

SECTION 7A

AUTOMATIC TRANSMISSION

THM 200 TRANSMISSION

INDEX

Disassembly	7A-1	Rear Gear Parts	7A-13
Removal of Converter	7A-1	Low and Reverse Clutch	7A-17
Teflon Seals	7A-1	Front Gear Parts	7A-20
External Parts	7A-2	Front Unit Parts	7A-23
Front Unit Parts	7A-5	Forward and Direct Clutch	7A-29
Front Gear Parts	7A-6	Pump Assembly	7A-30
Rear Gear Parts	7A-8	External Parts	7A-34
Manual Shaft and Parking Pawl	7A-9	Control Valve Assembly	7A-37
Inspection and Reassembly	7A-9	Bushing Replacement	7A-42
Case	7A-9	Specifications	7A-47
Manual Shaft and Parking Pawl	7A-10	Special Tools	7A-47

DISASSEMBLY

Removal of Converter

1. With transmission in cradle of portable jack, remove J-21366 and then converter assembly by pulling straight out.
2. Install Holding Fixture, J-8763-02 on transmission and place into Holding Fixture, J-3289-20, with manual shaft facing bench and oil pan side up (Fig. 7A-1A).

CAUTION: Do not over-torque fixture holding screw.

NOTE: Cleanliness is an important factor in the overhaul of the transmission. Before attempting any disassembly operation, the exterior of the transmission should be thoroughly cleaned to prevent the possibility of dirt entering the transmission internal mechanism. During inspection and reassembly, all parts should be thoroughly cleaned with cleaning fluid and then air dried. Wiping cloths or rags should not be used to dry parts.

CAUTION: Do not use solvents on neoprene seals, composition-faced clutch plates or thrust washers.

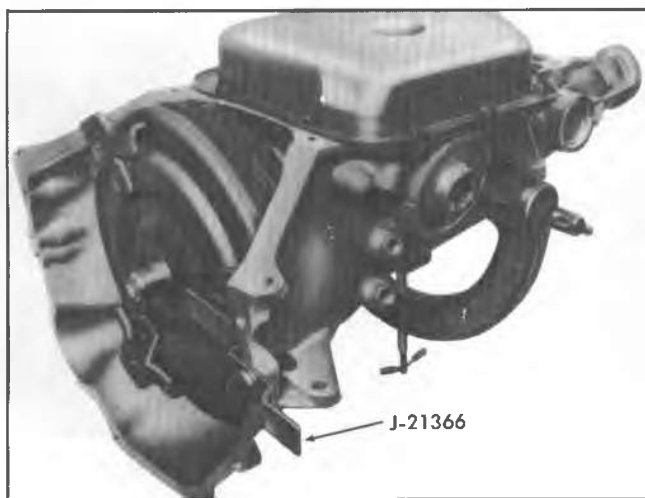


Fig. 7A-1A--Transmission Holding Fixture

Teflon Seals

If any teflon seal rings are damaged (distorted, cut, scored, etc.), or do not rotate freely in their groove, and replacement is necessary, do the following:

1. Remove and discard old angle cut seal rings; full circle rings must be cut off.
2. Inspect seal ring groove for burrs or damage.
3. When installing angle cut seal rings, do not over-stretch. Make sure cut ends are in same relation as cut (Fig. 7A-2A). Also, make sure rings are seated in the grooves to prevent damage to the rings during reassembly of mating part over rings. Retain with petrolatum.
4. New angle cut or full circle teflon seal rings may appear to be distorted after being installed. Once exposed to normal transmission oil temperatures, the new seal rings will return to their normal shape and fit freely in their bores.
5. The teflon seal rings allow for a free fit in their bores after operation. The free fit of the rings in their bores does not indicate leakage during operation.

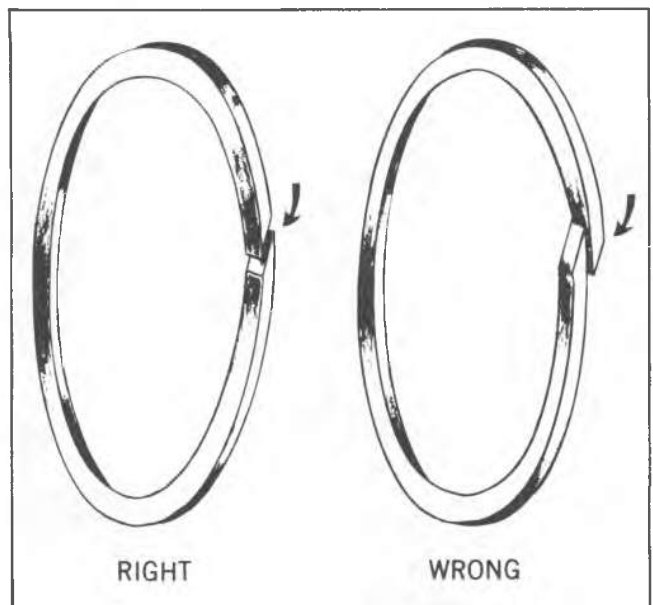


Fig. 7A-2A--Teflon Oil Seal Rings

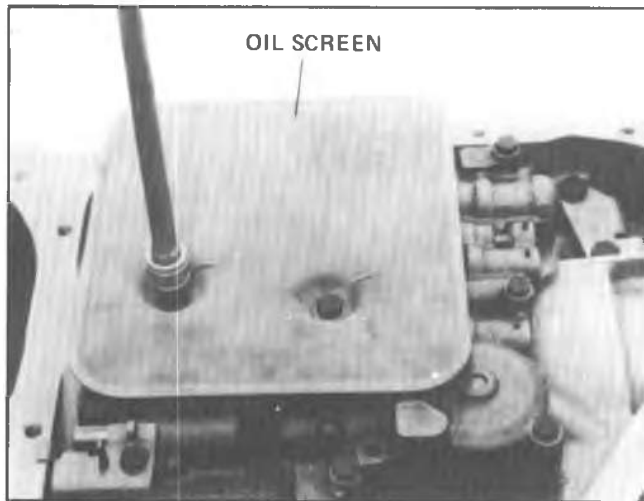


Fig. 7A-3A--Removing Oil Screen

Snap Rings

Do not over expand snap rings when removing or installing.

Thrust Washer Surfaces

The thrust washers and thrust bearings will polish the surfaces they protect. This is not to be considered a damaged part because of this condition.

EXTERNAL PARTS - REMOVAL

1. Remove oil pan and discard gasket.
2. Remove oil screen and discard gasket (Fig. 7A-3A).

CAUTION: The two oil screen attaching bolts are about 10mm (3/8") longer than the control valve assembly attaching bolts, and they are not interchangeable.

3. Control Valve Assembly:

- a. Remove throttle lever and bracket assembly (Fig. 7A-4A). Do not bend throttle lever link.

NOTE: T.V. exhaust valve lifter and spring may separate from throttle lever and bracket assembly.

- b. Remove manual detent roller and spring assembly (Fig. 7A-5A).
- c. Remove remaining control valve assembly attaching bolts.

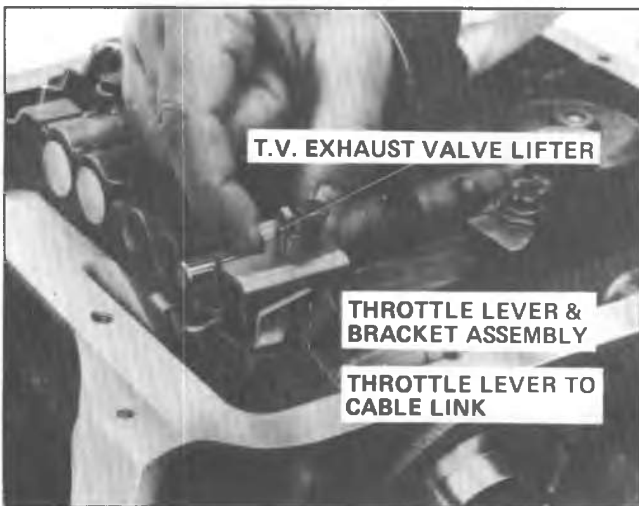


Fig. 7A-4A--Removing Throttle Valve and Bracket Assembly

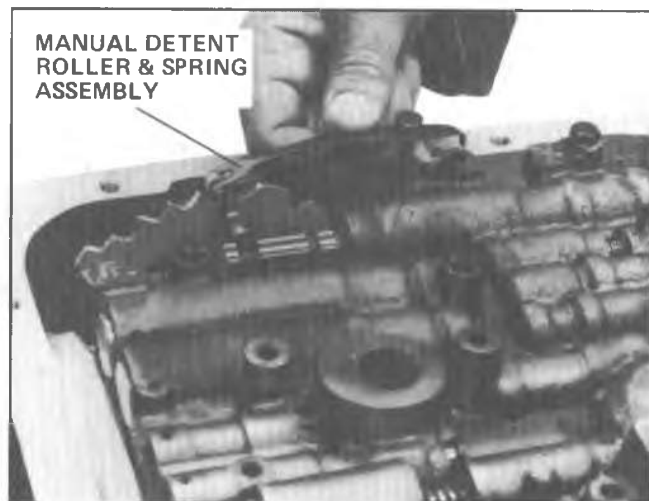


Fig. 7A-5A--Removing Manual Detent Roller and Spring Assembly

CAUTION: Do not drop manual valve.

- d. Holding manual valve with finger, remove control valve assembly, spacer plate, and gaskets together, to prevent the dropping of 4 check balls, located in the control valve assembly (Fig. 7A-6A).

- e. Lay control valve assembly down with spacer plate side up and discard gaskets.

4. Remove 1-2 accumulator spring (Fig. 7A-7A).

5. Remove 5th check ball located in case (Fig. 7A-8A).

6. Governor Assembly:

- a. Using small screwdriver, remove governor cover retaining ring (Fig. 7A-9A).

- b. Using pliers, remove governor cover and discard 2 seal rings; seal rings may be located in case (Fig. 7A-10A).

NOTE: Governor assembly may come out with cover.

CAUTION: Do not use any type of pliers to remove governor assembly.

- c. Remove governor assembly from case. It may be necessary to rotate output shaft counterclockwise while removing the governor.

7. Intermediate Servo Assembly:

- a. Using small screwdriver, remove intermediate servo cover retaining ring (Fig. 7A-11A).

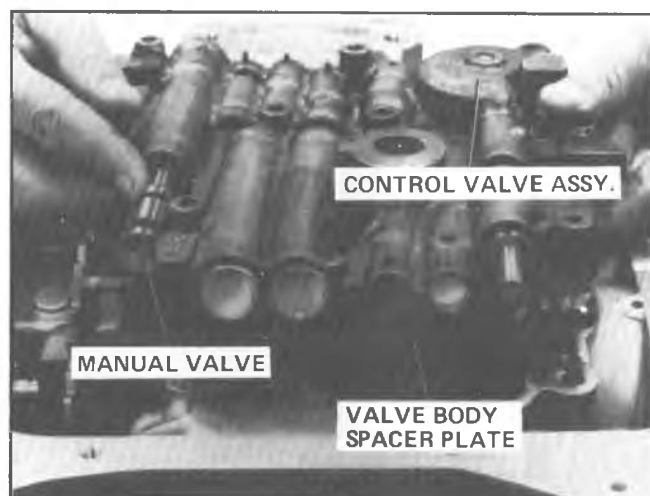


Fig. 7A-6A--Removing Control Valve Assembly from Case

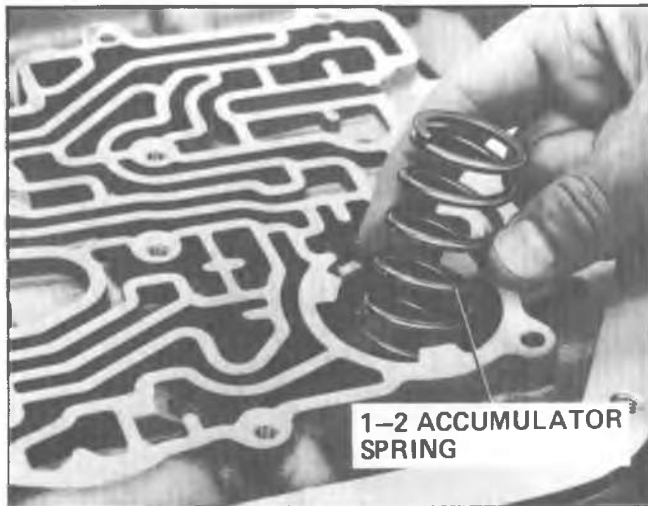


Fig. 7A-7A--Removing 1-2 Accumulator Spring

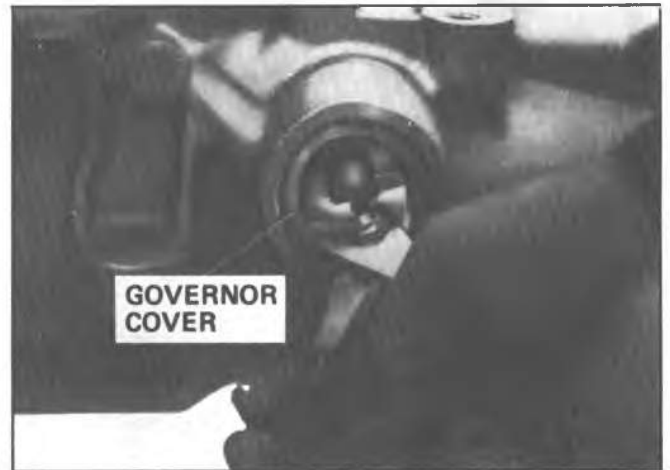


Fig. 7A-10A--Removing Governor Cover

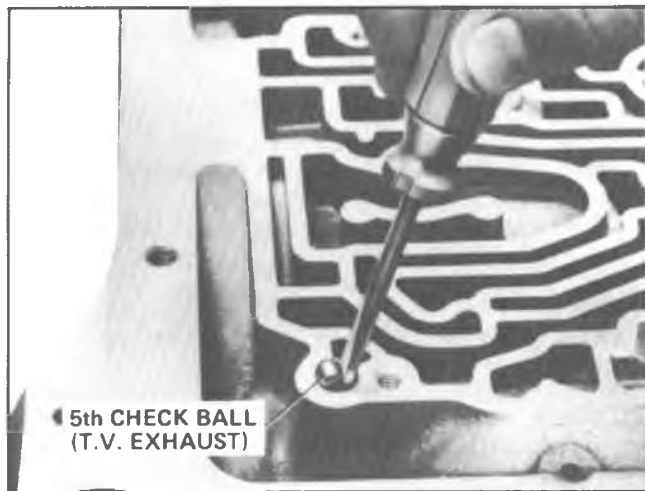


Fig. 7A-8A--Removing 5th Check Ball



Fig. 7A-11A--Removing Intermediate Servo Retaining Ring

b. Using pliers, remove intermediate servo cover and discard seal rings; cover seal ring may be located in case (Fig. 7A-12A).

c. Remove intermediate servo piston and band apply pin assembly (Fig. 7A-13A).

NOTE: If intermediate servo cover and seal assembly can not be removed easily, place shop towels and hand over cover and case. Apply air pressure into the direct clutch accumulator port (Figs. 7A-14A and 7A-15A).



Fig. 7A-9A--Removing Governor Cover Retaining Ring

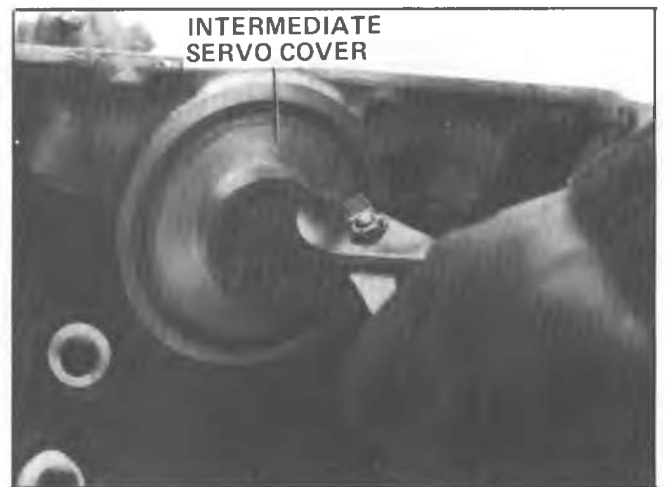


Fig. 7A-12A--Removing Servo Cover and Seal



Fig. 7A-13A--Removing Intermediate Servo



Fig. 7A-14A--Direct Clutch Accumulator Port

8. Check for proper intermediate band apply pin as follows:

a. Install J-25014-2 in intermediate servo bore and retain with intermediate servo cover retaining ring, aligning ring with gap at case slot (Fig. 7A-16A).

b. Install pin J-25014-1 into J-25014-2 (Fig. 7A-16A).



Fig. 7A-15A--Apply Air Pressure to Remove Intermediate Servo



Fig. 7A-16A--Checking for Proper Intermediate Band Apply Pin

CAUTION: Make sure the tapered pin end is properly located against the band apply lug. Also, make sure the band anchor pin is properly located in the case and band anchor lug.

c. Install dial indicator J-8001 and position dial indicator point (Fig. 7A-16A) on top of J-25014-2 zero post and set dial indicator to zero.

NOTE: Seat J-25014-2 squarely against the servo retaining snap ring.

d. Align stepped side of pin J-25014-1 with torquing arm of J-25014-2. Arm must stop against step of pin J-25014-1.

NOTE: If band selection pin does not register between the high and low limits, look for possible problem with the intermediate band, direct clutch or case.

e. Apply 12 N·m (100 in. lbs.) of torque to hex nut on side of gauge. Slide dial indicator over pin J-25014-1 (Fig. 7A-16A). Read dial indicator and see chart in Fig. 7A-17A for proper size.

NOTE: Dial indicator travel is reversed, making the indicator readings backwards. On an indicator that ranges from 0-100, a .5mm (.020") travel will read 2mm (.080"), a 1.5mm (.060") travel will read 1mm (.040").

INTERMEDIATE BAND APPLY PIN CHART

DIAL INDICATOR TRAVEL		APPLY PIN IDENTIFICATION	
		APPLY PIN IDENTIFICATION +	
.0	.72mm (.0 - .029")	1 Ring	
.72mm-	1.44mm (.029" - .057")	2 Rings	
1.44mm-	2.16mm (.057" - .086")	3 Rings	
2.16mm-	2.88mm (.086" - .114")	Wide Band	

Fig. 7A-17A--Intermediate Band Apply Pin Selector Chart

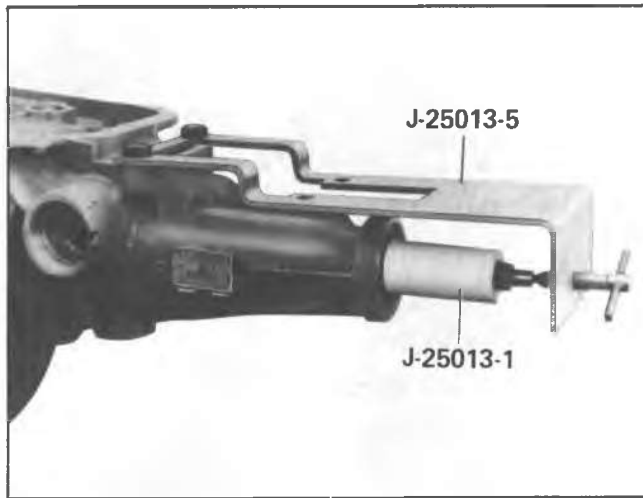


Fig. 7A-18A--Installing Tools on Rear End of Case

The identification ring is located on the band end of the pin.

f. Remove tools J-25014-2 and J-25014-1.

FRONT UNIT PARTS

Removal

1. Check front unit end play as follows:
 - a. Install J-25013-1 sleeve on output shaft first; then bolt J-25013-5 on end of case (Fig. 7A-18A).
 - b. Turn transmission to vertical position, pump side up.
 - c. Remove pump to case bolt and washer and install 278mm (11") long bolt and locking nut as shown (Fig. 7A-19A).
 - d. Push turbine shaft downward.
 - e. Install J-25022 on J-24773 tool and secure on end of turbine shaft (Fig. 7A-19A).
 - f. Mount dial indicator and clamp assembly on bolt, positioning indicator point against cap nut of J-24773.
 - g. Move output shaft upward by turning the adjusting screw on J-25013-5 until the white or scribed line on sleeve J-25013-1 begins to disappear (Fig. 7A-18A), then set dial indicator to zero.
 - h. Pull J-24773 on turbine shaft upward and read end play. Front unit end play should be 0.56mm-1.30mm (.022"-.051").



Fig. 7A-19A--Checking Front Unit End Play

FRONT UNIT END PLAY CHART

THICKNESS		IDENTIFICATION
		Number and/or Color
1.66-1.77mm	(0.065"-0.070")	1
1.79-1.90mm	(0.070"-0.075")	2
1.92-2.03mm	(0.076"-0.080")	3 - Black
2.05-2.16mm	(0.081"-0.085")	4 - Light Green
2.18-2.29mm	(0.086"-0.090")	5 - Scarlet
2.31-2.42mm	(0.091"-0.095")	6 - Purple
2.44-2.55mm	(0.096"-0.100")	7 - Cocoa Brown
2.57-2.68mm	(0.101"-0.106")	8 - Orange
2.70-2.81mm	(0.106"-0.111")	9 - Yellow
2.83-2.94mm	(0.111"-0.116")	10 - Light Blue
2.96-3.07mm	(0.117"-0.121")	11
3.09-3.20mm	(0.122"-0.126")	12

Fig. 7A-20A--Front Unit End Play Washer Chart

NOTE: Selective washer controlling this end play is located between the output shaft and turbine shaft. If more or less washer thickness is required to bring end play within specifications, select proper washer from the chart shown in figure 7A-20A.

i. Remove dial indicator clamp assembly, J-24773 and J-25022 (Fig. 7A-19A).

j. Do not remove J-25013-5 or J-25013-1.

2. Pump:

a. If necessary, remove pump oil seal and discard (Fig. 7A-21A).

b. Remove remaining pump to case bolts and washers; discard washers.

c. Using J-24773 tool, remove pump assembly, pump to case gasket and discard gasket (Fig. 7A-22A).

3. Forward and Direct Clutch:

a. Grasp turbine shaft and remove direct and forward clutch assemblies (Fig. 7A-23A).

b. Lift direct clutch assembly off forward clutch assembly.

NOTE: The direct-to-forward clutch thrust washer may stick to the end of the direct clutch housing when it is removed from the forward clutch housing.

4. Remove intermediate band assembly (Fig. 7A-24A).

5. Remove band anchor pin (Fig. 7A-25A).



Fig. 7A-21A--Removing Oil Pump Seal

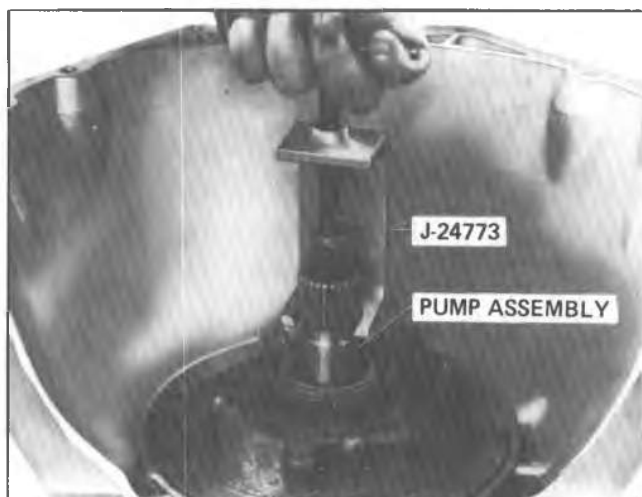


Fig. 7A-22A--Removing Pump Assembly

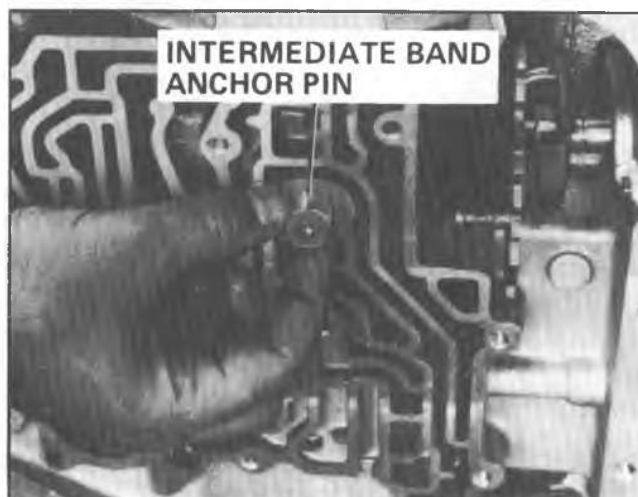


Fig. 7A-25A--Removing Intermediate Band Anchor Pin

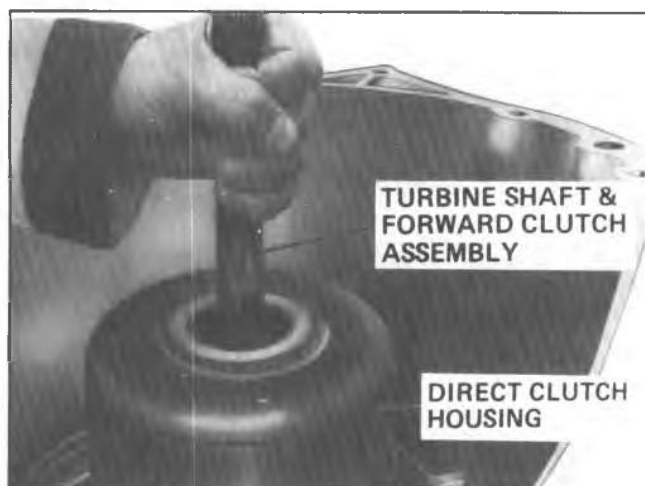


Fig. 7A-23A--Removing Forward and Direct Clutch Assemblies

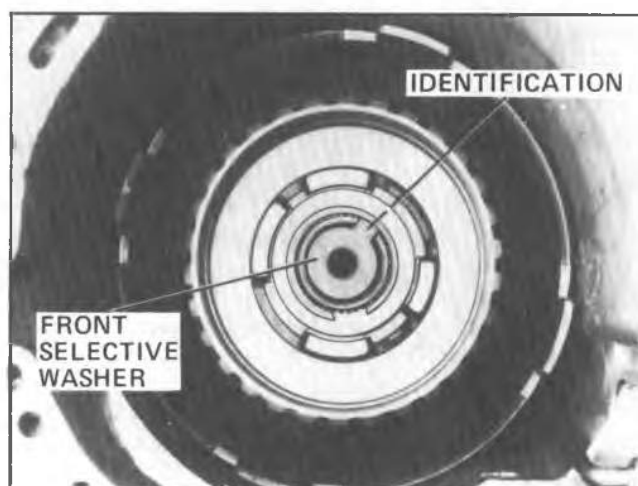


Fig. 7A-26A--Location of Front Selective Washer

FRONT GEAR PARTS

Removal

1. Remove output shaft to turbine shaft front selective washer (Fig. 7A-26A).

NOTE: This washer may be stuck to the end of the turbine shaft.

2. Check Rear Unit end play as follows:
 - a. Loosen J-25013-5 adjusting screw on output shaft and push output shaft downward (Fig. 7A-18A).
 - b. Install gauge clamp on case as shown (Fig. 7A-27A).
 - c. Install dial indicator J-8001 and plunger extension

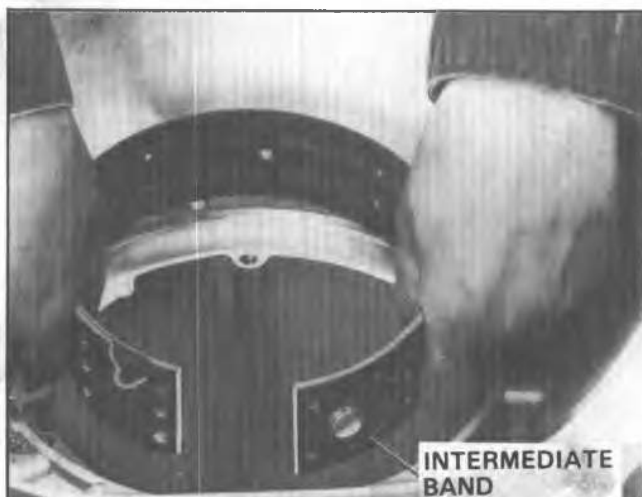


Fig. 7A-24A--Removing Intermediate Band Assembly

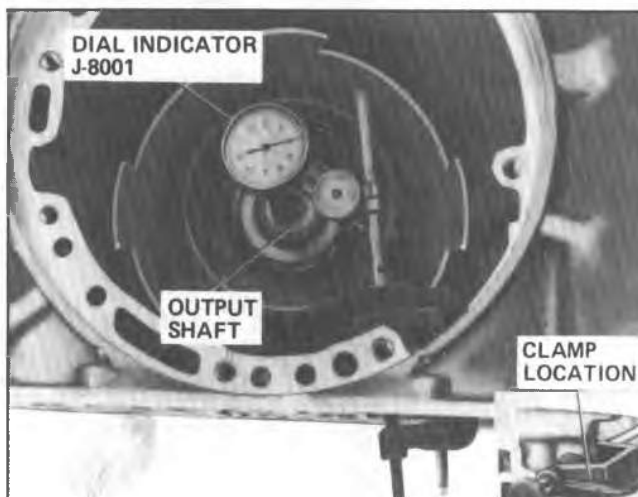


Fig. 7A-27A--Checking Rear Unit End Play

J-7057. Position extension against end of output shaft and set dial indicator to zero (Fig. 7A-27A).

d. Move output shaft upward by turning adjusting screw on J-25013-5 until the white or scribed line on sleeve J-25013 begins to disappear; then read end play. (Rear unit end play should be 0.10-0.63mm.) (.004"-.025".)

NOTE: Selective washer controlling this end play is located between the front internal gear thrust washer and output shaft snap ring. If more or less washer thickness is required to bring end play within specifications, select proper washer from the chart shown in Fig. 7A-28A.

e. Remove dial indicator and clamp assembly (Fig. 7A-27A). Do not remove J-25013 tools.

NOTE: It may be necessary to tighten J-25013 adjusting screw on output shaft to remove snap ring.

3. Using snap ring pliers, remove output shaft to selective washer snap ring (Fig. 7A-29A).

4. Front Internal Gear:

a. Remove front internal gear, rear selective washer and thrust washer.

b. Remove rear selective washer and thrust washer from front internal gear.

5. Remove front carrier assembly and the front internal gear to front carrier roller bearing assembly (Fig. 7A-30A).

NOTE: Models CN, CU and CZ use a front carrier with 2 pinions. All other models use 4 pinions.

REAR UNIT END PLAY CHART			
THICKNESS		IDENTIFICATION	
		Number and/or Color	
2.90 - 3.01mm	(0.114"-0.119")	1	Orange
3.08 - 3.19mm	(0.121"-0.126")	2	White
3.26 - 3.37mm	(0.128"-0.133")	3	Yellow
3.44 - 3.55mm	(0.135"-0.140")	4	Blue
3.62 - 3.73mm	(0.143"-0.147")	5	Red
3.80 - 3.91mm	(0.150"-0.154")	6	Brown
3.98 - 4.09mm	(0.157"-0.161")	7	Green
4.16 - 4.27mm	(0.164"-0.168")	8	Black
4.34 - 4.45mm	(0.171"-0.175")	9	Purple

Fig. 7A-28A--Rear Unit End Play Washer Chart

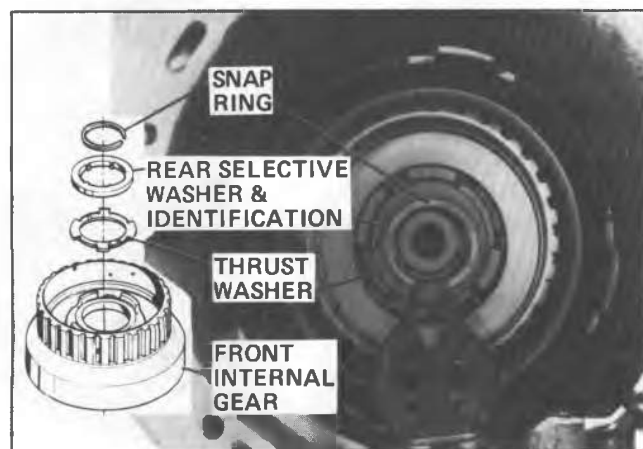


Fig. 7A-29A--Removing Output Shaft to Selective Washer Snap Ring

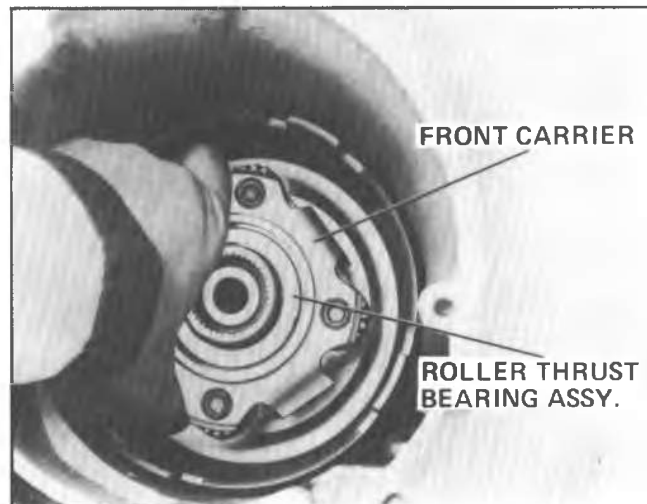


Fig. 7A-30A--Removing Front Carrier and Roller Thrust Bearing

NOTE: The front sun gear to front carrier thrust bearing assembly may come out as the front carrier is removed.

6. Remove front sun gear and front sun gear to front carrier thrust bearing assembly (Fig. 7A-31A).

NOTE: This thrust bearing requires only one thrust race.

7. Input drum and rear sun gear assembly:

a. Remove input drum and rear sun gear (Fig. 7A-32A).

b. Remove the 4 tanged input drum to reverse clutch housing thrust washer from rear of input drum or from reverse clutch housing.

8. Low and Reverse clutch housing assembly:

CAUTION: If low and reverse clutch housing assembly has to be removed, the low and reverse clutch piston travel must be checked.

a. Using a No. 14 sheet metal screw, remove housing to case cup plug and seal by turning screw 2 or 3 turns and pulling straight out. Discard cup plug and seal (Fig. 7A-33A).

NOTE: If cup plug will not remove, grind approximately 20mm (3/4") from end of 6.3mm (No. 4) easy out to remove cup plug. Then use No. 14 sheet metal screw to remove seal.

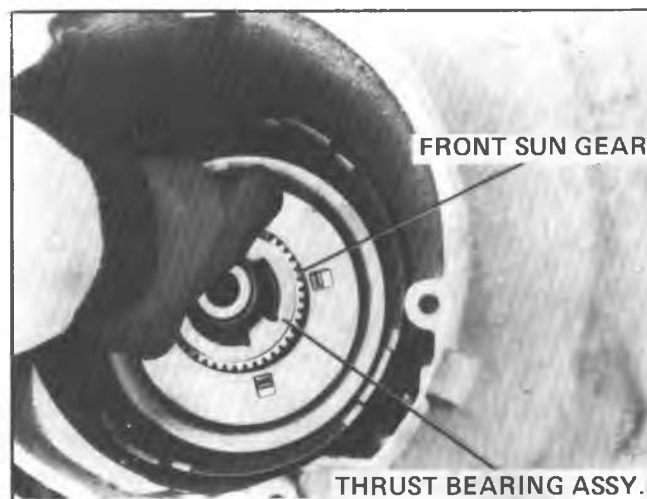


Fig. 7A-31A--Removing Thrust Bearing Assembly and Front Sun Gear



Fig. 7A-32A--Removing Input Drum and Rear Sun Gear

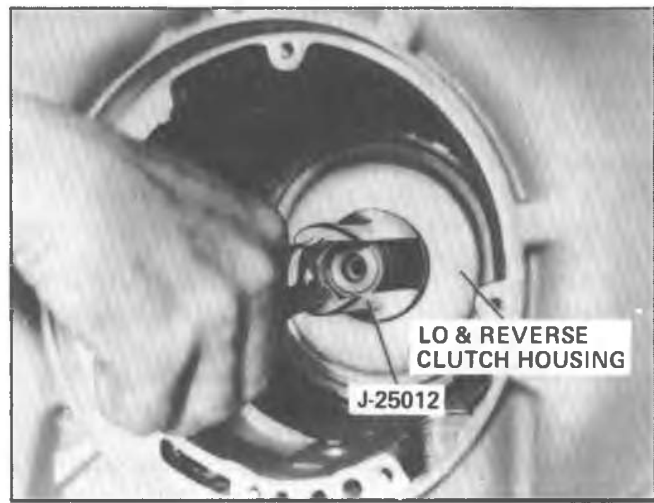


Fig. 7A-35A--Removing Low and Reverse Clutch Housing



Fig. 7A-33A--Removing Cup Plug and Seal

b. Remove low and reverse clutch housing to case beveled snap ring (Fig. 7A-34A).

NOTE: The flat side of the ring should have been against the low and reverse clutch housing with beveled side up.



Fig. 7A-34A--Removing Low and Reverse Housing to Case Snap Ring

c. Using J-25012, remove low and reverse clutch housing assembly by moving J-25012 back and forth (Fig. 7A-35A).

d. Remove low and reverse clutch housing to case spacer ring (Fig. 7A-36A).

REAR GEAR PARTS

Removal

NOTE: Make sure governor has been removed at this time.

1. Grasp output shaft and lift out remainder of rear unit parts and lay down in a horizontal position (Fig. 7A-37A).

2. Remove low and reverse clutch selective spacer.

3. Roller clutch and rear carrier assembly.

a. Remove roller clutch and rear carrier assembly off output shaft.

NOTE: Models CN, CU and CZ use a rear carrier with 2 pinions. All other models use 4 pinions.

b. Remove the 4 tanged rear carrier to rear internal gear thrust washer off the end of the rear carrier, or inside the rear internal gear (Fig. 7A-38A).

4. Remove low and reverse clutch plates off output shaft.

5. Rear internal gear:

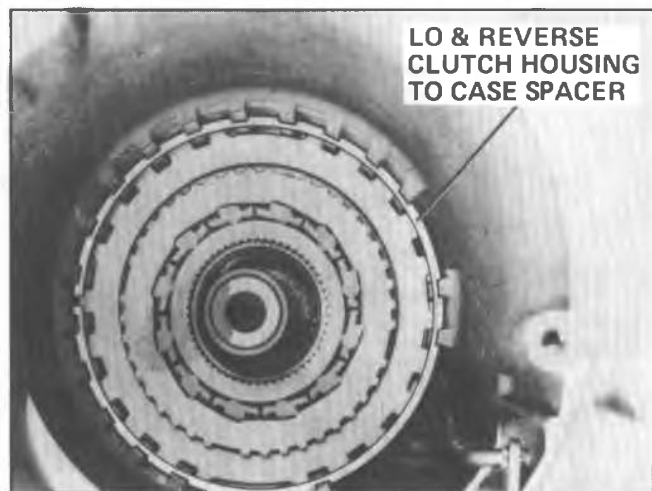


Fig. 7A-36A--Proper Location of Low and Reverse Housing to Case Spacer

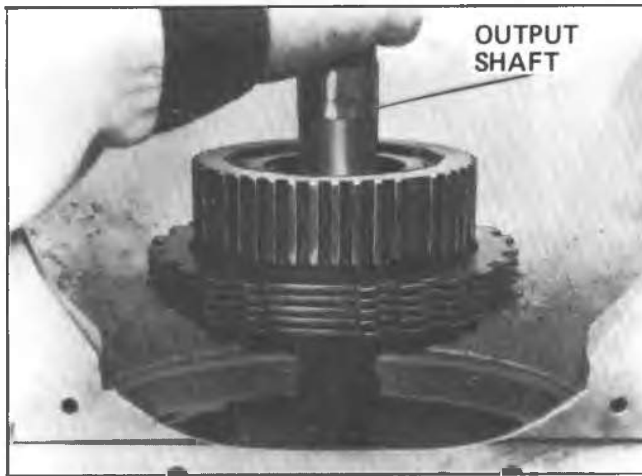


Fig. 7A-37A--Removing Rear Unit Parts



Fig. 7A-40A--Removing Rear Oil Seal

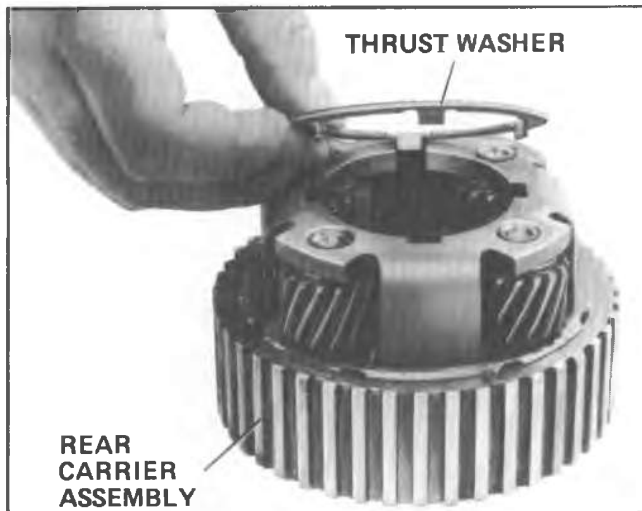


Fig. 7A-38A--Removing Thrust Washers

- a. Remove rear internal gear to rear sun gear roller thrust bearing assembly off rear internal gear.
- b. Remove gear internal gear off output shaft (Fig. 7A-39A).
6. Turn transmission to horizontal position and remove J-25013-5 and J-25013-1 tools from case. Turn transmission to vertical position with rear end up.

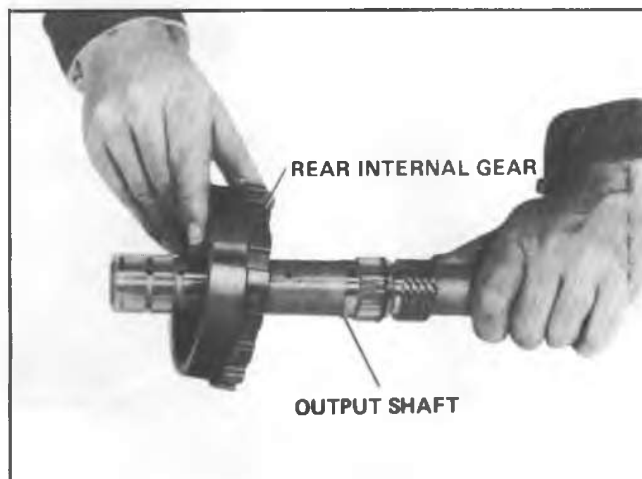


Fig. 7A-39A--Removing Rear Internal Gear

7. If necessary, remove rear oil seal (Fig. 7A-40A).

MANUAL SHAFT AND PARKING PAWL PARTS

Removal

1. Turn transmission to horizontal position, oil pan side up.
2. If necessary, remove manual shaft and parking linkage as follows:
 - a. Remove hex nut which holds inside detent lever to manual shaft (Fig. 7A-42A).
 - b. Remove parking brake actuator rod and inside detent lever assembly.
 - c. Remove manual shaft retaining pin from case and slide manual shaft out (Fig. 7A-43A).
 - d. Inspect manual shaft to case seal for damage. If necessary, pry out manual shaft seal using screwdriver (Fig. 7A-44A).
 - e. Remove parking brake bracket (Fig. 7A-45A).
 - f. Remove parking brake pawl shaft retaining pin (Fig. 7A-46A).
 - g. Using 6.3mm (No. 4) easy out, remove parking brake pawl cup plug and discard (Fig. 7A-47A).
- NOTE:** Grind approximately 20mm (3/4") from end of 6.3mm (No. 4) easy out to remove cup plug.
- h. Using sheet metal screw or 4mm (No. 3) easy out, remove parking brake pawl shaft (Fig. 7A-48A).
- i. Remove parking pawl and return spring.

INSPECTION AND REASSEMBLY

Inspection of Case Assembly

NOTE: Model CN, CU and CZ cases have a tapped hole with a hex head plug or a pressure switch near the intermediate servo bore. Do not remove the switch or plug unless replacement is required.

1. Inspect case assembly for damage, cracks, porosity or interconnected oil passages. If case is porous, refer to porosity repair.
2. Inspect orifice plug in the intermediate servo bore. If the plug requires replacement, place the new plug, orifice end first, into plug hole in case. Drive plug flush to slightly below top of plug hole.
3. Inspect the exhaust vents for being opened.
4. Inspect reverse clutch lugs, governor bore, intermediate servo bore, speedometer bore and snap ring grooves for damage.

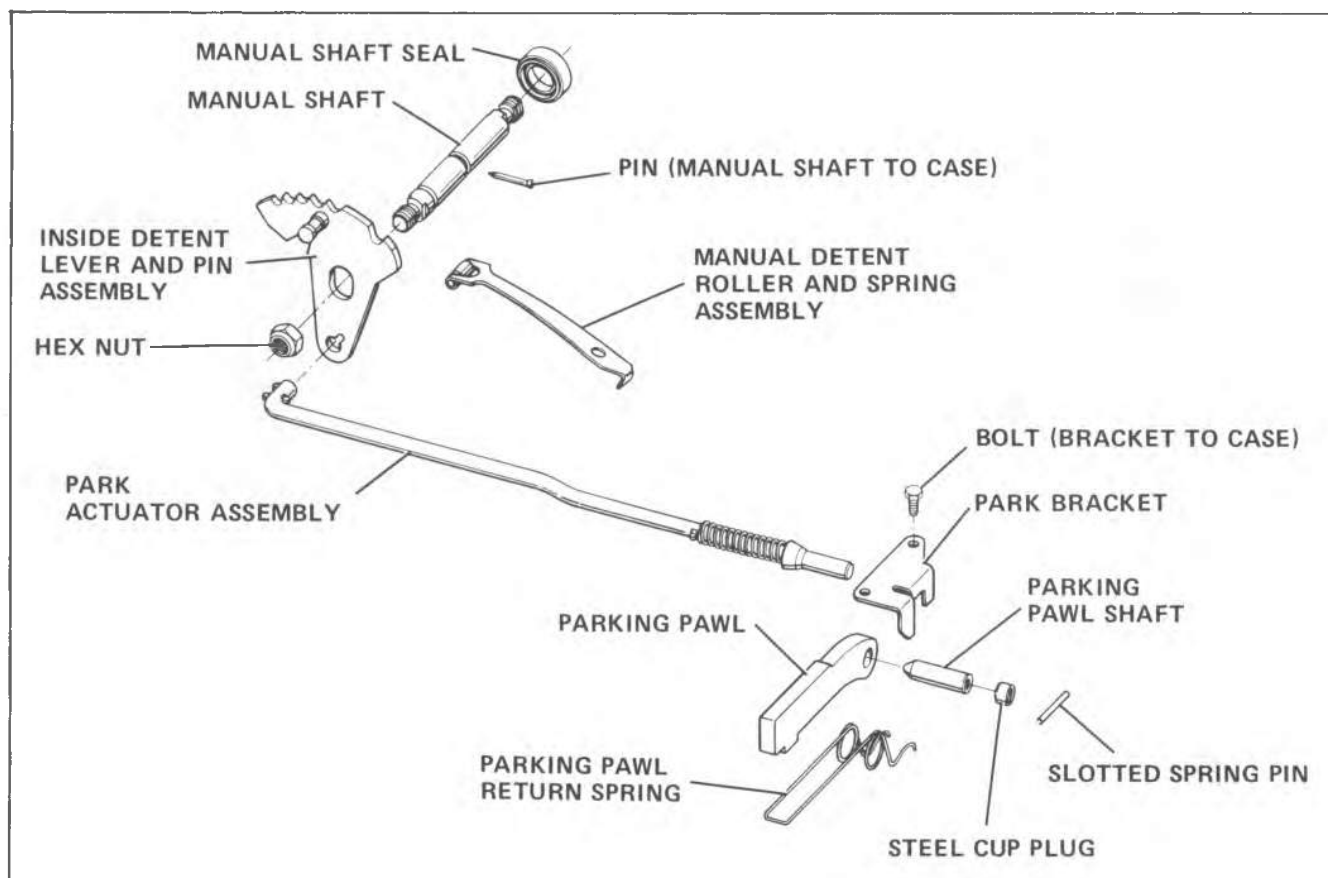


Fig. 7A-41A--Manual Shaft and Parking Shaft Parts

5. Inspect reverse clutch seal and intermediate band anchor pin bores for damage.

6. Inspect vent assembly in case for damage. Do not remove unless replacement is required.

7. Inspect for damaged or stripped bolt holes. If any threaded holes require heli-coils or equivalent, install these to renew the threads.

8. Turn transmission to vertical position, rear end up.

9. Inspect cooler line connectors for damage. Do not remove unless replacing.

10. Inspect case bushing for damage or scoring.

11. If removed, install a new oil seal, using J-21426 (Fig. 7A-51A).

12. If vent was removed, apply Loctite Primer "T", or equivalent, to the outside diameter of the vent that locates in the case and Loctite 35, or equivalent, to the vent hole in the case. Install vent, using a rubber or plastic hammer.

13. If removed, install new cooler line washer(s) and connector(s); torque connector(s) to 20.0-27.0 N·m (15-20 ft. lbs.).

MANUAL SHAFT AND PARKING PAWL PARTS (Fig. 7A-52A)

Inspection

1. Align actuator rod tangs with hole in inside detent lever and separate.

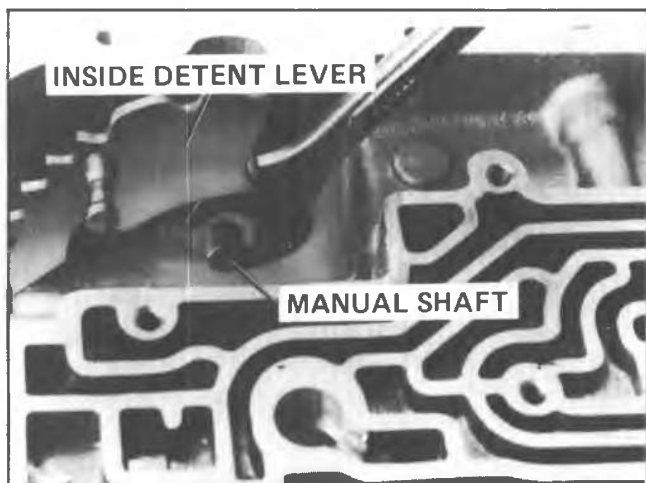


Fig. 7A-42A--Removing Manual Shaft Nut

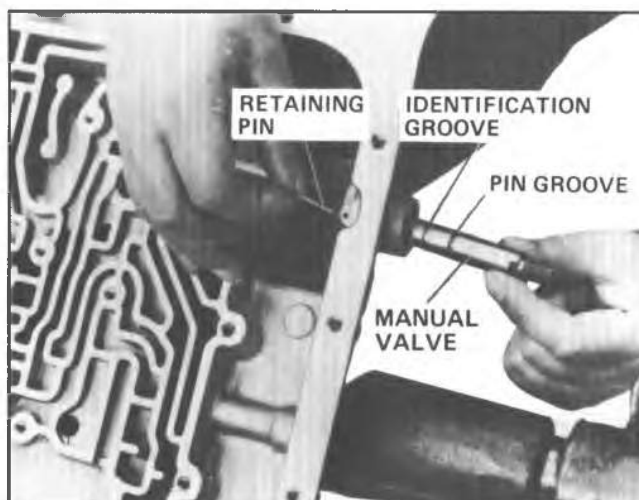


Fig. 7A-43A--Removing Manual Shaft from Case



Fig. 7A-44A--Removing Manual Shaft Seal From Case

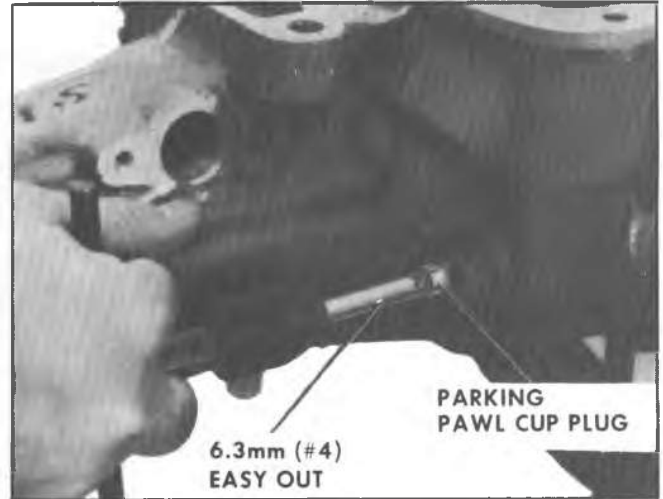


Fig. 7A-47A--Removing Parking Pawl Shaft Cup Plug from Case



Fig. 7A-45A--Removing Parking Pawl Bracket Bolt

2. Inspect parking actuator rod for damage, or broken retainer lugs.
3. Inspect parking actuator spring for damage.
4. Inspect actuator for free fit on actuator rod.
5. Inspect parking pawl for cracks or damage.

6. Inspect parking pawl return spring for deformed end or coils.

7. Inspect parking pawl shaft for damage.

8. Inspect parking bracket for cracks or wear.

9. Inspect inside detent lever for cracks or loose pin.

10. Inspect manual shaft for damaged threads and the flats for raised edges. File down any raised edges.

Reassembly

1. Turn transmission to horizontal position, oil pan side up.

2. If removed, install new manual shaft seal with lip facing inward into transmission case using a 13mm or 9/16" socket to seat seal (Fig. 7A-53A).

3. Install parking pawl and return spring with tooth toward inside of case and parking pawl return spring under pawl tooth with spring ends toward inside of case (Fig. 7A-54A). Make sure spring ends locate against case pad.

4. Align parking pawl and return spring with case shaft bore.

5. Install parking pawl shaft, tapered end first.

6. Using 10mm (3/8") rod, install new parking pawl shaft cup plug, open end out, past retaining pin hole (Fig. 7A-55A).



Fig. 7A-46A--Removing Parking Pawl Shaft Pin

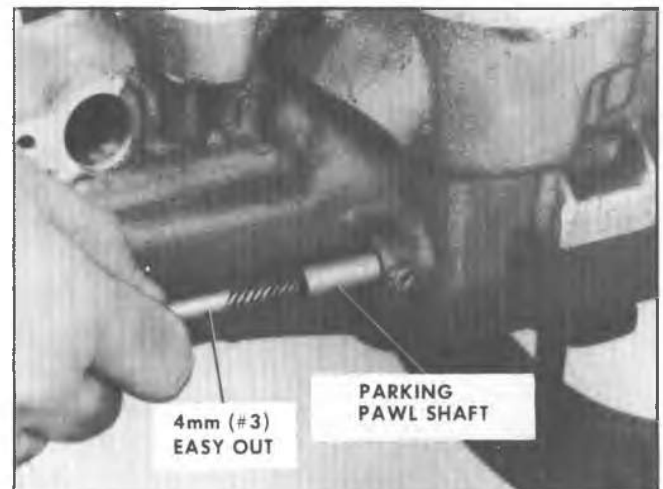


Fig. 7A-48A--Removing Parking Pawl Shaft from Case

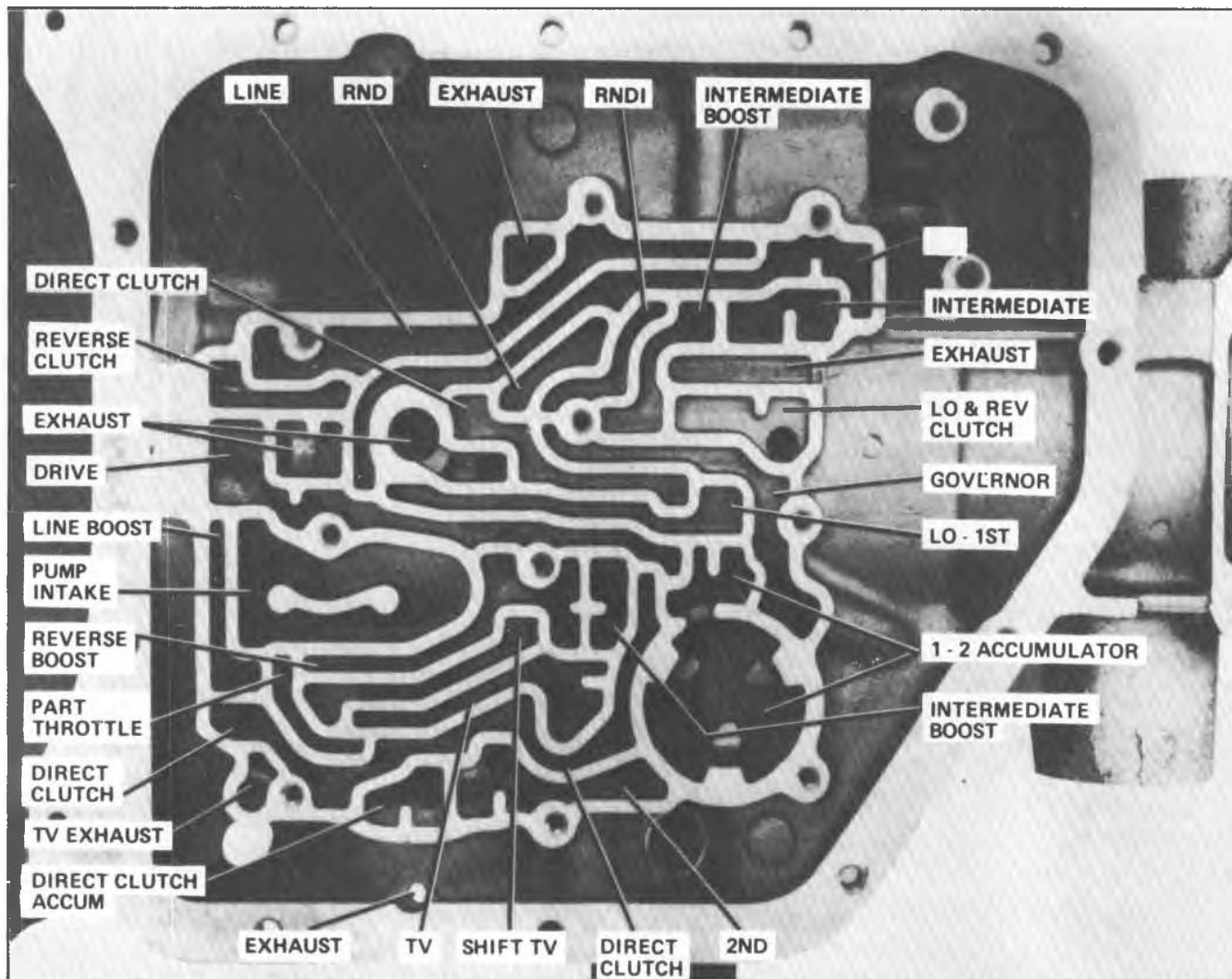


Fig. 7A-49A--Oil Passages - Bottom of Case

7. Install parking pawl shaft retaining pin.

8. While holding the parking pawl toward center of transmission, install parking bracket. Torque bolts to 20.0-27.0 N·m (15-20 ft. lbs.).

9. Install parking actuator rod into inside detent lever on pin side, locating lever between actuator rod tangs.

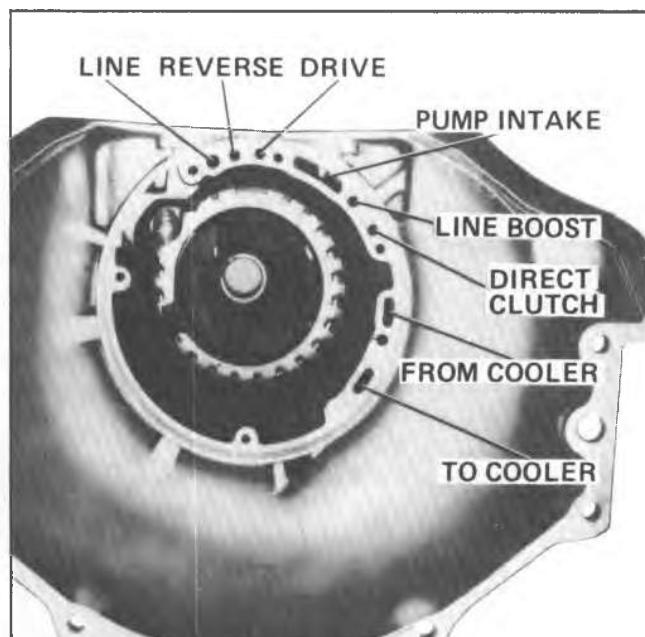


Fig. 7A-50A--Oil Passages, Front of Case

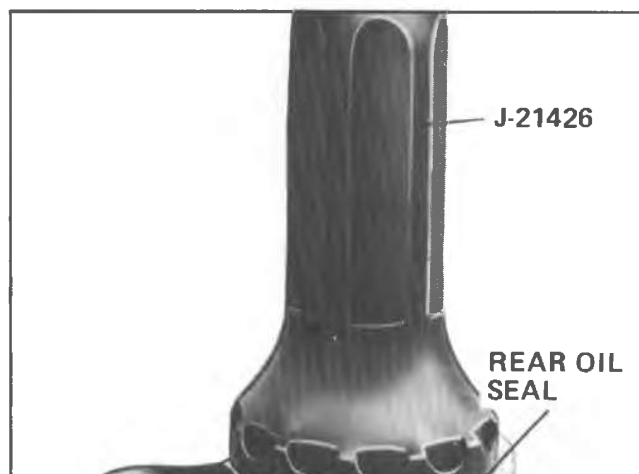


Fig. 7A-51A--Installing Rear Oil Seal

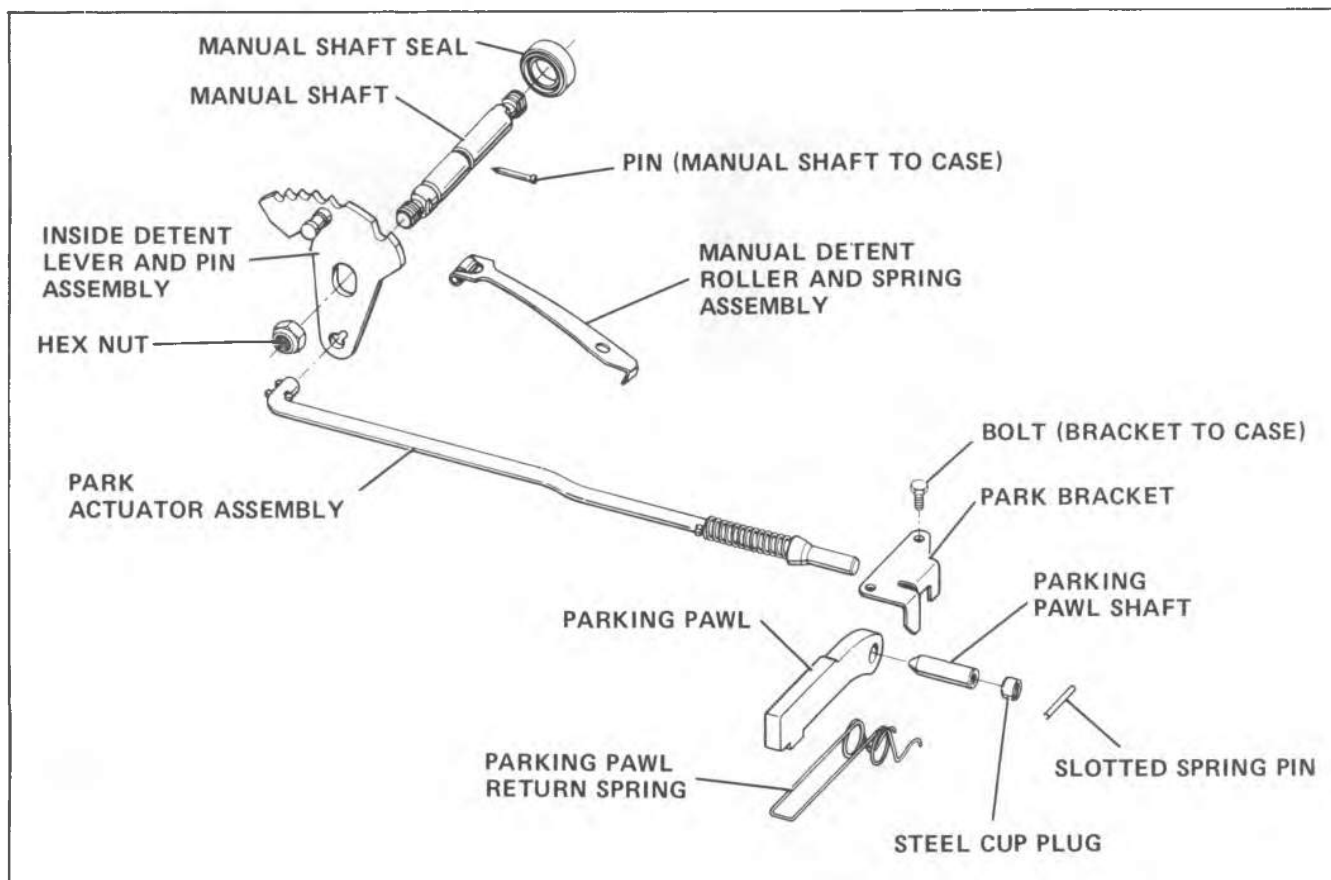


Fig. 7A-52A--Manual Shaft and Parking Shaft Parts

10. Install parking actuator rod and inside detent lever with detent lever pin toward center of transmission and actuator plunger between parking pawl and parking bracket (Fig. 7A-56A).

CAUTION: File any burrs or raised edges off the manual shaft that could damage the seal during installation of the shaft.

11. Install manual shaft, small identification ring groove first, through case. Install manual shaft to case retaining pin, indexing with larger groove on manual shaft (Fig. 7A-57A).

12. Aligning inside detent lever with flats on manual shaft, install inside detent lever on shaft.

13. Install hex nut on manual shaft and torque to 27.0-34.0 N·m (20-25 ft. lbs.).

REAR GEAR PARTS

Output Shaft (Fig. 7A-58A)

NOTE: The service output shaft has one speedometer drive gear clip hole at the front speedometer gear location which is about 6.3mm (1/4") diameter and opposite this hole is another clip hole which is about



Fig. 7A-53A--Installing Manual Shaft Seal Into Case



Fig. 7A-54A--Installing Parking Pawl

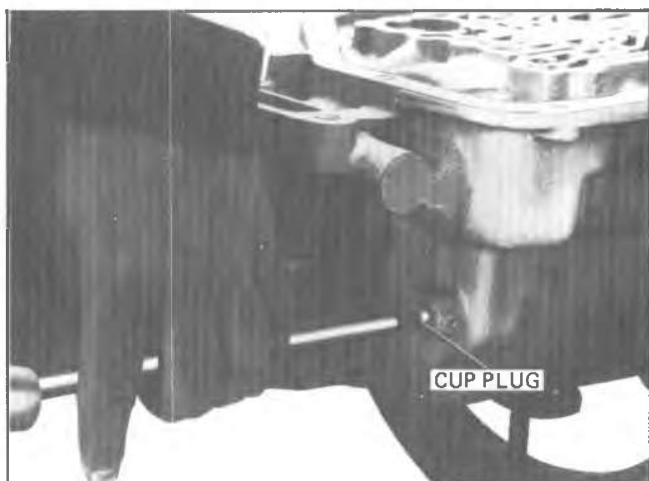


Fig. 7A-55A--Installing Parking Pawl Cup Plug

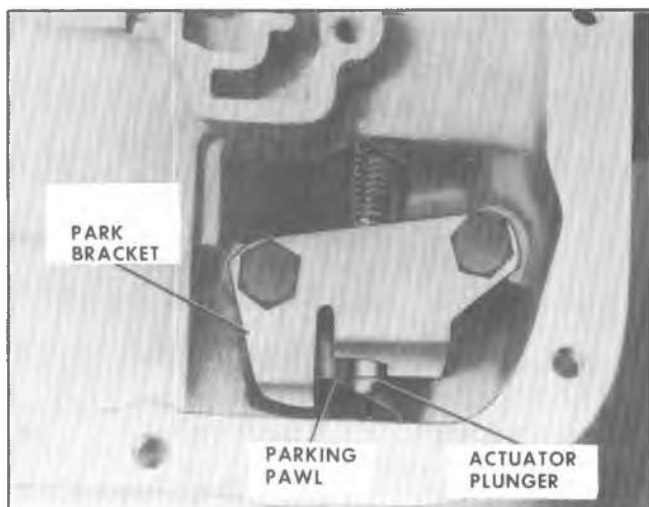


Fig. 7A-56A--Installing Parking Pawl Rod

4.0mm (5/32"). The shaft also has the same size holes at the rear speedometer gear location.

1. Inspect journals and snap ring grooves for wear or damage.

2. Inspect lubrication passages for being plugged or damaged.

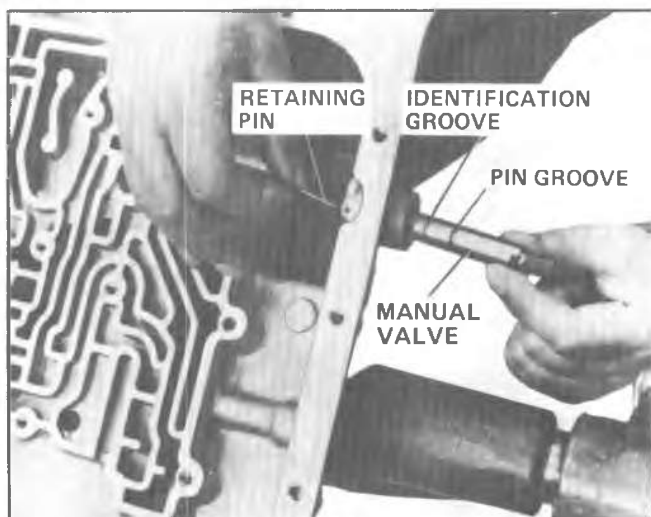


Fig. 7A-57A--Installing Manual Shaft Into Case

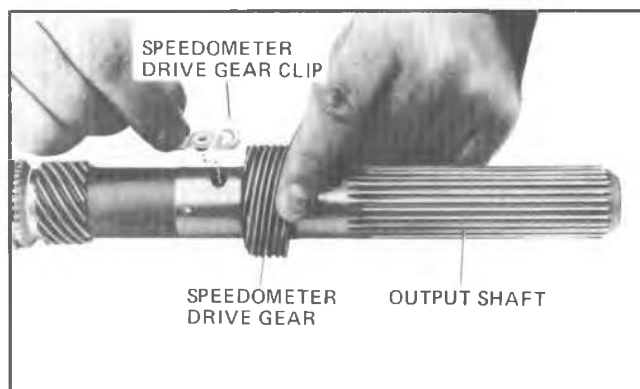


Fig. 7A-58A--Output Shaft

3. Inspect splines for damage.

4. Inspect governor drive gear for rough or damaged teeth.

5. Inspect speedometer drive gear for rough or damaged teeth and also the clip for damage.

6. If necessary to replace speedometer drive gear, proceed as follows:

a. Depress speedometer drive gear clip.

b. Remove gear and clip, tapping gear lightly with plastic hammer.

NOTE: Make sure speedometer drive gear is located so speedometer driven gear will mesh with it.

c. Place speedometer drive gear clip with the tanged end in the correct hole in the output shaft (Fig. 7A-59A).

d. Align the slot of the speedometer drive gear with the clip and install the gear.

7. If necessary, remove rear internal gear to output shaft snap ring. If damaged, replace with a new snap ring (Fig. 7A-58A).

Rear Internal Gear

1. Inspect rear internal gear, splines, teeth and bearing surface for wear, cracks or damage.

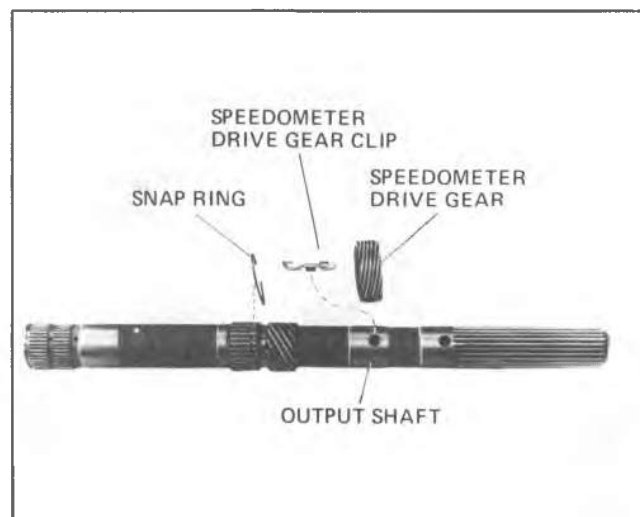


Fig. 7A-59A--Installing Speedometer Drive Gear and Clip

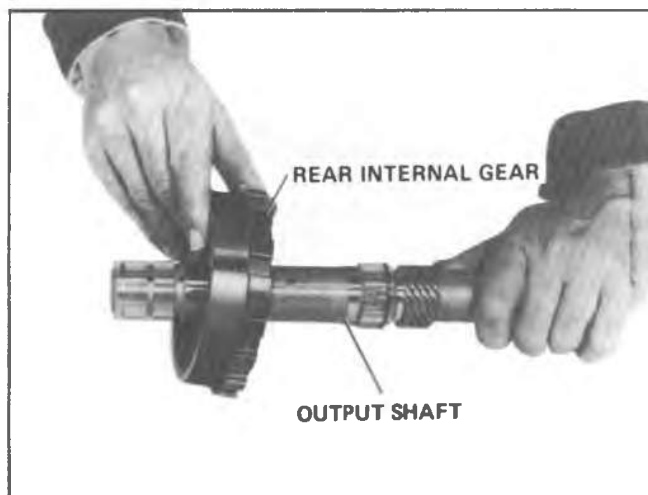


Fig. 7A-60A--Installing Rear Internal Gear on Output Shaft

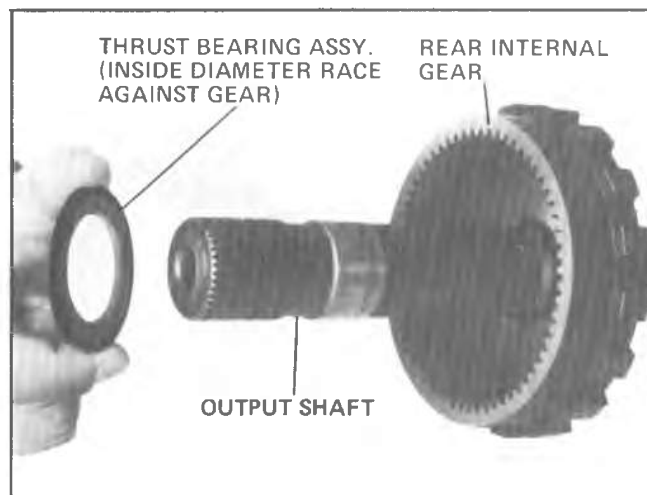


Fig. 7A-61A--Installing Thrust Bearing Assembly

2. Inspect parking pawl lugs for cracks or damage.
3. Install rear internal gear, hub end first, on output shaft, as shown in Fig. 7A-60A.
4. Thoroughly clean, air dry and inspect closely, the rear internal gear to rear sun gear roller thrust bearing assembly for pitted or rough conditions.
5. Install rear internal gear to rear sun gear roller thrust bearing assembly by placing the small diameter race over the output shaft (Fig. 7A-61A).

Roller Clutch and Rear Carrier Assembly

NOTE: Models CN, CU and CZ use a rear carrier with 2 pinions. All other models use 4 pinions.

Inspection

1. Remove roller clutch race. Inspect race and spline for scoring or wear (Fig. 7A-62A).
2. Remove roller clutch assembly and inspect roller bearings cage and springs for damage or wear (Fig. 7A-62A).
3. Remove and inspect rear carrier to roller clutch thrust washer for signs of scoring or excessive wear.
4. Inspect 4 tanged rear carrier to rear internal gear thrust washer for being scored or distorted tangs (Fig. 7A-62A).
5. Inspect rear carrier for damage.
6. Inspect roller clutch cam ramps for damage.
7. Inspect bushing for damage or scoring.

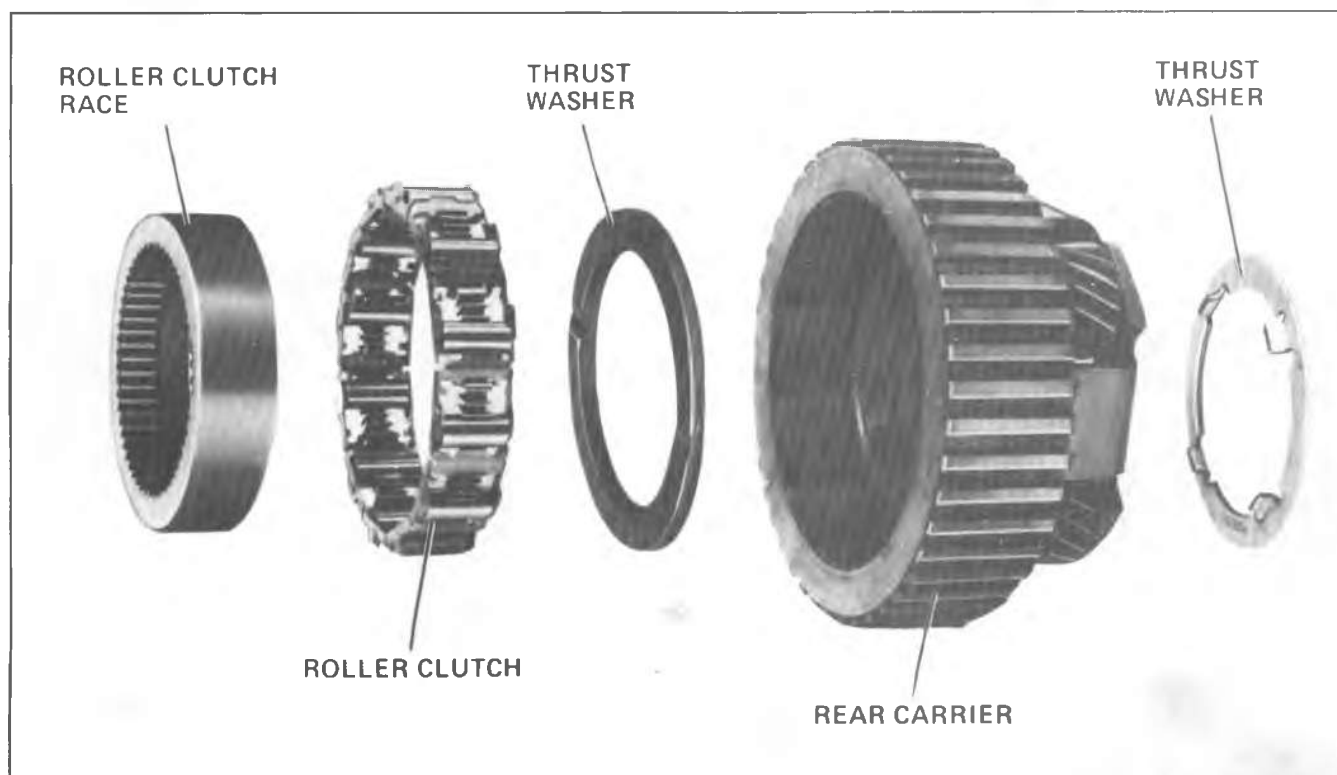


Fig. 7A-62A--Roller Clutch and Rear Carrier-Exploded

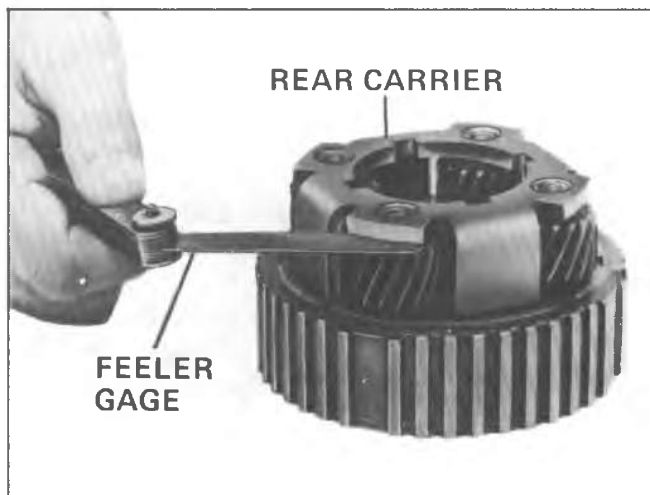


Fig. 7A-63A--Checking Rear Carrier Pinion End Play

8. Inspect planet pinions for damage, rough bearings or tilt.

9. Check pinion end play. Pinion end play should be 0.24-0.69mm (0.009"-0.027") (Fig. 7A-63A).



Fig. 7A-64A--Installing Thrust Washer Into Rear Carrier

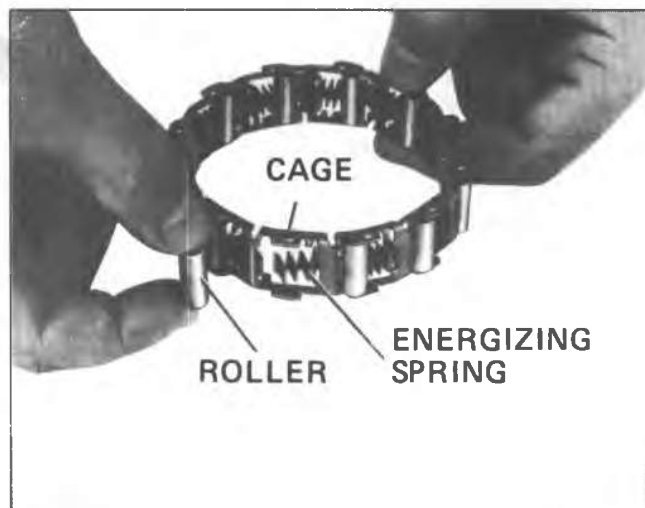


Fig. 7A-65A--Installing Roller Into Cage

Reassembly

1. Install roller clutch to rear carrier thrust washer (Fig. 7A-64A).

2. Install rollers that may have come out of roller clutch cage, by compressing the energizing spring with forefinger and inserting roller from outer edge (Fig. 7A-65A).

3. Install roller clutch assembly into roller clutch cam (Fig. 7A-66A).

4. Install roller clutch race, spline side out and rotate clutch race counterclockwise into position (Fig. 7A-67A).

5. Install 4 tanged rear carrier to rear internal gear thrust washer. Align tangs into slots of rear carrier and retain with petrolatum (Fig. 7A-68A).

6. Install roller clutch and rear carrier assembly into rear internal gear (Fig. 7A-69A).

7. Install J-25013-1, open end first, into rear end of case. Bolt J-25013-5 on end of case (Fig. 7A-70A).

8. Turn case to vertical position, pump end up.

9. Install rear unit parts into case and into J-25013-1 sleeve (Fig. 7A-71A) indexing rear internal gear parking pawl lugs to pass by parking pawl tooth.

10. Using J-25013-5 adjusting screw (Fig. 7A-70A) and looking through parking pawl case slot, adjust the height of the rear internal gear parking pawl lugs to align flush with the parking pawl tooth.

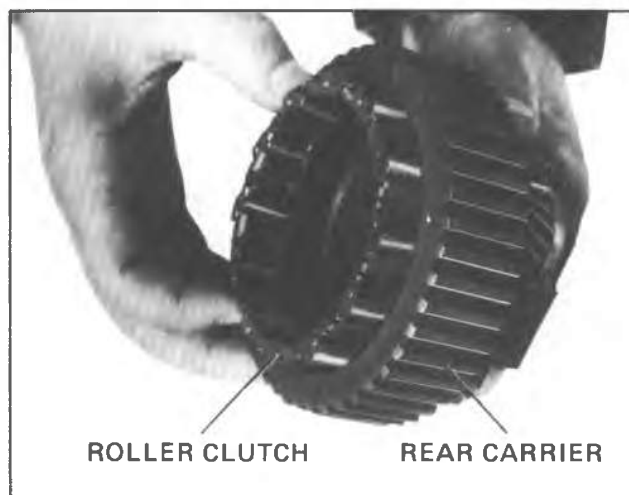


Fig. 7A-66A--Installing Roller Clutch Into Rear Carrier

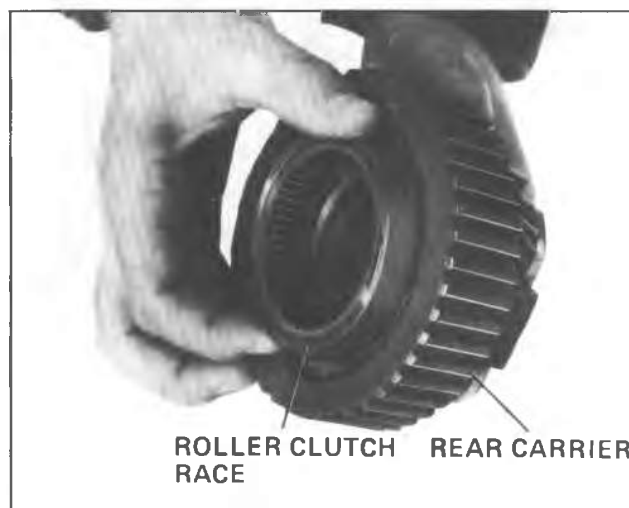


Fig. 7A-67A--Installing Roller Clutch Race

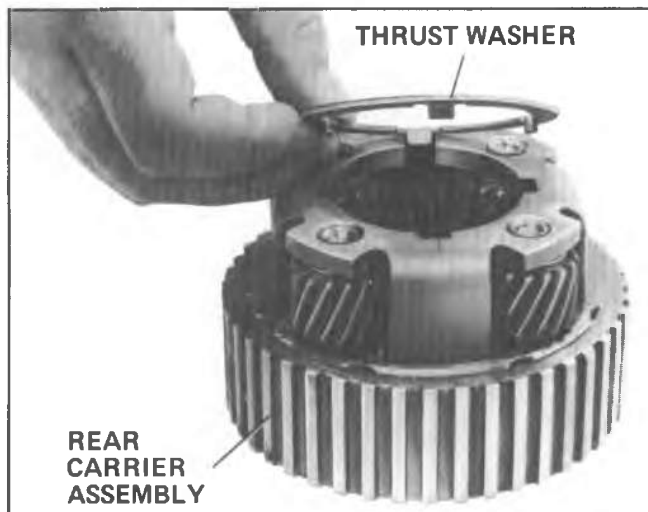


Fig. 7A-68A--Installing Thrust Washer

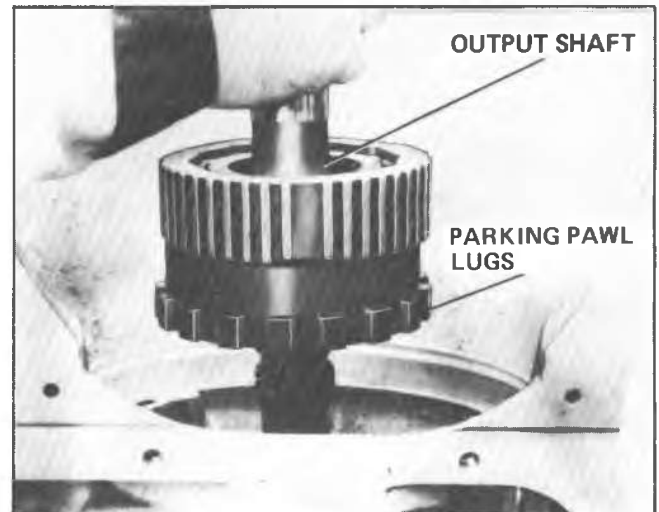


Fig. 7A-71A--Installing Rear Unit Parts

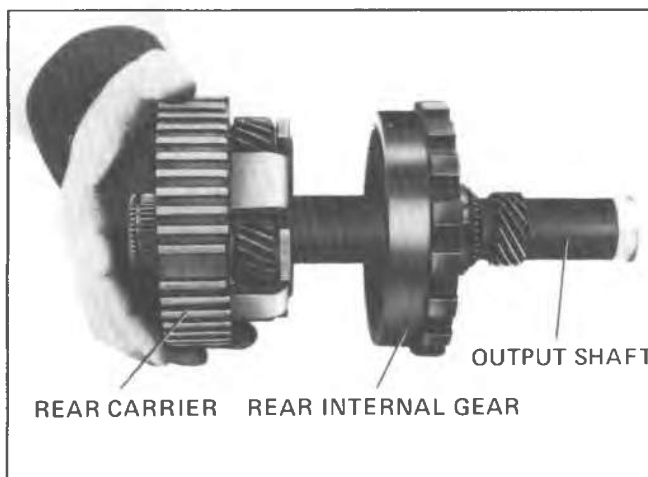


Fig. 7A-69A--Installing Rear Carrier Into Rear Internal Gear

NOTE: Make sure speedometer drive gear is visible through speedometer gear bore. If drive gear is not visible, it may be located on wrong journal of shaft.

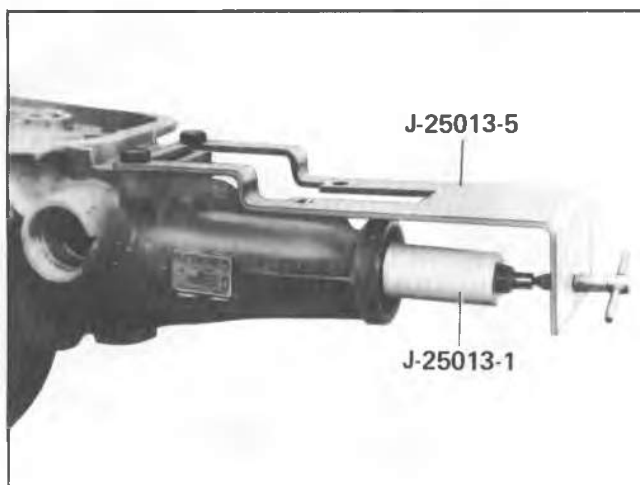


Fig. 7A-70A--Installing Tools on Rear End of Case

LOW AND REVERSE CLUTCH

Inspection

CAUTION: If low and reverse clutch housing has been removed, the low and reverse clutch piston travel must be checked.

Inspect low and reverse clutch composition-faced and steel clutch plates for signs of wear or burning.

Low and Reverse Clutch Housing Assembly (Fig. 7A-72A)

Disassembly

1. Compress low and reverse clutch spring retainer, remove snap ring and retainer and inspect for damage or distortion (Fig. 7A-73A).
2. Remove waved spring (Fig. 7A-74A).
3. Remove low and reverse clutch piston.
4. Remove outer and inner piston seals (Figs. 7A-75A and 7A-76A).
5. Remove clutch apply ring.

Inspection

1. Inspect low and reverse clutch housing for damage, plugged feed hole.
2. Inspect low and reverse clutch housing bushing for damage or scoring.
3. Inspect low and reverse clutch splines and snap ring groove for damage or burrs. Remove any burrs on splines or snap ring groove.
4. Inspect low and reverse clutch piston and clutch apply ring assembly for distortion, cracks or damage.

NOTE: The apply ring is identified by a number located on the ring. The ring usage and identification are as follows:

Models CE, CD, CR and CY are identified by No. 7.

Models CN, CU, CX and CZ are identified by No. 9.

5. Inspect low and reverse clutch spring retainer for damage.
6. Inspect waved spring for damage.
7. Inspect low and reverse clutch housing to case spacer ring for damage.

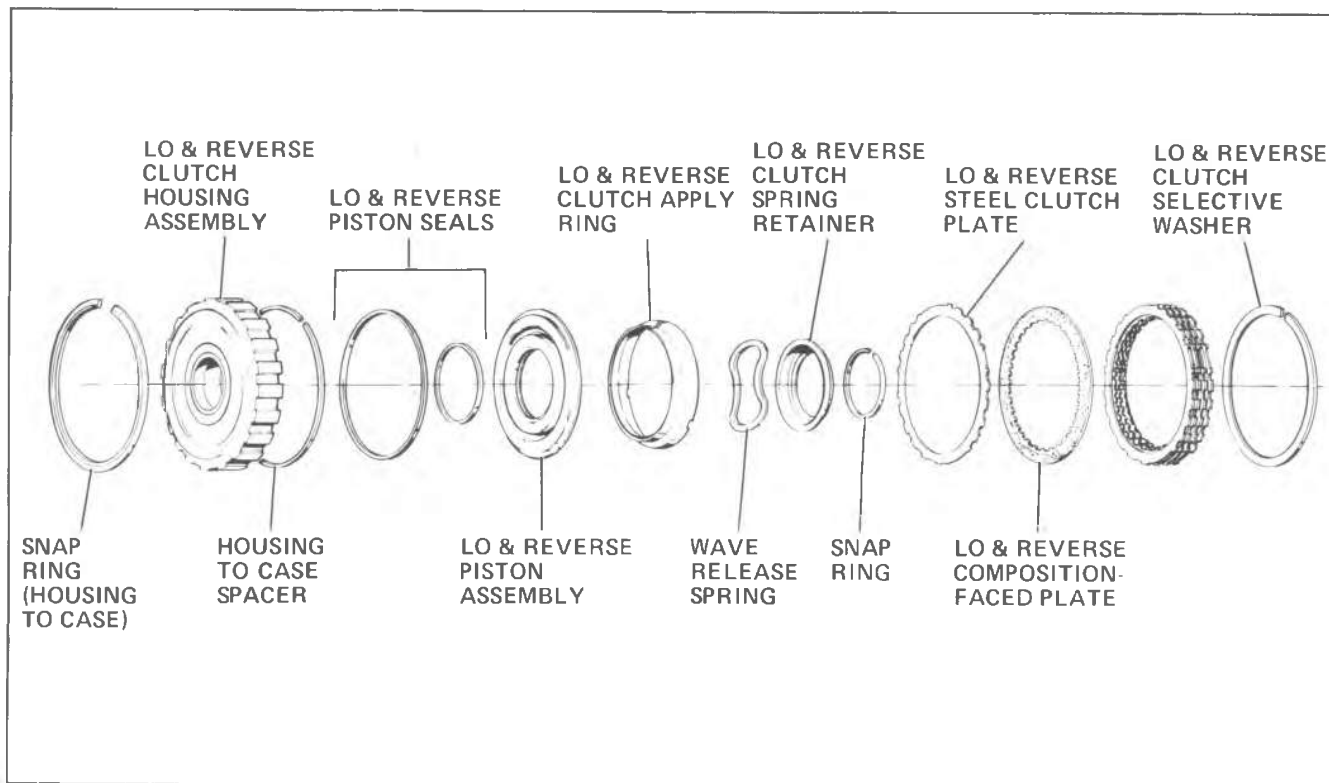


Fig. 7A-72A--Low and Reverse Clutch Housing-Exploded View

Reassembly

1. Install clutch apply ring on low and reverse clutch piston.

2. Install new outer and inner seals on piston with lips facing away from clutch apply ring side.

3. Install seal protector J-25011.

NOTE: Apply transmission fluid to all clutch seals before reassembly.

CAUTION: Flat screwdriver surface area must be smooth to prevent damaging outer seal.

4. Using flat edged small screwdriver, install low and reverse clutch piston, while rotating and pushing down into place (Fig. 7A-77A).

5. Remove seal protector J-25011.

6. Install waved release spring (Fig. 7A-74A).

7. Install retainer, cupped faced down.

8. Compress retainer and install snap ring (Fig. 7A-73A).

9. Check low and reverse clutch piston travel as follows:

a. Center the low and reverse clutch housing and piston assembly on J-25023-1 plate (Fig. 7A-78A).

b. Center steel and composition clutch plates on clutch apply ring, then place J-25023-2 with gauge pin toward housing.

c. Install spring J-25023-7 over bolt of J-25023-1.

d. Using nut and washer, compress spring J-25023-7 until washer bottoms against shoulder on J-25023-1 (Fig. 7A-78A).

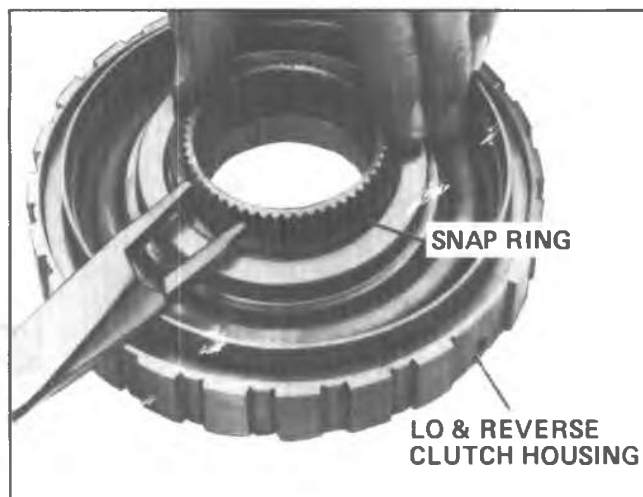


Fig. 7A-73A--Removing or Installing Low and Reverse Clutch Spring Retaining Snap Ring



Fig. 7A-74A--Removing or Installing Low and Reverse Clutch Wave Release Springs

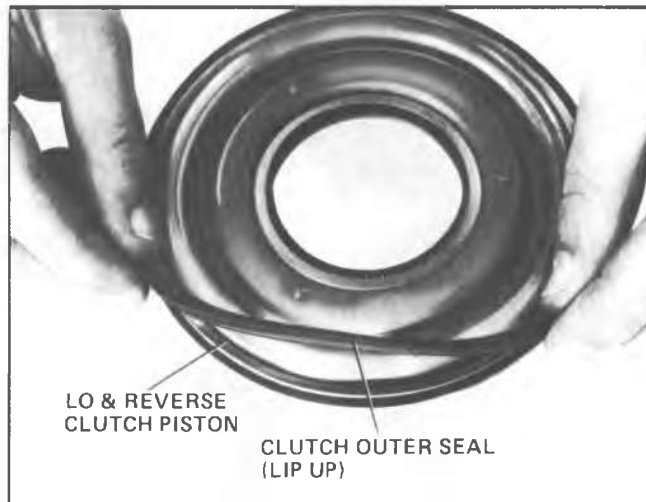


Fig. 7A-75A--Removing or Installing Low and Reverse Clutch Outer Seal

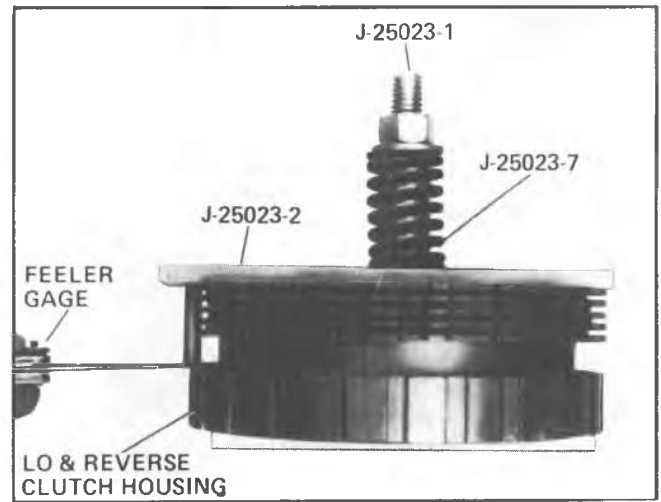


Fig. 7A-78A--Checking for Correct Low and Reverse Selective Spacer

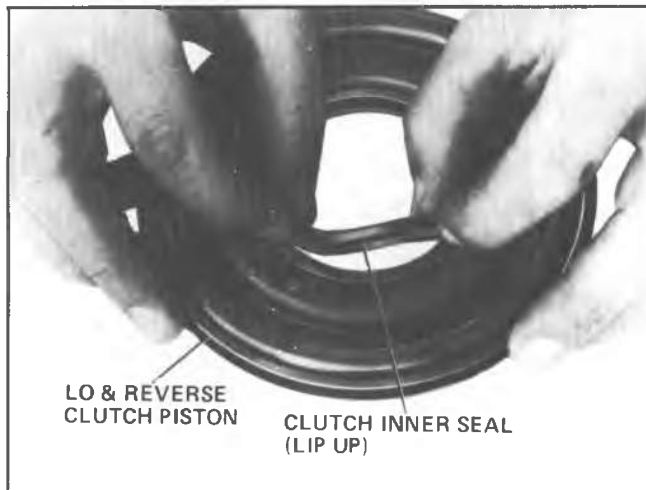


Fig. 7A-76A--Removing or Installing Low and Reverse Clutch Inner Seal

e. Using feeler gauge, determine distance between gauge pin on J-25023-2 and top edge of housing (Fig. 7A-78A). See Selective Spacer chart (Fig. 7A-79A) to determine proper selective spacer.

LO AND REVERSE CLUTCH SELECTIVE SPACER THICKNESS			
FEELER STOCK THICKNESS			SPACER I.D. NUMBER
0.04mm	0.4mm	(.001"-.016")	6
0.4mm	0.8mm	(.016"-.032")	5
0.8mm	1.20mm	(.032"-.048")	4
1.20mm	1.60mm	(.048"-.064")	3
1.60mm	2.0 mm	(.064"-.080")	2
2.0 mm	2.40mm	(.080"-.096")	1

Fig. 7A-79A--Lo and Reverse Clutch Selective Spacer Chart

NOTE: The low and reverse clutch selective spacer identification number is also the last number of the part number. It may be necessary to measure the thickness of the selective spacer for positive identification.

f. Remove J-25023.

g. Install proper low and reverse clutch selective spacer in the case (Fig. 7A-80A).

1. Oil and install the lo and reverse clutch plates into the case, starting with a flat steel and alternating

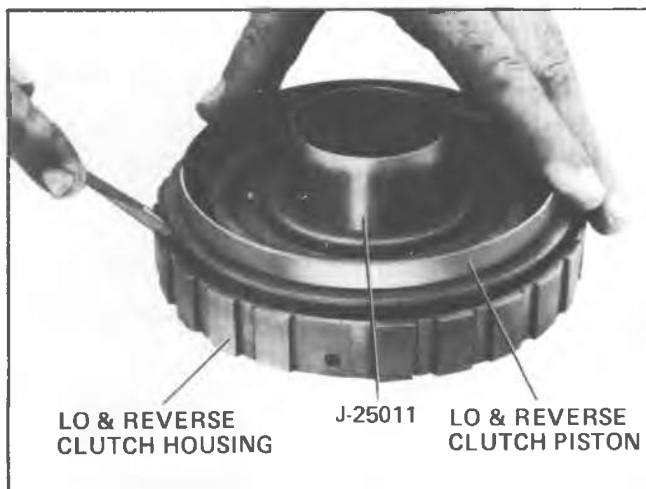


Fig. 7A-77A--Installing Low and Reverse Clutch Piston



Fig. 7A-80A--Correct Location of Low and Reverse Clutch Selective Spacer

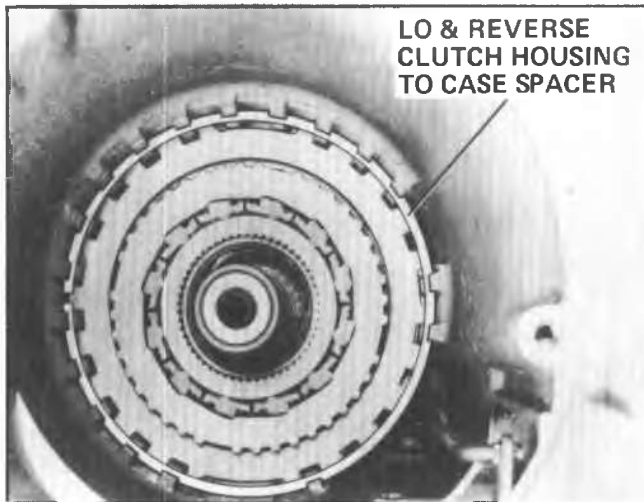


Fig. 7A-81A--Proper Location of Low and Reverse Housing to Case Spacer

composition-faced and flat steel clutch plates. (See Clutch Plate Usage Chart, Fig. 7A-82A).

2. Install low and reverse clutch housing to case spacer ring in case (Fig. 7A-81A).

3. Install low and reverse clutch housing assembly aligning reverse clutch housing feed hole to reverse clutch case feed passage, using J-25012 (Fig. 7A-83A).

If the low and reverse clutch housing does not seat past the case snap ring groove, proceed as follows:

- Remove tool J-25012.
- Using rear sun gear and input drum as a tool, install input drum and rear sun gear in case.
- Rotate rear sun gear back and forth, tapping lightly with input drum, to align roller clutch race and low and reverse clutch hub splines (Fig. 7A-84A).
- Remove tool (input drum and rear sun gear).

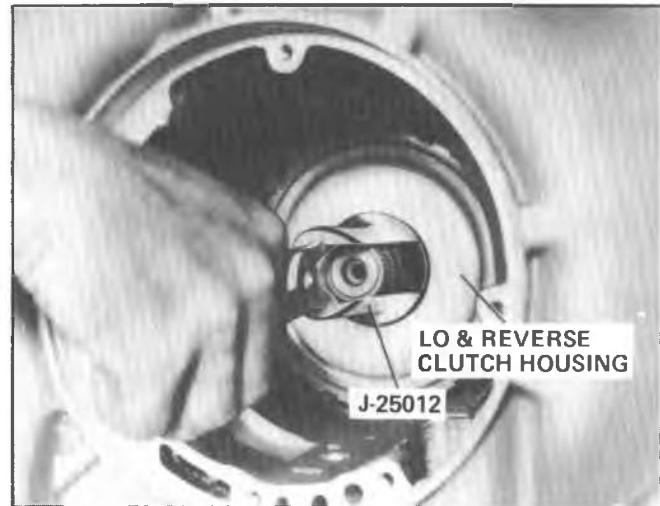


Fig. 7A-83A--Installing Low and Reverse Clutch Housing

NOTE: It may be necessary to loosen adjusting screw on J-25013-5 on output shaft to install snap ring.

e. Repeat the above steps if low and reverse clutch housing is not fully seated past case snap ring groove.

4. Install low and reverse clutch housing to case snap ring, flat side against housing (beveled side up). Position snap ring gap on opposite side of parking actuator rod.

FRONT GEAR PARTS

Rear Sun Gear and Input Drum (Fig. 7A-85A)

Inspection

- Inspect rear sun gear for cracks, splits, damage spline, worn gear or journals and plugged lubrication holes (Fig. 7A-85A).
- Inspect rear sun gear bushing for damage or scoring.
- If necessary, remove input drum to rear sun gear snap ring and remove sun gear from input drum.

MODEL	DIRECT CLUTCH			FORWARD CLUTCH					LO & REV. CLUTCH	
	Flat Steel		Composition Plates	Waved Plates		Flat Steel		Composition Plates	Flat Steel	Composition Plates
	No.	Thickness	No.	No.	Thickness	No.	Thickness	No.	No.	No.
CU, CN, CZ	4	2.324mm (.091")	4	1	1.585mm (.062")	2	1.969mm (.077")	3	5	4-Grooved
CX	3	2.324mm (.091")	3	1	1.585mm (.062")	2	1.969mm (.077")	3	5	4-Grooved
CD, CE, CR, CY	5	2.324mm (.091")	5	1	1.585mm (.062")	3	1.969mm (.077")	4	7	6-Non-Grooved

- NOTE:**
- The direct and forward clutch flat steel clutch plates should be identified by their thickness.
 - The waved plate has (3) teeth, equally spaced, omitted, for identification.
 - The direct and forward production installed composition-faced clutch plates must not be interchanged. For service, direct and forward clutch use the same composition-faced plates.
 - All lo and reverse clutch composition-faced plates are serviced with the grooved composition-faced plates.

Fig. 7A-82A--Clutch Plate Usage

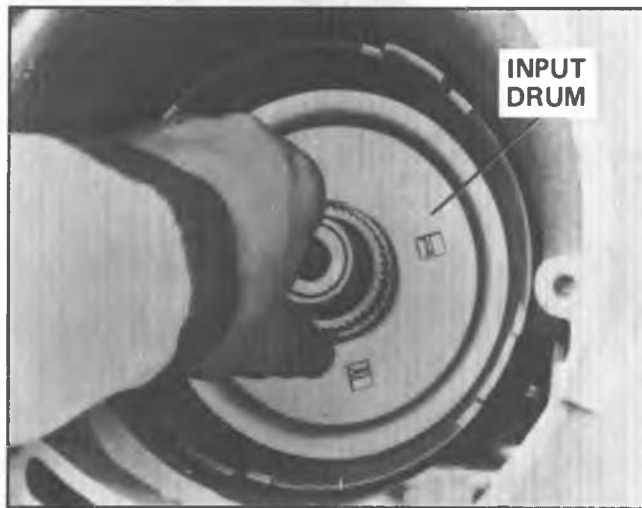


Fig. 7A-84A--Installing Input Drum and Rear Sun Gear

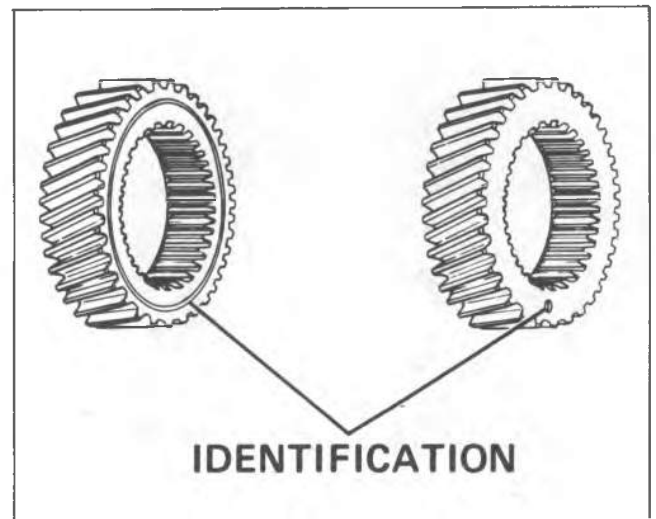


Fig. 7A-87A--Front Sun Gear Identification

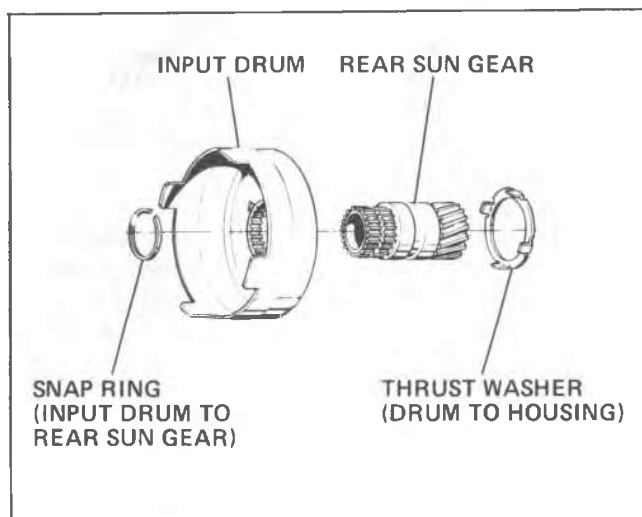


Fig. 7A-85A--Rear Sun Gear and Input Drum

4. Inspect input drum for damage.
5. Inspect 4 tanged input drum to low and reverse clutch housing thrust washer for scoring or distorted tangs.
6. If damaged, replace rear sun gear to input drum snap ring.

Reassembly

1. Install rear sun gear into input drum, spline side first, and retain with snap ring.
2. Install 4 tanged thrust washer on input drum over sun gear end; align tangs into input drum and retain with petrolatum (Fig. 7A-86A).
3. Install rear sun gear and input drum assembly (Fig. 7A-84A).

Front Sun Gear

1. Inspect front sun gear splines and teeth for damage or wear.
2. Inspect machined face for pitting, scoring or damage.
3. Install front sun gear face with the identification mark (a drill spot or groove) against input drum to rear sun gear snap ring (Fig. 7A-87A and 7A-88A).
4. Thoroughly clean, air dry and inspect front sun gear to front carrier thrust race and thrust bearing for pitted or rough conditions.
5. Install front sun gear to front carrier thrust bearing and race assembly with roller thrust bearing against the front sun gear (Fig. 7A-89A).

NOTE: This thrust bearing requires only 1 thrust race.



Fig. 7A-86A--Installing Thrust Washer

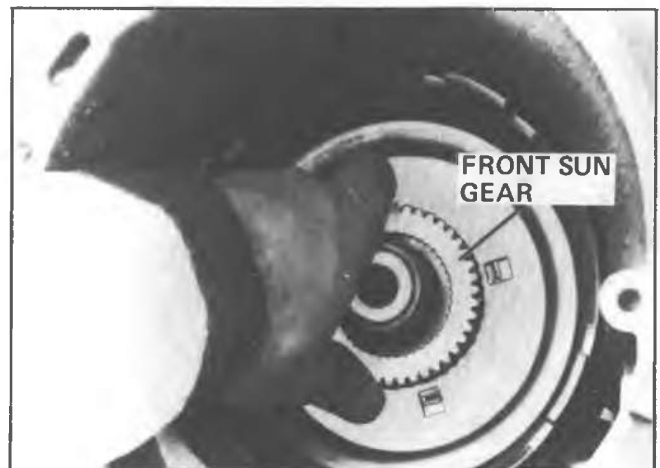


Fig. 7A-88A--Installing Front Sun Gear

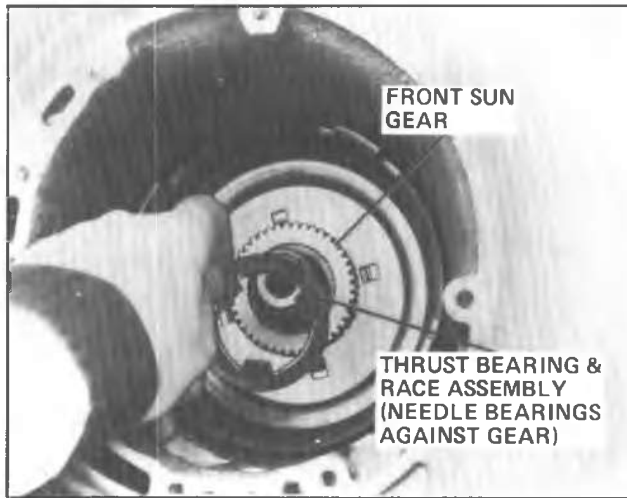


Fig. 7A-89A--Installing Thrust Bearing Assembly Against Front Sun Gear

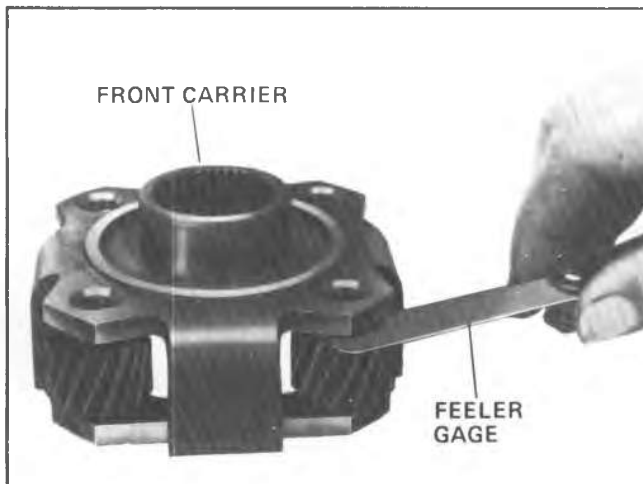


Fig. 7A-90A--Checking Front Carrier Pinion End Play

Front Carrier Assembly

NOTE: Models CN, CU and CZ use a front carrier with 2 pinions. All other models use 4 pinions.

Inspection

1. Inspect front carrier for damage (Fig. 7A-90A).



Fig. 7A-91A--Installing Thrust Bearing Assembly Onto Front Carrier

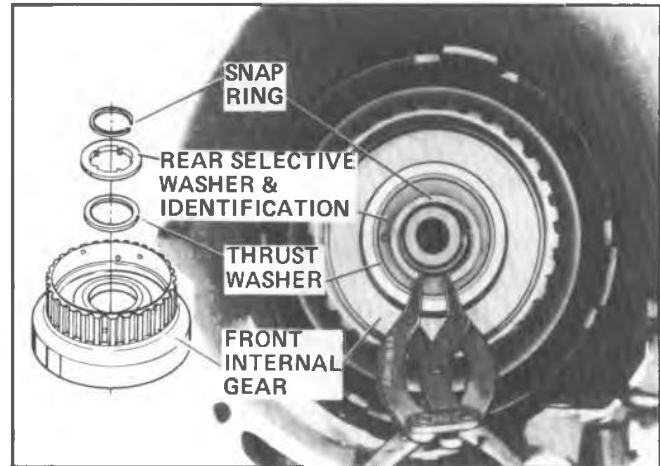


Fig. 7A-92A--Installing Output Shaft to Selective Washer Snap Ring

2. Inspect pinions for damage, rough bearings or tilt.
3. Check pinion end play. Pinion end play should be 0.24mm-0.69mm (0.009" to 0.027") (Fig. 7A-90A).
4. Thoroughly clean, air dry and inspect closely, front carrier to front internal gear roller thrust bearing assembly for pitted or rough conditions.

Reassembly

1. Install front carrier to front internal gear roller thrust bearing assembly by placing the smaller diameter race against carrier. Retain with petrolatum (Fig. 7A-91A).
2. Install front carrier and thrust bearing assembly (Fig. 7A-93A).

Front Internal Gear and Thrust Washer

1. Inspect forward clutch hub for worn splines and for lubrication holes.
2. Inspect internal gear for cracks or damage.
3. Inspect gear teeth for excessive wear or damage.
4. Inspect bushing for damage or scoring.
5. Inspect thrust washer, front internal gear to selective washer for scoring or damage.
6. Install thrust washer on front internal gear and retain with petrolatum (Fig. 7A-92A).
7. Install front internal gear and thrust washer.

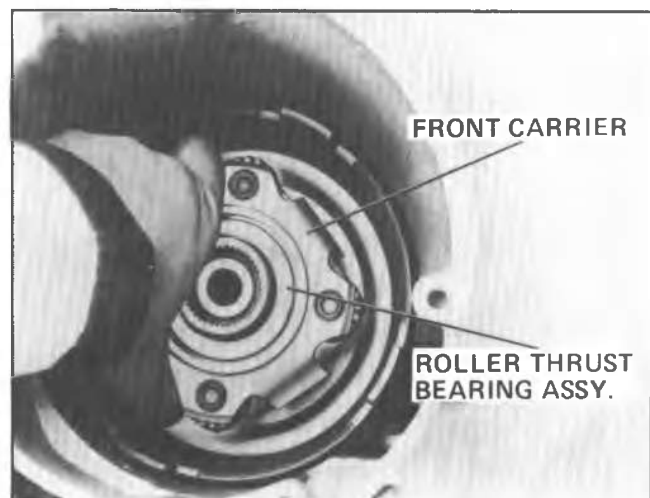


Fig. 7A-93A--Installing Front Carrier and Roller Thrust Bearing

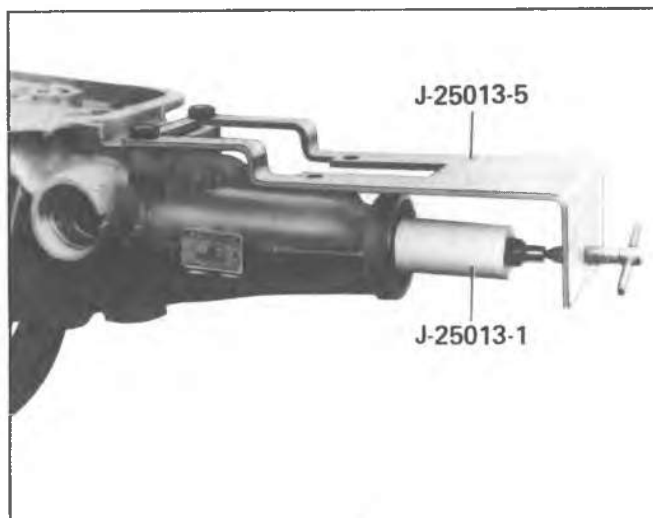


Fig. 7A-94A--Installing Tools on Rear End of Case

Rear Selective Thrust Washer

1. Inspect selective washer for scoring or damage (Fig. 7A-92A).

CAUTION: The rear selective thrust washer must be installed with the identification number toward the front of the transmission.

2. Install rear selective washer.

3. Inspect output shaft to selective thrust washer snap ring for damage or distortion.

NOTE: It may be necessary to move output shaft upward by turning the adjusting screw on J-25013-5 to install output shaft to selective washer snap ring.

4. Install snap ring on output shaft (Fig. 7A-92A).

CAUTION: Make sure snap ring is fully seated in output shaft groove.

Check Rear Unit End Play

1. Loosen J-25013-5 adjusting screw on output shaft and push output shaft downward (Fig. 7A-94A).

CAUTION: Do not install clamp assembly on any machined case surfaces.

2. Install gauge clamp on case as shown in Fig. 7A-95A.

3. Install dial indicator J-8001 and plunger extension J-7057. Position extension against end of output shaft. Set dial indicator to zero (Fig. 7A-95A).

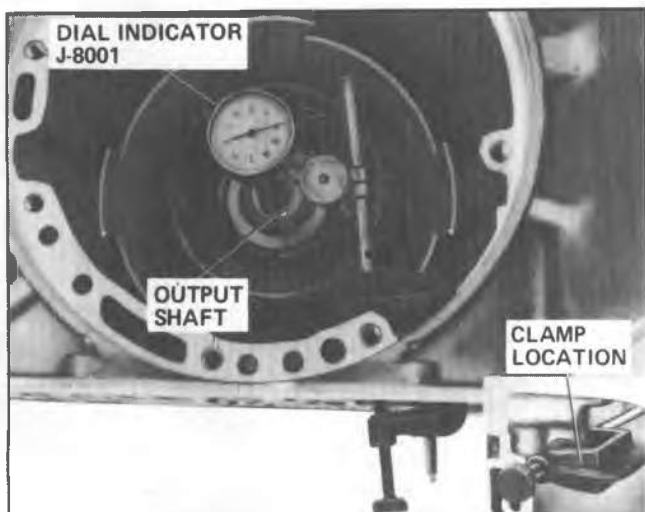


Fig. 7A-95A--Checking Rear Unit End Play

REAR UNIT END PLAY CHART

THICKNESS			IDENTIFICATION
			Number and/or Color
2.90 - 3.01mm	(0.114"-0.119")		1 Orange
3.08 - 3.19mm	(0.121"-0.126")		2 White
3.26 - 3.37mm	(0.128"-0.133")		3 Yellow
3.44 - 3.55mm	(0.135"-0.140")		4 Blue
3.62 - 3.73mm	(0.143"-0.147")		5 Red
3.80 - 3.91mm	(0.150"-0.154")		6 Brown
3.98 - 4.09mm	(0.157"-0.161")		7 Green
4.16 - 4.27mm	(0.164"-0.168")		8 Black
4.34 - 4.45mm	(0.171"-0.175")		9 Purple

Fig. 7A-96A--Rear Unit End Play Washer Thickness Chart

4. Move output shaft upward by turning the adjusting screw on J-25013-5 until the white or scribed line on sleeve J-25013-1 begins to disappear (Fig. 7A-94A) and read end play. Rear unit end play should be 0.10-0.64mm (.004"-.025").

NOTE: Selective washer controlling this end play is located between the front internal gear thrust washer and output shaft snap ring. If more or less washer thickness is required to bring end play within specifications, select proper washer from the chart shown in Figure 7A-96A.

5. Remove dial indicator and clamp assembly (Fig. 7A-95A).

6. Loosen J-25013-5 adjusting screw on output shaft.

7. Inspect output shaft to turbine shaft front selective thrust washer for damage or scoring.

8. Install output shaft to turbine shaft, front selective thrust washer, locating in output shaft and retain with petrolatum (Fig. 7A-97A).

FRONT UNIT PARTS

Direct Clutch Housing Assembly (Fig. 7A-98A)

1. Remove snap ring (Fig. 7A-99A).

2. Remove the clutch backing plate from the direct clutch housing.

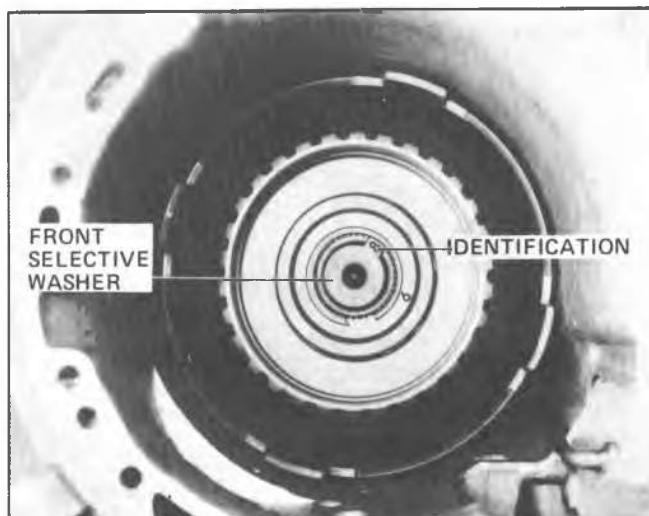


Fig. 7A-97A--Location of Front Selective Washer

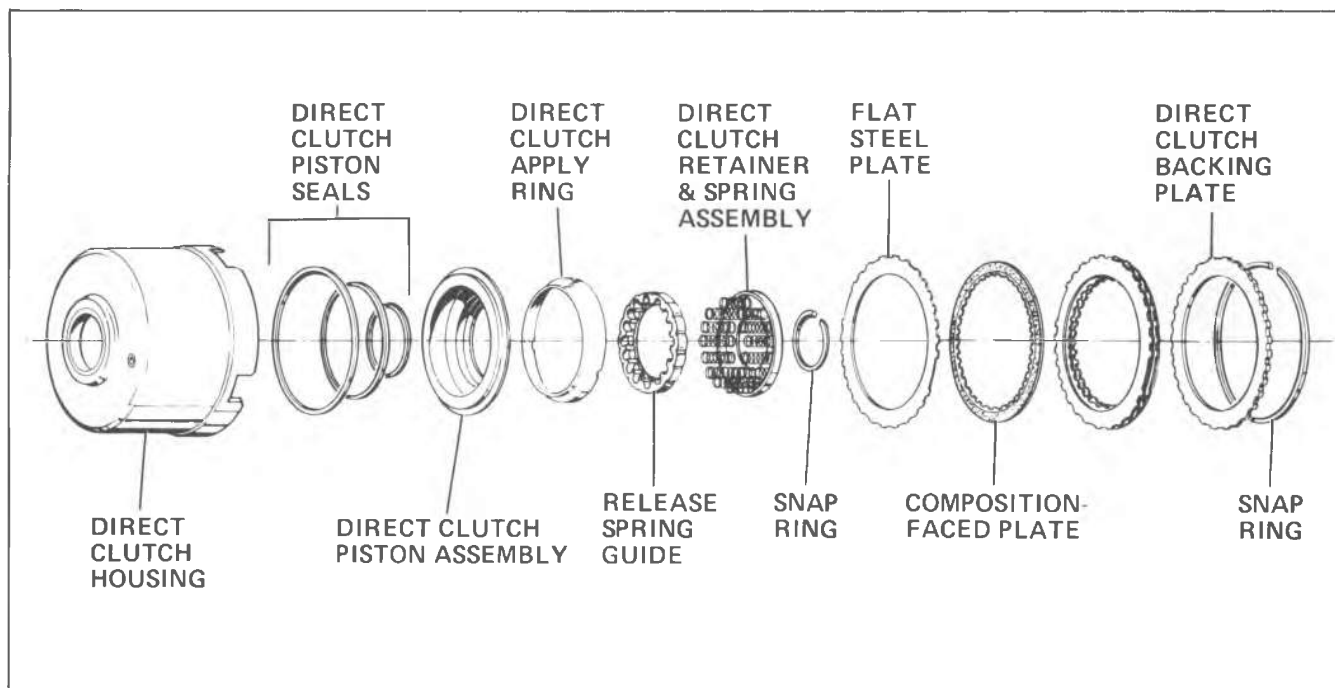


Fig. 7A-98A--Direct Clutch Assembly - Exploded

3. Remove the clutch plates from the direct clutch housing and keep them separated from the forward clutch plates. (See Clutch Plate Usage Chart, Fig. 7A-82A).

4. Inspect composition-faced plates and steel clutch plates for wear or burning.

5. Inspect clutch backing plate for scoring or other damage.

6. Using J-23327, compress retainer and spring assembly (Fig. 7A-100A), remove snap ring and inspect for damage distortion.

7. Remove J-23327.

8. Remove retainer and spring assembly from housing.

9. Inspect release spring retainer for being collapsed.

10. Inspect release springs for being collapsed.

11. Remove release spring guide and inspect for damage.

12. Remove direct clutch piston.

13. Remove outer and inner seals from direct clutch piston and discard (Figs. 7A-101A and 7A-102A).

14. Do not remove the clutch apply ring from the piston unless the piston or apply ring requires replacement.

NOTE: The apply ring is identified by a number on the ring. The ring usage and identification are as follows:

Models CN, CU and CZ are identified by No. 1

Model CX is identified by No. 2

Models CD, CE, CR and CY are identified by No. 9.

15. Inspect direct clutch piston assembly for distortion, cracks, damage and check ball for free operation.

16. Remove center seal from direct clutch housing and discard (Fig. 7A-103A).

17. Inspect direct clutch housing for cracks, wear and open oil passages.

18. Check for free operation of check ball.

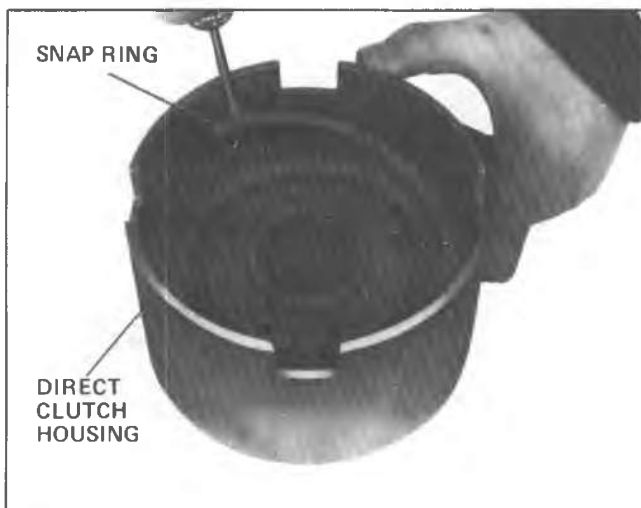


Fig. 7A-99A--Removing or Installing Direct Clutch Snap Ring

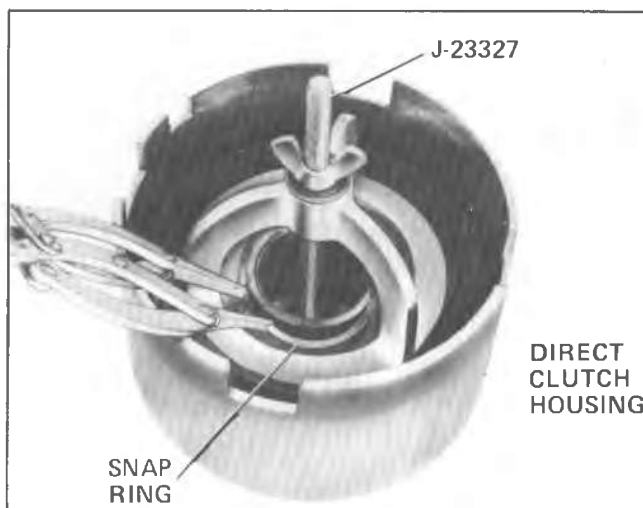


Fig. 7A-100A--Removing or Installing Direct Clutch Inner Snap Ring

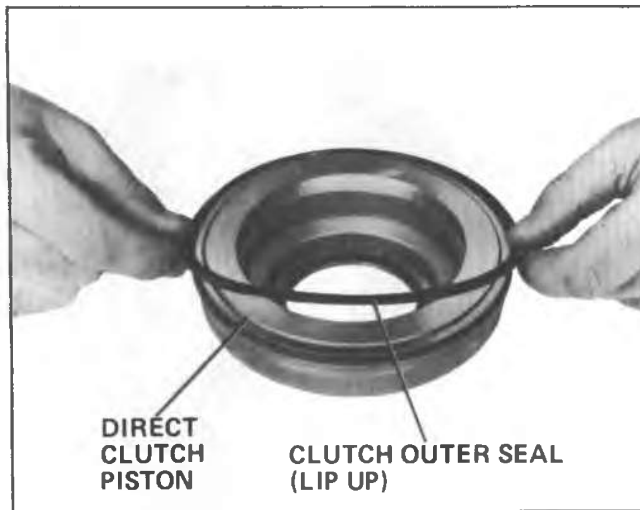


Fig. 7A-101A--Removing Direct Clutch Piston Outer Seal

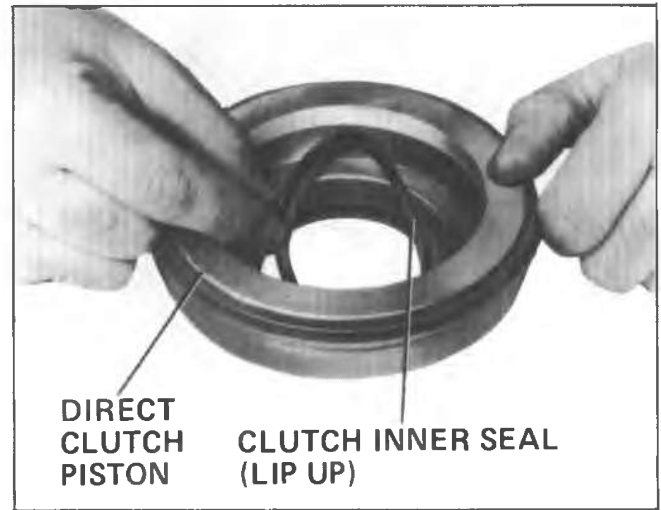


Fig. 7A-104A--Installing Direct Clutch Piston Inner Seal

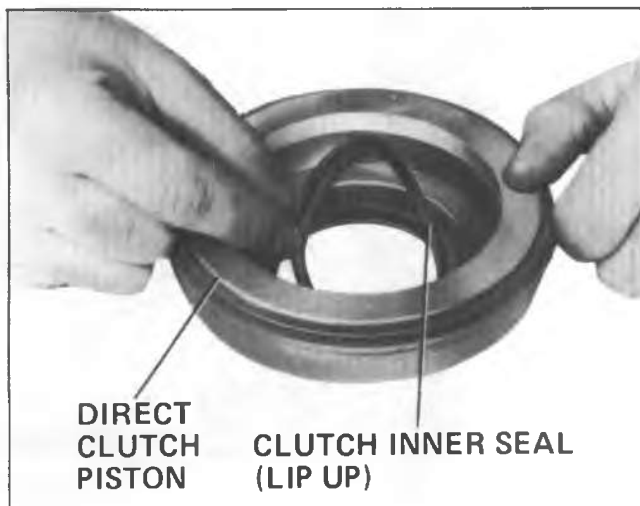


Fig. 7A-102A--Removing Direct Clutch Piston Inner Seal

19. Inspect direct clutch housing snap ring grooves for damage.

20. Inspect direct clutch bushings for damage or scoring.

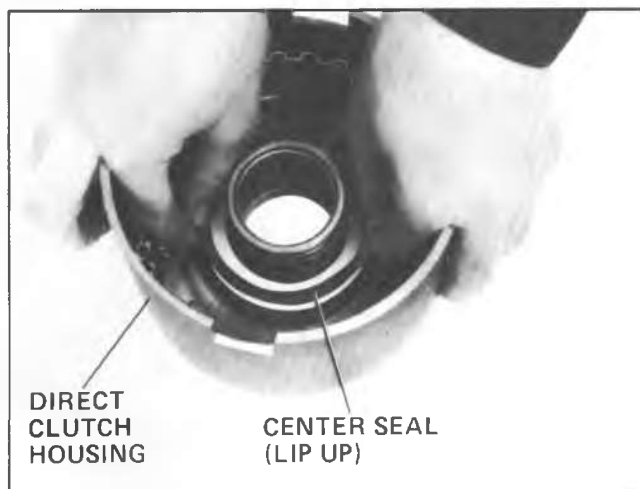


Fig. 7A-103A--Removing or Installing Center Seal of Direct Clutch Housing

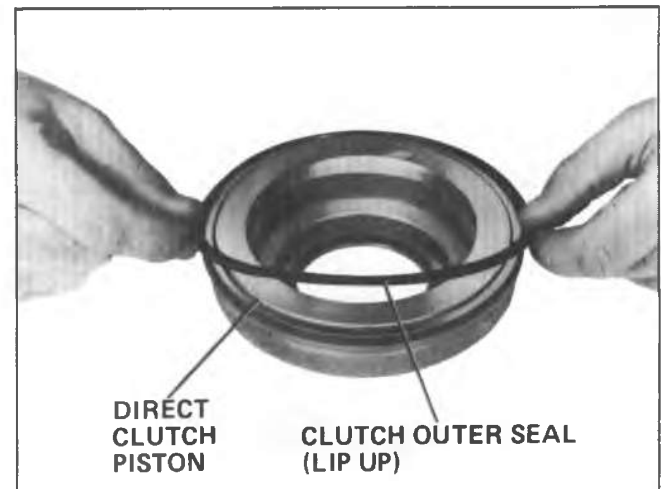


Fig. 7A-105A--Installing Direct Clutch Piston Outer Seal

Reassembly

1. Install clutch apply ring on piston.
 2. Install new inner and outer seals on piston with lips facing away from clutch apply ring side (Figs. 7A-104A and 7A-105A).
 3. Install new center seal on direct clutch housing with lip facing up.
 4. Install seal protector J-25010 (Fig. 7A-105A).
- CAUTION:** Use extreme care when installing direct clutch piston past larger direct clutch snap ring groove. Groove could cut outer seal on piston.
5. Oil seals and install direct clutch piston (Fig. 7A-106A).
- NOTE:** To make the piston easier to install, insert tool between seal and housing; rotate tool around the housing to compress the lip of the seal, while pushing down slightly on the piston. See Fig. 7A-107A.
 6. Remove seal protector J-25010.
 7. Install release spring guide with the omitted rib over the check ball in the piston, as shown in Fig. 7A-108A.
 8. Install retainer and spring assembly.

NOTE: Models CN, CU, CX and CZ use a direct clutch retainer and spring assembly which contains (16) release springs. All other models use a retainer and spring assembly with (10) release springs.

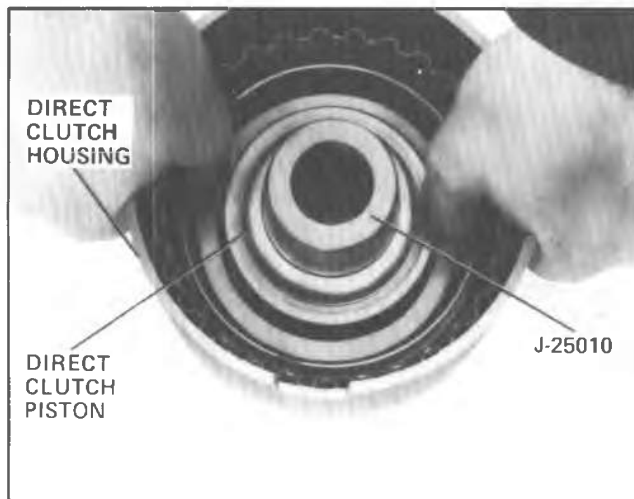


Fig. 7A-106A--Installing Direct Clutch Piston

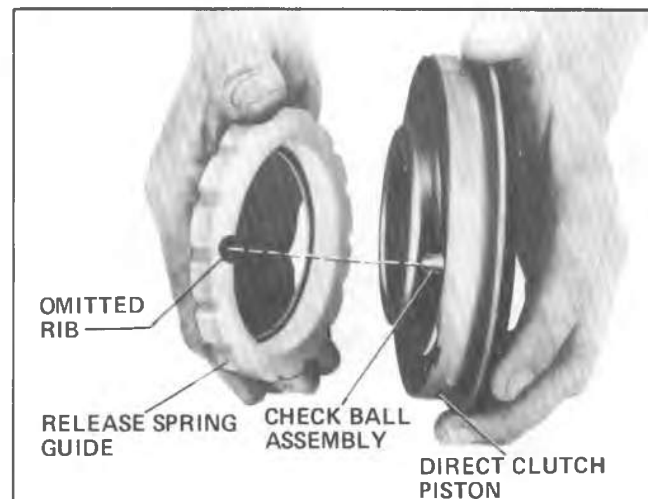


Fig. 7A-108A--Installing Release Spring Guide

CAUTION: Retainer could locate in snap ring groove and forcing retainer to compress springs, could damage retainer plate when installing.

9. Using J-23327 tool, compress retainer and spring assembly past the snap ring groove. Install the snap ring (Fig. 7A-100A). An arbor press and J-23327-1 can be used to compress the retainer and spring assembly.

10. Remove J-23327-1 and/or J-6129.

11. Oil and install the direct clutch plates into the direct clutch housing, starting with a flat steel and alternating composition-faced and flat steel clutch plates. (See Figs. 7A-109A and Fig. 7A-82A).

12. Install backing plate, chamfered side up.

13. Install snap ring (Fig. 7A-99A).

NOTE: Make sure composition clutch plates turn freely.

14. Set direct clutch assembly aside.

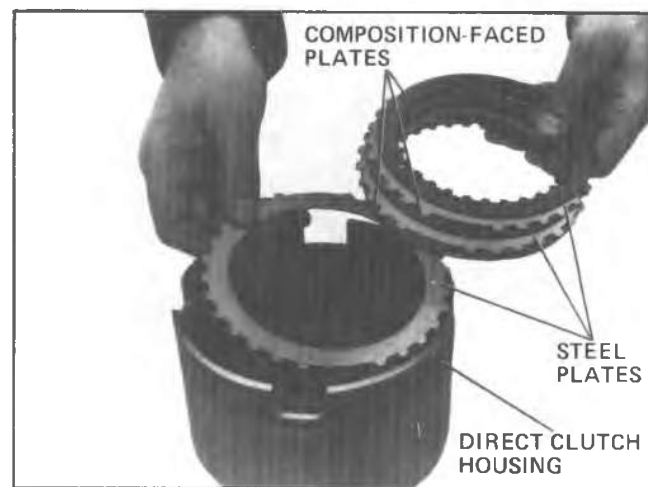


Fig. 7A-109A--Installing Clutch Plates into Direct Clutch Housing

Forward Clutch Housing Assembly (Fig. 7A-110A)

Inspection

1. Inspect teflon oil seals on turbine shaft for damage and free fit in grooves. Do not remove unless replacing.

2. Remove and inspect forward clutch to direct clutch thrust washer for damage (Fig. 7A-111A).

3. Place forward clutch down with turbine shaft through hole in work bench.

4. Remove snap ring and inspect for damage (Fig. 7A-112A).

5. Remove backing plate from the forward clutch housing.

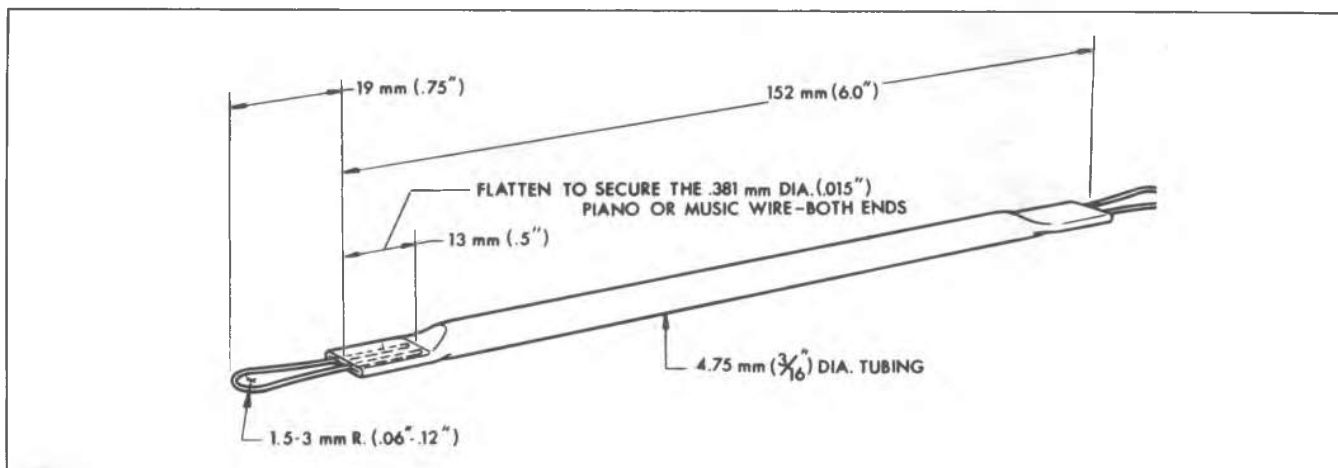


Fig. 7A-107A--Piston Installing Tool

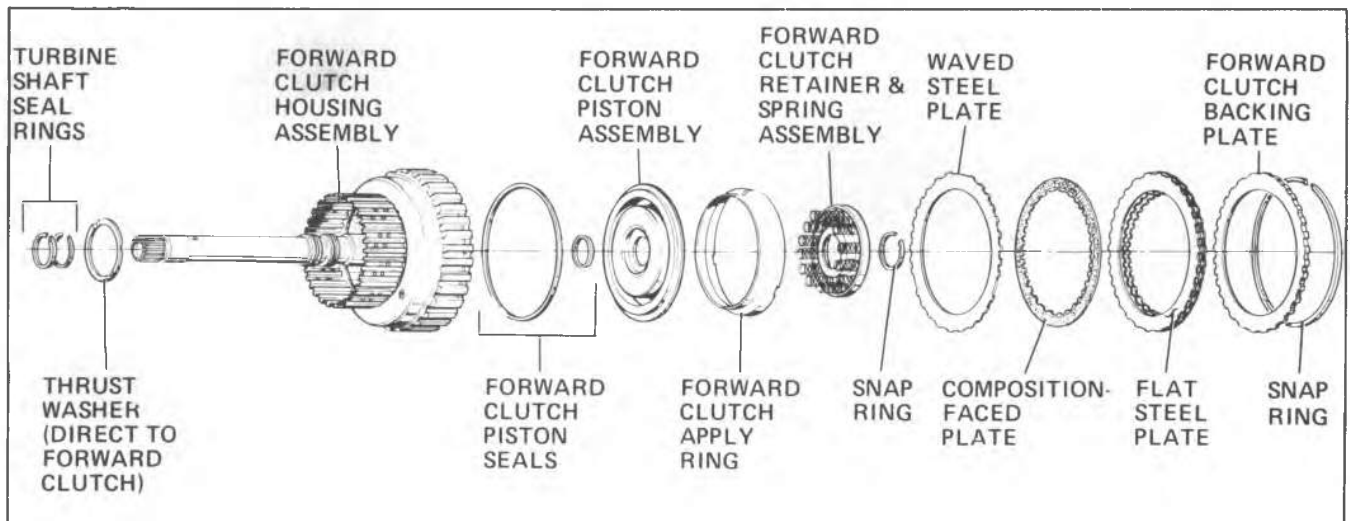


Fig. 7A-110A--Forward Clutch Assembly - Exploded View

6. Remove the clutch plates from the forward clutch housing and keep them separated from the direct clutch plates. (See Clutch Plate Usage Chart Fig. 7A-82A).

7. Inspect composition-faced and steel clutch plates for signs of wear or burning.

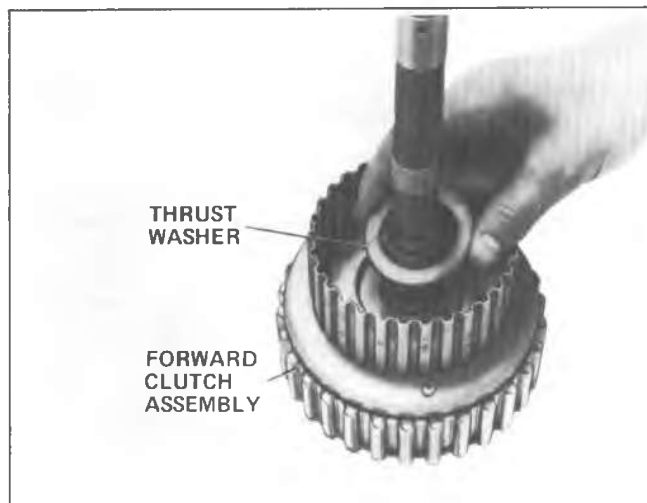


Fig. 7A-111A--Removing or Installing Forward Clutch to Direct Clutch Thrust Washer

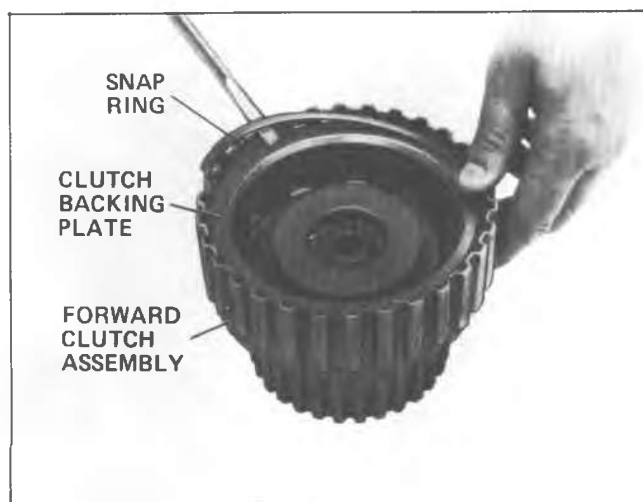


Fig. 7A-112A--Removing or Installing Snap Ring from Forward Clutch Housing

8. Inspect backing plate for scratches or damage.

9. Using tools J-25018, -25024 and J-23327, compress retainer and spring assembly and remove snap ring (Fig. 7A-113A). An arbor press and tools J-25018 and J-23327-1 can be used to compress the retainer and spring assembly.

10. Remove J-23327-1, J-25024 and J-25018.

11. Remove retainer and spring assembly from housing.

12. Inspect release spring retainer for distortion.

13. Inspect release springs for being collapsed.

14. Remove forward clutch piston.

15. Remove forward clutch outer and inner piston seals and discard (Figs. 7A-114A and 7A-115A).

16. Do not remove the clutch apply ring from the piston unless the piston or apply ring requires replacement.

17. Inspect the forward clutch piston and clutch apply ring assembly for cracks or damage.

NOTE: The apply ring is identified by a number located on the apply ring, as follows:

Models CN, CU, CX and CZ are identified by No. 0.

Models CD, CE, CR and CY are identified by No. 8.

18. Inspect forward clutch housing for cracks, opened oil passages or other damage (Fig. 7A-116A).

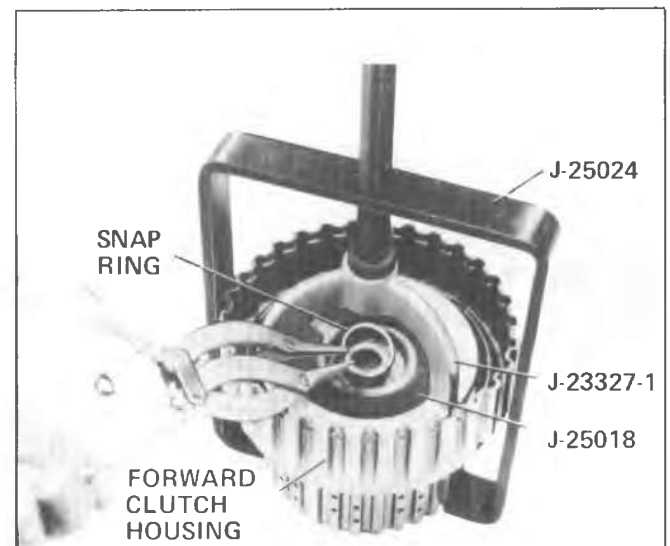


Fig. 7A-113A--Removing or Installing Forward Clutch Release Spring Snap Ring



Fig. 7A-114A--Removing or Installing Outer Piston Seal



Fig. 7A-115A--Removing or Installing Inner Piston Seal

19. Check for free operation of check ball.
20. Inspect forward clutch housing snap ring groove for damage or burrs.
21. Inspect turbine shaft for open oil passages on both ends of shaft and journals for damage.

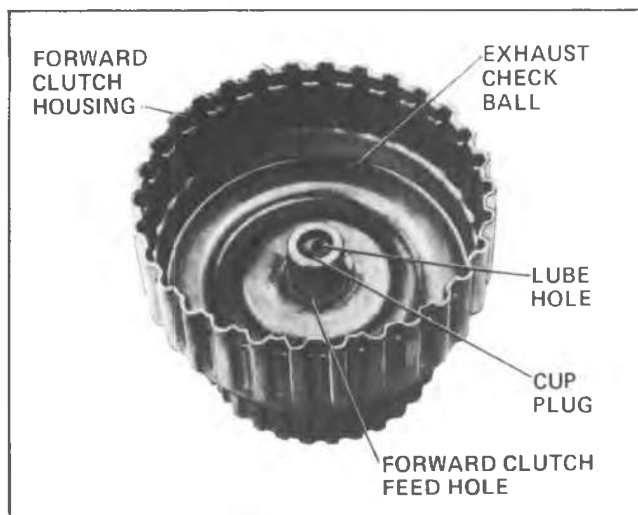


Fig. 7A-116A--Forward Clutch Housing

22. Inspect cup plug for damage. If cup plug is damaged or missing, proceed as follows:
 - a. Use 4mm (No. 3) easy out (grind to fit) and remove cup plug.
 - b. Install new cup plug to 1.0mm (.039") below surface.

Reassembly

1. Install clutch apply ring on piston.
2. Install new outer and inner seals on piston with lips facing away from clutch apply ring side (Figs. 7A-114A and 7A-115A).

CAUTION: Use extreme care when installing forward clutch piston past large forward clutch snap ring groove. Groove could cut outer seal on piston.

3. Lubricate seals and install forward clutch piston (Fig. 7A-117A).

NOTE: To make the piston easier to install, insert tool between the inner seal and shaft; rotate tool around the shaft to compress the lip of the seal, while pushing down slightly on the piston. Use the same procedure between the outer seal and the housing. Refer to Figs. 7A-117A and 7A-118A.

4. Install retainer and spring assembly.

CAUTION: Retainer could locate in snap ring groove and forcing retainer to compress springs, could damage retainer plate.

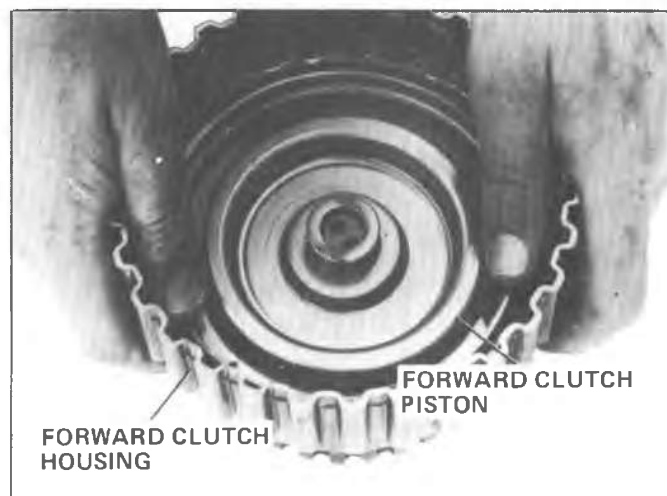


Fig. 7A-117A--Installing Forward Clutch Piston

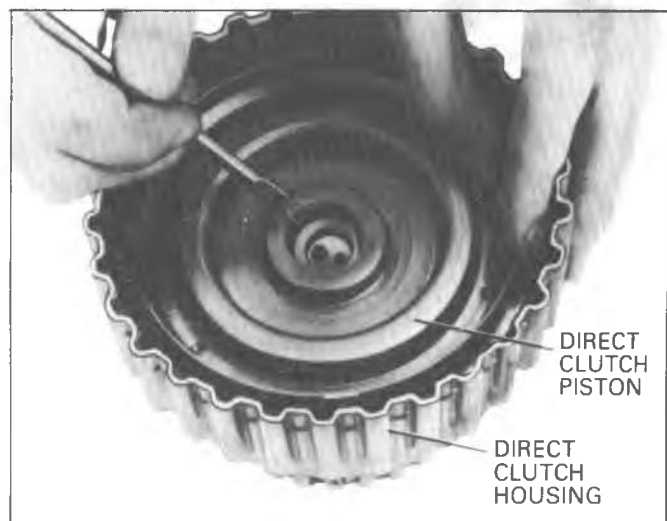


Fig. 7A-118A--Installing Forward Clutch Piston



Fig. 7A-119A--Installing Clutch Plates Into Forward Clutch Housing

5. Using J-23327-1, J-25024 and J-25018 adaptor, compress retainer past the snap ring groove, and install snap ring (Fig. 7A-113A).

NOTE: An arbor press and J-23327-1 and J-25018 can be used to compress the retainer and spring assembly.

6. Remove J-23327-1 and J-25018.

7. Oil and install the forward clutch plates into the forward clutch housing, starting with the waved steel plate and alternating composition-faced and flat steel clutch plates. (See Fig. 7A-119A, and Clutch Plate Usage Chart Fig. 7A-82A).

8. Install backing plate, chamfered side up.

9. Install snap ring (Fig. 7A-112A).

NOTE: Make sure composition clutch plates turn freely.

10. Install forward to direct clutch thrust washer and retain with petrolatum (Fig. 7A-111A).

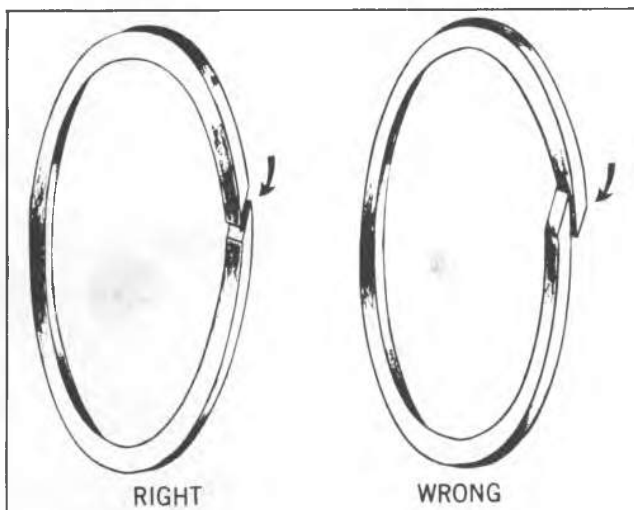


Fig. 7A-120A--Teflon Oil Seal Rings

11. If removed, install new turbine shaft seal rings, making sure cut ends are assembled in the same relationship as cut and rings are seated in their groove. Retain with petrolatum. (See Fig. 7A-120A for correct way to position cut ends.)

Intermediate Band Assembly

1. Inspect band for burning, flaking or damage.
2. Install intermediate band, locating band apply lug and anchor pin lug in case slots (Fig. 7A-125A).

Forward and Direct Clutch

Installation

1. Position direct clutch assembly, clutch plate end up, over hole in bench.

NOTE: Align direct clutch composition-faced clutch plate teeth one above the other to make the forward clutch assembly easier to install.

2. Install forward clutch assembly into direct clutch. Hold direct clutch housing and rotate forward clutch back and forth until the forward clutch is seated (Fig. 7A-121A).

NOTE: When the forward clutch is seated, it will be approximately 19.05mm (3/4") from the tang end of the direct clutch housing to the end of the forward clutch drum, Fig. 7A-122A.

3. Grasp direct and forward clutch assemblies to prevent their separation and position on bench, with the turbine shaft up.

4. Install J-25021 as shown in Fig. 7A-123A.

5. Install direct and forward clutch assemblies, using J-25021, and rotate into position (Fig. 7A-123A).

NOTE: The direct clutch housing will be approximately 33.34mm (1-5/16") from the pump face in case when correctly seated. See Fig. 7A-124A.

6. Remove J-25021.

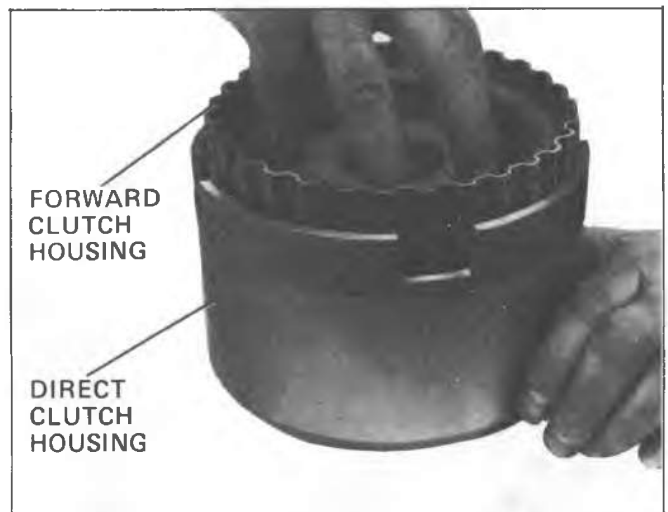


Fig. 7A-121A--Installing Forward Clutch Assembly

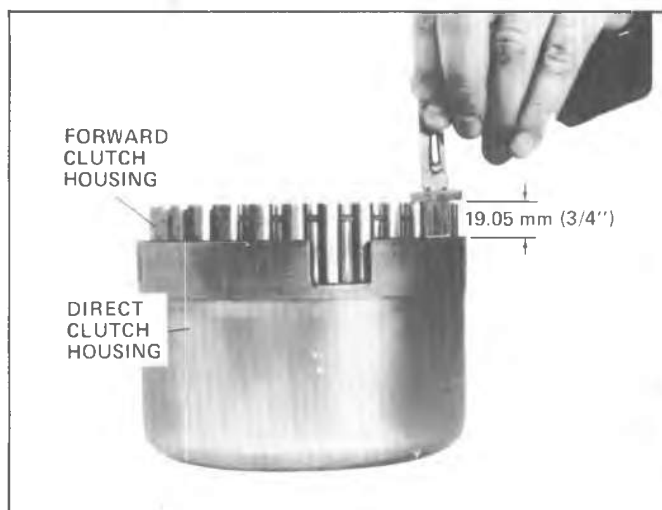


Fig. 7A-122A--Forward Clutch Properly Seated in Direct Clutch

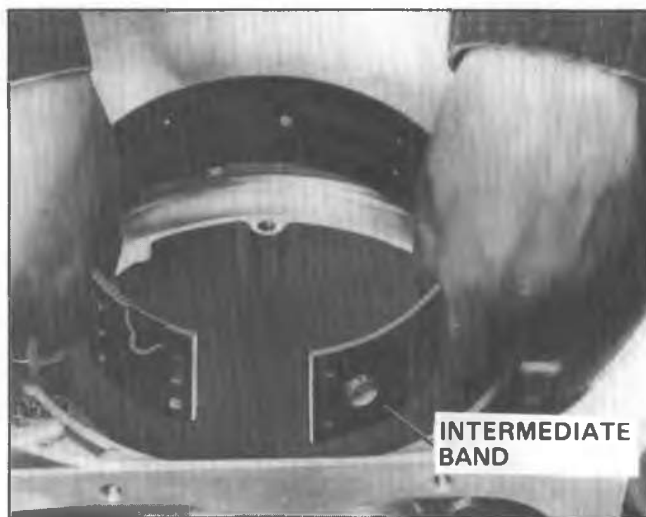


Fig. 7A-125A--Installing Intermediate Band Assembly

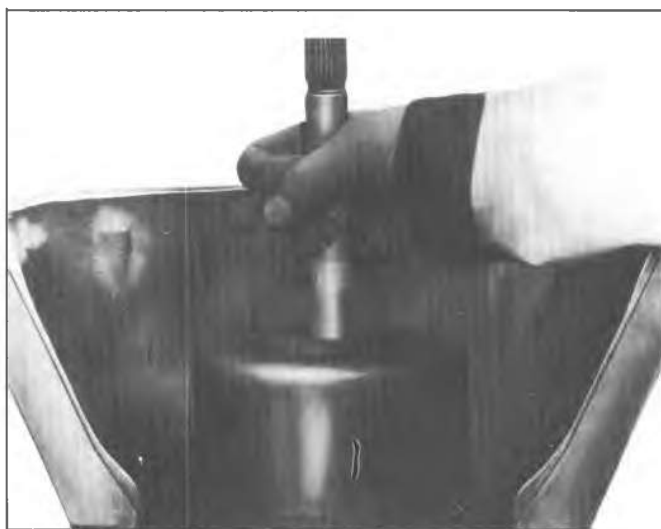


Fig. 7A-123A--Installing Direct and Forward Clutch Assemblies

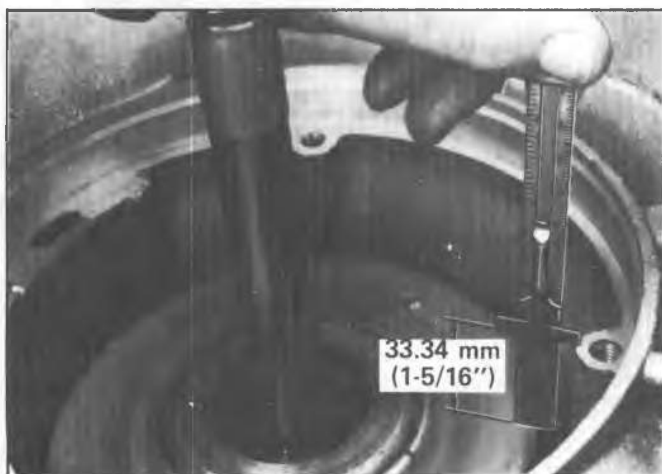


Fig. 7A-124A--Direct and Forward Clutch Assemblies Properly Installed

Pump Assembly (Fig. 7A-126A)

Inspection

1. Remove pump to case seal ring and inspect groove for damage.
2. Place pump over hole in bench with pump cover side up.
3. Remove pump to direct clutch thrust washer and inspect for damage or wear (Fig. 7A-127A).
4. Inspect 3 teflon oil ring seals for damage and free fit in grooves. Do not remove unless replacing.

Pressure Regulator

Inspection

1. To prevent the pump from turning while removing the pressure regulator valve, place a bolt or screwdriver through a hole in the pump and bench (Fig. 7A-128A).
2. Using small screwdriver, push on bore plug, compressing pressure regulator spring; and using snap ring pliers, remove retaining ring (Fig. 7A-128A).
3. Release valve spring tension slowly and remove valve train.
4. Inspect pressure regulator valve for nicks or damage.

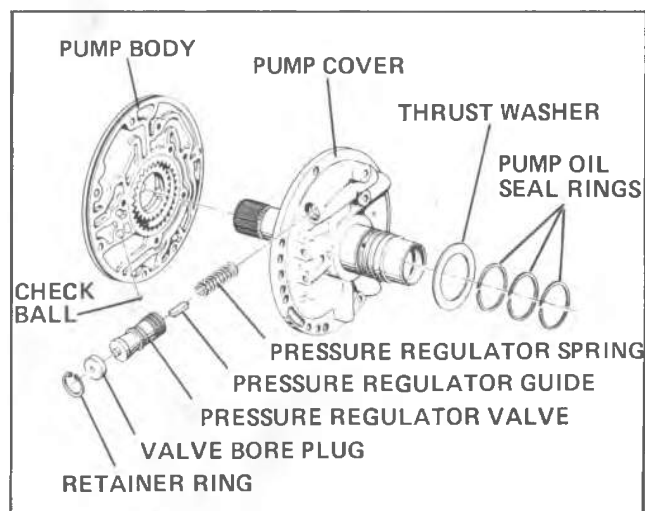


Fig. 7A-126A--Pump Assembly - Exploded View

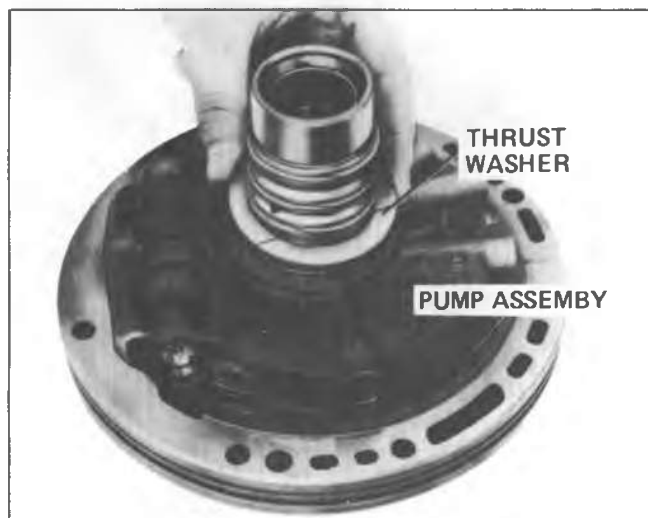


Fig. 7A-127A--Removing or Installing Thrust Washer from Pump

5. Inspect spring and guide for damage or distortion.
6. Inspect pressure regulator valve for free operation in bore.

CAUTION: Do not drop the check ball that is in the pump, as the pump body and pump cover are separated.

7. Remove pump cover to pump body attaching bolts and separate pump cover from pump body.

Pump Body

Inspection

1. Remove the 7.14mm (.281") check ball from the pump body or pump cover and keep it separated from the five 6.35mm (.250") check balls used in the case and control valve assembly.

2. Remove drive gear and driven gear from pump body (Fig. 7A-129A).

3. Inspect drive and driven gears for scoring, galling or damage.

NOTE: Driven gear identification marks should have been against the pump body gear pocket. (See Fig. 7A-133A for identification.) The drive gear has 1 identification mark on each drive tang (Fig. 7A-129A).

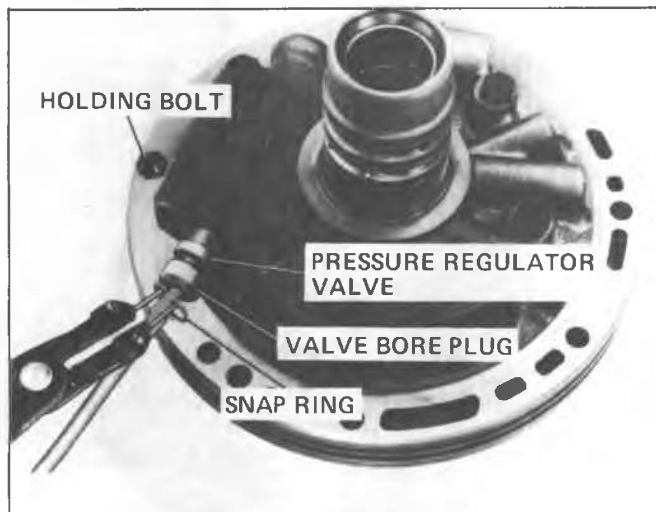


Fig. 7A-128A Removing or Installing Pressure Regulator Valve

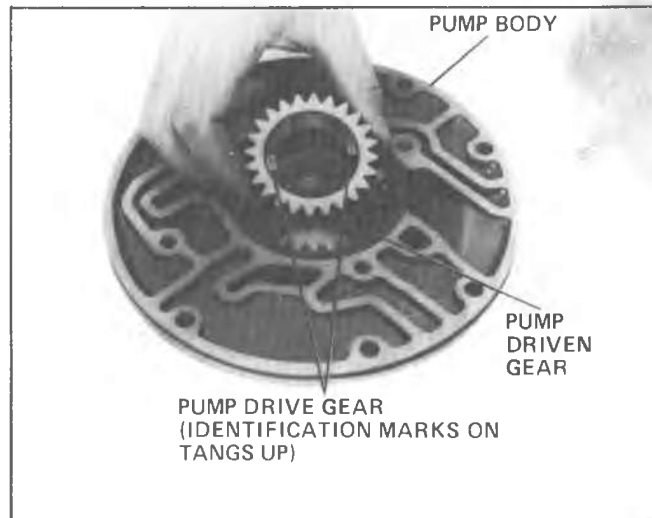


Fig. 7A-129A--Removing Pump Drive Gear

This side should be facing away from the pump body gear pocket.

4. Inspect drive and driven gear pocket and crescent for scoring or damage.

5. Inspect pump body face for nicks and overall flatness.

6. Inspect for open oil passages (Fig. 7A-130A).

7. Inspect for damaged bolt hole threads.

8. Inspect for open drainback hole.

9. Inspect bushing for scores or nicks.

10. If removed, coat outside of seal body with non-hardening sealing compound; support pump body, oil seal side up, and using J-25016, install new pump body oil seal (Fig. 7A-131A).

11. Install driven pump gear with identification mark down against gear pocket of pump body (Figs. 7A-132A and 7A-133A).

12. Install drive gear with identification marks on drive tangs up (Fig. 7A-129A).

13. Pump body face to gear face clearance should be 0.020-0.055mm (.0007"-.0021") (Fig. 7A-134A).

14. Place the check ball into the check ball pocket in the pump body and retain it with petrolatum. (See Fig. 7A-130A for ball location).

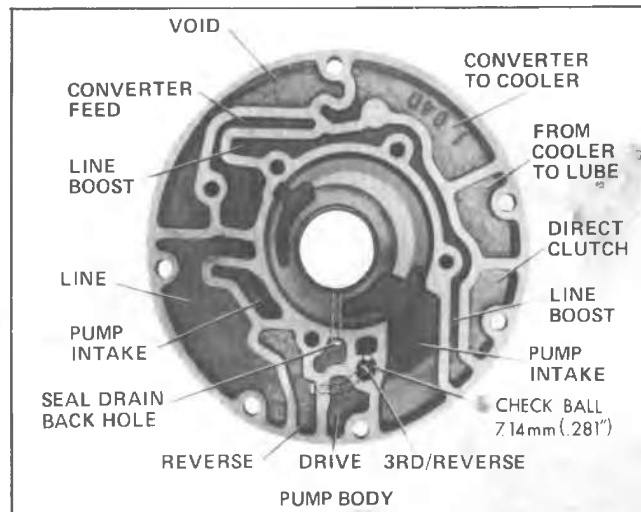


Fig. 7A-130A--Pump Body Assembly

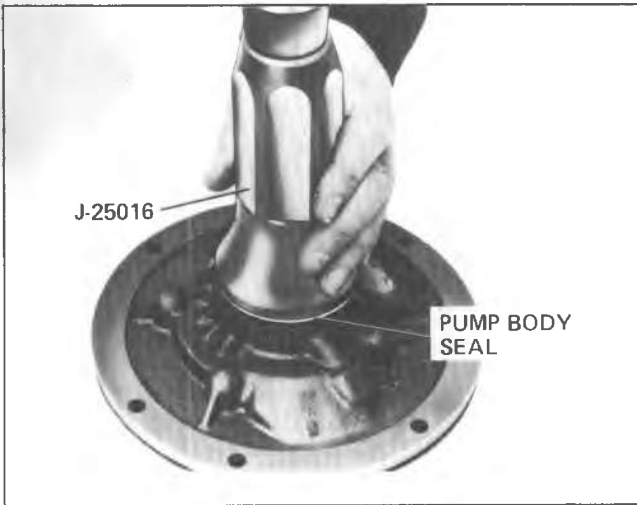


Fig. 7A-131A--Installing Seal Into Pump Body



Fig. 7A-134A--Checking Pump Body-to-Gear End Clearance

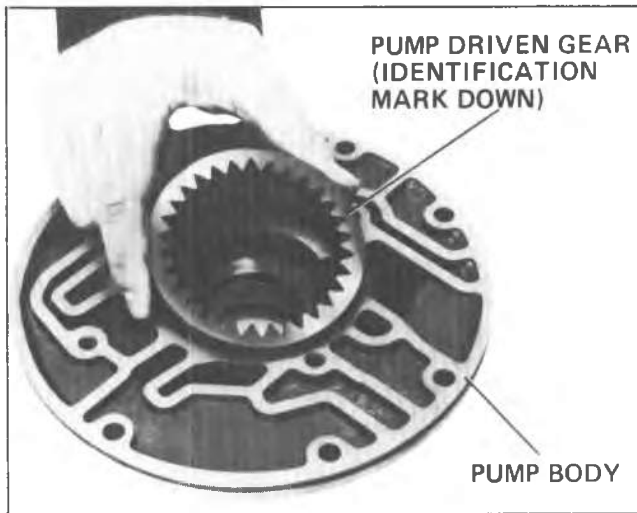


Fig. 7A-132A--Installing Pump Driven Gear

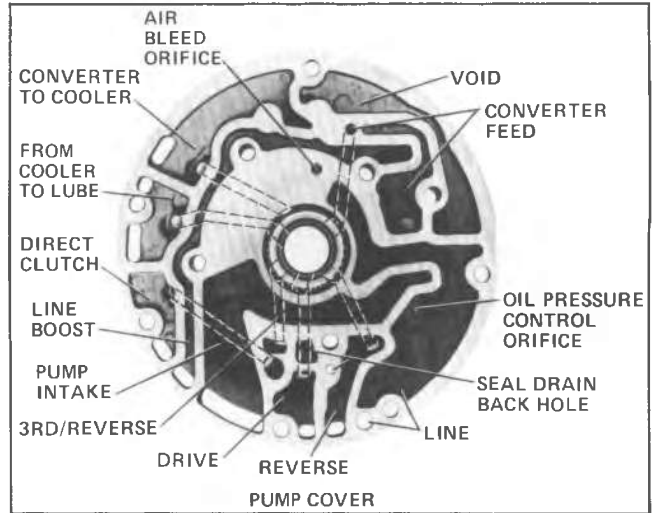


Fig. 7A-135A--Pump Cover Assembly

Pump Cover

Inspection

1. Inspect for open oil passages (Figs. 7A-135A and 7A-136A).

2. Inspect seven (7) cup plugs. If a plug is missing, drive a new cup plug to .79mm (1/32") below top of hole, using a 7.14mm (9/32") diameter rod on the smaller plugs and

a 7.92mm (5/16") diameter rod on the larger plugs. Stake top of hole two places, directly opposite each other, to retain plug.

3. Inspect pump cover face for nicks and overall flatness.

4. Inspect for chips in pressure regulator bore.

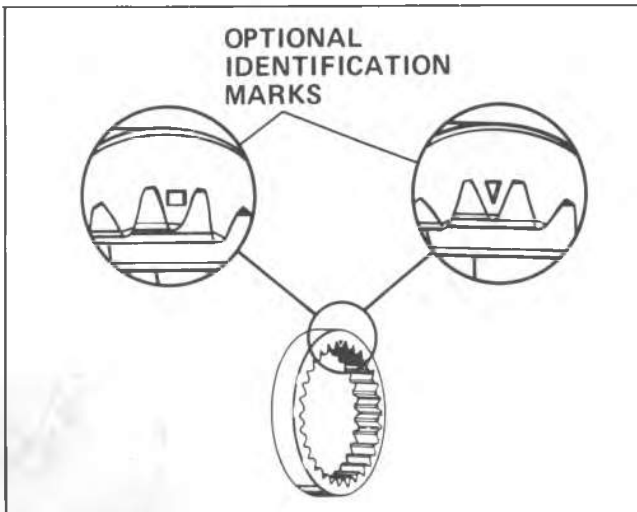


Fig. 7A-133A--Pump Driven Gear Identification

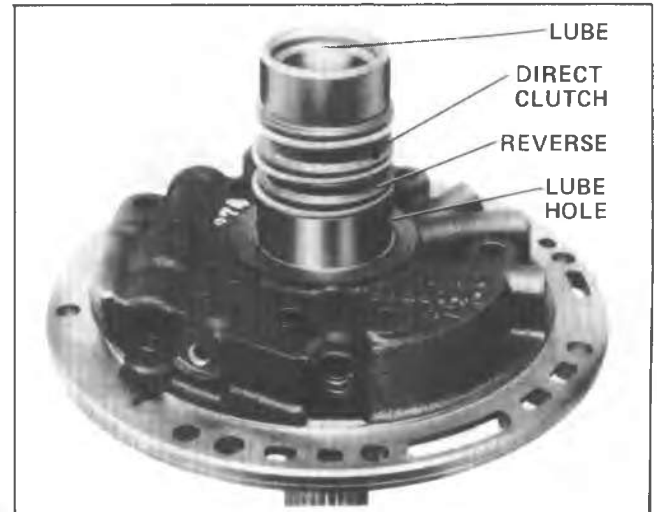


Fig. 7A-136A--Pump Cover Oil Passages

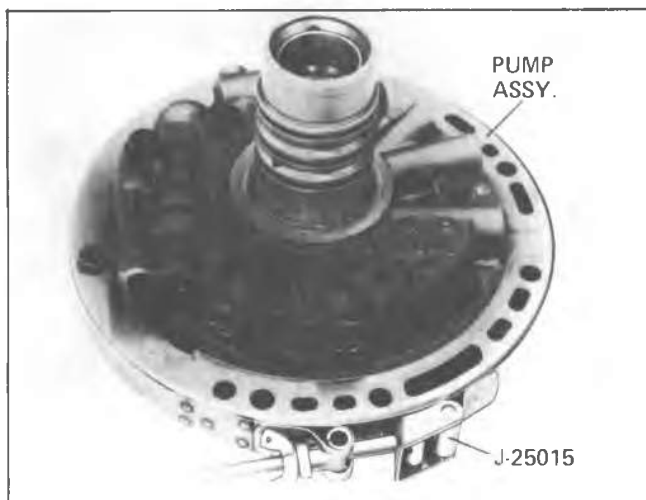


Fig. 7A-137A--Aligning Pump Cover and Pump Body

5. Inspect stator shaft for damaged splines or damaged bushings.

6. Inspect orifice plug (see Fig. 7A-135A). If the plug requires replacement, place new plug, orifice end first, into plug hole from the rough casting side. Drive the plug flush to .25mm (.010") below top of hole, rough casting side. Stake the top of hole two places to retain the plug.

Reassembly

1. Place pump body over hole in bench.

2. Assemble pump cover to pump body with attaching bolts, finger tight.

3. Align pump cover and pump body using J-25015 (Fig. 7A-137A) and place bolt or screwdriver through pump to case bolt hole and bench.

4. Torque pump cover attaching bolts to 20.0-27.0 N·m (15-20 ft. lbs.).

5. Remove J-25015.

6. Install pressure regulator spring, guide, valve with stem end out, and bore plug, hole side out (Fig. 7A-126A).

7. Compress pressure regulator valve spring by pushing on bore plug with small screwdriver and install retaining ring (Fig. 7A-128A).

8. If removed, install 3 new oil seal rings, making sure cut ends are assembled in the same relationship as cut (Fig.

7A-120A). Also, make sure rings are seated in the grooves to prevent damage to the rings during reassembly of mating part over rings. Retain with petrolatum.

9. Install pump to case seal ring, chamfered side out, making sure the ring is not twisted.

10. Install pump to direct clutch thrust washer and retain with petrolatum (Fig. 7A-127A).

11. Remove holding bolt or screwdriver.

12. Install new pump to case gasket on pump and retain with petrolatum.

13. Install 2 pump to case alignment pins in case as shown in Fig. 7A-138A.

NOTE: Before installing pump, make sure intermediate band anchor pin lug is aligned with band anchor pin hole in case.

14. Install pump assembly and finger start pump to case bolts and new washers, except one bolt hole (Fig. 7A-139A), which will be used to make the front unit end play check.

NOTE: If turbine shaft cannot be rotated as pump is being pulled into place, the forward or direct clutch housings have not been installed properly to index with all the clutch plates. This condition must be corrected before pump is pulled fully into place.

15. Replace 2 alignment pins with 2 bolts and new washers.

16. Torque pump to case bolts to 20.0-27.0 N·m (15-20 ft. lbs.).

NOTE: Make sure turbine shaft rotates freely.

Check Front Unit End Play (Fig. 7A-139A)

1. Install 278mm (11") bolt and locking nut as shown in Fig. 7A-139A.

2. Push turbine shaft downward.

3. Install J-25022 on J-24773 tool and locate on end of turbine shaft (Fig. 7A-139A).

4. Mount dial indicator on bolt and position indicator point against cap nut of J-24773.

5. Move output shaft forward by turning the adjusting screw on J-25013-5 until the white or scribed line on sleeve J-25013-1 begins to disappear, then set dial indicator to zero.

6. Pull turbine shaft upward, and read end play. Front unit end play should be 0.56mm-1.30mm (.022"-.051").

NOTE: Selective washer controlling this end play is located between the output shaft and turbine shaft. If more or less washer thickness is required to bring end



Fig. 7A-138A--Installing Pump Assembly



Fig. 7A-139A--Checking Front Unit End Play

FRONT UNIT END PLAY CHART

THICKNESS	IDENTIFICATION
	Number and/or Color
1.66-1.77mm (0.065"-0.070")	1
1.79-1.90mm (0.070"-0.075")	2
1.92-2.03mm (0.076"-0.080")	3 - Black
2.05-2.16mm (0.081"-0.085")	4 - Light Green
2.18-2.29mm (0.086"-0.090")	5 - Scarlet
2.31-2.42mm (0.091"-0.095")	6 - Purple
2.44-2.55mm (0.096"-0.100")	7 - Cocoa Brown
2.57-2.68mm (0.101"-0.106")	8 - Orange
2.70-2.81mm (0.106"-0.111")	9 - Yellow
2.83-2.94mm (0.111"-0.116")	10 - Light Blue
2.96-3.07mm (0.117"-0.121")	11
3.09-3.20mm (0.122"-0.126")	12

Fig. 7A-140A--Front Unit End Play Washer Thickness Chart

play within specifications, select proper washer from Fig. 7A-140A.

7. Remove front unit end play checking tools.

8. Install remaining pump to case bolt and new washer, torquing bolt to 20.0-27.0 N·m (15-20 ft. lbs.).

9. Remove J-25013-5 and J-25013-1 from rear end of transmission (Fig. 7A-141A).

10. Turn transmission to horizontal position, oil pan side up.

EXTERNAL PARTS**Governor Assembly****Inspection**

1. Inspect governor cover for damage, scored or worn bore, or plugged oil passage.

2. Wash in cleaning solvent and blow out oil passage.

3. Inspect governor driven gear for nicks or damage.

4. Inspect governor shaft seal ring for cuts, damage and free fit in groove.

5. Inspect for free operation of governor weights.

6. Inspect for damaged, mispositioned, or tilted springs. (Some governors use one spring, and some governors use two springs.)

7. Inspect for presence of 2 check balls.

8. Inspect shaft for damage.

9. Inspect governor washer for damage.

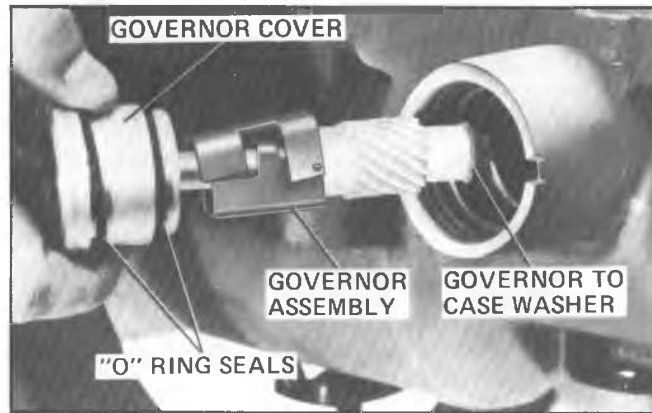


Fig. 7A-142A--Installing Governor and Cover Assembly

10. If damaged, cut seal ring off governor shaft.

CAUTION: Do not damage seal ring when removing seal.

Installation

1. If removed, install new seal ring on shaft and place seal ring end into governor cover to size seal; lubricate with petrolatum.

2. Lubricate with petrolatum and install 2 new seal rings on governor cover.

CAUTION: The governor cover seal rings must be well lubricated with petrolatum to prevent damage or cutting of the rings. Also, make sure 2 check balls are in the governor before installation.

3. Install governor assembly, seal ring end first, into cover.

CAUTION: Do not use any type of hammer to install governor assembly and cover into case. Damage to case, governor or cover could result.

4. Install governor and cover assembly, aligning governor shaft with shaft hole in case (Fig. 7A-142A). Rotate governor and cover assembly and output shaft slightly. The governor cover fits tight in the bore the last 1.5mm (1/16").

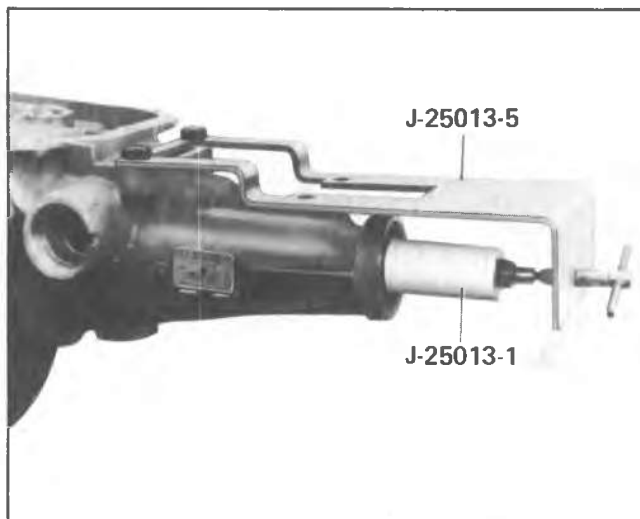


Fig. 7A-141A--Installing Tools on Rear End of Case



Fig. 7A-143A--Installing Intermediate Band Anchor Pin

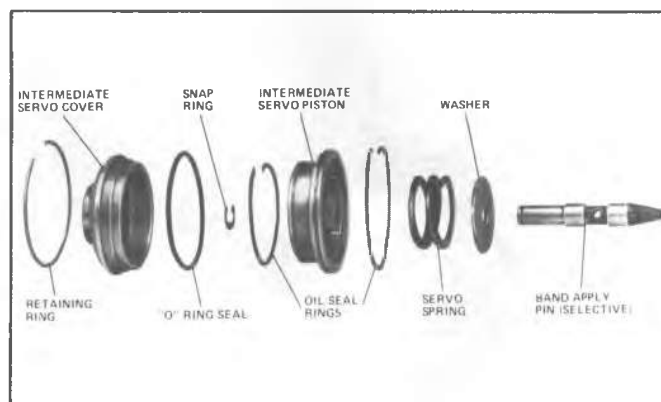


Fig. 7A-144A--Intermediate Servo-Exploded

NOTE: Governor shaft is not aligned with case hole, if retaining ring cannot be installed.

5. Install governor retaining ring. Align ring gap with an end showing in case slot.

Intermediate Band Anchor Pin

1. Inspect anchor pin for damage.
2. Install anchor pin, stem end first, making sure stem locates in hole of intermediate band lug (Fig. 7A-143A).

Intermediate Servo Piston Assembly (Fig. 7A-144A)

Inspection

NOTE: Production transmissions may be built with either two or zero oil seal rings on the band apply pin. All service band apply pins will have two oil seal rings.

1. Inspect pin for damage and fit in case bore.
2. Inspect inner and outer piston seal rings for damage and free fit in ring grooves. Do not remove unless replacing.

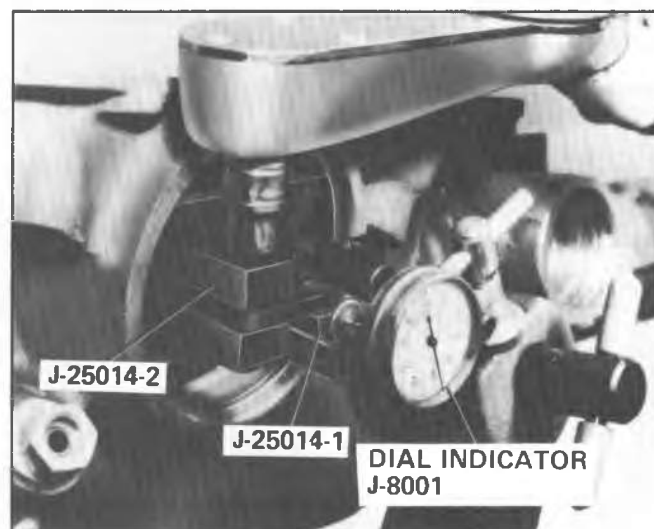


Fig. 7A-146A--Intermediate Band Apply Gages

3. Inspect spring.

4. Inspect intermediate servo cover and piston assembly for proper combination and usage. (See Fig. 7A-145A).

5. Check for proper intermediate band apply pin as follows:

- a. Install J-25014-2 in intermediate servo bore and retain with intermediate servo cover retaining ring, aligning ring with gap at case slot (Fig. 7A-146A).
- b. Install pin J-25014-1 into J-25014-2.

CAUTION: Make sure the tapered pin end is properly located against the band apply lug. Also, make sure the band anchor pin is properly located in the case and band anchor lug.

T. H. M. "200" INTERMEDIATE SERVO COVER & PISTON USAGE - 1977		
MODEL	COVER Identified by Cast Part No. On Cover	PISTON Identified by Cast Part No. On Piston
CU CN CZ	8628696	8630131
CX	*8630085	**8630083
CE CR	8628134	8628112
CD CY	8628133	8628111
NOTE: *Intermediate servo cover, 8630085, at start of production will be identified by the part no. 8628696 cast on the cover with the letter "A" stamped on it. **Intermediate servo piston, 8630083, at start of production will be identified by the part no. 8628111 cast on the cover with the letter "A" stamped on it.		

Fig. 7A-145A--Intermediate Servo Cover and Piston Usage Chart

INTERMEDIATE BAND APPLY PIN CHART			
DIAL INDICATOR TRAVEL		APPLY PIN IDENTIFICATION	
		APPLY PIN IDENTIFICATION +	
.0	.72mm (.0 - .029")	1 Ring	
.72mm	1.44mm (.029" - .057")	2 Rings	
1.44mm	2.16mm (.057" - .086")	3 Rings	
2.16mm	2.88mm (.086" - .114")	Wide Band	

Fig. 7A-147A--Intermediate Band Apply Pin Chart

c. Install dial J-8001 and position dial indicator point on top of J-25014-2 zero post, and set dial indicator to zero.

d. Align stepped side of pin J-25014-1 with torquing arm of J-25014-2. Arm must stop against step of pin J-25014-1.

NOTE: If band selection pin does not register between the high and low limits, look for possible problem with the intermediate band, direct clutch or case.

Make sure J-25014-2 gauge plate is pulled backwards and seated squarely against the retaining ring.

e. Apply 12 N·m (100 in. lbs.) of torque to hex nut on side of gauge. Slide dial indicator over gauge pin J-25014-1 (Fig. 7A-146A). Read dial indicator and see Fig. 7A-147A for proper size.

NOTE: Dial indicator travel is reversed, making the indicator readings backwards. On an indicator that ranges from 0-100, a 5mm (.020") travel will read 2mm (.080"), a 1.5mm (.060") travel will read 1mm (.040"). The identification ring is located on the band end of the pin.

f. Remove retaining ring and band apply pin gauges. If new apply pin or replacement of piston is required, proceed as follows:

Disassembly

1. Using J-22269-01, compress intermediate servo piston spring (Fig. 7A-148A).

2. Using small flat edge screwdriver, remove intermediate pin to piston snap ring.

3. Remove J-22269-01 and separate band apply pin, spring and washer from intermediate servo piston.

Reassembly

1. Install washer on snap ring end of band apply pin (Fig. 7A-144A).

2. Install spring on washer.

3. Install band apply pin, spring end first through intermediate servo piston.

4. Using J-22269-01, compress intermediate servo piston spring (Fig. 7A-148A).

5. Using small pliers, install intermediate servo pin to piston snap ring. Remove J-22269-01.

6. If removed, install new intermediate servo piston, inner and outer seal rings. Make sure cut ends are assembled in the same relationship as cut (Fig. 7A-120A). Make sure rings are seated in the grooves to prevent damage to the rings. Retain with petrolatum.

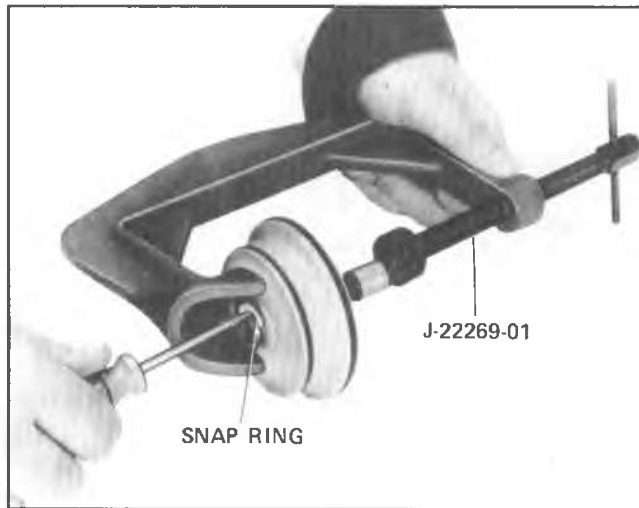


Fig. 7A-148A--Removing Intermediate Servo Piston from Apply Pin

7. Lubricate with petrolatum and install new seal ring on intermediate servo cover.

CAUTION: The intermediate servo cover seal rings must be well lubricated with petrolatum to prevent damage or cutting of ring.

8. Install intermediate servo piston assembly into intermediate servo cover (Fig. 7A-149A).

9. Install intermediate servo assembly into case, tapping lightly with non-metal or plastic hammer if necessary (Fig. 7A-150A).

CAUTION: Make sure the tapered end of the band apply pin is properly located against the band apply lug.

10. Install servo retaining ring. Align ring gap with an end showing in case slot.

Low and Reverse Clutch Housing to Case Cup Plug and Seal (Fig. 7A-151A)

1. Install new seal.

2. Place cup plug, with smaller hole end first, into hole in case. Using a 10mm (3/8") diameter by 150mm (6") metal rod and hammer, drive plug until flush with top of plug hole in case.

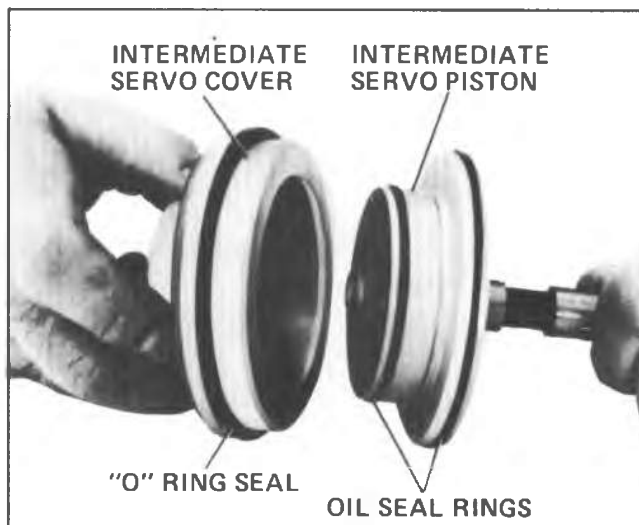


Fig. 7A-149A--Installing Intermediate Servo Piston into Cover



7A-150A--Installing Intermediate Servo Piston and Cover Assembly

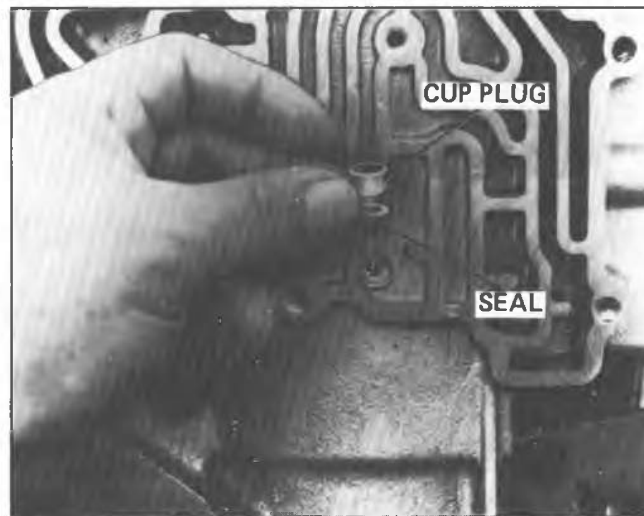


Fig. 7A-151A--Installing Low and Reverse Clutch Housing to Case Cup Plug and Seal

Control Valve Assembly

Disassembly

NOTE: As each valve train is removed, place the individual valve train in the order that it is removed and in a separate location relative to its position in the valve body. None of the valves, bushings or springs are interchangeable; some coiled pins are interchangeable.

Remove all coiled pins by pushing through from the rough cast surface side of the control valve assembly, except the 2 pins which retain the throttle valve and throttle valve plunger.

1. Remove the 4 check balls.
2. Position control valve assembly as shown in Fig. 7A-152A.
3. Remove 1-2 accumulator piston.
4. Remove manual valve from upper bore.

CAUTION: Some of the coiled pins in the control valve assembly have pressure against them. Therefore, hold a shop towel over the bore while removing the pin, to prevent possibly losing a bore plug, spring, etc.

5. Remove coiled pin from upper right bore. Remove 2-3 throttle valve bushing 2-3 throttle valve spring, 2-3 throttle valve and 2-3 shift valve.

NOTE: The 2-3 throttle valve spring and 2-3 throttle valve may be inside the 2-3 throttle valve bushing.

6. From next bore down, remove coiled pin. Remove 1-2 throttle valve bushing, 1-2 throttle valve spring, 1-2 throttle valve and 1-2 shift valve.

NOTE: The 1-2 throttle valve spring and the 1-2 throttle valve may be inside the 1-2 throttle valve bushing.

7. From next bore down, remove coiled pin and bore plug. Remove reverse boost spring and reverse boost valve.

8. Check the operation of the shift T.V. valve in the next bore down, by moving the valve against the spring. If it is necessary to remove the valve, proceed as follows: (Figs. 7A-153A and 7A-154A).

- a. Remove coiled pin and place valve body on shop towel with rough casting surface up.
- b. Using needle nose pliers, compress the shift T.V. spring by pushing on the shift T.V. valve; hold valve with small screwdriver.

- c. Place 6.3mm (1/4") rod, 9.5mm (3/8") long, against the end of the shift T.V. valve.

- d. Prying on end of the rod with a large screwdriver, remove small screwdriver and remove shift T.V. plug, shift T.V. spring and shift T.V. valve.

- e. Discard shift T.V. plug and remove 6.3mm (1/4") rod from shift T.V. bore.

9. From next bore down, remove outer coiled pin. Remove the throttle valve plunger, bushing, throttle valve spring and detent pin. Using a 1.5mm (1/16") allen wrench with ground sides to fit inside the pin, remove the inner coiled pin (Fig. 7A-155A). Remove the throttle valve.

10. From upper left bore, remove coiled pin, intermediate boost spring and intermediate boost valve.

11. From next bore down, remove coiled pin, low overrun clutch spring and low overrun clutch valve.

12. From next bore down, remove coiled pin, direct clutch exhaust spring and direct clutch exhaust valve.

13. From next bore down, remove coiled pin, valve bore plug, 1-2 accumulator valve and 1-2 accumulator valve and 1-2 accumulator valve spring.

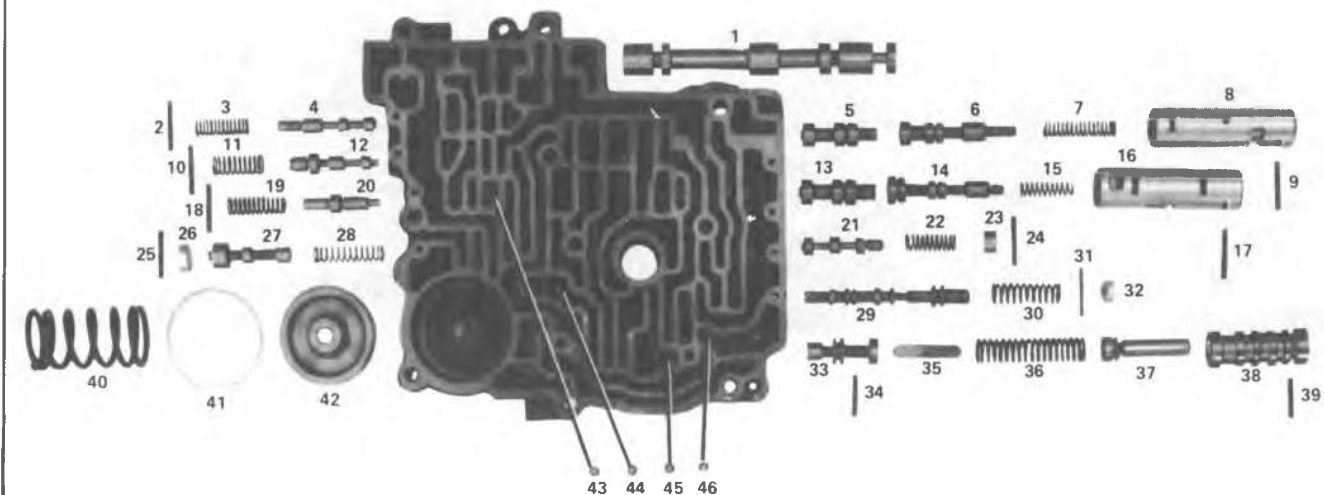
Inspection

1. Wash control valve body, valves, springs, and other parts in clean solvent and air dry.
2. Inspect 1-2 accumulator piston for damage.
3. Inspect 1-2 accumulator piston seal for damage and free fitting groove. Do not remove seal unless replacing.
4. Inspect valve for scoring, cracks and free movement in their bores.
5. Inspect bushings for cracks or scored bores.
6. Inspect valve body for cracks damage or scored bores.
7. Inspect springs for distortion or collapsed coils.
8. Inspect bore plugs for damage.

Reassembly

NOTE: Install all coiled pins from machined face side except the coiled pin retaining the throttle valve bushing, plunger, spring and detent pin. Install this coiled pin from rough casting side. Coiled pins do not fit flush on rough casting face.

1. Position control valve body as shown in Fig. 7A-152A.



- | | | |
|--------------------------------|----------------------------------|---|
| 1. MANUAL VALVE | 17. RETAINING COILED PIN | 33. THROTTLE VALVE |
| 2. RETAINING COILED PIN | 18. RETAINING COILED PIN | 34. RETAINING COILED PIN |
| 3. INTERMEDIATE BOOST SPRING | 19. DIRECT CLUTCH EXHAUST SPRING | 35. DETENT PIN |
| 4. INTERMEDIATE BOOST VALVE | 20. DIRECT CLUTCH EXHAUST VALVE | 36. THROTTLE VALVE SPRING |
| 5. 2-3 SHIFT VALVE | 21. REVERSE BOOST VALVE | 37. THROTTLE VALVE PLUNGER |
| 6. 2-3 THROTTLE VALVE | 22. REVERSE BOOST SPRING | 38. THROTTLE VALVE PLUNGER BUSHING |
| 7. 2-3 THROTTLE VALVE SPRING | 23. REVERSE BOOST BORE PLUG | 39. RETAINING COILED PIN |
| 8. 2-3 THROTTLE VALVE BUSHING | 24. RETAINING COILED PIN | 40. 1-2 ACCUMULATOR SPRING |
| 9. RETAINING COILED PIN | 25. RETAINING COILED PIN | 41. 1-2 ACCUMULATOR PISTON SEAL |
| 10. RETAINING COILED PIN | 26. 1-2 ACCUMULATOR BORE PLUG | 42. 1-2 ACCUMULATOR PISTON |
| 11. LO OVERRUN CLUTCH SPRING | 27. 1-2 ACCUMULATOR VALVE | 43. CHECK BALL #4 |
| 12. LO OVERRUN CLUTCH VALVE | 28. 1-2 ACCUMULATOR VALVE SPRING | 44. CHECK BALL #3 |
| 13. 1-2 SHIFT VALVE | 29. SHIFT T.V. VALVE | 45. CHECK BALL #2 |
| 14. 1-2 THROTTLE VALVE | 30. SHIFT T.V. SPRING | 46. CHECK BALL #1 (Note: 5th Check Ball Is In The Case) |
| 15. 1-2 THROTTLE VALVE SPRING | 31. RETAINING COILED PIN | |
| 16. 1-2 THROTTLE VALVE BUSHING | 32. SHIFT T.V. BORE PLUG | |

Fig. 7A-152A--Control Valve Assembly - Exploded View

2. Install into lower left bore, 1-2 accumulator spring, 1-2 accumulator valve, smaller stem end out. Install bore plug, hole out, and coiled pin.

3. In next bore up, install direct clutch exhaust valve, longer stem end out, direct clutch exhaust spring and coiled pin.

4. In next bore up, install low overrun clutch valve, longer stem end out, low overrun clutch spring and coiled pin.

5. In next bore up, install intermediate boost valve, longer stem end out, intermediate boost spring and coiled pin.

6. In lower right bore, install throttle valve, smaller outside diameter land first, making sure valve is seated at the bottom of the bore. Install inner coiled pin between the lands of this valve (Fig. 7A-155A). Install the detent pin into

the shift T.V. spring and install these 2 parts into the bore. Install the throttle valve plunger, stem end first, into the throttle valve plunger bushing and install these 2 parts into the bore, valve end first. Install outer coiled pin from rough cast surface side, aligning pin with slot in bushing.

7. In next bore up, if removed, install shift T.V. valve, larger outside diameter stem end out, shift T.V. spring and coiled pin. Then, using plastic hammer, install new shift T.V. plug flush with rough casting surface.

8. In next bore up, install reverse boost valve, stem end out, reverse boost spring. Install bore plug, hole side out and coiled pin.

9. In next bore up, install 1-2 shift valve, longer stem end out, making sure valve is seated at the bottom of the bore. Install 1-2 throttle valve spring into the 1-2 throttle valve bushing and 1-2 throttle valve, stem end first, into the

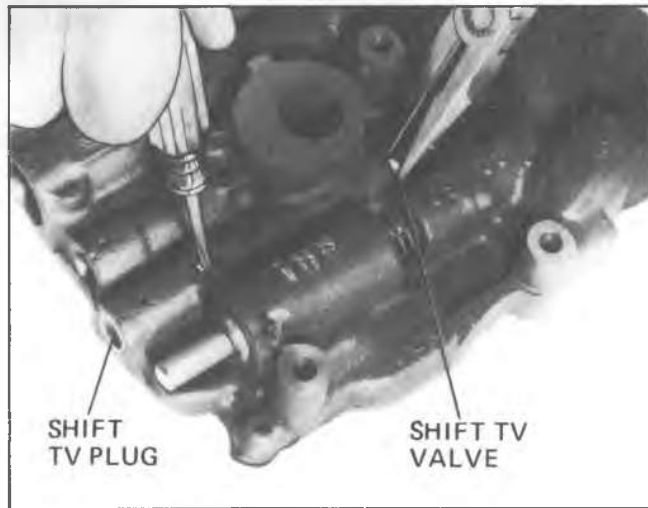


Fig. 7A-153A--Removing Shift T. V. Plug

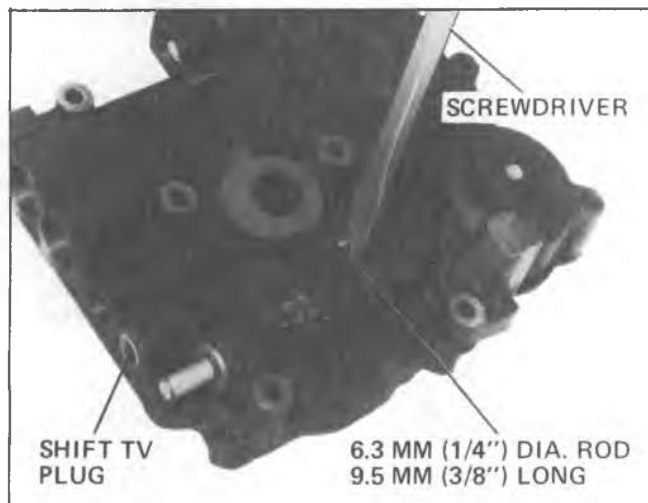


Fig. 7A-154A--Removing Shift T.V. Plug

bushing. Install these 3 parts, valve end first, into the bore, aligning bushing so the pin can be installed in the pin slot. (See Fig. 7A-156A for pin slot and identification of 1-2 throttle valve bushing.)

10. In next bore up, install 2-3 shift valve, longer stem end out, making sure valve is seated at the bottom of the

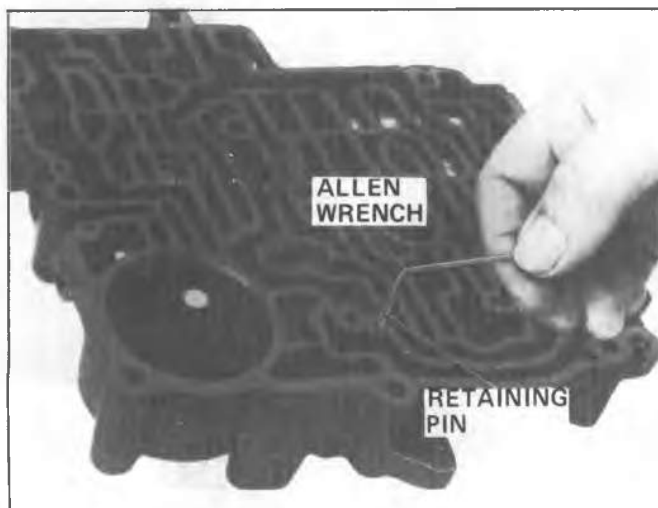


Fig. 7A-155A--Removing Inner Coiled Retaining Pin

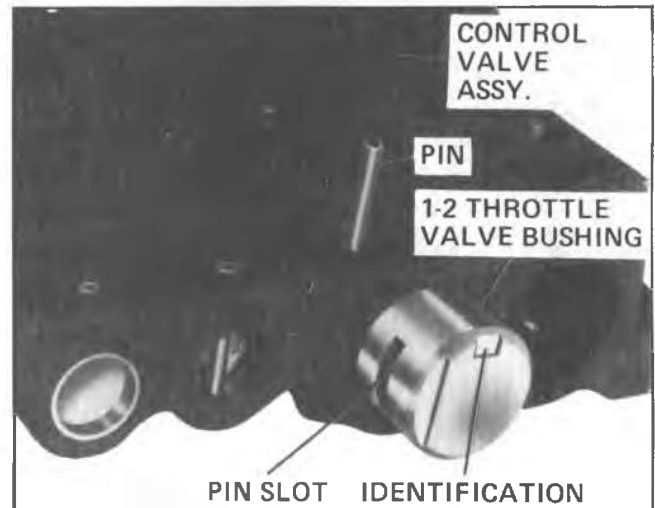


Fig. 7A-156A--Install 1-2 Throttle Valve Bushing

bore. Install 2-3 throttle valve spring into the 2-3 throttle valve bushing and 2-3 throttle valve, stem end first, into the bushing. Install these 3 parts, valve end first, into the bore, aligning bushing so pin can be installed in the pin slot (Fig. 7A-157A).

11. Install manual valve with the inside detent lever pin groove to the right.

12. If removed, install new seal ring on 1-2 accumulator piston.

13. Oil and install 1-2 accumulator piston, spring pocket side out, into 1-2 accumulator piston bore of valve body.

Control Valve Assembly

Installation

1. Inspect 1-2 accumulator spring for damage.

2. Install 1-2 accumulator spring into case (Fig. 7A-158A).

3. Inspect control valve assembly and spacer plate for damage (Fig. 7A-159A).

NOTE: The size of the 5 check balls used in the case and control valve assembly is 6.35mm (.250"). The size of the check ball used in the pump is 7.14mm (.281"). Do not interchange.



Fig. 7A-157A--Installing 2-3 Throttle Valve Bushing



Fig. 7A-158A--Installing 1-2 Accumulator Spring

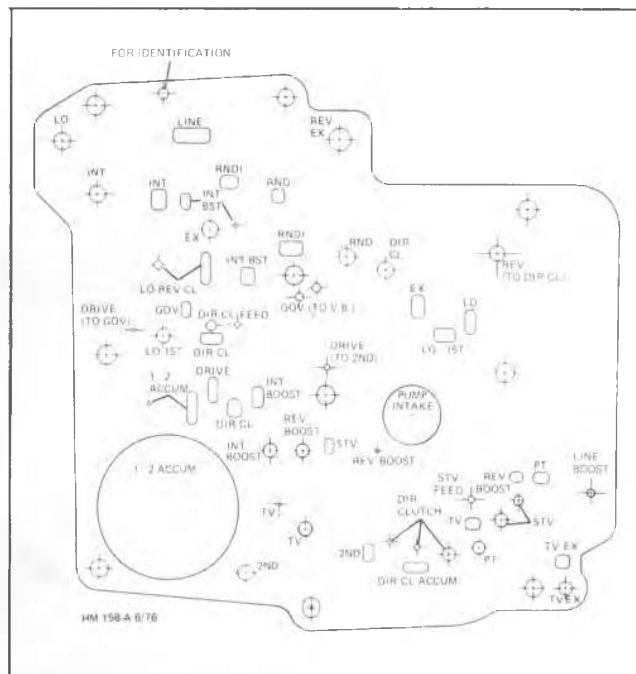


Fig. 7A-159A--Typical Valve Body Spacer Plate

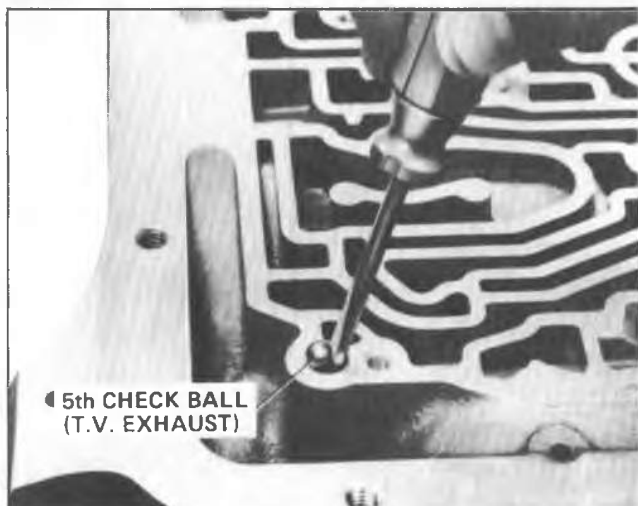


Fig. 7A-160A--Installing 5th Check Ball

4. Install 5th check ball in case as shown (Fig. 7A-160A).
5. Install 2 guide pins as shown in Fig. 7A-161A.
6. Install 4 check balls into ball seat pockets in control valve assembly and retain with petrolatum. (See Fig. 7A-162A for check ball location.)
7. Place the control valve assembly to spacer plate gasket marked "VB" on the control valve assembly.
8. Place the valve body spacer plate on the gasket marked "VB".
9. Place the spacer plate to case gasket marked "C" on the spacer plate.
10. Insert 2 control valve assembly to case attaching bolts through the control valve assembly, gaskets and spacer plate; and install these parts, aligning the manual valve with the detent lever pin (Fig. 7A-161A).

NOTE: Make sure check balls, 1-2 accumulator piston and manual valve do not fall out.

11. Start control valve assembly to case attaching bolts, except the throttle lever and bracket assembly and the oil screen attaching bolts.

CAUTION: The (2) oil screen attaching bolts are about 10mm (3/8") longer than the control valve assembly attaching bolts, and they are not interchangeable.

12. Inspect inside manual detent roller and spring assembly for damage.
13. Remove guide pins and replace with bolts and inside manual detent roller and spring assembly, locating the tang in the control valve assembly, and the roller on the inside detent lever (Fig. 7A-163A).
14. Throttle lever and bracket assembly.
 - a. Inspect throttle lever and bracket assembly for damage (Fig. 7A-164A).
 - b. If removed, install spring on top of lifter, then lifter spring first into throttle bracket.
 - c. Install link on throttle lever making sure link is hooked as shown (Fig. 7A-165A).
 - d. Install throttle lever and bracket assembly, locating slot in bracket with coiled pin, aligning lifter through valve body hole and link through T.V. linkage case bore. Retain with bolt.

15. Torque all control valve assembly to case attaching bolts to 13.0-17.0 N·m (9-12 ft. lbs.).

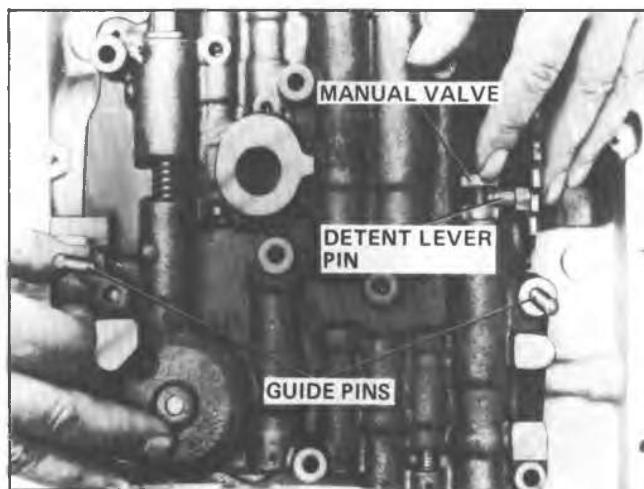


Fig. 7A-161A--Installing Control Valve Assembly Using Guide Pins

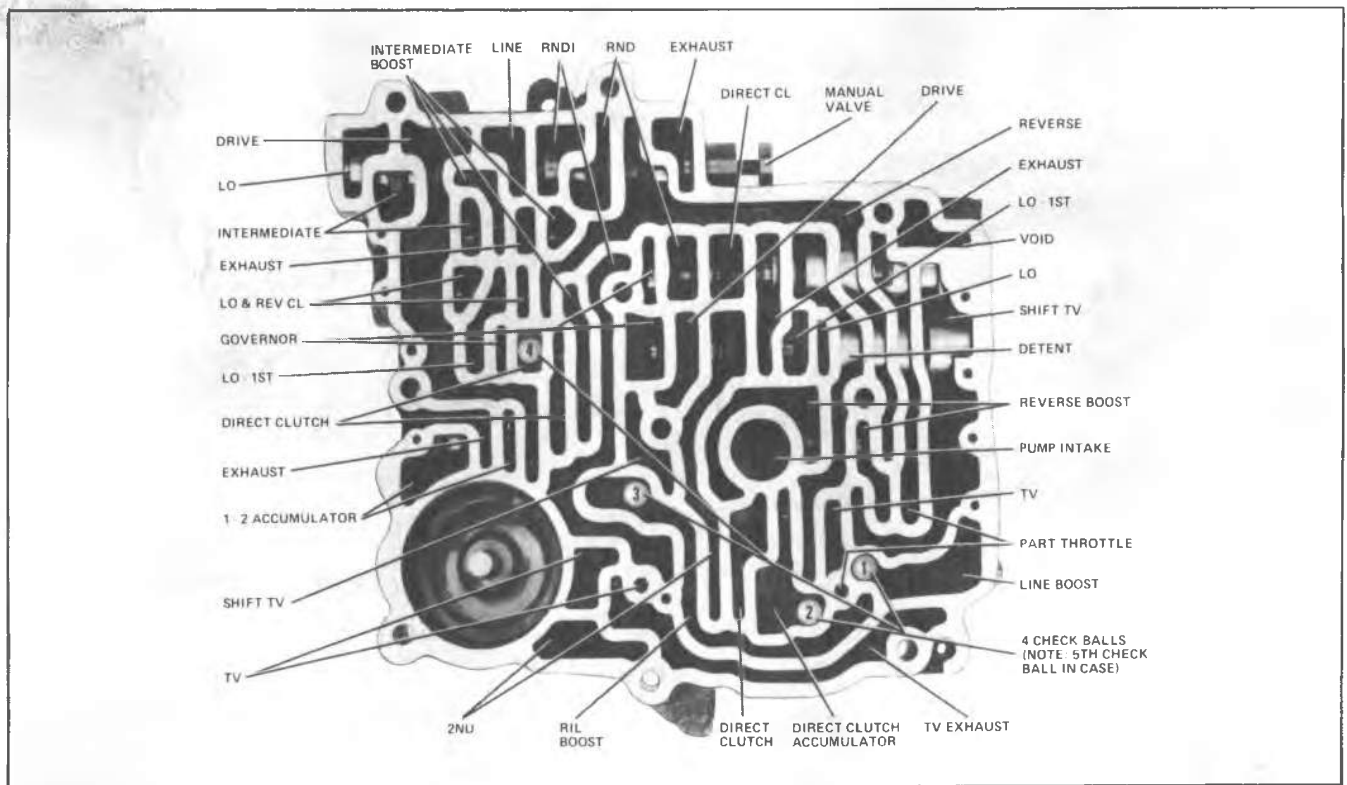


Fig. 7A-162A--Location of Four Check Balls

Oil Screen

1. Thoroughly clean, air dry and inspect oil screen assembly.
2. Install new oil screen gasket on screen and retain with petrolatum.
3. Install oil screen assembly and attaching bolts (Fig. 7A-166A). Torque bolts to 13.0-17.0 N·m (9-12 ft. lbs.).

Oil Pan

1. Clean and inspect oil pan for damage.
2. Install new oil pan to case gasket on case.
3. Install oil pan and retaining bolts. Torque bolts to 14.0-18.0 N·m (10-13 ft. lbs.).



Fig. 7A-163A--Installing Manual Detent Roller and Spring Assembly

Speedometer Driven Gear (Fig. 7A-167A)

Inspection

1. Remove speedometer driven gear from housing and inspect for damage.
2. Inspect housing for damage and "O" ring for damage or cuts.
3. If damaged, remove and discard "O" ring.

Reassembly

1. If removed, install new "O" ring on housing.
2. Install speedometer driven gear into housing.
3. Install speedometer driven gear assembly into case (Fig. 7A-167A).

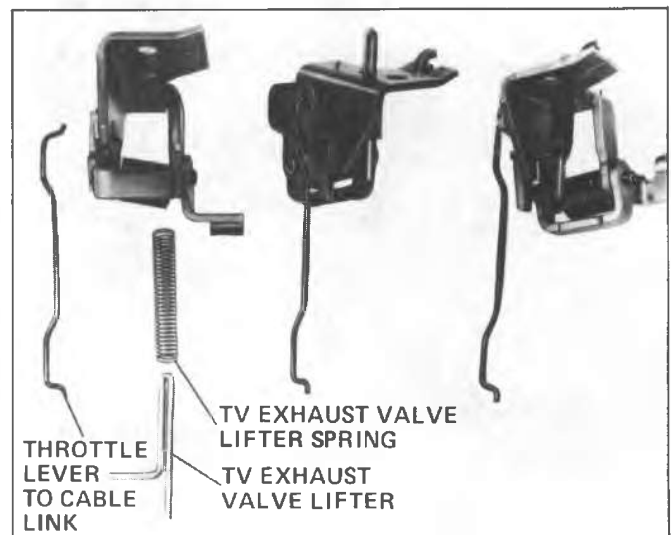


Fig. 7A-164A--Throttle Lever and Bracket Assembly

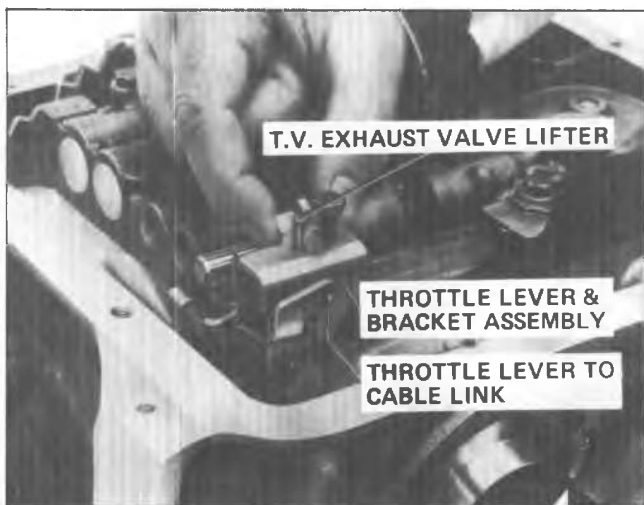


Fig. 7A-165A--Installing Throttle Valve and Bracket Assembly

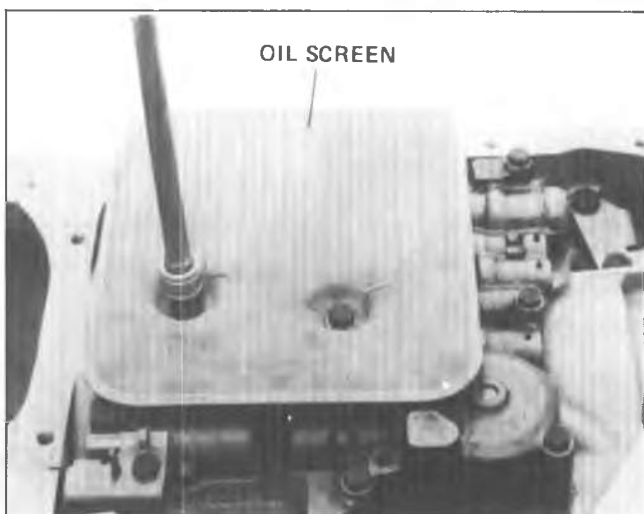


Fig. 7A-166A--Installing Oil Screen

4. Install speedometer retainer and attaching bolt, align slot in speedometer driven gear housing with retainer. Torque bolt to 8.0-14.0 N·m (6-10 ft. lbs.).

5. Place transmission in cradle or transmission jack. Remove holding fixture, J-8763-02 from transmission.

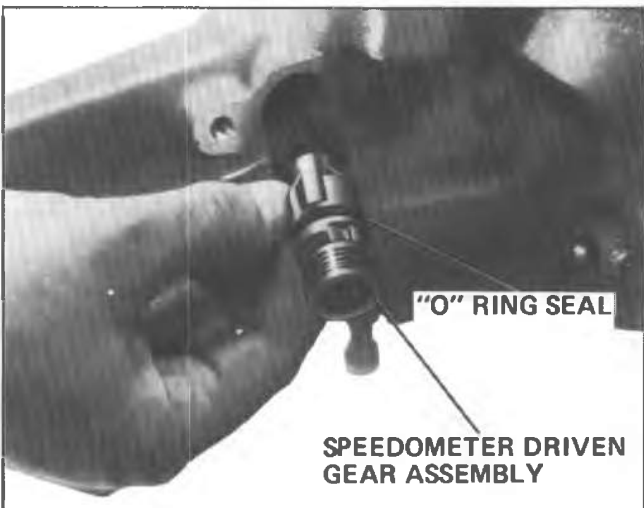


Fig. 7A-167A--Removing and Installing Speed Driven Gear - Typical

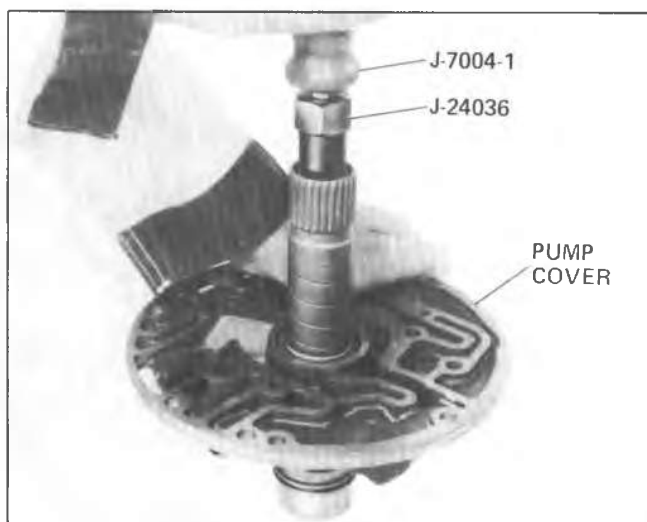


Fig. 7A-168A--Removing Pump Cover Bushing - Front

BUSHING REPLACEMENT

PUMP COVER BUSHINGS

Front Bushing

1. Using tool J-24036 with Slide Hammer, J-7004-1, remove bushing (Fig. 7A-168A).

2. Using tool J-25019-2 with Driver Handle J-8092, drive or press new bushing into place until tool bottoms (Fig. 7A-169A).

Rear Bushing

1. Using tool J-25019-14 with Slide Hammer J-7004-1, remove bushing (Fig. 7A-170A).

2. Using tool J-25019-6 with Driver Handle J-8092, drive or press new bushing until tool bottoms (Fig. 7A-171A).

PUMP BODY BUSHING

1. Place pump body with the machined face down, on two blocks of wood, to prevent damaging the machined surface.

2. Using tool J-25019-4 with Drive Handle J-8092, remove bushing (Fig. 7A-172A).

3. Using tool J-25019-12 with Driver Handle J-8092, drive or press new bushing into place until tool bottoms (Fig. 7A-173A).

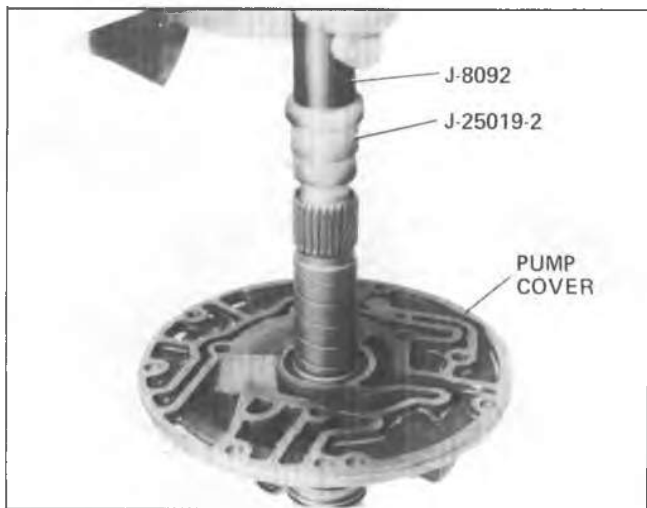


Fig. 7A-169A--Installing Pump Cover Bushing - Front

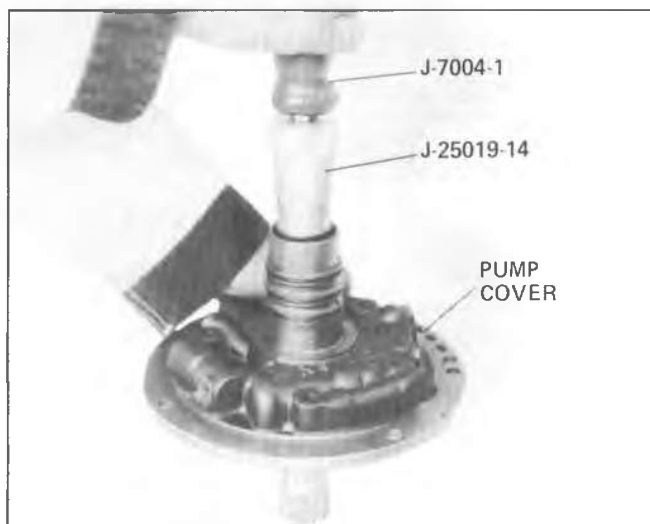


Fig. 7A-170A--Removing Pump Cover Bushing - Rear

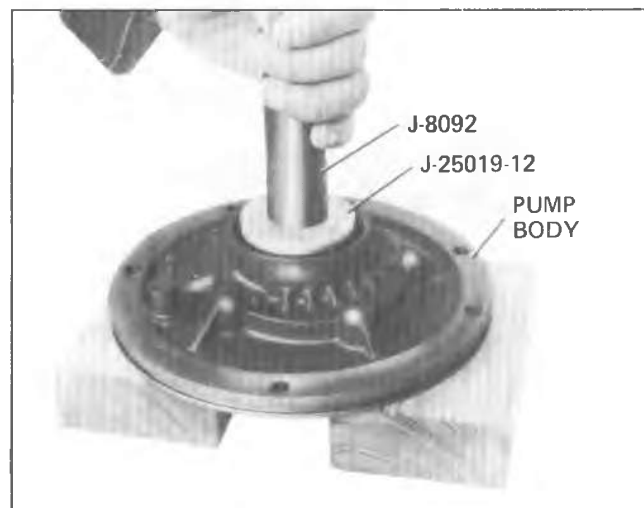


Fig. 7A-173A--Installing Pump Body Bushing



Fig. 7A-171A--Installing Pump Cover Bushing - Rear

DIRECT CLUTCH HOUSING

Front Bushing

1. Using tool J-25019-16 with Slide Hammer J-7004-1, remove bushing (Fig. 7A-174A).
2. Place bushing, chamfered inside diameter end first, over tool J-25019-9. Using tool J-25019-9 with Driver

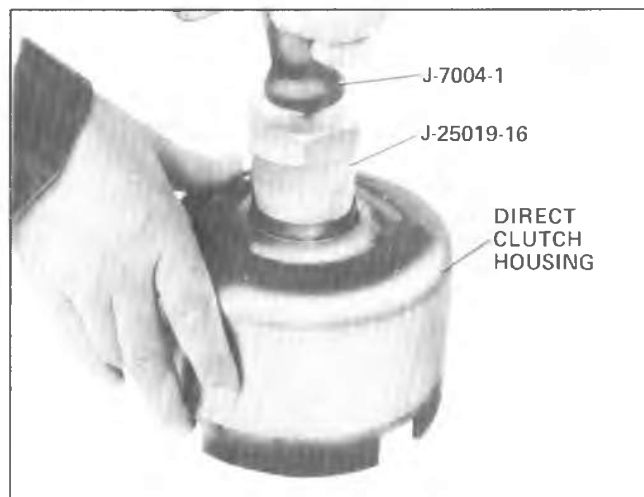


Fig. 7A-174A--Removing Direct Clutch Housing Bushing - Front

Handle J-8092, drive or press new bushing into place until tool bottoms (Fig. 7A-175A).

Rear Bushing

1. Place direct clutch housing with the thrust washer

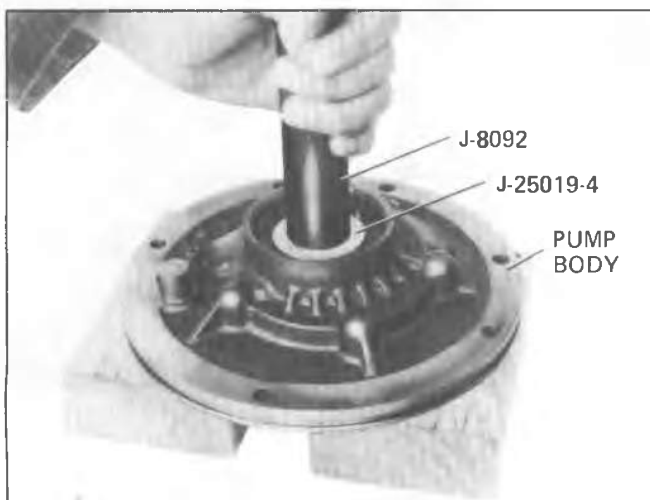


Fig. 7A-172A--Removing Pump Body Bushing



Fig. 7A-175A--Installing Direct Clutch Housing Bushing - Front

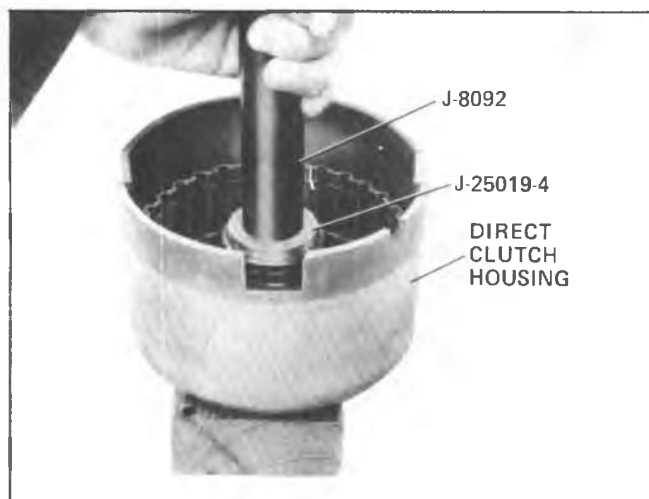


Fig. 7A-176A--Removing Direct Clutch Housing Bushing - Rear

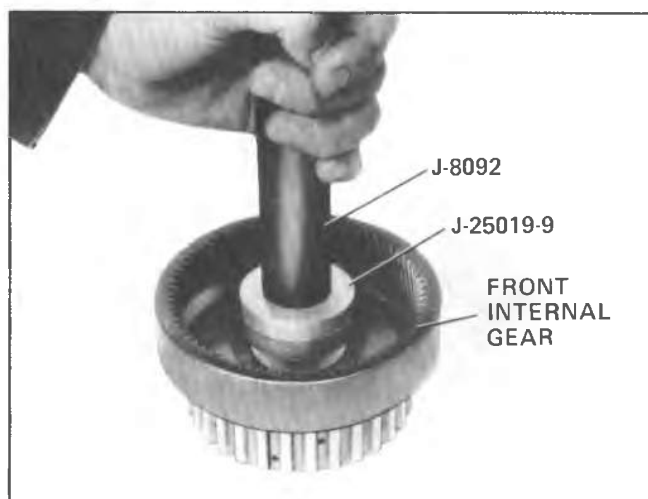


Fig. 7A-179A--Installing Front Internal Gear Bushing

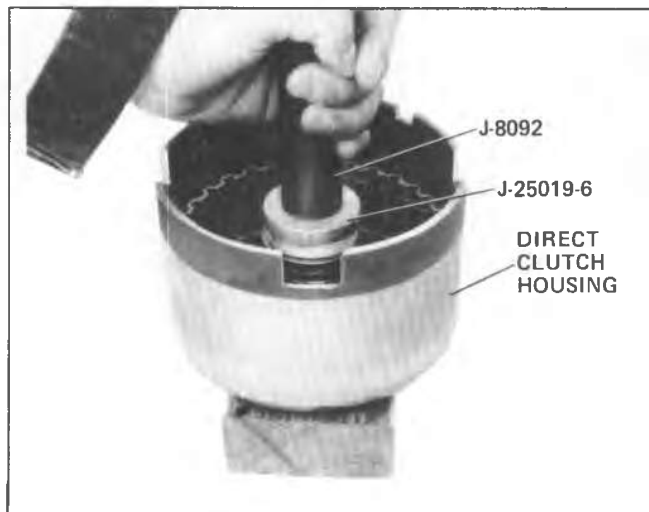


Fig. 7A-177A--Installing Direct Clutch Housing Bushing - Rear

face down on a block of wood to prevent damaging the thrust washer surface.

2. Using tool J-25019-4 with Driver Handle J-8092, remove bushing (Fig. 7A-176A).

3. Using tool J-25019-6 with Driver Handle J-8092,

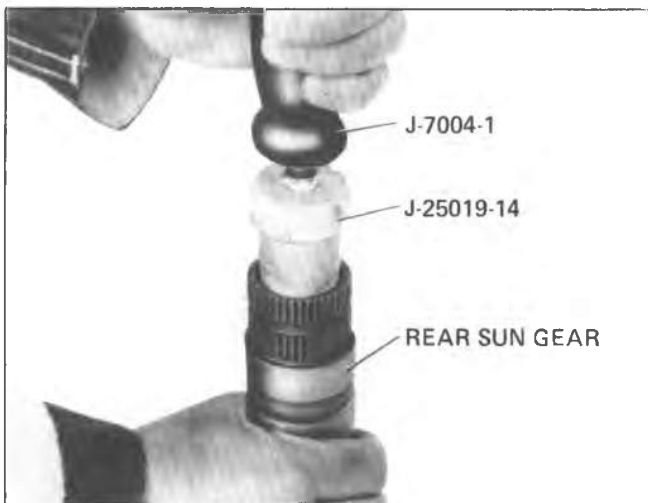


Fig. 7A-180A--Removing Rear Sun Gear Bushing

drive or press new bushing into place until tool bottoms (Fig. 7A-177A).

FRONT INTERNAL GEAR BUSHING

1. Using tool J-25019-3 with Driver Handle J-8092, remove bushing (Fig. 7A-178A).

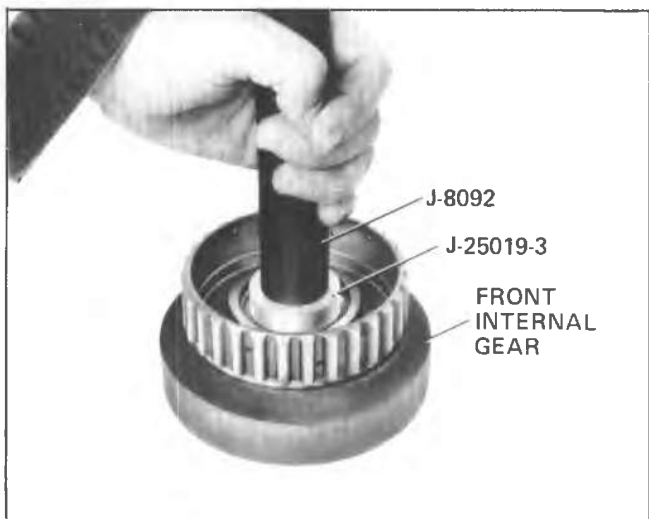


Fig. 7A-178A--Removing Front Internal Gear Bushing



Fig. 7A-181A--Installing Rear Sun Gear Bushing

2. Using tool J-25019-9 with Driver Handle J-8092, drive or press new bushing into place until tool bottoms (Fig. 7A-179A).

REAR SUN GEAR

1. Using tool J-25019-14 with Slide Hammer J-7004-1, remove bushing (Fig. 7A-180A).

2. Place rear sun gear with gear side down on block of wood to prevent damaging the gear.

3. Using tool J-25019-2 with Driver Handle J-8092, drive or press new bushing into place until tool bottoms (Fig. 7A-181A).

LO AND REVERSE CLUTCH HOUSING BUSHING

1. Using tool J-25019-16 with Slide Hammer J-7004-1, remove bushing (Fig. 7A-182A).

2. Place lo and reverse clutch housing with splined hub between two blocks of wood to prevent damaging the splines.

3. Using tool J-25019-8 with Driver Handle J-8092, drive or press new bushing into place until tool bottoms (Fig. 7A-183A).

REAR CARRIER BUSHING

1. Using tool J-25019-16 with Slide Hammer J-7004-1, remove bushing (Fig. 7A-184A).

2. Using tool J-25019-7 with Driver Handle J-8092, drive or press new bushing into place until tool bottoms (Fig. 7A-185A).

CASE BUSHING

1. Using tool J-21424-9 with Driver Handle J-8092, remove bushing (Fig. 7A-186A).

2. Using tool J-21424-9 with Driver Handle J-8092, drive or press new bushing to a distance of approximately 17.3mm (11/16") between rear end of the bushing and rear end of the case (Fig. 7A-186A).



Fig. 7A-182A--Removing Lo and Reverse Clutch Housing Bushing



Fig. 7A-183A--Installing Lo and Reverse Clutch Housing Bushing



Fig. 7A-184A--Removing Rear Carrier Bushing

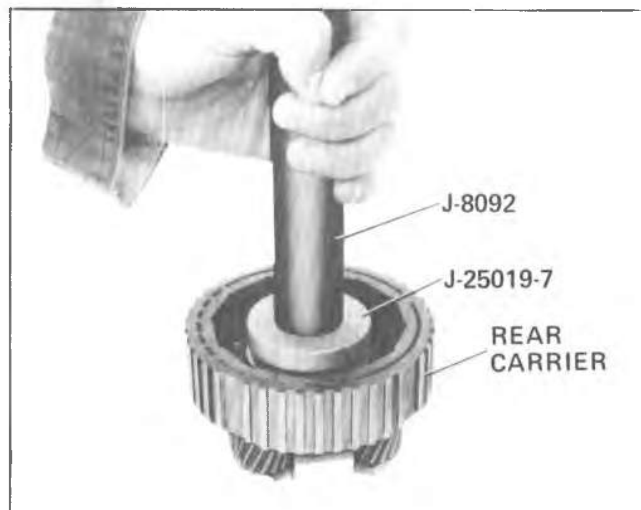


Fig. 7A-185A--Installing Rear Carrier Bushing

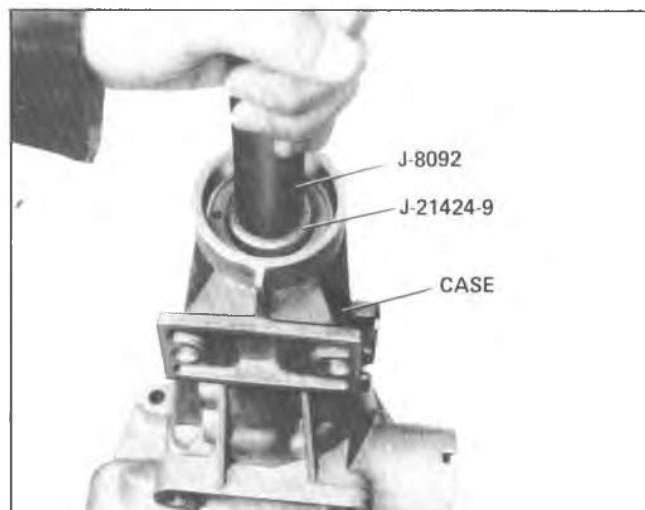


Fig. 7A-186A--Removing or Installing Case Bushing

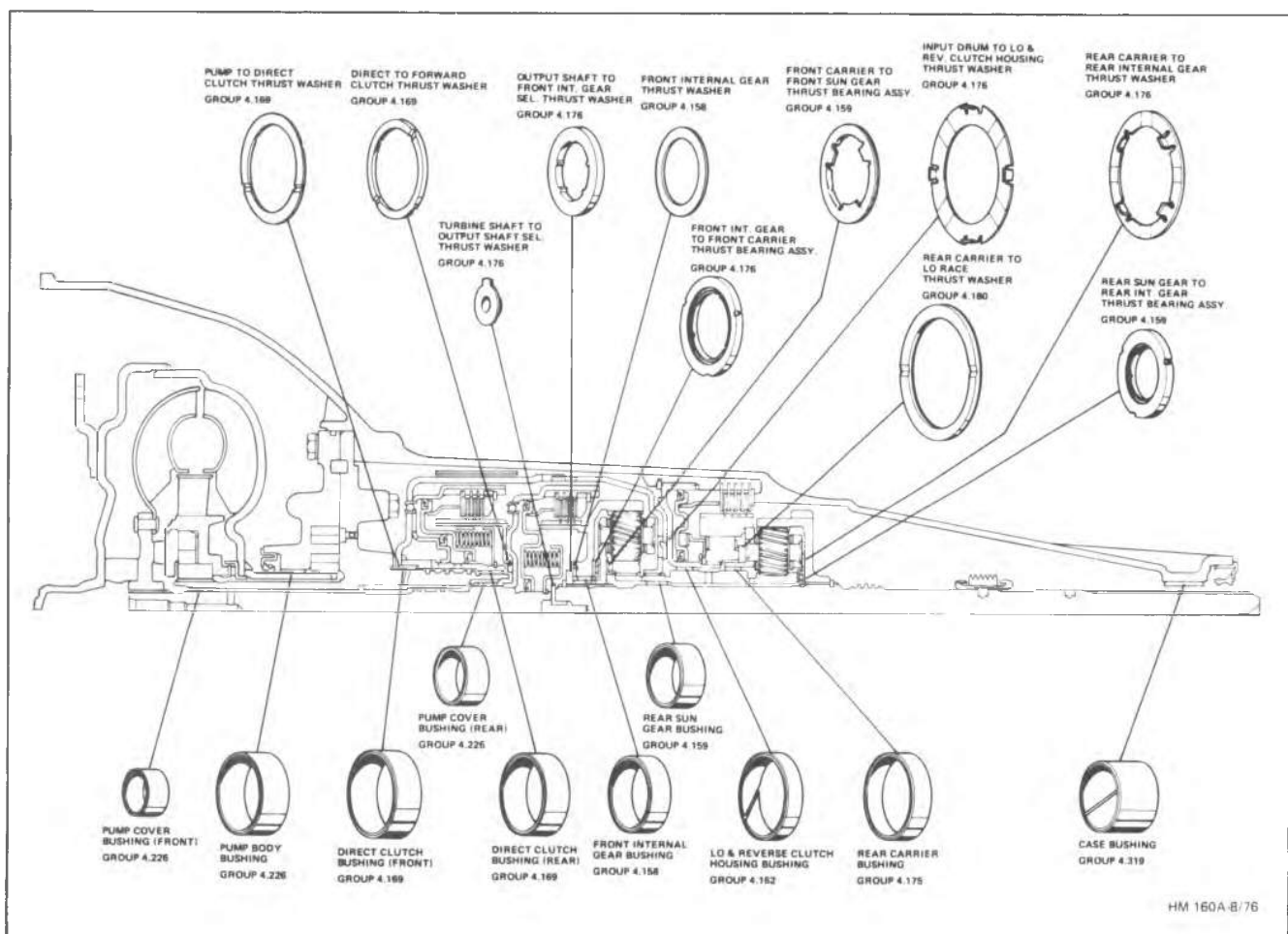


Fig. 7A-187A--Bushing Locations

SPECIFICATIONS

TURBO-HYDRAMATIC "200"

Pump Cover Bolts	24 N·m	(18 ft. lbs.)
Pump to Case Attaching Bolts	24 N·m	(18 ft. lbs.)
Parking Pawl Bracket Bolts	24 N·m	(18 ft. lbs.)
Control Valve Body Bolts	15 N·m	(11 ft. lbs.)
Oil Screen Retaining Bolts	15 N·m	(11 ft. lbs.)
Bottom Pan Attaching Bolts	16 N·m	(12 ft. lbs.)
Converter to Flywheel Bolts	48 N·m	(35 ft. lbs.)
Transmission to Engine Mounting Bolts	34 N·m	(25 ft. lbs.)
Converter Dust Shield Screws	11 N·m	(8 ft. lbs.)
Manual Shaft Nut	31 N·m	(23 ft. lbs.)
Speedometer Driven Gear Attaching Bolts	11 N·m	(8 ft. lbs.)
Detent Cable Attaching Screw	9 N·m	(6 ft. lbs.)
Oil Cooler Line to Transmission Connector	37 N·m	(25 ft. lbs.)
Oil Cooler Line to Radiator Connector	27 N·m	(20 ft. lbs.)
Linkage Swivel Clamp Nut	41 N·m	(30 ft. lbs.)
Shifter Assembly to Sheet Metal Screws	10 N·m	(8 ft. lbs.)
Converter Bracket to Adapter Nuts	17 N·m	(13 ft. lbs.)
Catalytic Converter to Rear Exhaust Pipe Nuts	23 N·m	(17 ft. lbs.)
Exhaust Pipe to Manifold Nuts	16 N·m	(12 ft. lbs.)
Rear Transmission Support Bolts	54 N·m	(40 ft. lbs.)
Mounting Assembly to Support Nuts	29 N·m	(21 ft. lbs.)
Mounting Assembly to Support Center Nut	44 N·m	(33 ft. lbs.)
Adapter to Transmission Bolts	44 N·m	(33 ft. lbs.)

SPECIAL TOOLS

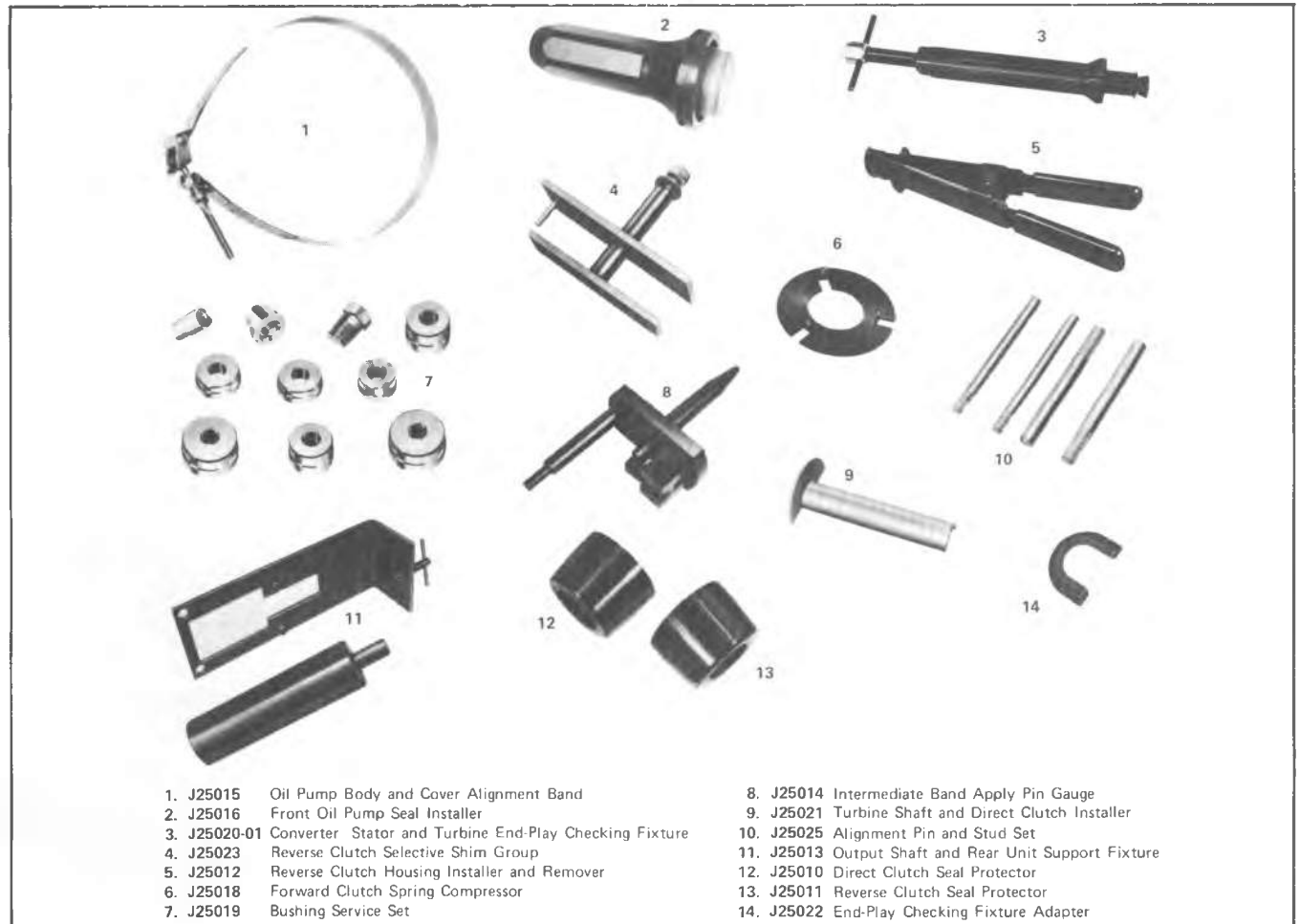


Fig. 7A-ST--THM 200, Special Tools

SECTION 7A

AUTOMATIC TRANSMISSION

CBC 350 TRANSMISSION

INDEX

Transmission Disassembly and Reassembly	7A-3	Low and Reverse Roller Clutch Support	7A-29
Disassembly (Transmission)	7A-3	Disassembly	7A-29
Converter Inspection	7A-3	Inspection	7A-29
Converter End Clearance Check	7A-4	Assembly	7A-29
Removal of Extension, Speedometer Driven Gear		Governor Assembly	7A-29
Oil Pan and Screen	7A-4	Disassembly	7A-30
Removal of Valve Body and Linkage	7A-6	Inspection	7A-30
Removal of Oil Pump and Internal Case		Governor Driven Gear Replacement	7A-30
Components	7A-10	Reassembly	7A-30
Valve Body	7A-16	Bushing Replacement	7A-31
Disassembly	7A-16	Extension Housing Bushing	7A-31
Inspection	7A-16	Output Shaft Bushing	7A-31
Reassembly	7A-16	Case Bushing	7A-31
Oil Pump	7A-18	Stator Shaft Front Bushing	7A-31
Disassembly	7A-18	Stator Shaft Rear Bushing	7A-32
Inspection	7A-19	Input Ring Gear Bushing	7A-32
Assembly	7A-19	Sun Gear Bushing	7A-32
Direct Clutch and Intermediate Overrun		Reaction Carrier Bushing	7A-32
Roller Clutch	7A-21	Direct Clutch Bushing	7A-32
Disassembly	7A-21	Transmission Assembly	7A-32
Inspection	7A-23	Transmission Internal Components	7A-32
Reassembly	7A-23	Speedometer Drive Gear and Extension	7A-34
Forward Clutch	7A-25	Manual Linkage	7A-35
Disassembly	7A-25	Intermediate Servo Piston	
Inspection	7A-26	Valve Body, Oil Pan and Gasket	7A-35
Reassembly	7A-26	Governor and Vacuum Modulator	7A-35
Sun Gear and Sun Gear Drive Shell	7A-26	Intermediate Clutch Accumulator	7A-35
Disassembly	7A-26		
Inspection	7A-27		
Assembly	7A-27		

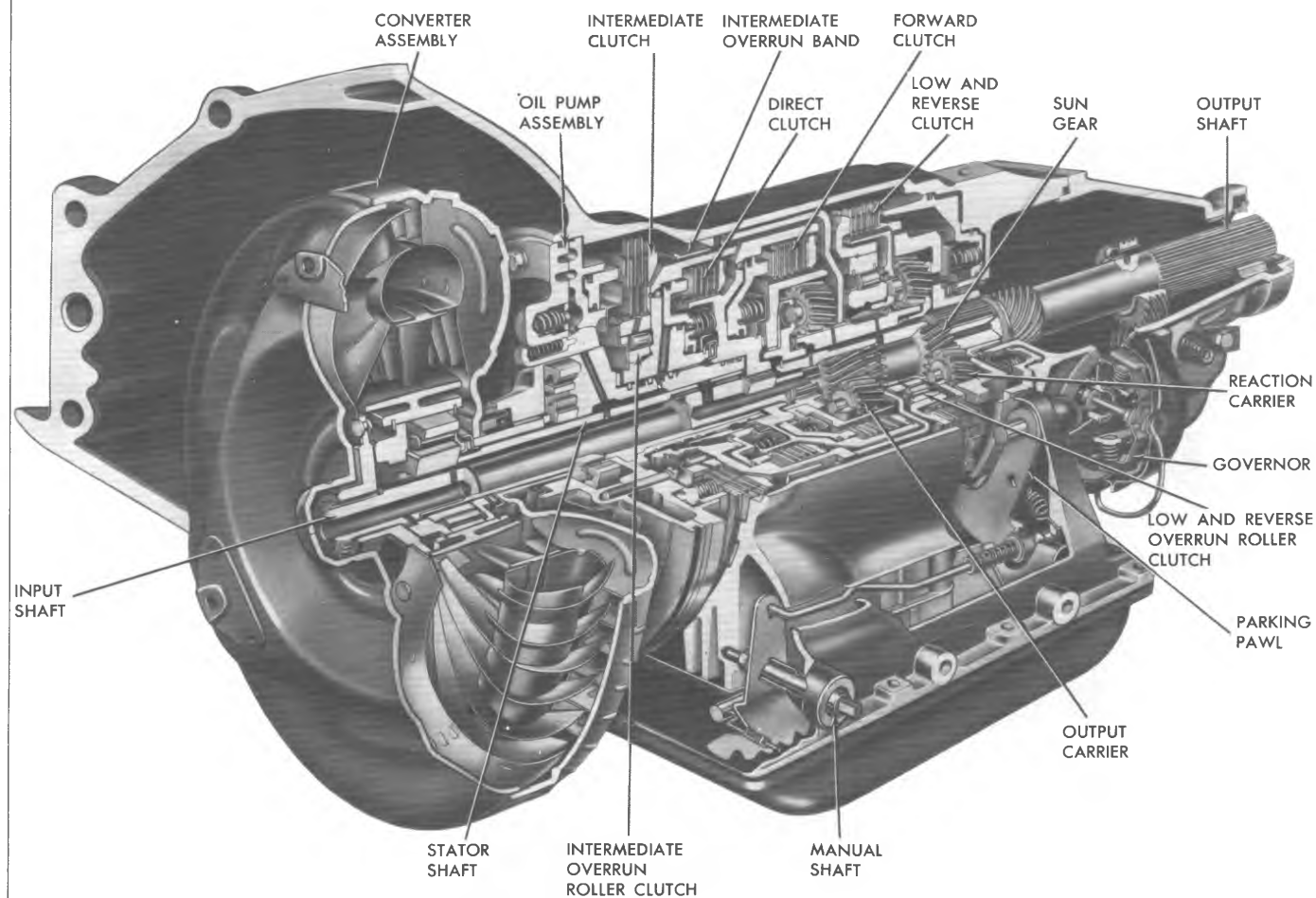


Fig. 7A-1B-CBC 350 Sectioned View

TRANSMISSION DISASSEMBLY AND REASSEMBLY

DISASSEMBLY

1. Install Holding Fixture J-8763-02 on transmission and place into Holding Tool base J-3289-20 with converter facing up (fig. 7A-2B).

NOTE: Cleanliness is an important factor in the overhaul of the transmission. Before attempting any disassembly operation, the exterior of the case should be thoroughly cleaned to prevent the possibility of dirt entering the transmission internal mechanism. During disassembly, all parts should be thoroughly cleaned in cleaning fluid and then air dried. Wiping cloths or rags should not be used to dry parts.

CAUTION: Do not use solvents which could damage rubber seals or clutch facings.

2. With transmission in holding fixture remove torque converter assembly.

3. Remove vacuum modulator assembly attaching bolt and retainer.

4. Remove vacuum modulator assembly, "O" ring seal, and modulator valve from case (fig. 7A-3B). Discard "O" ring.

Inspection of Converter

1. Check converter for leaks as follows (fig. 7A-4B):

- a. Install Tool J-21369 and tighten.
- b. Apply 80 psi air pressure to tool.

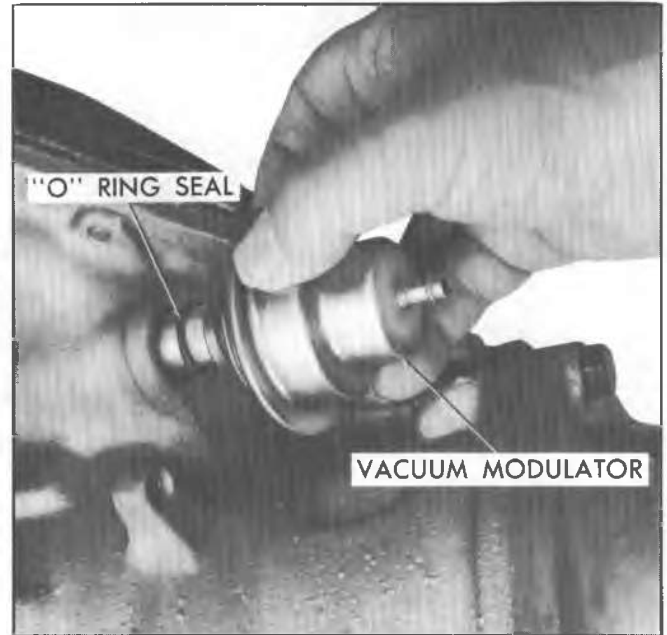


Fig. 7A-3B--Removing Vacuum Modulator Assembly

c. Submerge in water and check for leaks.

2. Check converter hub surfaces for signs of scoring or wear.

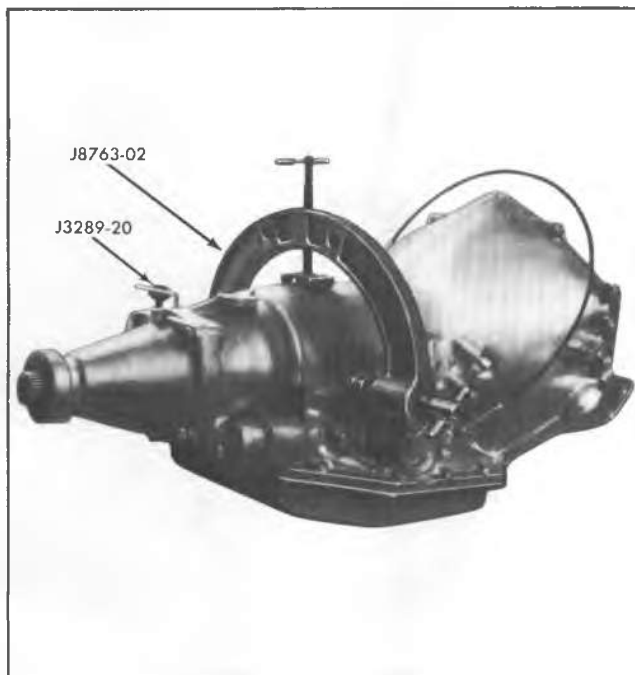


Fig. 7A-2B--Transmission in Holding Fixture

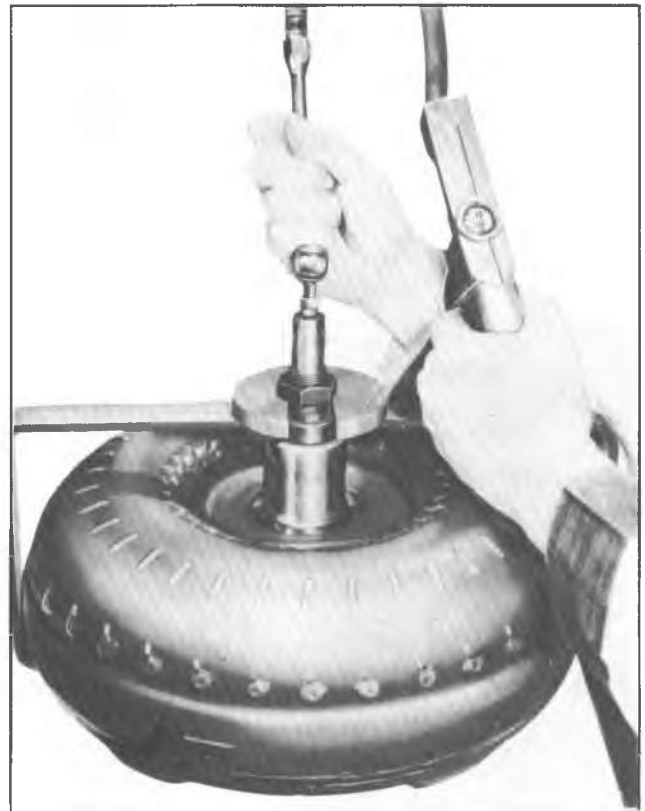


Fig. 7A-4B--Checking Converter for Leaks

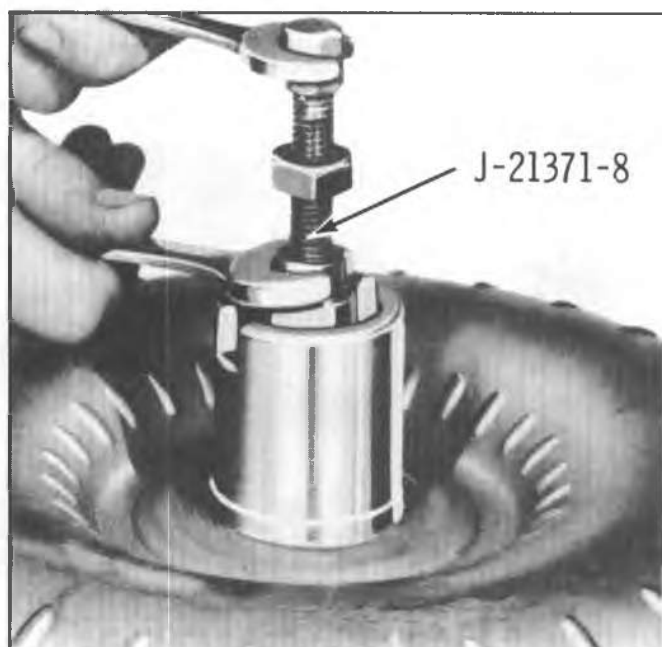


Fig. 7A-5B--Installing J-21371-8

Converter End Clearance Check (Figs. 7A-5B, 7A-6B)

1. Fully release collet end of Tool J-21371-8.
2. Install collet end of Tool J-21371-8 into converter hub until it bottoms; then tighten cap nut to 5 ft. lbs. (fig. 7A-5B).
3. Install Tool J-21371-3 and tighten hex nut to 3 ft. lbs. (fig. 7A-6B).
4. Install Dial Indicator J-8001 and set it at "zero", while its plunger rests on the cap nut of Tool J-21371-8.
5. Loosen hex nut while holding cap nut stationary. With the hex nut loosened and holding Tool J-21371-3 firmly against the converter hub, the reading obtained on the dial indicator will be the converter end clearance. End clearance should be less than .050". If the end clearance is .050" or greater, the converter must be replaced.

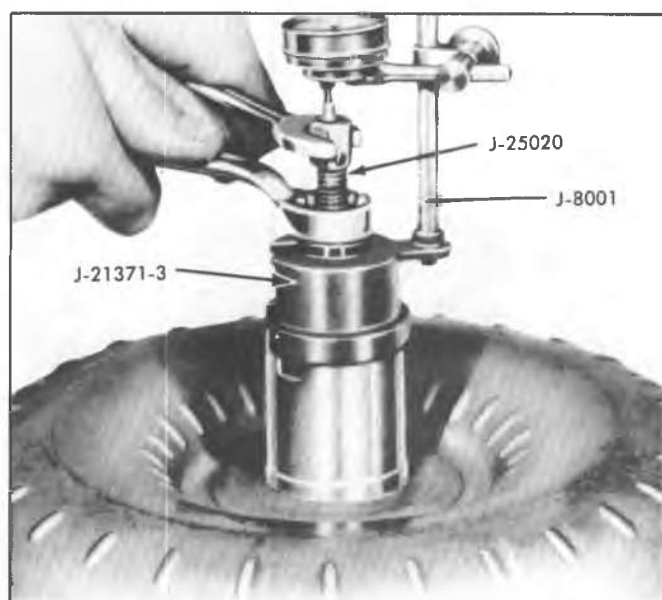


Fig. 7A-6B--Checking Converter End Clearance



Fig. 7A-7B--Removing Extension Housing Lip Seal

REMOVAL OF EXTENSION, SPEEDOMETER DRIVEN GEAR, GOVERNOR, OIL PAN AND SCREEN

1. Remove four housing to case attaching bolts.
2. Remove extension housing from case and remove square cut "O" ring seal from extension housing.
3. Remove extension housing lip seal using screw driver (fig. 7A-7B).
4. If extension housing bushing is to be replaced, collapse bushing (fig. 7A-8B) and refer to Figure 7A-98B for installation.



Fig. 7A-8B--Removing Extension Housing Bushing

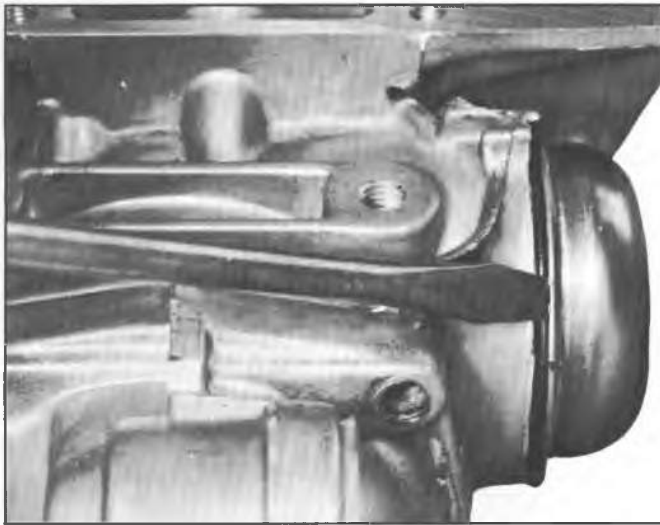


Fig. 7A-9B--Removing Governor Cover

5. Install speedometer drive gear remover tool J-21427-01 and J-9539 bolts with J-8105 or suitable puller on output shaft and remove speedometer drive gear. Remove retaining clip.

6. Remove governor cover retainer with a screwdriver.

7. Using a screwdriver and hammer, gently tap along governor cover lip (fig. 7A-9B), remove governor cover and "O" ring seal (fig. 7A-10B). Discard seal.

CAUTION: Do not attempt to pry the screwdriver between the case and governor cover as this could cause damage to the case.

8. Withdraw governor assembly from case (fig. 7A-11B)

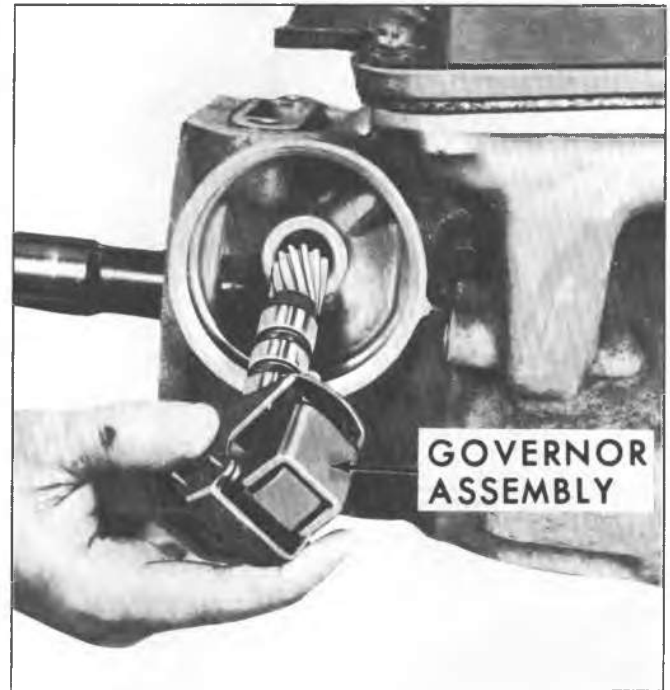


Fig. 7A-11B--Removing Governor from Case

and check governor bore and governor sleeve for scoring.

9. Remove oil pan attaching screws (fig. 7A-12B), oil pan, and gasket. Discard gasket.

10. Remove oil pump suction screen (strainer) to valve body attaching screws (fig. 7A-13B).

11. Remove oil pump screen (strainer) and gasket from valve body.



Fig. 7A-10B--Governor Cover and "O" Ring Seal



Fig. 7A-12B--Removing Transmission Oil Pan



Fig. 7A-13B--Removing Oil Pump Suction Screen (Strainer) from Valve Body

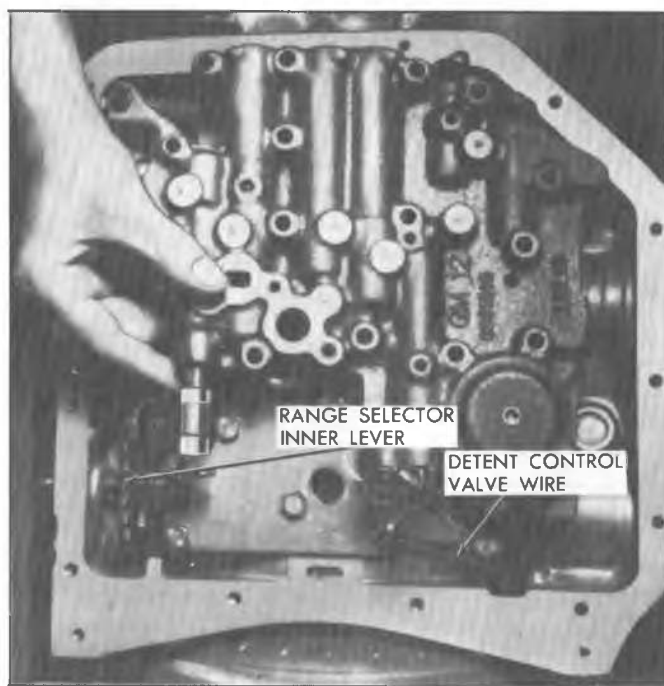


Fig. 7A-15B--Removing Manual Control Valve Link, Valve Body and Detent Actuating Lever

REMOVAL OF VALVE BODY AND LINKAGE

1. Remove detent spring and roller assembly from valve body. Remove valve body to case attaching bolts (fig. 7A-14B).
2. Remove manual control valve link from range selector inner lever. Remove detent control valve link from detent

actuating lever (fig. 7A-15B). Refer to valve body disassembly.

3. Remove transfer plate support bolts. Remove transfer support plate (fig. 7A-16B).

4. Remove upper gasket, valve body transfer (spacer) plate and valve body transfer (spacer plate to case gasket (fig. 7A-17B).

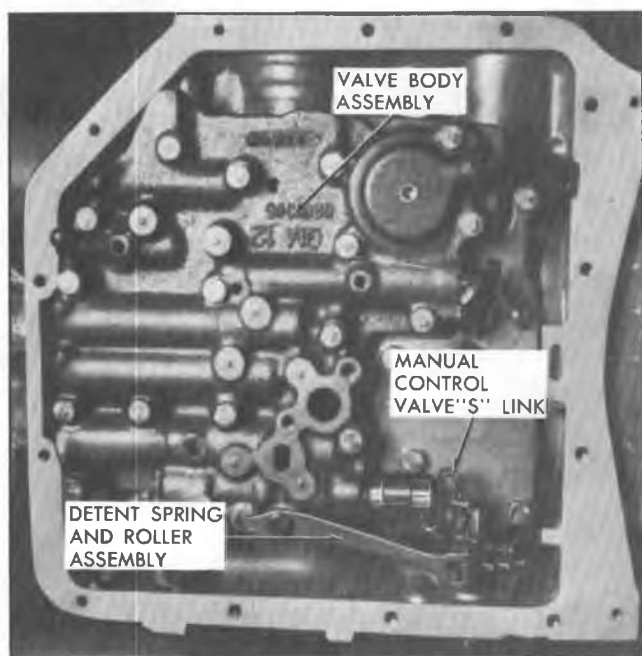


Fig. 7A-14B--Detent Spring and Roller Assembly

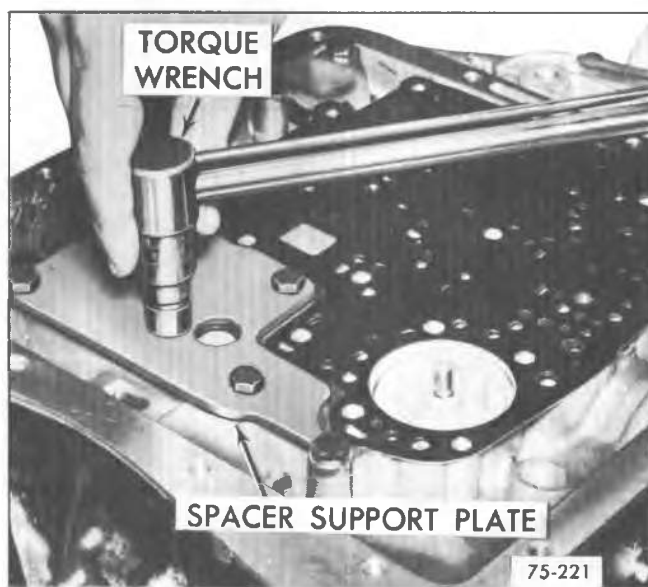


Fig. 7A-16B--Removing Transfer (Spacer) Support Plate

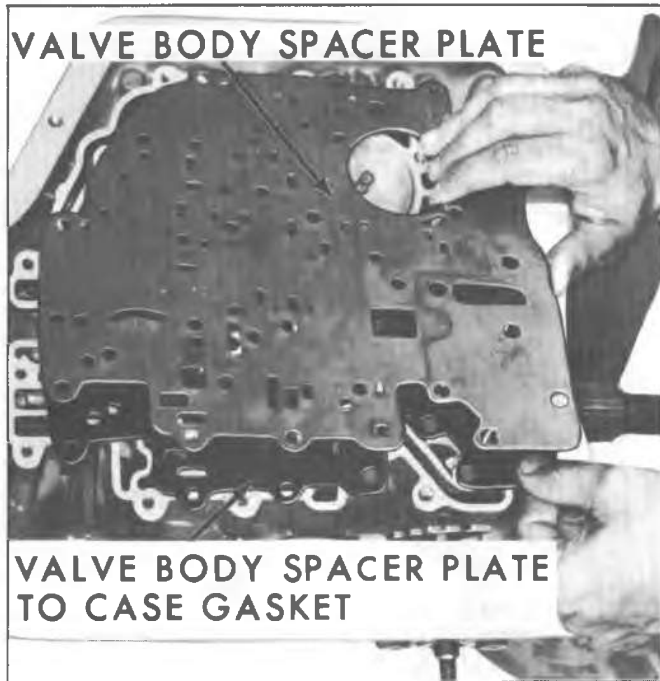


Fig. 7A-17B--Removing Valve Body Transfer (Spacer) Plate and Gasket

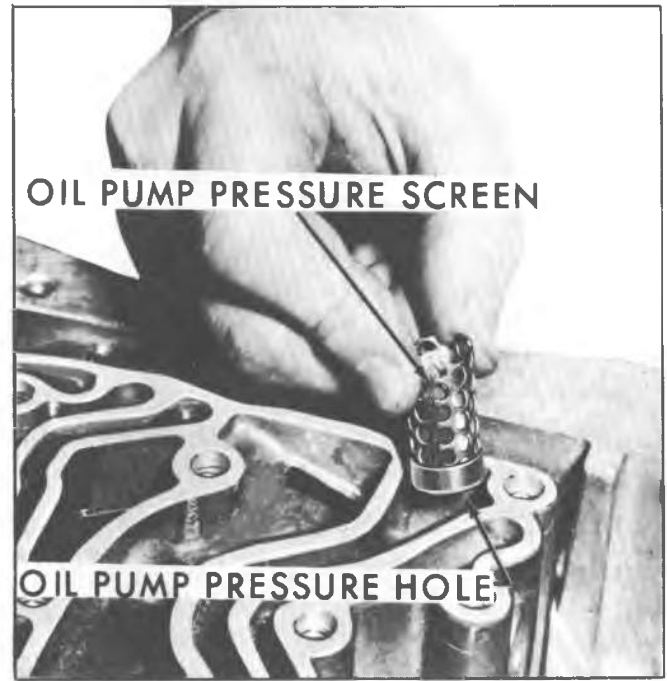


Fig. 7A-19B--Removing Oil Pump Pressure Screen

5. Remove four (4) check balls from correct passages in case face (fig. 7A-18B).

6. Remove oil pump pressure screen from oil pump pressure hole in case (fig. 7A-19B).

7. Remove governor feed screen from governor feed hole (drive oil) in case (fig. 7A-20B).

NOTE: on JA and JH models, there are two governor feed screens.

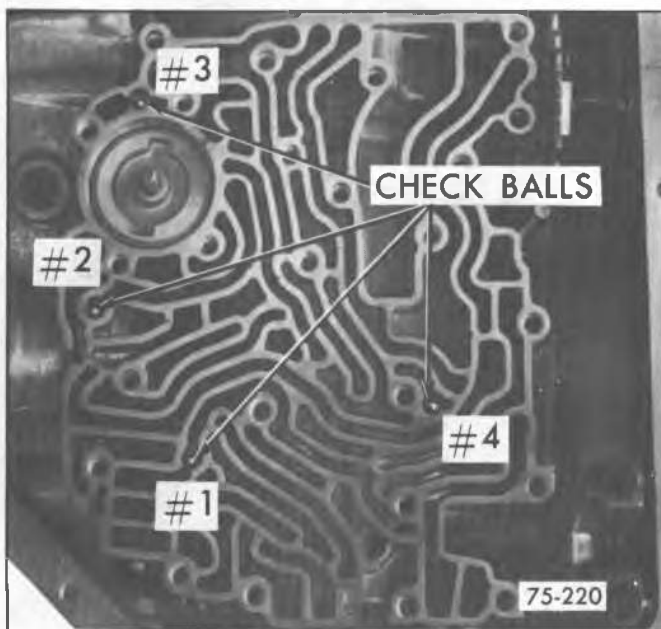


Fig. 7A-18B--Check Ball Four (4) Locations

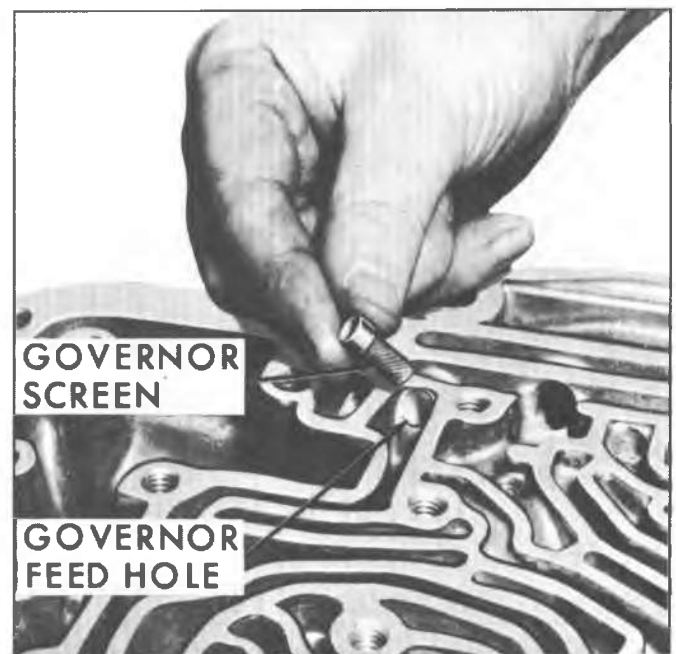


Fig. 7A-20B--Removing Governor Feed Screen

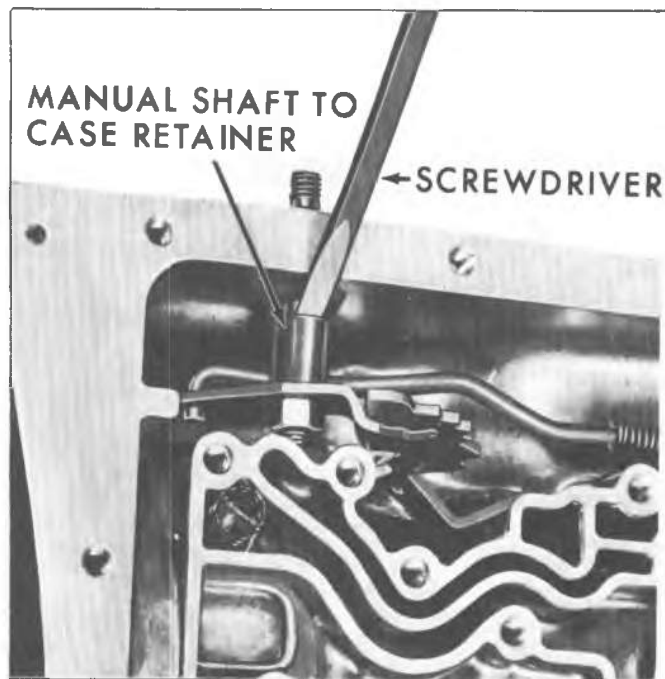


Fig. 7A-21B--Removing Manual Shaft to Case Retainer



Fig. 7A-23B--Removing Manual Shaft and Inner Lever and Parking Pawl Actuator Rod from Case

8. Remove manual shaft to case retainer with screwdriver (fig. 7A-21B).

9. Loosen nut holding range selector inner lever to manual shaft (fig. 7A-22B).

10. Remove range selector inner lever from manual shaft. Remove manual shaft from case. Remove inner lever and parking pawl actuator rod from case. Disassembly inner lever from parking pawl actuator rod (fig. 7A-23B).

11. Remove manual shaft to case lip seal (fig. 7A-24B).

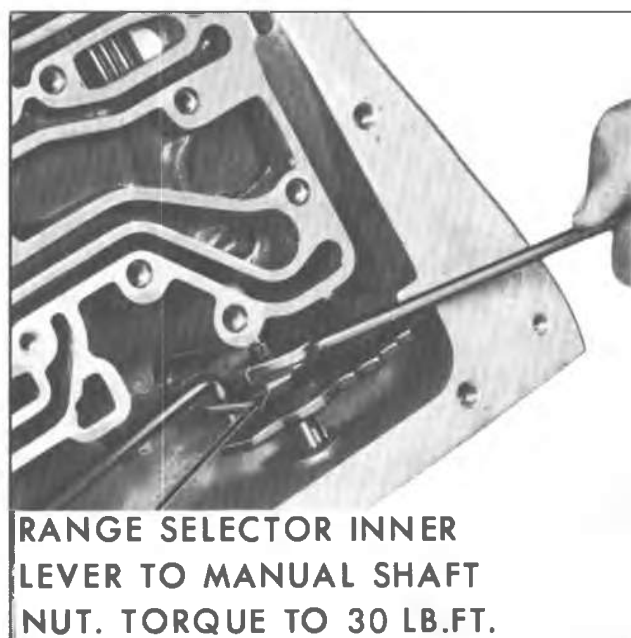


Fig. 7A-22B--Loosening Nut Holding Range Selector Inner Lever to Manual Shaft

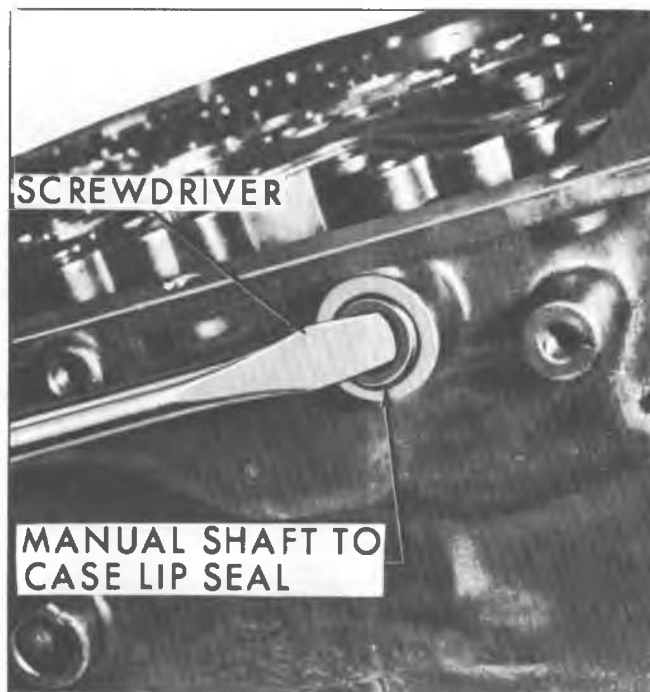


Fig. 7A-24B--Removing Manual Shaft to Case Lip Seal

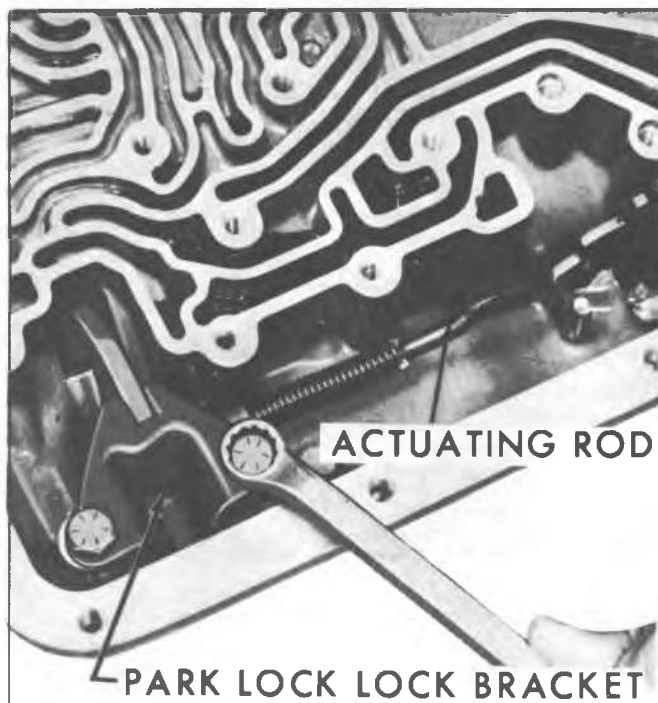


Fig. 7A-25B--Removing Park Lock, Lock Bracket

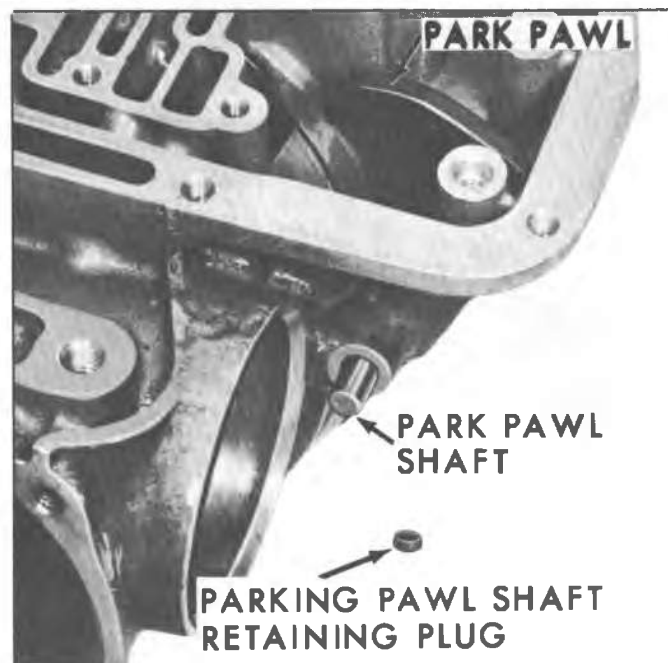


Fig. 7A-27B--Parking Pawl Shaft Retaining Plug, Parking Pawl Shaft and Parking Pawl

12. Remove parking lock; lock bracket (fig. 7A-25B). (Special Bolts).

13. Remove parking pawl disengaging spring (fig. 7A-26B).

14. Remove parking pawl shaft retaining plug, parking pawl shaft, and parking pawl (fig. 7A-27B) if replacement is required.

NOTE: The parking pawl shafts retaining plug may be removed by using a bolt extractor.

15. Remove intermediate servo piston and seal ring. Remove washer, spring seat and apply pin (fig. 7A-28B).



Fig. 7A-26B--Removing Parking Pawl Disengaging Spring

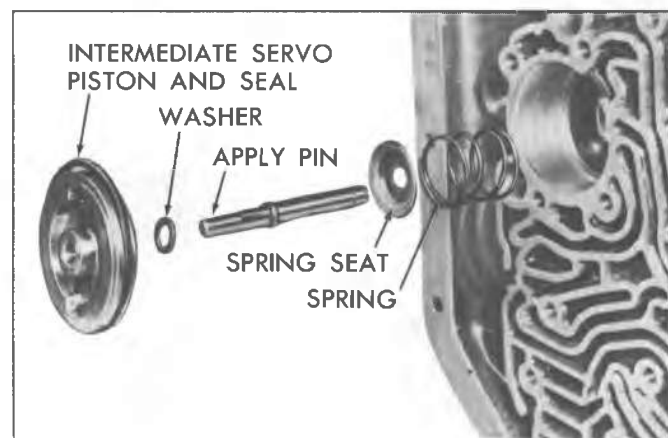


Fig. 7A-28B--Intermediate Servo Piston and Related Parts



Fig. 7A-29B--Removing Pump Attaching Bolts

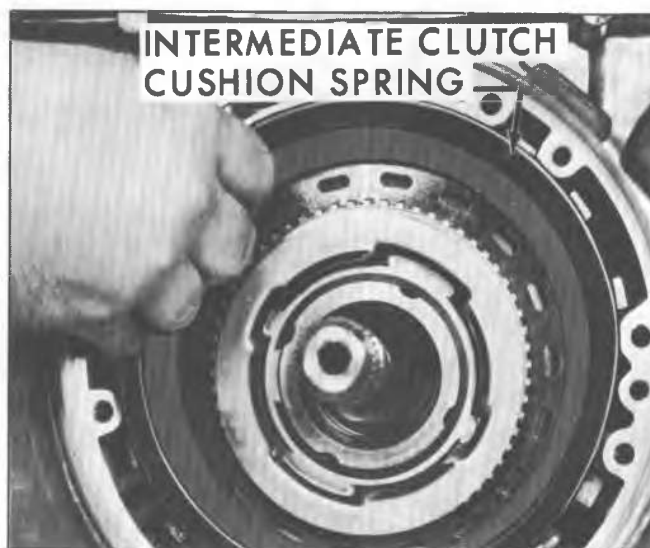


Fig. 7A-31B--Removing Intermediate Clutch Cushion Spring

REMOVAL OF OIL PUMP AND INTERNAL CASE COMPONENTS

1. Remove eight (8) pump attaching bolts with washer type seals (fig. 7A-29B).

2. Install two (2) threaded slide hammers J-7004 into threaded holes in pump body and remove pump assembly from case (fig. 7A-30B). Discard pump gasket.



Fig. 7A-30B--Removing Pump from Case

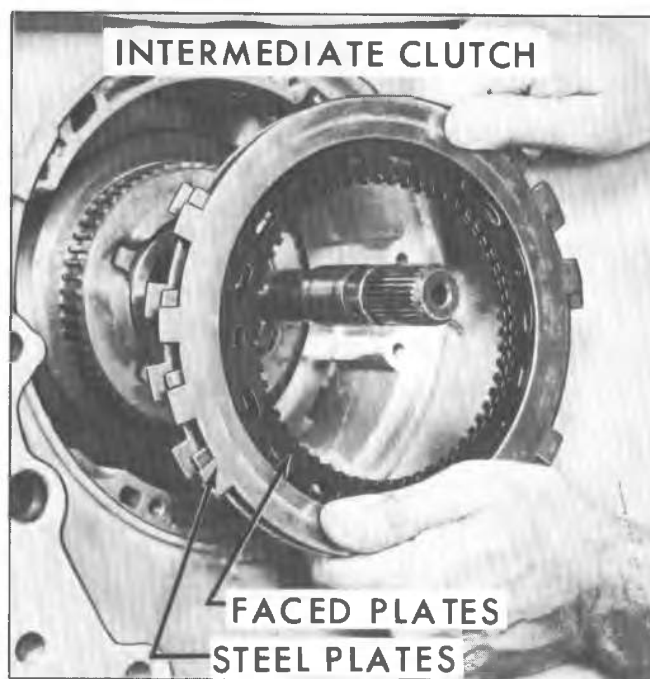


Fig. 7A-32B--Removing Intermediate Clutch Plates

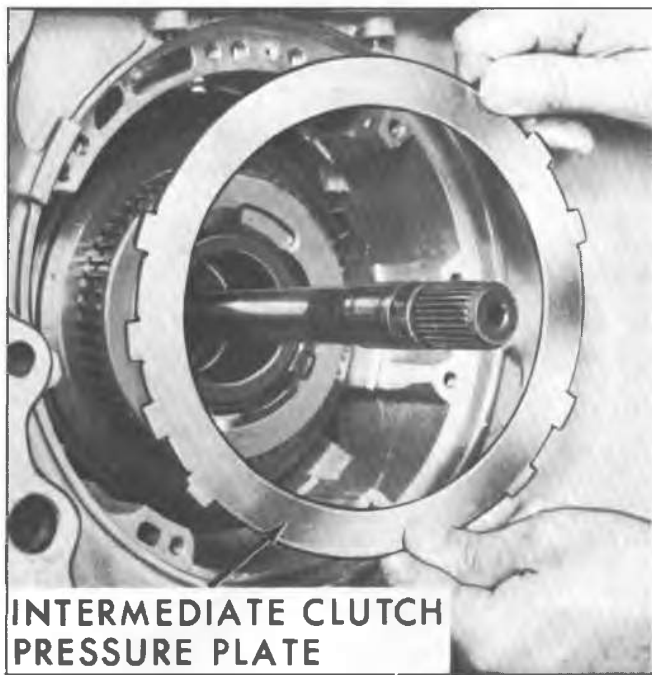


Fig. 7A-33B--Removing Intermediate Clutch Pressure Plate

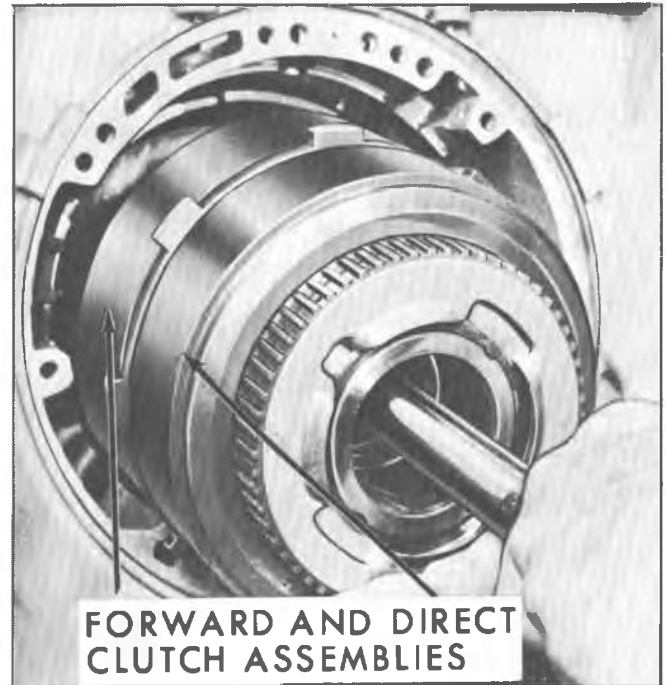


Fig. 7A-35B--Removing Direct and Forward Clutch Assemblies

5. Remove intermediate clutch pressure plate (fig. 7A-33B).
6. Remove intermediate overrun brake band (fig. 7A-34B).

7. Remove direct and forward clutch assemblies from case (fig. 7A-35B).
8. Remove input ring gear front thrust washer (fig. 7A-36B).

NOTE: Washer has 3 tangs.



Fig. 7A-34B--Removing Intermediate Overrun Brake Band

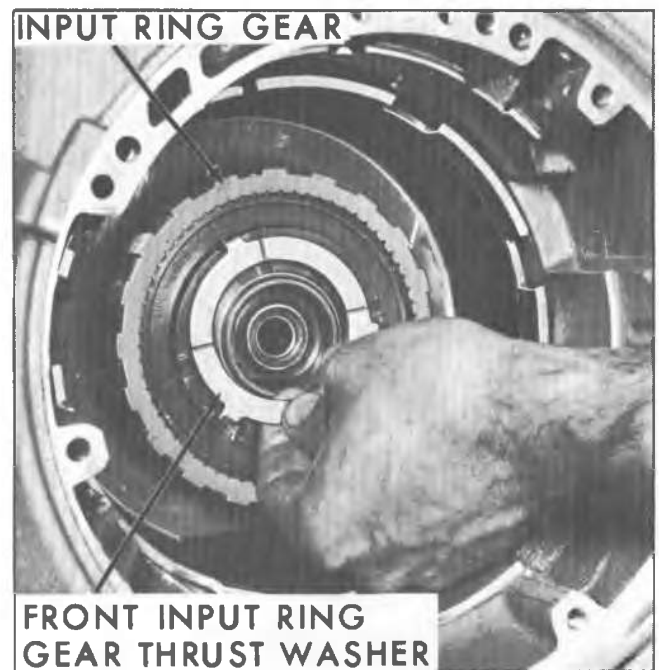


Fig. 7A-36B--Removing Input Ring Gear Front Thrust Washer

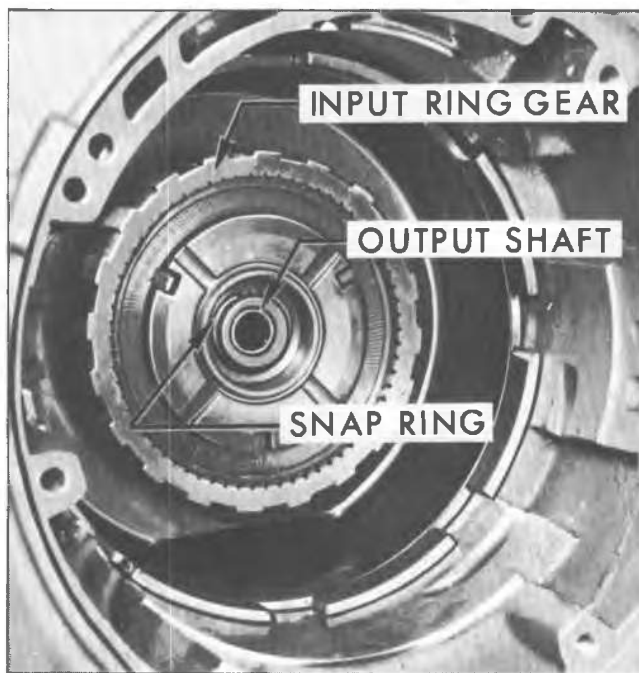


Fig. 7A-37B--Removing Input Ring Gear to Output Shaft Snap Ring

9. Remove input ring gear to output shaft snap ring (fig. 7A-37B).

10. Remove input ring gear (fig. 7A-38B).

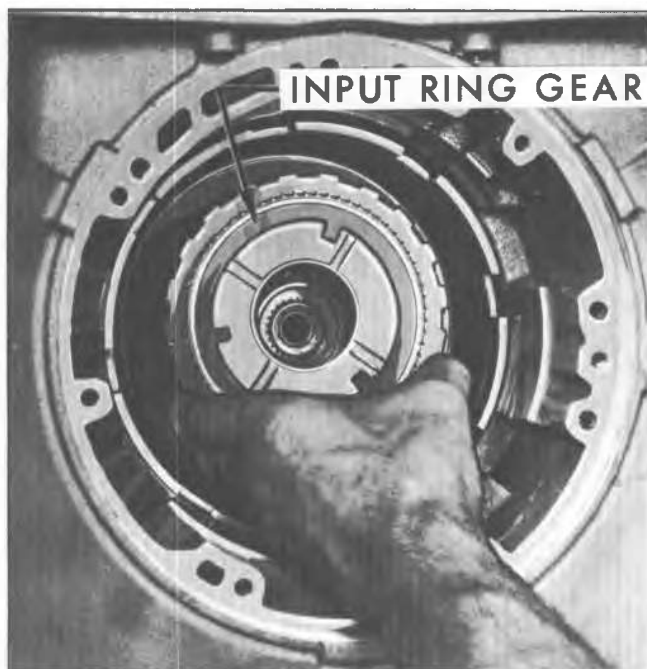


Fig. 7A-38B--Removing Input Ring Gear

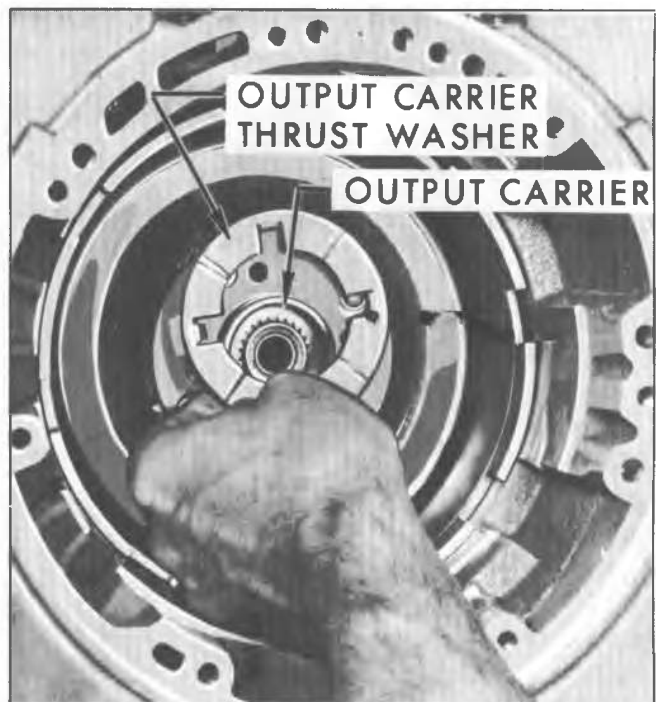


Fig. 7A-39B--Removing Input Ring Gear Rear Thrust Washer

11. Remove input ring gear rear (output carrier) thrust washer (fig. 7A-39B).

12. Remove output carrier assembly (fig. 7A-40B).

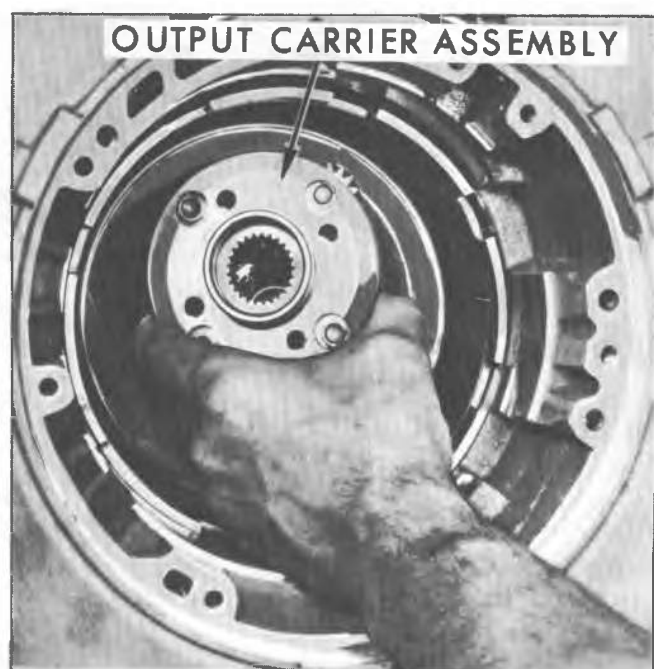


Fig. 7A-40B--Removing Output Carrier Assembly



Fig. 7A-41B--Removing Sun Gear Drive Shell

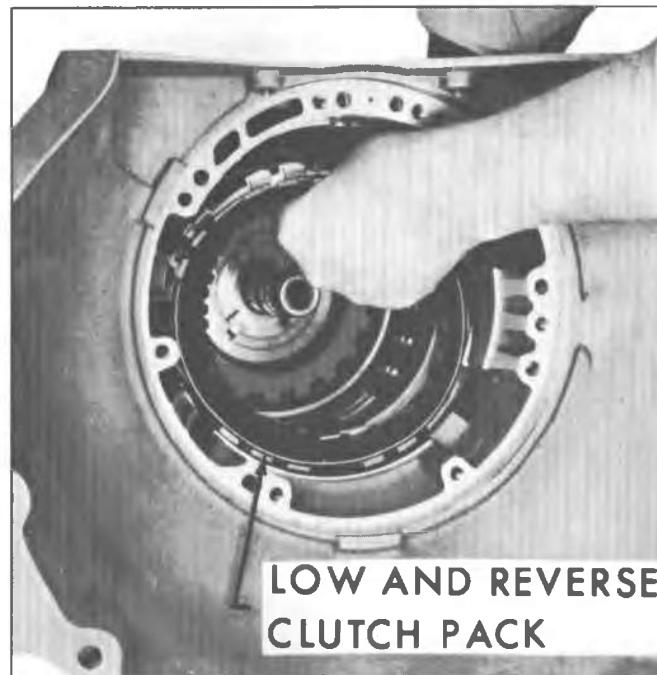


Fig. 7A-43B--Removing Low and Reverse Clutch Pack

13. Remove sun gear drive shell assembly (fig. 7A-41B).
14. Remove low and reverse roller clutch support to case retaining ring (fig. 7A-42B).
15. Remove low and reverse clutch support and race assembly and anti-clunk spring.

16. Remove low and reverse clutch plates and steel reaction plates (fig. 7A-43B).

17. Remove reaction carrier assembly from output ring gear and shaft assembly (fig. 7A-44B).

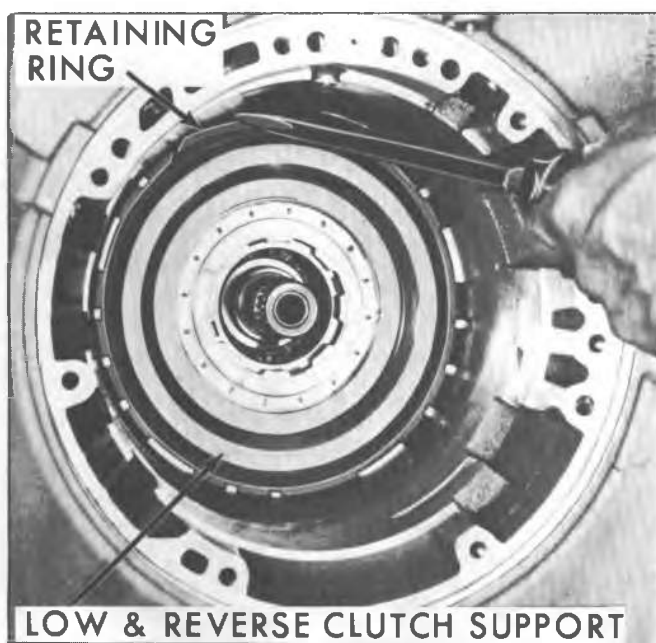


Fig. 7A-42B--Removing Low and Reverse Clutch Support Retaining Ring



Fig. 7A-44B--Removing Reaction Carrier Assembly

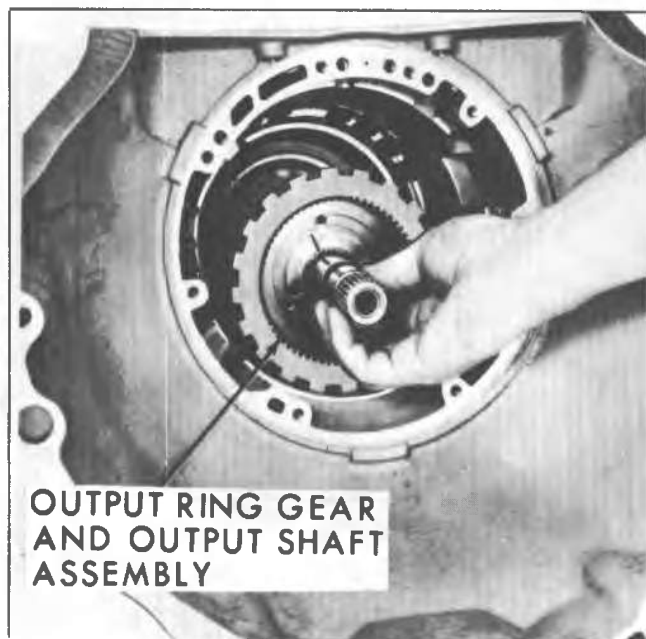


Fig. 7A-45B--Removing Output Ring Gear and Shaft Assembly

18. Remove output ring gear and shaft assembly from case (fig. 7A-45B).

NOTE: On Trucks, also remove grease pack sleeves from output shaft before taking shaft from case.

19. Remove reaction carrier to output ring gear tanged (front) thrust washer (fig. 7A-46B).

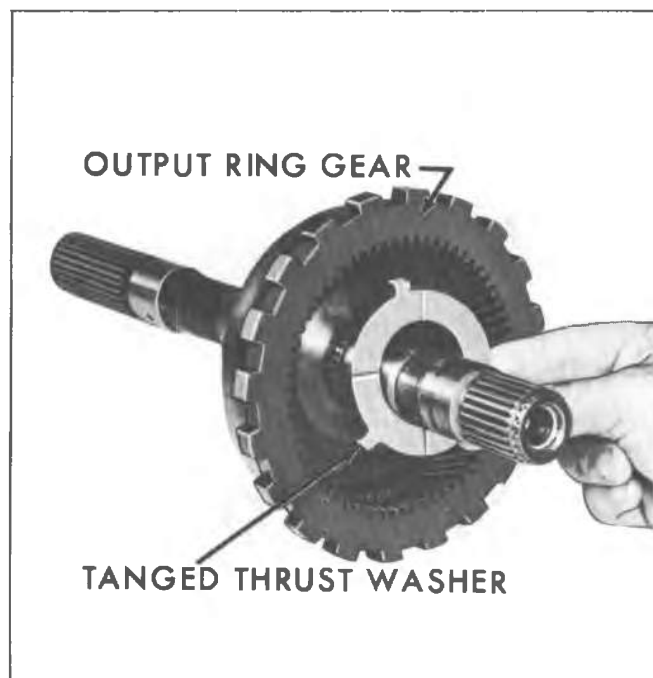


Fig. 7A-46B--Removing Output Ring Gear Tanged Thrust Washer



Fig. 7A-47B--Removing Output Ring Gear to Case Needle Bearing Assembly

20. Remove output ring gear to case needle bearing assembly (fig. 7A-47B).

21. Compress low and reverse clutch piston spring retainer using tool J-23327 (fig. 7A-48B) and remove piston retaining ring and spring retainer.

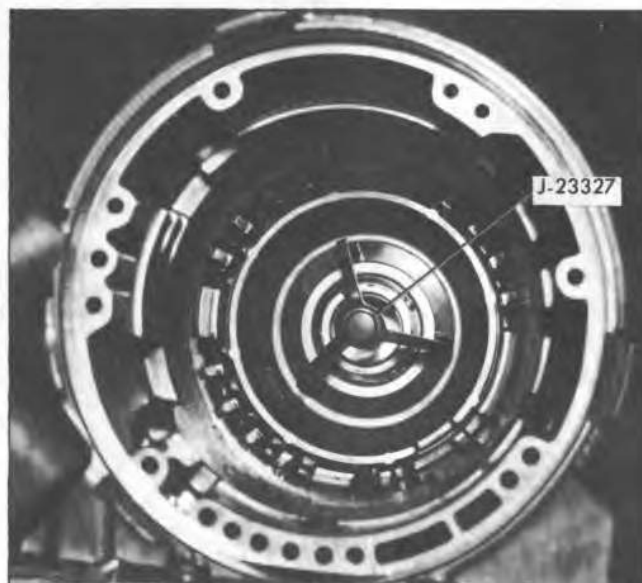


Fig. 7A-48B--Compressing Low and Reverse Clutch Piston Spring Retainer

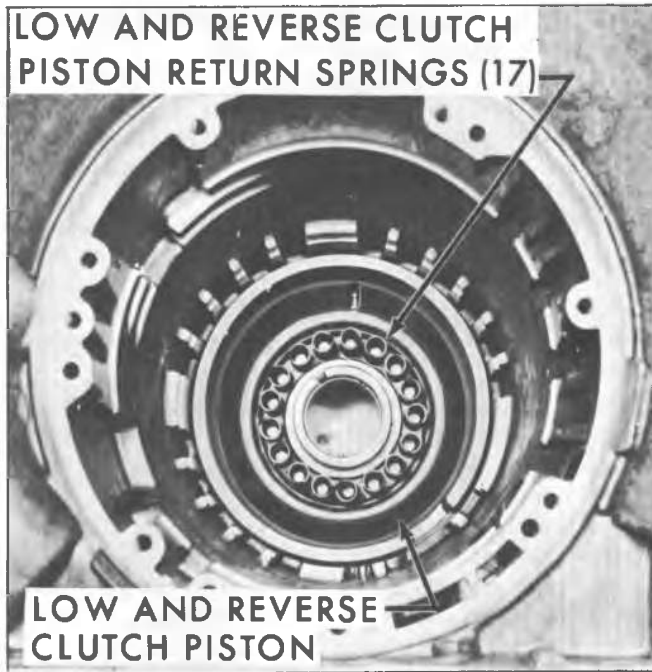


Fig. 7A-49B--Low and Reverse Clutch Piston Springs and Piston

22. Remove seventeen (17) piston springs from piston (fig. 7A-49B).

23. Remove low and reverse clutch piston assembly by applying compressed air in passage shown on Figure 7A-50B.

24. Remove low and reverse clutch piston outer seal (fig. 7A-51B).

25. Remove low and reverse clutch piston center and inner seal (fig. 7A-52B).

26. Install tool J-23069 to compress intermediate clutch accumulator piston cover and remove retaining ring (fig. 7A-53B).



Fig. 7A-50B--Removing Low and Reverse Clutch Piston

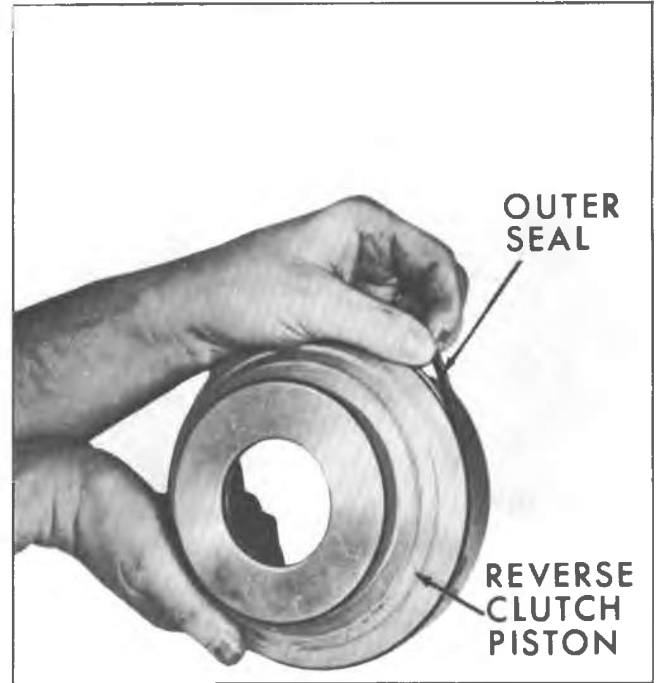


Fig. 7A-51B--Removing Low and Reverse Clutch Piston Outer Seal

27. Remove intermediate clutch accumulator piston cover and remove "O" ring seal from case.

28. Remove intermediate clutch accumulator piston spring.

29. Remove intermediate clutch accumulator piston assembly (fig. 7A-54B).

30. Also, remove inner and outer hook type oil seal rings if required.



Fig. 7A-52B--Removing Low and Reverse Clutch Piston Center and Inner Seal

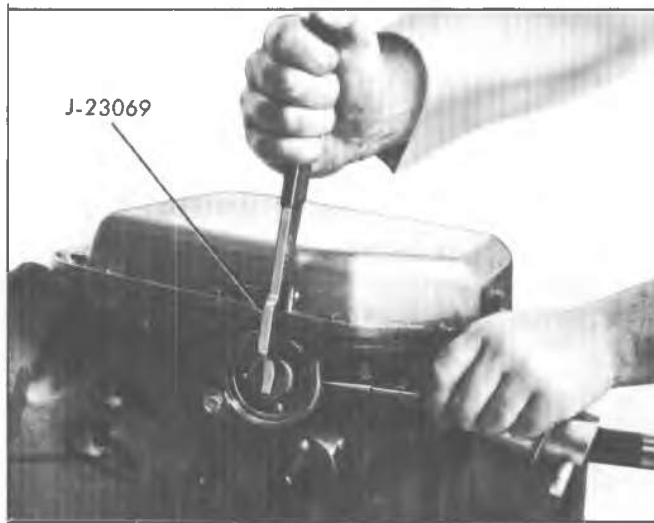


Fig. 7A-53B--Removing Accumulator Piston Cover Retaining Ring

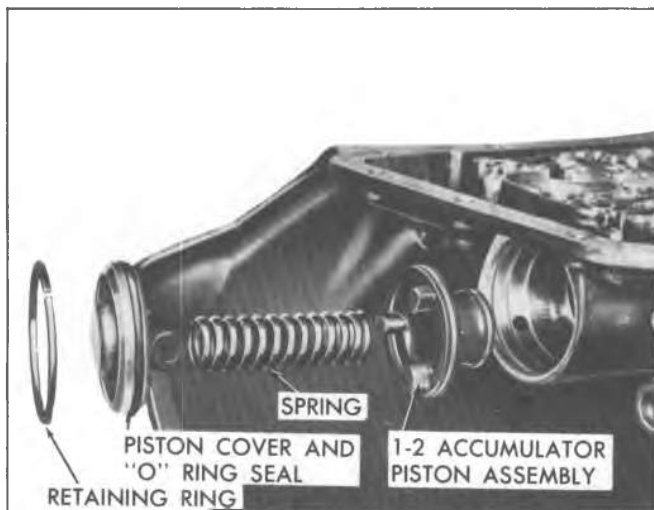


Fig. 7A-54B--Intermediate Clutch Accumulator Components



Fig. 7A-55B--Removing Direct Clutch Accumulator Piston Retaining "E" Ring

VALVE BODY DISASSEMBLY, INSPECTION, AND REASSEMBLY (FIG. 7A-56B)

Disassembly

1. Position valve body assembly with cored face up and direct clutch accumulator piston pocket positioned as shown in Figure 7A-56B.

2. Remove manual valve from lower left hand bore.

3. From lower right hand bore remove the pressure regulator valve train retaining pin, boost valve sleeve, intermediate boost valve, reverse and modulator boost valve, pressure regulator valve spring, and the pressure regulator valve.

4. From the next bore, remove the 2-3 shift valve train retaining pin, sleeve, control valve spring, 2-3 shift control valve, shift valve spring, and the 2-3 shift valve.

5. From the next bore, remove the 1-2 shift valve train retaining pin, sleeve, shift control valve spring, 1-2 shift control valve, and the 1-2 shift valve.

6. From the next bore, remove retaining pin, plug, manual low control valve spring, and the manual low control valve.

7. From the next bore, remove the retaining pin, spring, seat, and the detent regulator valve.

8. Install Tools J-22269 and J-24675 on direct clutch accumulator piston and compress piston only enough to remove retaining "E" ring (fig. 7A-55B).

CAUTION: *Piston may be damaged if piston is over compressed.*

9. Remove direct clutch accumulator piston, and metal oil seal ring, and spring.

10. From the next bore down from the direct clutch accumulator, remove the detent actuating lever bracket bolt, bracket, actuating lever and retaining pin, stop, spring retainer, seat, outer spring, inner spring, washer and detent valve.

Inspection

1. Inspect all valves for scoring, cracks and free movement in their respective bores.

2. Inspect valve body for cracks, scored bores, interconnected oil passages and flatness of mounting face.

3. Check all springs for distortion or collapsed coils.

Reassembly

1. Install direct clutch accumulator piston spring and piston into valve body.

2. Install special tool J-22269 and J-24675 and compress spring and piston only enough to install retaining ring.

NOTE: Align piston and oil seal ring when entering bore.

3. Install the detent valve, washer, outer spring, inner spring, spring seat, and spring retainer. Install detent valve stop and detent valve actuating bracket. Torque bolt to 52 in. lbs. Assemble detent actuating lever with retaining pin.

4. Install the pressure regulator valve, spring, reverse and modulator boost valve, intermediate boost valve, boost valve sleeve and retaining pin.

5. In the next bore up, install 2-3 shift valve, shift valve

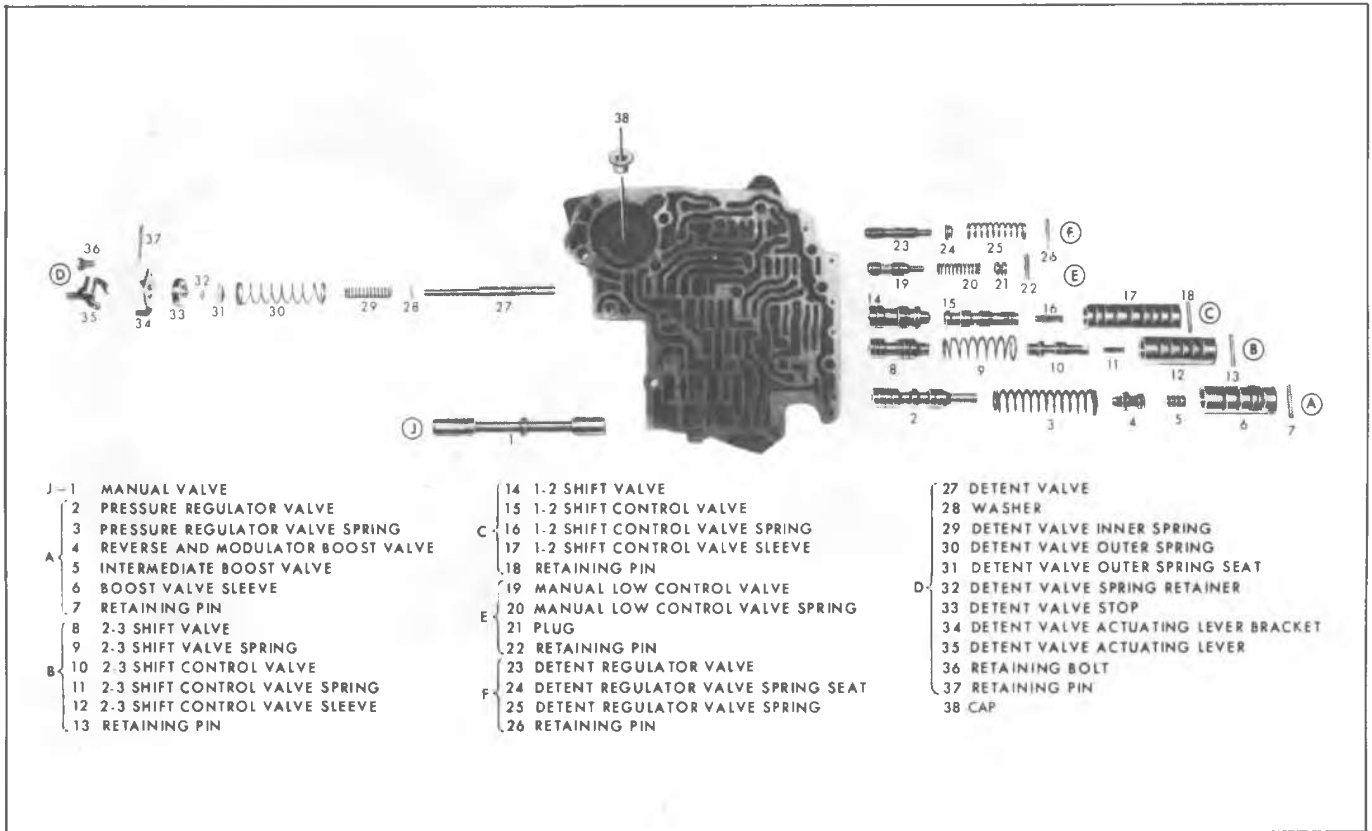


Fig. 7A-56B--Valve Body - Exploded View

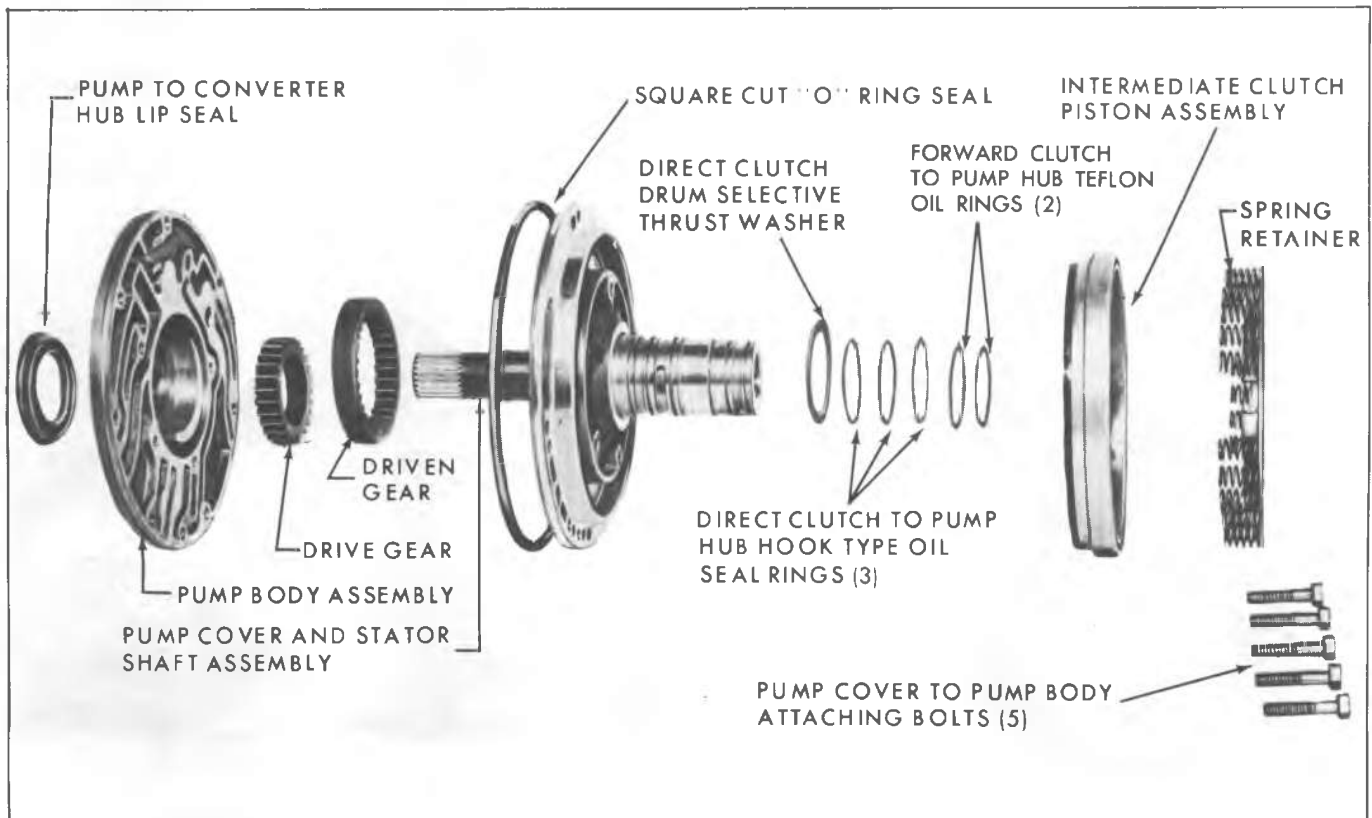


Fig. 7A-57B--Pump Assembly - Exploded View

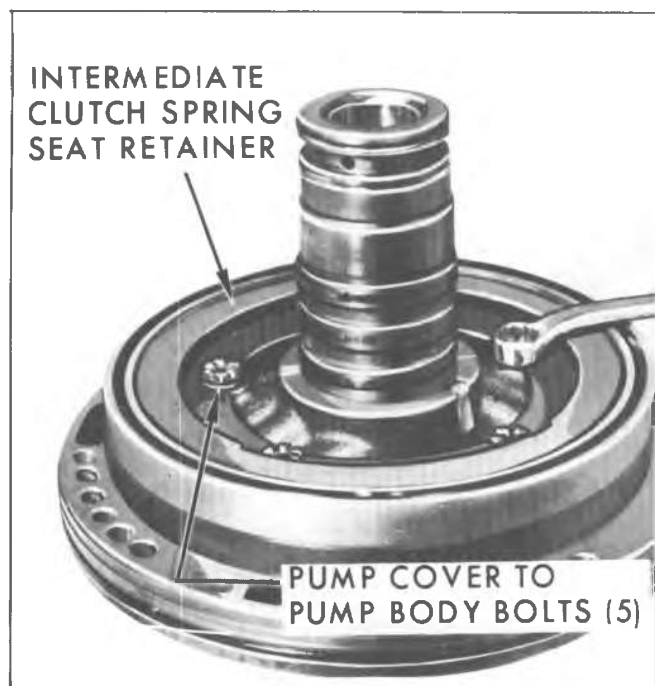


Fig. 7A-58B--Removing Pump Cover to Pump Body Bolts

spring, 2-3 shift control valve, shift control valve spring, shift control valve sleeve and retaining pin.

6. In the next bore up, install the 1-2 shift valve, 1-2 shift control valve, control valve spring, control valve sleeve and retaining pin.

7. In the next bore up, install the manual low control valve, spring, plug and retaining pin.

8. In the top right hand bore, install the detent regulator valve, spring seat, spring and retaining pin.

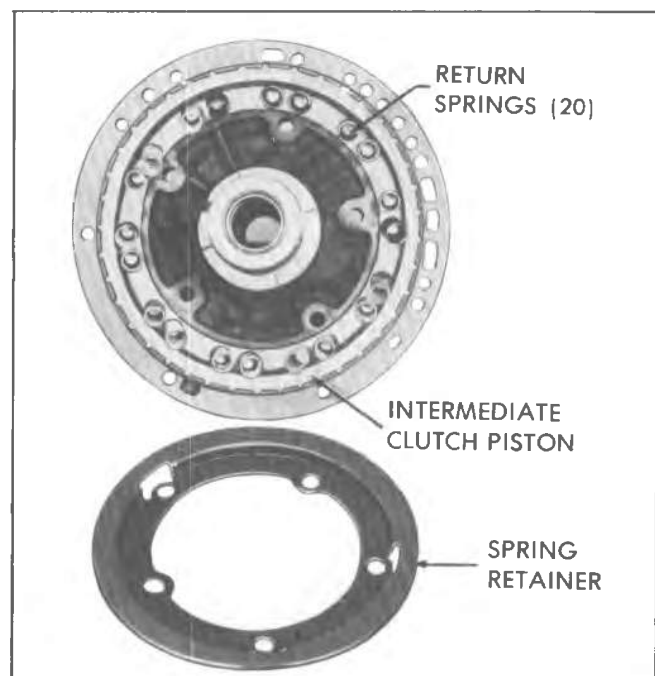


Fig. 7A-59B--Intermediate Clutch Spring Retainer, Return Springs and Piston

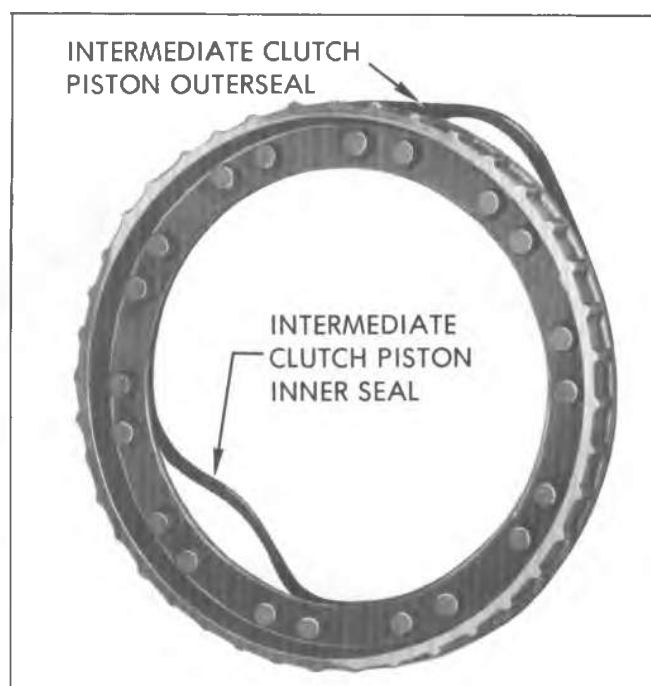


Fig. 7A-60B--Removing Intermediate Clutch Piston Inner and Outer Seal

OIL PUMP (FIG. 7A-57B)

Disassembly

1. Place pump cover and stator shaft assembly through hole in bench.

2. Remove pump cover to body attaching bolts 5/16 x 18-1 1/2 (fig. 7A-58B).

3. Remove intermediate clutch spring retainer, twenty (20) intermediate clutch return springs and the intermediate clutch piston assembly (fig. 7A-59B).

4. Remove intermediate clutch piston inner and outer seals (fig. 7A-60B).

5. Remove two (2) forward clutch housing to pump hub hook type oil seal rings and three (3) direct clutch drum to pump hub hook type oil rings (fig. 7A-61B).



Fig. 7A-61B--Pump Hub Oil Seal Rings

NOTE: Forward clutch oil seal rings are teflon on JA and JH models.

6. Remove pump cover to direct clutch drum housing selective thrust washer (fig. 7A-61B).

NOTE: A needle bearing is used on C series Truck instead of a thrust washer.

7. Remove pump cover and stator shaft assembly from pump body (fig. 7A-62B).

8. Remove pump drive gear and driven gear.

9. Remove pump outside diameter to case (square cut) "O" ring seal. Discard seal.

Inspection

1. Wash all parts in cleaning solvent and blow out all oil passages. **DO NOT USE RAGS TO DRY PARTS.**

CAUTION: Some solvents may be harmful to rubber seals.

2. Inspect pump gears for nicks or damage.

3. Inspect body and cover faces for nicks or scoring. Inspect cover hub O.D. for nicks or burrs which might damage clutch drum bushing journal.

4. Inspect body bushing for galling or scoring. Check clearance between body bushing and converter pump hub. Maximum clearance is .005". If the bushing is damaged, the oil pump body should be replaced.

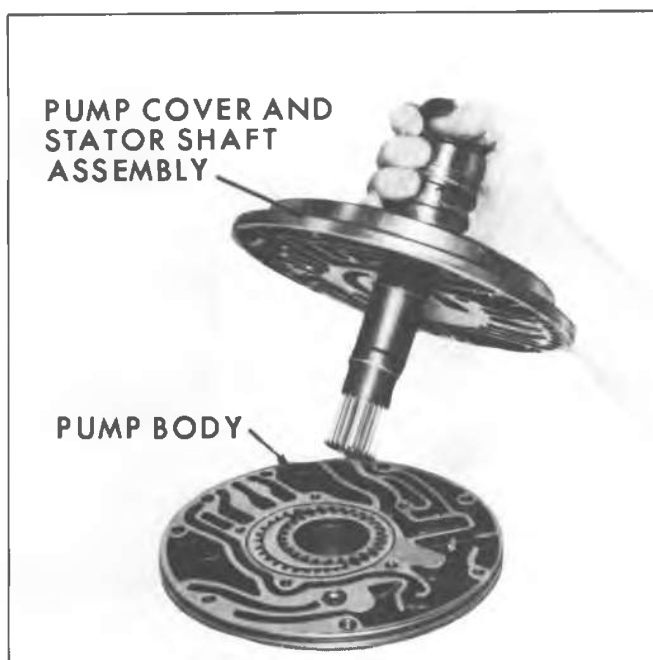


Fig. 7A-62B--Separating Pump Cover From Pump Body



Fig. 7A-63B--Checking Pump Body to Gear Face Clearance

5. Inspect converter housing hub O.D. for nicks or burrs which might damage pump seal or bushing. Repair or replace as necessary.

6. If hub lip seal is damaged or is leaking (and the pump body is otherwise suitable for reuse), replace seal.

7. With parts clean and dry, install pump gears in pump body and check pump body face to gear face clearance. Clearance should be .0005"-.0015" (fig. 7A-63B).

Reassembly

1. Replace hub lip seal if defective (figs. 7A-64B and 7A-65B).

2. Place pump body on wood blocks and pry out defective seal. Coat outer diameter of new seal with a non-hardening sealer and install seal using seal installer J-21359 to seat seal fully in counterbore.

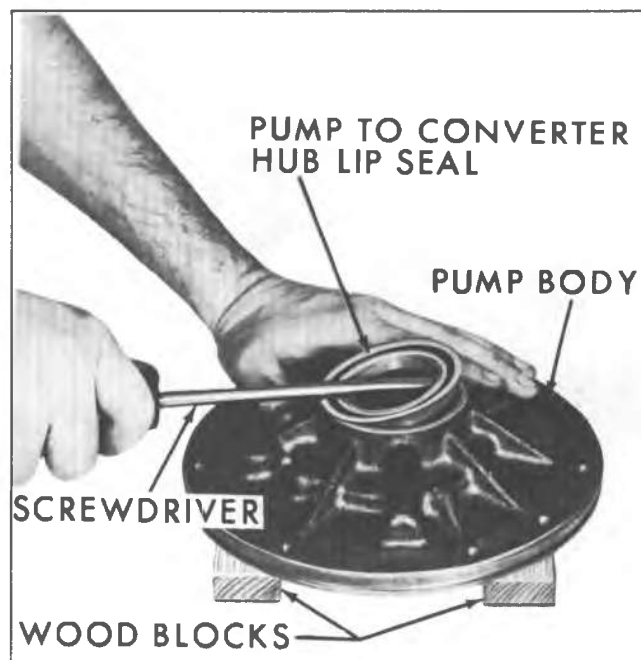


Fig. 7A-64B--Removing Pump to Converter Hub Lip Seal

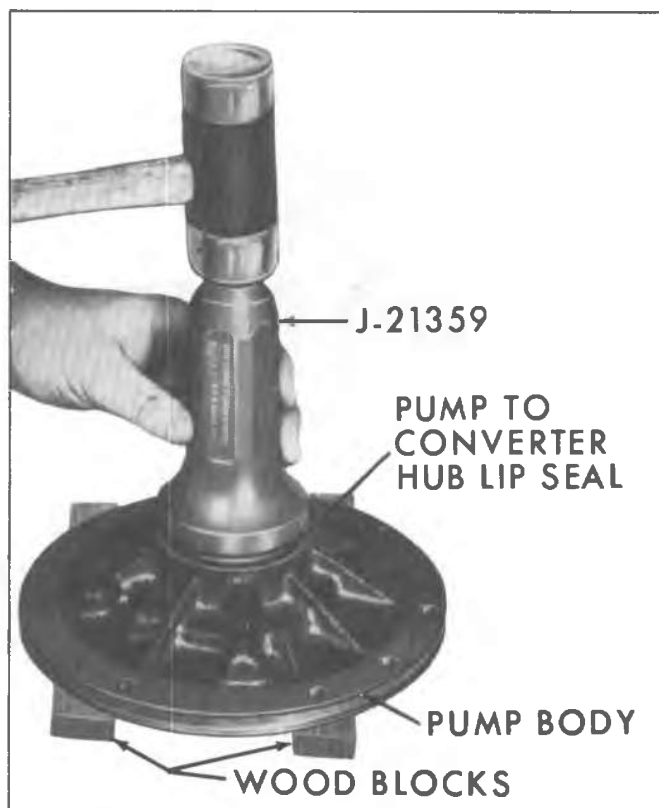


Fig. 7A-65B--Installing Hub Lip Seal

3. Install pump drive gear and driven gear (fig. 7A-66B).
4. Install direct clutch drum housing to pump cover selective thrust washer over pump cover delivery sleeve.
5. Install three (3) direct clutch to pump hub hook type oil seal rings. Install two (2) forward clutch to pump hub hook type oil seal rings.



Fig. 7A-66B--Installing Pump Drive and Driven Gears

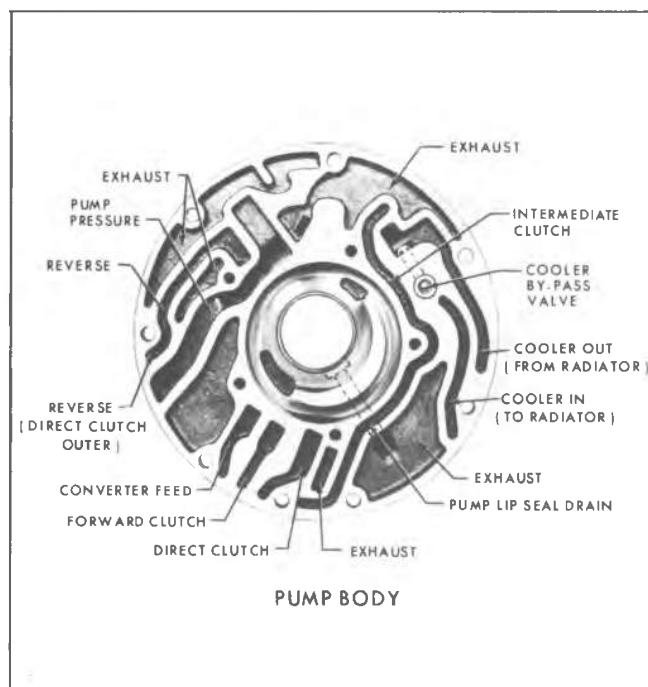


Fig. 7A-67B--Pump Body Oil Passages

CAUTION: Check pump cover and body oil passages to make sure they are not restricted (figs. 7A-67B and 7A-68B).

6. Install intermediate clutch piston inner seal and outer seal on piston.
7. Install pump outside diameter to case (square cut) "O" ring seal.
8. Install intermediate clutch piston assembly into pump cover being careful not to damage seals.
9. Install spring retainer with attached clutch return springs, align pump body to cover, and install five (5) attaching bolt. Tighten bolts to 18 pound-feet.
10. Align pump body to cover and start bolts.

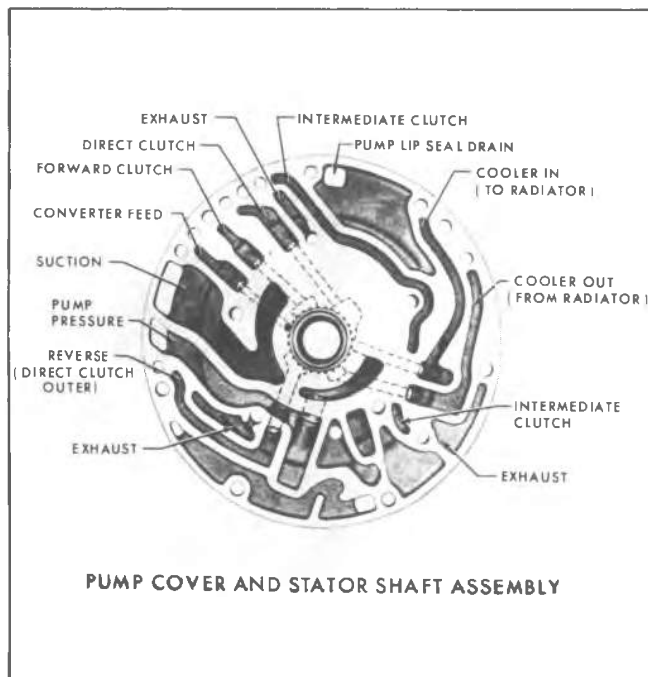


Fig. 7A-68B--Pump Cover Oil Passages

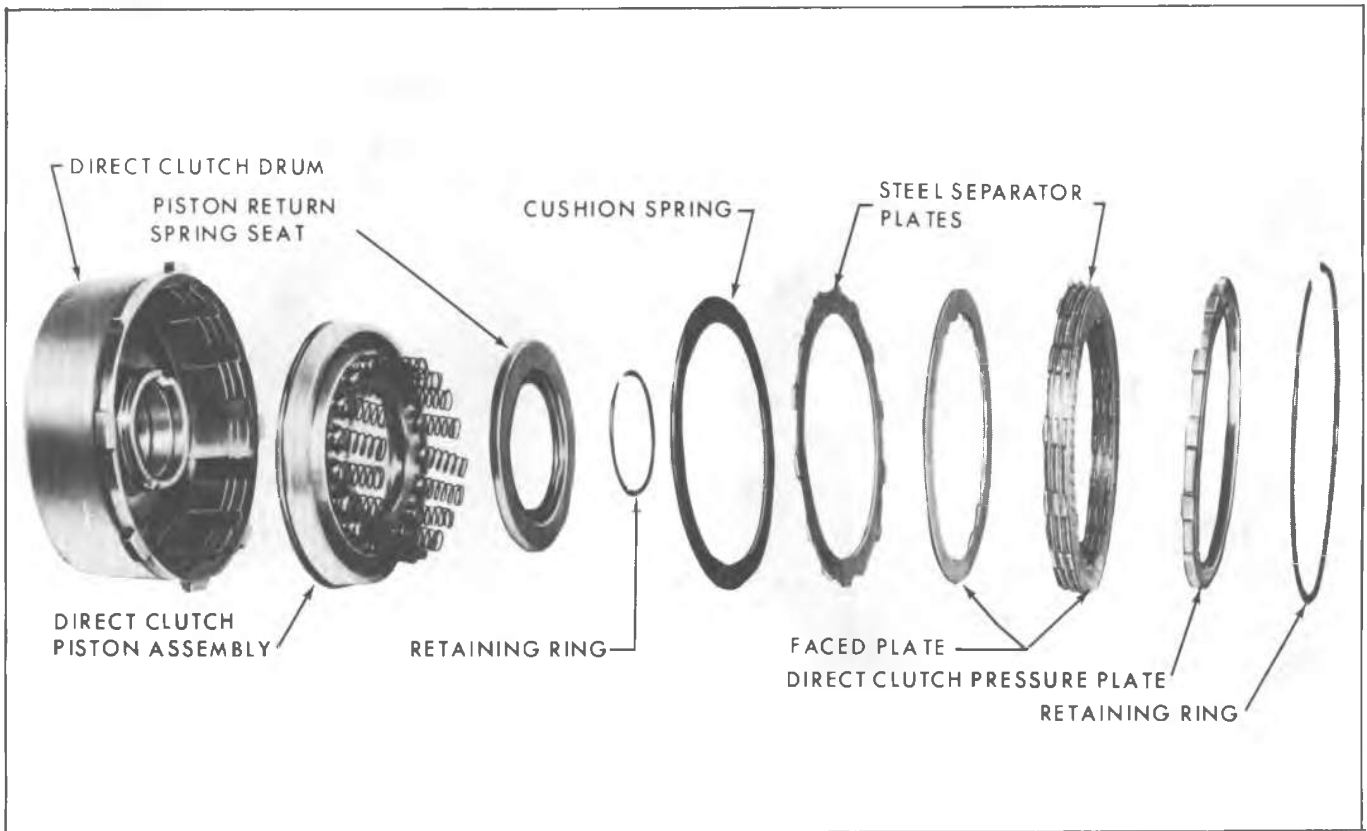


Fig. 7A-69B--Direct Clutch Assembly - Exploded View

DIRECT CLUTCH AND INTERMEDIATE OVERRUN ROLLER CLUTCH (FIG. 7A-69B)

Disassembly

1. Remove intermediate overrun clutch drum front retaining ring and retainer (fig. 7A-70B).
2. Remove intermediate clutch overrun outer race (fig. 7A-70B).

3. Remove intermediate overrun roller clutch assembly (fig. 7A-71B).

NOTE: Intermediate overrun roller clutch inner race is a press fit. Do not remove unless replacement is necessary.

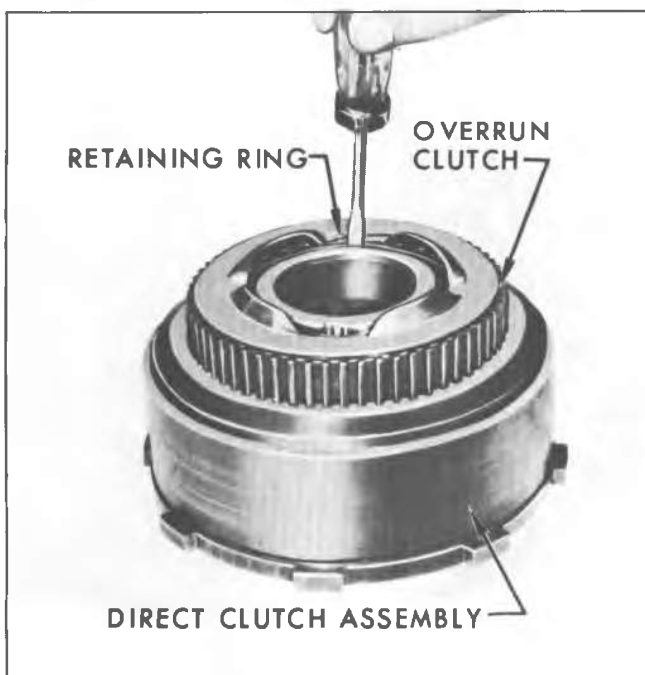


Fig. 7A-70B--Removing Overrun Clutch Retaining Ring and Retainer

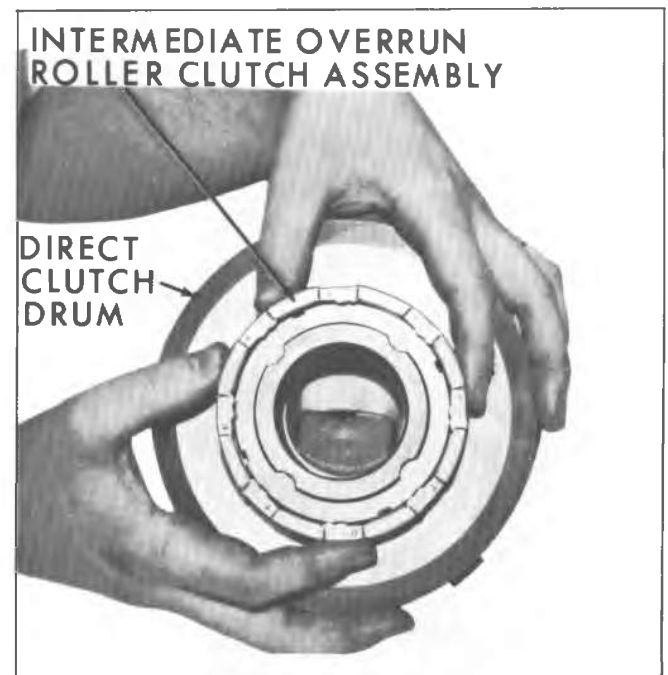


Fig. 7A-71B--Removing Intermediate Overrun Roller Clutch

**DIRECT CLUTCH DRUM TO
FORWARD CLUTCH HOUSING
NEEDLE ROLLER BEARING**

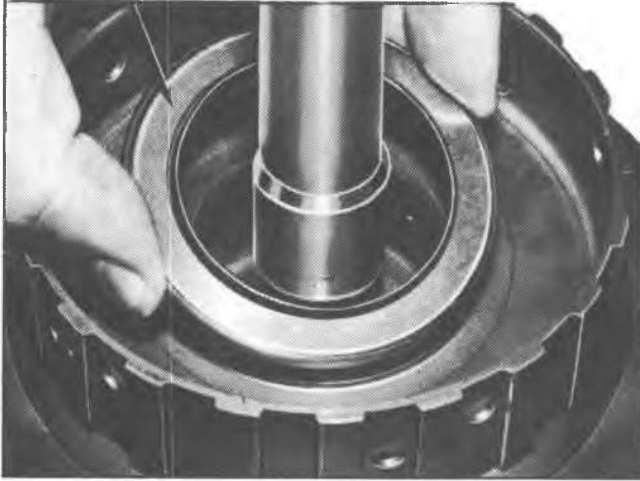


Fig. 7A-72B--Direct Clutch Drum to Forward Clutch Housing Needle Roller Bearing

4. Remove direct clutch drum to forward clutch housing needle roller bearing (fig. 7A-72B).

5. Remove direct clutch pressure plate to clutch drum retaining ring and pressure plate (fig. 7A-73B).

6. Remove drive plates and steel driven plates (fig. 7A-74B).

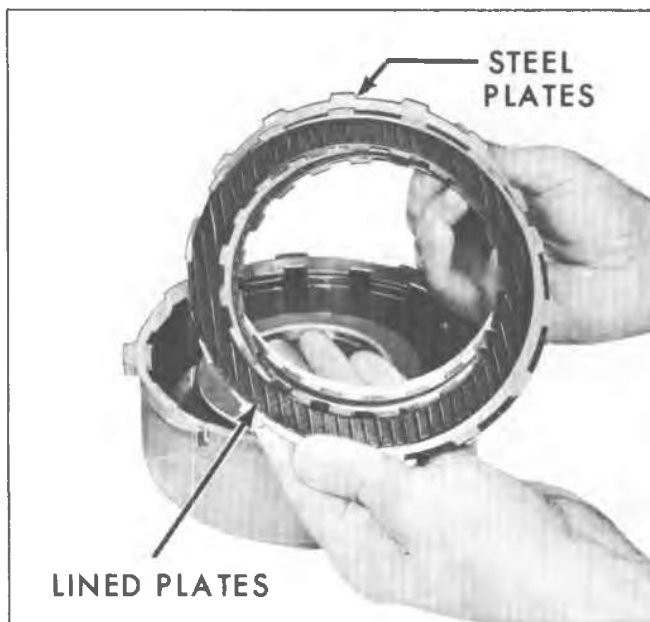


Fig. 7A-74B--Removing Face Plates and Steel Separator Plates



Fig. 7A-73B--Removing Direct Clutch Pressure Plate

7. Using compressor tool J-23327, remove direct clutch piston return spring seat retaining ring, spring seat and seventeen (17) clutch return coil springs (fig. 7A-75B).

NOTE: On JA and JH models, return coil springs are attached to retaining ring.



Fig. 7A-75B--Compressing Direct Clutch Spring Seat



Fig. 7A-76B--Removing Direct Clutch Outer and Inner Seals

8. Remove direct clutch piston.
9. Remove direct clutch piston outer seal and inner seal (fig. 7A-76B).
10. Remove direct clutch piston center seal from drum (fig. 7A-77B).

Inspection

1. Inspect drive and driven clutch plates for signs of burning, scoring or wear.
2. Inspect seventeen (17) springs for collapsed coils or signs of distortion.



Fig. 7A-77B--Removing Direct Clutch Piston Center Seal



Fig. 7A-78B--Installing Direct Clutch Piston

3. Inspect piston for cracks.
4. Inspect clutch housing for wear, scoring, open oil passages and free operation of ball check.
5. Inspect roller clutch inner and outer race for scratches or indentations.
6. Inspect roller cage for wear and roller springs for distortion.

Reassembly

1. Install new direct clutch piston outer seal and inner seals.
2. Install new direct clutch piston center seal on drum with lip facing upward.
3. Install direct clutch piston into housing with aid of a feeler gauge or a piece of .020" piano wire crimped into copper tubing (fig. 7A-78B).
4. Install seventeen (17) clutch return coil springs.
5. Install piston return spring seat. Compress spring seat with tool J-23327 and install retaining ring (fig. 7A-79B).
6. Lubricate with transmission fluid and install face plates and steel separator plates, alternating steel and faced plates.
7. Install direct clutch pressure plate and retaining ring.
8. Install intermediate overrun roller clutch assembly with four (4) holes toward front of transmission.

CAUTION: If roller falls out during assembly operation, reinstall roller from inside to outside cage direction to avoid bending spring.

9. Install intermediate clutch overrun outer race.

NOTE: When outer race is installed, it should free wheel in counterclockwise direction only.

10. Install intermediate overrun clutch retainer and retainer ring as shown on Figure 7A-70B.



Fig. 7A-79B--Installing Direct Clutch Springs, Spring Seat and Retaining Ring

CLUTCH ASSEMBLIES FOR THM 350

CLUTCH	DRIVE PLATE	DRIVEN PLATES	CUSHION SPRING
FORWARD			
250 L-6, 262-305 V-8	4	4	1
350 V-8, 400 V-8			
TAXI AND TRUCK	5	5	1
INTERMEDIATE			
250 L-6, 262 V-8	2	2	1
305-350 V-8, 400 V-8			
TAXI AND TRUCK	3	3	1
DIRECT			
250 L-6, 262 V-8	3	3	NONE
305-350 V-8, 400 V-8			
TAXI AND TRUCK	4	4	NONE
REVERSE			
250 L-6, 262-305 V-8	4	4	NONE
350 V-8, 400 V-8			
TAXI AND TRUCK	5	5	NONE

Fig. 7A-80B--Automatic Clutch Chart

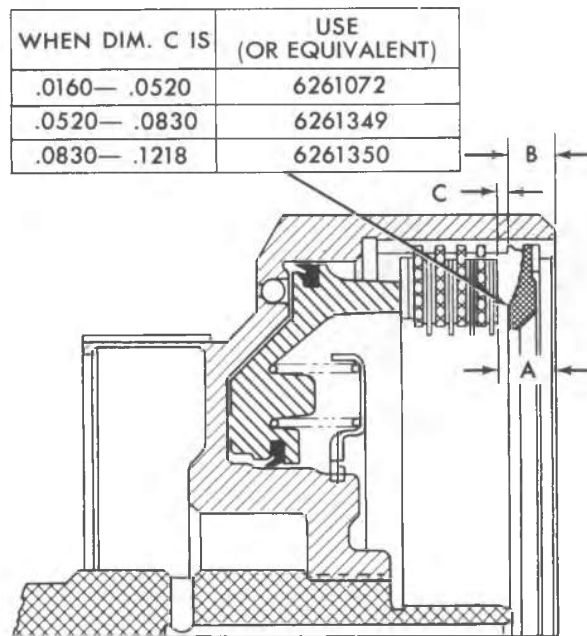


Fig. 7A-81B--Forward Clutch Assembly - Exploded View

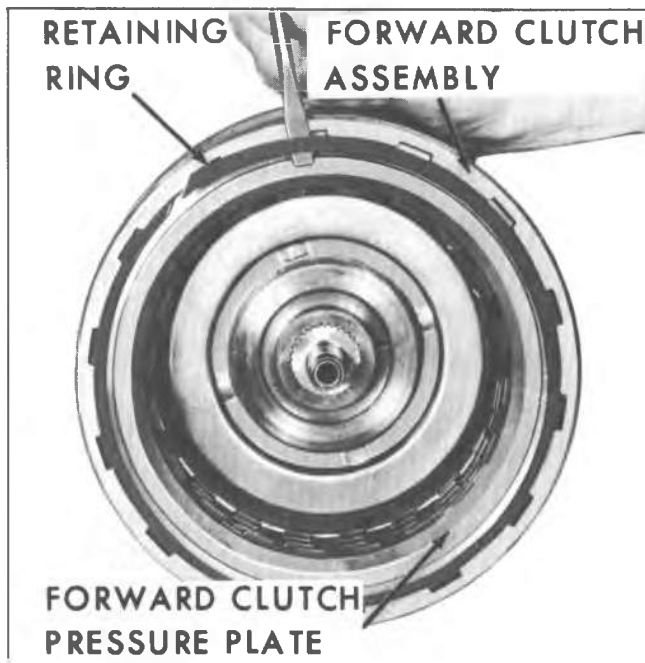


Fig. 7A-82B--Removing Forward Clutch Retaining Ring and Pressure Plate

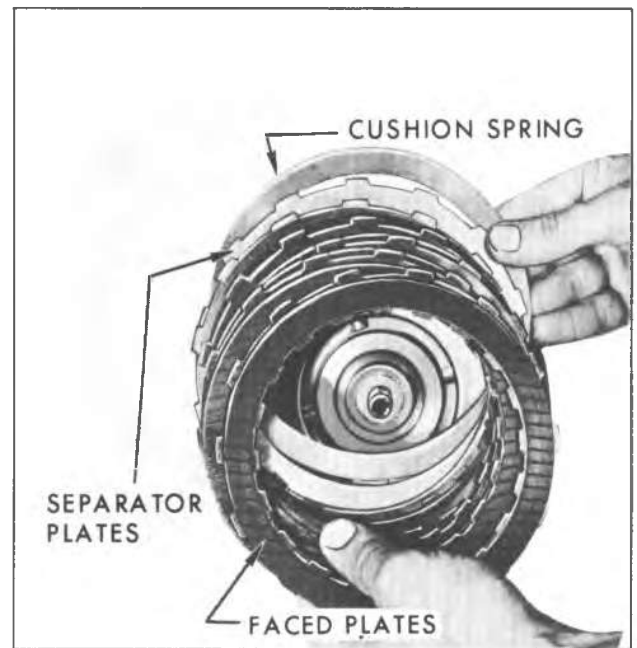


Fig. 7A-83B--Removing Forward Clutch, Clutch Pack

FORWARD CLUTCH (FIG. 7A-81B)

Disassembly

1. Remove forward clutch retaining ring and pressure plate (fig. 7A-82B).
2. Remove face plates, steel separator plates and cushion spring (fig. 7A-83B).
3. Using tool J-23327, compress piston return seat and remove retaining ring (fig. 7A-84B).

4. Remove piston return seat and twenty-one (21) clutch return springs.

NOTE: On JA and JH models, return springs are attached to return seat.

5. Remove forward clutch piston assembly.
6. Remove the forward clutch inner and outer piston seals (fig. 7A-85B).

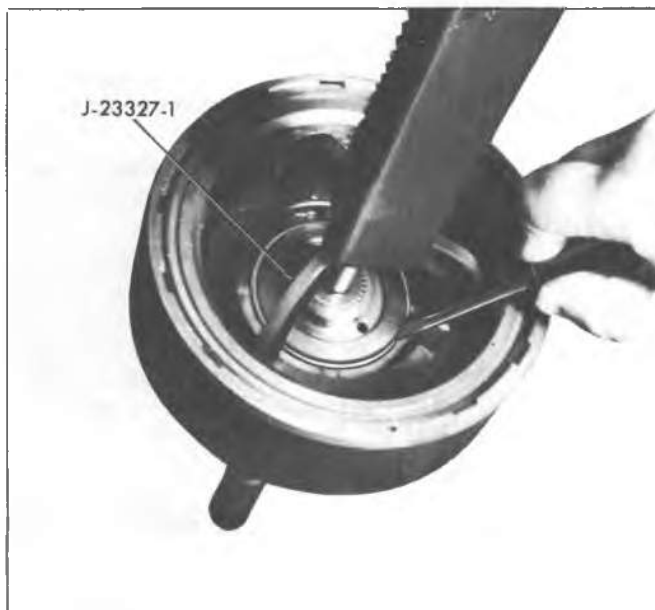


Fig. 7A-84B--Compressing Forward Clutch Piston Return Seat

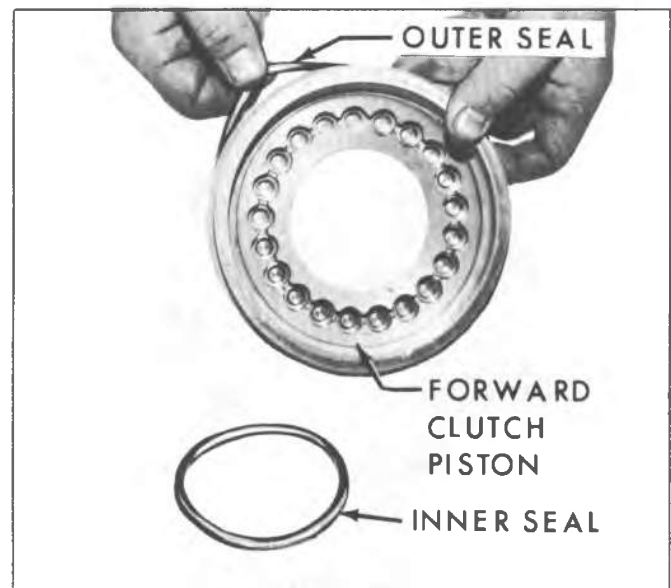


Fig. 7A-85B--Removing Forward Clutch Piston Inner and Outer Seals

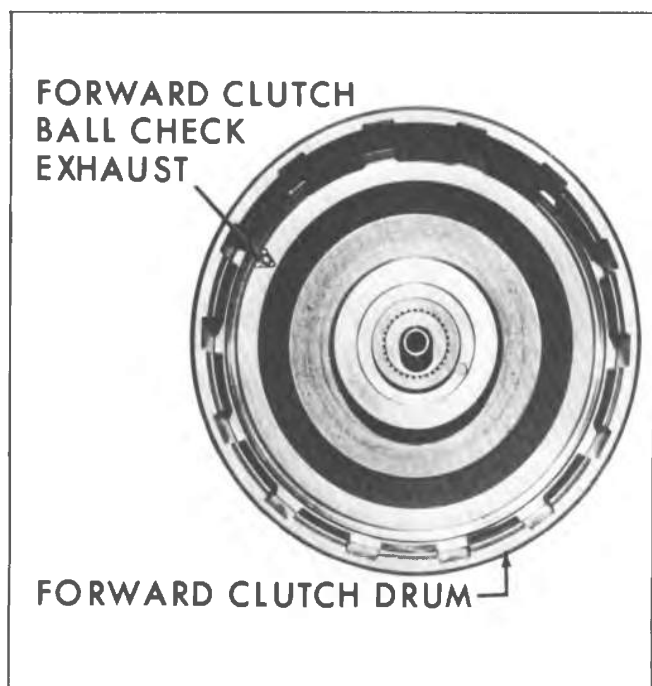


Fig. 7A-86B--Forward Clutch Exhaust Check Ball

Inspection

1. Inspect drive and driven clutch plates for signs of burning, scoring or wear.
2. Inspect twenty one (21) springs for collapsed coils or signs of distortion.
3. Inspect piston for cracks.
4. Inspect clutch housing for wear, scoring, open oil passages and free operation of exhaust check ball (fig. 7A-86B).

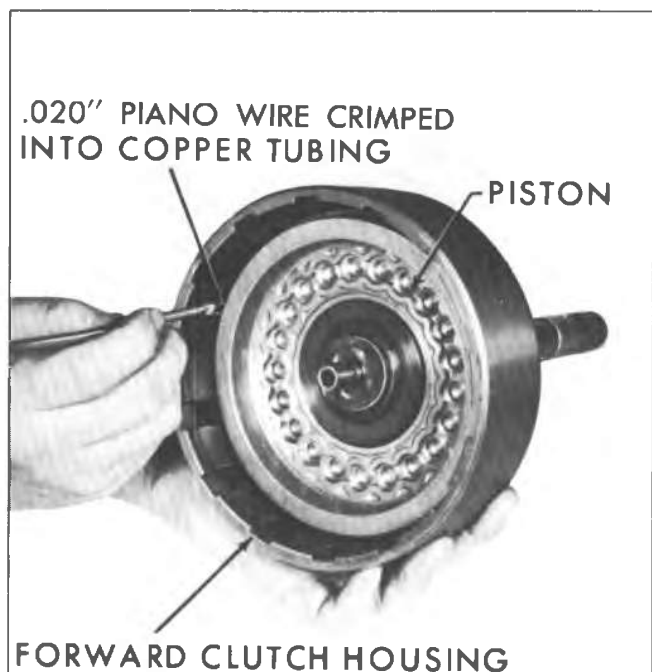


Fig. 7A-87B--Installing Forward Clutch Piston

WHEN DIM. C IS	USE (OR EQUIVALENT)
.0160— .0520	6261072
.0520— .0830	6261349
.0830— .1218	6261350

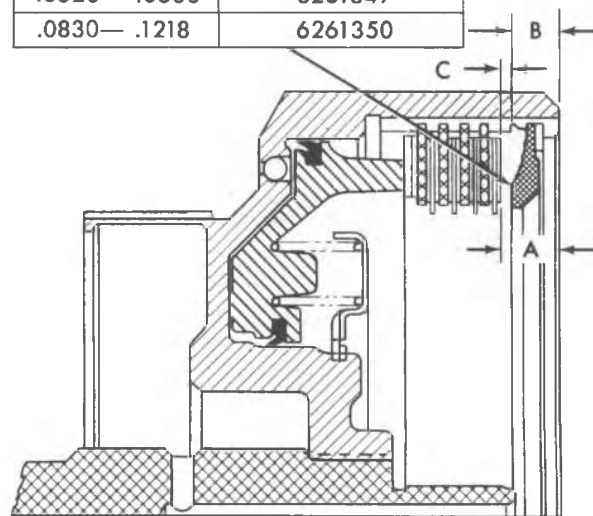


Fig. 7A-88B--Determining Selective Fit for Forward Clutch Pressure Plate

5. Inspect input shaft.

- a. Inspect for open lubrication passages at each end.
- b. Inspect splines for damage.
- c. Inspect ground bushing journals for damage.
- d. Inspect shaft for cracks or distortion.

NOTE: Input shaft and clutch housing are serviced separately.

Reassembly

1. Install new forward clutch inner piston seal and outer piston seal.
2. Install the forward clutch pistons assembly with the aid of a feeler gauge or a piece of .020" piano wire crimped into copper tubing (fig. 7A-87B).
3. Install twenty-one (21) clutch return coil springs.
4. Install spring retainer. Compress spring retainer and install retaining ring using tool J-23327-1 as shown on Figure 7A-84B.
5. Lubricate with transmission fluid and install cushion spring face plates and steel separator plates, starting with the cushion spring and alternating steel and faced.
6. Install forward clutch pressure plate (selective fit) and retaining ring. Using chart on Figure 7A-88B to select correct pressure plate (dimension C), measure distance from the top of clutch pack to the top of clutch drum (dimension A). Measure distance from the lower edge of the notch on the inner surface of the drum to the end of the drum (dimension B). Subtract B from A to get dimension C.

SUN GEAR AND SUN GEAR DRIVE SHELL (FIG. 7A-89B)

Disassembly

1. Remove sun gear to sun gear drive shell rear retaining ring (fig. 7A-90B).

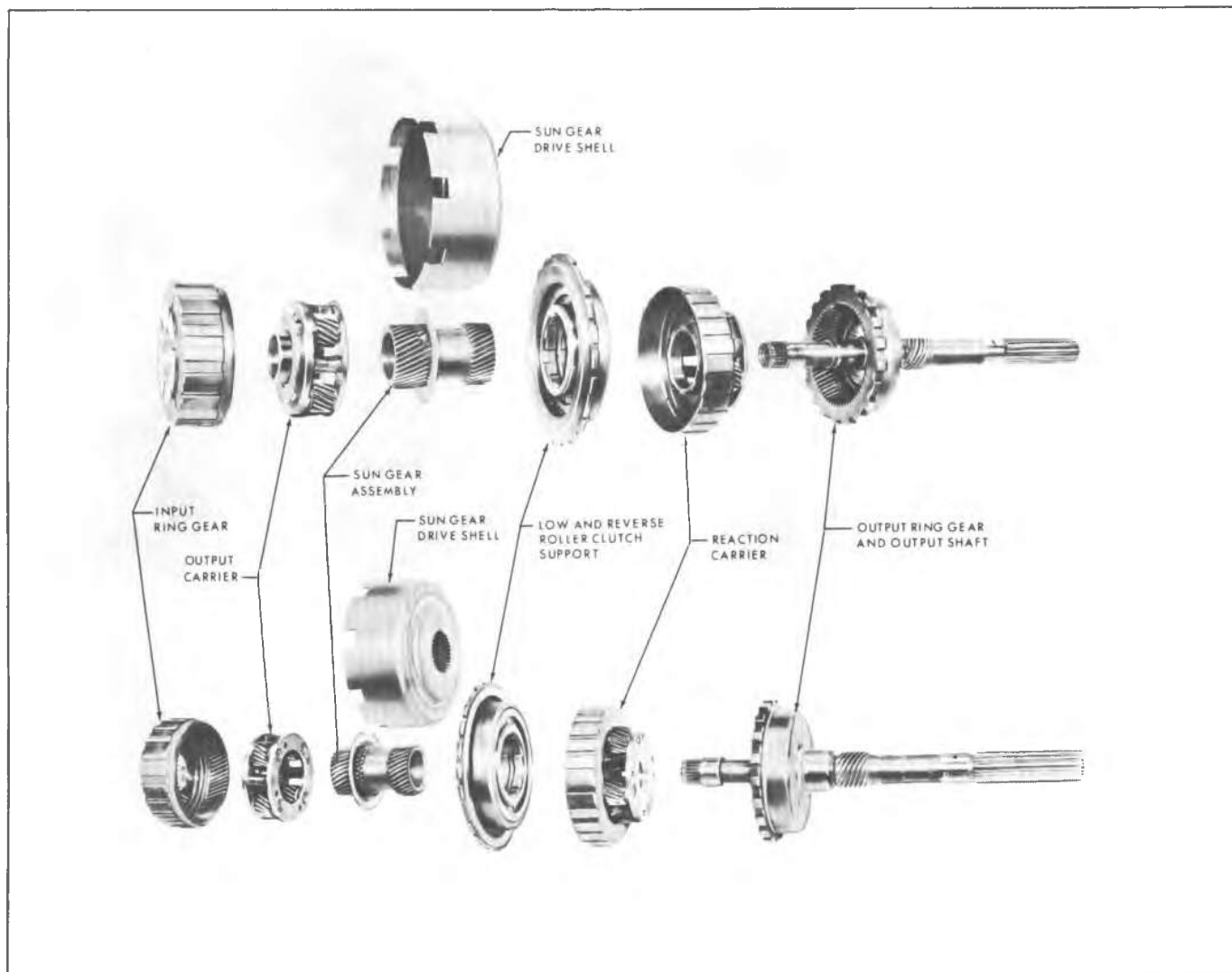


Fig. 7A-89B-Planetary Gear Train - Exploded View



Fig. 7A-90B-Removing Sun Gear Drive Shell Rear Retaining Ring

2. Remove sun gear to drive shell flat rear steel thrust washer (fig. 7A-91B).

3. Remove sun gear assembly from drive shell.

4. Remove sun gear to drive shell front retaining ring (fig. 7A-92B). Discard retaining ring.

5. If bushing is to be replaced, refer to Figure 7A-104B.

Inspection

Check gear and sun gear shell for damage or wear.

Assembly

1. Install new sun gear to drive shell front retaining ring.
2. Install sun gear assembly into drive shell.
3. Install sun gear to drive shell flat steel thrust washer.
4. Install new sun gear to sun gear drive shell retaining ring.

NOTE: Do not stress front and rear retaining rings at installation.

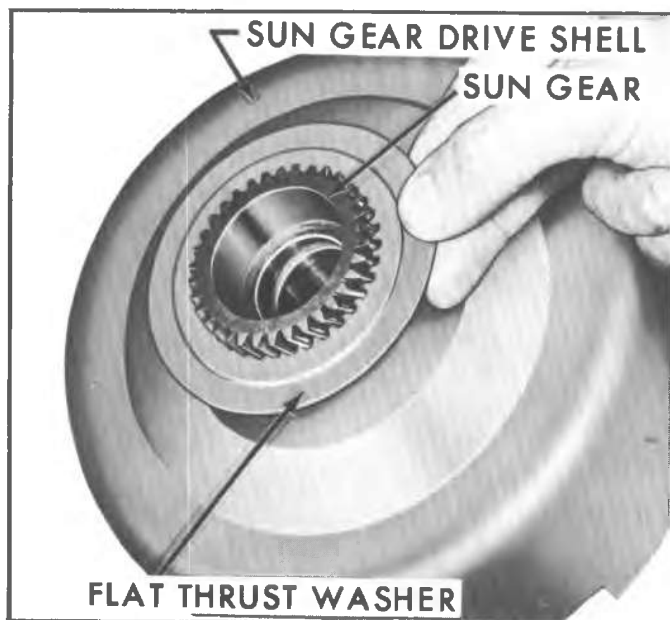


Fig. 7A-91B—Removing Sun Gear to Drive Shell Rear Steel Thrust Washer

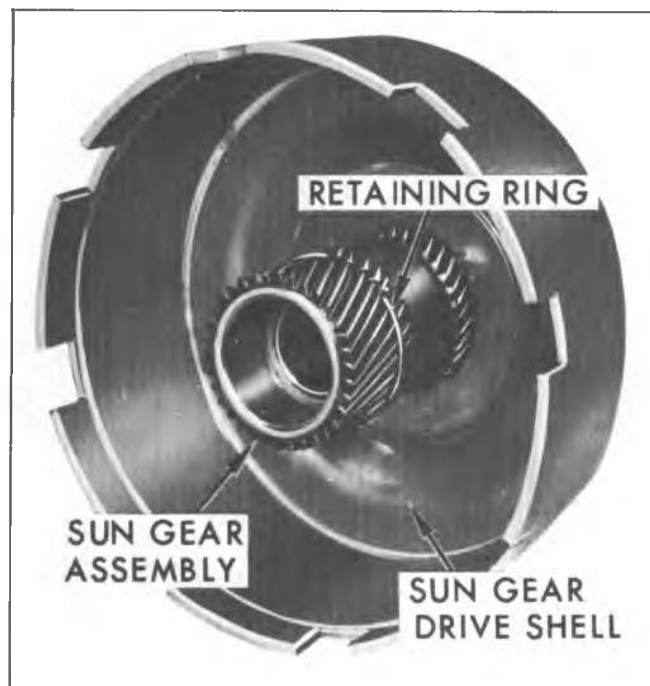


Fig. 7A-92B—Removing Sun Gear to Drive Shell Front Steel Thrust Washer

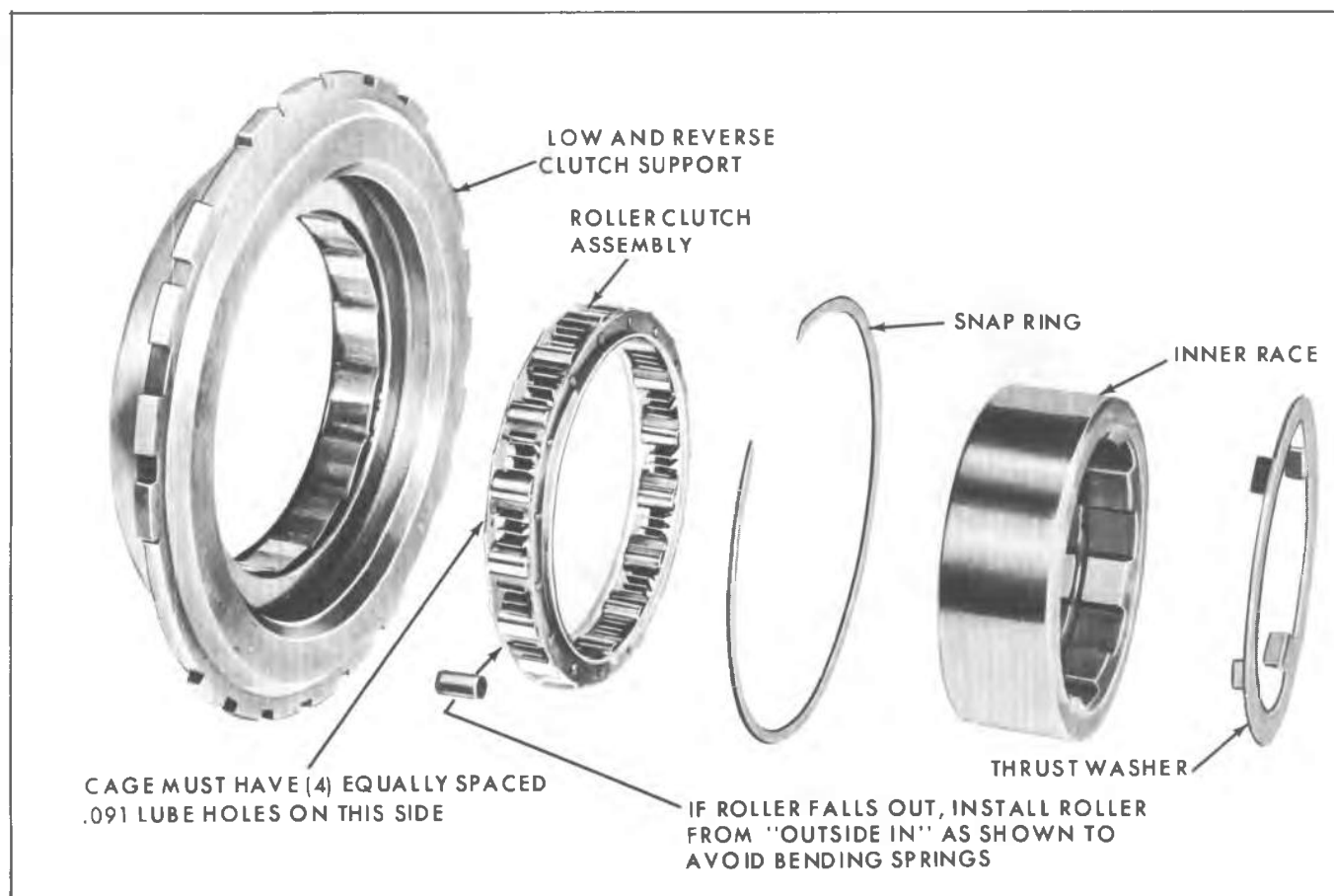


Fig. 7A-93B—Low and Reverse Clutch Assembly - Exploded View



Fig. 7A-94B--Removing Overrun Clutch Inner Race

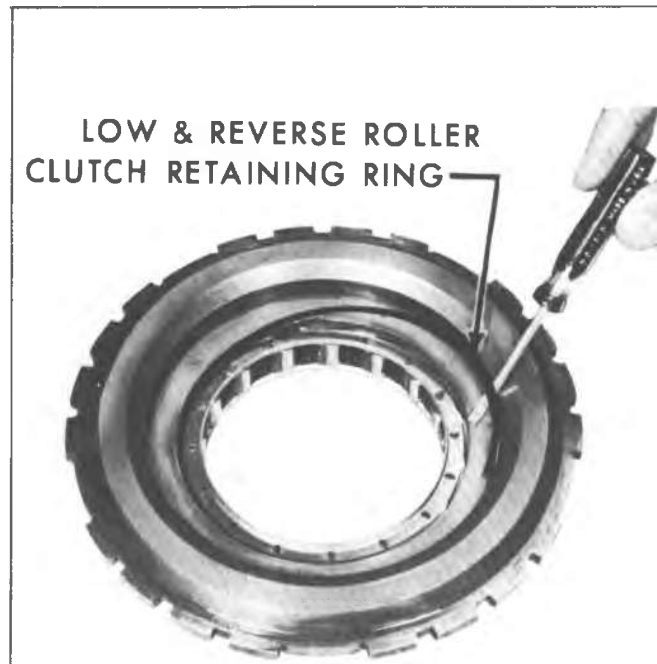


Fig. 7A-95B--Removing Overrun Roller Clutch Retaining Ring

LOW AND REVERSE ROLLER CLUTCH SUPPORT (FIG. 7A-93B)

Disassembly

1. Remove low and reverse clutch to sun gear shell thrust washer.
2. Remove low and reverse overrun clutch inner race from support (fig. 7A-94B).
3. Remove low and reverse clutch roller clutch retaining ring (fig. 7A-95B).
4. Remove low and reverse roller clutch assembly (fig. 7A-96B).

Inspection

1. Inspect roller clutch inner and outer race for scratches and indentations.
2. Inspect rollers for wear and roller springs for distortion.

Assembly

1. Install low and reverse roller clutch assembly to inner race with oil holes toward rear of transmission.
2. Install low and reverse overrun clutch outer race.
3. Install low and reverse clutch to cam retaining ring.

NOTE: Low and reverse overrun clutch inner race should free wheel in the clockwise direction only.

GOVERNOR ASSEMBLY

All components of governor assembly, with exception of driven gear, are a select fit and each assembly is calibrated.

The governor, including the driven gear, is serviced as a complete assembly. The driven gear can be serviced separately.

It is necessary to disassemble governor assembly in order to replace driven gear. Disassembly may also be necessary due to improper operation. In such cases, proceed as follows:



Fig. 7A-96B--Removing Overrun Roller Clutch Assembly

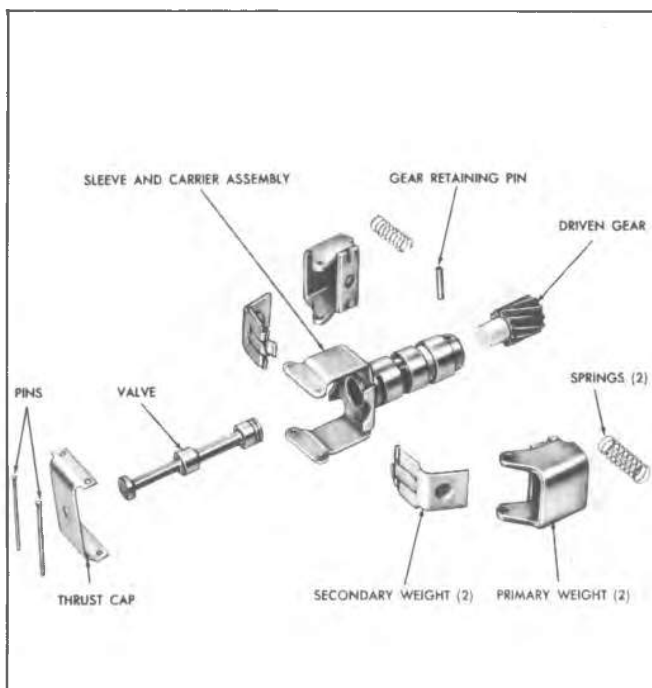


Fig. 7A-97B--Governor Assembly - Exploded View Typical

Disassembly

1. Cut off one end of each governor weight pin and remove pins, governor thrust cap, governor weights, and springs. Governor weights are interchangeable from side to side and need not be identified (fig. 7A-97B).
2. Remove governor valve from governor sleeve. Be careful not to damage valve.
3. Perform following inspections and replace governor driven gear, if necessary.

Inspection

1. Wash all parts in cleaning solvent, air dry and blow out all passages.
2. Inspect governor sleeve for nicks, burrs, scoring or galling.
3. Check governor sleeve for free operation in bore of transmission case.
4. Inspect governor valve for nicks, burrs, scoring or galling.
5. Check governor valve for free operation in bore of governor sleeve.
6. Inspect governor driven gear for nicks, burrs, or damage.
7. Check governor driven gear for looseness on governor sleeve.
8. Inspect governor weight springs for distortion or damage.
9. Check governor weights for free operation in their retainers.
10. Check valve opening at entry and exhaust (.020 inch minimum).

Governor Driven Gear Replacement

To facilitate governor repair in the field, a governor driven gear and replacement pins are available for service use. The service package contains a nylon driven gear, two

governor weight retaining pins and one governor gear retainer split pin. Replacement of gear must be performed with care in the following manner:

1. Drive out governor gear retaining split pin using small punch.
2. Support governor on 3/16 inch plates installed in exhaust slots of governor sleeve, place in arbor press, and with a long punch, press gear out of sleeve.
3. Carefully clean governor sleeve of chips that remain from original gear installation.
4. Support governor on 3/16 inch plates installed in exhaust slots of sleeve, position new gear in sleeve and, with a suitable socket, press gear into sleeve until nearly seated. Carefully remove any chips that may have shaved off gear hub and press gear in until it bottoms on shoulder.
5. A new pin hole must be drilled through sleeve and gear. Locate hole position 90 degrees from existing hole, center punch and then, while supporting governor in press, drill new hole through sleeve and gear using a standard (1/8 inch) drill.
6. Install split retaining pin.
7. Wash governor assembly thoroughly to remove any chips that may have collected.

Assembly

1. Install governor valve in bore of sleeve, large land end first.
2. Install governor weights and springs, and thrust cap on governor sleeve.
3. Align pin holes in thrust cap, governor weight assemblies and governor sleeve, and install new pins. Crimp both ends of pins to prevent them from falling out.
4. Check governor weight assemblies for free operation on pins.
5. Check governor valve for free movement in governor sleeve.

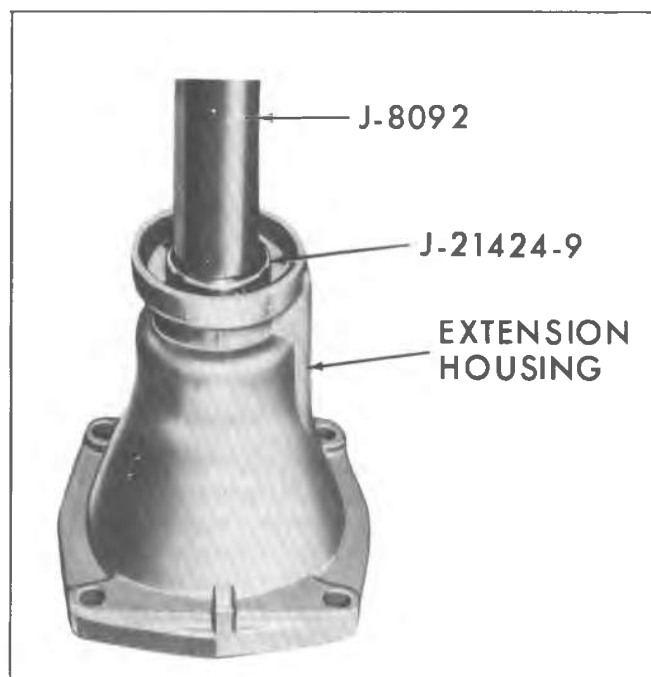


Fig. 7A-98B--Installing Extension Housing Bushing

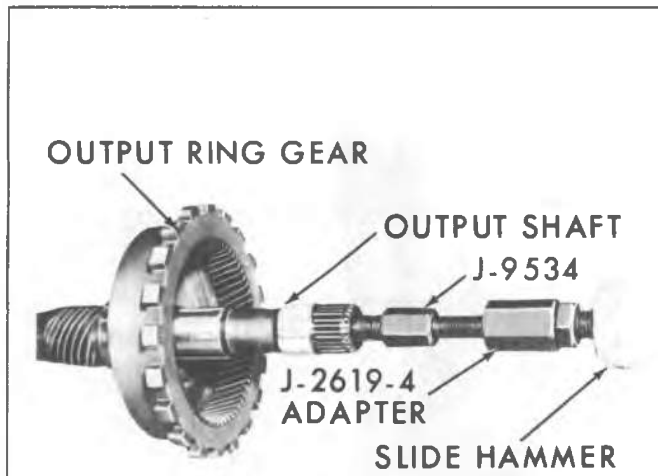


Fig. 7A-99B--Removing Output Shaft Bushing

BUSHING REPLACEMENT

Extension Housing Bushing

Remove extension housing bushing from housing using tool J-21424-9 with drive handle J-8092. Install extension housing bushing in housing flush to .010 below seal counter bore surface using tool J-21424-9 with drive handle J-8092 (fig. 7A-98B).

Output Shaft Bushing

With output shaft properly supported, remove bushing using remover J-9534-01 and slide hammer J-7004 (fig. 7A-99B). Using tool J-23062-7, install bushing until tool bottoms on output shaft.

Case Bushing

With case properly supported, drive out bushing from rear of case using tool J-23062-1 and drive handle J-8092. Using tool J-23062-1 and drive handle J-8092 with extension J-21465-13, install bushing from interior of case to 3/16"

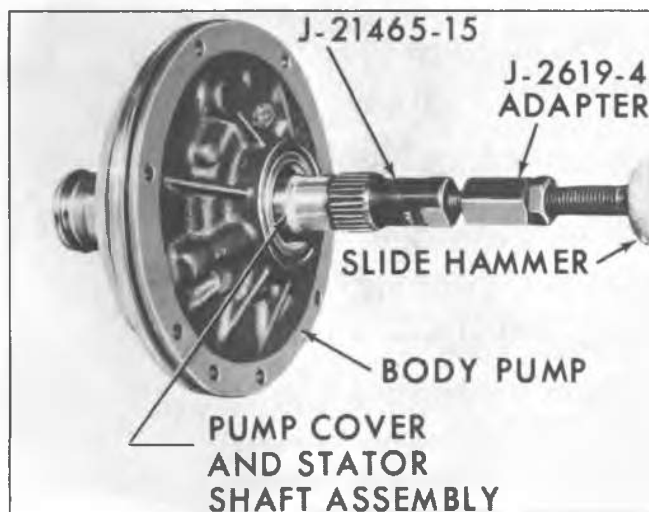


Fig. 7A-100B--Removing Stator Shaft Front Bushing

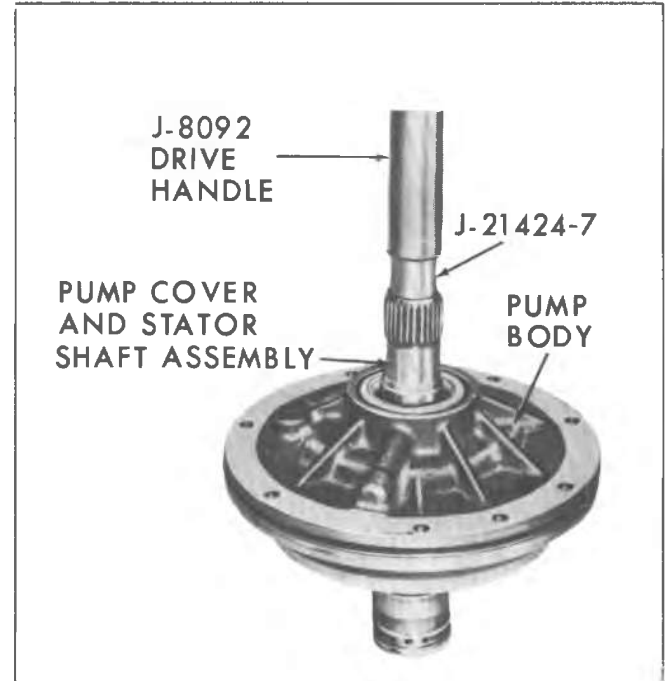


Fig. 7A-101B--Installing Stator Shaft Front Bushing

from front surface with split in bushing located at governor pilot upper bore wall area.

Stator Shaft Front Bushing

With stator shaft properly supported, remove front bushing using tool J-21465-16 and slide hammer with adapter J-2619-01 (fig. 7A-100B). Using tool J-21242-7 and drive handle J-8092, install bushing to .250" from face (fig. 7A-101B).

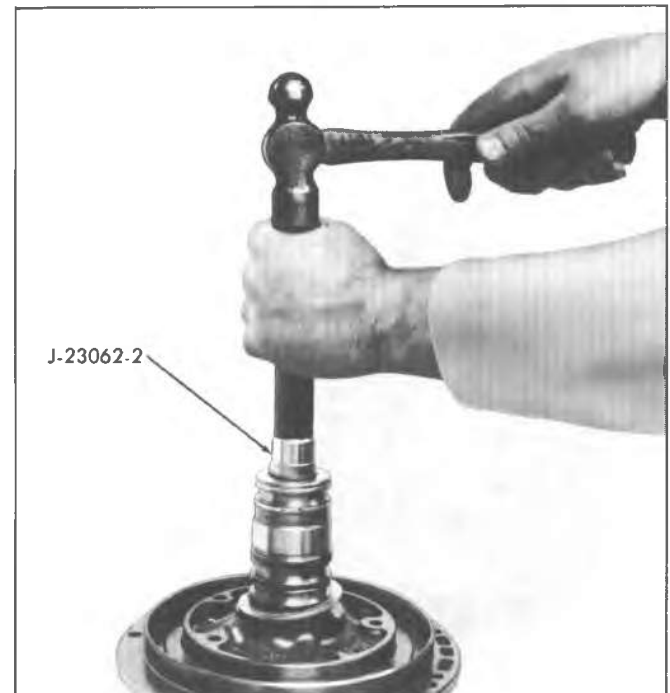


Fig. 7A-102B--Installing Inner and Outer Stator Shaft Bushing

Stator Shaft Rear Bushing

With stator shaft properly supported, remove front bushing (fig. 7A-102B). Place tool J-21424-7 and drive handle J-8092 with extension J-21465-13 through front of stator shaft and drive out two (2) rear bushings. Using tool J-23062-2 and extension J-21465-13, install inner bushing to approximately $1\text{-}5/32$ " below front face and outer bushing $3/32$ " below front face (fig. 7A-102B). Install new front bushing (fig. 7A-101B).

Input Ring Gear Bushing

With input ring gear properly supported, remove bushing using tool J-23062-5 and drive handle J-8092. Using tool J-23062-5 and drive handle J-8092, install bushing to approximately $1/16$ " below rear face inside gear end (fig. 7A-103B).

Sun Gear Bushing

With sun gear properly supported, remove two (2) sun gear bushing using tool J-23062-3 and drive handle J-8092 with extension J-21465-13. Using tool J-23062-3 and drive handle J-8092, install sun gear bushing to .010" below surface at either end (fig. 7A-104B).

Reaction Carrier Bushing

With reaction carrier properly supported, remove bushing using tool J-23062-3 and drive handle J-8092. Using tool J-23062-3 and drive handle J-8092, install bushing flush to or .010" below inside face.

Direct Clutch Bushing

With direct clutch drum properly supported, remove bushing (fig. 7A-105B). Using tool J-23329 and drive handle J-8092, install direct clutch drum bushing (fig. 7A-106B).

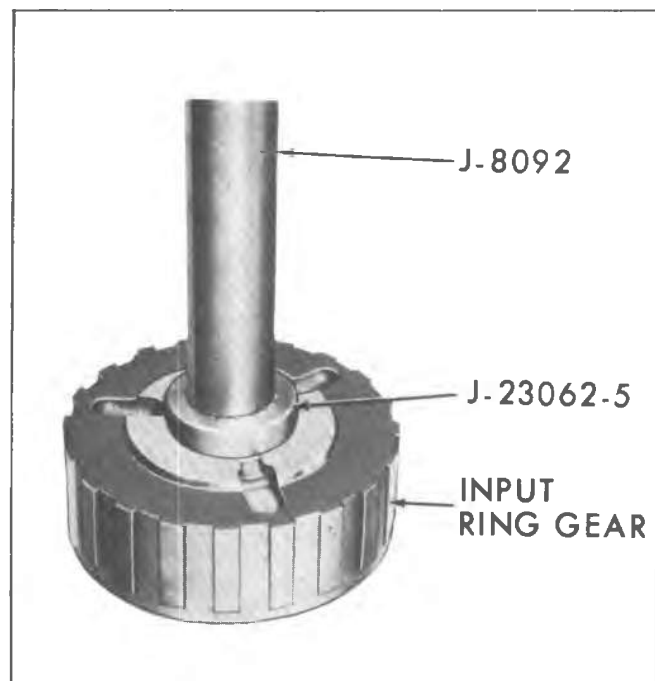


Fig. 7A-103B--Installing Input Ring Gear Support Bushing

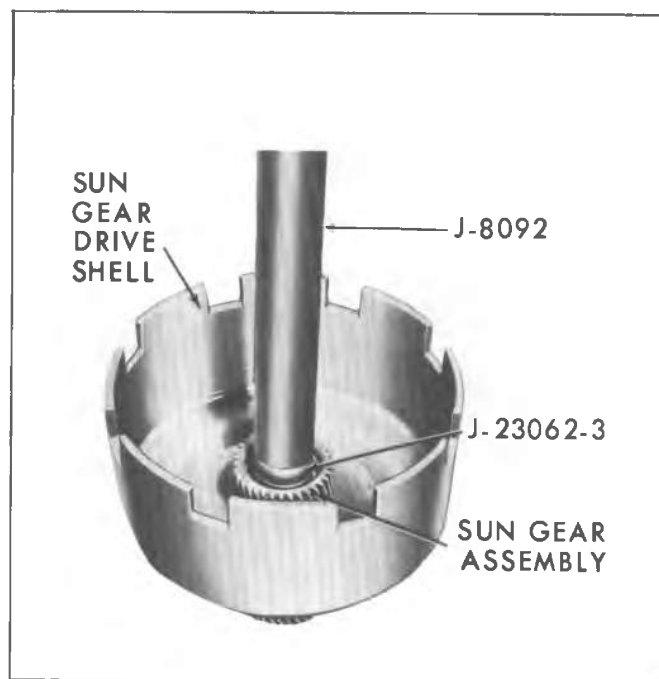


Fig. 7A-104B--Installing Sun Gear Bushings

TRANSMISSION ASSEMBLY

When servicing transmission, use only transmission oil or petroleum jelly as lubricants to retain bearings or races during assembly. Lubricate all bearings, seal rings and clutch plates prior to assembly.

Transmission Internal Components

1. Install low and reverse clutch piston assembly with notch in piston installed adjacent to parking pawl.
2. Install seventeen (17) piston return (coil) springs.
3. Install spring retainer and retaining ring. Using tool

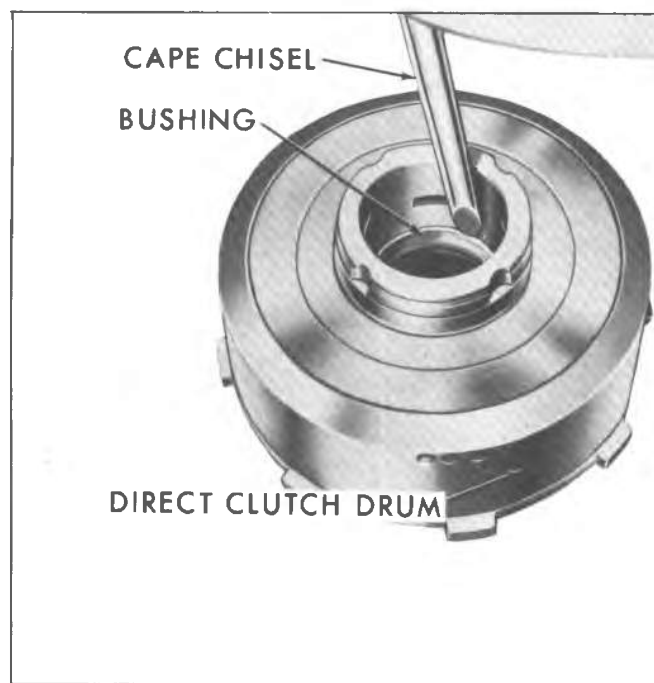


Fig. 7A-105B--Removing Direct Clutch Drum Bushing



Fig. 7A-106B--Installing Direct Clutch Drum Bushing

J-23327, compress return seat so spring retainer retaining ring may be installed. Install output ring gear rear thrust bearing in case.

4. Install output ring gear on output shaft.
5. Install reaction carrier to output ring gear front thrust washer (3 tangs) into output ring gear support.
6. Install output shaft assembly into case.
7. Install reaction carrier assembly into output ring gear and shaft assembly.
8. Oil and install low reverse clutch steel reaction plates

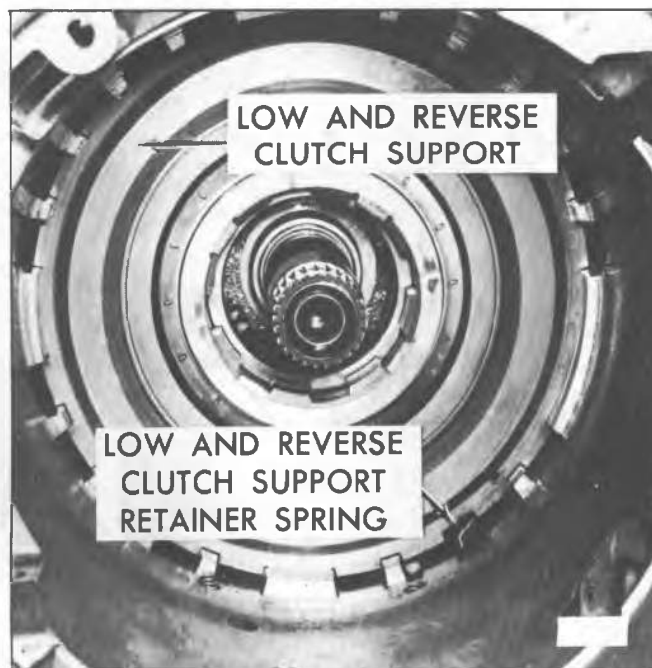


Fig. 7A-107B--Installing Low and Reverse Clutch Support Assembly

and face plates, starting with a steel plate and alternating with face plates. Install low and reverse clutch support retainer (anti-clunk) spring.

NOTE: Notch in steel separator plates should be placed toward bottom of case.

9. Install low and reverse clutch support assembly with position of notch with low and reverse clutch support retainer (anti-clunk) spring as shown on Figure 7A-107B.

10. Install low and reverse roller clutch inner race to sun gear shell thrust washer.

11. Install low and reverse clutch support to case snap ring with anti-clunk spring between gap.

12. Install rear thrust washer and sun gear drive shell assembly.

13. Install output carrier assembly.

14. Install input ring gear rear thrust washer.

15. Install input ring gear.

16. Install new input ring gear to output shaft snap ring.

CAUTION: Do not over stress snap ring.

17. Install input gear front thrust washer.

18. Install direct clutch assembly, and special thrust washer to forward clutch assembly.

19. Install clutch assemblies into case.

CAUTION: Make certain forward clutch face plates are positioned over input ring gear and the tangs on direct clutch housing are installed into slots on the sun gear drive shell.

20. Install intermediate clutch overrun brake band.

21. Install intermediate clutch pressure plate.

22. Oil and install face and steel intermediate clutch plates, starting with a face plate and alternating steel and face.

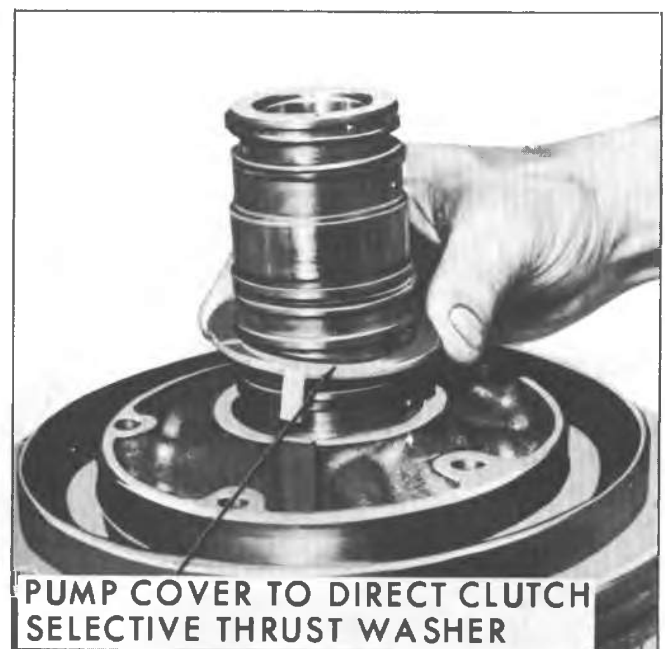


Fig. 7A-108B--Pump Cover to Direct Clutch Selective Thrust Washer

NOTE: Notch in steel reaction plates is installed toward selector lever inner bracket.

23. Install intermediate clutch cushion spring.

Pump to Direct Clutch Thrust Washer Selection Procedure

24. To check for proper thickness of selective fit thrust washer between the oil pump cover and direct clutch assembly, proceed as follows:

a. Install selective fit thrust washer, (fig. 7A-108B) oil pump gasket and using guide studs from J-3387 set install oil pump. Install two pump to case bolts.

b. Move transmission so that output shaft points down. Mount a dial indicator so that plunger of indicator is resting on end of the input shaft. J-5492 may be used to support the dial indicator as shown in Figure 7A-109B. Zero the indicator.

c. Push up on the transmission output shaft and observe the total indicator movement.

d. The indicator should read .010" to .044". If the reading is within limits, the proper selective fit washer is being used. If the reading is not within limits, it will be necessary to remove the pump and change to a thicker or thinner selective fit thrust washer, as required to obtain the specified clearance. Repeat the above checking procedure.

NOTE: Selective fit thrust washers are available in thicknesses of .066", .083" and .100".

25. Install new pump assembly in case gasket.

26. Install new pump assembly to case square cut oil seal ring.

27. Install guide pins into case.

28. Install pump assembly into case. Install attaching bolts with new washer type seals.

Speedometer Drive Gear and Extension

1. Place speedometer drive gear retaining clip into hole in output shaft.

2. Heat a new speedometer drive gear using a heat lamp or suitable heat method.

3. Align slot in speedometer drive gear with retaining clip and install.

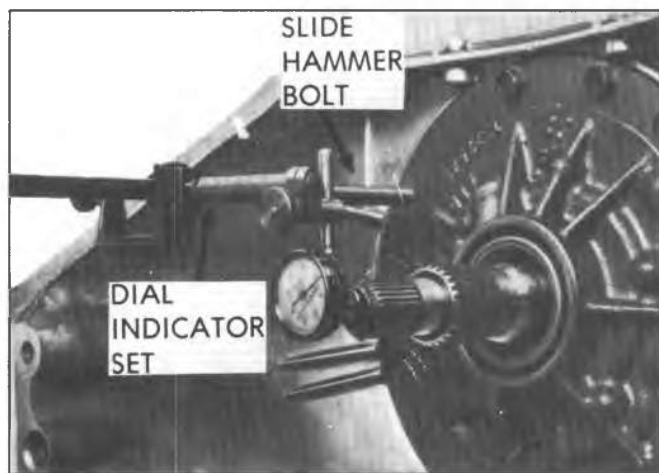


Fig. 7A-109B--Checking End Play for Proper Thrust Washer Selection

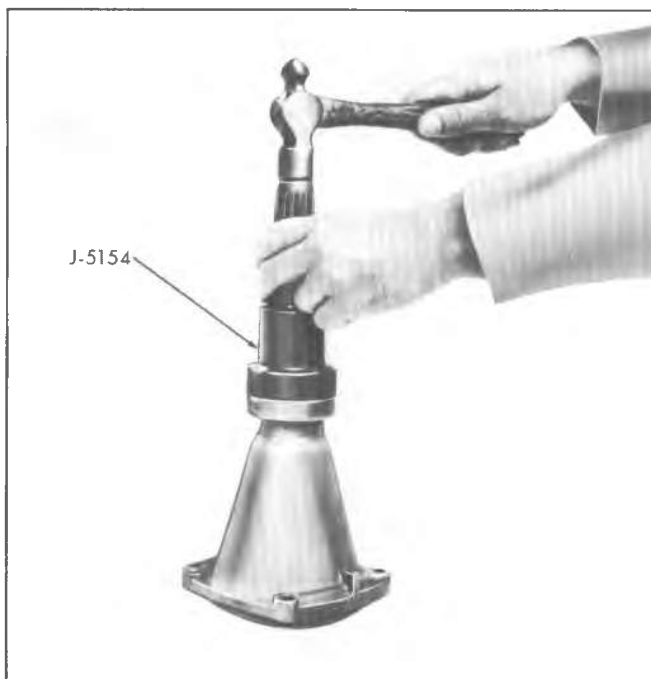


Fig. 7A-110B--Installing Extension Housing Seal

4. Install extension housing to case square cut "O" ring seal.

5. Attach extension housing to case using attaching bolts. Torque to 25 ft. lbs.

6. If necessary, install a new extension housing seal, using seal installer J-5154 or J-21426 (fig. 7A-110B).

Manual Linkage

1. If necessary, install a new manual shaft to case lip seal using 3/4" dia. rod, seat seal in case.

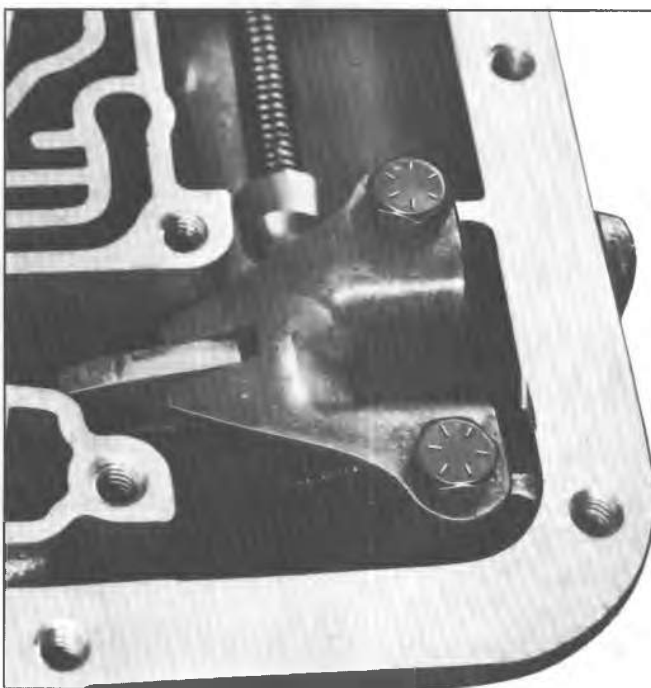


Fig. 7A-111B--Park Lock Bracket Special Bolt Identification

2. Install parking pawl, tooth toward the inside of case, into case.

3. Install parking pawl shaft into case and through parking pawl.

4. Install parking pawl shaft retainer plug. Drive into case using a 3/8" dia. rod, until retainer plug is .130" to .170" below face of case, then stake in three places.

5. Install parking pawl disengaging spring, square end hooked on pawl.

6. Install park lock bracket, torque bolts to 29 ft. lb. (fig. 7A-111B).

CAUTION: 290 M Bolts - 6 marks on head.

7. Install range selector inner lever to parking pawl actuator rod.

8. Install actuating rod under the park lock bracket and parking pawl.

9. Install manual shaft through case and range selector inner lever.

10. Install retaining nut on manual shaft. Torque to 30 ft. lbs.

11. Install manual shaft to case spacer clip.

Intermediate Servo Piston, Valve Body, Oil Pan and Gasket

1. Install intermediate servo piston, apply pin, spring and spring seat.

2. Install intermediate servo piston and metal oil seal ring.

3. Install four (4) check balls into proper transmission case pockets (fig. 7A-18B).

4. Install oil pump pressure screen and governor feed screen.

5. Install valve body transfer plate and gasket assembly.

6. Install valve body to transfer plate gasket.

7. Install valve body. Connect manual control valve link to range selector inner lever. Torque bolts in random sequence to 130 inch pounds.

8. Install spacer support plate, torque bolts to 130 in. lbs.

9. Connect detent control valve wire to detent valve actuating lever, then attach lever to valve body.

10. Install detent roller and spring assembly to valve body.

11. Align lube holes in strainer with those in valve body and install strainer assembly gasket and strainer.

12. Install oil pan using a new gasket. Tighten bolts to 130 inch pounds in succession until bolts maintain torque specification.

NOTE: If a new oil pan is being installed, transfer production code number is on right side of old pan to new pan. On JA and JH models, production code number is on governor cover.

Governor and Vacuum Modulator

1. Install governor assembly, cover and seal and retainer wire.

2. Install vacuum modulator valve.

3. Install vacuum modulator and retainer clip. Torque bolt to 130 inch pounds.

NOTE: Position retainer with tangs pointing toward modulator.

Intermediate Clutch Accumulator (Refer to Figures 7A-54B and 7A-55B)

1. Install intermediate clutch accumulator piston assembly.

2. Install intermediate clutch accumulator spring.

3. Install new "O" ring seal in groove in case before installing cover.

4. Install intermediate clutch accumulator cover and retaining ring using tool J-23069.

SECTION 7A

AUTOMATIC TRANSMISSION

TURBO HYDRA-MATIC 400 TRANSMISSION

INDEX

Transmission Disassembly and Reassembly	7A- 1	Output Shaft, Rear Internal Gear,	
Disassembly of Major Units.....	7A- 1	Sun Gear and Shaft.....	7A-40
Governor, Speedometer Driven Gear, Pan, Filter		Sun Gear Shaft Bushing-Front.....	7A-40
and Intake Pipe.....	7A- 1	Sun Gear Shaft Bushing-Rear	7A-40
Control Valve Assembly, Solenoid Connector,		Main Shaft Inspection.....	7A-40
Governor Pipes and Detent Spring.....	7A- 3	Front and Rear Bands Inspection.....	7A-40
Rear Servo, Valve Body Spacer, Gasket		Case Extension	7A-40
and Front Servo	7A- 4	Modulator and Valve.....	7A-41
Rear Band Apply Pin Selection	7A- 5	Manual and Parking Linkage Inspection	7A-41
Manual Linkage	7A- 7	Case Assembly Inspection	7A-42
Rear Oil Seal and Case Extension	7A- 9	Case Assembly Bushing.....	7A-42
Front Unit End Play Checking Procedure.....	7A- 9	Converter Inspection.....	7A-42
Oil Pump and Internal Case Components.....	7A-10	Converter End Clearance Check.....	7A-44
Rear End Play Checking Procedure	7A-11	Assembly of Rear Unit.....	7A-44
Gear Unit Assembly	7A-13	Case Modification-Corvette.....	7A-46
Speedometer Drive Gear.....	7A-15	Assembly of Units to Transmission Case.....	7A-47
Governor Assembly	7A-16	Install Manual Linkage.....	7A-49
Driven Gear Replacement	7A-17	Rear Extension Assembly.....	7A-51
Front Servo Parts Inspection	7A-18	Check Balls, Front Servo, Spacer and Solenoid.....	7A-51
Rear Servo Parts Service	7A-18	Rear Servo Assembly.....	7A-53
Control Valve Service	7A-19	Control Valve Assembly and Governor Pipes.....	7A-54
Oil Pump Service	7A-22	Filter and Intake Pipe.....	7A-55
Forward Clutch Service.....	7A-24	Modulator Valve and Valve and Vacuum	
Direct Clutch and Intermediate Roller Service.....	7A-29	Modulator	7A-55
Center Support Service.....	7A-34	Governor.....	7A-55
Reaction Carrier, Roller Clutch and Output		Speedometer Driven Gear	7A-55
Carrier Assembly.....	7A-38	Converter Assembly-Installation	7A-56
Pinion Replacement	7A-39	Special Tools	7A-57

DISASSEMBLY OF MAJOR UNITS

1. With transmission in cradle on portable jack, remove converter assembly by pulling straight out.

NOTE: Converter contains a large amount of oil.

2. Install holding Fixture J-8763-01 on transmission so that modulator assembly will be located on side of holding fixture nearest bench (Fig 7A-2C).

NOTE: Do not over-torque holding screw. This will bind center support.

3. Install fixture and transmission into holding Tool Base J-3289-14 with bottom pan facing up (Fig. 7A-2C).

4. Remove modulator assembly attaching screw and retainer (Fig. 7A-3C).

5. Remove vacuum modulator assembly and "O" ring seal from case (Fig. 7A-4C). Discard "O" ring.

6. Remove modulator valve from transmission case (Fig. 7A-4C).

Removal of Governor,

Speedometer Driven Gear,

Pan, Filter and Intake Pipe

1. Remove attaching screws, governor cover and gasket (Fig. 7A-5C). Discard gasket.

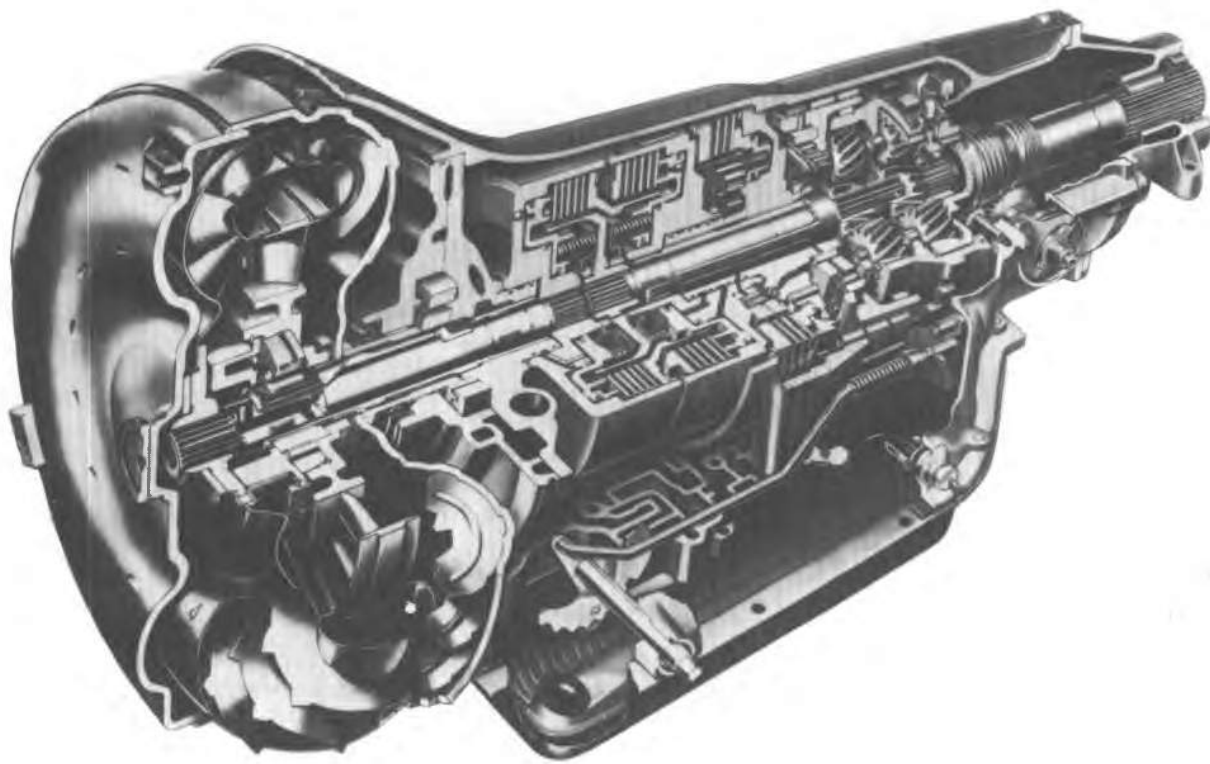


Fig. 7A-1C--Side Cross Section--Typical

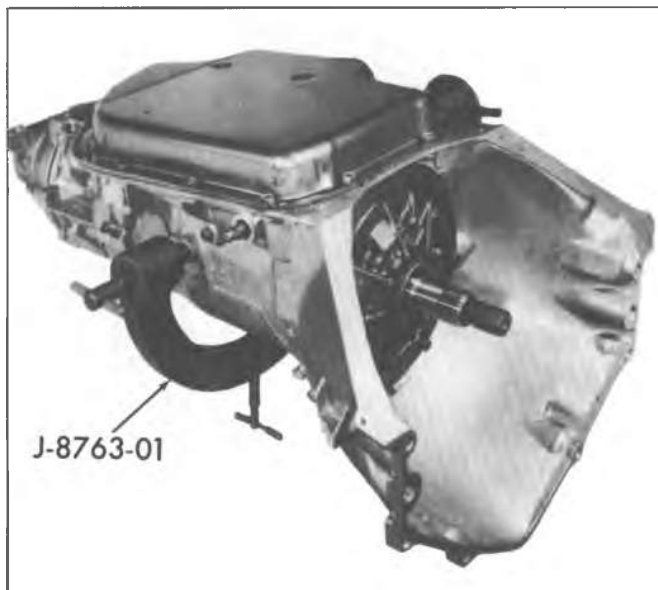


Fig. 7A-2C--Transmission in Holding Fixture

2. Withdraw governor assembly from case.
3. Remove speedometer driven gear attaching screw and retainer (Fig. 7A-6C).
4. Withdraw speedometer driven gear assembly from case.
5. Remove bottom pan attaching screws, bottom pan and bottom pan gasket. Discard gasket.



Fig. 7A-3C--Removing Modulator Retainer

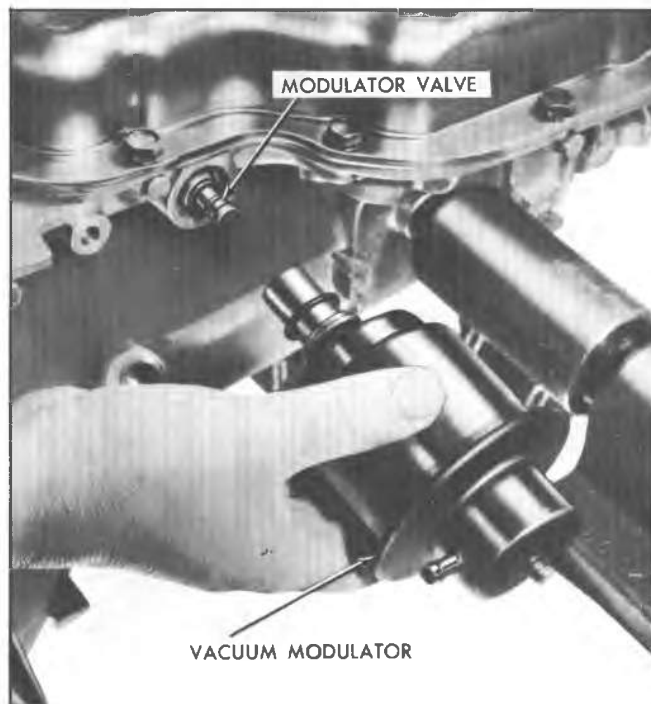


Fig. 7A-4C--Removing Vacuum Modulator and Valve

6. Remove the filter retainer bolt (Fig. 7A-7C).
7. Remove filter and intake pipe assembly from case (Fig. 7A-8C) and discard filter.
8. Remove intake pipe to case "O" ring seal from intake pipe or case and discard.

Removal of Control Valve Assembly, Solenoid Connector, Governor Pipes, Governor Screen Assembly, and Detent Spring Assembly

1. Remove control valve body attaching screws and detent roller and spring assembly (Fig. 7A-9C).



Fig. 7A-5C--Removing Governor Cover Attaching Screws

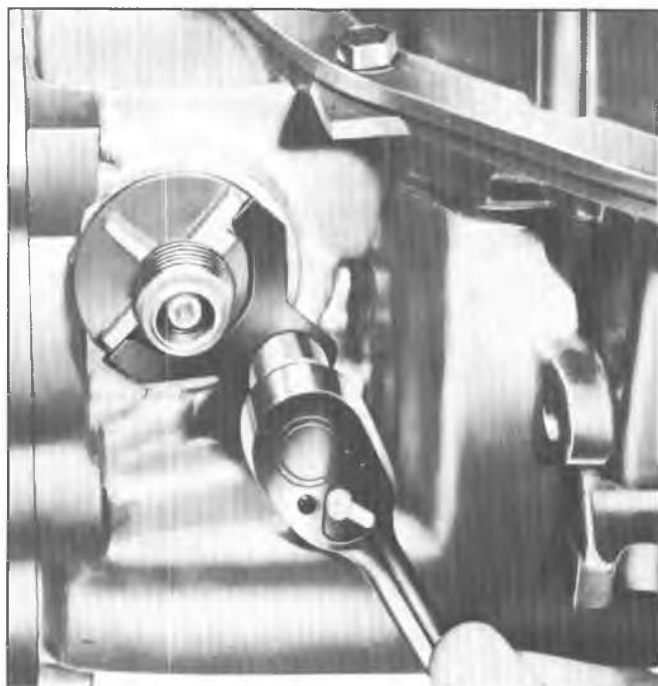


Fig. 7A-6C--Removing Speedometer Driven Gear Retainer

NOTE: Do not remove solenoid attaching screws.

CAUTION: If transmission is in the vehicle, the front servo parts may drop out as the control valve assembly is removed.

2. Remove control valve assembly and governor pipes (Fig. 7A-10C).

CAUTION: Do not drop manual valve.

3. Remove governor screen assembly from governor feed pipe hole in the case or from end of governor feed pipe (Fig.

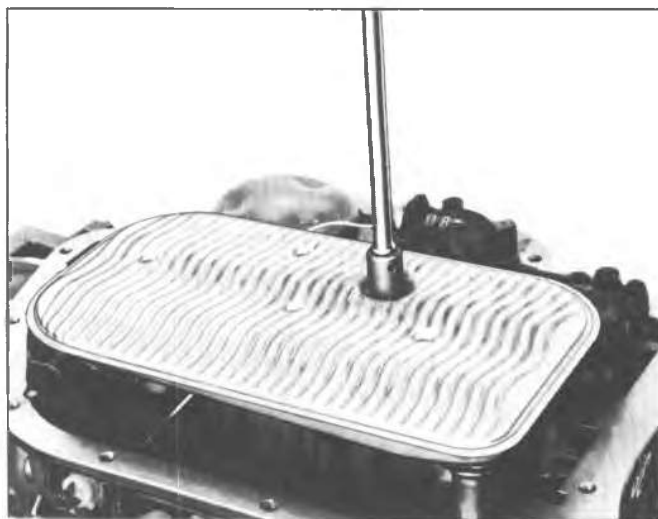


Fig. 7A-7C--Removing Filter Retainer Bolt

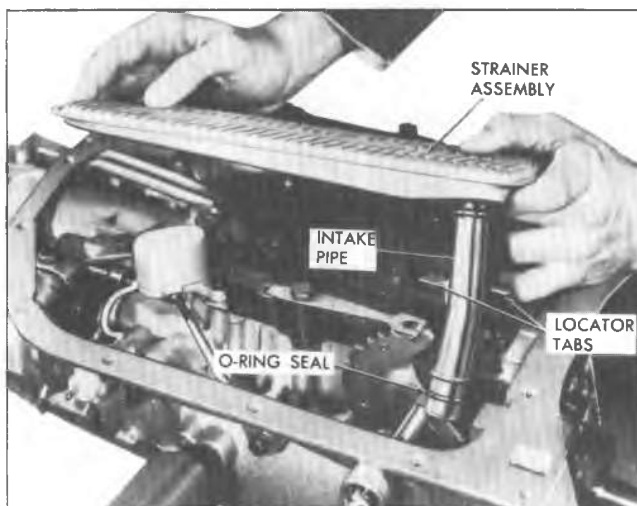


Fig. 7A-8C--Removing Filter Assembly and "O" Ring

7A-11C). Clean governor screen in clean solvent and air dry.

4. Remove governor pipes from control valve assembly.

5. Disconnect solenoid lead wire from connector terminal (Fig. 7A-12C).

Removal of Rear Servo, Valve Body Spacer, Gasket and Front Servo

1. Remove rear servo cover attaching screws, servo cover and gasket. Discard gasket (Fig. 7A-13C).

2. Remove rear servo assembly from case (Fig. 7A-14C).

3. Remove rear servo accumulator spring.

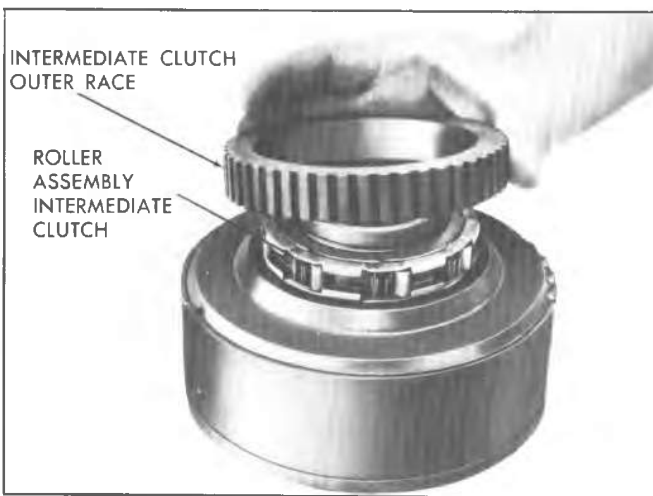


Fig. 7A-9C--Removing Detent Roller and Spring Assembly

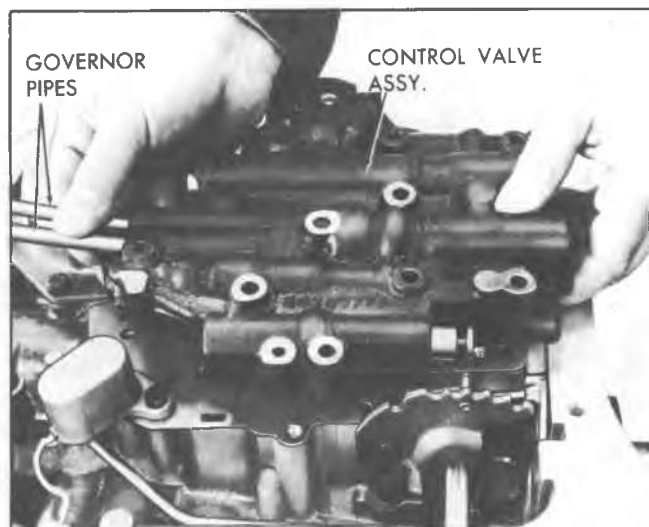


Fig. 7A-10C--Removing Control Valve Assembly and Governor Pipes from Case

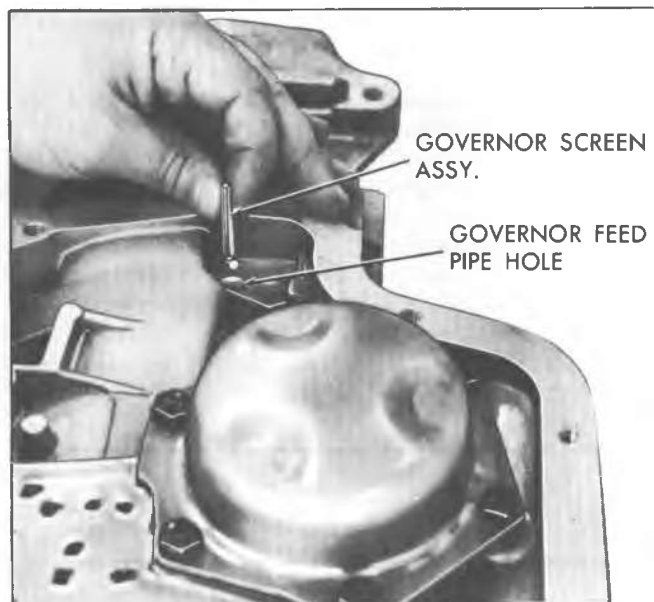


Fig. 7A-11C--Removing Governor Screen Assembly

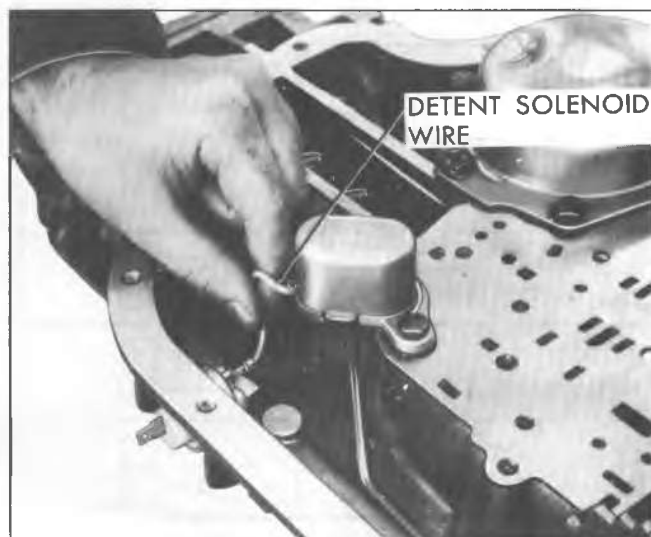


Fig. 7A-12C--Disconnecting Detent Solenoid Wire

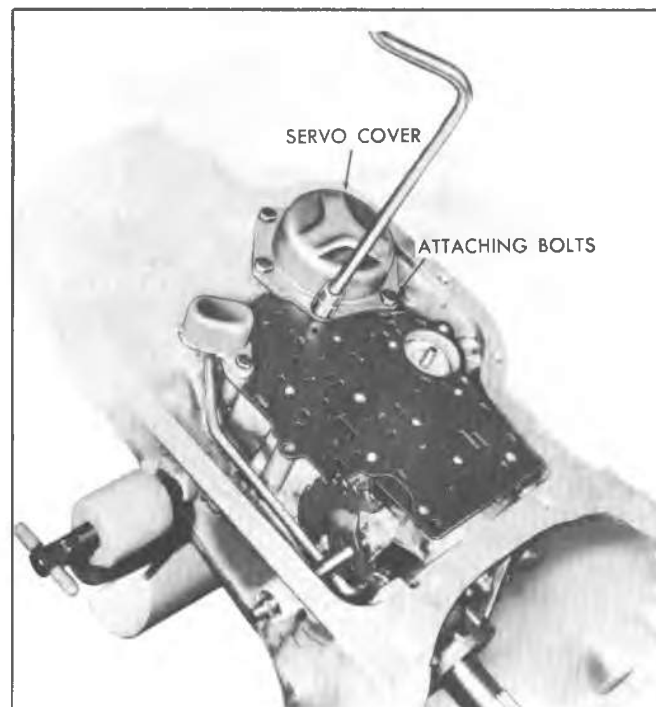


Fig. 7A-13C--Removing Rear Servo Cover Attaching Bolts

4. Make band apply pin selection check to determine possible cause of malfunction (Fig. 7A-15C).

Rear Band Apply Pin Selection (All Models Except CB and CL)

a. Attach band apply pin selection Gauge J-21370-5 and J-21370-6 to transmission case with attaching screws checking to make certain the gauge pin does not bind in servo pin hole (Fig. 7A-15C).

b. Apply 25 ft. lb. torque and select proper pin to be used during assembly of transmission.

NOTE: Selecting proper length pin is equivalent to adjusting band. The band lug end of each selective apply pin bears identification in the form of one, two or three rings.



Fig. 7A-14C--Removing Rear Servo Assembly

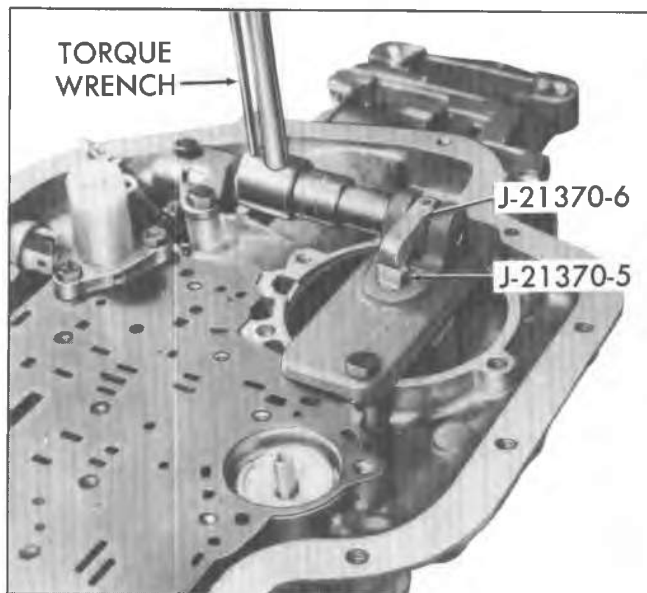


Fig. 7A-15C--Checking Rear Band Apply Pin, Except Models CB and CL

c. If both steps of J-21370-5 are below the gauge surface, the long pin, identified by 3 rings, should be used.

d. If the gauge surface is between the steps, the medium pin, identified by 2 rings, should be used.

e. If both steps are above the gauge surface, the short pin, identified by 1 ring, should be used.

Rear Band Apply Pin Selection (Models CB and CL)

NOTE: There are six selective pins identified as shown in Figure 7A-17C. Selecting proper pin is equivalent to adjusting band.

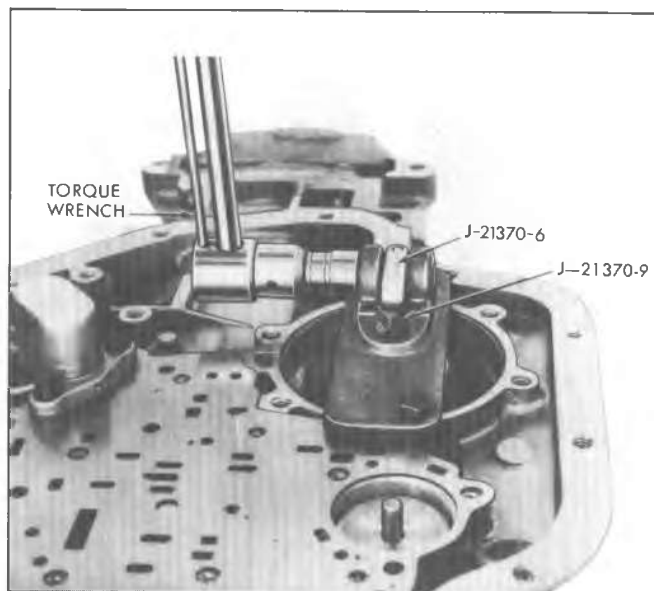


Fig. 7A-16C--Checking Rear Band Apply Pin, Models CB and CL

a. Attach band apply pin selection gauge (J-21370-9 and J-21370-6), to transmission case (lever pivot pin to rear) with rear servo cover attaching screws.

b. Attach tool attaching screws finger tight and check freeness of selective pin. Torque attaching screws to 15 foot-pounds and recheck pin to make certain it does not bind.

c. Apply 25 foot-pounds torque to the lever on Tool J-21370-6 (Fig. 7A-16C). Selection of the proper rear band apply pin is determined by the relation of the flat on Tool J-21370-9 to the flat machined area around the hole on Tool J-21370-6.

GAGING STEPS LOCATED ON THREE SIDES OF TOOL J-21370-9		PART NO.	PIN IDENTIFICATION
	C LONGEST PIN	THIS STEP: USE PIN NO. 8627195	
		THIS STEP: SIDES B TO C USE PIN NO. 8627194	
	B	THIS STEP: USE PIN NO. 8624141	
		THIS STEP: SIDES A TO B USE PIN NO. 8627193	
	A	THIS STEP: USE PIN NO. 8624140	
	LOWER STEP SHORTEST PIN	LOWER STEP: USE PIN NO. 8627192	

Note: The Identification Rings are .030" and .100" wide.

Fig. 7A-17C--Rear Band Apply Pin Identification



Fig. 7A-18C--Removing Detent Solenoid and Gasket

d. Before removing gauging tool make note of the proper band apply pin to be used during assembly of the transmission as determined by the six selective pins identified as shown in Fig. 7A-17C.

NOTE: If the transmission is in the vehicle, be careful when the detent solenoid is removed as it prevents the spacer plate and gasket and check balls from dropping down.

5. Remove detent solenoid attaching screws, detent solenoid and gasket (Fig. 7A-18C).

6. Withdraw electrical connector and "O" ring seal (Fig. 7A-19C).

7. Remove control valve assembly spacer plate and gasket.

8. Remove six (6) check balls from cored passages in transmission case.

NOTE: Mark location of balls for aid in reassembly.

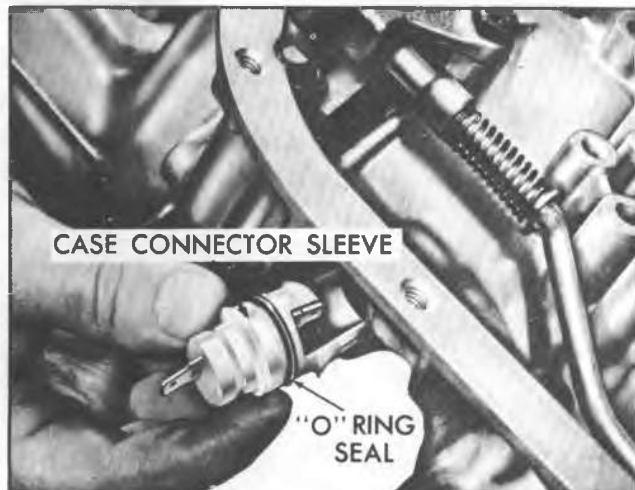


Fig. 7A-19C--Removing Electrical Connector and "O" Ring Seal

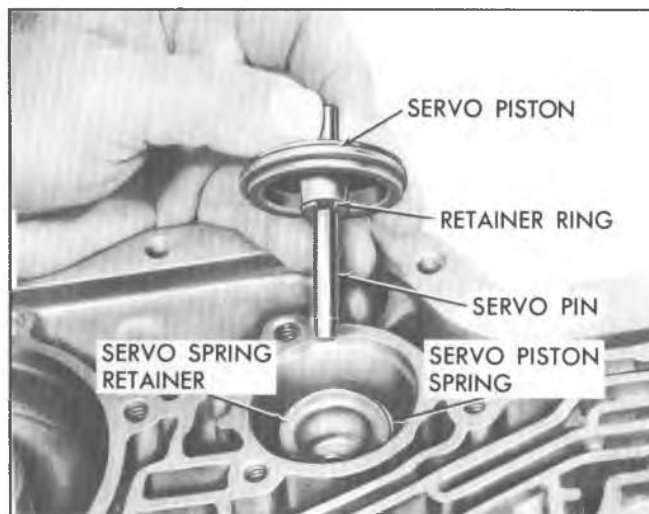


Fig. 7A-20C--Removing Front Servo Piston, Retainer Ring, and Pin

9. Remove front servo piston, retainer ring, washer, pin, spring retainer and spring from transmission case (Fig. 7A-20C).

Remove Manual Linkage

NOTE: If necessary, remove manual linkage as follows:

1. Unthread jam nut holding detent lever to manual shaft.

2. Remove manual shaft retaining pin from case (Fig. 7A-21C).

3. Remove manual shaft and jam nut from case (Fig. 7A-22C). Do not lose jam nut as it becomes free from manual shaft.

4. Remove parking actuator rod and detent lever assembly.

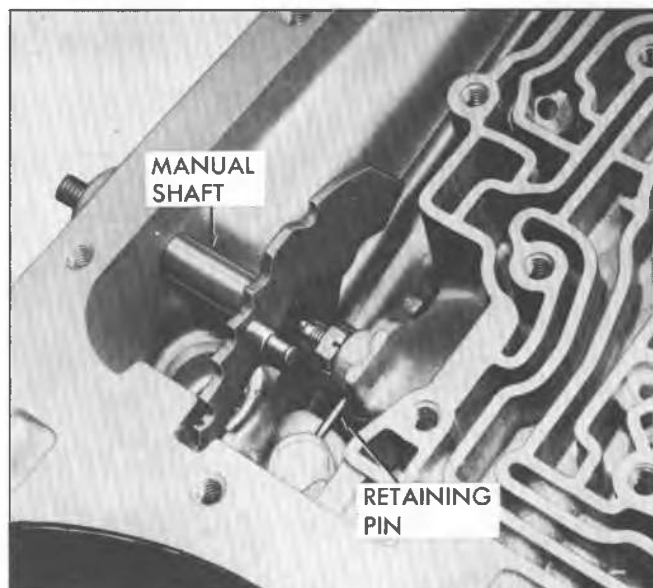


Fig. 7A-21C--Removing Manual Shaft Retaining Pin from Case

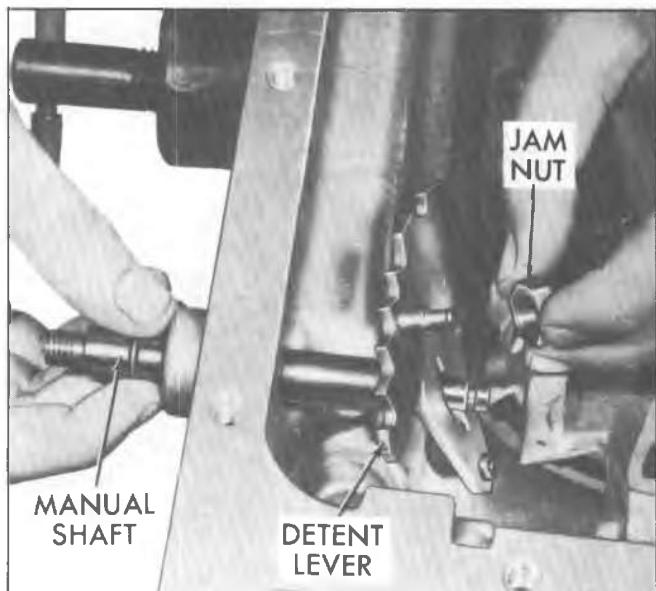


Fig. 7A-22C--Removing Detent Lever and Jam Nut from Manual Shaft

5. Remove attaching screws and parking bracket (Fig. 7A-23C).

6. Remove parking pawl return spring (Fig. 7A-24C).

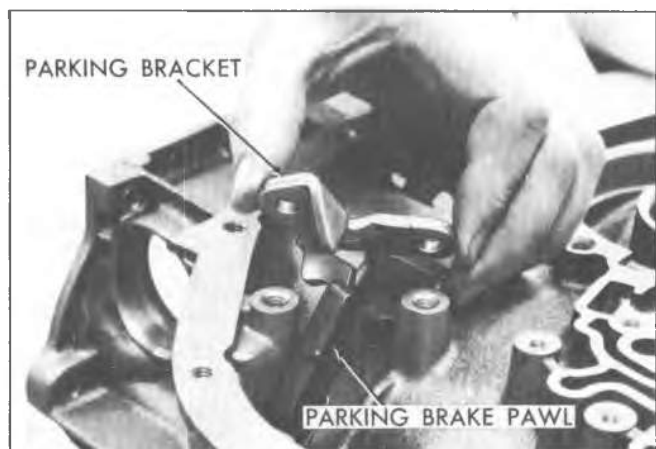


Fig. 7A-23C--Removing Parking Bracket



Fig. 7A-24C--Removing Parking Pawl Return Spring

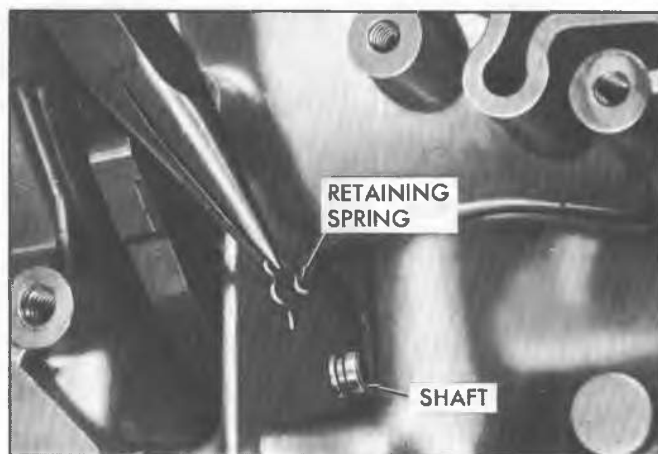


Fig. 7A-25C--Removing Parking Shaft Retaining Spring

NOTE: The following steps are to be completed only if 1 or more of the parts involved require replacement.

7. Remove parking pawl shaft retainer (Fig. 7A-25C).

8. Remove parking pawl shaft cup plug by inserting a screwdriver, between the parking pawl shaft and the case rib, and prying outwards (Fig. 7A-26C).

9. Remove parking pawl shaft and parking pawl (Fig. 7A-26C).

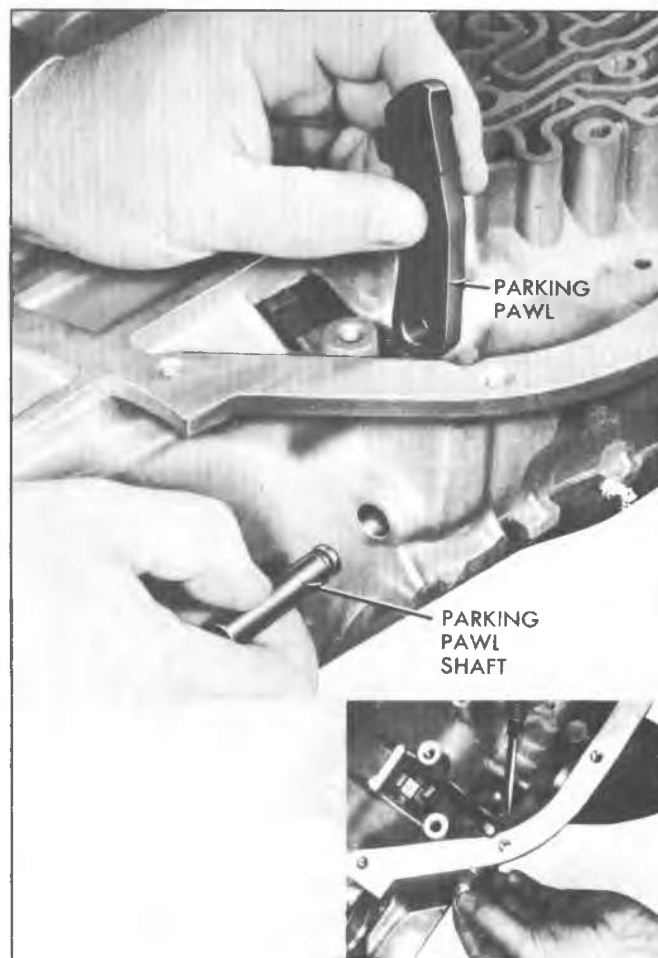


Fig. 7A-26C--Removing Parking Pawl, Shaft and Cup Plug

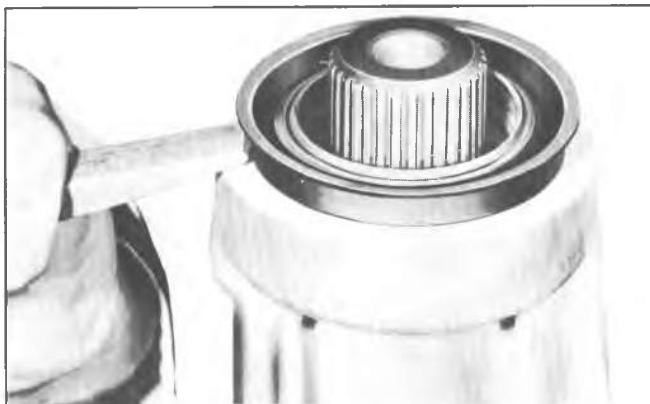


Fig. 7A-27C--Removing Rear Oil Seal from Case Extension

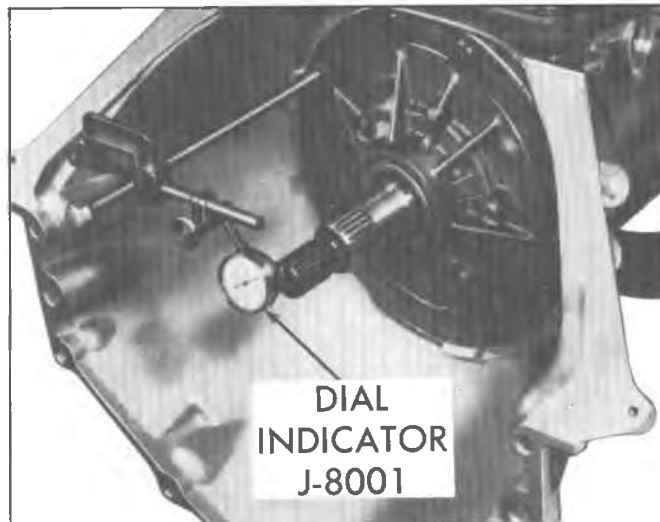


Fig. 7A-29C--Checking Front Unit End Play

Removal of Rear Oil Seal and Case Extension

1. If necessary to replace, pry rear oil seal from case extension (Fig. 7A-27C).
2. Remove case extension to case attaching bolts.
3. Remove case extension to case gasket (Fig. 7A-28C).
4. Make front unit end play check as follows (Fig. 7A-29C):
 - a. Remove one front pump attaching bolt, and bolt washer. (See Fig. 7A-29C for location).
 - b. Install a 3/8"-16 threaded slide hammer bolt or J-9539, into bolt hole.

c. Mount a dial indicator on rod and index indicator to register with end of turbine shaft.

d. Push on turbine shaft rearward.

e. Push output shaft forward.

f. Set dial indicator to Zero.

g. Pull turbine shaft forward.

Read resulting travel or end play. Should be .003"-.024".

Selective washer controlling this end play is the washer located between pump cover and forward clutch housing. If more or less washer thickness is required to bring end play within specifications, select proper washer from the chart shown in Fig. 7A-30C.

NOTE: An oil soaked washer may tend to discolor, so it will be necessary to measure washer for its actual thickness.

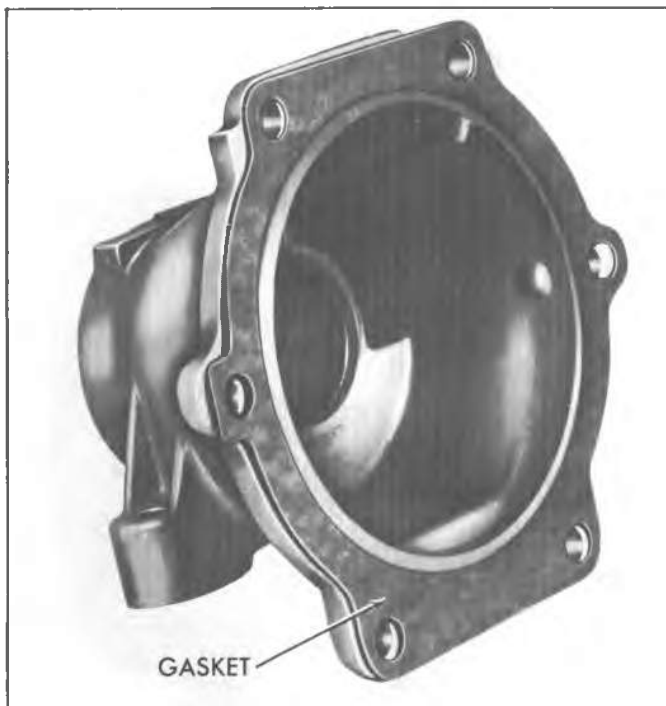


Fig. 7A-28C--Case Extension and Gasket

FRONT END WASHER THICKNESS

Thickness	Color
.060 - .064	Yellow
.071 - .075	Blue
.082 - .086	Red
.093 - .097	Brown
.104 - .108	Green
.115 - .119	Black
.126 - .130	Purple

Fig. 7A-30C--Front End Washer Selection Chart



Fig. 7A-31C--Removing Front Seal

Oil Pump and Internal Case Components

Removal

1. If necessary to replace, pry front seal from pump (Fig. 7A-31C).
2. Remove pump attaching bolts.
3. Install two 3/8"-16 threaded slide hammer bolts, J-



Fig. 7A-32C--Removing Pump Assembly

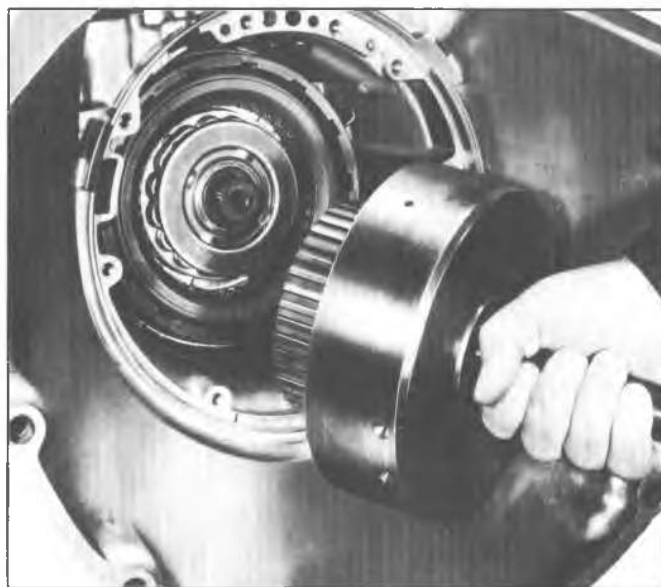


Fig. 7A-33C--Removing Forward Clutch Assembly and Turbine Shaft

9539 with weights J-6585-01, into bolt holes in pump body and remove pump assembly from case (Fig. 7A-32C). (See illustration for location of threaded holes.)

4. Remove and discard pump to case seal and gasket.
5. Remove forward clutch assembly and turbine shaft from transmission (Fig. 7A-33C).
6. Remove forward clutch hub to direct clutch housing thrust washer, if it did not come out with forward clutch housing assembly.
7. Remove direct clutch assembly (Fig. 7A-34C).
8. Remove front band assembly (Fig. 7A-35C).

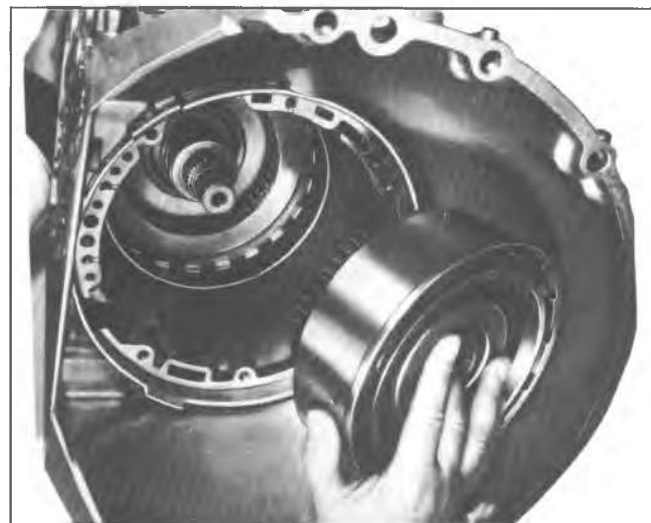


Fig. 7A-34C--Removing Direct Clutch Assembly

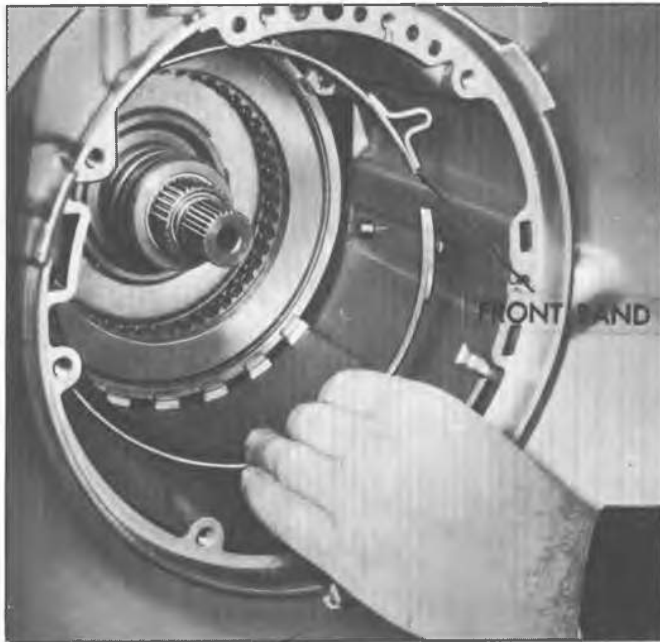


Fig. 7A-35C--Removing Front Band

9. Remove sun gear shaft (Fig. 7A-36C).

Check Rear End Play as Follows (Fig. 7A-37C)

- Install J-9539 or a 3/8"-16 threaded bolt into an extension housing attaching bolt hole (Fig. 7A-37C).
- Mount a dial indicator on bolt and index with end of output shaft.
- Move output shaft in and out to read end play. End play should be from .007"-.019". Selective washer controlling this end play is a steel washer having 3 lugs that is located between output shaft thrust washer and rear face of transmission case.

If a different washer thickness is required to bring end play within specification, it can be selected from the chart

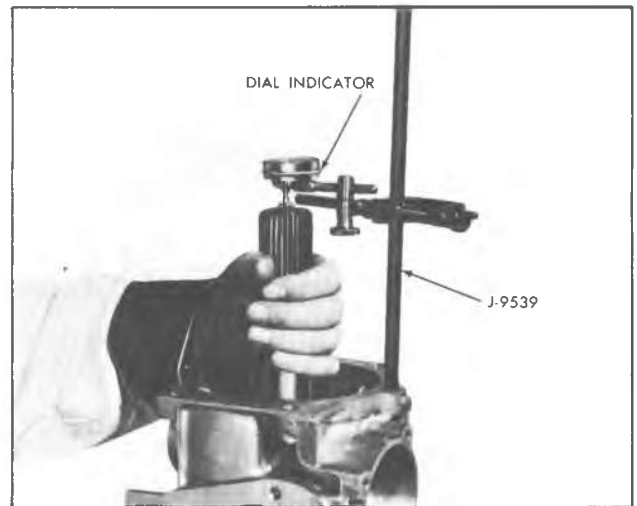


Fig. 7A-37C--Checking Rear Unit End Play

REAR END WASHER THICKNESS

Thickness	Identification
	Notches and/or Numeral
.074 - .078	None 1
.082 - .086	1 Tab Side 2
.090 - .094	2 Tab Side 3
.098 - .102	1 Tab O.D. 4
.106 - .110	2 Tabs O.D. 5
.114 - .118	3 Tabs O.D. 6

Fig. 7A-38C--Rear End Washer Thickness Chart

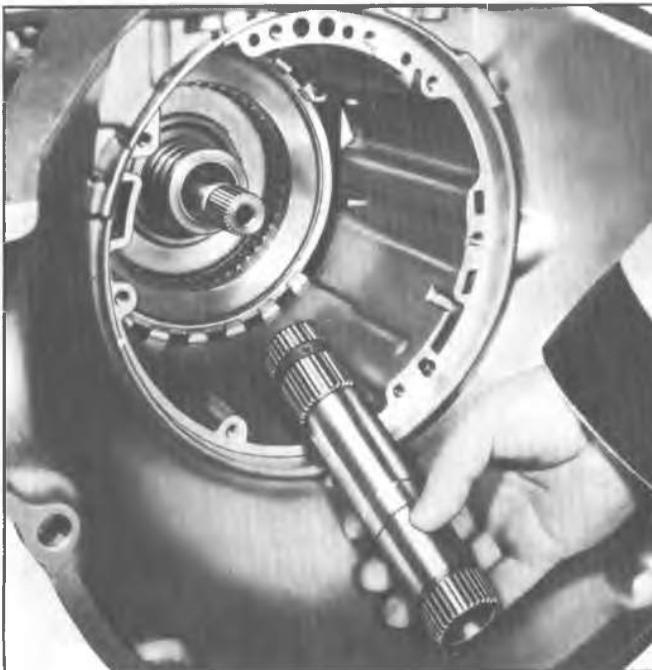


Fig. 7A-36C--Removing Sun Gear Shaft

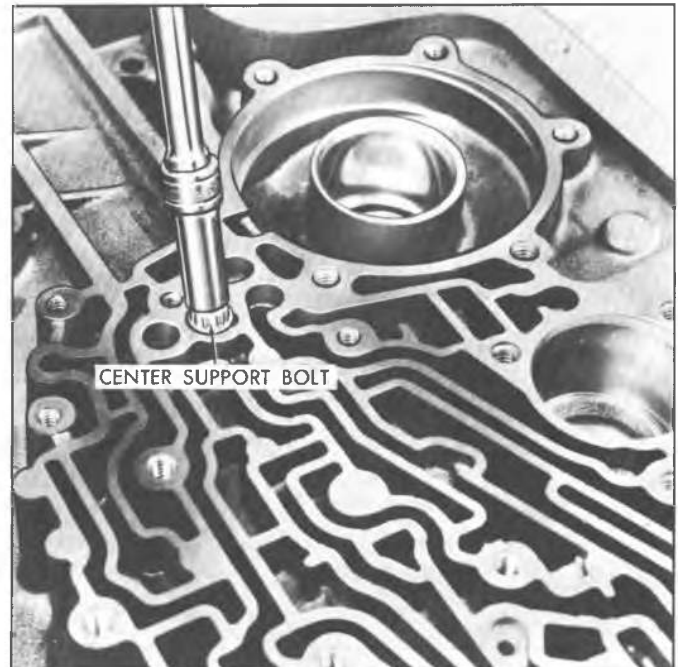


Fig. 7A-39C--Removing Center Support Bolt

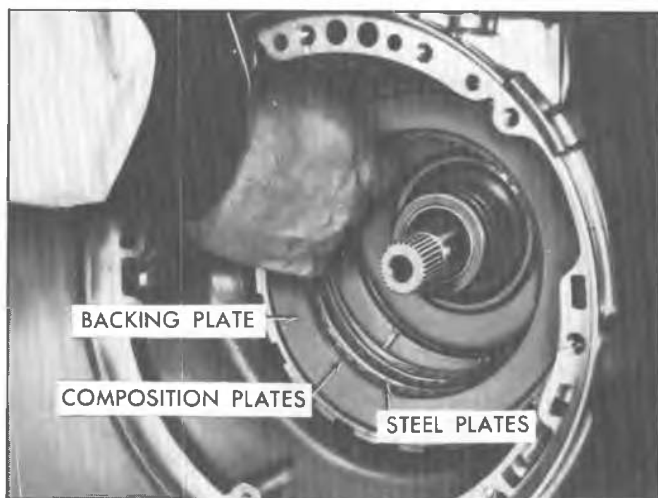


Fig. 7A-40C--Removing Intermediate Backing Plate and Clutch Plates

shown in Fig. 7A-38C.

10. Remove center support to case bolt (Fig. 7A-39C), using a 3/8" 12-point thin wall deep socket.

11. Remove intermediate clutch backing plate to case snap ring.

12. Remove intermediate clutch backing plate, as shown in Fig. 7A-40C.

13. Remove intermediate clutch plates.

a. (All except CB, CL and CS models) Remove three (3) composition, two (2) steel clutch plates and one waved steel plate.

b. (CB, CL and CS models) Remove three (3) composition, and three (3) steel clutch plates.

14. Remove center support to case retaining snap ring (Fig. 7A-41C).

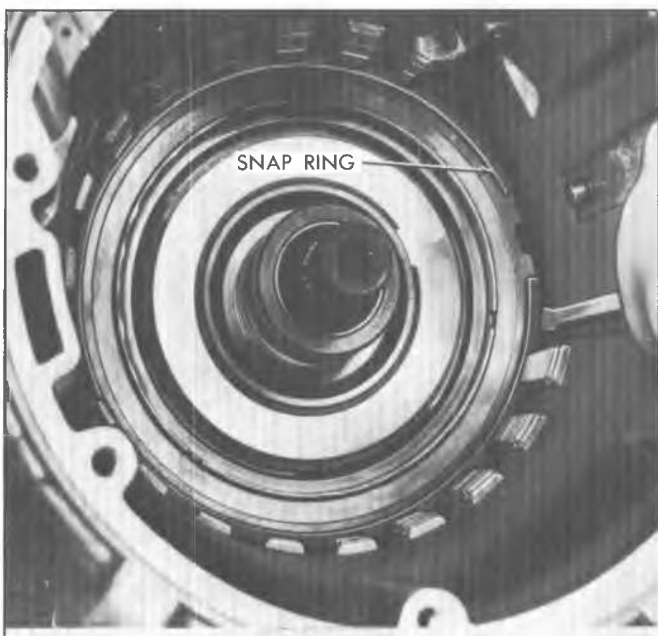


Fig. 7A-41C--Removing Center Support to Case Retaining Snap Ring

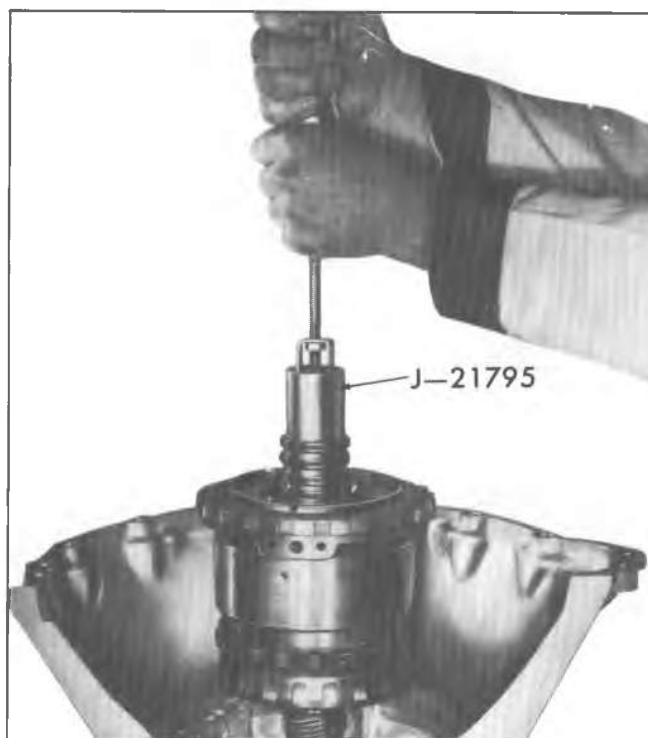


Fig. 7A-42C--Removing Center Support and Gear Unit from Case

15. Remove entire gear unit assembly by lifting with gear assembly installing and removing Holding Tool J-21795 with J-9539 slide hammer (Fig. 7A-42C).

16. Remove shaft to case thrust washer from rear of output shaft or inside case.

17. Place gear unit assembly, with output shaft facing down through hole in work bench.

18. Remove rear unit selective washer from transmission case (Fig. 7A-43C).



Fig. 7A-43C--Removing Selective Washer



Fig. 7A-44C--Removing Center Support to Case Spacer

19. Remove center support to case spacer (Fig. 7A-44C).
20. Remove rear band assembly (Fig. 7A-45C).

Disassembly of Gear Unit Assembly

NOTE: CL Model (spur gears) disassembly procedure is identical as illustrated.

1. Remove center support assembly (Fig. 7A-46C).

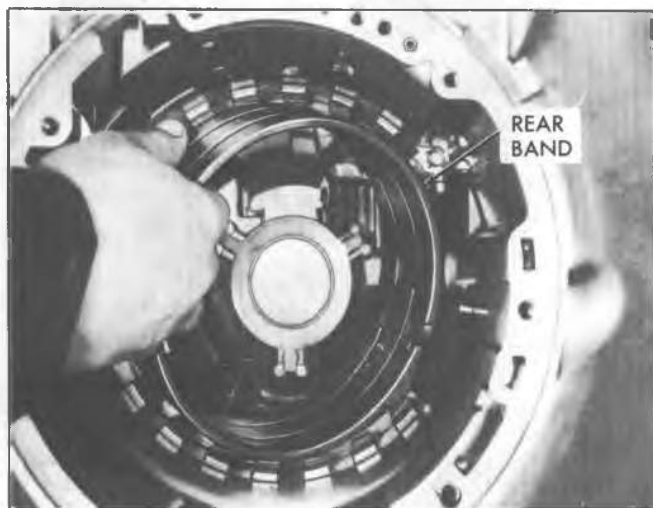


Fig. 7A-45C--Removing Rear Band



Fig. 7A-46C--Removing Center Support Assembly

2. Remove center support to reaction carrier thrust washer (Fig. 7A-47C).
3. Remove center support to sun gear races and thrust bearing.

NOTE: One race may have been removed with center support.

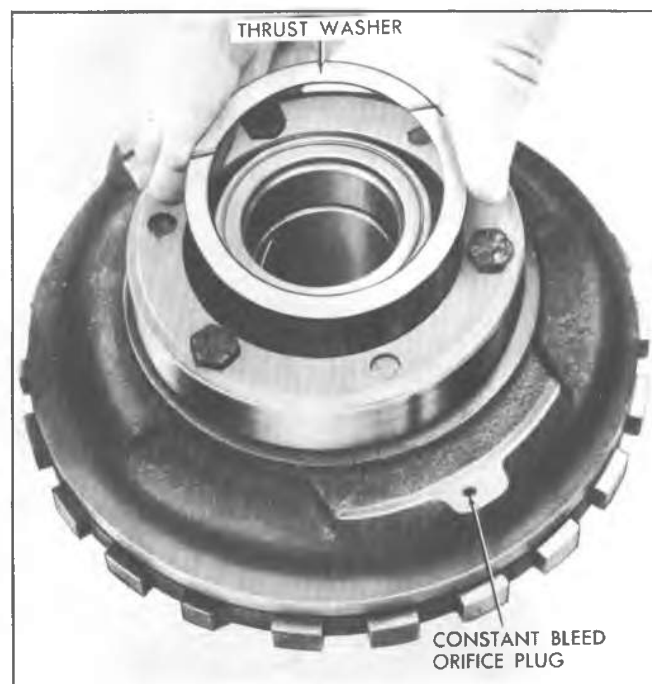


Fig. 7A-47C--Removing Center Support Thrust Washer

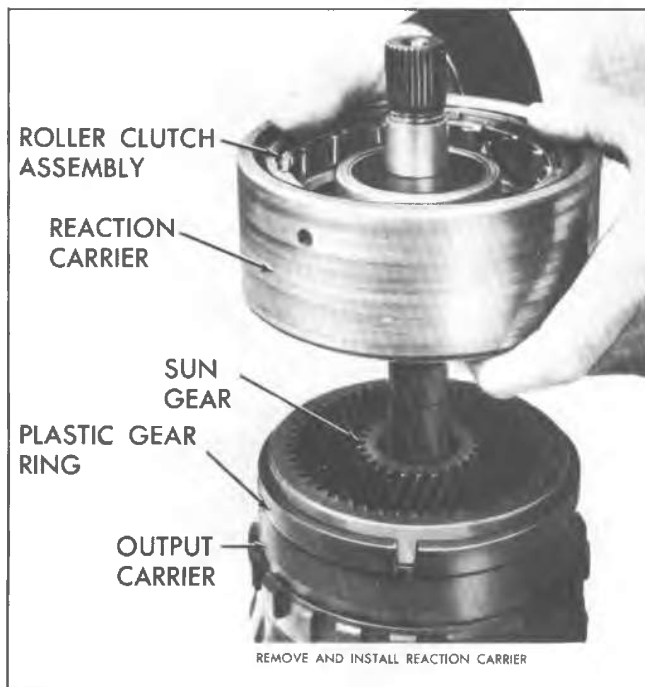


Fig. 7A-48C--Removing Reaction Carrier and Roller Clutch from Output Carrier

4. Remove reaction carrier and roller clutch assembly (Fig. 7A-48C). Lift roller clutch assembly out of carrier.
5. Remove front internal gear ring from output carrier assembly.
6. Remove sun gear (Fig. 7A-49C).
7. Remove reaction carrier to output carrier thrust washer.
8. Turn assembly over and place main shaft through hole in work bench.
9. Remove "O" ring from output shaft of models that use an "O" ring.



Fig. 7A-49C--Removing Sun Gear

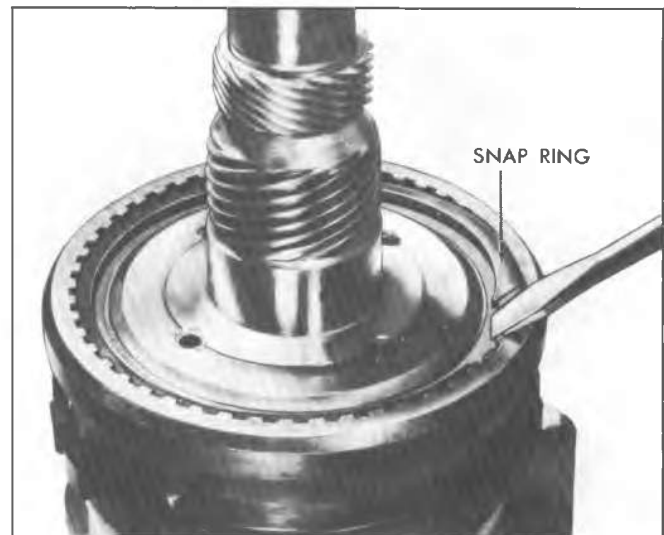


Fig. 7A-50C--Removing Output Shaft to Carrier Snap Ring

10. Remove output shaft to output carrier snap ring (Fig. 7A-50C).
 11. Remove output shaft.
 12. Remove output shaft to rear internal gear thrust bearing and two (2) races.
 13. Remove rear internal gear and mainshaft (Fig. 7A-51C).
- NOTE:** Do not drop bearings.
14. Remove rear internal gear to sun gear thrust bearing and two (2) races.
 15. If necessary, remove rear internal gear to mainshaft snap ring, to remove mainshaft (Fig. 7A-52C).



Fig. 7A-51C--Removing Rear Internal Gear and Mainshaft

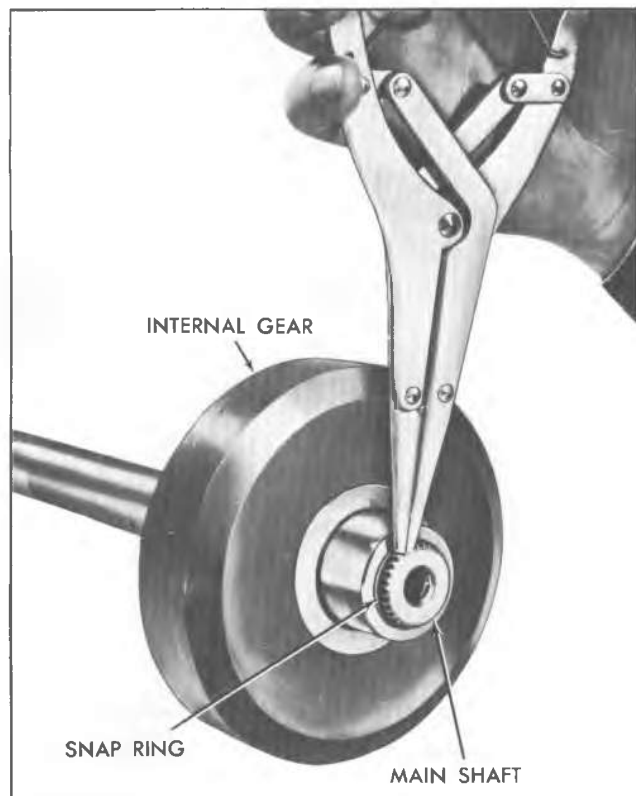


Fig. 7A-52C--Removing Rear Internal Gear to Main Shaft Snap Ring

Speedometer Drive Gear Replacement

If removal and installation or replacement of the speedometer drive gear is necessary, proceed as follows:

Nylon Speedometer Drive Gear

1. Depress clip and slide speedometer drive gear off output shaft (Fig. 7A-53C).
2. To install, place clip (square end toward flange of shaft) into hole in output shaft (Fig. 7A-54C). Align slot in

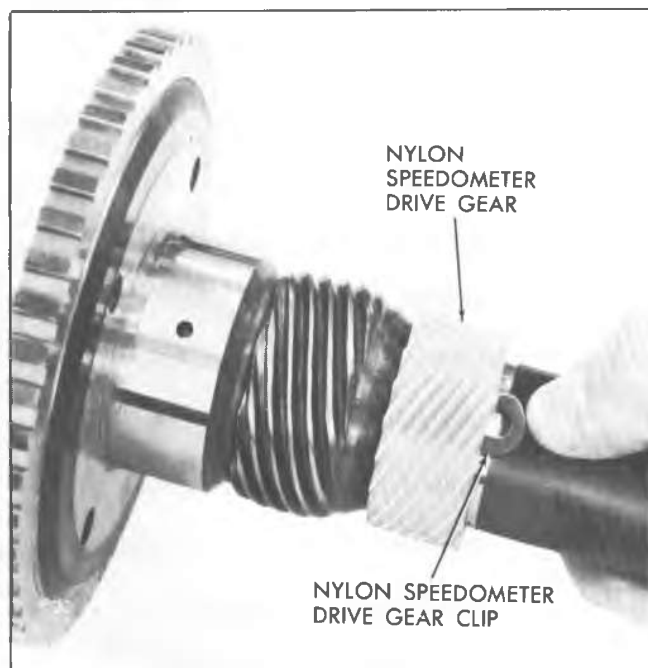


Fig. 7A-53C--Removing Nylon Speedometer Drive Gear

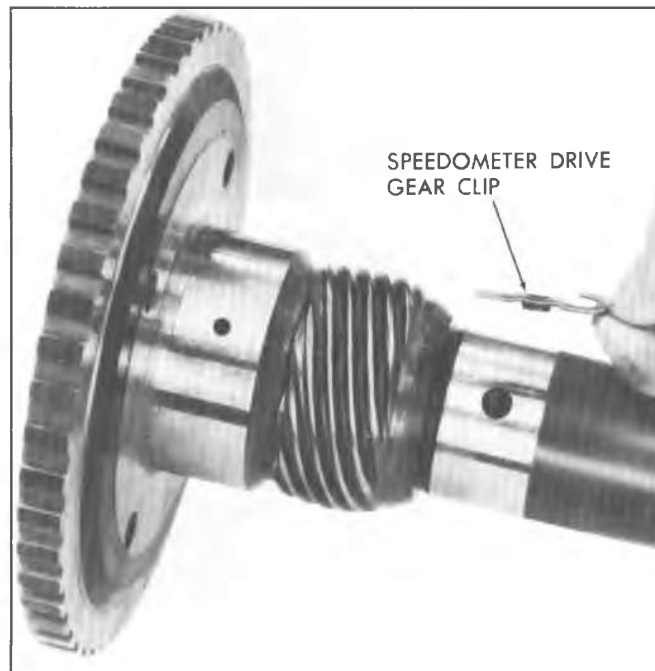


Fig. 7A-54C--Installing Speedometer Drive Gear Clip

speedometer drive gear with clip and install gear.

NOTE: The nylon speedometer drive gear is installed at the factory only. ALL SERVICE REPLACEMENT SPEEDOMETER DRIVE GEARS ARE STEEL.

When replacing the nylon speedometer drive gear with a steel gear, discard the retaining clip and refer to step "2" of steel speedometer drive gear installation.

Steel Speedometer Drive Gear

1. Install speedometer drive gear remover Tool J-21427-01 and J-9539 bolts with J-8105 or suitable puller on output shaft, and remove speedometer drive gear (fig. 7A-55C).

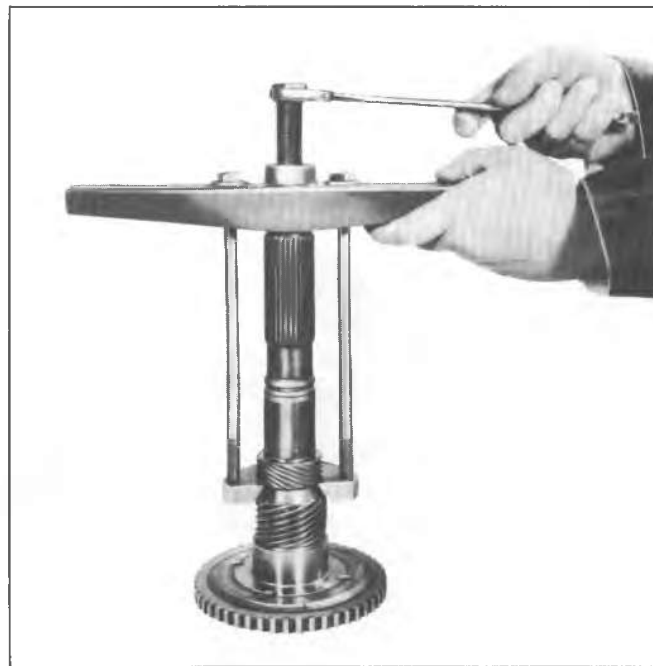


Fig. 7A-55C--Removing Steel Speedometer Drive Gear

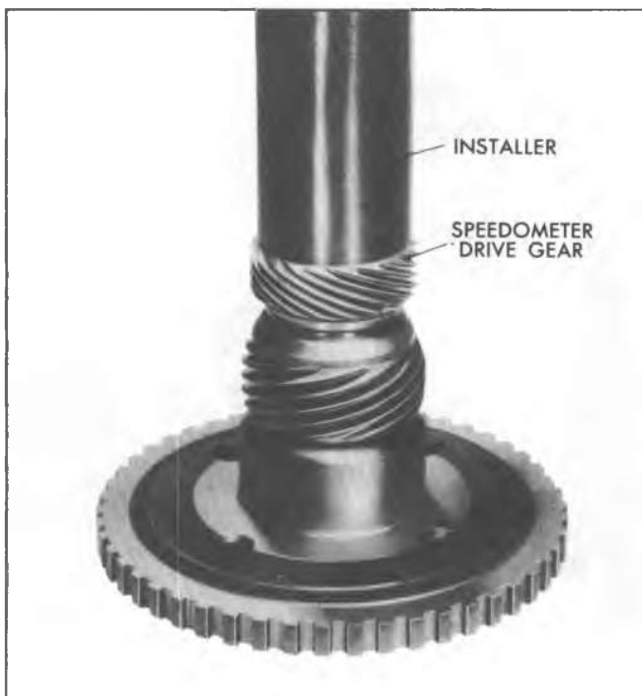


Fig. 7A-56C--Installing Steel Speedometer Drive Gear

2. Install new steel speedometer drive gear and drive to location (5-43/64" below end of output shaft for all models except CA, CG and CR) (11-15/64" below end of output shaft for model CA) (11-29/64 below end of output shaft for models CG and CR) using J-5590 (Fig. 7A-56C).

GOVERNOR ASSEMBLY

All components of governor assembly, with exception of driven gear, are a select fit and each assembly is calibrated. The governor, including the driven gear, is serviced as a complete assembly. However, the driven gear can also be serviced separately.

It is necessary to disassemble governor assembly in order to replace driven gear. Disassembly may also be necessary

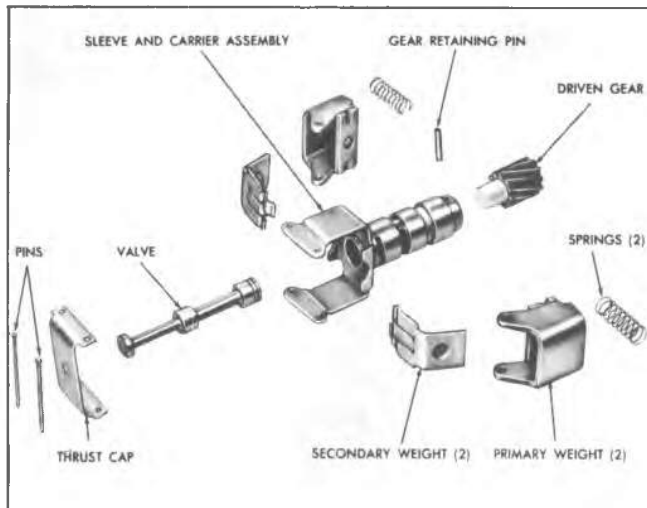


Fig. 7A-57C--Governor--Exploded

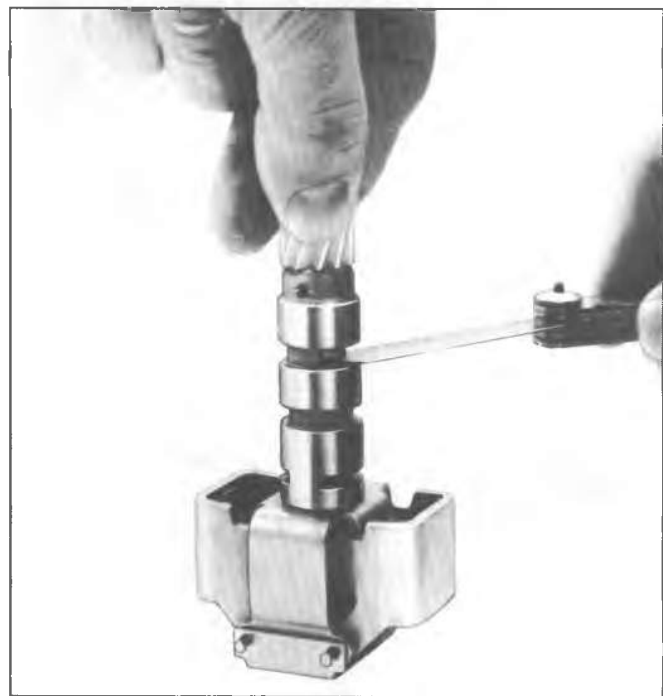


Fig. 7A-58C--Checking Valve Opening With Weights Outward

due to foreign material causing improper operation. In such cases, proceed as follows:

Disassembly

1. Cut off one end of each governor weight pin and remove pins, governor thrust cap, governor weights, and springs. Governor weights are interchangeable from side to side and need not be identified. (Fig. 7A-57C).
2. Remove governor valve from governor sleeve. Be careful not to damage valve.
3. Perform following inspections and replace governor driven gear, if necessary.

Inspection

1. Wash all parts in cleaning solvent, air dry and blow out all passages.
2. Inspect governor sleeve for nicks, burrs, scoring or galling.
3. Check governor sleeve for free operation in bore of transmission case.
4. Inspect governor valve for nicks, burrs, scoring or galling.
5. Check governor valve for free operation in bore of governor sleeve.
6. Inspect governor driven gear for nicks, burrs, or damage.
7. Check governor driven gear for looseness on governor sleeve.
8. Inspect governor weight springs for distortion or damage.
9. Check governor weights for free operation in their retainers.
10. Check valve operating at entry (.020" minimum) with a feeler gage, holding governor as shown with governor weights extended completely outward (Fig. 7A-58C).



Fig. 7A-59C--Checking Valve Opening With Weight Inward

11. Check valve opening at exhaust (.020" minimum) with a feeler gauge, holding governor as shown with governor weights completely inward (Fig. 7A-59C).

Governor Driven Gear Replacement

To facilitate governor repair in the field, a governor driven gear and replacement pins are available for service use. The service package contains a nylon driven gear, two governor weight retaining pins and one governor gear retainer split pin. Replacement of gear must be performed with care in the following manner:

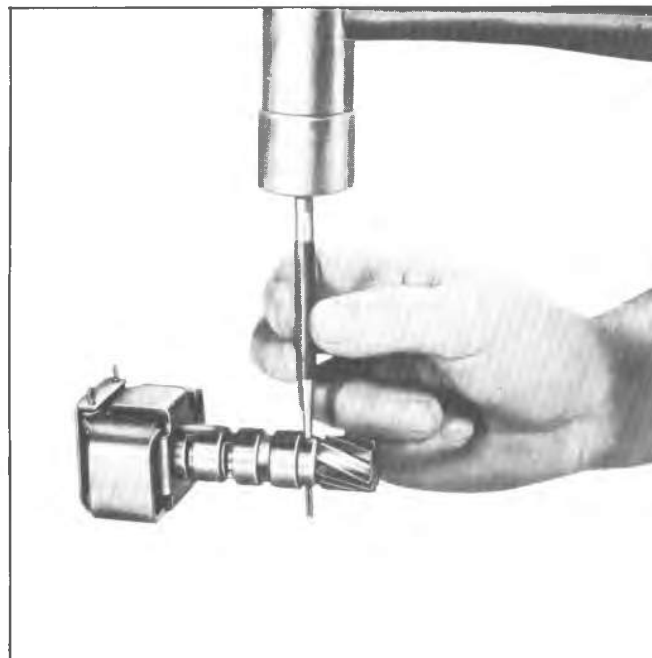


Fig. 7A-60C--Removing Governor Gear Retaining Pin

1. Drive out governor gear retaining split pin using small punch (Fig. 7A-60C).

2. Support governor on 7/64 inch plates installed in exhaust slots of governor sleeve, place in arbor press, and with a long punch, press gear out of sleeve.

3. Carefully clean governor sleeve of chips that remain from original gear installation.

4. Support governor on 7/64 inch plates installed in exhaust slots of sleeve, position new gear in sleeve and, with a suitable socket, press gear into sleeve until nearly seated.

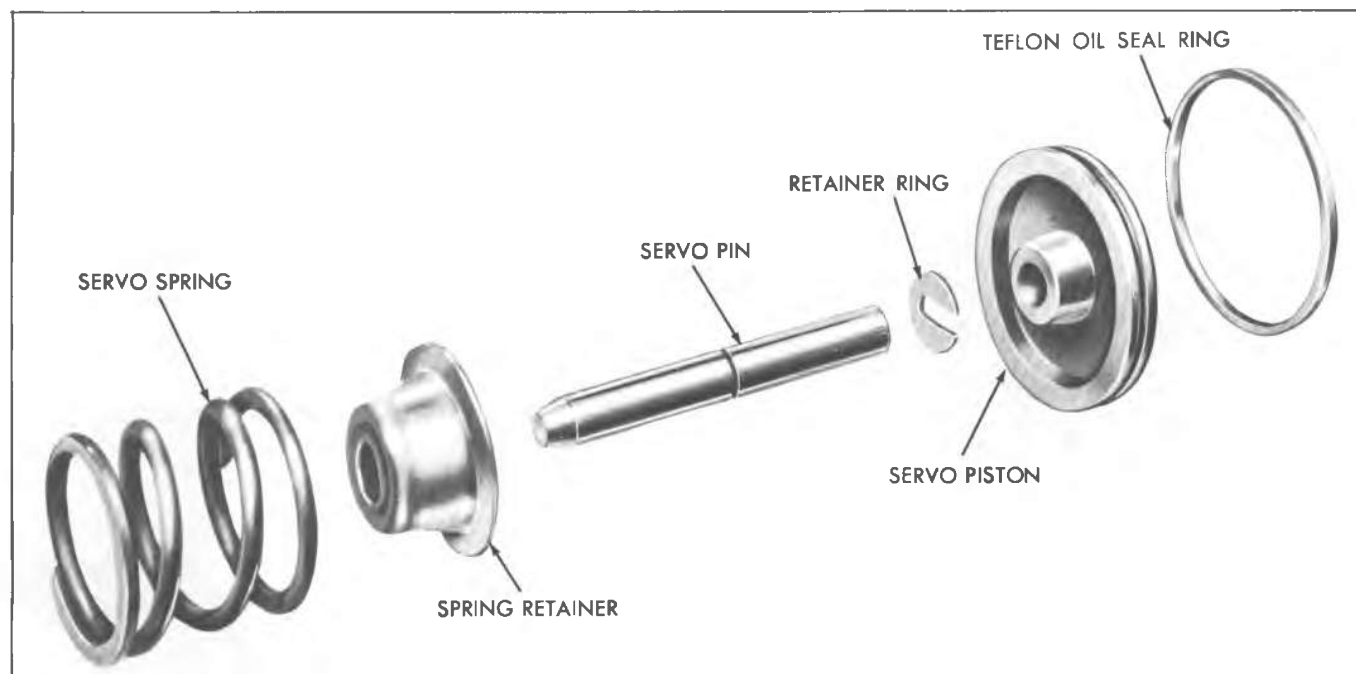


Fig. 7A-61C--Front Servo Assembly--Exploded View

Carefully remove any chips that may have shaved off gear hub and press gear in until it bottoms on shoulder.

5. A new pin hole must be drilled through sleeve and gear. Locate hole position 90 degrees from existing hole, center punch and then, while supporting governor in press, drill new hole through sleeve and gear using a standard (1/8 inch) drill.

6. Install split retaining pin.

7. Wash governor assembly thoroughly to remove any chips that may have collected.

Assembly

1. Install governor valve in bore of governor sleeve, large end first.

2. Install governor weights and springs, and thrust cap on governor sleeve.

3. Align pin holes in thrust cap, governor weight assemblies and governor sleeve, and install new pins. Crimp both ends of pins to prevent them from falling out.

4. Check governor weight assemblies for free operation on pins.

5. Check governor valve for free movement in governor sleeve.

Front Servo Parts Inspection

NOTE: See Fig. 7A-61C. Do not remove the teflon oil seal ring from the front servo piston unless the oil seal ring requires replacement. For service, the oil seal ring is aluminum.

1. Inspect servo pin for damage.
2. Inspect piston and oil ring for damage.
3. Check fit of servo pin in piston and case bore.



Fig. 7A-62C--Removing Rear Accumulator Piston from Rear Servo Piston

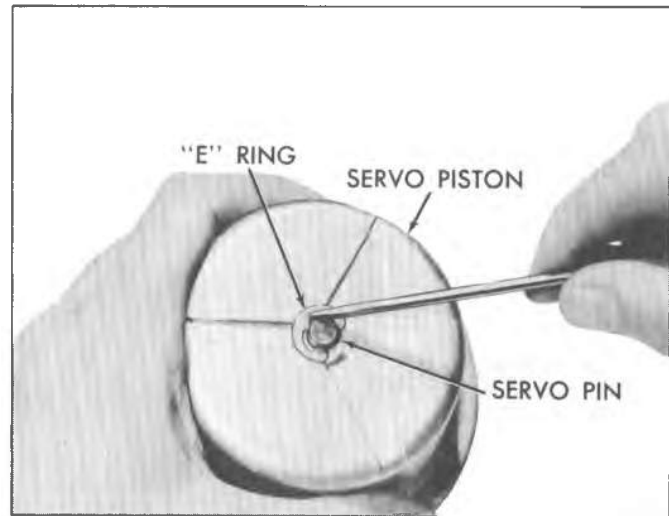


Fig. 7A-63C--Removing Retaining "E" Ring from Rear Servo Pin

Rear Servo Assembly

Disassembly

1. Remove rear accumulator piston from rear servo piston (Fig. 7A-62C-A).
2. Remove "E" ring retaining rear servo piston to servo pin (Fig. 7A-63C).
3. Remove rear servo piston and seal from servo pin (Fig. 7A-64C). (Exploded view.)
4. Remove washer, spring, and spring retainer.

Inspection

NOTE: See Fig. 7A-64C. Do not remove the teflon oil seal rings from the rear accumulator piston, unless the oil seal rings require replacement. If the teflon inner oil seal ring (small diameter) requires replacement, for service, use the aluminum oil seal ring.

The rear accumulator piston, large diameter ring groove depth, is machined shallower to take the large teflon oil seal ring. If this ring requires replacement use only the teflon oil seal ring.

1. Inspect freedom of accumulator rings in piston grooves.
2. Inspect fit of servo pin in servo piston in case bore.
3. Inspect servo pin for scores or cracks.
4. Inspect accumulator and servo pistons for scoring, cracks or porosity.

Assembly

1. Install spring retainer cup side down, spring and washer on servo pin.
2. Install servo pin, retainer, spring and washer, into bore of servo piston and secure with "E" ring.
3. Install oil seal ring on servo piston, if removed.
4. Install outer and inner oil rings on accumulator piston, if removed, and assemble into bore of servo piston.

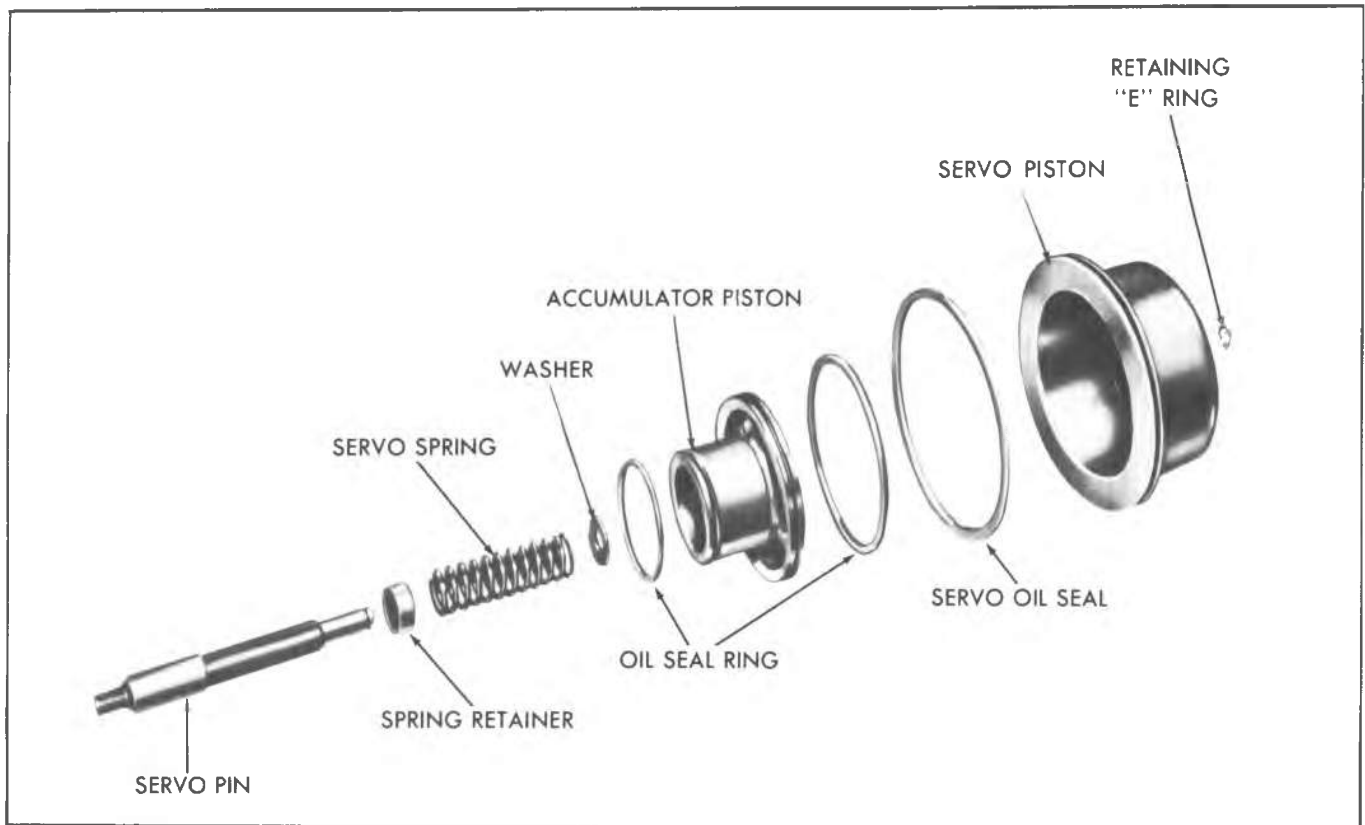


Fig. 7A-64C--Rear Servo and Accumulator Assembly--Exploded View

CONTROL VALVE, DISASSEMBLY, INSPECTION AND RE-ASSEMBLY (Fig. 7A-67C)

Disassembly

1. Position control valve assembly with cored face up and accumulator pocket nearest operator.
2. Remove manual valve from upper bore.
3. Install Special Tools J-22269 and J-24675, on accumulator piston and remove retaining ring (Fig. 7A-65C).



Fig. 7A-65C--Installing Compressor Tool to Front Accumulator Piston

4. Remove front accumulator piston and spring (Fig. 7A-66C).

5. On the right side adjacent to the manual valve, remove the 1-2 valve train as follows:

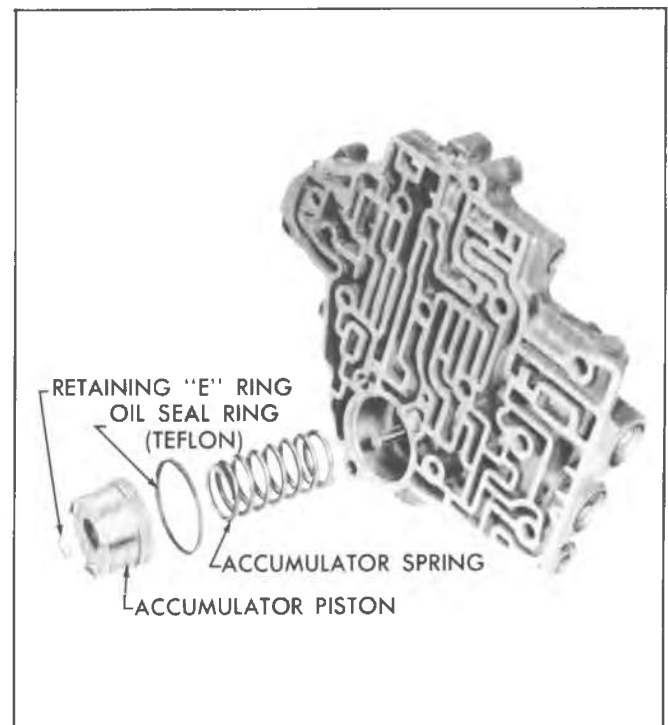


Fig. 7A-66C--Front Accumulator Assembly - Exploded View

a. (Models CG, CJ and CP) Remove retaining pin, 1-2 modulator bushing, 1-2 valve spring, 1-2 modulator valve, and 1-2 shift valve.

b. (All other models) Remove retaining pin, 1-2 modulator bushing, 1-2 regulator valve, 1-2 regulator spring, 1-2 detent valve and 1-2 shift valve.

6. From next bore down, remove retaining pin, 2-3 shift valve spring, 2-3 modulator valve bushing, 2-3 modulator valve, 3-2 intermediate spring, and 2-3 shift valve.

7. From next bore down remove retaining pin, bore plug, spring, spacer, and 3-2 valve.

8. At other end of assembly, top bore, remove retaining pin and bore plug, detent valve, detent regulator valve, spring and spacer.

9. From the next bore down, remove the 1-2 accumulator valve train as follows:

a. (Model CP) Remove the grooved retaining pin, bore

plug, 1-2 accumulator valve and spring.

b. (Models CB, CG, CJ, CL and CS) Remove the grooved retaining pin, bore plug, 1-2 accumulator valve.

c. (Models CF, CM and CT) Remove the grooved retaining pin, bore plug, 1-2 accumulator secondary spring and 1-2 accumulator valve.

Inspection

NOTE: See Fig. 7A-66C. Do not remove the teflon oil seal ring from the front accumulator piston unless the oil seal ring requires replacement. For service, the oil seal ring is cast iron.

1. Inspect all valves for scoring, cracks and free movement in their respective bores.

2. Inspect bushings for cracks, scratches or distortion.

3. Inspect body for cracks, or scored bores.

4. Check all springs for distortion or collapsed coils.

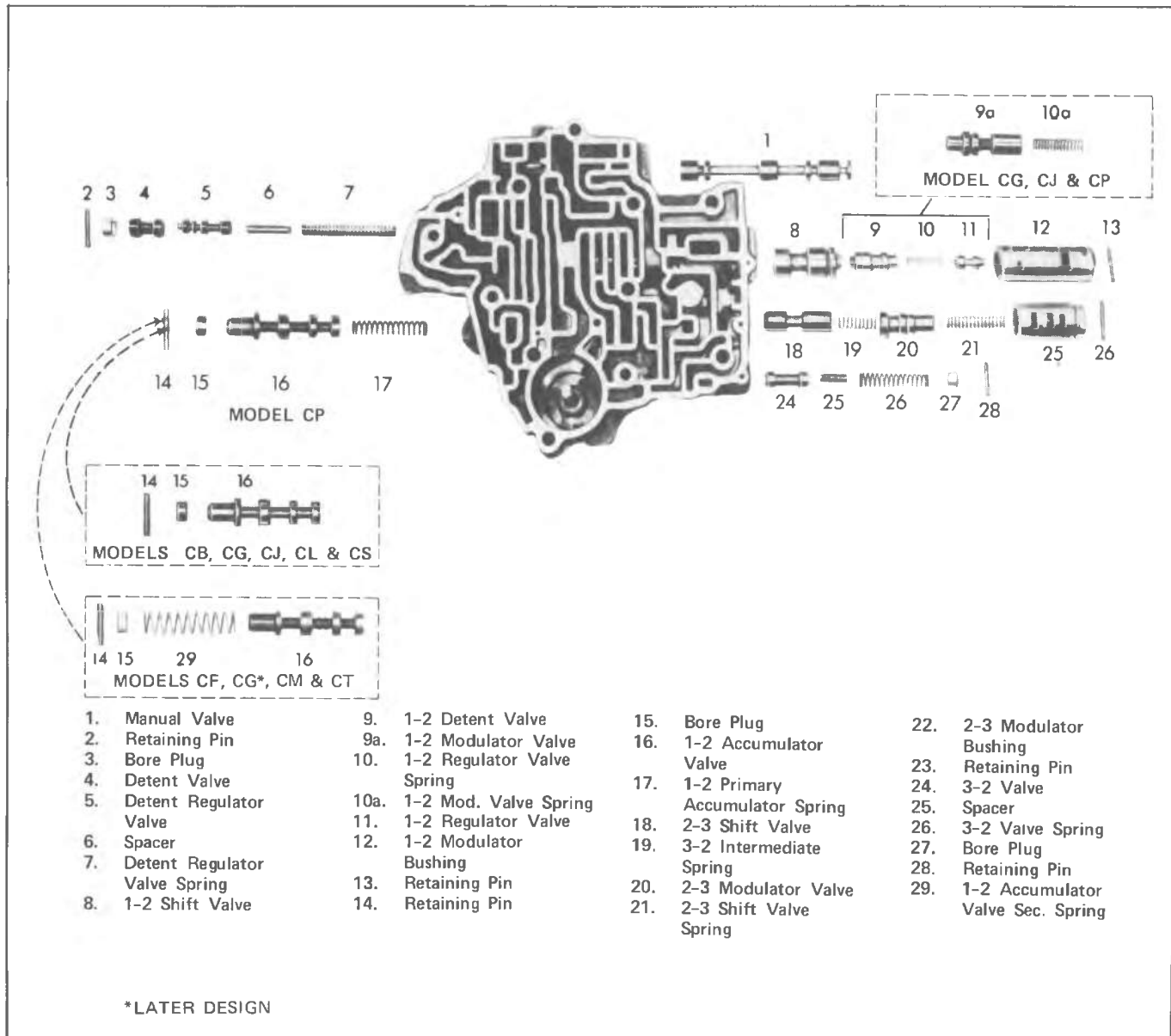


Fig. 7A-67C--Control Valve Assembly--Exploded View

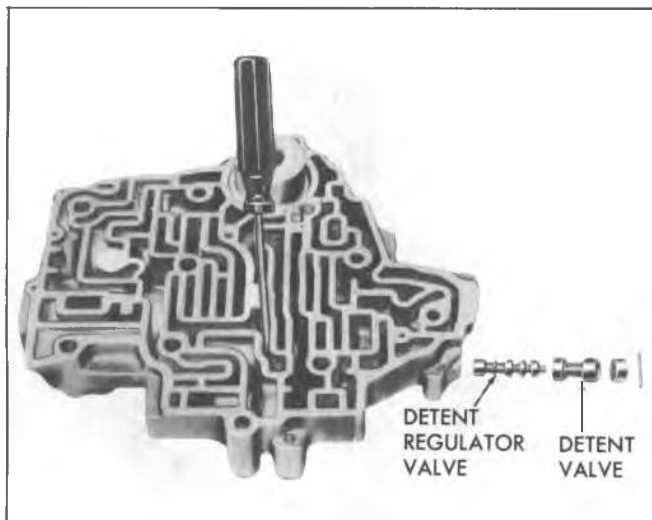


Fig. 7A-68C--Installing Detent Regulator Valve and Detent Valve

5. Inspect accumulator piston and oil seal ring for damage.

Reassembly

1. Install front accumulator spring and piston into valve body.
2. Install Special Tools J-22269 and J-24675 and compress spring and piston and secure with retaining "E" ring.
3. Install the 1-2 accumulator valve train into the lower left hand bore as follows:
 - a. (Model CP) Install the 1-2 accumulator spring and 1-2 accumulator valve, stem end out, into bore. Place the bore plug into valve bore and install grooved retaining pin from the cast surface side of the valve body, with the grooves entering the pin hole last. Tap pin with a hammer until flush with cast surface of valve body.
 - b. (Models CB,CG (early design),CJ,CL and CS) Install 1-2 accumulator valve stem end out, into bore. Place bore plug into valve bore and install grooved retaining pin from cast surface side of the valve body, with the groove entering the pin holes last. Tap pin with a hammer until flush with cast surface of valve body.

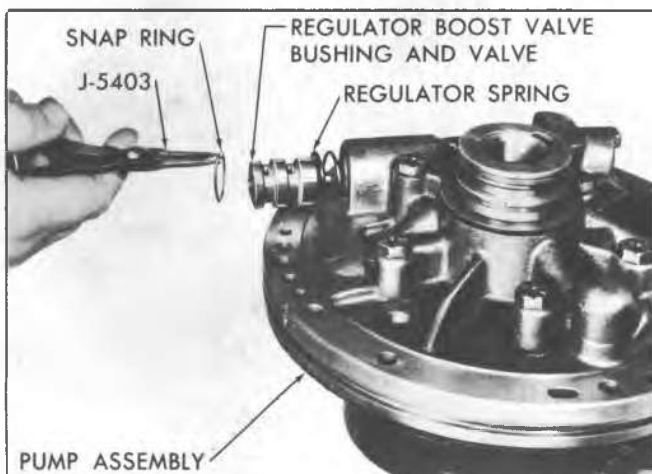


Fig. 7A-69C--Removing Pump Regulator Valve Snap Ring

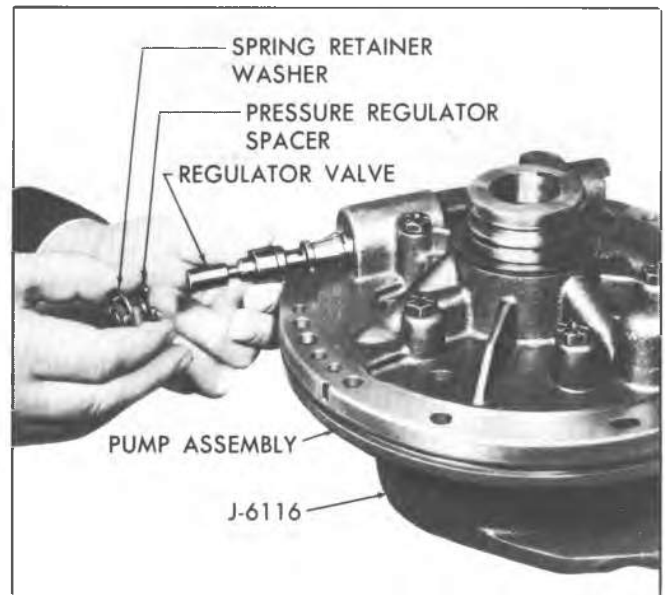


Fig. 7A-70C--Removing Pressure Regulator Valve

- c. (Models CF, CG (later design), CM and CT) Install the 1-2 accumulator valve, stem end out, and 1-2 accumulator secondary spring. Install the bore plug and compress spring until grooved retaining pin can be inserted from the cast surface side of the valve body. Install retaining pin with the grooved end entering the pin hole last and tap in place until flush with cast surface of the valve body.
4. In next bore up, install detent spring and spacer. Compress spring and secure with small screwdriver (Fig. 7A-68C).
5. Install detent regulator valve, wide land first.
6. Install detent valve, narrow land first.
7. Install bore plug (hole out), depress spring by pressing in on plug, install retaining pin, and remove screwdriver.
8. In lower right hand bore, install 3-2 valve.
9. Install 3-2 spring, spacer, bore plug (hole out) and

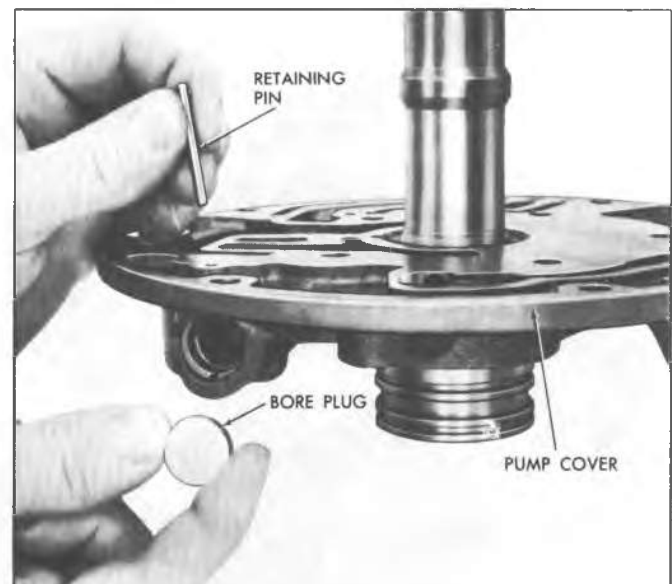


Fig. 7A-71C--Installing Pressure Regulator Retaining Pin and Bore Plug

retaining pin.

10. In next bore up, install the 2-3 shift valve, open end out, into the bore and install 3-2 intermediate spring.

11. Install 2-3 modulator valve into bushing and install both parts into valve body bore.

12. Install 2-3 valve spring and retaining pin.

13. In next bore up, install 1-2 valve, stem end out.

14. Install parts as follows:

a. (Models CG, CJ and CP) Install the 1-2 valve spring and 1-2 modulator valve into the 1-2 modulator bushing, aligning the spring in the bore of the modulator valve. Install parts into the valve body bore.

b. (All other models) Install the 1-2 regulator valve, regulator spring and 1-2 detent valve open hole first into the 1-2 modulator bushing, aligning the spring in the bore of the detent valve.

15. Compress bushing against spring and install retaining pin.

16. Install manual valve with detent pin groove to the right.

Oil Pump Disassembly, Inspection and Assembly

Disassembly

1. Place oil pump assembly in hole in bench or holding fixture, J-6116 with J-21364 adapter.

2. Compress regulator boost valve bushing against pressure regulator spring and remove snap ring, using J-5403 pliers (Fig. 7A-69C).

3. Remove regulator boost valve bushing and valve.

4. Remove pressure regulator spring.

5. Remove regulator valve, spring retainer and spacer(s), if present (Fig. 7A-70C).

6. Remove pump cover to body attaching bolts.

7. Remove pump cover from body.

8. Remove retaining pin and bore plug from pressure regulator bore (Fig. 7A-71C).

9. Remove hook type oil rings from pump cover.

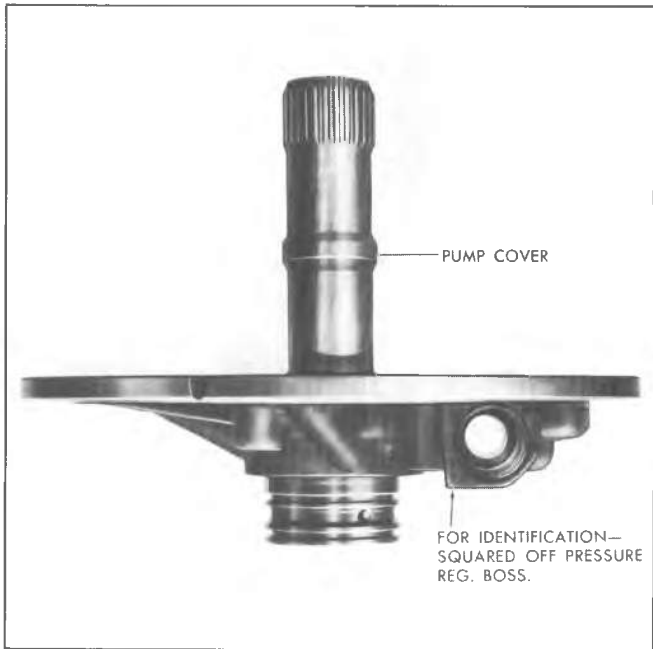


Fig. 7A-73C--Pressure Regulator Valve Identification

10. Remove pump to forward clutch housing selective washer.

11. Mark drive and driven gears for reassembly in same position and remove from the pump body. See Fig. 7A-72C.

Inspection of Pump Body and Pump Cover

NOTE: A solid type pressure regulator valve must only be used in a pump cover with a squared off pressure regulator boss. See Fig. 7A-73C. A pressure regulator valve with oil holes and orifice cup plug may be used to service either type pump cover.

1. Inspect drive and driven gear pocket and crescent for

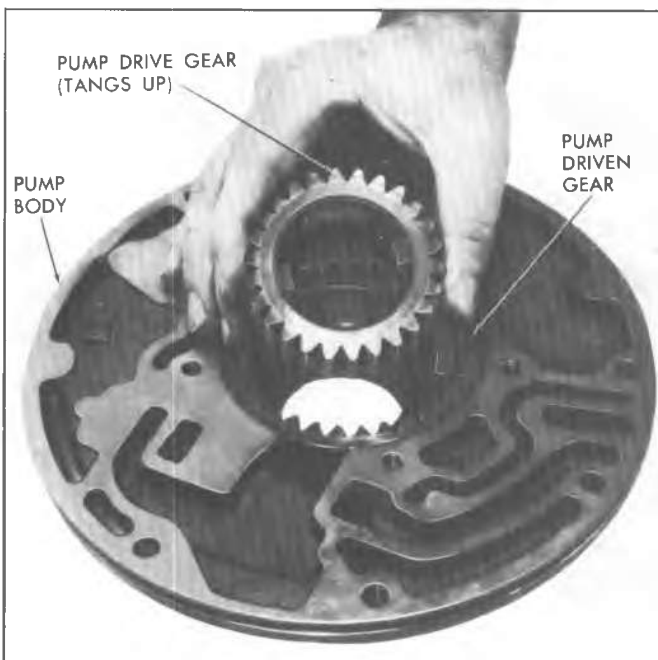


Fig. 7A-72C--Installing Pump Drive Gear



Fig. 7A-74C--Checking Pump Body Face to Gear Face Clearance

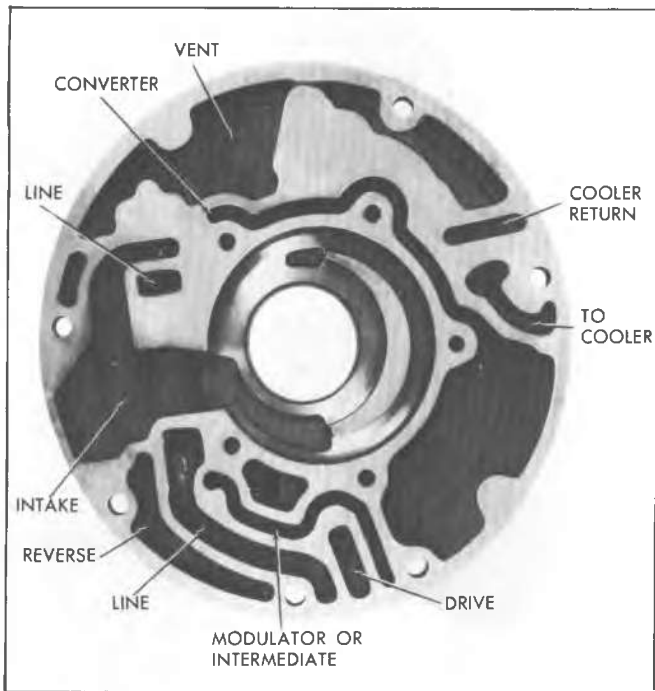


Fig. 7A-75C--Pump Body Oil Passages

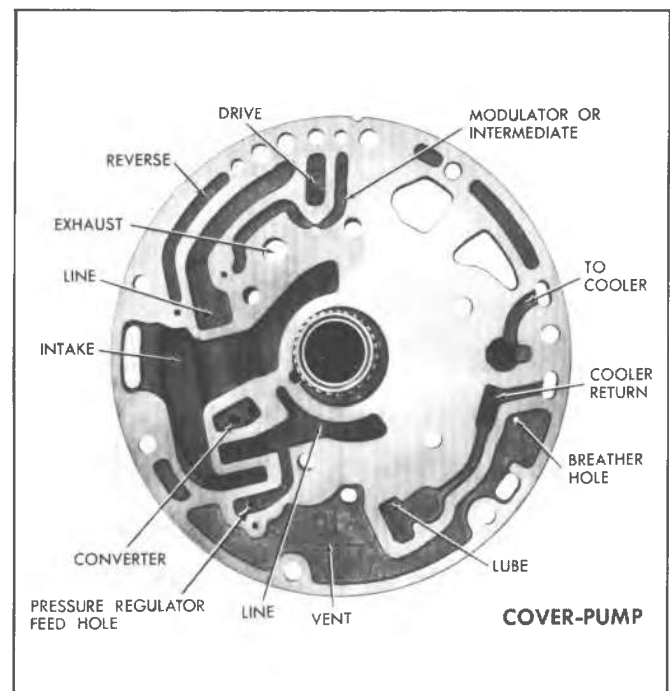


Fig. 7A-76C--Pump Cover Oil Passages

scoring, galling or other damage.

2. Place pump gears in pump body and check pump body face to gear face clearance (should be .0008" - .0035") (Fig. 7A-74C).

3. Check face of pump body for scores or nicks.

4. Check oil passages (Fig. 7A-75C).

5. Check for damaged cover bolt attaching threads.

6. Check for overall flatness of pump body face.

7. Check bushing for scores or nicks. If replacement is necessary, proceed as follows:

a. Using Tool J-21465-17 and driver Handle J-8092 remove bushing.

b. From front side of pump, using J-21465-17 and driver Handle J-8092 install new bushing flush to .010" below gear pocket face.

8. Inspect pump attaching bolt seals for damage, replace if necessary.

9. Inspect pump cover face for overall flatness.

10. Check for scores or chips in pressure regulator bore.

11. Check that all passages are open and not interconnected (Fig. 7A-76C).

12. Check for scoring or damage at pump gear face.

13. Inspect stator shaft for damaged splines, or scored bushings. If replacement of bushing is necessary proceed as follows:

Front

a. With pump cover and stator shaft properly supported, using Tool J-21465-15, with slide hammer tool J-2619, and adapter Tool J-2619-4 remove bushing.

b. Using Tool J-21465-3 with Driver Handle J-8092 press or drive replacement bushing into place until tool bottoms.

Rear

c. With pump and stator shaft properly supported, using

Tool J-21465-15, with slide hammer Tool J-2619 and adapter tool J-2619-4, remove bushing.

d. Using Tool J-21465-2 with Driver Handle J-8092, pressor drive replacement bushing into place until tool bottoms.

14. Inspect oil ring grooves for damage or wear.

15. Inspect selective washer thrust face for wear or damage.

16. Inspect pressure regulator and boost valve for free operation in their respective bores.

17. Inspect pump cover for open 1/8" breather hole (Fig. 7A-76C).

Assembly

1. Install drive and driven pump gears with alignment marks up into pump body (Fig. 7A-72C) drive gear tangs up.

2. Protect stator shaft and install pump cover in vise.

3. Install spacer(s) if used, retainer and spring, into pressure regulator bore (Fig. 7A-77C).

4. Install pressure regulator valve from opposite end of bore, stem end first.

5. Install boost valve into bushing, stem end out, and install both parts into pump cover by compressing bushing against spring.

6. Install retaining snap ring.

7. Install pressure regulator valve bore plug and retaining pin into opposite end of bore.

8. Install previously selected front unit selective thrust washer over pump cover delivery sleeve.

9. Install two (2) hook type oil seal rings.

10. Assemble pump cover to pump body with attaching bolts (Fig. 7A-78C).

NOTE: Leave bolts one turn loose at this time.

11. To align the pump body and cover, place the pump

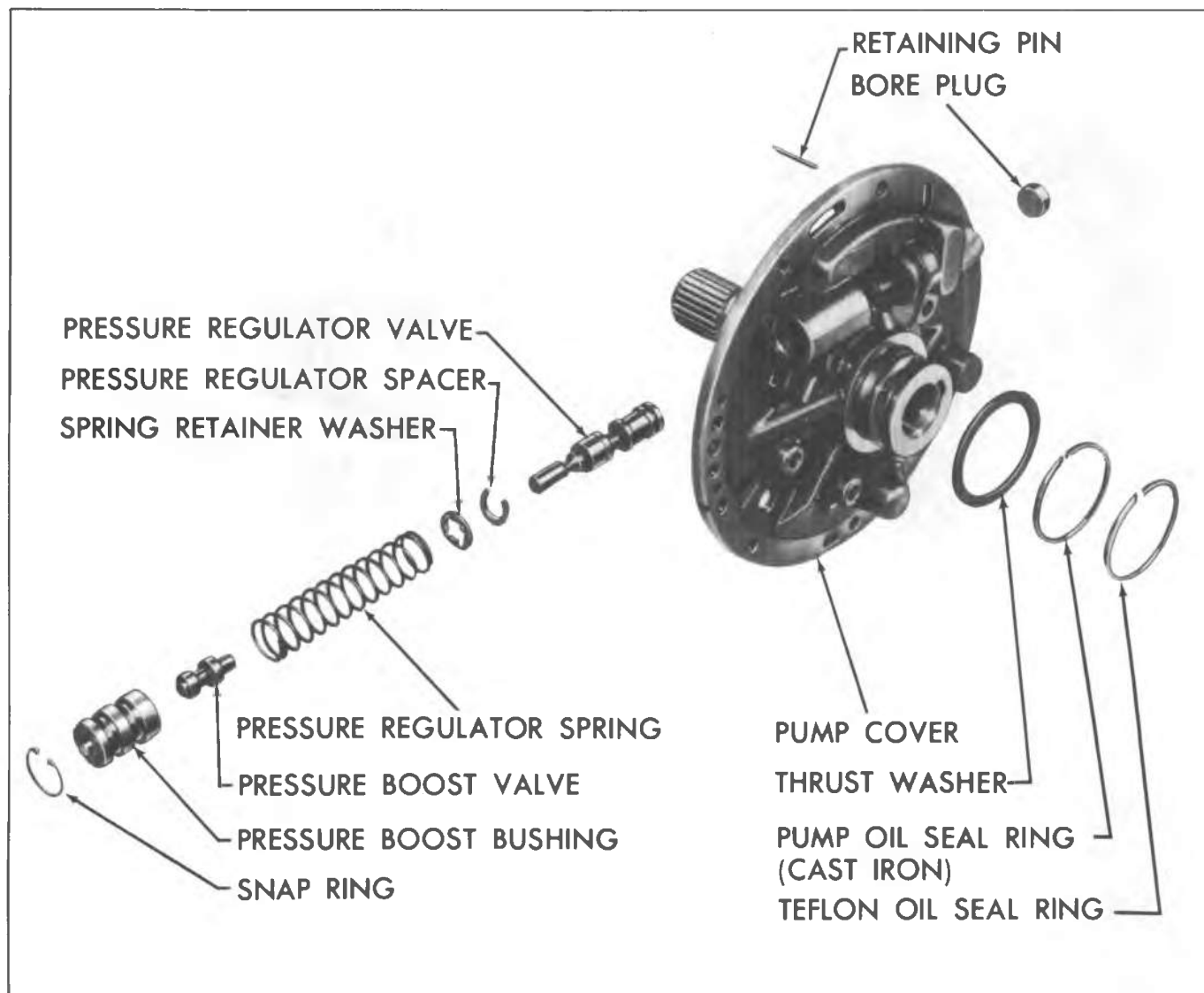


Fig. 7A-77C--Pump Cover--Exploded View

assembly, less rubber seal ring, upside down into the pump bore of the case (Fig. 7A-79C).

12. Tighten pump cover bolts to 18 foot pounds. Remove pump assembly from case bore.

13. Install pump to case "O" ring seal.

FORWARD CLUTCH DISASSEMBLY, INSPECTION AND ASSEMBLY

Disassembly

1. Place forward clutch assembly with turbine shaft through hole in bench or Holding Fixture J-6116, and remove

forward clutch housing to direct clutch hub snap ring (Fig. 7A-80C).

2. Remove direct clutch hub.

3. Remove forward clutch hub and thrust washers (Fig. 7A-81C).

4. Remove composition, steel clutch plates, and waved steel plate.

NOTE: Models CL and CS do not use a waved steel plate.

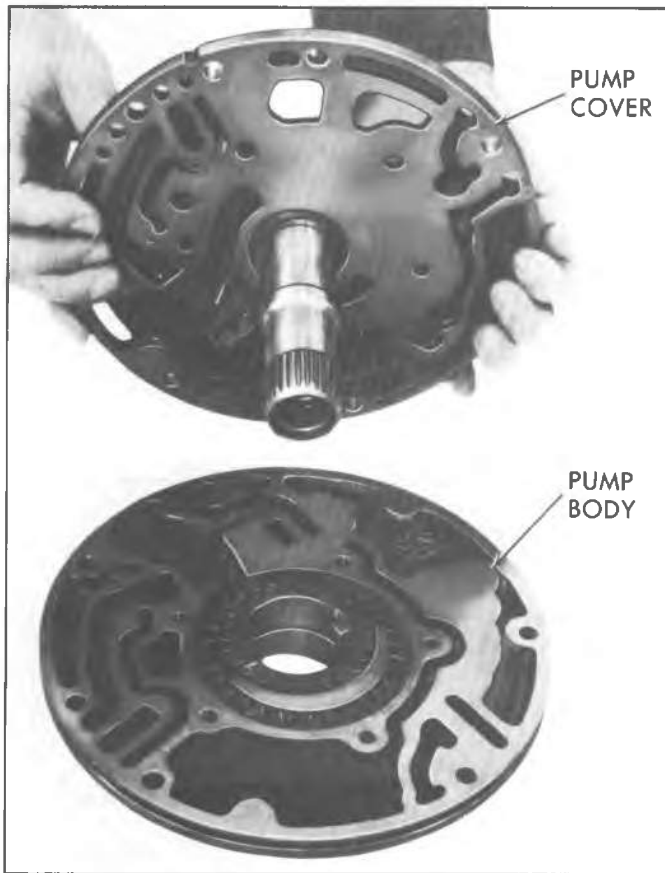


Fig. 7A-78C--Aligning Pump, Cover to Pump Body

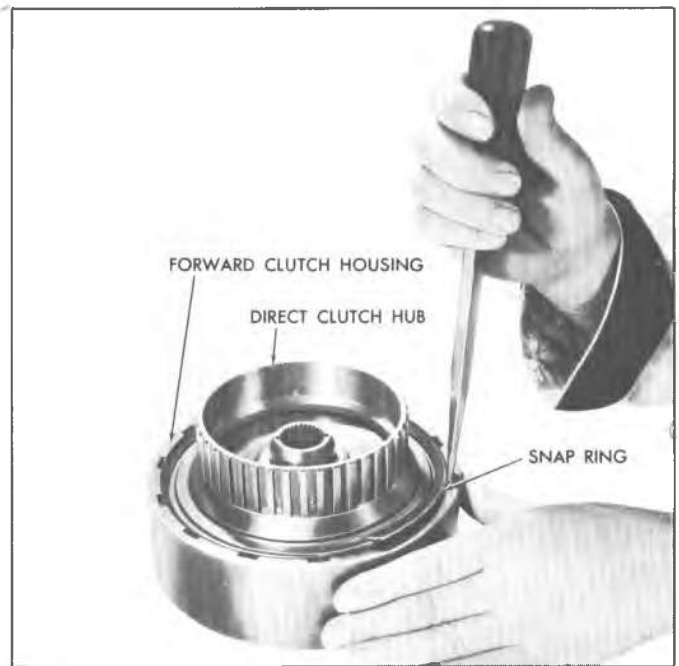


Fig. 7A-80C--Removing Forward Clutch Housing to Direct Clutch Hub Snap Ring

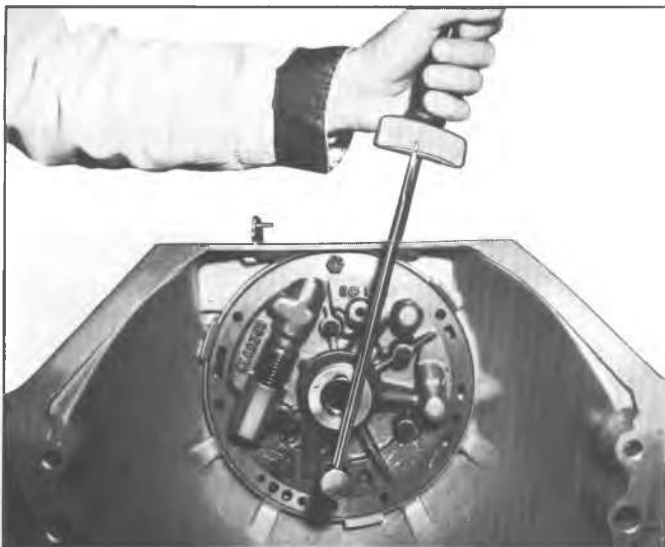


Fig. 7A-79C--Installing Pump Cover to Pump Body

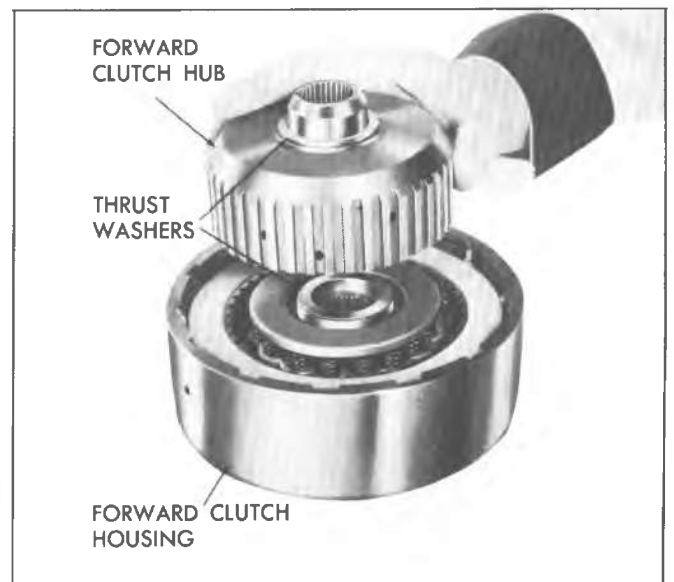


Fig. 7A-81C--Removing Forward Clutch Hub and Thrust Washers

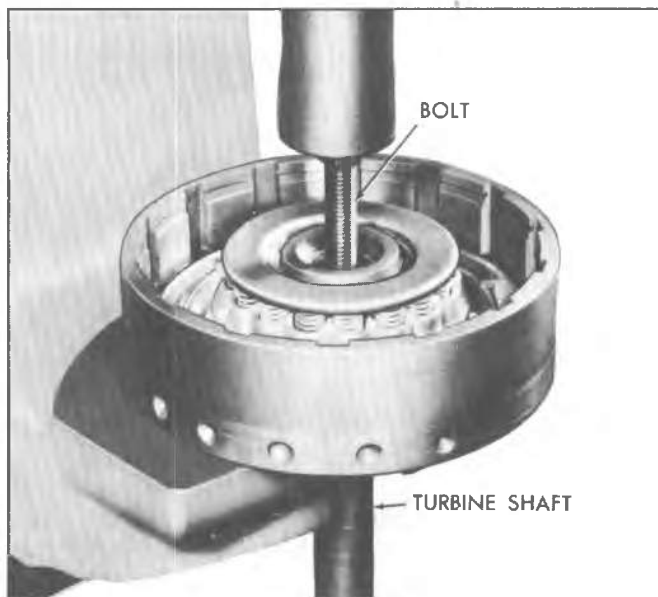


Fig. 7A-82C--Removing Turbine Shaft from Forward Clutch Housing

5. If necessary place forward clutch and turbine shaft in arbor press and remove turbine shaft (Fig. 7A-82C).

6. Using J-4670 clutch spring compressor in arbor press with Adapter J-21664, compress spring retainer and remove snap ring (Fig. 7A-83C).

7. Remove spring retainer and sixteen (16) clutch release springs.

NOTE: Keep springs separate from direct clutch release springs.

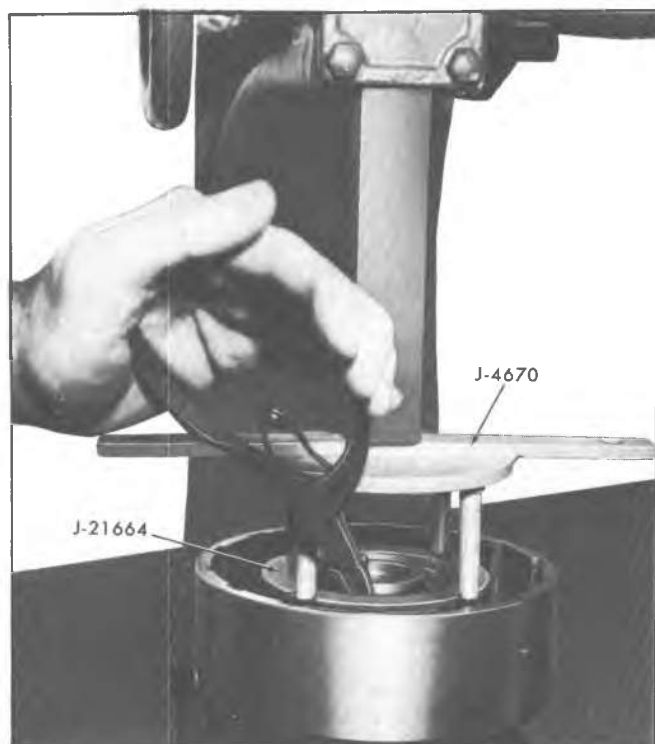


Fig. 7A-83C--Removing Forward Clutch Spring Retaining Snap Ring



Fig. 7A-84C--Removing Forward Clutch Piston Outer Seal

8. Remove forward clutch piston.

9. Remove inner and outer clutch piston seals (Fig. 7A-84C).

10. Remove center piston seal from forward clutch housing (Fig. 7A-85C).

Inspection

1. Inspect composition-faced and steel clutch plates for signs of burning, scoring or wear.

2. Inspect sixteen (16) springs for collapsed coils or signs of distortion.

3. Inspect clutch hubs for worn splines, proper lubrication holes or scored thrust faces.

4. Inspect piston for cracks.

5. Inspect clutch housing for wear, scoring, open oil passages and free operation of ball check.

6. Inspect turbine shaft.

a. Inspect for open lubrication passages at each end.

b. Inspect splines for damage.

c. Inspect ground bushing journals for damage.

d. Inspect shaft for cracks or distortion.



Fig. 7A-85C--Removing Forward Clutch Center Seal

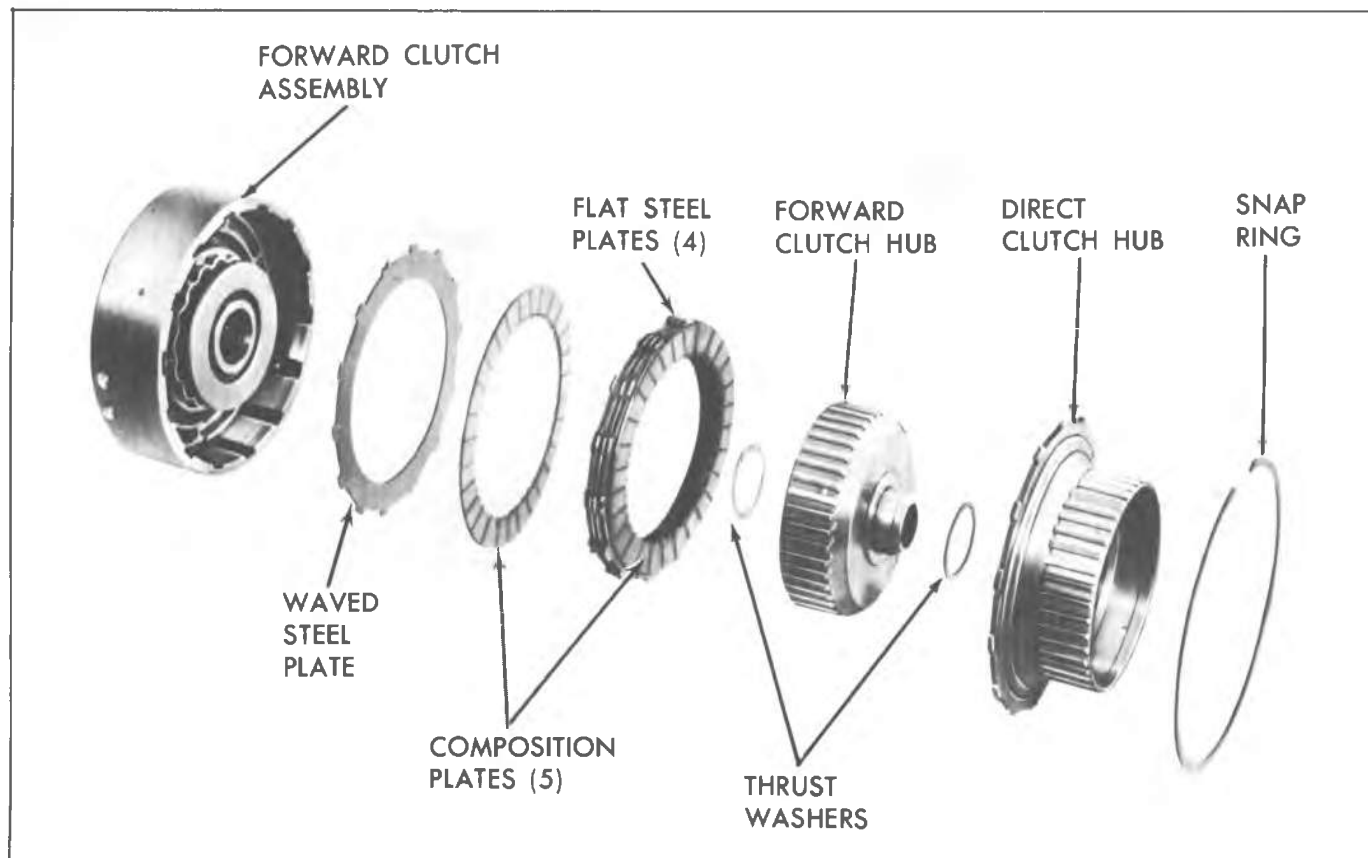


Fig. 7A-86C--Forward Clutch Assembly--Exploded View

NOTE: Turbine shaft and clutch housing are serviced separately. Shaft may be removed from housing by using a suitable size socket in an arbor press (Fig. 7A-82C).

Assembly (Fig. 7A-86C)

NOTE: The Turbo Hydra-Matic forward and direct clutch pistons have identical inside and outside diameters. It is possible to reverse the pistons during reassembly, therefore, care should be exercised to make

certain the proper piston be installed in the clutch assemblies, as shown in Figure 7A-102C.

1. Place new inner and outer oil seals on clutch piston, lips face away from spring pockets (Fig. 7A-84C).

2. Place a new center seal on clutch housing, lip faces up (Fig. 7A-85C).

NOTE: Apply automatic transmission oil to all seals and clutch plates.

3. Place seal protector Tool J-21362, over clutch hub and install outer clutch piston seal Protector J-21409, into clutch drum and install piston, rotating piston on drum until seated (Fig. 7A-87C).

4. Install sixteen (16) clutch release springs into pockets in piston.

5. Place spring retainer and snap ring on springs.

6. Compress springs in arbor press, using clutch compressor Tools J-4670 and J-21664, install snap ring.

7. If removed, install turbine shaft in forward clutch housing, using arbor press.

8. Install forward clutch hub washers on forward clutch hub. Retain with petrolatum.

9. Place forward clutch hub into forward clutch housing.

10. Oil and install five (5) composition, and four (4) flat steel and one (1) waved steel clutch plate (with "U" notches), starting with waved steel and then alternating composition and steel clutch plates, as shown in Fig. 7A-88C.

NOTE: Models CL and CS do not use a waved steel clutch plate.

The model "CL" forward clutch composition-faced

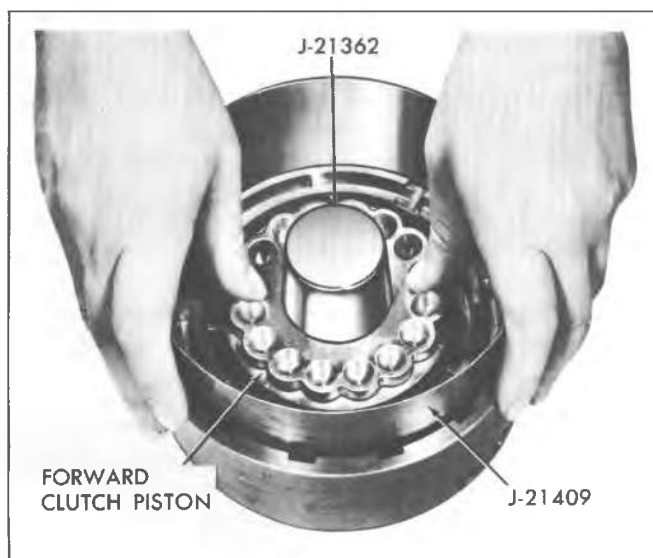


Fig. 7A-87C--Installing Forward Clutch Piston

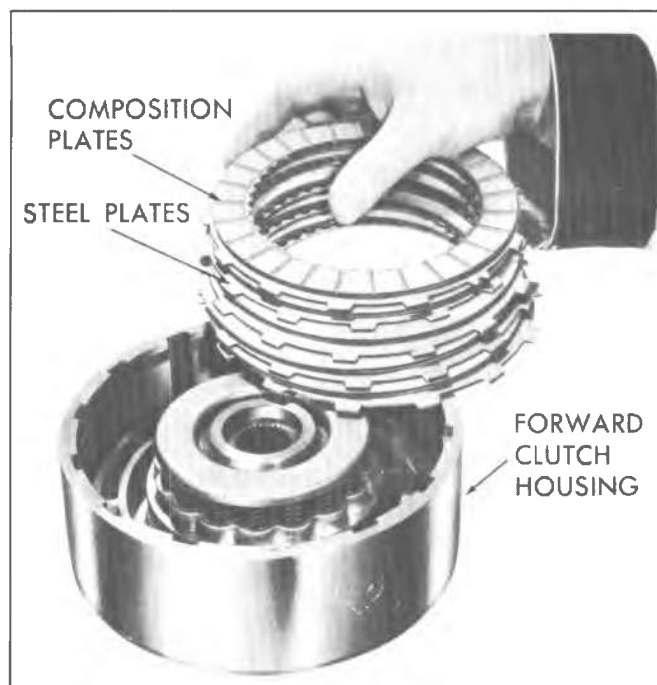


Fig. 7A-88C--Installing Forward Clutch Composition and Steel Plates

plates are different from the other models. Refer to parts catalog book for correct usage.

CAUTION: Do not confuse the flat steel clutch plate (plate with "V" notch) with the waved steel clutch plate (plate with "U" notch).

NOTE: Radially grooved composition clutch plates are installed at the factory only. All service composition plates have the smooth surface configuration.



Fig. 7A-89C--Installing Forward Clutch Housing to Direct Clutch Hub Snap Ring



Fig. 7A-90C--Air Checking Forward Clutch Assembly

11. Install direct clutch hub and retaining snap ring (Fig. 7A-89C).

12. Place forward clutch housing on pump delivery sleeve and air check clutch operation (7A-90C).

DIRECT CLUTCH AND INTERMEDIATE ROLLER DISASSEMBLY, INSPECTION AND ASSEMBLY Disassembly (Fig. 7A-91C)

1. Remove intermediate roller assembly retainer snap ring and retainer (Fig. 7A-92C).

2. Remove roller outer race and roller assembly.

3. Turn unit over and remove backing plate to direct clutch housing snap ring (Fig. 7A-93C).

4. Remove direct clutch backing plate, composition plates, and steel clutch plates.

5. using clutch compressor Tool J-4670 and J-21664, compress spring retainer in arbor press and remove snap ring (Fig. 7A-94C).

6. Remove retainer and fourteen (14) piston release springs.

NOTE: Keep springs separate from forward clutch release springs.

7. Remove direct clutch piston (Fig. 7A-95C).

8. Remove outer seal from piston.

9. Remove inner seal from piston.

10. Remove center piston seal from direct clutch housing.

Inspection

1. Inspect roller assembly for popped or loose rollers.

2. Inspect inner cam and outer race for scratches or wear.

3. Inspect clutch housing for cracks, wear, proper opening of oil passages or wear on clutch plate drive lugs.

4. Inspect composition-faces and steel clutch plates for sign of wear or burning.

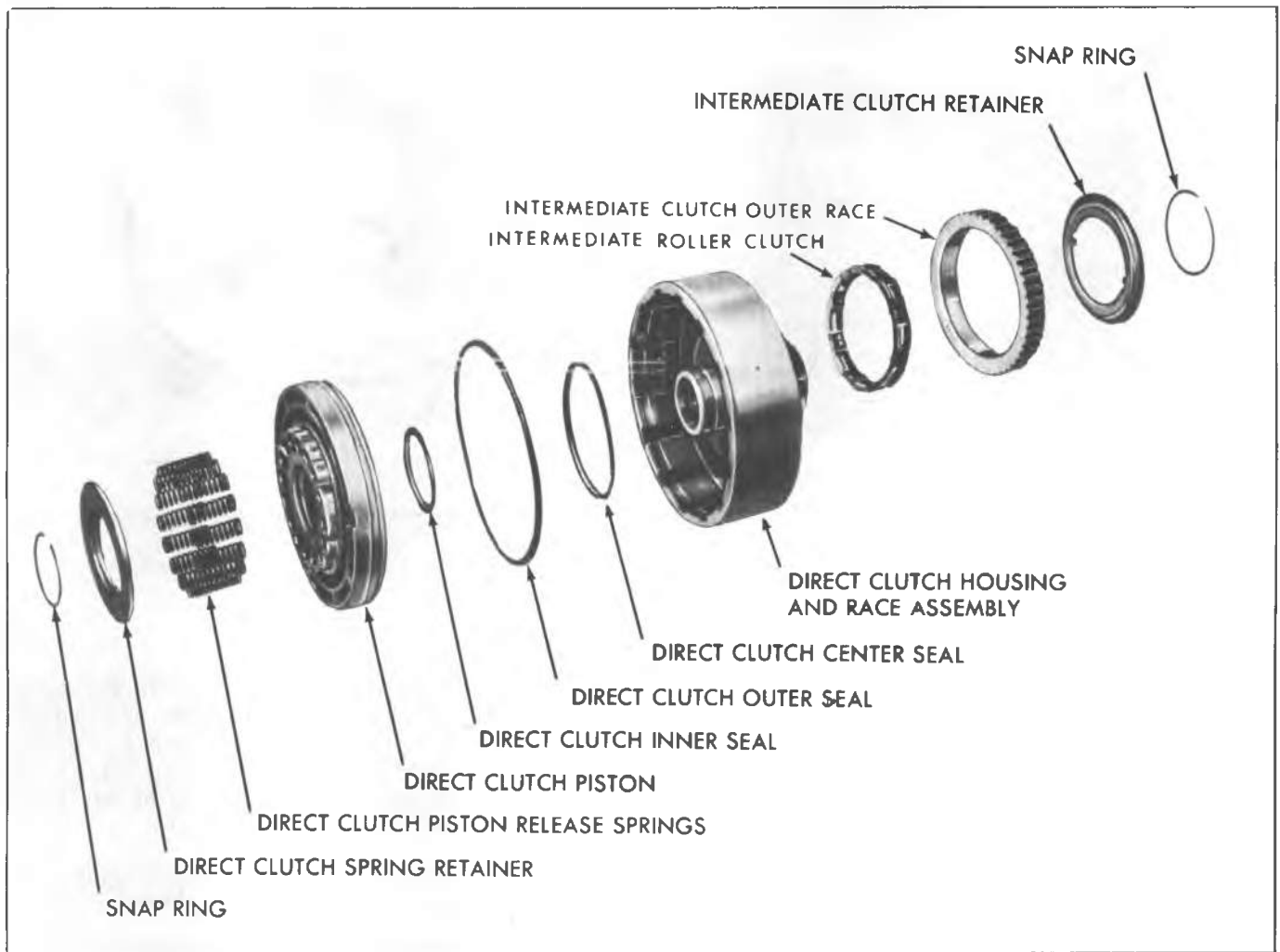


Fig. 7A-91C--Direct Clutch and Intermediate Roller Assembly

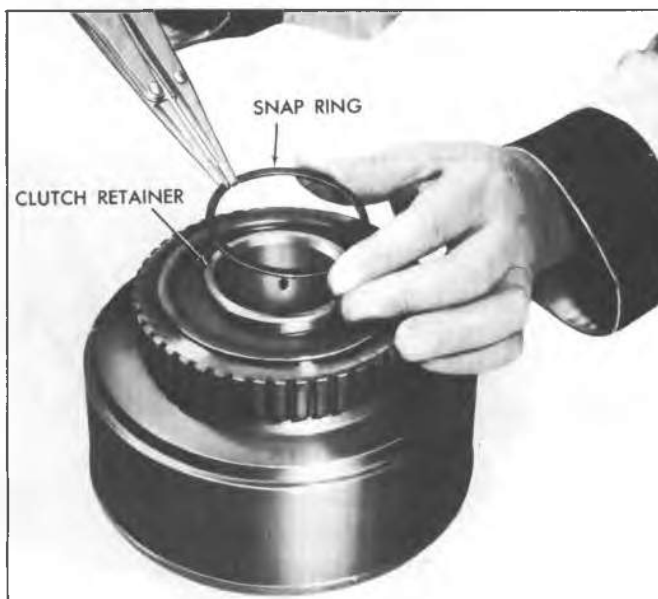


Fig. 7A-92C--Removing Intermediate Clutch Retainer Snap Ring

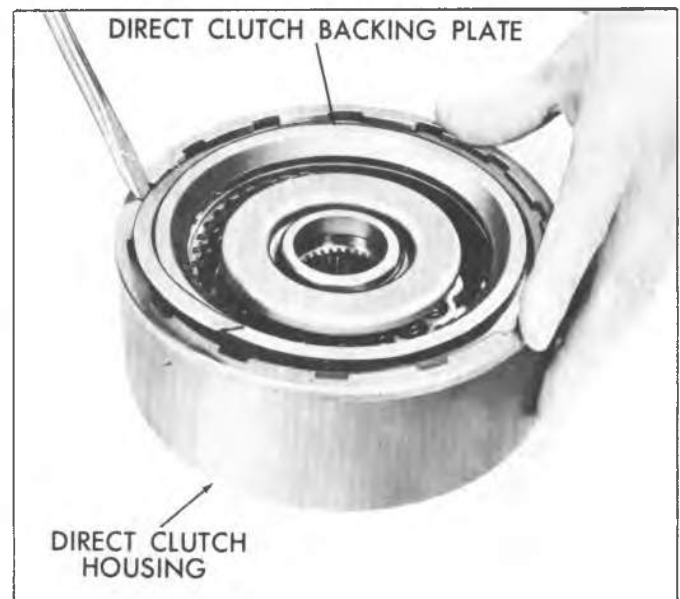


Fig. 7A-93C--Removing Direct Clutch Backing Plate Snap Ring



Fig. 7A-94C--Removing or Installing Direct Clutch Snap Ring

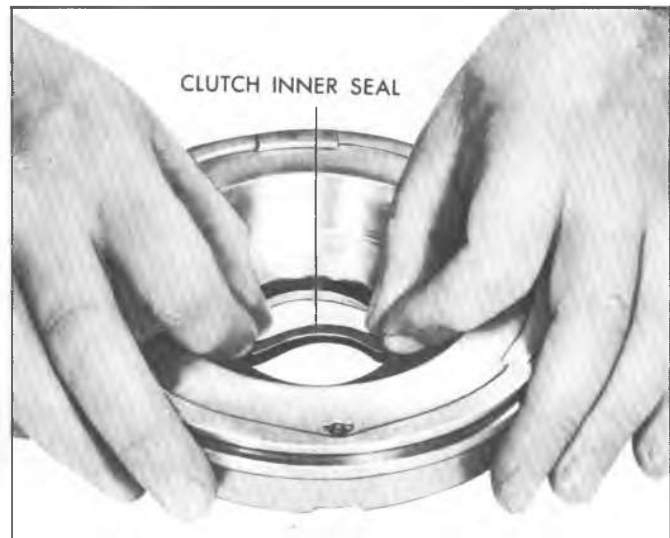


Fig. 7A-96C--Installing Direct Clutch Inner Seal

5. Inspect backing plate for scratches or other damage.
6. Inspect clutch piston for cracks.
7. Inspect fourteen (14) release springs for collapsed coils or signs of distortion.

NOTE: The 14 direct clutch release springs are not serviced. If one or more of these springs require replacement, discard all of them and install the 16 service direct clutch release springs.

8. Inspect housing for free operation of check ball.

Assembly

NOTE: The Turbo Hydra-Matic forward and direct clutch pistons have identical inside and outside diameters. It is possible to reverse the pistons during reassembly, therefore, care should be exercised to make certain the proper piston be installed in the clutch assemblies, as shown in Figure 7A-102C.

1. Install a new inner clutch piston seal on piston with lip facing away from spring pockets (Fig. 7A-96C).
2. Install a new outer clutch piston seal with lip facing away from spring pockets (Fig. 7A-97C).
3. Install a new center seal on clutch housing with lip of seal facing up (Fig. 7A-98C).

NOTE: Apply automatic transmission oil to all seals and clutch plates before installation.



Fig. 7A-95C--Removing Direct Clutch Piston Assembly

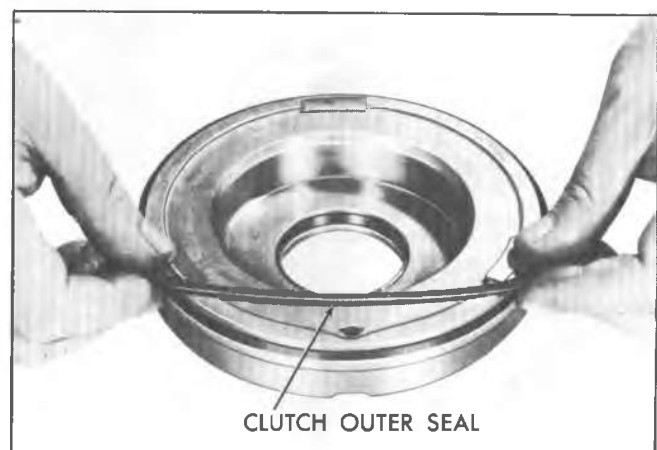


Fig. 7A-97C--Installing Direct Clutch Outer Seal

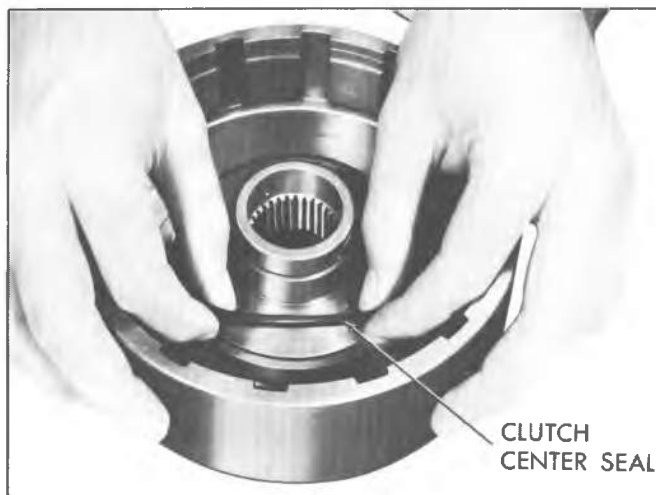


Fig. 7A-98C--Installing Direct Clutch Center Seal

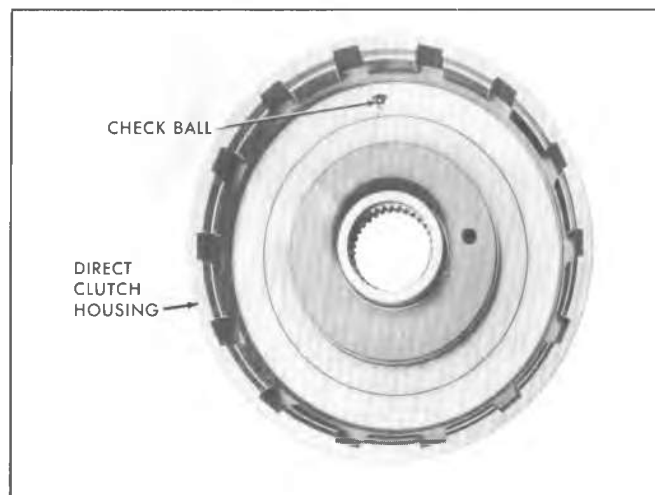


Fig. 7A-100C--Direct Clutch Housing with Check Ball

CAUTION: The direct clutch housing for models CB, CL and CS use the 6 plate clutch assembly.

This housing can be identified by the elimination of the inside diameter chamfer on the clutch plate end and/or a groove in the face at the base of the tower (Fig. 7A-99C). Should replacement of the direct clutch housing become necessary, extreme care must be taken in obtaining the correct part for the model involved.

Production built transmissions use a direct clutch housing with a check ball (See Fig. 7A-100C). If the housing requires replacement and the replacement housing does not contain a check ball, replace the direct clutch piston with the service piston which has a check ball (Models CL and CZ service piston has 2 check balls). **EITHER THE DIRECT CLUTCH HOUSING AND/OR THE PISTON MUST CONTAIN A CHECK BALL(S).**

4. Place seal protectors, Tools J-21362 Inner, J-21409

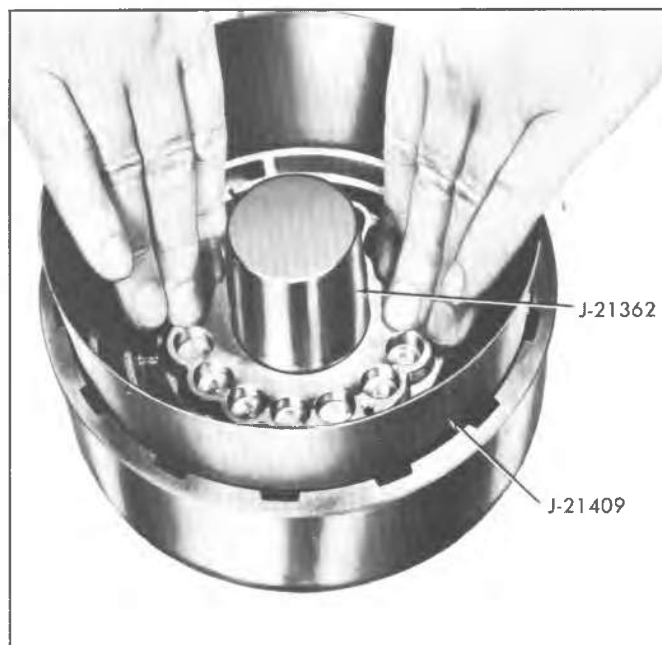


Fig. 7A-101C--Installing Direct Clutch Piston

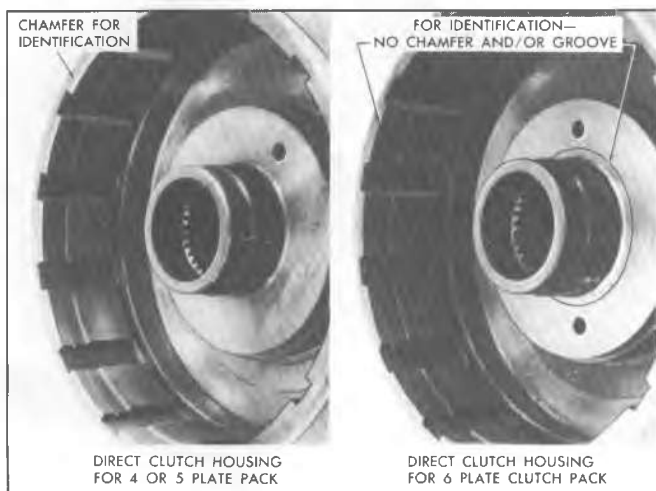


Fig. 7A-99C--Direct Clutch Housing Identification

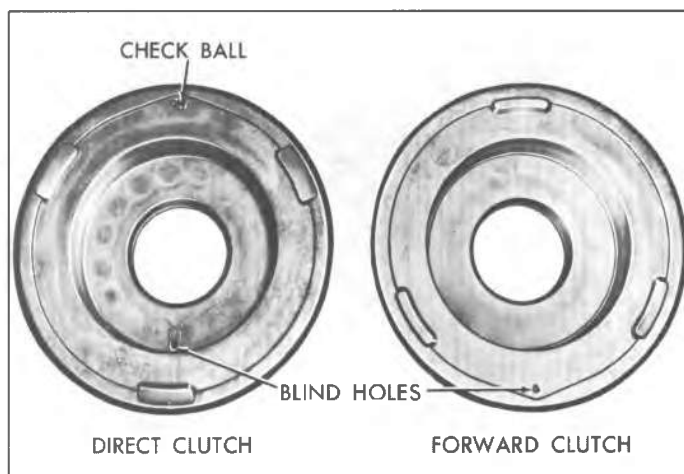


Fig. 7A-102C--Forward and Direct Clutch Piston Identification

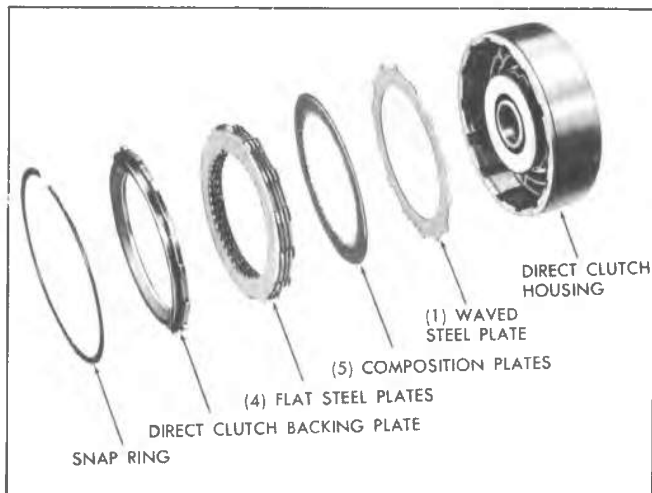


Fig. 7A-103C--Direct Clutch Assembly Exploded

Outer, over hub and clutch housing and install clutch piston, with a rotating motion (Fig. 7A-101C).

5. Install fourteen (14) springs into piston leaving two pockets diagonally opposite with no springs.

6. Place spring retainer and snap ring on retainer.

7. Using an arbor press and Tool J-4670, with J-21664, compress springs and install snap ring (Fig. 7A-94C):

8. Install direct clutch plates. See Fig. 7A-103C.

a. (Models CF, CG, CJ, CM, CP And CT) Oil and install five (5) composition and five (5) flat steel plates, starting with the steel plate and alternating composition clutch plates (Fig. 7A-104C).

b. (Models CB, CL and CS) Oil and install six (6) composition and six (6) flat steel plates, starting with a flat steel plate and alternating composition and flat steel clutch plates.

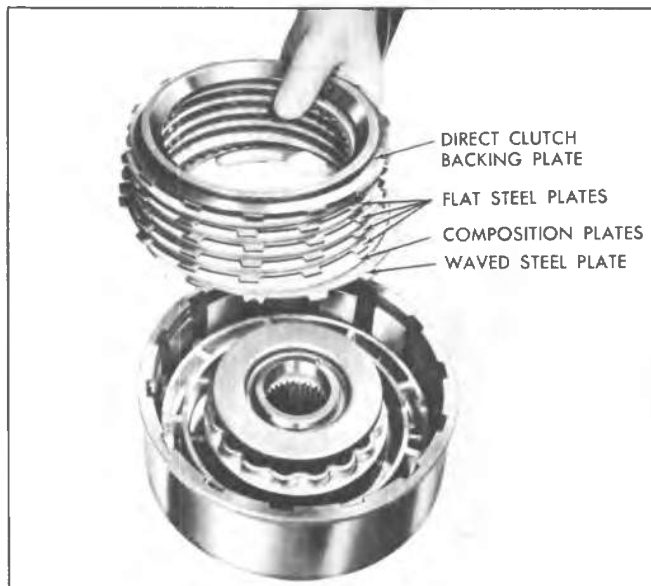


Fig. 7A-104C--Install Direct Clutch Backing Plate, Composition Plates, and Steel Plates

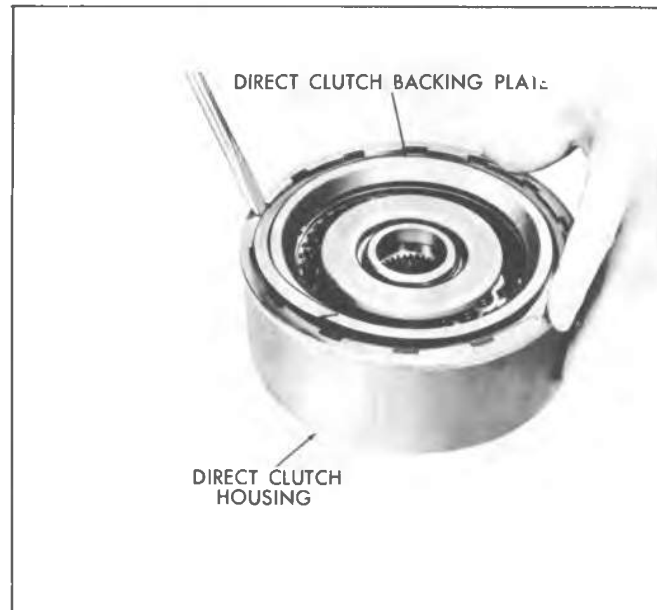


Fig. 7A-105C--Installing Direct Clutch Housing to Backing Plate Snap Ring

NOTE: Do not use radial grooved composition plates here.

9. Install clutch backing plate.

10. Install backing plate retaining snap ring (Fig. 7A-105C).

NOTE: Install rollers that may have come out of the roller cage by compressing the energizing spring with forefinger and inserting the roller from the outer side.

11. Turn unit over and install the intermediate clutch roller assembly onto the intermediate clutch inner cam (fig. 7A-106C).

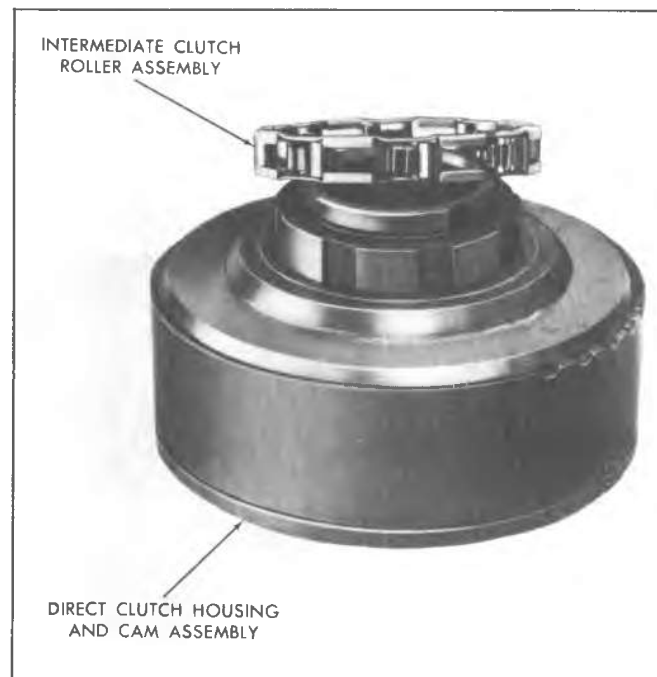


Fig. 7A-106C--Installing Intermediate Clutch Roller Assembly

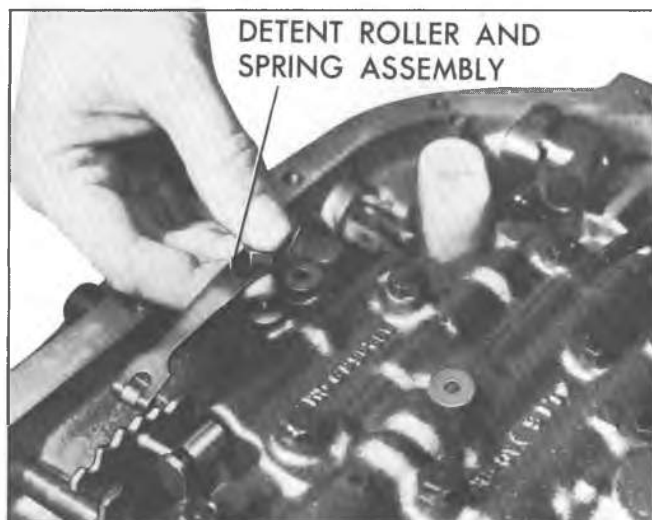


Fig. 7A-107C--Installing Intermediate Clutch Outer Race to Direct Clutch



Fig. 7A-109C--Installing Intermediate Clutch Retainer

12. Install the intermediate clutch outer race with a clock wise turning motion (fig. 7A-107C).

NOTE: Intermediate roller clutch is not released for the CL and CZ models. The sprag assembly is released for these models.

Outer race should not turn counter-clockwise after installation. (See Figure 7A-108C).

13. Install intermediate clutch retainer and snap ring

(Fig. 7A-109C and 7A-110C).

14. Place direct clutch assembly over center support and air check operation of direct clutch (Fig. 7A-111C).

NOTE: If air is applied through reverse passage, (right oil feed hole) it will escape from direct clutch passage (left oil feed hole). This is considered normal. Apply air through left oil feed hole to actuate piston and move direct clutch plates.

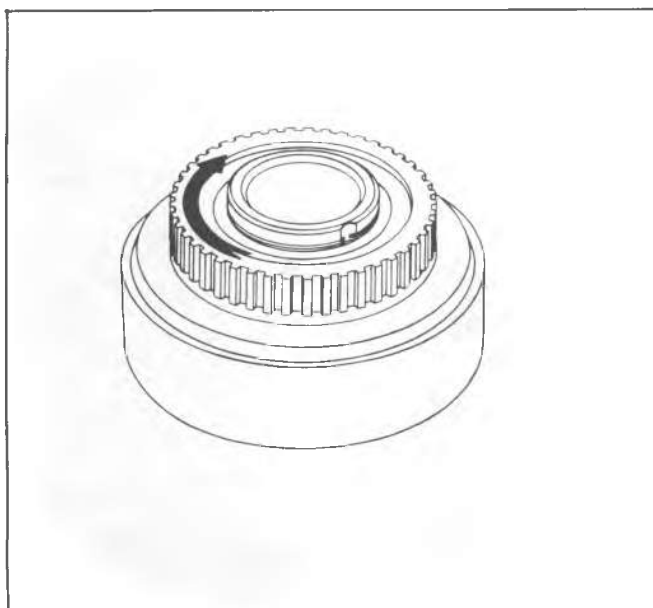


Fig. 7A-108C--Intermediate Roller Clutch Rotation

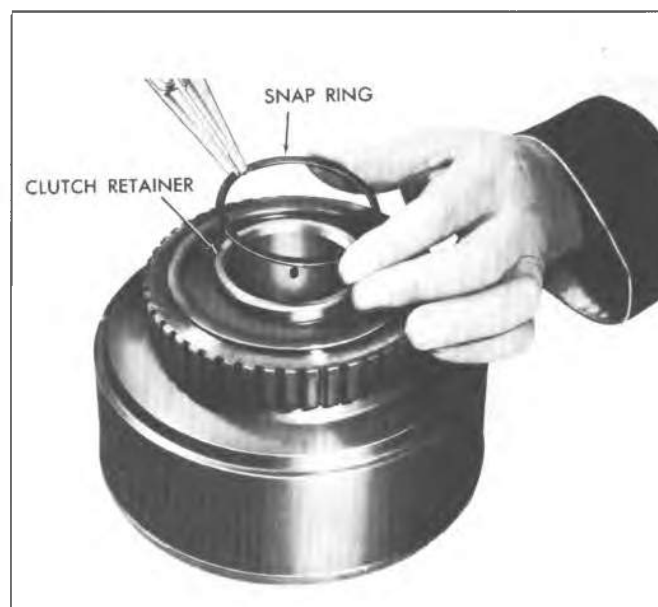


Fig. 7A-110C--Installing Intermediate Clutch Retainer Snap Ring



Fig. 7A-111C--Air Checking Direct Clutch Assembly



Fig. 7A-113C--Removing Intermediate Clutch Piston Snap Ring

DISASSEMBLY, INSPECTION AND RE-ASSEMBLY OF CENTER SUPPORT

Disassembly

1. Remove four (4) oil seal rings from the center support (Fig. 7A-112C).
2. Compress spring retainer and remove snap ring (7A-113C).

3. Remove spring retainer (Fig. 7A-114C) and three (3) clutch release springs (Fig. 7A-115C).

4. Remove intermediate clutch spring guide (Fig. 7A-116C).

5. Remove intermediate clutch piston (Fig. 7A-117C).

6. Remove inner and outer piston seal.

CAUTION: Do not remove three (3) screws

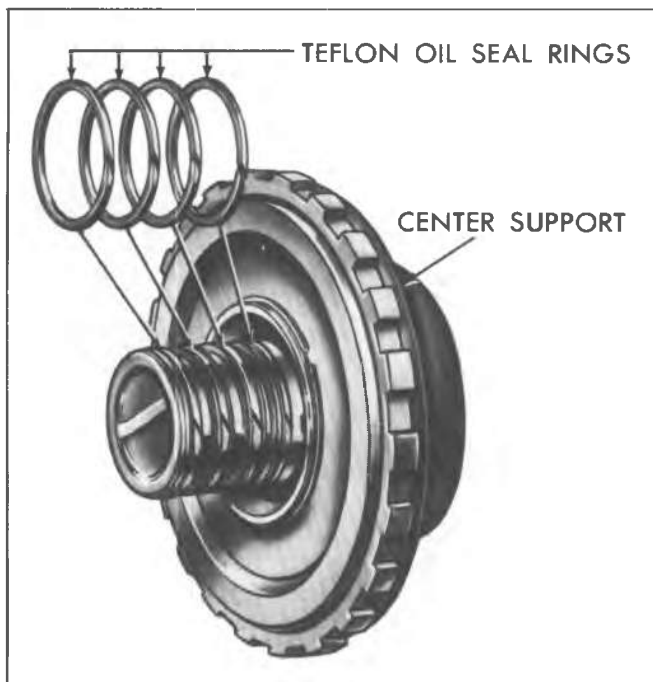


Fig. 7A-112C--Center Support and Oil Seal Rings

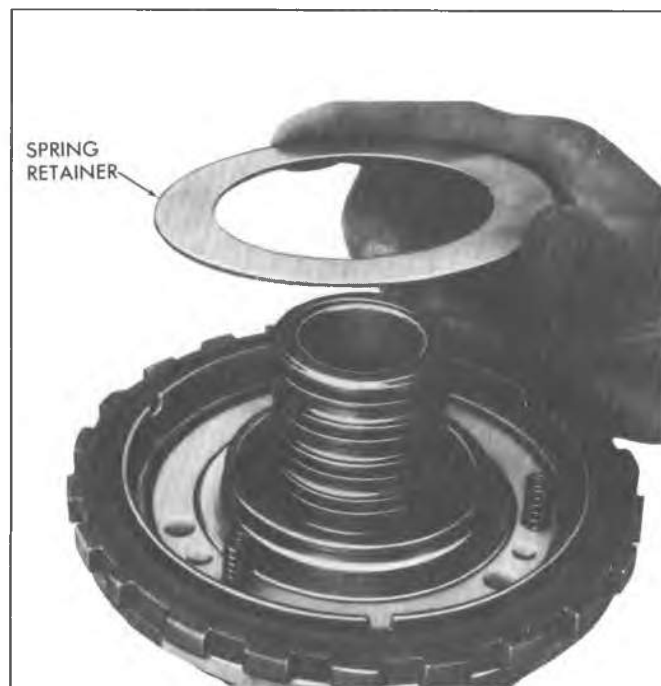


Fig. 7A-114C--Removing Spring Retainer



Fig. 7A-115C--Removing Clutch Release Springs



Fig. 7A-117C--Removing Intermediate Clutch Piston

retaining roller clutch inner race to center support.

Inspection (Fig. 7A-118C)

1. Inspect roller clutch inner race for scratches or indentations. Be sure lubrication hole is open. Be sure constant bleed plug orifice, (approx. .020 dia.), is open (Fig. 7A-47C).

2. Inspect bushing for scoring, wear or galling. If replacement is necessary, proceed as follows:

a. Using Tool J-21465-6 with Driver Handle J-8092 remove bushing.

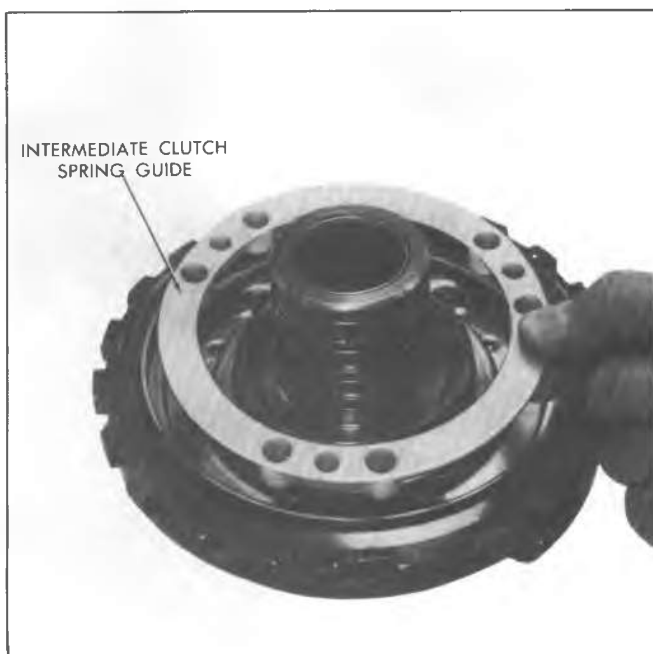


Fig. 7A-116C--Removing Intermediate Clutch Spring Guide

b. From front side of center support, align elongated slot in the bushing with drilled hole in the oil delivery sleeve closest to the piston. Using Tool J-21465-6 and Driver Handle J-8092, drive bushing squarely into the bore until the bushing is flush to .010" below top of oil delivery sleeve.

3. Check oil ring grooves and oil rings for damage.

NOTE: All service center support oil seal rings are hook type cast iron.

4. Air check oil passages to be sure they are not interconnected.

5. Inspect piston sealing surfaces for scratches.

6. Inspect piston seal grooves for nicks or other damage.

7. Inspect piston for cracks.

8. Inspect release springs for distortion.

9. Inspect support to case for burrs or raised edges. If present, remove with a stone or fine sandpaper.

Assembly

1. Lubricate and install new inner and outer seals on piston with lip of seal facing away from spring pocket (Fig. 7A-119C and 7A-120C).

2. Install inner seal protector, Tool J-21363, on center support hub, install piston, indexing spring pockets of piston into cored areas of the center support (Fig. 7A-121C).

3. Install intermediate clutch spring guide (Fig. 7A-122C).

4. Install three (3) release springs into holes of spring guide. Space equally during assembly (Fig. 7A-123C).

5. Place spring retainer and snap ring over springs.

6. Compress springs and install snap ring (Fig. 7A-124C).

7. Install four (4) oil seal rings on the center support.

NOTE: When installing teflon oil seal rings, make sure slit ends are assembled in same relation as cut (Fig. 7A-125C). Also, make sure oil seal rings are seated in ring grooves to prevent damage to rings during re-assembly

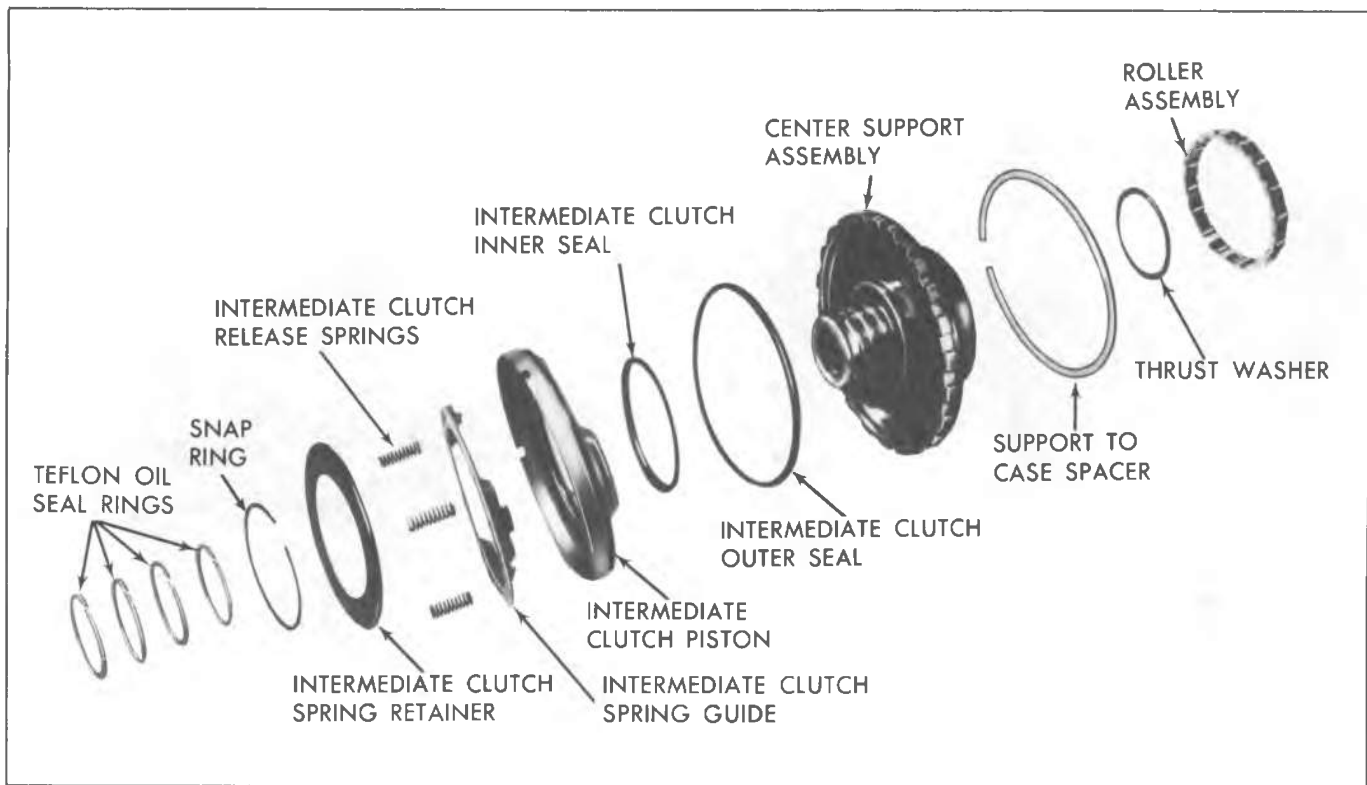


Fig. 7A-118C--Center Support Assembly--Exploded View



Fig. 7A-119C--Installing Intermediate Clutch Inner Seal



Fig. 7A-120C--Installing Intermediate Clutch Outer Seal

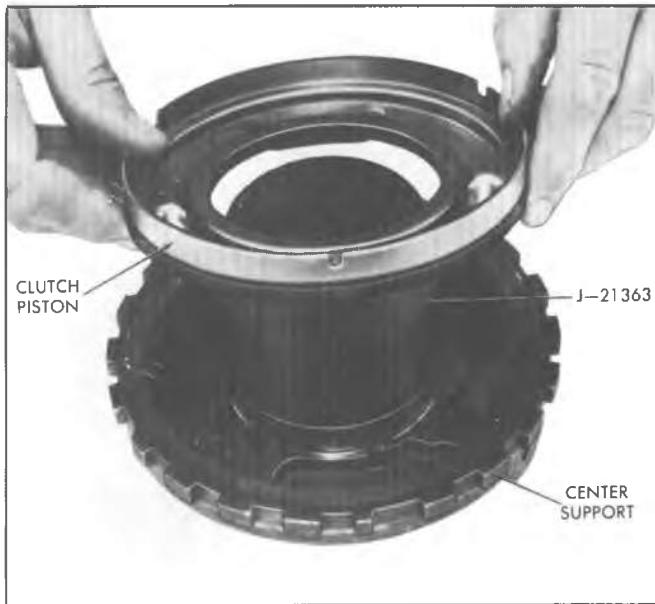


Fig. 7A-121C--Installing Intermediate Clutch Piston

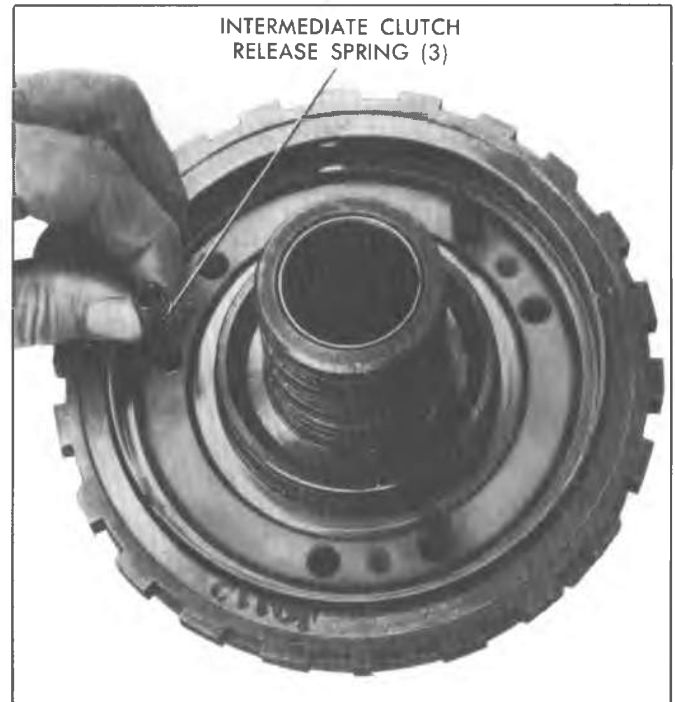


Fig. 7A-123C--Installing Intermediate Clutch Release Springs

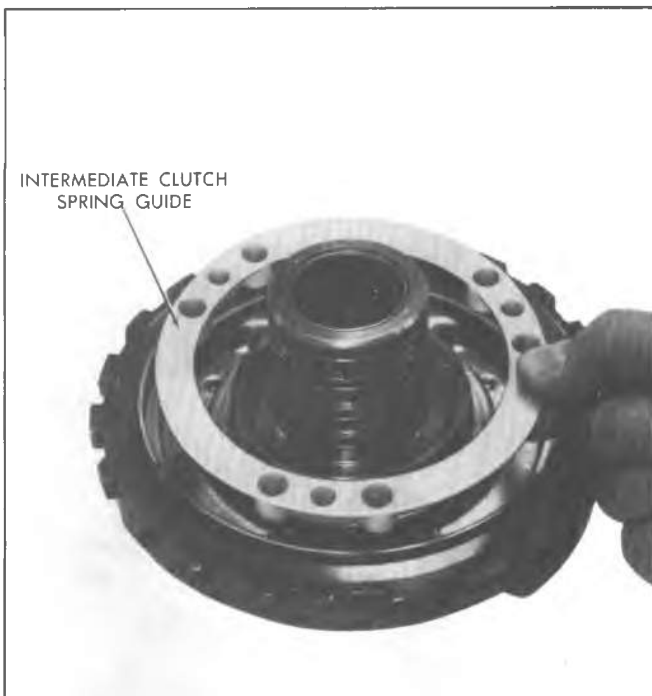


Fig. 7A-122C--Installing Intermediate Clutch Spring Guide



Fig. 7A-124C--Installing Intermediate Clutch Piston Snap Ring



Fig. 7A-125C--Teflon Rings

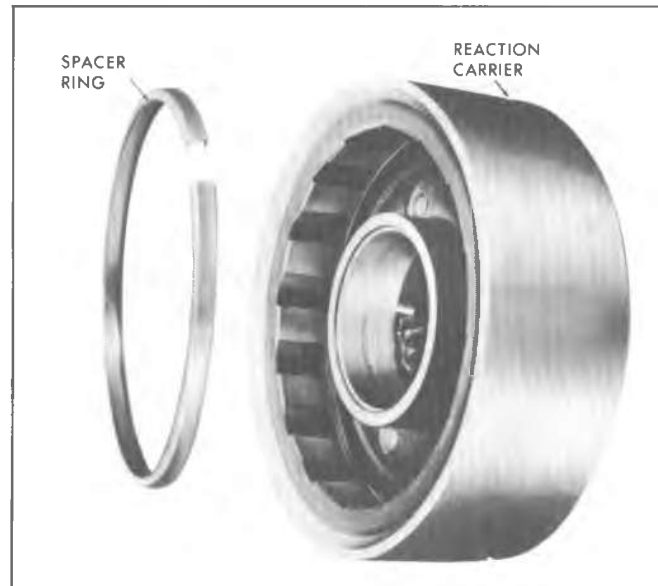


Fig. 7A-127C--Inspecting Spacer Ring

of mating parts over rings. Retain with petrolatum.

8. Air check operation of intermediate clutch piston (Fig. 7A-126C).

Inspection of Reaction Carrier, Roller Clutch, and Output Carrier Assembly

1. If the reaction carrier has a spacer ring in an undercut at the bottom of the roller cam ramps, inspect it for damage (Fig. 7A-127C).

NOTE: The reaction carrier with the undercut and

spacer ring is used optionally and interchangeably with the reaction carrier which does not have an undercut and spacer ring.

2. Inspect band surface on reaction carrier for signs of burning or scoring.
3. Inspect roller clutch outer race for scoring or wear.
4. Inspect thrust washer surfaces for signs of scoring or wear.
5. Inspect bushing for damage. If bushing is damaged, reaction carrier must be replaced.
6. Inspect reaction carrier pinions for damage, rough bearings, or excessive tilt.
7. Check pinion end play. Pinion end play should be .009"-.024" (Fig. 7A-128C).
8. Inspect roller clutch for damaged rollers.
9. Inspect roller clutch cage and springs for damage.



Fig. 7A-126C--Air Checking Intermediate Clutch Piston

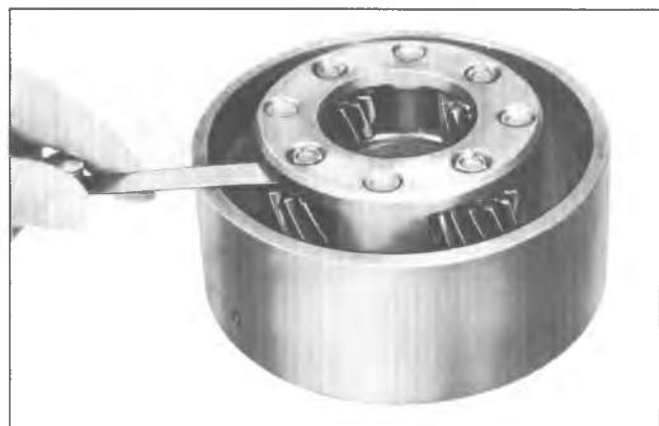


Fig. 7A-128C--Checking Pinions End Play



Fig. 7A-129C--Checking Output Carrier Pinion End Play

10. Inspect front internal gear (output carrier) for damaged teeth.
11. Inspect output carrier pinions for damage, rough bearings or excessive tilt.
12. Check pinion end play. Pinion end play should be .009"-.024" (Fig. 7A-129C).
13. Inspect parking pawl lugs for cracks or damage.
14. Inspect output locating splines for damage.
15. Inspect front internal gear ring for flaking (Fig. 7A-49C).

Pinion Replacement Procedure

1. Support carrier assembly on its front face.
2. Using a 1/2 inch diameter drill, remove stake marks from the end of the pinion pin, or pins, to be replaced. This will reduce the probability of cracking the carrier when pinion pins are pressed out. Do not allow drill to remove any stock from the carrier.
3. Using a tapered punch, drive or press pinion pins out of carrier (Fig. 7A-130C).
4. Remove pinions, thrust washers and roller needle



Fig. 7A-130C--Removing Planet Pinion Pin

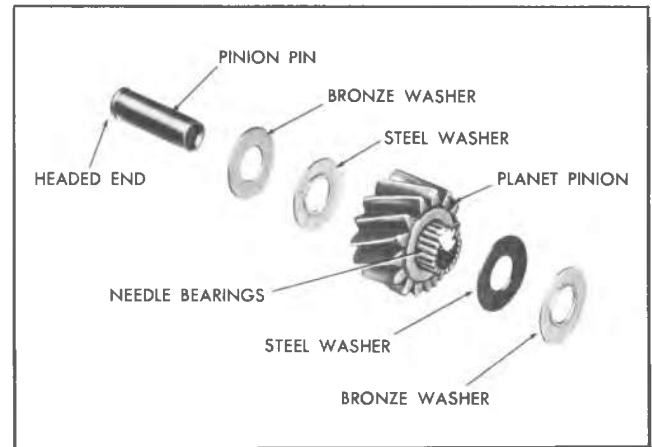


Fig. 7A-131C--Planet Pinion Assembly--Exploded View

5. Inspect pinion pocket thrust faces for burrs and remove if present.

6. Install eighteen (18) needle bearings into each pinion using petrolatum to hold bearings in place. Use pinion pin as guide (Fig. 7A-131C).

7. Place a bronze and steel washer on each side of pinion so steel washer is against pinion, hold them in place with petrolatum.

8. Place pinion assembly in position in carrier and install a pilot shaft through rear face of assembly to hold parts in place.

9. Drive a new pinion pin into place while rotating pinion from front, being sure that headed end is flush or below face of carrier (Fig. 7A-132C).

10. Place a large punch in a bench vise to be used as an anvil while staking opposite end of pinion pin in three places. Both ends of pinion pins must lie below face of carrier or interference may occur.



Fig. 7A-132C--Installing Planet Pinion Pin

OUTPUT SHAFT, REAR INTERNAL GEAR, SUN GEAR AND SHAFT

Output Shaft

1. Inspect bushing for wear or galling. If replacement is necessary, proceed as follows:

a. Thread Tool J-21465-16 into bushing and using Slide Hammer J-2619, remove bushing.

b. Using Tool J-21465-1 with drive handle J-8092, install bushing into place until tool bottoms.

2. Inspect bearing and thrust washer surfaces for damage.

3. Inspect governor drive gear for rough or damaged teeth.

4. Inspect splines for damage.

5. Inspect drive lugs for damage.

6. Inspect speedometer drive gear.

Inspection of Rear Internal Gear

1. Inspect gear teeth for damage or wear.

2. Inspect splines for damage.

3. Inspect gear for cracks.

Inspection of Sun Gear

1. Inspect gear teeth for damage or wear.

2. Inspect splines for damage.

3. Be sure oil lubrication hole is open.

Inspection of Sun Gear Shaft

1. Inspect shaft for cracks or splits.

2. Inspect splines for damage.

3. Inspect bushings for scoring or galling. If necessary to replace, proceed as follows:

SUN GEAR SHAFT BUSHING-FRONT AND REAR

Remove

With sun gear shaft properly supported, using Tool J-21465-15, with slide hammer and Adapter J-2619, remove bushing.

Replace

Using Tool J-21465-5 with Driver Handle J-8092 press or drive replacement bushing into place until tool bottoms.

INSPECTION OF MAIN SHAFT

1. Inspect shaft for cracks or distortion.

2. Inspect splines for damage.

3. Inspect ground bushing journals for damage.

4. Inspect snap ring groove for damage.

5. Make sure that lubrication holes are open.

NOTE: If replacement of mainshaft is required, make sure that the orifice cup plug in the service mainshaft is removed.

INSPECTION OF FRONT AND REAR BANDS, SUPPORT TO CASE SPACER

1. Inspect lining for cracks, flaking, burning, or looseness.

2. Inspect bands for cracks or distortion.

3. Inspect end for damage at anchor lugs or apply lugs.

4. Inspect support to case spacer for burrs or raised edges, if present remove with stone or fine abrasive.

INSPECTION OF CASE EXTENSION - ALL EXCEPT CL MODEL

1. Inspect bushing for excessive wear or damage. If replacement is necessary, remove rear seal and with extension housing properly supported, remove bushing as follows:

a. (All except CA and CB Models) Using tool J-21465-17, with Driver Handle J-8092, drive or press replacement bushing into place, flush to .010 below oil seal counter bore area. Stake bushing, using tool J-21465-10. Stake marks to be in bushing lubrication grooves.

b. (CA and CB Models) Using Tool J-21424-9 with Driver Handle J-8092, drive or press replacement bushing into place flush to .010 below oil seal counter bore area. Stake bushing, using tool J-21465-10 (or J-8400-22). Stake marks to be in bushing lubrication grooves.

2. Inspect gasket mounting face for damage.

3. Inspect housing for cracks or porosity.

4. Be sure rear seal drain back port is not obstructed.

INSPECTION OF CASE EXTENSION-

CL MODEL (FIG. 7A-133C)

1. Inspect seal (case extension to case) groove for damage.

2. Inspect for cracks, or porosity.

3. Inspect dowel pin in rear face for damage.

4. Inspect oil seal for damage. If replacement is required, proceed as follows:

a. Pry oil seal from extension.

b. Apply non-hardening sealer to outside of new oil seal, and install oil seal into case extension using tool (J-24057) (see Fig. 7A-171C).

5. Inspect ball bearing assemblies. If they are damaged, or if they require cleaning, proceed as follows:

a. Remove rear seal.

b. Remove snap ring.

c. Remove ball bearings and bearing spacer, using a brass rod on the outside race of bearing. An arbor press can be used if tool to press bearing out is located on outer race of bearing.

CAUTION: *DO NOT* locate against inner race or balls.

d. Install ball bearing assembly and spacer, bearing first.

e. Install ball bearing assembly and snap ring.

f. Install new rear oil seal.

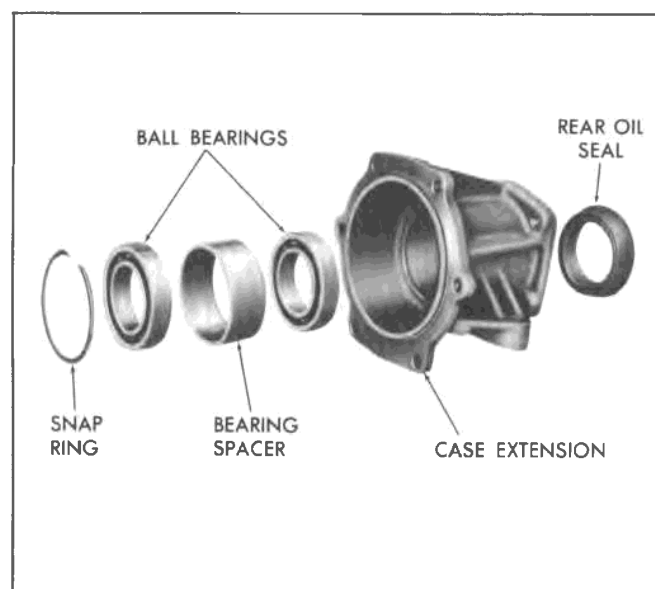


Fig. 7A-133C--Model CL Case Extension

INSPECTION OF MODULATOR AND VALVE

1. Inspect modulator assembly for any signs of bending or distortion (Fig. 7A-134C).
2. Inspect "O" ring seal seat for damage.
3. Apply suction to vacuum tube and check for diaphragm leaks.
4. Check modulator bellows as outlined in Section 7 of Service Manual (modulator plunger is under pressure - 16 lbs.). If bellows is damaged plunger will have very little pressure.
5. Inspect modulator valve for nicks or damage.
6. Check freeness of valve operation in case bore.

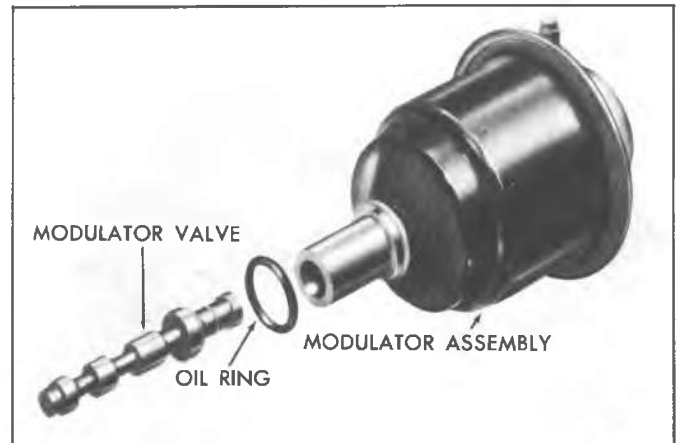


Fig. 7A-134C--Modulator Assembly and Valve

INSPECTION OF MANUAL AND PARKING LINKAGE

1. Inspect parking actuator rod for cracks, or broken spring retainer lugs (Fig. 7A-135C).
2. Inspect actuator spring for damage.
3. Inspect actuator for free fit on actuator rod.
4. Inspect parking pawl for cracks or wear.
5. Inspect manual shaft for damaged threads, rough oil surface or loose lever.
6. Inspect inside detent lever for cracks or a loose pin.
7. Inspect parking pawl shaft if removed for damaged retainer groove.
8. Inspect parking pawl return spring for deformed coils or end.
9. Inspect parking bracket for cracks or wear.
10. Inspect detent roller and spring assembly.

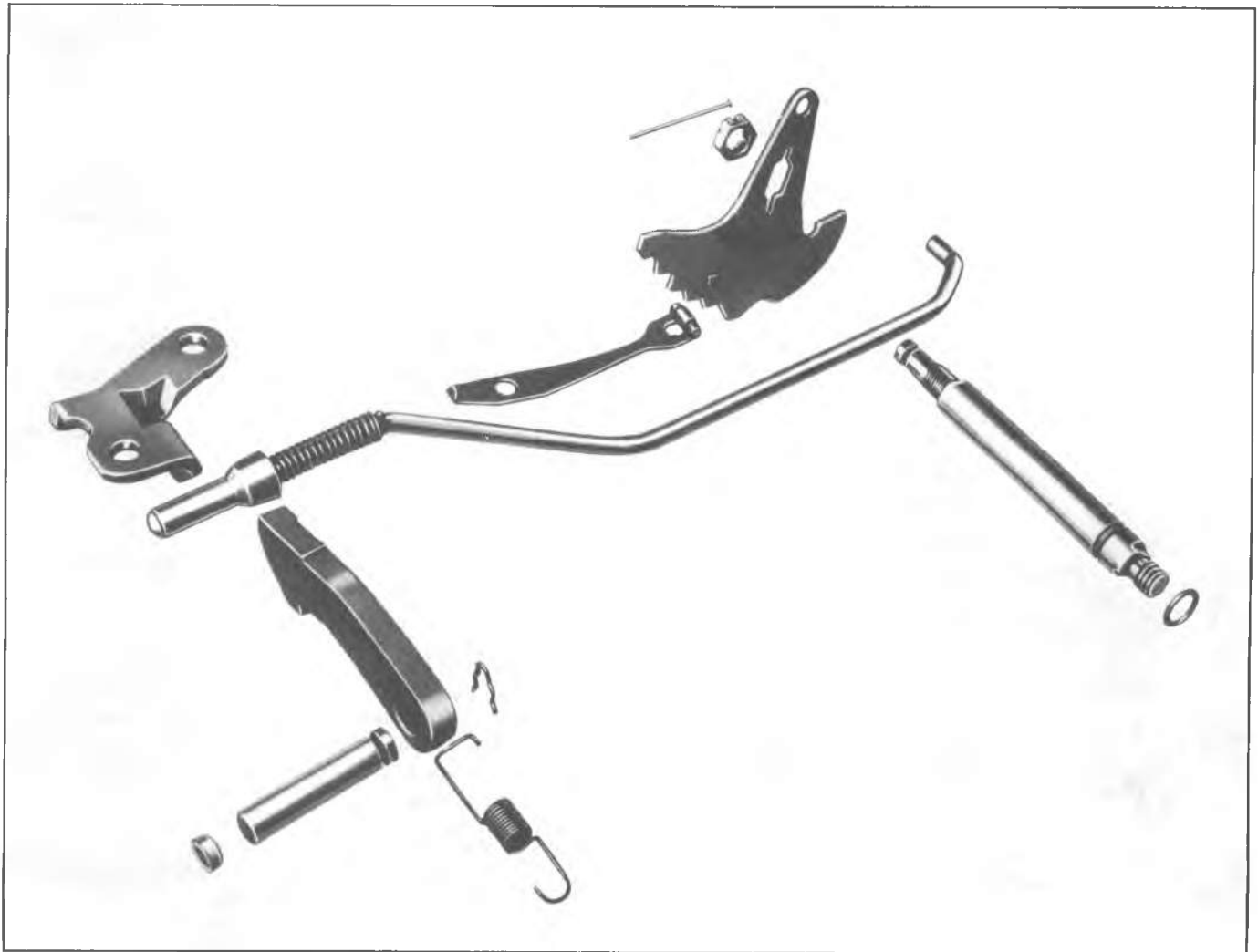


Fig. 7A-135C--Manual and Parking Linkage--Exploded View

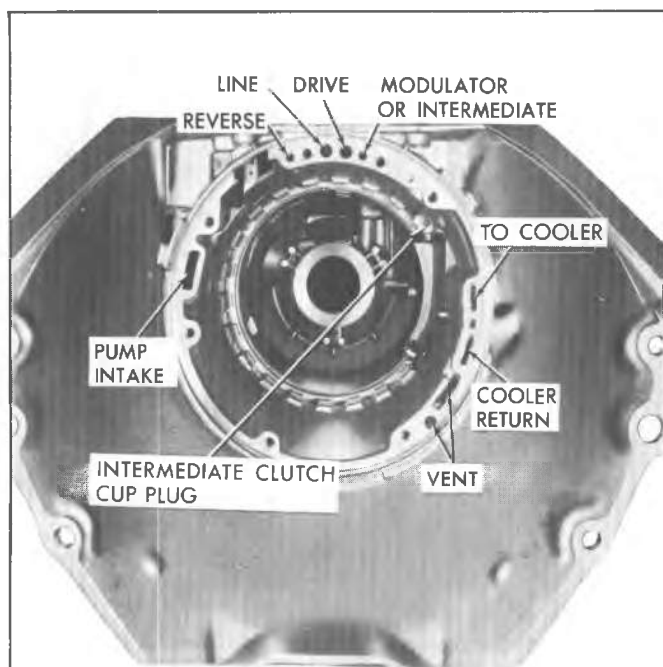


Fig. 7A-136C-Case--Front View Passage Identification

INSPECTION OF CASE ASSEMBLY (FIGS. 7A-136C AND 7A-137C)

CAUTION: If the case assembly requires replacement, make sure the center support-to-case spacer is removed from the old case and reinstalled in the new case.

1. Inspect case assembly for cracks, porosity or interconnected passages.
2. Check for good retention of band anchor pins.
3. Inspect all threaded holes for thread damage.
4. On model CL inspect studs for thread damage, and make sure they are tight.

NOTE: The two (2) studs at 9 o'clock and 11 o'clock (when viewed from the rear of case and transmission in

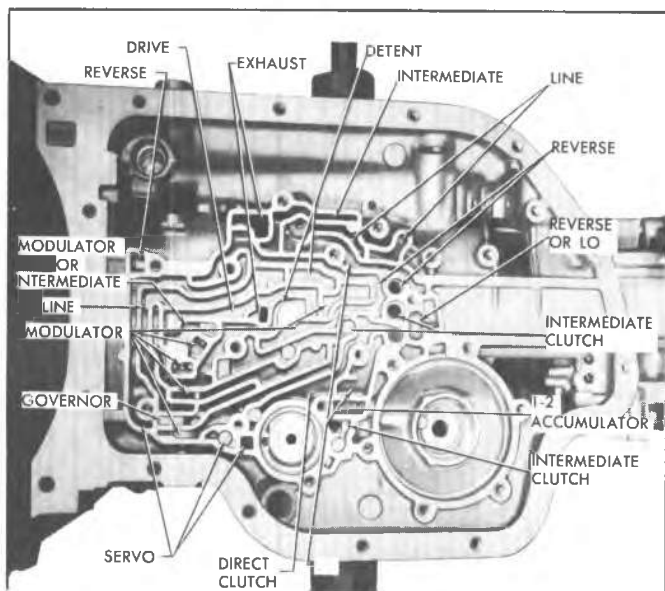


Fig. 7A-137C--Inspect Transmission Case



Fig. 7A-138C--Air Checking Converter

vehicle) are approximately 1/4" longer than the other four (4) studs. These two longer studs are required to accommodate the parking brake actuating cable bracket.

5. Inspect intermediate clutch driven plate lugs for damage or brinelling.

NOTE: If the case assembly requires replacement, remove the nameplate from the old case and re-install it on the new case, using the truss head nameplate attaching screw that is serviced with the case.

6. Inspect snap ring grooves for damage.
7. Inspect bore for governor assembly for scratches or scoring.
8. Inspect modulator valve bore for scoring or damage.
9. Inspect cup plug inside case for good staking and sealing.
10. Inspect case bushing. If necessary to replace, proceed as follows:

Case Bushing

Remove

With case properly supported, using tool J-21465-8, with Driver Handle J-8092, remove bushing.

Replace

Using tool J-21465-8 adaptor ring J-21465-9, Driver Handle J-8092, and extension J-21465-13, with lube passage facing front of transmission case, drive replacement bushing into case until .040 to .055 above selective washer face. Stake bushing with tool J-21465-10. Stake marks to be in bushing lubrication grooves.

INSPECTION OF CONVERTER

1. Check converter for leaks as follows (Fig. 7A-138C):

- a. Install Tool J-21369 and tighten.
- b. Apply 80 psi air pressure to tool.
- c. Submerge in water and check for leaks.

2. Check converter hub surfaces for signs of scoring or wear.

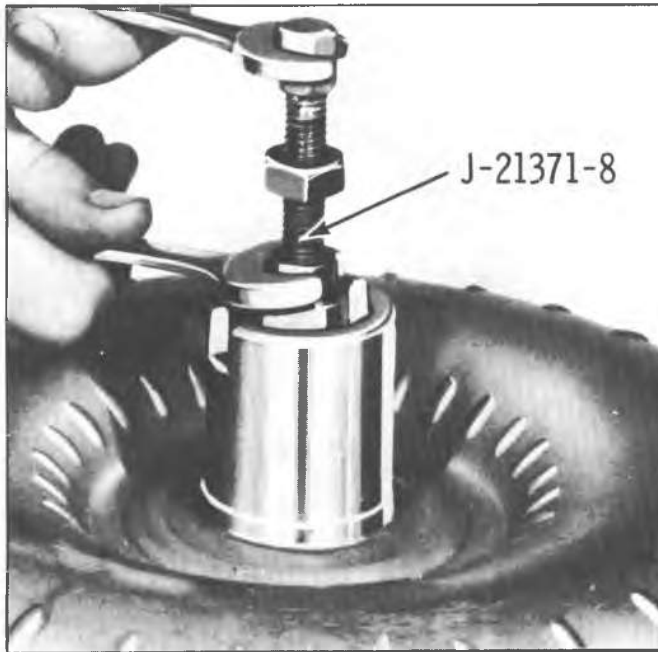


Fig. 7A-139C--Loosening Collet on Tool J-21571-8

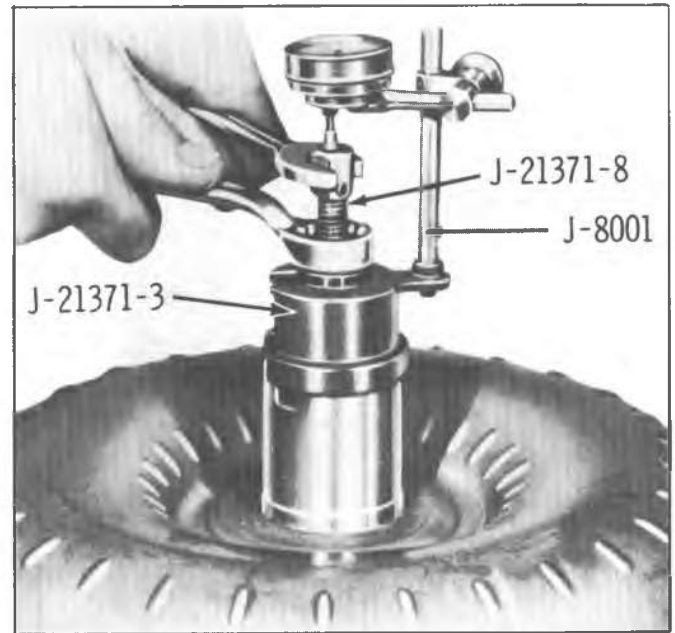


Fig. 7A-140C--Checking Converter End Clearance

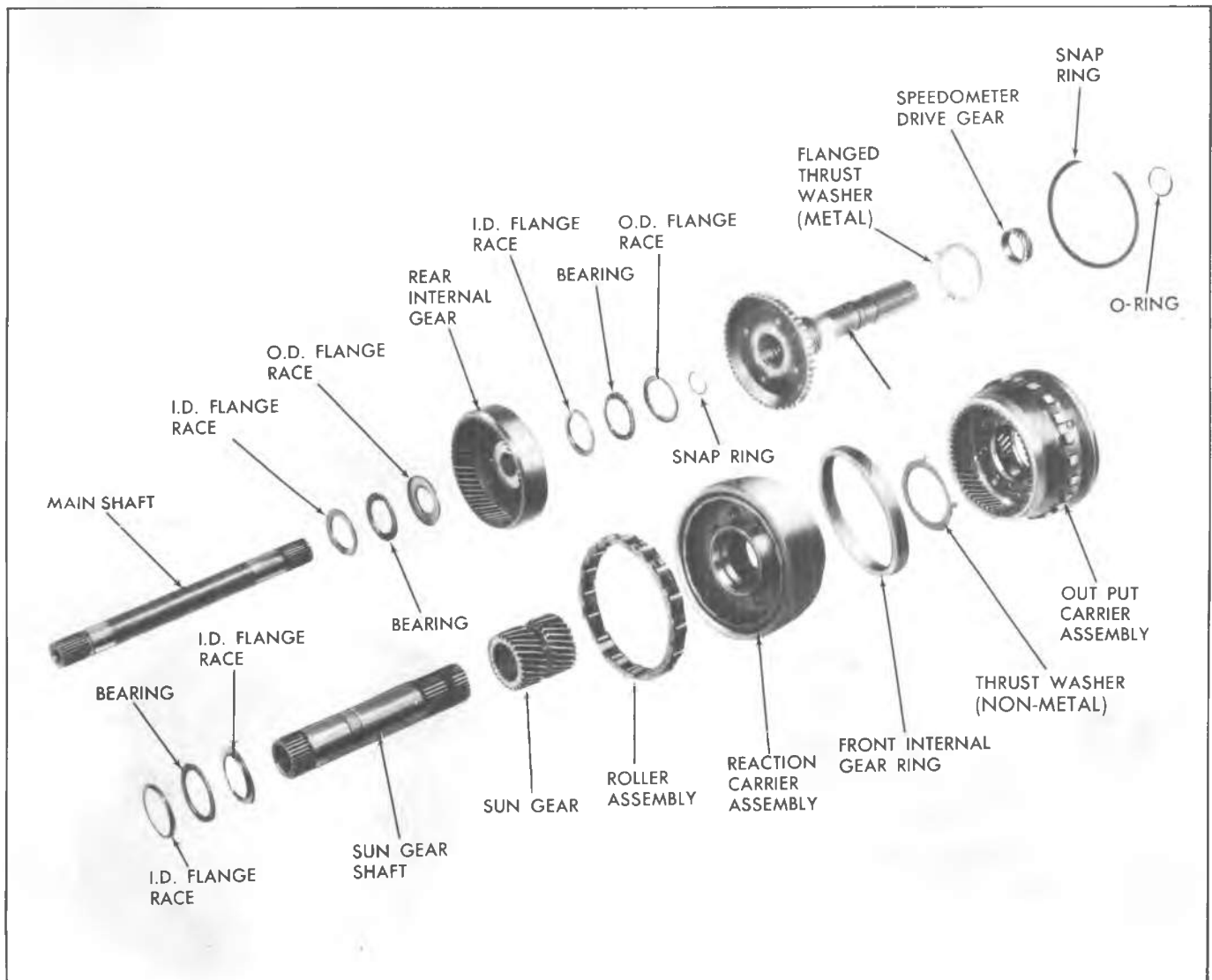


Fig. 7A-141C--Gear Unit Assembly--Exploded View

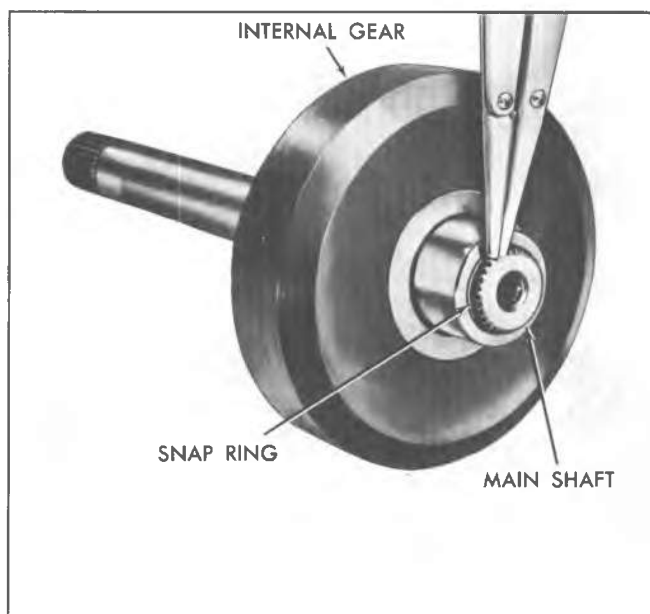


Fig. 7A-142C--Installing Rear Internal Gear Snap Ring

Converter End Clearance Check (Figs. 7A-139C and 7A-140C)

1. Fully release collet end of Tool J-21371-8.
2. Install collet end of Tool J-21371-8 into converter hub until it bottoms; then tighten cap nut to 5 lb. ft. (Fig. 7A-139C).
3. Install Tool J-21371-3 and tighten hex nut to 3 lb. ft. (Fig. 7A-140C).
4. Install Dial Indicator J-8001 and set it at "zero", while its plunger rests on the cap nut of Tool J-21371-8.
5. Loosen hex nut while holding cap nut stationary. With the hex nut loosened and holding Tool J-21371-3 firmly against the converter hub, the reading obtained on the dial indicator will be the converter end clearance. End clearance should be less than .050". If the end clearance is .050" or greater, the converter must be replaced.

ASSEMBLY OF REAR UNIT (FIG 7A-141C)

1. Install rear internal gear on end of main shaft.
2. Install rear internal gear retaining snap ring (Fig. 7A-142C).

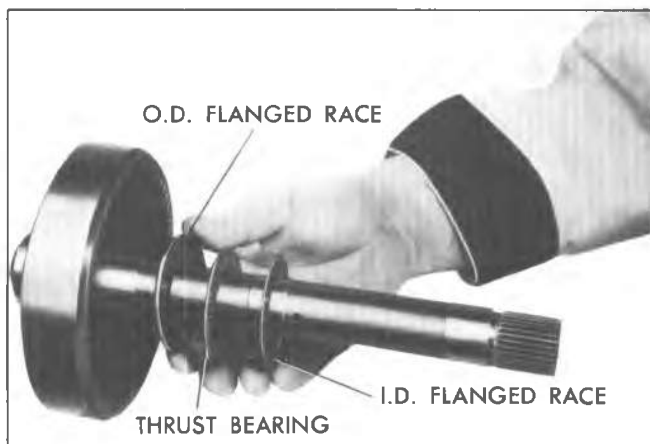


Fig. 7A-143C--Installing Rear Internal Gear to Sun Gear Bearing and Races

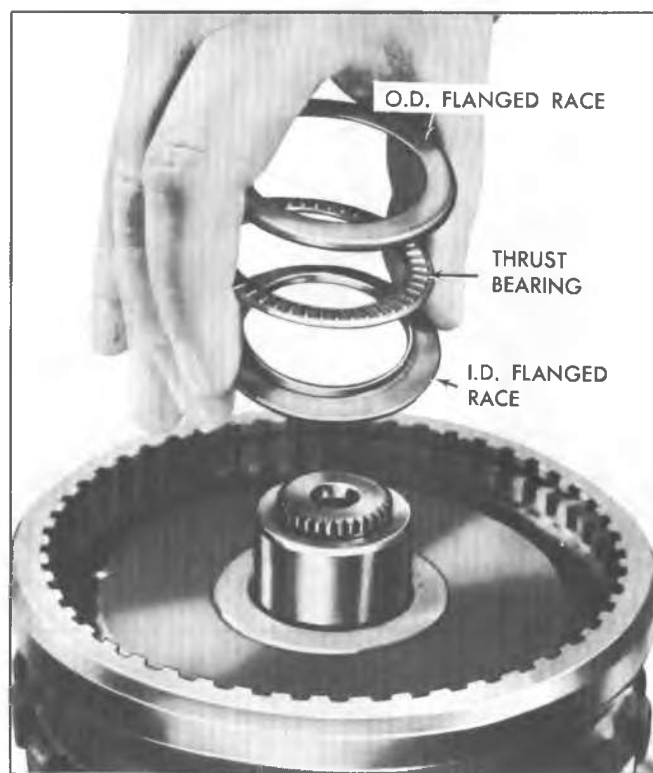


Fig. 7A-144C--Installing Rear Internal Gear to Output Shaft Bearing and Races

3. Install sun gear to internal gear thrust races and bearings against inner face of rear internal gear as follows, and retain with petrolatum.
 - a. Place large race against internal gear with outer flange



Fig. 7A-145C--Installing Output Shaft

facing forward or up (Fig. 7A-153C).

- b. Place thrust bearing against race.
- c. Place small race against bearing with inner flange facing into bearing or down.
4. Install output carrier over mainshaft so that pinions mesh with rear internal gear.
5. Place above portion of "build-up" through hole in bench so that mainshaft hangs downward.
6. Install rear internal gear to output shaft thrust races and bearings as follows and retain with petrolatum (Fig. 7A-144C).
 - a. Place small diameter race against internal gear with center flange facing up.
 - b. Place bearing on race.
 - c. Place second race on bearing with outer flange cupped over bearing.
7. Install output shaft into output carrier assembly (Fig. 7A-145C).
8. Install output shaft to output carrier snap ring.
9. Install "O" ring on output shaft of models that use an "O" ring.
10. Turn assembly over and support so that output shaft hangs downward.
11. Install reaction carrier to output carrier metal or non-metal thrust washer with tabs facing down in pockets of output carrier and retain with petrolatum.

NOTE: The production built transmissions use a non-metal washer here. However, the service replacement washer is made of metal.

12. Install sun gear I.D. splines with chamfer down.
13. Install front internal gear ring over output carrier (Fig. 7A-146C).
14. Install sun gear shaft with long splined end down.
15. Install reaction carrier (Fig. 7A-147C).

NOTE: When a new output carrier and/or reaction carrier is being installed and if the front internal gear ring prevents assembly of the carriers, replace the front internal gear ring with the SERVICE ring.

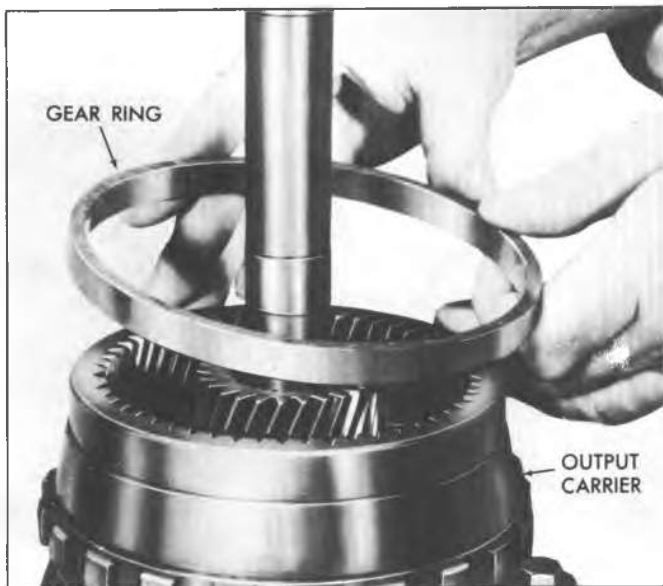


Fig. 7A-146C--Installing Front Internal Gear Ring to Output Carrier



Fig. 7A-147C--Installing Reaction Carrier

16. Install center support to sun gear thrust races and bearings as follows: (Retain with petrolatum).
 - a. Install large race, center flange up over sun gear shaft.
 - b. Install thrust bearing against race.
 - c. Install second race, center flange up (Fig. 7A-148C).

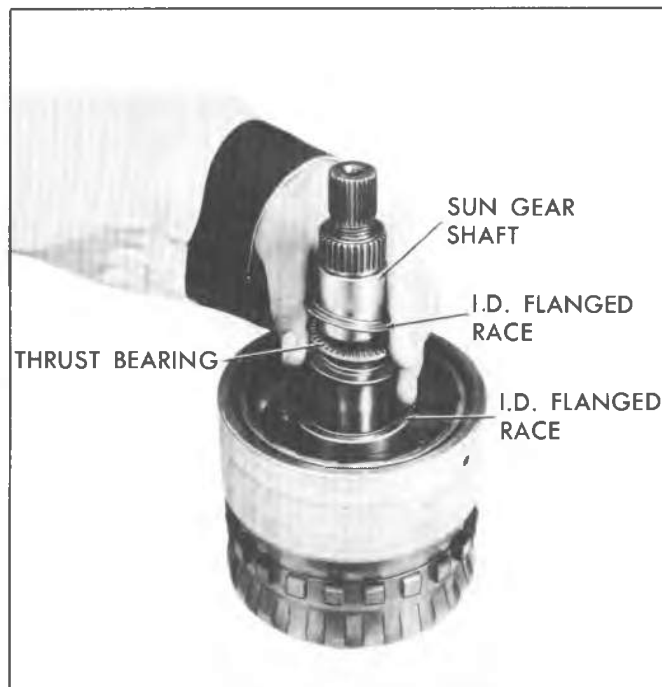


Fig. 7A-148C--Installing Center Support to Sun Gear Thrust Bearing and Races



Fig. 7A-149C--Installing Roller into Roller Clutch Cage

17. Install rollers that may have come out of the roller clutch cage, by compressing the energizing spring with forefinger and inserting roller from the outer edge (Fig. 7A-149C).

18. Install roller clutch assembly (Fig. 7A-150C) into reaction carrier.

19. Install center support to reaction carrier thrust washer into recess in center support. Retain with petrolatum (Fig. 7A-47C).

20. Install center support into roller clutch in reaction carrier (Fig. 7A-151C).

NOTE: With reaction carrier held, center support should only turn counter-clockwise after installation.

21. Install J-21795 on gear unit assembly to hold units in place.



Fig. 7A-151C--Installing Center Support to Reaction Carrier

22. Install output shaft to case thrust washer tabs in pockets (Fig. 7A-152C), and retain with petrolatum.

NOTE: This must be a metal washer.

CASE MODIFICATION--CORVETTE

NOTE: Due to the configuration of the body floor pan, it is necessary to modify the standard Service Case when used as a replacement part for the Corvette.

Using a "C" Clamp, clamp the transmission case firmly to a suitable bench, with the converter under pan attaching face down, as shown in Figure 7A-153C, (do not damage machined surface of the case).

Using a hacksaw, remove the two front manufacturing lugs (one on each side), as close to the wall of the case as possible, using caution not to cut into the wall of the case.

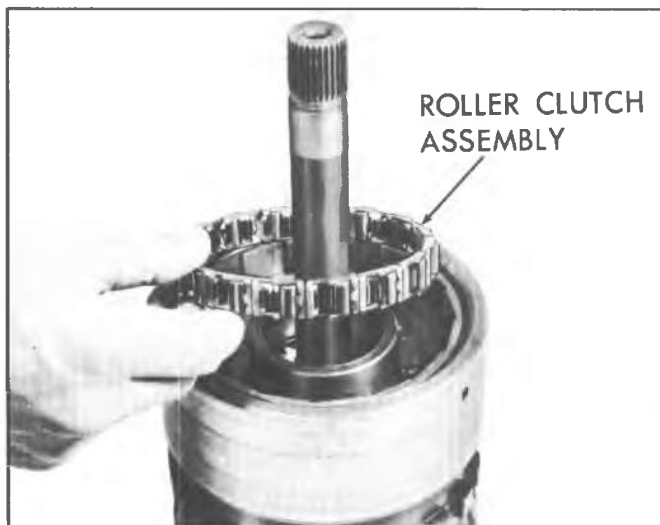


Fig. 7A-150C--Installing Roller Clutch to Reaction Carrier



Fig. 7A-152C--Installing Case to Output Shaft Thrust Washer

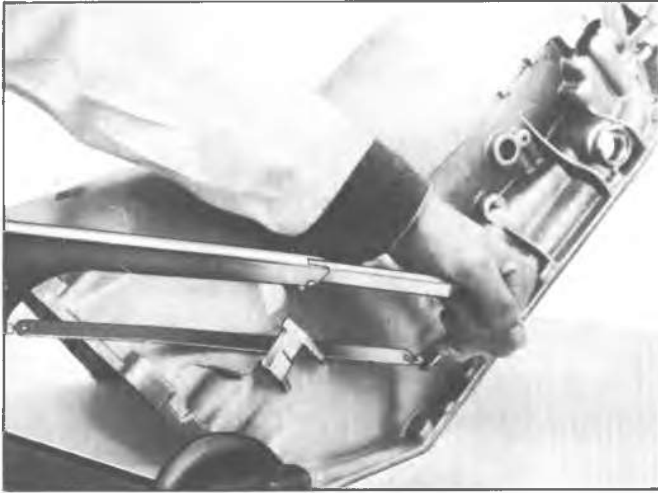


Fig. 7A-153C--Modification of Service Case for Corvette Models

ASSEMBLY OF UNITS TO TRANSMISSION CASE

NOTE: The first three steps can be omitted if the parts involved were not removed on disassembly.

1. Install parking pawl tooth toward inside of case, and parking pawl shaft (Fig. 7A-154C).
2. Install parking pawl shaft retainer clip (Fig. 7A-155C).
3. Install parking pawl shaft cup plug and drive into the case, using a 3/8 dia. rod, until the parking pawl shaft bottoms on the case rib (Fig. 7A-154C).
4. Install parking pawl return spring, square end hooked on pawl and other end on case.
5. Install parking bracket with guides over parking pawl using two attaching bolts, torque to 18 ft. lbs.
6. Install rear band assembly so that two lugs index with two anchor pins. Check to make sure band is seated on lugs (Fig. 7A-156C).



Fig. 7A-154C--Installing Parking Pawl Shaft Cup Plug

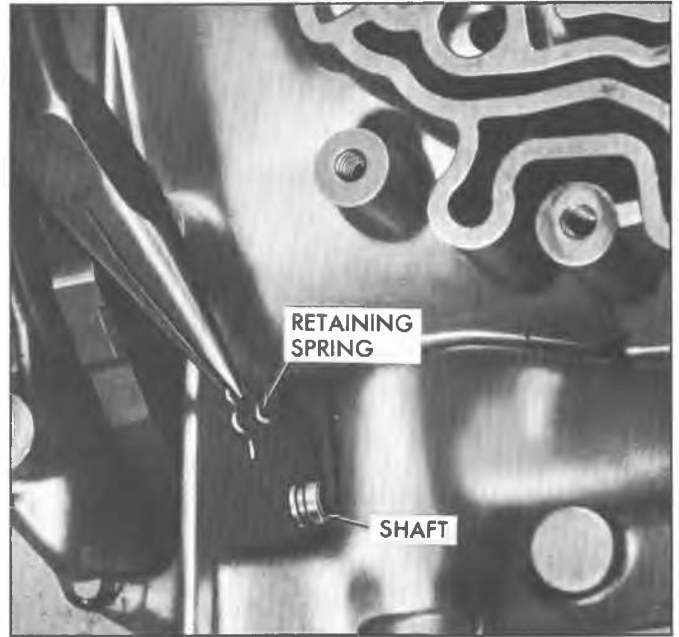


Fig. 7A-155C--Installing Parking Shaft Retaining Spring



Fig. 7A-156C--Installing Rear Band



Fig. 7A-157C--Installing Center Support to Case Spacer

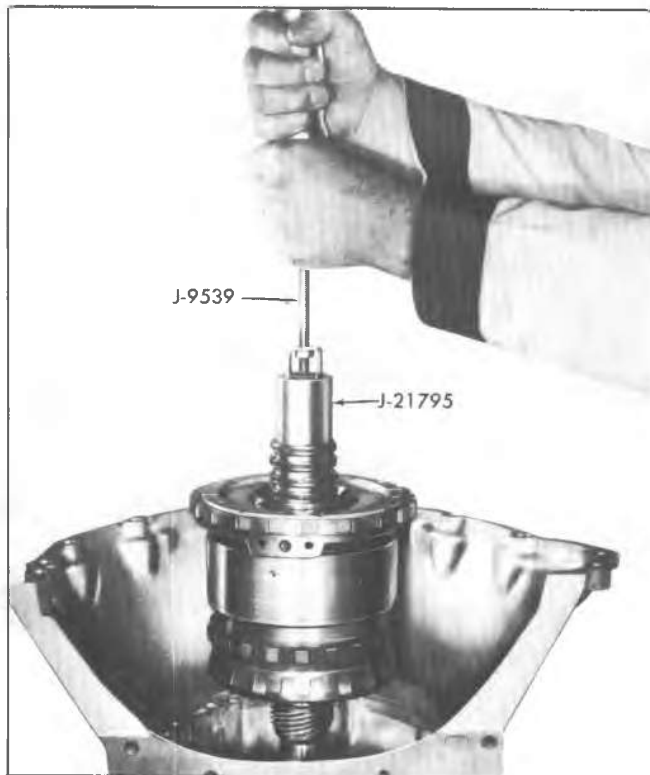


Fig. 7A-158C--Installing Center Support and Gear Unit

7. Install the center support to case spacer against the shoulder at the bottom of case splines and the gap located adjacent to the band anchor pin (Fig. 7A-157C).

CAUTION: Do not confuse this spacer (.040" thick and both sides flat) with either the center support to case snap ring (one side beveled) or the intermediate clutch backing plate to case snap ring (.093" thick and both sides flat).

8. Install proper rear selective washer (proper washer determined by previous end play check) into slots provided inside rear of transmission case.

9. Install complete gear unit assembly into case, using Tool J-21795 (Fig. 7A-158C).

10. Install center support to case retaining snap ring with bevel side up (flat surface against the center support) and locating gap adjacent to band anchor pin. Make certain ring is properly seated in case (Fig. 7A-159C).

11. Install case to center support bolt by placing the

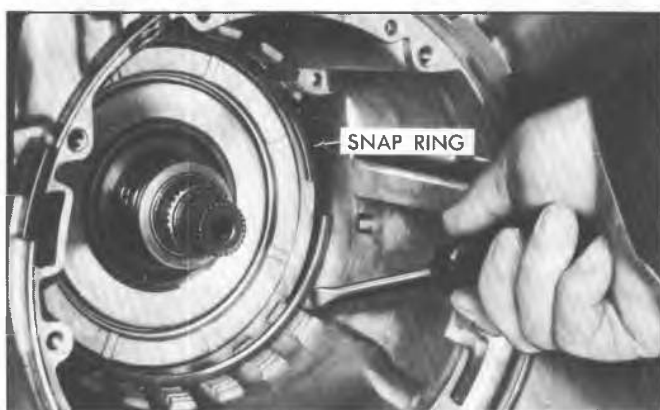


Fig. 7A-159C--Installing Center Support to Case Snap Ring

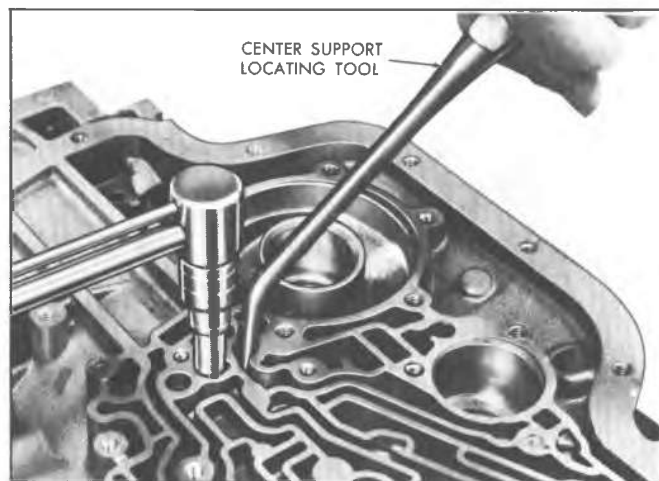


Fig. 7A-160C--Installing Center Support Bolt

center support locating tool into the case direct clutch passage, with the handle of the tool pointing to the right as viewed from the front of the transmission and parallel to the bell housing mounting face. Apply pressure downward on the tool handle which will tend to rotate the center support counterclockwise as viewed from the front of the transmission. While holding the center support firmly, counterclockwise against the case splines, torque the case to center support bolt to 20-25 ft. lbs., using a 3/8" 12-point thin wall deep socket (Fig. 7A-160C).

CAUTION: When using the locating tool, care should be taken not to raise burrs on the case valve body mounting face.

12. Install intermediate clutch plates.

a. (All models except CB, CL and CS) Lubricate with transmission oil two (2) flat steel and one (1) waved steel plates and three (3) composition-faced intermediate clutch plates and install, starting with waved steel plate and alternating composition-faced and flat steel plates (Fig. 7A-161C).

b. (Models CB, CL and CS) Lubricate with transmission oil three (3) flat steel and three (3) composition-faced intermediate clutch plates and install, starting with flat steel and alternating composition-faced and flat steel plates (Fig. 7A-161C).

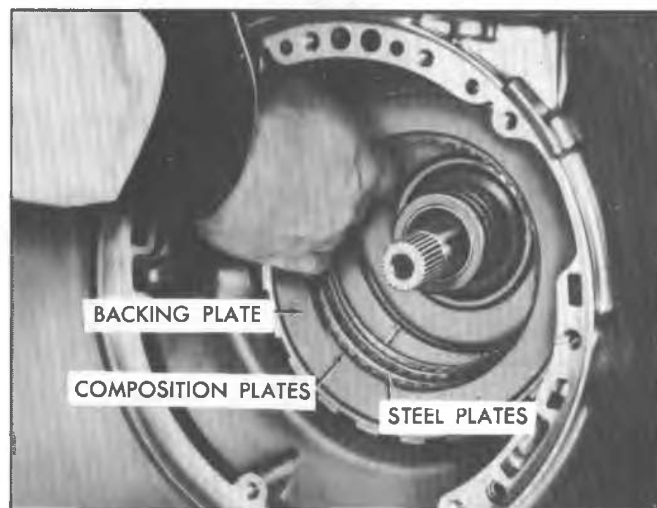


Fig. 7A-161C--Installing Intermediate Backing Plate and Clutch Plates

REAR END WASHER THICKNESS

Thickness	Identification
	Notches and/or Numeral
.074 - .078	None 1
.082 - .086	1 Tab Side 2
.090 - .094	2 Tab Side 3
.098 - .102	1 Tab O.D. 4
.106 - .110	2 Tabs O.D. 5
.114 - .118	3 Tabs O.D. 6

Fig. 7A-162C--Rear End Washer Selection Chart

NOTE: The models CL and CZ intermediate composition-faced plates are different from the other models. Refer to parts catalog for correct usage.

13. Install intermediate clutch backing plate, ridge up (Fig. 7A-161C).

14. Install intermediate clutch backing plate to case snap ring, locating gap opposite band anchor pin.

NOTE: Both sides of this snap ring are flat, and it is .093" thick.

15. Check rear end play as follows:

a. Install a 3/8"-16 bolt or J-9539, into an extension housing attaching bolt hole (Fig. 7A-37C).

b. Mount a dial indicator on a rod and index with end of output shaft.

c. Move output shaft in and out to read end play. End play should be from .007"-.019". The selective washer controlling this end play is a steel washer having 3 lugs that is located between thrust washer and rear face of transmission case.

If a different washer thickness is required to bring end play within specifications, it can be selected from the chart shown in Fig. 7A-162C.

16. Install front band with anchor hole placed over band anchor pin and apply lug facing servo hole (Fig. 7A-163C).



Fig. 7A-163C--Installing Front Band

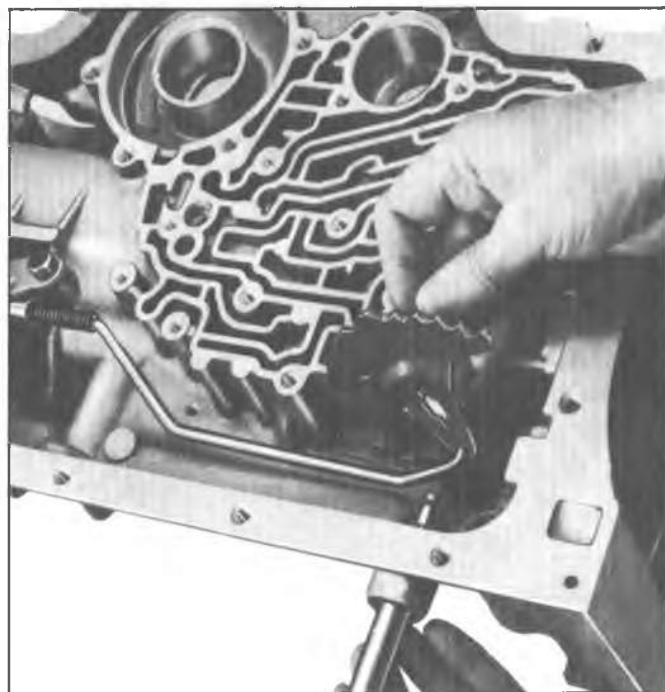


Fig. 7A-164C--Installing Manual Shaft to Case

Install Manual Linkage

a. Install a new manual shaft seal into transmission case using a 3/4 diameter rod to seat seal.

b. If removed, insert actuator rod into manual detent lever from side opposite pin.

c. Install actuator rod plunger under parking bracket over parking pawl.

d. Install manual shaft through case and detent lever (Fig. 7A-164C).

e. Install detent jam nut on manual shaft, and tighten to 18 ft. lbs. (Fig. 7A-165C).

f. Install retaining pin indexing with groove in manual shaft. Rotate transmission to vertical position and remove J-21795.

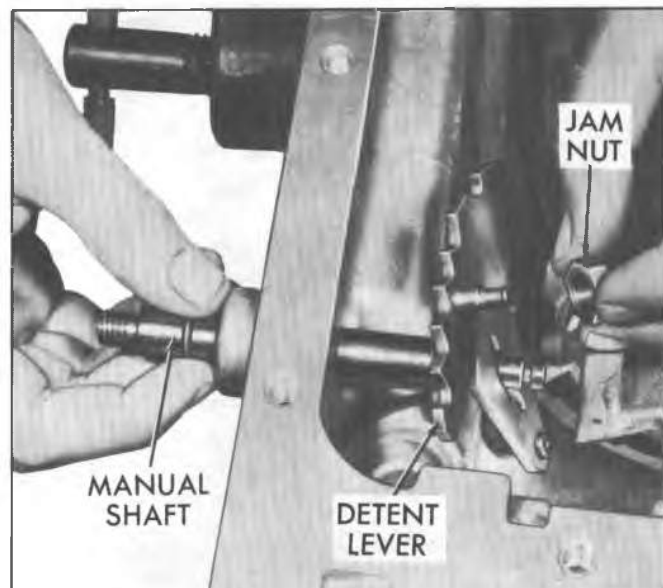


Fig. 7A-165C--Installing Detent Lever and Jam Nut to Manual Shaft

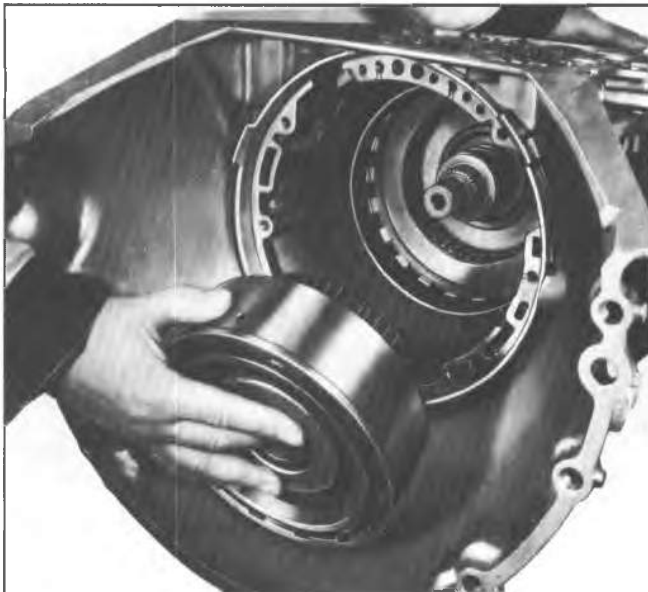


Fig. 7A-166C—Installing Direct Clutch Assembly

17. With converter end of transmission up, carefully install direct clutch and intermediate roller assembly. It will be necessary to shake and slightly twist housing to allow roller outer race to index with composition plates. Housing hub will bottom on sun gear shaft (Fig. 7A-166C).

NOTE: First visually line up the intermediate clutch drive lugs, one above the other to help engagement of housing hub splines. It also may be helpful to remove the direct clutch plates while installing housing.

18. Install forward clutch hub to direct clutch housing thrust washer on forward clutch hub, if not already installed. Retain with petrolatum.

19. Install forward clutch assembly and turbine shaft; indexing direct clutch hub so end of mainshaft will bottom on end of forward clutch hub. When forward clutch is seated it will be approximately 1-1/4" from pump face in case (Fig. 7A-167C).

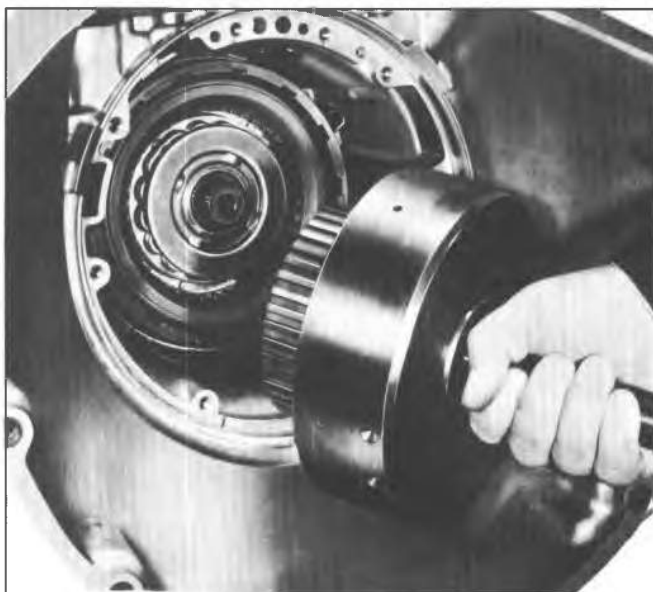


Fig. 7A-167C—Installing Forward Clutch Assembly and Turbine Shaft



Fig. 7A-168C—Installing Pump Seal

20. Install pump assembly and gasket.

NOTE: If turbine shaft cannot be rotated as pump is being pulled into place, forward or direct clutch housing have not been properly installed to index with all clutch plates. This condition must be corrected before pump is pulled fully into place.

21. Install all but one pump attaching bolts and seals. Torque to 18 ft. lbs. (See Figure 7A-169C for location of omitted bolt.)

22. If necessary to install a new front seal, use a non-hardening sealer on outside of seal body; and using Tool J-21359, drive seal in place (Fig. 7A-168C).

23. Check front unit end play as follows (Fig. 7A-169C).

a. Install a 3/8"-16 threaded bolt or a Slide Hammer Bolt J-9539 into bolt hole in pump.

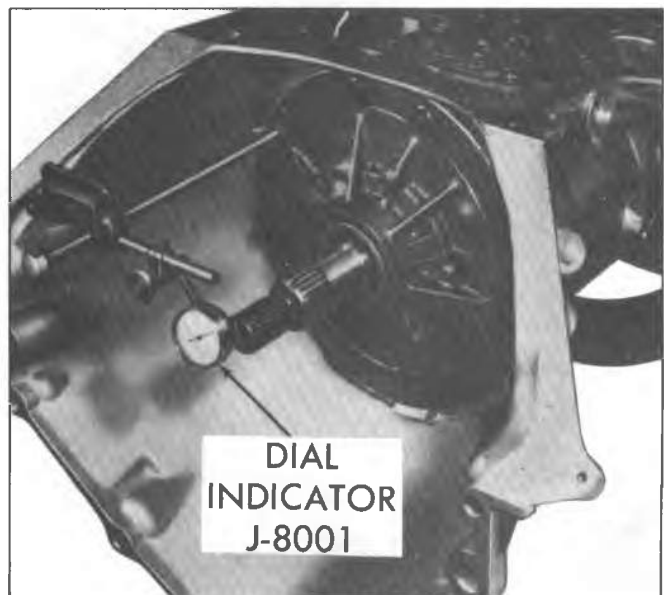


Fig. 7A-169C—Checking Front Unit End Play

FRONT END WASHER THICKNESS

Thickness	Color
.060 - .064	Yellow
.071 - .075	Blue
.082 - .086	Red
.093 - .097	Brown
.104 - .108	Green
.115 - .119	Black
.126 - .130	Purple

Fig. 7A-170C--Front End Washer Selection Chart

- b. Mount a dial indicator on rod and index indicator to register with end of turbine shaft.
- c. Push turbine shaft rearward.
- d. Push output shaft forward.
- e. Set dial indicator to zero.
- f. Pull turbine shaft forward.

Read resulting travel or end play which should be .003"-.024". Selective washer controlling this end play is located between pump cover and forward clutch housing. If more or less washer thickness is required to bring end play within specifications, select proper washer from the chart in Fig. 7A-170C.

NOTE: An oil soaked washer may tend to discolor. It will be necessary to measure washer for its actual thickness.

24. Install remaining front pump attaching bolt and seal. Torque 18 ft. lbs.

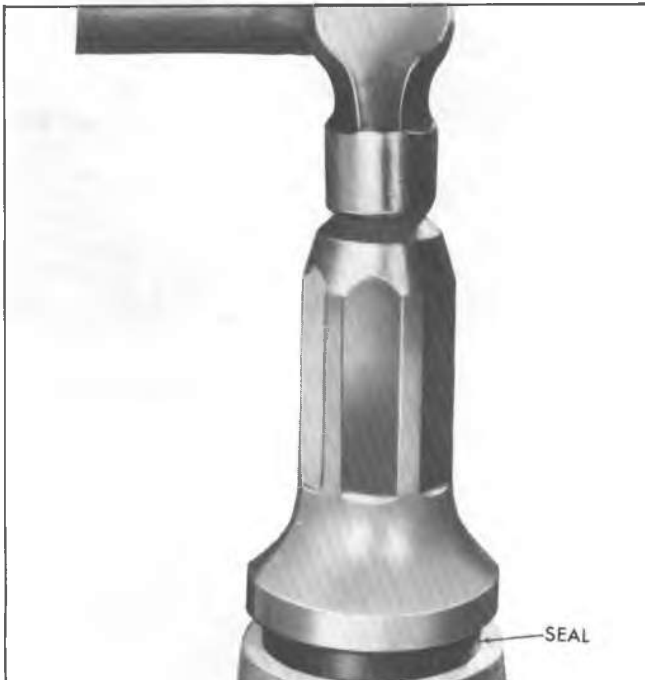


Fig. 7A-171C--Installing Extension Oil Seal (Typical)

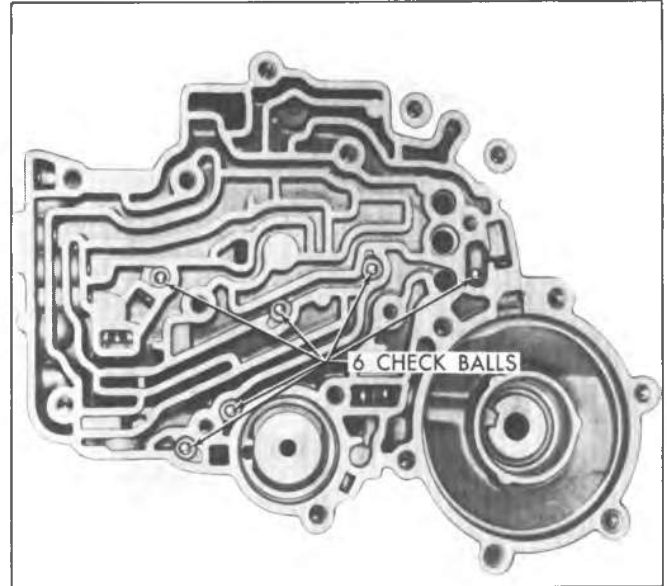


Fig. 7A-172C--Location of Check Balls

CASE EXTENSION ASSEMBLY

1. Install new case extension housing to case gasket on extension housing. Model CL uses a seal between the extension housing and case extension.

2. Attach extension housing to case using attaching bolts and/or studs. Torque bolts to 20-25 ft. lbs.

NOTE: Models CA, CG and CR use two (2) studs at 5 o'clock and 7 o'clock positions (when viewed from the rear of case and transmission in vehicle). These studs are for the installation of the catalytic converter. Torque the studs to 20-25 ft. lbs.

3. If necessary, install a new seal as follows:

- a. (All except CL Models) use a non-hardening sealer on outside of seal body; and using Tool J-21359, drive seal in place (Fig. 7A-171C).

- b. (Model CL) use a non-hardening sealer on outside of seal body; and using Tool J-24057 drive seal in place (Fig. 7A-171C).

Installation of Check Balls, Control Valve Spacer Plate and Gasket, Detent Solenoid, Front Servo Assembly, and Electrical Connector

1. Install two control valve assembly attaching bolts with heads cut off as guide pins as shown in figure 7A-183C.

2. Install six (6) check balls into ball seat pockets in transmission case. Figure 7A-172C.

NOTE: If transmission is in the vehicle, install check balls into ball seat pockets on spacer plate (Fig. 7A-173C).

3. Install control valve spacer plate-to-case gasket (gasket with extension for detent solenoid and a "C" near front servo location) (Fig. 7A-174C).

4. Install control valve spacer plate and control valve to spacer plate gasket (gasket identified with a "VB" near front servo).

5. Install detent solenoid gasket.

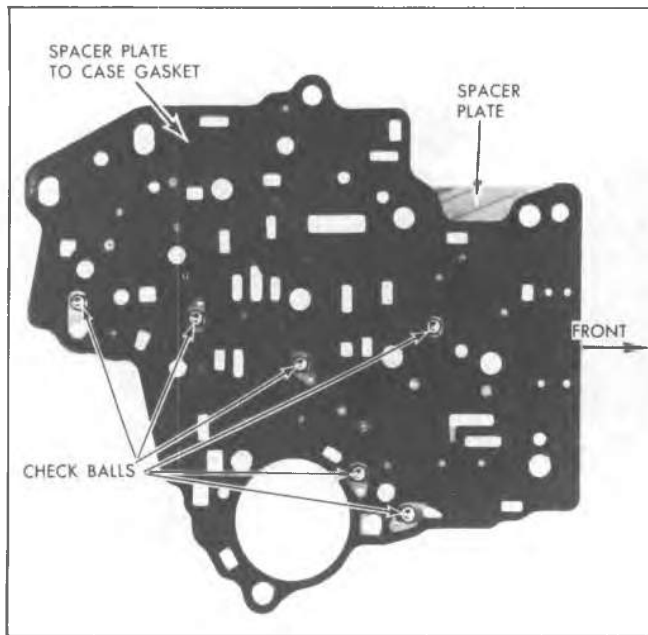


Fig. 7A-173C--Location of Check Balls--In Vehicle Installation

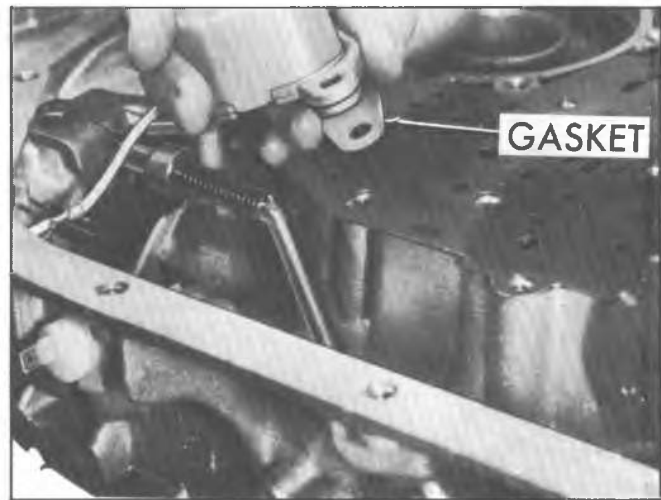


Fig. 7A-175C--Installing Detent Solenoid and Gasket

6. Install detent solenoid assembly with connector facing outer edge of case (Fig. 7A-175C). Do not tighten bolts at this time.

7. Install front servo spring and spring retainer into transmission case.

8. Install retainer pins in front servo pin groove and install pin into case so that tapered end contacts band. Make certain retainer ring is installed in servo pin groove.

9. Install seal ring on servo piston, if removed, and install on servo pin with flat side of piston positioned toward bottom pan. (Figure 7A-176C).

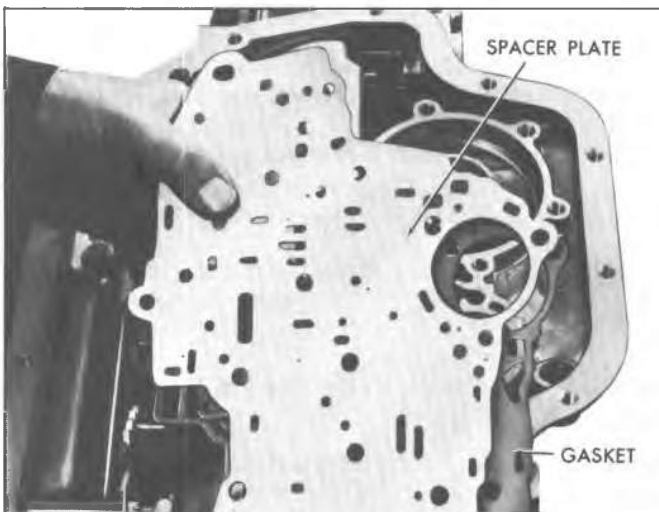


Fig. 7A-174C--Installing Control Valve Assembly Spacer Plate and Gasket

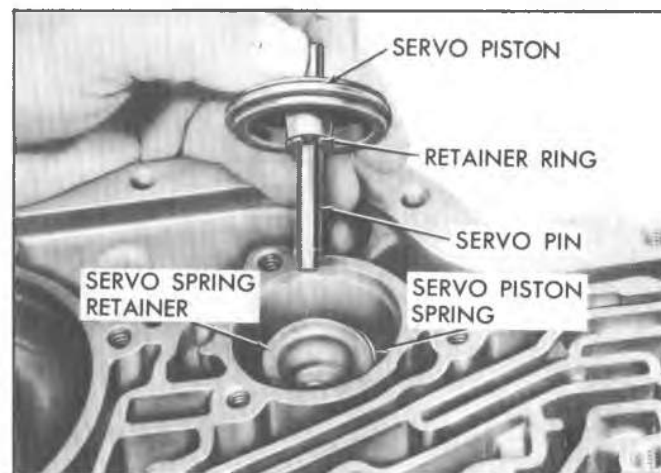


Fig. 7A-176C--Installing Front Servo Piston, Washer, and Pin

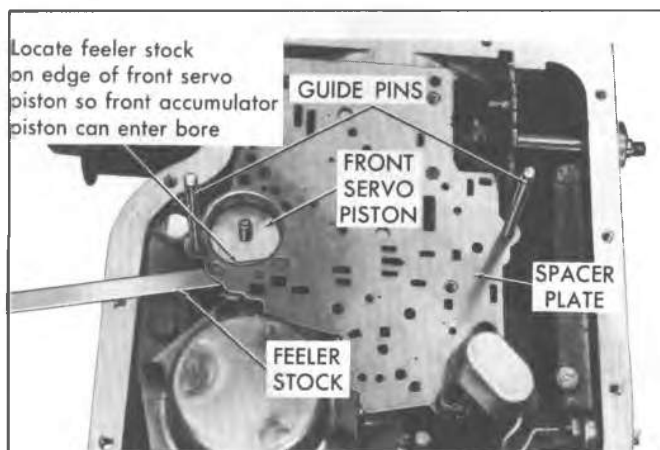


Fig. 7A-177C--Front Servo Group--In Vehicle Installation

NOTE: The teflon ring allows the front servo piston to slide very freely in the case. The free fit of the ring in the bore is a normal characteristic and does not indicate leakage during operation. The teflon ring should only be replaced if it shows damage or if evidence of leakage during operation exists.

If transmission is in the vehicle, assemble front servo group as shown in figure 50T and install this group of parts into front servo bore in case and hold. Slip a length of straight, clean feeler gauge or shim stock (about .020") between spacer plate and front servo piston to temporarily retain front servo group. Figure 7A-177C.

10. Install "O" ring seal on electrical connector.

11. Lubricate and install electrical connector with lock tabs facing into case, positioning locator tab in notch on side of case (Fig. 7A-178C).

12. Install detent wire to electrical connector (Fig. 7A-12C).



Fig. 7A-178C--Installing Electrical Connector and "O" Ring Seal

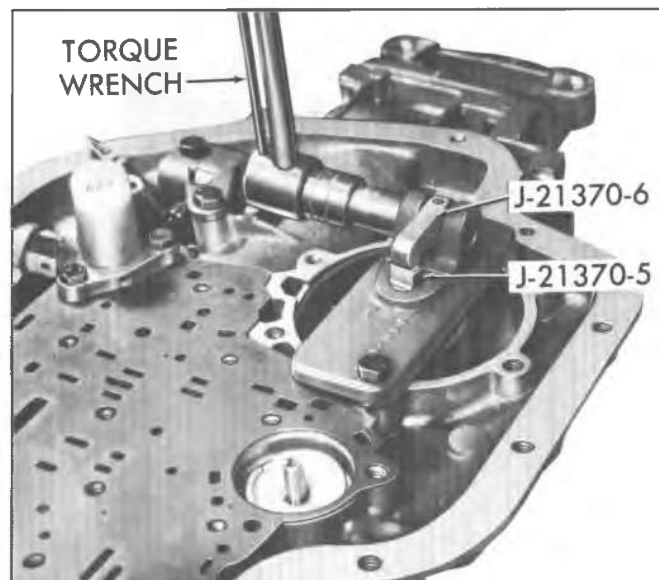


Fig. 7A-179C--Checking Rear Band Pin

Installation of Rear Servo Assembly

1. Check rear servo band apply pin. (Fig. 7A-179C).

a. Attach band apply pin selection Gauge J-21370-6 and J-21370-5 to transmission case (lever pivot pin to rear) with attaching screws.

Attach tool attaching screws finger tight and check freeness of selective pin. Torque attaching screws to 15 ft. lbs. and recheck pin to make certain it does not bind.

b. Apply 25 ft. lb. torque and select proper servo pin to be used from scale on tool.

Selecting proper length pin is equivalent to adjusting band. The band lug end of each selective apply pin bears identification in the form of one, two, or three rings.

There are three selective pins identified as follows:

1. If both steps are below the gauge surface, the long pin, identified by 3 rings, should be used.
2. If the gauge surface is between the steps, the medium pin, identified by 2 rings, should be used.



Fig. 7A-180C--Installing Rear Accumulator Spring



Fig. 7A-181C--Installing Rear Servo Assembly

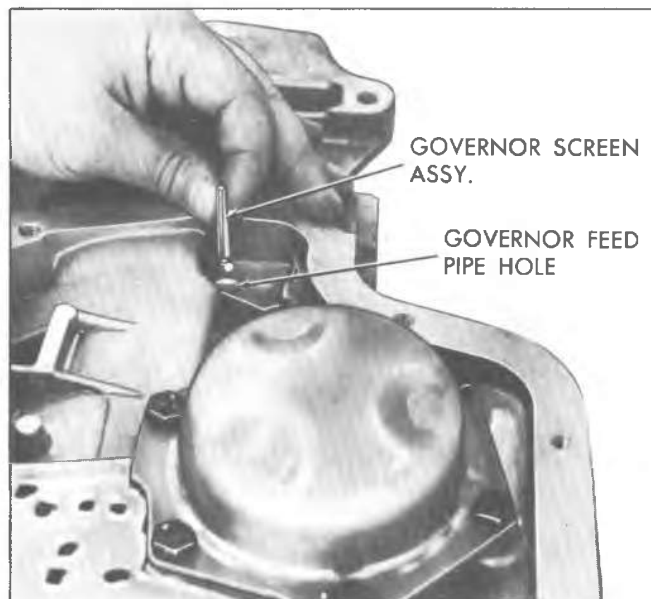


Fig. 7A-183C--Installing Governor Screen Assembly

3. If both steps are above the gauge surface, the short pin, identified by 1 ring, should be used.

2. Install rear accumulator spring into case (Fig. 7A-180C).

3. Lubricate and install rear servo assembly into case (Fig. 7A-181C).

4. Install rear servo gasket and cover (Fig. 7A-182C).

5. Install attaching screws. Torque bolts to 15-20 ft. lbs.

INSTALLATION OF CONTROL VALVE ASSEMBLY, GOVERNOR PIPES AND GOVERNOR SCREEN ASSEMBLY

1. Install governor pipes on control valve assembly. Governor pipes are interchangeable.

2. Install governor screen assembly, open end first, into governor feed pipe hole in case (hole nearest the center of the transmission) (Fig. 7A-183C).

NOTE: If transmission is in vehicle, before installing the

control valve assembly and governor pipes as outlined in Step 3 below, insert the governor screen, closed end first, into governor feed pipe. (This pipe locates in the governor feed pipe hole in the case nearest the center of the transmission). See Figure 7A-183C).

3. Install control valve assembly and governor pipes on transmission, while carefully aligning the governor feed pipe over the governor screen (Fig. 7A-184C). Make certain gasket and spacer do not become mispositioned.

NOTE: Check manual valve to make sure it is indexed properly with pin on detent lever and check governor pipes to make certain they are properly seated in case holes.

4. Start control valve assembly attaching bolts.

NOTE: If transmission is in the vehicle, remove feeler stock before tightening any control valve bolts.

5. Remove guide pins and install detent roller and spring assembly and remaining bolts (Fig. 7A-185C).



Fig. 7A-182C--Installing Rear Servo Cover and Gasket

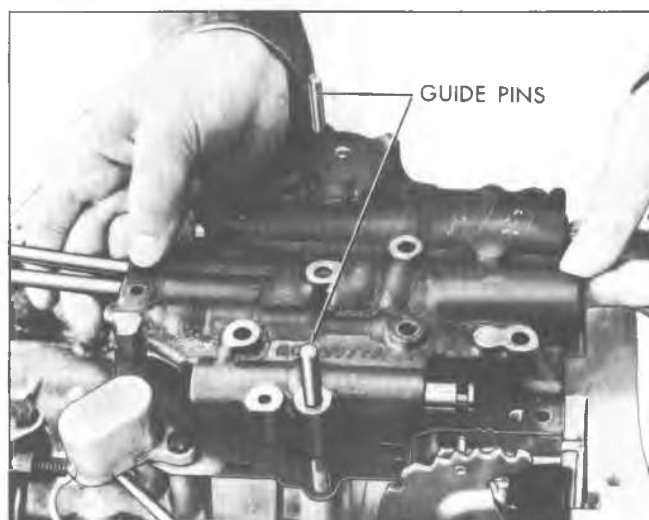


Fig. 7A-184C--Installing Control Valve Assembly and Governor Pipes

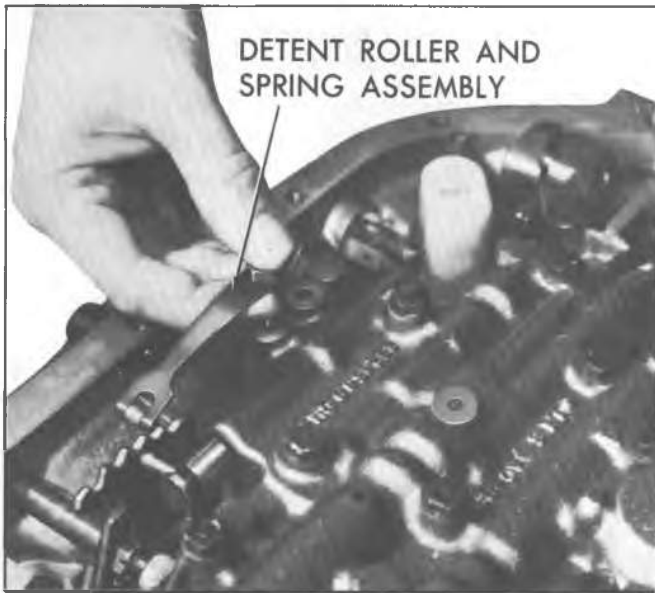


Fig. 7A-185C--Installing Detent Roller and Spring Assembly

INSTALLATION OF FILTER AND INTAKE PIPE

1. Install case to intake pipe "O" ring seal on intake pipe and assemble into filter assembly.

2. Install filter and intake pipe assembly (Fig. 7A-8C).

NOTE: It is recommended that the filter be replaced, rather than cleaned, whenever the transmission is disassembled.

3. Install filter retainer bolt (Fig. 7A-7C).

4. Install new bottom pan gasket and bottom pan, with attaching screws. Torque to 12 ft. lbs.

INSTALLATION OF MODULATOR VALVE AND VACUUM MODULATOR

1. Install modulator valve into case, stem end out (Fig. 7A-186C).

2. Install "O" ring seal on vacuum modulator.

3. Install vacuum modulator into case.

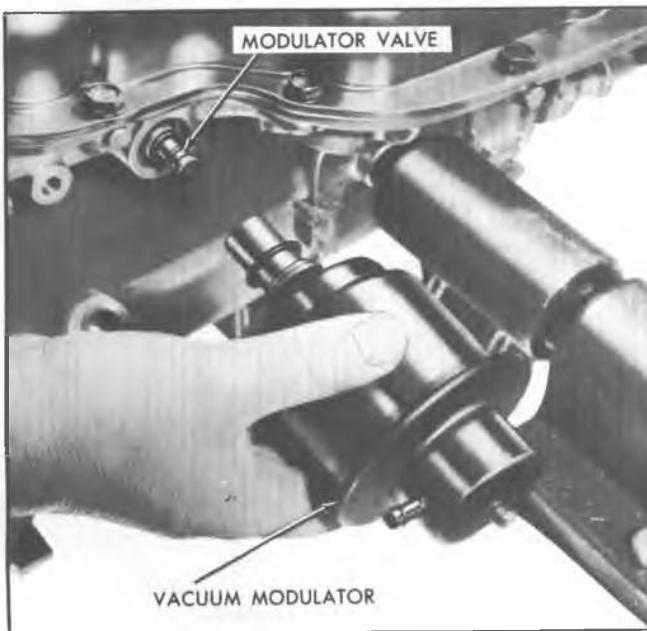


Fig. 7A-186C--Installing Vacuum Modulator and Valve

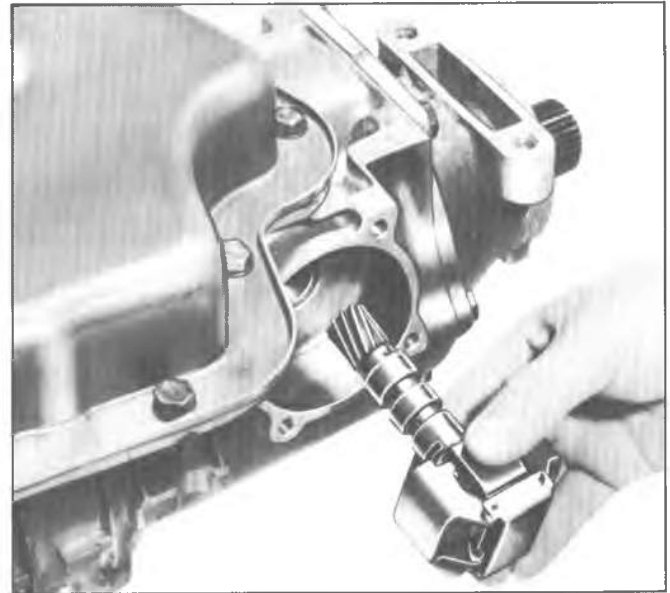


Fig. 7A-187C--Installing Governor Assembly

NOTE: Models CA and CZ use a modulator that is different than the modulator used on the other models. Refer to parts catalog book for correct usage.

4. Install modulator retainer and attaching bolt. Torque bolt 18 ft. lbs.

INSTALLATION OF GOVERNOR ASSEMBLY

1. Install governor assembly into case (Fig. 7A-187C).

2. Attach governor cover and gasket with four (4) attaching bolts. Torque bolts to 18 ft. lbs.

INSTALLATION OF SPEEDOMETER DRIVEN GEAR ASSEMBLY

1. Install speedometer driven gear assembly (Fig. 7A-188C).

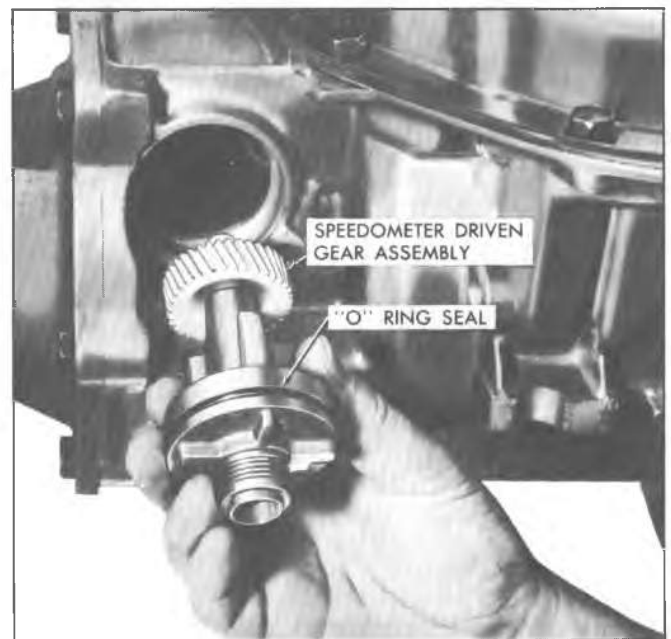


Fig. 7A-188C--Installing Speedometer Driven Gear and Sleeve

2. Install speedometer driven gear retainer and attaching bolt.

INSTALL CONVERTER ASSEMBLY

With the transmission in cradle or portable jack, install the converter assembly into the pump assembly making

certain that the converter hub drive slots are fully engaged with the pump drive gear tangs and the converter installed fully towards the rear of the transmission.

NOTE: The converter used in the CB, CF, CL, CM, CS and CT models has six (6) mounting lugs.

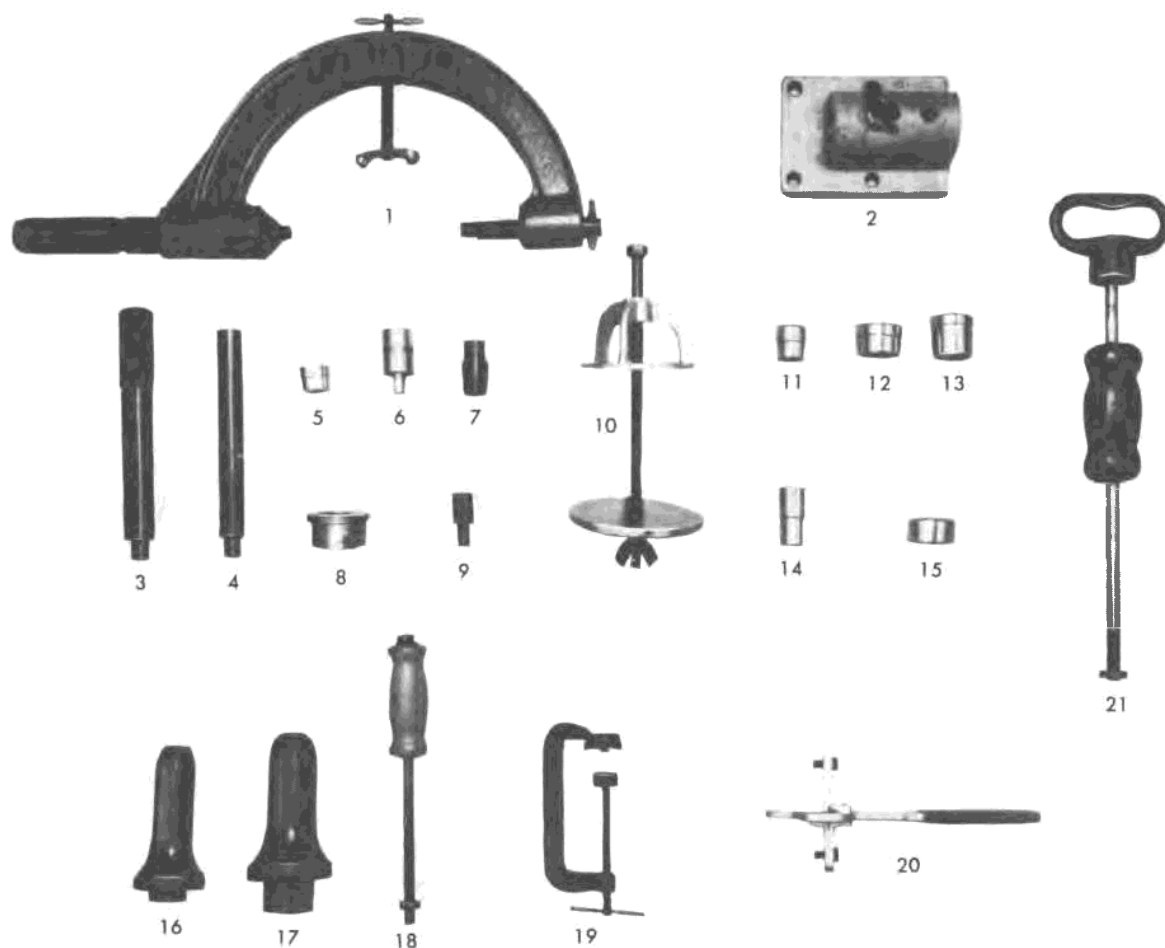
SPECIAL TOOLS



1. J25015 Oil Pump Body and Cover Alignment Band
2. J25016 Front Oil Pump Seal Installer
3. J25020-01 Converter Stator and Turbine End-Play Checking Fixture
4. J25023 Reverse Clutch Selective Shim Group
5. J25012 Reverse Clutch Housing Installer and Remover
6. J25018 Forward Clutch Spring Compressor
7. J25019 Bushing Service Set

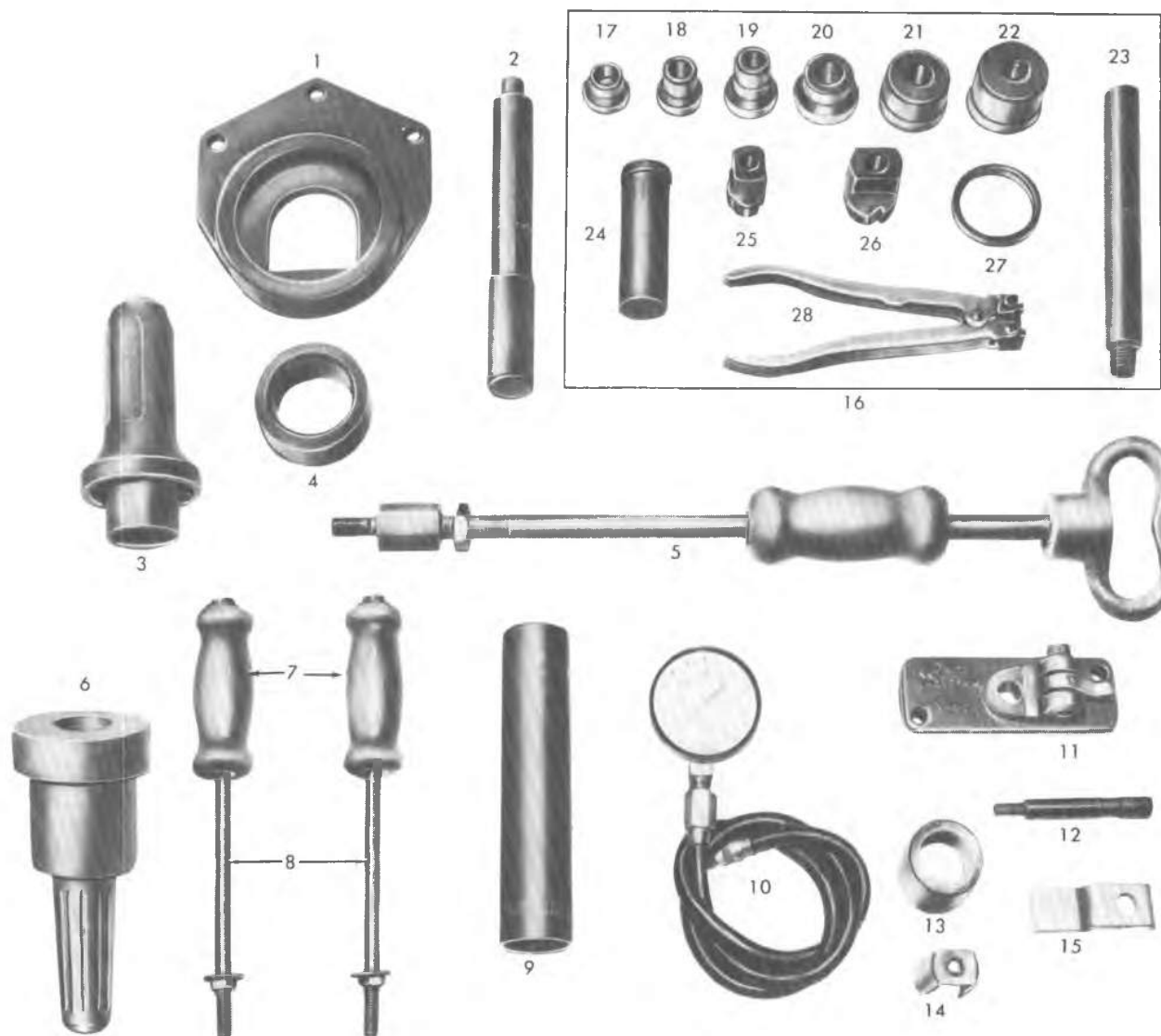
8. J25014 Intermediate Band Apply Pin Gauge
9. J25021 Turbine Shaft and Direct Clutch Installer
10. J25025 Alignment Pin and Stud Set
11. J25013 Output Shaft and Rear Unit Support Fixture
12. J25010 Direct Clutch Seal Protector
13. J25011 Reverse Clutch Seal Protector
14. J25022 End-Play Checking Fixture Adapter

Fig. 7A-1ST-THM 200 Special Tools



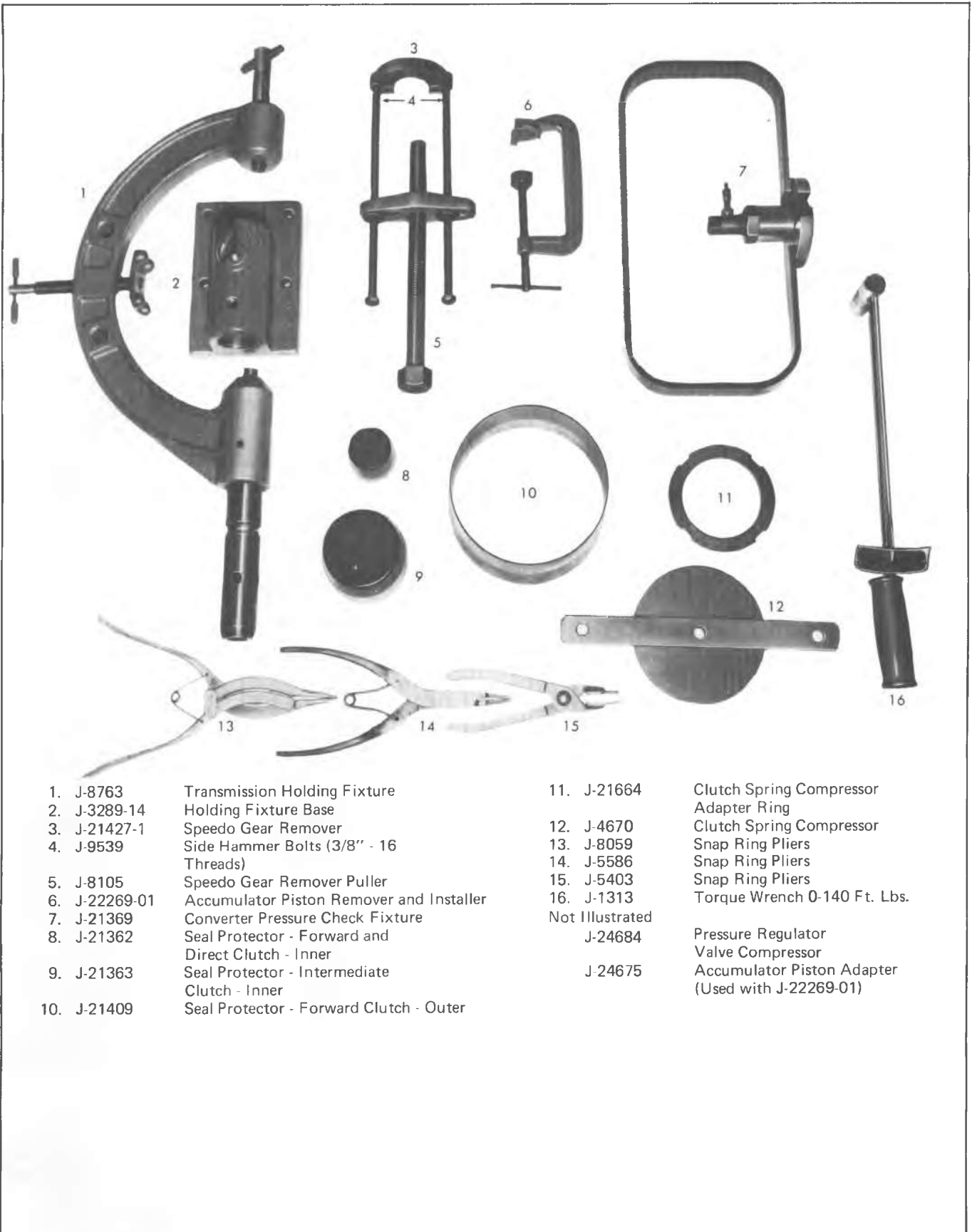
- | | | | |
|---------------|--|-----------------------|---|
| 1. J-8763-02 | Transmission Holding Fixture (Used with J-3289-20 Base) | 16. J-5154 or J-21426 | Extension Housing Oil Seal Installer |
| 2. J-3289-20 | Transmission Holding Fixture Base | 17. J-21359 | Pump Oil Seal Installer |
| 3. J-8092 | Driver Handle (Threaded type) | 18. J-7004 | Slide Hammers (Pair) For Pump Body removal (3/8" x 16 thread) |
| 4. J-21465-13 | Driver Handle Extension (Used with J-8092) | 19. J-22269-01 | Direct Clutch Accumulator Piston Remover and Installer (THM 350 only) |
| 5. J-23062-3 | Sun Gear and Reaction Carrier Bushing | 20. J-23069 | Intermediate Accumulator Cover Remover and Installer |
| 6. J-23062-7 | Output Shaft Bushing Installer | 21. J-2619-01 | Slide Hammer (5/8" x 18 with 1/2" x 13 Adapter) |
| 7. J-21465-15 | Stator Shaft Front Bushing Remover (Used with J-8092) | Not Illustrated | |
| 8. J-23329 | Direct Clutch Bushing Installer | J-21369 | Converter Pressure Check Fixture |
| 9. J-9534-01 | Output Shaft Bushing Remover | J-8001 | Dial Indicator Set (.001" Increments, .001" Travel) |
| 10. J-23327 | Clutch Spring Compressor | J-21427-1 | Speedo Gear Remover |
| 11. J-23062-2 | Stator Shaft Rear Bushing Installer (Both Rear) | J-9539 | Slide Hammer Bolts (3/8" - 16 Threads) |
| 12. J-23062-1 | Case Bushing Remover and Installer | J-8105 | Speedo Gear Remover Puller |
| 13. J-21424-9 | Extension Housing Bushing Remover and Installer (Used with J-8092) | J-5586 | Snap Ring Pliers |
| 14. J-21424-7 | Stator Shaft Front Bushing Installer (Used with J-8092) | J-24367 | Transmission Band Adjuster (THM 250 only) |
| 15. J-23062-5 | Input Ring Gear Bushing Remover and Installer | J-24675 | Accumulator Piston Adapter (Used with J-22269-01) |

Fig. 7A-2ST-CBC 250/350 Special Tools



- | | | | |
|---------------|--|----------------|---|
| 1. J-6116-01 | Rear Unit Holding Fixture | 14. J-21795-2 | Part of Above Holding Tool |
| 2. J-8092 | Driver Handle | 15. J-5384 | Converter Holding Strap |
| 3. J-21359 | Pump Oil Seal Installer | 16. J-21465-01 | Bushing Tool Set |
| 4. J-21364 | Holding Fixture Adapter (Used with J-6116-01 Fixture) | 17. J-21465-5 | Part of Bushing Tool Set |
| 5. J-2619 | Slide Hammer (Used with 2619-4 Adapter and Remover Tools J-21465-01) | 18. J-21465-3 | Part of Bushing Tool Set |
| 6. J-5154 | Extension Oil Seal Installer | 19. J-21465-2 | Part of Bushing Tool Set |
| 7. J-6585 | Slide Hammer Weights | 20. J-21465-1 | Part of Bushing Tool Set |
| 8. J-9539 | Slide Hammer Bolts (3/8" - 16 Threads) | 21. J-21465-17 | Part of Bushing Tool Set |
| 9. J-5590 | Speedo Gear Installer | 22. J-21465-8 | Part of Bushing Tool Set |
| 10. J-21867 | Pressure Gauge and Hose | 23. J-21465-13 | Part of Bushing Tool Set |
| 11. J-21370-6 | Rear Band Apply Fixture | 24. J-21465-6 | Part of Bushing Tool Set |
| 12. J-21370-5 | Rear Band Apply Pin | 25. J-21465-15 | Part of Bushing Tool Set |
| 13. J-21795-1 | Gear Unit Assembly Holding Tool | 26. J-21465-16 | Part of Bushing Tool Set |
| | | 27. J-21465-9 | Part of Bushing Tool Set |
| | | 28. J-21465-10 | Part of Bushing Tool Set |
| | | 29. J-22182 | Ext. Bushing Rem. and Inst. (Not Illustrated) |

Fig. 7A-3ST-THM 400/475 Special Tools



- | | | | |
|---------------|--|-----------------|---|
| 1. J-8763 | Transmission Holding Fixture | 11. J-21664 | Clutch Spring Compressor |
| 2. J-3289-14 | Holding Fixture Base | 12. J-4670 | Adapter Ring |
| 3. J-21427-1 | Speedo Gear Remover | 13. J-8059 | Clutch Spring Compressor |
| 4. J-9539 | Side Hammer Bolts (3/8" - 16 Threads) | 14. J-5586 | Snap Ring Pliers |
| 5. J-8105 | Speedo Gear Remover Puller | 15. J-5403 | Snap Ring Pliers |
| 6. J-22269-01 | Accumulator Piston Remover and Installer | 16. J-1313 | Torque Wrench 0-140 Ft. Lbs. |
| 7. J-21369 | Converter Pressure Check Fixture | Not Illustrated | |
| 8. J-21362 | Seal Protector - Forward and Direct Clutch - Inner | J-24684 | Pressure Regulator |
| 9. J-21363 | Seal Protector - Intermediate Clutch - Inner | J-24675 | Valve Compressor |
| 10. J-21409 | Seal Protector - Forward Clutch - Outer | | Accumulator Piston Adapter (Used with J-22269-01) |

Fig. 7A-4ST-THM 400/475 Special Tools

SPECIFICATIONS

TURBO-HYDRAMATIC "200"

Pump Cover Bolts	24 N·m	(18 ft. lbs.)
Pump to Case Attaching Bolts	24 N·m	(18 ft. lbs.)
Parking Pawl Bracket Bolts	24 N·m	(18 ft. lbs.)
Control Valve Body Bolts	15 N·m	(11 ft. lbs.)
Oil Screen Retaining Bolts	15 N·m	(11 ft. lbs.)
Bottom Pan Attaching Bolts	16 N·m	(12 ft. lbs.)
Converter to Flywheel Bolts	48 N·m	(35 ft. lbs.)
Transmission to Engine Mounting Bolts	34 N·m	(25 ft. lbs.)
Converter Dust Shield Screws	11 N·m	(8 ft. lbs.)
Manual Shaft Nut	31 N·m	(23 ft. lbs.)
Speedometer Driven Gear Attaching Bolts	11 N·m	(8 ft. lbs.)
Detent Cable Attaching Screw	9 N·m	(6 ft. lbs.)
Oil Cooler Line to Transmission Connector	37 N·m	(25 ft. lbs.)
Oil Cooler Line to Radiator Connector	27 N·m	(20 ft. lbs.)
Linkage Swivel Clamp Nut	41 N·m	(30 ft. lbs.)
Shifter Assembly to Sheet Metal Screws	10 N·m	(8 ft. lbs.)
Converter Bracket to Adapter Nuts	17 N·m	(13 ft. lbs.)
Catalytic Converter to Rear Exhaust Pipe Nuts	23 N·m	(17 ft. lbs.)
Exhaust Pipe to Manifold Nuts	16 N·m	(12 ft. lbs.)
Rear Transmission Support Bolts	54 N·m	(40 ft. lbs.)
Mounting Assembly to Support Nuts	29 N·m	(21 ft. lbs.)
Mounting Assembly to Support Center Nut	44 N·m	(33 ft. lbs.)
Adapter to Transmission Bolts	44 N·m	(33 ft. lbs.)

TURBO HYDRA-MATIC— 350

TORQUE SPECIFICATIONS

Pump Cover to Pump Body	17 ft. lbs.
Pump Assembly to Case	18-1/2 ft. lbs.
Valve Body and Support Plate	130 in. lbs.
Parking Lock Bracket	29 ft. lbs.
Oil Suction Screen	40 in. lbs.
Oil Pan to Case	130 in. lbs.
Extension to Case	25 ft. lbs.
Modulator Retainer to Case	130 in. lbs.
Inner Selector Lever to Shaft	25 ft. lbs.
Detent Valve Actuating Bracket	52 in. lbs.
Converter to Flywheel Bolts	35 ft. lbs.
Under Pan to Transmission Case	110 in. lbs.
Transmission Case to Engine	35 ft. lbs.
Oil Cooler Pipe Connectors to Transmission	
Case (Straight Pipe Fitting)	25 ft. lbs.
(Tapered Pipe Fitting)	15 ft. lbs.
Oil Cooler Pipe to Connectors	10 ft. lbs.
Gearshift Bracket to Frame	15 ft. lbs.
Gearshift Shaft to Swivel	20 ft. lbs.
Manual Shaft to Bracket	20 ft. lbs.
Detent Cable to Transmission	75 in. lbs.
Intermediate Band Adjust Nut	15 ft. lbs.

TURBO HYDRA-MATIC— 400

TORQUE SPECIFICATIONS

Pump Cover Bolts	18 ft. lbs.
Parking Pawl Bracket Bolts	18 ft. lbs.
Center Support Bolt	23 ft. lbs.
Pump to Case Attaching Bolts	18 ft. lbs.
Extension Housing to Case Attaching Bolts	23 ft. lbs.
Rear Servo Cover Bolts	18 ft. lbs.
Detent Solenoid Bolts	7 ft. lbs.
Control Valve Body Bolts	8 ft. lbs.
Bottom Pan Attaching Screws	12 ft. lbs.
Modulator Retainer Bolt	18 ft. lbs.
Governor Cover Bolts	18 ft. lbs.
Manual Lever to Manual Shaft Nut	8 ft. lbs.
Manual Shaft to Inside Detent Lever	18 ft. lbs.
Linkage Swivel Clamp Nut	43 ft. lbs.
Converter Dust Shield Screws	93 ft. lbs.
Transmission to Engine Mounting Bolts	35 ft. lbs.
Converter to Flywheel Bolts	32 ft. lbs.
Rear Mount to Transmission Bolts	40 ft. lbs.
Rear Mount to Crossmember Bolt	40 ft. lbs.
Crossmember Mounting Bolts	25 ft. lbs.
Line Pressure Take-Off Plug	13 ft. lbs.
Strainer Retainer Bolt	10 ft. lbs.
Oil Cooler Pipe Connectors to Transmission	
Case	28 ft. lbs.
Oil Cooler Pipe to Connector	10 ft. lbs.
Gearshift Bracket to Frame	15 ft. lbs.
Gearshift Shaft to Swivel	20 ft. lbs.
Manual Shaft to Bracket	20 ft. lbs.
Downshift Switch to Bracket	30 in. lbs.