TURBO HYDRA-MATIC TRANSMISSION

94 AND 96 SERIES

CONTENTS OF SECTION 7

PERIODIC MAINTENANCE

The fluid level should be checked at every engine oil change interval, and should be changed at 24,000 mile intervals. The fluid level should be checked with the transmission at normal operating temperature (180°-190°F.) and the selector lever in PARK position; the engine running at idle speed and car on a level surface. The oil indicator and filler tube are located under the hood at the left front corner of the engine. (The filler tube comes from the final drive housing but it is for the transmission.)

If any work is performed on the transmission, it will require the following amounts of oil to bring the oil back up to the correct level:

1. Pan removed 5-1/2 quarts.
2. Drive cover sprocket housing 1/2 quart.
3. Converter changed 3-1/2 quarts.
4. Total overhaul 13 quarts. (Total capacity)

When changing the transmission oil add four quarts, start the engine, and add oil to bring fluid level to the FULL mark on oil level indicator.

NOTE: To insure efficient and effective transmission operation, it is important to maintain the correct oil level. Low oil level can lead to clutch malfunctions. High oil level reduces horsepower by causing excessive drag on the link assembly. Oil level should ALWAYS be checked with transmission at normal operating temperature (180°-190°F.).

Use only fluid with the following identification on the container: Brand name, including the words "...Fluid Type A, plus the mark 'AQ-ATF'-number and a letter 'A' embossed on the top of the can as follows: 'AQ-ATF-number-A'."

GENERAL DESCRIPTION

The Turbo Hydra-matic transmission used on the 94 and 96 Series is a fully automatic transmission used for front wheel drive applications. It consists primarily of a three-element hydraulic torque converter, dual sprocket and link assembly, compound planetary gear set, three multiple-disc clutches, a sprag clutch, a roller clutch, two band assemblies, and a hydraulic control system.

The three-element torque converter consists of a pump or driving member, a turbine or driven member, and a variable stator or reaction member.

The stator assembly is mounted on a one-way roller clutch which allows the stator to overrun when not used as a reaction member. The stator assembly is a variable type that allows the blades to change from low to high angle.

The torque converter couples the engine to the planetary gear set through the use of a drive sprocket, a link assembly, and a driven sprocket. Clockwise engine torque turns the drive sprocket clockwise. This, in turn, drives the driven sprocket in a clockwise direction. This in effect is a reverse in the direction of engine torque due to the side mounting of the gear unit. (Fig. 7E-1)

The planetary gear set provides three forward ratios and reverse. The approximate gear ratios are as follows:

First - 2.5 gear ratio x 2. Converter stall ratio equals 5:1.
*Second - 1.5 gear ratio.
*Third - 1.1 gear ratio.
Reverse - 2.1 gear ratio x 2. Converter stall ratio equals 4:1.

*Second and third are also multiplied to a lesser degree.

The three multiple-disc clutches, the sprag and roller clutch assemblies, and the two band assemblies provide the friction elements required to obtain the desired function of the compound planetary gear set.

The hydraulic control system automatically selects the proper gear ratio depending upon vehicle load and speeds. It also provides the working pressures required to operate the friction elements of the transmission.

External control connections to the transmission are:

Engine Vacuum
12 Volt Electrical Signals
Manual Linkage Control

Engine vacuum is used to operate the vacuum modulator assembly. The vacuum modulator automatically senses any change in torque input to the transmission that the driver induces through a change in accelerator position.

The 12 volt electrical signal is used to operate the electrical detent and stator solenoids. The detent solenoid is activated by an electrical switch in the throttle linkage. When the throttle is fully opened the switch in the throttle linkage is closed, activating the detent solenoid and causing the transmission to downshift at speeds below approximately 70 mph.

The stator solenoid is also activated by an electrical switch in the throttle linkage. The stator is activated at small carburetor openings to reduce creep, and at large carburetor openings and high speeds to increase engine output.

The manual linkage is used to select the desired operating ranges, reverse, neutral and park.

The selector quadrant has six positions: P, R, N, D, S, L.

P. - Park position positively locks the output carrier to the transmission case by means of a locking pawl to prevent vehicle from rolling in either direction. This position should be selected whenever the driver leaves the vehicle. The engine may be started in Park position.

R. - Reverse enables the vehicle to be operated in a Reverse direction.

N. - Neutral position enables the engine to be started and run without driving the vehicle.

D. - Drive range is used for all normal driving conditions and maximum economy.

Drive range has three gear ratios, from the starting ratio to direct drive. Detent downshifts are available for passing by depressing the accelerator to the floor.

S. - Super range adds performance for congested traffic or hilly terrain. Super range has the same starting ratio as Drive range, but prevents the transmission from shifting above second gear to retain second gear acceleration when extra performance is desired. Super range can also be used for engine braking.

Super range can be selected at any

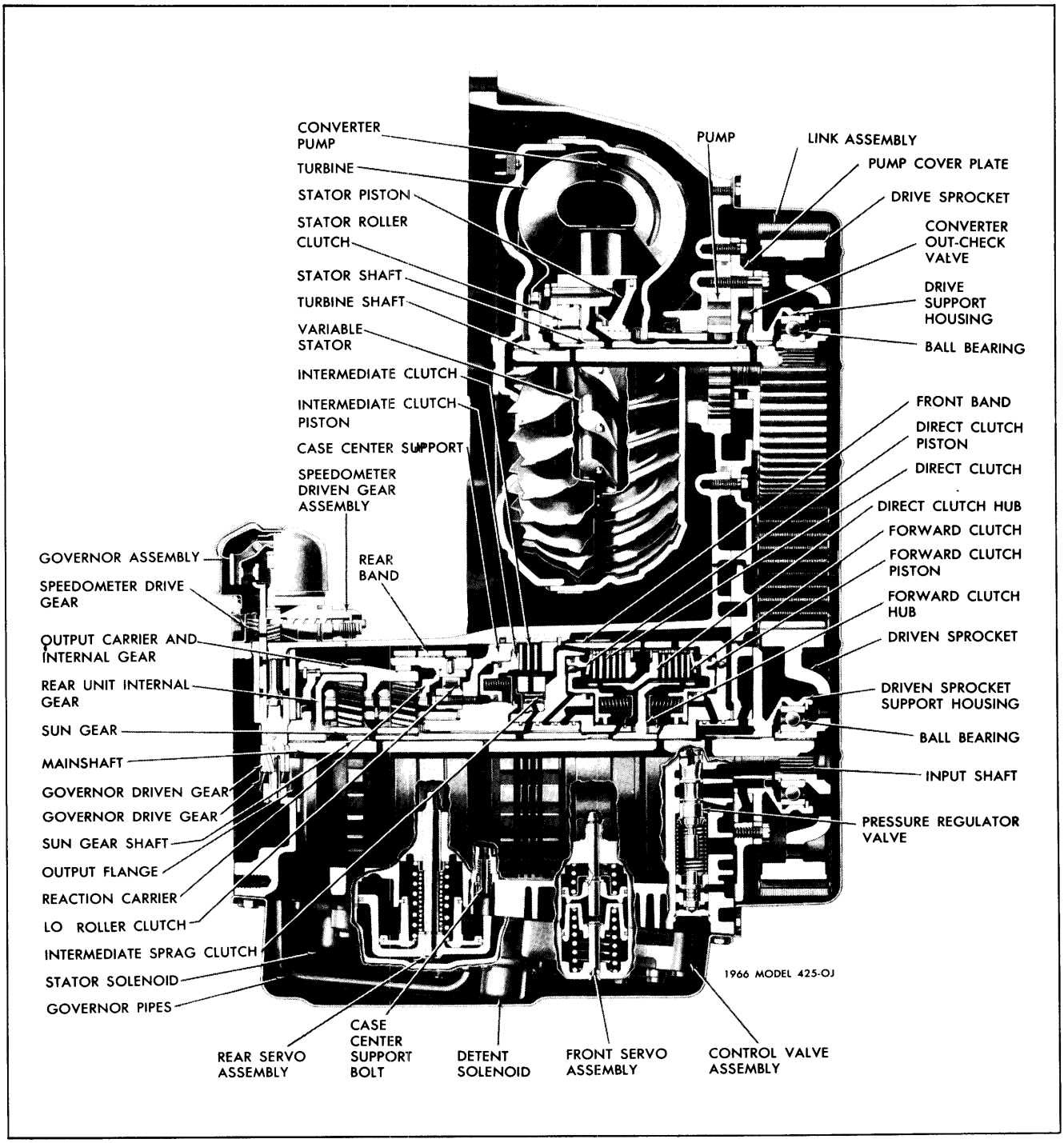


Fig. 7E-1 Turbo Hydra-Matic Transmission

vehicle speed, and the transmission will shift to second gear and remain in second until the vehicle speed or the throttle are changed to obtain first gear operation in the same manner as in Drive range.

L. - Lo range can be selected at any vehicle speed, and the transmission will shift to second gear and remain in second until vehicle speed is reduced to approximately 40 mph, depending on axle ratio.

Lo range position prevents the transmission from shifting out of first gear. This is particularly beneficial for maintaining maximum engine braking when continuous first gear operation is desirable.

VALVES AND THEIR FUNCTIONS

The valves in the Turbo Hydra-matic transmission used on the 94 and 96 Series function identically to their corresponding valves in the regular Turbo Hydra-Matic transmission with the following exceptions:

1. The pressure regulator valve is located in the transmission case. The valve functions as a regulator of line pressure. The bottom pan must be removed to service this valve located in the right rear corner of the case valve body mounting pad.

2. The stator valve is located in the control valve assembly. The stator solenoid is located just left of front center on the case valve body mounting pad.

When the stator solenoid is activated, stator signal oil is exhausted from the stator feed line. This allows drive oil to overcome a spring pressure and move the valve. This in turn, allows stator signal oil to exhaust from the stator piston, which then moves to high angle. (Fig. 7E-2)

When the stator solenoid is NOT activated, drive oil and spring pressure keep the stator valve closed and the stator piston in its normal low angle position. (Fig. 7E-3)

3. The modulator valve has a case to valve bushing in which it operates.

4. The governor is mounted with a clip, an external stamped housing, and a square cut "O" ring seal.

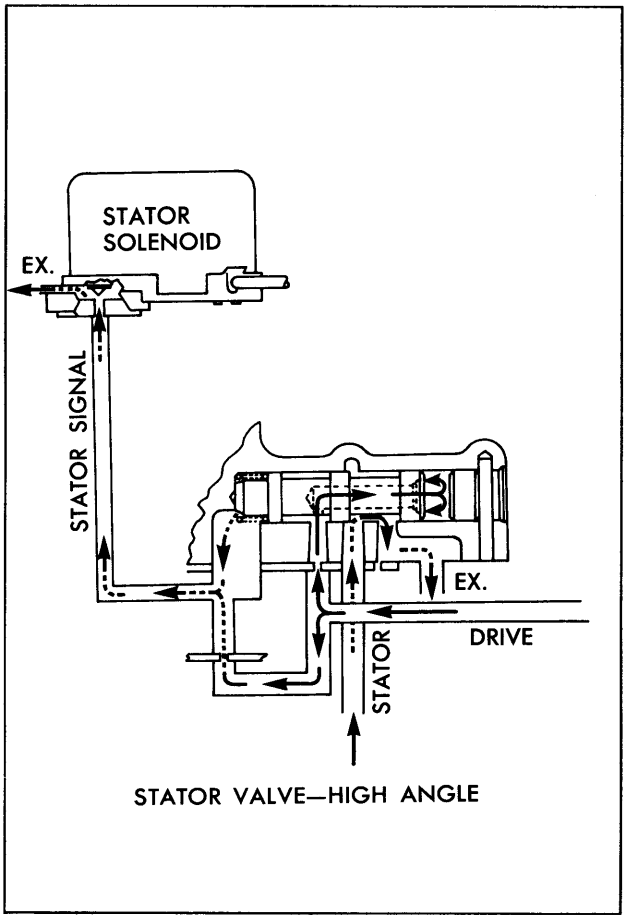


Fig. 7E-2 Stator Valve - High Angle

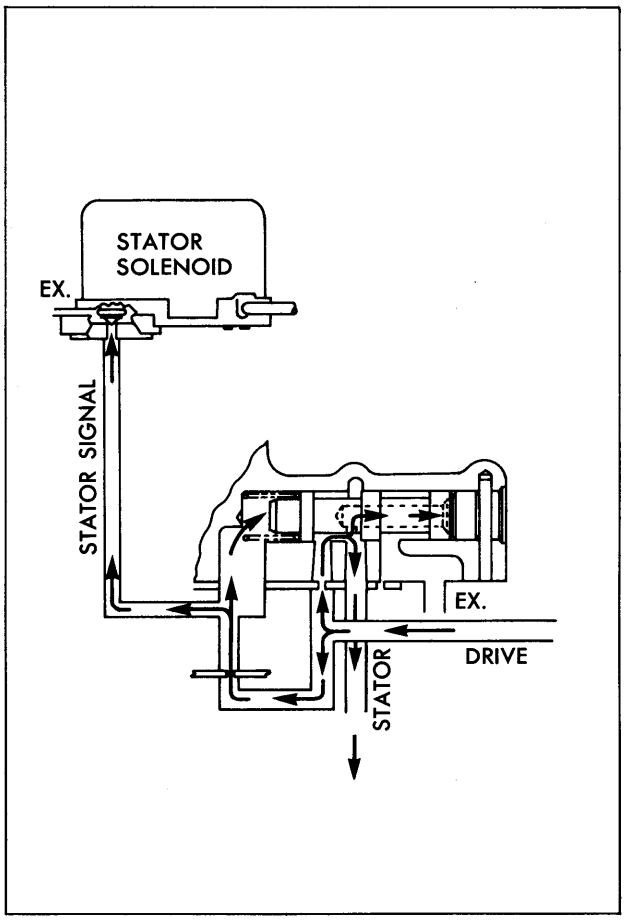


Fig. 7E-3 Stator Valve - High Angle

POWER FLOW (Fig. 7E-4)

DRIVE RANGE — FIRST GEAR

FORWARD CLUTCH - APPLIED
ROLLER CLUTCH - EFFECTIVE

DIRECT CLUTCH - RELEASED
FRONT BAND - RELEASED
REAR BAND - RELEASED

INTERMEDIATE CLUTCH - RELEASED
INTERMEDIATE SPRAG - INEFFECTIVE

With the selector lever in "D" range, the forward clutch is applied. This delivers turbine torque to the drive sprocket, through the link assembly to the driven sprocket and mainshaft and turns the rear internal gear in a counterclockwise direction. (Converter torque ratio equals approximately 2:1 at stall.)

Counterclockwise motion of the rear internal gear causes the rear pinions to turn counterclockwise to drive the sun gear clockwise. In turn, the sun gear drives the front pinions counterclockwise, turning the front internal gear, output carrier, and output flange counterclockwise in a reduction ratio of approximately 2.5:1. The reaction of the front pinions against the front internal gear is taken by the reaction carrier and roller clutch assembly to the transmission case. (Approximate stall ratio equals 5:1.)

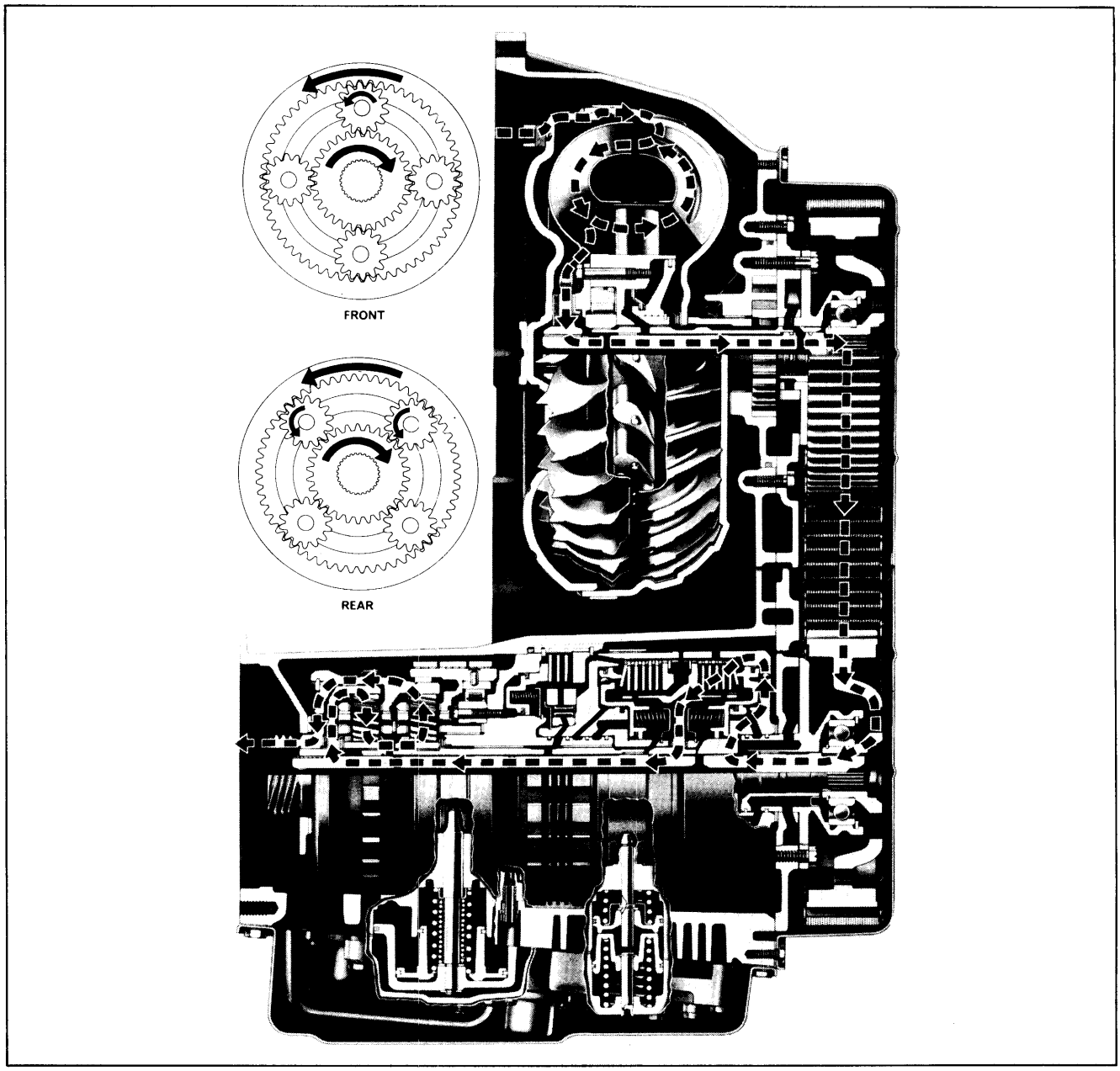


Fig. 7E-4 Drive Range - First Gear

DRIVE RANGE—SECOND GEAR
(Fig. 7E-5)

FORWARD CLUTCH - APPLIED
ROLLER CLUTCH - INEFFECTIVE

DIRECT CLUTCH - RELEASED
FRONT BAND - RELEASED
REAR BAND - RELEASED

INTERMEDIATE CLUTCH - APPLIED
INTERMEDIATE SPRAG - EFFECTIVE

In second gear, the intermediate clutch is applied to allow the intermediate sprag to hold the sun gear against clockwise rotation. Turbine torque, through the forward clutch, is now applied through the mainshaft to the rear internal gear in a counterclockwise direction.

Counterclockwise rotation of the rear internal gear turns the rear pinions counterclockwise against the stationary sun gear. This causes the output carrier and output flange to turn counterclockwise in a reduction ratio of approximately 1.5:1.

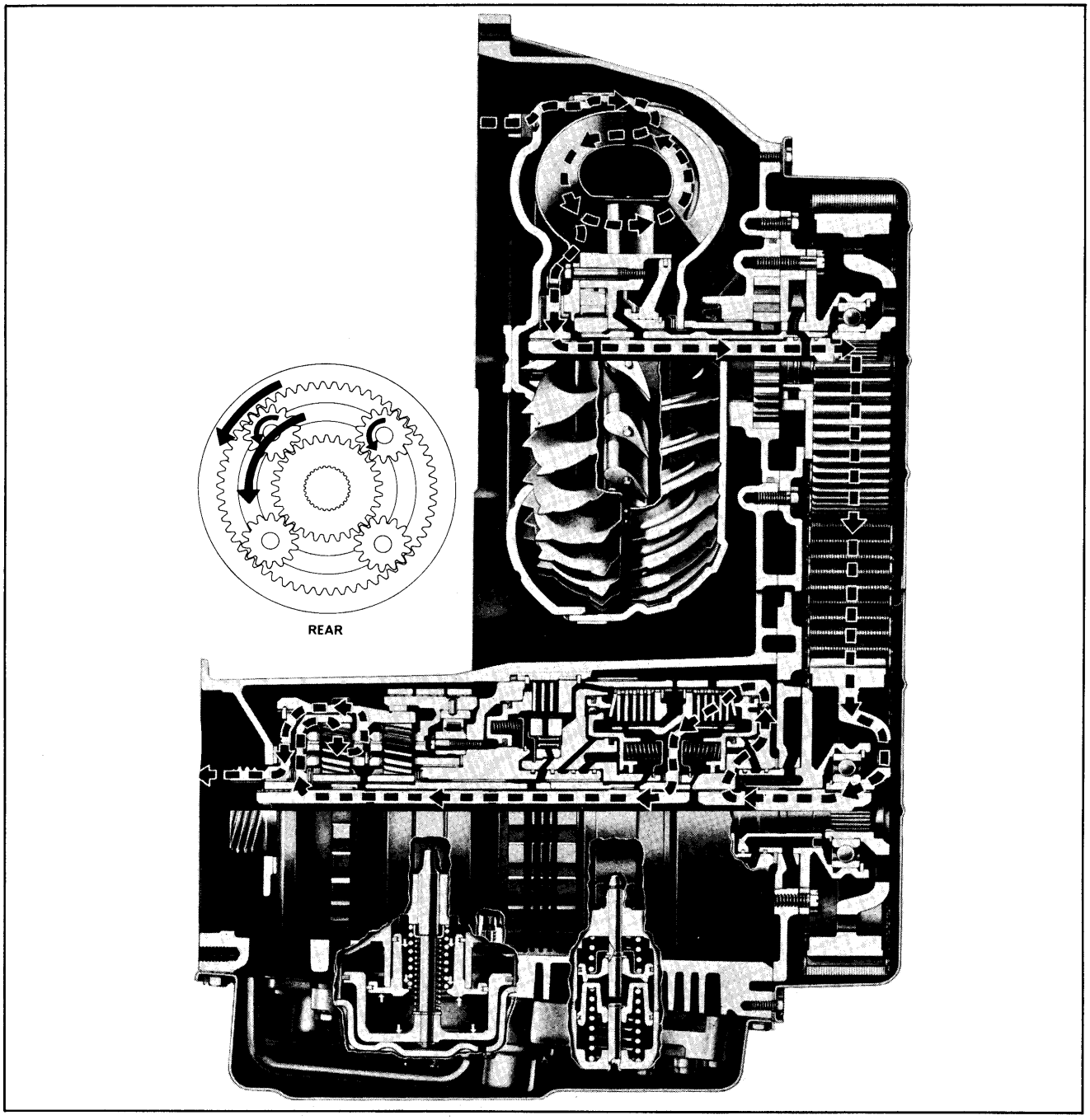


Fig. 7E-5 Drive Range - Second Gear

DRIVE RANGE—THIRD GEAR
(Fig. 7E-6)

FORWARD CLUTCH - APPLIED
ROLLER CLUTCH - INEFFECTIVE

DIRECT CLUTCH - APPLIED
FRONT BAND - RELEASED
REAR BAND - RELEASED

INTERMEDIATE CLUTCH - APPLIED
INTERMEDIATE SPRAG - INEFFECTIVE

In direct drive, engine torque is transmitted to the converter to the drive sprocket, through the link assembly, to the driven sprocket and through the forward clutch to the mainshaft and rear internal gear. Because the direct clutch is applied, equal power is also transmitted to the sun gear shaft and the sun gear. Since both the sun gear and internal gears are now turning at the same speed, the planetary gear set is essentially locked and turns as one unit in direct drive, or a ratio of 1:1.

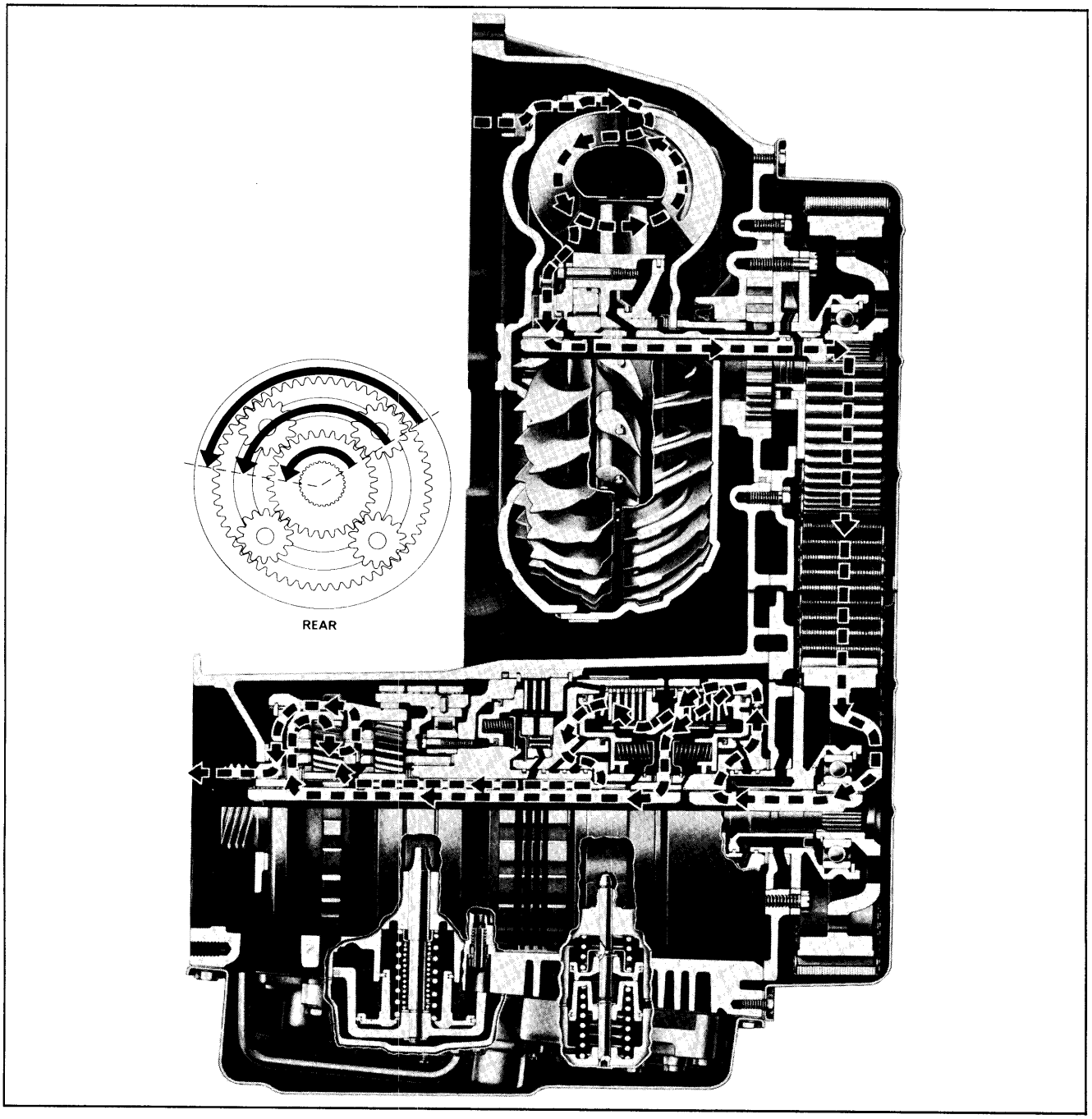


Fig. 7E-6 Drive Range - Third Gear

SUPER RANGE—SECOND GEAR
(Fig. 7E-7)

FORWARD CLUTCH - APPLIED
ROLLER CLUTCH - INEFFECTIVE

DIRECT CLUTCH - RELEASED
FRONT BAND - APPLIED
REAR BAND - RELEASED

INTERMEDIATE CLUTCH - APPLIED
INTERMEDIATE SPRAG - EFFECTIVE

In second gear, the intermediate clutch is applied to allow the intermediate sprag to hold the sun gear against clockwise rotation. Turbine torque through the forward clutch is now applied through the mainshaft to the rear internal gear in a counterclockwise direction.

Counterclockwise rotation of the rear internal gear turns the rear pinions counterclockwise against the stationary sun gear. This causes the output carrier and output flange to turn counterclockwise in a reduction ratio of approximately 1.5:1.

In second gear, overrun braking is provided by the front band as it holds the sun gear fixed. Without the band applied, the sun gear would overrun the intermediate sprag.

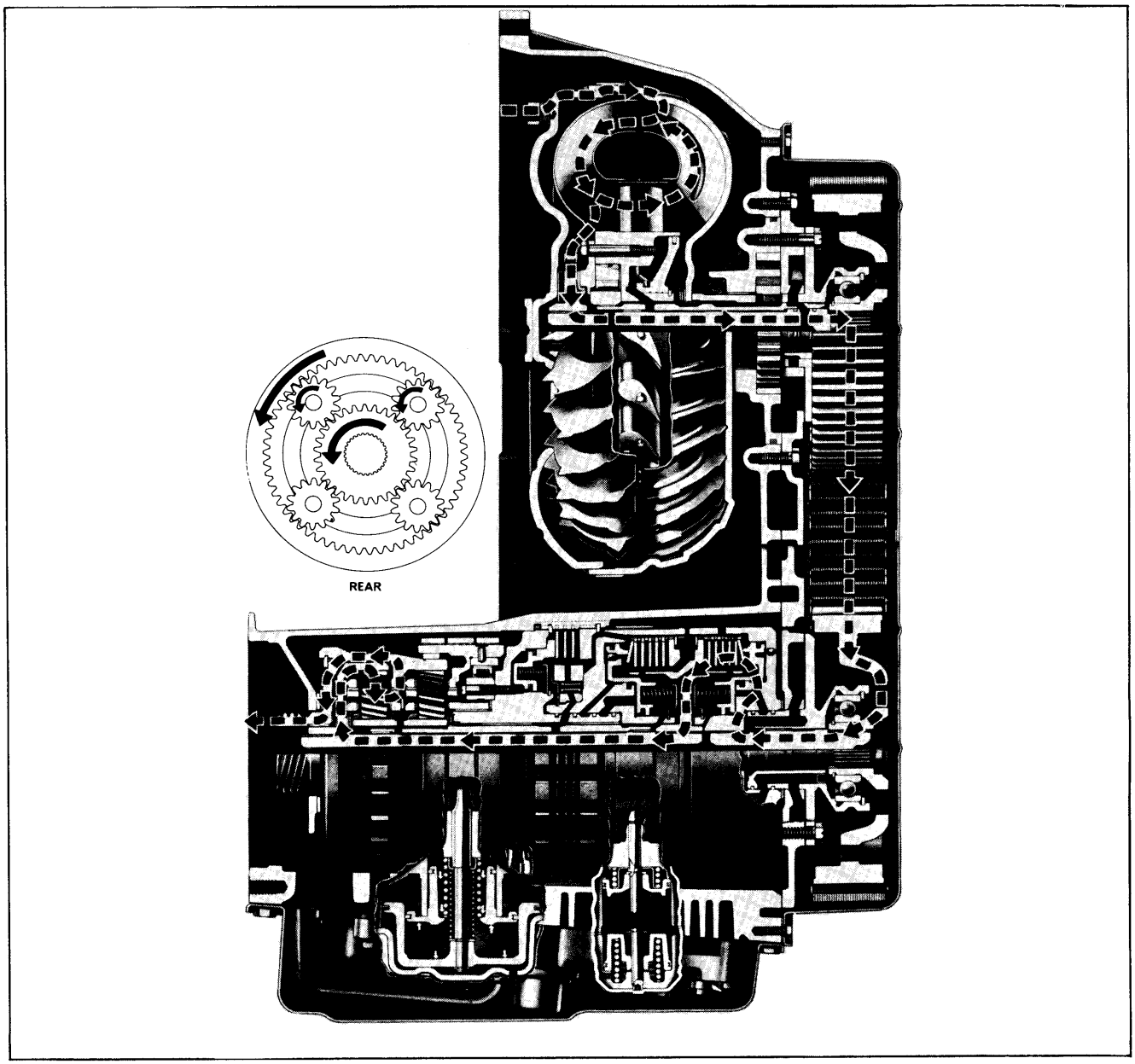


Fig. 7E-7 Super Range - Second Gear

LO RANGE—FIRST GEAR
(Fig. 7E-8)

FORWARD CLUTCH - APPLIED
ROLLER CLUTCH - EFFECTIVE

DIRECT CLUTCH - RELEASED
FRONT BAND - RELEASED
REAR BAND - APPLIED

INTERMEDIATE CLUTCH - RELEASED
INTERMEDIATE SPRAG - INEFFECTIVE

With the selector lever in "L" range, the forward clutch is applied. This delivers turbine torque through the drive sprocket, link assembly, and driven sprocket to the mainshaft and turns the rear internal gear in a counterclockwise direction. (Converter torque ratio equals approximately 2:1 at stall.)

Counterclockwise motion of the rear internal gear causes the rear pinions to turn counterclockwise to drive the sun gear clockwise. In turn, the sun gear drives the front pinions counterclockwise, turning the front internal gear, output carrier, and output flange, counterclockwise in a reduction ratio of approximately 2.5:1. The reaction of the front pinions against the front internal gear is taken by the reaction carrier and roller clutch assembly to the transmission case. (Total stall ratio equals approximately 5:1.)

Downhill or overrun braking is provided in "L" range by applying the rear band as this prevents the reaction carrier from overrunning the roller clutch.

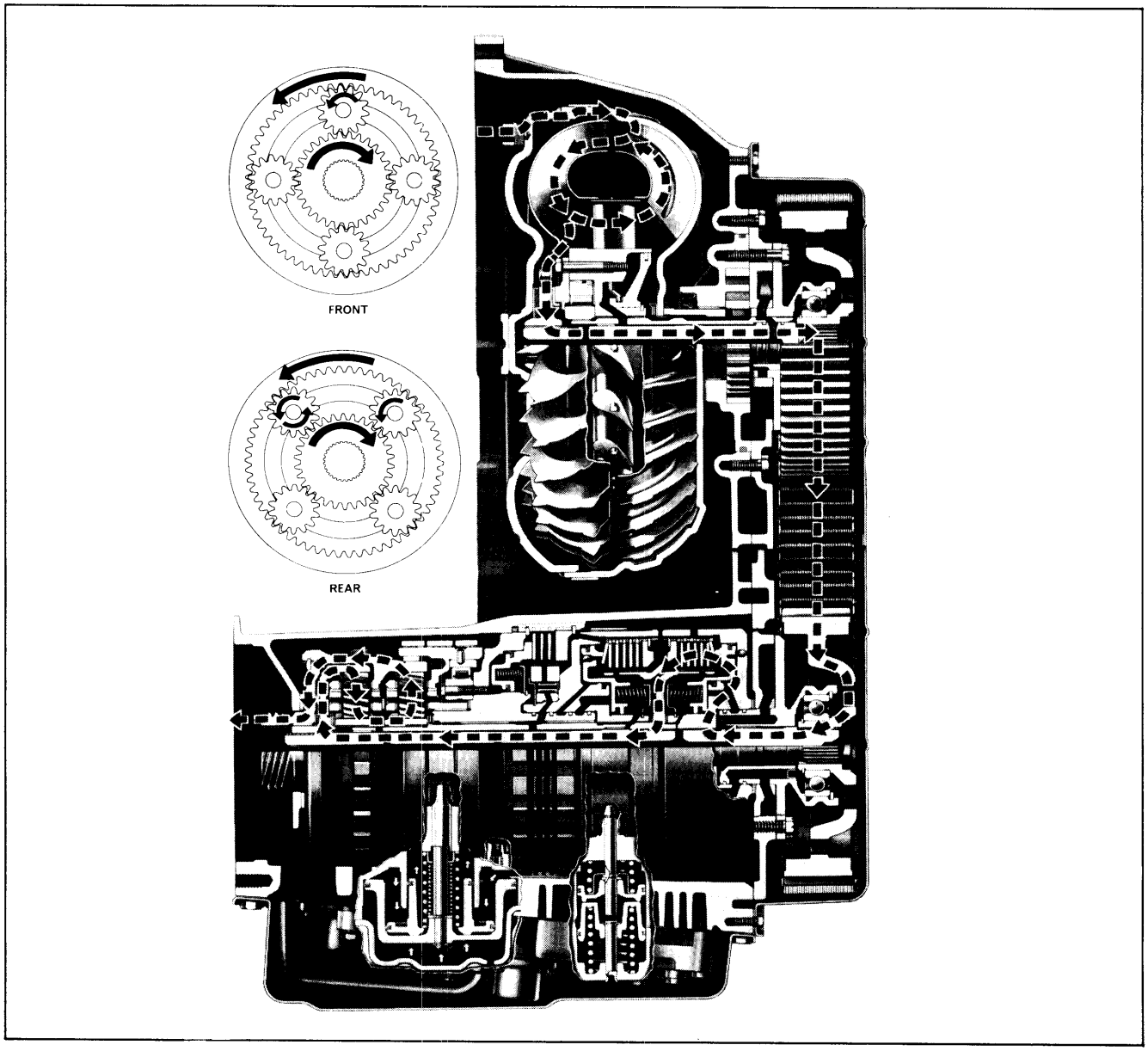


Fig. 7E-8 Low Range - First Gear

REVERSE
(Fig. 7E-9)

FORWARD CLUTCH - RELEASED
LO SPRAG - INEFFECTIVE

DIRECT CLUTCH - APPLIED
FRONT BAND - RELEASED
REAR BAND - APPLIED

INTERMEDIATE CLUTCH - RELEASED
INTERMEDIATE SPRAG - INEFFECTIVE

In Reverse, the direct clutch is applied to direct turbine torque, through the drive sprocket, link assembly and driven sprocket, to the sun gear shaft and sun gear. The rear band is also applied, holding the reaction carrier.

Counterclockwise torque to the sun gear causes the front pinions and front internal gear to turn clockwise in reduction. The front internal gear is connected directly to the output shaft, thus providing the reverse output gear ratio of approximately 2:1. The reverse torque multiplication at stall (converter and gear ratios) is approximately 4:1.

Fig. 7E-9 Reverse

OIL FLOW CIRCUITS

The oil flow circuits are similar to the oil flow circuits used in the regular Turbo Hydra-Matic transmission. When tracing oil circuits refer to Figs. 7-15 through 7-22 in the TURBO HYDRA-MATIC TRANSMISSION, Section 7, 54 through 86 Series.

OPERATIONS NOT REQUIRING TRANSMISSION REMOVAL

1. Oil cooler fitting replacement or adjustment.
2. Governor assembly service.
3. Vacuum modulator, and valve service.
4. Speedometer drive gear service.
5. Cruise Control service.
6. Oil level check.
7. Oil pressure check with oil pressure gauge.

UNITS THAT CAN BE SERVICED AFTER REMOVAL OF OIL PAN (Fig. 7E-10)

1. Oil pan and pan to case gasket.
2. Pressure regulator valve assembly.
3. Valve body assembly.
4. Rear servo and accumulator assembly.
5. Front servo and accumulator assembly.
6. Governor pipes.
7. Detent solenoid.
8. Stator solenoid.
9. Solenoid connector.
10. Manual linkage.
11. Parking linkage.
12. Valve body to case spacers and gaskets.

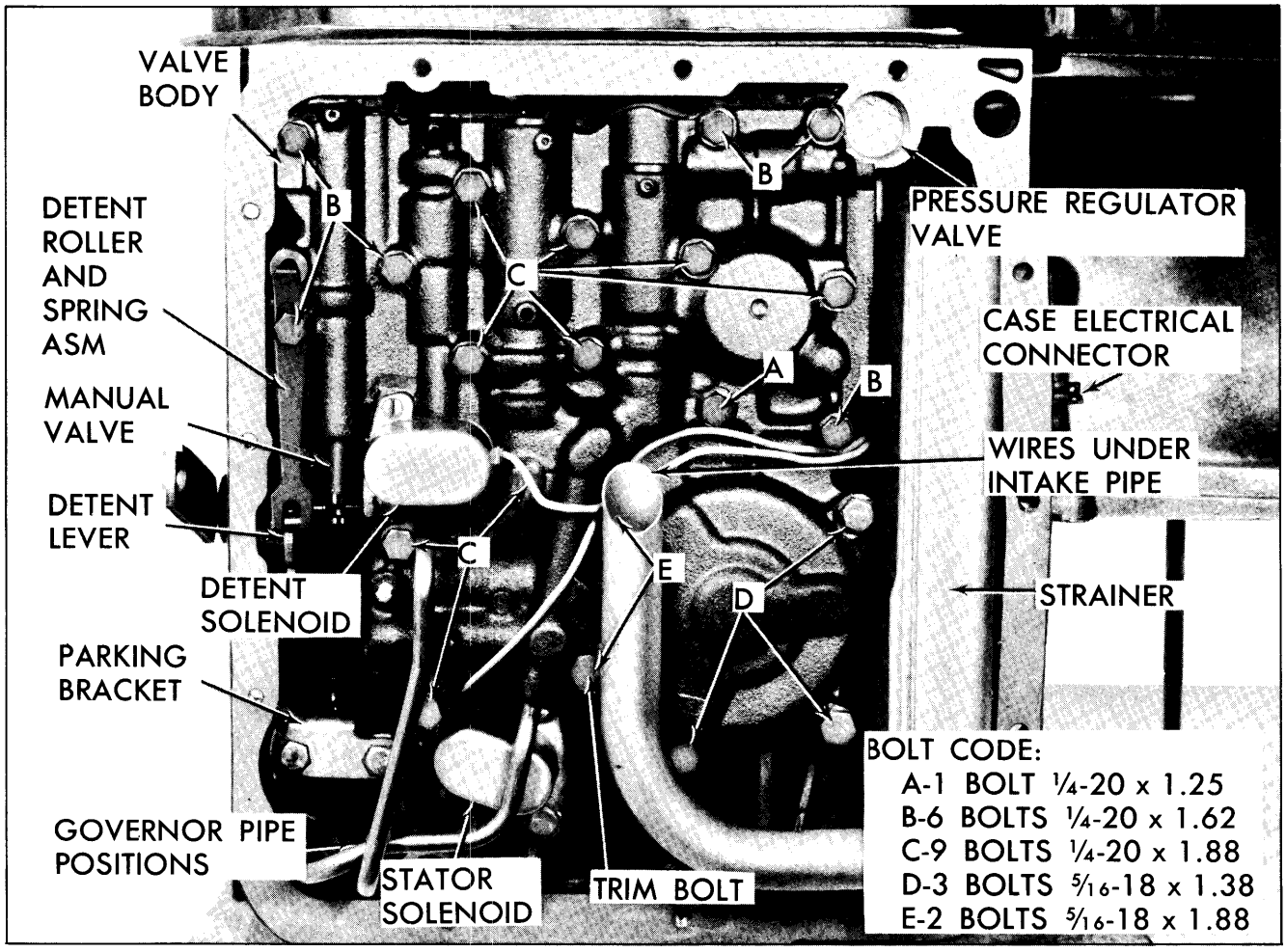


Fig. 7E-10 Oil Pan Removal

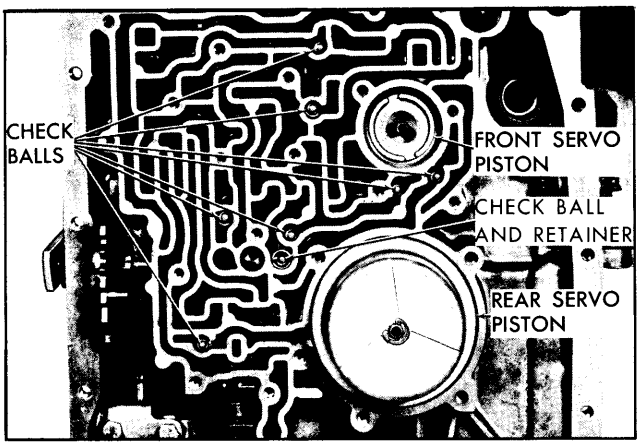


Fig. 7E-11 Location of Check Balls

13. Check balls (7). See Fig. 7E-11 for proper location.
14. Detent roller and spring assembly.
15. Strainer assembly.

General disassembly and assembly instructions should be followed whenever service is performed with the transmission remaining in the vehicle.

GENERAL SERVICE NOTES

When servicing the transmission, it is recommended that upon disassembly of a unit, all parts should be cleaned and inspected as outlined under CLEANING AND INSPECTION, then the unit should be reassembled before disassembly of other units to avoid confusion and interchanging of parts.

1. Before disassembly of a unit, thoroughly clean the exterior.
2. Disassembly and assembly of the unit and sub-assemblies must be made on a clean work bench. As in repairing any hydraulically operated unit, cleanliness is of the utmost importance; therefore, the work bench, tools, and parts must be kept clean at all times.
3. Before installing screws or bolts into aluminum parts, ALWAYS DIP SCREWS OR BOLTS INTO HYDRA-MATIC OIL to prevent screws or bolts from galling the aluminum threads and also to prevent the screws or bolts from seizing.
4. Always use a torque wrench and tighten bolts to the recommended torque specifications when installing bolts into aluminum parts to prevent the possibility of stripping the aluminum threads.
5. If tapped threads in aluminum parts are stripped or damaged, the part can, in most cases, be made serviceable by the careful use of Heli-coils.
6. Seal protecting tools must be used when assembling the units to prevent damage to the seals. Hydra-Matic oil should be applied to all seals before they are assembled into sealed units. The slightest flaw in the sealing surface of the seal can cause an oil leak.
7. All aluminum castings and valve body parts are very susceptible to nicks, burrs and handling damage, so extreme care should be used in handling these parts.
8. The internal snap rings should be expanded and external snap rings compressed if they are to be reused. This will insure proper seating when they are reinstalled into the unit. DO NOT REUSE TRU-ARC SNAP RINGS.
9. Replace all "O" rings, gaskets and oil seals that are removed. Complete overhaul service packages are available for these items.
10. During reassembly of each unit, all internal parts must be lubricated with Hydra-Matic oil.
11. Always refer to the lubrication chart (Fig. 7E-231 for the location of all oil and lubrication holes and passages. Lubrication holes are all shown in the chart.

PARTS CLEANING AND INSPECTION

After complete disassembly of a unit, all metal parts should be washed in a clean solvent and dried with compressed air. All oil passages should be blown out and checked to make sure that they are open and not obstructed. Small passages should be checked with tag wire. All parts should be inspected to determine which parts are to be replaced.

The various inspections of parts are as follows:

1. Inspect linkage and pivot joints for excessive wear.
2. Bearing and thrust surfaces of all parts should be checked for excessive wear or scoring.
3. Check for broken seal rings, damaged ring lands and damaged threads.
4. Inspect seals and "O" rings. (Check these for damage, even though they will be replaced, to determine if they are part of the transmission problem.)
5. Mating surfaces of castings and end plates should be checked for burrs and irregularities. If a good seal is not apparent, burrs or

irregularities may be removed by lapping the surface with crocus cloth. The crocus cloth should be held on a flat surface, such as a piece of plate glass.

6. Castings should be checked for cracks and sand holes.

7. Gear teeth should be examined for chipping, scoring, and excessive wear.

8. Valves should be free of burrs, nicks, and chips and the shoulders of the valves must be square. Any burrs or irregularities may be removed by honing. Valves should be free to slide in their respective bores.

9. Inspect composition clutch plates for damaged surfaces and loose facings. If flakes of the facing material can be removed with the thumbnail, the plates should be replaced; however, composition clutch plate discoloration is not an indication of composition clutch plate failure. Discoloration is natural for these parts.

10. Inspect steel clutch plates for scored or damaged surfaces.

11. Inspect springs for distortion or collapsed coils. Slight wear (bright spots) on the sides of the springs is permissible.

12. When inspecting bushings, fit the mating part into the bushing and observe the amount of looseness. Bushing clearance is excessive if more than .008" exists when checked with a wire feeler gauge.

13. If the transmission shows evidence that foreign material has circulated throughout the transmission or if the oil strainer is dirty, the oil strainer should be discarded and a new one installed upon reassembly of the transmission. (A NEW STRAINER SHOULD ALWAYS BE INSTALLED FOR A CONVERTER, CLUTCH, OR PUMP FAILURE.)

14. Transmission oil cooler lines should always be flushed and reverse flushed whenever foreign material has circulated throughout the transmission.

15. Always refer to the lubrication chart page, when inspecting the oil passages and holes, for the location of oil passages and lubrication holes.

TRANSMISSION

Remove (less final drive)

1. Disconnect battery.

2. Disconnect oil cooler lines at transmission (Fig. 7E-12) and speedometer cable at governor.

3. Install engine support bar as shown in Figs. 7E-13 and 7E-14.

4. Remove nut "D" and bolts "A", "B" and "C". (Fig. 7E-15) A special wrench such as MAC S-147 must be used on nut "D".

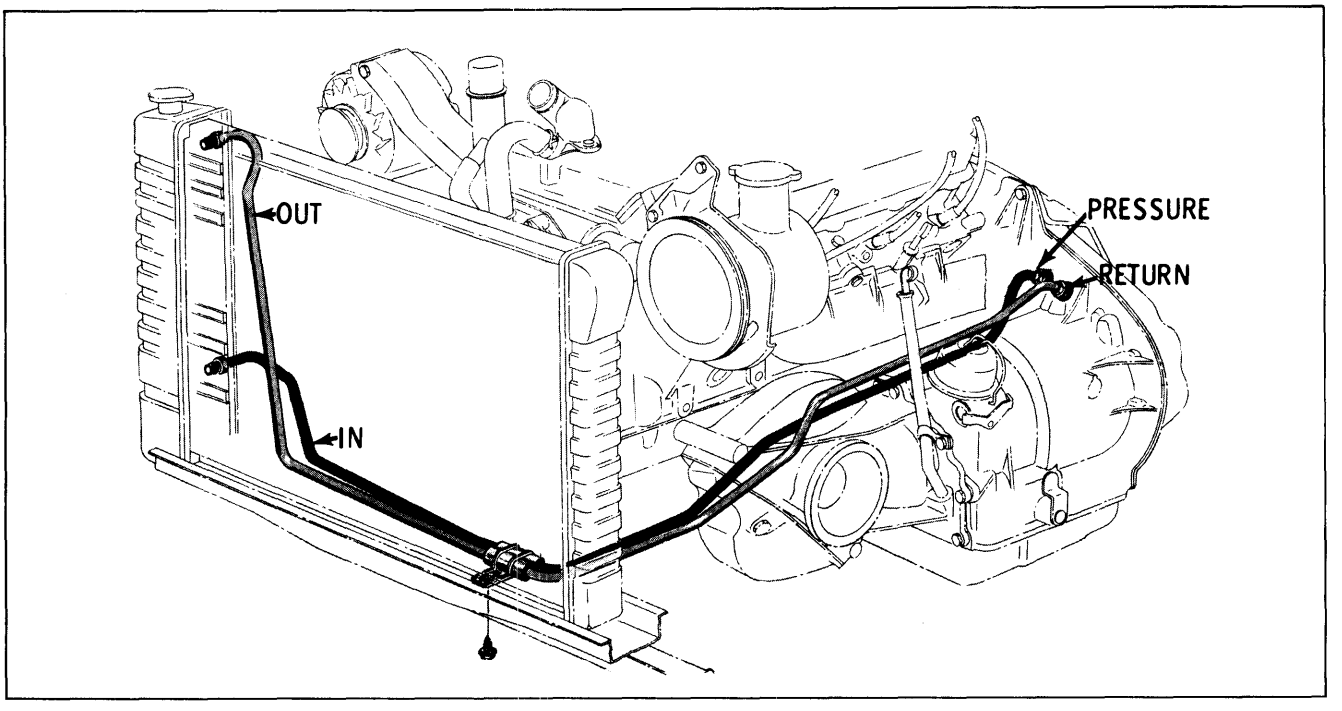


Fig. 7E-12 Oil Cooler Lines

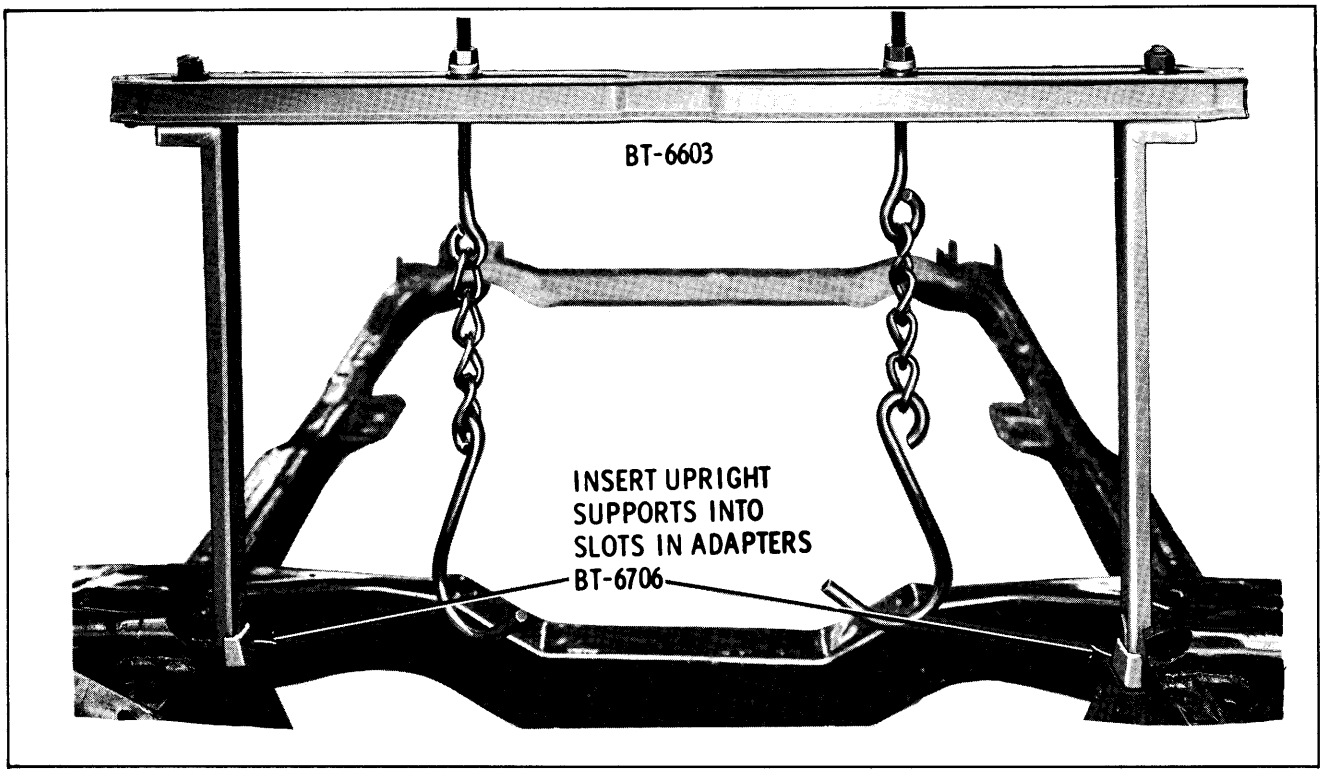


Fig. 7E-13 Installing Support Bars

5. Remove bolts "A", "B", "C" and "D". (Fig. 7E-16)
6. Remove flywheel cover plate bolt "A". (Fig. 7E-17)
7. Hoist car.
8. Disconnect starter wiring, then remove starter. (Fig. 7E-17)
9. Remove bolts "B", "C" and "D" from flywheel cover plate. (Fig. 7E-17)
10. Remove flywheel to converter bolt "E". (Fig.

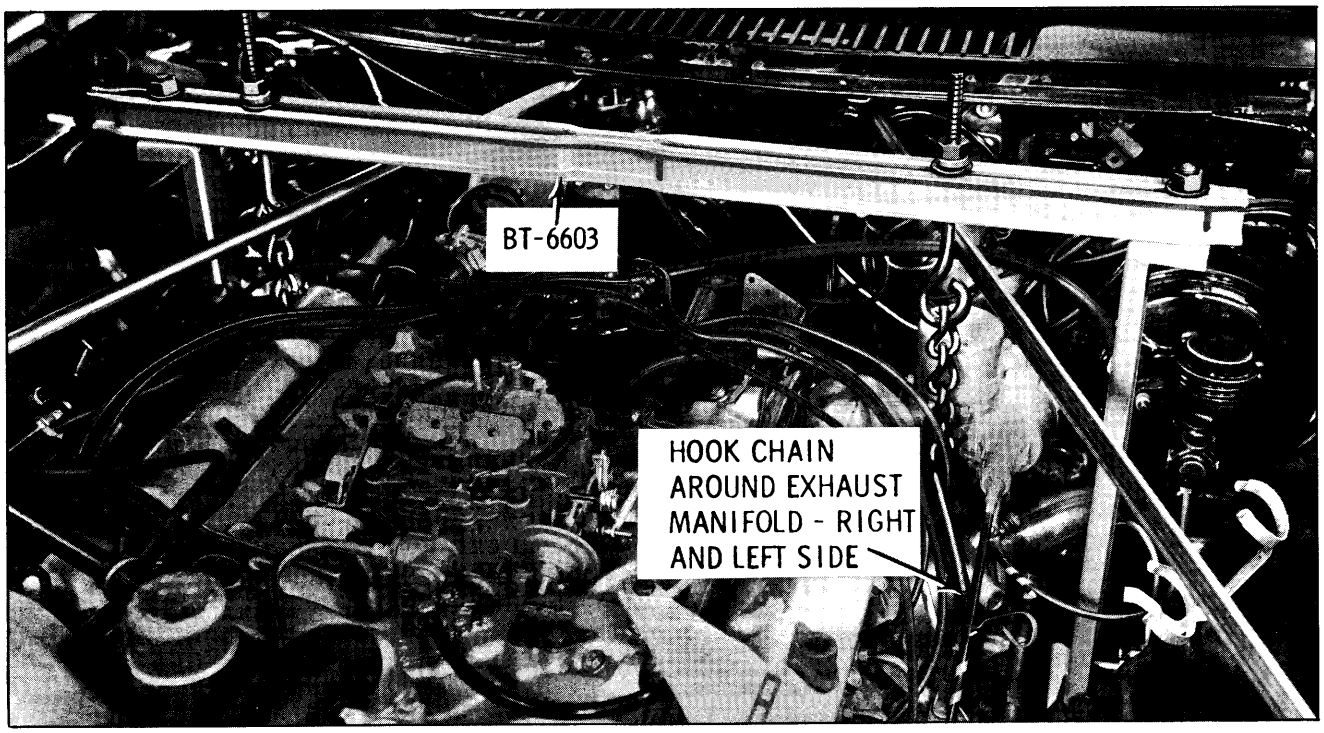


Fig. 7E-14 Supporting Engine

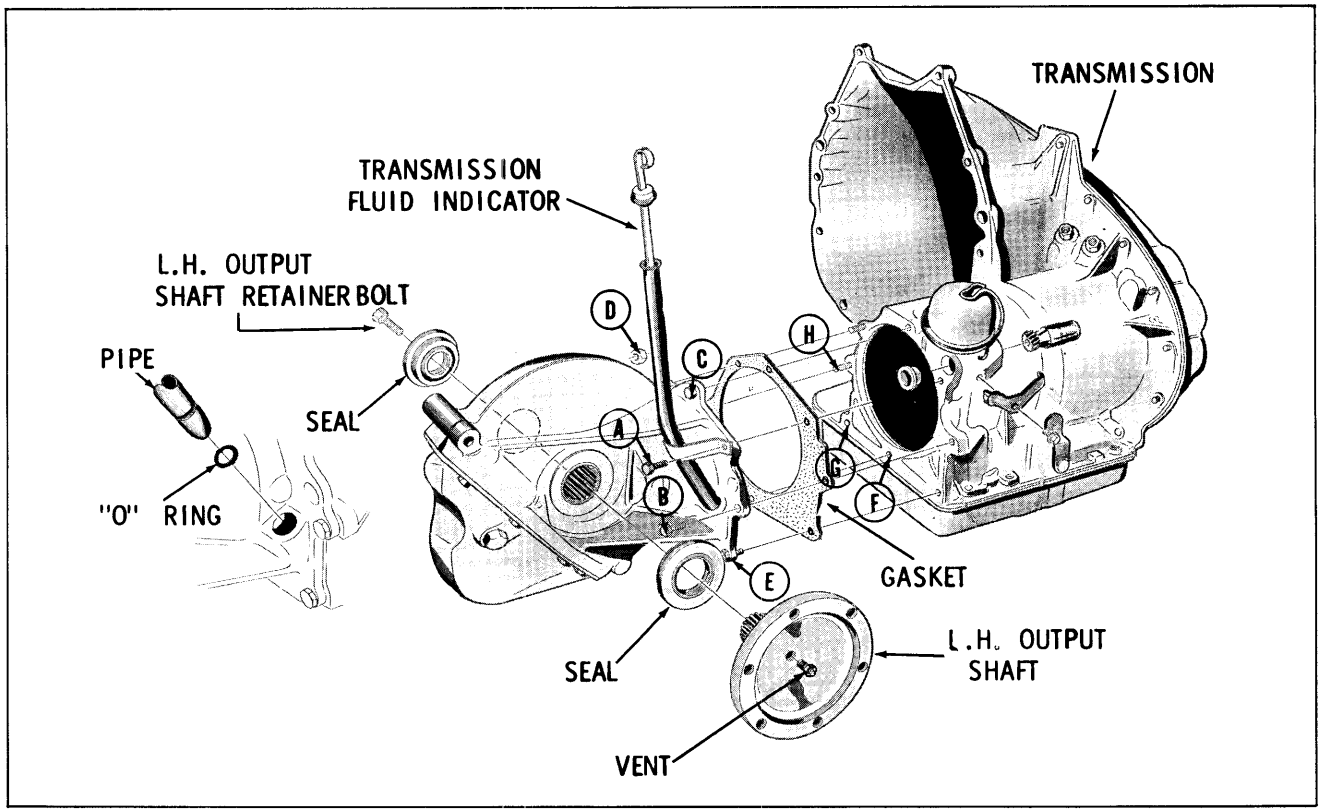


Fig. 7E-15 Transmission Attachment

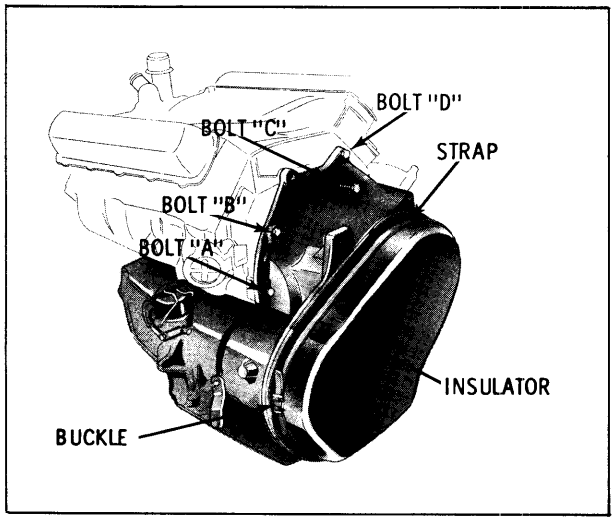


Fig. 7E-16 Transmission to Engine Attachment

7E-17) Rotate flywheel until all bolts are removed.

11. Disconnect vacuum modulator line and stator wiring. (Fig. 7E-18)
12. Install transmission lift. (Fig. 7E-19, 7E-20 and 7E-21)
13. Remove shift linkage.
14. Remove bolts "E", "F", "G" and nut "H". (Fig. 7E-15)

NOTE: When the last three transmission to final drive bolts are removed, a quantity of oil will be lost.

15. Remove bolts "A" and "B". (Fig. 7E-22)
16. Remove the two upper engine mount bracket to transmission bolts "A" and "B". (Fig. 7E-22A)
17. Remove the four bracket to engine mount bolts. (Fig. 7E-22A)
18. Slide transmission rearward and down. Engine mount bracket will follow transmission down. Install Converter Holding Tool J-21654 as shown in Fig. 6EB-1.
19. After transmission is removed from car, the link assembly cover insulator can be removed or installed. (Fig. 7E-16)

Install

When installing the transmission, the motor mount bracket must be positioned loosely on the link assembly cover until the transmission is in place; then, reverse removal procedure. Torque bolts as follows:

Engine to Torque Converter Housing	25 ft. lbs.
Engine Bracket to Transmission	55 ft. lbs.
Engine Bracket to Rubber Mount	55 ft. lbs.
Oil Cooler Lines to Transmission	25 ft. lbs.
Final Drive to Transmission Nuts and Bolts	25 ft. lbs.

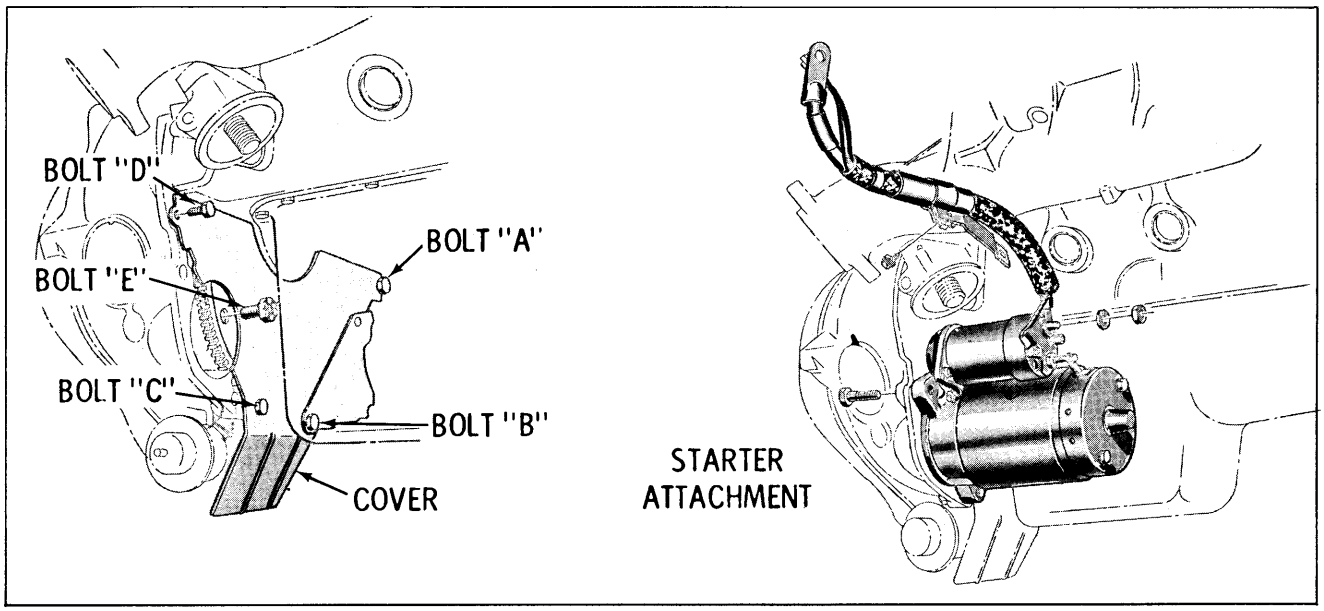


Fig. 7E-17 Starter and Converter Attachment

Torque Converter to Flywheel Bolts	30 ft. lbs.
Flywheel Housing Cover	5 ft. lbs.
Starter to Transmission	30 ft. lbs.

After transmission is installed, check transmission oil level. Refer to PERIODIC MAINTENANCE. Adjust manual control shift linkage.

MINOR SERVICE OPERATIONS

SERVICING THE OIL COOLER

The oil cooler is located in the side tank of the radiator and its purpose is to cool the oil in the event excessive temperature tends to develop. (Fig. 7E-12)

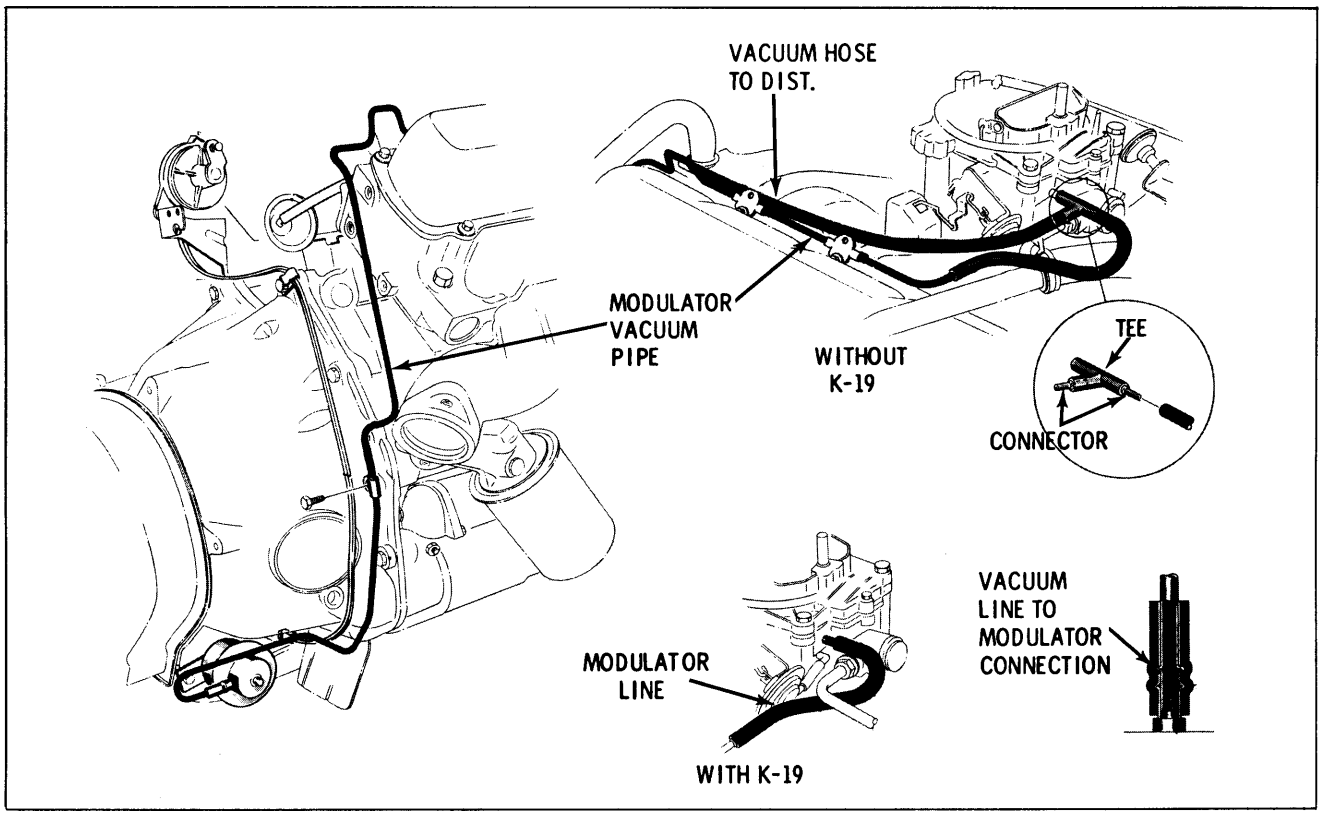


Fig. 7E-18 Modulator and Stator Lines

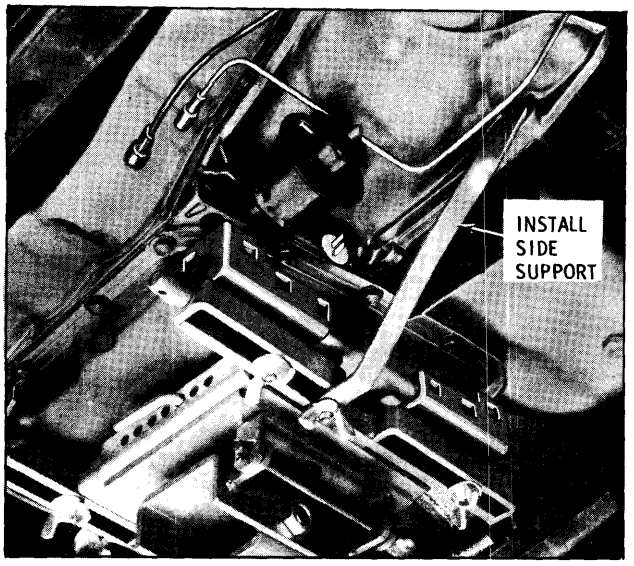


Fig. 7E-19 Transmission Lift in Position

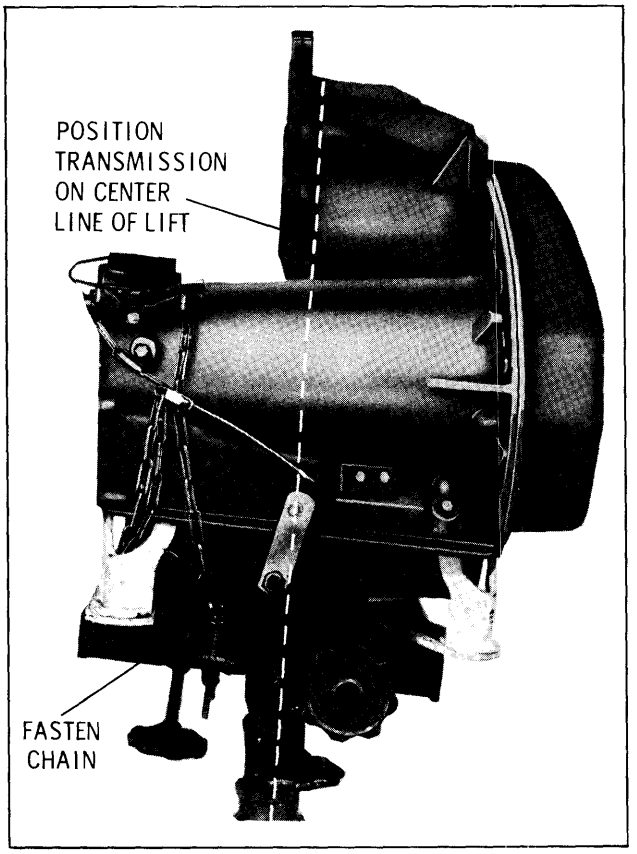


Fig. 7E-20 Transmission on Lift

In a major transmission failure, where particles of metal have been carried with the oil throughout the units of the transmission, it will be necessary to flush out the oil cooler and connecting lines. The oil cooler is a sealed container providing a passage for oil to flow from the inlet to the outlet. Clean solvent can be flushed through the cooler with air pressure. (An engine desludge gun may be used.) The cooler should be back-flushed first

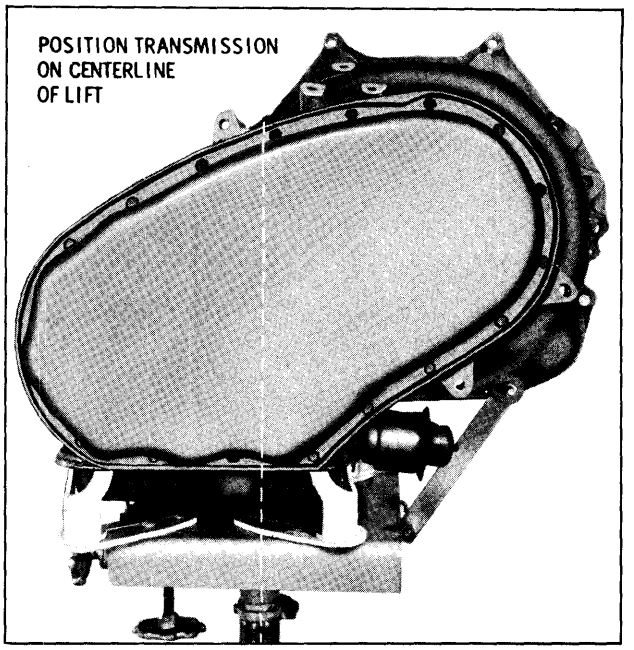


Fig. 7E-21 Transmission on Lift

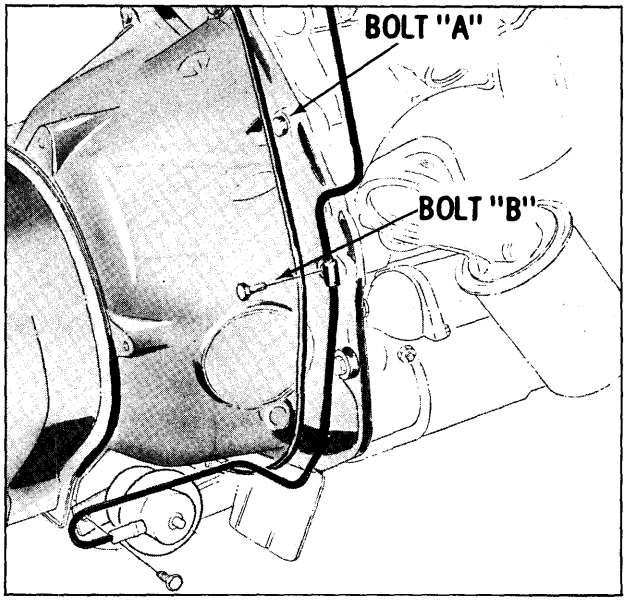


Fig. 7E-22 Transmission to Engine Attachment

through the return line to remove all foreign material possible. Then flush through the inlet line and finish by flushing through the return line. Clean remaining solvent from cooler with compressed air applied to the return line and flush with Hydra-Matic oil.

THROTTLE LINKAGE ADJUSTMENTS (Refer to ENGINE TUNE-UP, Section 6)

MANUAL LEVER ADJUSTMENT

The manual lever adjustment provides proper

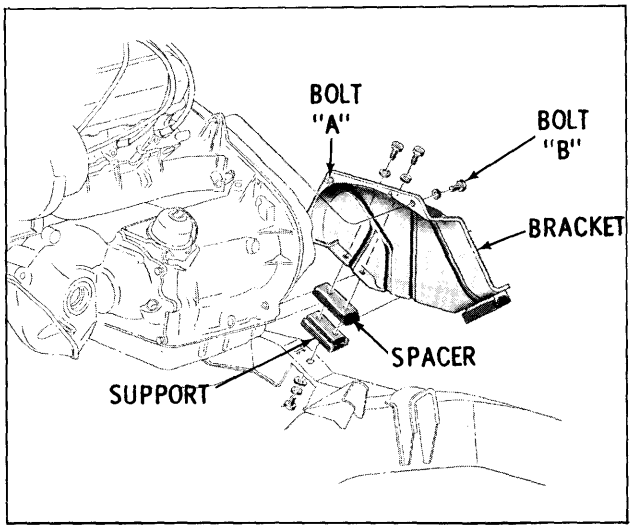


Fig. 7E-22A Engine Mount Attachment

clearance between the "D" detent in the transmission and the stop for the manual shift lever in the upper steering column mast jacket. The adjustment is made as outlined in Fig. 7E-23.

TRANSMISSION DISASSEMBLY

CONVERTER, MODULATOR, AND SPEEDOMETER DRIVE GEAR

Remove

1. With the transmission in cradle or portable jack, remove the torque converter assembly by pulling straight out from the transmission housing.

   NOTE: The torque converter is heavy due to the large amount of oil that it contains.

2. Install two 3/8 x 8 inch bolts into the case to engine mounting face. (Fig. 7E-24)

3. Remove the speedometer driven gear attaching screw and retainer clip. (Fig. 7E-25)

4. Withdraw speedometer driven gear assembly from case bore. Remove and discard "O" ring seal. (Fig. 7E-26)

5. Remove the governor attaching clip.

6. Withdraw governor assembly and "O" ring seal from case bore. (Fig. 7E-27)

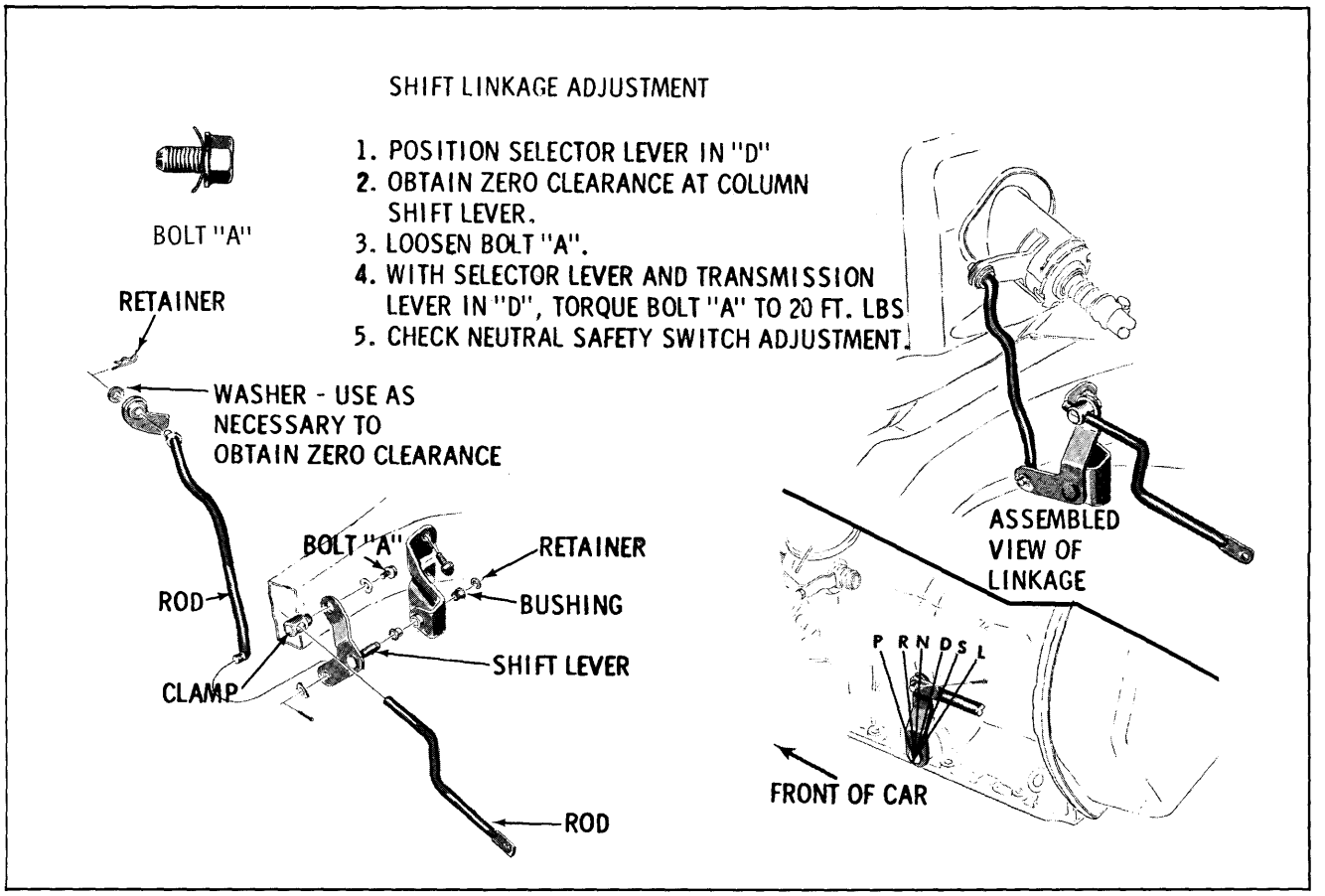


Fig. 7E-23 Shift Linkage

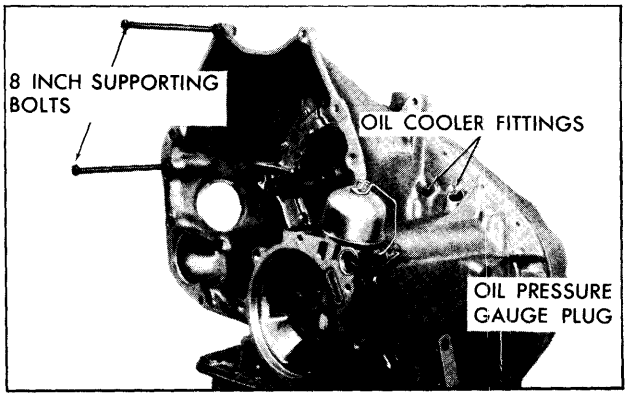


Fig. 7E-24 Supporting Bolt Installation

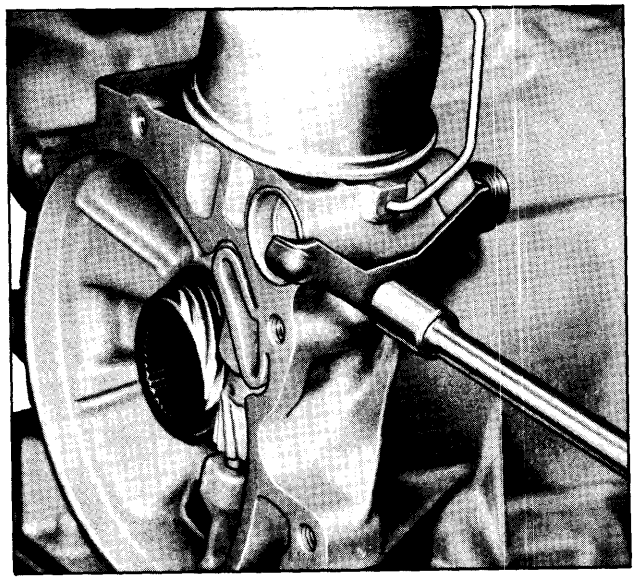


Fig. 7E-25 Removing Retainer

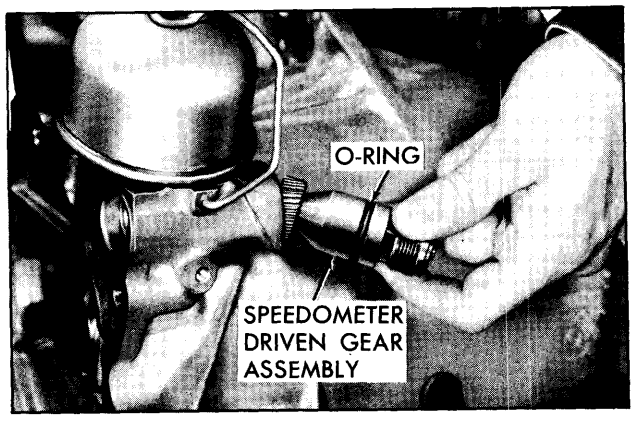


Fig. 7E-26 Removing Speedometer Driven Gear

NOTE: IF CRUISE CONTROL IS USED IT MUST ALSO BE REMOVED AT THIS TIME.

7. Remove two studs from output end of case and place a piece of plywood under output end of case, place transmission on work bench with

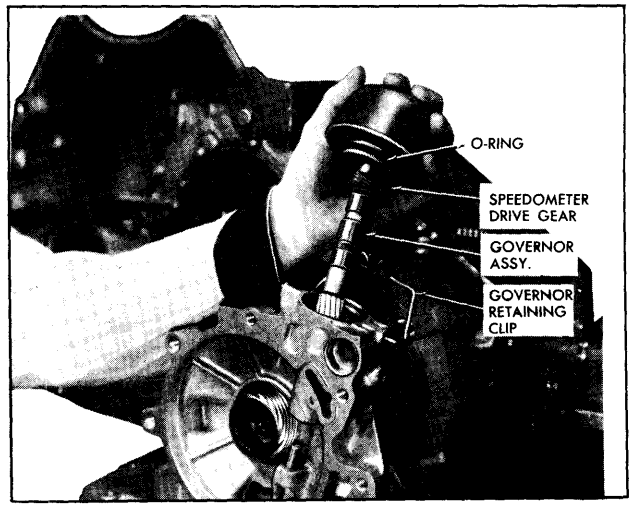


Fig. 7E-27 Removing Governor

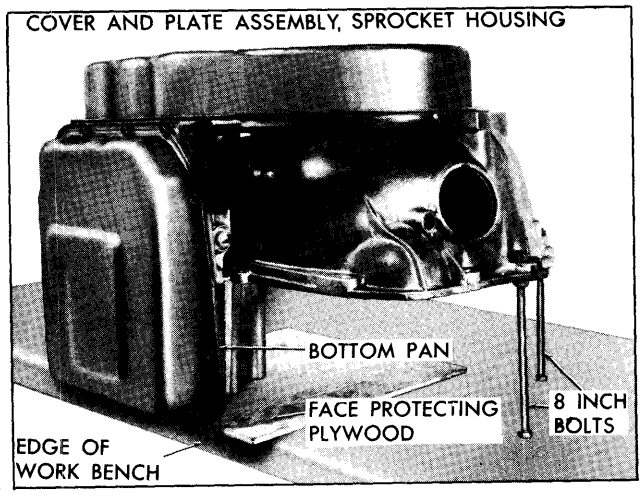


Fig. 7E-28 Transmission on Bench

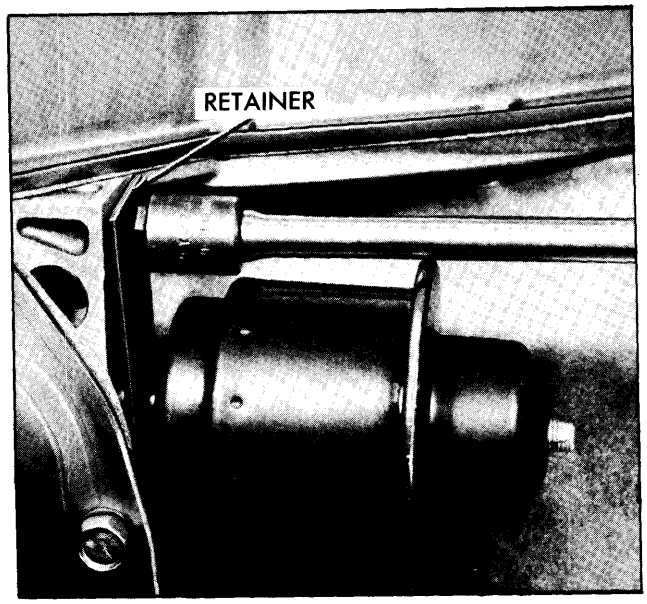


Fig. 7E-29 Removing Modulator Attaching Bolt

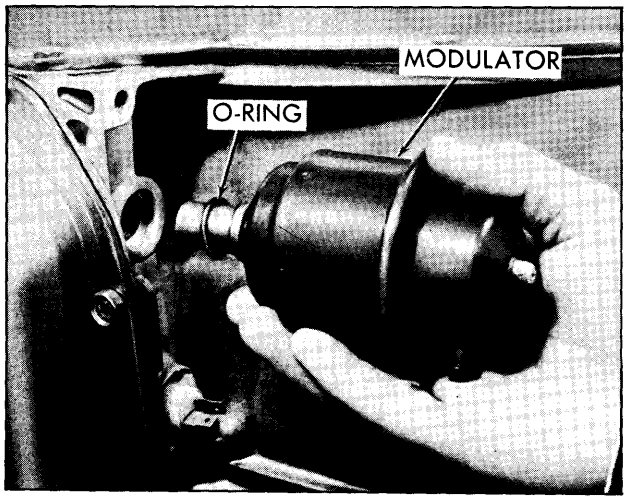


Fig. 7E-30 Removing Modulator

bottom pan facing the outside edge of work bench. (Let pan overhang edge of bench.) Stand transmission on the two eight inch bolts and the output flange end of the transmission case. (Fig. 7E-28)

8. Remove vacuum modulator assembly attaching screw and retainer clip. (Fig. 7E-29)

9. Remove vacuum modulator assembly and "O" ring seal from case bore. (Fig. 7E-30)

10. Remove vacuum modulator valve from bushing in case. (Fig. 7E-31)

NOTE: Modulator bushing may be press fit in case bore and should not be removed with force.

BOTTOM PAN, STRAINER, AND INTAKE PIPE "O" RING SEAL

Removal

1. Remove thirteen bottom pan attaching screws.

2. Remove bottom pan and discard gasket.

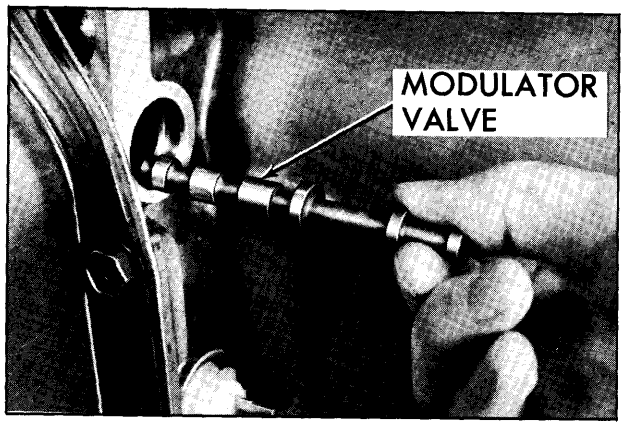


Fig. 7E-31 Removing Modulator Bushing and Valve

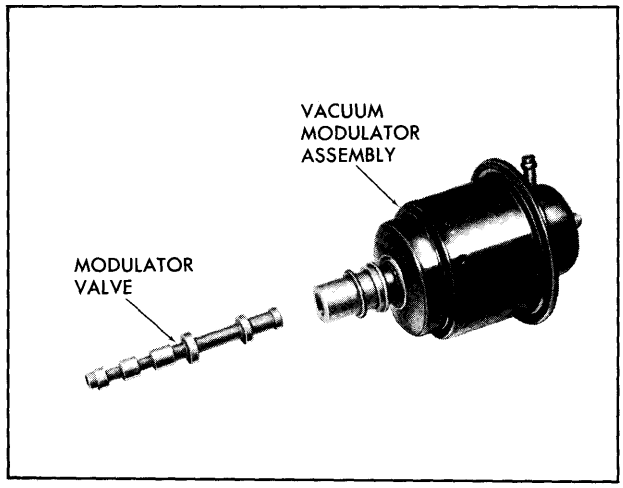


Fig. 7E-32 Removing Modulator Bushing from Valve

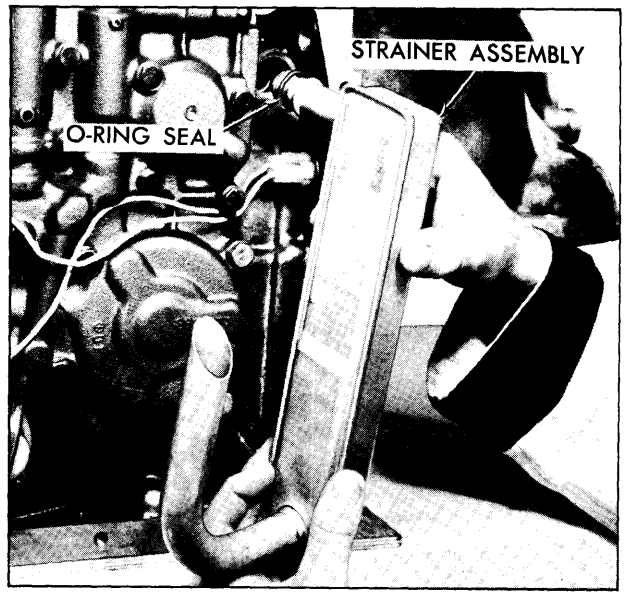


Fig. 7E-33 Removing Oil Strainer

3. Remove oil strainer assembly. (Fig. 7E-33)

4. Remove and discard the intake pipe to case "O" ring seal from the oil strainer assembly or from the case counterbore.

PRESSURE REGULATOR AND BOOST VALVE CONTROL VALVE ASSEMBLY, GOVERNOR PIPES, DETENT SPRING ASSEMBLY, REAR SERVO, MANUAL AND PARKING LINKAGE, AND CASE CONNECTOR

Removal

1. Compress the regulator boost valve bushing against the pressure regulator spring and remove the retaining snap ring from the case, using J-5043 pliers. (Fig. 7E-34)

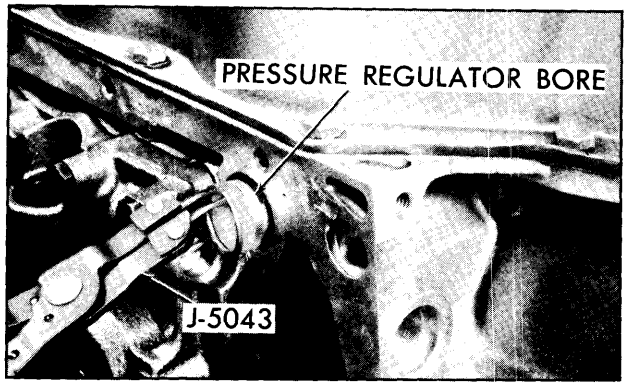


Fig. 7E-34 Removing Retaining Ring

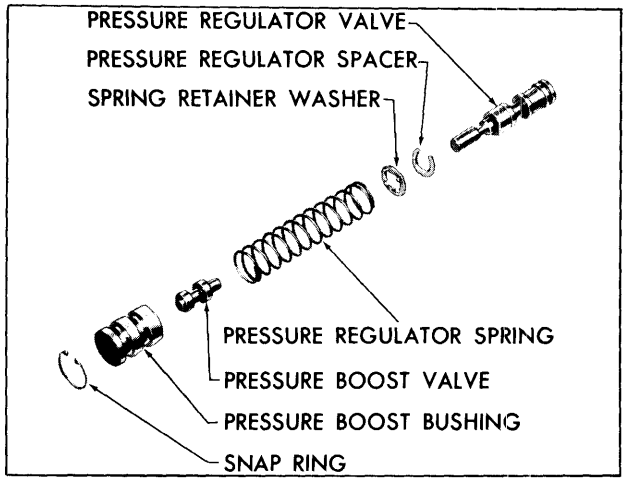


Fig. 7E-35 Pressure Regulator Valve

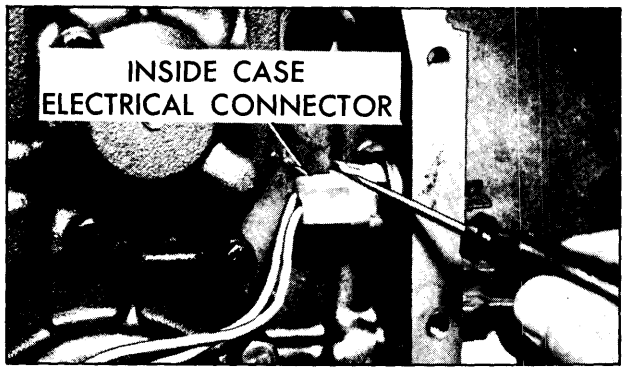


Fig. 7E-36 Removing Connector

2. Remove the regulator boost valve bushing and valve from the case bore. (Fig. 7E-35)

3. Remove the pressure regulator spring from the case bore.

4. Remove regulator valve, spring retainer, and spacer(s) if present, from the case bore.

5. Disconnect stator and detent solenoid inside connector from case connector. (Fig. 7E-36) Disconnect stator solenoid (pink wire) from inside connector. (Fig. 7E-37)

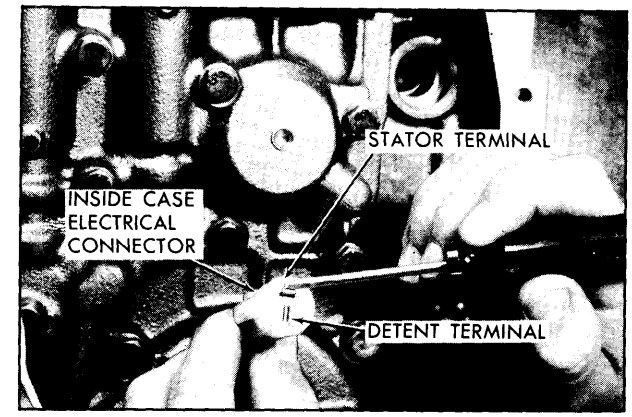


Fig. 7E-37 Removing Stator Wire

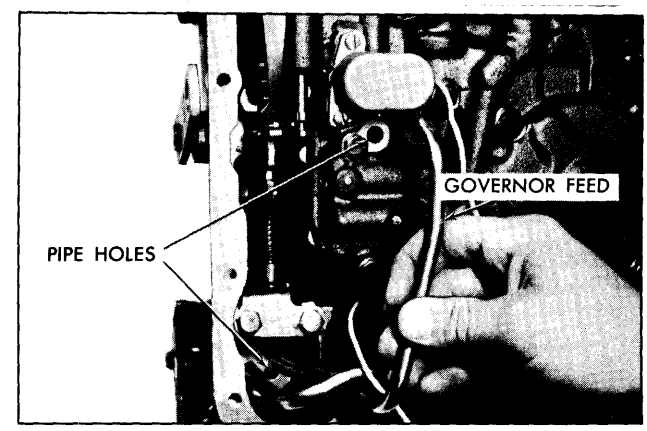


Fig. 7E-38 Removing Governor Feed Pipe

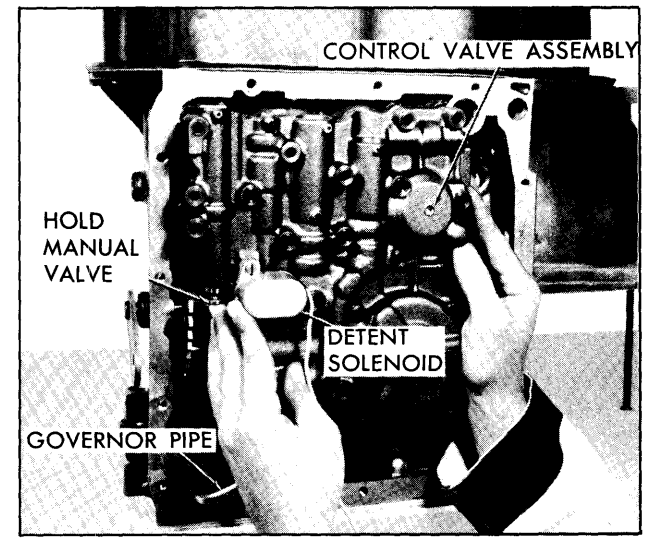


Fig. 7E-39 Removing Control Valve

6. Remove governor feed pipe closest to stator solenoid. (Fig. 7E-38)

7. Remove control valve body to case attaching screws, detent roller spring and assembly. Leave two top bolts in until all other bolts are removed.

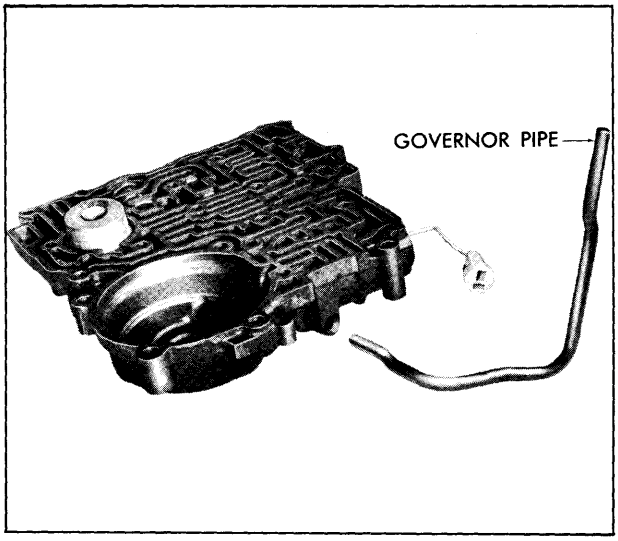


Fig. 7E-40 Removing Governor Pipe

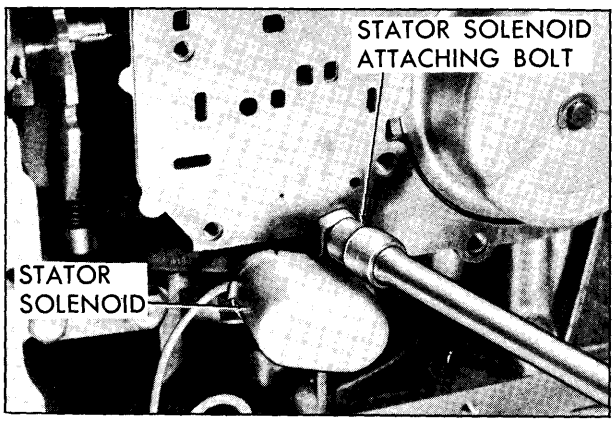


Fig. 7E-41 Removing Stator Solenoid

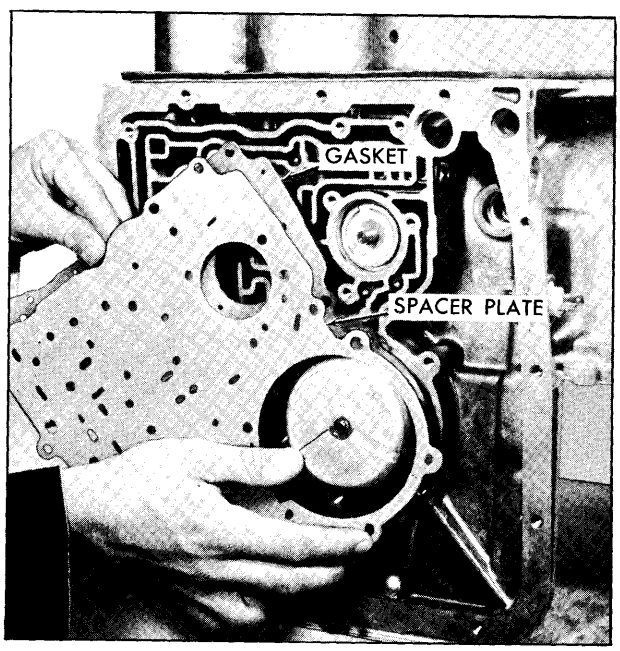


Fig. 7E-42 Removing Gasket and Spacer Plate

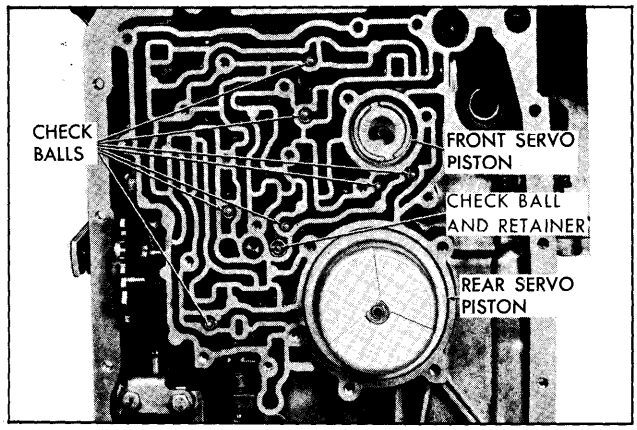


Fig. 7E-43 Check Ball Location

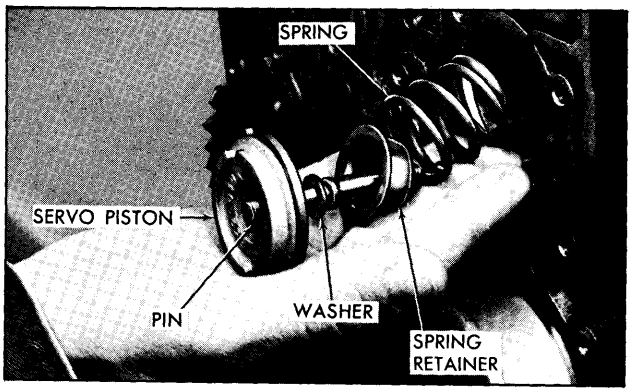


Fig. 7E-44 Removing Front Servo

NOTE: DO NOT REMOVE DETENT OR STATOR SOLENOID ATTACHING SCREWS.

8. Remove control valve body assembly, gasket, and remaining governor pipe. (Fig. 7E-39)

NOTE: DO NOT ALLOW MANUAL VALVE TO FALL OUT OF CONTROL VALVE ASSEMBLY DURING REMOVAL OF CONTROL VALVE ASSEMBLY.

9. Remove the remaining governor pipe from control valve assembly. (Fig. 7E-40)

NOTE: DO NOT REMOVE WHITE DETENT SOLENOID WIRE (SHORT WIRE) FROM INSIDE CONNECTOR.

10. Remove stator solenoid attaching screws, solenoid assembly, and gasket. (Fig. 7E-41)

11. Remove the control valve assembly spacer plate and gasket. (Fig. 7E-42)

12. Remove the seven check balls from the cored passages in transmission case. (Fig. 7E-43)

13. Remove the front servo piston, washer, pin, retainer, and spring from transmission case. (Fig. 7E-44)

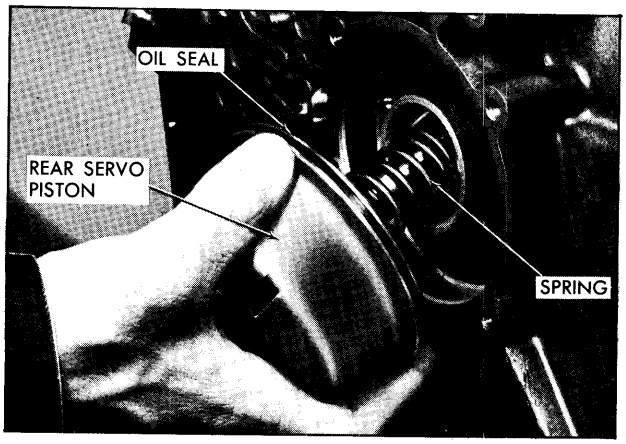


Fig. 7E-45 Removing Rear Servo

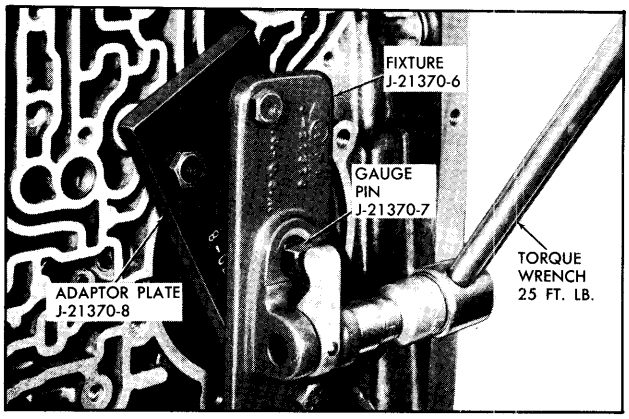


Fig. 7E-46 Checking Band Apply Pin

STEP LOCATION	PIN IDENT.	SIZE
TOP STEP OR ABOVE	THREE RINGS	LONG
THIS AREA	TWO RINGS	MED.
LOWER STEP OR BELOW	ONE RING	SHORT

J-21370-7

Fig. 7E-47 Pin Selection Chart

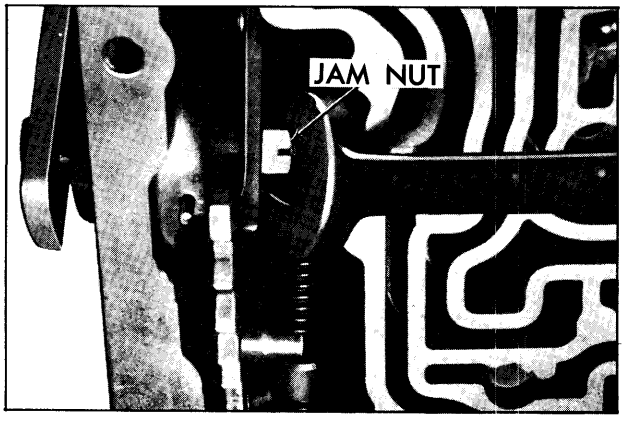


Fig. 7E-48 Removing Jam Nut

14. Remove the rear servo assembly from the case. (Fig. 7E-45)

15. Remove rear servo accumulator spring from case.

16. Make band apply pin selection check. (Fig. 7E-46).

Band Apply Pin Selection

a. Attach Adapter Plate J-21370-8 to case valve body face and torque to 18 ft. lbs. Band Apply Pin Selector Gauge J-21370-6 to J-21370-8 Adapter Plate and insert J-21370-7 Gauge Pin into proper hole in selector gauge. Be sure the pin does not bind when tightening bolts to adapter plate and to case face.

b. Apply 25 ft. lb. torque and note position of step on gauge pin. Below first step requires short pin. Above top step requires long pin, and between steps requires medium length pin. (Fig. 7E-47)

The three selective pins are identified as follows:

PIN IDENTIFICATION	PIN LENGTH
3 Rings	Long
2 Rings	Medium
1 Ring	Short

The identification ring is located on the band lug end of the pin. Selecting the proper pin length is the equivalent of adjusting the band.

17. If necessary, remove the manual linkage as follows:

a. Unthread the jam nut holding detent lever to manual shaft. (Fig. 7E-48)

b. Remove manual shaft retaining pin from case. Pull straight out. (Fig. 7E-49)

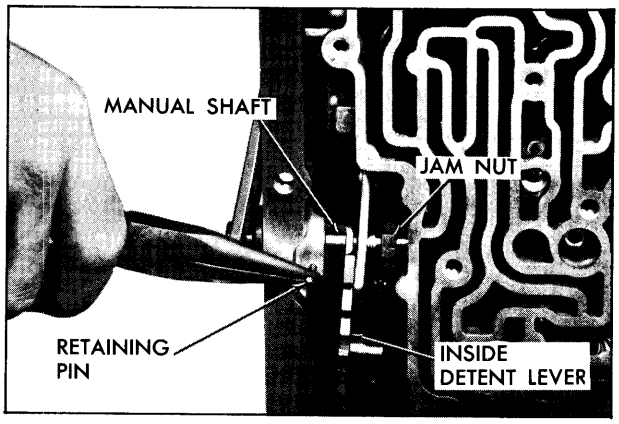


Fig. 7E-49 Removing Retaining Pin

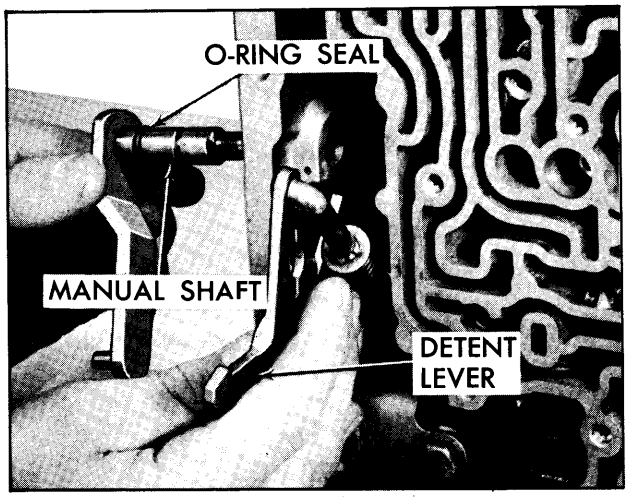


Fig. 7E-50 Removing Manual Shaft and Detent Lever

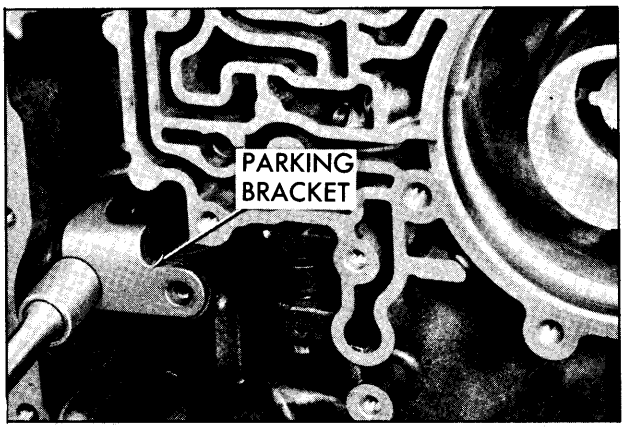


Fig. 7E-51 Removing Parking Bracket

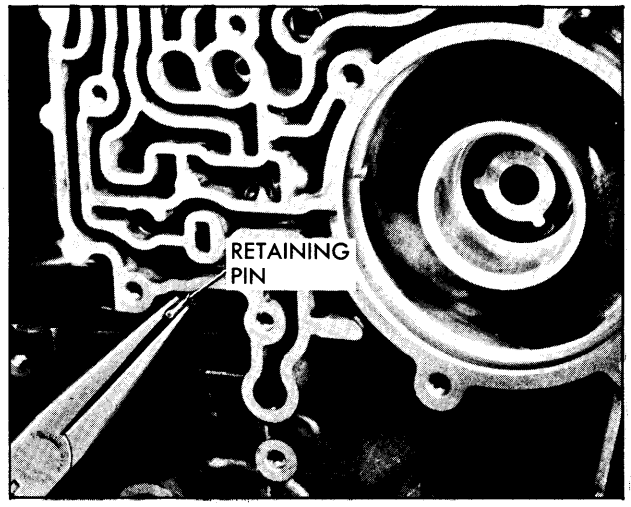


Fig. 7E-52 Removing Retaining Pin

c. Loosen detent lever from ground flats on manual shaft.

d. Withdraw manual shaft from case bore and remove and discard "O" ring seal from manual shaft. (Fig. 7E-50)

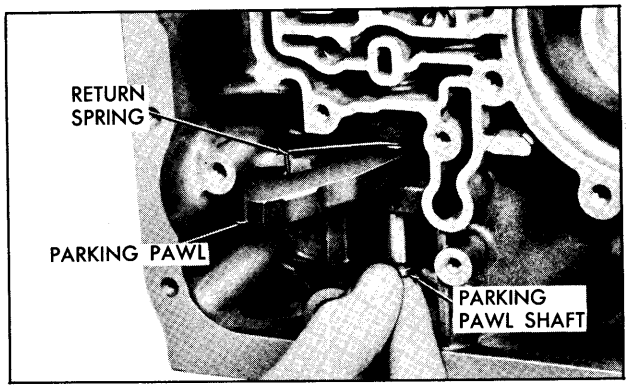


Fig. 7E-53 Removing Parking Pawl, Spring and Shaft

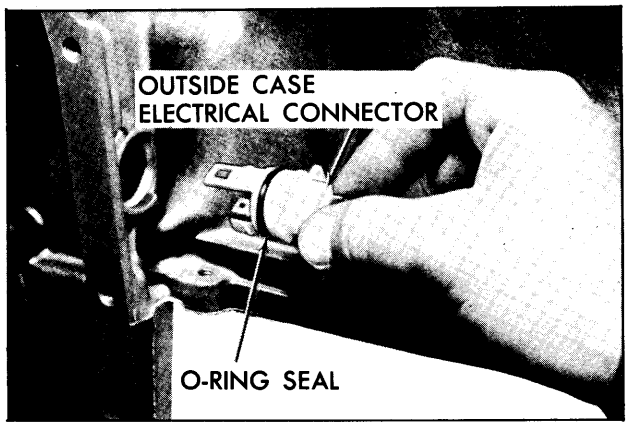


Fig. 7E-54 Removing Electrical Connector

NOTE: Be careful not to drop jam nut inside case.

e. Remove detent lever, parking brake actuator rod, and jam nut from case.

18. Remove two attaching screws and parking bracket. (Fig. 7E-51)

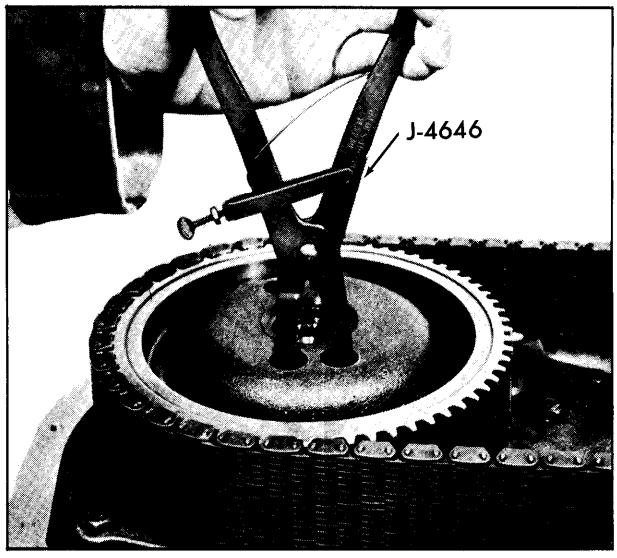


Fig. 7E-55 Removing Retaining Rings

19. Remove parking pawl shaft retaining pin from case and pull straight out. (Fig. 7E-52)

20. Remove parking pawl shaft, parking pawl, and return spring from case. (Fig. 7E-53)

21. Remove detent and stator electrical connector sleeve from case. (Fig. 7E-54)

22. Remove and discard "O" ring seal from connector sleeve.

COVER AND PLATE ASSEMBLY SPROCKET HOUSING, LINK ASSEMBLY, DRIVE AND DRIVEN SPROCKETS

Removal

1. Remove sprocket cover housing attaching bolts.

2. Remove cover housing and gasket. Discard gasket.

3. Install J-4646 snap ring pliers into sprocket bearing retaining snap rings located under the drive and driven sprockets, and remove snap rings from retaining grooves in support housings. (Fig. 7E-55)

NOTE: Do not remove snap rings from beneath the sprockets, leave them in a loose position between the sprockets and the bearing assemblies.

4. Remove drive and driven sprockets, link assembly, bearings, and shafts simultaneously by alternately pulling upwards on the drive and driven sprockets until the bearings are out of the drive and driven support housings. (Fig. 7E-56)

NOTE: If the sprockets are difficult to remove, place a small piece of masonite, or similar material between the sprocket and 1/2x9 inch pry bar, and alternately pry upward under each sprocket. Do not pry on the guide links or the aluminum case. Pry only on the sprockets. (Fig. 7E-57)

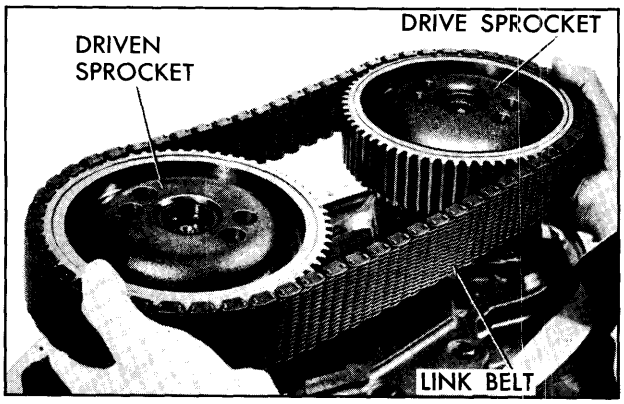


Fig. 7E-56 Removing Sprockets and Link Assembly

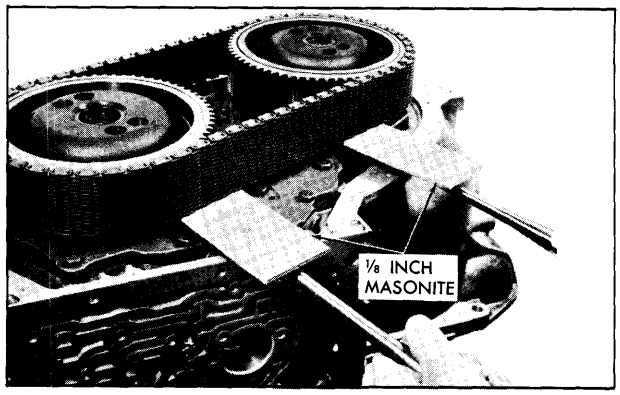


Fig. 7E-57 Removing Tight Sprockets

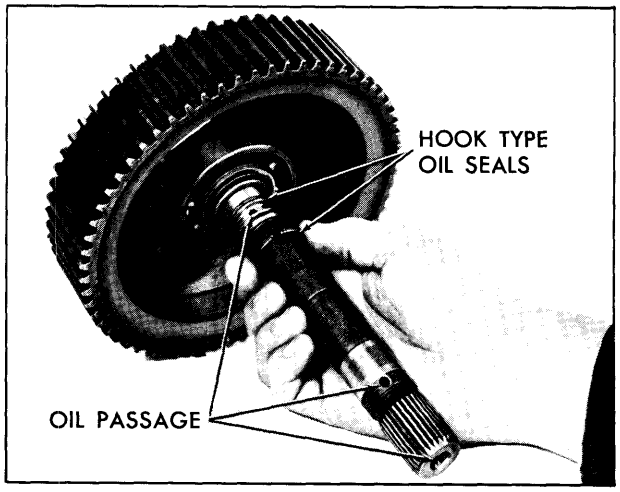


Fig. 7E-58 Removing or Installing Oil Seal Rings

5. Remove link assembly from drive and driven sprockets.

6. Remove two hook type oil seal rings from turbine shaft. (Fig. 7E-58)

7. Inspect drive and driven sprocket bearing assemblies for rough or defective bearings.

NOTE: Do not remove bearing assemblies from drive and driven sprockets unless they need replacement.

8. If removal of bearing assembly from drive and/or driven sprockets is necessary, proceed as follows:

   a. Remove sprocket to bearing assembly retaining snap ring using J-5586, snap ring pliers. (Fig. 7E-59)

   b. Mount sprocket, with turbine or input shaft placed in hole in work bench, on two 2" x 4" x 10" pieces of wood.

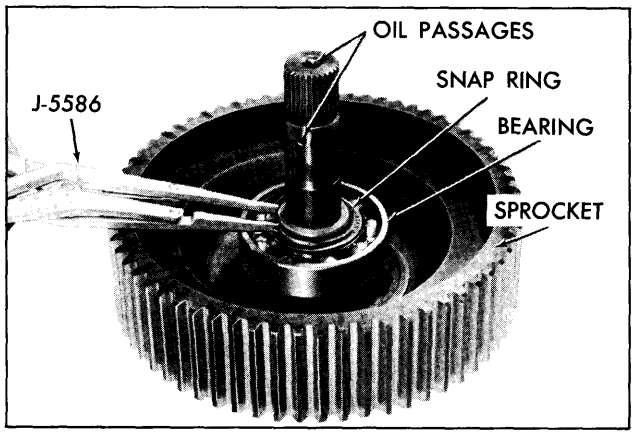


Fig. 7E-59 Removing Retaining Rings

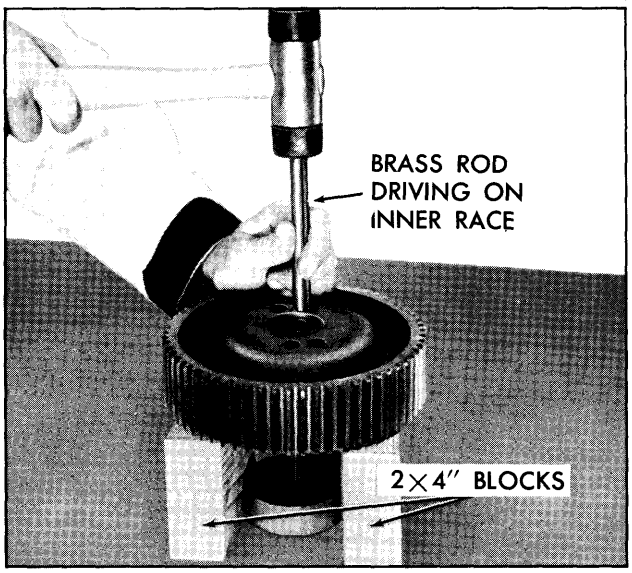


Fig. 7E-60 Removing Bearing

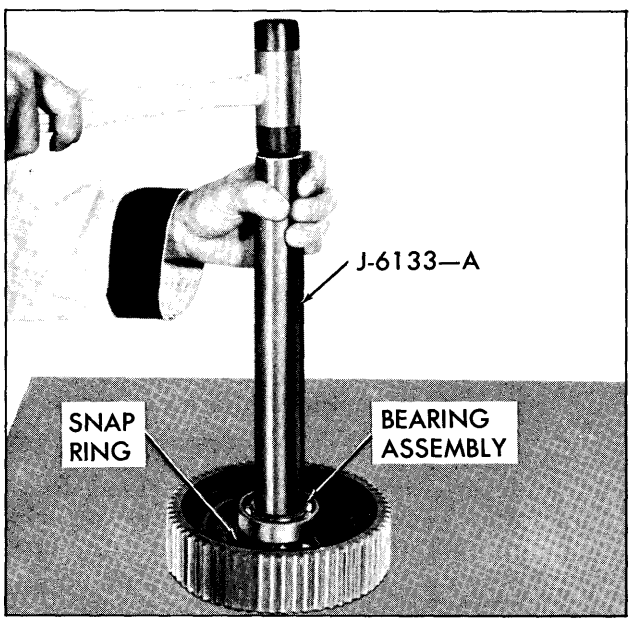


Fig. 7E-61 Installing Bearing

c. With a hammer and brass rod, drive the inner race, alternately through each of the access openings, until the bearing assembly is removed from the sprocket hub. (Fig. 7E-60)

DRIVE SPROCKET AND TURBINE SHAFT, AND LINK ASSEMBLY

Inspection

1. Inspect drive sprocket teeth for nicks, burrs, scoring, galling, and excessive wear.

   NOTE: Wear pattern at bottom of teeth is normal.

2. Inspect drive sprocket to ball bearing retaining snap ring for damage.

3. Inspect drive sprocket ball bearing inner race mounting surface for damage.

4. Inspect turbine shaft for open lubrication passages. Run a tag wire through the passages to be sure they are open. See lubrication chart for passage location. (Fig. 7E-240)

5. Inspect spline for damage.

6. Inspect the ground bushing journals for damage.

7. Inspect the two hook type oil seal grooves for damage or excessive wear.

8. Inspect the turbine shaft for cracks or distortion.

9. Inspect the link assembly for damage or loose links.

   NOTE: Check the guide links. Guide links are the wide outside links on each side of the link assembly.

DRIVEN SPROCKET AND INPUT SHAFT

Inspection

1. Inspect driven sprocket teeth for nicks, burrs, scoring, galling, and excessive wear.

   NOTE: Wear pattern at bottom of teeth is normal.

2. Inspect sprocket to ball bearing retaining snap ring for damage.

3. Inspect ball bearing inner race mounting surface for damage.

4. Inspect input shaft for open lubrication holes. Run a tag wire through the holes to be sure they are open. See lubrication chart for location of holes. (Fig. 7E-231)

5. Inspect spline for damage.

6. Inspect ground bushing journal for damage.

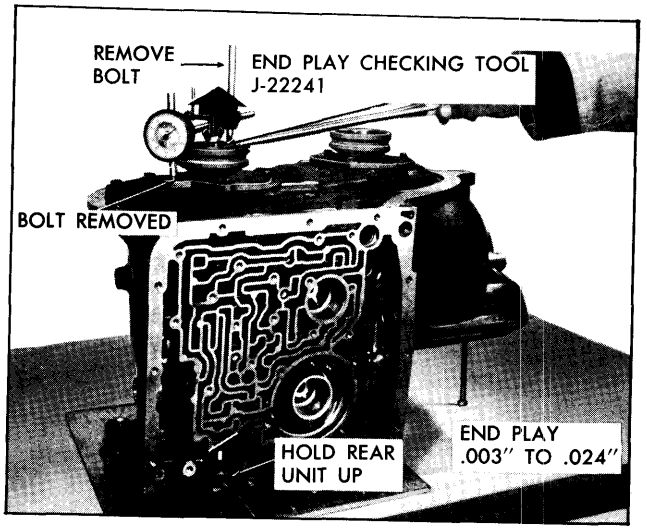


Fig. 7E-62 Checking Front Unit End Play

SPROCKET BEARINGS

Install

1. Turn sprocket so that turbine or input shaft is pointing upward.
2. Install new sprocket bearing as follows:
   a. Install support snap ring, letter side down, onto shaft.
   b. Assemble bearing assembly on turbine or input shaft.
   c. Using J-6133-A, drive the bearing assembly onto the hub of the sprocket until it is resting on the bearing seat of the sprocket. (Fig. 7E-61)
   d. Install sprocket to bearing assembly retaining snap ring into groove in sprocket hub.
3. Install two hook type oil seal rings on turbine shaft. (Fig. 7E-58)

   NOTE: Turbine and/or input shaft may appear not to be pressed fully into the sprockets. DO NOT attempt pressing shaft into sprocket further as a specific length dimension is held during initial assembly.

FRONT UNIT END PLAY CHECK

1. Make front unit end play check as follows:
   a. Install front unit end play checking tool J-22241 into driven sprocket housing so that the urethane on the tool can engage the splines in the forward clutch housing. Let the tool bottom on the mainshaft and then withdraw it approximately 1/16 to 1/8 of an inch and tighten wing nut. (Fig. 7E-62)
   b. Remove two of the 5/16-18 bolts from the driven support housing.
   c. Install 5/16-18 threaded slide hammer bolt with jam nut into one bolt hole in driven support housing.

      NOTE: Do not thread slide hammer bolt deep enough to interfere with forward clutch housing travel.

   d. Mount dial indicator on rod and index indicator to register with the forward clutch drum that can be reached through second bolt removed from driven support housing.
   e. Push end play tool down to remove slack.
   f. Push and hold output flange upward. Place a screw driver in case opening at parking pawl area and push upward on output carrier.
   g. Place another screw driver between the metal lip of the end play tool and the driven sprocket housing, now push upward on the metal lip of the end play tool and read the resulting end play, which should be between .003" and .024".

The selective washer controlling this end play is the phenolic thrust washer located between the driven support housing and the forward clutch housing. If more or less washer thickness is required to bring the end play within specifications, select the proper washer from the chart below:

THICKNESS	COLOR
.060 - .064	Yellow
.071 - .075	Blue
.082 - .086	Red
.093 - .097	Brown
.104 - .108	Green
.115 - .119	Black
.126 - .130	Purple

NOTE: An oil soaked washer may tend to discolor so that it will be necessary to measure the washer with a set of one inch micrometers to determine its actual thickness.

OIL PUMP

Removal

1. Remove two opposite pump attaching bolts from the drive support housing.
2. Install two 5/16" - 18 x 4" guide pins. (Fig. 7E-63)
3. Remove the remaining pump attaching bolts from the drive support housing.

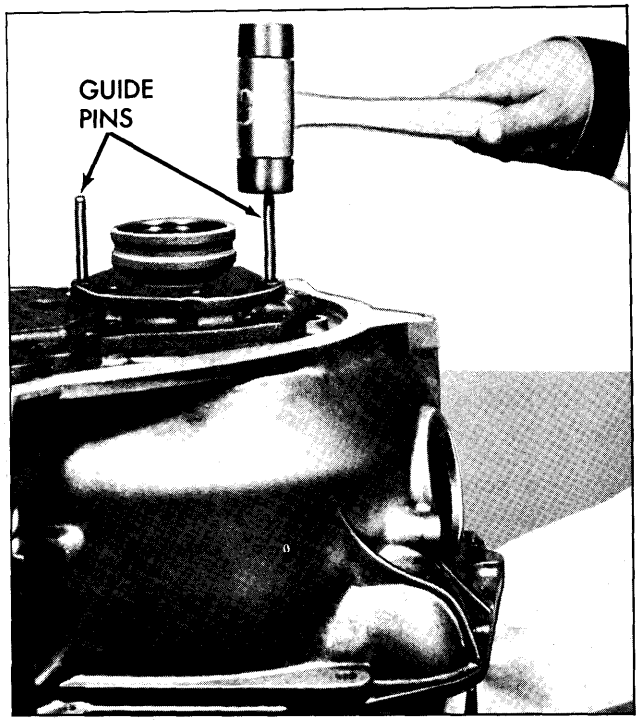


Fig. 7E-63 Oil Pump Removal

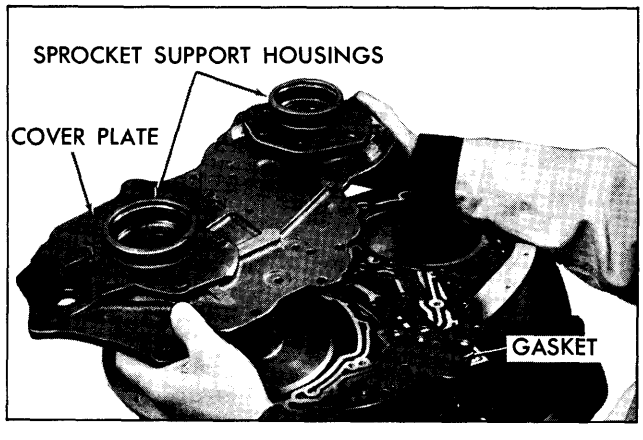


Fig. 7E-64 Removing Support Housings and Cover Plate

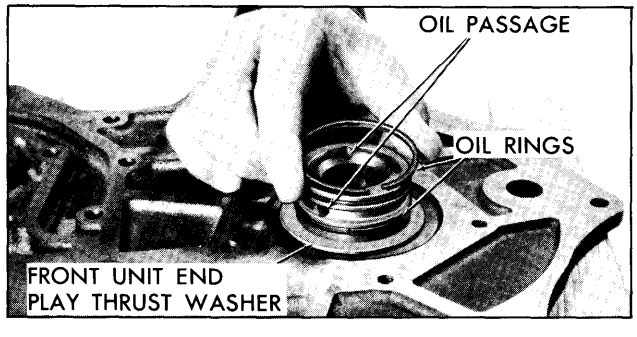


Fig. 7E-65 Removing or Installing Oil Rings and Thrust Washer

4. With one hand hold the under side of the pump, gently tap the guide pin until the pump is removed from the case.

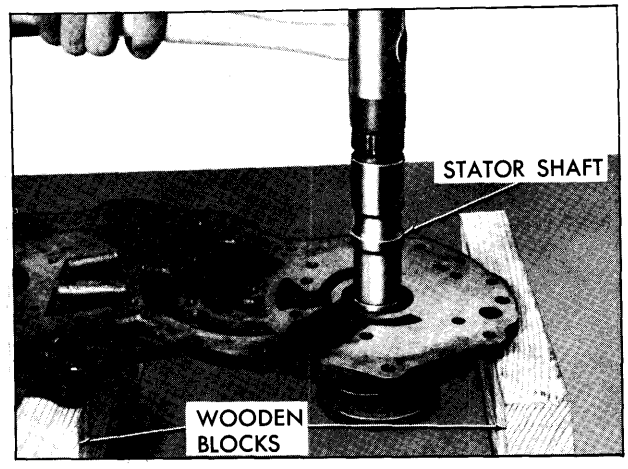


Fig. 7E-66 Removing Drive Sprocket Support

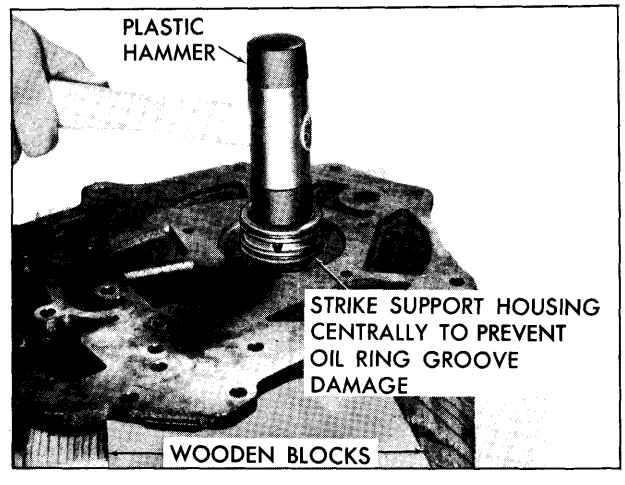


Fig. 7E-67 Removing Driven Sprocket Support

PUMP COVER PLATE AND DRIVE AND DRIVEN SUPPORT HOUSING ASSEMBLIES

Removal

1. Remove the pump cover plate to case attaching screws. Do not remove sprocket support housing bolts at this time.

2. Remove pump cover plate and plate to case face gasket. Discard gasket. (Fig. 7E-64)

3. Remove two hook type oil seal rings from the driven support housing. (Fig. 7E-65)

4. Remove the front unit end play selective phenolic thrust washer from the hub of the driven support housing.

NOTE: Drive and driven support housing assemblies are pressed into and removed with the pump cover plate. Do not remove them unless it is necessary.

5. If necessary to remove the drive and driven

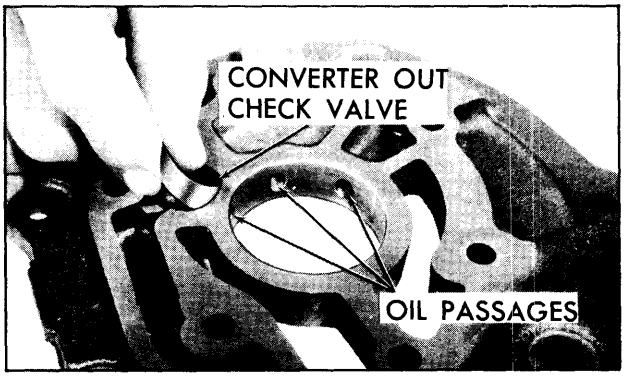


Fig. 7E-68 Removing or Installing Check Valve

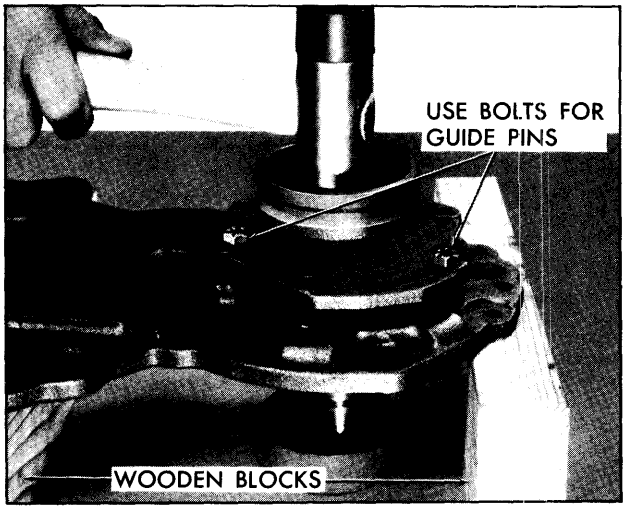


Fig. 7E-69 Installing Drive Sprocket

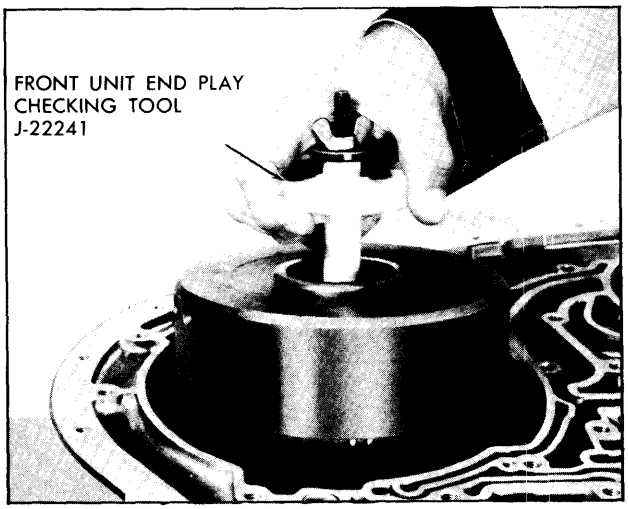


Fig. 7E-70 Removing Forward Clutch Housing

sprocket support housing assemblies, proceed as follows:

a. Remove the remaining sprocket support to pump cover plate attaching bolts.

b. Using a plastic mallet, vigorously strike the stator shaft of the drive sprocket support (Fig. 7E-66) and the hub of the driven sprocket support (Fig. 7E-67) until they are removed from their pump cover plate bores.

NOTE: When driving the housings out of the pump cover plate avoid damaging or distorting the stator shaft or the ring grooves in the hub of the driven housing.

c. Remove and discard housing to pump cover plate gaskets.

d. Remove and inspect stator out check valve from pump cover. (Fig. 7E-68)

DRIVE AND DRIVEN SPROCKET

Assembly

NOTE: Steps 1 through 7 can be omitted if parts were not disassembled.

1. Install stator out check valve in drive sprocket support housing. (Fig. 7E-68)
2. Install drive sprocket support housing to pump cover plate gasket.
3. Install drive sprocket support housing into pump cover plate by using a plastic mallet to seat the housing. Use bolts for guides. (Fig. 7E-69)
4. Install driven sprocket support housing to pump cover plate gasket.
5. Install driven sprocket support housing to pump cover plate attaching bolts for gasket guides.
6. Install driven sprocket support housing into pump cover plate by using a plastic mallet to seat the housing.
7. Install all but two driven support housing to pump cover plate attaching bolts. Torque to 20 ft. lbs.

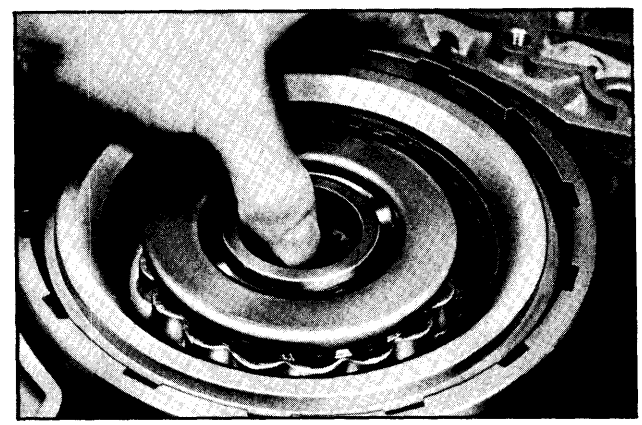


Fig. 7E-71 Removing Direct Clutch

8. Install proper front unit end play phenolic selective thrust washer on the hub of the driven sprocket support housing. Use micrometers to determine the actual thickness of the phenolic thrust washer. (Fig. 7E-65)

9. Install two hook type oil seal rings into the grooves in the hub of the driven sprocket support housing.

FORWARD CLUTCH, DIRECT CLUTCH, FRONT BAND ASSEMBLIES, AND SUN GEAR SHAFT

Removal

1. Remove forward clutch housing assembly, using Tool J-22241. (Fig. 7E-70)

2. Remove forward clutch hub to direct clutch housing phenolic thrust washer if it did not come out with the forward clutch housing assembly.

3. Remove direct clutch housing assembly. (Fig. 7E-71)

4. Remove the front band. (Fig. 7E-72)

5. Remove sun gear shaft from gear unit assembly. (Fig. 7E-73)

REAR UNIT END PLAY CHECK

1. Make rear unit end play check as follows:

   a. Install 3/8"-16" bolt for slide hammer, into one of the differential attaching bolt holes. Allow end of case to hang over edge of bench. (Fig. 7E-74)

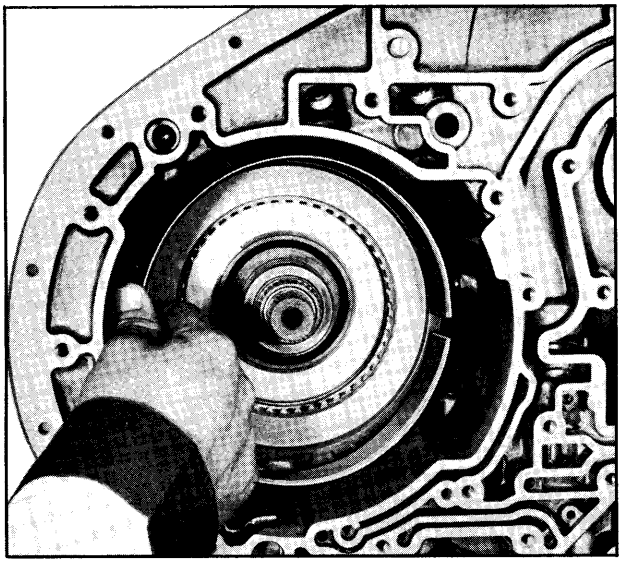


Fig. 7E-72 Removing Front Band

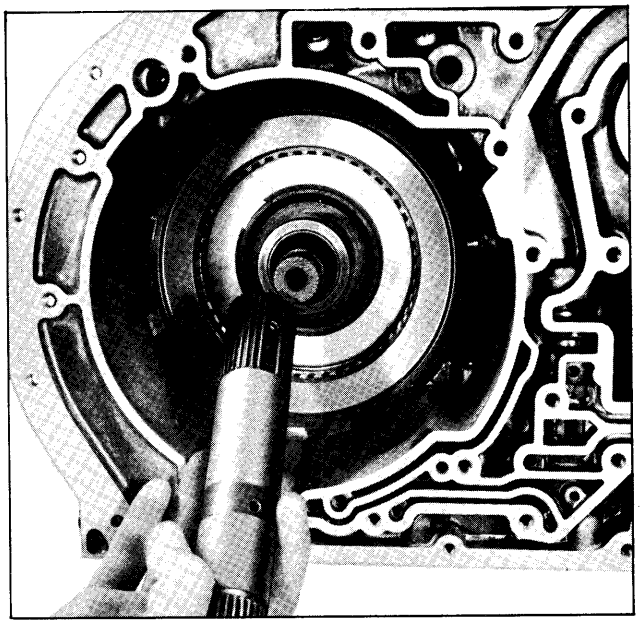


Fig. 7E-73 Removing Sun Gear Shaft

   b. Mount dial indicator on the bolt and index with end of output flange.

   c. Move the output flange in and out to read the end play. End play should read .003" to .019". The selective washer controlling this end play is the steel washer having three lugs that is located between the output flange thrust washer and the rear face of the transmission case.

If a different washer thickness is required to bring the end play within specifications, it can be selected from the following chart:

Thickness	Notches
.078 - .082	None
.086 - .090	1 Lug Side
.094 - .098	2 Lug Side
.102 - .106	1 Lug O.D.
.110 - .114	2 Lug O.D.
.118 - .122	3 Lug O.D.

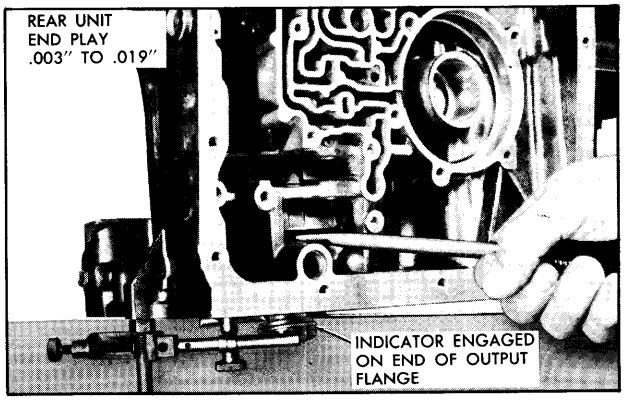


Fig. 7E-74 Checking Rear Unit End Play

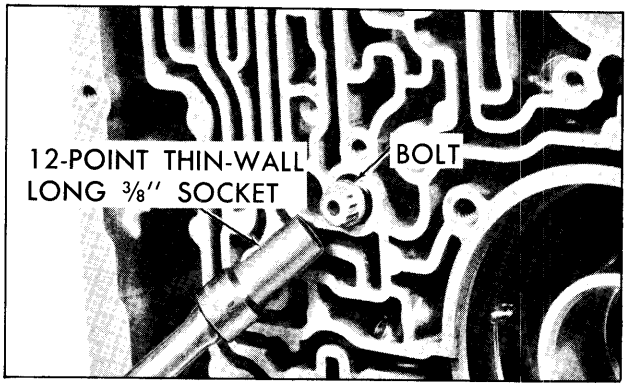


Fig. 7E-75 Removing Case Center Support Bolt

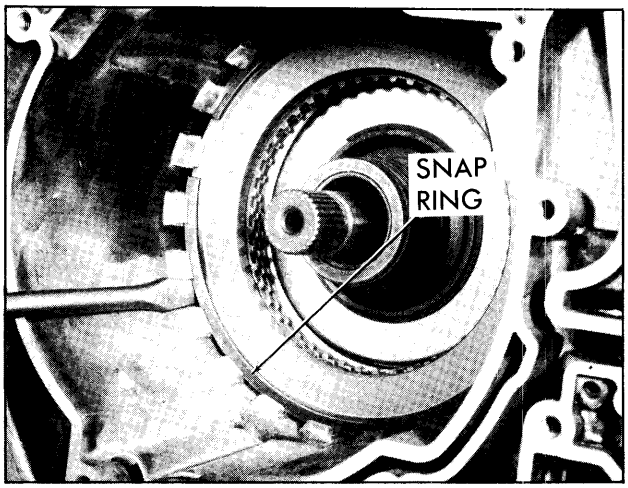


Fig. 7E-76 Removing Intermediate Clutch Snap Ring

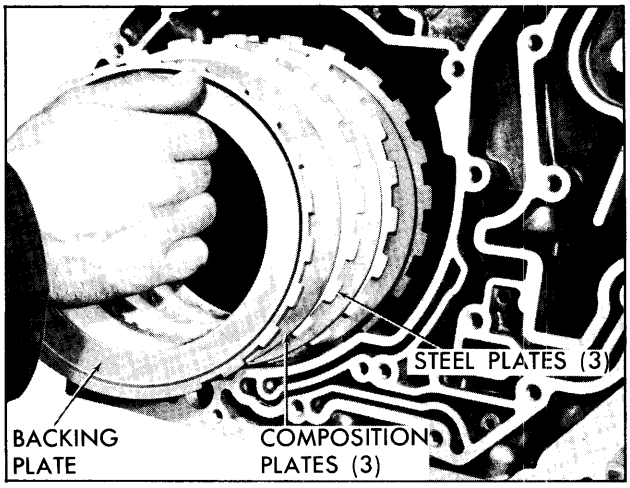


Fig. 7E-77 Removing Backing and Clutch Plates

CENTER SUPPORT, GEAR UNIT ASSEMBLY, REAR BAND ASSEMBLY, AND REAR UNIT SELECTIVE WASHER

Removal

1. Remove the case center support to case bolt, using a 3/8" 12-point thin wall socket such as Snap On FDHB-120. (Fig. 7E-75)

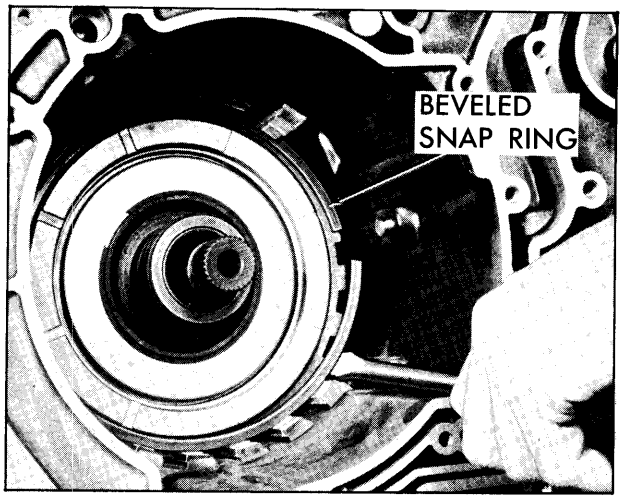


Fig. 7E-78 Removing Case Center Support Snap Ring

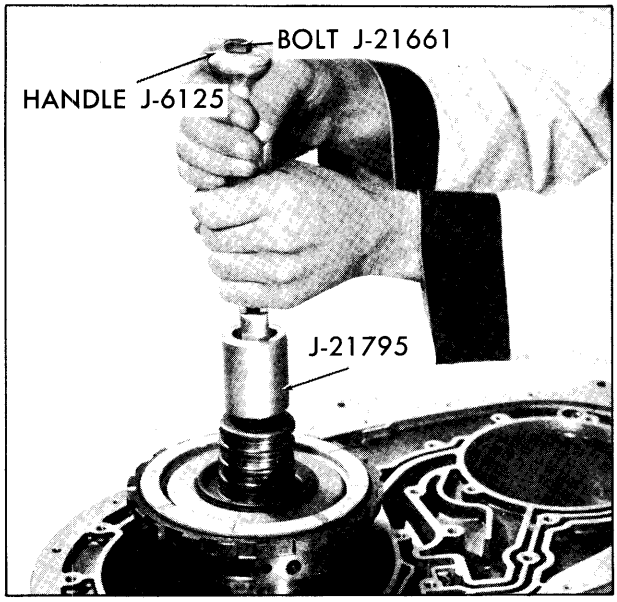


Fig. 7E-79 Removing Gear Unit

2. Remove the intermediate clutch backing plate to case snap ring. (Fig. 7E-76)
3. Remove the intermediate clutch backing plate, three composition and three steel clutch plates. (Fig. 7E-77)
4. Remove the center support to case retaining snap ring. (Fig. 7E-78)
5. Install Tool J-21795 with J-6125 slide hammer into mainshaft. Tool should tighten against shaft. Using the slide hammer as a handle, lift entire support and gear unit assembly from case. (Fig. 7E-79)
6. Remove the output flange to case thrust washer from the rear of the output flange or inside the case. (Fig. 7E-80)

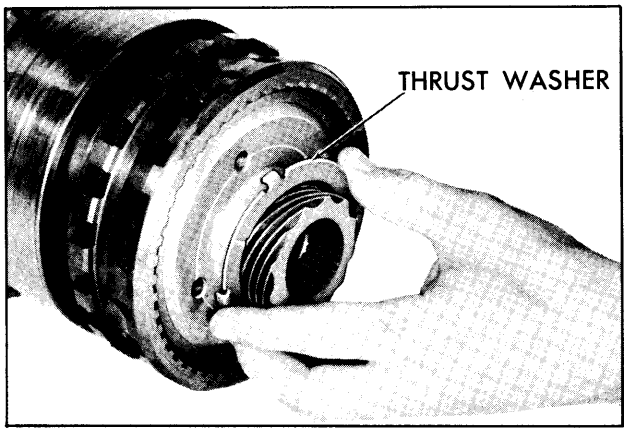


Fig. 7E-80 Removing Thrust Washer

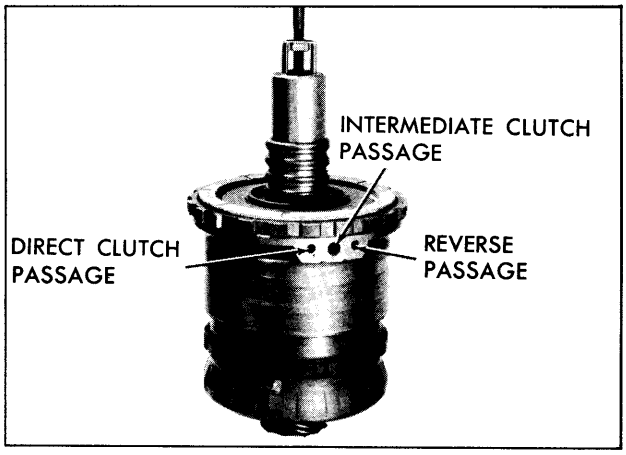


Fig. 7E-81 Gear Unit Positioned on Bench

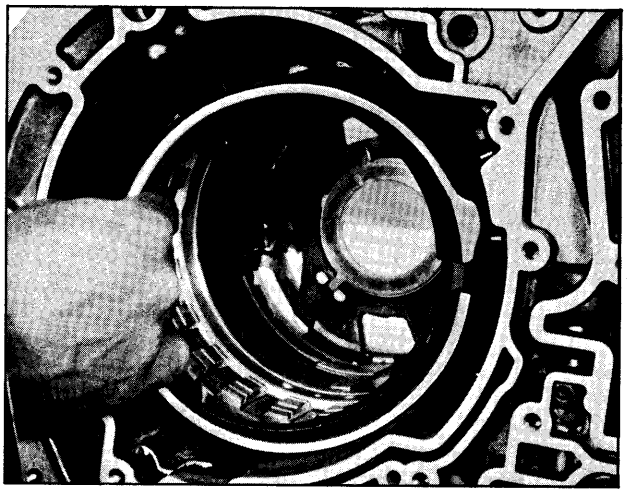


Fig. 7E-82 Removing Rear Band

7. Place the gear unit assembly with output flange facing down on work bench. (Fig. 7E-81)
8. Remove the rear band assembly. (Fig. 7E-82)
9. Remove the rear unit selective washer from the transmission case. (Fig. 7E-83)

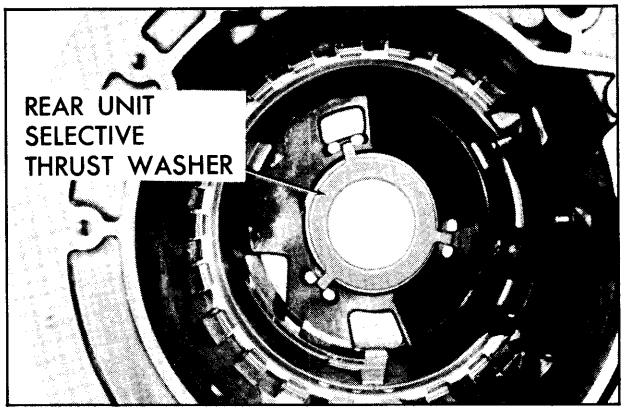


Fig. 7E-83 Removing Selector Washer

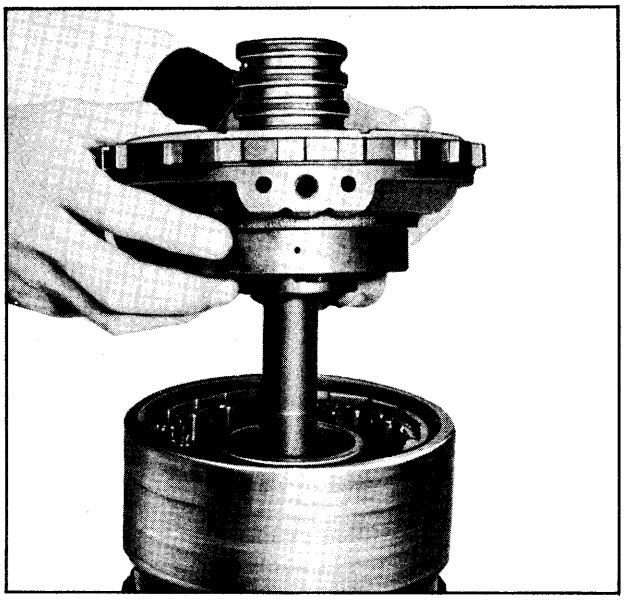


Fig. 7E-84 Removing Center Support

Fig. 7E-85 Removing Thrust Washer

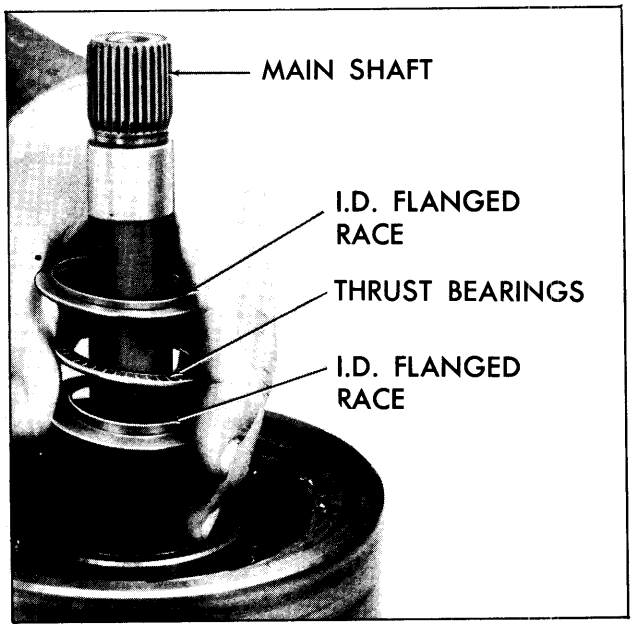


Fig. 7E-86 Removing Sun Gear Races and Bearings

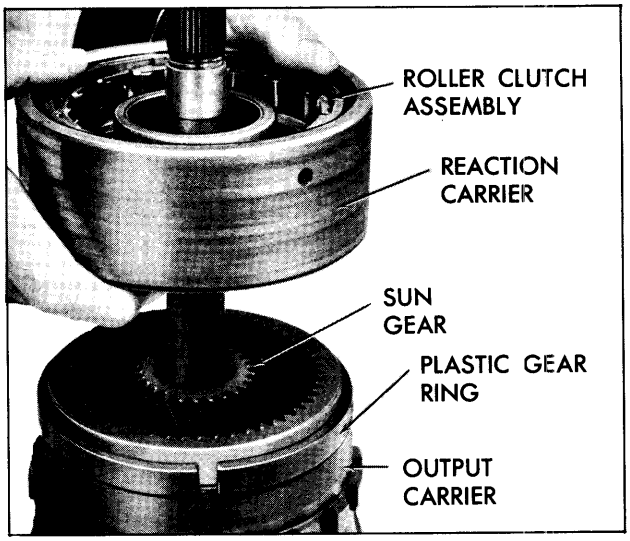


Fig. 7E-87 Removing Reaction Carrier

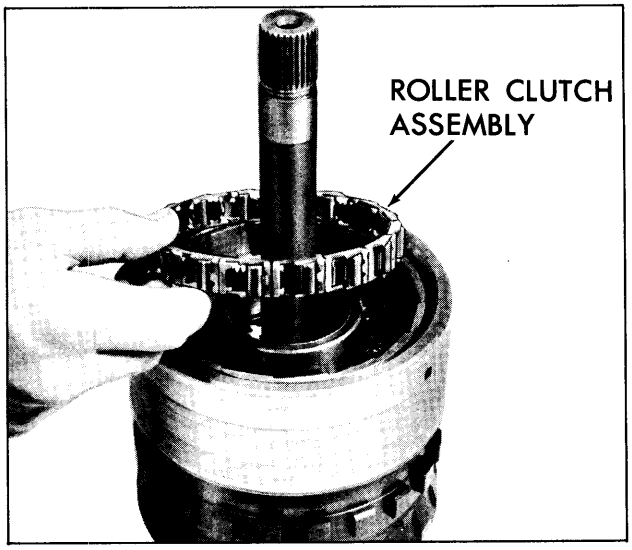


Fig. 7E-88 Removing Roller Clutch

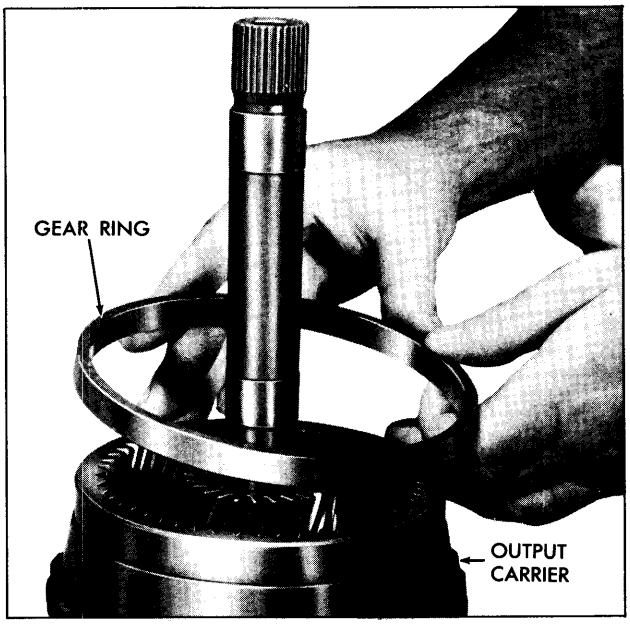


Fig. 7E-89 Removing Front Internal Gear Ring

DISASSEMBLY AND ASSEMBLY OF INDIVIDUAL UNITS

SUPPORT AND GEAR UNIT

Disassembly

1. Remove the case center support assembly. (Fig. 7E-84)
2. Remove the center support to reaction carrier phenolic or plastic thrust washer. (Fig. 7E-85)
3. Remove the center support to sun gear races and thrust bearing. (Fig. 7E-86)

NOTE: One of the races may have been removed with the center support.

4. Remove the reaction carrier and roller clutch assembly. (Fig. 7E-87)
5. Remove roller clutch assembly from reaction carrier. (Fig. 7E-88)
6. Remove front internal gear ring from output carrier assembly. (Fig. 7E-89)
7. Remove sun gear. (Fig. 7E-90)
8. Remove reaction carrier to output carrier plastic thrust washer. (Fig. 7E-91)
9. Turn assembly over.
10. Remove output flange to output carrier snap ring. (Fig. 7E-92)

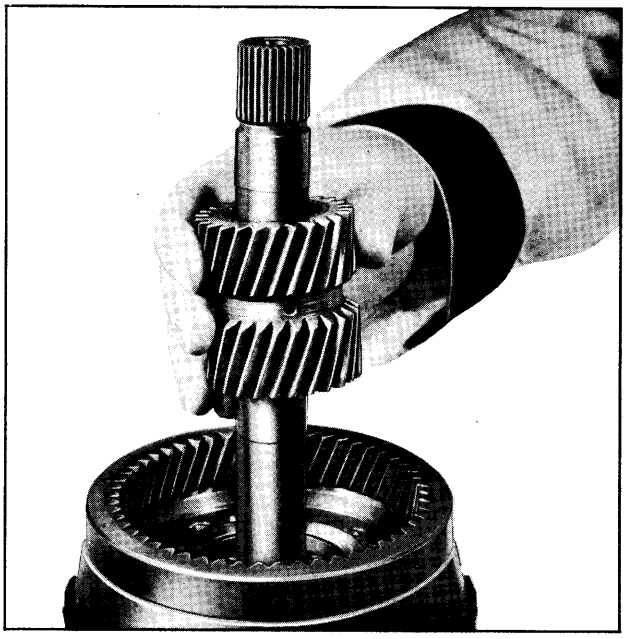


Fig. 7E-90 Removing Sun Gear

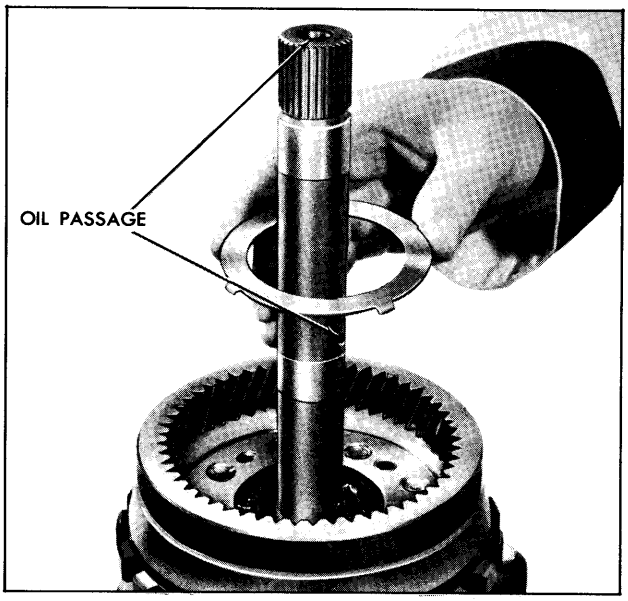


Fig. 7E-91 Removing Output Carrier Thrust Washer

11. Remove output flange. (Fig. 7E-93)

12. Remove output flange to rear internal gear thrust bearing and two races. (Fig. 7E-94)

NOTE: Do not drop roller thrust bearings.

13. Remove rear internal gear and mainshaft. (Fig. 7E-95)

14. Remove the rear internal gear to sun gear thrust bearing and two races. (Fig. 7E-96)

15. If necessary, remove the rear internal gear to mainshaft snap ring to remove mainshaft. (Fig. 7E-97)

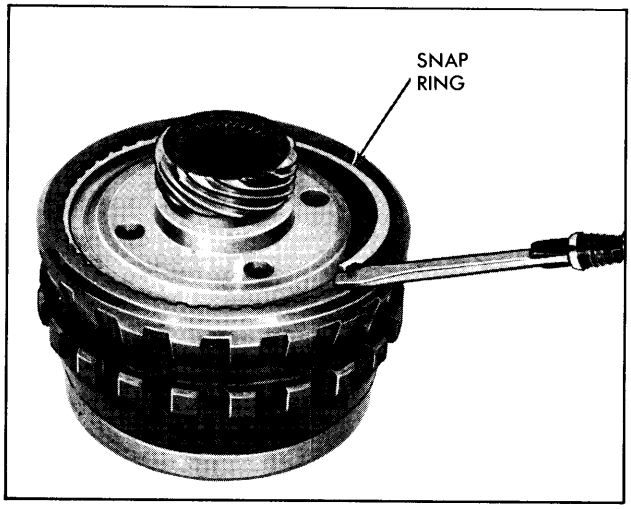


Fig. 7E-92 Removing Output Carrier Snap Ring

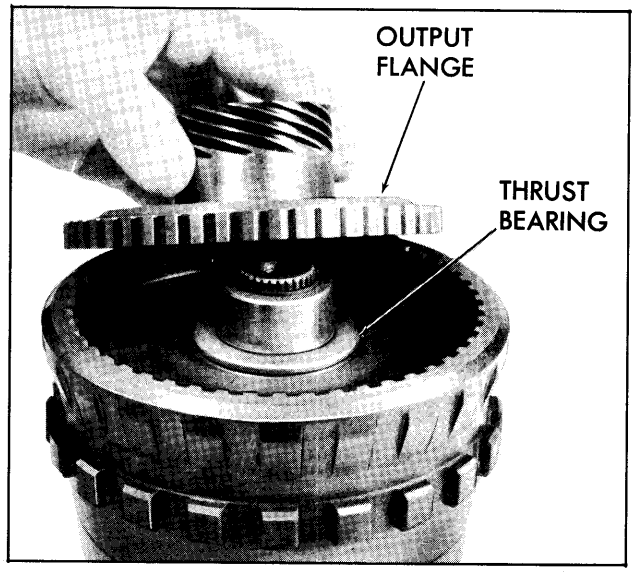


Fig. 7E-93 Removing Output Flange

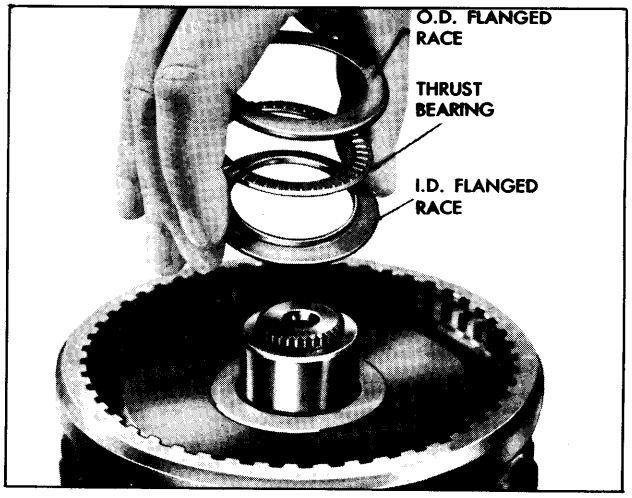


Fig. 7E-94 Removing Thrust Bearing and Races

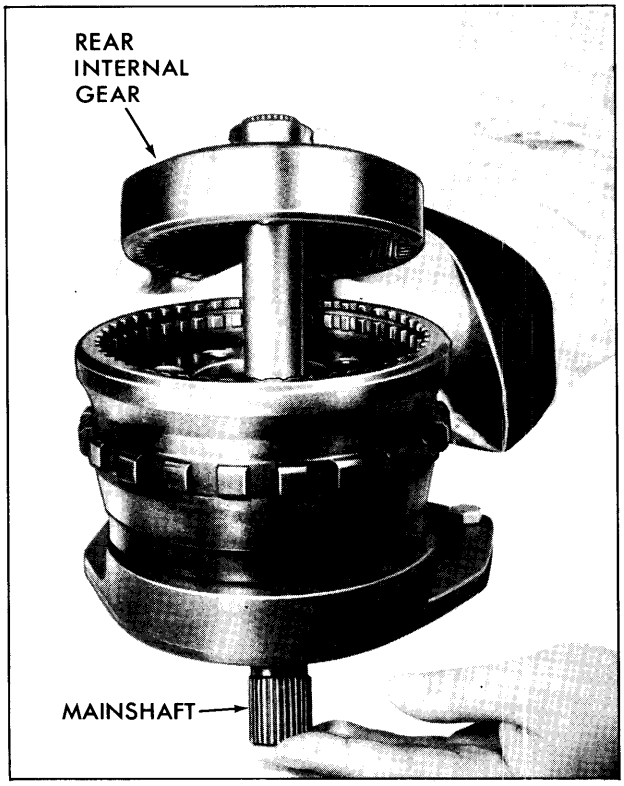


Fig. 7E-95 Removing Rear Internal Gear and Mainshaft

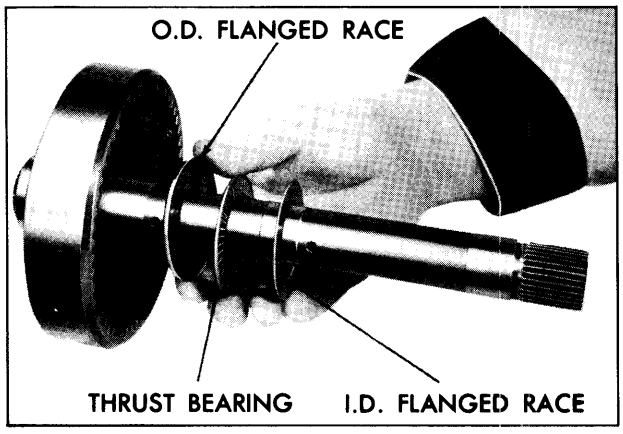


Fig. 7E-96 Removing Thrust Bearing and Races

CASE CENTER SUPPORT

Disassembly

1. Remove four hook type oil seal rings from center support. (Fig. 7E-98)

2. Using clutch compressor or tools J-6129 and J-4670, compress the spring retainer and remove snap ring. (Fig. 7E-99)

3. Remove the spring retainer and twelve clutch release springs. (Fig. 7E-100)

4. Remove the intermediate clutch piston. (Fig. 7E-101)

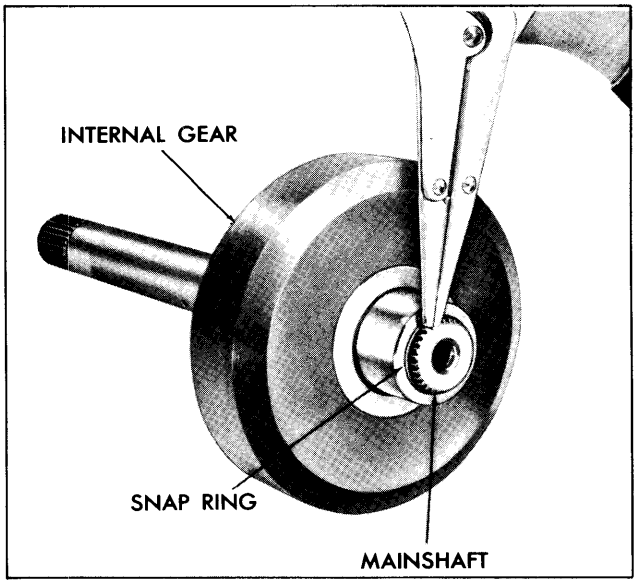


Fig. 7E-97 Removing Snap Ring

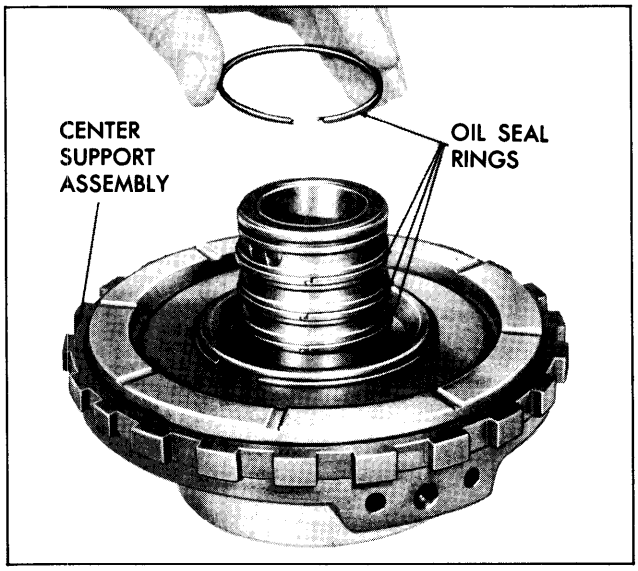


Fig. 7E-98 Removing Oil Seal Rings

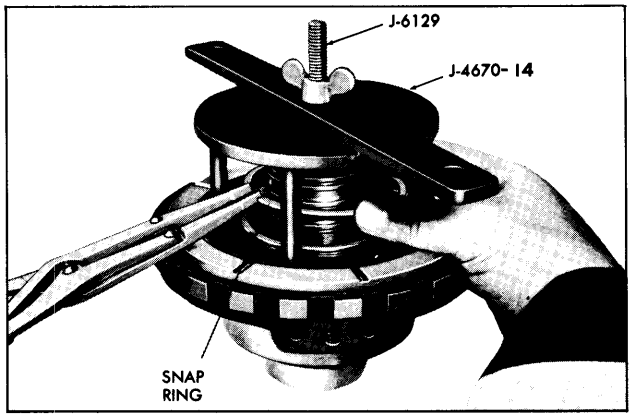


Fig. 7E-99 Removing Snap Ring

5. Remove and discard the inner piston seal. (Fig. 7E-102)

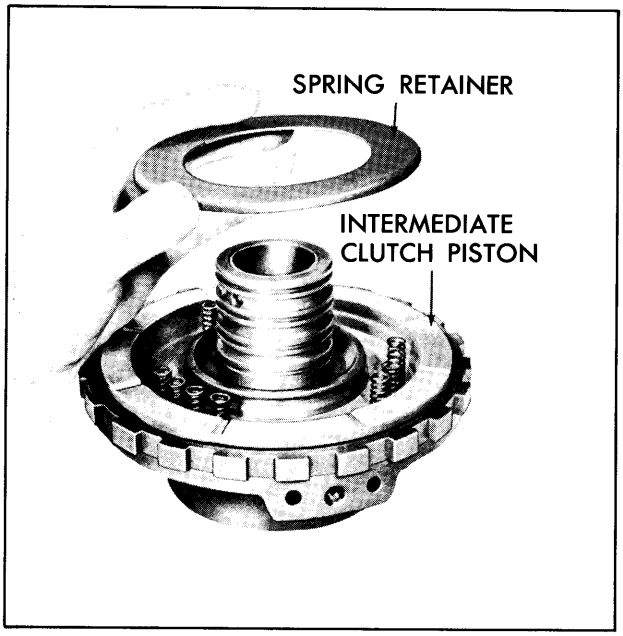


Fig. 7E-100 Removing Spring Retainer

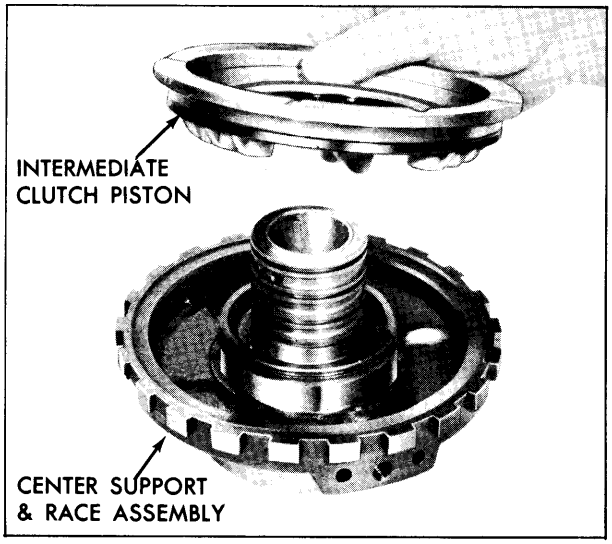


Fig. 7E-101 Removing Intermediate Clutch Piston

6. Remove and discard the outer piston seal. (Fig. 7E-103)

NOTE: Do not remove the three screws retaining the roller clutch inner race to the center support.

Inspection

1. Inspect the roller clutch inner race for scratches or indentations. Be sure the lubrication hole is open by running a tag wire through this hole. See lubrication chart (Fig. 7E-240) for location of holes.

2. Inspect the bushing for scoring, wear, or galling.

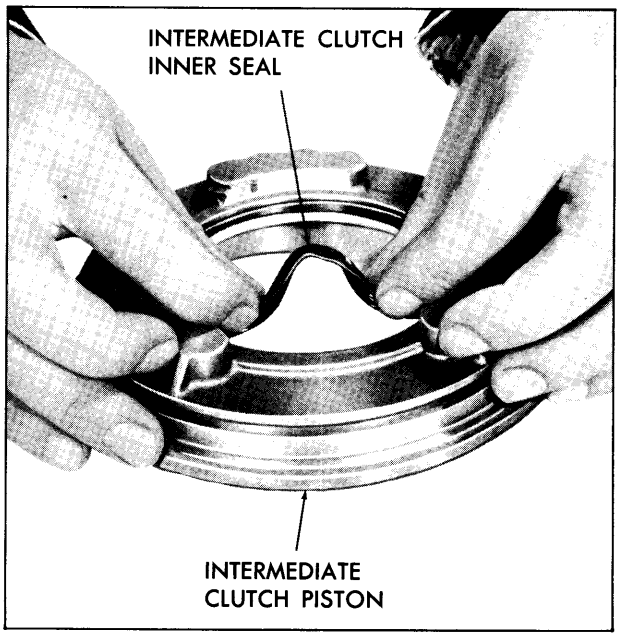


Fig. 7E-102 Removing or Installing Inner Seal

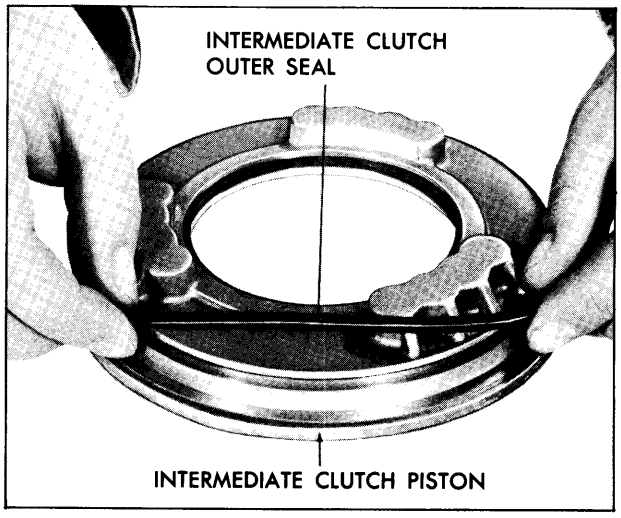


Fig. 7E-103 Removing or Installing Outer Seal

3. Check oil ring grooves for damage or excessive wear.

4. Air check the oil passages to be sure they are open and are not interconnected. See lubrication chart for location of holes. (Fig. 7E-240)

5. Inspect the piston sealing surfaces for scratches.

6. Inspect the piston seal grooves for nicks and other damage.

7. Inspect the piston for cracks or porosity.

8. Inspect the release springs for distortion or collapsed coils.

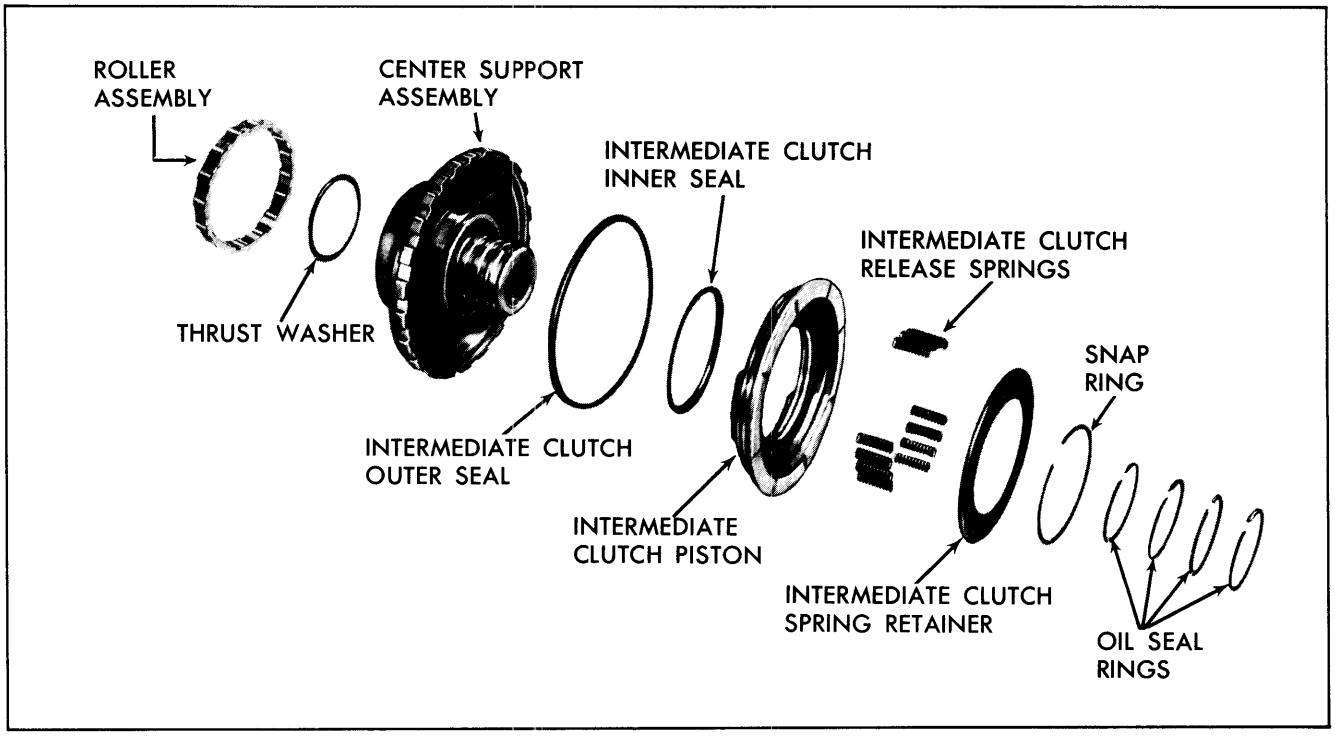


Fig. 7E-104 Center Support Assembly

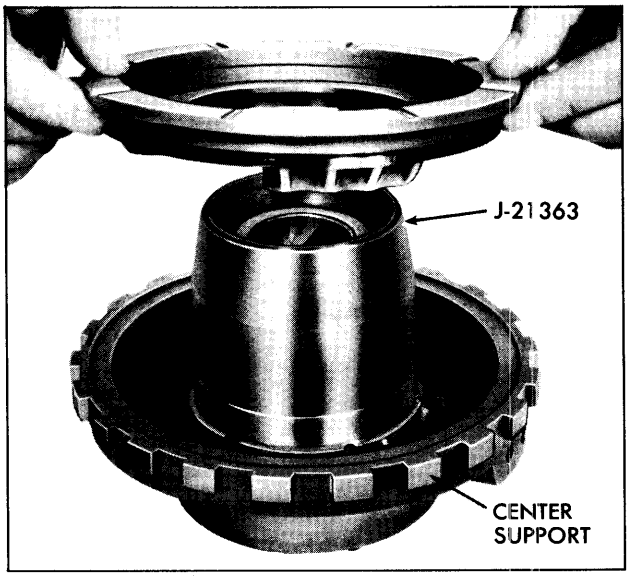


Fig. 7E-105 Installing Intermediate Clutch Piston

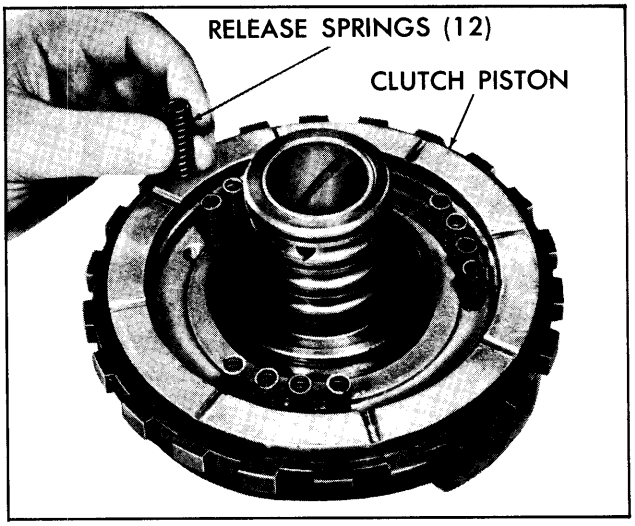


Fig. 7E-106 Installing Release Springs

Assembly (Fig. 7E-104)

1. Install new inner seal on the piston with lip of the seal facing away from the spring pocket. (Fig. 7E-102)
2. Install new outer seal with lip of seal facing away from the spring pockets. (Fig. 7E-103)

   NOTE: Apply Hydra-Matic oil to all seals before installing piston.
3. Install inner seal protector, Tool J-21363, on the center support hub. Install the piston, indexing spring pockets in drum and piston. (Fig. 7E-105)

   NOTE: Spring pocket recesses in the piston must match cast pocket in center support.
4. Install twelve release springs into the piston. Space equally during assembly. (Fig. 7E-106)
5. Place the spring retainer and snap ring over the springs. (Fig. 7E-100)
6. Using clutch compressor tools J-6129 and J-4670, compress the springs and install the snap ring. (Fig. 7E-99)

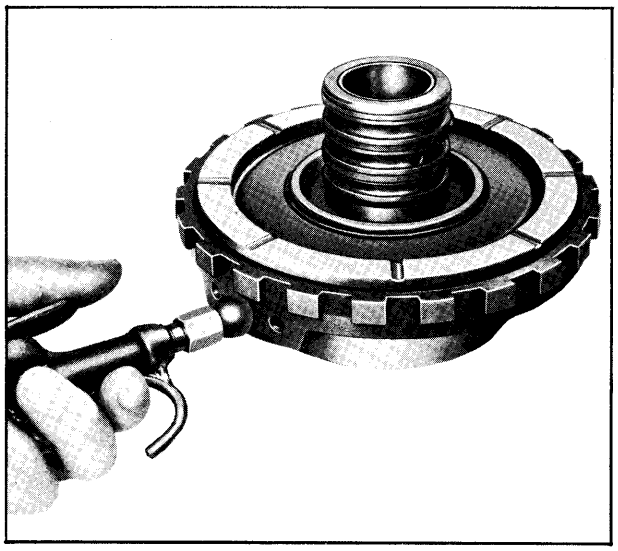


Fig. 7E-107 Air Checking Intermediate Clutch and Piston

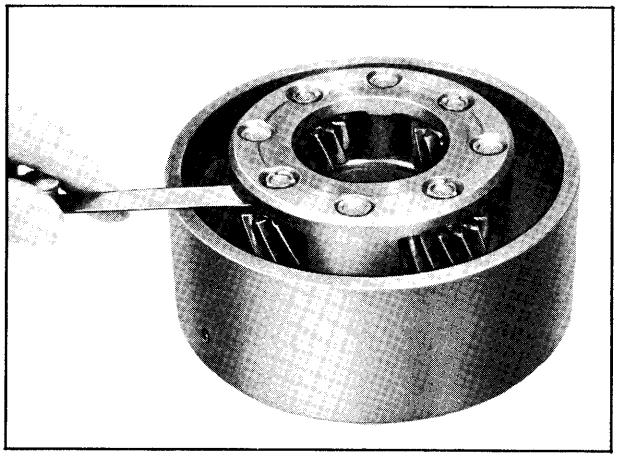


Fig. 7E-108 Checking Pinion End Play

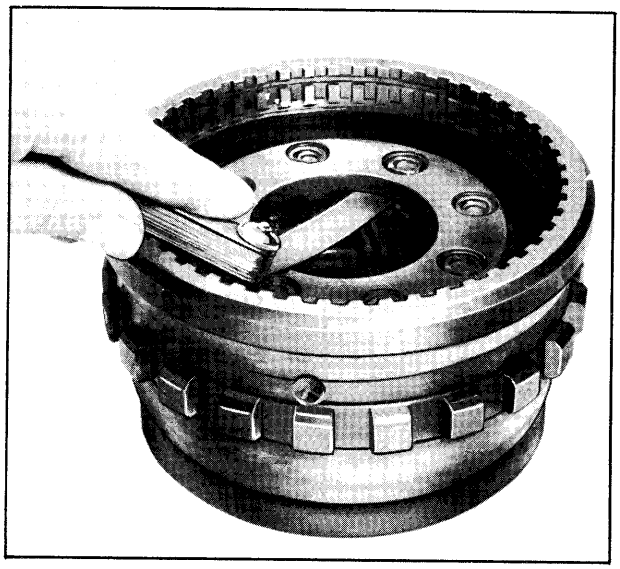


Fig. 7E-109 Checking Output Carrier Pinion End Play

7. Install four hook type oil rings. (Fig. 7E-98)

8. Air check operation of intermediate clutch and piston. (Fig. 7E-107)

REACTION CARRIER, ROLLER CLUTCH, AND OUTPUT CARRIER

Inspection

1. Inspect band surface on reaction carrier for signs of burning or scoring.

2. Inspect the roller clutch outer race for scoring or wear.

3. Inspect the thrust washer surfaces for signs of scoring or wear.

4. Inspect the bushing for damage. If bushing is damaged, the reaction carrier must be replaced.

5. Inspect the pinions for damage, rough bearings, or excessive tilt.

6. Check pinion end play. Pinion end play should be .009" to .024". (Fig. 7E-108)

7. Inspect the roller clutch for damaged members.

8. Inspect the roller cage and retaining springs for damage.

9. Inspect the front internal gear in output carrier assembly for damaged teeth.

10. Inspect the output carrier pinions for damage, rough bearings, or excessive tilt.

11. Check pinion end play. Pinion end play should be .009" to .024". (Fig. 7E-109)

12. Inspect the parking pawl lugs for cracks or damage.

13. Inspect the output locating splines for damage.

14. Inspect the front internal plastic gear ring for flaking or cracks.

PINION GEARS

Remove and Install

1. Support the carrier assembly on its front face.

2. Using a tapered punch, drive or press the pinion pins out of the carrier. (Fig. 7E-110)

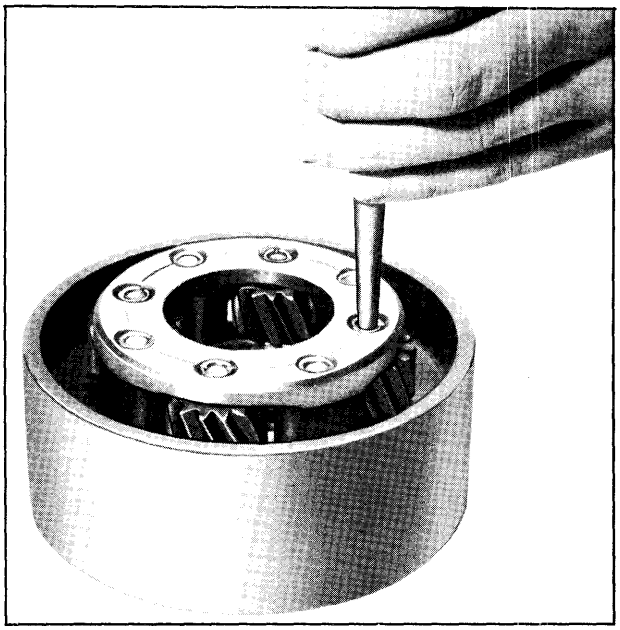


Fig. 7E-110 Removing Pinion Pins

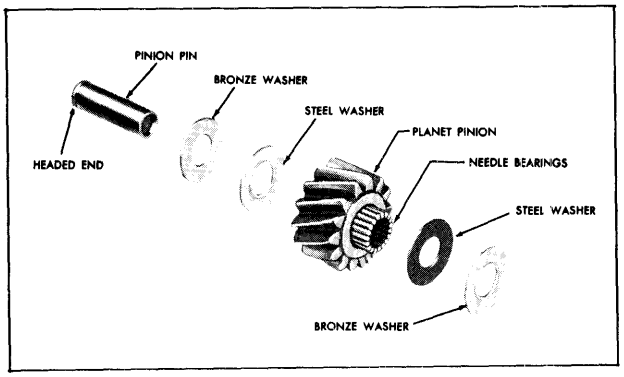


Fig. 7E-111 Planet Pinion Gears

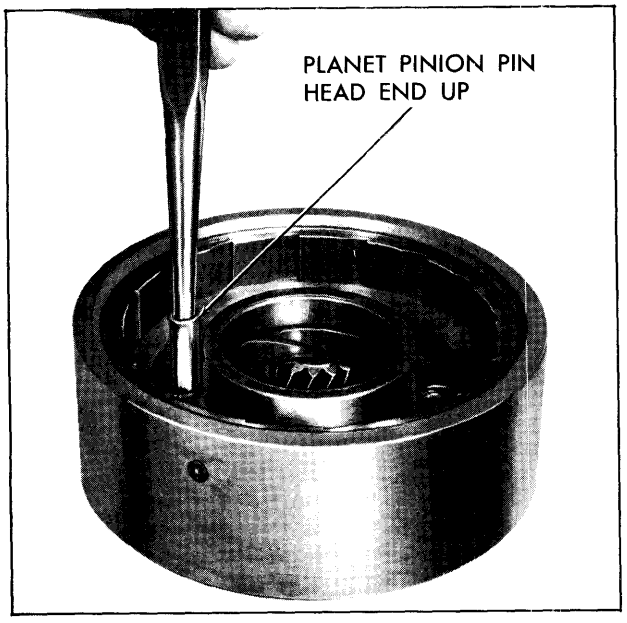


Fig. 7E-112 Installing Pinion Pin

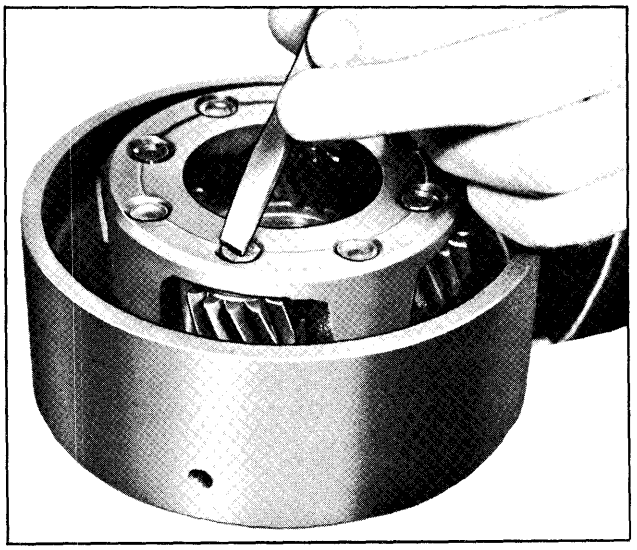


Fig. 7E-113 Staking Pinion Pin

3. Remove the pinions, thrust washers, and roller needle bearings.

4. Inspect the pinion pocket thrust faces for burrs and remove if present.

5. Install nineteen needle bearings into each pinion, using petrolatum to hold the bearings in place. Use a pinion pin as a guide. (Fig. 7E-111)

6. Place a steel and bronze washer on each side of pinion so steel washer is against pinion. Hold in place with petrolatum.

7. Place the pinion assembly in position in the carrier and install a pilot shaft through the rear face of the assembly to hold the parts in place.

8. Drive a new pinion pin into place while rotating pinion from the front. Be sure that the headed end is flush or below the face of the carrier. (Fig. 7E-112)

9. Place a large punch in a bench vise to be used as an anvil while staking the opposite end of the pinion pin in three places. (Fig. 7E-113)

NOTE: Both ends of the pinion pins must lie below the face of the carrier or interference may occur.

Output Flange

Inspection

1. Inspect the bushing for wear or galling.

2. Inspect the governor drive gear for rough or damaged teeth.

3. Inspect the drive lugs for damage.

Rear Internal Gear

1. Inspect the gear teeth for damage or wear.
2. Inspect the splines for damage.
3. Inspect the gear for cracks.

Sun Gear

1. Inspect the gear teeth for damage or wear.
2. Inspect splines for damage.
3. Be sure oil lubrication hole is open. See lubrication chart (Fig. 7E-240) for location of holes.

Sun Gear Shaft

1. Inspect shaft for cracks or splits.
2. Inspect splines for damage.
3. Inspect bushings for scoring or galling.
4. Inspect the ground bushing journals for damage.
5. Be sure the oil lubrication holes are open. See lubrication (Fig. 7E-240) chart for location of holes.

Mainshaft

1. Inspect the shaft for cracks or distortion.
2. Inspect the splines for damage.
3. Inspect the ground bushing journals for damage.
4. Inspect the snap ring groove for damage.
5. Inspect the orificed cup plug pressed into one end of mainshaft. Be sure it is not plugged by running a tag wire through the orifice hole.

GEAR UNIT (Fig. 7E-114)

Assembly

1. Install rear internal gear on end of mainshaft and install snap ring. (Fig. 7E-115)
2. Install the sun gear to internal gear thrust races and bearings against the inner face of the rear internal gear as follows: (Retain with petrolatum). (Fig. 7E-116)
   a. Place the large race against the internal gear with O.D. flange facing rearward or up.
   b. Place the thrust bearing against the race.
   c. Place the small race against the bearing with the inner flange facing into the bearing or down.

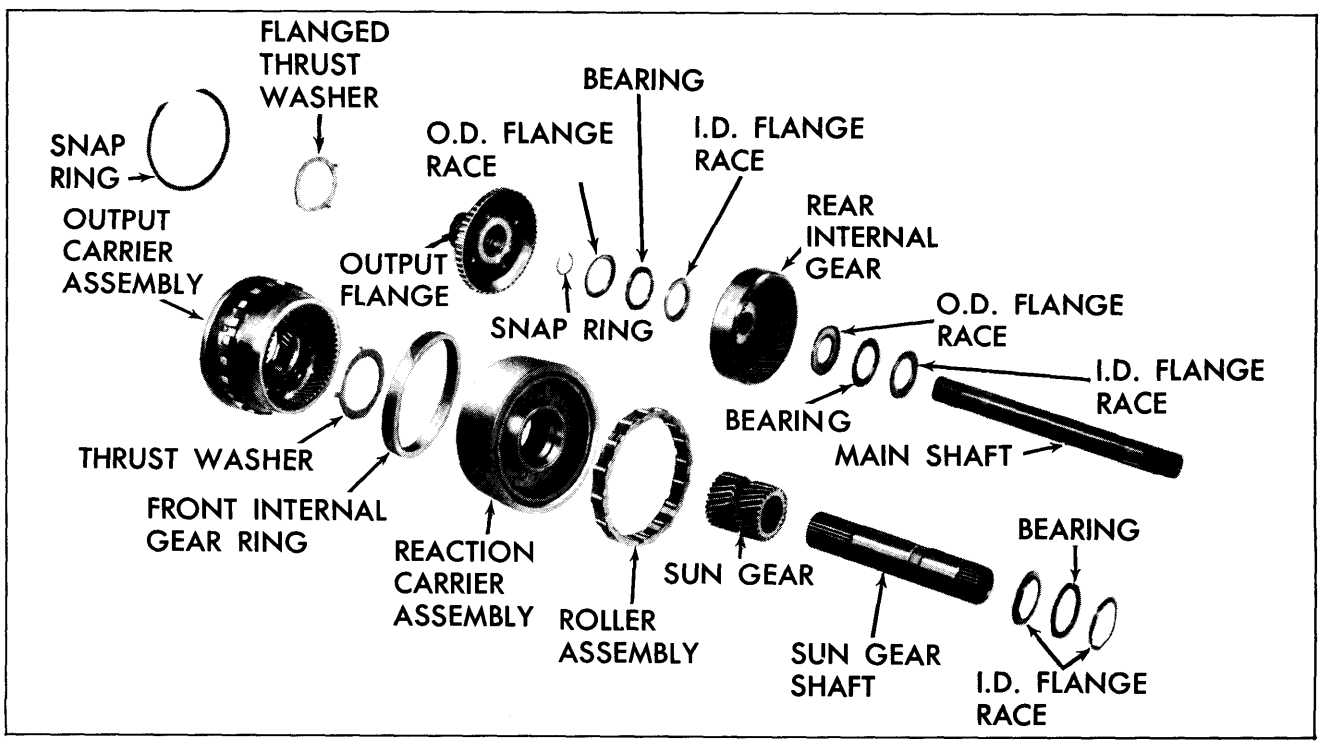


Fig. 7E-114 Gear Unit

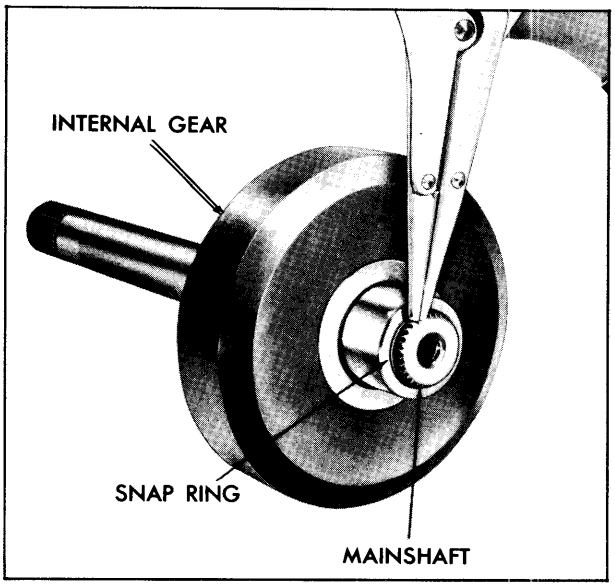


Fig. 7E-115 Installing Snap Ring

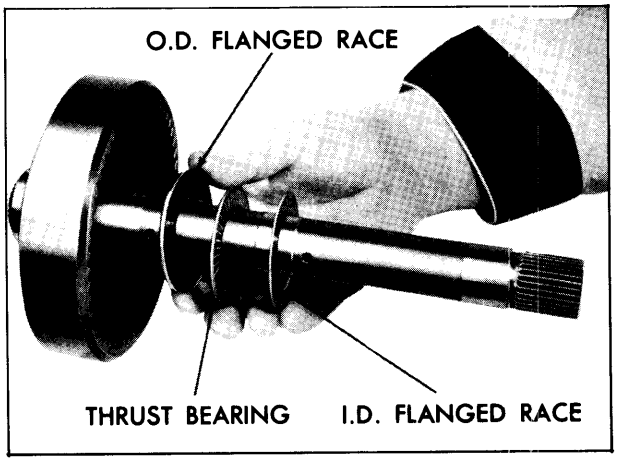


Fig. 7E-116 Installing Thrust Bearing and Races

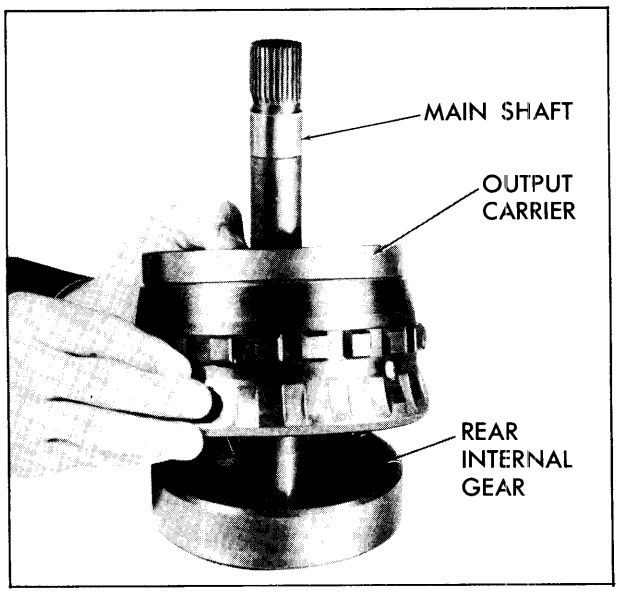


Fig. 7E-117 Installing Output Carrier

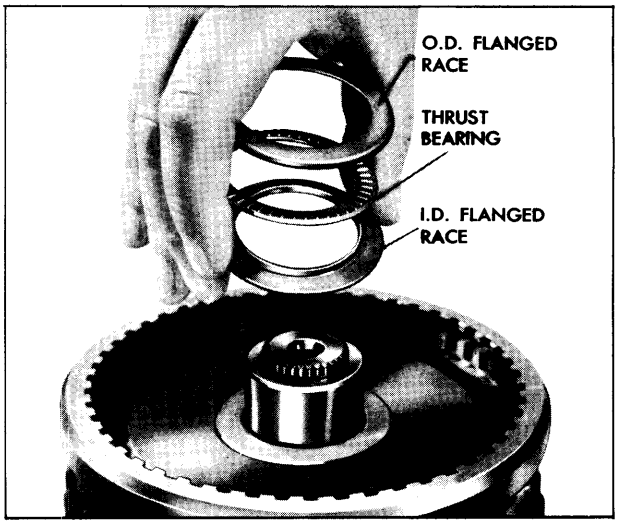


Fig. 7E-118 Installing Thrust Bearing and Races

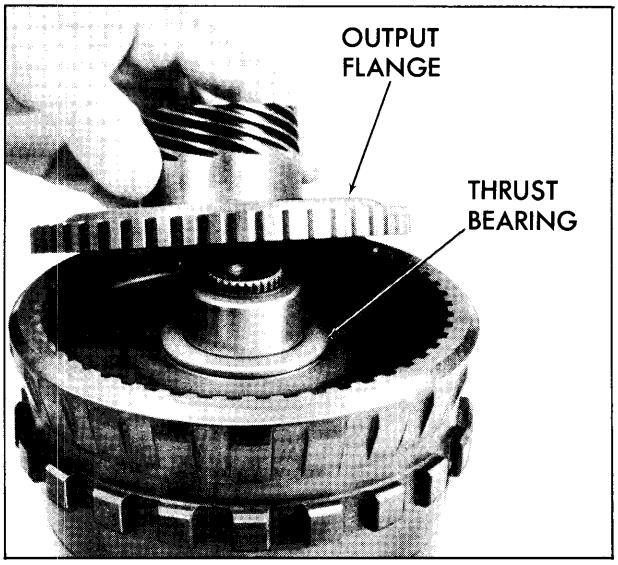


Fig. 7E-119 Installing Output Flange

4. Install the output carrier over the mainshaft so that the pinions mesh with the rear internal gear. (Fig. 7E-117)

5. Place the above portion of the build-up through hole in bench so that the mainshaft hangs downward.

6. Install the rear internal gear to output flange thrust races and bearings as follows: (Retain with petrolatum). (Fig. 7E-118)

   a. Place the small diameter race against the internal gear with the center flange facing up.

   b. Place the bearing on the race.

   c. Place the second race on the bearing with the outer flange cupped over the bearing.

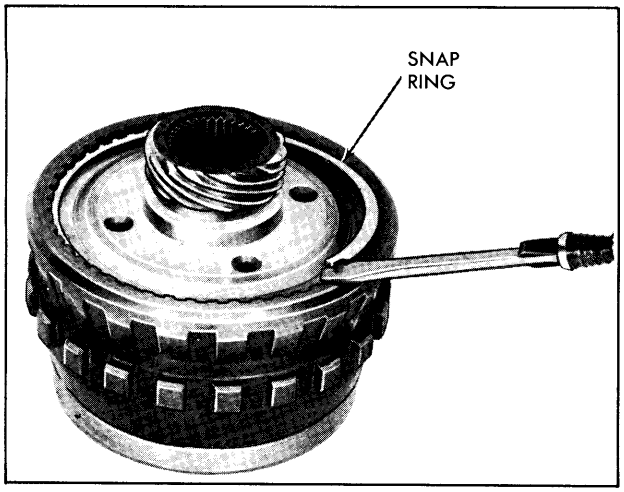


Fig. 7E-120 Installing Snap Ring

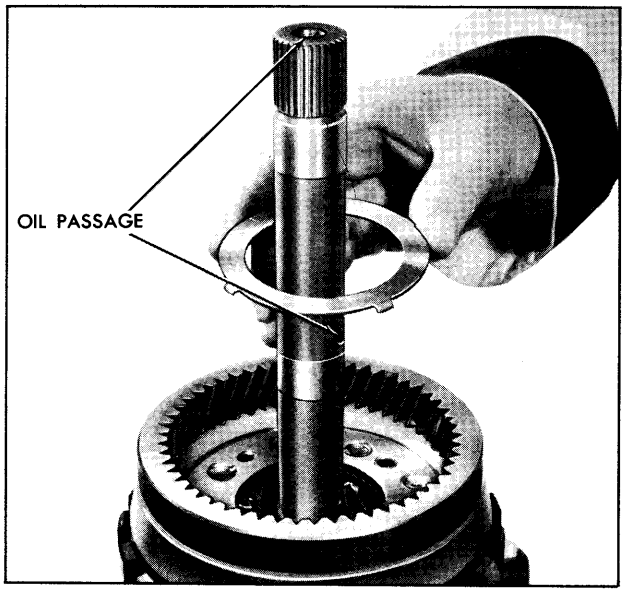


Fig. 7E-121 Installing Thrust Washer

7. Install the output flange into the output carrier assembly. (Fig. 7E-119)

8. Install the output flange to the output carrier snap ring bevel side up. (Fig. 7E-120)

9. Turn assembly over and support so that the output flange faces downward.

10. Install the reaction carrier to output carrier plastic thrust washer with the tabs facing down into pockets. (Fig. 7E-121)

11. Install the sun gear with chamfer end down. (Fig. 7E-122)

12. Install the plastic ring over the output carrier. (Fig. 7E-123)

13. Install the reaction carrier. (Fig. 7E-124)

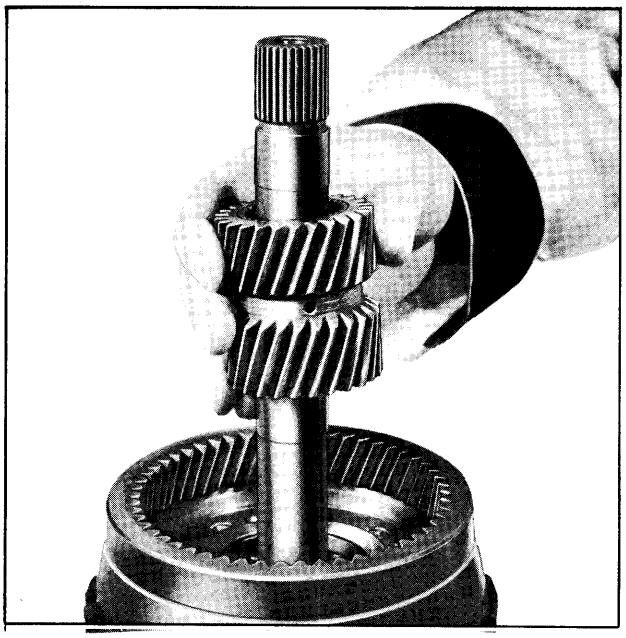


Fig. 7E-122 Installing Sun Gear

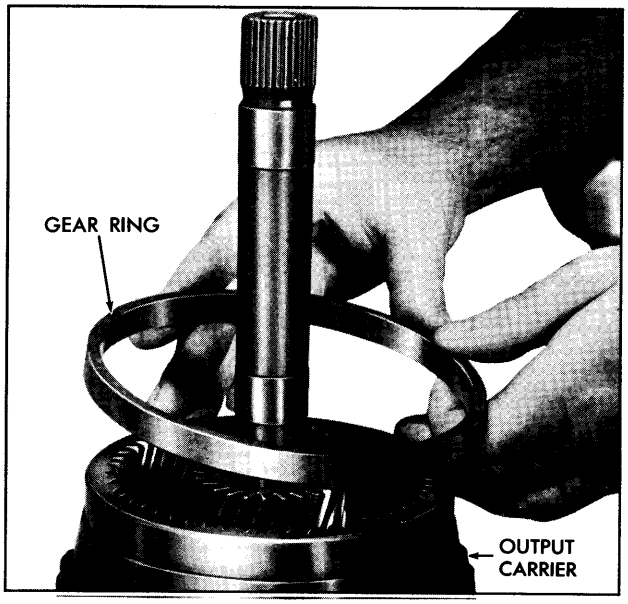


Fig. 7E-123 Installing Gear Ring

14. Install sun gear shaft.

15. Install the center support to sun gear thrust races and bearings as follows: (Fig. 7E-125)
    a. Install the large race, center flange up over the sun gear shaft.
    b. Install the thrust bearing against the race.
    c. Install the second race, center flange up.

16. Install the center support to reaction carrier phenolic thrust washer into the recess in the center support. (Fig. 7E-126)

17. Install the roller clutch assembly into reaction carrier. (Fig. 7E-127)

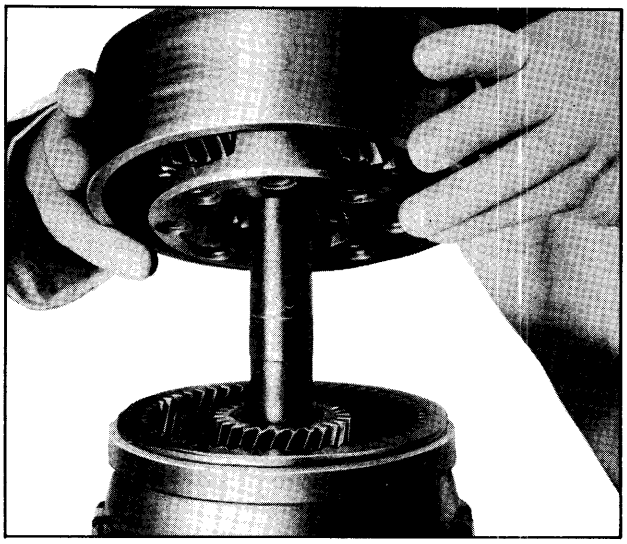


Fig. 7E-124 Installing Reaction Carrier

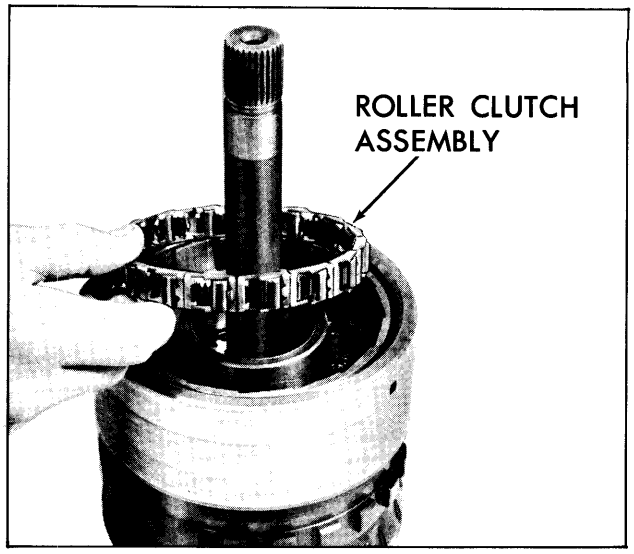


Fig. 7E-127 Installing Roller Clutch

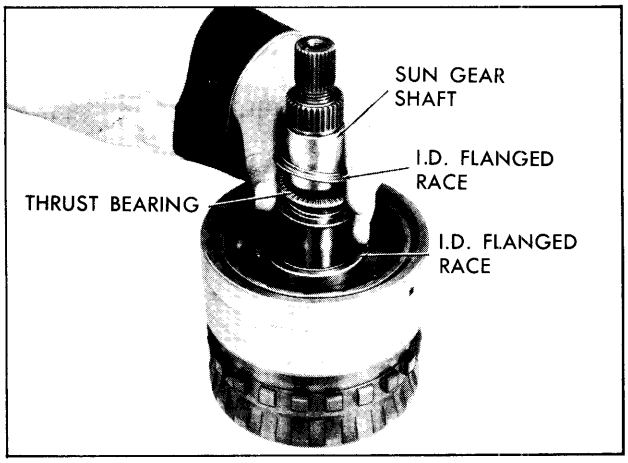


Fig. 7E-125 Installing Sun Gear Thrust Washers

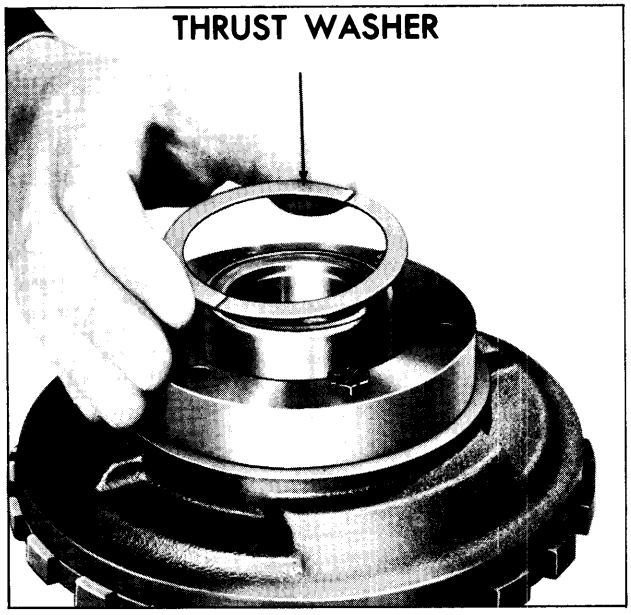


Fig. 7E-126 Installing Thrust Washers

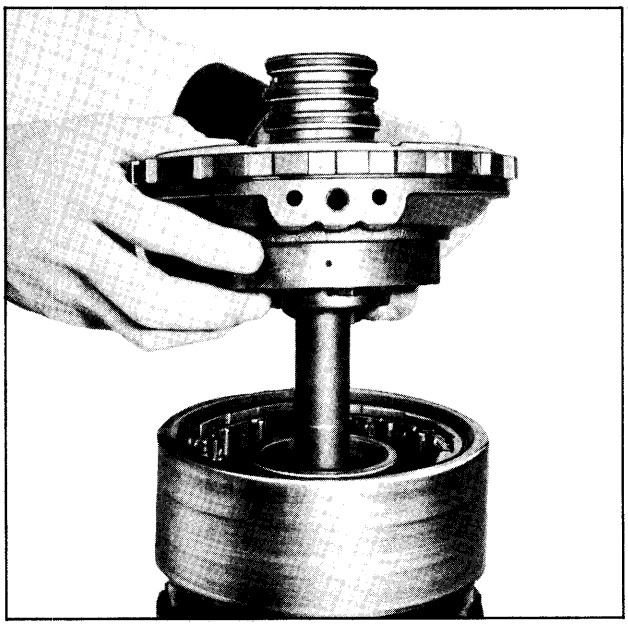


Fig. 7E-128 Installing Center Support

18. Install the case center support into roller clutch assembly. (Fig. 7E-128)

    NOTE: With reaction carrier held, case support should only turn clockwise.

19. Install thrust washer, output flange to case selective thrust, tabs in pockets. (Fig. 7E-129)

INSPECTION

Front and Rear Bands

1. Inspect the lining for cracks, flaking, burning, or looseness.

2. Inspect the bands for cracks or distortion.

3. Inspect the end for damage at the anchor lugs or apply lugs.

Modulator and Valve

1. Inspect the modulator assembly for any signs of bending, distortion, or presence of water or oil.

2. Inspect the "O" ring seal seat for damage.

3. Apply suction to the vacuum tube and check for diaphragm leaks.

4. Inspect the modulator valve for nicks or damage.

5. Inspect case bushing for nicks or scoring.

6. Check freeness of valve operation in case bushing bore.

7. Check modulator bellows, modulator plunger is under pressure (16 lbs.). If bellows are damaged the plunger will have very little pressure.

Manual and Parking Linkage

1. Inspect the parking actuator rod for cracks, damage, or broken spring retainer lugs.

2. Inspect the actuator spring for damage.

3. Inspect actuator for a free fit on the actuator rod.

4. Inspect the parking pawl for cracks or wear.

5. Inspect the manual shaft for damaged threads, rough oil seal groove or loose lever.

6. Inspect the inside detent lever for cracks or a loose pin.

7. Inspect the parking pawl shaft for damaged retainer grooves, or rough surface.

8. Inspect the parking pawl return spring for deformed coils or ends.

9. Inspect the parking bracket for cracks or wear.

10. Inspect the detent roller and spring assembly.

Case

1. Inspect case assembly for cracks, porosity, or interconnected passage. Air can be blown through passages to determine if they are interconnected. See lubrication chart (Fig. 7E-240) for location of passages.

2. Check for good retention of band anchor pins.

3. Inspect all threaded holes for thread damage.

4. Inspect the intermediate clutch driven plate lugs for damage or brinelling.

5. Inspect the snap ring grooves for damage.

6. Inspect the bore of the governor assembly for scratches or scoring.

7. Inspect the modulator bushing bore for scoring or damage.

8. Inspect the pressure regulator bore for scoring or damage.

Converter

1. Check converter for cracks or broken welds.

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

REAR SERVO

Disassembly

1. Remove the rear accumulator piston from rear servo piston. (Fig. 7E-130)

2. Remove E-ring retaining rear servo piston to band apply pin. (Fig. 7E-131)

3. Remove rear servo piston and seal from band apply pin.

4. Remove washer, spring and retainer.

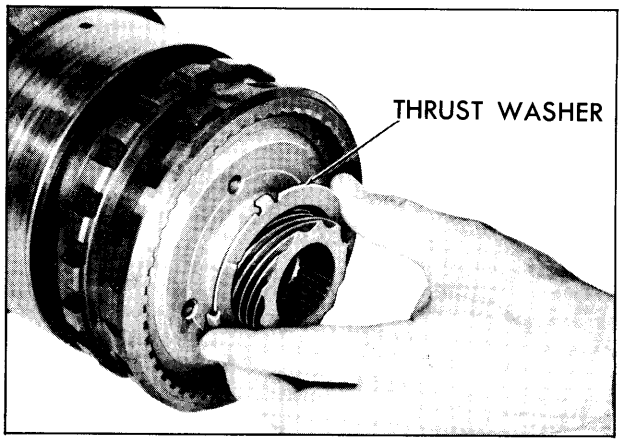


Fig. 7E-129 Installing Thrust Washer

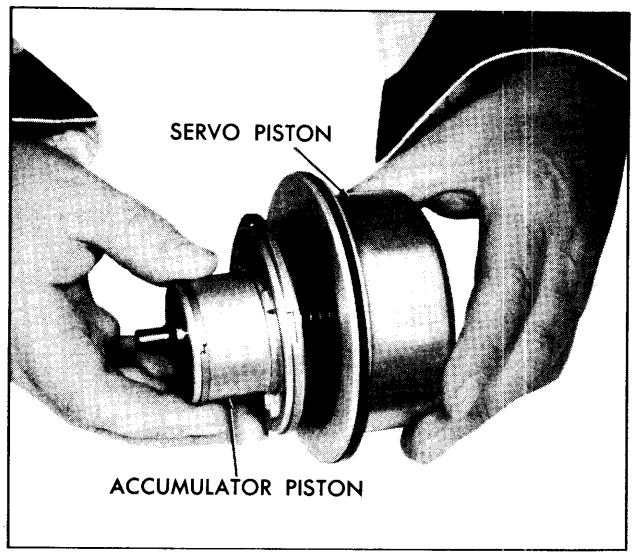


Fig. 7E-130 Removing Accumulator Piston

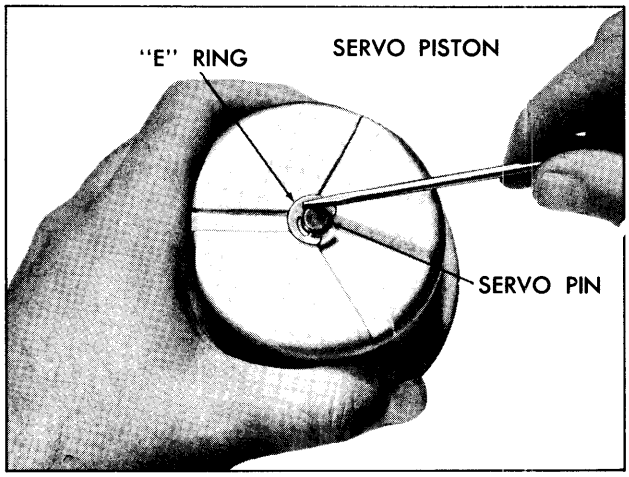


Fig. 7E-131 Removing "E" Ring

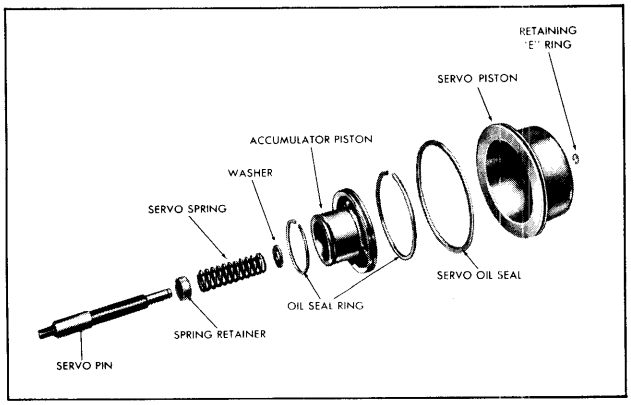


Fig. 7E-132 Rear Servo and Accumulator

Inspection

1. Inspect freedom of accumulator ring in piston.

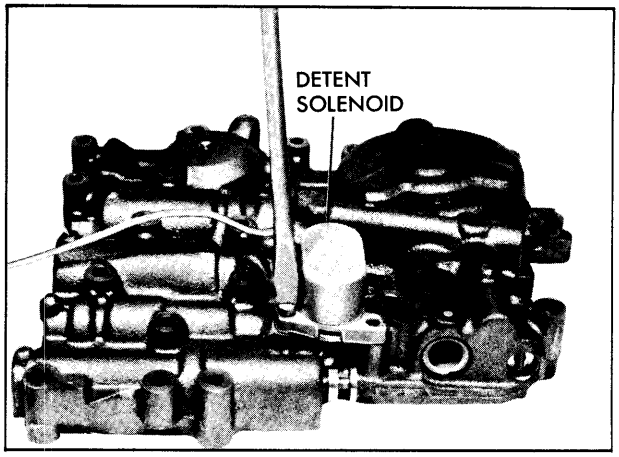


Fig. 7E-133 Removing Detent Solenoid

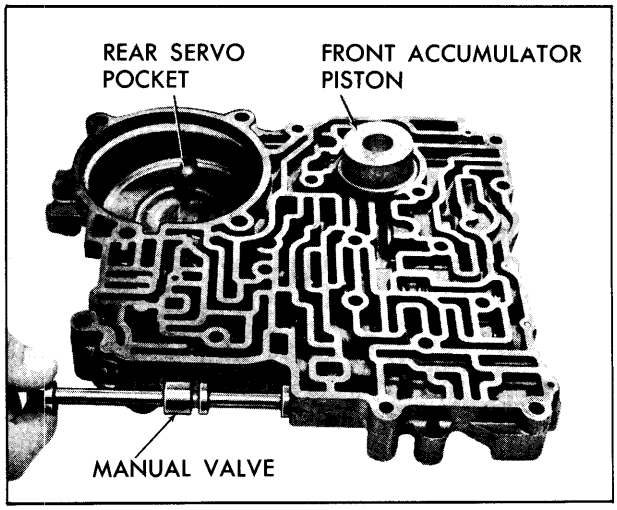


Fig. 7E-134 Removing Manual Valve

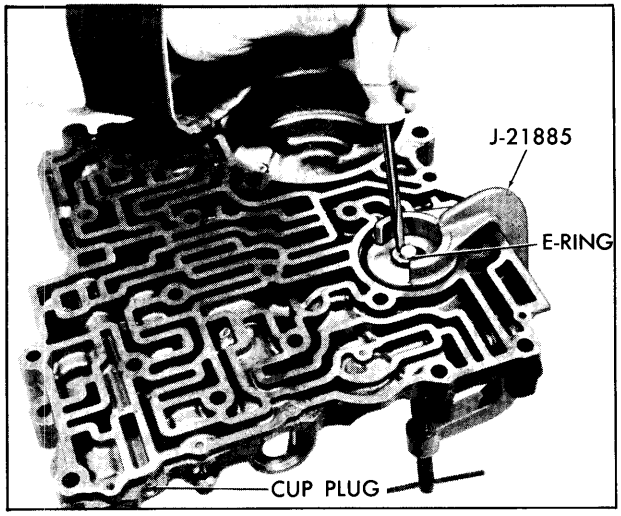


Fig. 7E-135 Removing Front Accumulator Piston

2. Pick up proper band apply pin determined by band apply pin selection check.

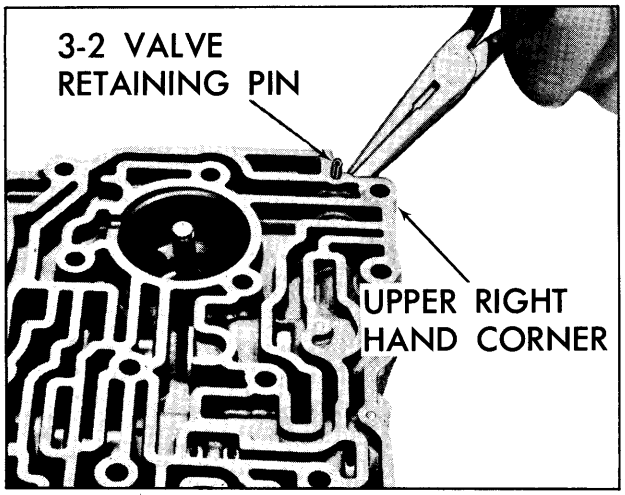


Fig. 7E-136 Removing 3-2 Valve Retaining Pin

3. Inspect fit of band apply pin in servo piston.
4. Inspect band apply pin and servo piston for scores and cracks.

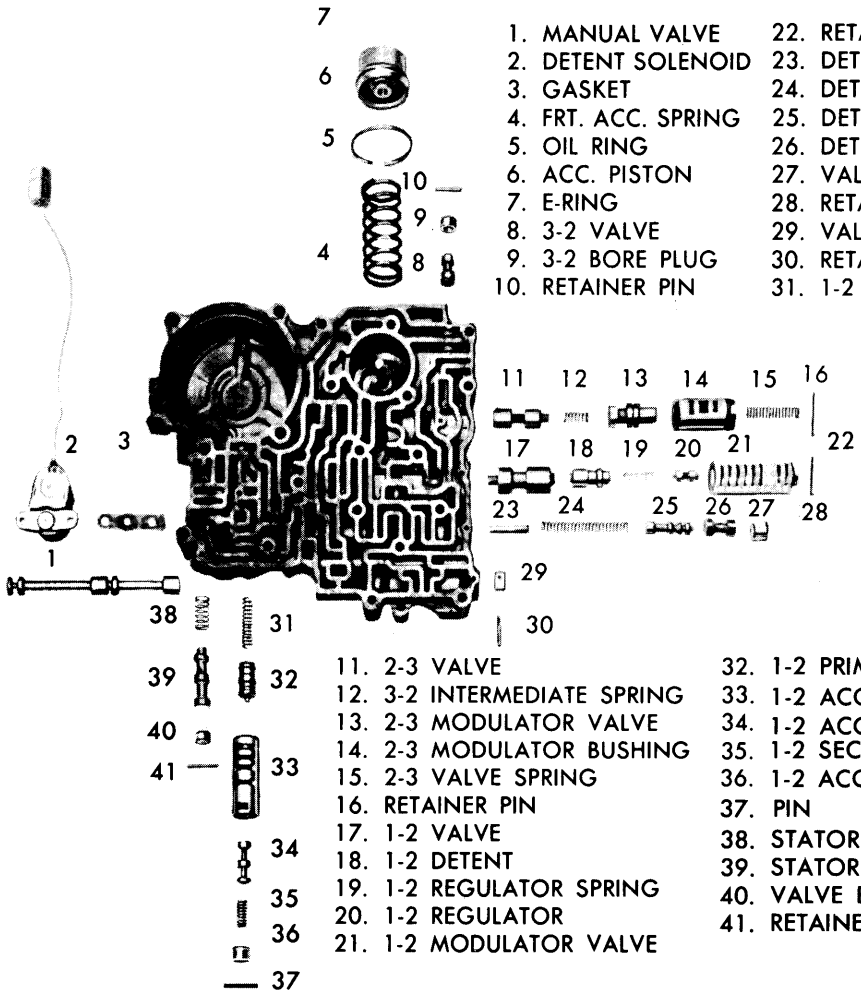
Assembly

1. Install spring retainer, cup end first; spring and washer on band apply pin. (Fig. 7E-132)
2. Install band apply piston and secure with E-ring. (Fig. 7E-131)
3. If removed, install oil seal ring on servo piston.
4. If removed, install outer and inner oil rings on accumulator piston. Assemble into bore of servo piston.

FRONT SERVO

Inspection

1. Inspect servo pin for damage. Roll pin on a flat surface to determine the straightness of pin.
2. Inspect piston for damaged oil ring groove. Check freedom of ring in groove.



1. MANUAL VALVE
2. DETENT SOLENOID
3. GASKET
4. FRT. ACC. SPRING
5. OIL RING
6. ACC. PISTON
7. E-RING
8. 3-2 VALVE
9. 3-2 BORE PLUG
10. RETAINER PIN
11. 2-3 VALVE
12. 3-2 INTERMEDIATE SPRING
13. 2-3 MODULATOR VALVE
14. 2-3 MODULATOR BUSHING
15. 2-3 VALVE SPRING
16. RETAINER PIN
17. 1-2 VALVE
18. 1-2 DETENT
19. 1-2 REGULATOR SPRING
20. 1-2 REGULATOR
21. 1-2 MODULATOR VALVE
22. RETAINER PIN
23. DETENT REGULATOR PIN
24. DETENT REGULATOR SPRING
25. DETENT REGULATOR
26. DETENT
27. VALVE BORE PLUG
28. RETAINER PIN
29. VALVE BORE PLUG
30. RETAINER PIN
31. 1-2 PRIM. ACCUM. SPRING
32. 1-2 PRIMARY ACCUMULATOR VALVE
33. 1-2 ACCUM. VALVE BUSHING
34. 1-2 ACCUMULATOR VALVE
35. 1-2 SECONDARY ACCUM. SPRING
36. 1-2 ACCUM. VALVE PLUG
37. PIN
38. STATOR VALVE SPRING
39. STATOR VALVE
40. VALVE BORE PLUG
41. RETAINER PIN

Fig. 7E-137 Valve Body Assembly

3. Inspect piston for cracks or porosity.
4. Check fit of servo pin in piston.

GOVERNOR ASSEMBLY

All components of the governor assembly, with the exception of the driven gear, are select fit. Each assembly is factory calibrated. The governor, including the driven gear and cover is serviced as a complete assembly.

CONTROL VALVE (Fig. 7E-137)

Disassembly

NOTE: As each valve train is removed, place the individual valve train in a separate location relative to its position in the valve body. Also, place each part of each valve train in the order that it is removed from the valve bore. None of the valves or springs are interchangeable. Keep them in the proper valve train.

1. Remove two detent solenoid to valve assembly attaching screws. (Fig. 7E-133)
2. Remove detent solenoid and solenoid gasket. Discard gasket.
3. Position valve assembly with lapped face up so that the servo bore and the front accumulator piston are away from the operator.
4. Remove manual valve from closest bore. (Fig. 7E-134)
5. Use a No. 1 easy-out and remove retaining pin and plug from manual bore.
6. Install available compressor Tool J-21885 on front accumulator piston and remove retaining E-ring. (Fig. 7E-135)
7. Release Tool J-21885 and remove the tool, the front accumulator piston, and spring from valve assembly.
8. Using a pair of needle nose pliers, compress the bore plug and remove the retaining pin from the 3-2 valve bore located in the extreme upper right hand corner of the valve assembly. (Fig. 7E-136)
9. Remove the bore plug and the 3-2 valve from the valve assembly.
10. Remove the retaining pin from the 2-3 valve train bore located directly below and at a right angle to the 3-2 valve.
11. Remove the 2-3 modulator bushing, 2-3 modulator valve and spring, the 3-2 intermediate spring, and the 2-3 valve.
12. Remove the retaining pin from the 1-2 valve bore located directly below the 2-3 valve train bore.
13. Remove the 1-2 modulator valve bushing, 1-2 regulator valve and spring, 1-2 detent valve, and the 1-2 valve.
14. Remove the retaining pin from the detent regulator bore located directly below the 1-2 valve bore.
15. Remove the bore plug, detent valve, detent regulator valve, detent regulator pin and spring.
16. Remove retaining pin from the stator valve bore located in the extreme lower left hand corner of the valve assembly.
17. Remove the bore plug, stator valve, and spring.
18. Remove the 1-2 accumulator bushing retaining pin and bore plug from the hole located to the right of the stator valve.
19. Remove 1-2 accumulator valve bushing, 1-2 accumulator valve and secondary spring, 1-2 accumulator primary valve, and spring.

Inspection (Fig. 7E-137)

1. Thoroughly wash and clean valve body in a clean solvent to remove the oil.
2. Inspect valve body for cracked lands in the valve port areas, scratches or porosity in bores, nicks on the machined face, and cracks, scratches, nicks or distortion in the servo bores.
3. Inspect front servo pin for scoring, cracks, and damage to the E-ring groove.
4. Inspect the valves for scoring, cracks, and squareness of corner shoulders.

   NOTE: Valve corners should be sharp and square.

5. Inspect bushings for galling, scratches, or distortion.
6. Check all springs for distortion or collapsed coils.

Assembly (Fig. 7E-137)

1. Install the 1-2 accumulator primary spring in 1-2 primary valve and install both, spring end first, into bore, using a retaining pin as a temporary retainer to hold the spring and valve in its operating position until the bushing assembly is installed. Pin goes into first drilled hole in port. (Fig. 7E-138)
2. Install the 1-2 accumulator secondary valve (wide land first) into the 1-2 accumulator bushing.
3. Install the 1-2 accumulator valve bushing into the bore, align the square port on the end of the bushing with the hole for the retaining pin.

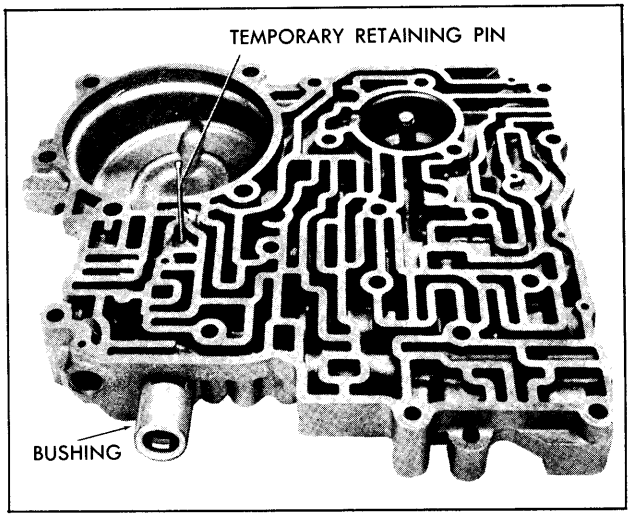


Fig. 7E-138 Temporary Retaining Pin Installation

4. Install the 1-2 secondary accumulator valve spring and 1-2 accumulator plug into the bushing.
5. Install grooved retaining pin, with the grooves entering the pin hole last, and tap with a hammer until flush with the cast surface of the valve body.
6. Install spring, stator valve (stem end first), bore plug, and retaining pin into stator valve bore.
7. Install spring, detent regulator pin, detent regulator valve (flat end first), detent valve (flat end first), bore plug, and retaining pin into detent bore. (Compress spring with screwdriver to aid installation of detent valve into the valve body).
8. Install 1-2 valve into 1-2 valve bore, long stem end first.
9. Install 1-2 regulator valve, spring, and 1-2 detent valve into 1-2 modulator valve bushing.
10. Install 1-2 modulator valve bushing assembly into 1-2 valve bore and install retaining pin into valve body.
11. Install the 2-3 valve (flat end first) into 2-3 bore. Install 3-2 intermediate spring on stem end of 2-3 valve.
12. Install 2-3 modulator into 2-3 modulator bushing and install 2-3 modulator bushing (large diameter hole first) into valve body.
13. Install 2-3 valve spring and retaining pin into valve bore.
14. Install 3-2 valve (either end first) into 3-2 valve bore.
15. Install valve bore plug and retaining pin into valve body.
16. Using Tool J-21885, install front servo spring, front servo piston, and retaining E-ring into front accumulator piston pocket.
17. Install detent solenoid gasket, detent solenoid, and attaching screws on reverse side of valve body assembly.
18. Check all valve trains to see that they are operating freely by compressing the valves on the springs.
19. Install manual bore plug and retaining pin.
20. Install manual valve into manual bore.

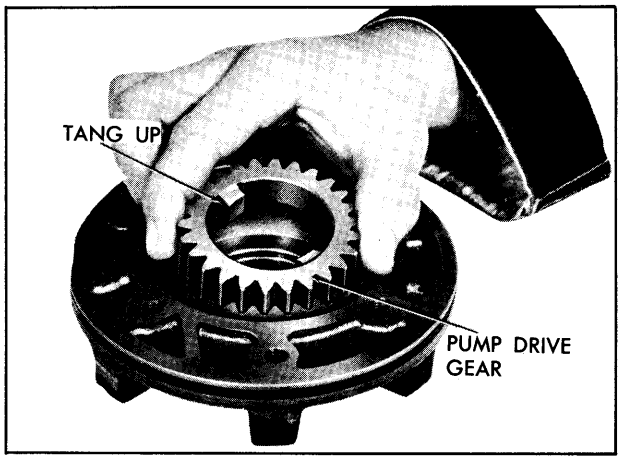


Fig. 7E-139 Removing or Installing Pump Drive Gear

OIL PUMP

Disassembly

1. Mark gears for reassembly and remove drive gear from pump body. (Fig. 7E-139)

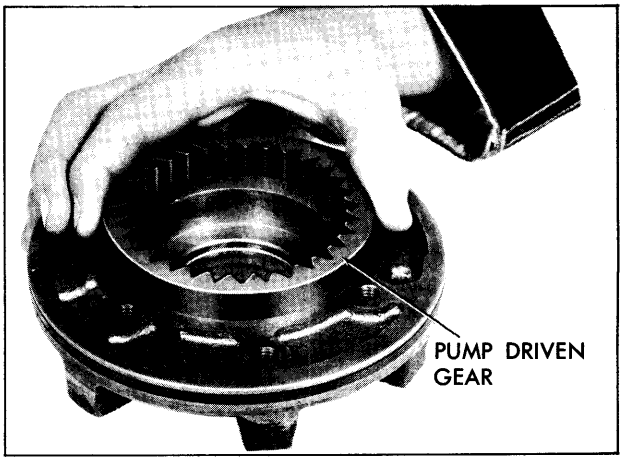


Fig. 7E-140 Removing or Installing Pump Driven Gear

2. Remove driven gear from pump body. (Fig. 7E-140)
3. Remove and discard pump body to case "O" ring seal. (Fig. 7E-141)

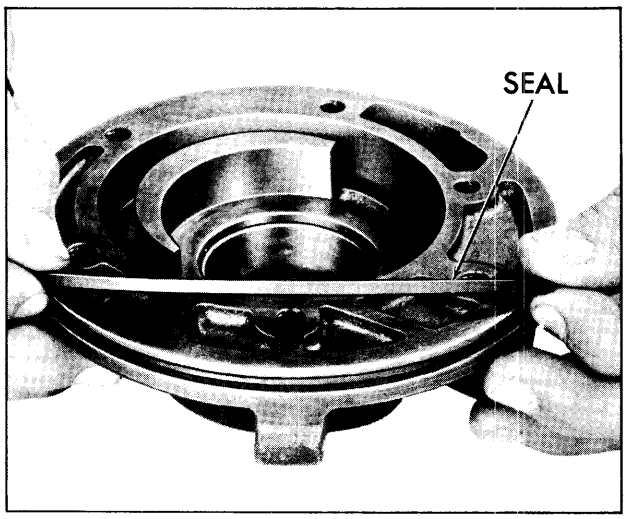


Fig. 7E-141 Removing or Installing Pump to Case Seal

Inspection

1. Using tip of finger, inspect gear pocket and crescent for nicks, burrs, scoring or galling.
2. Inspect drive gear for nicks, burrs, scoring, or galling.
3. Inspect driven gear for nicks, burrs, scoring, or galling.
4. Place pump gears in pump body and check the following gear face to pump face clearances.
   a. Pump body face to gear face can be checked by placing a dial indicator on the J-8619-11 gauge and reading the flatness between the pump face and the pump gears. End clearance should be .0008" to .0015". (Fig. 7E-142)

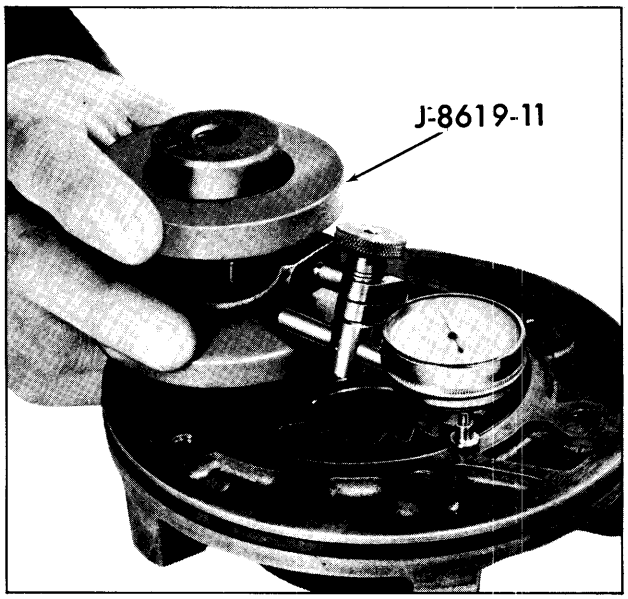


Fig. 7E-142

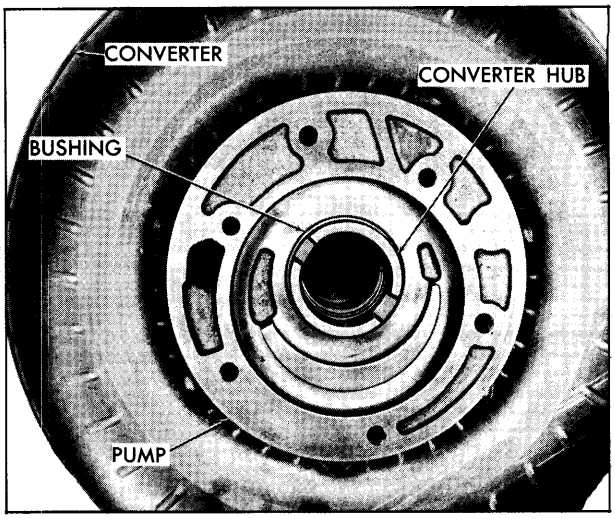


Fig. 7E-143 Checking Bushing Runout

5. Check face of pump body for nicks, burrs, scoring, or galling.
6. Check pump body face flatness. Overall flatness should be .000" to .002". Use J-8619-11.
7. Inspect bushing for nicks, burrs, scoring, galling, out-of-round, or excessive wear.
   a. To check for out-of-round, install pump body on the converter hub and look for eccentricity between pump bushing and converter hub. (Fig. 7E-143)
8. Check for damaged pump cover plate bolt holes.
9. Inspect front seal for damage. If replacement of front seal is necessary, use a standard 3/4" cold chisel and pry front seal from pump body. (Fig. 7E-144)

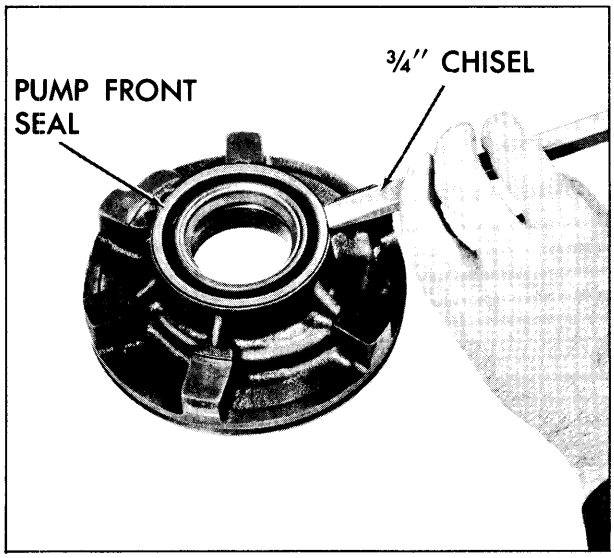


Fig. 7E-144 Removing Front Seal

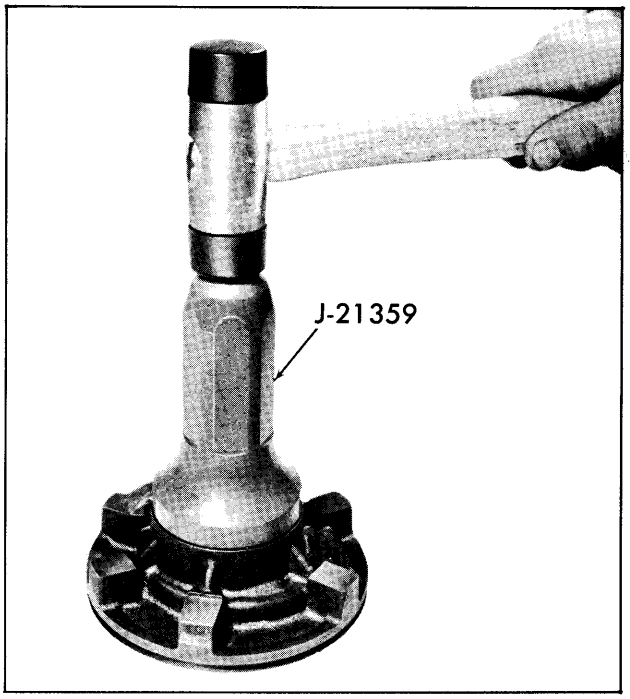


Fig. 7E-145 Installing Front Seal

Assembly

1. If necessary, install a new front seal, using Tool J-21359 to drive the seal in place. Use Sealer Part No. 1050026 on outside of seal before installing into pump. (Fig. 7E-145)

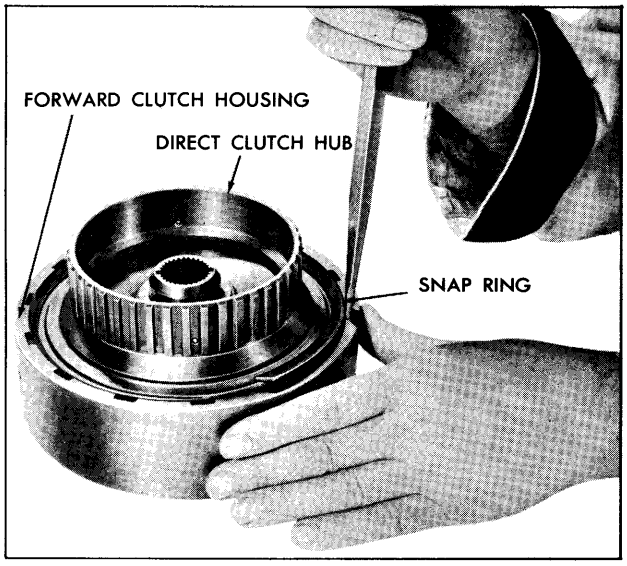


Fig. 7E-146 Removing Snap Ring

2. Install the driven gear into the pump body. (Fig. 7E-140)
3. Install the drive gear into the pump body with drive tangs up. (Fig. 7E-139)

   NOTE: The drive gear should always be installed with the counterbore down.

4. Install the new pump to case "O" ring seal. (Fig. 7E-141)

FORWARD CLUTCH

Disassembly

1. Place forward clutch on bench. Remove the forward clutch housing to direct clutch hub snap ring. (Fig. 7E-146)

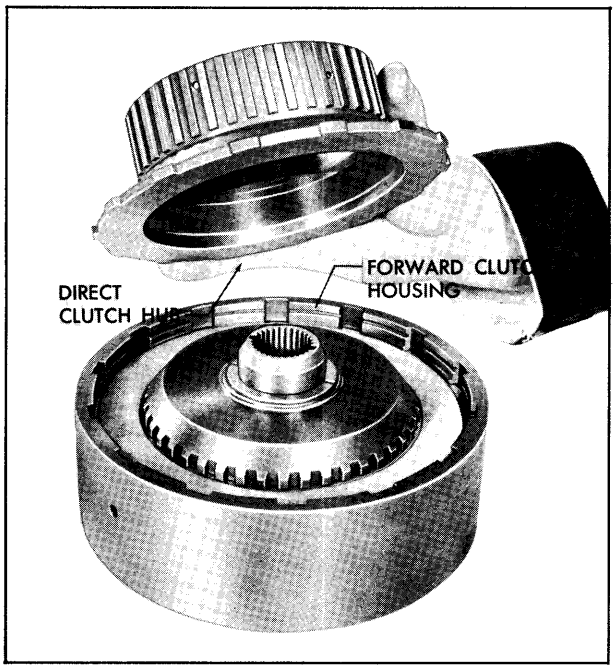


Fig. 7E-147 Removing Direct Clutch Hub

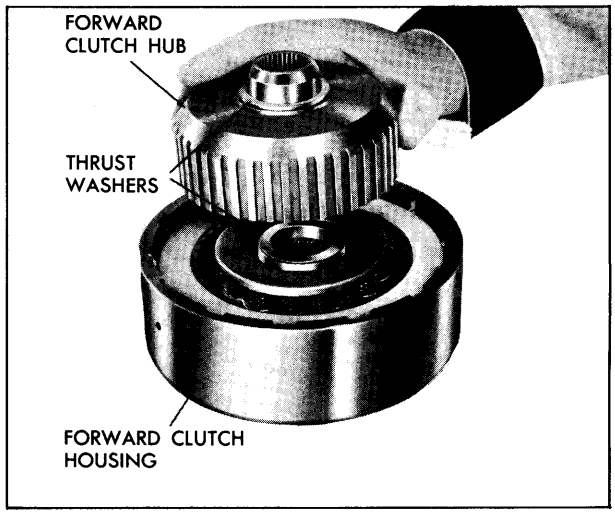


Fig. 7E-148 Removing Forward Clutch Hub and Thrust Washers

2. Remove the direct clutch hub. (Fig. 7E-147)
3. Remove the forward clutch hub and thrust washers. (Fig. 7E-148)
4. Remove five composition, five steel clutch

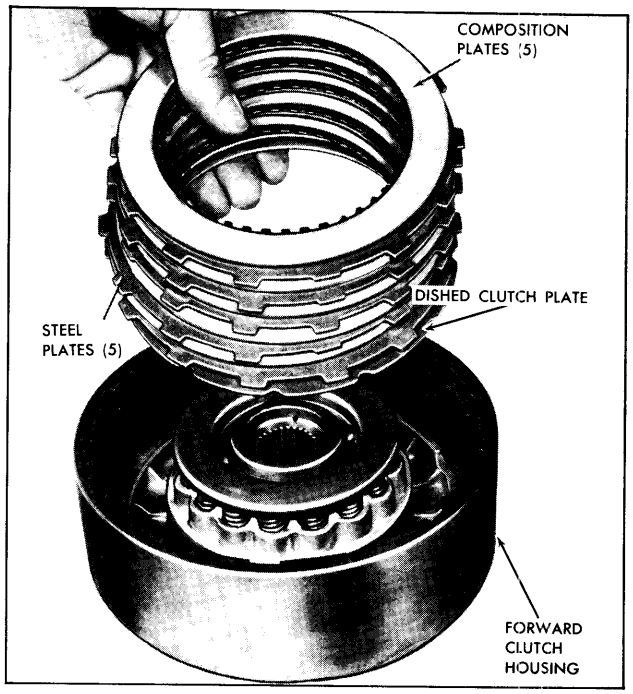


Fig. 7E-149 Removing Forward Clutch Plates

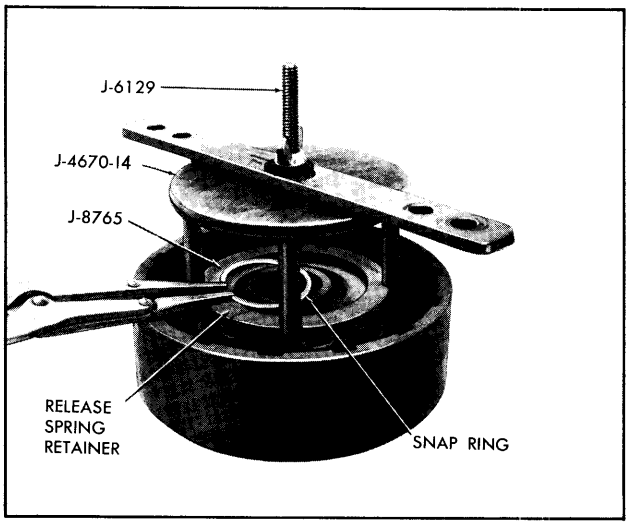


Fig. 7E-150 Removing Forward Clutch Snap Ring

plates, and one dished steel plate. (Fig. 7E-149)

5. Using J-6129 clutch spring compressor, with Adapters J-4670-14 and J-8765, compress the spring retainer and remove the snap ring. (Fig. 7E-150)
6. Remove the tools, snap ring, spring retainer, and sixteen clutch release springs. (Fig. 7E-151)
7. Remove the forward clutch piston. (Fig. 7E-152)
8. Remove and discard inner and outer clutch piston seals. (Figs. 7E-153 and 7E-154)

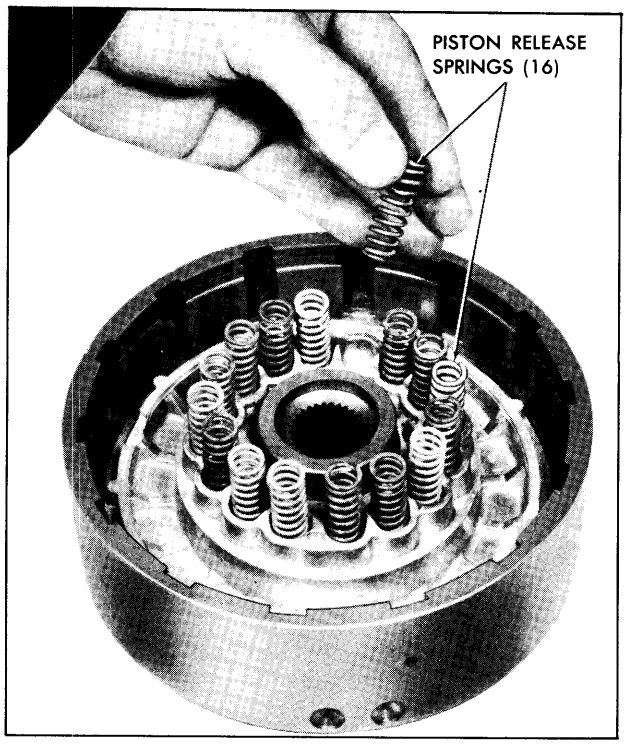


Fig. 7E-151 Removing Release Springs

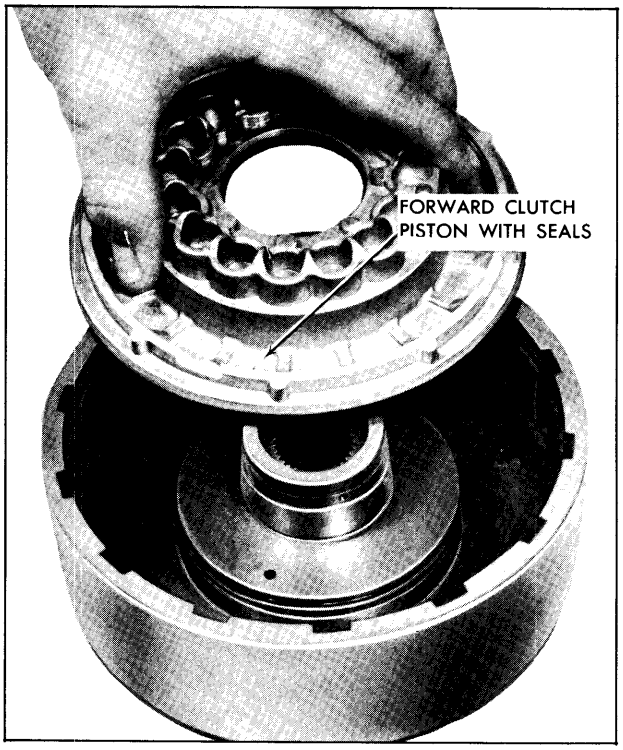


Fig. 7E-152 Removing Forward Clutch Piston

9. Remove and discard the center piston seal from the forward clutch housing. (Fig. 7E-155)

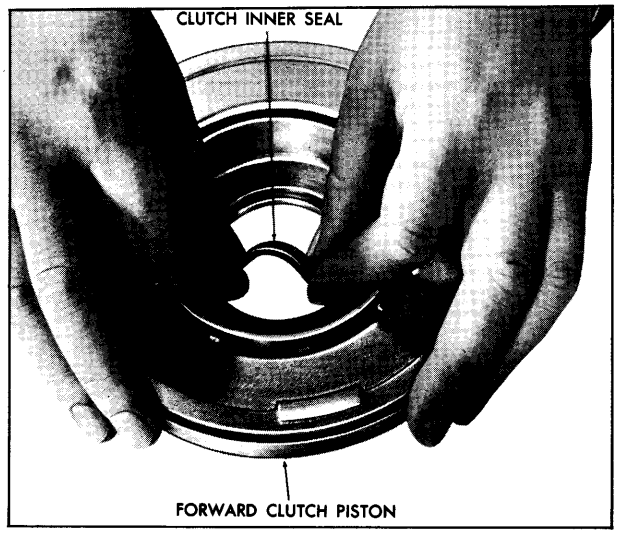


Fig. 7E-153 Removing or Installing Inner Oil Seal

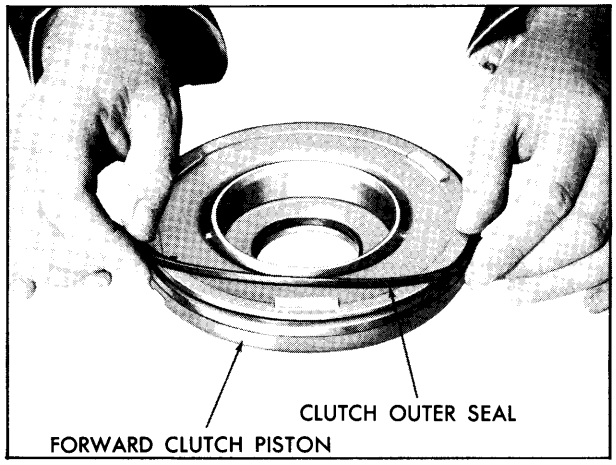


Fig. 7E-154 Removing or Installing Outer Oil Seal

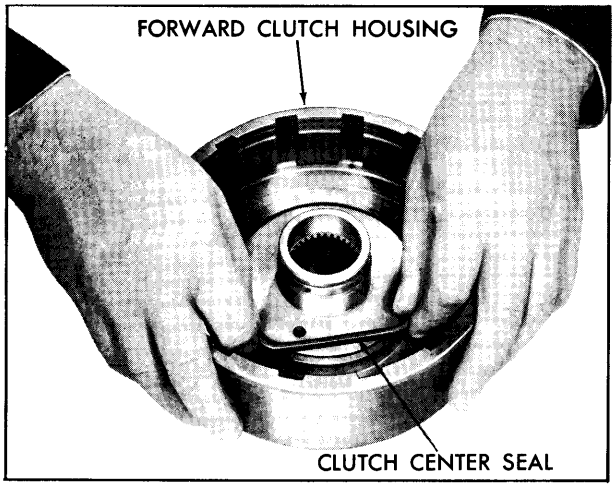


Fig. 7E-155 Removing or Installing Center Oil Seal

Inspection

1. Inspect the drive and driven clutch plates for signs of burning, scoring, or wear.
2. Inspect the sixteen springs for collapsed coils or signs of distortion.
3. Inspect the clutch hubs for worn splines, thrust faces and open lubrication holes. Run a tag wire through each lubrication hole. See lubrication chart (Fig. 7E-231) for location of holes.
4. Inspect the piston for cracks or excessive porosity on sealing surfaces.
5. Inspect the clutch housing for wear, scoring, open oil passages, and free operation of the ball check. Run a tag wire through lubrication holes. See lubrication chart for location of holes.

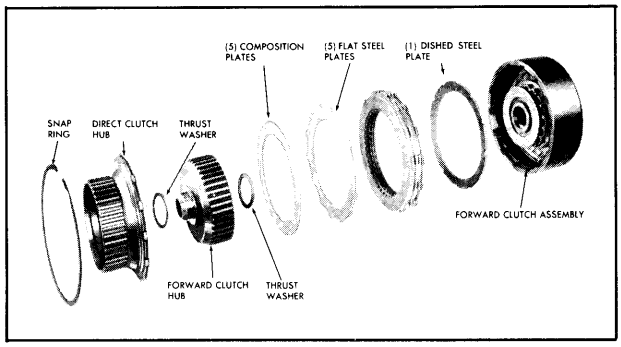


Fig. 7E-156 Forward Clutch Assembly

Assembly (Fig. 7E-156)

1. Place new inner and outer seals on clutch piston, lips away from spring pockets. (Figs. 7E-153 and 7E-154)

   NOTE: Make certain piston has blind hole. Piston with ball check is for direct clutch.

2. Place a new center seal on the clutch housing, lip faces up. (Fig. 7E-155)

   NOTE: Apply Hydra-Matic oil to all seals before reassembly.

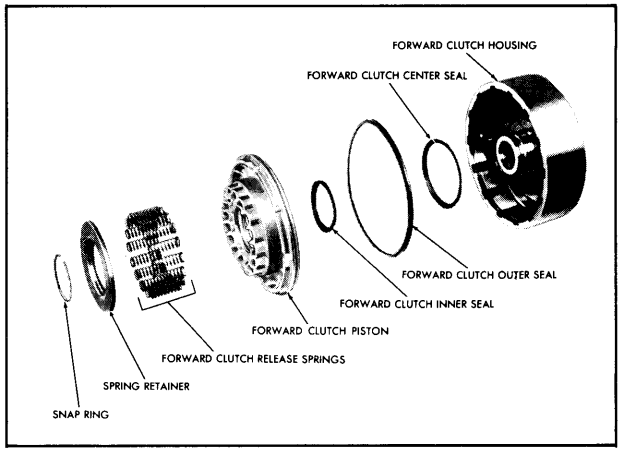


Fig. 7E-157 Forward Clutch Assembly

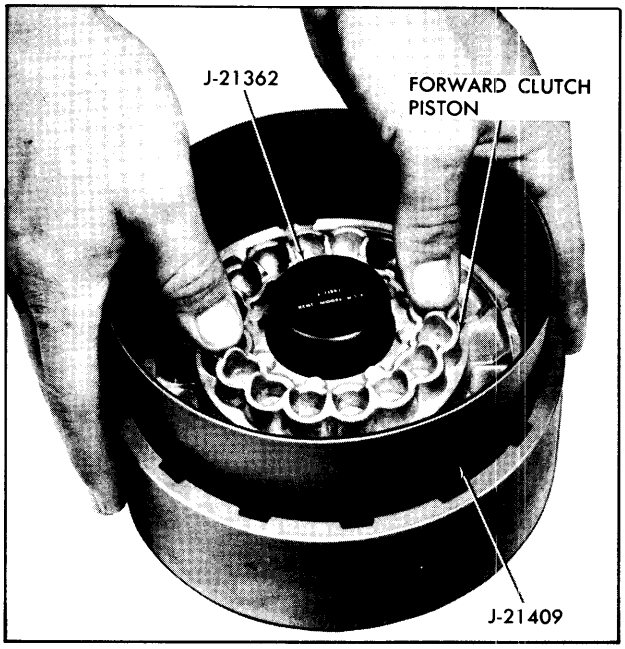


Fig. 7E-158 Installing Forward Clutch

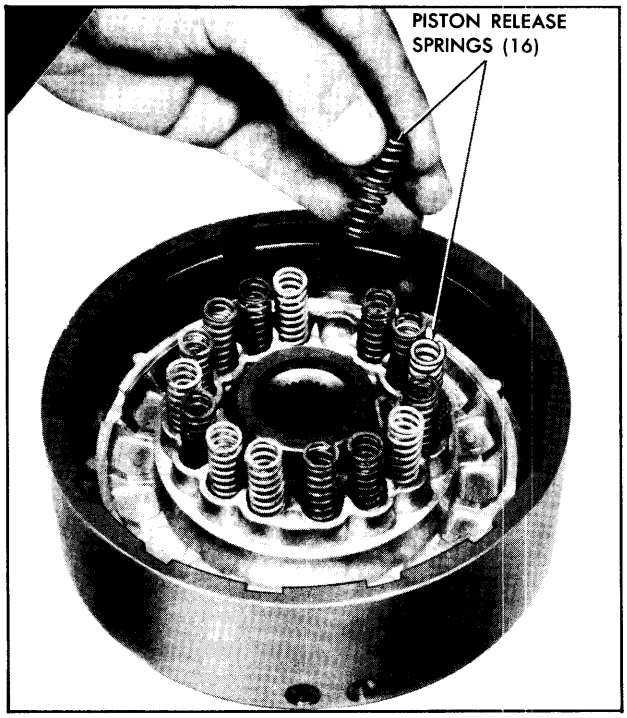


Fig. 7E-159 Installing Piston Release Springs

3. Place seal protector Tool J-21362 over clutch hub. Install outer clutch piston seal protector J-21409 into clutch drum and install piston, rotating the piston on the drum until seated. (Fig. 7E-158)
4. Install sixteen release springs into pockets in piston. (Fig. 7E-159)
5. Place spring retainer and snap ring on springs.

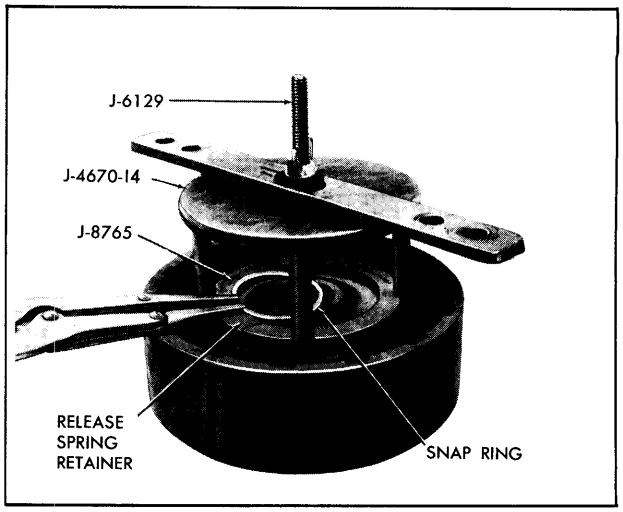


Fig. 7E-160 Installing Snap Ring

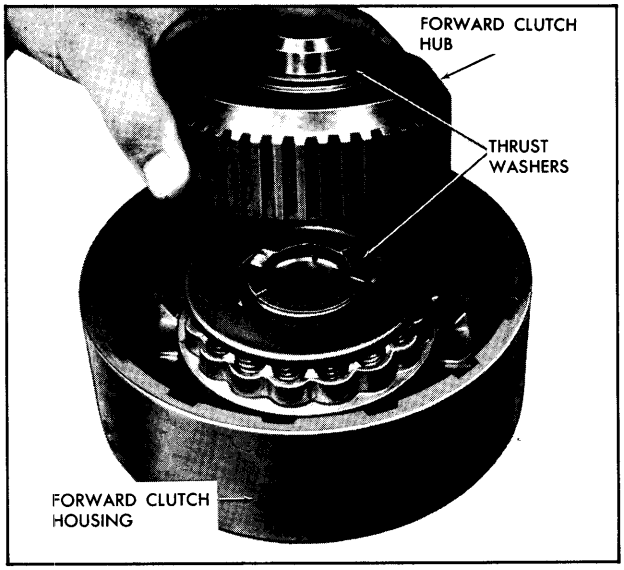


Fig. 7E-161 Installing Forward Clutch Hub

6. Compress springs using clutch compressor Tools J-6129, J-4670-14, and J-8765 and install snap ring. (Fig. 7E-160)
7. Install the forward clutch hub washers on forward clutch hub. Retain with petrolatum.
8. Place forward clutch hub into forward clutch housing. (Fig. 7E-161)
9. Oil and install five composition and five flat steel and one dished steel clutch plate, starting with the dished plate, placed so that the outside diameter contacts the first flat steel plate and then alternating composition and steel. (Fig. 7E-162)
10. Install the direct clutch hub and retaining snap ring. (Figs. 7E-163 and 7E-164)
11. Air check clutch and piston operation. (Fig. 7E-165)

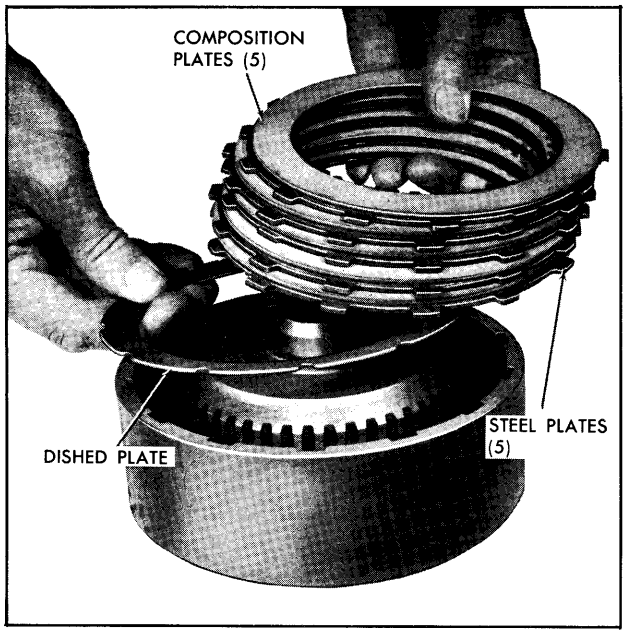


Fig. 7E-162 Installing Forward Clutch Plates

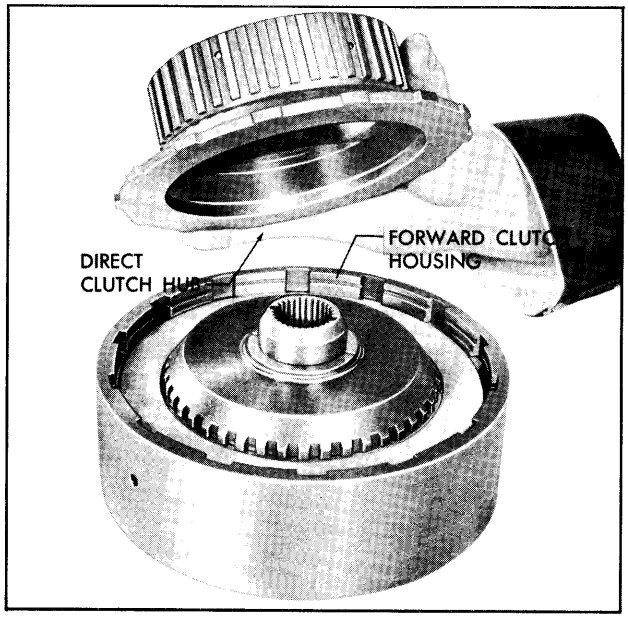


Fig. 7E-163 Installing Direct Clutch Hub

DIRECT CLUTCH AND INTERMEDIATE SPRAG

Disassembly

1. Remove sprag retainer snap ring and retainer. (Fig. 7E-166)
2. Remove sprag outer race, bushings, and sprag assembly. (Fig. 7E-167)
3. Turn unit over and remove backing plate to direct clutch housing snap ring. (Fig. 7E-168)
4. Remove direct clutch backing plate, five composition, five steel clutch plates, and one

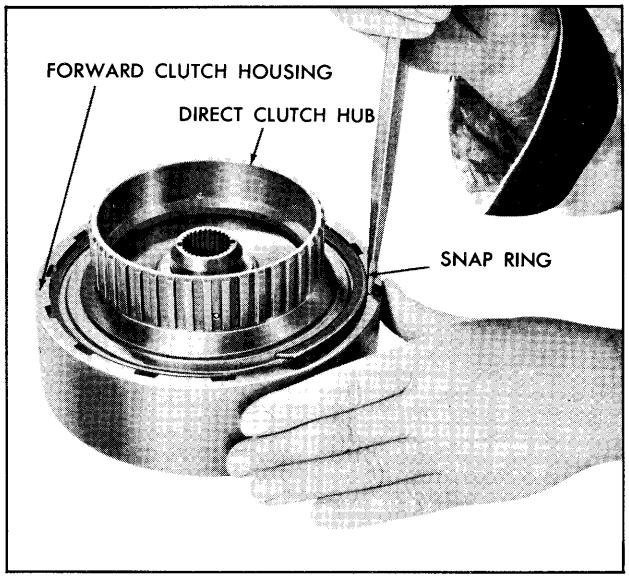


Fig. 7E-164 Installing Snap Ring

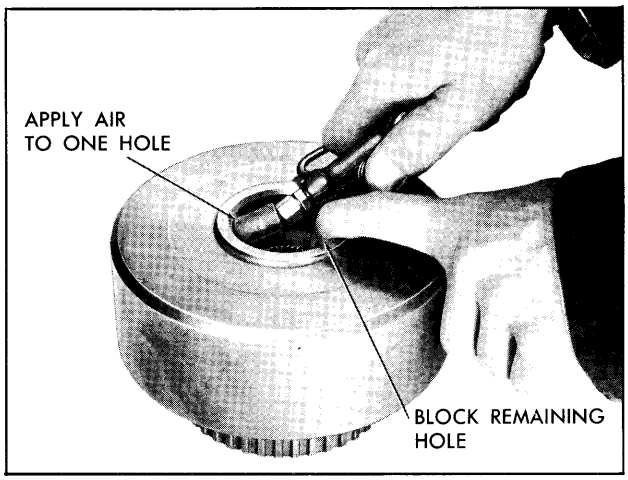


Fig. 7E-165 Air Checking Clutch and Piston

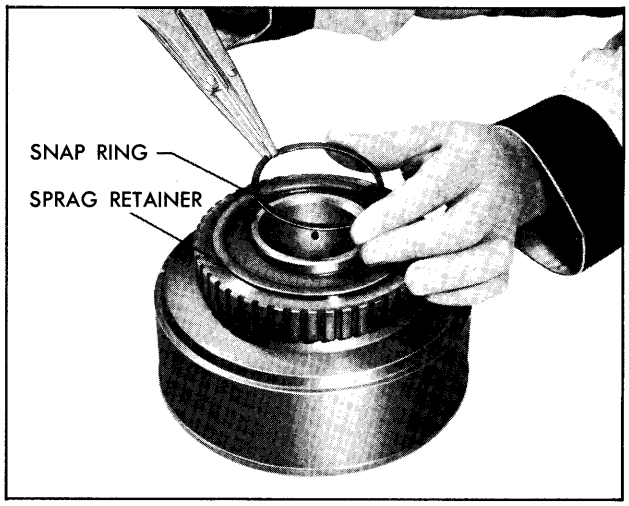


Fig. 7E-166 Removing Snap Ring

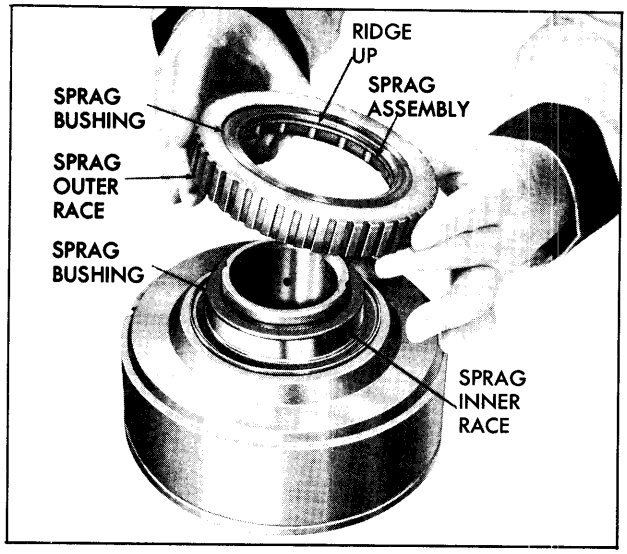


Fig. 7E-167 Removing Sprag, Race and Bushings

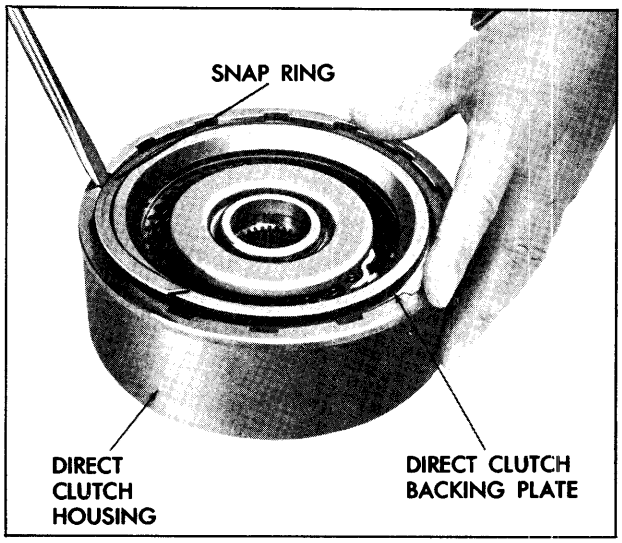


Fig. 7E-168 Removing Snap Ring

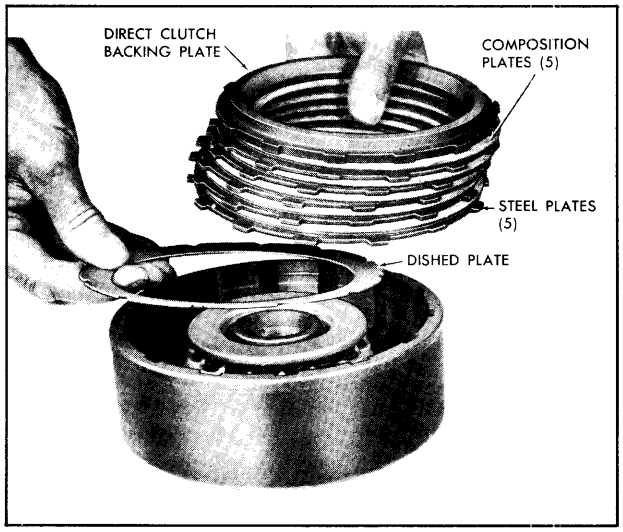


Fig. 7E-169 Removing Clutch Plates

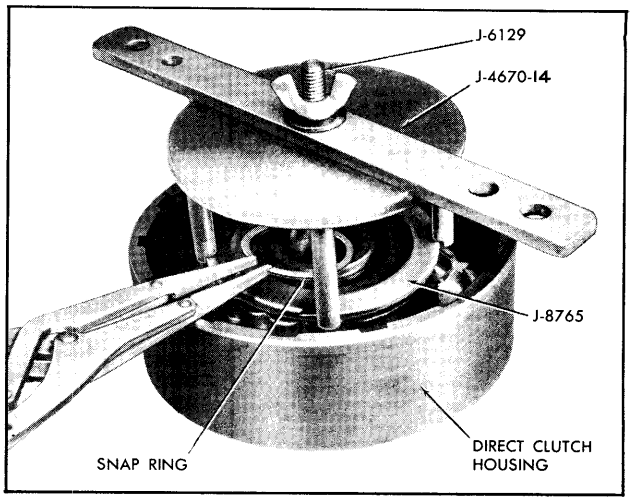


Fig. 7E-170 Removing Snap Ring

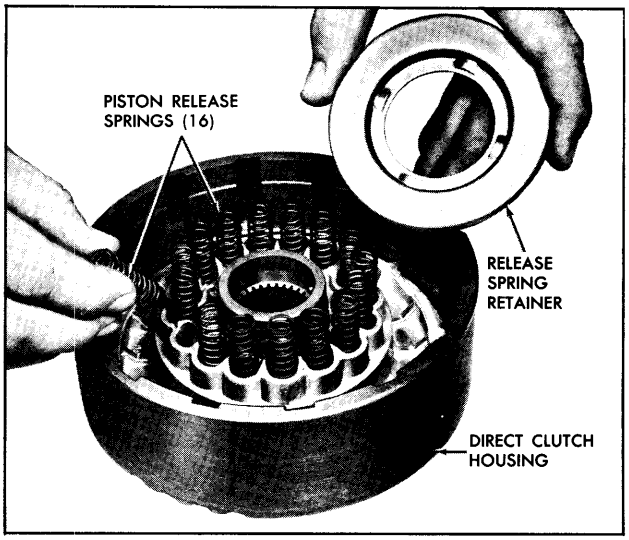


Fig. 7E-171

dished steel plate. (Fig. 7E-169)

5. Using Clutch Compressor Tools J-6129, J-4670-14, and J-8765, compress springs and remove snap ring. (Fig. 7E-170)
6. Remove retainer and sixteen piston release springs. (Fig. 7E-171)
7. Remove the direct clutch piston. (Fig. 7E-172)
8. Remove and discard the outer seal from the piston. (Fig. 7E-173)
9. Remove and discard the inner seal from the piston. (Fig. 7E-174)
10. Remove and discard the center piston seal from the direct clutch housings. (Fig. 7E-175)

Inspection

1. Inspect sprag assembly for damage.

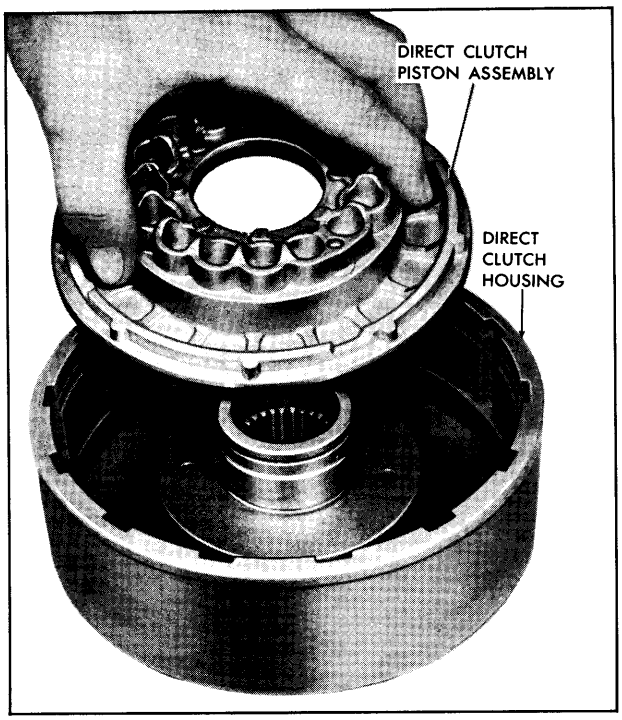


Fig. 7E-172 Removing Direct Clutch Piston

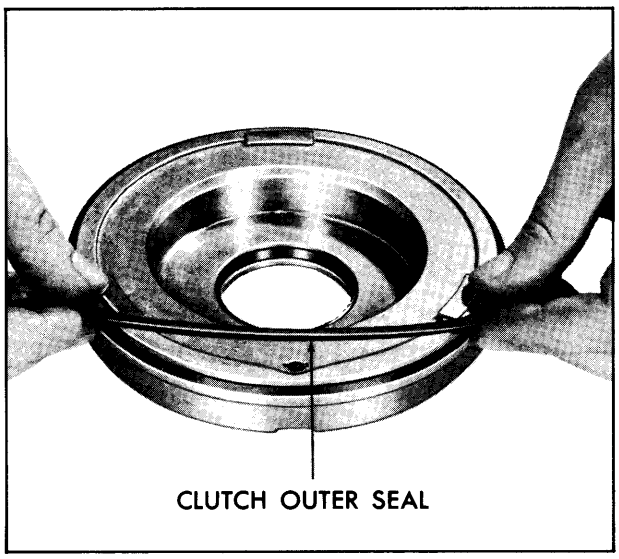


Fig. 7E-173 Removing or Installing Clutch Outer Seal

2. Inspect sprag bushings for wear or distortion.
3. Inspect the inner and outer races for scratches or wear that can be felt with finger nail.
4. Inspect the clutch housing for cracks, wear, proper opening of oil passages, or wear on clutch plate drive lugs. Probe oil passages with a tag wire to see that hole is open. See oil chart (Fig. 7E-231) for location of oil lubrication passages.

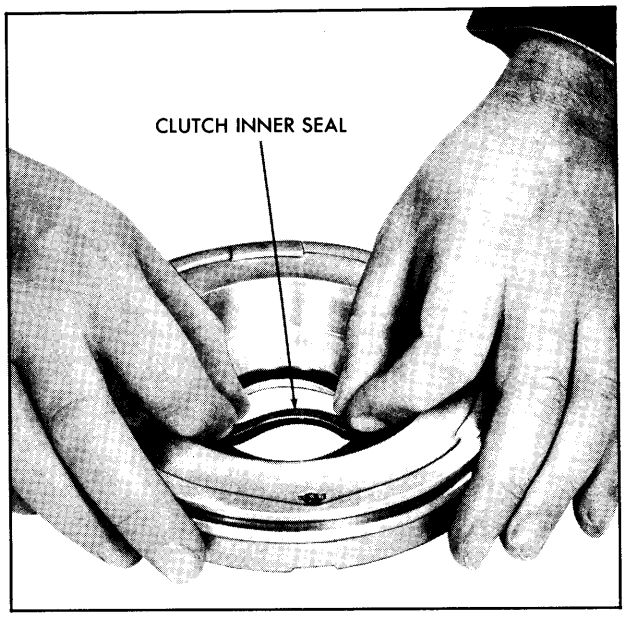


Fig. 7E-174 Removing or Installing Clutch Inner Seal

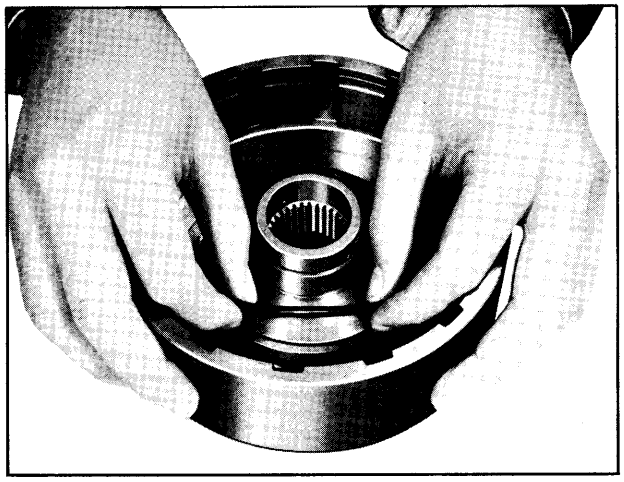


Fig. 7E-175 Removing or Installing Clutch Center Seal

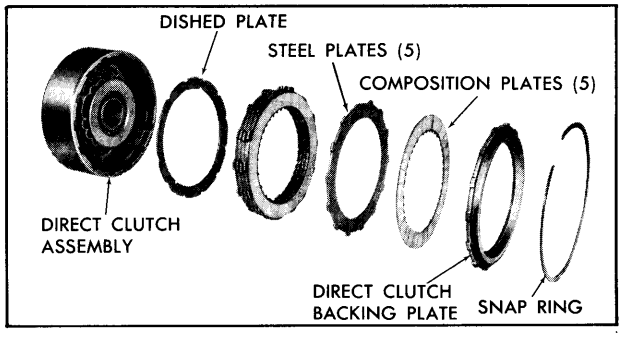


Fig. 7E-176 Direct Clutch Assembly

5. Inspect the drive and driven clutch plates for sign of wear or burning.
6. Inspect the backing plate for scratches or other damage.

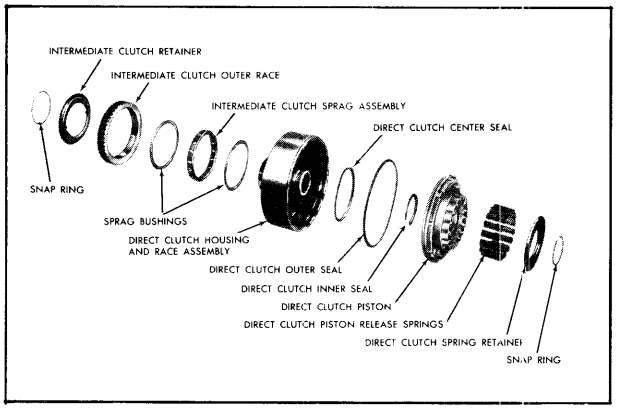


Fig. 7E-177 Direct Clutch Assembly

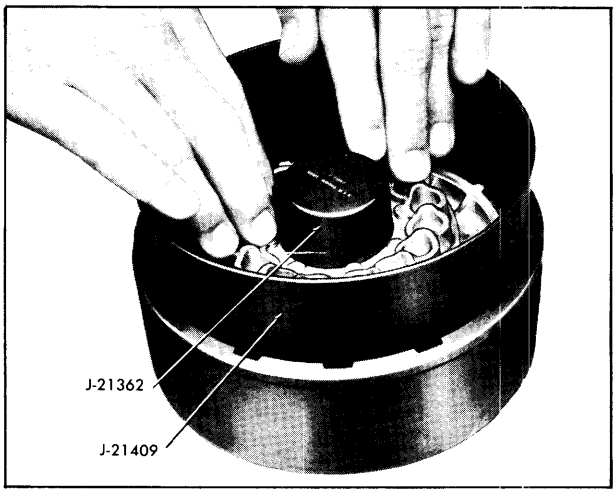


Fig. 7E-178 Installing Clutch Piston

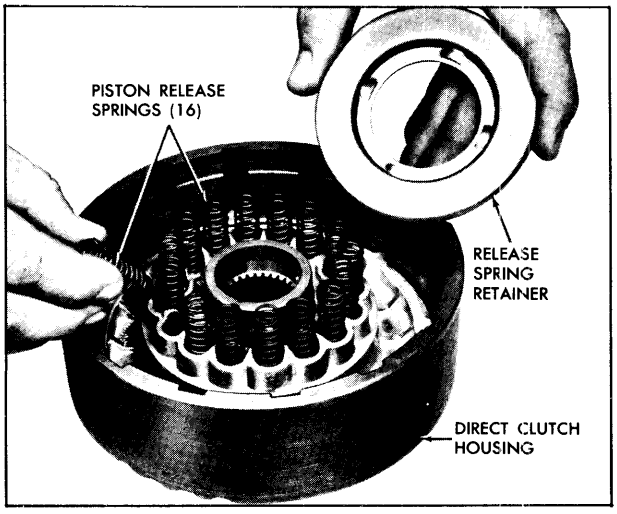


Fig. 7E-179 Installing Release Springs and Retainers

7. Inspect the clutch piston for cracks, porosity on sealing surfaces, and free operation of the ball check.

Assembly (Figs. 7E-176 & 7E-177)

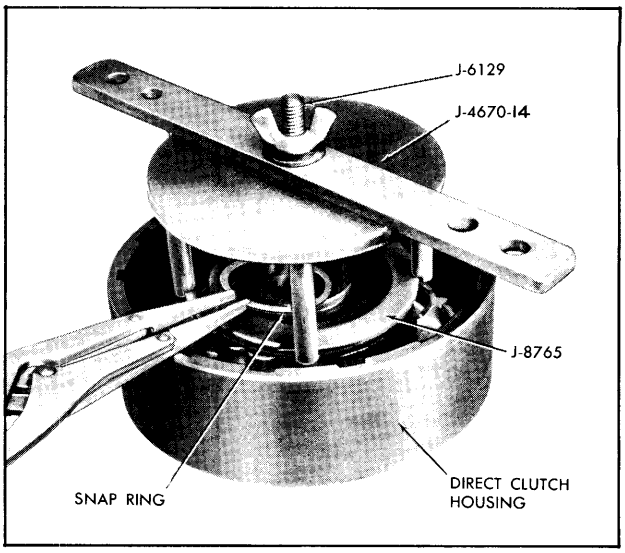


Fig. 7E-180 Installing Snap Ring

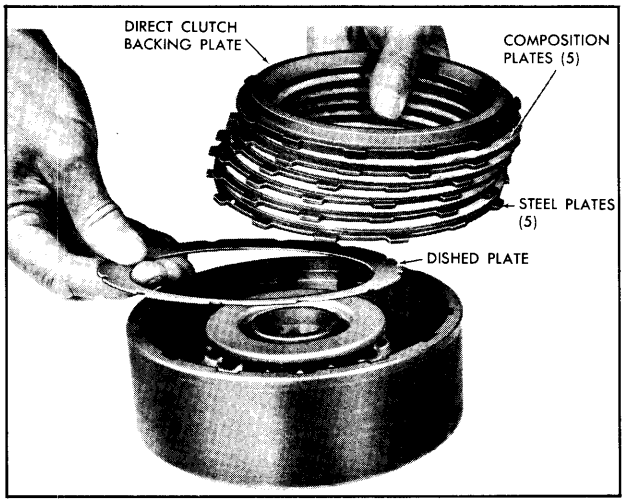


Fig. 7E-181 Installing Clutch Plates

1. Install a new inner clutch piston seal on piston with lip facing away from spring pockets. (Fig. 7E-174)

   NOTE: Make certain piston with ball check is used in direct clutch. Piston with blind hole is used in forward clutch.

2. Install a new outer clutch piston seal with lip facing away from spring pockets. (Fig. 7E-173)

3. Install a new center seal on clutch housing with lip of seal facing up. (Fig. 7E-175)

   NOTE: Apply Hydra-Matic oil to all seals.

4. Place Seal Protectors, Tool J-21362-Inner, J-21409-Outer, over hub and clutch housing and install clutch piston with a rotating motion. (Fig. 7E-178)

5. Install sixteen springs into the piston. (Fig. 7E-179)

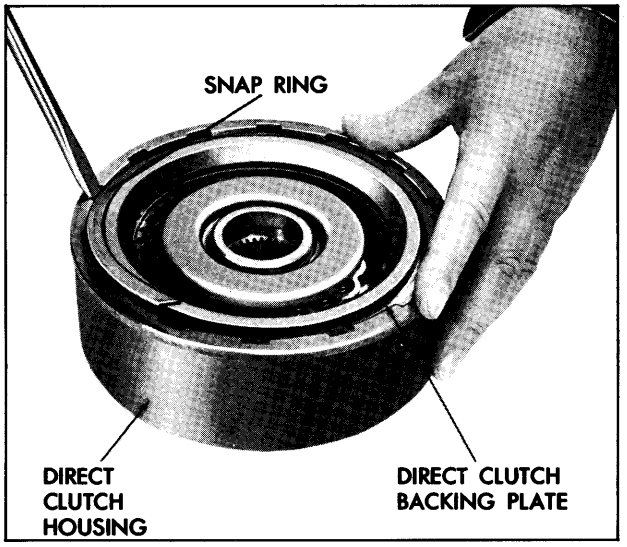


Fig. 7E-182 Installing Snap Ring

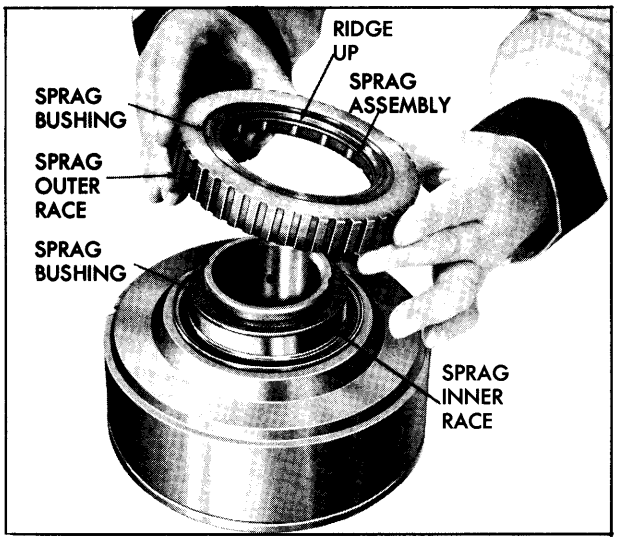


Fig. 7E-183 Installing Sprag

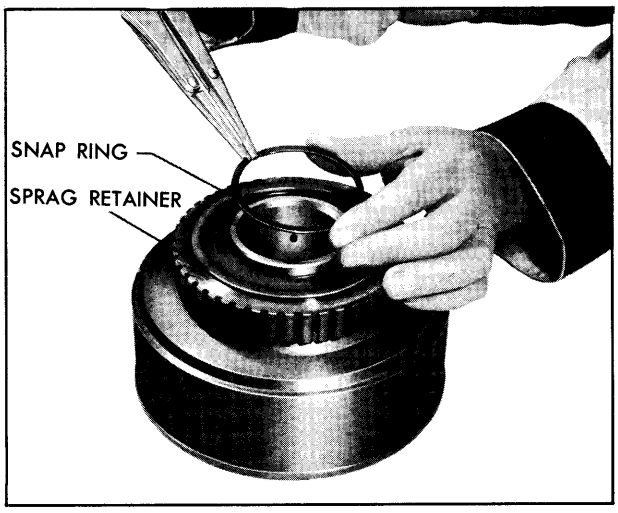


Fig. 7E-184 Installing Sprag Retainer and Snap Ring

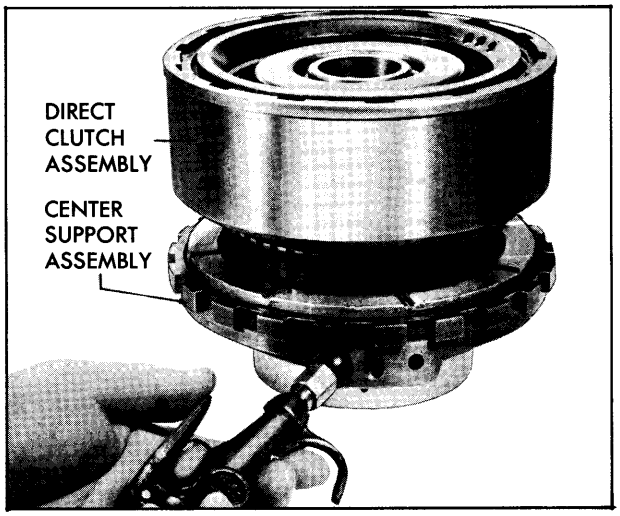


Fig. 7E-185 Air Checking Direct Clutch

6. Place spring retainer and snap ring on springs.
7. Using Clutch Compressor Tools J-6129, J-4670-14, and J-8765, install snap ring. (Fig. 7E-180)
8. Oil and install five composition, five flat steel, and one dished clutch plate starting with the dished plate placed so that the outside diameter contacts the first flat steel plate and then alternating composition and steel. (Fig. 7E-181)
9. Install the clutch backing plate.
10. Install the backing plate retaining snap ring. (Fig. 7E-182)
11. Turn unit over and install one sprag bushing, cup side up, over inner race.
12. Install sprag assembly into outer race.
13. With ridge or shoulder on inner cage up, start sprag and outer race over inner race with counterclockwise motion. (Fig. 7E-183)

    NOTE: Outer race should turn only counterclockwise.
14. Install sprag bushing over sprag, cup side down.
15. Install sprag retainer and snap ring. (Fig. 7E-184)
16. Place direct clutch assembly over center support and air check operation of direct clutch and piston. (Fig. 7E-185)

    NOTE: If air is applied through reverse passage it will escape from the direct clutch passage. This is normal.

ASSEMBLY OF UNITS INTO TRANSMISSION CASE

1. Install the proper rear selective washer

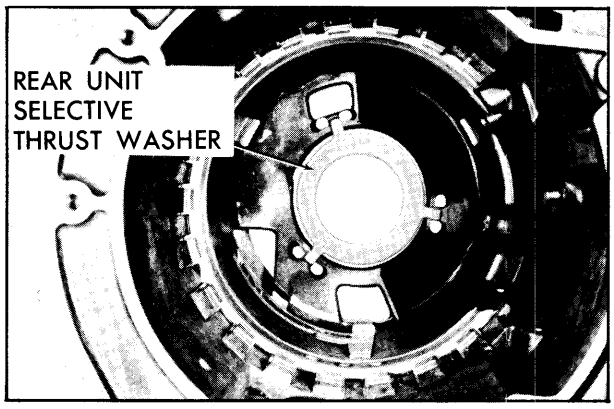


Fig. 7E-186 Installing Rear Unit Thrust Washer

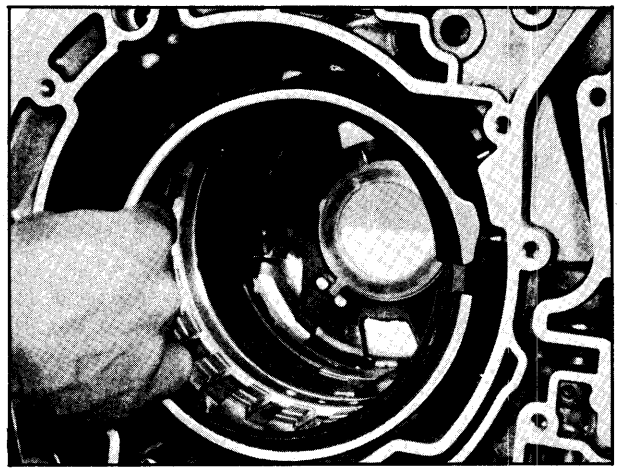


Fig. 7E-187 Installing Rear Band

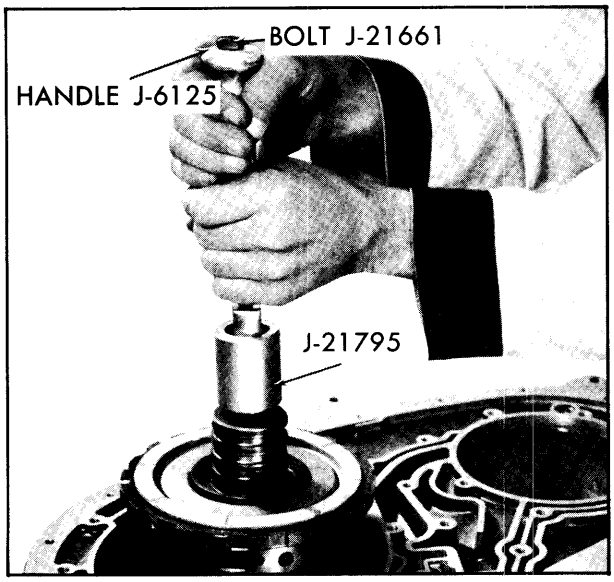


Fig. 7E-188 Installing Gear Unit into Case

(proper washer determined by previous rear end play check) into slots provided inside front of transmission case. (Fig. 7E-186)

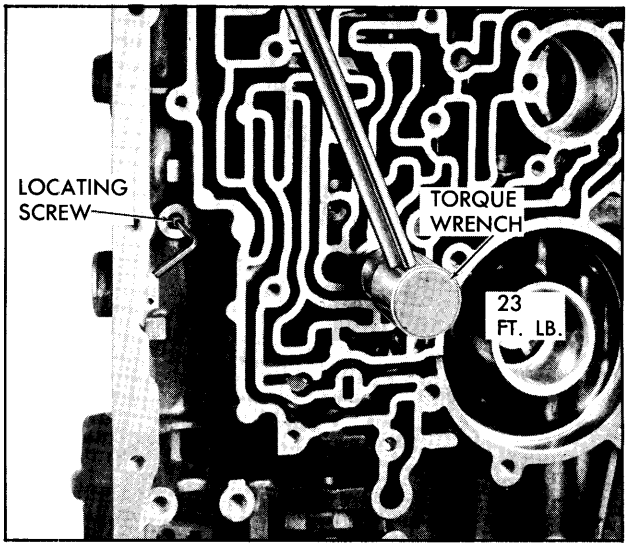


Fig. 7E-189 Installing Case Center Support Bolt

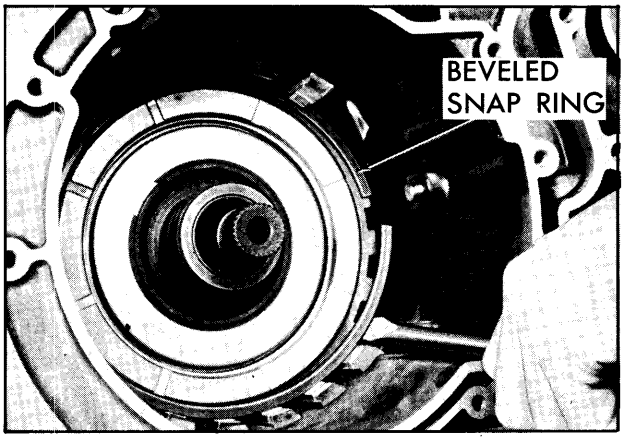


Fig. 7E-190 Installing Center Support Snap Ring

2. Install the rear band assembly so that two lugs index with the two anchor pins. Check band to be sure band ends are seated on lugs by inserting small screwdriver into servo pin hole in case and pushing on band. (Fig. 7E-187)

3. Install the complete gear unit assembly into the case using Tool J-21795 with J-6125 slide hammer. Be sure locating bolt hole in center support lines up with case hole. (Fig. 7E-188)

4. Install and tighten center support locating screw. Torque to 2 ft. lbs.

   NOTE: It may be necessary to shorten dog point end of locating screw by 1/4" to assure proper location of center support.

5. Install case to center support bolt. Torque to 20 ft. lbs. Remove center support locating screw. (Fig. 7E-189)

6. Oil and install center support to case retaining snap ring with the bevel side up. Locate

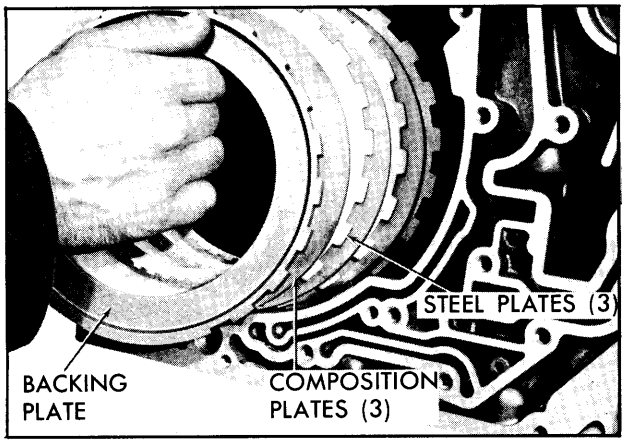


Fig. 7E-191 Installing Backing and Clutch Plates

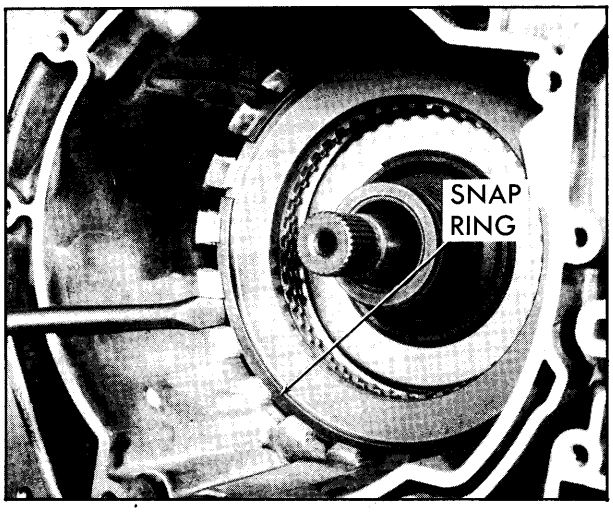


Fig. 7E-192 Installing Snap Ring

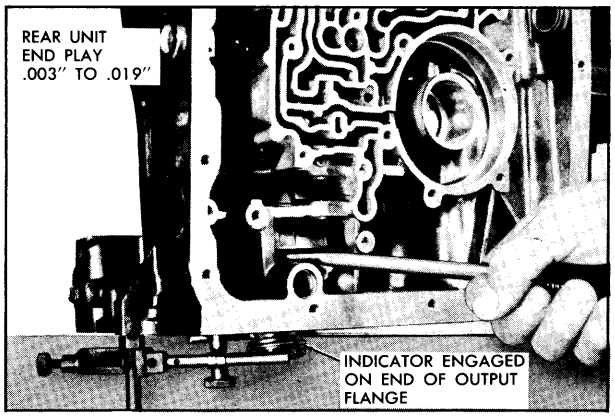


Fig. 7E-193 Checking Rear Unit End-Play

gap adjacent to band anchor pin. Make certain ring is properly seated in case. (Fig. 7E-190)

7. Install three steel and three composition intermediate clutch plates. Start with steel, alternate the plates.

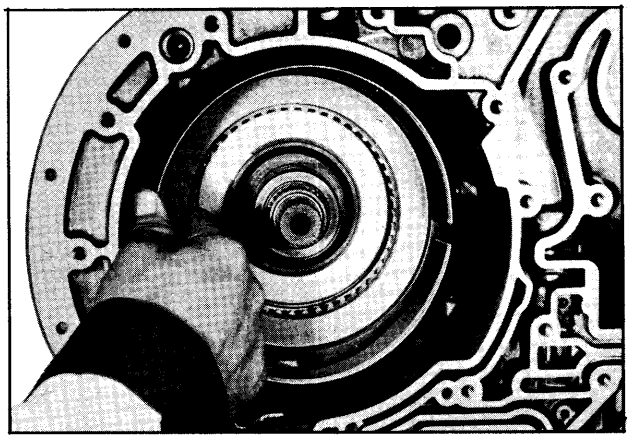


Fig. 7E-194 Installing Front Band

8. Install the intermediate clutch backing plate, ridge up. (Fig. 7E-191)
9. Install the backing plate to case snap ring, locating gap opposite band anchor pin. (Fig. 7E-192)
10. Check rear end play as follows: (Fig. 7E-193)
    a. Install 3/8"-16" bolt into final drive attaching bolt hole. Allow end of transmission to hang over edge of bench.
    b. Mount the dial indicator on the rod and index with the end of the output flange.
    c. Move the output flange in and out to read the end play. End play should be from .003" to .019". The selective washer controlling this end play is the steel washer having three lugs that is located between the thrust washer and the rear face of the transmission case.

    If a different washer thickness is required to bring the end play within specification, it can be selected from the following chart:

Thickness	Notches
.078 - .082	None
.086 - .090	1 Tab Side
.094 - .098	2 Tab Side
.102 - .106	1 Tab OD
.110 - .114	2 Tabs OD
.118 - .122	3 Tabs OD

11. If a different selective washer thickness is required it will be necessary to disassemble the transmission back to this washer so that the correct washer can be installed.
12. Install front band with anchor hole placed over the band anchor pin and apply lug facing servo hole. (Fig. 7E-194)
13. Be sure center support oil rings are hooked and centered, then install the direct clutch and intermediate sprag assembly. It will be necessary to twist the housing to allow the

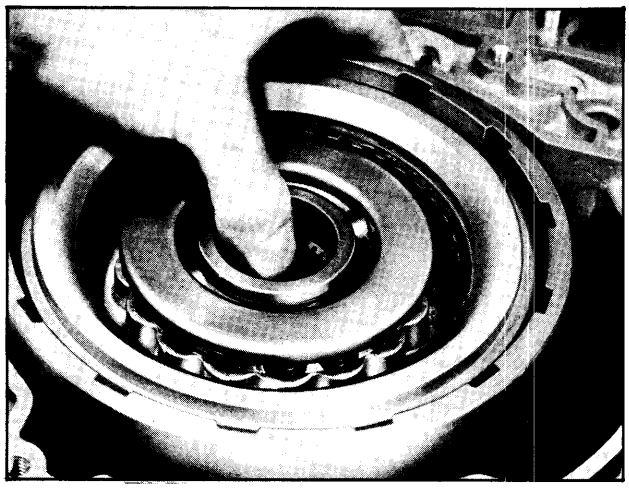


Fig. 7E-195 Installing Direct Clutch and Sprag

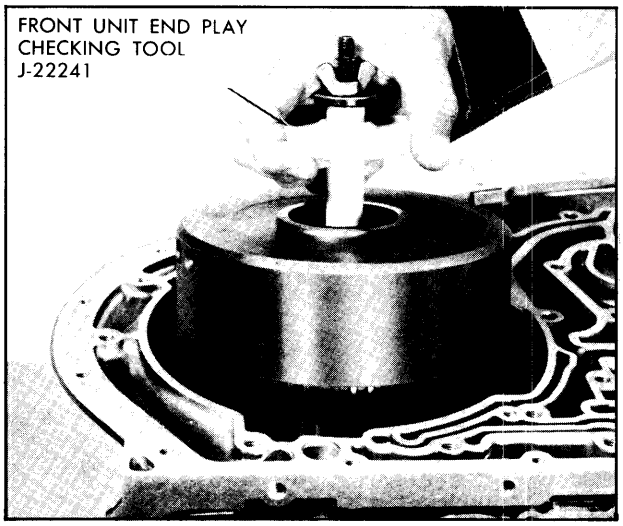


Fig. 7E-196 Installing Forward Clutch

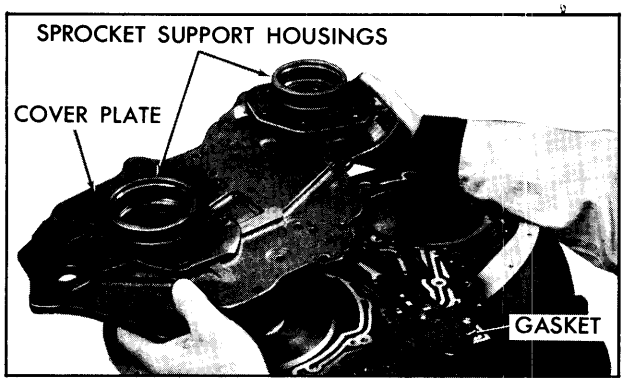


Fig. 7E-197 Installing Pump Cover Plate and Gasket

sprag outer race to index with the clutch drive plates. The sun gear shaft splines will be flush with housing splines. (Fig. 7E-195)

NOTE: Removal of direct clutch drive and driven plates may be helpful.

14. Install the forward clutch hub to direct clutch housing phenolic thrust washer on the forward clutch hub. Retain with petrolatum.

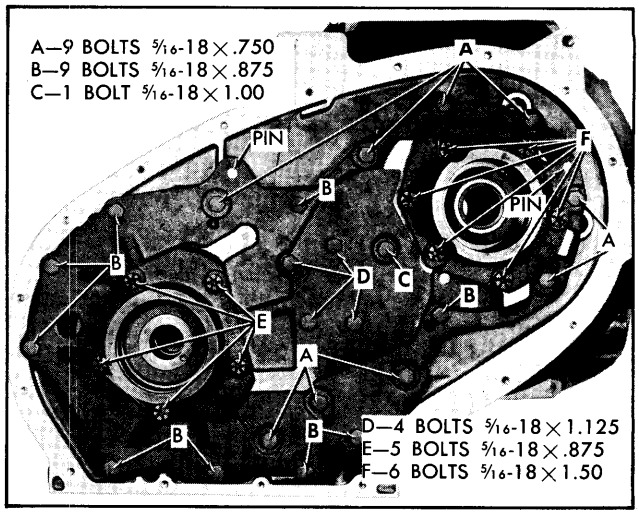


Fig. 7E-198 Pump Cover Plate Attaching Screw Location

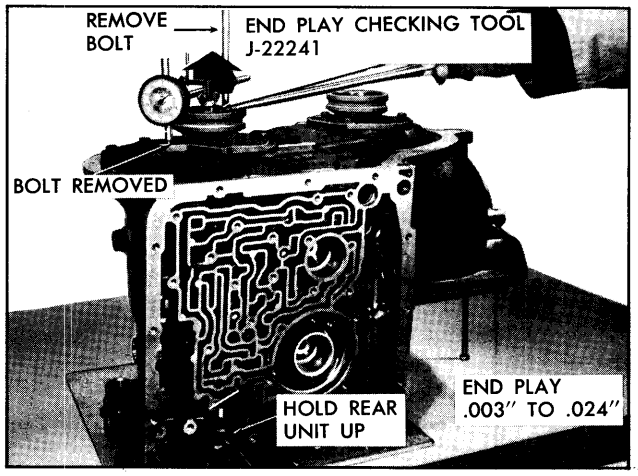


Fig. 7E-199 Checking Front Unit Endplay

15. Install the forward clutch assembly, indexing the direct clutch hub so end of the mainshaft will bottom on end of the forward clutch. If seated it will be approximately flush - 1/4" below pump cover plate face in case. (Fig. 7E-196)
16. Install pump cover plate assembly and gasket. (Fig. 7E-197)
17. Install pump cover plate attaching bolts. Torque bolts to 20 ft. lbs. (Fig. 7E-198)

    NOTE: If the forward clutch housing cannot be rotated (using the driven sprocket as a driver) as the pump cover plate is being pulled into place, the forward or direct clutch housings have not been properly installed to index with all the clutch plates. This condition must be corrected before the pump cover plate is pulled fully into place.

18. Check front unit end play as follows: (Fig. 7E-199)

a. Install a 5/16-18 threaded slide hammer bolt or J-6126 into bolt hole in pump cover plate. (Install End Play Checking Tool J-22241 into pump cover plate and forward clutch housing.)

b. Mount a dial indicator on the rod. Index indicator to register with the forward clutch drum that can be reached through second bolt omitted from cover plate.

c. Push End Play Tool J-22241 down to remove slack.

d. Push and hold output flange upward. Place screwdriver in case opening at parking pawl area and push on upward output carrier.

e. Set dial indicator to zero.

f. Pull end play checking tool upward by placing another screwdriver between metal lip of end play tool and the driven sprocket housing.

Read the resulting travel or end play which should be .003" to .024". The selective washer controlling this end play is the phenolic resin washer located between the driven support housing and the forward clutch housing. If more or less washer thickness is required to bring end play within specifications, select the proper washer from the chart below:

Thickness	Color
.060 - .064	Yellow
.071 - .075	Blue
.082 - .086	Red
.093 - .097	Brown
.104 - .108	Green
.115 - .119	Black
.126 - .130	Purple

NOTE: An oil soaked washer may tend to discolor so that it will be necessary to measure the washer for its actual thickness.

19. Install the remaining pump cover plate attaching bolts. Torque bolts to 20 ft. lbs.

INSTALLATION OF FRONT PUMP

1. Mount two 5/16-18 x 4" guide pins in pump attaching screw holes.
2. Align guide pins with matching holes in pump cover plate and insert bolts into open holes in pump body. (Keep the crescent to the outside of the case.)
3. Tighten bolts, remove dowel pins, and insert remaining attaching bolts and tighten to 18 ft. lbs.

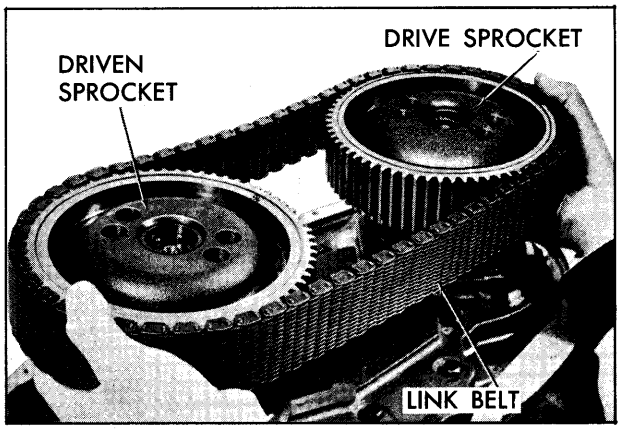


Fig. 7E-200 Removing Sprockets and Link Assembly

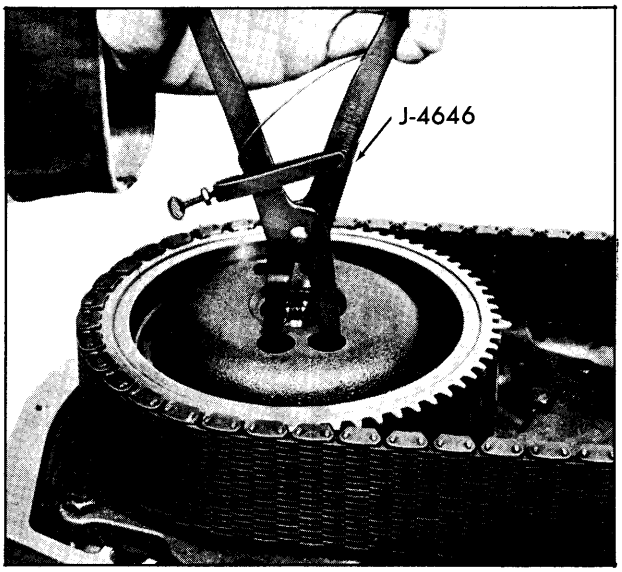


Fig. 7E-201 Installing Snap Rings

LINK ASSEMBLY, DRIVE AND DRIVEN SPROCKET COVER PLATE AND SPROCKET HOUSING

Assembly

1. Place link assembly around the drive and driven sprockets so that the links engage the teeth of the sprockets, colored guide link facing link cover.
2. Simultaneously place link assembly, drive and driven sprockets into support housing. (Fig. 7E-200).
3. Using a plastic mallet, gently seat the sprocket bearing assemblies into the support housings.
4. Install sprocket assembly to support housing snap rings using J-4646 snap ring pliers. (Fig. 7E-201)
5. Install new case to cover and plate assembly sprocket housing gasket.

6. Install cover and plate assembly sprocket housing and eighteen attaching bolts. Torque bolts to 8 ft. lbs.

NOTE: One sprocket cover housing attaching bolt is 1/4 inch longer. This bolt must be installed in the tapped hole located directly over the cooler fittings on the transmission case.

PARKING PAWL, BRACKET AND MANUAL LINKAGE (Fig. 7E-202)

Install

1. Install parking pawl (tooth toward the inside of case), pawl return spring and parking pawl shaft into case. (Fig. 7E-203)
2. Install the parking pawl shaft retaining pin. (Fig. 7E-204)

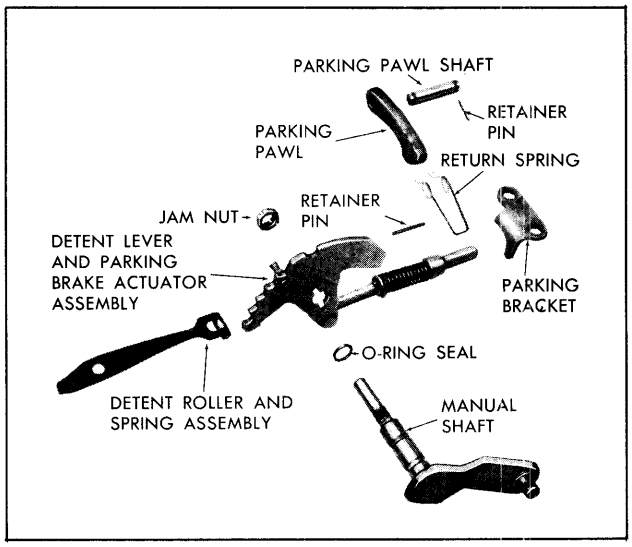


Fig. 7E-202 Manual and Parking Linkage

3. Install the parking bracket into case (pawl below finger on bracket). Torque the attaching bolts to 18 ft. lbs. (Fig. 7E-205)
4. Install a new manual shaft "O" ring seal on manual shaft.
5. Install the actuator rod plunger under the parking bracket and over the parking pawl.
6. Install the manual shaft assembly through the case and detent lever. Install the retaining hex-lock nut on the manual shaft. Lever points away from oil pan. (Fig. 7E-206)
7. Install manual shaft retaining pin into case. Install the long, smooth end into case first. (Fig. 7E-207)
8. Torque nut to 18 ft. lb. (Fig. 7E-208)

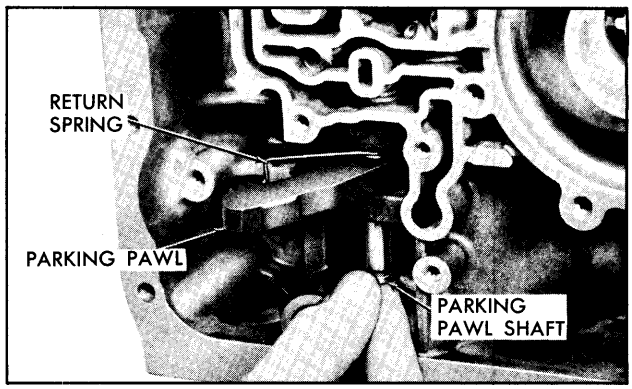


Fig. 7E-203 Installing Parking Pawl Shaft

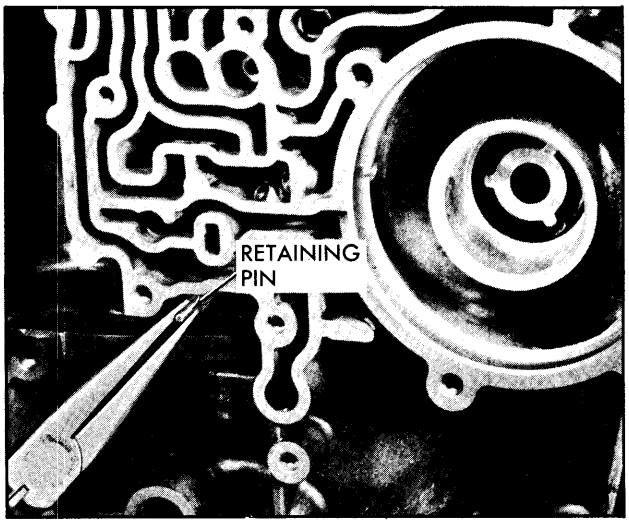


Fig. 7E-204 Installing Retaining Pin

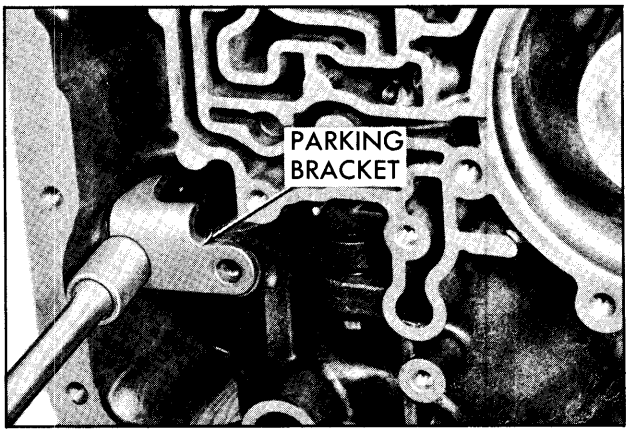


Fig. 7E-205 Installing Parking Bracket

REAR SERVO

Install

NOTE: Before installing the rear servo assembly check band apply pin using Tool J-21370 as follows:

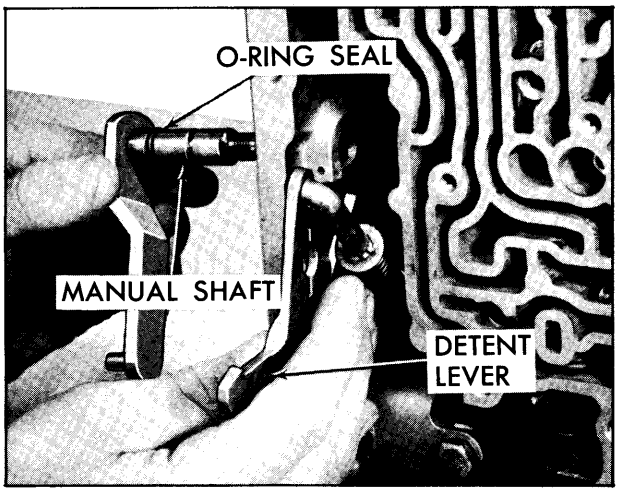


Fig. 7E-206 Installing Manual Shaft

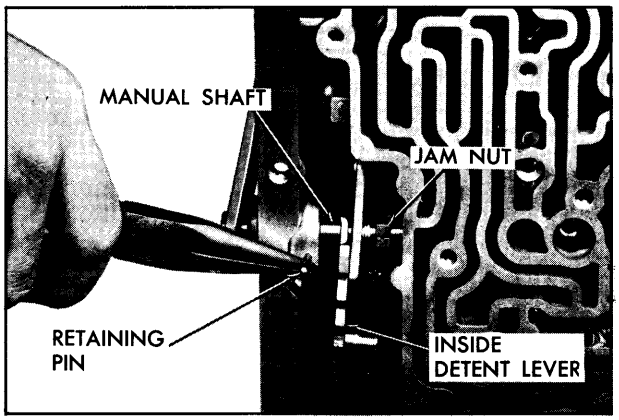


Fig. 7E-207 Installing Retaining Pin

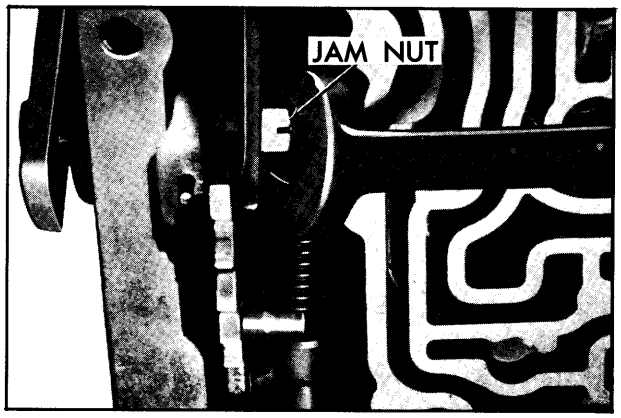


Fig. 7E-208 Installing Locknut

A. Attach the band apply pin selection gauge spacing plate J-21370-8, J-21370-6 and J-21370-7 to the transmission case as shown with attaching screws. (Fig. 7E-209)

NOTE: Attach tool attaching screws finger tight and check freeness of selective pin. Torque attaching screw and recheck pin to make certain it does not bind.

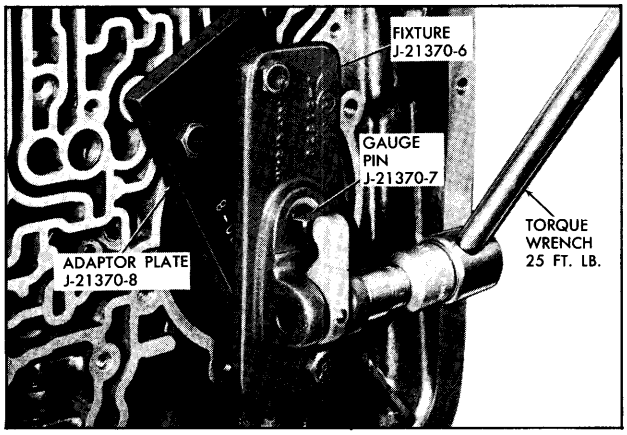


Fig. 7E-209 Checking Band Apply Pin

STEP LOCATION	PIN IDENT.	SIZE
TOP STEP OR ABOVE	THREE RINGS	LONG
THIS AREA	TWO RINGS	MED.
LOWER STEP OR BELOW	ONE RING	SHORT

J-21370-7

Fig. 7E-210 Pin Selection Chart

B. Apply 25 ft. lb. torque and select proper servo pin to be used from scale on tool.

C. Remove the tool and make note of the proper pin to be used during assembly of the transmission. (Fig. 7E-210)

There are three selective pins identified as follows:

Pin Identification	Pin Size
3 Rings	Long
2 Rings	Medium
1 Ring	Short

The identification rings are located on the ground band lug end of the pin. Selecting the proper pin is the equivalent of adjusting the band.

1. Install rear accumulator spring into case.

2. Lubricate and install the rear servo assembly into case. (Fig. 7E-211)

FRONT SERVO, CHECK BALLS, GASKETS, SPACER, AND SOLENOID

Installation

1. Install front servo spring and retainer on front servo pin. (Fig. 7E-212)

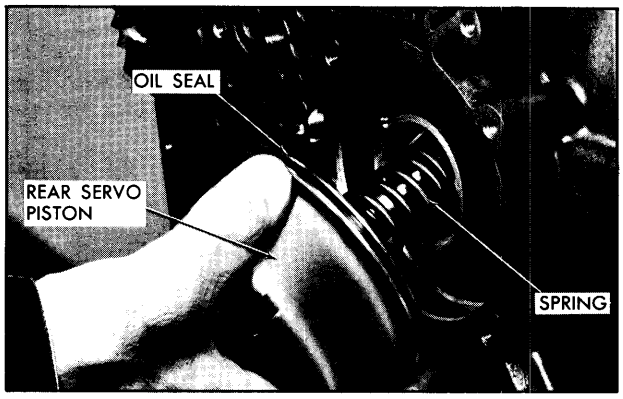


Fig. 7E-211 Installing Rear Servo

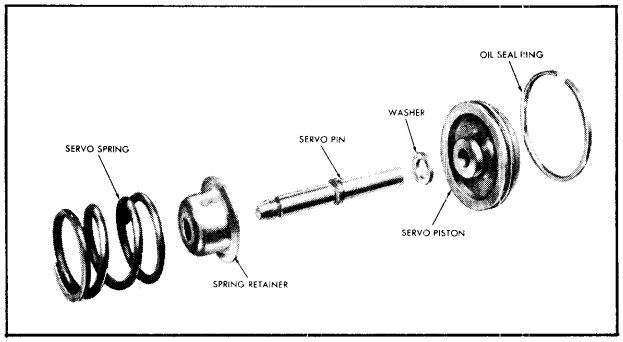


Fig. 7E-212 Front Servo

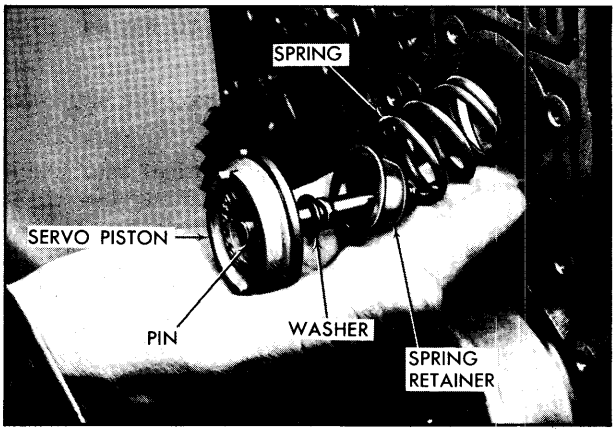


Fig. 7E-213 Install Front Servo

2. Install flat washer on front servo pin on end opposite taper.
3. If removed, install oil seal ring on front servo piston. Install piston on apply pin so that part number faces away from spring.
4. Install piston into case so that tapered end of pin is contacting band. (Fig. 7E-213)
5. Check freeness of piston by stroking piston in bore.
6. Install seven check balls into the transmission case pockets. (Use petrolatum to retain balls in case.) (Fig. 7E-214)

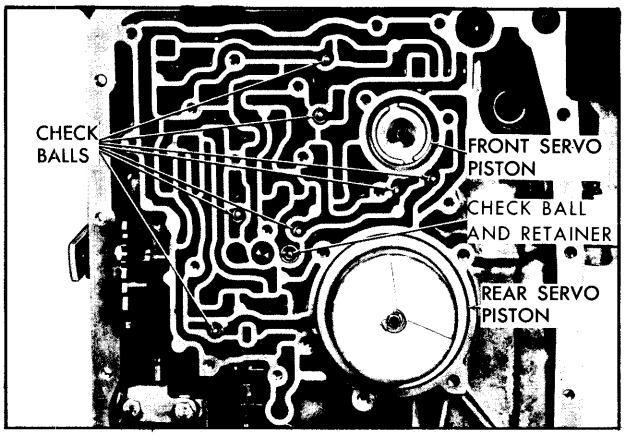


Fig. 7E-214 Check Ball Location

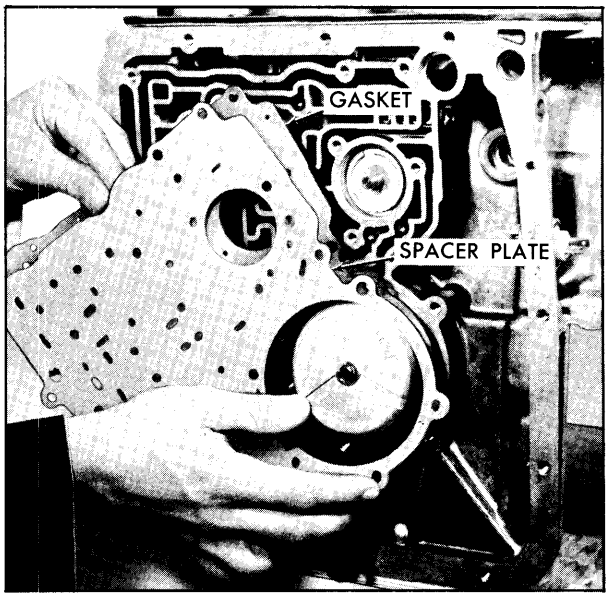


Fig. 7E-215 Installing Gasket and Specer Plate

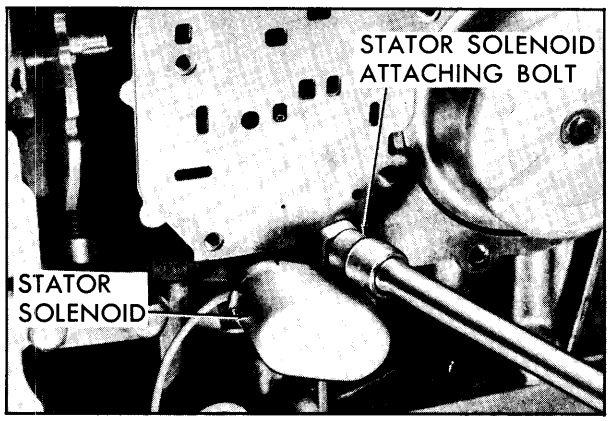


Fig. 7E-216 Installing Stator Solenoid

7. Install the valve body spacer to case gasket (gasket with extension for solenoid) and spacer plate. Install guide pins for alignment. (Fig. 7E-215)

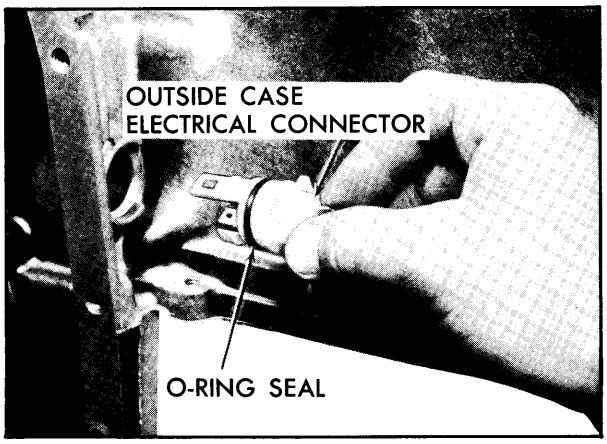


Fig. 7E-217 Installing Connector

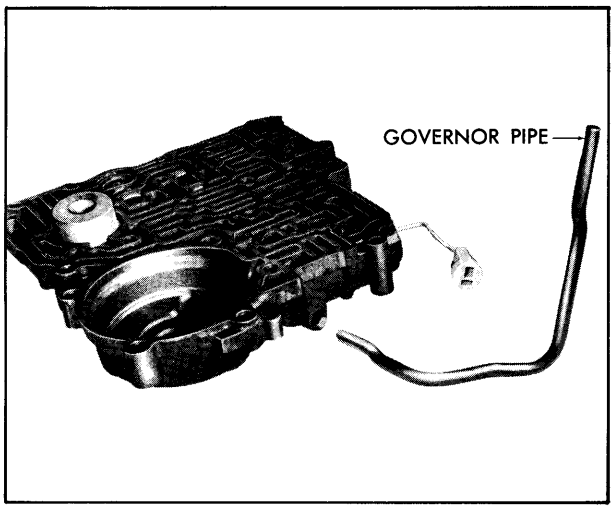


Fig. 7E-218 Installing Governor Pipe

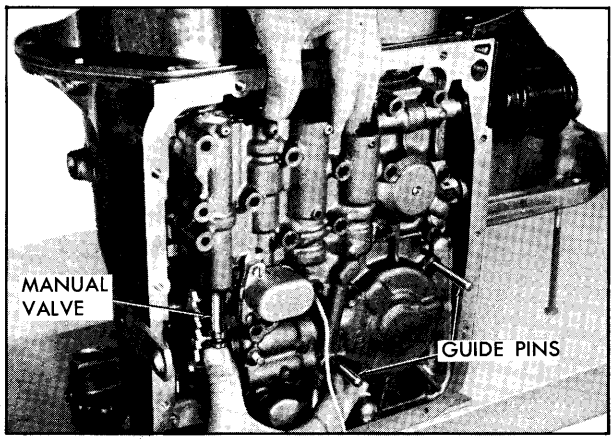


Fig. 7E-219 Installing Control Valve

8. Install the stator solenoid assembly and gasket with attaching bolts. Connector wire should face away from rear servo. (Fig. 7E-216)

   NOTE: Do not tighten bolts at this time.

9. Install the "O" ring seal on the case solenoid connector.
10. Lubricate and install case connector with lock tabs facing into case, positioning locater tabs up on side of case. (Fig. 7E-217)

CONTROL VALVE ASSEMBLY AND GOVERNOR PIPES

Installation

1. Install the control valve assembly to spacer gasket.
2. Install governor screens into case governor pipe holes if removed.
3. Install governor pipe into valve body. (Fig. 7E-218)
4. Install control valve assembly and governor pipe into the transmission. Engage manual valve with detent lever. (Fig. 7E-219)

   NOTE: Be sure manual valve is properly indexed with the pin on the manual detent lever.

5. Install the control valve assembly attaching bolts, and manual detent and roller assembly. (Fig. 7E-220)
6. Tighten solenoid and control valve attaching bolts. Torque valve body bolts to 8 ft. lbs. and stator solenoid bolts to 10 ft. lbs. (Fig. 7E-216)
7. Install governor feed pipe into case and valve body assembly. (Fig. 7E-221)
8. Install detent connector terminal into inside case electrical connector pushing inward so that detent terminal connections are locked.

   NOTE: Check by pulling on detent connector wire. If detent connector wire can be removed, turn wire connector over and reinstall into inside case connector. If both electric wires were removed, reinstall.

9. Install inside case connector into case sleeve connector. (Fig. 7E-222)

PRESSURE REGULATOR VALVE

Install (Fig. 7E-223)

1. Install regulator valve, spring retainer, and spacer, if present, into case bore.
2. Install pressure regulator spring into bore.
3. Install regulator valve bushing and valve into case bore.
4. Compress the regulator boost valve bushing against the pressure regulator spring and

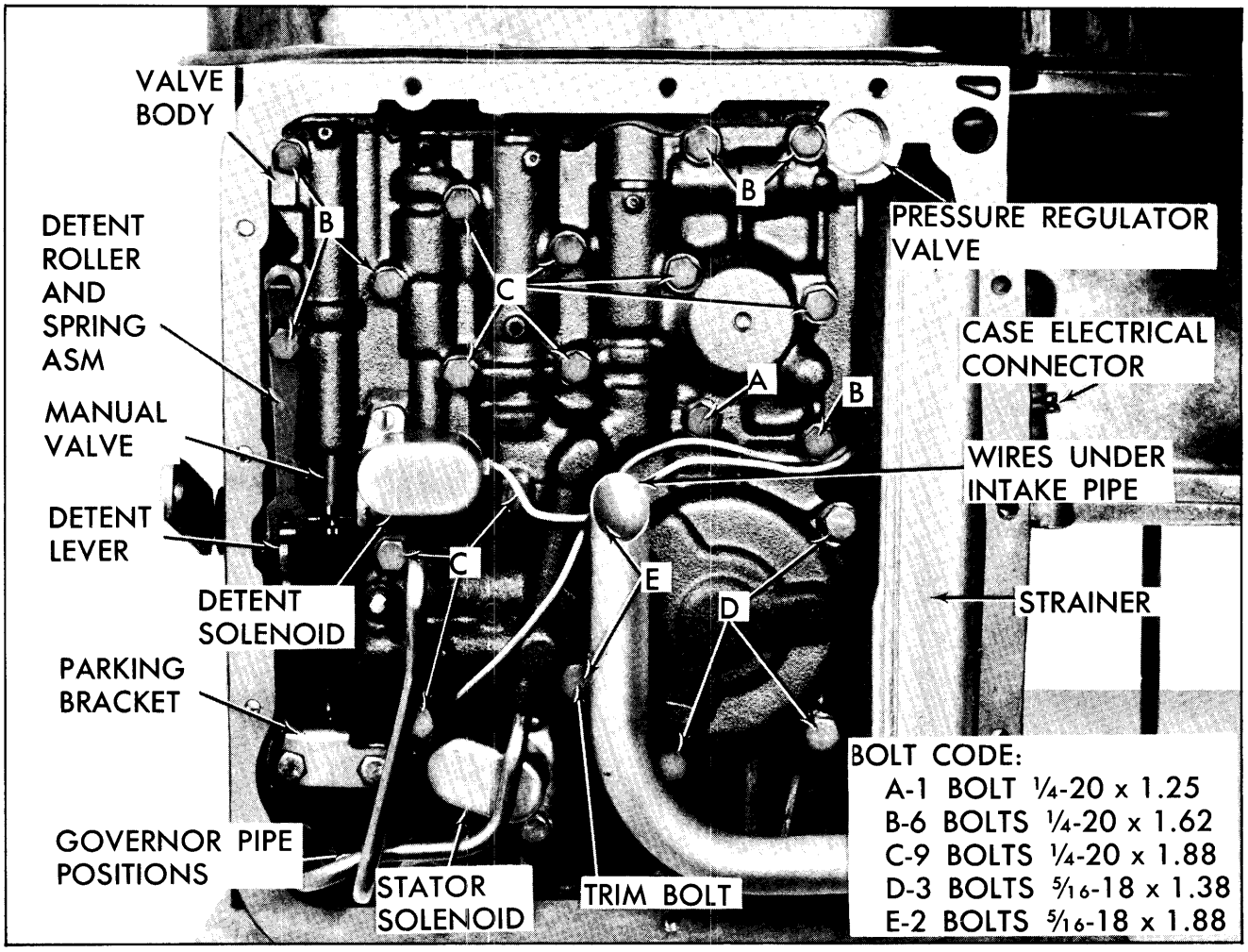


Fig. 7E-220 Attaching Bolt Location

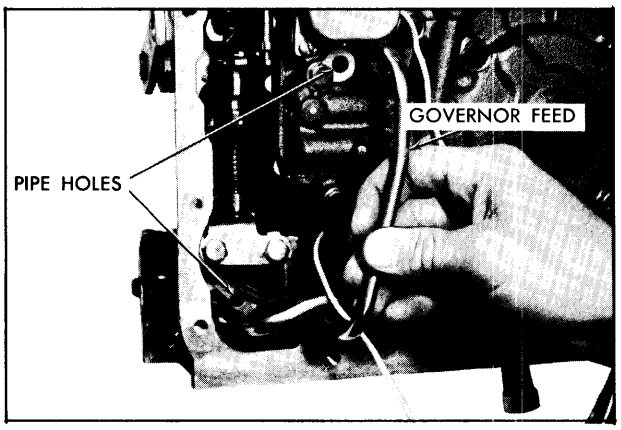


Fig. 7E-221 Installing Governor Feed Pipe

install the retaining snap ring into the case, using J-5043 pliers. (Fig. 7E-224)

STRAINER AND INTAKE PIPE

Install

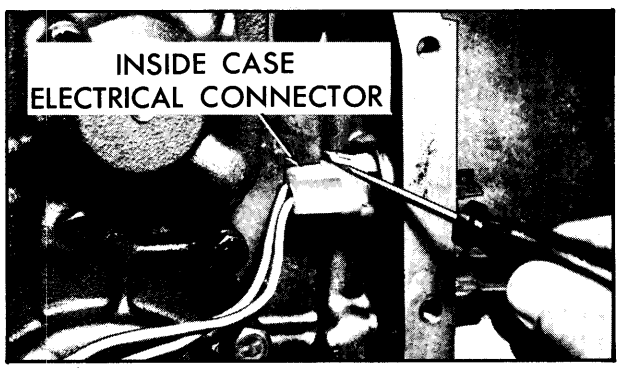


Fig. 7E-222 Installing Stator Connector

1. Install the case to intake pipe "O" ring seal on strainer and intake pipe assembly. (Fig. 7E-225)
2. Install the strainer and intake pipe assembly. (Wires under strainer intake pipe.)
3. Using a new bottom pan gasket, install pan. Torque attaching screws to 10 ft. lbs.

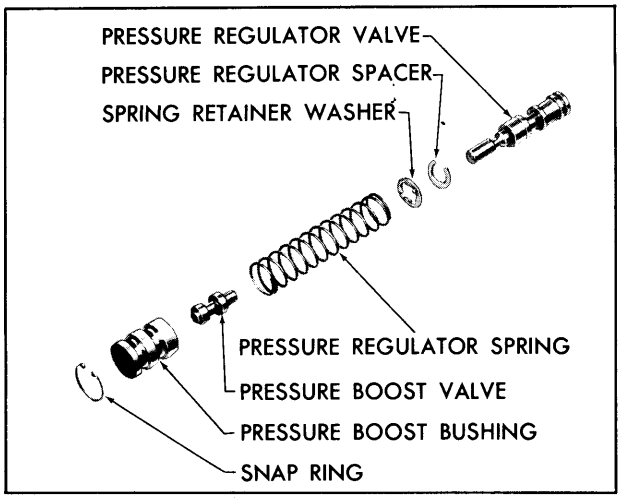


Fig. 7E-223 Pressure Regulator Valve

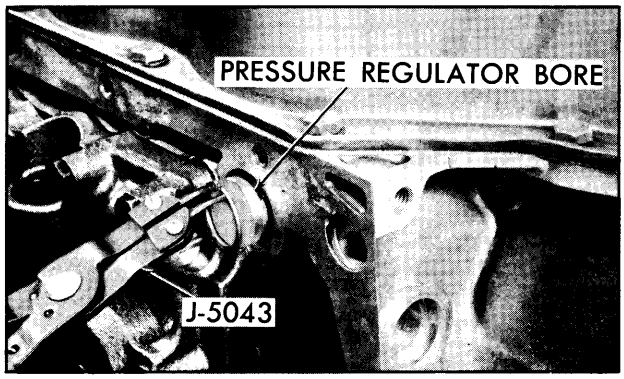


Fig. 7E-224 Installing Pressure Regulator Valve

MODULATOR VALVE AND VACUUM MODULATOR

Install

1. Install the modulator valve into the case bushing bore with stem end out.
2. Install the "O" ring seal on vacuum modulator.
3. Install the vacuum modulator into the case. (Fig. 7E-226)
4. Install the modulator retainer and attaching bolt. Torque bolt to 14 ft. lbs. (Fig. 7E-227)

GOVERNOR

Install

1. Lay the transmission on the oil pan.
2. Position new "O" ring seal on governor assembly then install into the case. (Fig. 7E-228)
3. Attach the governor with the attaching bracket.

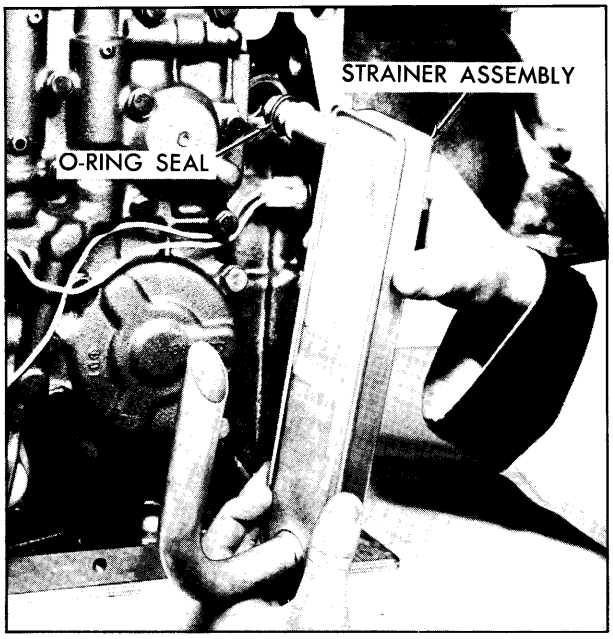


Fig. 7E-225 Installing "O" Ring Seal

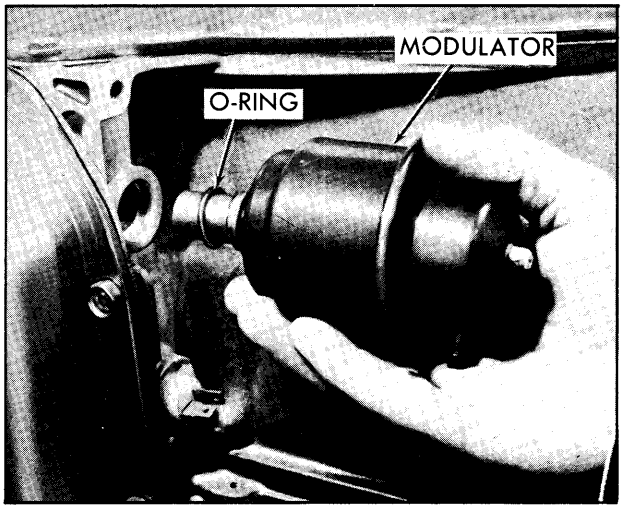


Fig. 7E-226 Installing Vacuum Modulator

INSTALL SPEEDOMETER DRIVEN GEAR

1. Install new "O" ring seal on speedo driven gear assembly.
2. Install speedometer driven gear assembly into transmission. (Fig. 7E-229)
3. Install retainer clip and screw, torque to 3 ft. lbs. (Fig. 7E-230)

INSTALL CONVERTER ASSEMBLY

1. With transmission in cradle or portable jack, install converter into pump, making certain the converter hub slots engage the pump drive gear tangs.

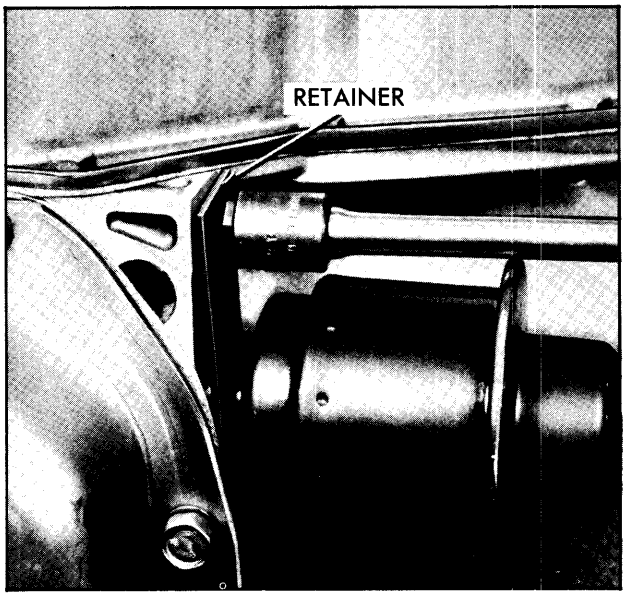


Fig. 7E-227 Installing Modulator Retainer Bold

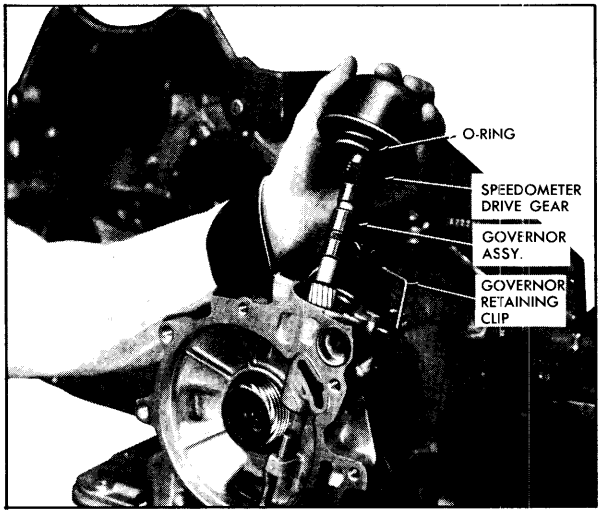


Fig. 7E-228 Installing Governor

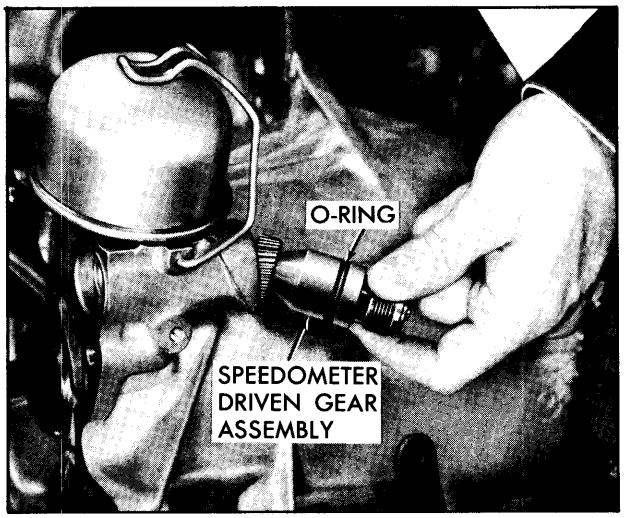


Fig. 7E-229 Installing Speedometer Driven Gear

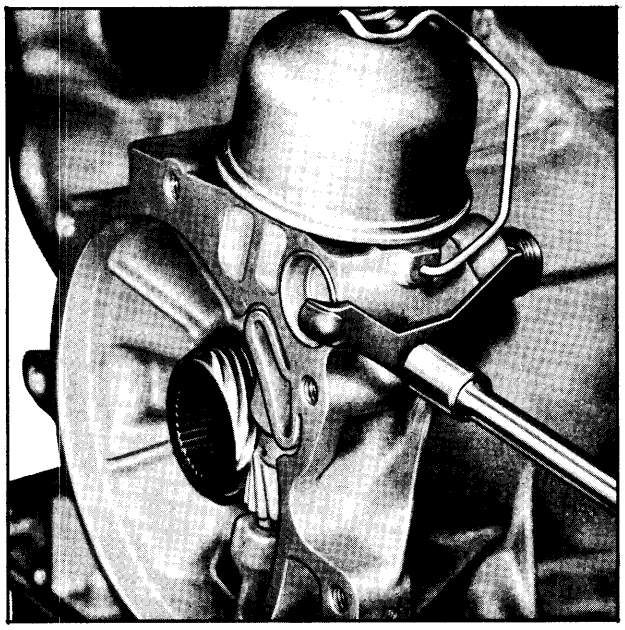


Fig. 7E-230 Installing Retainer Clip

LUBRICATION CHART (Fig. 7E-231)

The lubrication chart illustrates the lubricating oil flow from the oil pan through the transmission. The chart can be used to assist in locating areas of possible oil flow restrictions.

DIAGNOSIS GUIDE

NOTE: In many of the following diagnosis procedures, it is recommended that air pressure be applied. The purpose of this is to help determine if seal, rings or pistons are stuck, missing or damaged. Therefore, when air is applied, it is important to listen carefully for escaping air and piston action as air is applied to a particular area.

All passages can be located by referring to Fig. 7E-232 through Fig. 7E-236.

NO DRIVE IN "D" RANGE

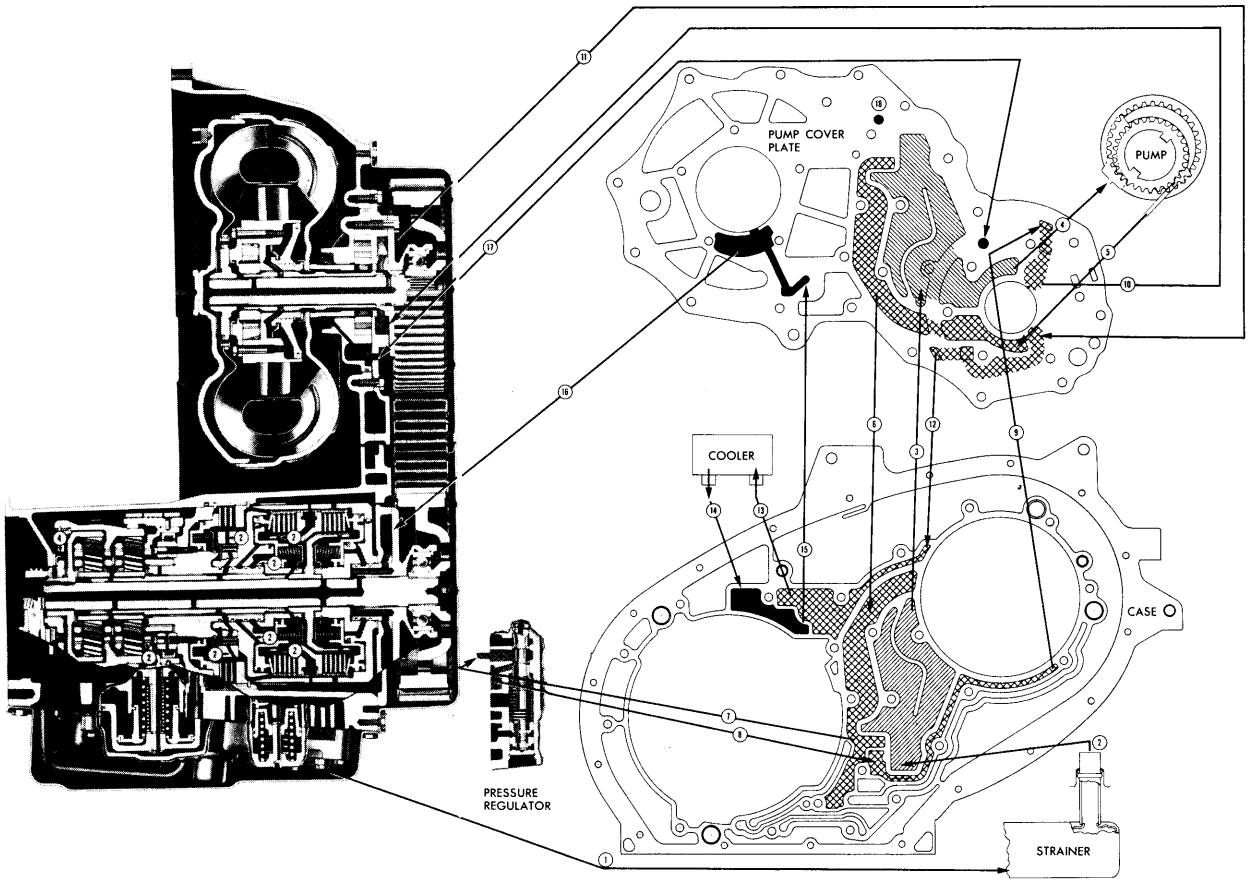
Possible Causes

A. Low Oil Level

Correct level-check for external leaks or vacuum modulator diaphragm leaking.

B. Manual Linkage

Maladjusted; correct alignment in manual lever shift quadrant.



1 OIL FROM SUMP TO STRAINER

2 STRAINER TO CASE PASSAGE

3 CASE PASSAGE TO PUMP COVER PLATE PASSAGE

4 PUMP COVER PLATE PASSAGE TO PUMP

5 PUMP TO PUMP COVER PLATE PASSAGE

6 PUMP COVER PLATE PASSAGE TO CASE PASSAGE

7 CASE PASSAGE TO PRESSURE REGULATOR VALVE

8 PRESSURE REGULATOR VALVE TO CASE PASSAGE

9 CASE PASSAGE TO PUMP COVER PLATE PASSAGE

10 PUMP COVER PLATE PASSAGE TO CONVERTER

11 CONVERTER TO CONVERTER OUT-CHECK VALVE AND PUMP COVER PLATE PASSAGE

12 PUMP COVER PLATE PASSAGE TO CASE PASSAGE

13 CASE PASSAGE TO COOLER

14 COOLER RETURN TO CASE PASSAGE

15 CASE PASSAGE TO PUMP COVER PLATE PASSAGE

16 PUMP COVER PLATE PASSAGE TO TRANSMISSION POWER TRAIN (ALL INTERNAL LUBRICATION)

NOTE: THE NUMBERS IN THE CROSS SECTION INDICATE THAT THERE ARE ADDITIONAL LUBRICATION HOLES IN THIS AREA THAT ARE NOT SHOWN IN THE CROSS SECTION.

17 FRONT SEAL DRAIN BACK HOLE

18 PRESSURE REGULATOR VENT HOLE

Fig. 7E-231 Lubrication Chart

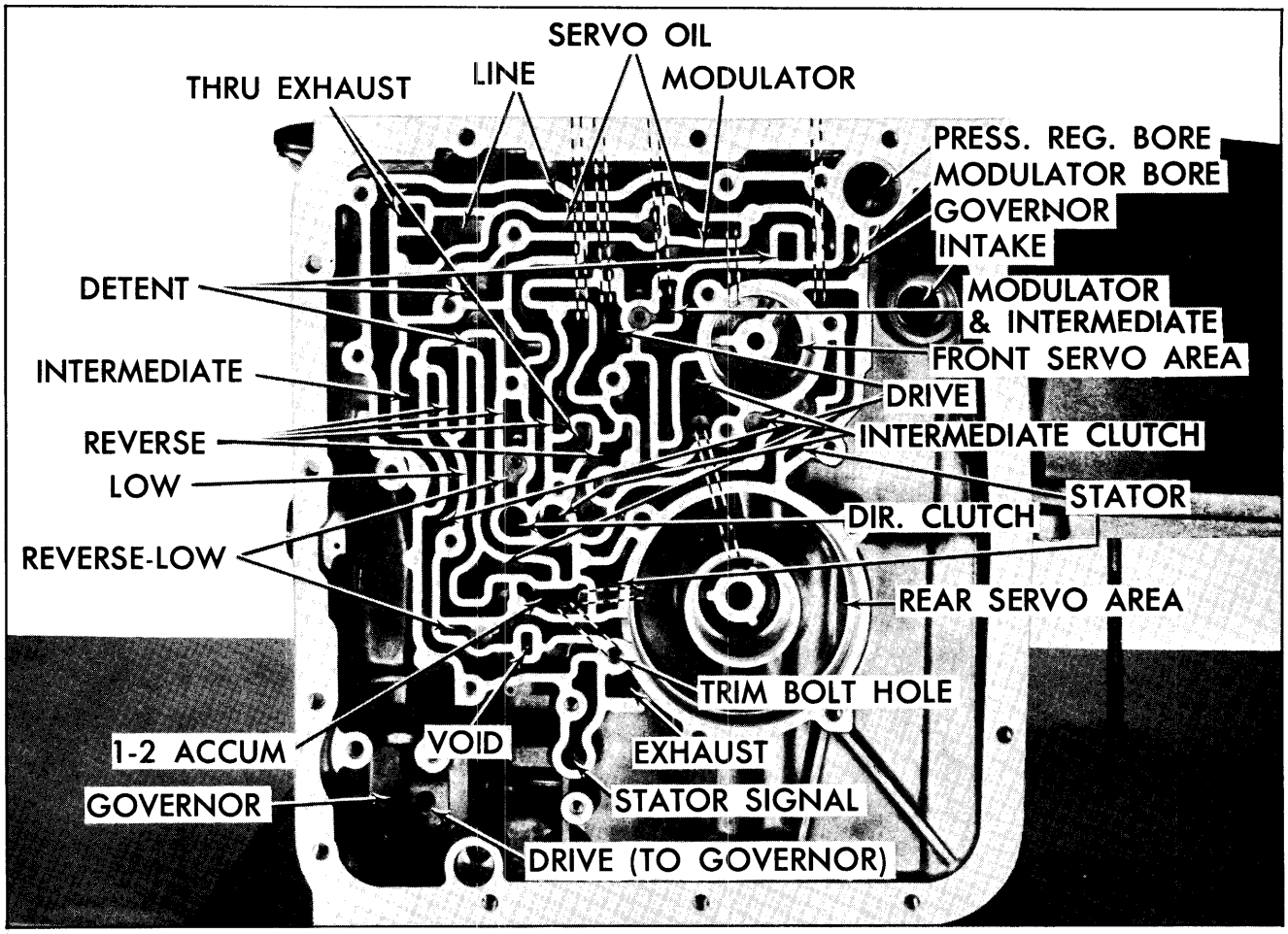


Fig. 7E-232 Case - Oil Passages

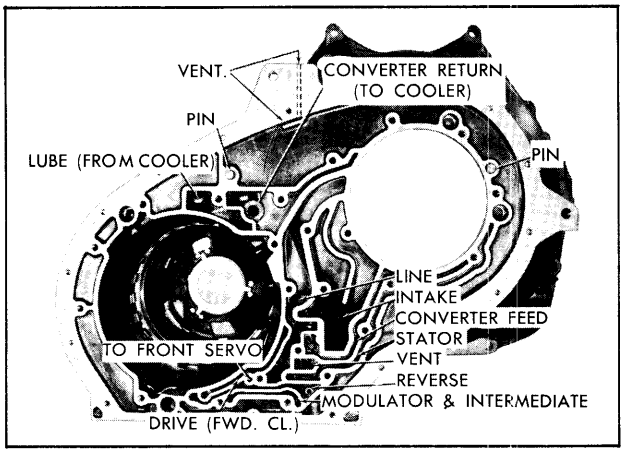


Fig. 7E-233 Oil Passages

C. Low Oil Pressure - Refer to oil pressure chart Fig. 7E-238 and connect oil pressure gauge to transmission.

1. Strainer Assembly - "O" ring missing or damaged, neck weld leaking, strainer blocked.

2. Pump Assembly - Pressure regulator

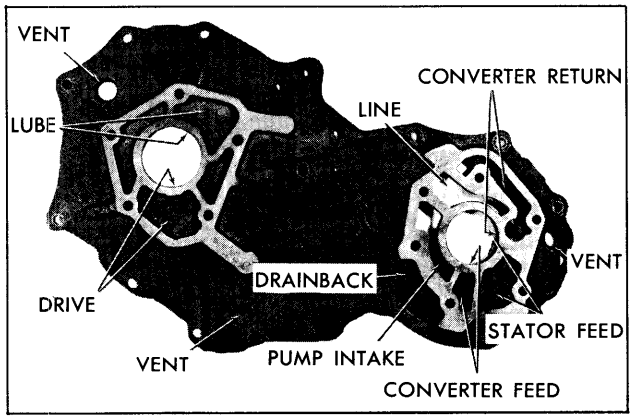


Fig. 7E-234 Oil Passages

stuck or inoperative (located in case); pump drive gear - tangs damaged by converter.

3. Case - Porosity in intake bore.

D. Control Valve Assembly

Manual valve disconnected from manual lever pin. (Other shift lever positions would also be affected.)

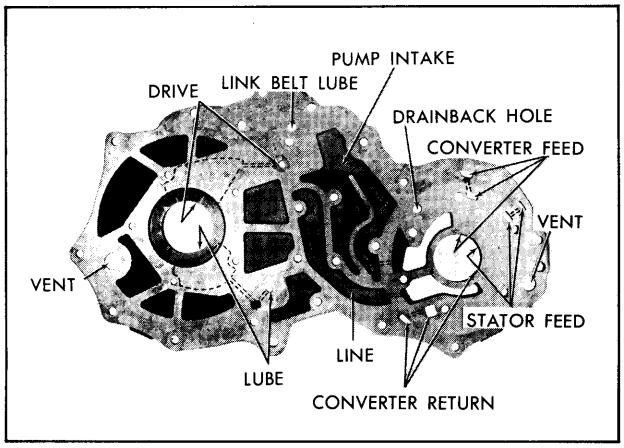


Fig. 7E-235 Oil Passages

E. Forward Clutch

Forward clutch does not apply - piston cracked; seals missing or damaged (these defects can be checked by removing the valve body and applying air pressure to the drive cavity in the case valve body face. Missing, damaged, or worn oil rings on the driven support housing can also be checked in this manner at the same time because they can also cause the forward clutch not to apply); clutch plates burned.

F. Roller Clutch Assembly

Roller clutch inoperative. Rollers worn, damaged springs, or damaged races. May be checked by placing selector lever in "L" range.

NO DRIVE IN "R" OR SLIPS IN REVERSE

Possible Causes

A. Low Oil Level

B. Manual Linkage

C. Oil Pressure - Refer to Oil Pressure Chart Fig. 7E-238 for specifications.

1. Vacuum modulator assembly defective.
2. Vacuum modulator valve sticking.
3. Restricted strainer, leak at intake pipe, or "O" ring seal.
4. Pump Assembly - Regulator or boost valve sticking.

D. Control Valve Assembly

1. Valve body gaskets - leaking or damaged. (Other malfunctions may also be indicated.)
2. Low reverse check ball - missing from case (this will cause no overrun braking in low range.)
3. 2-3 valve train stuck open (this will also cause 1-3 upshifts in drive range.)
4. Reverse feed passage - not drilled - also check case passages. Apply air to reverse passage in case valve body face.

E. Rear Servo and Accumulator

1. Servo piston seal ring broken or missing. Apply air pressure to drilled hole in the intermediate clutch passage of the case valve body face to check for piston operation and excessive leakage.
2. Band apply pin too short (this may also cause no overrun braking or slip in overrun braking in low range.)

F. Rear Band

Burned, loose lining, apply pin or anchor pins not engaged, band broken.

G. Direct Clutch

1. Outer seal damaged or missing.
2. Clutch plates burned - may be caused by stuck ball-check in piston.

H. Forward Clutch

Clutch does not release (will also cause drive in Neutral Range).

DRIVE IN NEUTRAL

Possible Causes

A. Manual Linkage - Maladjusted

B. Forward Clutch

Clutch does not release (this condition will also cause No Reverse).

FIRST SPEED ONLY—NO 1-2 SHIFT

Possible Causes

A. Governor Assembly

1. Governor valve sticking.
2. Driven gear loose, damaged or worn.

If driven gear shows signs of wear or damage, check output flange drive gear for nicks or rough finish.

B. Control Valve Assembly

1. 1-2 shift valve train stuck closed. Dirt, chips, or damaged valve in 1-2 shift valve train.
2. Governor feed channels blocked, or leaking; pipes out of position.

3. Valve body gaskets - leaking, damaged.

C. Case

1. Porosity between oil channels.
2. Governor feed passage blocked.

D. Intermediate Clutch

1. Case center support - oil rings missing, broken, defective. Apply air to intermediate clutch passage in case valve body face to check this defect.
2. Clutch piston seals - missing, improperly assembled, cut or damaged. Apply air to the intermediate clutch passage located in case valve body face to check for this defect.

1-2 SHIFT CAN ONLY BE OBTAINED AT FULL THROTTLE

Possible Causes

A. Detent Switch

Sticking or defective.

B. Detent Solenoid

1. Loose.
2. Gasket leaking.
3. Sticks open.
4. Electrical wire pinched between cover and casting.

C. Control Valve Assembly

1. Valve body gasket - Leaking, damaged.
2. Detent valve train stuck - dirt or foreign material.

FIRST AND SECOND SPEEDS ONLY— NO 2-3 SHIFT

Possible Causes

A. Detent Solenoid

Stuck open (the 2-3 would occur only at very high speeds) may be diagnosed as no 2-3 shift.

B. Detent Switch - Sticking or defective.

C. Control Valve Assembly

1. 2-3 valve train stuck - dirt or foreign material in valve train.
2. Valve body gaskets - leaking, damaged.

D. Direct Clutch

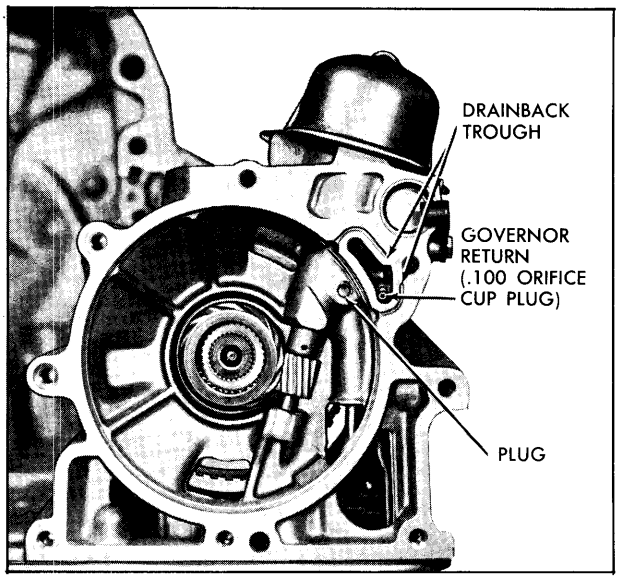


Fig. 7E-236 Oil Passages

1. Case center support - oil rings missing. broken. Apply air to direct clutch passage in case valve body face to check this area.
2. Clutch piston seals - missing, improperly assembled, cut or damaged; piston ball check stuck or missing. Apply air to direct clutch passage in case valve body face to check this condition.

SLIPS IN ALL RANGES

Possible Causes

A. Oil Level Incorrect - check oil level.

B. Oil Pressure Low - Refer to Oil Pressure Chart Fig. 7E-238 for specifications.

1. Vacuum modulator defective.
2. Vacuum modulator valve sticking.
3. Oil strainer assembly - plugged or leaks at neck; "O" ring, case to strainer, missing or damaged.
4. Pressure regulator or boost valve sticking.
5. Pump gears damaged or worn.

C. Case - Cross channel leaks - porosity.

D. Forward, Intermediate, and Direct Clutches Slipping - composition and steel clutch plates burned. (Burned clutch plates are usually resultant defects; always look for a primary defect that would cause the clutch plates to burn. Missing feed holes, seals and oil rings, etc., are primary defects.

E. Roller Clutch Assembly - Rollers worn,

SHIFT SPEED CHART

DRIVE RANGE	LIGHT THROTTLE	THRU DETENT
1-2	6 to 11 mph	35 to 51.5 mph
2-3	15.5 to 29.5 mph	70 to 85 mph
3-2	16.5 to 11.5 mph	78 to 61.5 mph
2-1	10 to 3.5 mph	35 to 17 mph
LO RANGE		
2-1	51 to 40 mph	

N/V = 38.15 with 3.21:1 axle; 8.85 Tire Size
Wheel Rev/mile = 713

Fig. 7E-237 Shift Speed Chart

springs or cage damaged, and worn or damaged races; (operates normally in low and reverse ranges).

SLIPS 1-2 SHIFT

Possible Causes

A. Oil Level Incorrect - Check oil level.

B. Oil Pressure Low - Refer to chart Fig. 7E-238 for pressure specifications.
   1. Vacuum modulator assembly - defective.
   2. Vacuum modulator valve sticking.
   3. Pump pressure regulator valve stuck.

C. Front Servo Accumulator
   1. Piston-cracked or porosity.
   2. Oil ring damaged or missing.

D. Control Valve Assembly
   1. 1-2 accumulator valve train (may cause a slip-bump shift.)
   2. Porosity in valve body or case valve body face.

E. Rear Servo Accumulator - Oil ring missing or damaged; case bore damaged; piston cracked or damaged.

F. Case - Porosity between oil passages.

G. Intermediate Clutch
   1. Lip seals missing, cut, or damaged. Apply air pressure to the intermediate clutch passage in the case valve body face to check.
   2. Clutch plates burned. (Burned clutch plates are usually the result of some other defect. Always look for other defects when clutch plates are found burned.)
   3. Case Center Support.
      a. Leaks in feed circuits (oil rings damaged or grooves damaged) or excessive leak between tower and bushing.

ROUGH 1-2 SHIFT

Possible Causes

A. Oil Pressure - Refer to Oil Pressure Chart Fig. 7E-238 for specifications.
   1. Vacuum modulator - check for loose fittings; restrictions in line; modulator assembly defective.
   2. Modulator valve stuck.
   3. Pump - regulator boost valve stuck.

B. Control Valve Assembly
   1. 1-2 accumulator valve train.
   2. Valve body to case bolts loose.
   3. Gaskets inverted, off location, or damaged.

C. Case
   1. Intermediate clutch passage check ball missing or not sealing.
   2. Porosity between channels.

D. Rear Servo Accumulator Assembly
   1. Oil rings damaged.
   2. Piston stuck. Apply air pressure to the 1-2 accumulator passage in the case valve body face. (You should hear the servo piston move.)
   3. Broken or missing spring.
   4. Bore scored or damaged.

SLIPS 2-3 SHIFT

Possible Causes

A. Oil Level - high or low.

B. Oil Pressure Low - refer to Oil Pressure Chart Fig. 7E-238 for specifications.
   1. Modulator assembly defective.
   2. Modulator valve sticking.
   3. Pump pressure regulator valve or boost valve sticking.

RANGE	GEAR	PUMP PRESS	FORWARD CLUTCH	2ND CLUTCH	3RD CLUTCH	2ND OVER RUN BAND	REV BAND
PARK		70-150	OFF	OFF	OFF	OFF	OFF
REV		107.5-230	OFF	OFF	ON	OFF	ON
NEUT		70-150	OFF	OFF	OFF	OFF	OFF
DRIVE	FIRST	70-150	ON	OFF	OFF	OFF	OFF
	SECOND	70-150	ON	ON	OFF	OFF	OFF
	THIRD	70-150	ON	ON	ON	OFF	OFF
INT	FIRST	150	ON	OFF	OFF	OFF	OFF
	SECOND	150	ON	ON	OFF	ON	OFF
LOW	FIRST	150	ON	OFF	OFF	OFF	ON
	SECOND	150	ON	ON	OFF	ON	OFF

Fig. 7E-238 Oil Pressure Chart

C. Control Valve Assembly

Accumulator piston pin - leak at valve body end.

D. Direct Clutch

1. Piston seals leaking. Apply air to the direct clutch passage in the case valve body face.
2. Case center support - oil seal rings damaged, excessive leak between tower and bushing. Apply air to the direct clutch passage in the case valve body face. If air comes out the intermediate passage, center support is defective.

ROUGH 2-3 SHIFT

Possible Causes

A. Oil Pressure High - Refer to Oil Pressure Chart Fig. 7E-238 for specifications.

1. Vacuum modulator assembly defective.
2. Vacuum modulator valve sticking.
3. Pump - pressure regulator or boost valve stuck or inoperative.

B. Front Servo Accumulator Assembly

1. Front accumulator spring missing or broken.
2. Accumulator piston stuck.

SHIFTS OCCUR AT TOO HIGH OR TOO LOW CAR SPEED

Possible Causes

A. Oil Pressure - Refer to Oil Pressure Chart Fig. 7E-238 for specifications.

1. Vacuum modulator assembly defective.
2. Modulator valve sticking.
3. Leak in vacuum line, engine to transmission.
4. Vacuum modulator line fitting on the carburetor blocked.
5. Pump - pressure regulator and boost valve train stuck.

B. Governor

1. Valve stuck or sticking.
2. Feed holes restricted or leaking; pipes damaged or mispositioned.

C. Detent Solenoid

1. Stuck open.
2. Loose on valve body (will cause late shifts).

D. Control Valve Assembly

1. Detent valve train sticking.
2. 3-2 valve train sticking.
3. 1-2 shift valve train.
   a. 1-2 regulator valve stuck.

b. 1-2 detent valve sticking open (will probably cause early 2-3 shift).

E. Spacer Plate Gaskets
1. Inverted or mispositioned.
2. Spacer plate orifice holes missing or blocked.
3. Check balls missing or mislocated.

F. Case
1. Porosity in channels.
2. Foreign material blocking channels.

NO DETENT DOWNSHIFTS

Possible Causes

A. Detent Switch
1. Mispositioned.
2. Electrical connections loose.

B. Solenoid
1. Defective.
2. Electrical connections loose.

C. Control Valve Assembly

Detent valve train stuck.

NO ENGINE BRAKING—SUPER RANGE—SECOND SPEED

Possible Causes

A. Front Servo Accumulator Assembly
1. Servo or accumulator piston rings broken or missing.
2. Case or valve body bores worn oversize causing excessive leakage.

B. Front Band
1. Band worn or burned. (Check for cause).
2. Band end lugs broken or damaged.
3. Band lugs not engaged on anchor pins or servo apply pin. (Check for cause).

NO ENGINE BRAKING—LOW RANGE—FIRST SPEED

Possible Causes

A. Control Valve Assembly

Low-reverse check ball missing from case.

B. Rear Servo
1. Oil seal ring damaged or missing.
2. Piston damaged or porous causing a leak in apply pressure.

C. Rear Band
1. Band lining worn or burned (check for cause).
2. Band end lugs broken.
3. Band ends not engaged on anchor pin or servo apply pin.

NOTE: Items A, B and C will also cause slip in reverse or No Reverse.

WILL NOT HOLD CAR IN PARK POSITION

Possible Causes

A. Manual Linkage - Maladjusted - external.

B. Internal Linkage
1. Parking brake lever and actuator rod assembly defective (check for proper actuator spring action).
2. Parking pawl broken or inoperative.

POOR PERFORMANCE OR ROUGH IDLE—DUE TO STATOR NOT CHANGING ANGLE

Possible Causes

A. Stator Switch
1. Defective.
2. Maladjusted - Refer to TUNE-UP Section.

B. Stator Solenoid
1. Defective (Wire ground to solenoid housing).
2. Electrical connection loose.
3. Stator valve train - located in valve body - stuck.
4. Oil feed circuit to stator restricted or blocked (check feed hole in stator shaft - see Lubrication Oil Flow Chart Fig. 7E-231).
5. Converter out-check valve (reed valve located in cover plate under drive support housing) broken or missing.

C. Turbine Shaft
1. Converter return passage not drilled.
2. Oil seal rings broken, worn, or missing.

D. Case

1. Porosity in feed circuit channels.
2. Foreign material blocking feed circuit.

E. Converter Assembly - Defective.

TRANSMISSION NOISE

Possible Causes

A. Pump Noise

1. Oil level high or low.
2. Water in oil.
3. Driving gear assembled upside down.
4. Driving or driven gear teeth damaged.

B. Gear Noise - (First Gear Drive Range)

1. Check pinions in planetary gear set for tooth finish or damage.
2. Check sun gear and both front and rear internal gears for tooth finish or damage.

C. Clutch Noise - During Application

1. Forward Clutch - (Neutral to drive, park to drive). Check clutch plates.
2. Intermediate Clutch - (1-2 in Super and Drive Range). Check clutch plates.
3. Direct Clutch - (2-3 shift in drive range and neutral to Reverse, park to reverse). Check clutch plates.

D. Sprocket and Link Assembly Noise

1. Link assembly too long. Sounds similar to pop corn popping. (There will be a rough burr along the teeth of the drive sprocket if the link assembly is too long). Replace link assembly and drive sprocket.
2. Drive or Driven sprocket teeth damaged.
3. Engine mounts worn or damaged.

OIL LEAKS

The suspected area should be wiped clean of all oil before inspecting for the source of the leak. Red dye is used in the transmission oil at the assembly plant and will indicate if the oil leak is from the transmission. The use of a "black light"* to identify the oil at the source of the leak is also helpful. Comparing the oil from the leak to that on the engine or transmission dip stick (when viewed by black light) will determine the source of the leak.

Oil leaks around the engine and transmission are generally carried toward the rear of the car by the air stream. For example, a transmission "oil filler tube to case leak" will sometimes appear as a leak at the rear of transmission. In determining the source of an oil leak, it is most helpful to keep the engine running.

*A "black light" testing unit such as J-6640 may be obtained from service tool suppliers.

Possible Points of Oil Leaks

A. Transmission Oil Pan

1. Attaching bolts not correctly torqued.
2. Pan gasket improperly installed or damaged.
3. Oil pan case mounting face not flat.

B. Cover and Plate Assembly Sprocket Housing Leak

1. Attaching bolts not correctly torqued.
2. Housing to case gasket improperly installed or damaged.
3. Housing to case gasket face not flat.

C. Final Drive to Transmission Leak

1. Attaching bolts not correctly torqued.
2. Final drive to transmission gasket improperly installed or damaged.
3. Mounting surfaces not flat.

D. Case Leaks

1. Filler pipe "O" ring seal damaged or missing. (Filler pipe is located in the final drive housing).
2. Mispositioning of filler pipe mounting bracket - loading one side of "O" ring seal.
3. Modulator assembly "O" ring seal damaged or improperly installed.
4. Governor cam, "O" ring and bracket damaged or loose.
5. Manual shaft "O" ring seal damaged or improperly installed.
6. Line pressure tap plug loose or stripped.
7. Cooler connectors loose, cracked, or stripped.
8. Porosity in case.

E. Front End Leaks

1. Front seal in pump damaged (check converter neck for nicks, etc., also for pump bushing moved forward).

2. Garter spring missing or loose on front seal.
3. Converter weld leaks.
4. Pump to case "O" ring cut or damaged.
5. Vent fitting damaged.

F. Oil Comes Out Vent Pipe

1. Transmission overfilled.
2. Water in oil.
3. Cooler lines blocked causing excessive heat.

TOOLS

Three new essential tools are used on the 94 and 96 Series transmission.

J-22241	Forward Clutch End Play Checking Tool
J-21370-7	Band Apply Selector Pin
J-21370-8	Band Apply Selector Pin Adapter Plate

For usage of additional tools, refer to Figs. 7-264 and 7-265 of the TURBO HYDRA-MATIC TRANSMISSION, Section 7.

TORQUE CHART

APPLICATION	FT. LBS.
Transmission to Engine Bolts	25
Torque Converter to Flywheel	30
Flywheel Housing Cover	5
Oil Cooler Lines to Radiator and Transmission	25
Final Drive to Transmission	25
Starter Motor to Transmission	25
Solenoid to Valve Body	3
Line Pressure Plug	13
Vacuum Modulator Retainer	18
Solenoid to Case	8
Valve Body to Case	8
Center Support to Case	23
Manual Shaft to Inside Lever	18
Pump Body to Cover Plate	18
Parking Brake Bracket to Case	18
Oil Pan to Case	12
Sprocket Housing	8
Support Housing to Cover Plate	18
Speedometer Drive Gear Retainer	3