembly section.

TRANSFER CASE ASSEMBLY

(1) Lubricate the 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. Be sure replacement bearings do not block these feed holes.

(2) Remove the front output shaft, front bearing snap ring (Fig. 42).

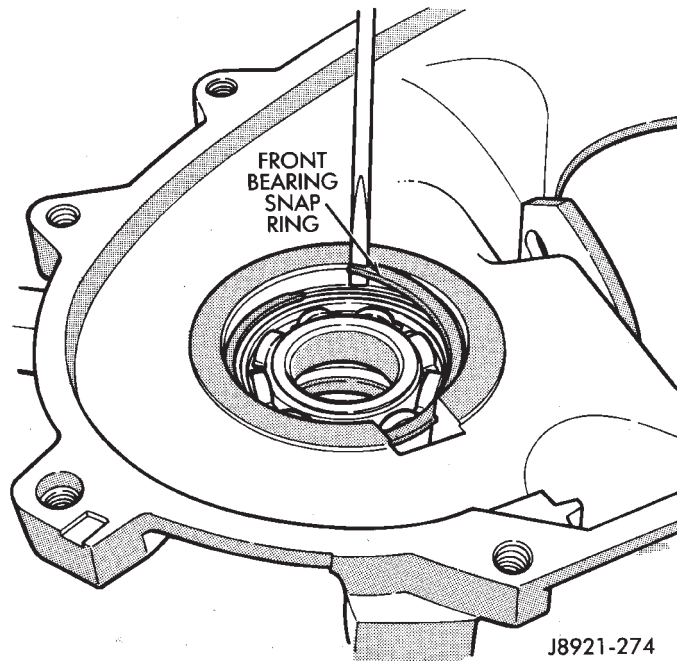


Fig. 42 Removing/Installing Front Output Shaft Front Bearing Snap Ring

(3) Remove the old bearing and install the new bearing with a driver handle and installer tool (Fig. 43).

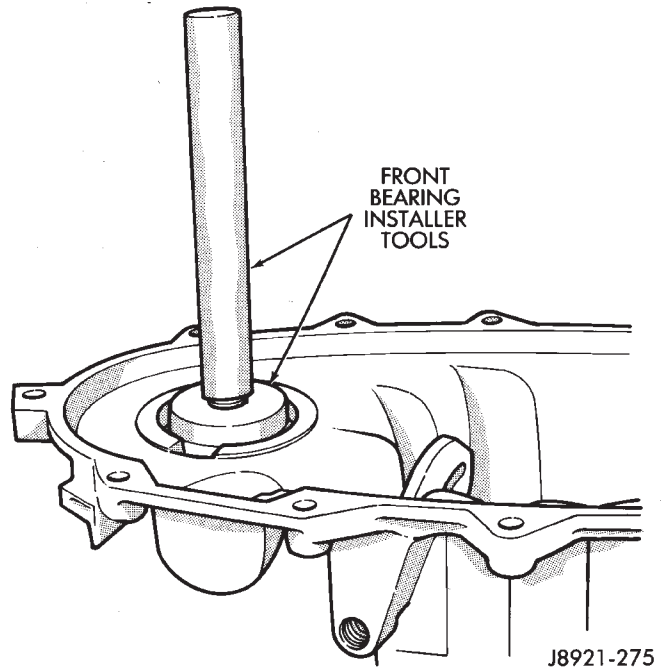


Fig. 43 Replacing Output Shaft Front Bearing

(4) Install the front bearing snap ring (Fig. 42).
 (5) Install new front output shaft oil seal (Fig. 44).

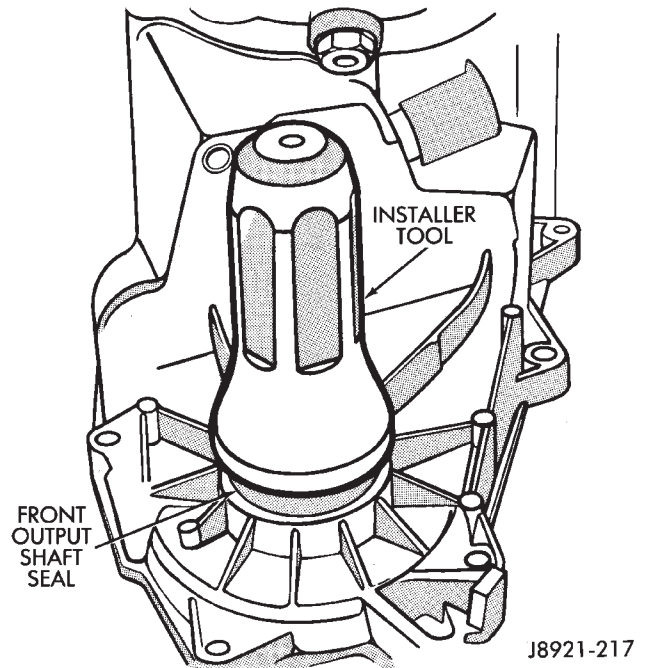
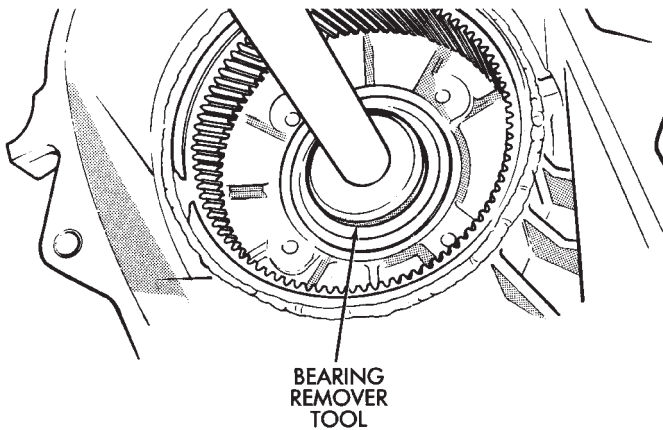


Fig. 44 Installing Front Output Shaft Seal

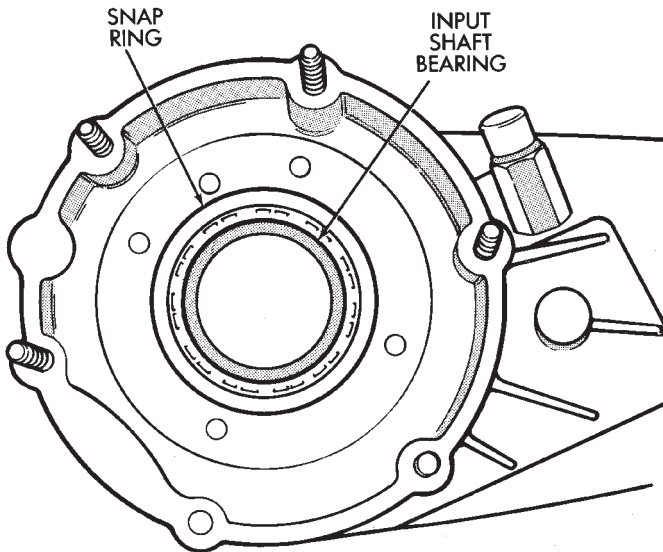
(6) Press input gear bearing out of front case with driver tool and shop press (Fig. 45).



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Fig. 45 Removing Input Gear Bearing

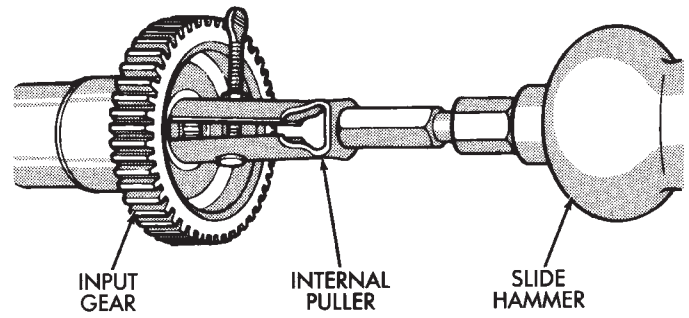
(7) Install the snap ring on the new bearing.
 (8) Install the new input gear bearing with a shop press and wood block. Install the bearing far enough to seat the snap ring against the case (Fig. 46).



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Fig. 46 Seating Input Gear Bearing

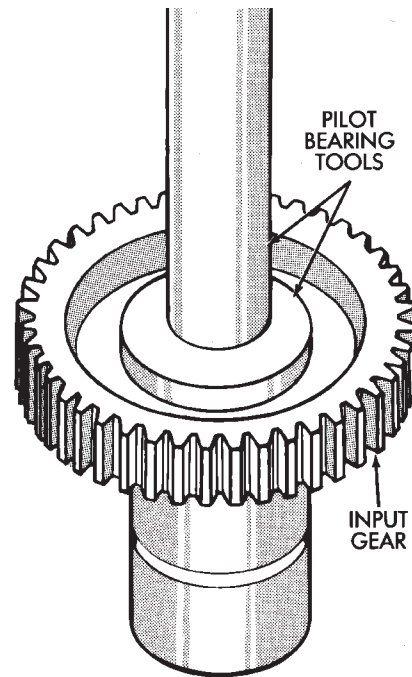
(9) Remove input gear pilot bearing with slide hammer and internal puller (Fig. 47).



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Fig. 47 Removing Input Gear Pilot Bearing

(10) Install new pilot bearing with driver tools (Fig. 48).



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Fig. 48 Installing Input Gear Pilot Bearing

(11) Assemble low range gear, input gear thrust washers, input gear and input gear retainer (Fig. 49).

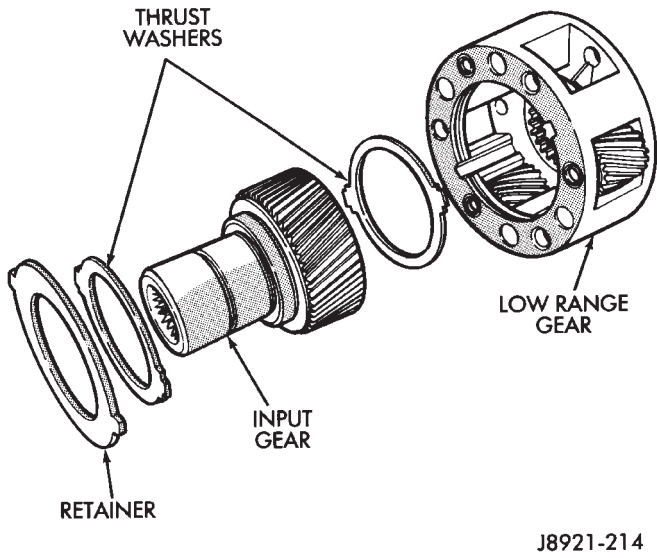


Fig. 49 Low Range And Input Gear Assembly

(12) Install low range gear snap ring (Fig. 50).

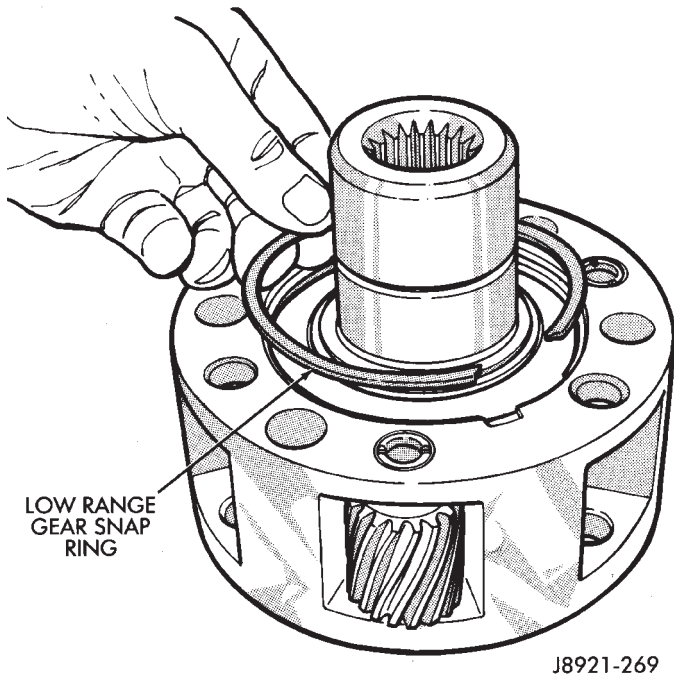


Fig. 50 Install Low Range Gear Snap Ring

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

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

(15) Press the input gear shaft into the front bearing.

CAUTION: Be sure the input gear installer tool is the proper size. The wrong size tool could push the input gear pilot bearing too far into the gear bore (Fig. 51). Also, do not press against the end surfaces of the low range gear. The gear case and thrust washers could be damaged.

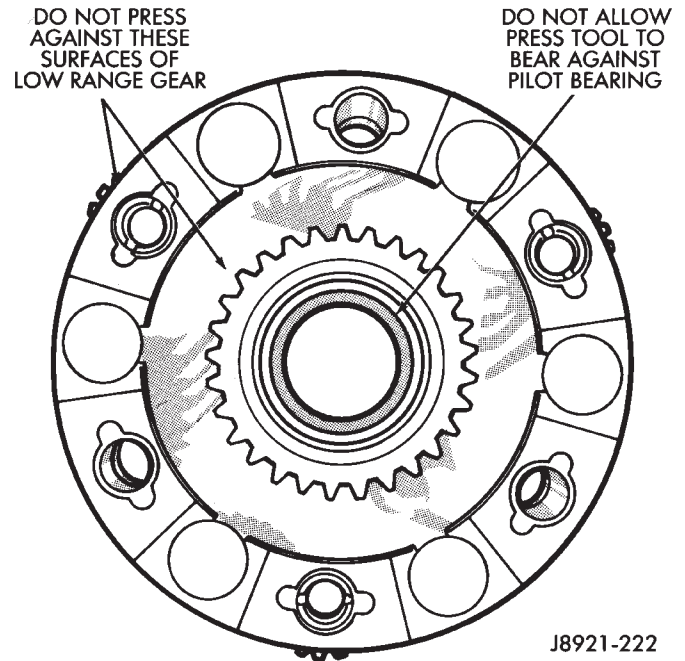


Fig. 51 Input Gear Installation

(16) Install new input gear snap ring (Fig. 52).

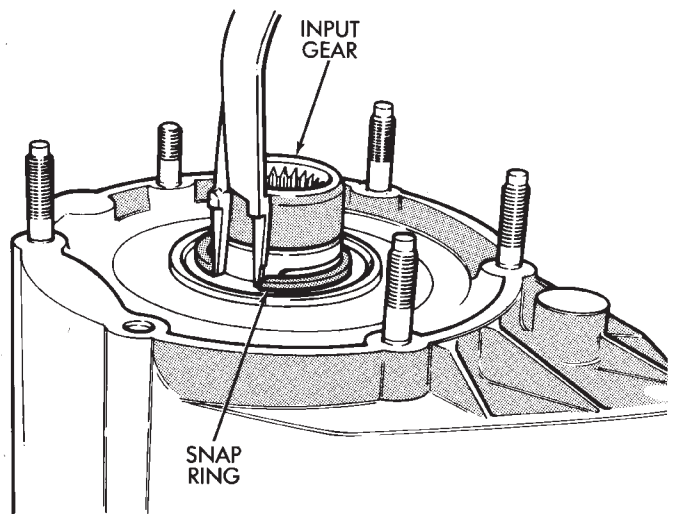


Fig. 52 Install Input Gear Snap Ring

(17) Install new seal in front bearing retainer (Fig. 53).

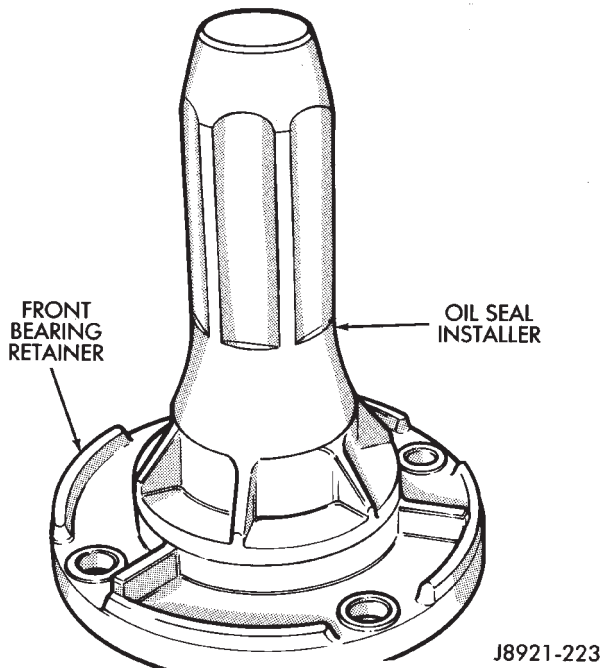


Fig. 53 Install Front Bearing Retainer Seal

(18) Apply 3 mm (1/8 in.) wide bead of Mopar gasket maker, silicone adhesive sealer, or Loctite 518 to seal surface of front bearing retainer.

(19) Install the front bearing retainer (Fig. 54). Tighten the retainer bolts to 16 ft. lbs. (21 N·m) torque.

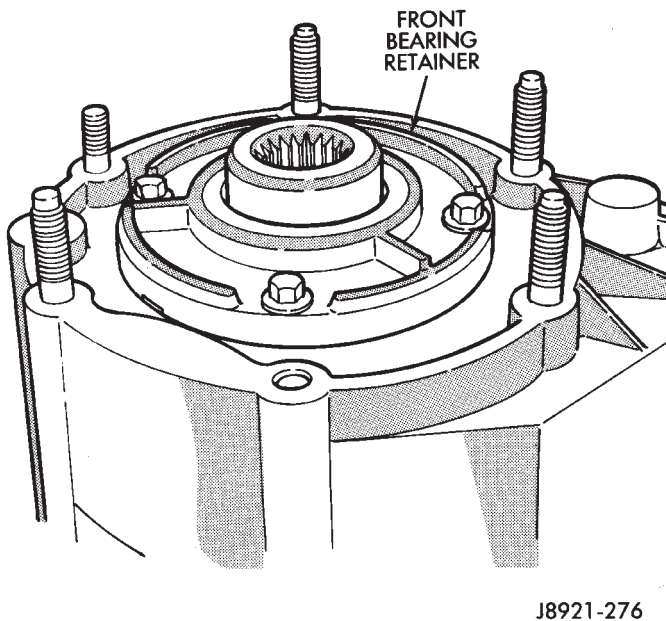


Fig. 54 Installing Front Bearing Retainer

(20) Install new sector shaft O-ring and bushing (Fig. 55).

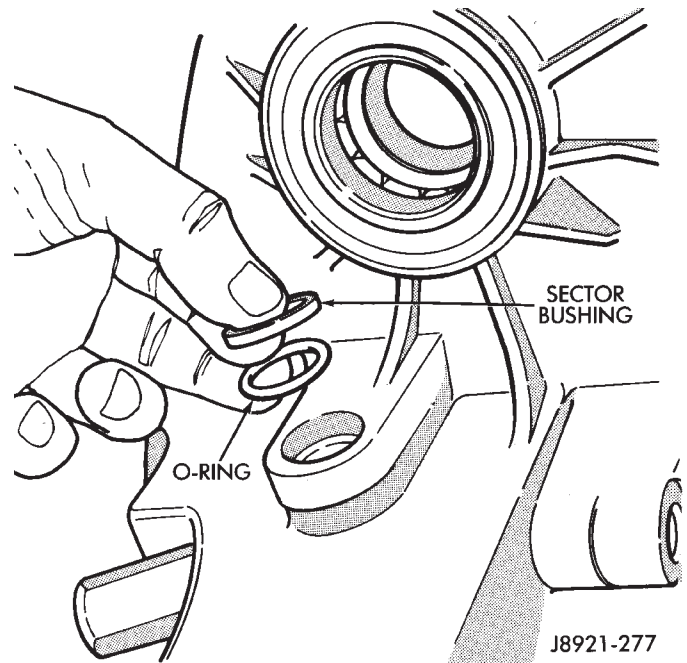


Fig. 55 Installing Sector O-Ring And Bushing

(21) Install the shift sector.

(22) Install new pads in low range fork (Fig. 56).

(23) Assemble low range fork and hub (Fig. 56).

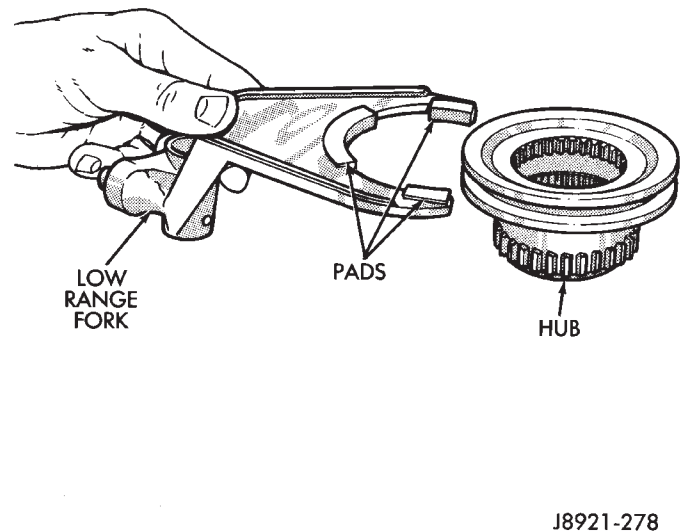


Fig. 56 Assembling Low Range Fork And Hub

(24) Position low range fork and hub in case. Be sure low range fork pin is engaged in the shift sector slot (Fig. 57).

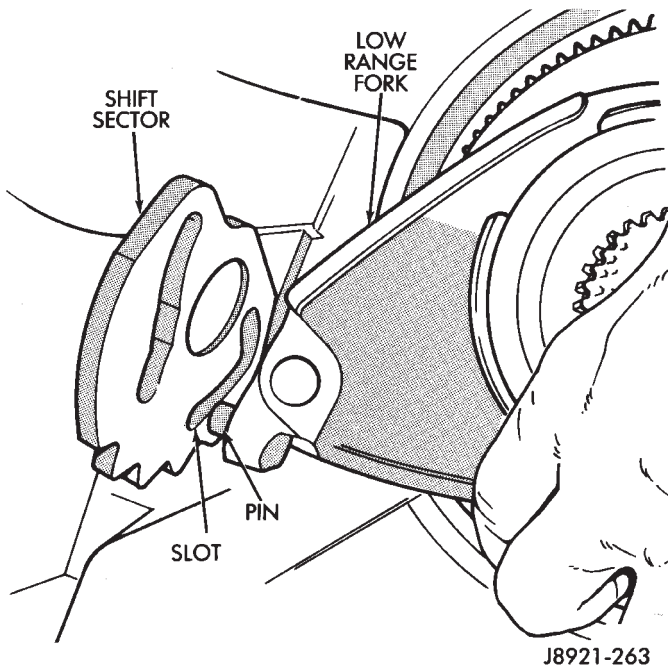


Fig. 57 Positioning Low Range Fork

(25) Lubricate differential components with automatic transmission fluid.

(26) Install sprocket gear in differential bottom case (Fig. 58).

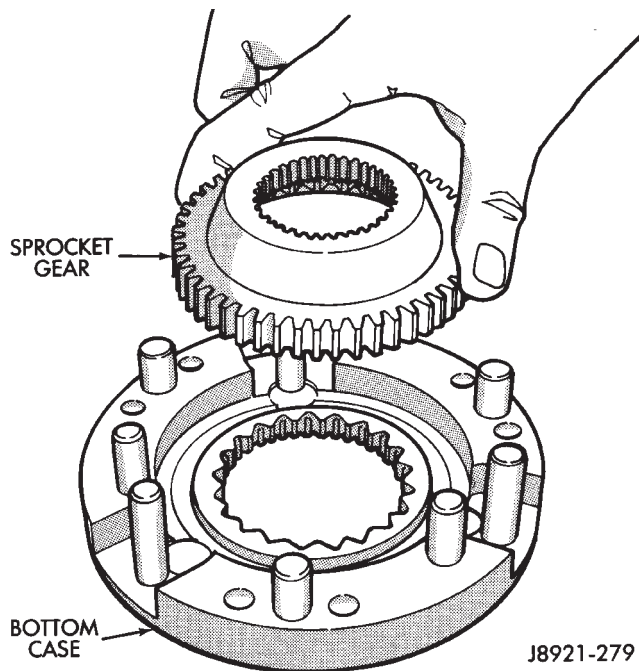


Fig. 58 Installing Differential Sprocket Gear

(27) Install differential planet gears and new thrust washers (Fig. 59). **Be sure thrust washers are installed at top and bottom of each planet gear.**

(28) Install differential mainshaft gear (Fig. 59).

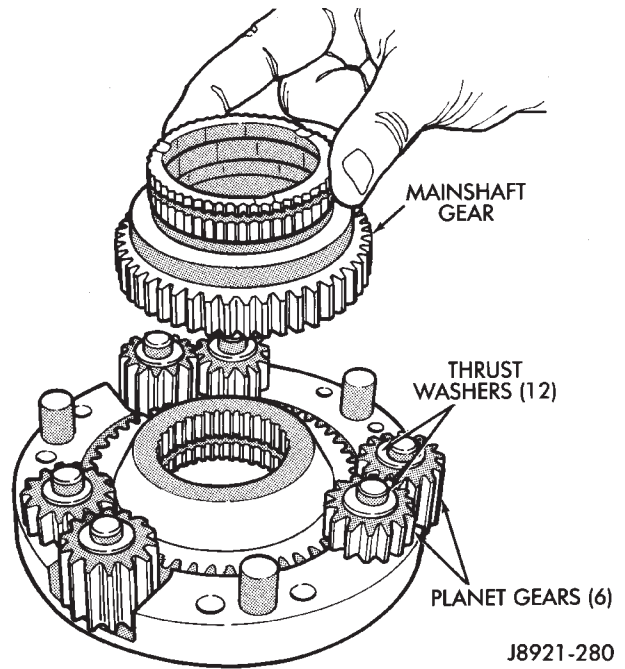


Fig. 59 Installing Mainshaft And Planet Gears

(29) Align and position differential top case on bottom case (Fig. 60). Align using scribe marks made at disassembly.

(30) Install and tighten the differential case bolts to specified torque.

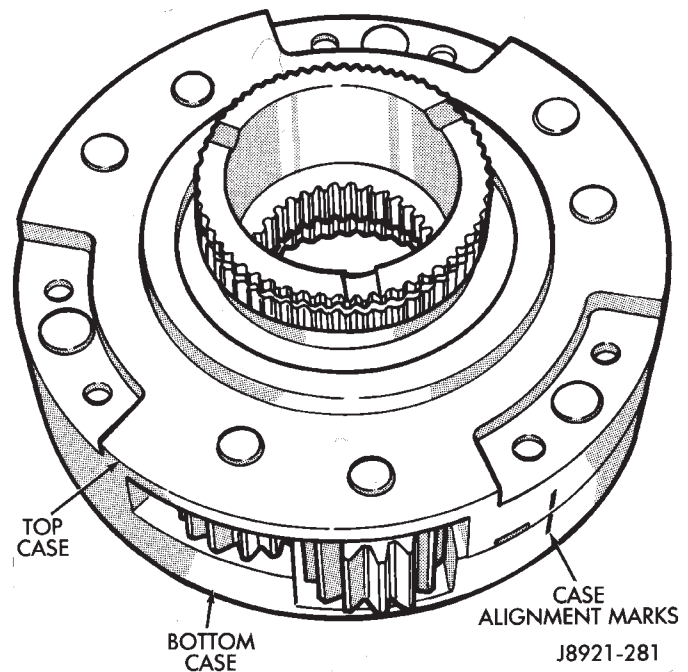
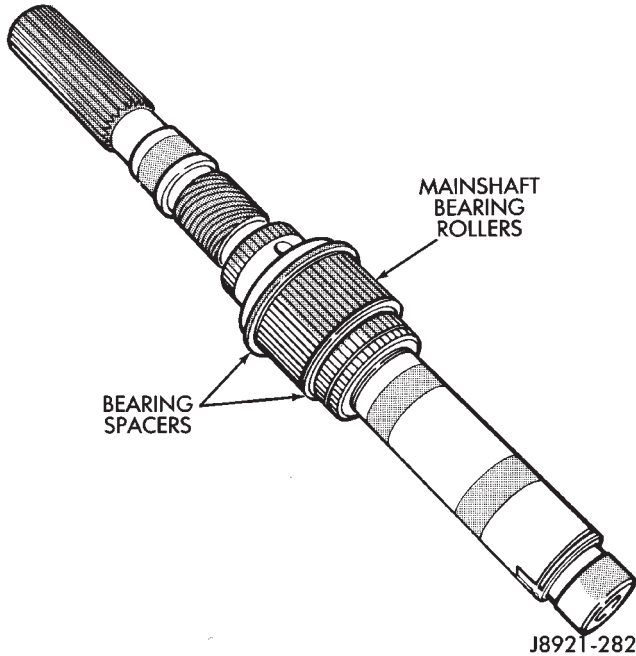


Fig. 60 Differential Case Assembly

(31) Install first mainshaft bearing spacer on mainshaft (Fig. 61).

(32) Install bearing rollers on mainshaft (Fig. 61). **Coat bearing rollers with generous quantity of petroleum jelly to hold them in place.**

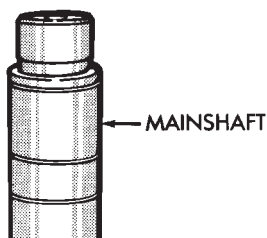
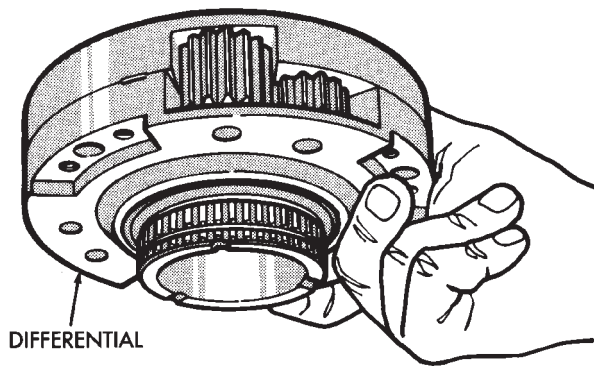
(33) Install remaining bearing spacer on mainshaft (Fig. 61). Do not displace any bearings while installing spacer.



J8921-282

Fig. 61 Installing Mainshaft Bearing Rollers and Spacers

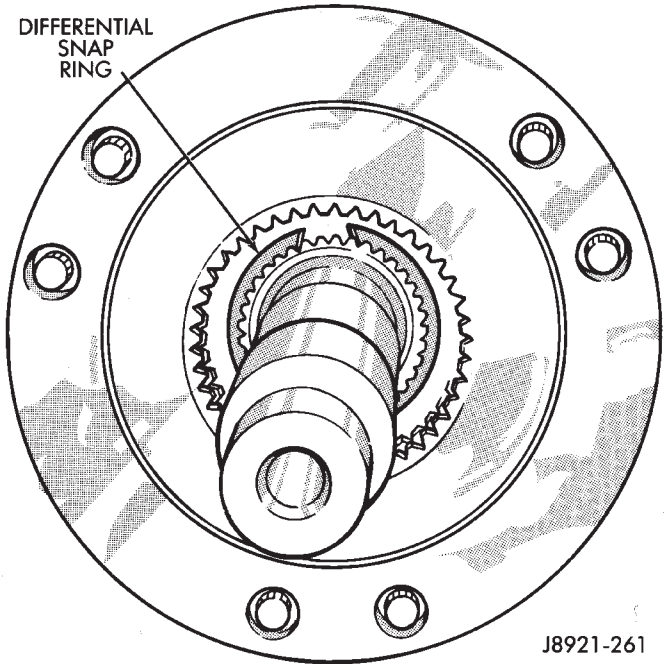
(34) Install the differential (Fig. 62). **Do not displace the mainshaft bearings when installing the differential.**



J8921-283

Fig. 62 Differential Installation

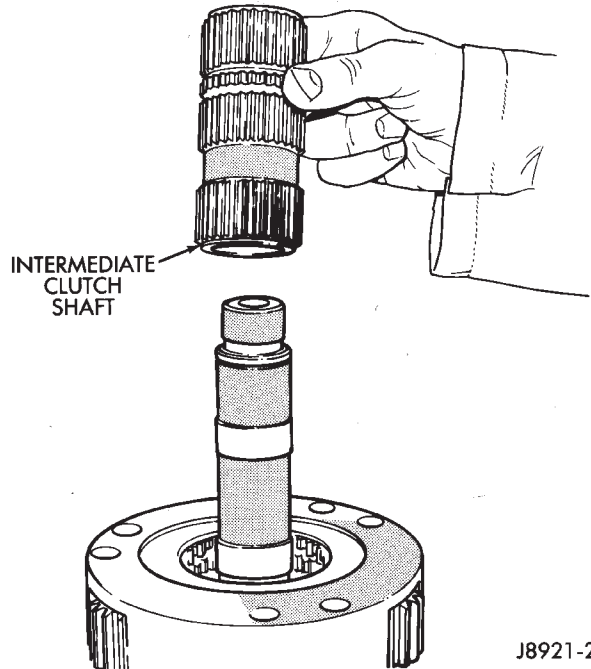
(35) Install the differential snap ring (Fig. 63).



J8921-261

Fig. 63 Installing Differential Snap Ring

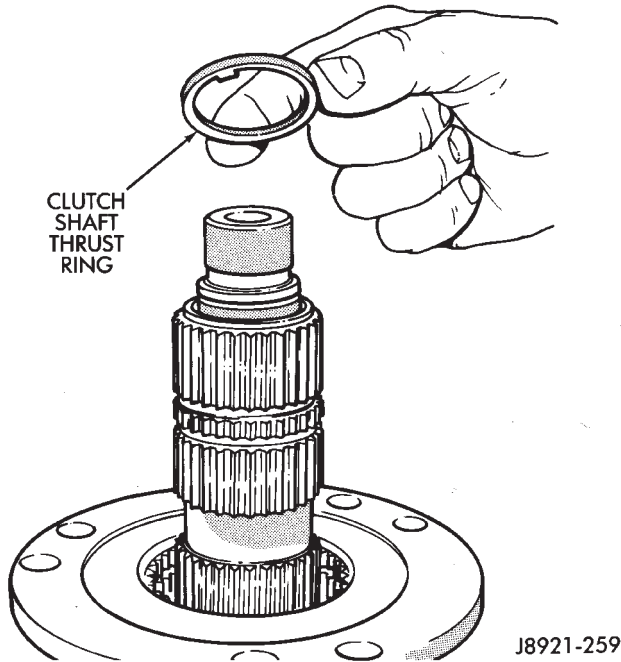
(36) Install the intermediate clutch shaft (Fig. 64).



J8921-260

Fig. 64 Installing Intermediate Clutch Shaft

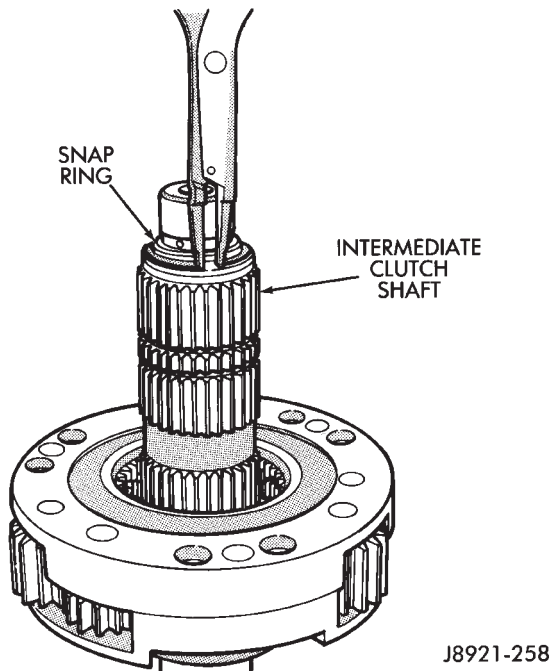
(37) Install clutch shaft thrust washer (Fig. 65).



J8921-259

Fig. 65 Installing Clutch Shaft Thrust Washer

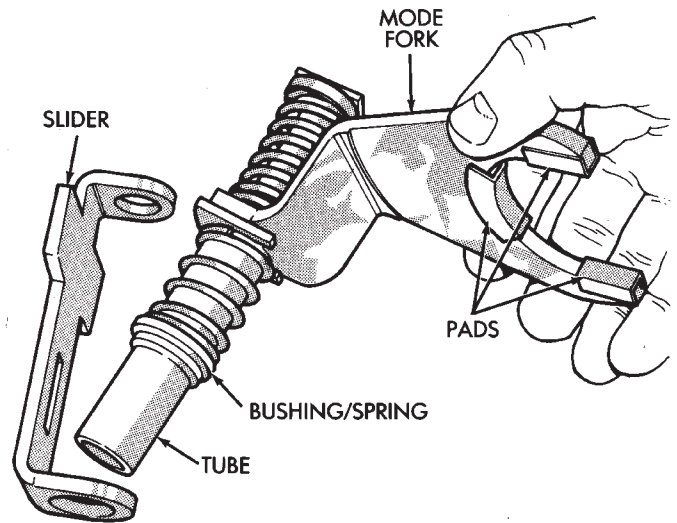
(38) Install clutch shaft snap ring (Fig. 66).



J8921-258

Fig. 66 Installing Clutch Shaft Snap Ring

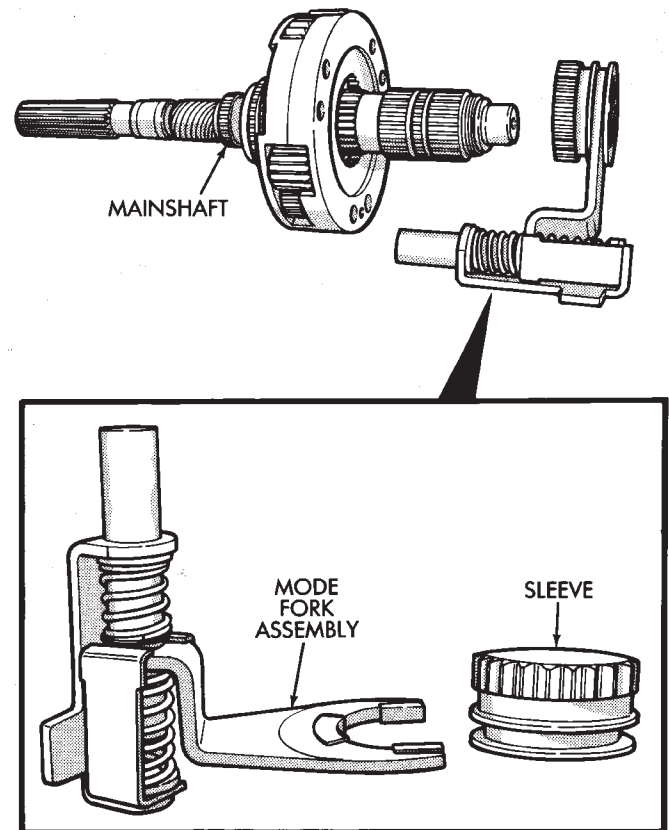
(39) Inspect mode fork assembly (Fig. 67). Replace pads and bushing if necessary. Replace fork tube if bushings inside tube are worn or damaged. Also check springs and slider bracket (Fig. 67). Replace worn, damaged components.



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Fig. 67 Inspect Mode Fork Assembly

(40) Install mode sleeve in mode fork (Fig. 68). Then install assembled sleeve and fork on mainshaft. Be sure mode sleeve splines are engaged in differential splines.



J8921-257

Fig. 68 Installing Mode Fork And Sleeve

(41) Install mode fork and mainshaft assembly in case (Fig. 69). Rotate mainshaft slightly to engage shaft with low range gears.

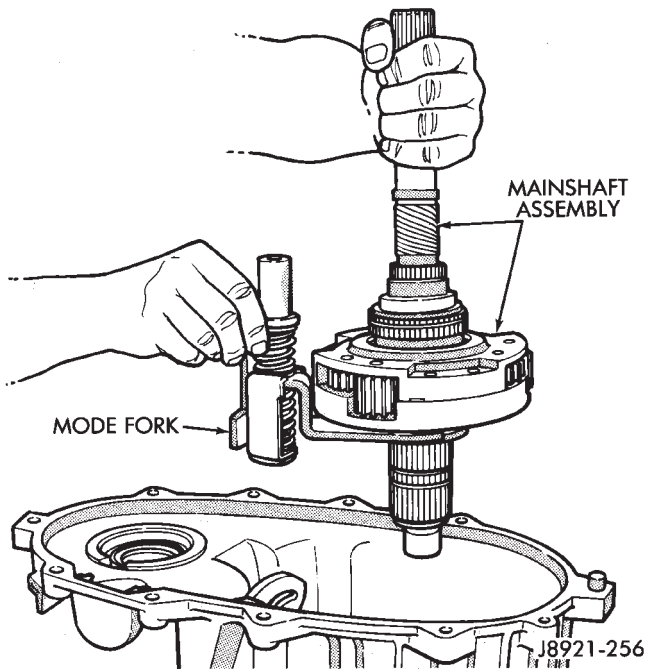


Fig. 69 Installing Mainshaft And Mode Fork

(42) Rotate mode fork pin into shift sector slot.

(43) Install shift rail (Fig. 70). Be sure rail is seated in both shift forks.

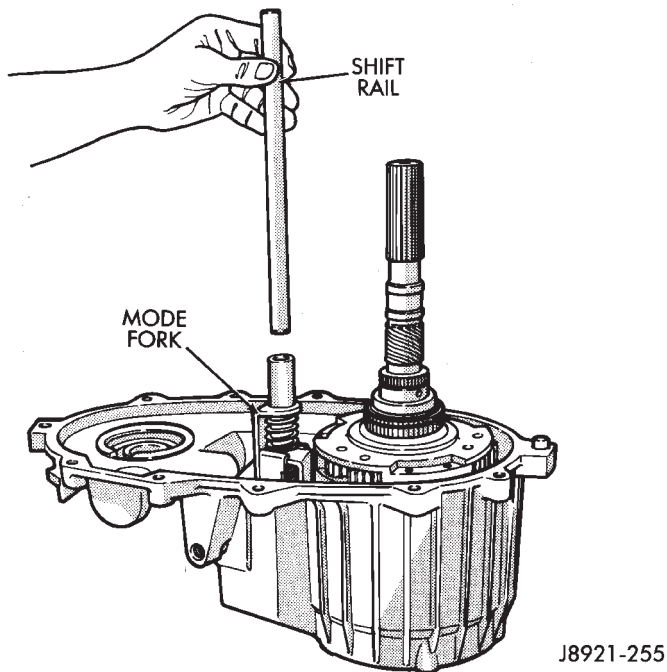


Fig. 70 Installing Shift Rail

(44) Rotate shift sector to align lockpin hole in low range fork with access hole in case.

(45) Insert an easy-out in range fork lockpin to hold it securely for installation (Fig. 71). **Lockpin is slightly tapered on one end. Insert tapered end into fork and rail.**

(46) Insert lockpin through access hole and into shift fork (Fig. 71). Then remove the easy-out and seat the pin with pin punch.

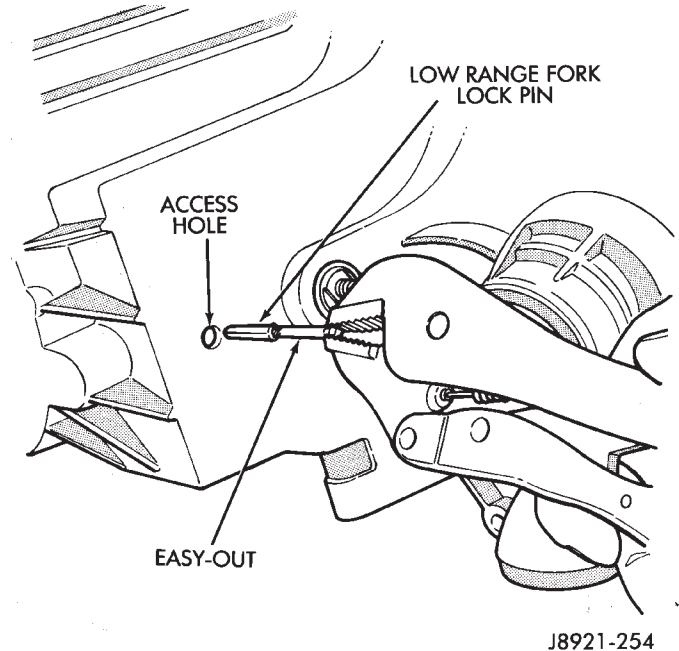


Fig. 71 Installing Low Range Fork Lockpin

(47) Install plug in lockpin access hole.

(48) Install transfer case shift lever and attaching nut. Tighten nut to 30 N·m (22 ft. lbs.) torque.

(49) Install detent plunger, detent spring and detent plug in the case (Fig. 72).

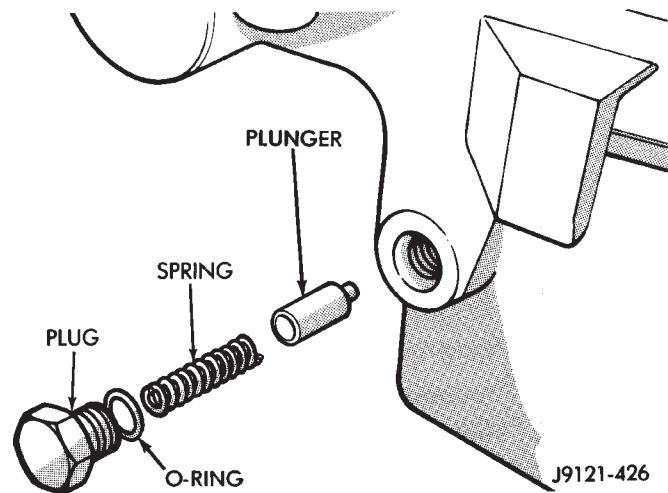
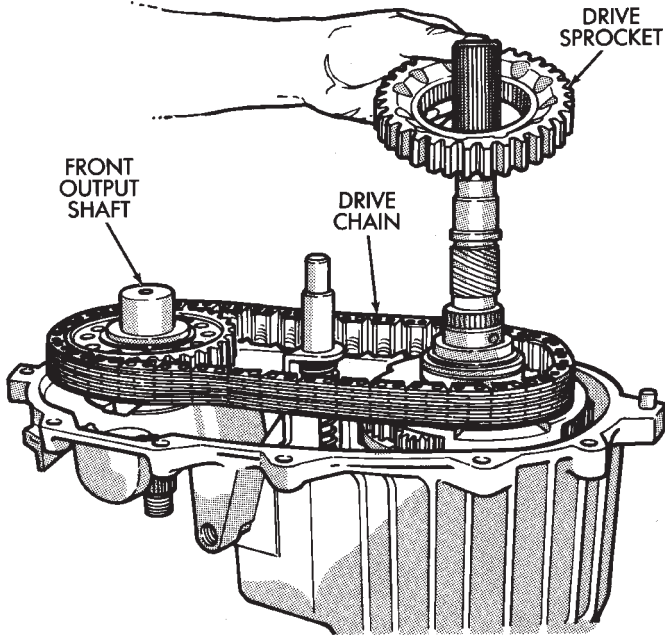


Fig. 72 Installing Detent Pin, Spring And Plug

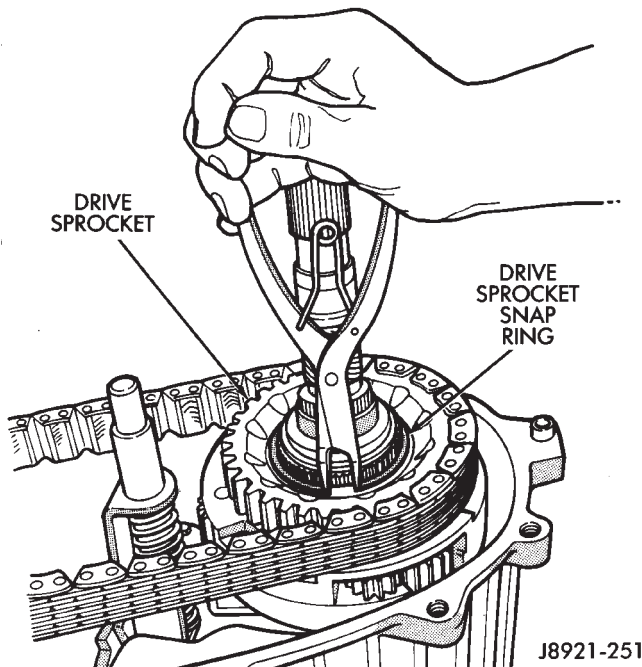
- (50) Install front output shaft (Fig. 73).
- (51) Install drive chain (Fig. 73). Engage chain with front output shaft sprocket teeth.
- (52) Install drive sprocket (Fig. 73).
- (53) Engage drive sprocket teeth with chain. Then engage sprocket splines with mainshaft splines.



J8921-285

Fig. 73 Installing Drive Chain And Sprocket

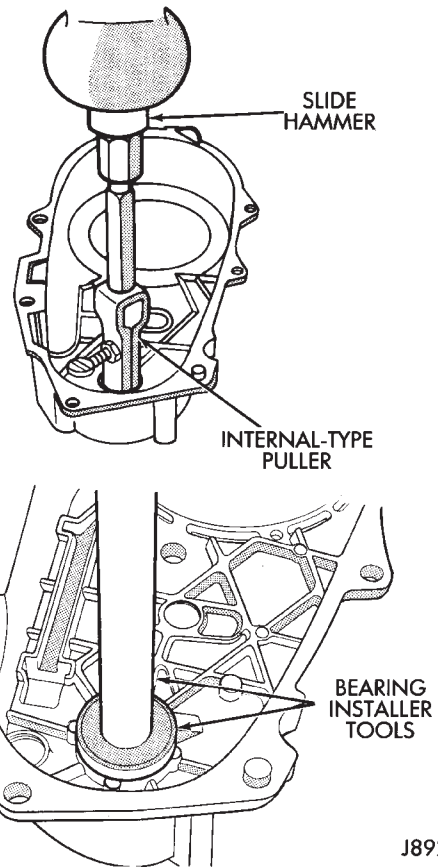
- (54) Install drive sprocket snap ring (Fig. 74).



J8921-251

Fig. 74 Installing Drive Sprocket Snap Ring

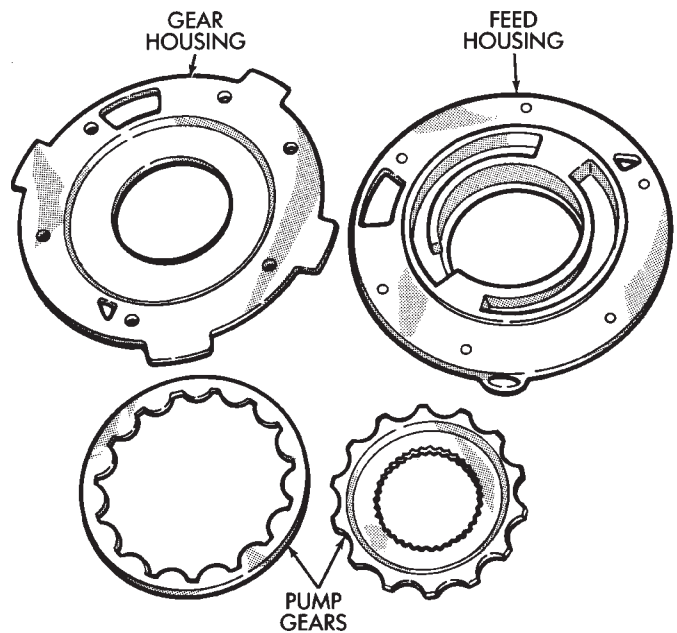
- (55) Replace front output shaft rear bearing. Remove bearing with internal puller and slide hammer (Fig. 75). Install new bearing with bearing driver tools (Fig. 75). Lubricate bearing after installation.



J8921-234

Fig. 75 Installing Front Output Shaft Rear Bearing

- (56) Assemble oil pump (Fig. 76). Replace any pump components that are worn or damaged.



J8921-195

Fig. 76 Oil Pump Assembly

(57) Install new seal in oil pump feed housing (Fig. 77).

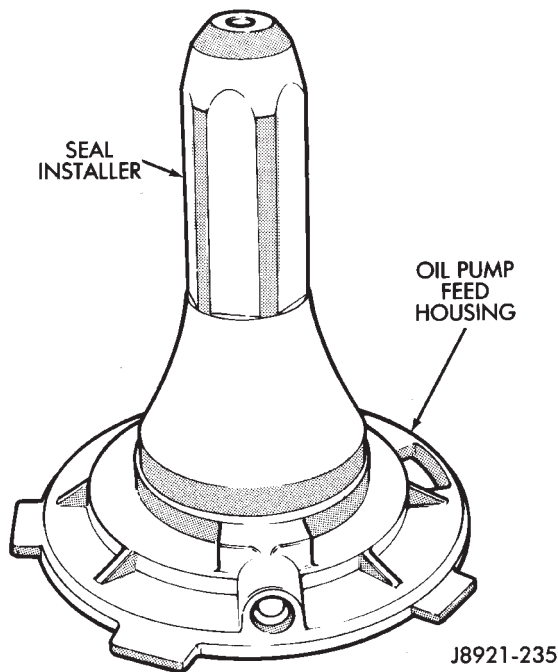


Fig. 77 Installing Oil Pump seal

(58) Install new pickup tube O-ring in oil pump (Fig. 78).

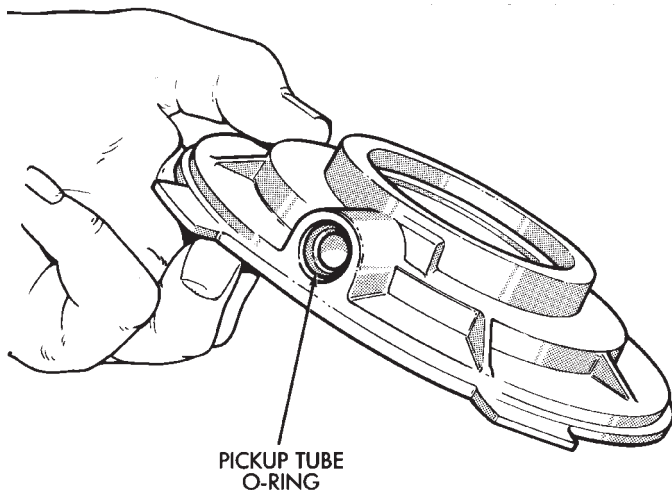


Fig. 78 Installing Pickup Tube O-Ring

(59) 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. 79). Be sure screen is seated in case slot as shown.

(60) Install magnet in front case pocket (Fig. 80).

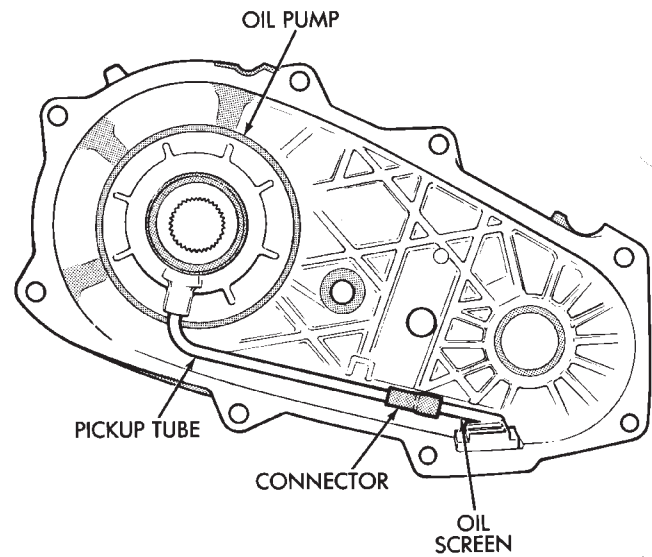


Fig. 79 Installing Oil Screen And Pickup Tube

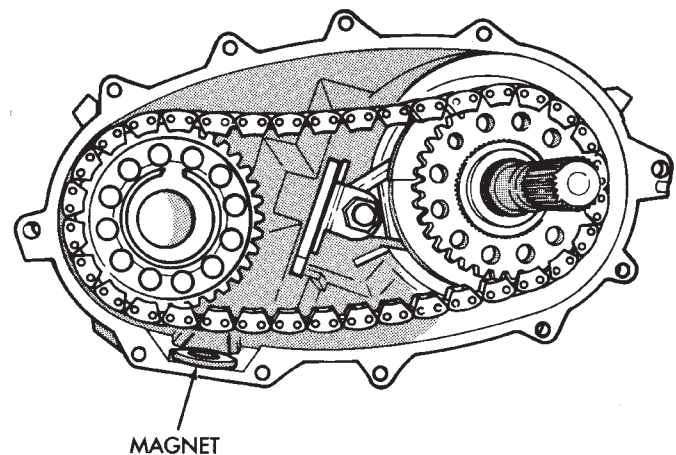


Fig. 80 Installing Case Magnet

(61) Apply 3 mm (1/8 in.) wide bead of Mopar gasket maker, silicone adhesive sealer, or Loctite 518 to seal surface of front case.

(62) 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.

(63) Install and tighten the front case-to-rear case bolts to 41 N·m (30 ft. lbs.) torque. **Be sure to install a washer under each of the bolts used at the case dowel locations.**

(64) Tap rear retainer bearing out of retainer with hammer and brass drift.

(65) Install new bearing in rear retainer with driver tools (Fig. 81).

(66) Apply 3 mm (1/8 in.) wide bead of Mopar gasket maker, silicone adhesive sealer, or Loctite 518 to seal surface of rear retainer.

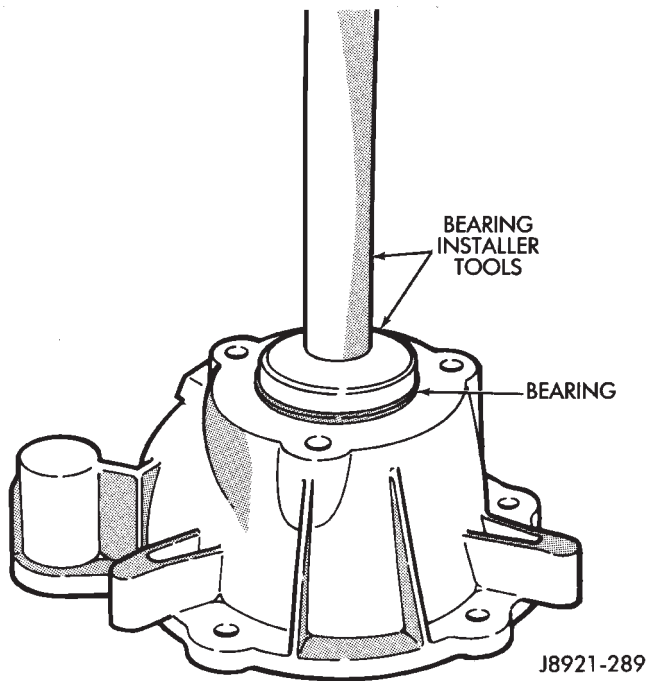


Fig. 81 Installing Rear Bearing In Retainer

(67) Install locating dowel in rear retainer (if removed) and install the retainer on the case. Tighten the retainer bolts to 41 N·m (30 ft. lbs.) torque.

(68) Install new rear bearing snap ring (Fig. 82). Lift mainshaft slightly to seat the snap ring if necessary.

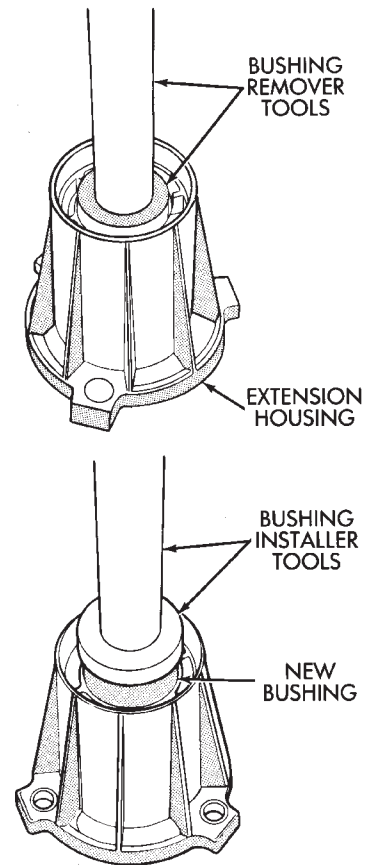


Fig. 83 Replacing Extension Housing Bushing

(71) Install new extension housing oil seal (Fig. 84).

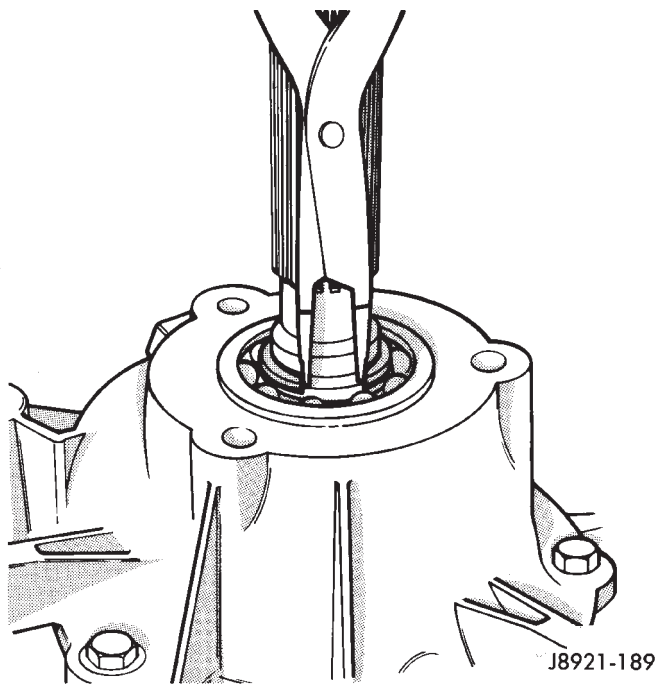


Fig. 82 Installing Rear Bearing Snap Ring

(69) Remove extension housing seal if not removed previously.

(70) Replace extension housing bushing with driver tools (Fig. 83).

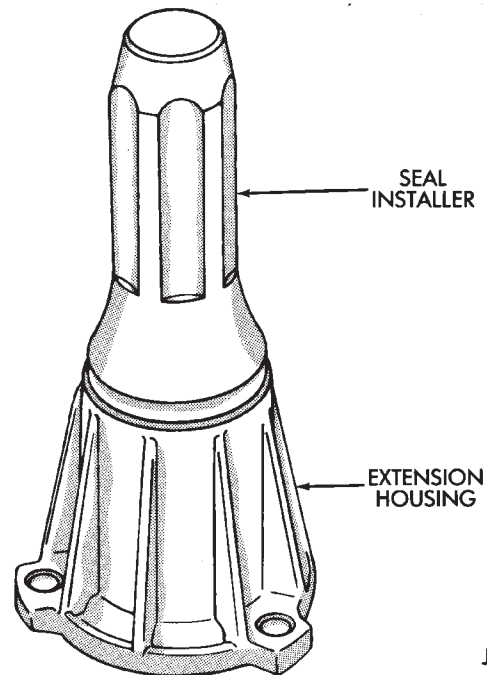


Fig. 84 Replacing Extension Housing Seal

(72) Apply 3 mm (1/8 in.) wide bead of Mopar gasket maker, silicone adhesive sealer, or Loctite 518 to seal surface of extension housing.

(73) Install extension housing on case. Tighten housing bolts to 41 N·m (30 ft. lbs.) torque.

(74) Install front yoke. Secure yoke with new seal washer and nut. Tighten nut to 149 N·m (110 ft. lbs.) torque.

(75) Install new gasket on vacuum switch and install switch in the case. Tighten switch to 27 N·m (20 ft. lbs.) torque.

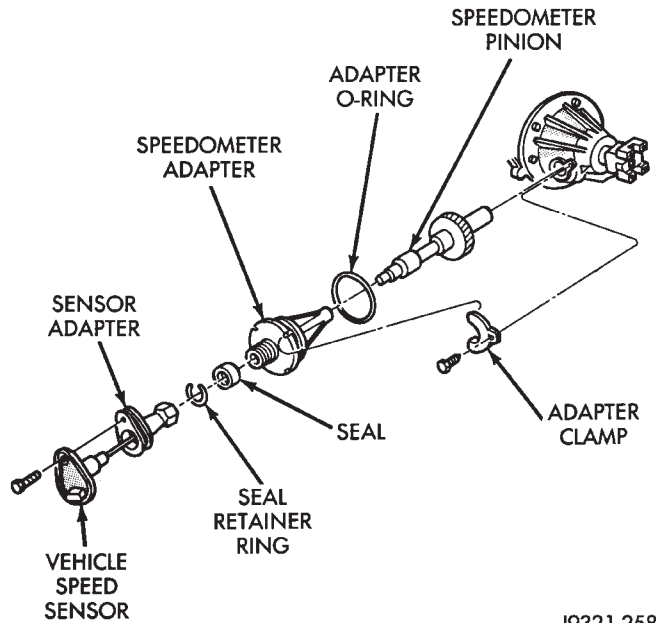
(76) Install speedometer components (Fig. 85).

(77) Install and tighten drain plug to 47 N·m (35 ft. lbs.) torque.

(78) After installing transfer case, refill with recommended transmission fluid.

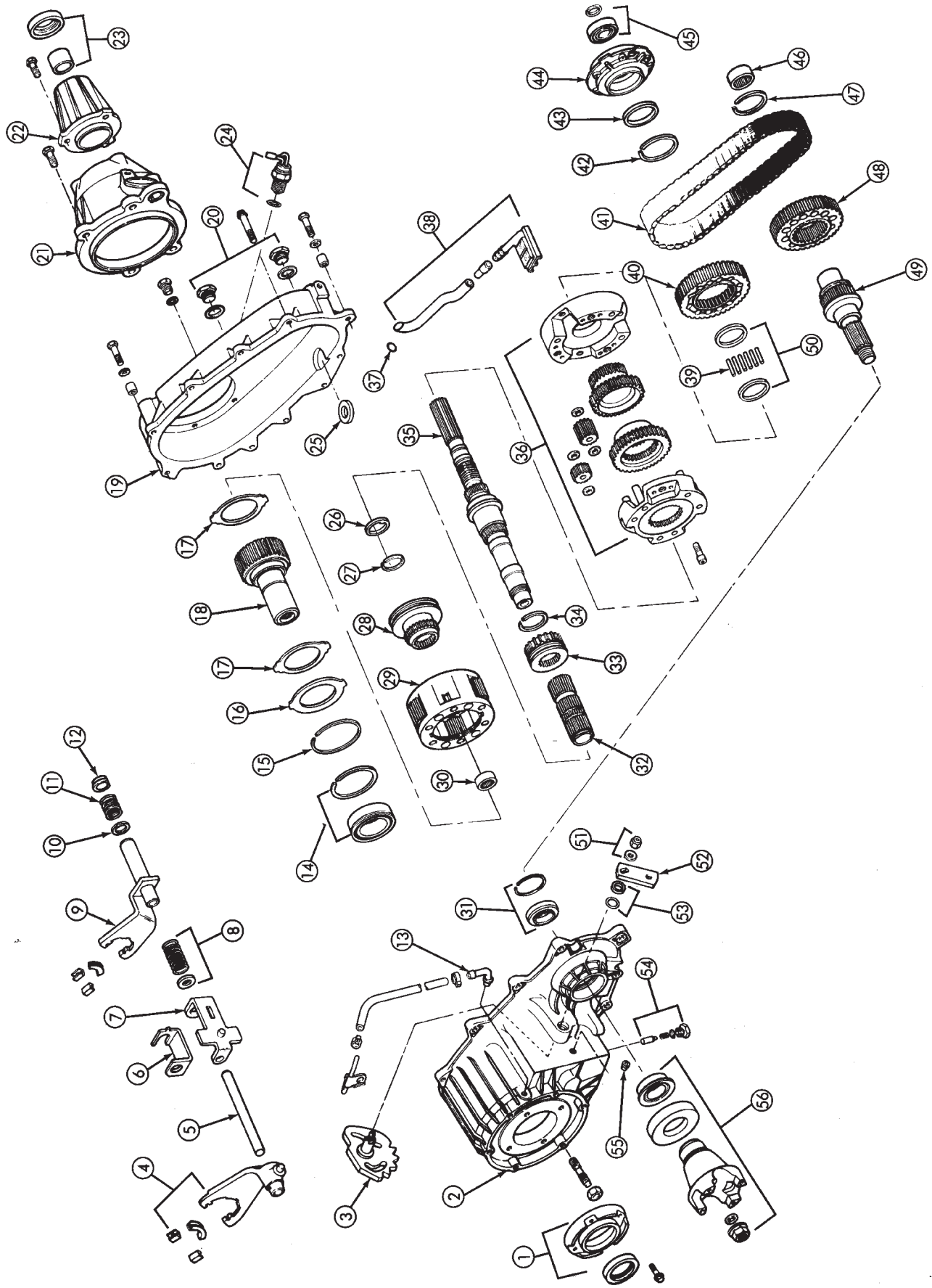
(79) Tighten fill plug to 47 N·m (35 ft. lbs.) torque.

(80) Adjust transfer case shift linkage.



J9321-258

Fig. 85 Speedometer Components



J8921-290

LEGEND FOR NP242 TRANSFER CASE

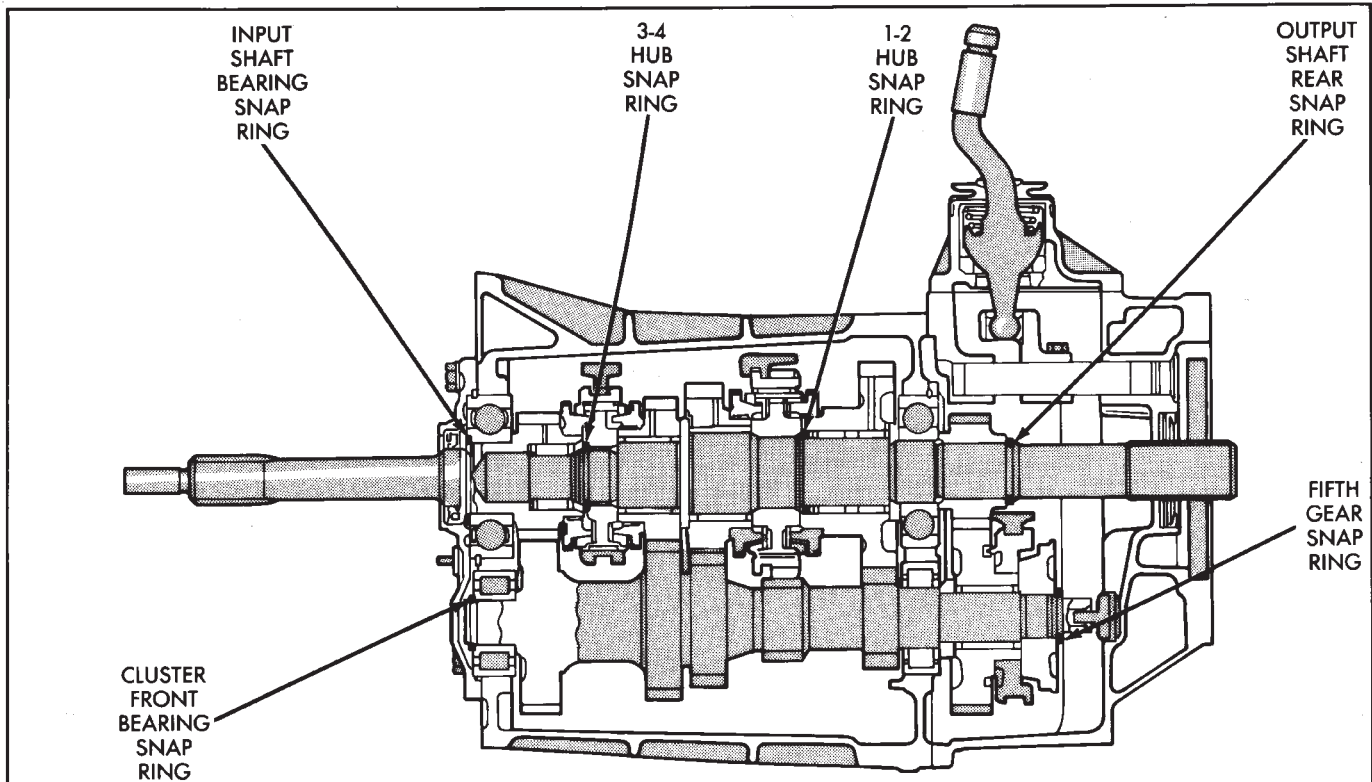
1	FRONT BEARING RETAINER AND SEAL	20	DRAIN/FILL PLUGS	38	OIL PUMP PICKUP TUBE AND SCREEN
2	FRONT CASE	21	REAR BEARING RETAINER	39	MAINSHAFT BEARING ROLLERS
3	SHIFT SECTOR	22	EXTENSION HOUSING	40	DRIVE SPROCKET
4	LOW RANGE FORK AND INSERTS	23	BUSHING AND OIL SEAL	41	DRIVE CHAIN
5	SHIFT RAIL	24	VACUUM SWITCH	42	SNAP RING
6	SHIFT BRACKET	25	MAGNET	43	OIL PUMP SEAL
7	SLIDER BRACKET	26	THRUST RING	44	OIL PUMP
8	BUSHING AND SPRING	27	SNAP RING	45	REAR BEARING AND SNAP RING
9	MODE FORK AND INSERTS	28	SHIFT SLEEVE	46	FRONT OUTPUT SHAFT REAR BEARING
10	BUSHING	29	LOW RANGE GEAR	47	SNAP RING
11	FORK SPRING	30	PILOT BUSHING	48	DRIVEN SPROCKET
12	BUSHING		(INPUT GEAR/MAINSHAFT)	49	FRONT OUTPUT SHAFT
13	VENT TUBE ASSEMBLY	31	FRONT OUTPUT SHAFT FRONT	50	MAINSHAFT BEARING SPACERS
14	INPUT GEAR BEARING AND		BEARING AND SNAP RING	51	SHIFT LEVER WASHER AND NUT
	SNAP RING	32	INTERMEDIATE CLUTCH SHAFT	52	SHIFT LEVER
15	LOW RANGE GEAR SNAP RING	33	SHIFT SLEEVE	53	SECTOR O-RING AND SEAL
16	RETAINER, LOW RANGE GEAR	34	SNAP RING	54	DETENT PIN, SPRING AND PLUG
17	THRUST WASHER, LOW RANGE GEAR	35	MAINSHAFT	55	SEAL PLUG
18	INPUT GEAR	36	DIFFERENTIAL ASSEMBLY	56	FRONT YOKE NUT, SEAL WASHER,
19	REAR CASE	37	OIL PUMP TUBE O-RING		YOKE, SLINGER AND OIL SEAL

TRANSMISSION/TRANSFER CASE SPECIFICATIONS

TORQUE SPECIFICATIONS— AX 15 MANUAL TRANSMISSION

Description	Torque
Access Plugs	19 N•m (14 ft. lbs.)
Adapter Housing Bolts	37 N•m (27 ft. lbs.)
Backup Light Switch	37 N•m (27 ft. lbs.)
Drain and Fill Plugs	37 N•m (27 ft. lbs.)
Front Bearing Retainer Bolts	17 N•m (12 ft. lbs.)
Interlock and Detent Ball Plugs	19 N•m (14 ft. lbs.)
Propeller Shaft Clamp Screws	16-23 N•m (140-200 in. lbs.)
Rear Mount-To-Transmission Bolts	33-60 N•m (24-44 ft. lbs.)
Rear Mount Clevis Bolt/Nut	54-75 N•m (40-55 ft. lbs.)
Rear Mount-To- Crossmember Nuts	33-49 N•m (24-36 ft. lbs.)
Restrictor Pins	19 N•m (14 ft. lbs.)
Reverse Shift Arm Bracket Bolts	18 N•m (13 ft. lbs.)
Shift Arm Set Screw	38 N•m (28 ft. lbs.)
Shift Fork Set Screws	20 N•m (15 ft. lbs.)
Shift Knob Nut	20-34 N•m (15-25 ft. lbs.)
Shift Lever Floor Cover Screws	2-3 N•m (17-30 in. lbs.)
Shift Tower Bolts	18 N•m (13 ft. lbs.)
Transfer Case Mounting Nuts	30-41 N•m (22-30 ft. lbs.)

SELECTIVE SNAP RING CHART—AX 15 MANUAL TRANSMISSION



<table border="1"> <thead> <tr> <th colspan="2"><u>INPUT SHAFT BEARING SNAP RING</u></th> </tr> <tr> <th>I.D. MARK</th> <th>THICKNESS</th> </tr> </thead> <tbody> <tr><td>A</td><td>2.10-2.15 mm</td></tr> <tr><td>B</td><td>2.15-2.20 mm</td></tr> <tr><td>C</td><td>2.20-2.25 mm</td></tr> <tr><td>D</td><td>2.25-2.30 mm</td></tr> <tr><td>E</td><td>2.30-2.35 mm</td></tr> <tr><td>F</td><td>2.35-2.40 mm</td></tr> <tr><td>G</td><td>2.40-2.45 mm</td></tr> </tbody> </table>	<u>INPUT SHAFT BEARING SNAP RING</u>		I.D. MARK	THICKNESS	A	2.10-2.15 mm	B	2.15-2.20 mm	C	2.20-2.25 mm	D	2.25-2.30 mm	E	2.30-2.35 mm	F	2.35-2.40 mm	G	2.40-2.45 mm	<table border="1"> <thead> <tr> <th colspan="2"><u>1-2 HUB SNAP RING</u></th> </tr> <tr> <th>I.D. MARK</th> <th>THICKNESS</th> </tr> </thead> <tbody> <tr><td>B</td><td>2.35-2.40 mm</td></tr> <tr><td>C</td><td>2.40-2.45 mm</td></tr> <tr><td>D</td><td>2.45-2.50 mm</td></tr> <tr><td>E</td><td>2.50-2.55 mm</td></tr> <tr><td>F</td><td>2.55-2.60 mm</td></tr> <tr><td>G</td><td>2.60-2.65 mm</td></tr> </tbody> </table>	<u>1-2 HUB SNAP RING</u>		I.D. MARK	THICKNESS	B	2.35-2.40 mm	C	2.40-2.45 mm	D	2.45-2.50 mm	E	2.50-2.55 mm	F	2.55-2.60 mm	G	2.60-2.65 mm								
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30RH/32RH GENERAL SPECIFICATIONS

TRANSMISSION MODEL	32RH	30RH
Oil Pump Clearances	0.089-0.190 mm (0.0035-0.0075 in.)	0.089-0.190 mm (0.0035-0.0075 in.)
Planetary End Play	0.127-1.22 mm (0.005-0.048 in.)	0.025-1.19 mm (0.001-0.047 in.)
Input Shaft End Play	0.56-2.31 mm (0.002-0.091 in.)	0.050-2.31 mm (0.002-0.091 in.)
Clutch Pack Clearance: Front Clutch – 4 Disc Rear Clutch – 3 Disc Rear Clutch – 4 Disc	1.70-3.40 mm 0.067-0.134 in. 0.81-1.40 mm 0.032-0.055 in.	1.70-3.40 mm (0.067-0.134 in.) 0.635-1.14 mm (0.025-0.045 in.)
Clutch Disc Usage: Front Clutch Rear Clutch	4 4	4 3
Band Adjustments: (Turns backed off from indicated torque) Front Rear Ⓐ Backed off from 72 in. lbs. Ⓑ Backed off from 41 in. lbs.	2 1/4 Ⓐ 4 Ⓑ	2 1/2 Ⓐ 7 Ⓑ
Recommended (and preferred) Fluid (all)	MOPAR ATF Plus, Type 7176 Automatic Transmission Fluid J9421-194	

30RH/32RH SNAP RING/THRUST WASHER/THRUST PLATE SPECIFICATIONS

COMPONENT	TRANSMISSION MODEL	
	32RH	30RH
Front Clutch Thrust Washer (on reaction shaft support hub)	0.061 in.	0.061-0.063 in.
Rear Clutch Thrust Washer (on clutch retainer)	0.061 in.	0.061-0.063 in.
Output Shaft Thrust Plate (on output shaft pilot hub)	0.060-0.063 in.	0.060-0.063 in.
Output Shaft Thrust Washer (in rear clutch hub)	0.052-0.054 in. 0.068-0.070 in. 0.083-0.085 in.	0.052-0.054 in. 0.068-0.070 in. 0.083-0.086 in.
Rear Clutch Pack Snap Ring	0.068 in. 0.060 in. 0.076 in. 0.098 in.	0.06-0.062 in. 0.068-0.070 in. 0.076-0.078 in.
Planetary Geartrain Snap Ring (At front end of output shaft)	0.040-0.044 in. 0.062-0.066 in. 0.082-0.086 in.	0.040-0.044 in. 0.062-0.066 in. 0.082-0.086 in.

J9421-193

30RH/32RH PRESSURE TEST SPECIFICATIONS

Line Pressure	Closed Throttle 1000 rpm	372-414 kPa (54-60 psi) 648 kPa (94 psi)
Front Servo Release	Third Gear Only	No more than 21 kPa (3 psi) lower than line pressure.
Rear Servo Apply	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 and Closed Throttle	Pressure should respond smoothly to changes in mph and return to 0-7 kPa (0-1½ psi) when stopped with transmission in D, 1, 2. Pressure above 7 kPa (1½ psi) at standstill will prevent transmission from downshifting. J9421-191

30RH/32RH TORQUE SPECIFICATIONS

DESCRIPTION	TORQUE
Cooler Line Fittings	18 N•m (13 ft. lbs.)
Converter Bolts:	
9.5 in., 3-lug converter	54 N•m (40 ft. lbs.)
9.5 in., 4-lug converter	74 N•m (55 ft. lbs.)
10.0 in., 4-lug converter	74 N•m (55 ft. lbs.)
Crossmember Bolts/Nuts	68 N•m (50 ft. lbs.)
Driveplate Bolts	75 N•m (55 ft. lbs.)
Extension/Adapter Housing Bolts	43 N•m (32 ft. lbs.)
Front Band Pivot Pin Access Plug	17 N•m (13 ft. lbs.)
Front Band Adjusting Screw Locknut	34 N•m (25 ft. lbs.)
Governor Body-to-Park Gear Bolts	11 N•m (8 ft. lbs.)
Converter Clutch Park/Module Screws	4 N•m (35 in. lbs.)
Neutral Position Switch	34 N•m (25 ft. lbs.)
Oil Filter Screws	4 N•m (35 in. lbs.)
Oil Pan Bolts	17 N•m (13 ft. lbs.)
Oil Pump Bolts	20 N•m (15 ft. lbs.)

DESCRIPTION	TORQUE
Rear Support Bolts	17 N•m (150 in. lbs.)
Pressure Test Port Plugs	14 N•m (10 ft. lbs.)
Propeller Shaft Clamp Bolts	19 N•m (170 in. lbs.)
Reaction Shaft Support Bolts	10 N•m (15 ft. lbs.)
Rear Band Adjusting Screw Locknut	41 N•m (30 ft. lbs.)
Rear Mount Bolts/Nuts	68 N•m (50 ft. lbs.)
Solenoid-to-Transfer Plate Screw	4 N•m (35 in. lbs.)
Speedometer Adapter Clamp Bolt	11 N•m (8 ft. lbs.)
Valve Body Screws	4 N•m (35 in. lbs.)
Valve Body-to-Case Bolts	12 N•m (100 in. lbs.)

J9421-192

AW-4 GENERAL SPECIFICATIONS

Gear Ratios:

First	2.804:1
Second	1.531:1
Third	1.000:1
Fourth (Overdrive)	0.753:1
Reverse	2.393:1

Transmission Fluid Mopar Dexron II E/Mercon

Fluid Level To "Full" mark with fluid hot (normal operating temperature)

Fluid Capacity (all models) 8.0 Liters (8.45 qts.)

Test Specifications

Stall Speed:

In D Range and Reverse 2100–2400 rpm

Line Pressure:

In D at Curb Idle	61–70 psi (421–481 kPa)
In D at WOT	173–209 psi (1196–1442 kPa)
In Reverse at Curb Idle	75–90 psi (519–618 kPa)
In Reverse at WOT	213–263 psi (1471–1814 kPa)

Time Lag Test:

Engagement in D Range	1.2 seconds
Engagement in Reverse	1.5 seconds

Valve Body Solenoid Resistance 11–15 ohms

Transmission Fluid Normal Operating Temperature 50–80°C (122–176°F)

TPS Input Voltage (AU) 5.0 Volts (approx.)

TPS Output Voltage

4-Cylinder	0.2 Volts (approx.)
6-Cylinder	4.2 Volts (approx.)

AW-4 OIL PUMP WEAR LIMITS

Drive Gear

Tip Clearance:

Standard 0.11-0.14 mm (0.0043-0.0055 in.)
 Maximum Allowance 0.3 mm (0.012 in.)

Gear-to-Pump Body

End Clearance:

Standard 0.02-0.05 mm (0.0008-0.0020 in.)
 Maximum Allowance 0.1 mm (0.004 in.)

Driven Gear-to-Pump

Body Clearance:

Standard 0.07-0.15 mm (0.0028-0.0059 in.)
 Maximum Allowance 0.3 mm (0.012 in.)
 J8921-740

AW-4 CLUTCH DISC AND PLATE THICKNESS

Component	Minimum Allowable Thickness
Clutch Disc (all except first-reverse and forward clutch discs)	1.84 mm (0.0724 in.)
6-Cylinder Forward Clutch Disc	1.51 mm (0.0594 in.)
6 Cylinder Direct Clutch Plates: Thin Plate (1) Thick Plates (3)	2.3 mm (0.905 in.) 3.0 mm (0.118 in.)
6-Cylinder Forward Clutch Plate	1.8 mm (0.070 in.)
First-Reverse Brake Disc (all)	1.51 mm (0.0594 in.)

AW-4 BUSHING AND PISTON CLEARANCE

BUSHING INSIDE DIAMETER (MAXIMUM)

Bushing Location	Maximum Allowance Inside Diameter
Extension Housing	38.09 mm (1.4996 in.)
Direct Clutch Drum	53.97 mm (2.1248 in.)
Overdrive Planetary Gear	11.27 mm (.4437 in.)
Overdrive Direct Clutch Drum	27.11 mm (1.0673 in.)
Stator Shaft (Front)	21.58 mm (.8496 in.)
Stator Shaft (Rear)	27.08 mm (1.0661 in.)
Oil Pump Body	38.19 mm (1.5035 in.)
Transmission Case	38.18 mm (1.5031 in.)

PISTON STROKE LENGTH

Piston Location	Specification
Direct Clutch (all)	1.37–1.67 mm (.0539–.0657 in.)
6-Cylinder Overdrive Brake	1.40–1.70 mm (.0551–.0669 in.)
Second Coast Brake (all)	1.5–3.0 mm (.059–.118 in.)
6-Cylinder Forward Clutch	3.55–3.73 (.1397–.1468 in.)
Overdrive Direct Clutch (all)	1.85–2.15 mm (.0728–.0846 in.)

END PLAY AND CLEARANCE

Component	Specification
Output Shaft End Play	.27–.86 mm (.0106–.0339 in.)
6-Cylinder First-Reverse Brake Pack Clearance	.70–1.20 mm (.028–.047 in.)
6-Cylinder Second Brake Pack Clearance	.62–1.98 mm (.024–.078 in.)

AW-4 RETAINER AND PISTON SPECIFICATIONS

OVERDRIVE BRAKE RETAINER SELECTION

Retainer No.	Thickness	Retainer No.	Thickness
26	3.3 mm (.130 in.)	11	3.8 mm (.150 in.)
25	3.5 mm (.138 in.)	23	3.9 mm (.154 in.)
12	3.6 mm (.142 in.)	Not Marked	4.0 mm (.157 in.)
24	3.7 mm (.146 in.)	—	—

DIRECT CLUTCH RETAINER SELECTION

Retainer No.	Thickness	Retainer No.	Thickness
33	3.0 mm (.118 in.)	29	3.4 mm (.134 in.)
32	3.1 mm (.122 in.)	28	3.5 mm (.138 in.)
31	3.2 mm (.126 in.)	27	3.6 mm (.142 in.)
30	3.3 mm (.130 in.)	34	3.7 mm (.146 in.)

OVERDRIVE CLUTCH RETAINER SELECTION

Retainer No.	Thickness	Retainer No.	Thickness
16	3.6 mm (.142 in.)	19	3.3 mm (.130 in.)
17	3.5 mm (.138 in.)	20	3.2 mm (.126 in.)
18	3.4 mm (.134 in.)	21	3.1 mm (.122 in.)

SECOND COAST BRAKE PISTON ROD SELECTION

Rod	Rod Length
No. 1	71.4 mm (2.811 in.)
No. 2	72.9 mm (2.870 in.)

FORWARD CLUTCH RETAINER SELECTION

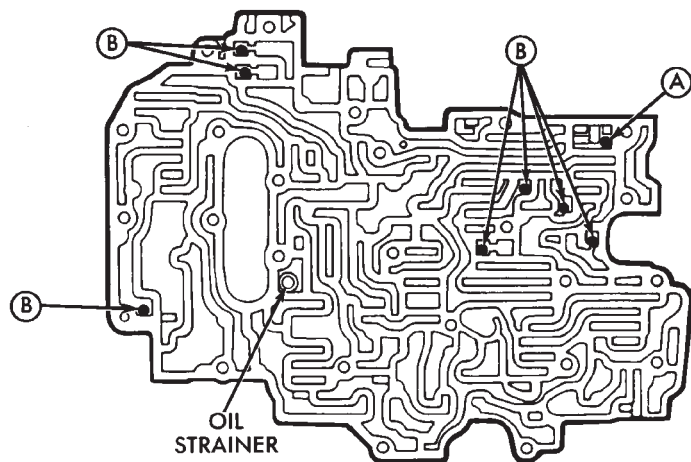
Retainer No.	Thickness	Retainer No.	Thickness
42	4.0 mm (.157 in.)	61	3.0 mm (.118 in.)
44	3.8 mm (.149 in.)	62	3.6 mm (.142 in.)
45	3.4 mm (.134 in.)	63	4.2 mm (.165 in.)
60	3.2 mm (.126 in.)	64	4.4 mm (.173 in.)

FIRST-REVERSE BRAKE CLEARANCE SELECTION

Retainer No.	Thickness	Retainer No.	Thickness
50	5.0 mm (.197 in.)	53	4.4 mm (.173 in.)
51	4.8 mm (.189 in.)	54	4.2 mm (.165 in.)
52	4.6 mm (.181 in.)	55	4.0 mm (.157 in.)

AW-4 VALVE BODY CHECK BALL DIMENSIONS

Check Ball	Diameter
(A) Rubber Ball	6.35 mm (0.250 in.)
(B) Rubber Ball	5.535 mm (.218 in.)



J9121-405

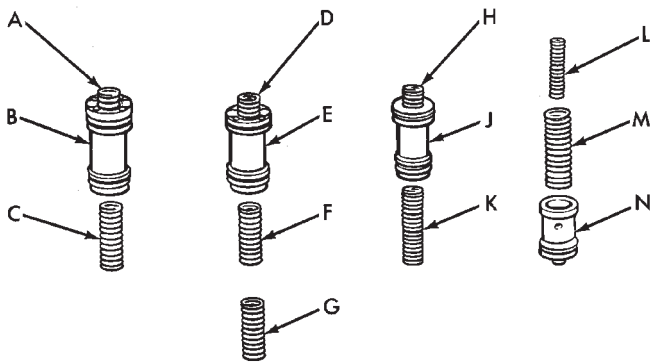
AW-4 CLUTCH AND BRAKE PACK REQUIREMENTS

Component	Discs Required	Plates Required	Retainers Required
6-Cylinder Overdrive Brake	4	3	2
6-Cylinder Second Brake	5	5	1
6-Cylinder Overdrive Direct Clutch	2	2	1
6-Cylinder Direct Clutch	4	4	1
6-Cylinder Forward Clutch	6	6	1
6-Cylinder First-Reverse Brake	7	7	1

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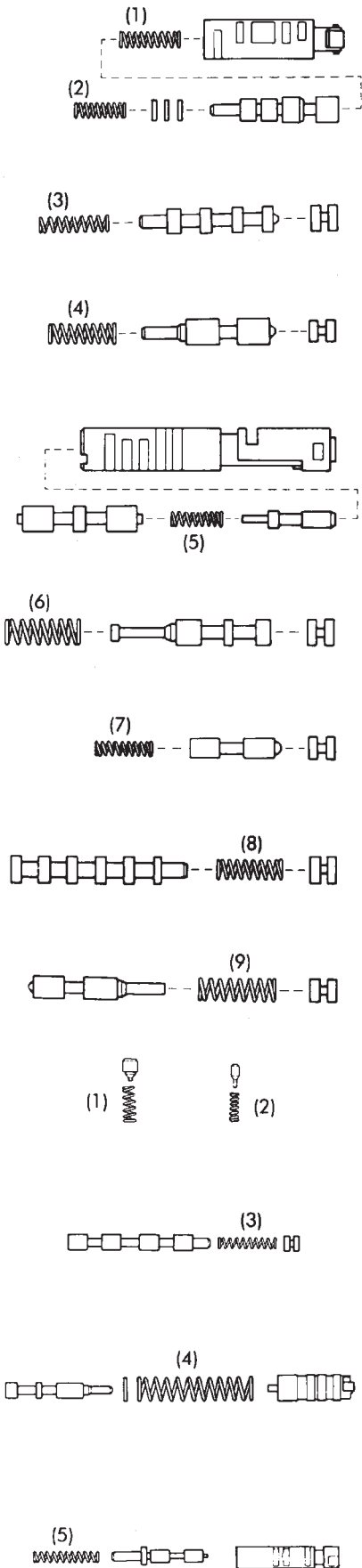
AW-4 ACCUMULATOR COMPONENT IDENTIFICATION

	Component	Approximate Outside Diameter
SECOND BRAKE ACCUMULATOR	SPRING A	14.17 mm (.558 in.)
	PISTON B	36.9 mm (1.453 in.)
	SPRING C	19.91 mm (.784 in.)
DIRECT CLUTCH ACCUMULATOR	SPRING D	12.07 mm (.475 in.)
	PISTON E	36.9 mm (1.453 in.)
	SPRING F	20.19 mm (.795 in.)
	SPRING G	14.81 mm (.583 in.)
OVERDRIVE BRAKE ACCUMULATOR	SPRING H	14.10 mm (.555 in.)
	PISTON J	31.9 mm (1.256 in.)
	SPRING K	19.99 mm (.785 in.)
OVERDRIVE CLUTCH ACCUMULATOR	SPRING L	14.0 mm (0.551 in.)
	SPRING M	20.3 mm (0.799 in.)
	PISTON N	29.9 mm (1.177 in.)



J9121-407

AW-4 VALVE AND SPRING IDENTIFICATION



Spring	Free Length
(1) Downshift Plug	27.3 mm (1.074 in.)
(2) Throttle Valve	20.6 mm (.811 in.)
(3) 3-4 Shift Valve	30.8 mm (1.212 in.)
(4) Second Coast Modulator Valve	25.3 mm (.996 in.)
(5) Lockup Relay Valve	21.4 mm (.843 in.)
(6) Secondary Regulator Valve	30.9 mm (1.217 in.)
(7) Cut-Back Valve	21.8 mm (.858 in.)
(8) 2-3 Shift Valve	30.8 mm (1.212 in.)
(9) Low Coast Modulator Valve	27.8 mm (1.094 in.)

Spring	Spring Length
(1) Check Valve	20.2 mm (.797 in.)
(2) Pressure Relief Valve	11.2 mm (.441 in.)
(3) 1-2 Shift Valve	30.8 mm (1.213 in.)
(4) Primary Regulator Valve	62.3 mm (2.453 in.)
(5) Accumulator Control Valve	29.8 mm (1.173 in.)

AW-4 TORQUE SPECIFICATIONS

Description	Torque	Description	Torque
Converter Housing Bolts		Rear Mount-To-Transmission	
10 mm	32-36 N•m (23-27 ft. lbs.)	Bolts	60-81 N•m (44-66 ft. lbs.)
12 mm	55-59 N•m (40-43 ft. lbs.)	Rear Mount-To-Clevis Bracket	
Cooler Line Retaining		Bolt/Nut	54-75 N•m (40-55 ft. lbs.)
Clip Nuts	2-4 N•m (18-35 in. lbs.)	Rear Mount Clevis Bracket-To-	
Cooler Line Bracket		Crossmember Nuts	33-49 N•m (24-36 ft. lbs.)
Nuts	5-11 N•m (48-96 in. lbs.)	Shift Cable Bracket Screws	
Cooler Line Fitting Nuts		At Transmission	25-39 N•m (221-345 in. lbs.)
(at auto. trans. fittings)	18-23 N•m (160-200 in. lbs.)	Shift Lever Mounting	
Detent Spring Bolt	9-11 N•m (80-96 in. lbs.)	Cover Screws	1-2 N•m (9-20 in. lbs.)
Dust Cover Nuts/Bolts	18-23 N•m (159-203 in. lbs.)	Shift Lever Housing Nuts	16-26 N•m (141-230 in. lbs.)
Extension Housing Bolts	32-36 N•m (23-27 ft. lbs.)	Solenoid Harness Bolt	6-8 N•m (57-75 in. lbs.)
Fill Tube Bracket Bolt	50-64 N•m (37-47 ft. lbs.)	Speedometer Adapter	
Neutral Switch		Clamp Screw	10-12 N•m (90-110 in. lbs.)
Bolt	12-14 N•m (8-10 ft. lbs.)	Speed Sensor Coupling Nut	14-20 N•m (125-175 in. lbs.)
Nut	6-8 N•m (53-70 in. lbs.)	Throttle Cable Engine	
OD Support Bolt (to case)	23-27 N•m (18-20 ft. lbs.)	Bracket Screws	7-11 N•m (63-94 in. lbs.)
Oil Pan Bolts	6-8 N•m (53-70 in. lbs.)	Throttle Cable Retaining	
Oil Pan Drain Plug	19-21 N•m (14-16 ft. lbs.)	Screw (at transmission)	8-10 N•m (70-98 in. lbs.)
Oil Pump Bolt		Transfer Case Mounting Nuts	30-41 N•m (22-30 ft. lbs.)
(to case)	21-23 N•m (16-18 ft. lbs.)	Transmission Shift Lever Nut	15-17 N•m (134-154 in. lbs.)
Oil Pump Bolt		Transmission-To-Engine	
(to stator shaft)	9-11 N•m (80-96 in. lbs.)	Block Bolts	50-64 N•m (37-47 ft. lbs.)
Oil Screen Bolt	9-11 N•m (80-96 in. lbs.)	Valve Body Bolts (to case)	9-11 N•m (80-96 in. lbs.)
Park Pawl Bracket	9-11 N•m (80-96 in. lbs.)	Valve Body Bolts (to valve body)	6-7 N•m (54-58 in. lbs.)
Propeller Shaft Clamp			
Screws	16-23 N•m (140-200 in. lbs.)		

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NP231/NP242 TORQUE SPECIFICATIONS

Description	Torque
Detent Plug	16-24 N•m (12-18 ft. lbs.)
Differential Case Bolt	17-27 N•m (150-240 in. lbs.)
Drain/Fill Plugs	40-54 N•m (30-40 ft. lbs.)
Extension Housing Bolt	35-46 N•m (26-34 ft. lbs.)
Front Bearing Retainer Bolt	16-27 N•m (12-20 ft. lbs.)
Front Case-To-Rear	
Case Bolt	35-46 N•m (26-34 ft. lbs.)
Front Yoke Nut	122-176 N•m (90-130 ft. lbs.)
Oil Pump Screw	1.4-1.8 N•m (12-15 in. lbs.)
Range Lever Nut	27-34 N•m (20-25 ft. lbs.)
Rear Retainer Bolt	35-46 N•m (26-34 ft. lbs.)
Transfer Case Mounting Nuts	35-47 N•m (26-35 ft. lbs.)
U-Joint Clamp Bolts	19 N•m (170 in. lbs.)
Vacuum Switch	20-34 N•m (15-25 ft. lbs.)

J9321-95

