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# TORQUEFLITE

## A-404, A-413 A-415, A-470

### GENERAL INFORMATION

These transaxles combine a torque converter, fully automatic 3 speed transmission, final drive gearing and differential into a compact front-wheel-drive system. The unit is basically a "Metric" design.

The identification markings and usage of the transaxle are charted in Diagnosis and Tests.

**Transaxle operation requirements are different for each vehicle and engine combination and some internal parts will be different to provide for this. Therefore, when replacing parts, refer to the seven digit part number stamped on rear of the transmission oil pan flange.**

Within this transaxle, there are 3 primary areas:

- (1) Main centerline plus valve body (similar to conventional TorqueFlite).
- (2) Transfer shaft centerline (includes governor and parking sprag).
- (3) Differential centerline.

Center distances between the main rotating parts in these 3 areas are held precisely to maintain a low noise level through smooth accurate mesh of the gears connecting the centerlines.

The torque converter, transaxle area, and differential are housed in an integral aluminum die casting. **NOTE: The differential oil sump is separate from the "transaxle sump."**

**Special emphasis is placed on filling and maintaining the differential oil level—to 1/8 inch to 3/8 inch below the fill hole in the differential cover.**

The torque converter is attached to the crankshaft through a flexible driving plate. Cooling of the converter is accomplished by circulating the transaxle fluid through an oil-to-water type cooler, located in the radiator side tank. The torque converter assembly is a sealed unit which cannot be disassembled.

The transaxle fluid is filtered by an internal "Dacron Type" filter attached to the lower side of the valve body assembly.

Engine torque is transmitted to the torque converter then, through the input shaft to the multiple disc clutches in the transaxle. The power flow depends on the application of the clutches and bands. Refer to "Elements in Use Chart" in Diagnosis and Tests section.

The transaxle consists of two multiple disc clutches, an overrunning clutch, two servos, a hydraulic accumulator, two bands, and two planetary gear sets to provide three forward ratios and a reverse ratio. The common sun gear of the planetary gear sets is connected to the front clutch by a driving shell which is splined to the sun gear and to the front clutch retainer. The hydraulic system consists of an oil pump, and a single valve body which contains all of the valves except the governor valves.

The transaxle sump is vented through the "dipstick". The differential sump is vented by a spring loaded cap on the "extension housing."

Output torque from the main centerline is delivered through helical gears to the "transfer shaft." This gear set is a factor of the final drive (axle) ratio. The shaft also carries the governor and parking sprag.

An integral helical gear on the transfer shaft drives the differential ring gear. The final drive gearing is completed with either of two gear sets producing overall ratios of:

- |      |                                    |
|------|------------------------------------|
| 3.48 | 1.7L engine models                 |
| 2.78 | 2.2L and 2.6L engine models        |
| 3.22 | 2.2L (high altitude) engine models |

**Safety goggles should be worn at all times when working on these transaxles.**

### HYDRAULIC CONTROL SYSTEM

The hydraulic control circuits (Pages 21-74 through 21-82) show the position of the various valves with color coded passages to indicate those under hydraulic pressure for all operations of the transaxle.



## TRANSAXLE

### ELEMENTS IN USE AT EACH POSITION OF THE SELECTOR LEVER

Lever Position	Gear Ratio	Start Safety	Parking Sprag	Clutches			Bands (Kickdown) (Low-Rev.)	
				Front	Rear	Over-running	Front	Rear
P—PARK		X	X					
R—REVERSE	2.10			X				X
N—NEUTRAL		X						
D—DRIVE								
First	2.69				X	X		
Second	1.55				X		X	
Direct	1.00			X	X			
2—SECOND								
First	2.69				X	X		
Second	1.55				X		X	
1—LOW (First)	2.69				X			X

By observing that the rear clutch is applied in both the "D" first gear and "1" first gear positions, but that the overrunning clutch is applied in "D" first and the low and reverse band is applied in "1" first, if the transaxle slips in "D" range first gear but does not slip in "1" first gear, the overrunning clutch must be the unit that is slipping. Similarly, if the transaxle slips in any two forward gears, the rear clutch is the slipping unit.

Using the same procedure, the rear clutch and front clutch are applied in "D" third gear. If the transaxle slips in third gear, either the front clutch or the rear clutch is slipping. By selecting another gear which does not use one of those units, the unit which is slipping can be determined. If the transaxle also slips in reverse, the front clutch is slipping. If the transaxle does not slip in reverse, the rear clutch is slipping.

This process of elimination can be used to detect any unit which slips and to confirm proper operation of good units. However, although road test analysis can usually diagnose slipping units, the actual cause of the malfunction usually cannot be decided. Practically any condition can be caused by leaking hydraulic circuits or sticking valves.

Therefore, unless the condition is obvious, like no drive in "D" range first gear only, the transaxle should never be disassembled until hydraulic pressure tests have been performed.

### HYDRAULIC PRESSURE TESTS

Pressure testing is a very important step in the diagnostic procedure. These tests usually reveal the cause of most transaxle problems.

Before performing pressure tests, be certain that fluid level and condition, and control cable adjust-

### AUTOMATIC SHIFT SPEEDS AND GOVERNOR PRESSURE CHART (APPROXIMATE MILES AND KILOMETERS PER HOUR)

Vehicle	M and Z		M, Z, P, D, C, V		M, Z, P, D, C, V High Altitude	
Engine (Liter) .....	1.7L.		2.2 and 2.6L.		2.2L.	
Overall Top Gear Ratio .....	3.48		2.78		3.22	
Throttle Minimum	<b>MPH</b>	<b>km/hr</b>	<b>MPH</b>	<b>km/hr</b>	<b>MPH</b>	<b>km/hr</b>
1-2 Upshift .....	11-15	18-24	10-14	16-23	11-15	18-24
2-3 Upshift .....	16-21	26-34	15-20	24-32	16-22	26-35
3-1 Downshift .....	11-14	18-23	10-13	16-21	11-15	18-24
Throttle Wide Open						
1-2 Upshift .....	33-39	53-63	37-44	60-71	33-38	53-61
2-3 Upshift .....	55-64	89-103	61-71	98-114	62-73	100-117
Kickdown Limit						
3-2 WOT Downshift .....	51-60	82-97	57-66	92-106	56-66	90-106
3-2 Part Throttle Downshift .....	28-32	45-51	26-30	42-48	29-33	47-53
3-1 WOT Downshift .....	30-35	48-56	32-38	51-61	31-36	50-58
Governor Pressure*						
15 psi .....	23-26	37-42	22-24	35-39	24-27	39-43
50 psi .....	54-61	87-98	61-68	98-109	61-68	98-109

\*Governor pressure should be from zero to 3 psi at stand still or downshift may not occur.

NOTE: Changes in tire size will cause shift points to occur at corresponding higher or lower vehicle speeds.

Km/hr. = Kilometers per hour.



High oil level can result in oil leakage out the vent located in the dipstick. If the fluid level is high, adjust to proper level.

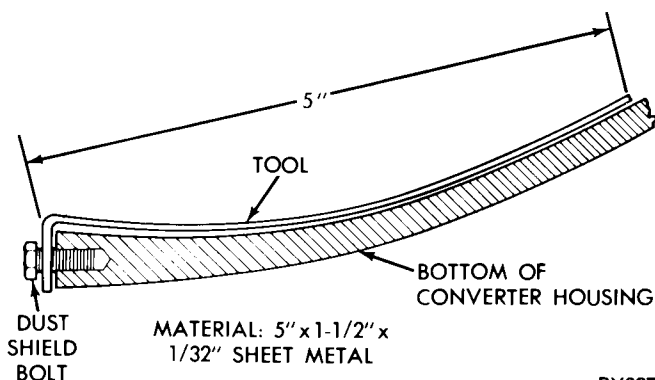
After performing this operation, inspect for leakage. If a leak persists, perform the following operation on the vehicle to determine if it is the converter or transaxle that is leaking.

**Leakage Test Probe**

- (1) Remove converter housing dust shield.
- (2) Clean the inside of converter housing (lower area) as dry as possible. A solvent spray followed by compressed air drying is preferable.
- (3) Fabricate and fasten test probe (Fig. 7) securely to convenient dust shield bolt hole. Make certain converter is cleared by test probe. Tool must be clean and dry.
- (4) Run engine at approximately 2,500 rpm with transmission in neutral, for about 2 minutes. Transaxle must be at operating temperature.
- (5) Stop engine and carefully remove tool.
- (6) If upper surface of test probe is dry, there is no converter leak. A path of fluid across probe indicates a converter leak. Oil leaking under the probe is coming from the transaxle converter area.
- (7) Remove transaxle and torque converter assembly from vehicle for further investigation. The fluid should be drained from the transaxle. Install oil pan (with R.T.V. Sealant) at specified torque.

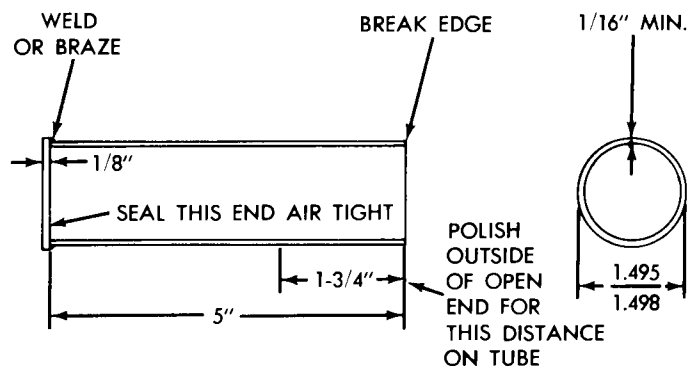
Possible sources of transaxle converter area fluid leakage are:

- (1) Converter Hub Seal.
  - (a) Seal lip cut, check converter hub finish.
  - (b) Bushing moved and/or worn.
  - (c) Oil return hole in pump housing plugged or omitted.
  - (d) Seal worn out (high mileage vehicles).
- (2) Fluid leakage at the outside diameter from pump housing "O" ring seal.
- (3) Fluid leakage at the front pump to case bolts.



RY287

**Fig. 7. Leak Locating Test Probe Tool**



MATERIAL: 1-1/2 INCH O.D. THIN WALLED STEEL TUBING AND 1/8 INCH STEEL DISC

PY305

**Fig. 8. Converter Hub Seal Cup**

- (4) Fluid leakage due to case or front pump housing porosity.

**Torque Converter Leakage**

Possible sources of converter leakage are:

- (a) Torque converter weld leaks at the outside diameter (peripheral) weld.
- (b) Torque converter hub weld.

**Hub weld is inside and not visible. Do not attempt to repair. Replace torque converter.**

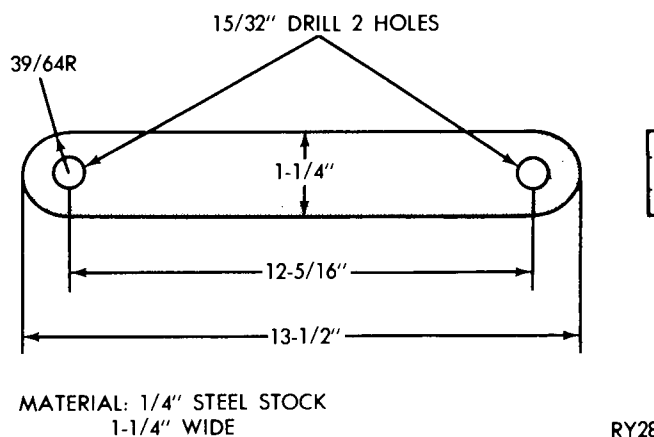
**Air Pressure Test of Transaxle**

Fabricate equipment needed for test as shown in (Figs. 8 and 9).

The transaxle should be prepared for pressure test as follows after removal of the torque converter:

- (1) Install a dipstick bore plug and plug oil cooler line fitting (lower fitting).
- (2) With rotary motion, install converter hub seal cup over input shaft, and through the converter hub seal until the cup bottoms against the pump gear lugs. Secure with cup retainer strap (Fig. 9) using converter housing to engine block retaining bolt for tapped hole.

**NOTE:** Use lower starter hole and front dowel hole.

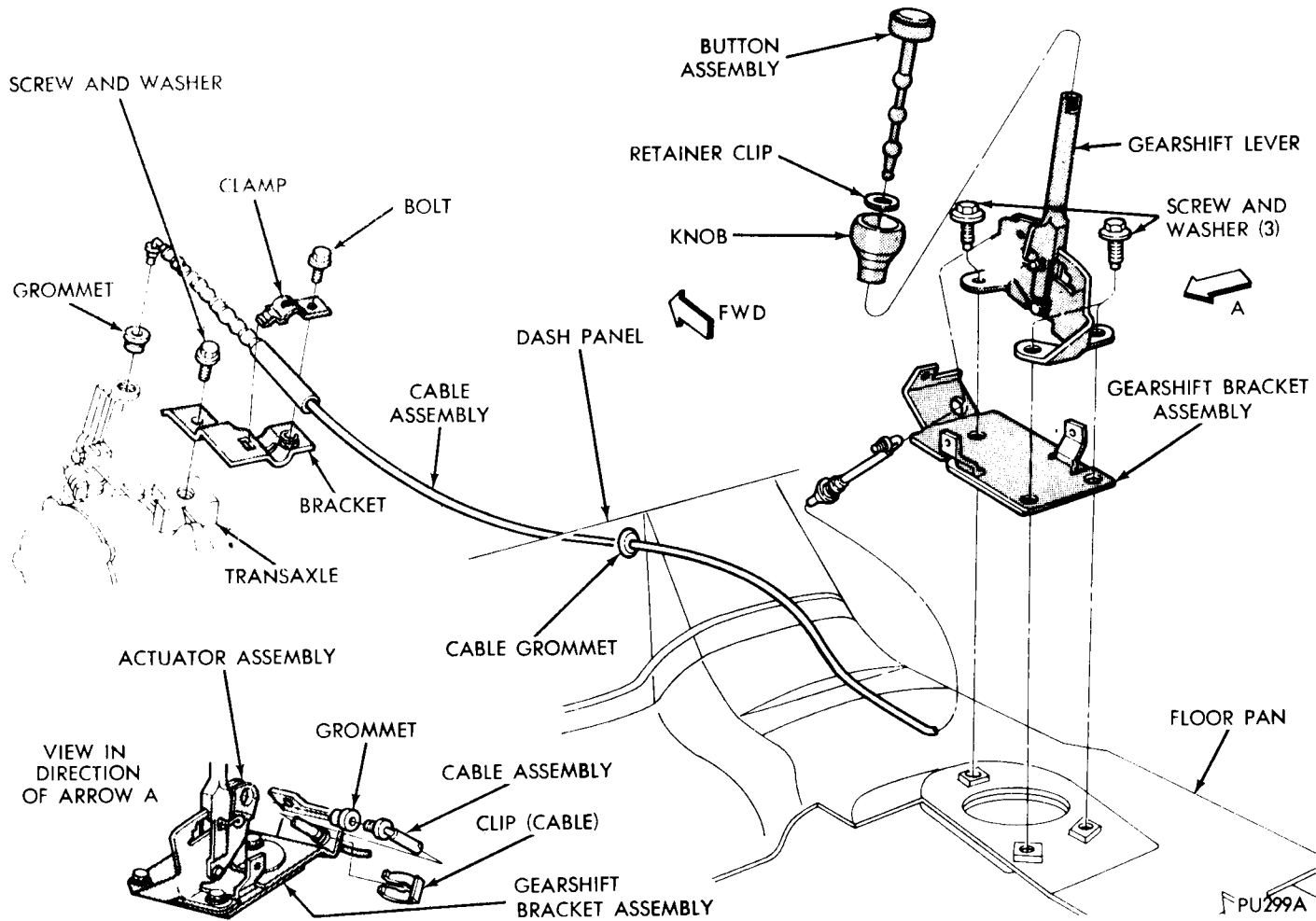


RY288

**Fig. 9. Hub Seal Cup Retaining Strap**



## TRANSAXLE



**Fig. 2. Gearshift Linkage**

clockwise (action similar to a light bulb socket). Pull knob straight up to remove from gearshift lever. Proceed as outlined in console removal, "Group 23".

(7) After console is in place, install shift knob and button by reversing the procedure in step (6).

### THROTTLE CABLE ADJUSTMENT (Fig. 3)

With engine at operating temperature and carburetor off fast idle cam, adjust idle speed of engine using a tachometer. Refer to "Fuel System" Group 14 for idle speed Specifications and carburetor cable adjustment.

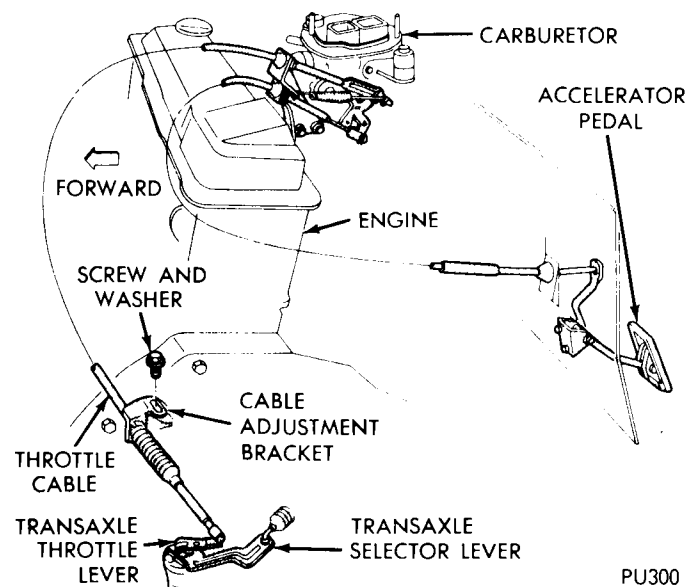
#### **Adjustment Procedure**

(1) Perform transaxle throttle cable adjustment while engine is at normal operating temperature, otherwise make sure carburetor is not on fast idle cam by disconnecting choke.

(2) Loosen adjustment bracket lock screw.

(3) To insure proper adjustment, bracket must be free to slide on its slot. If necessary, disassemble and clean or repair bracket and case boss sliding surface to assure free action.

(4) Hold throttle lever firmly rearward against its internal stop and tighten the adjusting bracket lock screw to 12 N·m (105 in. lbs.).



**Fig. 3. Throttle Control (Typical)**

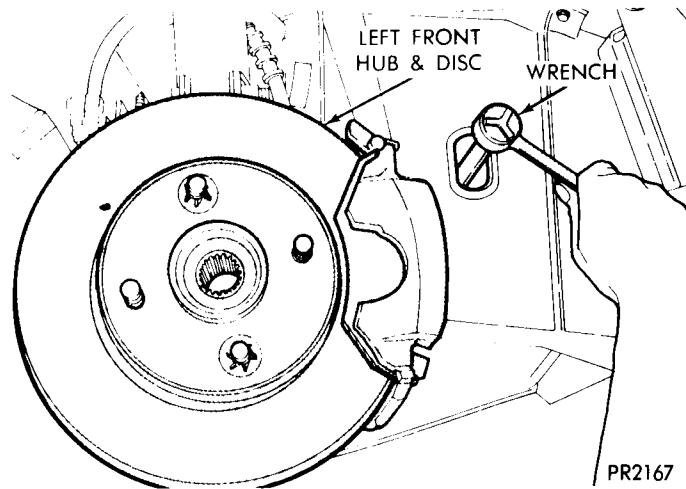


Fig. 16. Remove or Install Access Plug in right Splash Shield to Rotate Engine Crankshaft

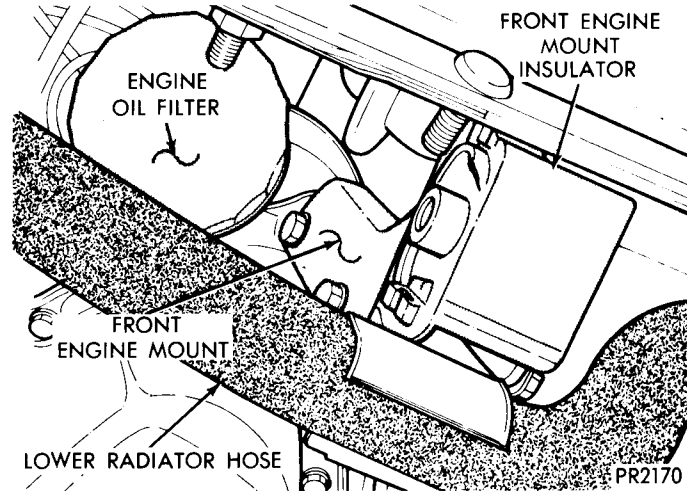


Fig. 19. Remove or Install Front Mount Insulator Through-Bolt and Bell Housing Bolts

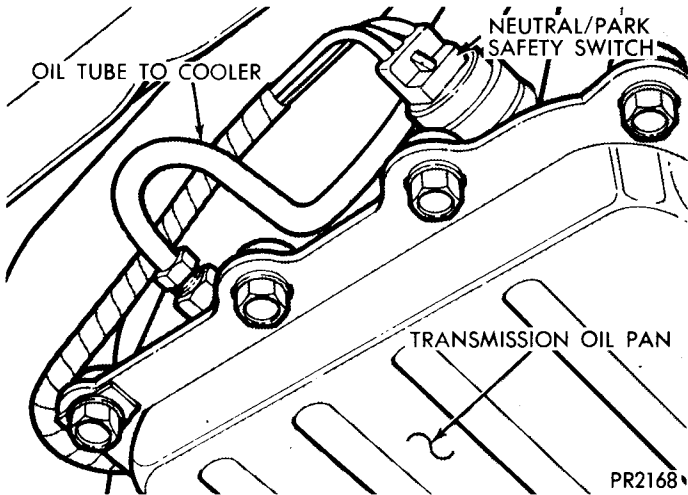


Fig. 17. Remove or Install Lower Cooler Tube and Wire to Neutral/Park Safety Switch

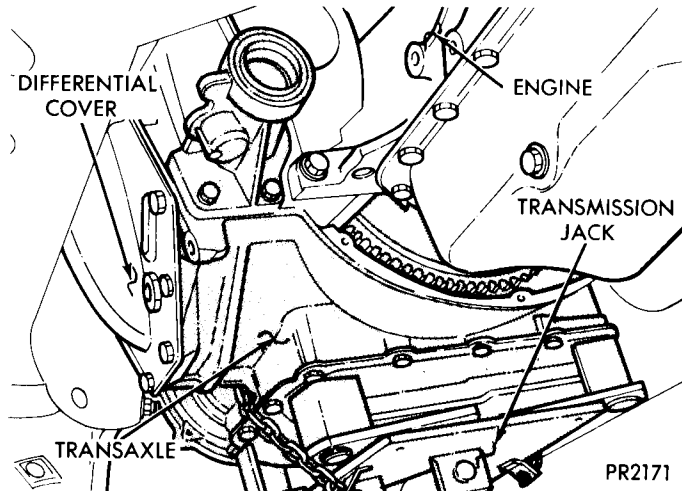


Fig. 20. Position Transmission Jack under Transaxle

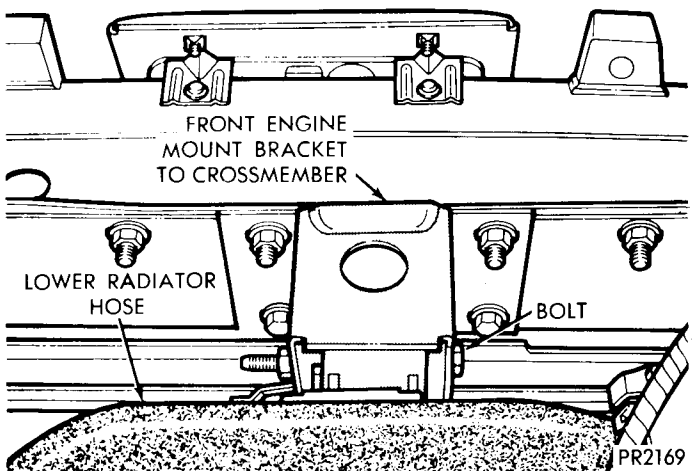


Fig. 18. Remove or Install Engine Mount Bracket from Front Crossmember

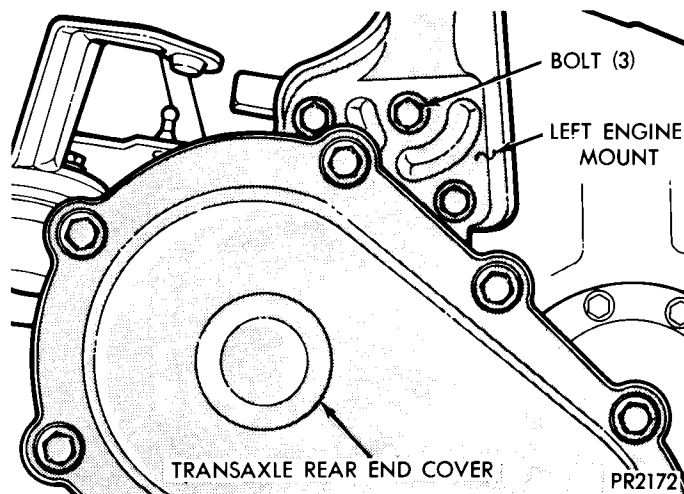
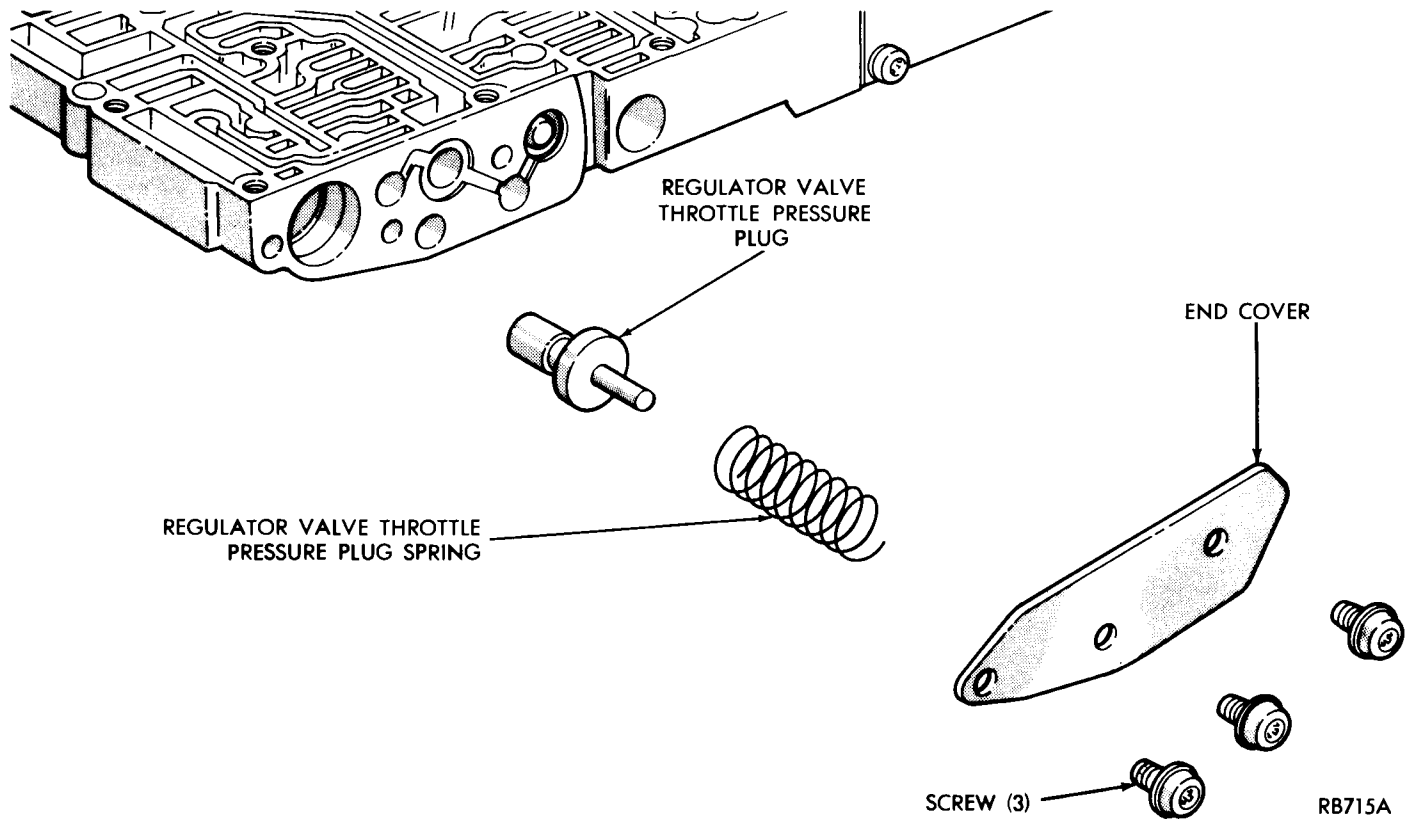


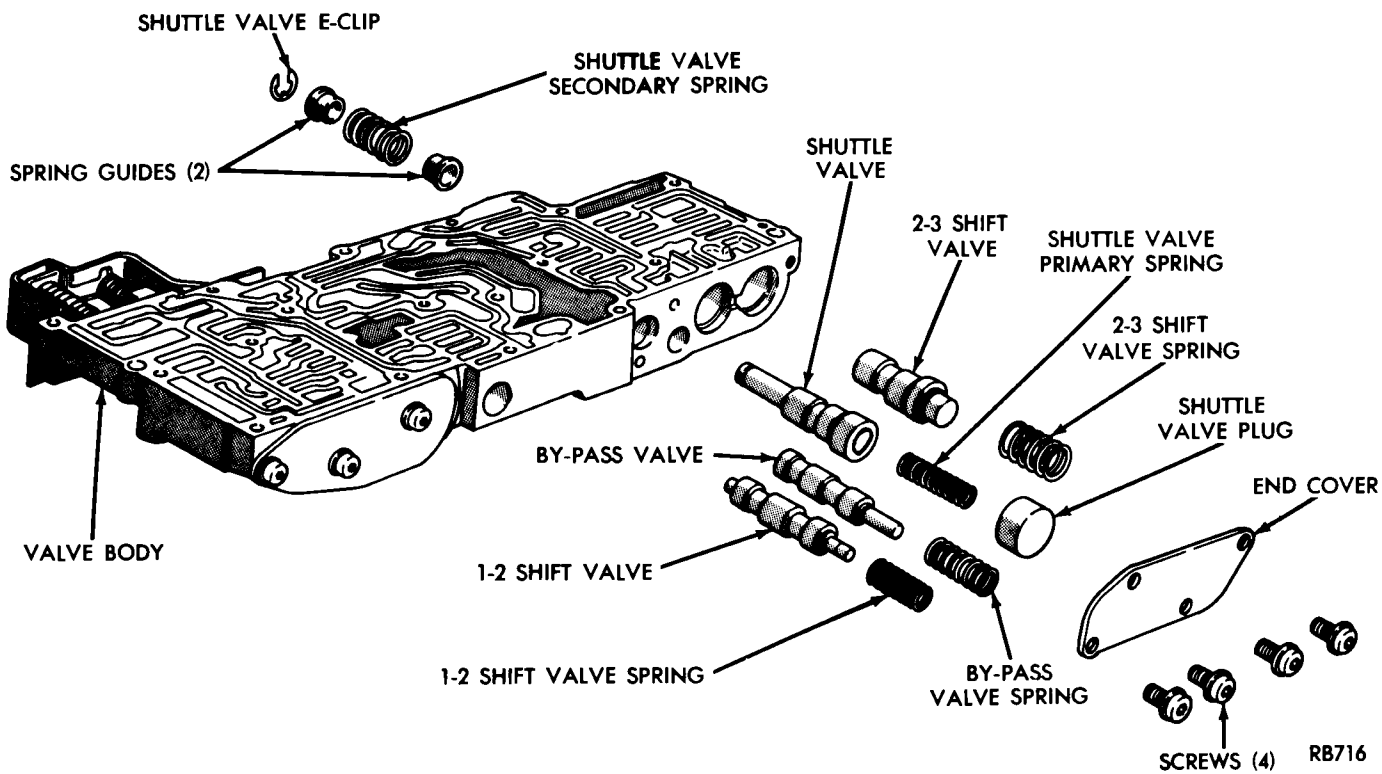
Fig. 21. Remove or Install Engine Left Mount



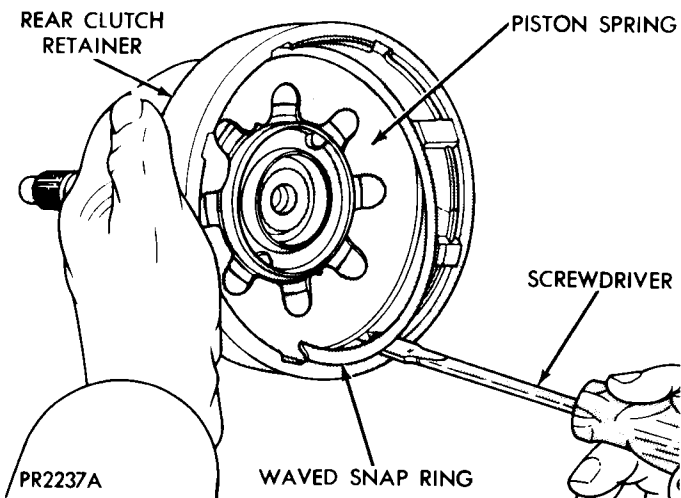
# TRANSAXLE



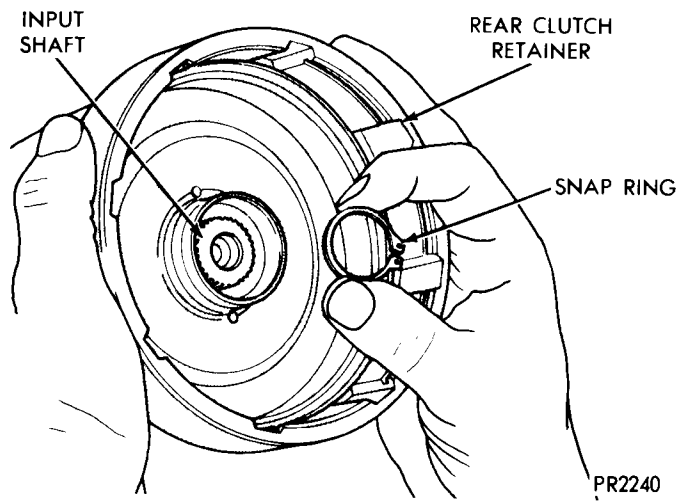
**Fig. 15. Pressure Regulator Valve Plugs**



**Fig. 16. Shift Valves and Shuttle Valve**

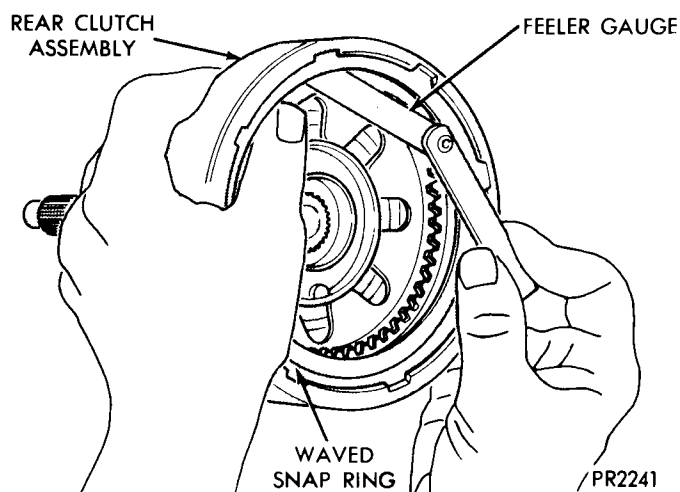


**Fig. 3. Remove or Install Piston Spring Waved Snap Ring**



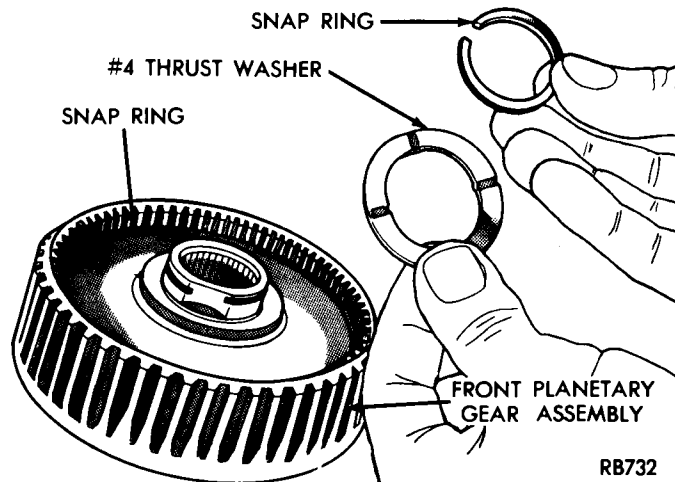
**Fig. 6. Input Shaft Snap Ring—Removed**

Press out input shaft, if required.  
To reassemble, reverse the above procedure.

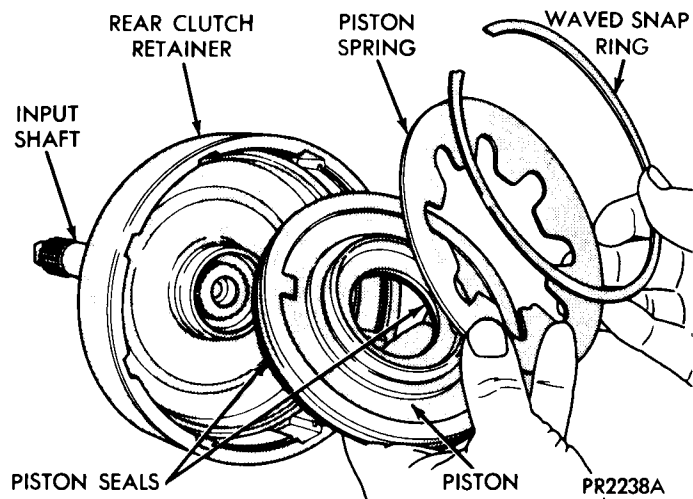


**Fig. 7. Measuring Rear Clutch Plate Clearance**

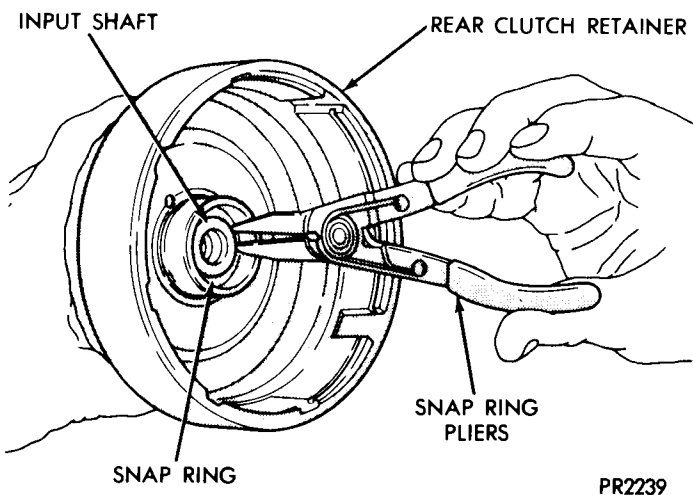
**FRONT PLANETARY & ANNULUS GEAR**



**Fig. 1. Remove or Install Front Planetary Gear Snap Ring and No. 4 Thrust Washer**



**Fig. 4. Remove or Install Rear Clutch Piston and Piston Spring**



**Fig. 5. Remove or Install Input Shaft Snap Ring**



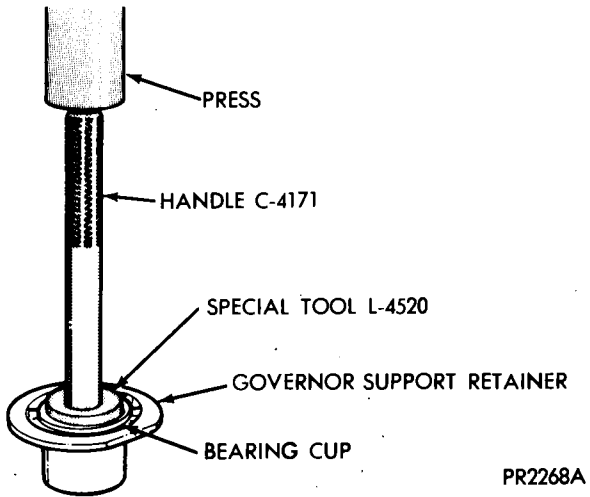


Fig. 10. Remove Governor Support Retainer Bearing Cup

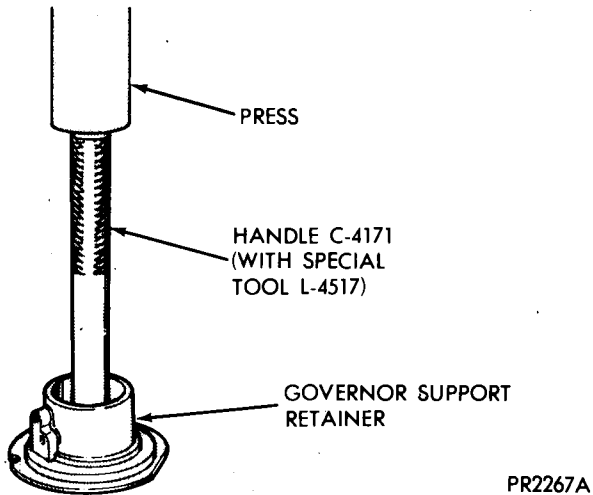


Fig. 11. Install Governor Support Retainer Bearing Cup

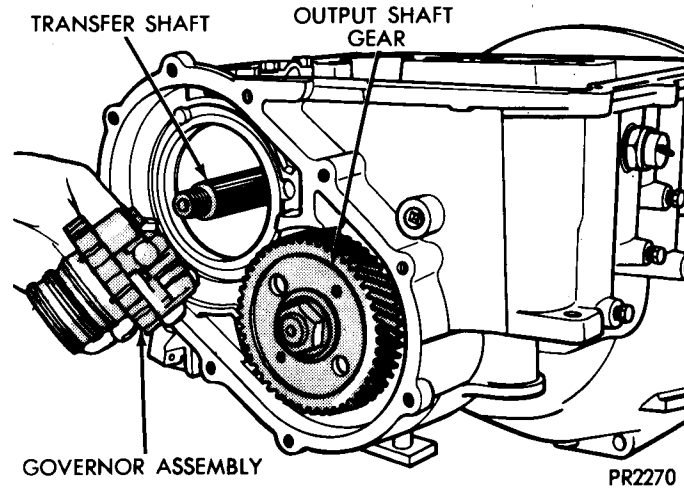


Fig. 13. Remove or Install Governor Assembly

NOTE: Remove or install both governor valves and governor body.

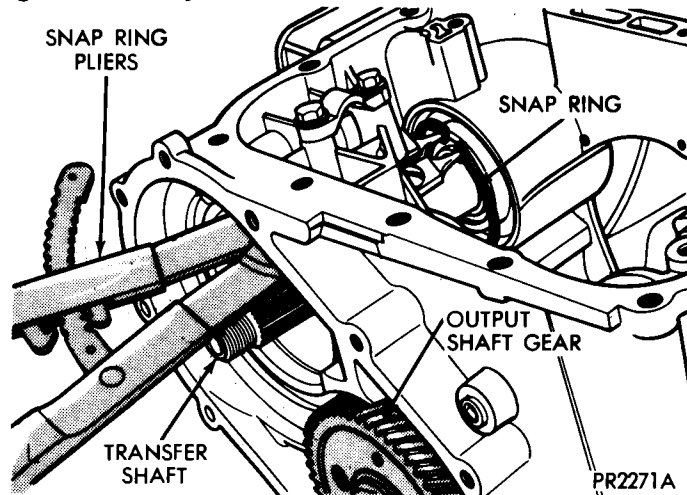


Fig. 14. Remove or Install Transfer Shaft Bearing Retainer Snap Ring

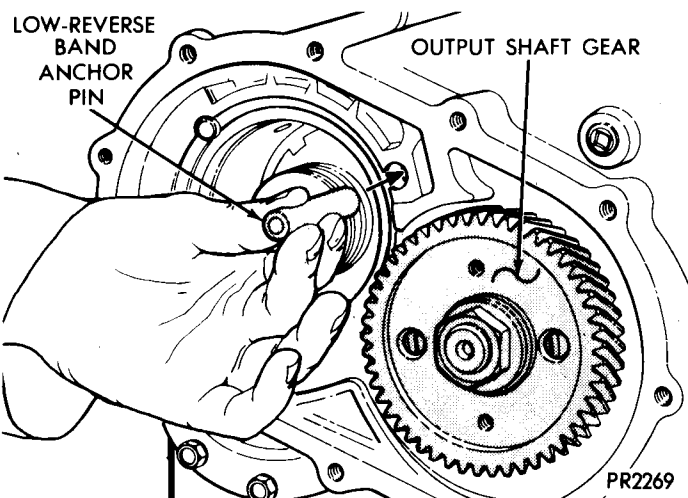


Fig. 12. Remove or Install Low-Reverse Band Anchor Pin

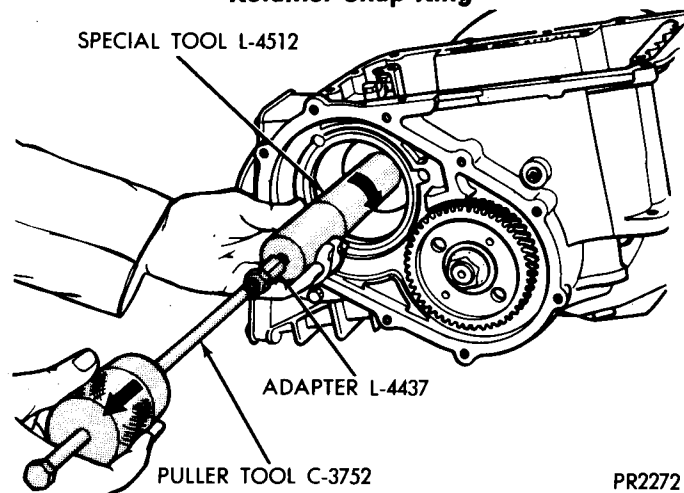
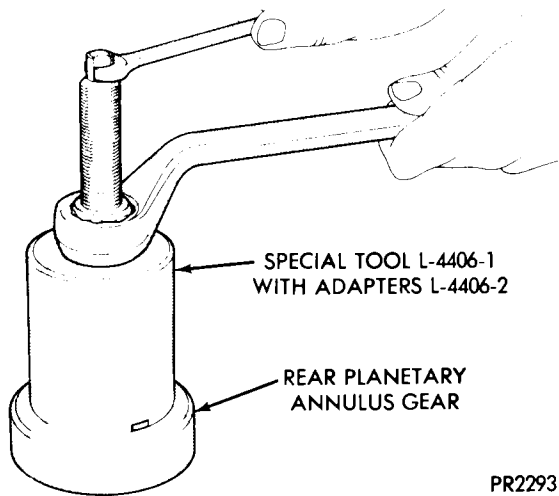
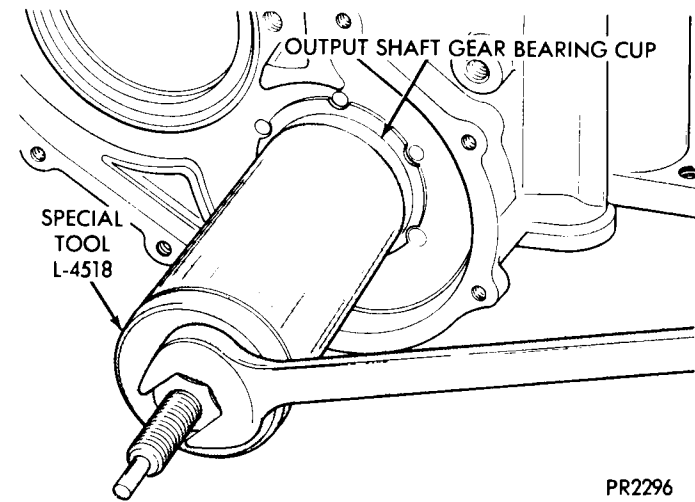


Fig. 15. Remove Transfer Shaft and Bearing Retainer Assembly



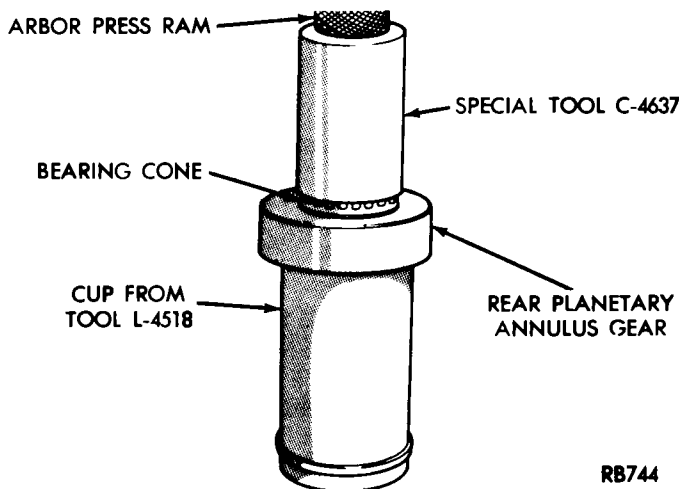
PR2293

Fig. 8. Remove Rear Planetary Annulus Gear Bearing Cone



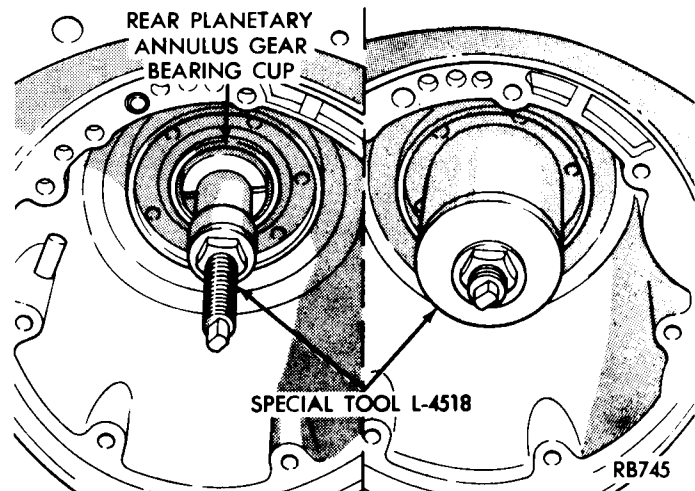
PR2296

Fig. 11. Remove Output Shaft Gear Bearing Cup



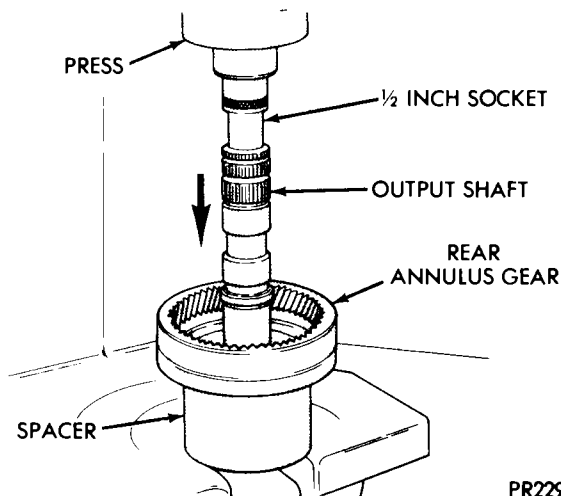
RB744

Fig. 9. Install Rear Planetary Annulus Gear Bearing Cone



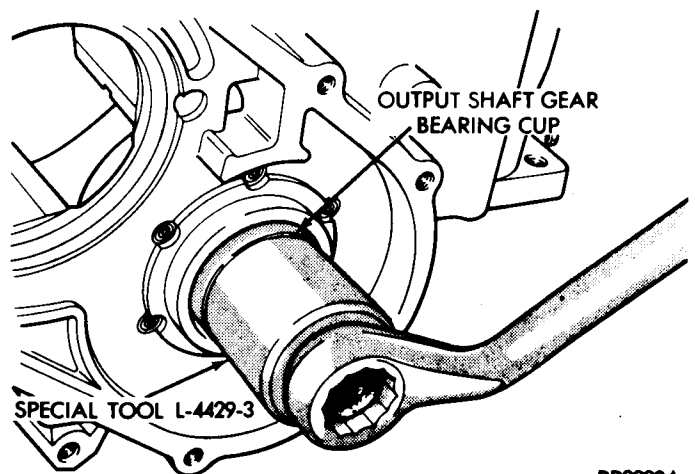
RB745

Fig. 12. Remove Rear Planetary Annulus Gear Bearing Cup



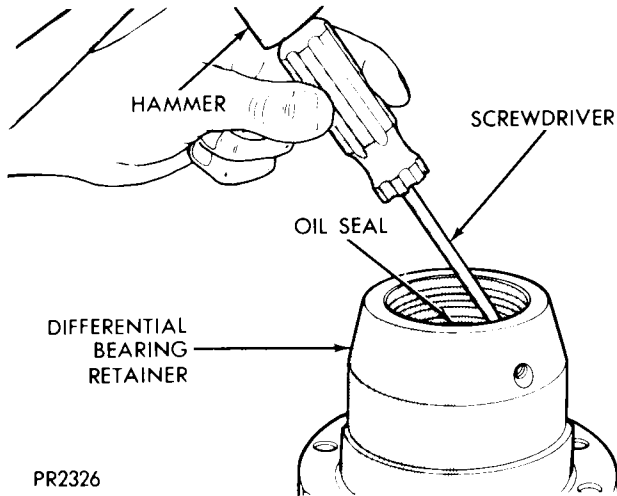
PR2295A

Fig. 10. Install Output Shaft into Rear Planetary Annulus Gear

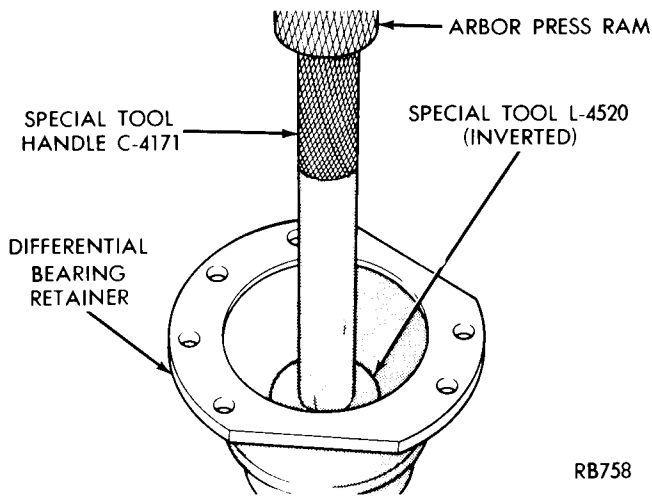


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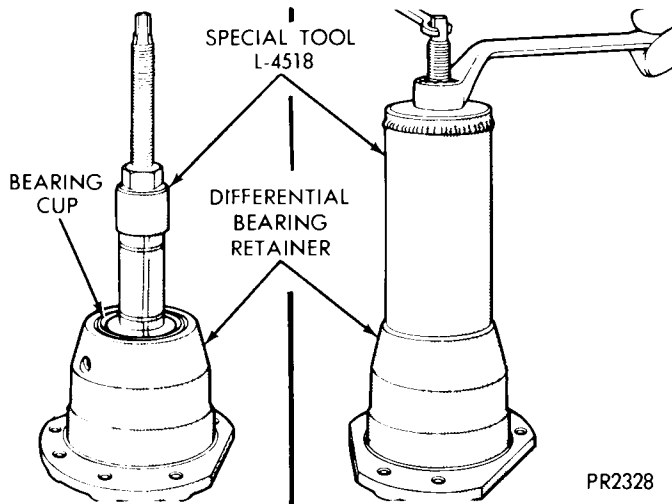
Fig. 13. Install Output Shaft Gear Bearing Cup



**Fig. 22. Using Suitable Tool, Remove Differential Bearing Retainer Oil Seal**



**Fig. 23. Install New Oil Seal into Differential Bearing Retainer**



**Fig. 24. Remove Bearing Cup from Differential Bearing Retainer**

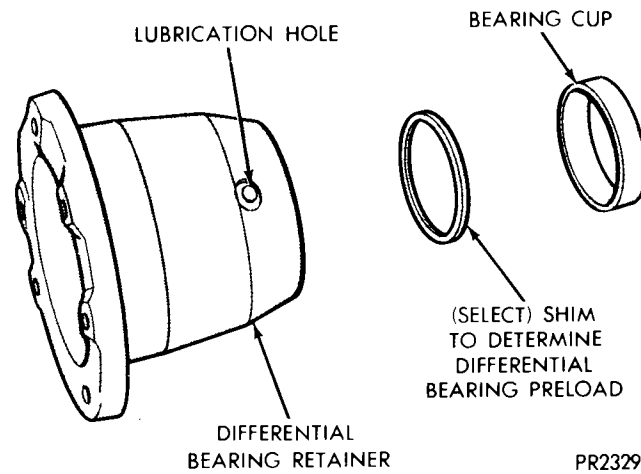
**NOTE: Bearing cones and cups are matched. DO NOT INTERCHANGE.**

**Determining Shim Thickness**

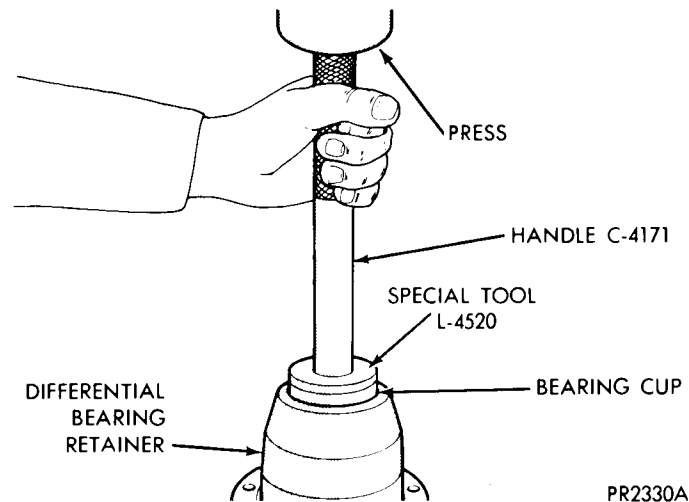
Shim thickness determining need only be done if any of the following parts are replaced:

- (a) transaxle case
- (b) differential carrier
- (c) differential bearing retainer
- (d) extension housing
- (e) differential bearing cups and cones

Refer to "Bearing Adjustment Procedure" in rear of this section to determine proper shim thickness for correct bearing preload and proper bearing turning torque.



**Fig. 25. Disassembled View of Differential Bearing Retainer (Select) Shim, and Bearing Cup**



**Fig. 26. Install Bearing Cup into Differential Bearing Retainer**

When rebuilding, reverse the above procedure.

**NOTE: Use R.T.V. Sealant on retainer to seal retainer to case.**

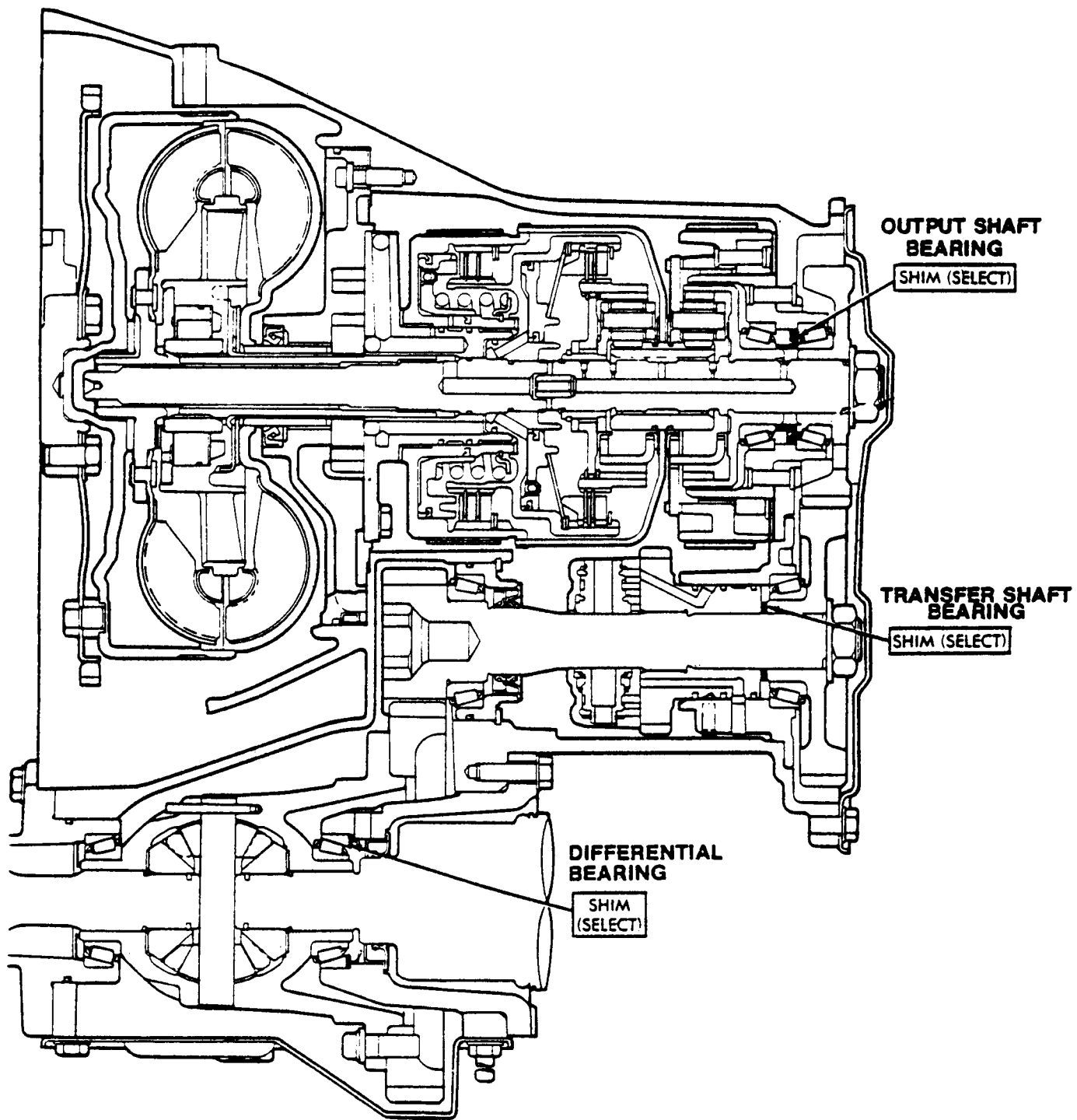


**TIGHTENING REFERENCE**

Item	Qty.	Thread Size	Driver	Torque	
				Newton-meters	Inch-Pounds
<b>A-404, A-413, and A-470 Automatic Transaxle</b>					
Bolt—Bell Housing Cover	3	9.8-M6-1-10	10mm Hex	12	105
Bolt—Flex Plate to Crank (A-404)	6	10.9-M10-1-16††	16mm Hex	68	50*††
Bolt—Flex Plate to Torque Converter (A-404)	3	10.9-M10-1.5-11#	18mm Hex	54	40*#
Screw Assy. Transmission to Cyl. Block	3	9.8A-M12-1.75-65	18mm Hex	95	70*
Screw Assy. Lower Bell Housing Cover	3	9.8-M6-1-10	10mm Hex	12	105
Screw Assy. Manual Control Lever	1	9.8A-M6-1-35	10mm Hex	12	105
Screw Assy. Speedometer to Extension	1	9.8A-M6-1-14	10mm Hex	7	60
Nut—Cooler Tube to Transmission	2	1/2-20	5/8 Hex	16	150
Connector, Cooler Hose to Radiator	2	1/8-27 NPTF	12mm Hex	12	110
Bolt—Starter to Transmission Bell Housing	3	M10-1.5-30	15mm Hex	54	40*
Bolt—Throttle Cable to Transmission Case	1	M6-1.0-14	10mm Hex	12	105
Bolt—Throttle Lever to Transmission Shaft	1	M6-1-25	10mm Hex	12	105
Bolt—Manual Cable to Transmission Case	1	M8-1.75-30	13mm Hex	28	250
Bolt—Front Motor Mount	2	M10	15mm Hex	54	40*
Bolt—Left Motor Mount	3	M10-1.5-25	15mm Hex	54	40*
<b>Dress Up</b>					
Connector Assembly, Cooler Line	2	M12-1.75-122	17.5mm Hex	28	250
Plug, Pressure Check	7	1/16-27NPTF	5/16 in. Hex	5	45
Switch, Neutral Safety	1	3/4-16UNF	1.0 in. Hex	34	25*
<b>Differential Area</b>					
Ring Gear Screw	8	12.9-M13-1.5-25	Tool C-4706	95	70*
Bolt, Extension to Case	4	9.8-M8-1.25-28	13mm Hex	28	250
Bolt, Differential Bearing Retainer to Case	6	9.8-M8-1.25-28	13mm Hex	28	250
Screw Assy., Differential Cover to Case	10	9.8-M8-1.25-16	13mm Hex	19	165
<b>Transfer &amp; Output Shaft Areas</b>					
Nut, Output Shaft	1	M20-1.5	30mm Hex	271	200*
Nut, Transfer Shaft	1	M20-1.5	30mm Hex	271	200*
Bolt, Gov to Support	2	9.8-M5-0.8-20	7mm Hex	7	60
Bolt, Gov to Support	1	9.8-M5-0.8-30	7mm Hex	7	60
Screw Assy., Governor Counterweight	1	M8-1.25-35	13mm Hex	28	250
Screw Assy., Rear Cover to Case	10	9.8-M8-1.25-16	13mm Hex	19	165
Plug, Reverse Band Shaft	1	1/4-18-NPTF	1/4 in. Sq. Skt.	7	60
<b>Pump &amp; Kickdown Band Areas</b>					
Bolt, Reaction Shaft Assembly	6	9.8-M8-1.25-19	13mm Hex	28	250
Bolt Assy., Pump to Case	7	9.8-M8-1.25-25	8mm 12 Pt.	31	275
Nut, Kickdown Band Adjustment Lock	1	M12-1.75	18mm Hex	47	35*
<b>Valve Body &amp; Sprag Areas</b>					
Bolt, Sprag Retainer to Transfer Case	2	9.8-M8-1.25-23	13mm Hex	28	250
Screw Assy., Valve Body	14	9.8A-M5-0.8-11	Torx, T25	5	40
Screw Assy., Transfer Plate	13	9.8A-M5-0.8-25	Torx, T25	5	40
Screw Assy., Filter	3	9.8A-M5-0.8-30	Torx, T25	5	40
Screw, Transfer Plate to Case	7	9.8-M6-1-30	10mm Hex	12	105
Screw Assy., Oil Pan to Case	14	9.8-M8-1.25-16	13mm Hex	19	165
Nut, Reverse Band Adjusting Lock	1	M8-1.25	13mm Hex	27	20

\*foot-pounds

† A-413 = M10 x 1.5 x 18      17mm Hex      88 N·m      65 ft. lbs.  
 ‡ A-470 = M12 x 1.25 x 21      19mm Hex      136 N·m      100 ft. lbs.  
 # A-413 and A-470 = M10 x 1.5 x 11.7      18mm Hex      54 N·m      40 ft. lbs.



**A-404 TORQUEFLITE TRANSAXLE - CUTAWAY VIEW**

## OUTPUT SHAFT BEARING SHIM CHART

End Play (with 7.65mm and 1.34mm gaging shims installed)		Required Shim Combination	Total Thickness	
mm	Inch		mm	Inch
0	0	7.65 + 1.34	8.99	.354
.05	.002	7.65 + 1.24	8.89	.350
.10	.004	7.65 + 1.19	8.84	.348
.15	.006	7.65 + 1.14	8.79	.346
.20	.008	7.65 + 1.09	8.74	.344
.25	.010	7.65 + 1.04	8.69	.342
.30	.012	7.65 + .99	8.64	.340
.35	.014	7.65 + .94	8.59	.338
.40	.016	7.15 + 1.39	8.54	.336
.45	.018	7.15 + 1.34	8.49	.334
.50	.020	7.15 + 1.29	8.44	.332
.55	.022	7.15 + 1.24	8.39	.330
.60	.024	7.15 + 1.19	8.34	.328
.65	.026	7.15 + 1.14	8.29	.326
.70	.028	7.15 + 1.09	8.24	.324
.75	.030	7.15 + 1.04	8.19	.322
.80	.032	7.15 + .99	8.14	.320
.85	.034	7.15 + .94	8.09	.318
.90	.036	6.65 + 1.39	8.04	.316
.95	.038	6.65 + 1.34	7.99	.314
1.00	.040	6.65 + 1.29	7.94	.312
1.05	.042	6.65 + 1.24	7.89	.311
1.10	.044	6.65 + 1.19	7.84	.309
1.15	.046	6.65 + 1.14	7.79	.307
1.20	.048	6.65 + 1.09	7.74	.305
1.25	.049	6.65 + 1.04	7.69	.303
1.30	.051	6.65 + .99	7.64	.301
1.35	.053	6.65 + .94	7.59	.299

Average Conversion .05mm = .002 inch

## TRANSFER SHAFT BEARING

1. Use Tool L-4424 to remove the retaining nut and washer. Remove the transfer shaft gear using Tool L-4407.
2. Install a 2.29 mm (.090 inch) and 1.39 mm (0.055 inch) gaging shims on the transfer shaft behind the governor support, reference Figure 13.

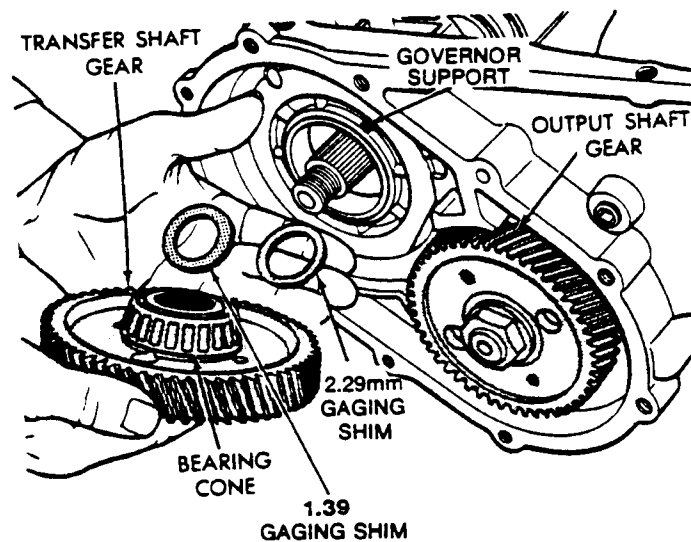


FIGURE 13

3. Install transfer shaft gear and bearing assembly and torque nut to 200 foot-pounds (271 N·m).

NOTE: A few drops of Automatic Transmission Fluid applied to the bearing rollers will ensure proper seating and rolling resistance.

4. To measure bearing end play: (Reference Figure 14)
  - o Attach Tool L-4432 to the transfer gear.
  - o Mount a steel ball with grease on the end of the transfer shaft.
  - o Push down on the gear while rotating back and forth to ensure proper seating of the bearing rollers.
  - o Using a dial indicator mounted to the transaxle case, measure transfer shaft end play.