

SECTION 5-C

TRANSMISSION REMOVAL AND INSTALLATION

DISASSEMBLY AND ASSEMBLY

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5-13 REMOVAL AND INSTALLATION OF TRANSMISSION

a. Removal of Transmission

1. Hoist front and rear of car and rest it solidly on stands placed under frame. Frame should be at least 20' above floor.
2. Disconnect exhaust pipe(s).
3. Remove converter housing cover.
4. Turn flywheel until one converter drain plug can be loosened to provide an air vent. Then turn opposite plug straight down. Remove plug and allow oil to drain from converter.
5. Remove filler pipe from oil pan to drain pan.
6. Disconnect cooler pipes. NOTE: If transmission is being removed to correct clutch or band difficulties, the cooler and lines must be flushed with air and, if possible, oil to remove residue.
7. Remove three flywheel to converter bolts.
8. Disconnect speedometer cable, stator control rod at accumulator and lower shift rods at equalizer.
9. Disconnect equalizer bracket at accumulator bolts. Slide equalizer out of bushing in frame rail. Remove equalizer and bracket.
10. Disconnect propeller shaft at rear com-

panion flange, mark flange and shaft so parts may be re-assembled in same relative position. Support shaft up out of the way to prevent damage to center joint caused by weight of shaft.

11. Place transmission jack or hoist in position and adjust it to securely support the transmission in accordance with instructions for the equipment being used.

12. Remove two center bearing support to frame bolts and slide propeller shaft rearward until shaft is disengaged from transmission output shaft.

13. Remove bolts attaching mounting pad to rear bearing regainer. See Figure 2-3.

14. Raise engine and transmission assembly just enough to relieve load on transmission support. Remove bolts attaching support to frame rails. Remove support and pad as an assembly. NOTE: Shims may be used between support and frame. If shims are present note number and location so they may be reinstalled in original location.

15. Place suitable jack under rear end of engine lower crankcase so that engine will be safely supported while transmission is removed.

16. Lower the transmission just enough so that converter housing bolts can be reached. With engine and transmission supported by the separate jacks, disconnect the converter housing from engine crankcase.

17. Move transmission rearward to disengage hub of converter pump cover from crankshaft, lower transmission and remove it from under car.

b. Installation of Transmission

1. Turn flywheel so that one hole for converter attaching bolt is straight up.

2. Raise transmission into place with same equipment as used for removal. Align converter attaching bolt holes with holes in flywheel before moving transmission forward against cylinder crankcase.

3. Adjust lifting equipment so that converter housing meets the engine crankcase squarely and engages the two dowels. Install all converter housing bolts and lockwashers. Tighten all bolts to 45-55 ft. lbs. torque. Connect cooler pipes.

4. Raise transmission just enough to install support and pad, installing support and shims (if any) in their original location.

5. Install three flywheel to ring gear bolts and lockwashers and torque to 30 ft. lbs. Check converter drain plugs for tightness and install converter housing cover.

6. Install mounting pad to rear bearing retainer bolts and torque to 50-60 ft. lbs.

7. Remove transmission lifting equipment and engine support.

8. Attach oil filler pipe to oil pan.

9. Attach speedometer cable to speedometer driven gear sleeve.

10. Attach stator control linkage to lever on high accumulator. Adjust if necessary as outlined in paragraph 3-9 (b).

11. Assemble equalizer to bracket and frame bushing. Attach bracket to accumulator bolts. Attach and adjust linkage as outlined in paragraph 5-12. See Figure 5-27.

12. Slide propeller shaft forward to engage yoke with output shaft splines. Reinstall propeller shaft center bearing support to frame bolts.

13. Re-attach propeller shaft to rear companion flange as outlined in paragraph 6-16.

14. Fill transmission as outlined in paragraph 1-4.

5-14 DISASSEMBLY OF TRANSMISSION TO REMOVE MAJOR PARTS AND UNITS

a. Preliminary Instructions

1. Before starting disassembly of the transmission it should be thoroughly cleaned externally to avoid getting dirt inside.

2. Place transmission on a CLEAN work bench and use CLEAN tools during disassembly and assembly. Provide CLEAN storage space for parts and units removed from transmission. An excellent working arrangement is provided by assembling the transmission to holding fixture J-7009. See Figure 5-30.

3. The transmission contains parts which are ground and highly polished, therefore, parts should be kept separated to avoid nicking and burring surfaces.

4. When disassembling transmission carefully inspect all gaskets at times of removal. The imprint of parts on both sides of an old gasket will show whether a good seal was obtained. A poor imprint indicates a possible source of oil leakage due to gasket condition, looseness of bolts, or uneven surfaces of parts.

5. None of the parts require forcing when disassembling or assembling transmission. Use a rawhide or similar soft mallet to separate tight fitting cases - do not use a hard hammer.

6. It is good practice to reassemble parts in the same relative position as they were originally assembled, however, parts must not be prick punched or filed for assembly identification. The wear pattern of the parts will usually indicate their original assembly positions.

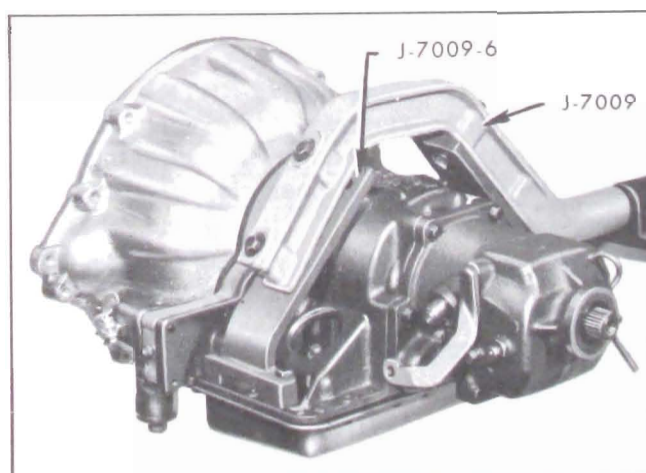


Figure 5-30—Transmission Assembled To Fixture J-7009

b. Removal of Converter and Housing

NOTE: This operation not required for removal of valve and servo body or rear bearing retainer.

1. Remove both drain plugs from converter pump cover to drain any oil remaining in converter.

2. Remove all bolts and lock washers attaching cover to converter pump, then remove cover. Check the cover seal for damage or evidence of oil leakage before removing it from cover.

3. Remove reverse band adjustment cover and gasket, using remover tool J-2655. Shift into "Parking" and pry up on reverse band operating lever with screwdriver to lock input shaft while removing the bolt, lockwasher, retaining washer and thrust washer from front end of input shaft. See Figure 5-31. Remove bronze thrust washer from first turbine support hub.

4. Insert screwdriver in first turbine support hole and slide turbine assembly off input shaft.

5. Install tool J-5806 over input shaft with beveled end outward. Pull stator forward on reaction shaft, grasp spacer and needle bearing race behind stator to retain all free wheeling parts of the stator, then slide the assembly forward upon the tool and remove from input shaft. See Figure 5-32.

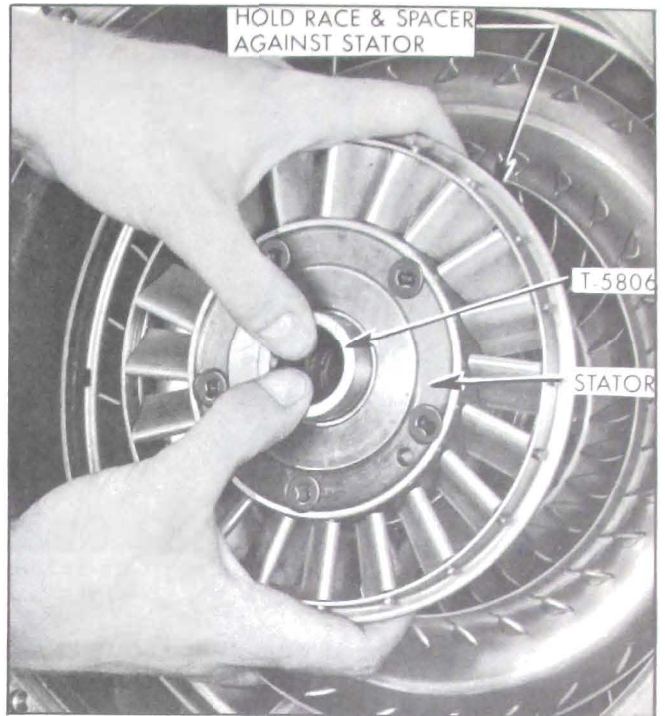


Figure 5-32—Removing Stator Assembly

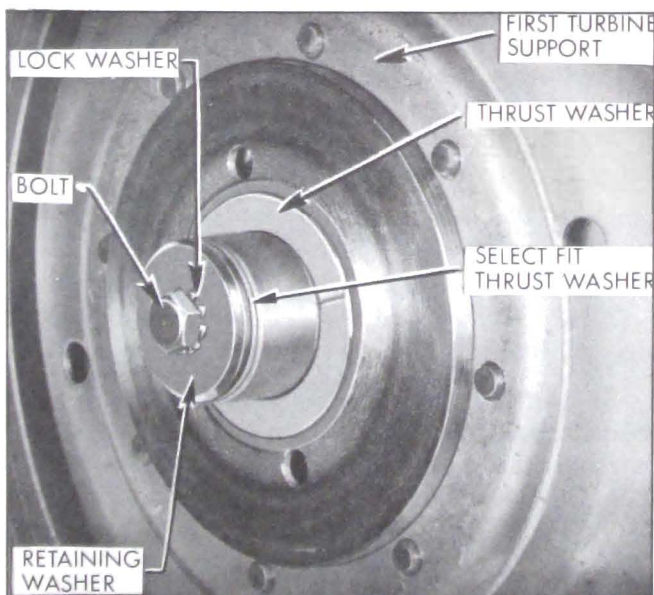


Figure 5-31—Turbine Retaining Washer and Thrust Washer

6. Pull the converter pump forward from the reaction shaft and immediately check for evidence of oil leakage. Radial streaks of fresh oil on back of pump and fresh oil streaks on face of front oil pump body indicate leakage past the oil pump seal. Examine needle bearing assembly staked in pump. See Figure 5-52.

7. Before removing the converter housing check to see whether all attaching bolts are tight. Loose bolts may be the cause of oil leakage at this point.

8. Place transmission so housing is over edge of bench and remove it. Examine the rubber oil seal located around the front oil pump to see whether it has been uniformly compressed by the housing; if not, check for any obstacle that may be around the oil pump or opening in housing that would prevent uniform compression of the seal.

9. See paragraph 5-15 for overhaul of converter units and paragraph 5-23 (i) for installation of converter housing and converter.

c. Removal of Oil Pan, Valve and Servo Body Assembly

NOTE: For removal of only the valve and servo body assembly the converter and converter housing (subpar. b) need not be removed. The following procedure also may be used with transmission in car.

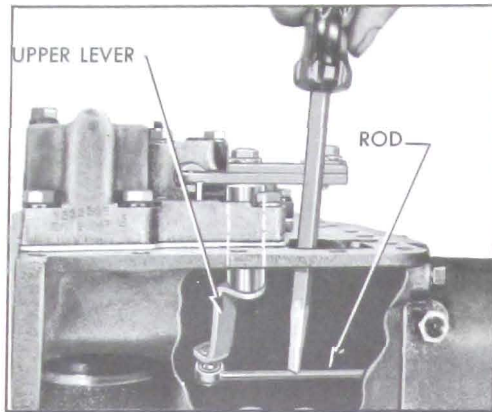


Figure 5-33—Disconnecting Valve Operating Rod from Upper Lever

1. Disconnect shift rod at lever (if transmission is in car).
2. Remove both band adjustment covers and gaskets, using removing tool J-2655.
3. Turn transmission bottom side up.
4. Remove the oil pan and gasket.
5. Remove six screws holding oil screen and remove screen.
6. Disconnect valve operating rod from valve operating lever (upper) by placing screwdriver on rod close to lever and exerting slight pressure. A spring loaded socket on rod engages a ball stud on lever. See Figure 5-33.
7. Slightly loosen all valve and servo body attaching bolts, then remove bolts and lock-washers. Do not loosen or remove the slotted safety nuts on valve-to-servo body studs.

8. Lightly pry upward on the assembly to free the gasket between servo body and transmission case. Push shift control valve and lower operating lever inward to align the lower lever with opening in transmission case, then remove the assembly. See Figure 5-34.

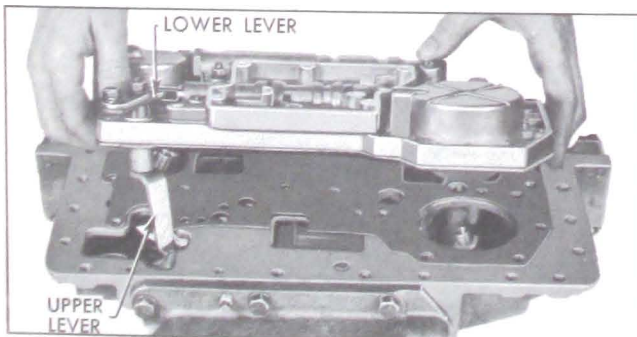


Figure 5-34—Removing Valve and Servo Body Assembly

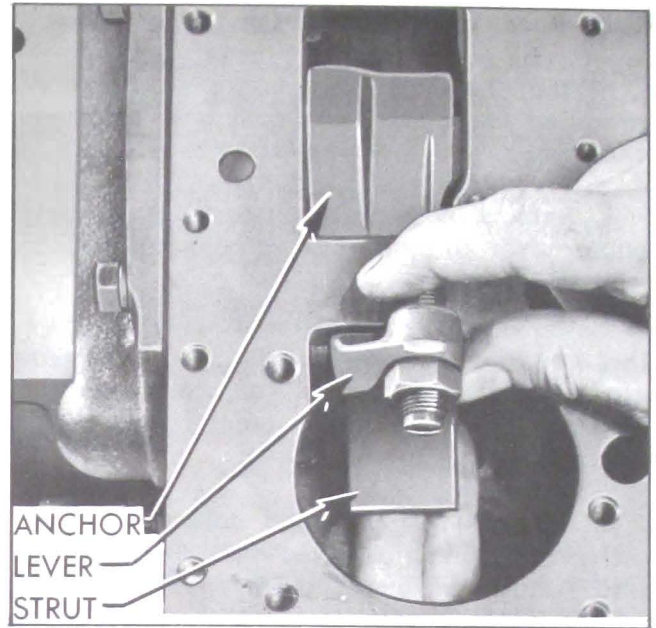


Figure 5-35—Removing Reverse Band Operating Strut

CAUTION: Do not grasp slotted end of control valve because sharp edges may cut hand. Remove gasket and check for indication of oil leakage.

9. Remove the reverse band operating strut by extending fingers through the adjustment hole to prevent strut from falling into transmission case then release the strut by raising the operating lever. See Figure 5-35.
10. See paragraph 5-17 for overhaul of valve and servo bodies and oil pan, and paragraph 5-23 (g) for installation of these units.

d. Removal of Reaction Shaft Flange, Oil Pump, Accumulators, and Clutch

NOTE: The converter and converter housing (subpar. b) must be removed.

1. Remove retaining ring from groove in input shaft.
2. Loosen; but do not remove caps on both accumulators.
3. Remove the bolts which attach the accumulators and the oil pump cover but do not remove the stud nuts which attach these parts. See Figure 5-36.
4. Tap very lightly on rear of accumulator bodies with fiber mallet to loosen reaction shaft flange, then remove the assembly and gasket. Leave input shaft in place in transmission.

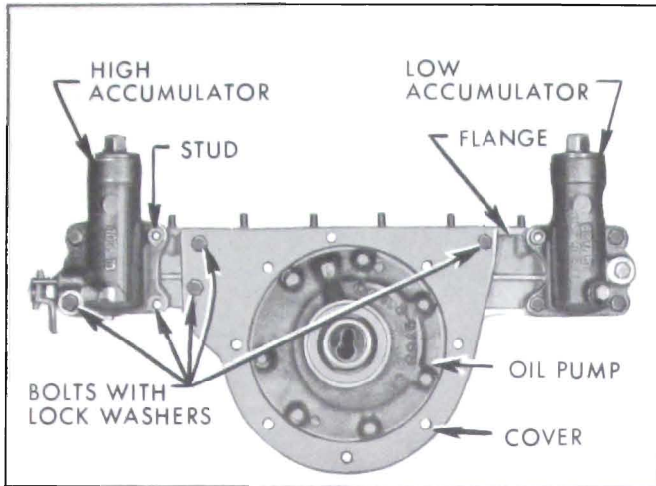


Figure 5-36—Accumulator Body and Reaction Shaft Flange Attaching Screws

5. Check reaction flange gasket for good imprint and freedom from damage which would cause an oil leak at this point.

6. Remove the input shaft and clutch hub front thrust washer from the clutch assembly, then remove the clutch assembly. See Figure 5-37.

7. Remove the low band operating lever by threading a 1/4"-20 cap screw into the lever shaft and pulling shaft out of case.

8. Compress the low band either with reworked pliers or tool J-9478 and remove band from case. See Figures 5-38 and 5-39.

9. See paragraph 5-18 for overhaul of front pump and reaction shaft flange, paragraph 5-19 for overhaul of accumulators, paragraph 5-20 for overhaul of clutch, and paragraph 5-23 for installation of these units.

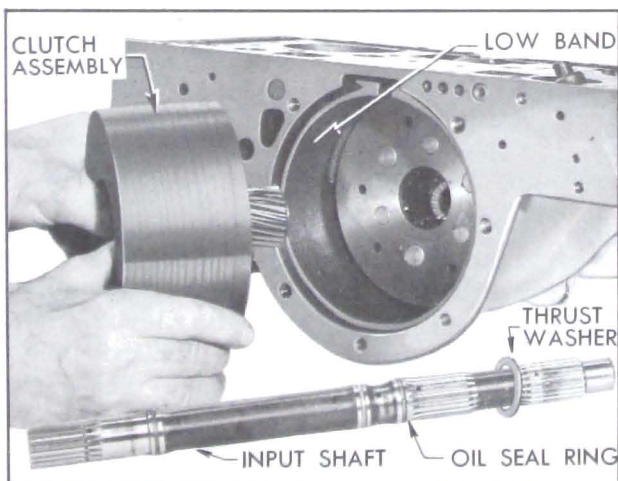


Figure 5-37—Removal of Clutch Assembly

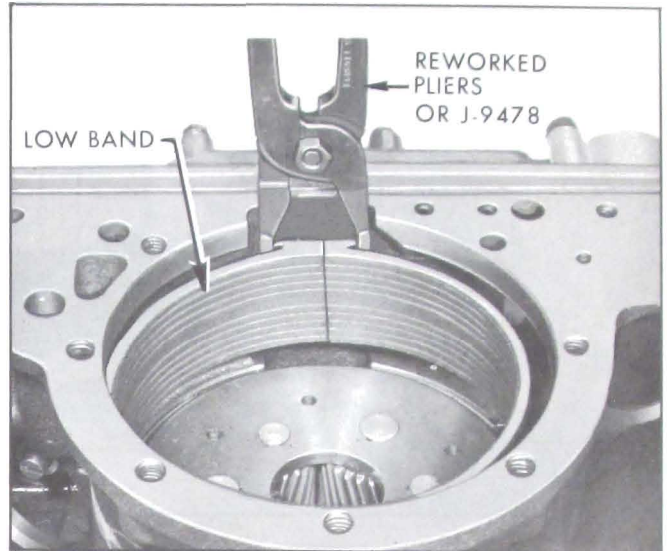


Figure 5-38—Removing Low Band

e. Removal of Rear Bearing Retainer, Rear Bushing, Parking Lock Ratchet Wheel, and Speedometer Driving Gear

NOTE: Only the oil pan need be removed.

1. Disconnect valve operating rod from upper operating lever if not previously done. See Figure 5-33.

2. Remove rear bearing to case retaining bolts using 7/16" 12 point socket.

3. Remove rear bearing retainer and gasket. Check gasket for evidence of oil leakage.

4. Remove speedometer gear and ratchet

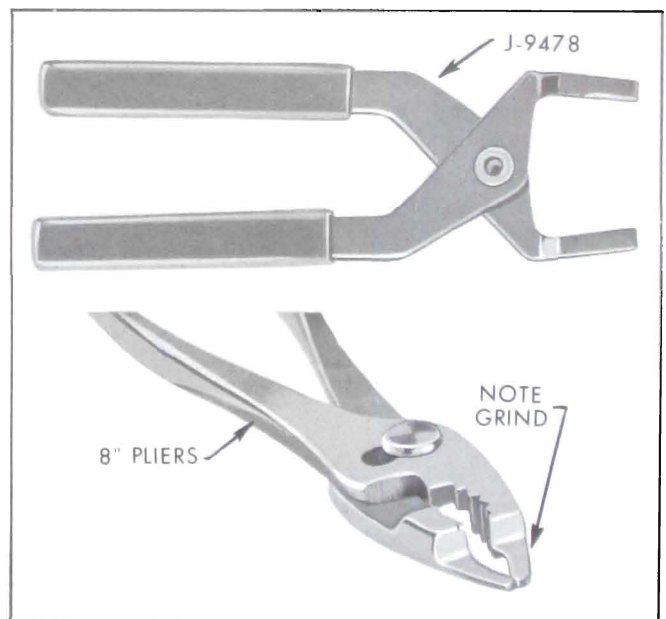


Figure 5-39—Low Band Compressing Tools

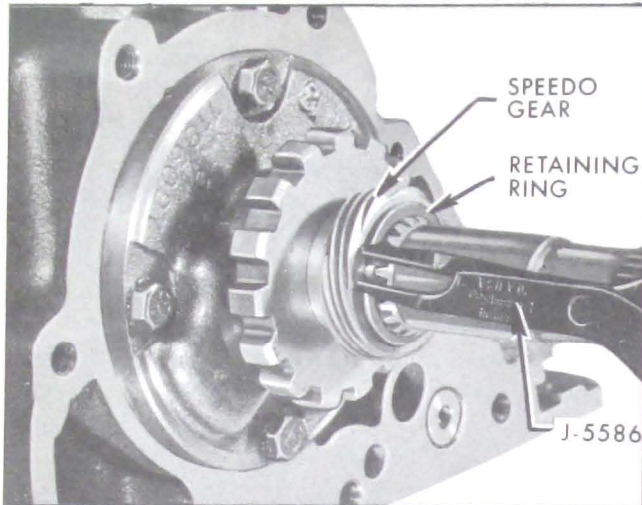


Figure 5-40—Removing Speedometer Gear and Ratchet Wheel Retaining Ring

wheel retaining ring using snap ring pliers J-5586. See Figure 5-40.

5. Remove speedometer driving gear, shim or shims and spacer.

6. See paragraph 5-21 for overhaul of rear bearing retainer and paragraph 5-23 (d) for installation.

f. Removal of Rear Oil Pump and Cleaning of Lubrication Oil Pressure Regulator Valve

NOTE: Rear bearing retainer (subpar. e) must be removed.

1. Remove retaining bolts then remove pump body, which contains the pump gears.

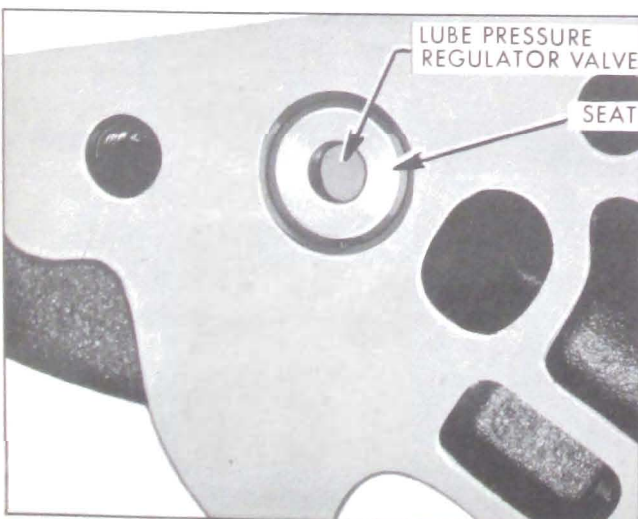


Figure 5-40-A—Lube Pressure Regulator Valve

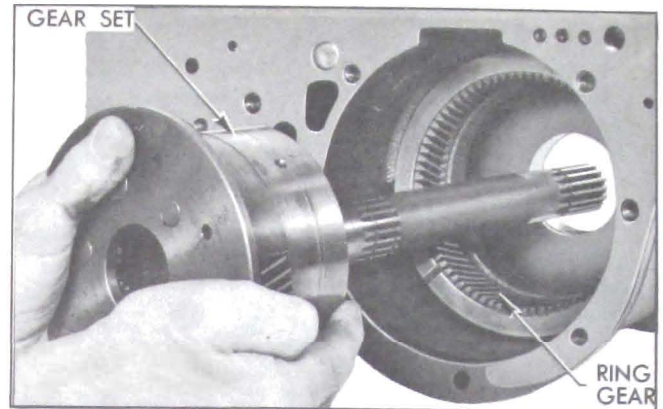


Figure 5-41—Removing Planetary Gear Set

2. Remove the drive key, then use pointed tool to remove the rubber cushion which is located under drive key in the output shaft.

3. Remove the rear pump plate and gasket if they can be removed from the case without prying. If plate is stuck, it can be tapped out after removal of the planetary gear set. Check gasket for indication of oil leakage.

4. Use compressed air and solvent if necessary to clean lube oil pressure regulator valve. See Figure 5-40-A.

5. See paragraph 5-18 for inspection of rear oil pump and paragraph 5-23 (c) for installation.

g. Removal of Planetary Gear Set, Reverse Ring Gear and Reverse Band

NOTE: All of the preceding operations must be performed before removal of planetary gear set.

1. Remove planetary gear set through front of case. See Figure 5-41.

2. Remove the reverse ring gear.

3. Remove ring gear slipper.

4. If rear oil pump plate and gasket were not previously removed, tap them out with hammer handle from front side of case.

5. Thread a 1/4'-20 bolt into the reverse band anchor shaft to pull it from transmission case; then remove the operating lever. Rotate the reverse band until the anchor can be disengaged, then remove this part. See Figure 5-42.

6. Compress ends of reverse band and apply Band Installing Clip J-2595 across the strut flanges, then remove band.

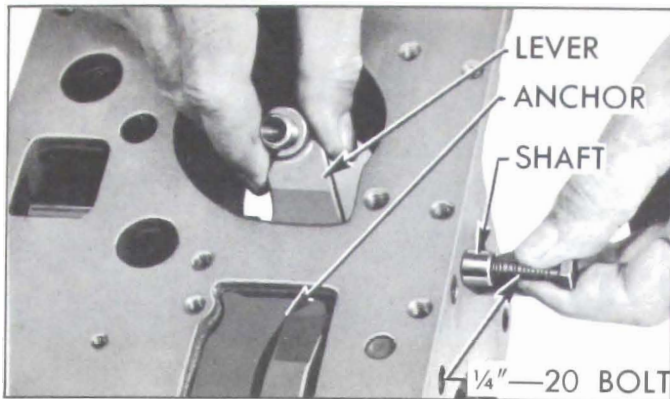


Figure 5-42—Removing Reverse Band Operating Lever and Shaft

7. Remove the reverse ring gear thrust washer and planet carrier rear thrust washer from case.

8. See paragraph 5-22 for overhaul of planetary gear set and paragraph 5-23 (b) for installation.

5-15 DISASSEMBLY, INSPECTION, ASSEMBLY OF TORQUE CONVERTER UNIT

a. Disassembly of Twin Turbine

1. Drive the three roll pins holding the first turbine blades to the turbine support "in" approximately 1/4" using a 1/8" punch. It is not necessary to remove the pins. See Figure 5-43.

2. Attach a bar 1 1/2" x 1/4" x 1" (See Figure 5-44) to a J-7004 slide hammer. Place the edge of the remover under the edge of the first turbine. Hammer sharply on first one side then the other to move the first turbine straight up out of the turbine support.

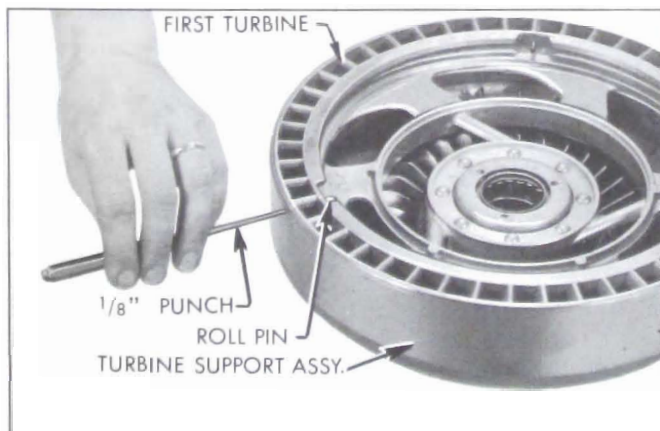


Figure 5-43—Driving in First Turbine Support Pins

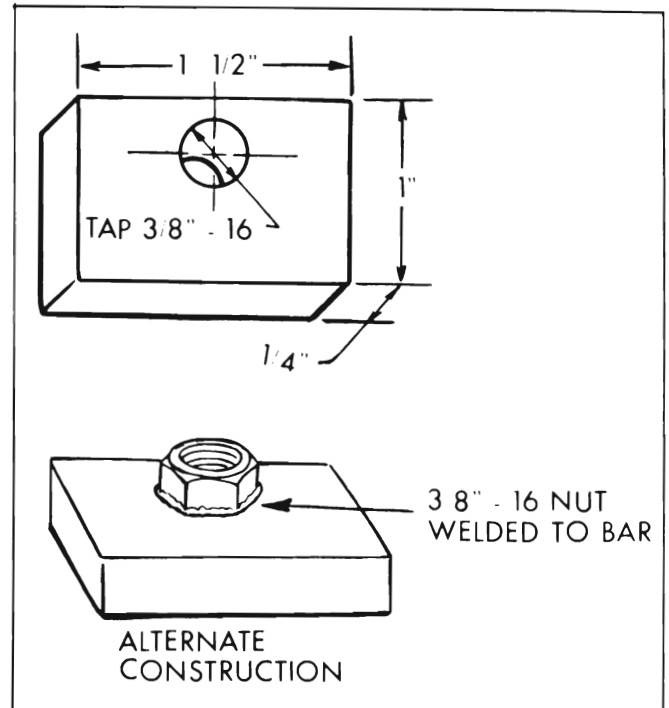


Figure 5-44—Turbine Removing Tool

3. Lift the first stator assembly out of the first turbine support.

4. Pry off the cupped thrust washers and remove the first stator bearings and sprag assembly. See Figure 5-46.

5. Lift the sun gear assembly out of the second turbine carrier.

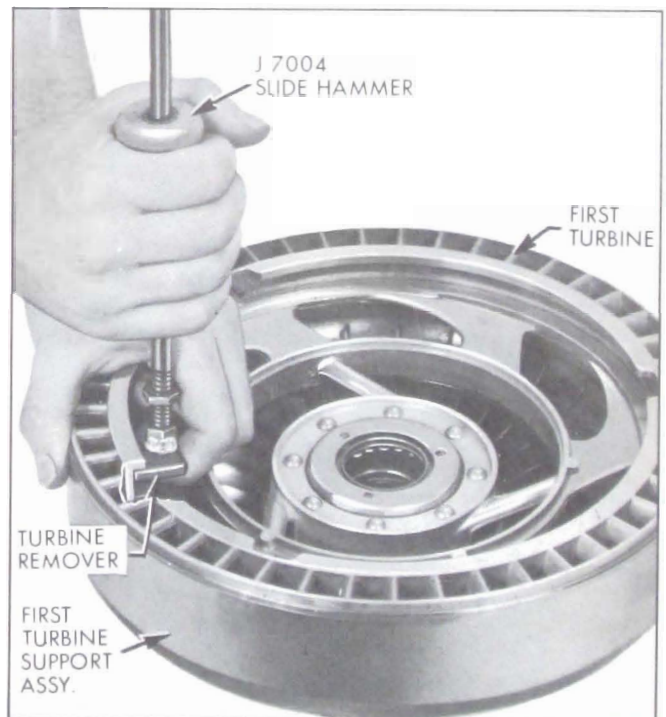


Figure 5-45—Removing First Turbine From Support

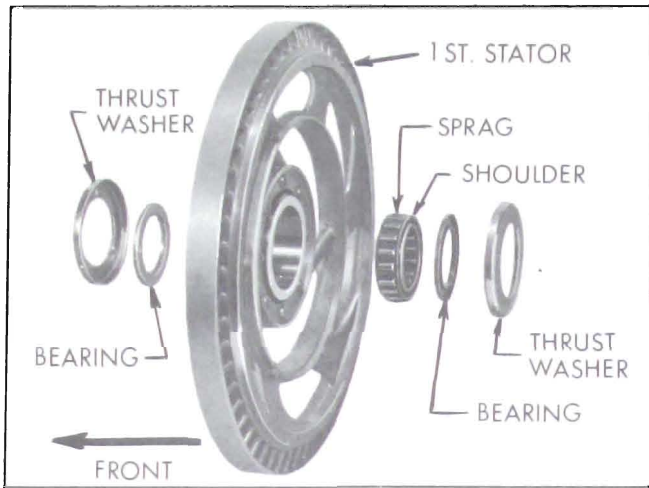


Figure 5-46—First Stator Parts

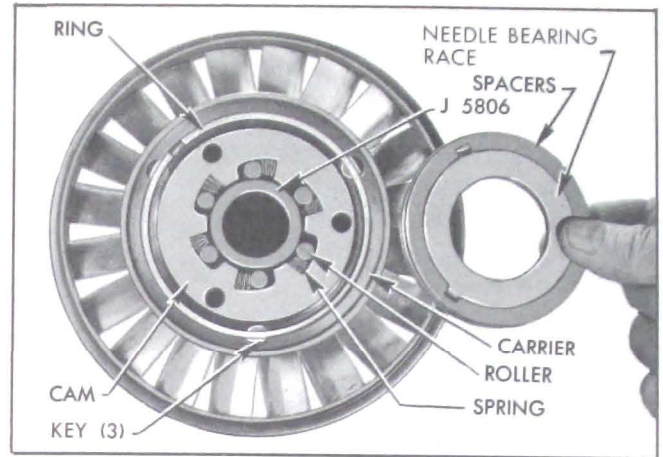


Figure 5-49—Parts in Rear Side of Stator

6. Remove bearing and sprag assembly from the sun gear. See Figure 5-47.

7. Lift the second turbine assembly out of

the first turbine support.

b. Disassembly of Two Position Stator

1. Remove stator thrust washer and selective spacers from rear side of stator, remove tool J-5806, then remove free wheel rollers and springs from the cam.

2. Pry the retaining ring from groove in stator blade rear carrier, and remove free wheel cam and three driving keys. See Figure 5-49.

3. Use screwdriver J-5826 to remove the stator blade front carrier screws and lock-washers, then remove front carrier which is also held to rear carrier by two dowels. See Figure 5-50.

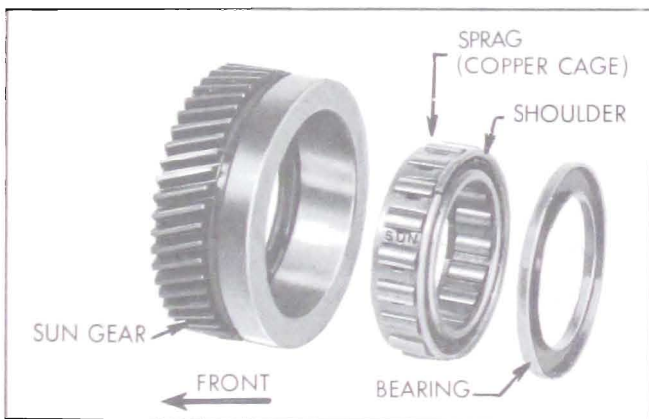


Figure 5-47—Sun Gear Parts

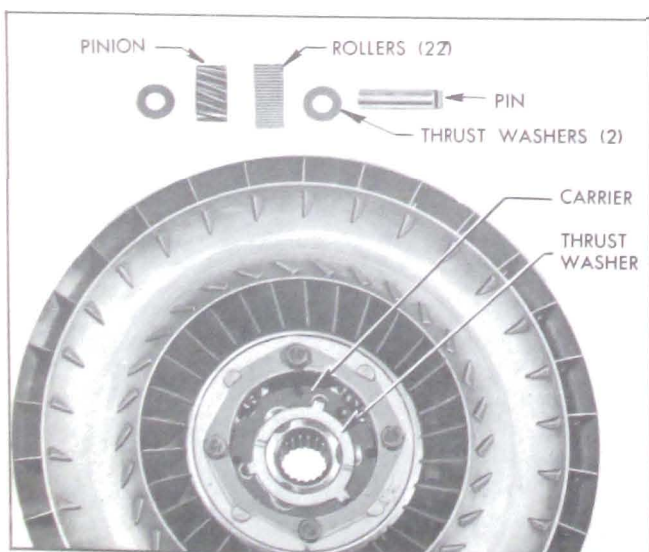


Figure 5-48—Second Turbine Parts

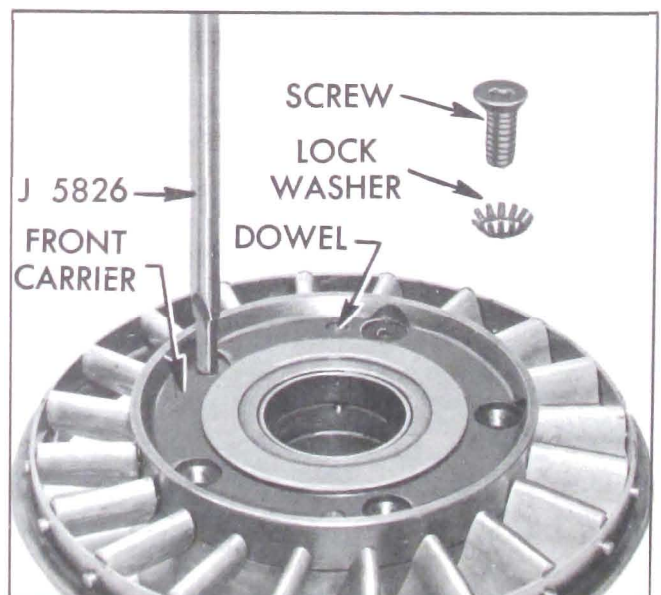


Figure 5-50—Removing Front Carrier Screws

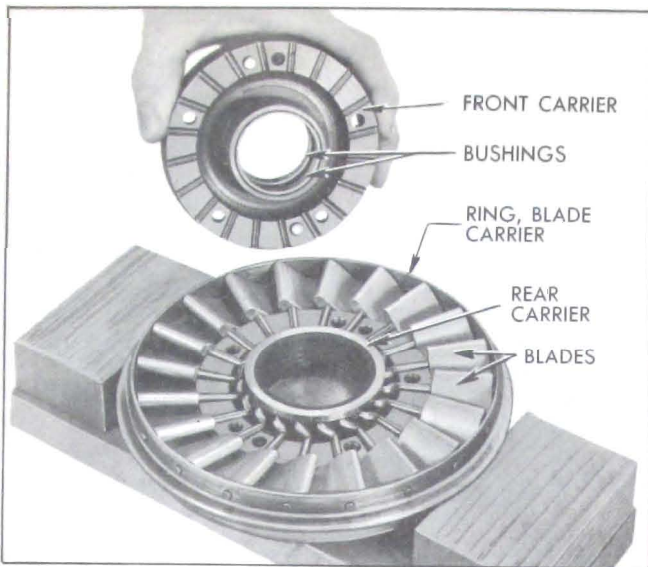


Figure 5-51—Front of Stator Assembly

4. Tilt three or four blades toward the low angle position and slide the crank pin ends clockwise around the stator piston groove. The next blade and all succeeding blades will then have enough clearance to be removed.

c. Inspection of Torque Converter Parts

1. Wash all parts in clean solvent and dry thoroughly.

2. Inspect converter pump hub for scores and for wear caused by the front pump seal. If pump is suspected of leaking oil it may be tested as described in subparagraph d, below.

3. Inspect converter pump and turbines for cracked or distorted vanes. Inspect turbine carrier, planetary gear teeth, thrust washers,

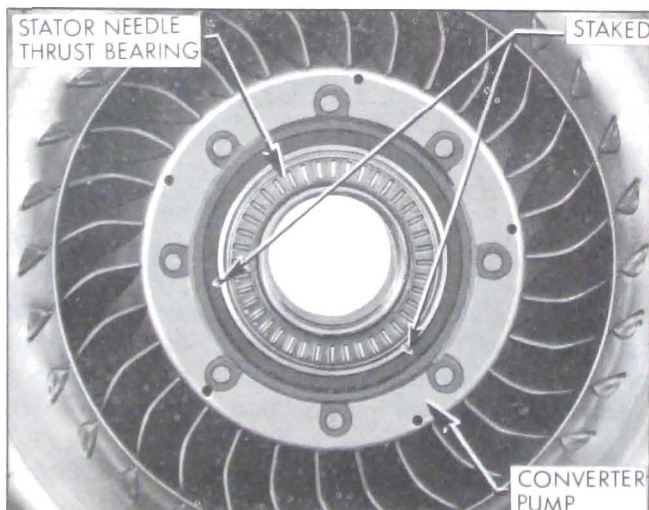


Figure 5-52—Stator Needle Thrust Bearing

bushings and related bearing surfaces for excessive wear, scoring or other damage. Examine stator needle thrust bearing staked in converter pump. See Figure 5-52. If bearing is damaged or worn excessively, carefully drive back the outer staking and remove the bearing. A new bearing assembly should be staked in very lightly, only enough to keep the bearing from falling out.

4. Inspect sprag bores in first stator and sun gear also O.D. of reaction shaft for brinelling, wear or burrs. Inspect sprags and sprag cages for distortion or excessive wear. Replace sprag if cage is distorted.

NOTE: If sprag clutches are dropped or handled in any manner which dislocates a sprag or distorts either cage, the assembly must be replaced.

5. Inspect stator free wheel rollers and cam for nicks or burrs, which should be removed with an Arkansas stone and polished with crocus cloth. Discard any roller springs that are damaged or distorted.

6. Inspect stator blades for distortion, cracks, loose on cranks, or other damage.

7. Inspect piston oil seal ring and bore of blade carrier for scoring or wear. If bushings in carrier are worn they should be replaced, using installer J-5913 to properly locate new bushings. See Figure 5-53.

8. If second turbine or the carrier must be replaced, use care in separating them to avoid damage to the good part.

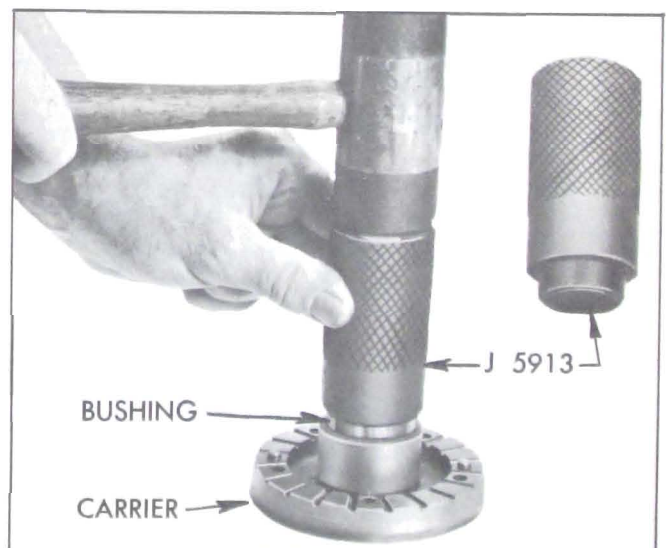


Figure 5-53—Installing Bushing in Blade Carrier

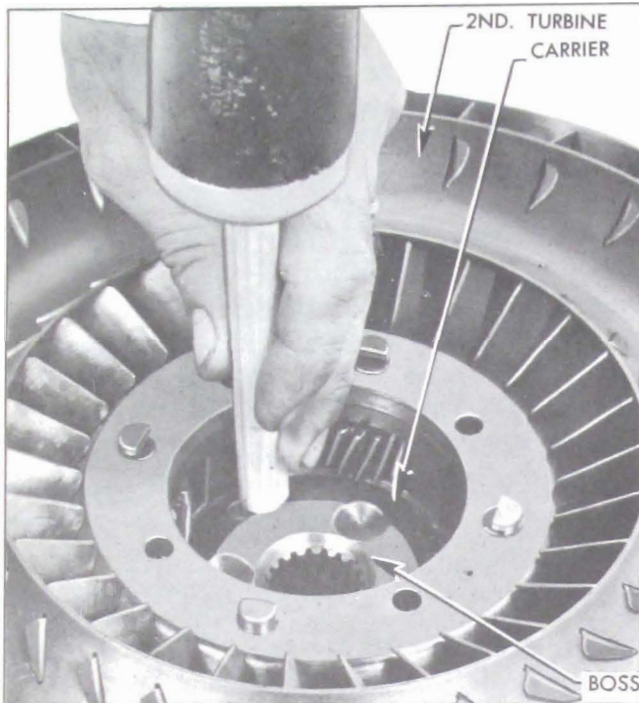


Figure 5-54—Removing Second Turbine Carrier

With second turbine suitably supported, tap carrier **free** of counterbore in turbine, using hammer and a hardwood dowel or other soft punch. Do not drive against surface of thrust boss in carrier. See Figure 5-54.

d. Testing Converter Pump for Oil Leakage

1. Prepare a plate with rubber washer to close the opening in converter pump hub, as

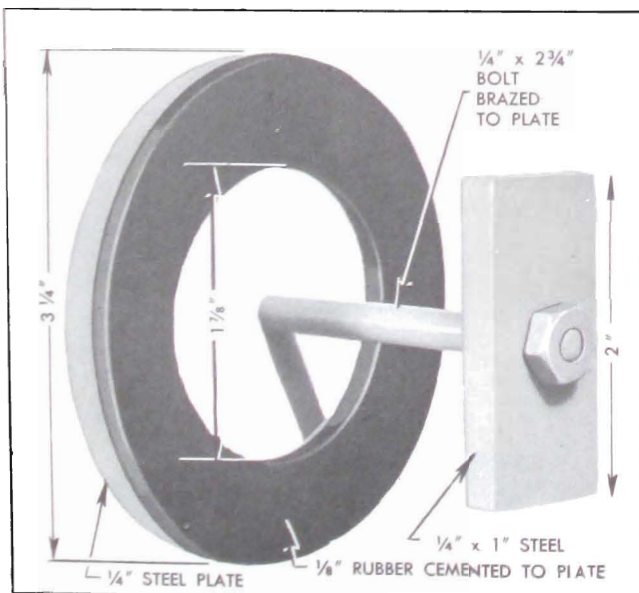


Figure 5-55—Plate and Washer for Pump Test

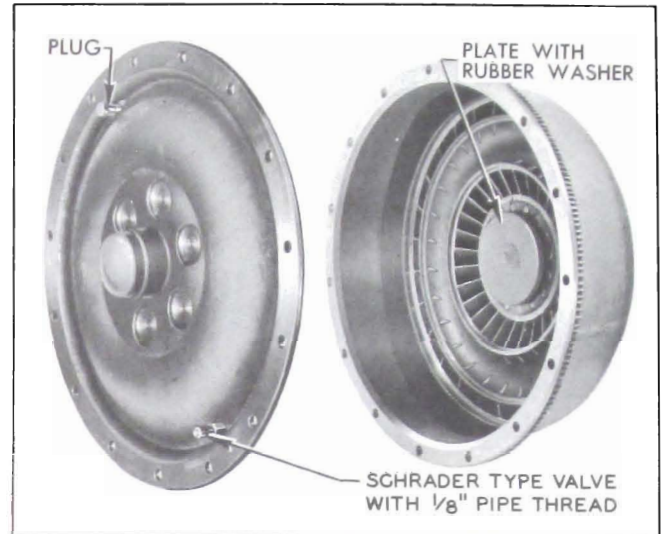


Figure 5-56—Plate and Plugs Installed in Pump and Cover

shown in Figure 5-55. The bolt head should be brazed to the plate to seal the bolt hole, and the 1/8" thick rubber washer should be cemented to the plate.

2. Install plate with washer over inside surface of pump hub (Figure 5-56), then install pump cover with seal and tighten all bolts to 25-30 ft. lbs. torque in sequence shown in Figure 5-133.

3. Install one drain plug, and install a Schrader type valve with 1/8" pipe thread in other drain hole. Tighten parts securely. See Figure 5-56.

4. Attach air hose to valve fitting, fill pump with compressed air at 80 to 100 lbs./sq. in. and submerge pump in water tank. Air bubbles will appear at any point where oil leakage exists.

CAUTION: After a pump cover seal is used in this test it should not be used when rebuilding transmission.

e. Replacement of Starter Ring Gear

1. If ring gear is damaged or worn and must be replaced, drive ring gear off converter pump with drift. Gear will clear balance weights on side of pump. See Figure 5-56-A.

2. Install new gear by carefully positioning new gear over pump and aligning bolt holes. Install 2 or 3 bolts to position ring gear and draw it into place.

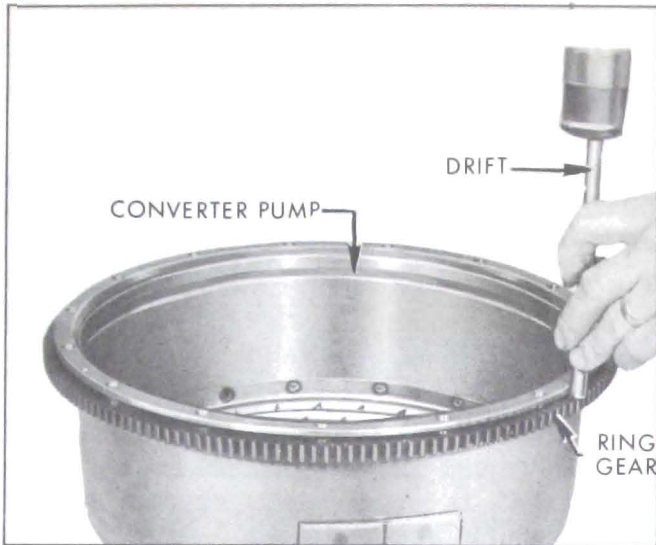


Figure 5-56-A—Removing Ring Gear From Converter Pump

f. Assembly of Two Position Stator

1. Insert stator piston and oil seal ring in the rear carrier and push to extreme forward position.

2. Place the rear carrier and piston on center block of fixture to hold the piston in position. See suggested fixture shown in Figure 5-57.

3. Place the stator outer ring on 2 outer blocks of fixture with crank pin holes up. See Figure 5-58.

4. Holding the blade in the approximate "low pitch" position insert the crank pin in the outer ring. Then rotate the blade to bring the

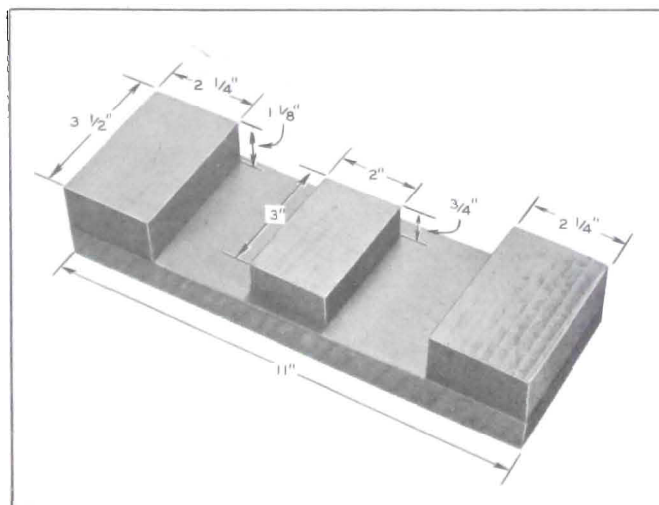


Figure 5-57—Two Position Stator Assembling Fixture

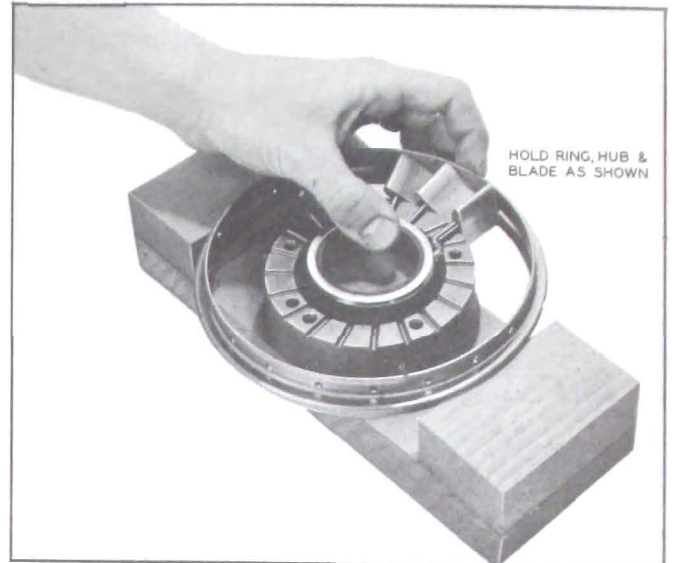


Figure 5-58—Inserting Stator Blades in Carrier

crank throw into the piston groove. Hold the piston, blades, and outer ring together as shown in Figure 5-58.

5. Install the remainder of the blades, working in a clockwise direction.

6. To insert the last blade it will be necessary to tilt the adjacent 3 blades. See Figure 5-59.

7. Install the front carrier and bolt in place. Be sure the blades operate freely in the carrier.

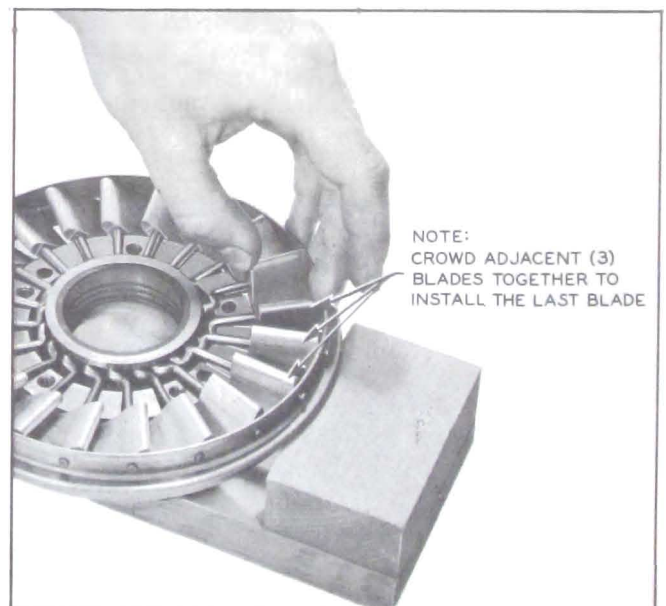


Figure 5-59—Inserting Last Blade

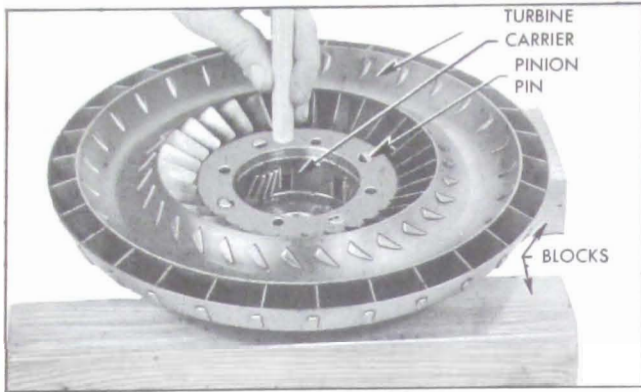


Figure 5-60—Installing Turbine on Carrier

g. Assembly of Sun Gear and Twin Turbine

NOTE: If second turbine carrier was not separated from second turbine, steps 1 through 5 are not necessary.

1. If second turbine was separated from the carrier, make certain that counterbored recess in turbine and mating surfaces of carrier are clean and free of burrs, and apply a film of oil to these surfaces.

2. Support the carrier on suitable blocks, install several pinion pins to serve as pilots, then place turbine in position so that carrier is squarely started into recess in turbine.

3. Use a hammer and hardwood dowel or other soft punch to tap the turbine down over the carrier. Avoid distortion of turbine by using light blows applied midway between holes and alternated from side to side to keep parts square with each other. See Figure 5-60.

NOTE: If turbine cannot be assembled on carrier with moderate force, remove it and

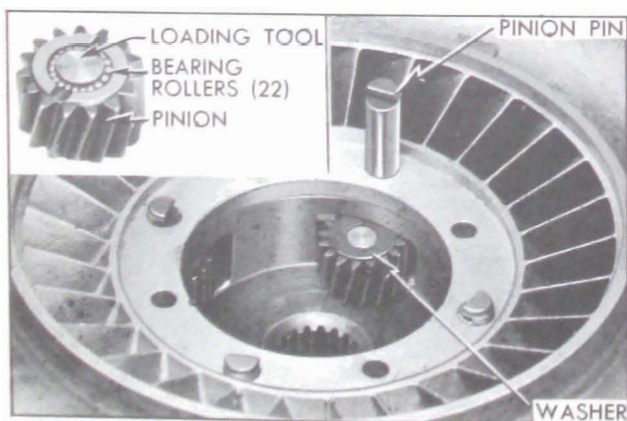


Figure 5-61—Installing Pinion in Carrier

check for burrs in counterbored recess.

4. With turbine and carrier supported on wood blocks, hub side down, assemble and install the four pinions as follows:

(a) Place planet pinion on a thrust washer, install 22 needle bearing rollers in pinion and place a thrust washer on top of pinion.

NOTE: A loading tool made locally of steel rod 3/8" in diameter by 11/16" long will simplify loading and installation of pinion. See Figure 5-61.

(b) Place assembled pinion in carrier and install a pinion pin with notched end up. After loading tool is pushed out of carrier, slide a block under pinion pin to hold it in place. Turn all pins so that notches face center of carrier. See Figure 5-61.

5. Install pinion pin lock plate so that it enters the notches of all pins, then install the four turbine-to-carrier bolts with lockwashers. See Figure 5-48.

6. Install sprag in bore of sun gear with shoulder out then carefully press bearing in place. See Figure 5-47.

NOTE: The sprag for the sun gear has a copper colored cage while the first stator sprag has a plain steel cage. The two sprags must not be interchanged.

7. Check operation of sun gear sprag clutch by sliding sun gear assembly on reaction shaft with gear end toward front of transmission. When viewed from front of transmission sun gear must rotate freely clockwise and lock in a counterclockwise direction. See Figure 5-62.

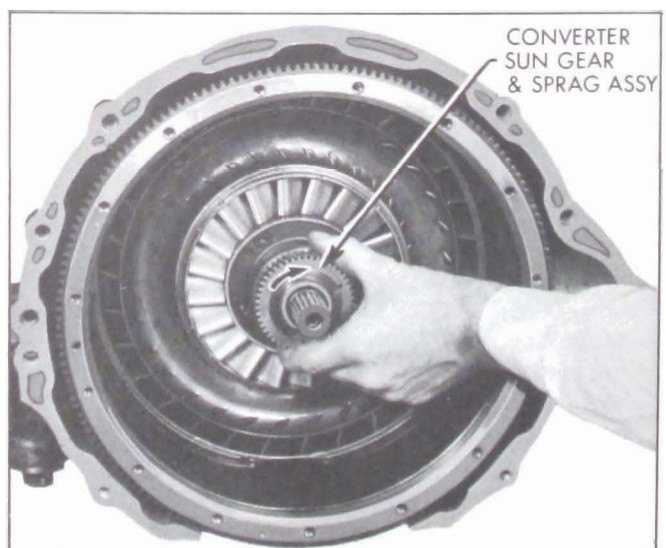


Figure 5-62—Checking Sun Gear Sprag Operation



Figure 5-63—Installing Second Turbine in First Turbine Support

8. Place tanged thrust washer in second turbine carrier and install sun gear in second turbine assembly. See Figure 5-48.

9. Place tanged thrust washer on forward

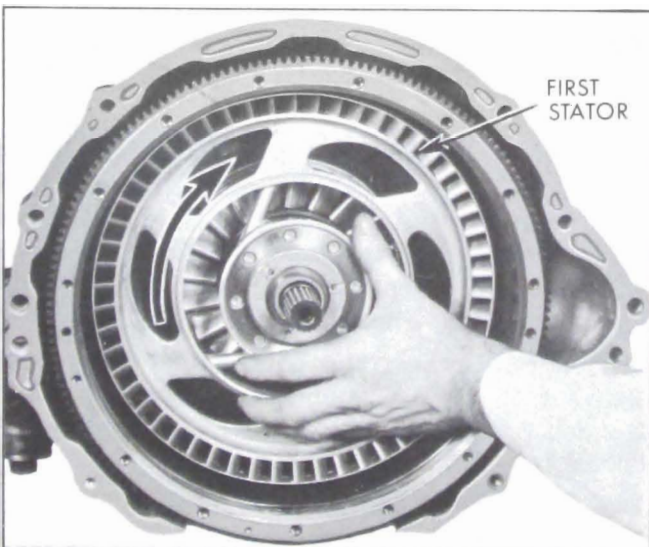


Figure 5-64—Checking First Stator Sprag Clutch

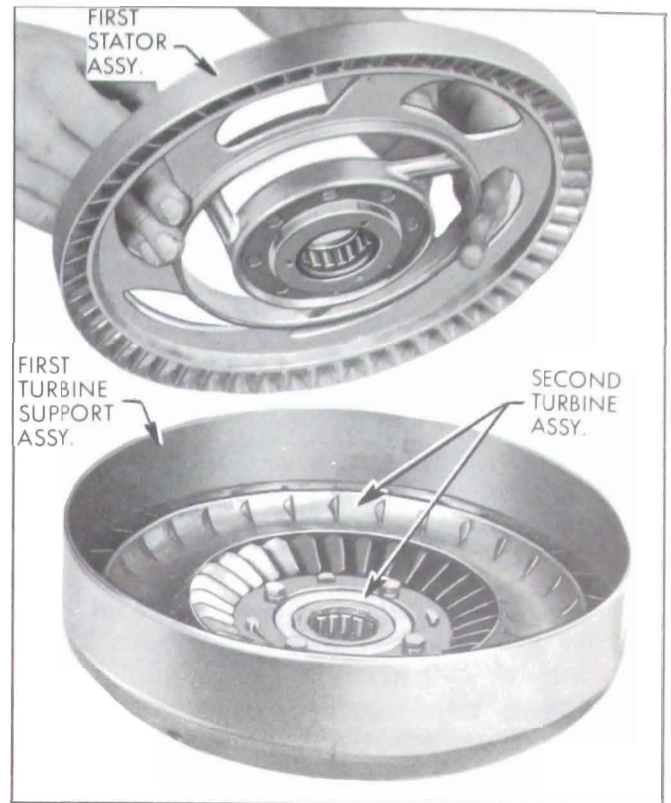


Figure 5-65—Installing First Stator Assy.

face of second turbine carrier. Hold in place with chassis lube if necessary. See Figure 5-63.

10. Lower second turbine assembly into first turbine support and ring gear assembly. See Figure 5-63.

11. Lay first stator on bench with thick edge of blades up. Refer to Figure 5-46, then place first stator sprag in hub of first stator with shoulder up. Install one bronze bearing and one cupped thrust washer on each side of sprag.

NOTE: The sprag for the first stator has a plain steel cage while the sun gear sprag has a copper colored cage. The two sprags must not be interchanged.

12. Check operation of first stator sprag clutch by sliding the first stator on the reaction shaft with thin edge of blades toward front of transmission. The first stator must turn freely clockwise and lock in a counterclockwise direction when viewed from front of transmission. See Figure 5-64.

13. Lower first stator assembly into turbine support on top of second turbine assembly. Wide edge of stator blades "up." See Figure 5-65.

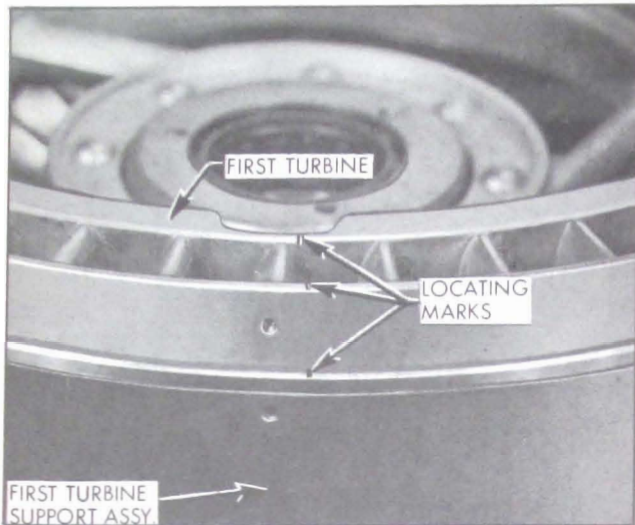


Figure 5-66—Positioning First Turbine on First Turbine Support

14. Place first turbine in position on turbine support paying particular attention that the turbine is assembled in its original position as the turbine and support are balanced as an assembly. See Figure 5-66.

15. Carefully drive turbine down into position by tapping with a wood block. Roll pin holes must line up. See Figure 5-67.

16. Use a pair of channel lock or other suitable pliers to force roll pins into engagement with first turbine support roll pin holes. Roll pins should not extend outside support more than $1/32''$. See Figure 5-68.

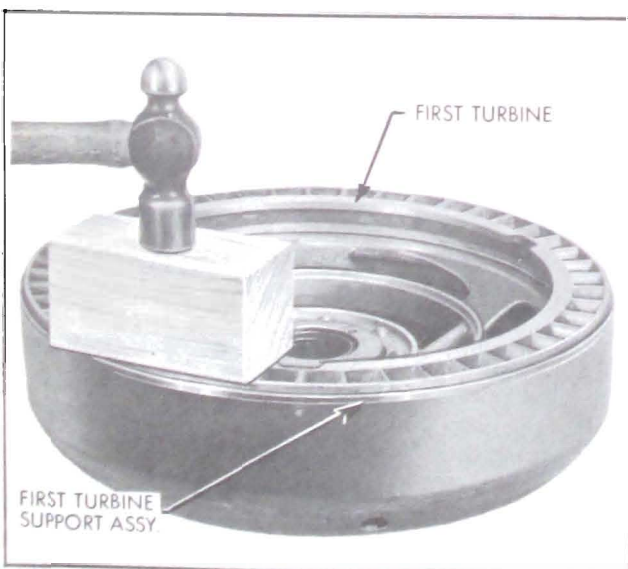


Figure 5-67—Driving First Turbine Into Support

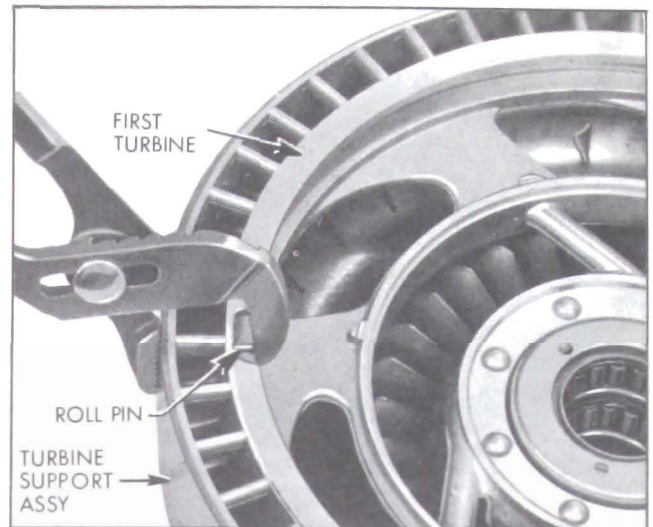


Figure 5-68—Positioning Turbine Roll Pins

5-16 ALIGNMENT OF CONVERTER PUMP AND CONVERTER HOUSING

Converter oil leaks, front oil pump body leaks, front oil pump noise, and excessive wear of front oil pump bushing and oil seal may be caused by: (1) Excessive run-out of flywheel face (2) Excessive run-out of converter pump hub (3) Misalignment of converter housing.

When any of these conditions are encountered and there is any doubt as to their true cause, check the flywheel, converter pump and converter housing as follows:

1. Check run-out of flywheel face as described in paragraph 2-26 and make required corrections before proceeding further.

2. Install converter pump and cover on flywheel and tighten mounting bolts to 25-30 ft. lb. torque. Install converter housing on crankcase.

3. Prepare a special dial indicator clamp by welding a piece of $5/16''$ x 3'' drill rod to a 1'' C-clamp. Use the special clamp and Sleeve KMO-30-K to mount Dial Indicator KMO-30-B so that indicator stem bears against the pump hub as shown in Figure 5-69.

4. Turn flywheel and note indicator reading. Run-out of pump hub should not exceed $.012''$. If run-out exceeds $.012''$, replace pump and recheck run-out.

5. Attach the special dial indicator clamp to the oil pump driving lug on rear end of converter pump hub. **CAUTION: Do not clamp to bearing surface on hub. Mount Dial Indicator**

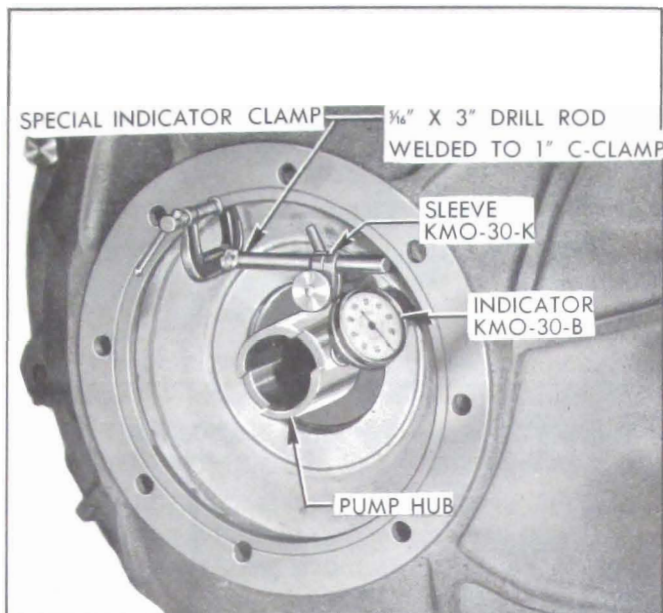


Figure 5-69—Checking Run-Out of Converter Pump Hub

KMO-30-B to bear against rear face of housing at a radius of 3 3/4". See Figure 5-70.

6. Turn flywheel, making sure that crankshaft end thrust is held in one direction, and note run-out of housing face as shown by dial indicator. Run-out should not exceed .005".

7. If run-out of housing face exceeds .005", cement paper shims of proper thickness to rear face of crankcase to bring run-out of housing face to .005" or less, with all bolts securely tightened.

8. Mount dial indicator and Hole Attachment KMO-30-F to bear against inner edge of pilot hole in housing. See Figure 5-71. Run-out of pilot hole should not exceed .004".

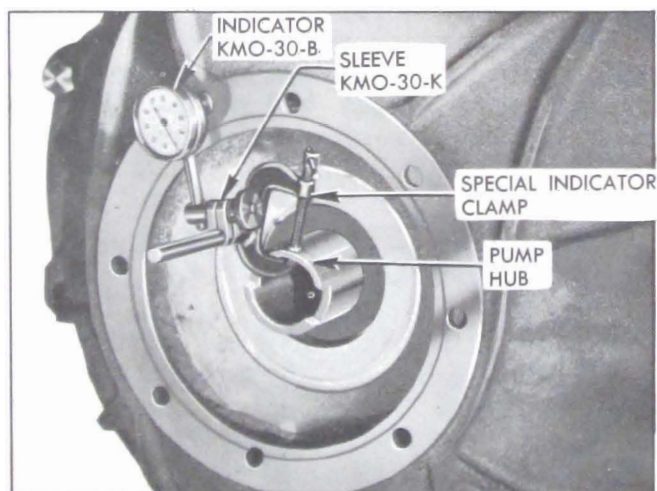


Figure 5-70—Checking Run-Out of Rear Face of Bell Housing

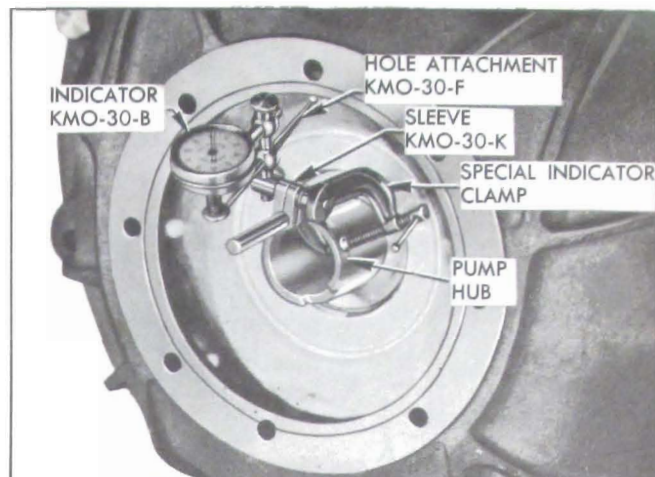


Figure 5-71—Checking Run-Out of Bell Housing Pilot Hole

9. If run-out of pilot hole exceeds .004", remove housing, remove the two dowels, and reinstall housing, leaving bolts just loose enough to permit shifting housing by tapping with a lead hammer.

10. Set up dial indicator as shown in Figure 5-71 and bring pilot hole of housing within .004" run-out by tapping in required direction with lead hammer. If it is not possible to move housing far enough, remove housing and drill bolt holes with 1/2" drill. When housing is placed so that pilot hole run-out is .004" or less, tighten all bolts securely.

11. Ream the two dowel holes through housing and crankcase, using Ratchet J-808-6 with tapered Reamer J-2548-3 (17/32") until this reamer bottoms in hole, then finish with bottoming Reamer J-4710-6 to provide full size to bottom of hole.

12. Remove converter housing and install oversize dowels J-808-5 in crankcase.

5-17 DISASSEMBLY, INSPECTION, ASSEMBLY OF VALVE AND SERVO BODIES

a. Disassembly of Valve Body

CAUTION: The valves have sharp edges which can cut fingers if improperly handled. As these parts are removed wrap them separately in clean cloths to avoid damage through contact with other parts.

1. Remove nut and lockwasher which attaches the lower valve operating lever and linkage adjusting lever to the upper lever shaft and remove levers.

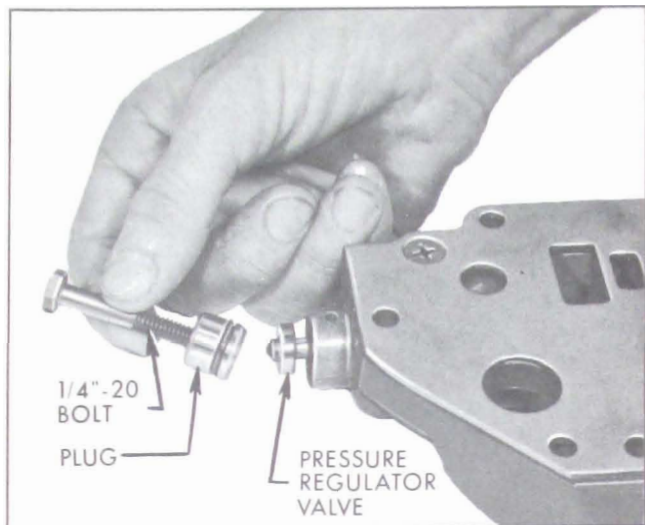


Figure 5-72—Removing Large Pressure Regulator Valve Plug

2. Remove safety nuts and washers from studs, then lift the valve body and gasket from servo body. Remove shift control valve from valve body. Check gasket for evidence of oil leakage.

3. Remove the rear pump delivery check valve and spring from servo body to avoid losing these parts.

4. Cover the large pressure regulator valve plug with a wadded rag and pull the plug retaining pin out of the valve body. Use extreme care during this operation as the plug will be ejected with considerable force. Remove the two springs and spring seat. See Figure 5-72.

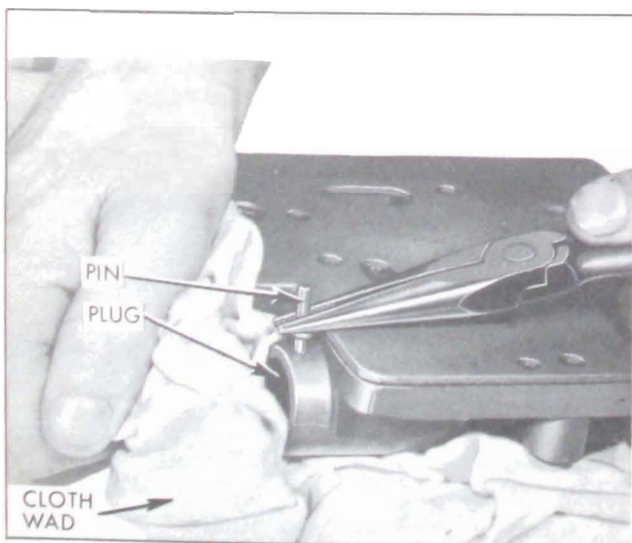


Figure 5-73—Removing Small Pressure Regulator Valve Plug

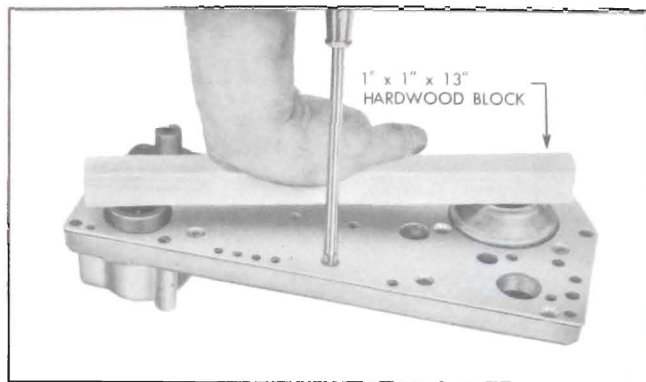


Figure 5-74—Removing Servo Body Spacer Plate

5. Remove small plug retaining pin. Thread a 1/4"-20 cap screw into plug and remove plug from valve body. Remove pressure regulator valve. See Figure 5-73.

6. Remove valve body plate and gasket, then remove the front pump delivery check valve and spring. Check gasket for evidence of oil leakage.

b. Disassembly of Servo Body

1. Remove servo body spacer plate attaching screw at reverse servo which is in line with the low servo then place a 1" x 1" x 13" wooden block across the low and reverse servo spring seats. See Figure 5-74.

2. Hold the block down firmly while removing the remaining spacer plate attaching screws, then carefully release pressure on block to allow servo springs to expand. This operation must be done carefully to avoid springing the spacer plate or letting the servo springs fly out. Remove spacer plate and gasket. Check gasket for indication of oil leakage.

3. Remove reverse and low servo piston spring seats, springs and pistons. Remove check ball from reverse servo feed channel. See Figure 5-76.

c. Cleaning and Inspection of Valve and Servo Parts

1. Thoroughly wash valve and servo bodies with clean solvent, dry and blow out all passages with air. Wash other parts and dry thoroughly.

2. Carefully inspect bodies for cracks, damage to gasket surfaces, scores in piston and valve cylinders, or other damage which would render these parts unfit for use.

3. Inspect surfaces and shoulders of shift control valve and pressure regulator valve. Surfaces must be free of nicks, scores, or deep scratches. A valve must be replaced if the sharp edges of shoulders are marred or rounded because such conditions will permit fine particles of foreign matter to work in between the part and the body and cause sticking. Check valves on surface plate and replace if bent.

4. Worn or damaged piston seals should be replaced. When a new seal is installed on a piston make sure that the lip fits over the smaller diameter land. See Figure 5-75.

5. Thoroughly clean oil screen and check for any cracks or holes which would allow dirt to pass through.

d. Assembly of Servo Body

1. Oil and install the low and reverse servo piston assemblies in servo body. To avoid curling or damaging edge of piston seal, start each piston into cylinder at an angle then turn piston slightly as it is straightened and pushed into cylinder. See Figure 5-76. Check pistons for free movement in cylinders.

2. Install the small return spring against the low servo piston. Install the large return spring with the large end against the reverse servo piston. Place spring seats on upper ends of both springs. See Figure 5-76.

3. Place check ball in reverse servo feed channel. See Figure 5-76.

4. Install a new spacer plate gasket and place spacer plate in position over spring seats. Place a 1" x 1" x 13" wooden block across spring seats to compress the springs while installing the spacer plate screws (Figure

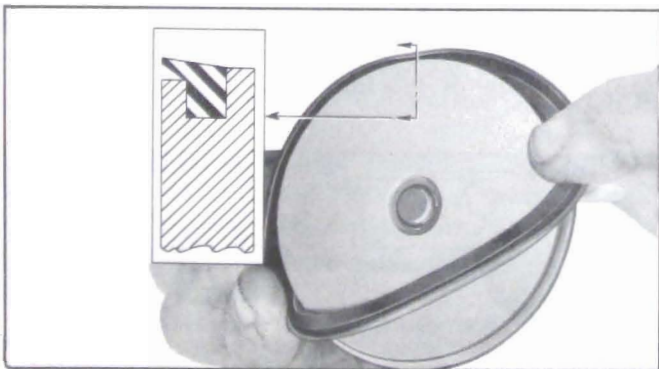


Figure 5-75—Installation of Servo Piston Seal

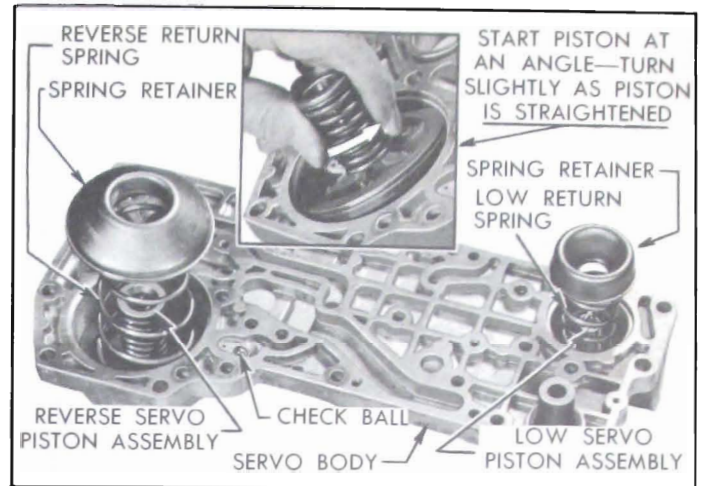


Figure 5-76—Parts Installed in Servo Body

5-74). Tighten screws uniformly to avoid distorting spacer plate.

e. Assembly of Valve Body

1. Place front pump delivery check valve spring in body with large end down and place check valve on spring with ridged side up. See Figure 5-77.

2. Install valve body plate and a new gasket, making sure that check valve is seated against plate and is not caught under gasket.

3. Check oil orifice in pressure regulator valve and land to be certain it is clear. Install valve with this land outward. Assemble "O" ring on small plug and install plug with tapped hole outward and install short retaining pin with shoulder of pin toward valve body plate side of body.

4. Assemble spring seat on inner spring and install springs and seat into valve body through large plug opening. Clamp a drift or dowel in a vise and position a 1" I.D. pipe nipple over the dowel. Position plug and "O" ring over

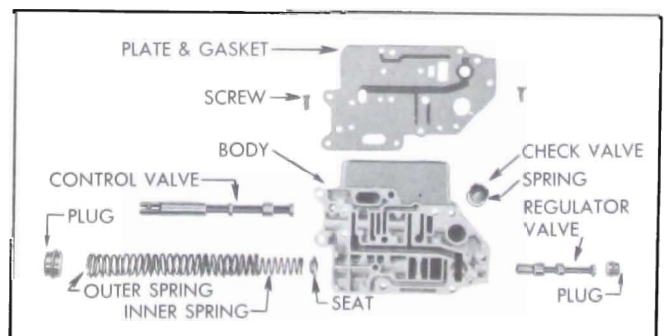


Figure 5-77—Valve Body Disassembled

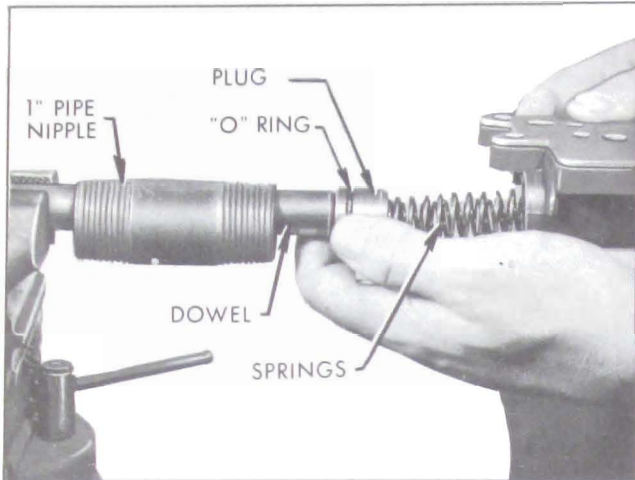


Figure 5-78—Installing Large Plug and Springs

spring ends and against dowel. Slide pipe nipple over plug so that when pressure is exerted to compress springs into valve body plug will not slip off dowel. See Figure 5-78. Push valve body toward dowel to push plug into valve body. Install long retaining pin with shoulder toward valve body plate side of valve. See Figure 5-79.

5. Install shift control valve with slotted end on same end of valve body as the large pressure regulator plug.

6. Install rear pump delivery check valve in its seat in servo body, ridged face inward, and place valve spring on valve with large end up.

7. Install a new gasket and the valve body on servo body, using care to keep pump delivery check valve spring below the gasket, then install lock washers and safety nuts on two studs

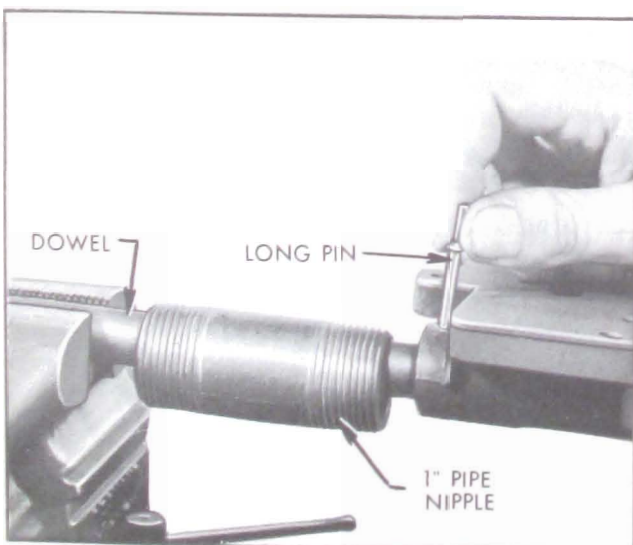


Figure 5-79—Installing Plug Retaining Pin

adjacent to the control valve. Tighten stud nuts evenly to 11-15 ft. lbs. torque.

8. Insert valve operating upper lever shaft through bearing in servo body. With upper lever pointing toward the reverse servo, place lower lever with linkage adjusting lever on shaft so that forked end of lower lever engages shift valve pin, then install lockwasher and nut.

9. See paragraph 5-23 (g) for installation of valve and servo bodies.

5-18 DISASSEMBLY, INSPECTION, ASSEMBLY OF REACTION SHAFT FLANGE AND OIL PUMPS

a. Disassembly of Front Oil Pump and Reaction Shaft Flange

1. Remove high and low accumulators from reaction shaft flange, using care to prevent the retaining pin and check ball from dropping out of high accumulator and being lost. Check gaskets for indication of oil leakage.

2. Inspect the input shaft bushing in front end of reaction shaft. If bushing is damaged or excessively worn, remove outer retaining ring and then remove the bushing, using remover J-5822 installed on remover J-1436. See Figure 5-80. Oil pump must be in place to support the reaction flange during bushing removal.

If inner retaining ring remained in place in shaft make sure it is firmly seated in its groove; otherwise replace it.

3. Check front oil pump bolts to make sure they are tight. Loose bolts would be the cause of oil leakage around the pump. Remove front oil pump body and gears, tapping body lightly with mallet to free it, if necessary.

4. Remove front oil pump cover and gasket from reaction shaft flange, and check gasket for evidence of oil leakage.

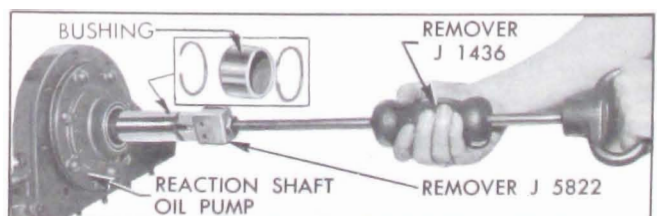


Figure 5-80—Removing Input Shaft Bearing

5. If the check ball located in clutch feed passage of reaction shaft flange is free to drop out, remove ball to avoid loss in handling parts. Do not remove if securely retained by peened edge of hole.

b. Cleaning and Inspection of Front and Rear Oil Pumps

1. Wash pump parts in clean solvent and dry thoroughly.

2. Check mounting faces of pump bodies, gears, front pump cover and rear pump cover plate for excessive wear.

3. Inspect front oil pump bushing. If bushing is loose or excessively worn replace the pump assembly.

4. If front oil pump bushing is loose or excessively worn, or pump was noisy always check for flywheel run-out, converter pump hub run-out, and misalignment of converter housing as described in paragraph 5-16.

5. Inspect the front pump oil seal but replace it only if there is definite evidence of leakage or damage. Carefully drive out defective seal with a punch. Lightly coat outside of new seal with No. 3 Permatex, start seal squarely into pump body with deep groove in seal retainer outward and tap into place with J-6964 and mallet. Wipe off excess Permatex.

6. Check pump gear end clearance by mounting dial indicator on support, J-1013. Place indicator support on pump body so that the indicator button bears on body and set indicator at zero. Then rotate the support and indicator, keeping the support on the pump body and indicate each pump gear. The indicator readings for the front pump should be .001" to .0025" and rear pump .001" to .002". See Figure 5-81.

7. Insert feeler gauge between crescent and driven gear to check clearance, which should be .005" to .009" on front pump and .0045" to .007" on rear pump. See Figure 5-82, view A.

8. Insert feeler gauge between crescent and driving gear to check clearance, which should be .010" to .016" on front pump and .006" to .012" on rear pump. See Figure 5-82, view B.

9. Check front pump cover and rear pump cover plate for depth of wear caused by the gears. Replace the part if depth of wear exceeds .001" or surface is scored.

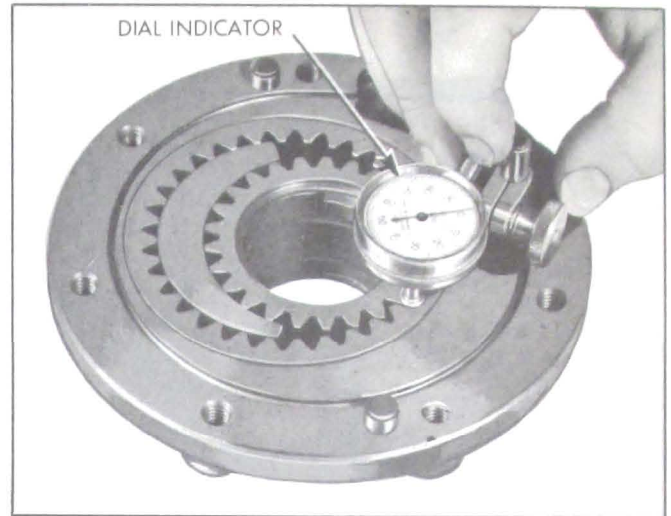


Figure 5-81—Checking End Clearance of Gears in Pump Body

c. Cleaning and Inspection of Reaction Shaft Flange

1. Wash flange in clean solvent, dry thoroughly and blow out all passages with air.

2. Inspect surfaces of reaction shaft flange and transmission case for nicks or burrs and remove with mill file.

3. Inspect race for clutch drum roller bearing on rear end of reaction shaft. If this bearing surface is worn excessively or scored, replace reaction shaft flange.

NOTE: If reaction shaft flange is replaced, stamp transmission identification number in lower edge of new part in same place as on original flange. See Figure 5-1.

4. Check all studs for tightness and replace any with damaged threads. If stud threads are stripped in reaction shaft flange, it will be necessary to tap out the hole for installation of step studs which are available. The 5/16" -18 step studs have a 3/8" -16 thread on the flange

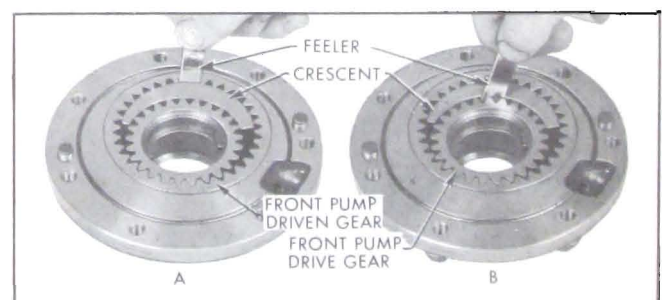


Figure 5-82—Checking Clearance Between Crescent and Gears

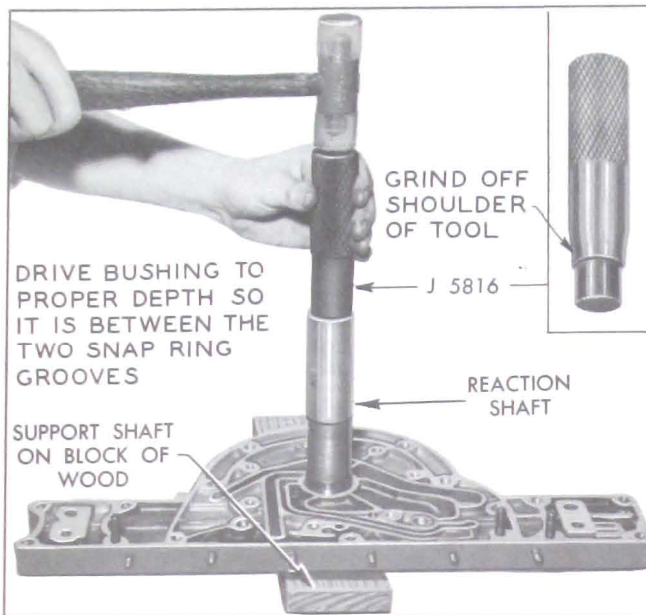


Figure 5-83—Installing Input Shaft Bushing

end, while the 3/8"-16 step studs have a 7/16"-14 thread on the flange end.

5. Inspect the oil sealing rings on hub of reaction shaft flange and replace if excessively worn or damaged in any way.

d. Assembly of Front Oil Pump and Reaction Shaft Flange

1. If old input shaft bushing was removed, first make sure that inner retaining ring is firmly seated in groove in reaction shaft, then install a new bushing using installer J-5816. Support shaft on wooden block to avoid damage and drive bushing into place with light hammer until shoulder of tool contacts reaction shaft. See Figure 5-83. Install outer retaining ring.

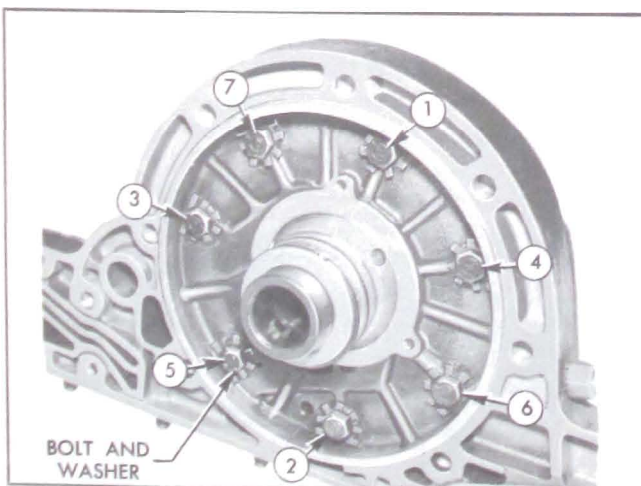


Figure 5-84—Front Oil Pump Bolt Tightening Sequence

2. Install check ball in clutch feed passage if ball was removed, then install a new gasket and the pump cover on reaction shaft flange.

3. Lubricate and install gears in front pump body. The driving gear must be installed with the beveled side outward so that this side will be against the cover when pump is installed. See Figure 5-82. Reversing this gear in pump body will result in severe damage to the transmission.

4. Install oil pump on cover so that the two dowel pins and the bolt holes match holes in cover, then install bolts with lockwashers. Tighten bolts to approximately 5 ft. lbs. torque in the sequence shown in Figure 5-84 and then tighten in same sequence to 25-30 ft. lbs. Bend a tang of each lockwasher up against flat of bolt head. Tighten cover attaching stud nut to 25-30 ft. lbs. torque.

5. See paragraph 5-23 (f) for installation of front pump and reaction shaft flange assembly.

5-19 DISASSEMBLY, INSPECTION, ASSEMBLY OF ACCUMULATORS

1. Remove retaining pin and check ball from high accumulator body. The low accumulator does not have the check ball.

2. Remove the pipe plug, cap, gasket, spring (2 in low) and piston from accumulator body. Keep parts separated so that same parts will be reinstalled in same body. See Figure 5-85.

3. On high accumulator only, remove clamp bolt, lever, bearing with seal, gasket, thrust washer and control valve crank from accumulator body, then remove valve stop with gasket, control valve and spring. See Figure 5-85.

4. Wash accumulator parts in clean solvent, dry thoroughly, and blow out all passages with air. Examine all parts of each accumulator for excessive wear, scoring, or other damage.

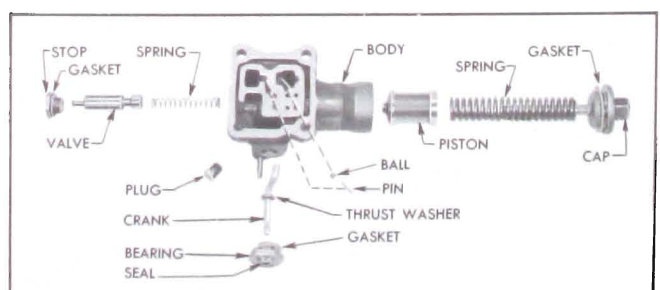


Figure 5-85—High Accumulator—Disassembled

5. Remove any nicks or burrs from pistons or valve with an Arkansas stone; however, do not round the sharp edges of lands on pistons and valves. If the sharp edges are marred or rounded foreign particles may wedge between the part and the body and cause sticking.

6. With parts clean and dry, install pistons and check for free sliding as body is tipped back and forth.

7. Check mounting surface of body with a straight edge. If surface is uneven it may be trued up by moving body in a circular motion over emery cloth placed on a surface plate. Thoroughly wash body to remove all traces of emery.

8. If the body or piston is worn or damaged, or piston does not slide freely in body after all burrs are removed, replace accumulator assembly. The body and piston are not furnished separately for service replacement.

9. Lubricate each piston and install it in the accumulator body from which it was removed. Start piston squarely into body; do not tap or force it into body.

10. Install proper piston springs in each body. The high accumulator uses one heavy spring approximately 4-5/16" long. The low accumulator uses one shorter heavy spring and one inner spring. Install caps with new gaskets but these will be tightened later — do not clamp accumulator in vise to tighten cap.

11. On high accumulator only, install spring, control valve and stop, then install crank with thrust washer, bearing with new gasket and

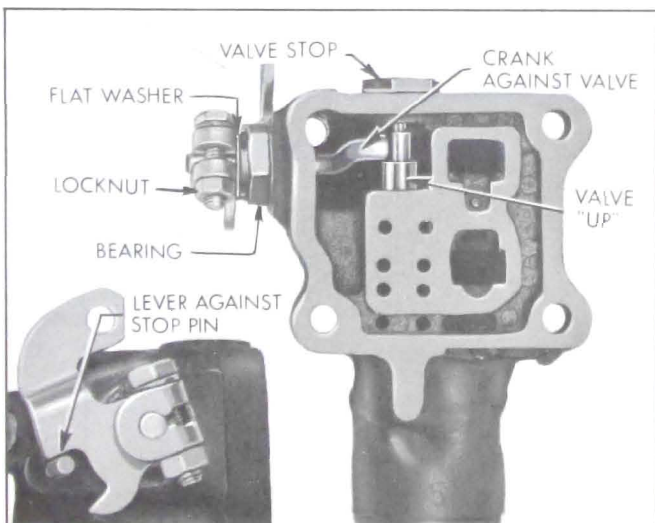


Figure 5-86—Valve Operating Lever Adjustment

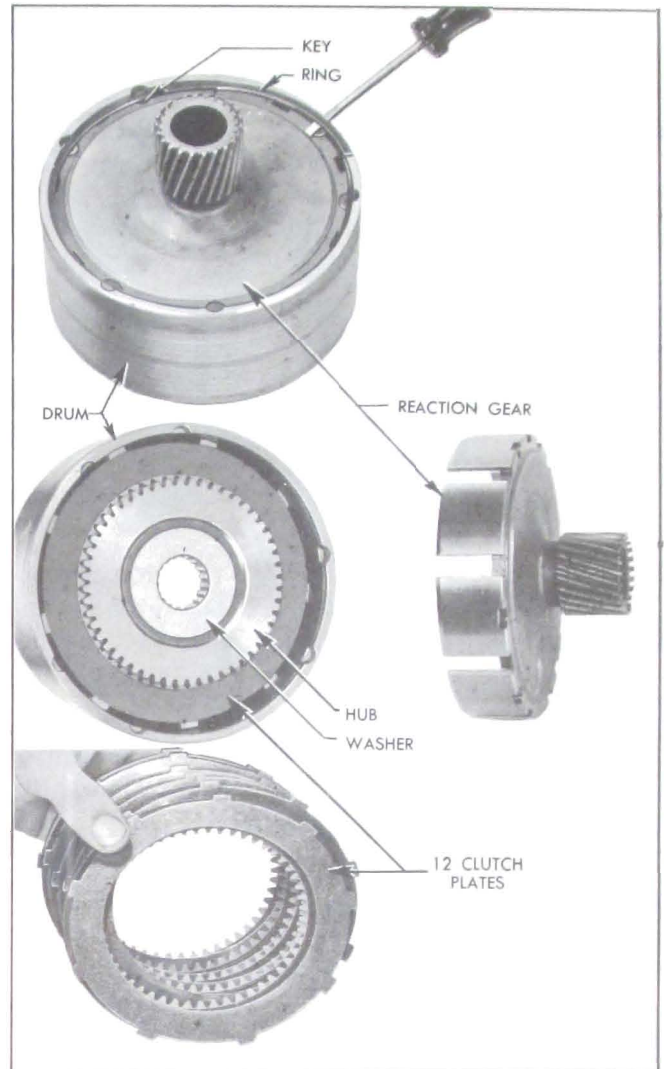


Figure 5-87—Removal of Reaction Gear, Hub, & Plates

seal (grooved side inward), operating lever and clamp bolt. See Figure 5-85.

12. Adjust operating lever on crank so that lever contacts its stop and the crank contacts the valve with valve in extreme upper position, then tighten the clamp bolt. See Figure 5-86.

13. Install pipe plugs in both accumulator bodies and install check ball and retaining pin in the high accumulator body. See Figure 5-85.

14. See paragraph 5-23 (f) for installation of accumulators.

5-20 DISASSEMBLY, INSPECTION, ASSEMBLY OF CLUTCH

a. Disassembly of Clutch

1. Remove reaction gear flange retainer ring with screwdriver and remove the 6 flange driving keys with pointed tool. See Figure 5-87.

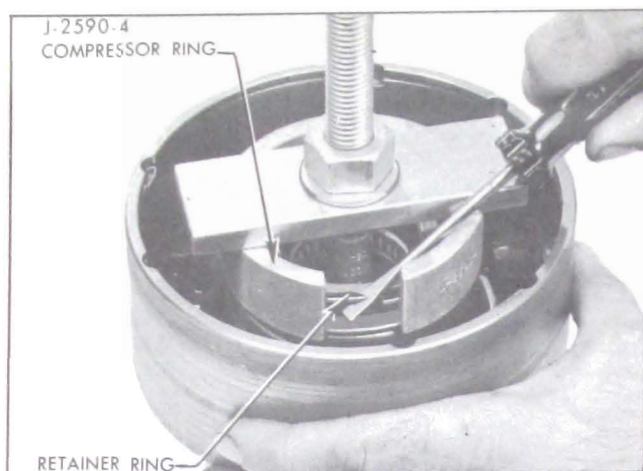


Figure 5-88—Using Clutch Spring Compressor J-2590

2. Remove the low range reaction gear, thrust washer, clutch hub, and 12 clutch plates from drum. See Figure 5-87.

3. Install Clutch Spring Compressor J-2590 in assembled drum placing the slot in compressor ring over the ends of spring seat retaining ring. Compress clutch spring sufficiently to remove the retaining ring. See Figure 5-88.

4. Release pressure on clutch spring, making sure that spring seat does not engage retaining ring groove in drum, then remove spring compressor, spring seat and spring.

5. Remove piston from drum. It may be necessary to rap the open end of drum against a block of wood to remove the piston.

b. Cleaning and Inspection of Clutch and Input Shaft

1. Wash all parts in clean solvent and dry thoroughly. Use only gasoline or kerosene to clean clutch plates and bands — DO NOT use any chemical degreasers or other commercial solvents.

2. Inspect all clutch plates and replace any that are scored, burned, warped or worn excessively. Check fit of any new internally splined plates on clutch hub to make certain that they slide freely on hub. Tight plates will prevent full disengagement of the clutch.

3. Inspect drum for cracks or scores. Inspect oil seal on hub of drum and replace it if damaged.

4. Inspect clutch piston outer seal and replace if hardened, broken, or has turned edges. Install new seal with lip extending over the

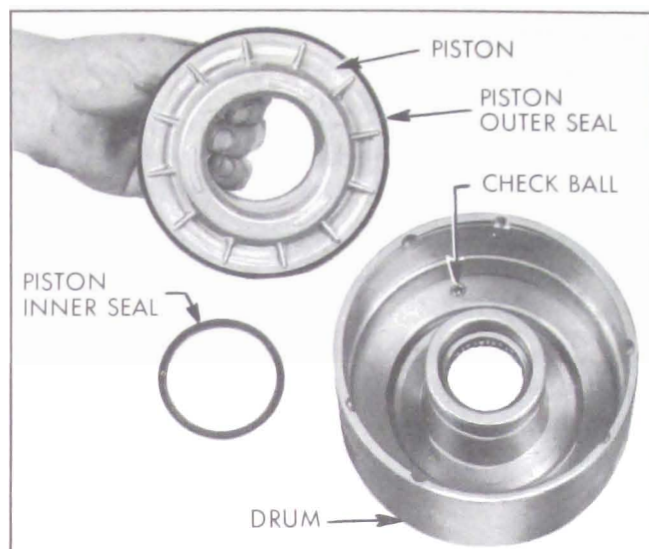


Figure 5-89—Removal of Clutch Piston and Oil Seal

smaller diameter land of piston. See Figure 5-90.

5. Make sure that small bleed hole in drum is open and that check ball is staked in place but free to move in recess. If needle bearing in drum is excessively worn or scored carefully remove it and install a new one, using Installer J-5191. This tool will locate bearing flush with shoulder in drum. Place numbered end of bearing, which is hardened, toward shoulder of tool to avoid distortion of cage.

c. Assembly of Clutch

1. Apply light oil to the piston outer seal and the inside of drum, then install piston carefully to avoid distorting or turning the lip of seal. When piston is fully installed in drum, the top of piston will be approximately flush with the shoulder on inside of drum.

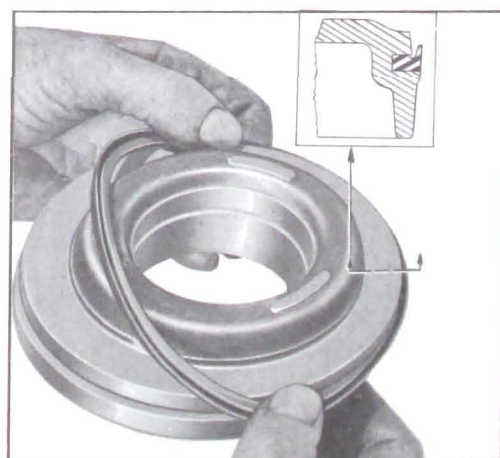


Figure 5-90—Replacement of Clutch Piston Outer Seal



Figure 5-91—Installing Thrust Washer and Clutch Hub in Reaction Gear

2. Place clutch spring in piston and place spring seat and seat retaining ring on spring. Install Clutch Spring Compressor J-2590-4 (Figure 5-88) and compress spring until the retaining ring can be snapped into the groove in hub of drum, then remove the spring compressor.

3. Place reaction gear on bench with flange upward, then install clutch hub thrust washer and clutch hub over the hub of reaction gear, with open end of clutch hub facing up. See Figure 5-91.

4. Separate the internally splined (faced) clutch plates from the externally splined (plain steel) clutch plates. Internally splined plates are flat and may be installed in either direction. Externally splined plates are "dished" and all these plates must be installed with the "dish" in the same direction; however, the "dish" may be either up or down. Check each plate for "dish" with a straight edge, Figure



Figure 5-92—Checking "Dished" Side of Externally Splined Clutch Plate

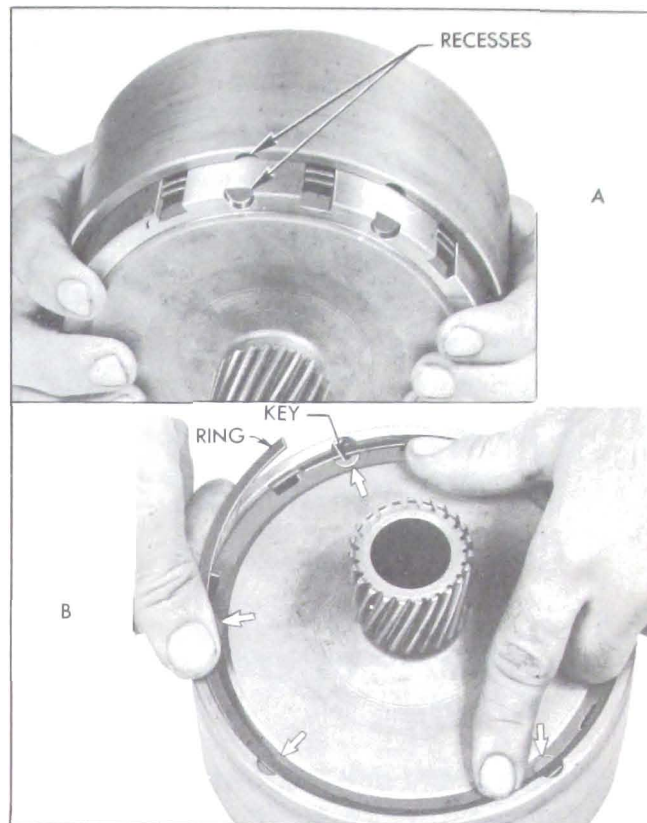


Figure 5-93—Installing Drum Over the Reaction Flange Gear

5-92, and stack plates so that all are "dished" in same direction.

5. Install an internally splined clutch plate over clutch hub, next to gear flange, then install an externally splined plate. Alternately install the remaining plates, making sure that externally splined plates are "dished" in same direction. If properly installed, the top plate will be externally splined.

6. Place the drum and clutch piston assembly over the reaction gear flange so that the driving key recesses in drum and flange are approximately aligned. See Figure 5-93, view A. Press the drum evenly into place over the reaction gear flange.

7. Complete the alignment of driving key recesses by tapping the reaction gear flange, then install the six driving keys and the reaction gear flange retainer ring.

NOTE: The retainer rings are supplied by the Parts Department in two thicknesses .065" and .072" thick. Always use the thicker retainer ring if it will fit the groove in the drum. Excessive clearance at this point will adversely affect output shaft end play checks.

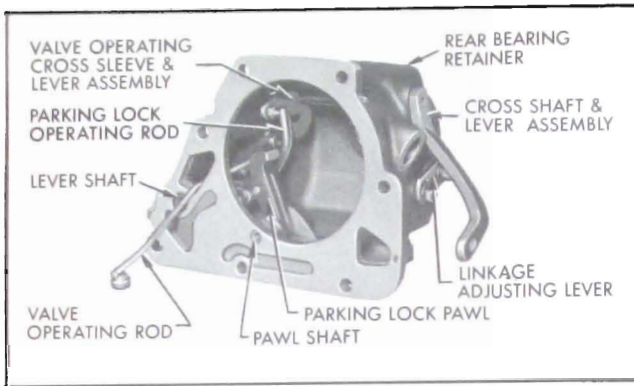


Figure 5-94—Parts in Rear Bearing Retainer

See paragraph 5-23 (e) for installation of clutch and input shaft.

5-21 DISASSEMBLY, INSPECTION, ASSEMBLY OF REAR BEARING RETAINER

a. Disassembly and Inspection of Rear Bearing Retainer

1. Remove spring from detent roller lever and support. Remove nut and lockwasher from support shaft at adjust lever.

2. Pull roller lever and support assembly into rear bearing retainer and remove. Examine "O" ring on support shaft. If damaged or worn, replace it. See Figure 5-95.

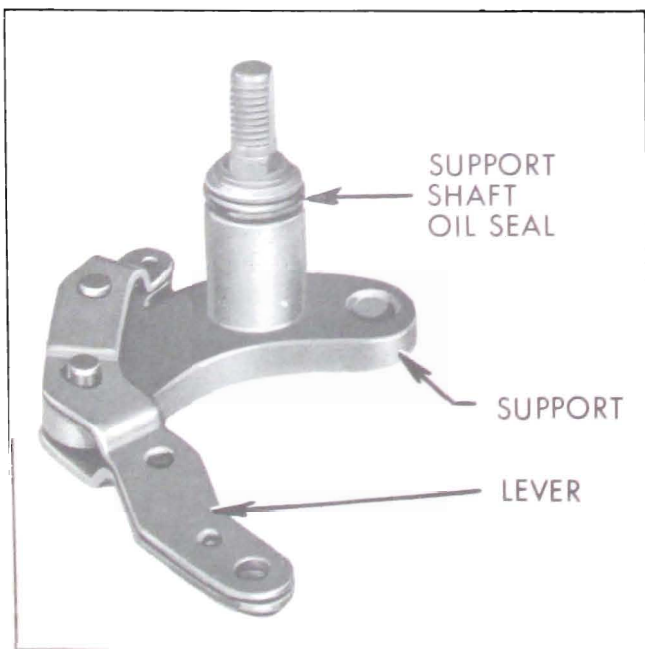


Figure 5-95—Detent Roller Lever and Support

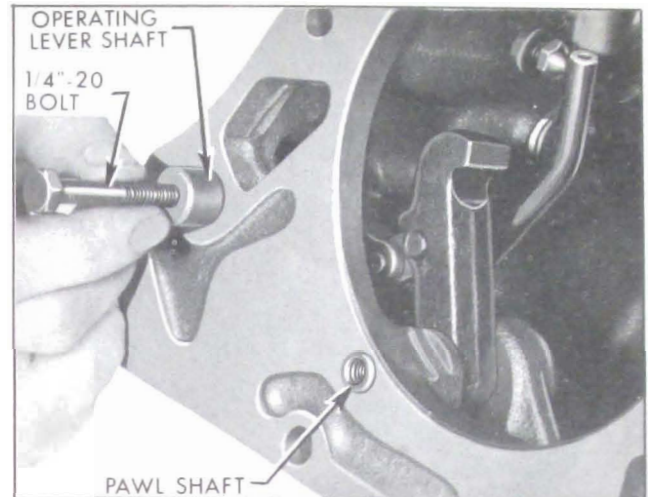


Figure 5-96—Removing Lever and Pawl Shafts

3. Remove cotter key and clip from valve operating rod and remove rod.

NOTE: If transmission is not equipped with valve operating rod with hole for installation of cotter key, install new valve operating rod and parking lock operating rod. Parts Department stock of these two parts are second type with greater clearances to prevent interference between rods.

4. Thread parking lock operating rod ball stud out of lever.

5. Thread a 1/4" - 20 bolt into pawl shaft and withdraw shaft from retainer. Pull lever shaft from retainer in same manner. See Figure 5-96.

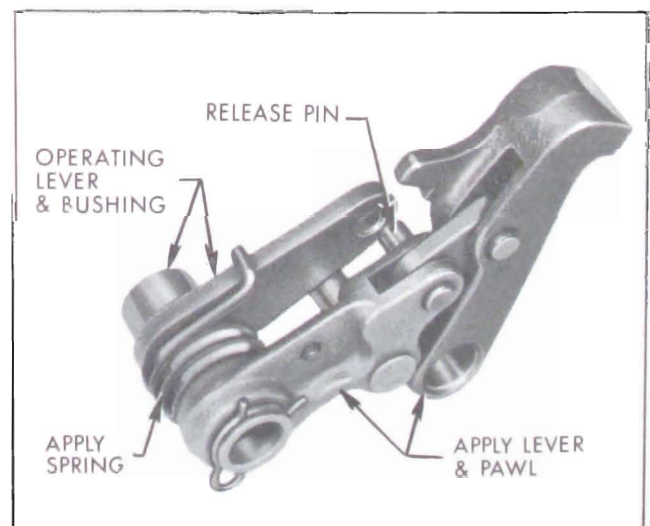


Figure 5-97—Parking Lock Lever and Pawl Assembly

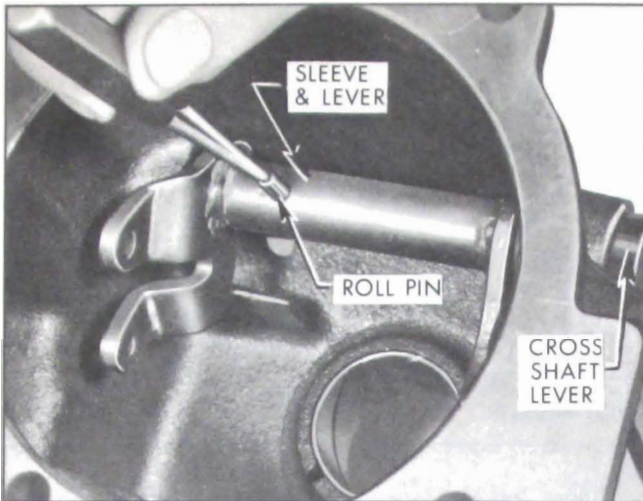


Figure 5-98—Removing Cross Shaft and Sleeve

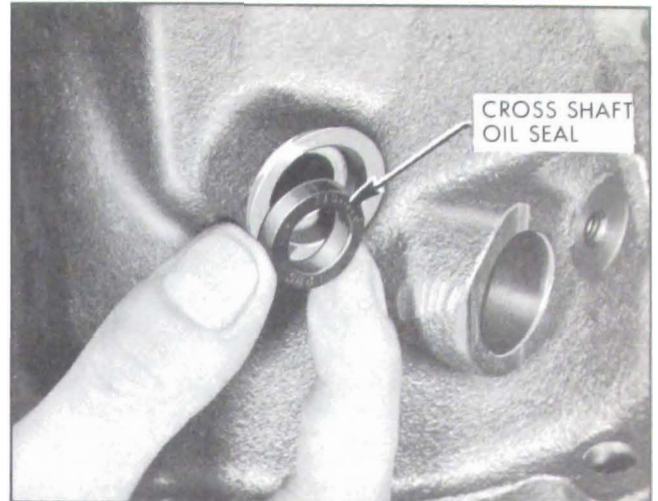


Figure 5-100—Installing Cross Shaft Oil Seal

6. Remove parking lock pawl and lever assembly from retainer.

7. Examine pawl, lever and spring. If damaged or excessively worn, disassemble by removing hairpin retainer and replace parts as necessary. See Figure 5-97.

8. Drive roll pin out of cross shaft and remove cross shaft and lever assembly and cross sleeve and lever. See Figure 5-98.

9. Check cross shaft seal and bearing. If seal is worn or damaged, replace it. If bearing is worn so excessive free play exists between it and the cross shaft, mark position of bearing in retainer and drive out bearing with a drift. Press a new bearing into place to the same position as the original bearing.

10. Examine output shaft bushing. If worn or

scored drive bushing out using Tool J-7273-7 and handle J-7013-1. See Figure 5-99.

b. Assembly of Rear Bearing Retainer

1. If new bushing is being installed, drive bushing into place (flush with counter bore) using tool J-7273-7 and handle J-7013-1. See Figure 5-99. Coat O.D. of new seal with Permatex and install with J-8864.

2. Lubricate cross shaft seal and position in recess over cross shaft bearing with lip "in". See Figure 5-100.

3. Hold valve operating lever and shaft in position inside retainer and slide cross shaft through bushing and seal inside valve operating lever and sleeve. Line up holes and drive roll pin into place. See Figure 5-98.

4. Be sure detent support shaft oil seal is in good condition properly installed and lubricated. See Figure 5-95. Then install detent roller lever and support. Assemble linkage adjusting lever on support shaft and install nut and lock washer. See Figure 5-94.

5. Install detent spring.

6. Assemble parking lock operating rod to operating lever assembly. Use lock washer under ball end hex. Full pivoting ball end of rod must be assembled to operating lever. Upper ball end is held more rigidly in rod.

7. Position pawl levers and rod assembly in retainer. Slide pawl and lever shafts into place taking care that tapped holes are "out".

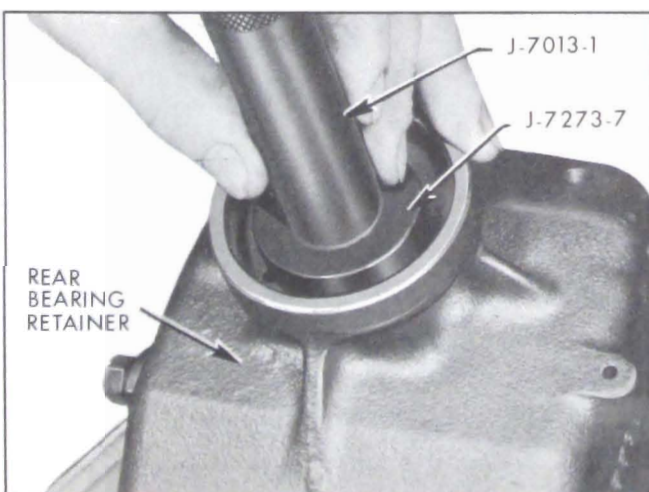


Figure 5-99—Installing Bushing in Rear Bearing Retainer

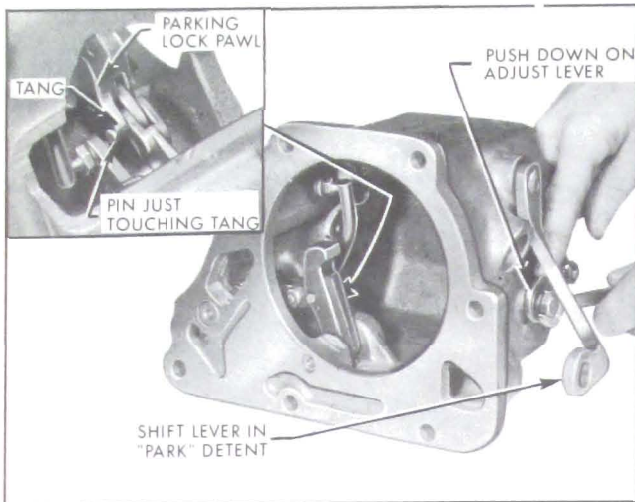


Figure 5-101—Linkage Adjustment

8. Attach parking lock operating ball end to upper lever using lock washer under ball end hex.

9. Assemble valve operating rod to valve operating lever using rod end clip and cotter key. If rod does not have hole for installation of cotter key, rod should be replaced with new part.

c. Adjustment of Rear Bearing Retainer Linkage

1. Place shift lever in "Park" detent (lever forward).

2. Loosen bolt at linkage adjustment lever. Do not loosen nut.

3. Push down on forward end of lever until slight resistance is felt. Pin at rear of pawl should be touching tang at rear of pawl. Tighten bolt. See Figure 5-101.

5-22 DISASSEMBLY, INSPECTION ASSEMBLY OF PLANETARY GEAR SET AND TRANSMISSION CASE

a. Disassembly of Planetary Gear Set

1. Remove tanged planet carrier thrust washer.

2. Remove three planet carrier screws and special lockwashers, using a $7/32$ " hexagon (Allen) wrench. See Figure 5-102. A used universal joint front yoke may be placed on output shaft and held with a bar while loosening the screws.

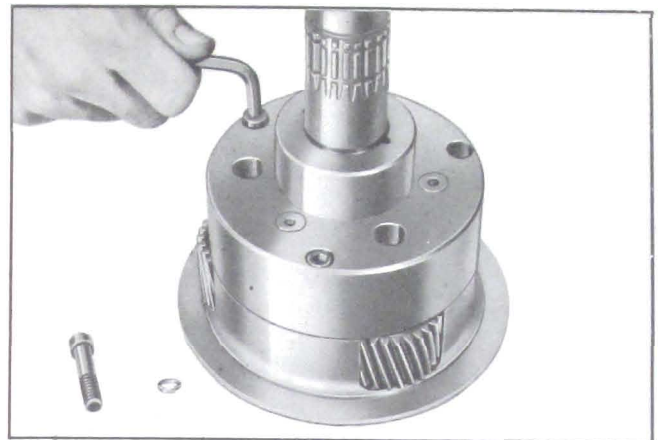


Figure 5-102—Removing Planet Carrier Screws

3. Separate the front and rear ends of planet carrier by carefully tapping around the front flange while holding the unit clear of bench.

4. Remove the sun gear rear thrust washer, which may be either on sun gear or stuck in rear end of carrier. Remove reverse sun gear. See Figure 5-103.

5. Remove needle thrust bearing.

6. Remove the 3 low planet pinion assemblies, each consisting of a pinion, shaft, and bearing rollers retained at each end of pinion by steel thrust washers. See Figure 5-103. A retaining ring snapped into a groove in shaft will hold the lower thrust washer in place as shaft is tapped out of carrier. The shaft is prevented from turning in carrier by a $3/32$ " steel ball imbedded in end of shaft. Do not lose the steel ball.

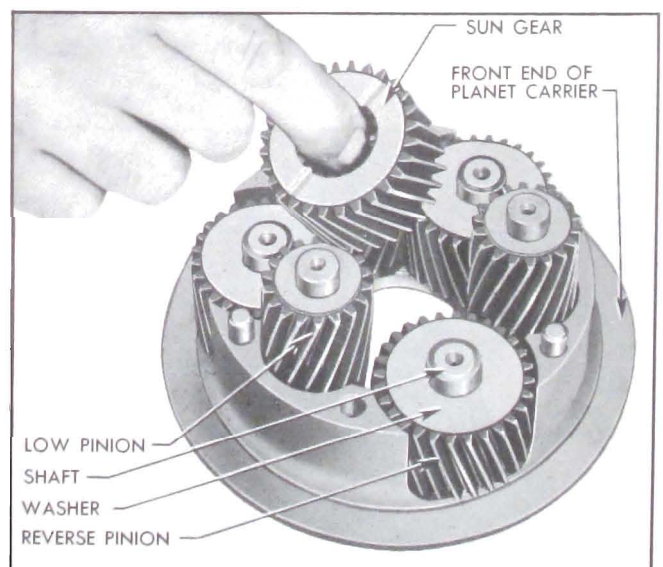


Figure 5-103—Removal of Sun Gear and Planet Pinions

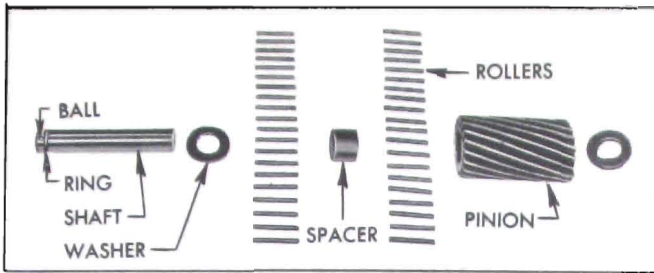


Figure 5-104—Low Planet Pinion, Disassembled

7. Remove the 3 reverse planet pinion assemblies which are similar to the low planet pinion assemblies and are removed in the same manner.

8. Remove the thrust washers and shafts from pinions, then remove the bearing rollers. Note that the reverse planet pinions have a single set of rollers and the low planet pinions have two sets of rollers separated by a spacer. See Figure 5-104.

b. Cleaning and Inspection of Planetary Gear Set

1. Wash all parts in clean solvent and dry thoroughly.

2. Carefully inspect shaft and rollers for excessive wear. Replace if worn.

3. Inspect reverse ring gear, sun gear, and pinions for wear; remove any nicks or burrs with Arkansas stone.

4. Inspect bushing in rear end of planet carrier, and replace it if worn or scored. The bushing may be removed with Bushing Remover J-3197 and new bushing may be installed,

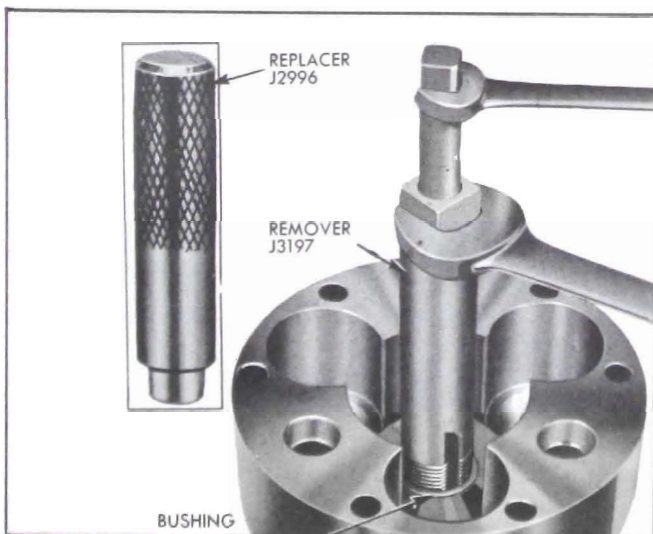


Figure 5-105—Replacing Planet Carrier Bushing

either end first, by using Bushing Replacer J-2996. See Figure 5-105. Reaming to size is not required.

5. Inspect reverse band and replace it if cracked or lining is worn so that grooves are gone. Inspect reverse band anchor for cracks.

c. Cleaning and Inspection of Transmission Case

1. Wash case thoroughly and blow out all passages.

2. Carefully inspect case for cracks, breaks, and stripped threads in bolt holes.

3. Inspect all machined surfaces for nicks or burrs and smooth off with a mill file.

4. Inspect the bushing for wear and scoring. Insert planet carrier into bushing and check clearance with feeler gauge. If clearance is excessive due to wear of bushing, replace the bushing.

5. To remove old bushing, place case over an opening with rear end down and drive bushing from case with Remover J-3175-1. To install new bushing place J-3175-2 in rear oil pump recess of case to serve as a pilot, slip bushing over J-3175-1 and drive bushing into case from front side until bushing is flush with front surface of wall which supports the bushing. Bushing must be installed with the wide deep ends of oil grooves toward rear side of case. See Figure 5-106.

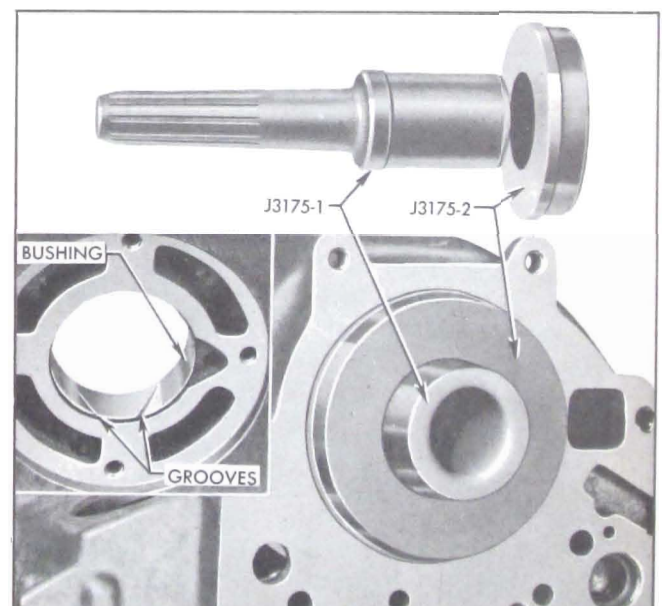


Figure 5-106—Transmission Case Bushing Remover and Replacer J-3175

d. Assembly of Planetary Gear Set

1. Reassemble planet pinions and shafts with bearing rollers and thrust washers. The bottom thrust washer goes between retaining ring on shaft and the end of pinion. Each reverse planet pinion contains 24 rollers. Each low planet pinion contains 20 rollers at each end separated by a spacer. See Figure 5-104. Place a thrust washer on upper end of each assembly to hold rollers in place.

2. Make sure that steel ball is embedded in each shaft to prevent turning in carrier, then install planet pinion assemblies in front end of planet carrier, using care to engage the steel balls in the notches in carrier. See Figure 5-103.

3. Install reverse sun gear and place bronze thrust washer on top of gear and needle thrust bearing on bottom of gear. (Toward Front of Transmission).

4. Install rear end of planet carrier on the assembled front end, making sure that the assembly marks on both parts are in alignment. These marks are numbers which are placed over the parting line during production of the carrier.

5. Install the 3 screws with special lock-washers and tighten to 25-30 ft. lbs. torque with a 7/32" hexagon (Allen) wrench.

6. Install reverse ring gear on planetary gear set.

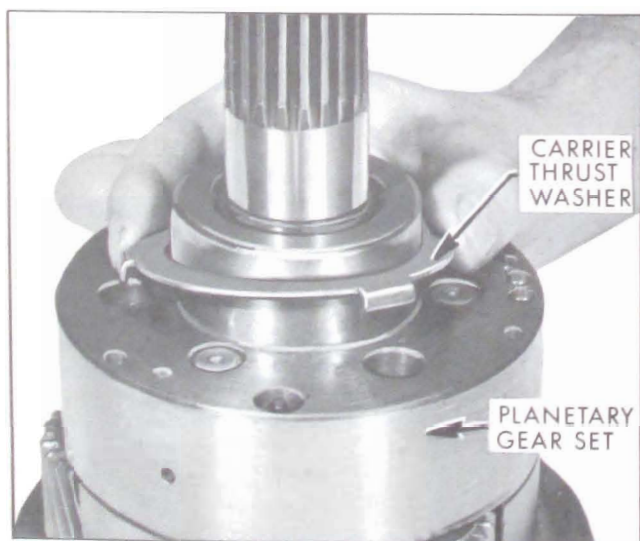


Figure 5-106-A—Installing Planet Carrier Thrust Washer

7. Install tanged thrust washer on rear of planet carrier. See Figure 5-106-A.

8. See paragraph 5-23 (b) for installation of planetary gear set.

5-23 ASSEMBLY OF TRANSMISSION FROM MAJOR PARTS AND UNITS

a. General Instructions

1. Before starting to assemble the transmission make certain that all parts are absolutely clean. Keep hands and tools clean to avoid getting dirt into assembly. If work is stopped before assembly is completed cover all openings with clean cloths.

2. All moving parts should be given a light coating of 10-W oil before installation. Thrust washers may be held in place with vaseline or chassis lubricant, sparingly applied.

3. Do not take a chance on used gaskets and seals — use new ones to avoid oil leaks.

4. Use care to avoid making nicks or burrs on parts, particularly at bearing surfaces and surfaces where gaskets are used.

5. It is extremely important to tighten all parts evenly and in proper sequence, to avoid distortion of parts and leakage at gaskets and other joints. Use a reliable torque wrench to tighten all bolts and nuts to specified torque and in the specified sequence.

6. Prepare two 5/16" x 2-1/2" guide pins and two 3/8" x 1-3/8" guide pins with screw-driver slot in plain end, as shown in Figure 5-107. These will be used for alignment of parts during assembly.

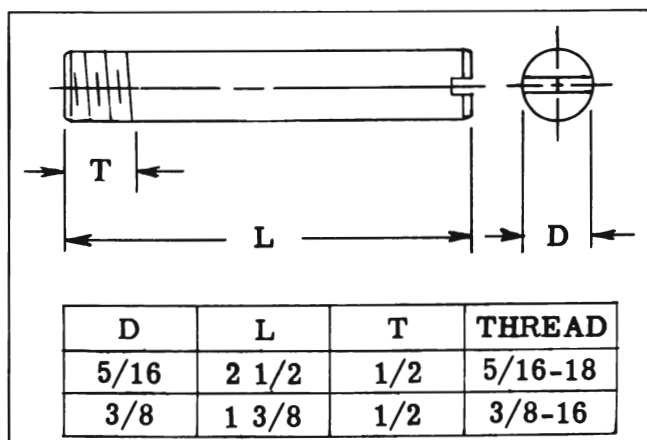


Figure 5-107—Guide Pins

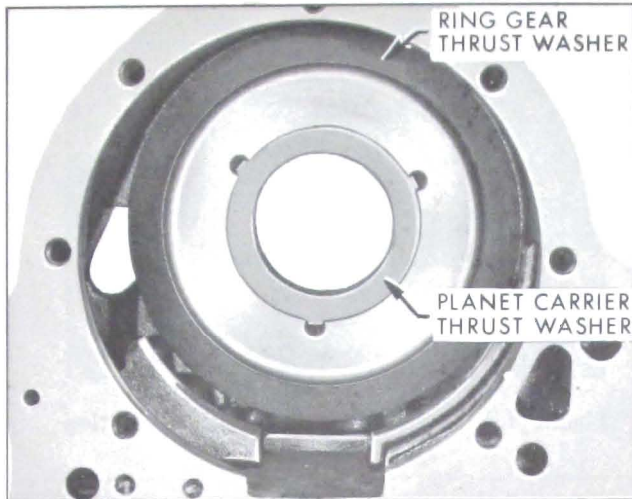


Figure 5-108—Ring Gear and Planet Carrier Thrust Washers Installed

b. Installation of Planetary Gear Set

1. Install reverse ring gear rear thrust washer and planet carrier rear thrust washer in transmission case. See Figure 5-108.

2. Compress ends of reverse band with band installing clip, J-2595 and install in case. When installing band make certain that the heavy side of the band is in the correct position so that it will attach to the reverse anchor and not to the strut. See Figure 5-109. Remove the clip.

3. Rotate the reverse band toward servo opening, insert anchor through opening and engage with hooked end of band, then rotate band and anchor back to normal position.

4. Hold band operating lever (with offset end) in place with strut shoulder toward inside of

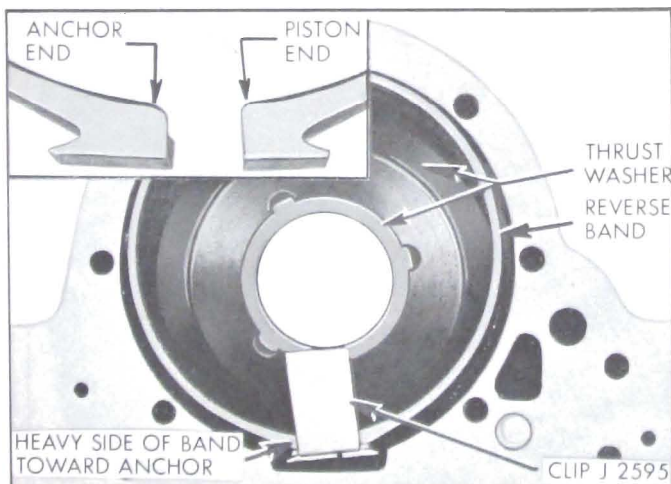


Figure 5-109—Thrust Washers and Reverse Band Installed

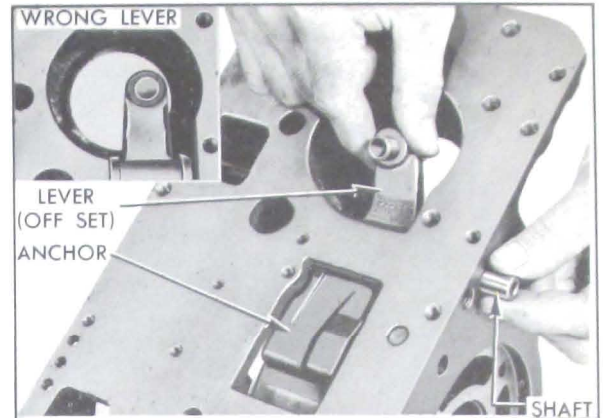


Figure 5-110—Installing Reverse Band Operating Lever and Shaft

case, and insert anchor shaft through case, anchor, and lever. Tapped end of shaft must be outward. If adjustment screw is not centered in servo opening, the low band operating lever has been installed by mistake. See Figure 5-110.

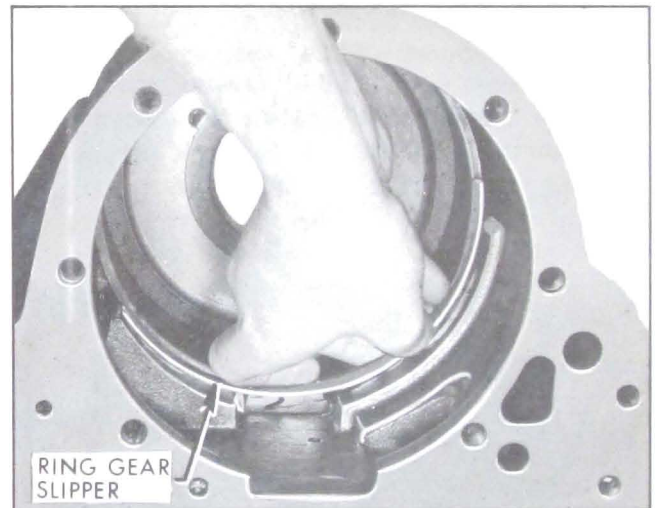


Figure 5-111—Installing Ring Gear Slipper

5. Install reverse ring gear slipper in case. See Figure 5-111.

6. Install assembled planetary gear set in transmission case.

c. Installation of Rear Oil Pump

1. Place gasket and rear oil pump plate in recess in transmission case and align the bolt holes, which are not equally spaced.

2. Install oil pump drive key cushion (rubber) and drive key in output shaft, then install

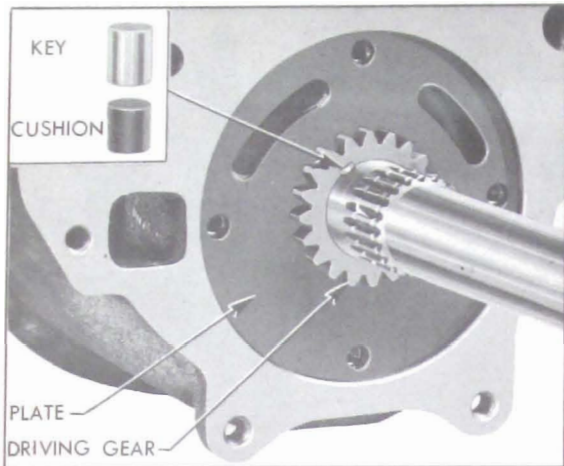


Figure 5-112—Oil Pump Driving Gear and Key Installed

driving gear to engage the key. Install old gear in same position as before removal — install a new gear either way. See Figure 5-112.

3. Lubricate both pump gears and pump body, then install driven gear and body over the driving gear and align bolt holes.

4. Install pump bolts with lockwashers, tighten evenly to 5 ft. lbs. torque in sequence shown in Figure 5-113, then tighten in same sequence to 25-30 ft. lbs. torque.

5. Turn output shaft to make sure pump operates freely.

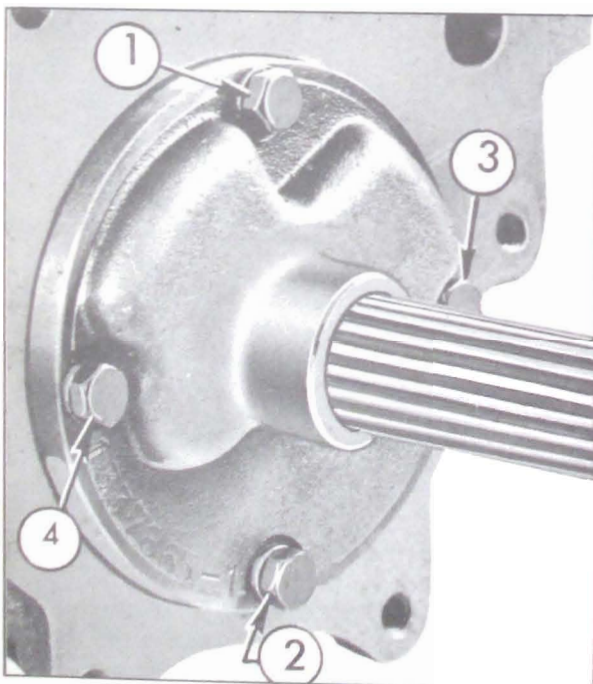


Figure 5-113—Pump Bolt Tightening Sequence - Installation of Ratchet Wheel

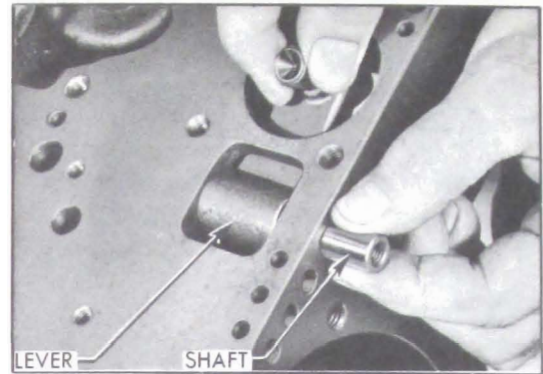


Figure 5-114—Installing Low Band Operating Lever and Shaft

d. Installation of Low Band, Clutch, and Input Shaft

1. Install the low band operating lever and shaft. Strut shoulder of lever must be toward inside of case and tapped end of shaft must be outward. See Figure 5-114.

2. With the assembly front end up, install a wooden block (1" x 1" x 3") as shown in Figure 5-115. Set both low band struts in position on block, with outer ends engaging strut shoulder of operating lever and groove in anchor shaft and with inner ends about 3/16" from wall of case. Spread struts as far apart as possible.

3. Compress ends of low band with reworked pliers or Tool J-9478. See Figure 5-115.

4. Install band in case with ends between the struts and resting on the wooden block. Apply

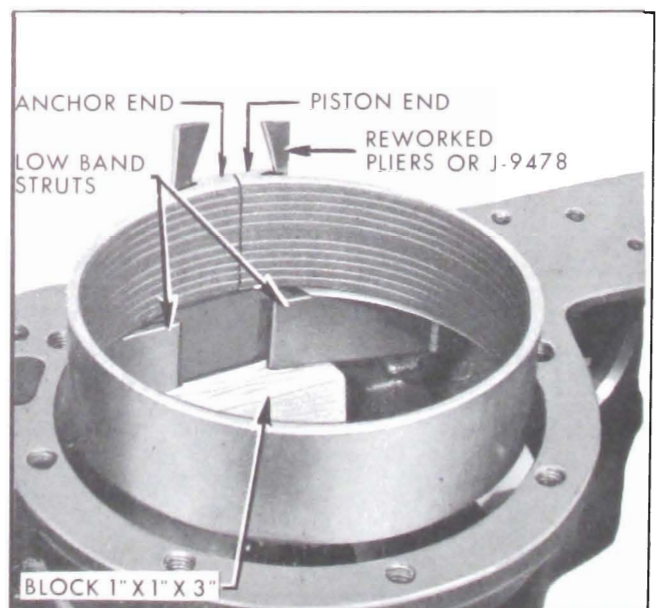


Figure 5-115—Installation of Low Band and Struts

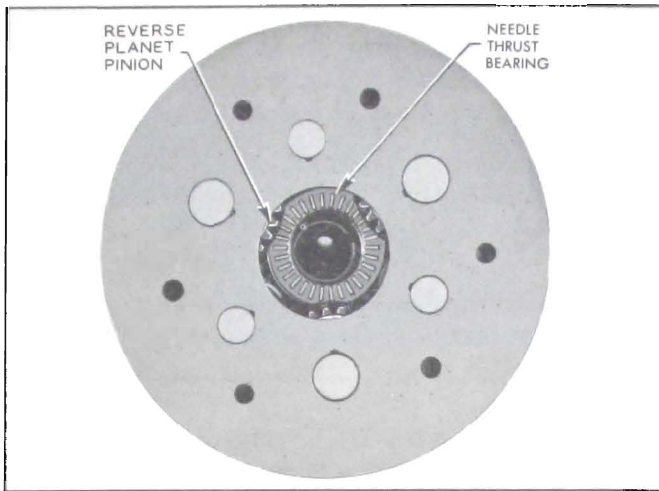


Figure 5-116—Reaction Gear Needle Thrust Bearing

the operating lever to hold struts and band, remove tool and block, then press band down until properly positioned.

5. Reaction gear selective thrust washers (steel) of four thicknesses are furnished under Group 4.161. Select one that measures between .114" and .117" and install it against the needle thrust bearing.

6. Install clutch assembly. If drum binds against low band so that clutch does not go all the way down, use a hooked wire to lift the band on side opposite struts.

7. Place bronze thrust washer on front face of clutch hub, then use a flashlight to make sure that all thrust washers and needle thrust bearing are centrally located so that input shaft can be inserted.

8. Make sure that ends of input shaft oil seal rings are properly locked, then install input shaft. It may be necessary to wiggle the shaft to get it through all thrust washers and needle thrust bearing.

e. Installation of Reaction Shaft Flange, Front Oil Pump, Accumulators, and Output Shaft End Play Check

1. Install a 5/16" guide pin (Figure 5-107) in accumulator bolt hole at each end of flange on transmission case. See Figure 5-118.

2. Place reaction shaft flange gasket in position on case so that all holes in gasket and case are aligned. Gasket can be incorrectly installed.

3. Install tanged bronze high clutch thrust

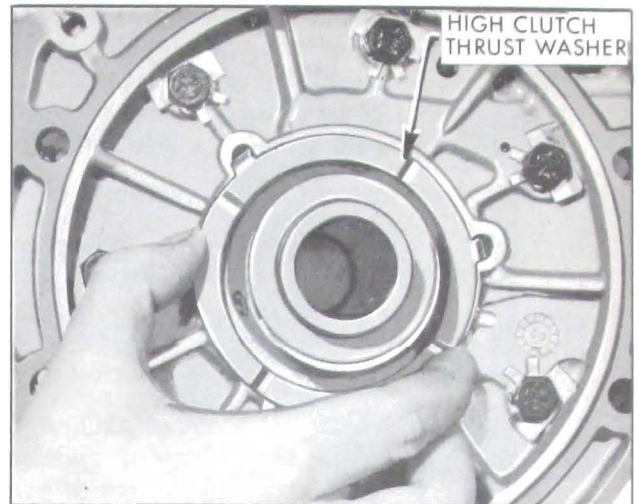


Figure 5-117—High Clutch Thrust Washer Installation

washer on reaction flange, using chassis lube to hold it in position. See Figure 5-117.

4. Make certain that oil seal rings are on flange hub, then install flange assembly on case using care to avoid damaging oil seal rings. See Figure 5-118.

5. Install 3 special bolts (3/8" -16 x 2") with plain washers in positions marked 2, 3, 4 in Figure 5-120. These bolts are for assembly purposes only. Install regular pump cover bolts and lockwashers at positions marked 1, 5, 6. Coat threads of bolts No. 5 and 6 with Permatex No. 3.

NOTE: Bolts used at No. 5 and No. 6 locations are special bolts with captive sealing lock washers.

6. Tighten bolts marked 1 through 4 to 35-40 ft. lbs. and bolts 5 and 6 to 20-25 ft. lbs. in numerical sequence.

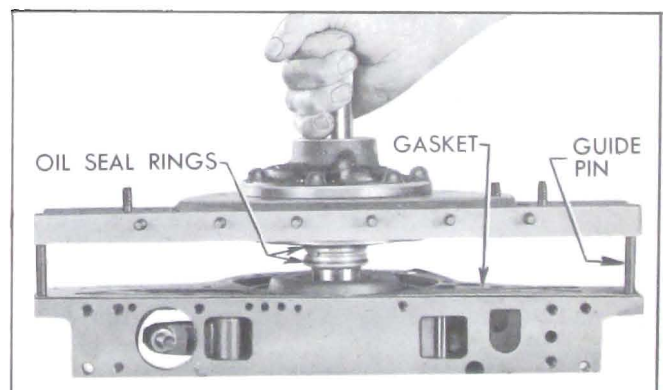


Figure 5-118—Installing Reaction Shaft Flange and Gasket

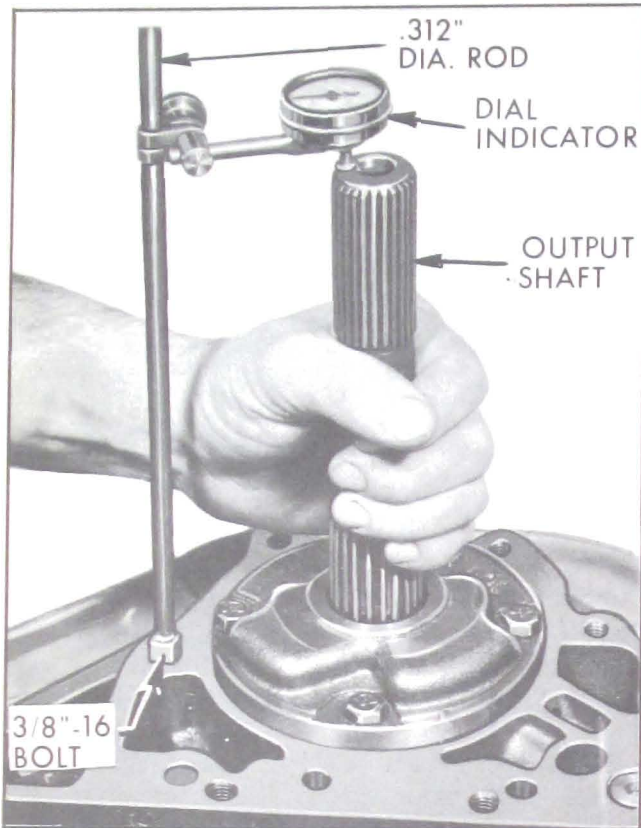


Figure 5-119—Checking Output Shaft End Play Inside Case

7. Assemble a suitable dial indicator support to the transmission case. A $3/8$ " - 16 bolt with a $.312$ " rod welded to the head makes an excellent arrangement. Assemble dial indicator to rod so plunger bears on end of output shaft. See Figure 5-119.

8. Push shaft forward with some force and rotate a few turns to squeeze grease from thrust surfaces.

9. Set dial indicator at zero. Pull output shaft rearward. Observe indicator reading. If reading is more than $.040$ " select a thicker washer for installation forward of the needle thrust bearing and recheck end play. If reading is less than $.020$ " select a thinner washer and recheck. If reading is between $.020$ " and $.040$ ", proceed with assembly of transmission. Remove dial indicator but do not remove indicator support.

10. Place accumulator gaskets in position so that holes match the holes in reaction shaft flange. Install low accumulator on same side as low band operating lever and install high accumulator on opposite side of flange, first making sure that check ball and retaining pin are in place in high accumulator body.

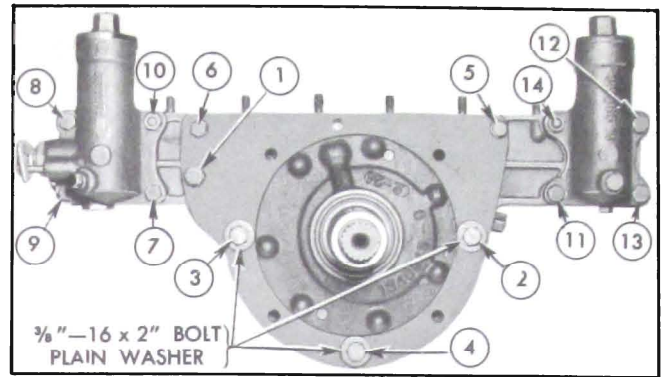


Figure 5-120—Reaction Shaft Flange and Accumulator Tightening Sequence

11. Coat accumulator bolt threads with Permatex No. 3 (non-hardening) and install bolts and stud nuts with lockwasher, but do not tighten.

NOTE: Captive sealing lock washer used under bolt head at #9 location.

12. Referring to Figure 5-120, tighten all bolts and nuts (1 through 14) to 5 ft. lbs. torque in the numerical sequence shown. Following the same sequence again, tighten bolts 1 through 4 to 35-40 ft. lbs. and the remaining bolts and nuts to 20-25 ft. lbs.

13. Remove the three special bolts (2, 3, 4) and tighten accumulator body caps to 40-50 ft. lbs. torque.

14. If edge of flange gaskets projects beyond bottom surface of transmission case, carefully trim it flush, using a sharp knife.

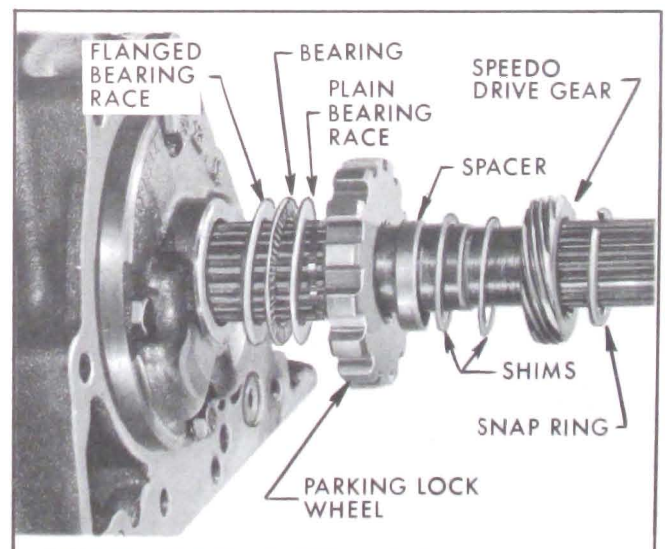


Figure 5-121—Ratchet Wheel and Speedo Gear Installation

15. Assemble flanged needle thrust bearing race over output shaft with flange toward rear oil pump body. Assemble needle thrust bearing against flanged bearing race, then plain race against bearing. See Figure 5-121.

16. Slide parking lock ratchet wheel over output shaft splines to rest against needle bearing and races.

17. Position spacer against ratchet wheel and place one or two shims having a total thickness of approximately .060" against spacer.

18. Slide speedo drive gear on splines and assemble snap ring in groove using snap ring pliers J-5586.

19. Assemble dial indicator to stand with plunger resting on end of output shaft. See Figure 5-122.

20. Pull output shaft rearward as far as possible. "Zero" dial indicator. Push output shaft forward with heavy hand pressure to be sure all springiness is removed from speedo driving gear spacer and grease is squeezed from between thrust surfaces.

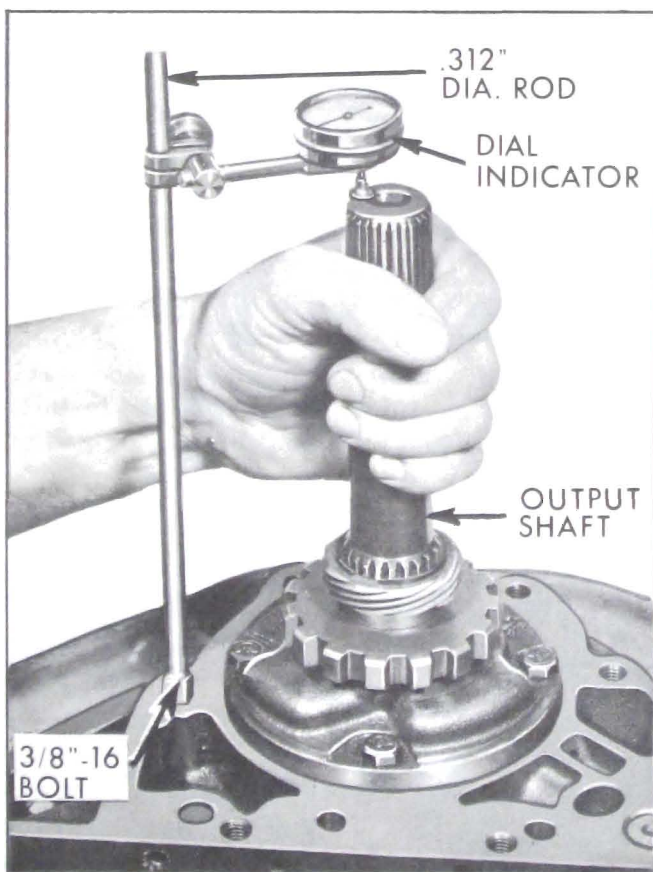


Figure 5-122—Checking Output Shaft End Play Outside Case

21. Read dial indicator. Reading should be between .005" and .017". If reading is less than .005" select a thinner shim to be installed forward of speedo gear. If reading is more than .017" select a thicker shim.

22. Remove dial indicator and stand.

f. Installation of Rear Bearing Retainer

1. Place rear bearing retainer to case gasket in position on transmission case.

2. Carefully move rear bearing retainer assembly into position taking care to avoid damage to valve operating rod.

3. Install seven retainer to case bolts and torque alternately and evenly to 35-40 foot pounds using a 7/16" 12 point socket.

g. Installation of Valve and Servo Body Assembly, and Oil Pan

1. With transmission laying bottom side up, raise the reverse band operating lever and insert the strut between shoulders on lever and end of band — rounded ends must be against lever and band. CAUTION: Do not lift the lever during the following steps because strut will fall into transmission case.

2. Install two 5/16" guide pins (Figure 5-107) in transmission case to guide each end of servo body, and install servo body spacer plate gasket over guide pins.

3. Push shift control valve and lower operating lever inward to align the upper lever with opening in case and install the valve and servo body on transmission case. See Figure 5-123.

4. Install various length bolts with lockwashers according to depth of holes through

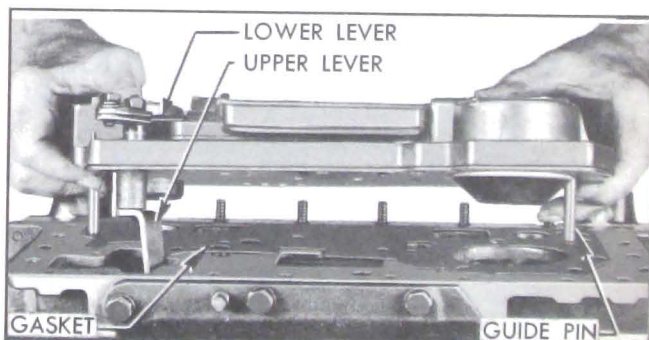


Figure 5-123—Installing Valve and Servo Body Assembly

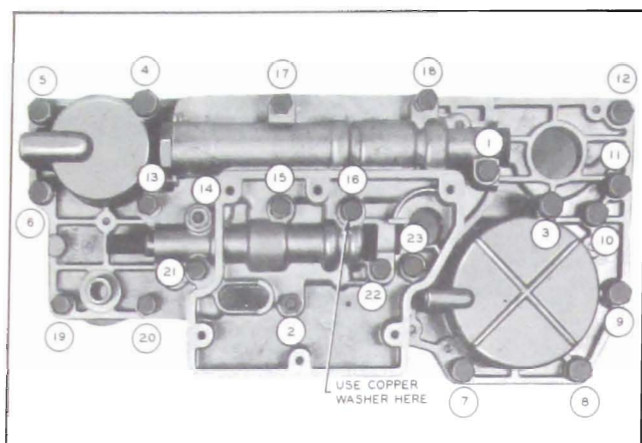


Figure 5-124—Valve and Servo Body Body Tightening Sequence

valve and servo bodies. Use copper washer on bolt indicated in Figure 5-124.

5. Tighten all bolts to 5 ft. lbs. torque in the numerical sequence shown in Figure 5-124. Repeating the same sequence, tighten all 1/4" bolts and nuts to 11-15 ft. lbs. torque and all 5/16" bolts to 15-20 ft. lbs. While tightening bolts and nuts adjacent to the shift control valve, operate the valve to make certain that it is not binding — it may be necessary to adjust some bolts to low limit on torque to prevent valve binding. Install oil screen with 6 slotted head screws.

6. Using Linkage Hook-Up Finger J-2591, position the socket of valve operating rod under the ball of valve upper operating lever and pull upward until ball snaps into the socket. See Figure 5-126.

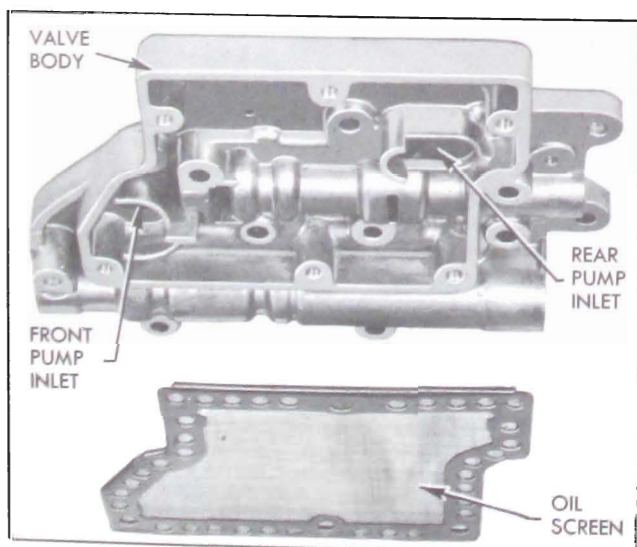


Figure 5-125—Oil Pump Suction Passages

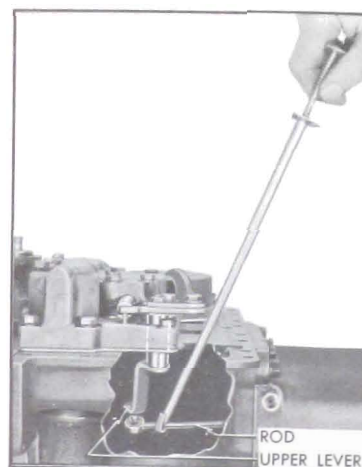


Figure 5-126—Connecting Valve Operating Rod to Upper Lever

7. Operate the valve linkage to make sure it works freely. Move lever toward front of transmission to engage parking lock pawl in the ratchet wheel. Turn output shaft to make certain it is locked.

8. Move shift lever to Direct Drive position and note position of control valve. The groove in the first land of the valve should be flush with the boss on the valve body. See Figure 5-127.

9. If edge of groove is not flush, loosen bolt and nut on adjustment lever and move to position valve correctly. Tighten bolt and nut. Re-check valve position.

10. Spread a thin coat of Permatex No. 3 on transmission case only in the area where the case is cut away under the oil pan gasket. This is adjacent to the valve operating lever.

11. Install a 5/16" guide pin (Figure 5-107) at each end of transmission case and install a new oil pan gasket over guide pins.

12. Install oil pan with bolts and stud nuts

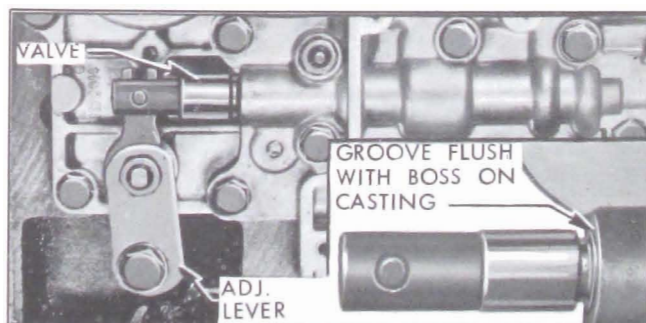


Figure 5-127—Position of Control Valve in Direct Drive Range

provided with lockwashers. Evenly tighten all bolts and nuts to 15-18 ft. lbs. torque.

h. Installation of Speedometer Driven Gear

1. Check "O" ring on speedometer driven gear, replace if not in good condition.
2. Lube "O" ring and gear and install in case.
3. Install speedo gear retainer.

i. Installation of Converter Housing and Torque Converter

1. Install front oil pump seal ring around pump body against pump cover.

2. Install converter housing, using bolts with captive sealing lock washers and plain lock washer under stud nut. Sparingly coat threads of bolts with Permatex No. 3 to protect against oil seepage. Tighten bolts and stud nut evenly to 35-40 ft. lbs. torque.

3. Support converter pump firmly on blocks and carefully place two position stator in proper position, with original spacers and the bearing race between stator and pump hub. Do not use grease to hold spacers in place.

4. Carefully lower twin turbine assembly into place.

5. Install Converter Clearance Gauge J-5899 on converter pump flange, making sure that indicator post does not contact the turbine support. Loosen wing screw, firmly press gauge plunger down against first turbine hub and tighten wing screw. See Figure 5-129.

6. Support the converter pump cover firmly on blocks with inner side up and place the bronze thrust washer in its recess. Remove Gauge J-5899 from pump, turn it over, and center it on the cover so that it rests squarely on the gasket surface. See Figure 5-130.

7. Mount Dial Indicator on the adjustable post of clearance gauge so that indicator button bears squarely against the upper end of clearance gauge plunger. Set dial at zero. See Figure 5-130.

8. Loosen plunger wing screw, firmly press gauge plunger down against the thrust washer

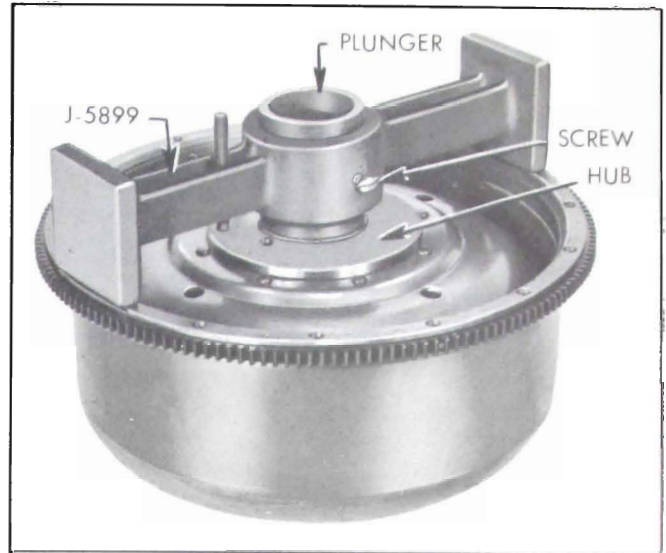


Figure 5-129—Gauge J-5899 on Pump and Turbine

and note the dial reading. The dial reading is the clearance that will exist between the turbine and pump cover when parts are installed, and should be .004" to .017".

9. If dial reading is not within specified limits, change the total thickness of selective spacers located under the stator. Increasing the spacer thickness will decrease clearance at cover and decreasing spacer thickness will increase the clearance. Spacers are available in three different thicknesses under Group 4.117.

10. Install the converter pump on reaction shaft, turning it until slots on pump hub enter the lugs in front oil pump driving gear. Make certain that ring gear is properly aligned on roll pins and against pump flange.

11. Coat the selective spacers and bearing race with petroleum jelly so that they will

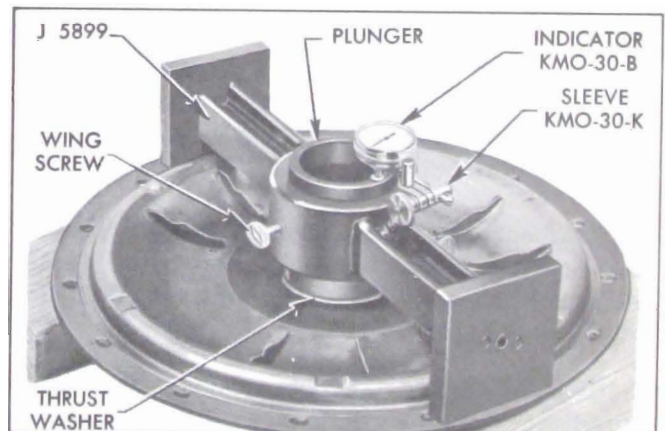


Figure 5-130—Gauge J-5899 on Pump Cover

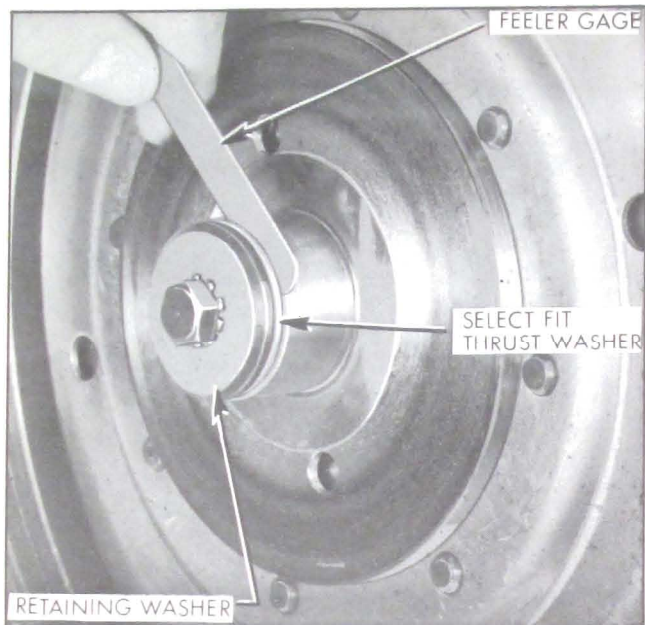


Figure 5-131—Checking Turbine Clearance

adhere to the stator during installation. Make sure that all rollers and springs are in place and held in stator with Tool J-5806 (Figure 5-48).

12. While holding bearing race and spacers to rear side of stator, slide stator off of installing tool upon the reaction shaft. Make certain that bearing race and spacers remain in place as stator is pushed back against converter pump.

13. Install input shaft retaining ring. Make sure that retaining ring is seated solidly in groove of input shaft, then install the twin turbine assembly, being careful not to force sprags onto reaction shaft -- rotate assembly clockwise while installing.

14. Install selective thrust washer, retaining washer, and bolt with external tooth lock washer on front end of input shaft. Shift into "Parking" and pry up on reverse band operating lever with screwdriver to lock input shaft, then tighten bolt to 35-40 ft. lbs. torque.

15. Check clearance between selective thrust washer and first turbine hub, using feeler gauges. Clearance should be between .002" and .009". See Figure 5-131.

16. If specified clearance does not exist, substitute another thrust washer of proper thickness. Two washers of different thicknesses are available under Group 4.127.

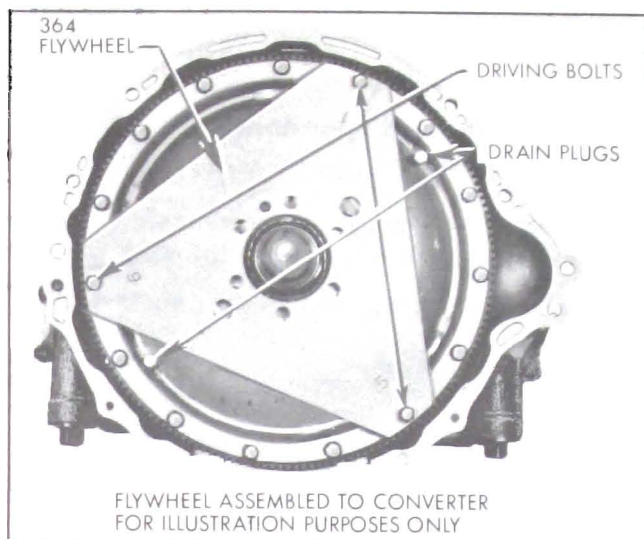


Figure 5-132—Location of Driving Bolt Holes

17. Refer to Figure 5-132 to determine which three bolt holes to leave empty for later installation of flywheel to pump driving bolts.

18. Install a new O-ring seal on pump cover, making sure that surfaces are clean and that seal has even tension all around and is not twisted.

19. Grease the selected thrust washer so it will adhere and place it in recess in cover, then install cover on pump.

20. Install bolts in all but the three driving bolt holes, insert the shank of a 11/32" drill through one bolt hole to align all holes, then tighten bolts to approximately 5 ft. lbs. torque in numerical sequence shown in Figure 5-133. Finally tighten bolts in same sequence to 25-30 ft. lbs. torque.

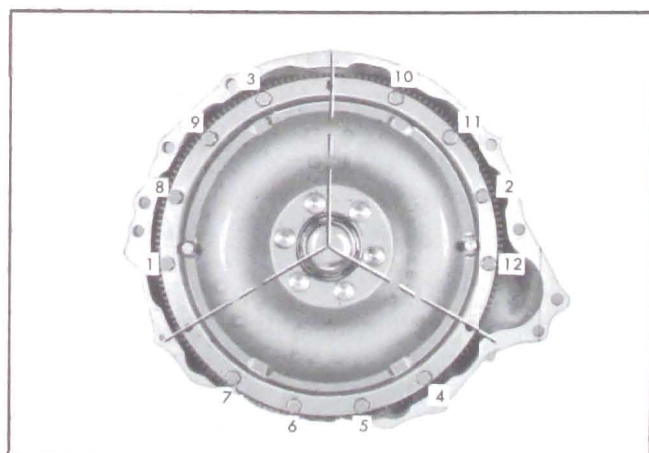


Figure 5-133—Bolt Tightening Sequence

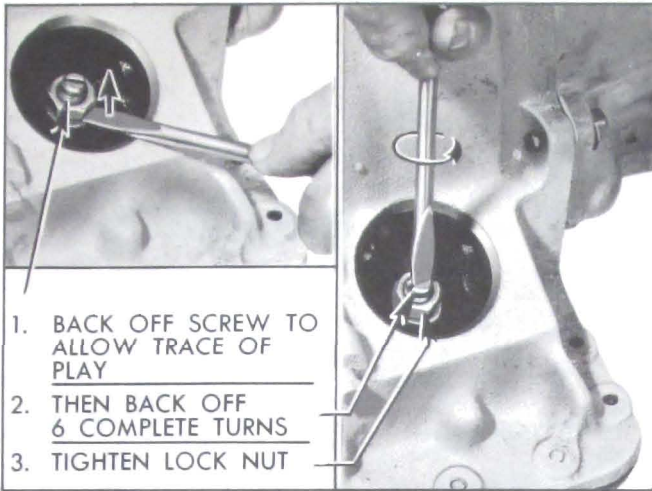


Figure 5-134—Band Adjustment

j. Low and Reverse Band Adjustment

NOTE: The following adjustment must be very carefully performed since it is not pos-

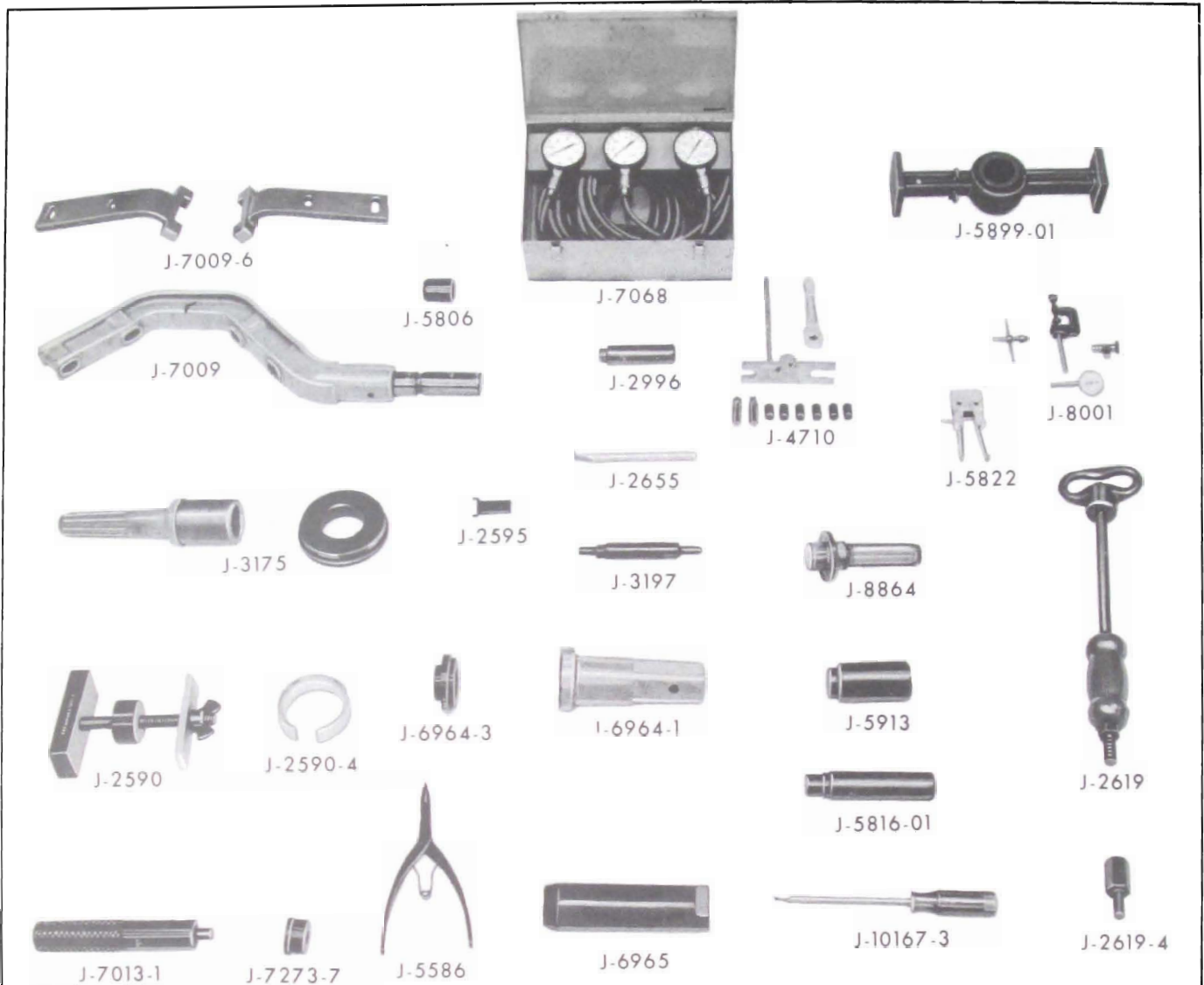
sible to readjust the bands after transmission is installed in car.

1. Loosen lock nut and turn adjusting screw clockwise until considerable resistance is felt, indicating that band is in full contact with the drum (low) or ring gear (reverse). See Figure 5-134.

2. Back off screw until just a trace of play can be felt by prying up on lock nut with screwdriver. From that point, back off screw six (6) complete turns and snug up the lock nut. See Figure 5-134.

3. After noting position of adjusting screw slot, tighten lock nut to 20-25 ft. lbs. torque. Remove torque wrench and check to make sure that adjusting screw did not turn.

4. Install band adjustment covers with new gaskets. Flat cover over reverse band adjustment hole (left side), domed cover over low band adjustment hole (right side).



J-2590	Clutch Spring Compressor	J-5913	Front Stator Blade Carrier Bushing Installer
J-2595	Transmission Band Installing Clip	J-6964-1&3	Front Pump Oil Seal Installer
J-2619	Slide Hammer Assembly	J-6965	Front Oil Pump Seal Remover
J-2619-4	Slide Hammer Adapter	J-7009	Transmission Holding Fixture
J-2655	Transmission Access Cap Remover	J-7009-6	Transmission Holding Fixture Adapters
J-2996	Planet Carrier Bushing Installer	J-7013-1	Driver Handle
J-3175	Case Bushing Remover & Installer	J-7068	3 Gauge Pressure Gauge Set
J-3197	Planet Carrier Bushing Remover	J-7273-7	Rear Bushing Remover and Installer (Part of J-7273, Triple Turbine Bushing Service Set.)
J-4710	Flywheel Housing Alignment Set	J-8001	Dial Indicator Set
J-5586	Snap Ring Pliers	J-8864	Transmission Seal Installer
J-5806	Stator Installer	J-10167-3	Palm Grip Clutch Head Screw Driver
J-5816-01	Reaction Flange Shaft Bushing Installer		
J-5822	Puller		
J-5899-01	Converter Cover Clearance Gauge		

Figure 5-135—Twin Turbine Transmission Special Tools