

INSPECTION AND GENERAL INSTRUCTIONS

1. Cleanliness is absolutely necessary during assembly to insure proper functioning of transmission. Transmission case passages should always have plugs removed to allow for through cleaning. Use compressed air, when available, to dry parts before they are assembled. Do not wipe parts with rags to clean or dry them as lint from the cloth may cause erratic valve action.
2. Inspect all parts for damage or wear. Replace defective parts.
3. Gaskets, oil seals and rubber parts should be replaced, except in new units. Exercise judgement as to the need for replacing these parts.
4. Oil seals and bearings are best installed by using an arbor press, suitable fixtures, and tools to properly align parts being assembled. Hammering seals and bearings into position can severely damage parts.
5. Automatic transmission fluid type "A" suffix "A" should be used to lubricate parts as they are assembled. Petroleum jelly may be used on gaskets or other parts that must be held in position during assembly. Lubricated parts will assemble more freely.
6. Tighten all bolts and screws evenly to the recommended torque. See chart on page 36 of this manual.
7. Needle bearings, which are pressed into the adapter and into pinion cage and output shaft assembly, should be carefully inspected in position in mating part. Do not remove needle bearing unless inspection shows a need for replacing.
8. Inspect needle thrust bearing, ball bearings and mating thrust faces or journals for scuffing, pits or deforming of any nature. Replace damaged parts.
9. Clutch plates should be flat with the pattern still showing on friction plates. Plates, which have slipped, will show heat by discoloration and should be carefully inspected for wear and warpage. Replace clutch plates in sets of steel or friction, or both steel and friction, but not as single plates.
10. Pinions should be checked for pitting or scuffing on teeth and pinion thrust washers should be inspected for wear. The oil fling, which is spun onto carrier, should be oil tight and secure.
11. Pumps are built to very close tolerances and gears are matched to the pump housing at the factory; therefore it is necessary to replace a complete pump assembly and not individual parts. Inspect pump gears for scratches, galling and wear.
12. Two ball check valves, located just below the front transmission case face, should not be removed except when it is necessary to replace one of the parts. The lube check valve is on the left and the cooler check valve is on the right, when looking into the case from the front. The lube check valve may be checked by blowing into cooler return opening and observing to see if valve opens and closes. The cooler valve may be similarly checked by blowing air into the cooler opening, (D, Fig. 11).
13. It is wise to carefully check "O" rings and cast iron sealing rings before they are removed; since information may be gained, which if analyzed may give the answer to the reason for a failure. A broken sealing ring permits leakage, which could cause clutches to slip and fail.
14. Reduction housing tapered bearing must be replaced as a set. The cup, spacer and two cones will all have the same number with the cup and one cone having an A suffix. Place the cone with the A suffix in the end of the cup having the number with the A suffix. Do not interchange bearing components.

ASSEMBLY OF TRANSMISSION

PROCEDURE FOR ALL MODELS

1. Assemble regulator valve and spring into shift valve bore. Install spring retainer and press into place while snap ring is installed, (Fig. 33).
2. Install the rubber "O" ring in groove of shift valve and install valve into bore of transmission case, aligning groove in end of valve with lower valve cover bolt hole, (Fig. 34).
3. Install a new valve cover gasket, valve cover, and three 1/4-20 x 5/8 hex head bolts and lock washers, (Fig. 19).
4. Install shift lever, detent spring and ball, flat washer, lock washer and nut, (Fig. 18).

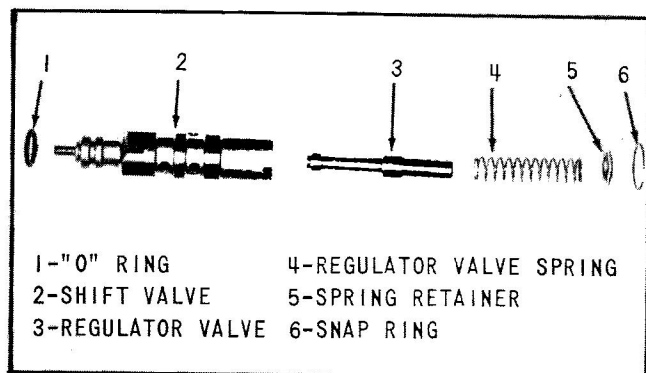


Fig. 33 Exploded View of Valve Assembly

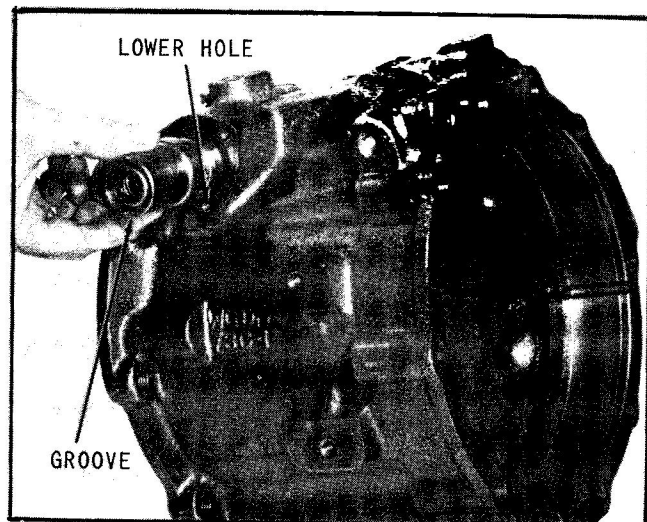


Fig. 34 Install Valve Assembly in Case

5. Replace oil screen, oil drain plug and oil filler plug in transmission case, (Fig. 12).
6. Replace all pipe plugs and cooler fittings in transmission case, (Figs. 2, 3, and 11).
7. Install oil baffle into transmission case, (Fig. 35). Be sure the tab at rear of baffle fits into recess of transmission case.
8. Install rubber clutch "O" ring on output shaft, (Fig. 36).

NOTE: BEARING SLEEVE PRESSES ONTO OUTPUT SHAFT AND A GOOD BEARING PULLER MAY BE USED TO PULL SLEEVE FROM SHAFT IF REPLACEMENT IS NECESSARY.

9. Place clutch piston return spring on shoulder of bearing sleeve, (Fig. 36).
10. Install rubber clutch sealing ring on forward clutch piston then place piston over output shaft and rest on return spring.
11. Place parts assembled in steps 8 through 10 on an arbor press and use a suitable tool to press against rear face of clutch piston while installing snap ring in snap ring groove of output shaft behind piston, (Fig. 23).

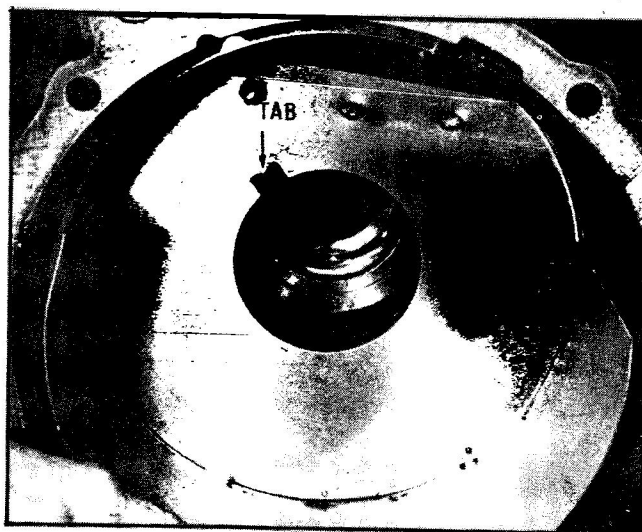


Fig. 35 Install Oil Baffle

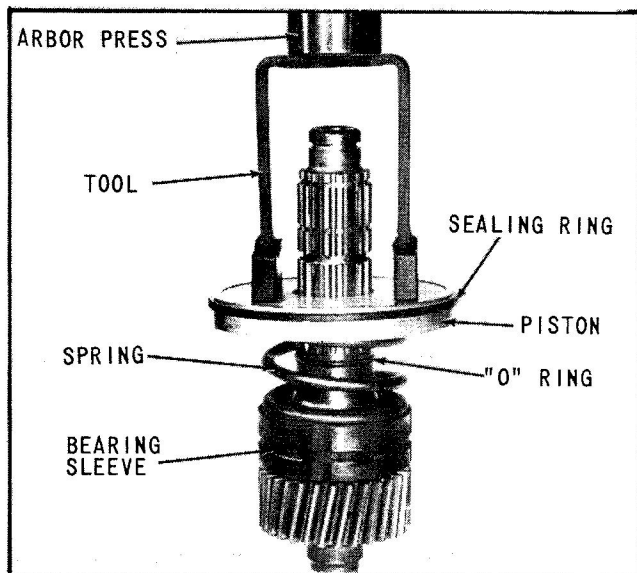


Fig. 36 Clutch Parts Assembly

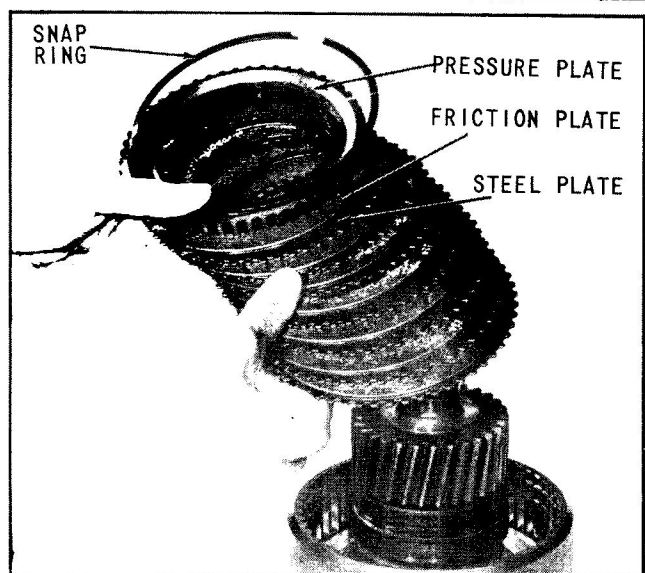


Fig. 38 Install Clutch Plates

TO COMPLETE ASSEMBLY OF FORWARD AND REVERSE TRANSMISSION (1 to 1 RATIO)

12. Install clutch cylinder over output shaft and piston assembly. Be careful not to damage rubber sealing rings and check after assembly is complete to see if any rubber has been sheared from sealing ring as ring entered clutch cylinder, (Fig. 37).
13. Starting with a steel outer clutch plate and ending with a clutch inner plate and alternating, install 7 outer and 7 inner clutch plates, then install clutch pressure plate and snap ring, (Fig. 38).
14. Install two cast iron sealing rings in grooves of clutch cylinder, (Fig. 39).

1. Press one of the two bearing cups into transmission case and the other into bearing retainer, (Fig. 40). Normally the cups will be left in position and replacement will be unnecessary. Press the oil seal into bearing retainer, if needed.
2. Install bearing spacer on output shaft behind clutch cylinder, (Fig. 39).
3. Install clutch and output shaft assembly in transmission case, being careful not to damage the cast iron sealing rings as they enter the transmission case, (Fig. 41).

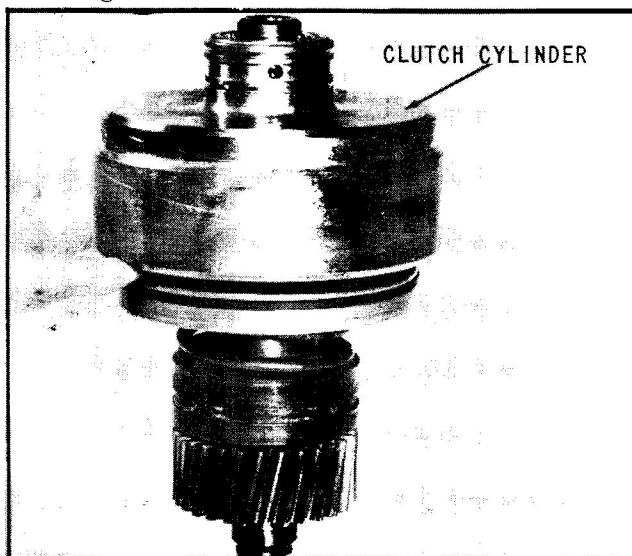


Fig. 37 Install Clutch Cylinder

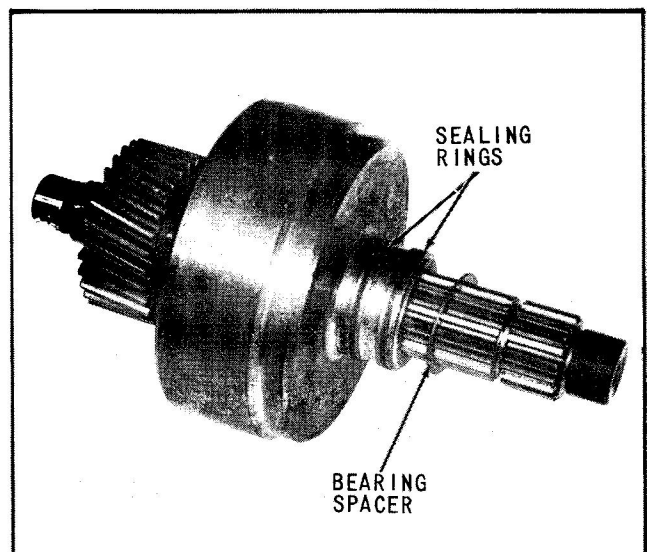


Fig. 39 Install Bearing Spacer

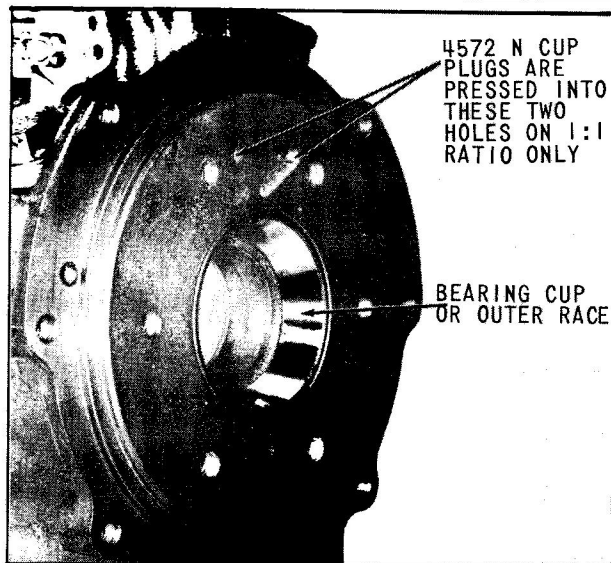


Fig. 40 Bearing Race Installed in Case

4. Install a special tool, (Fig. 24), to press against the forward face of the output shaft and press parts rearward until they just bottom on case.
5. Slide the two bearing cones and inner races over rear of output shaft and against spacer, (Fig. 42).
6. Install the rubber "O" ring in groove of output shaft just behind the rear bearing cone, (Fig. 42).
7. Install bearing retainer gasket, install the bearing spacer in recess of retainer and assemble retainer to rear of transmission, then replace the six 7/16-14 x 1 inch hex head bolts and lock washers, (Figs. 43 and 44).

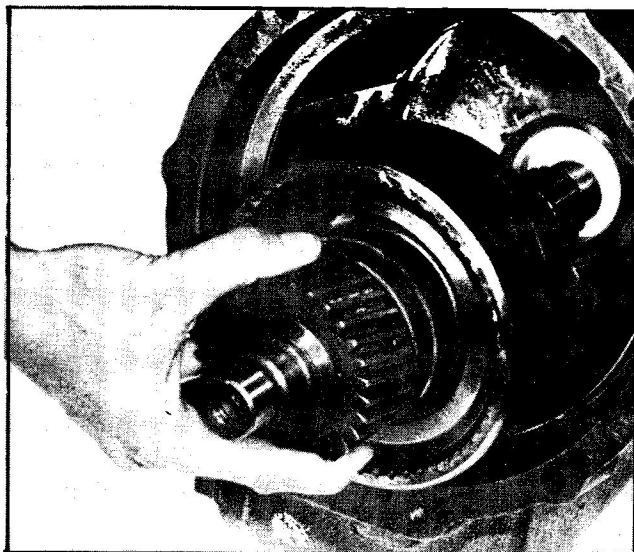


Fig. 41 Install Clutch and Output Shaft

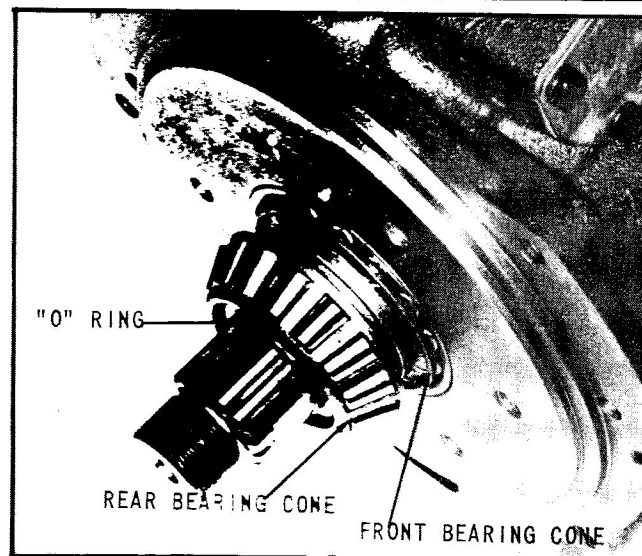


Fig. 42 Installed Bearings on Output Shaft

8. Assemble coupling and output shaft nut, (Fig. 44) and remove the tool from front of transmission case, (Fig. 24).
9. Position the assembled parts on end on coupling and install the thrust needles on front face of sun gear, (Fig. 45).
10. Inspect needle bearing, located in bore of input shaft and carrier assembly and replace if necessary. Press rear face of needle bearing in 7/8 inch below rear face of carrier assembly. Install needle thrust bearing race, with flange facing forward, into bore and against face of input shaft and carrier assembly, (Fig. 46).

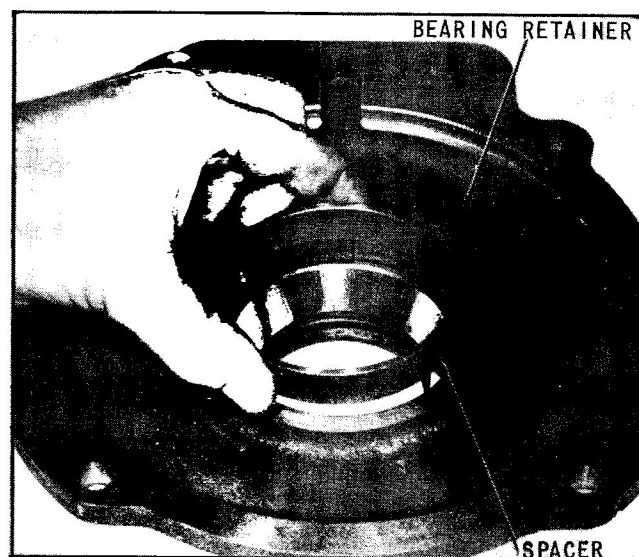


Fig. 43 Assemble Bearing Spacer

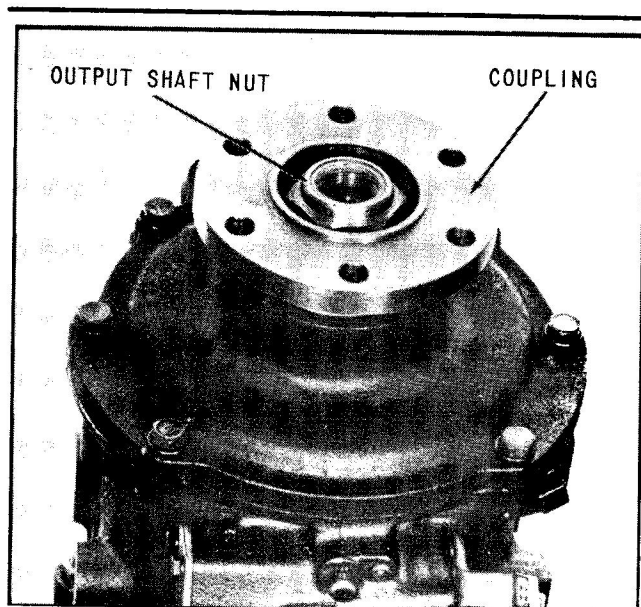


Fig. 44 Assemble Coupling and Nut

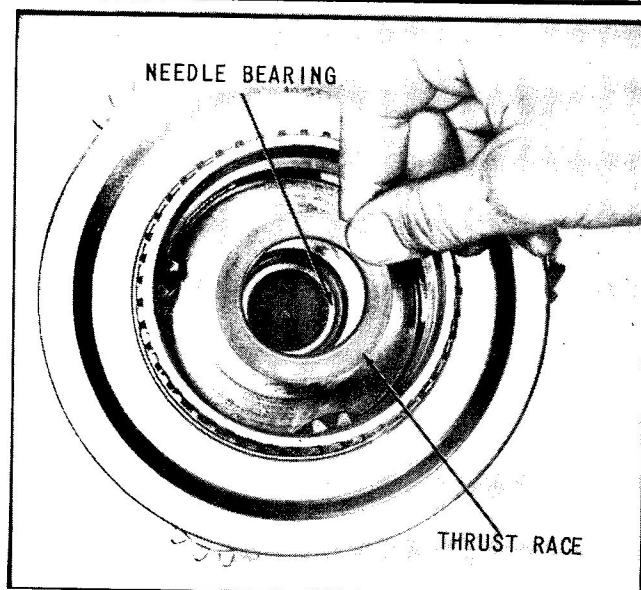


Fig. 46 Install Needle Thrust Race

11. Using a twisting motion to align gear teeth and clutch plate teeth with mating parts, carefully lower input shaft and carrier assembly over sun gear and into direct clutch, (Fig. 47).
12. Place the flat needle thrust race, and then needle bearing on forward thrust face of carrier assembly, (Fig. 47).
13. Install cast iron sealing ring in groove of input shaft, (Fig. 47).
14. Assemble ring gear hub into ring gear and install snap ring into groove of ring gear, (Fig. 17).
15. Install thrust race with flange toward ring gear hub, (Fig. 48).
16. Using a twisting motion, to align gears, carefully lower ring gear over input shaft and carrier assembly, (Fig. 49).
17. Install thrust washer on front face of ring gear hub, (Fig. 49).

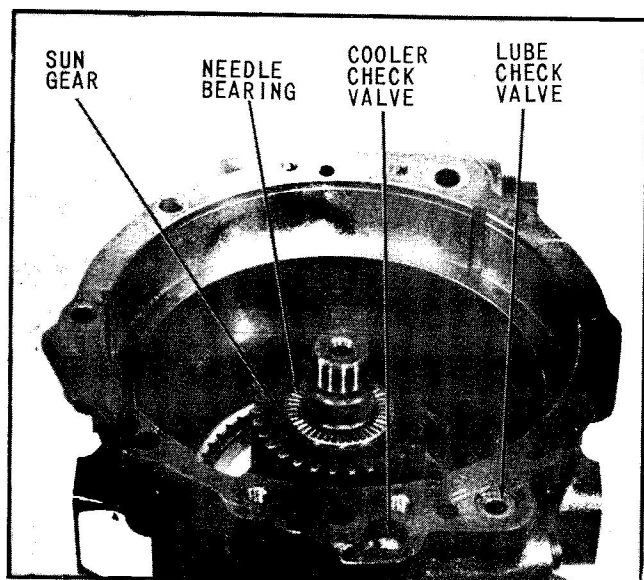


Fig. 45 Install Needles on Sun Gear

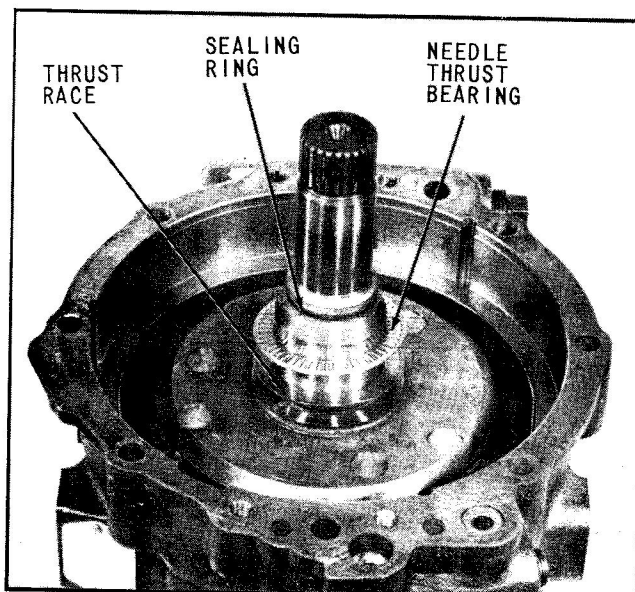


Fig. 47 Carrier Assembly Properly Installed

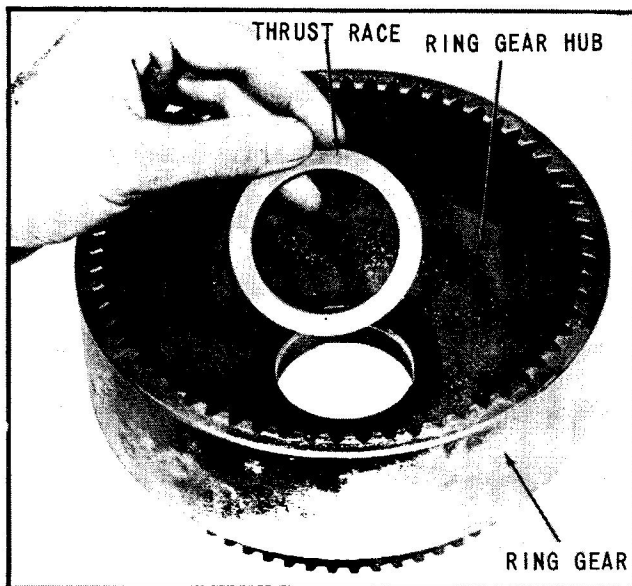


Fig. 48 Install Thrust Race

18. Install one of the reverse clutch pressure plates and three dowel pins, positioning the plate with V notch located next to bolt hole, (Figs. 49, 50 and 51).
19. Starting with a clutch inner plate aligned with splines of ring gear hub and alternating with a steel outer plate, aligned with dowel pins, (Fig. 50), install 4 inner and 3 outer plates.

NOTE: Place steel plate odd shaped lug over uppermost dowel for spring clearance, (Fig. 50).

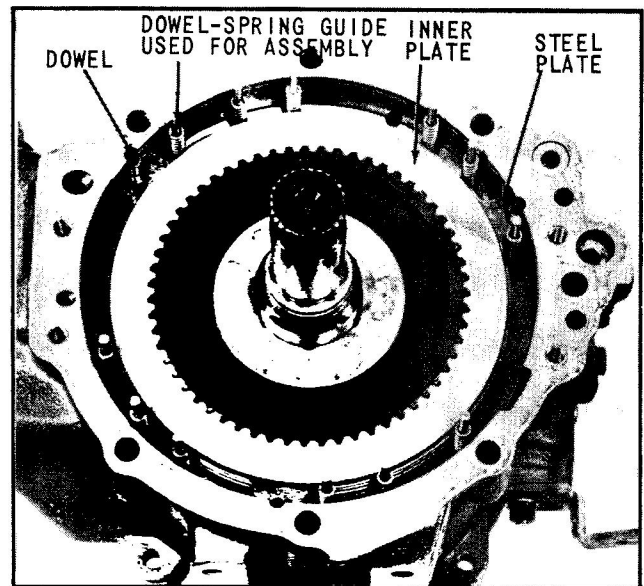


Fig. 50 Install Reverse Clutch Plates

20. Install 12 clutch return springs and place a dowel pin inside each spring. Be careful not to drop parts into transmission. Make dowels 3/16 x 2-1/4 inches approximately. Dowels hold springs during assembly and must fit holes in pressure plate and be long enough to extend through pressure plate so that they may be removed after pressure plate is installed.
21. Install pressure plate, aligning the pins with holes in plate as plate is lowered into position, (Fig. 51).
22. Remove dowel pins, which were installed in step number 20.

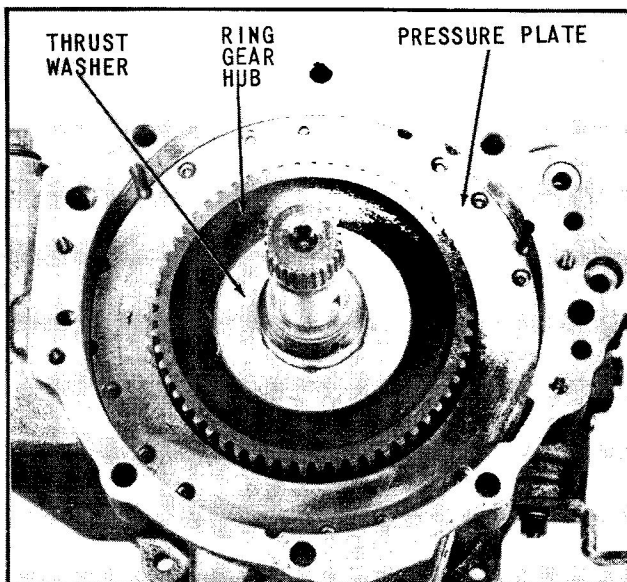


Fig. 49 Ring Gear Installed

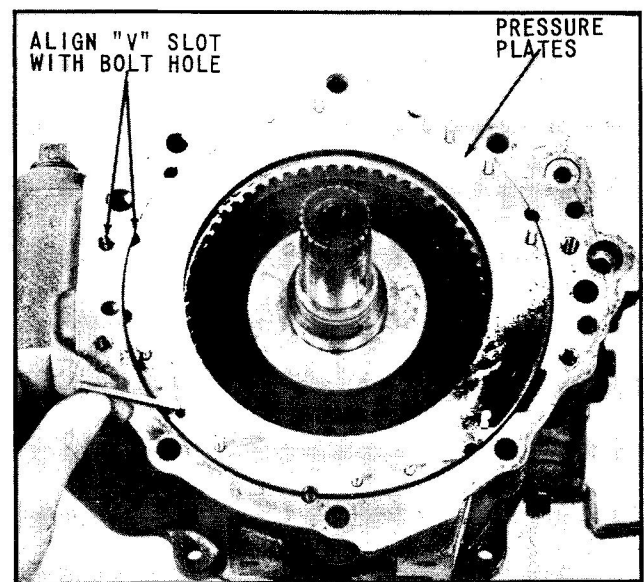


Fig. 51 Pressure Plate Installed

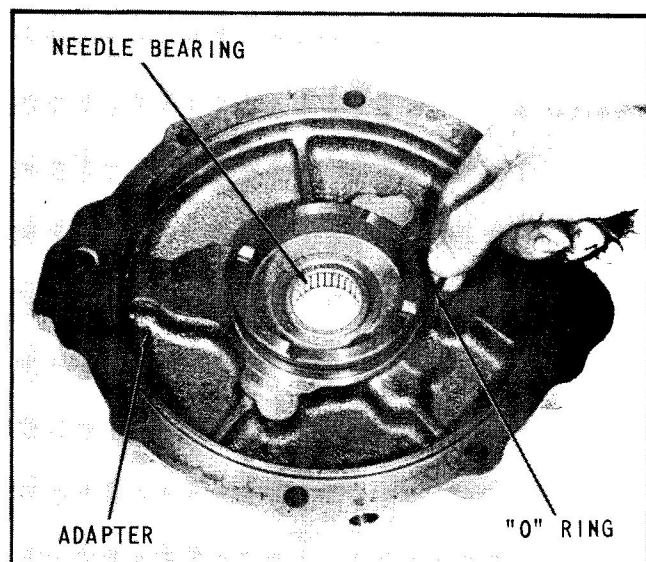


Fig. 52 Install Clutch Hub "O" Ring

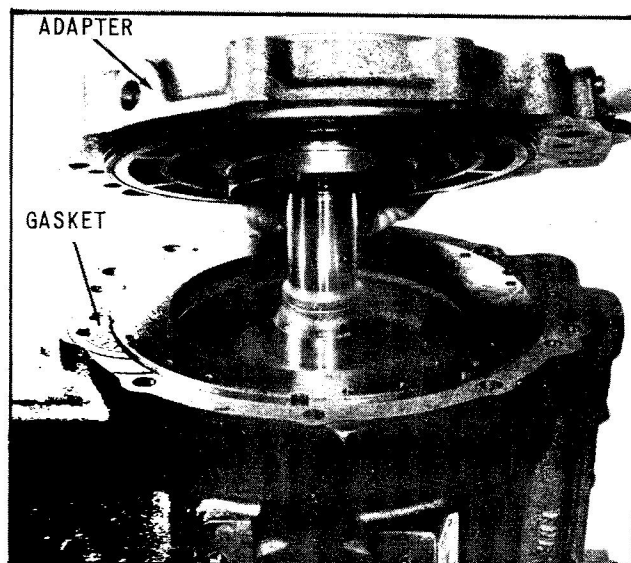


Fig. 54 Install Adapter

23. Assemble the reverse clutch rubber sealing rings on clutch piston and adapter hub. Lubricate and press piston into bore of adapter, (Figs. 52 and 53).

NOTE: Inspect needle bearing, located in adapter hub, and replace if needed.

24. Use petroleum to hold adapter gasket on case and install adapter to transmission case. Install four 3/8-16 x 1-1/4 adapter bolts and torque. Position transmission right side up on bench for the remainder of assembly procedure, (Fig. 54).
25. Press a new seal into pump housing until it is flush with front face of housing.

26. Install pump drive key into groove in input shaft and place smaller pump gear on shaft, aligning key with gear slot, (Fig. 55).

27. Install pump driven gear into pump housing and pump gasket on transmission case then install pump over input shaft, being careful not to damage pump oil seal. After pump is in position, rotate pump so that the letters LH or RH are up with the bolt holes correctly aligned, depending on input shaft rotation being right or left hand rotation. Install and torque pump bolts.

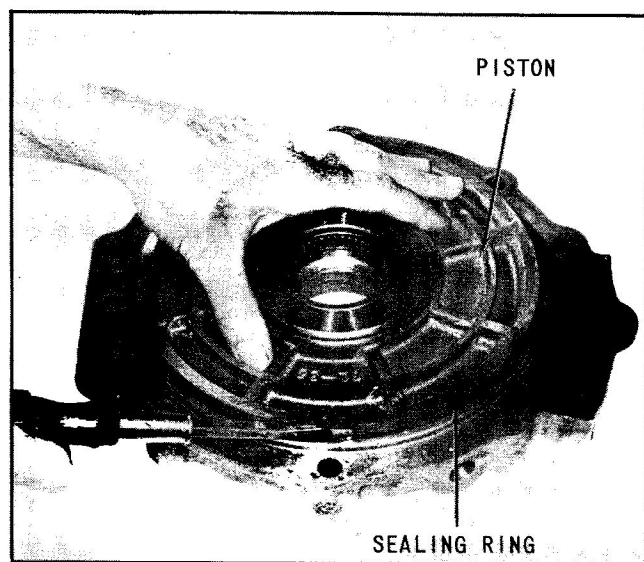


Fig. 53 Install Piston in Adapter

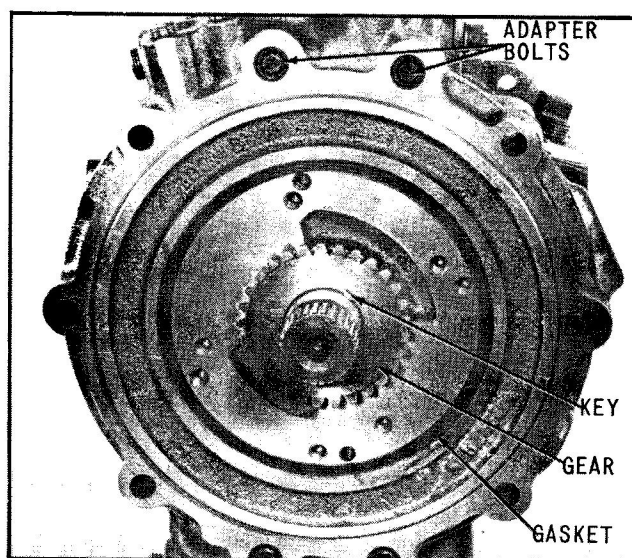


Fig. 55 Install Pump

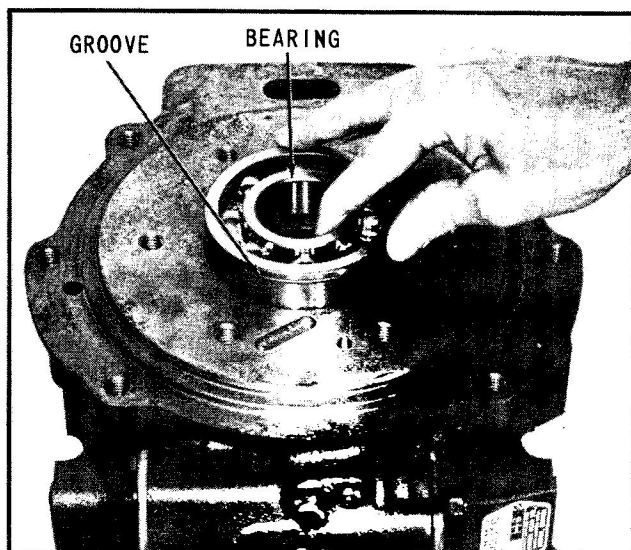


Fig. 56 Assemble Ball Bearing

TO ASSEMBLE TRANSMISSION WITH REDUCTION UNIT

NOTE: The following procedure to follow instructions given in section "Procedure for All Models".

1. Replace ball bearing, with groove to rear and snap ring in groove on the 1.5 to 1 units only, in the bore of forward and reverse transmission case and seat against case, (Fig. 56).
2. Install bearing retainer behind bearing and replace six 7/16-14 x 1 hex head bolts and lock washers, (Fig. 58). Lock washers are not used on 2 and 3 to 1 units, (Figs. 57 and 29).

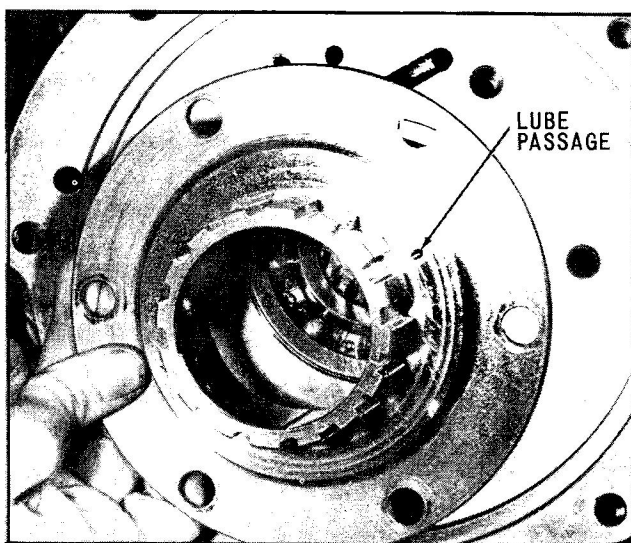


Fig. 57 Assemble Bearing Retainer (2 and 3 to 1 Ratio)

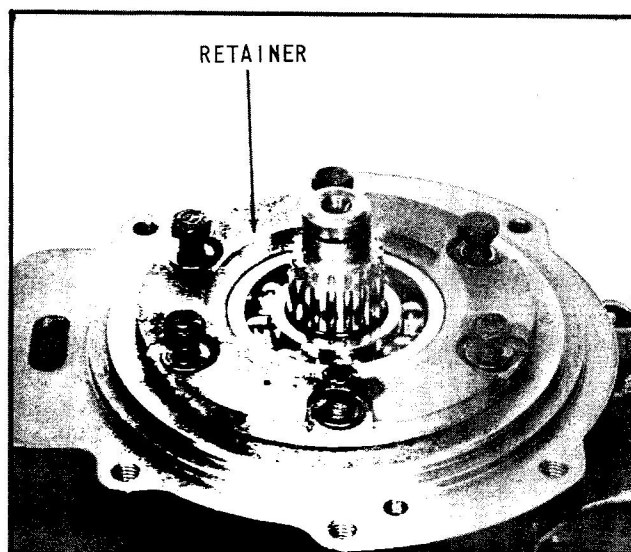


Fig. 58 Assemble Bearing Retainer (1.5 to 1 Ratio)

3. Install parts assembled in steps 8 through 14 of "Procedure for All Models" into forward and reverse transmission case and into ball bearing in rear of case, (Fig. 41).
4. Use an arbor press or a tool similar to the one shown in (Fig. 24) to press against sun gear while reduction unit parts are assembled to rear of output shaft as outlined in following steps.
5. Install large "O" ring behind bearing and small "O" ring in groove at rear end of output shaft, (Fig. 59).

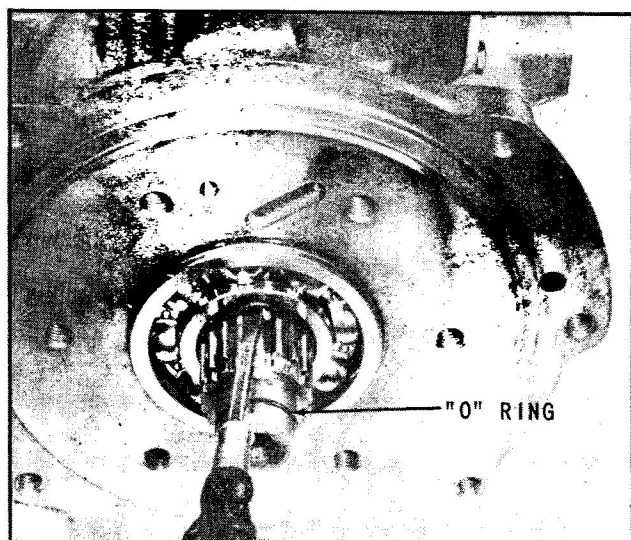


Fig. 59 Assemble "O" Ring (Retainer removed to show "O" rings)

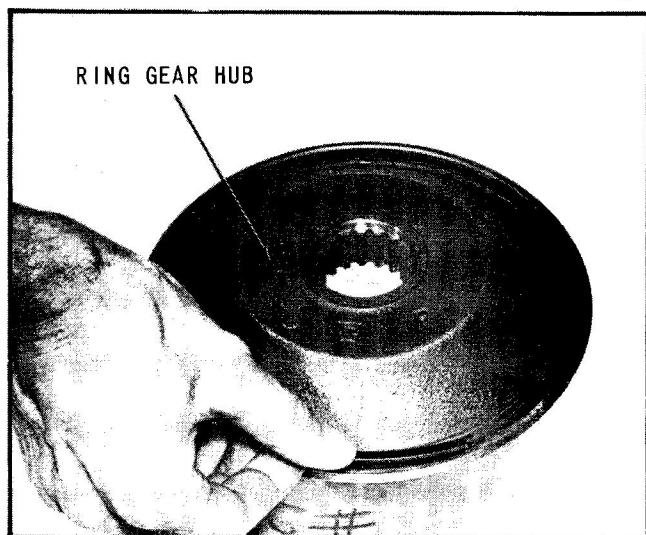


Fig. 60 Install Snap Ring
(1.5 to 1 Ratio)

6A. For 1.50 to 1.00 units only.

1. Install reduction unit ring gear hub into ring gear and replace snap ring in ring gear, (Fig. 60).
2. Assemble ring gear hub over splines of forward and reverse transmission output shaft and install snap ring to retain hub to shaft, (Fig. 61).

6B. For 2.00 to 1.00 units only

1. Install the pinion carrier over splines of bearing retainer and replace snap ring in groove of bearing retainer, (Fig. 28).

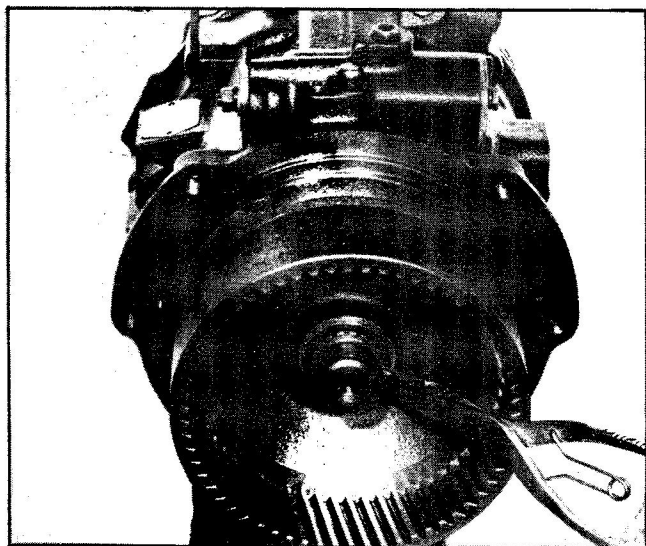


Fig. 61 Install Ring Gear to Output
Shaft (1.5 to 1 Ratio)

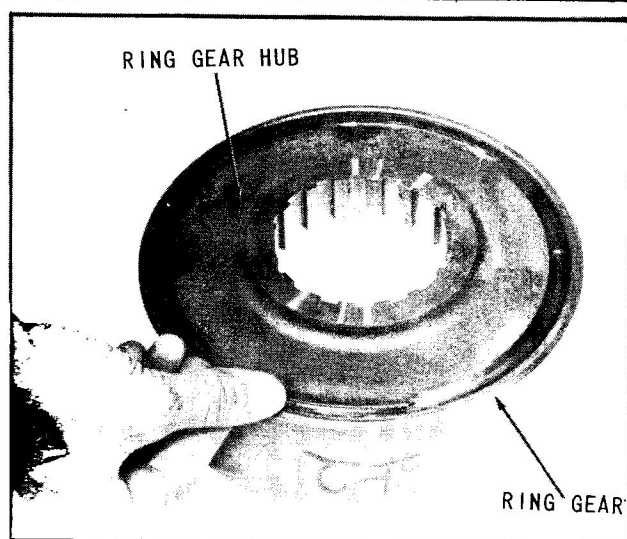


Fig. 62 Replace Snap Ring
(3 to 1 Ratio)

Splines assemble in one position only.

2. Install sun gear over splines of forward and reverse transmission output shaft and replace snap ring to retain sun gear, (Fig. 26). Use correct sun gear, (Fig. 64).

6C. For 3.00 to 1.00 units only.

1. Replace ring gear hub in ring gear and install snap ring, (Fig. 62).
2. Install splines of ring gear hub over splines of bearing retainer and replace snap ring in groove of bearing retainer, (Fig. 63).

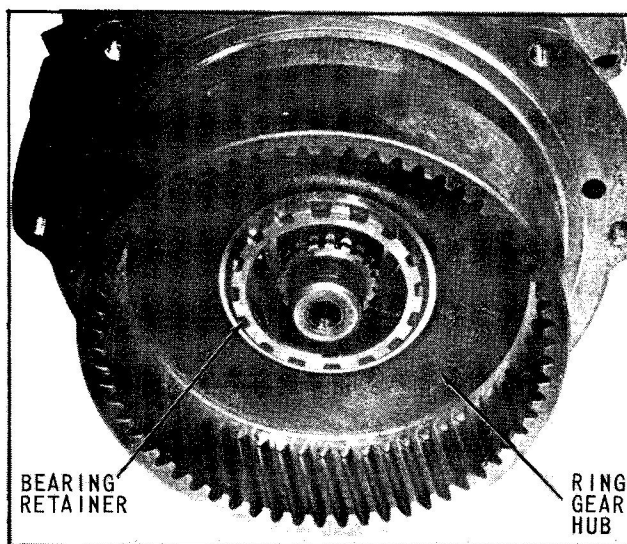


Fig. 63 Ring Gear Assembled
(3 to 1 Ratio)

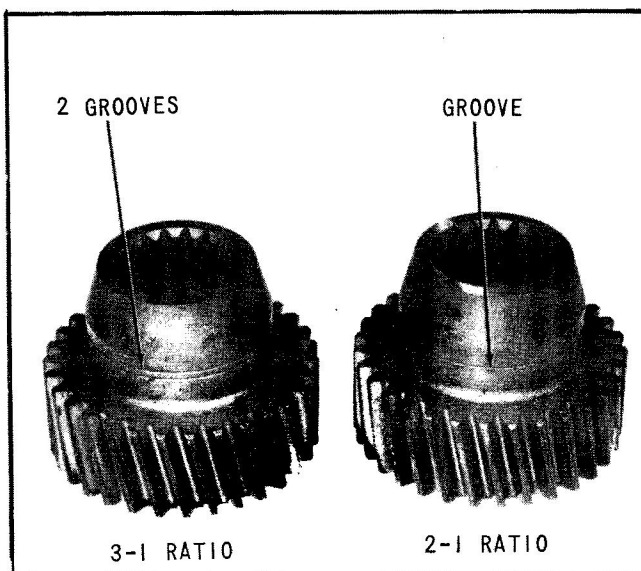


Fig. 64 Sun Gear Identification

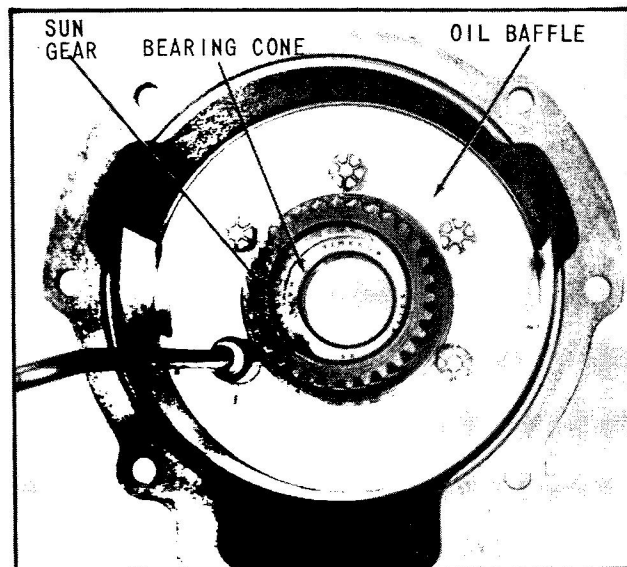


Fig. 66 Install Sun Gear & Baffle Bolts

3. Assemble sun gear over splines of forward and reverse transmission output shaft and replace snap ring in groove of output shaft, (Fig. 25). Use correct sun gear as shown in (Fig. 64).
7. Stand transmission on end on parts assembled in steps 6A, 6B, or 6C and complete steps 9 through 26 inclusive of section "To complete Assembly of Forward and Reverse Transmission (1 to 1 Ratio)".
8. Press bearing outer race into reduction housing and seat against shoulder, (Fig. 65).
9. Press a new seal into reduction unit bearing retainer. Seal and retainer rear faces should be flush.
10. Install rear bearing cone into rear bearing race and install bearing retainer gasket and retainer, using six 7-16-14 x 1-1/4 hex head bolts and lock washers, (Fig. 30). Be sure bearing parts are matched, see page 19, item 14.

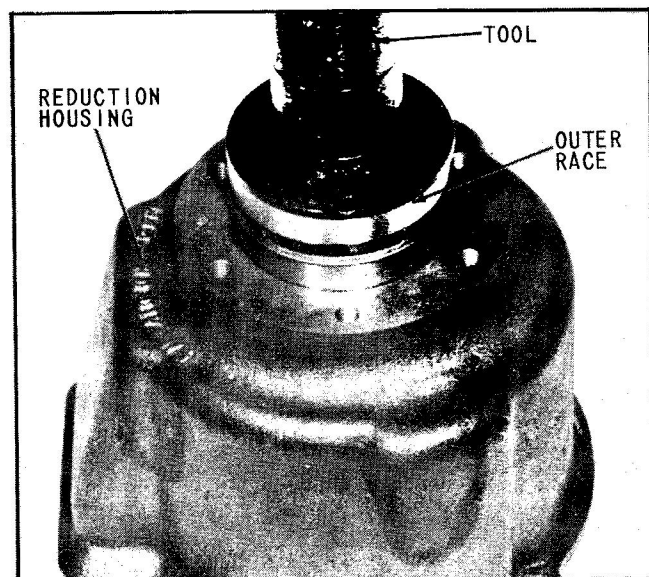


Fig. 65 Press Race into Housing

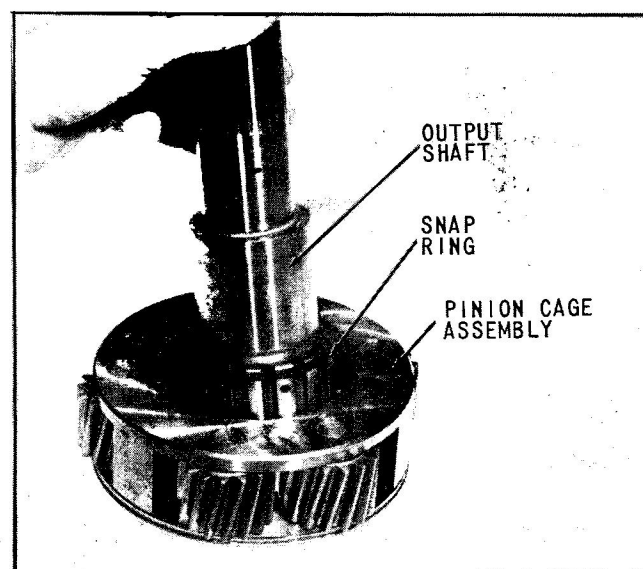


Fig. 67 Install Carrier to Output Shaft (1.5 to 1 Ratio)