Allison Transmissions

TT 3000 Series Service Manual

IMPORTANT SAFETY NOTICE

Proper service and repair is important to the safe, reliable operation of all motor vehicles. The service procedures recommended by Detroit Diesel Allison and described in this service manual are effective methods for performing service operations. Some of these service operations require the use of tools specially designed for the purpose. The special tools should be used when and as recommended.

It is important to note that some warnings against the use of specific service methods that can damage the vehicle or render it unsafe are stated in this service manual. It is also important to understand these warnings are not exhaustive. Detroit Diesel Allison could not possibly know, evaluate and advise the service trade of all conceivable ways in which service might be done or of the possible hazardous consequences of each way. Consequently, Detroit Diesel Allison has not undertaken any such broad evaluation. Accordingly, anyone who uses a service procedure or tool which is not recommended by Detroit Diesel Allison must first satisfy himself thoroughly that neither his safety nor vehicle safety will be jeopardized by the service method he selects.

SA 1584

Service Manual

Allison Transmissions

POWERSHIFT MODEL

TT 3420-1

1 MAY 1977

Detroit Diesel Allison
Division of General Motors Corporation
Indianapolis, Indiana 46206

NOTE:
Additional copies of this publication may be purchased from authorized Detroit Diesel Allison service outlets. See your yellow pages under Engines—Diesel or Transmissions—Truck, Tractor, etc.

Printed in U.S.A.

© 1977 General Motors Corp.

TABLE OF CONTENTS

Section 5. DISASSEMBLY OF TRANSMISSION INTO SUBASSEMBLIES (cont'd)

Section 6. REBUILD OF SUBASSEMBLIES

FOLDOUTS (back of book)

Cross Section

1 TT 3420-1 Transmission

A,2 Input and output flanges
B,2 Input components, remote mount

A,3 Input components, direct mount
B,3 Torque converter

A,4 Torque converter housing and turbine drive gears
B,4 Turbine driven gears and freewheel clutch

A,5 Power takeoff
B,5 Transmission housing

A,6 Reverse-range clutch and planetary
B,6 Low-range clutch and planetary

A,7 High-range clutch and piston housing
B,7 Transmission rear cover

A,8 Output shafts and disconnect assembly
B,8 Oil pump assembly

A,9 Parking brake
B,9 Control valve assembly

Section 1. GENERAL INFORMATION

1-1. SCOPE OF MANUAL

a. Coverage. This Service Manual describes the operation, maintenance, and overhaul procedures for the TT 3000 Series Powershift transmission. Figures 1-1 and 1-2 are representative of the models covered in this manual. The disassembly and assembly procedures are presented, and the function and operation of the hydraulic systems and torque paths are explained. Wear limits information, parts inspection procedures, and torque specifications also are included.

b. Illustrations. The text is illustrated with photographs, line drawings, schematic views, and cross-section and exploded views. Transmission features and overhaul procedures are illustrated mainly by photographs. Line drawings are used to illustrate the hydraulic system. Cross-section views illustrate the torque paths and the relationship of assembled parts. The cross-section and exploded views appear on foldouts at the back of the manual. The foldouts may be opened for reference while studying the text.

1-2. SUPPLEMENTARY INFORMATION

Supplementary information will be issued when significant design changes occur. The supplements will pertain only to specific changes, and therefore, must be used in conjunction with this Service Manual.

1-3. ORDERING PARTS

a. Transmission Nameplate

The nameplate (fig. 1-3), located on the lower left side of the transmission housing, has the serial number, part number (assembly number) and model number assigned to define a specific configuration. Because of the differences in models, options, and component arrangement, be sure to include all three numbers (and metal-stamped letters, if present) when ordering parts or requesting service information.

b. Parts Catalog. All replacement parts and service kits should be ordered from your dealer. These parts are listed in the current TT 3000 Series Allison Powershift Transmission Parts Catalog (SA 1519). Do not order parts by illustration item numbers used in this Service Manual.

1-4. DESIGN FEATURES

a. Mounting, Input Drive (foldout 1)

(1) The transmission may be direct mounted or remote mounted. In the direct-mount arrangement, the transmission is coupled to the engine through a modified SAE 3 mounting face on torque converter housing 8, bolted to the engine flywheel housing. Flexible disks 3 and 4 (A, foldout 3) bolt to the engine flywheel.

(2) For the remote-mount arrangement, the transmission is equipped with front cover 2 (foldout 1). An input shaft 42, connected to converter drive cover 3, extends through front cover 2 and receives the flange. Input flange 1 is driven by the engine through a drive shaft and universal joints.

b. Twin-turbine Torque Converter (foldout 1)

(1) Each turbine is connected to its own output gear set. First turbine 6 provides high torque at low speed; second turbine 5 provides higher speed with less torque. There are four elements in the twin-turbine torque converter—pump 8, first turbine 6, second turbine 5, and stator 7.

(2) First-turbine drive gear 14, driven gear 36, and freewheel clutch 38 connect the first turbine to the range gears and clutches. Second-turbine drive gear 39 and driven gear 37 connect second turbine 5 to the range gears and clutches. The first-turbine gear set provides a reduction in speed with an increase in torque delivered to the range gearing. The second-turbine gear set provides an increase in speed with a reduction in torque delivered to the range gearing.

(3) When torque demand is high, the freewheel clutch is engaged and the first turbine, assisted by the second turbine, drives the range gears. When the speed of the vehicle increases, torque demand decreases. When this occurs, the second turbine assumes the load and the freewheel clutch disengages. The transition from first turbine to second turbine (high torque to high speed) is automatic, being determined by speed and load conditions.

c. Range Gearing, Clutches (foldout 1)

(1) The transmission has two planetary gear sets and three clutches. The reverse-range planetary gear set consists of ring gear 33, carrier assembly 35, and sun gear 26 (integral with low-range sun gear). The reverse-range gear set is controlled by reverse-range clutch 16.

(2) The low-range planetary gear set consists of ring gear 31, carrier assembly 27 and sun gear 26 (integral with reverse-range sun gear). The low-range gear set is controlled by low-range clutch 18.

(3) Torque is supplied to the reverse- and low-range planetary gear sets by the shaft of second-turbine drive gear 37, which drives the reverse-and-low-range sun gear. High-range clutch 23, when engaged, gives direct drive from the turbine driven gear 37 to transfer drive gear 21. The low-range clutch, when engaged, provides drive from the turbine driven gear 37 to transfer drive gear 21 with a reduction in speed. The reverse-range clutch, when engaged, provides drive from gear 37 to gear 21, with a reversal of direction and reduction in speed. Two forward gears (F1 and F2) and reverse (R) are derived from the range gearing and clutches. All three clutches are multiplate, hydraulically applied, spring released.

d. Transfer Gears (foldout 1). The transmission output consists of transfer gears 21 and 30 which drive one of two output configurations—front and rear output or front disconnect and rear output (A, foldout 8). Constant-mesh, spur-type transfer gears are used in-line to provide a 19-inch vertical drop from the input shaft to the output shaft.

e. Output Shafts (foldout 1)

(1) The transmission may be equipped with one of two output shaft configurations—one-piece shaft 28, or two-piece shaft 4 and 14 (A, foldout 8).

(2) The one-piece shaft provides identical operation at the front and rear outputs. The two-piece shaft and disconnect coupling 7 allow front output shaft 4 to be disconnected from the driveline while drive at rear output shaft 14 is maintained.

f. Accessory Drive Pad

(1) An SAE size B, 2-bolt mounting pad is located at the upper-right rear of the transmission housing to accommodate a steer pump or other accessory (in addition to that mounted at the rear of the oil pump).

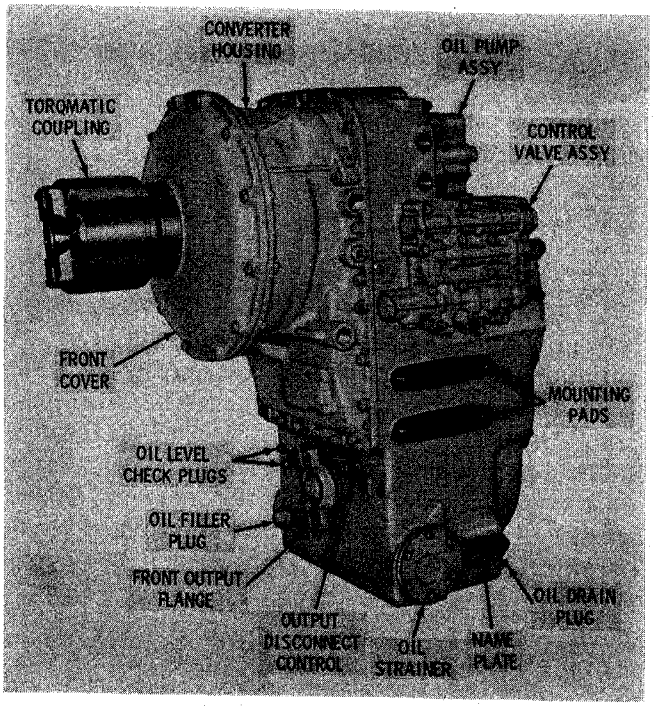
(2) If no requirement exists for an accessory drive at this location, the drive gear, shaft assembly, and related parts are omitted, and the openings in the housing are closed with plugs.

g. Oil Pump (foldout 1). A positive displacement, dual section, 3-gear oil pump 13 furnishes the oil flow and pressure necessary for hydraulic operation, lubrication, and cooling of the transmission components. A pad is provided at the rear of the pump to accommodate an implement pump. Rotation of the pump is in a clockwise direction (viewed from the rear) at engine speed.

h. Control Valve Body Assembly (B, foldout 9)

(1) Control valve body assembly 5 is mounted on the left side of the transmission housing (fig. 1-1). The significant components contained within the valve body are main-pressure regulator valve 8 (B, foldout 9), trimmer plug 16, range selector valve 25, and a clutch cutoff valve 20.

(2) The clutch cutoff valve is hydraulically actuated (by hydraulic brake pressure). When the vehicle brakes are applied, the valve releases the transmission drive clutch. Thus, when the vehicle is brought to a stop by the brakes, the power-driven pumps may be controlled by opening the throttle without having to shift to neutral.



S4073

Fig. 1-1. Model TT 3420-1 transmission equipped for remote mounting—left-front view

(3) Linkage connects the range selector valve to the operator's manual controls. A brake pressure line connects the clutch cutoff valve to the vehicle brake system.

i. Parking Brake (A, foldout 9). A 10 x 3-inch (254 x 76.2 mm), expanding shoe-type parking brake 1 is available. The brake is mechanical, and manually operated.

j. Housings (fig. 1-1 and 1-2). The torque converter housing is cast aluminum, and the transmission housing is cast iron. The front cover is cast iron. The rear cover is cast iron. The lower part of the transmission housing serves as an oil sump. Openings in the transmission housing provide for installation of external piping, oil check plugs, breather, drain plug, oil filler tube and oil strainer.

k. Oil Filter, Cooler. Provision is made for connecting a remote-mount, full-flow filter and an oil cooler to the transmission (both customer-furnished). Refer to figure 3-1 for the points at which these items are attached.

1-5. OPERATING INSTRUCTIONS

a. Related to Vehicle. For information on controls and linkage provided by the vehicle manufacturer, refer to vehicle service manual.

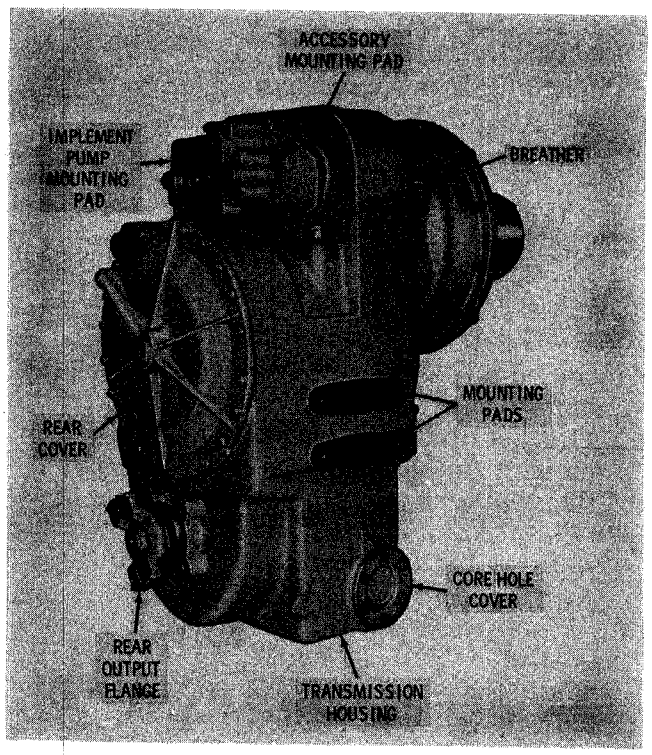


Fig. 1-2. Model TT 3420-1 transmission equipped for remote mounting—right-rear view

b. Range Selection

(1) Position the range selector control to neutral position while starting the engine. A neutral start switch will prevent the engine from starting if the shift lever is in any other position.

(2) When a shift is made from neutral to any driving range, the engine should be at idle speed. Any shift to a higher speed range, in the same direction, can be made at full throttle, under load. Downshift to the next lower speed range may be made at full throttle, under load, providing the vehicle is not exceeding the maximum speed attainable in the lower range.

c. Changing Direction of Travel. Directional shifts can be made under full-power and/or full-speed conditions in the working ranges (F1 to R and R to F1). Shifts from reverse should be made to F1 drive range—not F2. Direct shifts from R to F2 will adversely affect clutch service life.

d. Clutch Cutoff Control. When the transmission is equipped with the clutch cutoff control, the driving clutch is completely released whenever the vehicle brakes are applied. Hydraulic pressure which applies the brakes also actuates the clutch cutoff. Thus, with the clutch released, full engine power is available for PTO-driven equipment without shifting the range selector control to neutral.

e. Output Disconnect. The transmission front output may be disconnected by actuating the control (fig. 1-1) which moves the disconnect coupling (at the front of the transmission drop box) forward. Rearward movement connects the front and rear output shafts through the splines of the coupling. Two spring-loaded ball detents retain the coupling in either position. The control should never be shifted while the vehicle is moving.

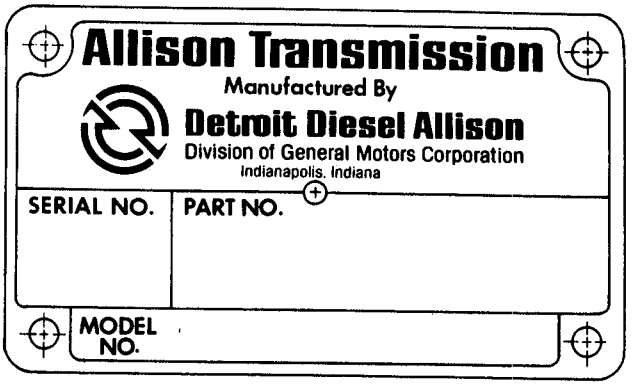


Fig. 1-3. Transmission nameplate

f. Temperatures, Pressures

(1) When a transmission is equipped with a temperature gage, the bulb or sending unit is mounted in the converter-out oil stream (fig. 3-1). Temperature should never be permitted to exceed 250°F (121°C). Extended, severe operating conditions may cause the temperature to reach this maximum. If so, the transmission should be shifted to neutral and the engine should be operated at approximately 1000 to 1500 rpm for several minutes until normal temperature (180 to 220°F (82 to 104°C) is restored. If the temperature reaches maximum (250°F (121°C)) during normal operation of the transmission, stop the engine and locate the trouble. Refer to Troubleshooting Chart (para 3-11).

(2) When a transmission is equipped with a clutch (main) pressure gage, it is connected to the front of the control valve body assembly (fig. 3-1). The pressure shown is that which is effective in the operating range clutch. Shifting or use of the clutch cutoff will cause fluctuations in the pressure indicated. If abnormal pressures are evident, refer to the Troubleshooting Chart (para 3-11).

1-6. SPECIFICATIONS, DATA

The following table of specifications and data are applicable to all models in this Service Manual.

SERIES TT 3000 POWERSHIFT TRANSMISSIONS SPECIFICATIONS AND DATA

Item	Description
Transmission type	Torque converter and planetary gear
Rating:	
input speed	2800 rpm (max.)
input torque	400 lb ft (542 Nm)
input horsepower	150-250 HP (112-186 kW) Depending upon application
Rotation, viewed from front:	
input	clockwise
output (forward operation)	clockwise
(reverse operation	counterclockwise
Mounting, drive:	
side	four 5/8-11 tapped holes in side pads, each side
front, direct mounted	modified SAE-3 flange on converter housing bolts to engine flywheel housing, flex plate attaches to engine flywheel
front, remote mounted	front unmounted, converter enclosed, input flange for shaft and universal joint coupling
Gear ranges, selector positions	reverse, neutral, low range (F1), high-range (F2)
Weight, dry (approx.):	
direct mount	1000 lb (454 Kg)
remote mount (add)	40 lb (18 Kg)
parking brake (add)	20 lb (9 Kg)
Torque converter	2-stage, 4-element, twin-turbine
*torque multiplication ratios:	TT-445 — 4.92:1 TT-465 — 4.67:1

SPECIFICATIONS AND DATA — Continued

Item	Description
Gear data:	
range gearing	constant mesh planetary
transfer gearing	constant mesh in-line
gear type	spur
*Gear ratios:	overall ratio with .846 dropbox
low range — F1	2.52:1
high range — F2	.70:1
reverse — R	2.33:1
Clutch data:	
type	multidisk, hydraulic-actuated, spring released, oil-cooled; automatically compensates for wear
material	external-tanged reaction plates — cross-ground steel internal-splined friction plates — resin-graphite on steel
Parking brake:	
size and type	10 x 3 DCM (254 x 76.2 mm), expanding shoe, mechanical-applied
static rating	60,000 lb in. (6779 Nm) at 1500 lb (6672 N) apply force
(run-in and burnished)	meets SAE J237 with respect to parking brake systems
Flanges:	
input	Mechanics 6C
output	Mechanics 7C
Torqmatic® coupling	Mechanics 7C, non-separating limited stroke design
Oil system:	
oil pump	input driven, positive displacement
sump	single, integral
oil type	hydraulic transmission fluid Type C-2
oil capacity (less external circuits)	initial fill — 8-1/2 US gal. (32.18 liters)
oil filter (customer furnished)	remote mounted
converter-out oil temperature	250° (121°C) max continuous
main pressure	160-195 psi (1103-1344 kPa)
converter-out pressure at full throttle stall	40 psi (276 kPa) min
converter-out pressure at full throttle, no-load	65 psi (448 kPa) max
Control valve body assembly:	
clutch cutoff	hydraulic-actuated

SPECIFICATIONS AND DATA — Continued

Item	Description
Power takeoff data:	
implement pump drive (pad at rear of oil pump):	
ratio	1.00 x engine speed
maximum rating horsepower, at 2000 to 2800 rpm:	
intermittent	160 HP (119 kW)
continuous	120 HP (90 kW)
**mounting pad	SAE size C, 4-bolt
spline coupling adapter	SAE size C-to-B reducer
Accessory drive pad:	
ratio	1.00 x engine speed
rating, maximum intermittent horsepower, at 2000 to 2800 rpm	70 HP (52 kW)
**mounting pad	SAE size B, 2-bolt

*To obtain overall transmission torque ratios, multiply the applicable torque converter ratio times the overall gear ratio.

**Customer supplied gasket required to seal lubrication at spline drive.

Section 2. DESCRIPTION AND OPERATION

2-1. SCOPE OF SECTION 2

This section describes the functions of the transmission components. The hydraulic system is explained and schematically illustrated. The transmission torque paths are also explained for each gear range.

2-2. TWIN-TURBINE TORQUE CONVERTER

a. Converter Construction (foldout 1). The torque converter consists of pump 8, first turbine 6, second turbine 5, and stator 7. Pump 8 is the driving member and is driven at engine output speed. First turbine 6 and second turbine 5 are driven members, connected by transfer gears 14, 36, 39, and 37 to the transmission range gearing. Stator 7 is the reaction member.

b. Converter Operation (foldout 1). During operation, the first and second turbines function jointly or separately, depending upon the load demand and speed of the vehicle. The first-turbine gear train consists of gears 14 and 36. The second-turbine gear train consists of gears 39 and 37. The turbines are able to function jointly or separately by means of a freewheel clutch 38. At high load demand and low speed, the freewheel clutch is engaged, permitting both turbines to drive, and providing maximum input torque to the range gearing. As the vehicle speed increases and load demand decreases, the second-turbine speed, as it approaches the first-turbine speed, provides all of the torque. The first turbine then freewheels. Upon an increase in load demand and the resulting decrease in vehicle speed, the freewheel clutch automatically reengages, permitting both the first turbine and second turbine to again provide the necessary torque multiplication.

2-3. LOW-, REVERSE-RANGE GEARING AND CLUTCHES

a. Two planetary gear sets are used in the transmission gear train. One transmits low-speed forward and the other transmits reverse drive. The planetary gear sets are interconnected through integral sun gear 26, (foldout 1) and reverse-range ring gear 33, which is splined to the low-range planetary carrier assembly 27.

b. The reverse-range planetary carrier assembly 35 (foldout 1) and the low-range planetary carrier assembly 27 (foldout 1) each have four pinions. Reverse-and-low-range sun gear 26 is the driving member for both planetary gear sets. In the reverse-range planetary, carrier assembly 35 is the reaction member and ring gear 33 is the driven member. In the low-range planetary, ring gear 31 is the reaction member and carrier assembly 27 is the driven member.

c. Reverse-range clutch 16 (foldout 1) has five external-tanged reaction plates and five internal-splined friction plates. The reaction plates engage the anchor pins in reverse-and-low-range clutch anchor 32. The friction plates engage the splined hub of reverse-range planetary carrier 35. Low-range clutch 18 has five internal-splined friction plates and five external-tanged reaction plates. The friction plates engage the spines of low-range ring gear 31 and the reaction plates engage the anchor pins in reverse-and-low-range clutch anchor 32. Engagement of the reverse-range clutch holds the reverse-range carrier stationary, and engagement of the low-range clutch holds the low-range ring gear stationary.

2-4. HIGH-RANGE CLUTCH

a. High-range drive is obtained through the high-range clutch—no planetary gearing is involved. High-range clutch 23 (foldout 1) consists of three friction plates and two external-tanged reaction plates. The friction plates attach to high-range clutch hub 24, which is driven by reverse-and-low-range sun gear 26. The external tanges on the reaction plates engage the drive pins in transfer drive gear 21.

b. Thus, when the high-range clutch is applied, transfer drive gear 21 is locked to reverse-and-low-range sun gear 26. This causes transfer drive gear 21 to rotate at a 1 to 1 ratio.

2-5. TRANSFER GEARS, OUTPUT SHAFTS

a. Transfer Gears. The transfer gears consist of two spur gears which are in constant mesh. Transfer drive gear 21 (foldout 1) is splined to the

hub of low-range planetary carrier assembly 27. Transfer-driven gear 30 is located directly below the drive gear and is splined to output shaft 28.

b. One-Piece Shaft. Output shaft 28 provides identical operation at the front and rear outputs. The output disconnect shaft hole is closed by a shifter shaft plug when the one-piece shaft is used.

c. Two-Piece Shaft, Front Disconnect. (A, foldout 8). The two-piece shaft configuration allows front output shaft 4 to be disconnected from the driveline. The front disconnect consists mainly of disconnect coupling 7 which is manually shifted by disconnect shifter fork 10 and shaft 9. In the engaged position (rearward) torque from rear output shaft 16 is transmitted through the coupling splines to the front output shaft. In the disengaged position (forward), the coupling rides on the rear splines of the front output shaft and torque to the front output is interrupted.

2-6. IMPLEMENT PUMP, ACCESSORY DRIVE PADS

NOTE

Refer to specifications and Data (para 1-6) for duty ratings.

a. Implement Pump Drive Pad. The implement pump drive pad, located on the rear face of oil pump 6 (B, foldout 8), is a 4-bolt, SAE size C. Accessory-driven gear 4 (A, foldout 4) is engine-driven through accessory drive gear 18 (B, foldout 3) at 1 to 1 ratio. Regardless of the range selector position, the shaft rotation is clockwise as viewed from the rear. An adapter drive coupling may be used to accommodate a B-size spline to the C-size splines in gear 4 (A, foldout 4).

b. Accessory Drive Pad. A 2-bolt, SAE size C pad is located at the upper right rear face of the transmission housing. The drive at the pad is provided by accessory drive gear 1 (A, foldout 5) and gear shaft 4, which rotates at engine speed. Regardless of the range selector position, the shaft rotation is clockwise as viewed from the rear. If no requirement exists for a PTO at this location, the drive gear, shaft, and related parts are omitted, the opening closed by cup plug 7 (A, foldout 5) and the oil passage closed by cup plug 6.

2-7. OIL PUMP

Oil pump assembly 6 (B, foldout 8) consists mainly of three spur gears 10, 12 and 14, body assembly 16, and cover 7. The oil pump assembly furnishes the entire oil flow and pressure for all transmission operations. The pump is driven by accessory drive gear 4 (A, foldout 4) and rotates any time the engine output shaft rotates. The transmission oil is drawn, through oil strainer 20 (B, foldout 5), into the lower end of suction tube 4 which directs it to the pump assembly. The oil is then directed, under pressure, through passages in the transmission housing to the control valve assembly and other locations for lubrication and cooling.

2-8. CONTROL VALVE BODY ASSEMBLY

a. Control Valve Body (B, foldout 9). The control valve body contains a manual-operated range selector valve 25 for reverse, neutral, low- or high-range operation, plus main-pressure regulator valve 8, and clutch cutoff valve 20.

b. Main-pressure Regulator, Selector Valve (B, foldout 9)

(1) Main-pressure regulator valve components and trimmer valve components are contained in the upper bore of the body; clutch cutoff valve components in the middle bore; and the selector valve components in the lower bore. The main-pressure regulator valve group includes items 6, 7, 8, 13, and 14. The selector valve group contains items 25, 26, 27, 28, 29, 30, 34, and 35.

(2) Main-pressure regulator valve 8 is spring loaded and regulates the pressure for all hydraulic functions. The selector valve is a spool-type valve which is manually moved lengthwise to the various range positions. Spring-loaded detent balls 27 position the valve in each range.

c. Clutch Cutoff Valve (B, foldout 9)

(1) Clutch cutoff valve 20 is located between the main-pressure regulator valve and selector valve 25. It is a spool-type valve which is moved rearward by spring 19 pressure and forward by plug 21 when brake hydraulic pressure acts on the plug.

(2) During normal operation, valve 20 is rearward. This allows main pressure to flow to the selector valve and trimmer plug 16. When vehicle brakes are applied, valve 20 moves against spring 19. This interrupts the flow of main pressure to the selector valve and exhausts clutch apply pressure, releasing the applied clutch.

2-9. PARKING BRAKE

An expanding shoe-type brake may be mounted at the lower-rear output location on the transmission housing. The brake assembly 1 (A, foldout 9) is bolted to the transmission housing. The brake is manually operated.

2-10. HOUSINGS, COVERS

a. Torque Converter Housing. Torque converter housing 7 (B, foldout 3) is cast aluminum. It covers the large front opening of the transmission housing, and it supports and encloses the torque converter components. It is the front support member for the accessory driven gears and the converter driven gears. In direct-mount transmissions, the front of the cover housing bolts to the engine flywheel housing. In remote-mount transmissions, the front of the housing is closed by transmission front cover 3 (B, foldout 2).

b. Transmission Front Cover. Transmission front cover 3 (B, foldout 2) is used only on remote-mount transmissions. It is cast iron, and is bolted to the front flange of the torque converter housing. It supports input shaft 8 in ball bearing 5. Oil seal 1 prevents loss of oil or entry of dirt.

c. Transmission Housing

(1) Transmission housing 9 (B, foldout 5) is cast iron and is the main structural member of the transmission assembly. It supports and encloses the rear ends of the accessory driven gears and converter driven gears, the range gearing, and clutches. It also supports and encloses the output transfer gears and output shaft. It provides an external mounting surface for the transmission oil pump and accessory pump. It includes various oil passages within the casting for oil circuits.

(2) The lower section of the housing provides a sump for the oil necessary for operation, lubrication, cooling, and control functions. Flat mounting surfaces with four tapped holes in each are provided at each side of the housing.

d. Rear Cover. Transmission rear cover 4 (B, foldout 7) is cast iron and closes the large circular opening at the rear of the transmission housing. It supports the rear end of the high-range clutch and the output transfer drive gear. The rear cover includes an oil passage which connects the control valve body and high-range clutch.

2-11. HYDRAULIC SYSTEM

a. System Functions. The hydraulic system generates, directs, and controls the pressure and flow of the hydraulic fluid within the transmission. The hydraulic fluid is the power-transmitting medium in the torque converter. Its flow lubricates and cools the transmission components, its pressure applies the clutches, and its velocity drives the converter turbines.

b. System Schematics (fig. 2-1). Color-coded schematics are presented which illustrate the hydraulic system with clutch cutoff.

c. Oil Pump, Filter Circuit. Oil is drawn from the transmission sump, through a wire-mesh strainer, into the oil pump. The pump delivers its entire output to a full-flow oil filter which is customer-supplied. The oil filter is mounted external to the transmission. From the filter, the entire oil supply is returned to the transmission and control valve assembly.

d. Main-pressure Regulator Valve, Converter-in Circuit (fig. 2-1)

(1) At the control valve assembly, oil from the oil filter (red) enters the valve body, and flows around the main-pressure regulator valve. The oil also flows through a diagonal passage (orifice A) to the left end of the valve. The resultant pressure at the left end of the valve pushes the valve rightward against a spring until the oil pressure is balanced by spring force.

(2) The rightward movement of the valve against the spring exposes the port to the converter-in circuit (yellow). Oil in excess of that required to maintain main pressure is allowed to escape into the converter-in circuit. Under certain conditions, the converter-in circuit can be charged with more oil than can be exhausted by the converter pressure regulator valve. When this is the case, the main-pressure regulator valve moves farther to the right and allows oil to flow directly into the exhaust port (blue) at the left end of the valve. This flow occurs between the two short lands at the left end of the regulator valve.

(3) Oil flowing into the converter-in (yellow) circuit is directed to the torque converter. A pressure regulator valve in the circuit limits converter-in pressure to 80 psi.

e. Torque Converter. The torque converter is continuously filled with oil during transmission operation. Rotation of the converter pump imparts energy to the oil which, in turn, drives the turbines. The oil then flows between the stator vanes which redirect it to the pump.

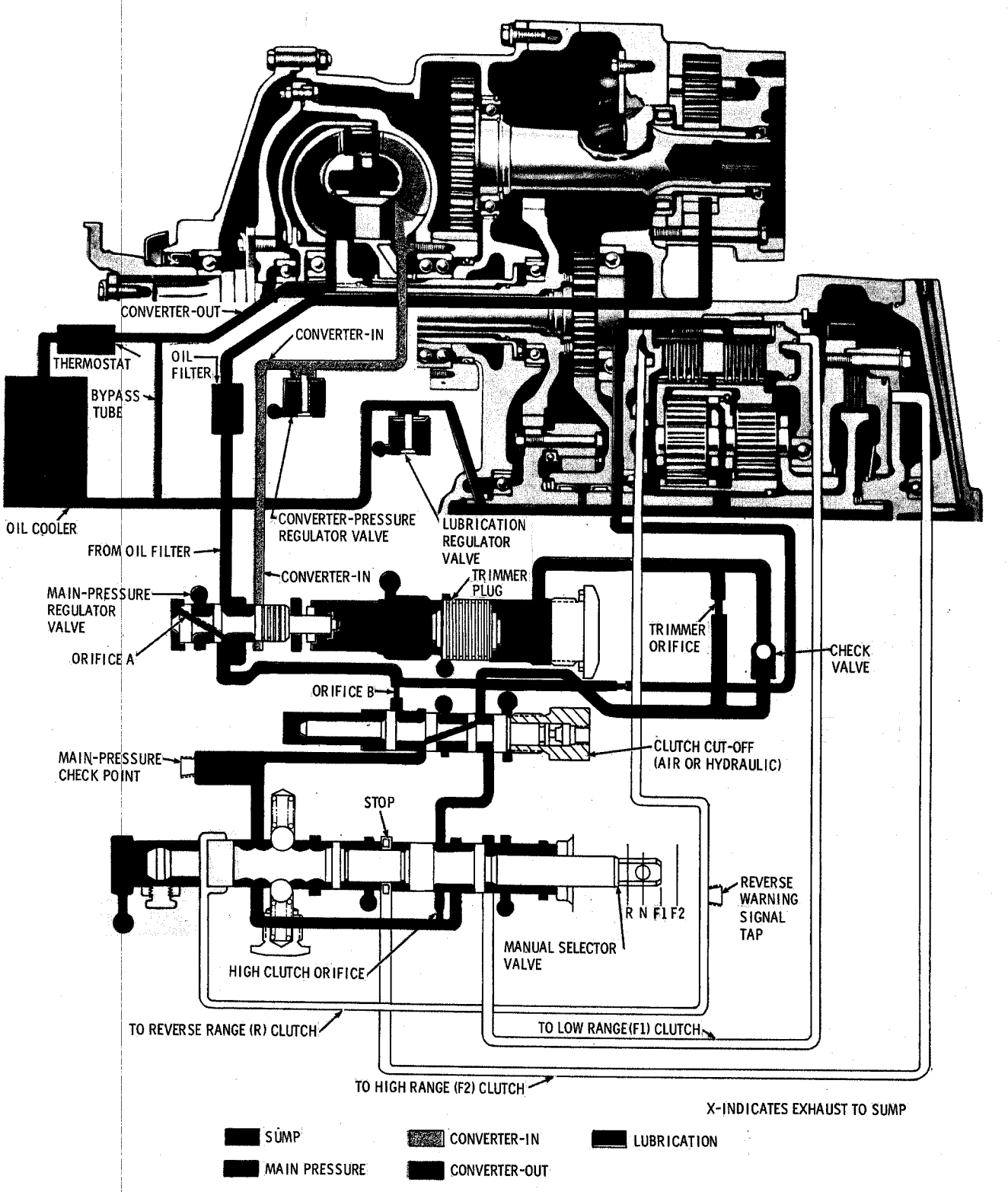


Fig. 2-1. TT 3420-1 hydraulic system with clutch cutoff control—schematic view

f. Converter-out, Cooler, Lubrication Circuit. (fig. 2-1)

(1) Oil flowing out of the torque converter (orange) is directed into the oil cooler. The oil cooler, like the oil filter, is customer supplied and vehicle mounted. The oil cooler is a heat exchanger in which the oil flows through water or air-cooled passages.

(2) From the cooler, oil flows to the lubrication circuit (green) for distribution to the transmission components. All oil in excess of that required to maintain lubrication pressure is exhausted to sump (blue) through the lubrication regulator valve.

g. Clutch Cutoff Valve Circuit (fig. 2-1)

(1) Main pressure oil (red), supplied from the left end of the main-pressure regulator valve, flows through orifice B to the clutch cutoff valve bore and then to the manual selector valve. From the selector valve the flow is directed back through the clutch cutoff valve bore to the trimmer. The orifice functions in conjunction with the trimmer (refer to **i**, below).

(2) The clutch cutoff valve is normally in the position shown and functions only when the vehicle brakes are applied. A spring holds the valve rightward, allowing main oil pressure to flow through the valve bore to the manual selector valve and trimmer.

(3) When the vehicle has hydraulic brakes, hydraulic brake pressure acts directly against a plug which moves the clutch cutoff valve leftward during brake application. When leftward against its spring, the clutch cutoff valve interrupts the flow of main pressure oil to the manual selector valve. In this position, the oil in the trimmer circuit is retained, and the charged clutch is allowed to exhaust to sump (blue) through the port shown at the top-center of the valve. Thus, when the vehicle brake is applied, the driving clutch is released.

(4) When the brake is released, the clutch cutoff valve returns to its normal position (as shown). This allows the oil retained at the trimmer to enter the exhausted clutch circuit. This additional volume from the trimmer assists the quick application of the clutch.

h. Manual Selector Valve Circuit

(1) Main-pressure oil from the clutch cutoff valve flows into the manual selector valve bore and surrounds the valve in the area of the detent notches. Main oil then flows, regardless of valve position, to another surrounding area toward the right end of the valve. Here it is available for low range, high range or for operation of the trimmer.

(2) Three clutch apply lines leave the bottom of the selector valve bore. From left to right, these are reverse range (R), high range (F2), and low range (F1). In neutral, all three clutch lines are exhausted, the neutral start switch is actuated. Moving the selector valve one notch rightward will charge the low-range line and thus apply the clutch. This condition provides low-range operation.

(3) Moving the selector valve to a second notch rightward will close off oil to the low-range line and allow it to exhaust. At the same time, oil will charge the high-range line and thus apply the clutch. This condition provides high-range operation. When the selector valve is in the high-range position, oil to fill the high-range clutch must pass through both orifice B and the high-range clutch orifice. The high-range clutch orifice being smaller than orifice B restricts the volume of oil which can flow through in a given time. As a result, the high-range clutch fills at a slower rate and thus provides smoother engagement.

(4) Moving the selector valve one notch leftward of neutral will charge the reverse line and thus apply the clutch. This condition provides reverse operation.

i. Trimmer Circuit

(1) The trimmer circuit works in conjunction with orifice B and the high-range orifice. The trimmer regulates clutch apply pressure during initial stages of clutch engagement, and the orifices provide a specific flow at a given pressure. The combination of the trimmer and orifices provides the final pressure and flow pattern to engage the clutches in the desired manner.

(2) Normally, full main pressure (red) holds the trimmer plug leftward against its spring and a shoulder in the valve body bore. This compresses the main-pressure regulator valve spring which causes main pressure to be regulated at maximum psi.

(3) When any shift is made, oil is required to charge the oncoming clutch. This oil must flow through orifice B, directly below the main-pressure regulator valve. The restriction of the oil flow through the orifice causes pressure below the orifice to be reduced. This reduction in pressure allows the trimmer plug to move rightward. Force against the main-pressure regulator valve spring is reduced and main pressure is reduced.

(4) When the clutch being charged is full, flow through the orifice stops and pressure below the orifice rises until it equals main pressure. This increased pressure acts against the right end of the trimmer plug, pushing the trimmer plug leftward. This compresses the main-pressure regulator valve spring and raises main pressure. As main pressure rises, the trimmer plug moves farther leftward until, finally, main pressure is restored to maximum.

(5) The check valve and orifice in parallel branches of the line connecting the selector valve bore to the trimmer plug bore insure rapid movement of the trimmer plug toward the right (check valve opens) and slower return of the trimmer plug leftward (check valve closes, orifice restricts flow). Main pressure is rapidly reduced but slowly restored.

2-12. TRANSMISSION TORQUE PATHS

a. Component Functions. The torque converter, driven by the engine, directs torque through the first and/or second turbine to the second-turbine driven gear shaft. The shaft, splined to the reverse-and-low-range sun gear, drives the range planetaries and the high-range clutch hub. Hydraulic-actuated clutches, when applied, cause reactions within the involved range components. The interaction within the planetaries or application of the high-range clutch determines the gear ratio and direction of torque imparted to transfer gears. Thus, the torque path changes for each operating condition. Therefore, a knowledge is necessary for proper diagnosis of transmission trouble. An understanding of the accessory gearing is also helpful when the vehicle includes equipment driven by the transmission PTO components.

b. Cross-Section Illustrations.

(1) Figure 2-2 is a cross-section view of the twin-turbine torque converter. Figures 2-3 through 2-6 illustrate the paths through which the power flows from the engine to the transmission outputs.

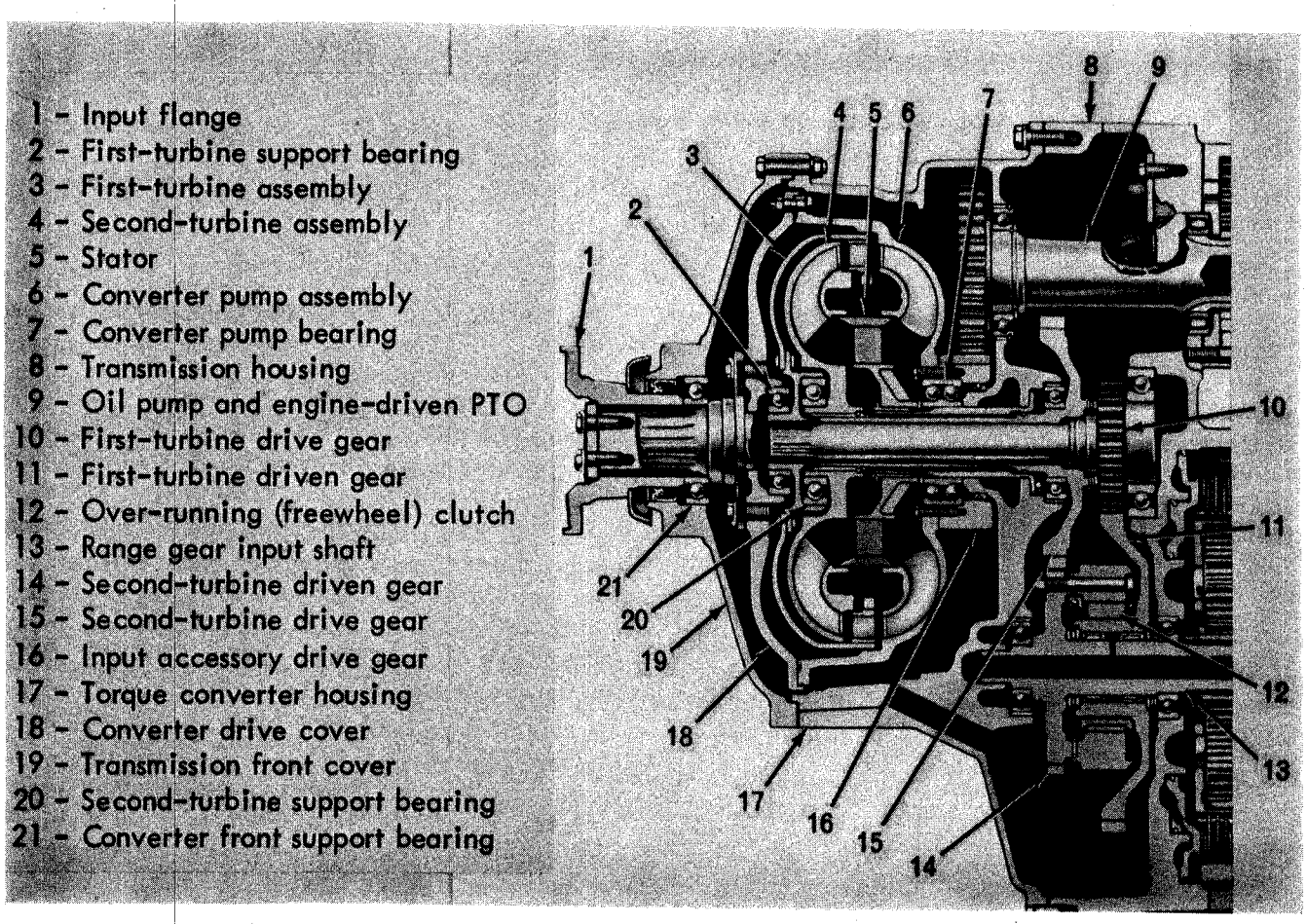


Fig. 2-2. Torque converter and converter gearing—cross-section view

(2) Because the driving turbine is automatically determined by the load and speed requirement imposed by the vehicle, the torque path through the converter is not necessarily confined to a specific operating range. Thus, both paths are shown—a dotted red line indicates the first-turbine torque path and a broken red line indicates the second-turbine torque path. Engagement of the range clutches is indicated by horizontal red bars across the clutch plates.

c. Torque Converter, Freewheel Clutch (fig. 2-2)

(1) Power is transmitted from the engine to torque converter pump assembly 6 by either a flex disk drive or an input flange. From the pump, power must be transmitted hydraulically to either first-turbine assembly 3 or second-turbine assembly 4, or to both under certain operating conditions.

(2) Speed and load determine whether the torque flows through the first- and second-turbine assemblies 3 and 4, or only through the second-turbine assembly 4. At high-load demand and low speed, freewheel clutch 12 is engaged and first-turbine assembly 3 acts as the driving member. As speed increases and load demand decreases, freewheel clutch 12 disengages and second-turbine assembly 4 becomes the primary driving member. Thus first-turbine operation is related to higher torque, and second-turbine operation to higher speed. The transition from the torque phases to the speed phase is entirely automatic, governed by the load and speed of the vehicle.

2-13. CONVERTER GEARING TO REVERSE-AND-LOW-RANGE SUN GEAR — TORQUE PATH

a. First Turbine (fig. 2-2). Torque from converter pump assembly 6 is transmitted hydraulically to first-turbine assembly 3. The first turbine is splined to first-turbine drive gear 10 which meshes with first-turbine driven gear 11. The first-turbine driven gear is connected by freewheel clutch 12 to second-turbine driven gear 14. The second-turbine driven gear is integral with range gear input shaft 13. The reverse-and-low-range sun gear is splined onto the shaft end. Thus, all these components rotate when the vehicle is operating in a high-load, low-speed condition. The hydraulic action in the converter and the interconnection of the turbine-driven gears (first and second) permit the second turbine to assist the first until the freewheel clutch disengages.

b. Second Turbine (fig. 2-2). When the output speed of the converter increases, the load is assumed by second-turbine assembly 4, and when it attains sufficient speed, freewheel clutch 12 will disengage. This allows first-turbine assembly 3 to rotate freely, and no drive is contributed to the first turbine. Second-turbine assembly 4 is splined to the hollow shaft of the second-turbine drive gear 15. The drive gear meshes with second-turbine driven gear 14 (integral with range gear input shaft 13) which is splined to the reverse-and-low-range sun gear. Thus, all these componenents rotate when the vehicle is operating in a low-load, high-speed condition.

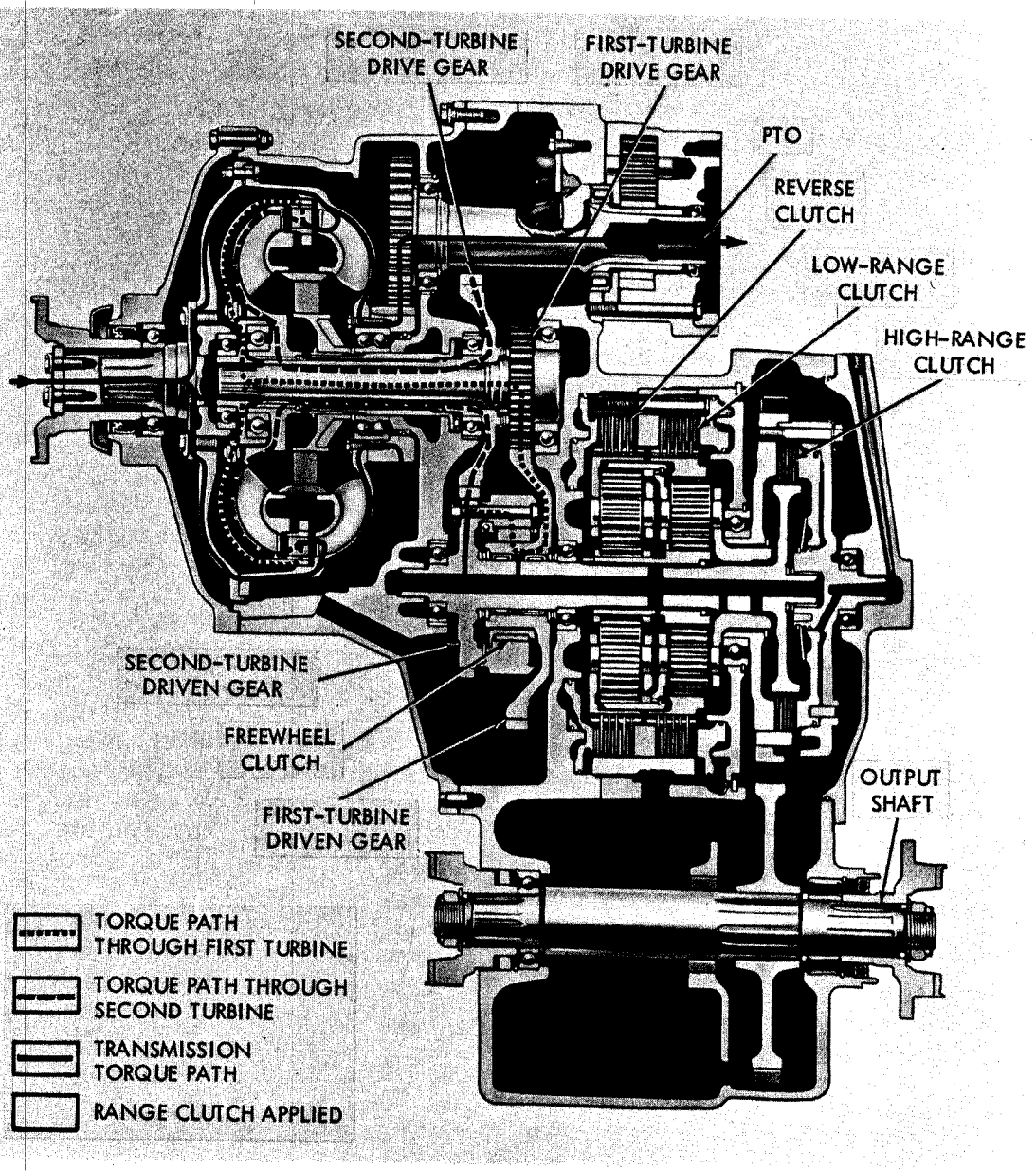


Fig. 2-3. Neutral and PTO torque path

2-14. NEUTRAL AND POWER TAKEOFF — TORQUE PATH (fig. 2-3)

a. When the range selector is in neutral position, power is transmitted through the torque converter to the reverse-and-low-range sun gear as described in paragraph 2-13. No range clutches are engaged. Thus, rotation of the sun gear causes the planetary pinions to rotate freely, and no power flow occurs in the range gearing.

b. Torque from the engine flows through the torque converter pump to the input accessory drive gear. Rotation of the input accessory drive gear drives the engine-driven PTO through the accessory driven gear. If the transmission is equipped with an accessory drive, rotation of the input accessory drive gear also drives the accessory drive gear and shaft assembly. The gearing for the accessory drive is located directly behind (relative to illustration) the engine-driven PTO gearing.

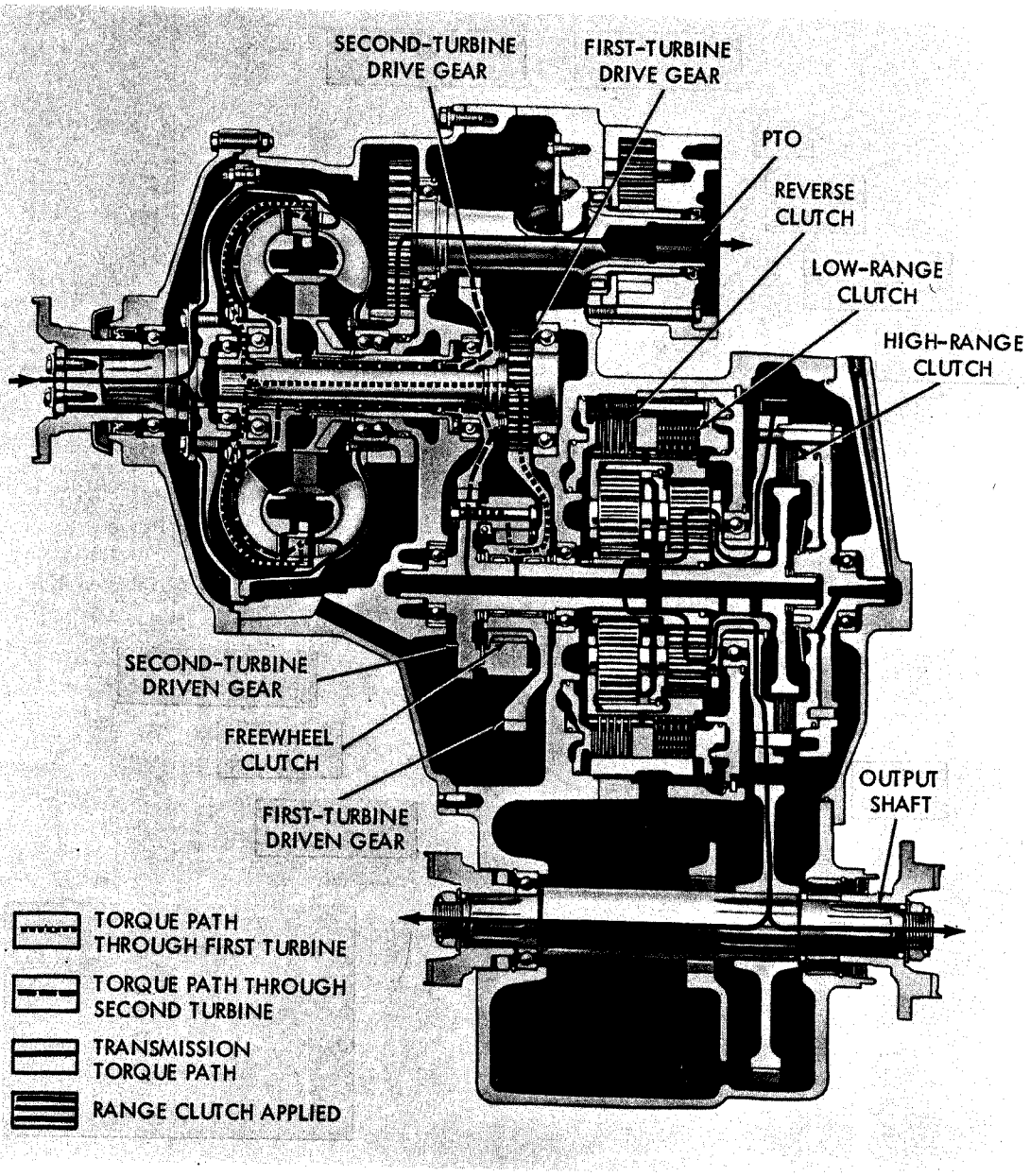
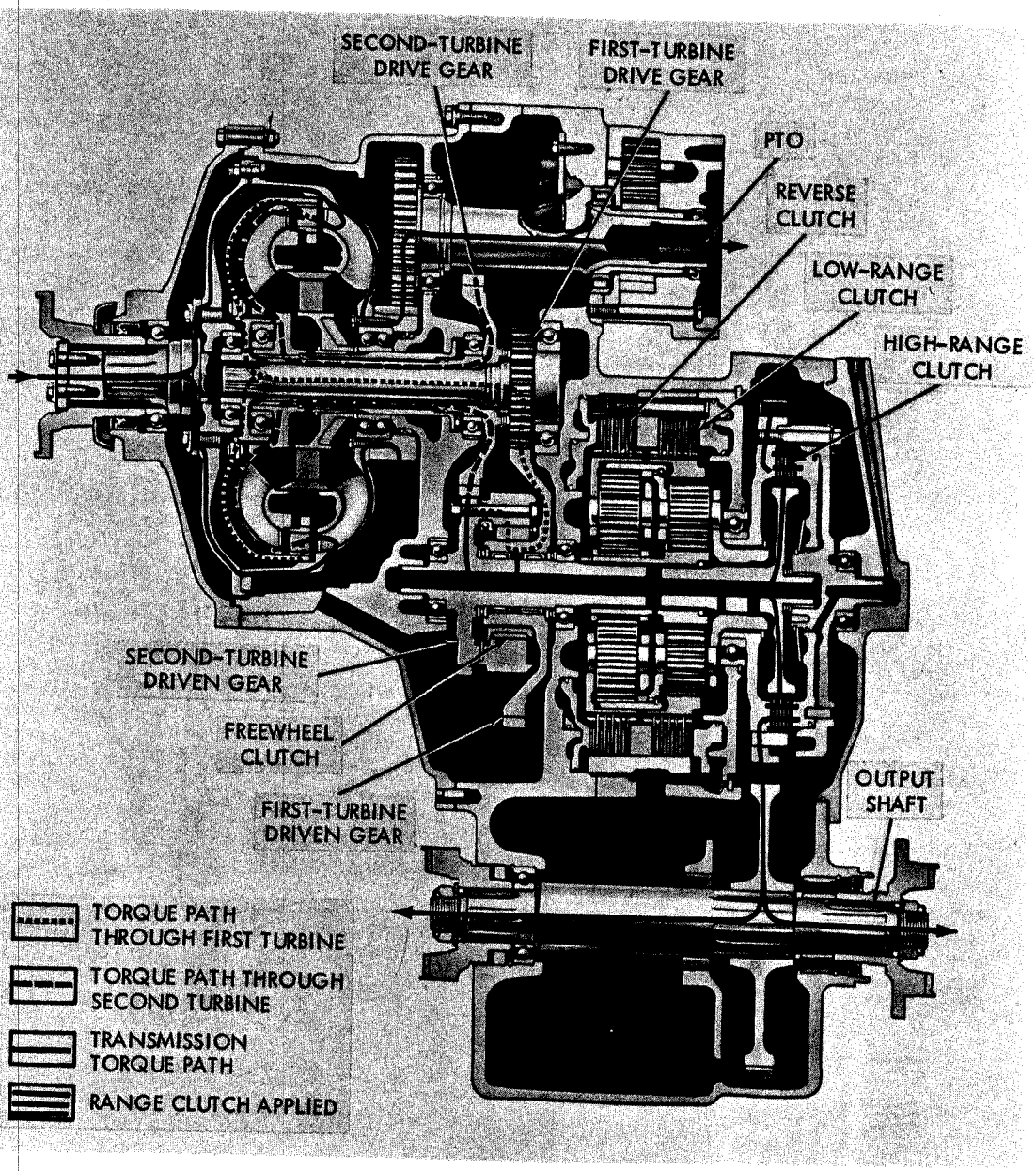


Fig. 2-4. Low-range torque path

2-15. LOW RANGE — TORQUE PATH (fig. 2-4)

a. In low-range operation, torque is transmitted through the torque converter to the reverse-and-low-range sun gear in the same manner as described in paragraph 2-13. When the range selector is moved from neutral to low range (F1), the low-range clutch engages and holds the low-range ring gear stationary.

b. The rotating reverse-and-low-range sun gear drives the low-range planetary pinions within the stationary ring gear. This causes the low-range planetary carrier to rotate. The hub of the carrier is splined to the transfer drive gear. The drive gear meshes with the driven gear which is splined to the output shaft. The manual-operated disconnect coupling, when moved forward, will interrupt the drive to the front output.



S4132

Fig. 2-5. High-range torque path

2-16. HIGH RANGE — TORQUE PATH (fig. 2-5)

a. In high-range operation, torque is transmitted through the torque converter to the reverse-and-low-range sun gear in the same manner as described in paragraph 2-13. When the range selector is moved from low range (F1) to high range (F2), the low-range clutch releases and the high-range clutch engages.

b. The rotating reverse-and-low-range sun gear drives the high-range clutch hub which is splined to the high-range clutch friction plates. Engagement of the high-range clutch locks the transfer drive gear to the rotating high-range clutch hub. The transfer drive gear meshes with the driven gear which is splined to the output shaft. The manual-operated disconnect coupling, when moved forward, will interrupt the drive to the front output.

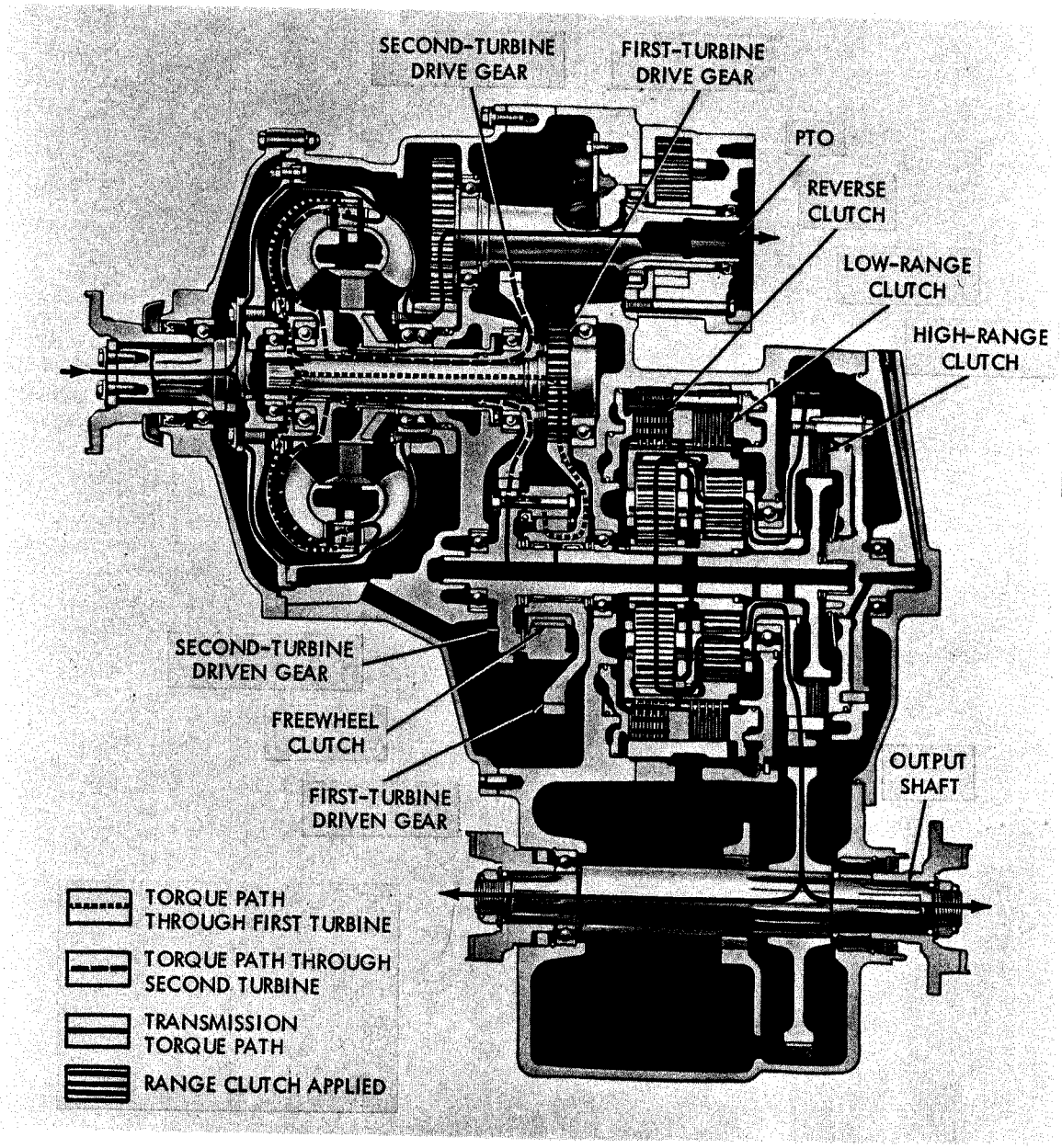


Fig. 2-6. Reverse torque path

2-17. REVERSE RANGE — TORQUE PATH
(fig. 2-6)

a. In reverse-range operation, torque is transmitted through the torque converter to the reverse-and-low-range sun gear in the same manner as described in paragraph 2-13. When the range selector is moved to reverse-range position, the forward-range clutches (F1 and F2) are exhausted and the reverse-range clutch engages and holds the reverse-range planetary hub (and carrier) stationary.

b. The rotating reverse-and-low-range sun gear drives the pinions which also are in mesh with the reverse-range ring gear. This causes the ring gear to rotate in a direction opposite to that of the sun gear. The ring gear is attached to the low-range planetary carrier. Thus, the reverse torque is transmitted from the reverse-range ring gear through the low-range planetary carrier to the transfer drive gear. The transfer drive gear meshes with the driven gear which, in turn, drives the transfer driven gear and output shaft in reverse. The manual-operated disconnect coupling, when moved forward, will interrupt the drive to the front output.

Section 3. PREVENTIVE MAINTENANCE

3-1. SCOPE OF SECTION 3

This section outlines the routine and periodic procedures required to maintain the transmission in good operating condition. Included are instructions for care of the oil system, minor adjustments of the transmission control linkages, tests to determine condition, instructions for extended storage, and troubleshooting.

3-2. PERIODIC INSPECTION, CLEANING

a. Inspecting Experior. The exterior of the transmission should be cleaned and inspected at regular intervals. The severity of service and operating environment will determine the frequency of such procedures. The transmission should be inspected for loose bolts, oil leaks, linkage troubles, and bent or damaged oil lines. Oil leaks that cannot be stopped by tightening the parts require immediate attention. Linkages must be kept clean, adjusted and well lubricated.

b. Cleaning Breather. The prevalence of dust and dirt will determine the frequency at which the breather requires cleaning. Clean the area around the breather stem before removing the breather. Wash the breather thoroughly by agitating it in mineral spirits or cleaning solvent. Dry it thoroughly with compressed air after cleaning. Always use a wrench of the proper size to remove or replace the breather. Pliers or a pipe wrench will crush or damage the breather and produce metal chips which could enter the transmission.

c. Oil Contamination

(1) At each oil change examine the oil which is drained for evidence of dirt or water. A normal amount of condensation will emulsify in the oil during operating of the transmission. However, if there is evidence of water, check the cooler (heat exchanger) for leakage between the water and oil areas. Oil in the water side of the cooler (or vehicle radiator) is another sign of leakage. This, however, may indicate leakage from the engine oil system. Any accumulation of sludge or soft dirt in the sump should be removed with flushing oil.

(2) Metal particles in the oil (except for the minute particles normally trapped in the oil filter) indicate damage has occured in the transmission. When these particles are found in the sump or on the magnetic drain plug, the transmission must be disassembled and closely inspected to find the source. Metal contamination will require complete disassembly of the transmission and cleaning of all internal and external circuits, cooler, filter, and all other areas where the particles could lodge.

(3) If engine coolant containing ethylene glycol leaks into the transmission oil system, immediate action must be taken to prevent malfunction and possible serious damage. The transmission must be completely disassembled, inspected and cleaned. All traces of the coolant, and varnish deposits resulting from coolant contamination, must be removed.

3-3. CHECKING OIL LEVEL

a. Cold Check.

(1) Two oil level check plugs are located at the lower-right front of the transmission housing (fig. 1-1). Before starting the engine, remove the upper (Full) plug. If oil flows from the plug opening, the hydraulic system has sufficient oil to permit starting the engine. If no oil flow is present, add sufficient oil to cause a flow from the opening, and replace the plug.

(2) Start the engine and operate at 1000 to 1500 rpm with the transmission in neutral range. Operate for approximately 1 minute to charge the hydraulic system.

(3) While the engine is running, add oil as required to establish the oil level at the lower (Add) plug. Then, proceed with the hot check (**b,** below).

NOTE

An oil check made at a lower engine rpm may result in low oil level at operating speeds. Thermal expansion will raise the oil level when the transmission attains operating temperature.

b. Hot Check. Start the engine and run it at 1000 to 1500 rpm until the transmission reaches operating temperature (180 to 220°F (82 to 104°C)). Then idle the engine and shift through all range positions slowly. This will insure that all parts of the system are filled with oil. Shift to neutral and set the engine speed at approximately 1200 to 1500 rpm. Remove the upper (Full) oil level checkplug. Oil should be at the level of the plug opening. Add or drain oil to bring it to this level.

NOTE

Foaming or spurting may indicate a false oil level. A true level is indicated by a steady trickle of oil flowing from the checkplug hole. The transmission may be operated safely as long as the oil is above the level of the lower (Add) oil checkplug.

c. Dipstick Cold Check

(1) If the transmission is equipped with an oil dipstick,check the oil level before starting the engine. It is safe to start the engine if the oil is near or above the HOT mark. If the oil level is not within this range, add oil. One quart (or liter) equals approximately 1/2-inch (12.7 mm) change in oil level.

(2) Start the engine and let engine idle (500-750 rpm) with the transmission in neutral. Idle engine for approximately 2 minutes to fully charge all oil lines and circuits.

(3) Add oil as required to establish the oil level at the COLD mark. One quart (or litre) equals approximately 1/2-inch (12.7 mm) change in oil level.

d. Dipstick Hot Check

(1) Start the engine. With the engine at idle speed and transmission in neutral range, the oil level should be within the OPERATING RANGE and **not** exceed the HOT mark.

(2) If oil level is below the COLD mark, add oil. One quart equals approximately 1/2-inch (12.7 mm) change in oil level.

3-4. MAINTENANCE INTERVALS

a. Frequency. The severity of service and the environment in which the transmission operates will determine the frequency of some maintenance operations. Under very dusty or dirty operating conditions the transmission oil should be changed more often. Oil should be changed immediately if it has been subjected to overheating. The breather will require more frequent cleaning when dirt and dust conditions are severe.

b. Oil and Filter Change. Generally the oil and filter should be changed after each 1000 hours of operation. For severe service, refer to **a,** above. Refer also to paragraph 3-2 before changing oil. Do not operate a transmission which is filled with preservative oil except for minimum necessary time and distance.

3-5. CHANGING OIL, FILTER

a. Draining Oil. Transmission should be at operating temperature (180 to 220°F (82 to 104°C)) when the oil is changed. Remove the drain plug at the lower-left rear of the transmission housing (fig. 5-2). Remove the oil filter element from the remote-mount filter. Remove and clean the oil strainer assembly (fig. 1-1). Let the oil drain for 30 minutes if time permits. Replace the oil strainer, gasket, and oil drain plug. Install a new oil filter element.

b. Refilling Oil System. Add 7-1/2 US gallons (28 liters) of specified transmission fluid (para 1-6). Then conduct the hot check as described in paragraph 3-3**b,** adding oil as necessary to establish the correct oil level for operation.

c. Oil System Capacity. Add 8-1/2 US gallons (32.18 liters) for an initial fill or after a complete overhaul. This amount does not include the oil necessary to fill the external filter and cooling circuits. Thus, the refill amount is less than the initial fill because some oil remains in the external circuits and transmission cavities.

3-6. PRESSURES, TEMPERATURES

Figure 3-1 illustrates the points where the transmission temperature and pressures may be measured. Vehicle may be equipped with a temperature gage and a pressure gage. If so, the temperature gage registers the converter-out (to cooler) temperature, and the pressure gage registers main (clutch) pressure. Clutch pressure during normal operation in any gear or in neutral is approximately equal to main pressure and may be regarded as main pressure. However, while the clutch cutoff control is being used, clutch pressure may fall to practically zero—this does not indicate that main pressure has decreased. Therefore, when checking main pressure, do not actuate this control.

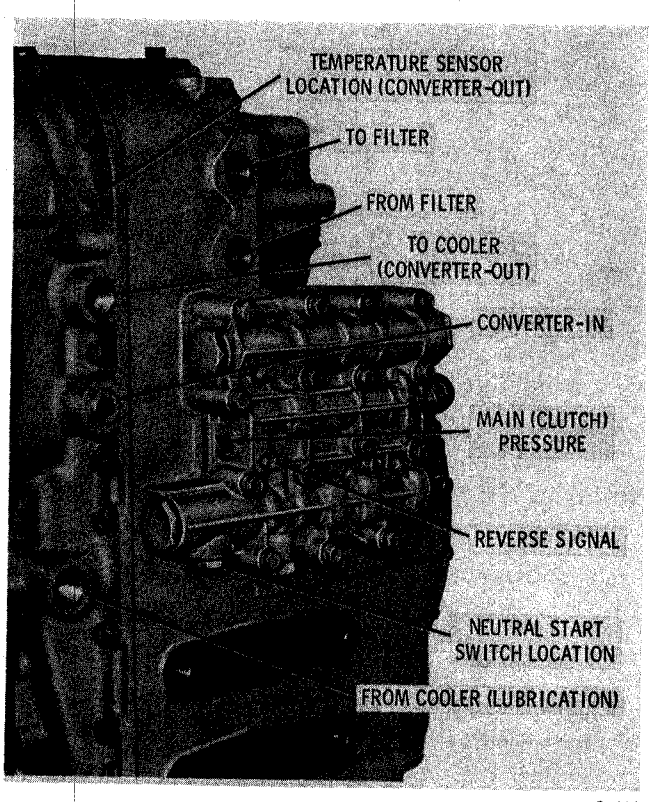


Fig. 3-1. Pressure and temperature check points

3-7. LINKAGE CHECKS, ADJUSTMENTS

a. See Vehicle Manual Instructions. The specific design of control linkage for range selection, output disconnect, and parking brake depends upon the installation. Therefore, only general instructions for linkage adjustments can be provided in this manual.

b. Front Output Disconnect

(1) There are two points of adjustment for the front output disconnect. The shifter shaft must be adjusted first, and then the linkage adjusted. Push the shifter shaft inward (toward the rear) to its engaged position. A spring-loaded detent will indicate positive engagement. Adjust the shifter shaft by rotating it until the center of the clevis pin hole is 0.17 to 0.21 inch (4.32 to 5.33 mm) behind the front face of the transmission housing (at rear of converter housing gasket).

(2) When the shifter shaft is pulled outward (forward) to its disengaged position the detent ball should seat when the center of the clevis pin hole is approximately 1.7 inch (43.18 mm) ahead of the engaged position. Adjust the linkage so that the engaged and disengaged positions of the operator's control correspond exactly with the detent positions of the shifter shaft.

3-8. TRANSMISSION STALL TEST

a. Purpose

(1) A stall test should be conducted when the power package (engine and transmission) is not performing satisfactorily. The purpose of the test is to determine if the transmission is the malfunctioning component.

(2) A stall test is conducted with the engine running at full throttle and the transmission outputs stalled. The data obtained from the test must be used in conjunction with engine-converter matched performance curves. These performance curves can be obtained from your equipment dealer or distributor.

b. Procedure

(1) Connect a tachometer of known accuracy to the engine, and bring the transmission to normal operating temperature (180-220°F (82-104°C)).

CAUTION

The stall condition should never be maintained for more than 30 seconds at any one time because of the rapid rise in oil temperature.

(2) Apply the parking brake, block the vehicle securely, and shift the selector control to high range. (The test may also be conducted in low- or reverse-range, if necessary. However, such tests must be made with extreme caution because of the high torque delivered at transmission output shaft.)

CAUTION

Do not apply service brakes if the transmission is equipped with a cutoff clutch.

(3) Accelerate the engine to wide-open throttle. After reaching a stabilized converter-out temperature of 225°F (107°C) minimum, record the engine speed while the engine is at open throttle. Do not let the converter-out temperature exceed 250°F (121°C).

NOTE

Allow approximately 2 minutes of neutral operation between stall tests to prevent overheating. During the 2-minute period, engine speed should be maintained (except for the momentary throttle release when shifting to neutral).

c. Results. Under stall test conditions, a comparison of actual engine speed with the established normal speed for such conditions will indicate if the engine or the transmission is malfunctioning. The established normal stall speed for a specific engine-transmission combination may be obtained from your equipment dealer or distributor.

NOTE

Environmental conditions, such as ambient temperature, altitude, engine accessory loss variations, etc., affect the power input to the converter. These conditions may cause the stall speed to vary ± 150 rpm from the established normal value. When deviation can be attributed to such causes, the actual speed can be accepted as normal.

3-9. PRESERVATION, STORAGE

a. Preservative Selection. When the transmissions are to be stored or remain inactive for extended periods of time, specific preservative methods are recommended to prevent rust and corrosion damage. The length of storage will usually determine the preservative method to be used. Various methods are described below.

b. Storage, New Units. New units contain preservative oil when shipped from Allison and can be safely stored (inside) for 6 weeks without further treatment.

c. Storage, Month to 6 Weeks

(1) The following procedures will prepare the transmission for a month to 6 weeks storage, depending on the environment.

(2) Drain the oil as described in paragraph 3-5**a**, above. Remove the transmission oil filter element(s).

(3) Install the drain plugs and new filter element(s).

(4) Fill the unit to operating level with any commercial preservative oil which meets US Military specifications MIL-L-21260, Grade 1, to latest specifications.

(5) Operate the unit for at least 5 minutes at a minimum of 1000 rpm. Shift the transmission slowly through all selector positions to thoroughly distribute the oil, then stall the converter to raise the oil temperature to 225°F (107°C).

CAUTION

Do not allow temperature to exceed 250°F (121°C). If the unit does not have a temperature gage, do not stall for more than 30 seconds.

(6) As soon as the unit is cool enough to touch, seal all openings and breathers with moisture-proof tape.

(7) Coat all exposed, unpainted surfaces with a good grade of preservative grease, such as Petrolatum (MIL-C-11796) Class 2.

(8) Repeat the above procedures ((5) through (7)) at monthly intervals for indefinite storage.

d. Storage, 1 Year — Without Oil

(1) Drain oil as described in paragraph 3-5**a**, above.

(2) Seal all openings and breathers, except oil drain hole, with moisture-proof tape.

(3) Coat all exposed, unpainted surfaces with a good grade of preservative grease.

(4) Atomize or spray 2 ounces (59 ml) of Motorstor*, or equivalent, into the transmission through the oil drain hole. Install the drain plug.

(5) If additional storage time is required, (3) and (4), above, should be repeated at yearly intervals.

e. Storage, 1 Year — With Oil

(1) Drain the oil as described in paragraph 3-5**a**, above. Remove the transmission oil filter element(s).

(2) Install the drain plugs and new filter element(s).

(3) Fill the transmission to operating level with a mixture of 30 parts hydraulic transmission fluid, type C2, and 1 part Motorstor preservative, or equivalent.

(4) Operate the unit for approximately 5 minutes at a minimum of 1000 rpm. Shift the transmission slowly through all selector positions to thoroughly distribute the oil, then stall the converter to raise the oil temperature to 225°F (107°C).

CAUTION

Do not allow temperature to exceed 250°F (121°C). If the unit does not have a temperature gage, do not stall for more than 30 seconds.

(5) As soon as the unit is cool enough to touch, seal all openings and breather with moisture-proof tape.

(6) Coat all exposed, unpainted surfaces with a good grade of preservative grease.

(7) If additional storage time is required, (3) through (6), above, should be repeated at yearly intervals, except it is not necessary to drain the transmission each year—just add the Motorstor, or equivalent.

f. Restoring Units to Service

(1) If Motorstor, or equivalent, was used in preparing the transmission for storage, use the following procedures to restore the unit to service.

(2) Remove the tape from the openings and breather.

(3) Wash off all the external grease with solvent.

(4) Add hydraulic transmission fluid, type C2, to proper level.

NOTE

It is not necessary to drain C2 oil and Motorstor mixture from the transmission.

(5) If Motorstor, or equivalent, was not used in preparing the transmission for storage, use the following procedures to restore the unit to service.

(6) Remove the tape from openings and breather.

(7) Wash off all external grease with solvent.

(8) Drain oil as described in paragraph 3-5**a**, above.

(9) Install a new oil filter element(s).

(10) Refill the transmission with hydraulic transmission fluid, type C2, to proper level.

*Motorstor is a preservative additive manufactured by Daubert Chemical Company, Chicago, Illinois. Motorstor (under the designation of "Nucle Oil") is covered by US Military Specifications MIL-L-46002 (ORD) and MIL-I-23310 (WEP).

3-10. FLANGE RETAINER SHIMS

a. If the transmission is equipped with input and/or output flanges which require shims, use the following procedure to determine the shim pack thickness.

b. Install the flange onto the splined shaft. Install the flange washer and the two self-locking bolts. Tighten the bolts sufficiently to draw the flange into its final position on the shaft.

c. Remove the two bolts and flange washer. Measure and record the dimension from the flange washer seat in the flange (face A) to the end of the shaft (fig. 3-2).

d. For input shafts, subtract 0.007 inch (0.17 mm) from the recorded dimension; for output shafts, subtract 0.010 inch (0.25 mm). The remainder is the thickness of the shim pack required for the specific location. Select shims which equal this thickness (within ±0.002 inch/0.05 mm/).

NOTE

Shims are available in 0.005 inch (0.12 mm) and 0.025 inch (0.63 mm) thicknesses. Combine these as required to obtain the proper pack.

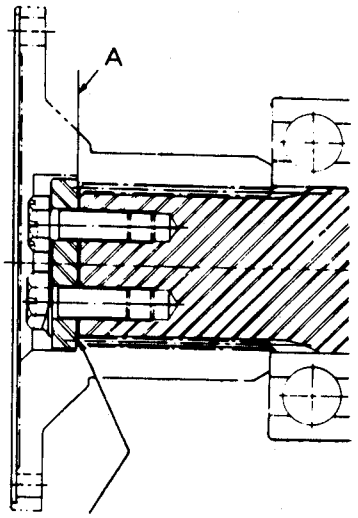


Fig. 3-2. Flange retainer shims

e. Install shim pack, flange washer, lockstrip, and two flange bolts. Tighten the 1/2-20 bolts to 96 to 115 pound feet (130 to 156 Nm) torque. Tighten the 3/8-24 bolts to 41 to 49 pound feet (56 to 66 Nm) torque. Bend the lockstrip corners against the flats on the bolt heads.

3-11. TROUBLESHOOTING

a. Importance. Troubleshooting is the systematic search for and location of malfunctions in the engine or transmission that affect transmission performance. A thorough study of the description and operation of components and the hydraulic system (Section 2) will be helpful in troubleshooting. The engine and transmission must be regarded as a single package during troubleshooting.

b. Troubleshooting Chart. The following chart outlines the possible causes of and remedies for transmission troubles. Capital letters indicate the symptom; numerals following the symptom indicate several possible causes; numerals in the right column indicate remedies for the correspondingly numbered causes in the left column.

TROUBLESHOOTING CHART

Cause	Remedy
(A) LOW MAIN PRESSURE	
1. Low oil level	1. Add oil to correct level (para 3-3)
2. Clogged oil strainer	2. Clean strainer (para 3-5**a**)
3. Clogged oil filter	3. Replace filter element (para 3-5**a**)
4. Weak or broken main-pressure regulator valve spring	4. Replace spring (para 6-3)
5. Oil pump worn	5. Rebuild oil pump (para 6-17)
6. Air leak at intake side of oil pump	6. Check pump mounting bolts (para 7-9**a**); check oil pickup tube (para 7-6**c** (3))
7. Internal oil leakage	7. Disassembly transmission; rebuild sub-assemblies as required
8. External oil leakage	8. Tighten bolts or replace gaskets
9. Brake hydraulic pressure applying clutch cutoff valve	9. Check brake residual pressure (brakes released); check brakes for full release
(B) OVERHEATING	
1. High oil level	1. Restore oil level (para 3-3)
2. Clutch failed	2. Rebuild transmission
3. Vehicle overloaded	3. Reduce load
4. Low main pressure	4. Refer to A, above
5. Engine water overheated	5. Correct engine overheating
6. Cooler oil or water line kinked or clogged	6. Clean or replace line
(C) LOW CLUTCH APPLY PRESSURE	
1. Low main pressure	1. Refer to A, above
2. Clutch piston sealrings failed	2. Overhaul transmission
3. Clutch cutoff control valve stuck	3. Rebuild control valve assembly (para 6-3)
4. Internal oil leakage	4. Overhaul transmission

TROUBLESHOOTING CHART — Continued

Cause	Remedy
(D) AERATED (foaming) OIL	
1. Incorrect type oil used	1. Change oil; use proper type (para 1-6)
2. High oil level	2. Restore proper oil level (para 3-3)
3. Low oil level	3. Restore proper oil level (para 3-3)
4. Air entering suction side of oil pump	4. Check oil pump bolts and gasket (para 7-9**a**); check oil pickup tube and flange (para 7-6**c** (3))
(E) VEHICLE WILL NOT TRAVEL	
1. Low main pressure	1. Refer to A, above
2. Low clutch apply pressure	2. Refer to C, above
3. Selector linkage broken or disconnected	3. Repair or connect linkage (para 3-7)
4. Internal mechanical failure	4. Overhaul transmission
(F) VEHICLE TRAVELS IN NEUTRAL WHEN ENGINE IS ACCELERATED	
1. Selector linkage out of adjustment	1. Adjust linkage (3-7)
2. Clutch failed (won't release)	2. Overhaul transmission
(G) VEHICLE LACKS POWER AND ACCELERATION AT LOW SPEED	
1. Low main pressure	1. Refer to A, above
2. Low clutch apply pressure	2. Refer to C, above
3. Freewheel clutch failed	3. Overhaul transmission
4. Engine malfunction	4. Check engine; refer to engine service manual
5. Aerated oil	5. Refer to D, above
(H) STALL SPEED TOO HIGH (see para 3-9)	
1. Clutch slipping	1. Overhaul transmission
2. Low main pressure	2. Refer to A and C, above
(I) STALL SPEED TOO LOW (see para 3-9)	
1. Engine not producing full power	1. Tune or repair engine; refer to engine service manual
2. Torque converter failed	2. Rebuild converter
3. Loss of engine power through accessories attached to engine	3. Disconnect accessories which are absorbing power

Section 4. GENERAL OVERHAUL INFORMATION

4-1. SCOPE OF SECTION 4

This section contains preliminary information required for the overhaul of the transmission. Cleaning instruction, inspection criteria, and recommended rework practices are discussed. Good shop practices, coupled with recommended procedures described herein, will aid in restoring high-quality performance.

4-2. MODEL CHANGES

The release of new assemblies may require new or different overhaul procedures. Major changes in the transmission will be described in subsequent issues of this manual. Contact your dealer or distributor for the latest information. When requesting service information, be sure to give the model, assembly part number, and serial number as stamped on the transmission nameplate (refer to para 1-3).

4-3. TOOLS, EQUIPMENT

In addition to ordinary hand tools, the following items should also be available.

- Chain hoist (1/2-ton [453.6 kg]) capacity, min)
- Suitable disassembly and assembly table
- Press (for removal and installation of press-fit parts)
- Supply of wood blocks
- Clean wiping cloths (do not use linty waste)
- Parts receptacles
- Cleaning equipment (brushes, solvents, etc.)
- Torque wrenches
- Oil-soluble grease
- Dry ice (for cooling interference-fit parts)
- Heating equipment or hot plate to provide oil at 300°F (150°C) (for heating interference-fit parts)
- Nonhardening sealer
- High-temperature grease

4-4. REPLACEMENT PARTS

a. Ordering Information. Refer to paragraph 1-3 for information on ordering parts and service kits.

b. Service Kits. Make use of the repair and overhaul kits which contain the gaskets, seals, lockstrips, etc. required for a complete overhaul (refer to para 1-3).

c. Parts Normally Replaced. The following parts are normally replaced during overhaul: gaskets, cotter pins, lockstrips, lip-type oil seals (when removed), damaged snaprings, and washers.

WARNING

Do not burn discarded Teflon seals. Toxic gases are produced.

4-5. CAREFUL HANDLING

Parts which have close operating tolerances must be handled carefully to prevent nicking, scratching, or denting. The slightest damage to these parts can result in erratic operation and possible malfunction of the transmission. These parts should be carefully handled and protected during removal, cleaning, inspection, and installation.

4-6. CLEANING, INSPECTION

a. Dirt-free Assembly. All parts must be clean to permit effective inspection. During assembly, it is very important that no dirt or foreign matter enters the transmission. Even minute particles can cause the malfunction of close-fitting parts.

b. Cleaning Parts

(1) All metallic parts of the transmission (except bearings) should be cleaned thoroughly with volatile mineral spirits, or by steam-cleaning method. Do not use a caustic soda solution for steam cleaning. Gum and varnish deposits should be removed by allowing the parts to soak in varnish remover.

(2) Parts should be dried with compressed air. Steam-cleaned parts should be oiled immediately after drying.

(3) Clean oil passages by working a piece of soft wire back and forth through the passages and flushing with spirits. Dry the passages with compressed air.

(4) After cleaning, examine the parts and especially the oil passages to make certain they are entirely clean. Reclean them, if necessary.

c. Cleaning Bearings

(1) Bearings that have been in service should be thoroughly washed in volatile mineral spirits.

(2) If the bearings are particularly dirty or filled with hardened grease, soak them in the spirits before trying to clean them.

(3) Before inspection, oil the bearings with the same type of oil that will be used in the transmission.

NOTE

Never dry bearings with compressed air. Do not rotate bearings while they are not lubricated.

d. Inspecting Bearings

(1) Inspect bearings for roughness of rotation. Replace a bearing if its rotation is still rough after cleaning and oiling.

(2) Inspect bearings for scored, pitted, scratched, cracked or chipped races, and for indication of excessive wear of rollers or balls. If one of these defects is found, replace the bearing.

(3) Inspect the defective bearing's housing and shaft for grooved, burred, or galled conditions that indicate the bearing has been turning in its housing or on its shaft. If the damage cannot be repaired with crocus cloth, replace the defective part.

(4) When installing a bearing on a shaft, heat the bearing to 200°F (93°C) on an electric hot plate or in an oil bath. Coat the mating surfaces with white lead and use the proper size installation sleeve and a press to seat the bearing.

NOTE

Bearings must be heated long enough for sufficient explansion. Heating time is determined by the size of the bearing. Forty-five minutes is sufficient for the largest bearing in the transmission.

(5) If a bearing must be removed or installed without a sleeve, **be careful to drive or press only on the race which is adjacent to the mounting surface.** If a press is not available, seat the bearing with a drift and a hammer, driving against the supported race.

e. Keeping Bearings Clean. The presence of dirt or grit in ball bearings is usually responsible for bearing failures. It is important to keep bearings clean during installation and removal. Observance of the following rules will do much to insure maximum bearing life.

(1) Do not remove the wrapper from new bearings until ready to install them.

(2) Do not remove grease in which new bearings are packed.

(3) Do not lay bearings on a dirty bench; place them on clean paper.

(4) If assembly is not to be completed at once, wrap or cover the exposed bearings with clean paper or cloth to keep out dust.

f. Inspecting Cast Parts, Machined Surfaces

(1) Inspect bores for scratches, wear, grooves, and dirt. Remove scratches and burs with crocus cloth. Remove foreign matter. Replace parts that are deeply grooved or scratched.

(2) Inspect all oil passages for obstructions. If an obstruction is found, remove it with compressed air, or by working a soft wire back and forth through the passage and flushing it out with cleaning solvent.

(3) Inspect mounting faces for nicks, burs, scratches, and foreign matter. Remove such defects with crocus cloth or a honing stone. If scratches are deep, replace the defective part.

(4) Inspect threaded openings for damaged threads. Chase damaged threads with the correct size tap.

(5) Replace housings or other cast parts that are cracked.

(6) Inspect all machined surfaces for damage that could cause oil leakage or other malfunction of the part. Rework or replace defective parts.

g. Inspecting Bushings, Thrust Washers

(1) Inspect bushings for scores, roundness, burs, sharp edges, and evidence of overheating. Remove scores with crocus cloth. Remove burs and sharp edges with a scraper or knife blade. If the bushing is out-of-round, deeply scored, or excessively worn, replace it, using the proper size replacer tool.

NOTE

Sometimes it is necessary to cut out a defective bushing. Be careful not to damage the bore into which the bushing fits.

(2) Inspect thrust washers for distortion, scores, burs, and wear. Replace the thrust washer if it is defective or worn.

h. Inspecting Oil Seals, Gaskets

(1) Inspect lip-type sealrings for cuts and hardness. Replace the sealrings if these defects are found.

(2) When replacing lip-type sealrings, make sure the spring-loaded side is toward the oil to be sealed in (toward the inside of the unit). Use a nonhardening sealing compound on the outside diameter of the seal to help prevent oil leaks. Coat the inside diameter of the seal with high temperature grease (MIL-G-3545A or equivalent) to protect the seal during the shaft installation and to provide lubrication during initial operation.

(3) Replace all composition gaskets.

(4) Inspect the hook-type sealrings for wear, broken hooks, and distortion.

(5) Install a new hook-type sealring if it is worn so much that there is no gap between the hooks of the sealring when it is installed.

(6) The sides of the sealring should be smooth (0.005 inch (0.12 mm) maximum side wear). The side of the shaft groove (or the bore) in which the sealring fits should be smooth (50 micro-inches (1.25 μm)) and square with the axis of rotation within .002 inch (0.05 mm). If the sides of the ring grooves have to be reworked (0.020 inch (0.51 mm) maximum side wear), install a new sealring.

i. Inspecting Gears

(1) Inspect gears for scuffed, nicked, burred, or broken teeth. If the defect cannot be removed with a soft honing stone, replace the gear.

(2) Inspect gear teeth for wear that may have destroyed the original tooth shape. If this condition is found, replace the gear.

(3) Inspect the thrust faces of gears for scores, scratches, and burs. Remove such defects with a soft honing stone.

j. Inspecting Splined Parts. Inspect parts for stripped, twisted or chipped splines. Replace the part if these defects are found. Remove any burs with a soft stone. Spline wear is not considered detrimental except where it affects tightness or fit of the splined parts.

k. Inspecting Clutch Plates

(1) Inspect the friction-faced plates for burs, imbedded metal particles, severely pitted faces, excessive wear, cone, cracks, distortion, and damaged spline teeth. Remove burs, using a soft honing stone. Replace plates which have other defects.

(2) Inspect steel plates for burs, scoring, excessive wear, cone, distortions, galling, cracks, breaks, and damaged tangs. Remove burs and minor surface irregularities, using a soft honing stone. Replace plates which have other defects.

(3) The amount of cone is determined by measuring the distance between the inside diameter of the plate and a level surface (fig. 4-1). When assembling a clutch pack, soak clutch plates in type C2 oil for a least 2 minutes and make sure that each plate is installed so that the cone is in the same direction as the adjacent plates. (Refer to wear limits chart in Section 8 for maximum allowable cone.)

l. Inspecting Threaded Parts. Inspect parts for burred or damaged threads. Remove burs with a soft honing stone or fine file. Replace damaged parts.

m. Inspecting Snaprings. Inspect all snaprings for nicks, distortion, and excessive wear. Replace the part if any one of these defects is found. The snapring must snap tight in its groove for proper functioning.

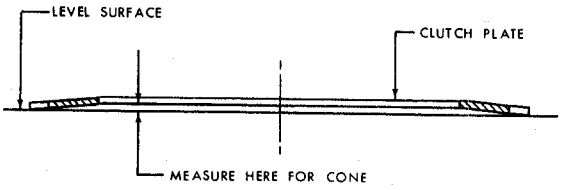


Fig. 4-1. Method for determining cone of clutch plate

n. Inspecting Springs. Inspect all the springs for signs of overheating, permanent set, or wear due to rubbing adjacent parts. Replace the spring if any one of these defects is found. Replace springs which do not meet the load-height specifications in the spring chart in Section 8.

4-7. REMOVING, INSTALLING TRANSMISSION

a. Drain Oil. Drain the oil from the transmission. For better drainage the transmission should be warm and allowed to drain overnight. Replace the drain plug. Consult the vehicle service manual for specific instructions for removal and installation, as applications will differ. Clean the exterior of the transmission. If the steam cleaning method is used, the transmission should be disassembled immediately — condensation of the steam will rust the ferrous parts in the transmission.

b. Check Linkages, Lines. Make sure that all linkages, controls, cooler and filter lines, pressure and temperature lines, driveline couplings, and mounting bolts are disconnected before transmission removal. Oil lines should be carefully placed clear of the removal path and all openings covered to keep them clean.

c. Reconnect at Installation

(1) At installation, reconnect all linkages and lines which were previously removed. Two 3/4-10 tapped openings are provided at the top of the transmission housing. Bolts or eyebolts may be installed in the openings for lifting the transmission assembly.

4-8. REMOVING, INSTALLING INTERFERENCE-FIT FLANGES

a. Removal. When the interference-fit flanges are used, they should be removed prior to complete disassembly. A heavy duty puller kit is required. A heavy steel plate may be bolted to the ears of the flange to provide a grip surface for the puller jaws and to prevent distortion. A steel bar may be used to prevent rotation of the flange during the pulling process. Removal of the Torqmatic coupling requires a puller which will engage the internal groove within the coupling hub. Always place a spacer between the transmission shaft and puller draw bolt to protect the end of the shaft.

b. Installation. Inspect the shaft and splines for dirt, paint, rust, burs, and rough spots. Remove any of these. Make sure that spacers or other parts are in place on the shaft. Coat the splines with light bearing grease and grease the lip of the oil seal. Lubricate the shaft threads with molybdenum disulfide grease (such as Molykote Type G, or equivalent). Heat the flange to approximately 300°F (150°C) for 45 minutes. While the flange is still hot, quickly install it on the shaft. Seat it immediately and install the retaining washer, sealring, and self-locking nut which retain it. Tighten the nut to the specified torque.

CAUTION

If the flange seizes to the shaft before it is properly seated, it will be necessary to remove the flange and repeat the assembly procedure. Do not attempt to force the flange with a hammer. Recheck the nut or bolt torque after the flange cools.

4-9. WEAR LIMITS, SPRING CHART

a. Wear Limits Inspection. When parts are being inspected, those listed in Section 8 should be measured for wear. Those parts which have reached or exceeded the specified wear limit should be discarded and replaced. All wear limits data are tabulated in Section 8. The item numbers are keyed to the parts shown in the exploded views at the back of the book.

b. Spring Inspection. The data presented in Spring Chart in Section 8 will aid in identification and inspection of the springs within the transmission.

4-10. TORQUE SPECIFICATIONS

The assembly procedures in Sections 6 and 7 specify the torque requirements for all bolts and nuts. For general reference, a torque specification chart is presented below. The torque specifications in the chart apply to all assembly procedures unless otherwise specified in the text or cross-section illustration at the end of Section 6. The illustration may be used as a convenient reference for the torque required to tighten the hardware in the cross-section view.

STANDARD TORQUE SPECIFICATIONS

(all torque values, given in pound feet and Newton metres)

Size	Threads per inch	Standard heat-treated bolts and screws		Special heat-treated bolts, screws, Allen-head screws and self-locking capscrews		Nuts	
							
		lb ft	(N·m)	lb ft	(N·m)	lb ft	(N·m)
1/4	20	9-11	(12-15)	9-11	(12-15)		
	28	10-12	(14-16)	10-12	(14-16)		
5/16	18	13-16	(18-21)	17-20	(23-27)		
	24	14-18	(19-24)	19-23	(26-32)	14-18	(19-24)
3/8	16	26-32	(35-43)	36-43	(49-58)		
	24	33-40	(45-54)	41-49	(56-66)	33-40	(45-54)
7/16	14	42-50	(57-67)	54-65	(73-88)		
	20	50-60	(68-81)	64-77	(87-104)		
1/2	13	67-80	(91-108)	81-97	(110-131)		
	20	83-100	(113-135)	96-115	(130-155)		
5/8	11	117-140	(159-189)	164-192	(222-260)		
	18	134-160	(182-217)	193-225	(262-305)	134-160	(182-217)

Section 5. DISASSEMBLY OF TRANSMISSION INTO SUBASSEMBLIES

5-1. SCOPE OF SECTION 5

a. Models Covered. This section describes the disassembly of the transmission into subassemblies. The procedures are applicable to the TT 3000 models and related optional features.

b. Disassembly Sequence. The instructions depict, in a logical sequence, the removal of exterior components and front components, through the torque converter assembly to the splitline at the transmission housing. The transmission is then repositioned and the remaining components are removed from the rear of the main housing.

c. Illustrations

(1) Disassembly is referenced primarily to photographs in this section. When considered helpful, reference is also made to photographs in Section 7.

(2) Disassembly of some components is referenced to foldouts in the back of the manual, especially when several small components are involved. A cross-sectional view is presented on foldout 1 to aid in defining relationship of assembled parts.

5-2. REMOVAL OF EXTERIOR COMPONENTS

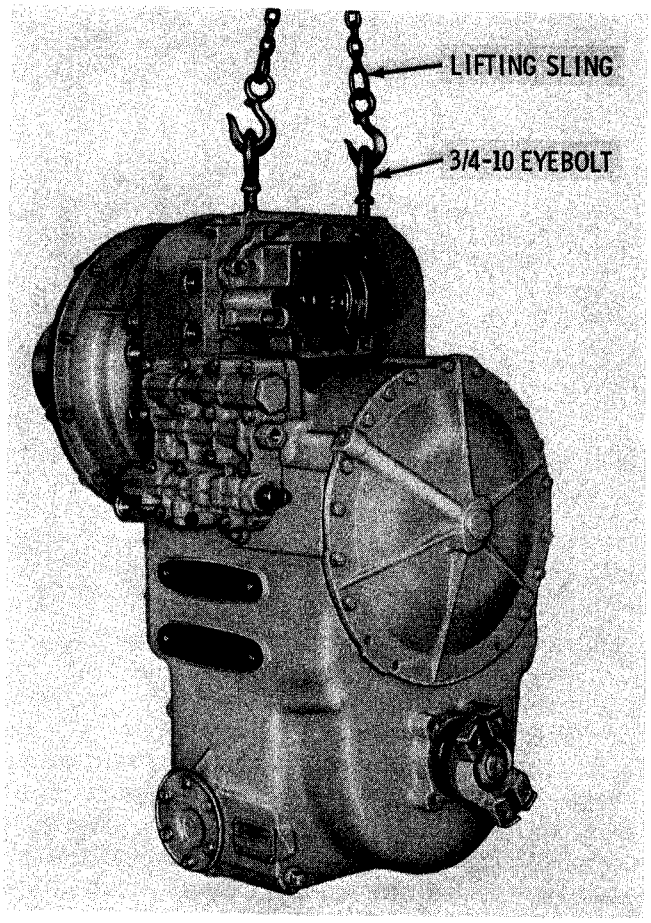
a. Lifting Points. All transmissions have two 3/4-10 tapped holes in the top of the transmission housing. Bolts or eyebolts may be installed into the holes to provide a means of supporting or repositioning the transmission during disassembly (fig. 5-1).

b. Oil Pump Drive Coupling. If the transmission is equipped with adapter drive coupling for an implement pump (fig. 1-2), remove the coupling.

c. Oil Strainer Assembly. Remove six bolts and lockwashers that retain the oil strainer assembly (fig. 5-2). Remove the strainer assembly and gasket. Remove the oil drain plug.

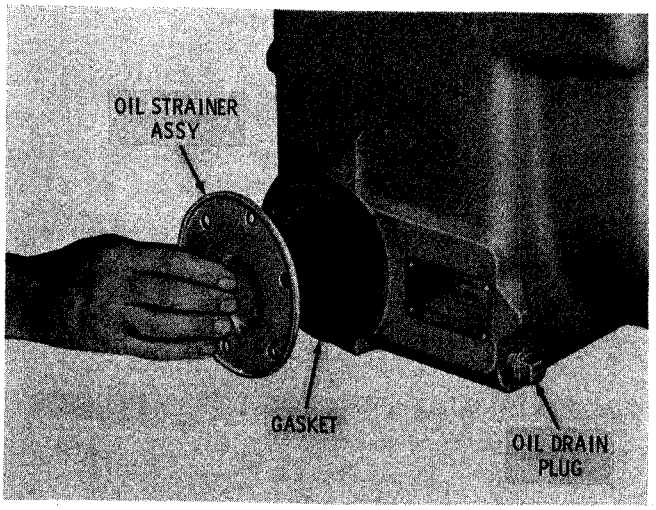
d. Parking Brake and Output Flanges

(1) Remove six self-locking bolts that retain the brake drum. Remove the brake drum.



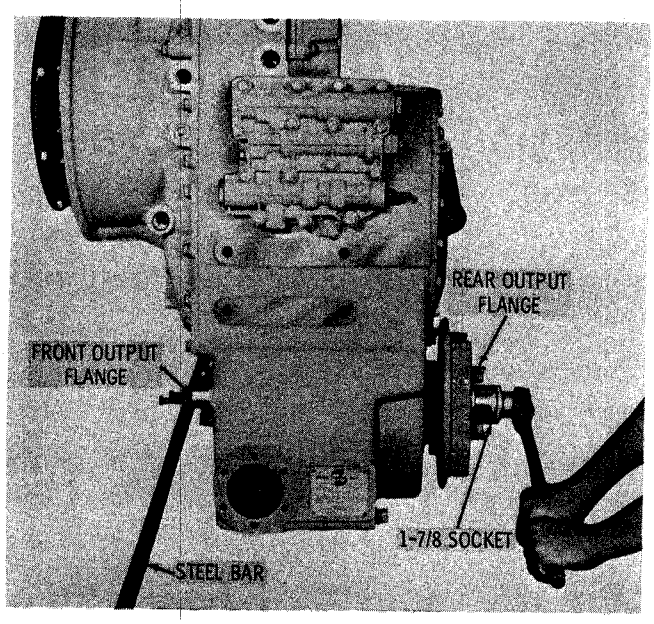
S4075

Fig. 5-1. Lifting transmission assembly



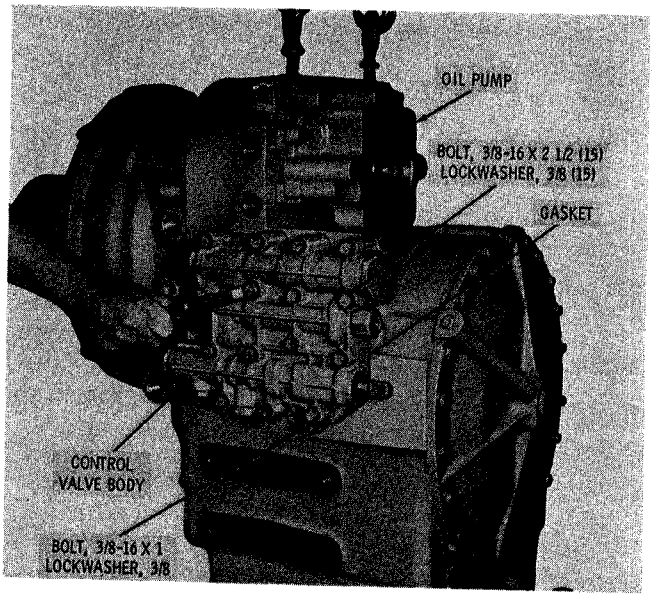
S4076

Fig. 5-2. Removing oil strainer assembly



S2536

Fig. 5-3. Removing rear-output flange nut



S4077

Fig. 5-4. Removing control valve body bolts

(2) Remove the 1-1/4-12 flange retaining nut and washer from the rear output shaft (fig. 5-3). To prevent rotation of the flange, install two bolts into the front output flange. Then, place one end of the bar stock between the bolts and allow the other end to press against the assembly table. Remove the front output flange retaining nut and washer, using the same procedure. Remove the front and rear output flanges. Remove the sealring from the bore of each flange. If necessary, use a flange puller as described in paragraph 4-8**a.**

(3) Remove four bolts 2 (A, foldout 9). Remove brake assembly 1.

e. Control Valve Body Assembly

(1) Remove the sixteen bolts and lockwashers that attach the control valve body assembly to the transmission housing (fig. 5-4).

(2) Remove the control valve body assembly and gasket. Refer to paragraph 6-3 for the control valve body assembly rebuild instructions.

5-3. REMOVAL OF INPUT COMPONENTS

NOTE

Position the transmission to rest on its rear surface. Do not allow the transmission to rest on the output shaft.

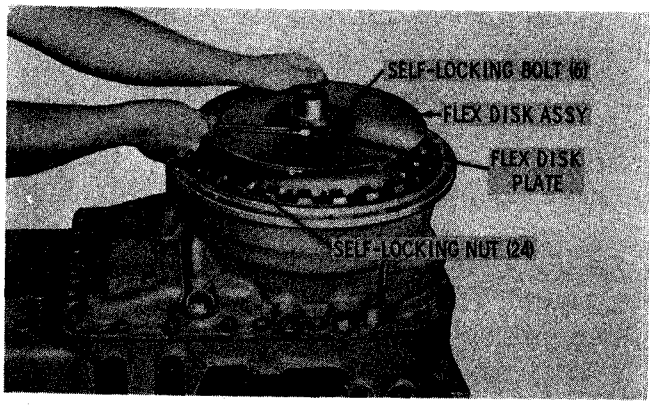
a. Direct Mount (flex disk)

(1) Remove the six self-locking bolts and plate that retain the flex disk assembly (fig. 5-5).

(2) Remove the flex disk plate and flex disk assembly consisting of three flex disks and a disk and washer assembly (fig. 5-5).

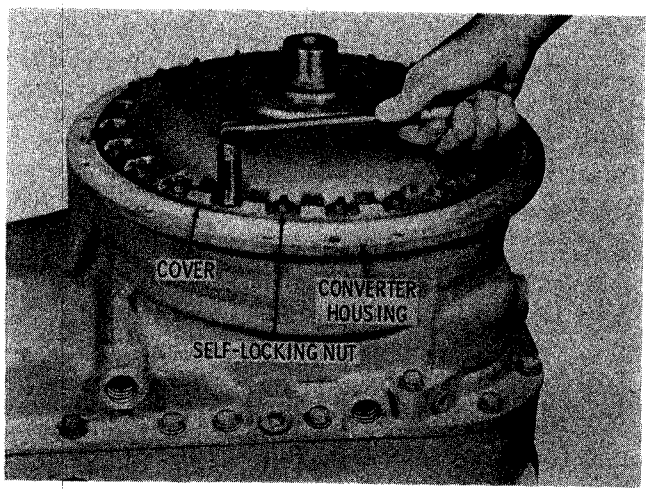
(3) Remove the twenty-four self-locking nuts that retain the torque converter drive cover (fig. 5-6).

(4) Attach a sling and remove the torque converter drive cover (fig. 5-7). Ball bearing 1 (B, foldout 3) may remain in the torque converter drive cover; if so, remove the bearing.



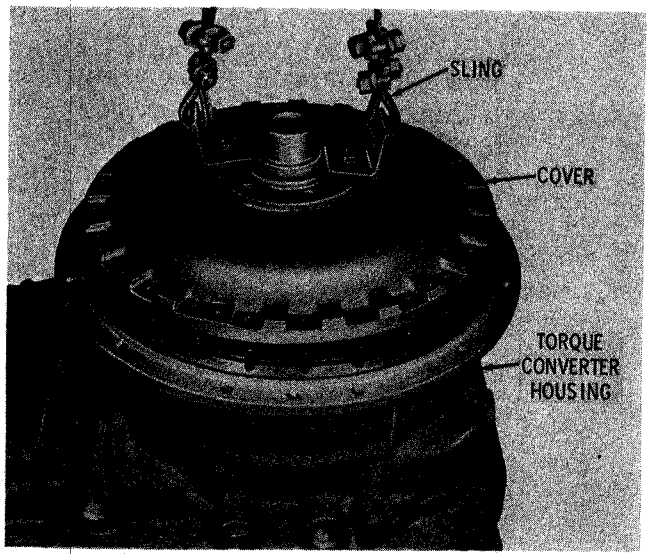
S2539

Fig. 5-5. Removing flex disk bolts



S2540

Fig. 5-6. Removing torque converter drive cover nuts



S2451

Fig. 5-7. Removing torque converter drive cover

b. Remote Mount

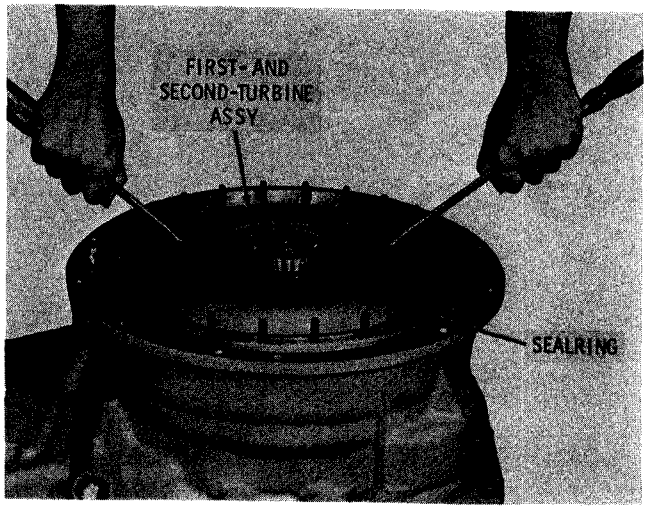
(1) The input flange is retained with two self-locking bolts 1 (A, foldout 2), lockstrip 2, and retaining washer 3.

(2) To remove the flange, straighten the ears of the lockstrip and remove the bolts. Remove the lockstrip, retaining washer, and shim(s) 4 and/or 5. Remove the flange or Torqmatic coupling assembly.

(3) If the Torqmatic coupling assembly 6 (A, foldout 2) has seized to the shaft splines, use a bearing puller for removal of the coupling assembly. Install the puller so that the puller feet nest in the groove within the inside diameter of the coupling and the puller bolt works against a spacer placed against the end of the input shaft. If a flange other than Torqmatic coupling has seized to the shaft splines, use a suitable puller for removal. Refer to paragraph 4-8 if the flange is a tight fit.

(4) Remove twelve 3/8-24 x 2-inch bolts, nuts and lockwashers that retain the transmission front cover (fig. 7-35). Remove the gasket. Refer to paragraph 6-4 for rebuild of the front cover.

(5) Remove the twenty-four self-locking nuts 9 (B, foldout 2) that retain torque converter drive cover 10. Remove torque converter drive cover 10 and attached input shaft 8 and bearing 5 as an assembly. Refer to paragraph 6-5 for the torque converter drive cover rebuild instructions. Remove the sealring (if used) from the torque converter pump (fig. 5-8).



S4078

Fig. 5-8. Removing first- and second-turbine assembly

5-4. REMOVAL OF CONVERTER COMPONENTS AND HOUSING

a. Converter Components

(1) Using two screwdrivers, and lifting straight upward, remove the first- and second-turbine assembly (fig. 5-8). Do not disassemble this unit unless inspection or parts replacement is necessary. If necessary, refer to paragraph 6-6 for turbine assembly rebuild instructions.

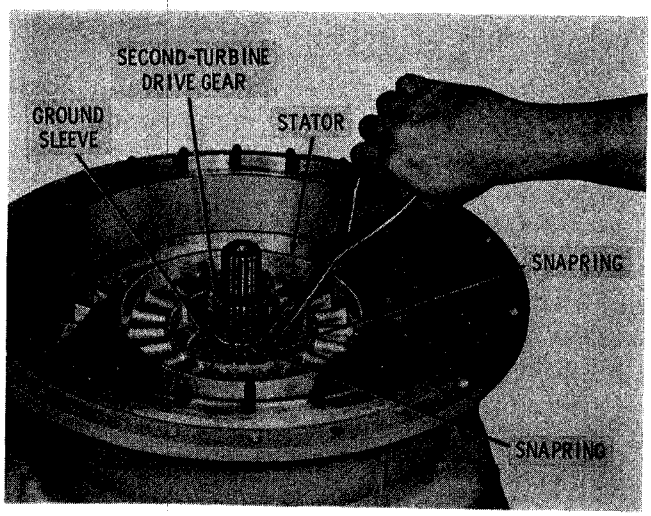


Fig. 5-9. Removing stator snapring

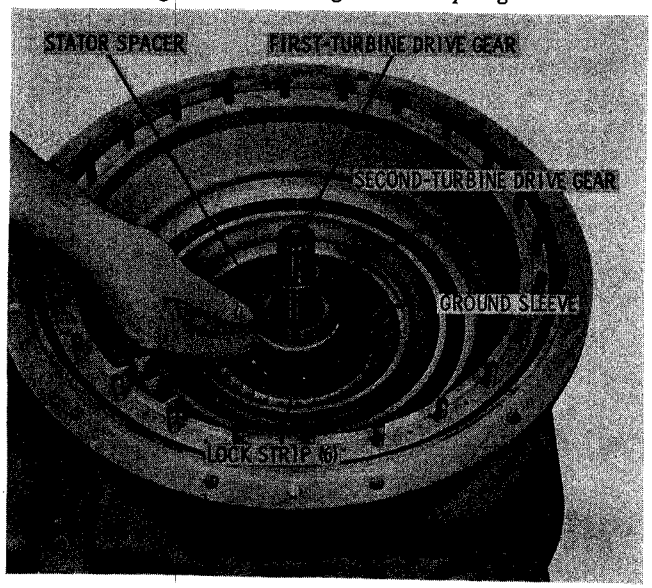


Fig. 5-10. Removing stator spacer

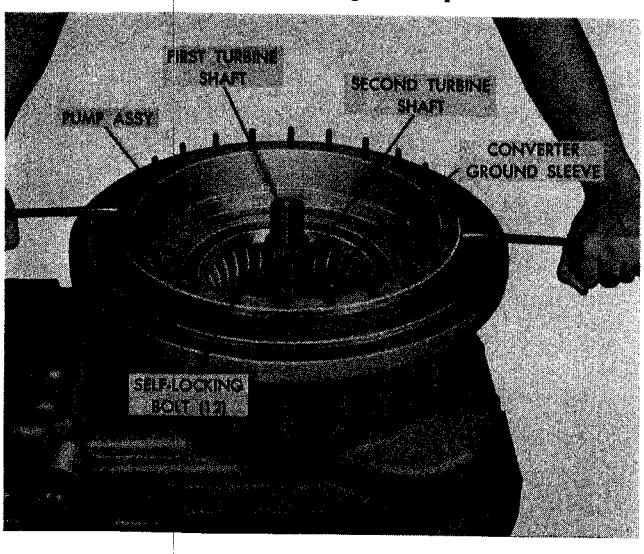


Fig. 5-11. Removing torque converter pump assembly

(2) Remove the snapring that retains the converter stator, and remove snapring from the second-turbine drive gear. Remove the stator from the converter ground sleeve (fig. 5-9).

(3) Remove the stator spacer from the converter ground sleeve (fig. 5-10).

(4) Loosen the torque converter pump assembly from the ground sleeve by prying evenly at opposite points on the rim of the pump (fig. 5-11).

NOTE

If the pump assembly will not loosen readily, attach a puller after two self-locking bolts are removed. Tighten the puller against a sleeve placed against the ground sleeve. The puller sleeve must extend above the turbine drive gear shafts (fig. 5-11). Do not apply puller pressure to the gear shafts.

(5) When the converter pump bearing has been drawn from its seat on the ground sleeve, remove the puller.

(6) Remove the torque converter pump and reinstall the two bolts removed in (4), above. If further disassembly is planned, refer to paragraph 6-7 for converter pump rebuild instructions. If disassembly is not necessary, tighten the two 1/4-28 x 1-1/4-inch bolts to 10 to 12 pound feet (14 to 16 Nm) torque, and bend the lockstrip tabs against the replaced bolts.

b. Converter Housing

(1) Remove the twenty-four bolts, lockwashers, and plain washers that attach the converter housing to the transmission main housing (fig. 7-30).

(2) Attach a sling to the converter housing flange (fig. 5-12). Apply slight tension on the sling and, using a soft hammer, bump the converter housing away from the transmission main housing.

CAUTION

When the converter housing has cleared the transmission housing (approximately 1-1/2-inches (38 mm)), check to insure that the freewheel unit remains with the transmission main housing. If necessary, use two long screwdrivers to pry the freewheel front bearing from the converter housing. If the freewheel unit is raised with the converter housing, the oil suction tube will be damaged.

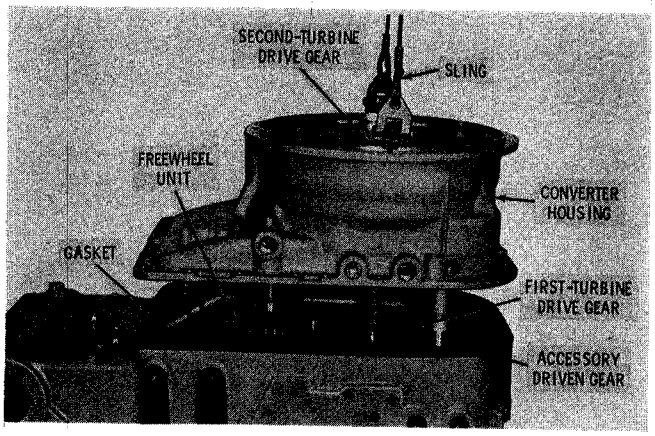


Fig. 5-12. Removing torque converter housing

(3) Remove the converter housing and attached parts (fig. 5-12). Remove the gasket. Remove bearing race 22 (B, foldout 3) from the hub of second-turbine drive gear 20. Remove the second-turbine drive gear (fig. 5-12). Remove sealring 18 (A, foldout 4) and ball bearing 19 from drive gear 20. Refer to paragraph 6-8 for converter housing rebuild instructions.

5-5. REMOVAL OF OIL SUCTION TUBE AND TURBINE GEARING

a. Oil Suction Tube

(1) Remove self-locking bolts 2 and 3 (B, foldout 4) and self-locking bolt 1, and remove oil suction tube 4 (fig. 5-13).

(2) Remove sealring 5 from top end of suction tube.

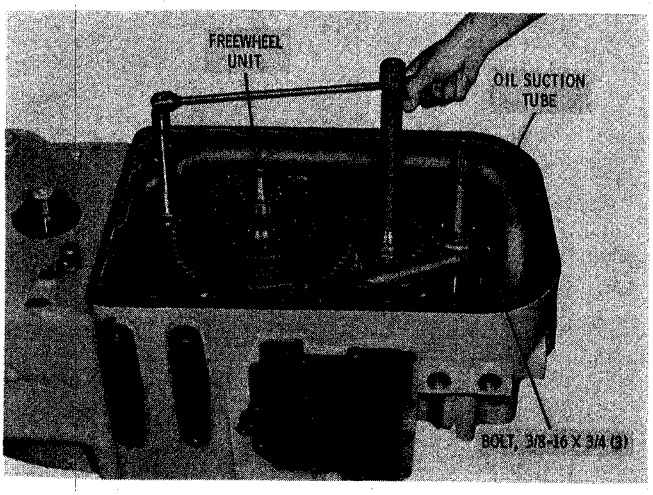


Fig. 5-13. Removing oil suction tube bolt

b. Turbine Gearing

(1) Remove the first- and second-turbine driven gear and freewheel unit as an assembly (fig. 5-13). Refer to paragraph 6-9 for freewheel unit rebuild instructions.

(2) Remove sun gear spacer 23 (A, foldout 4) from the shaft of the second-turbine driven gear (or the bore in the transmission housing).

(3) Remove the self-locking bolt that retains the lubrication tube (fig. 5-14), and lift the tube from the housing.

(4) Remove the needle thrust bearing and race from the first-turbine drive gear. Remove the sealring. Remove the first-turbine drive gear and ball bearing (fig. 5-14). Remove the bearing only if replacement is necessary. Refer to paragraph 6-10 for rebuild of first-turbine drive gear.

c. Accessory Drive Shaft

Remove the accessory drive shaft (fig. 5-14). Remove the bearing from the accessory drive shaft only if replacement is necessary. On models that are not equipped with an accessory drive shaft, the housing bore and lubrication orifice are sealed with plugs 6 and 7 (A, foldout 5). Remove these plugs only if replacement is necessary.

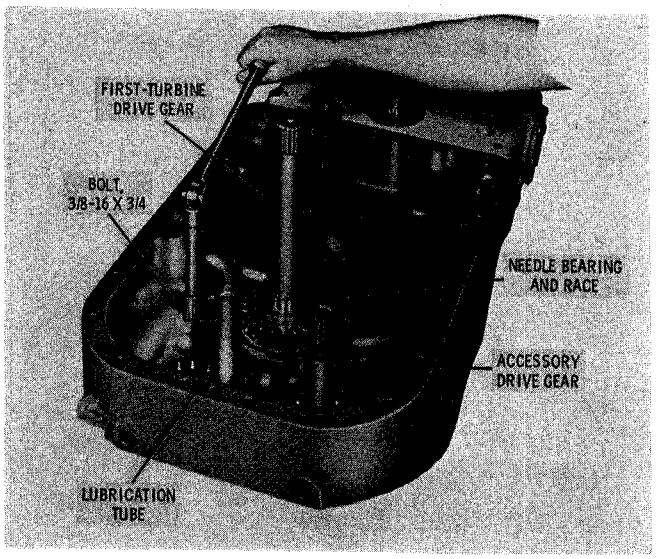


Fig. 5-14. Removing lubrication tube bolt

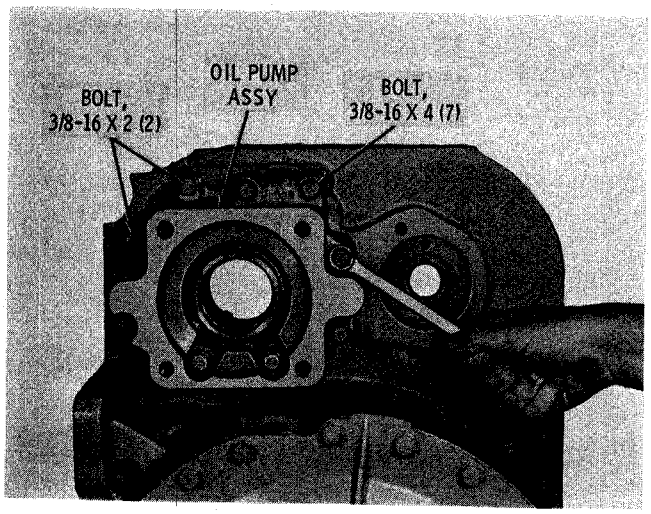


Fig. 5-15. Removing oil pump bolts

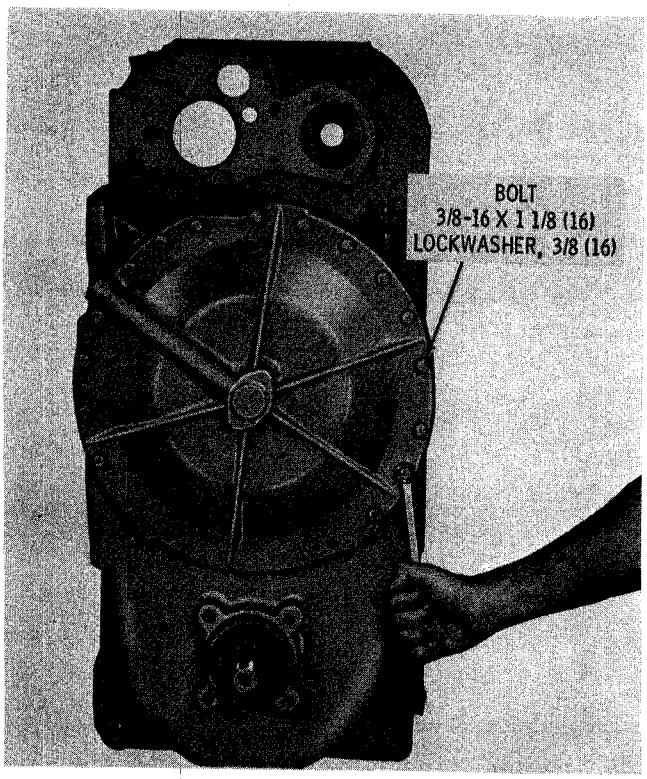


Fig. 5-16. Removing rear cover bolts

5-6. REMOVAL OF OIL PUMP AND HIGH—RANGE CLUTCH PISTON HOUSING

a. Oil Pump, Rear Cover

(1) Remove the nine bolts and lockwashers that attach the oil pump to the transmission housing (fig. 5-15). Remove the oil pump assembly and gasket. Do not separate the pump components unless inspection or parts replacement is necessary. Refer to paragraph 6-17 for the oil pump rebuild instructions.

(2) Remove the sixteen bolts and lockwashers that attach the rear cover to the transmission housing (fig. 5-16). Remove the cover and gasket. Remove sealring 2 (B, foldout 7) from the cover. Remove 1/8-inch plug 3 only if necessary for cleaning or parts replacement.

(3) Remove the hook-type sealring from the hub of the piston housing (fig. 5-17).

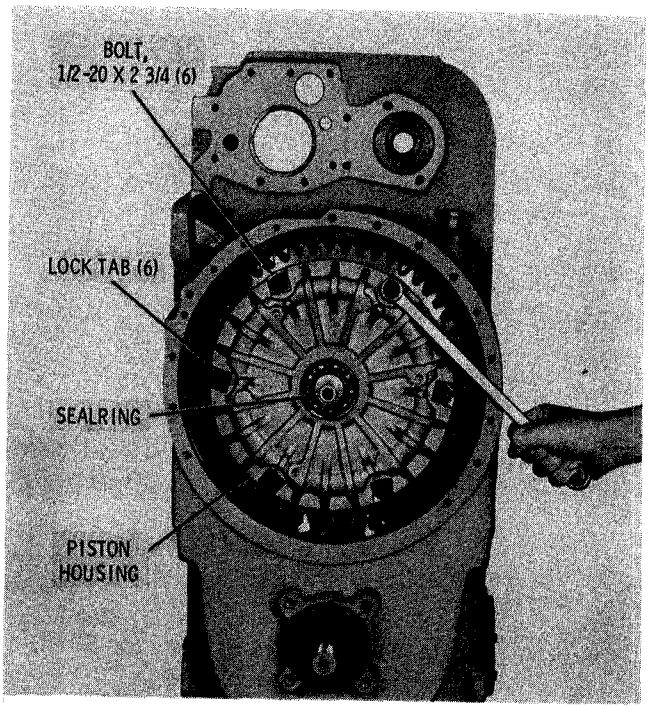


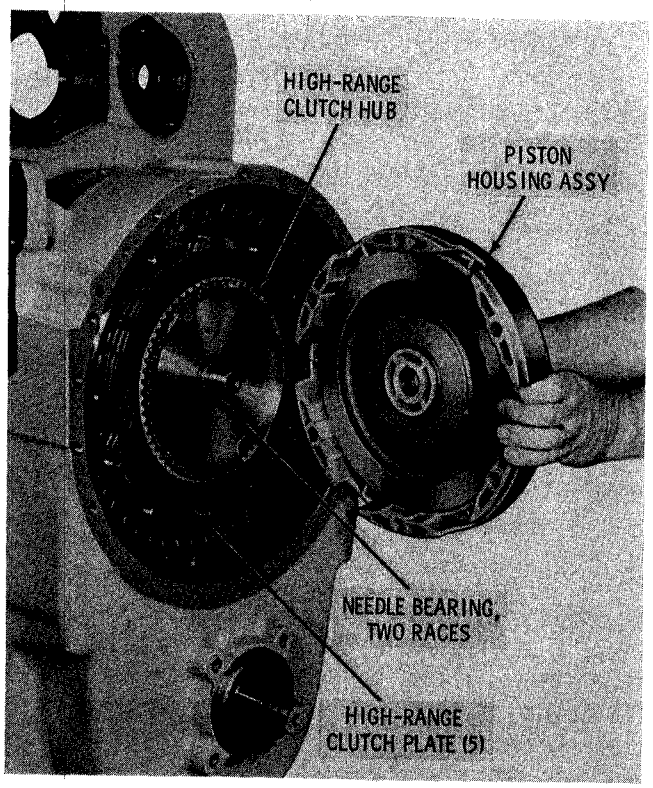
Fig. 5-17. Removing high-range clutch piston housing bolts

b. High-Range Clutch Piston Housing

(1) Straighten the lock tabs. Remove the six bolts and lock tabs that attach the piston housing to the transfer drive gear (fig. 5-17).

(2) Remove the high-range piston housing and attached parts from the transfer drive gear (fig. 5-18). It may be necessary to pry the housing from the bore in the drive gear. Refer to paragraph 6-11 for the high-range clutch piston housing rebuild instructions.

(3) Remove the bearing and two races from the high-range clutch hub. Remove the five high-range clutch plates, and remove the clutch hub. Remove snapring 6 (A, foldout 7) from the clutch hub.



S4086

Fig. 5-18. Removing high-range clutch piston housing assembly

5-7. REMOVAL OF TRANSFER GEARS, OUTPUT COMPONENTS

a. Transfer Drive Gear

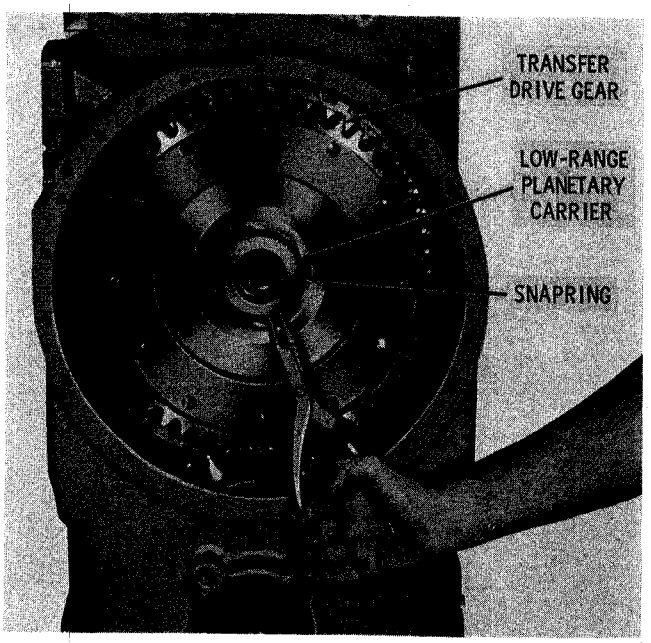
Remove the snapring that retains the transfer drive gear to the low-range carrier (fig. 5-19). Remove the transfer drive gear. Refer to paragraph 6-12 for the transfer drive gear rebuild instructions.

b. Two-piece Output Shaft (front disconnect)

CAUTION

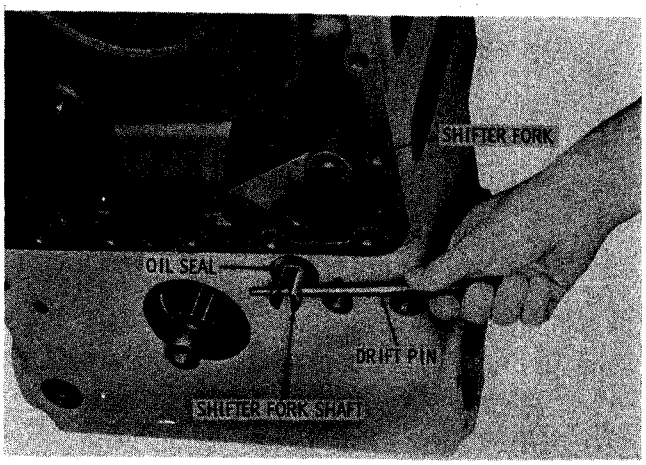
If only the shifter shaft oil seal requires replacement, do not remove shifter shaft. Removal of the shaft will allow the shifter fork to drop into the sump area, and partial disassembly of the transmission is required to reinstall the shifter components. (Destroy and remove the failed seal. Install the new seal and press it lightly against the shoulder in the bore.)

(1) Rotate shifter fork shaft counterclockwise to remove it from the front of the transmission housing (fig. 5-20). Removal of the shifter fork shaft will allow the shifter fork to fall into the sump area. Remove the shifter fork. Remove the shifter shaft oil seal only if replacement is necessary.



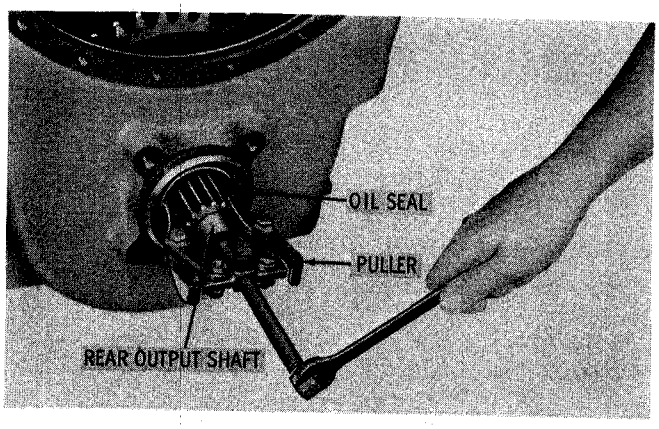
S4087

Fig. 5-19. Removing transfer drive gear snapring



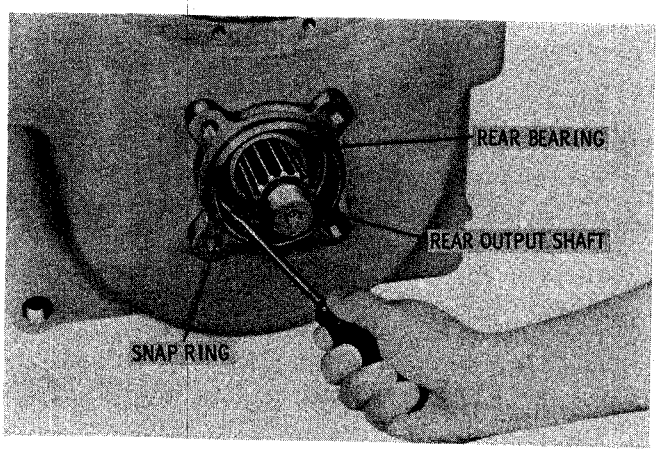
S1456

Fig. 5-20. Removing disconnect shifter shaft



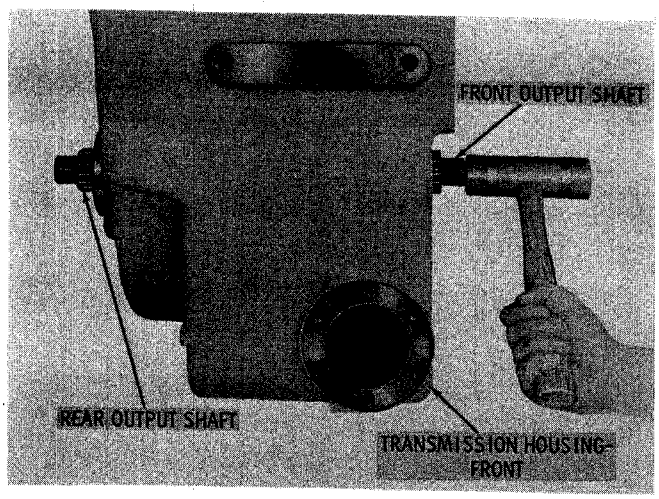
S2561

Fig. 5-21. Removing rear-output shaft oil seal



S2562

Fig. 5-22. Removing rear-output shaft bearing snapring



S1457

Fig. 5-23. Driving two-piece output shaft rearward

(2) Using a puller, remove the oil seal from the rear of the transmission housing (fig. 5-21). Remove the snapring (fig. 5-22).

(3) Using a soft hammer, drive the front output shaft rearward until the bearing on the rear output shaft is free from the housing bore (fig. 5-23). Remove the rear output shaft and the attached bearing and spacer as an assembly (fig. 5-24). Remove the bearing only if replacement of the bearing or spacer is necessary. Do not remove bushing 15 (A, foldout 8) from rear output shaft 16 unless replacement is necessary.

(4) Removal of the rear output shaft from the transmission housing will free transfer driven gear 13 (A, foldout 8) and allow spacer 12 to fall into the sump area. Remove the transfer driven gear (fig. 5-25), and remove the fallen spacer from the sump. If difficulty is encountered in removing the transfer driven gear, remove the fallen spacer before removing the gear.

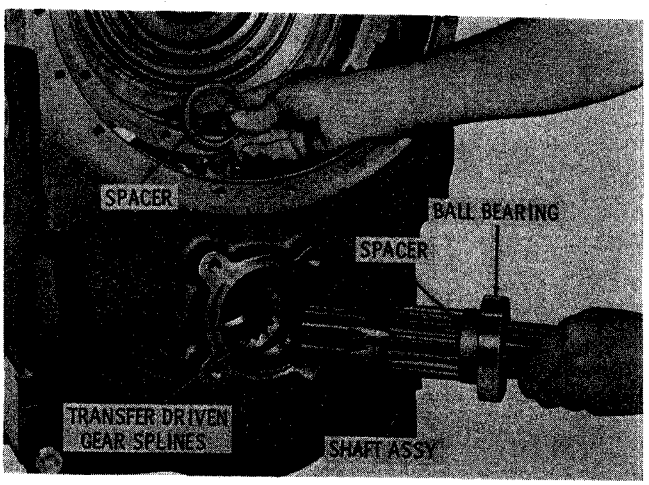
(5) Remove center bearing 11 (A, foldout 8) from its bore in the housing web.

(6) Remove the output shaft front oil seal (fig. 5-26). Remove the front bearing snapring (fig. 5-27). Using a soft metal drift, drive the front output shaft forward. When the front bearing is free from the housing, remove the shaft. Remove the ball bearing from the shaft only if parts replacement is necessary.

NOTE

A spring and two detent balls will be released when the disconnect coupling is removed from the front output shaft. Drape a shop towel over the assembly to prevent possible loss of balls.

(7) Remove the disconnect coupling from the front output shaft, and place the two detent balls and spring in a parts receptacle.



S2599

Fig. 5-24. Removing rear-output shaft assembly

S4088

Fig. 5-25. Removing transfer driven gear

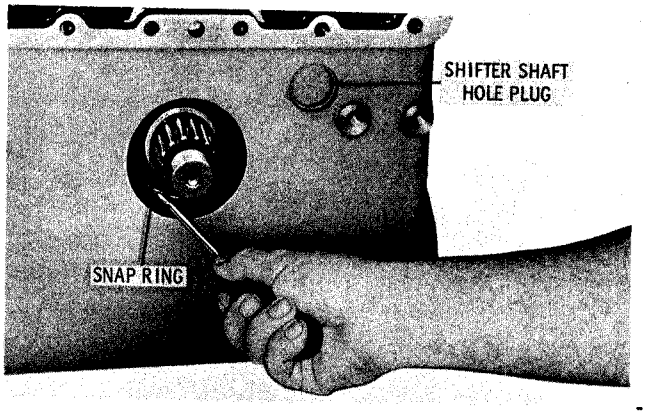
c. One-piece Output Shaft (without disconnect)

(1) Using a puller, remove the oil seal from the front of the transmission housing (fig. 5-26).

(2) Remove the snapring that retains the output shaft bearing in the housing bore (fig. 5-27). Do not remove the shifter shaft hole plug unless replacement is necessary.

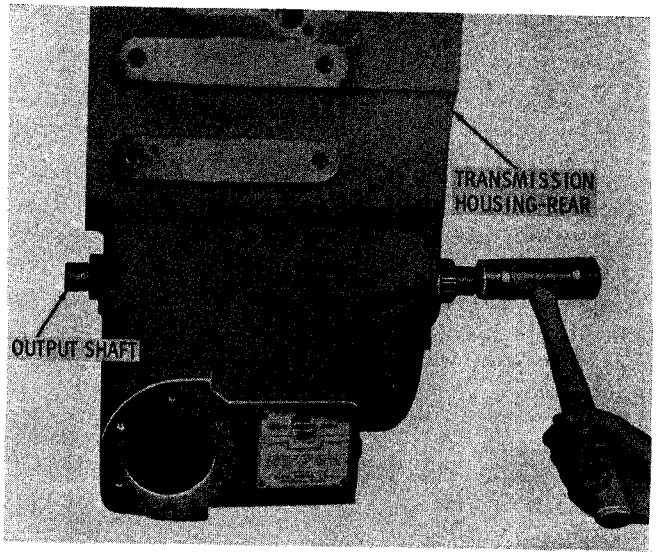
(3) Using a soft hammer, drive the output shaft forward until the front bearing is free from the housing bore (fig. 5-28).

(4) Remove the output shaft and front bearing as an assembly (fig. 5-29). Remove the front bearing from the output shaft.



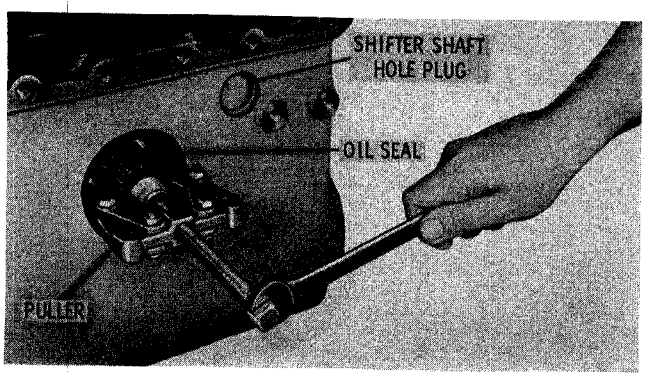
S1453

Fig. 5-27. Removing output shaft front bearing snapring



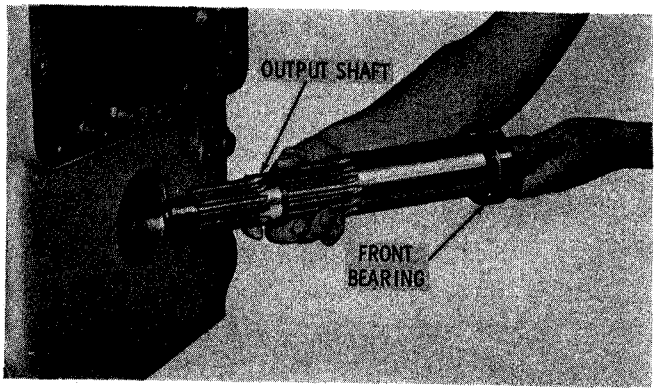
S1454

Fig. 5-28. Loosening one-piece output shaft front bearing



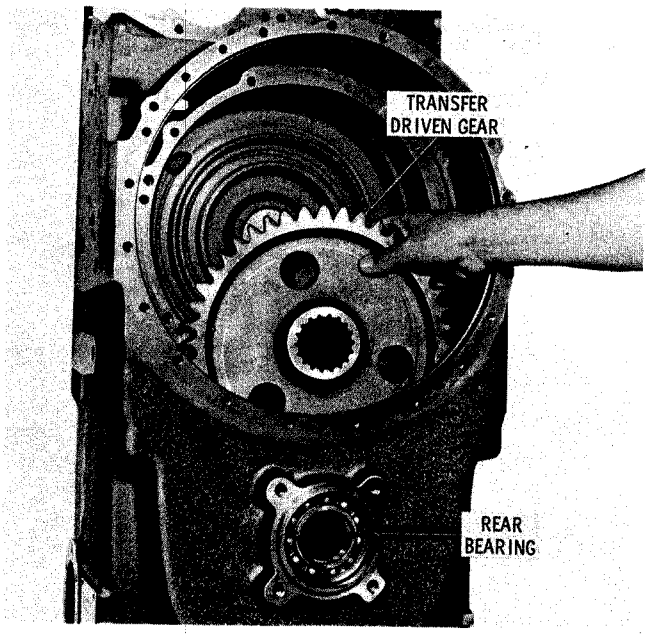
S1452

Fig. 5-26. Removing output shaft front oil seal



S2559

Fig. 5-29. Removing one-piece output shaft



S2560

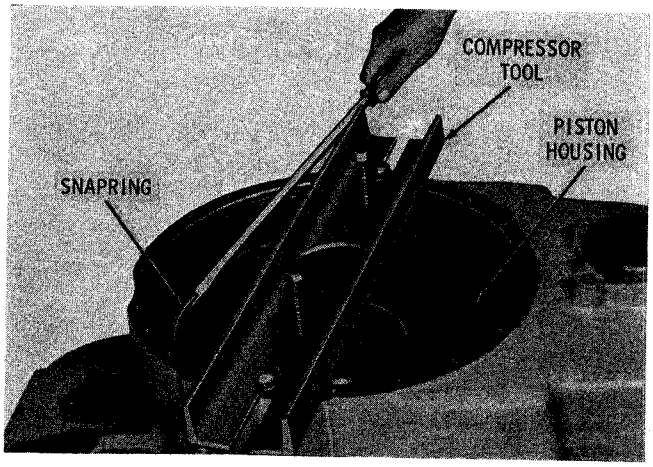
Fig. 5-30. Removing transfer driven gear (one-piece shaft)

(5) Removal of the output shaft will free the transfer driven gear 13 and spacer 12 (A, foldout 8). Remove the transfer driven gear (fig. 5-30) and remove the spacer from the sump area. Remove lip-type seal 20 (A, foldout 8) from the rear of the housing. Remove the output shaft rear bearing from its bore (fig. 5-30).

5-8. REMOVAL OF RANGE GEARING, CLUTCHES

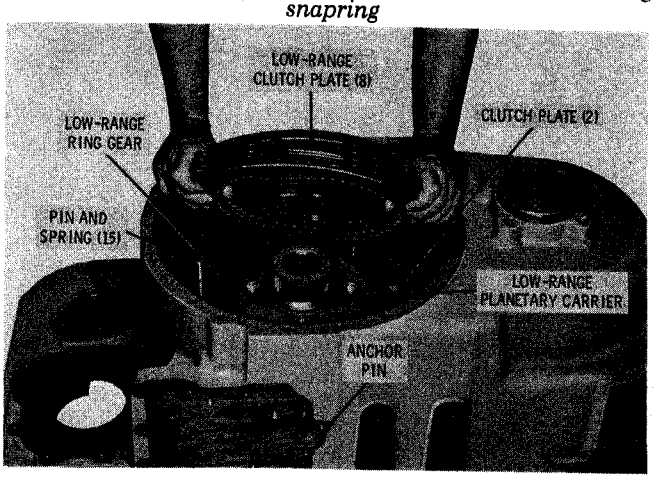
a. Low-range Clutch and Planetary

(1) Using a suitable compressor, compress the low-range clutch piston housing sufficiently to allow removal of the snapring (fig. 5-31). Remove the snapring, and remove the compressor.



S4089

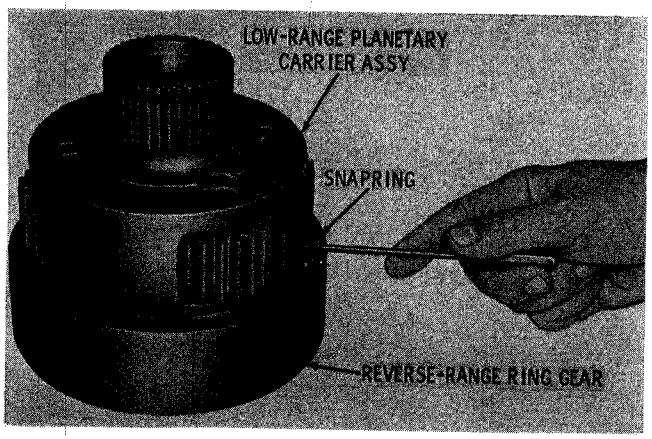
Fig. 5-31. Removing low-range clutch piston housing snapring



S4090

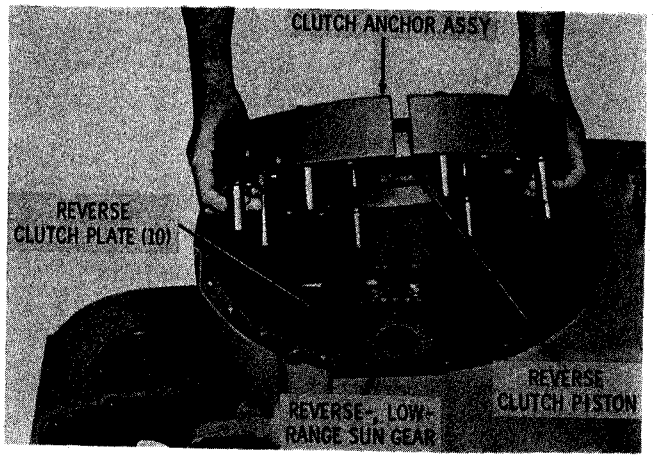
Fig. 5-32. Removing low-range clutch plates

(2) Remove the low-range clutch piston housing 18 (B, foldout 6) and piston 12 as an assembly. Remove insert 17 from the recess in piston housing 18. Remove low-range piston 12 from the housing. Remove sealrings 13, 14, and 15 from the piston only if parts replacement is necessary. Refer to paragraph 6-13 for clutch piston rebuild instructions.



S2557

Fig. 5-33. Removing snapring from reverse ring gear



S4091

Fig. 5-34. Removing reverse- and low-range clutch anchor assembly

(3) Remove eight of ten low-range clutch plates from the low-range ring gear (fig. 5-32). Remove the ring gear and the remaining two clutch plates. Separate the plates from the gear. Remove the low-range planetary carrier assembly and reverse ring gear as a unit. Remove the snapring and separate the ring gear from the planetary carrier assembly (fig. 5-33). Remove the fifteen piston return springs and guide pins. Remove the anchor pin from the valve body pad. Refer to paragraph 6-14 for the low-range planetary rebuild instructions.

b. Reverse Clutch and Planetary

(1) Remove the reverse- and low-range clutch anchor assembly (fig. 5-34). Refer to paragraph 6-15 for the clutch anchor rebuild instructions.

(2) Remove the reverse- and low-range sun gear. Remove the reverse planetary carrier and clutch plates as an assembly. Separate the ten clutch plates from the carrier. Refer to paragraph 6-16 for the reverse planetary carrier assembly rebuild instructions.

(3) Remove the reverse piston from the transmission housing. Remove sealrings 1, 2, and 3 (A, foldout 6) from the piston only if parts replacement is necessary. Refer to paragraph 6-13 for clutch piston rebuild instructions.

(4) Remove the remaining parts from the transmission housing only if parts replacement or additional servicing is required. Refer to paragraphs 6-18 for the transmission housing rebuild instructions.

Section 6. REBUILD OF SUBASSEMBLIES

6-1. SCOPE OF SECTION 6

a. This section contains the rebuild procedures for the subassemblies which were removed in Section 5.

b. The subassemblies are presented in this section in the same order as they were removed in Section 5.

6-2. GENERAL INFORMATION FOR SUBASSEMBLY REBUILD

a. Tools, Parts, Methods. Refer to paragraph 4-3 through 4-5.

b. Cleaning, Inspection. Refer to paragraph 4-6.

c. Torque Specifications. The specific torque value for each threaded fastener installed in this section is stated in the applicable assembly paragraph. Torque values are also presented in paragraph 4-10 and figure 6-17.

d. Wear Limits, Spring Data. Refer to Section 8 for wear limits and spring data.

e. Lubrication

(1) Soak each friction (faced) clutch plate in transmission fluid for a minimum of 2 minutes prior to assembly.

(2) Use oil-soluble grease (petroleum jelly) with a low melting point when it is required to facilitate assembly.

(3) Pack the ID of metal-encased, lip-type oil seals with high-temperature grease (MIL—G-3545A, or equivalent).

6-3. CONTROL VALVE BODY ASSEMBLY

a. Disassembly (B, foldout 9)

(1) Remove plug 6 and gasket 7 that retain main-pressure regulator valve 8. Remove the main-pressure regulator valve.

(2) Remove plug 18 and gasket 17 that retain trimmer plug 16. Remove the trimmer plug, and main-pressure regulator spring 14, spring retainer 13, and trimmer spring 15.

(3) Remove main-pressure check plug 36. Remove selector valve plug 35 and gasket 34.

(4) Remove plug 33. Remove plug 31 and gasket 32 (or neutral start switch and its aluminum washer).

(5) Remove retainer plug 24. Remove cutoff valve plug 21 from retainer plug 24. Remove sealring 22 from plug 21. Remove clutch cutoff valve 20 and valve spring 19 from control valve body 9.

(6) Remove plug 28 and gasket 29, and remove one spring 30 and ball 27. At the inner (mounting) side of control valve body 9, remove valve stop 12 from its position on range selector valve 25.

(7) Insert a bolt through the linkage pin hole in selector valve 25. Pull the selector valve and seal 26 from the bore and remove the seal from the selector valve. Remove the remaining detent ball 27 and spring 30 which were freed during removal of the selector valve.

(8) Do not remove plug 11 and ball 10 from control valve body 9 unless parts replacement is necessary.

NOTE

Refer to paragraph 6-2, above.

b. Assembly (B, foldout 9)

(1) If the retainer plug and ball were removed from the control valve body, install a new ball and retainer (fig. 6-1). Place the retainer plug, open end upward, over the ball. Press the retainer plug until it is flush with, to 0.010 inch (0.25 mm) below, the surface of the three supporting bosses.

(2) Install one spring 30 (B, foldout 9) and detent ball 27 into control valve body 9. Depress the ball against the spring, and install selector valve 25, linkage end last, through the seal bore of the control valve body.

(3) Install the remaining detent ball 27 and spring 30; install gasket 29 and plug 28 to retain the ball and spring. Tighten the plug securely.

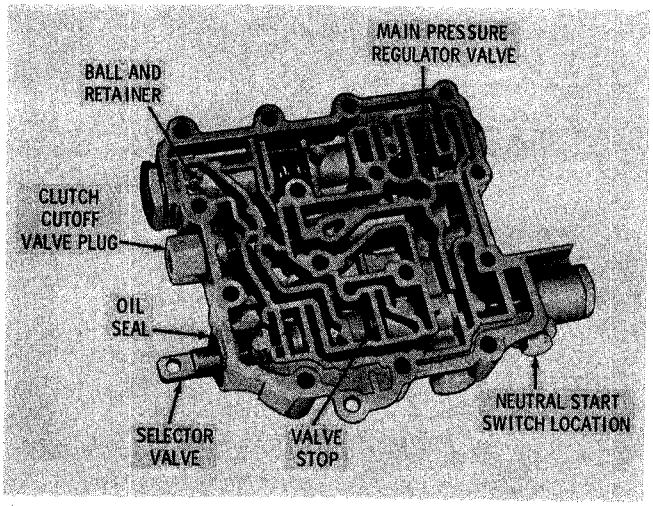


Fig. 6-1. Control valve body assembly-mounting side

(4) Position the selector valve in the middle detent position (neutral), and install the valve stop in the location shown in figure 6-1.

(5) Coat the outer circumference of the new selector valve oil seal with nonhardening sealer. Install the seal, spring-loaded lip first, over the linkage end of the selector valve into its bore (fig. 6-1). Press the seal into the bore until it is flush with, to 0.030 inch (0.76 mm) below, the surrounding surface. Install gasket 34 and plug 35. Tighten the plug securely.

NOTE

At assembly, all spool valves must move freely by their own weight within their bores.

(6) Install main-pressure regulator valve 8 (B, foldout 9), and install gasket 7 and plug 6. Tighten plug 6 securely. Install plug 36, and tighten sufficiently to prevent leakage.

(7) Install spring retainer 13, concave side first, onto the stem end of main-pressure regulator valve 8. Install main-pressure regulator spring 14, trimmer spring 15, and trimmer plug 16 into the valve bore. Install gasket 17 and plug 18, and tighten the plug securely.

(8) Assemble valve spring 19 onto clutch cutoff valve 20 and install them, spring first, into valve body 9. Install sealring 22 onto cutoff valve plug 21. Lubricate and install the assembled cutoff valve plug, seal first, into the smooth bore end of retainer plug 24. Install retainer plug 24 and gasket 23, and tighten the plug securely. Cover the exposed orifice in the retainer plug until the hydraulic brakeline is to be attached.

(9) Install gasket 32 and plug 31 (or the neutral start switch and its aluminum washer). Tighten the plug (or switch) securely.

6-4. TRANSMISSION FRONT COVER

a. Disassembly (B, foldout 2)

(1) If replacement of oil seal 1 is necessary, drive the seal out of the front of front cover 3.

(2) Clean the bore from which the seal was removed.

NOTE

Refer to paragraph 6-2, above.

b. Assembly (B, foldout 2)

(1) Coat the outer diameter of oil seal 1 with nonhardening sealer. Install seal, spring-loaded lip first, straight into the bore in front cover 3. Press oil seal 1 into cover 3 until it is 0.230 to 0.290 inch (5.8 to 7.3 mm) past the chamfer in the bore.

6-5. TORQUE CONVERTER DRIVE COVER

a. Disassembly (B, foldout 2)

(1) Remove ball bearing 5 from input shaft 8.

(2) Flatten the corners of lockstrips 7. Remove six bolts 6.

(3) Remove input shaft 8 from drive cover 10.

NOTE

Refer to paragraph 6-2, above.

b. Assembly (B, foldout 2)

(1) Install input shaft 8 onto torque converter drive cover 10. Install three lockstrips 7 and six 1/2-13 x 1-1/8-inch bolts 6. Tighten the bolts to 67 to 80 pound feet (91-108 Nm) torque. Bend the corners of lockstrips 7 against the heads of bolts 6.

(2) Install bearing 5, manufacturer's identification upward, onto input shaft 8. Press the bearing firmly against the shoulder of the input shaft.

6-6 FIRST- AND SECOND-TURBINE ASSEMBLY

a. Disassembly (B, foldout 3)

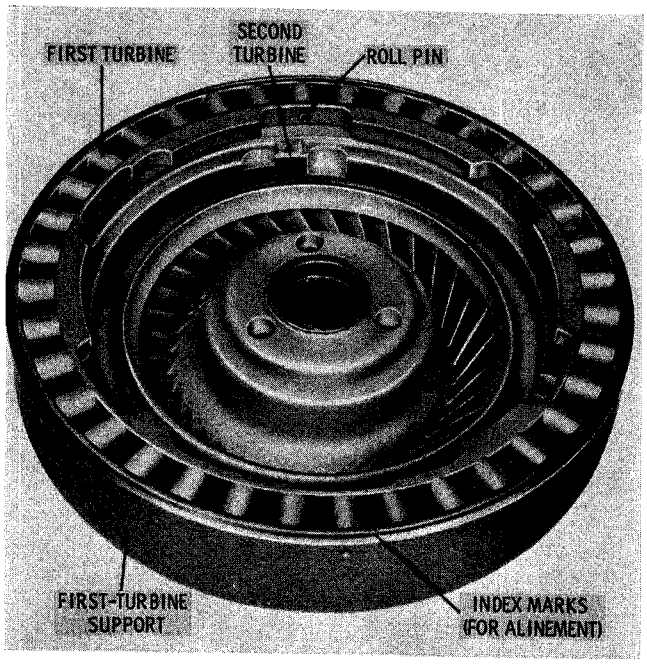
(1) Locate the index marks (V-groove) in the outer rims of the first-turbine support and the first turbine (fig. 6-2). Make sure these marks are well defined in both parts. If the marks are not prominent, deepen them to 0.040 inch (1 mm), maximum, before continuing with disassembly.

(2) Drive the six roll pins 4 (B, foldout 3) inward toward the hub until they clear the holes in the first-turbine support (fig. 6-2). Remove the roll pins only if replacement is necessary.

(3) Remove the first turbine from its support (fig. 6-3). Remove the second turbine and its bearing from the first-turbine support.

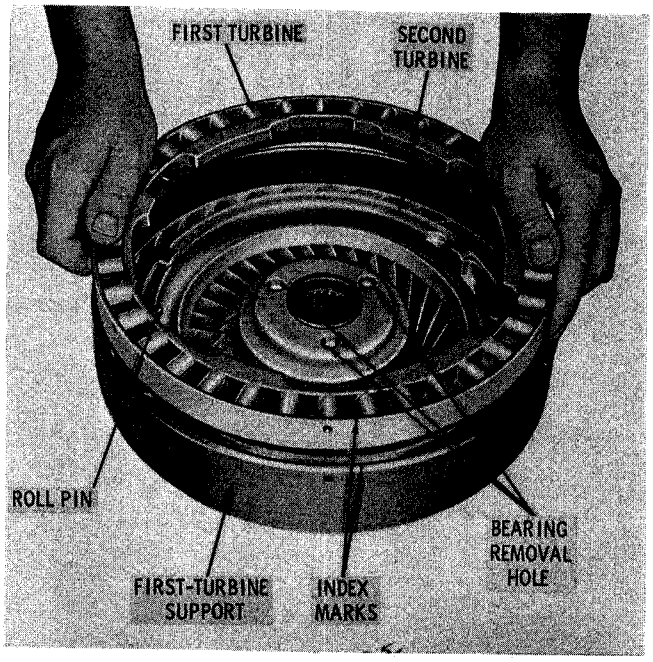
(4) Remove bearing 7A (B, foldout 3) from second turbine 7 only if replacement is necessary. If replacement is necessary, bearing 7A may be removed by pressing lengths of drill rod through the three removal holes in the hub of second turbine 7. Remove snapring 6 from second turbine 7 only if replacement is necessary.

(5) Remove bearing 1 from the first-turbine support only if replacement is necessary. If replacement is necessary, bearing 1 may be removed by pressing lengths of drill rod through the removal holes in the hub of the first-turbine support.



S2564

Fig. 6-2. First- and second-turbine assembly



S2565

Fig. 6-3. Removing first turbine

NOTE

Refer to paragraph 6-2, above.

b. Assembly (B, foldout 3)

(1) If bearing 1 was removed from first-turbine support, install its replacement. Position the bearing, manufacturer's indentification outward, and press the bearing firmly against its seat on the hub of support.

(2) If bearing 7A was removed from second turbine 7, install its replacement. Position the bearing, manufacturer's identification outward, and press the bearing firmly onto its seat in the turbine hub. If snapring 6 was removed, install its replacement.

(3) Install the second-turbine (and bearing) into the first-turbine support (fig. 6-3).

(4) Install the first turbine, thinner ends of vanes first, into the first-turbine support and aline the V-groove index marks (fig. 6-3).

(5) Drive the six roll pins outward until they are flush with, to 0.030 inch (0.76 mm) below, the outer surface of the first-turbine support (fig. 6-3).

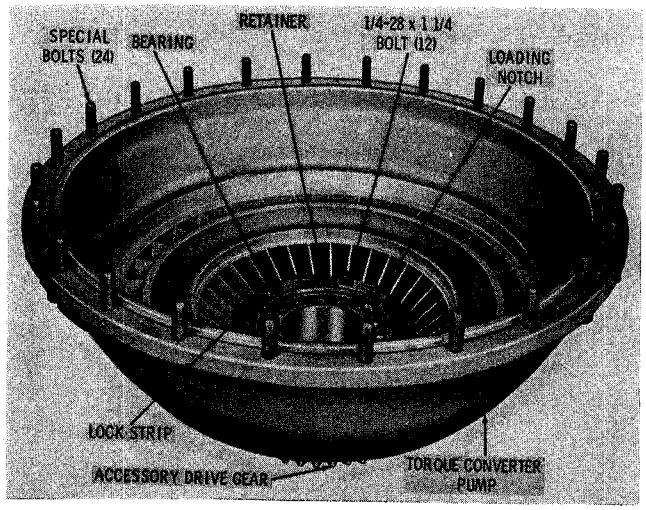


Fig. 6-4. Torque converter pump assembly

6-7. TORQUE CONVERTER PUMP

a. Disassembly (fig. 6-4)

(1) Straighten the ears of the six lockstrips. Remove the 12 bolts that attach the pump retainer and input accessory drive gear to the torque converter pump. Remove the six lockstrips, pump retainer, input accessory drive gear, and bearing. Remove gasket 16 (B, foldout 3) if present.

(2) Inspect the 24 special bolts around the circumference of the pump. Remove any defective bolts by pressing them from the pump flange.

NOTE

Refer to paragraph 6-2, above.

b. Assembly (fig. 6-4)

(1) If any of the special bolts were removed from the pump, install their replacements. Aline the flat side of the bolt head next to the pump and press the new bolt into place.

(2) Install the double-row ball bearing, loading notch upward, into the input accessory drive gear (fig. 6-4).

(3) Place gasket 16 (B, foldout 3) onto the input accessory drive gear and aline the bolt holes. Install the converter pump onto the drive gear, bearing, and gasket, alining the bolt holes in the pump with those in the gear and gasket.

(4) Install the pump retainer, and install the six lockstrips and twelve 1/4-28 x 1-1/4-inch bolts. Tighten the bolts to 10 to 12 pound feet (14 to 16 Nm) torque. Bend the lockstrip ears against the bolt heads.

6-8. TORQUE CONVERTER HOUSING

a. Disassembly (A, foldout 4)

(1) Remove step-joint sealring 19 (B, foldout 3) from converter housing sleeve 6 (A, foldout 4). If replacement of the converter housing sleeve is necessary, remove it from the front of the housing.

(2) If parts replacement is necessary, remove the inner race and rollers of bearing 15 (A, foldout 4) from gear 4. Remove the snaprings from the accessory driven gear bearings (fig. 6-5). Tap the accessory driven gears forward and remove them and their attached parts from the housing.

(3) Remove snapring 14 (A, foldout 4) and bearing 13 from gear 4.

(4) Remove snapring 3 (A, foldout 5) and bearing 2 from gear 1.

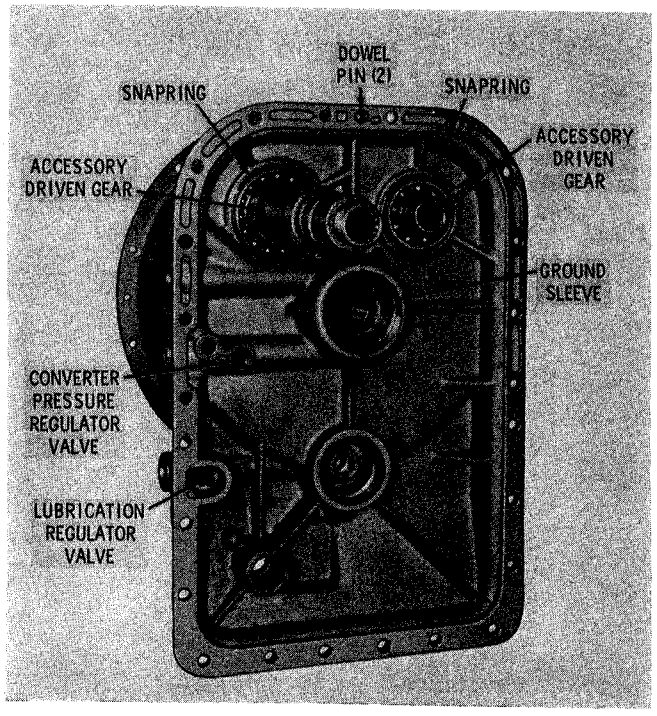


Fig. 6-5. Torque converter housing assembly—rear view

(5) If replacement of the ground sleeve 16 (A, foldout 4) is necessary, remove the four attaching bolts 17 and press the sleeve from the converter housing. Use care during this operation to prevent damage to the protruding converter pressure regulator valve.

(6) If converter pressure regulator valve components 30, 31, and 32 (A, foldout 4) require replacement, remove them by twisting pin 30 from the converter housing.

(7) If lubrication regulator valve components 27, 28 and 29 require replacement, remove them by twisting pin 27 from the converter housing.

(8) Do not remove plug 9 unless necessary for cleaning or replacement. Do not remove dowel pins 8 unless necessary for replacement.

NOTE

Refer to paragraph 6-2, above.

b. Assembly (A, foldout 4)

(1) If plug 9 was removed, replace it. Tighten the plug sufficiently to prevent leakage. If dowel pins 8 were removed, install new dowel pins. Press the pins into their bores until they protrude 0.430 to 0.450 inch (10.92 to 11.43 mm) above the housing splitline.

(2) If lubrication regulator valve 29 (A, foldout 4) was removed, install spring 28 and valve 29 onto guide pin 27. Install the assembled parts, pressing pin 27 into housing 7 until it projects 1.18 to 1.20 inches (29.9 to 30.4 mm) above the valve seat.

NOTE

If the press fit of pins 27 or 30 is not satisfactory, apply Loctite Grade B (Loctite Corp., Newington, Conn.), or equivalent. Clean the bore and pin of all oil residue. Apply the sealant to the bore and mating surface of pin and install as described above. Allow the sealant to cure for 2 hours at room temperature.

(3) If ground sleeve 16 was removed, chill the replacement sleeve in dry ice for at least 1 hour. Aline the bolt holes in ground sleeve 16 and those in housing 7, and press the sleeve to a firm seat against the rear of the housing. Install four 5/16-18 x 3/4-inch self-locking bolts 17, and tighten them to 17 to 20 pound fee (23 to 27 Nm) torque.

(4) Install bearing 2 (A, foldout 5), with snapring groove away from the gear, onto gear 1. Install snapring 3 to retain bearing 2.

(5) Install accessory drive gear 1 and assembled bearing (outer race snapring removed) into the front of the converter housing. Install the snapring onto the outer race of the bearing.

(6) Install bearing 13 (A, foldout 4), with its snapring groove away from the gear, onto accessory driven gear 4. Install snapring 14 to retain bearing 13. Press bearing 15 against the rearward seat on accessory driven gear 4.

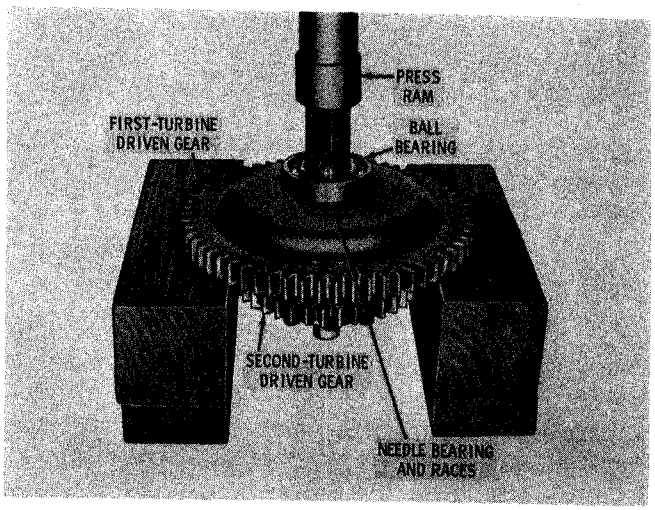
(7) Install accessory driven gear 4 and assembled bearings (outer race snapring removed) into the front of housing 7. Install the snapring onto the outer race of bearing 13.

(8) If converter housing sleeve 6 was removed from housing 7, install a new sleeve. Heat the sleeve for ease of replacement. Install converter housing sleeve 6, sealring groove last, and press it onto the hub of housing 7. Seat the sleeve firmly against the shoulder of the hub. Install stepjoint sealring 19 (B, foldout 3) into the groove in the converter housing sleeve. Retain the sealring with oil-soluble grease.

6-9. TURBINE-DRIVEN GEARS AND FREEWHEEL CLUTCH

a. Disassembly (B, foldout 4)

(1) Press the second-turbine driven gear out of the assembled unit (fig. 6-6). This will free bearing 22 (B, foldout 4), races 19 and 21, and bearing 20 which may be removed. Remove fifteen rollers 11, also freed.



S4095

Fig. 6-6. Pressing second-turbine driven gear from freewheel unit

(2) Remove bearings 17 from gear 18. Remove twelve nuts 2 from bolts 15.

(3) Using a screwdriver, pry cam assembly 12 away from gear 3. Remove spring plate 7 and roller cage 10. Remove three spring pins 8 and springs 9 from the roller cage. Remove bolts 15 from cam assembly 12. Remove roll pin 13 from cam 14 if replacement is necessary.

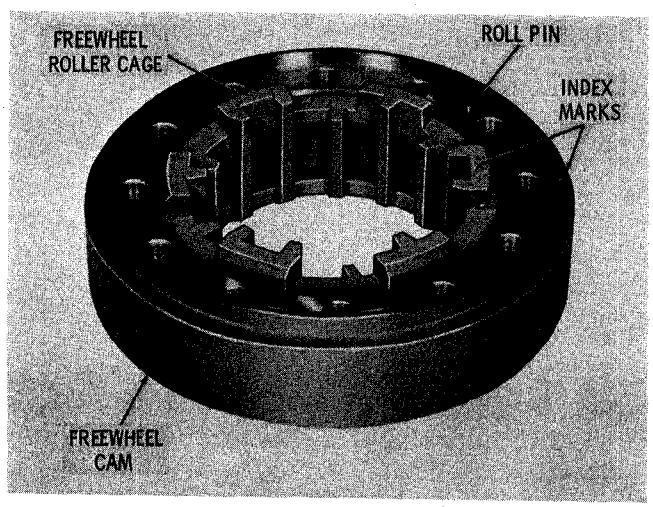
(4) If replacement is necessary, remove bearings 1 and 5, and races 4 and 6 from gear 3.

NOTE

Refer to paragraph 6-2, above.

NOTE

Observe the small index marks (X) on the spring plate and roller cage (fig. 6-7). If necessary, rescribe these marks for positive identification during reassembly.



S2570

Fig. 6-7. Freewheel roller cage installed in freewheel cam

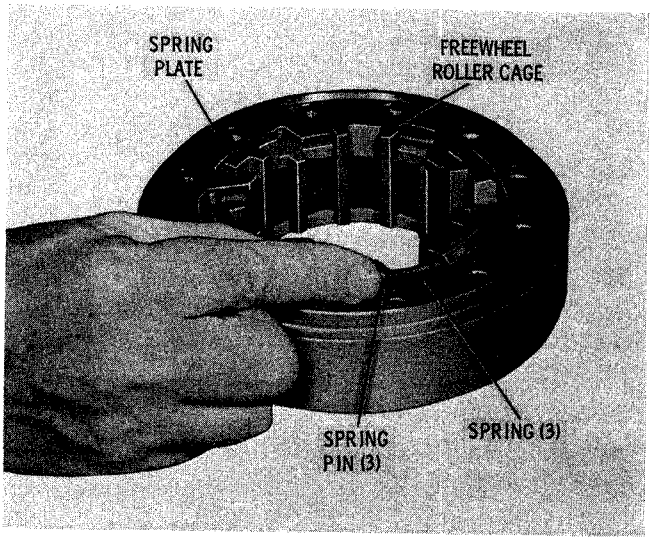
b. Assembly (B, foldout 4)

(1) If bearing 1 was removed from gear 3, install the bearing by pressing it against the shoulder on the gear.

(2) Install the roll pin into the cam and press it to the bottom of the bore (fig. 6-7).

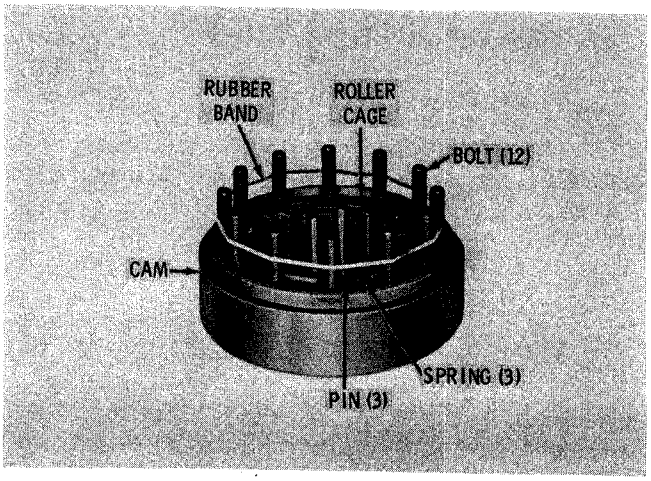
(3) Insert the roller cage into the freewheel cam, and aline the index marks on the cam and cage as shown in figure 6-7. Install spring retainer plate 7 (B, foldout 4) onto the cam, indexing the small hole with the roll pin.

(4) Install the three springs and spring pins into the drilled ears of the roller cage (fig. 6-8).



S2571

Fig. 6-8. Installing spring and spring pin into roller cage



S4096

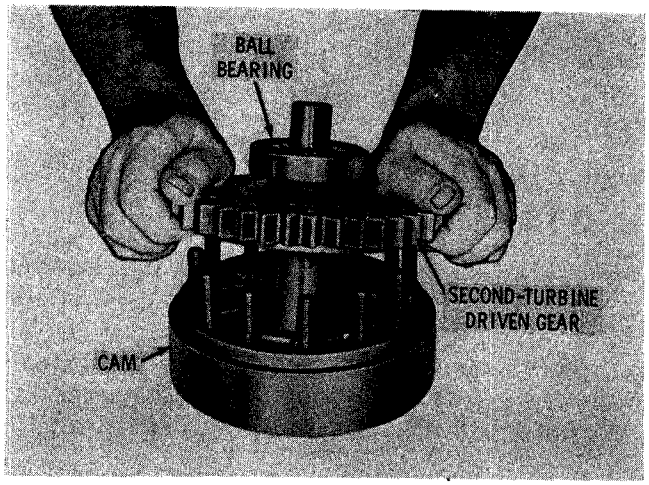
Fig. 6-9. Assembled freehweel cam, roller cage and spring plate

(5) Insert the twelve bolts (fig. 6-9) and stretch a rubber band around the circle of bolts to retain them.

(6) Install the assembled second-turbine driven gear onto the assembled cam (fig. 6-10).

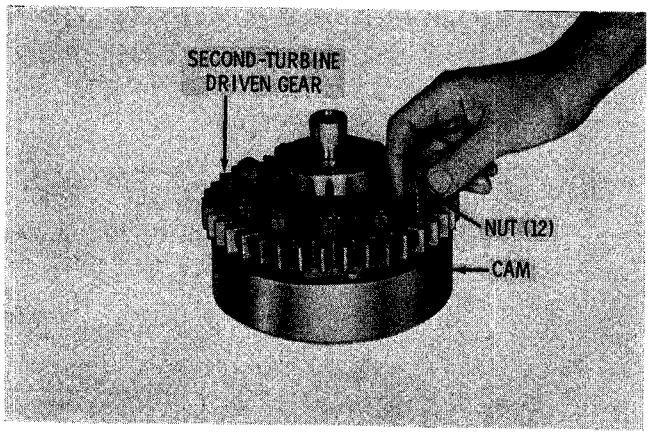
(7) Secure the assembled parts with twelve self-locking nuts (fig. 6-11). Tighten the nuts to 41 to 49 pound feet (56 to 66 Nm) torque.

(8) Install bearing thrust race (B, foldout 4), bearing 5 and thrust race 6 onto the second-turbine driven gear shaft (fig. 6-12).



S4097

Fig. 6-10. Installing second-turbine driven gear



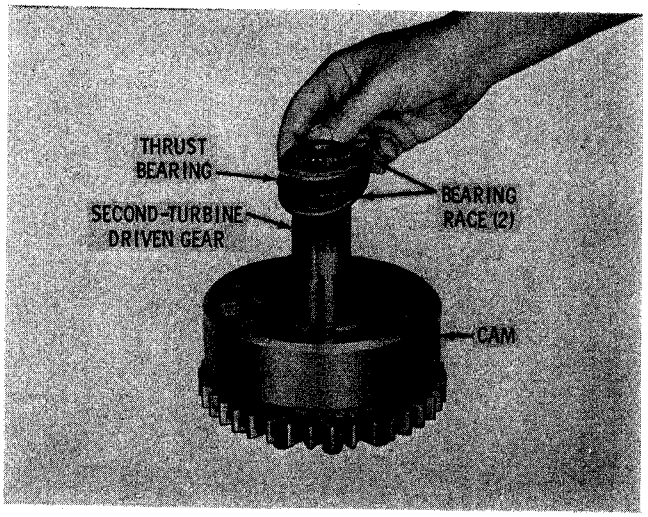
S4098

Fig. 6-11. Installing nuts to retain the second-turbine driven gear

(9) Install fifteen rollers into the cam pockets; use oil-soluble grease to retain the rollers in the cage (fig. 6-13).

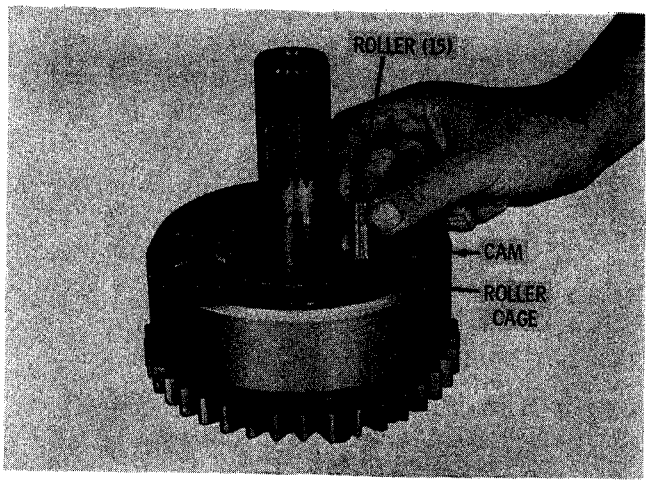
(10) If roller bearings 17 (B, foldout 4) were removed from gear 18, install new bearings. Press only on the numbered ends of the bearings, positioning them even with, or up to 0.030 inch (0.76 mm) past, the end of the chamfers at each end of the gear bore.

(11) Install the first-turbine driven gear by placing the lead chamfer on the gear hub against the rollers, and while pressing downward, rotate the first-turbine driven gear in a counterclockwise direction (fig. 6-14).



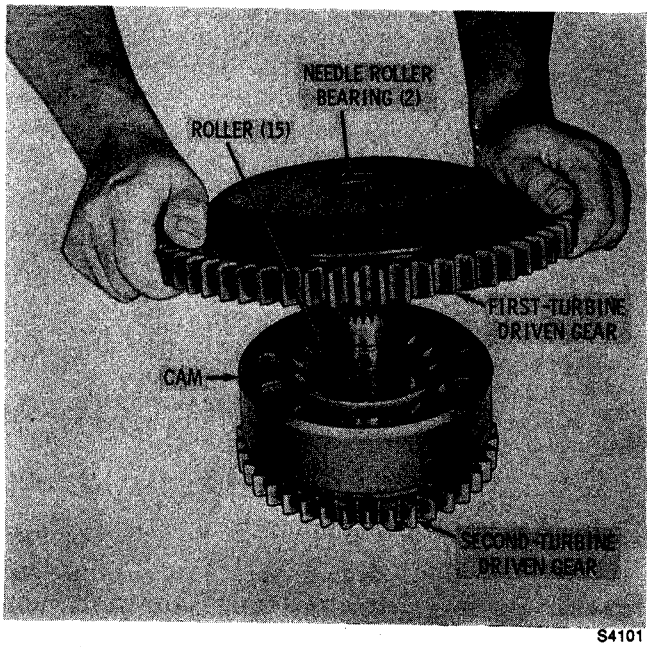
S4099

Fig. 6-12. Installing thrust races and bearing onto second-turbine driven gear



S4100

Fig. 6-13. Installing freewheel rollers



S4101

Fig. 6-14. Installing first-turbine driven gear

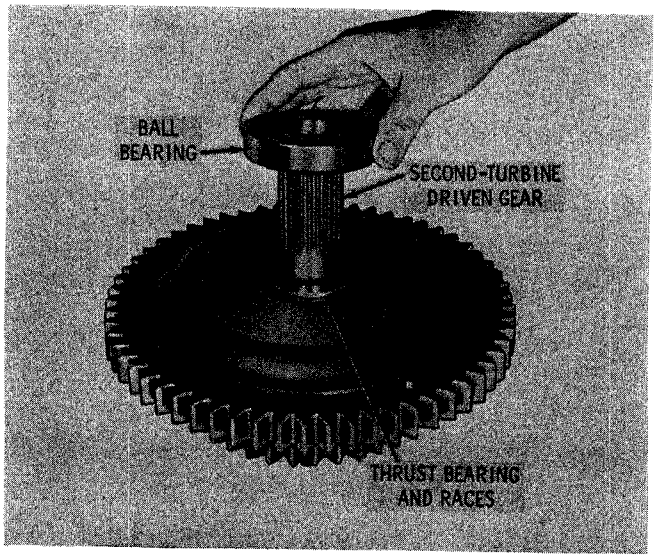


Fig. 6-15. Installing ball bearing onto second-turbine driven gear shaft

(12) Install bearing race 19 (B, foldout 4), bearing 20, and bearing race 21 onto the second-turbine driven gear shaft (fig. 6-15).

(13) Install the remaining bearing as shown in Figure 6-15, onto the shaft of the second-turbine driven gear. Press the bearing firmly into place while supporting the second-turbine driven gear.

6-10 FIRST-TURBINE DRIVE GEAR AND BEARING ASSEMBLY

NOTE

Not all bearings are installed with Loctite. If the bearing can be easily pressed from the drive gear, remove the bearing. If unusual resistance is encountered, refer to **a,** below.

a. Disassembly (A, foldout 4)

(1) Heat inner race of bearing 26 to 450°F (232°C) and press first-turbine drive gear 25 from bearing.

(2) Discard bearing 26 and clean the journal of gear 25.

NOTE

Refer to paragraph 6-2, above.

b. Assembly (B, foldout 3)

(1) Apply Loctite Retaining Compound (Loctite Corp., Newington, Conn.), or equivalent to the ID of new bearing 26 and its journal on first-turbine drive gear 25.

(2) Press bearing firmly against its seat on first-turbine drive gear 25. Allow assembled parts to cure for two hours at room temperature.

6-11. HIGH-RANGE CLUTCH HOUSING

a. Disassembly (A, foldout 7)

(1) Remove bearing 25. Place high range clutch housing 20 and attached parts, piston side upward, in a press. Support the housing at the outer circumference. Using a suitable press tool, compress spring 14 sufficiently to allow removal of snapring 13. Remove snapring and spring.

(2) Remove piston 16 and sealring and expander 17 from high-range clutch piston housing 20. Refer to paragraph 6-13 for clutch piston rebuild instructions.

(3) Remove hook-type sealring 15 from the inner hub of housing 20.

NOTE

Refer to paragraph 6-2, above.

b. Assembly (A, foldout 7)

(1) If bushing 19 (A, foldout 7) requires replacement, press the new bushing to a position 0.040 to 0.080 inch (1.02 to 2.03 mm) below the machined surface surrounding the bore of hub 20.

(2) If pins 21 require replacement, press the new pins in until they project 0.375 to 0.395 inch (9.53 to 10.03 mm) above the surface adjacent to the pins.

(3) Install hook-type sealring 15 onto the inner hub of housing 20. Install piston 16 (with sealring and expander 17), flatter side first, into piston housing 20. Install spring 14, concave side first, onto the piston. Depress the piston return spring, and install snapring 13.

(4) Install sealring 22 and bearing 25 onto the rear hub of high-range clutch piston housing 20.

6-12. TRANSFER DRIVE GEAR

a. Disassembly (A, foldout 7)

(1) Remove bearing 1 and six pins 4 from transfer drive gear 3 only if replacement is necessary.

(2) If bearing replacement is necessary, pull bearing 1 from transfer drive gear assembly 2.

(3) If pins 4 must be replaced, place gear 3 into a press, small diameter upward (front), and press out six pins.

NOTE

Refer to paragraph 6-2, above.

b. Assembly (A, foldout 7)

(1) If pins 4 were removed, place transfer drive gear 3, hub (front) downward, in a press and install new pins. Press the pins until they project 0.74 to 0.76 inch (18.8 to 19.3 mm) above the surface into which they are pressed.

(2) If bearing 1 was removed from the transfer drive gear assembly 2, install new bearing, outer snapring first, onto the gear hub. Seat the bearing firmly against the shoulder on the gear hub.

6-13. CLUTCH PISTON ASSEMBLIES

NOTE

Warming the Teflon sealrings in oil at 150°F (65°C) will make them easier to remove and install.

a. Disassembly

(1) Do not use sharp-edged or pointed tools to remove Teflon seal rings. Rather, slip a very thin, flat blade into piston groove, between the sealring and side of the groove and work the seal out of the groove until it can be grasped with the fingers.

(2) Remove the sealrings. Do not stretch or deform sealrings more than necessary, if they are to be reused.

(3) Remove expanders from grooves in the high-range clutch piston.

(4) Check the three holes in reverse- and low-range clutch pistons. One hole should be clear. The other two holes have ball check valves. The balls should be clean and seat properly.

NOTE

Refer to paragraph 6-2, above.

b. Assembly

(1) Install the sealring expanders into the grooves in the high-range clutch piston. Make sure the free ends of the expander turn away from the sealring. The ends of some expanders may require additional bending to insure they turn toward the bottom of the groove.

(2) Oil the installed expander and sealring. Start the sealring into the piston groove at a point directly opposite the gap in the expander.

(3) Carefully work the sealring into the groove, compressing the expander while moving both directions from the starting point to the expander gap location. Do not stretch or distort the sealring more than absolutely necessary.

(4) Install lip-type sealrings (no expanders required) into the grooves of the low-range and reverse clutch pistons. Make sure that the lip of each sealring is toward the oil-pressure side of the piston.

CAUTION

Improperly installed sealrings (lip in wrong direction) will cause improper clutch application or leakage.

(5) After installation, adjust the sealrings in their grooves to center them radially in the piston.

6-14. LOW-RANGE PLANETARY CARRIER ASSEMBLY (B, foldout 6)

NOTE

Do not disassemble low-range planetary carrier assembly 3 (B, foldout 6) unless there is evidence of undue wear or failure. The failure of one pinion requires replacement of all pinions in the carrier assembly.

a. Disassembly (B, foldout 5)

(1) Drill into the ends of the four pinion spindles 4 to weaken the swage. Use a 1-inch drill at spindle ends near the smaller, splined hub (rear) of the carrier.

CAUTION

Do not drill into the carrier. The diameter of the spindles is 1-inch. Centering the drill accurately will prevent drilling into the carrier.

(2) Place carrier assembly 2, small hub upward, in a press, and press out four spindles 4.

(3) Remove two thrust washers 5, pinion 7, and two roller bearings 6.

(4) Repeat step (3), above, for removal of the remaining three pinion assemblies.

NOTE

Refer to paragraph 6-2, above.

b. Assembly (B, foldout 5)

(1) Chill four new spindles 4 in dry ice for one hour, or heat carrier 3 in an oil bath or oven to 300-350°F (150-176°C).

(2) Install bearings 6 into each end of pinion. Assemble washers 5 onto opposite faces of the pinion and retain them with oil soluble grease.

(3) Position carrier 3 in a press, larger spline upward, and install the assembled pinion group. Aline the pinion with the spindle bore in the carrier. Install spindle 4 into the carrier. Press the spindle into the bore until it is flush with, or up to 0.010 inch (0.25 mm) below, the surface adjacent to the spindle.

(4) Support the spindle and swage it securely at both ends with an octagon punch. The pinion must rotate freely after assembly.

(5) Install the remaining three pinion assemblies in the same manner as described in (2) through (4), above.

(6) If chilled spindles were installed into the rebuilt carrier, and the carrier will not be installed into a transmission in the near future, apply a coating of oil around spindle locations to avoid rust.

6-15. REVERSE- AND LOW-RANGE CLUTCH ANCHOR ASSEMBLY

a. Disassembly (A, foldout 6)

(1) Place anchor assembly 14, flat side upward, in a press.

(2) Press eight pins 16 from anchor 15.

NOTE

Refer to paragraph 6-2, above.

b. Assembly (A, foldout 6)

(1) Coat pins 16 with white lead.

(2) Place anchor 15, flat side upward, in a press.

(3) Press eight pins 16 into anchor 15 until they project 1.490 to 1.510 inches (37.84 to 38.35 mm) above the flat side of the anchor.

6-16. REVERSE-RANGE PLANETARY CARRIER ASSEMBLY

NOTE

Do not disassemble reverse-range planetary carrier assembly 7 (A, foldout 6) unless there is evidence of undue wear or failure. The failure of one pinion requires replacement of all pinions in the carrier assembly.

a. Disassembly (A, foldout 6)

(1) Drill into the ends of four pinion spindles 12 to weaken the swage. Use a 1-inch drill at the ends, which are swaged to hub of carrier 8.

CAUTION

Do not drill into the carrier. The diameter of spindles is 1 inch. Centering the drill accurately will prevent drilling into the carrier.

(2) Place the carrier assembly 7 in a press, and press out four spindles 12.

(3) Remove two thrust washers 9, pinion 10 and roller bearings 11.

(4) Repeat step (3), above, for removal of remaining three pinion assemblies.

NOTE

Refer to paragraph 6-2, above.

b. Assembly (A, foldout 5)

(1) Chill four new spindles 12 in dry ice for one hour, or heat carrier 8 in an oil bath or oven to 300-350°F (150-176°C).

(2) Install bearings 11 into each end of pinion. Assembly washers 9 onto opposite faces of pinion 10 and retain them with oil soluble grease.

(3) Position carrier 8, hub upward, on a level surface. Aline the pinion with the spindle bore in the carrier. Start spindles 12 into the chamfered spindle bore in the carrier. Press the spindle into the bore until it is flush with, or up to 0.010 inch (0.25 mm) below the front surface of carrier 8.

(4) Install the remaining three pinion assemblies in the same manner as described in (2) and (3), above.

(5) Support ends of spindle 12 (A, foldout 6) and swage it securely with an octagon punch. Repeat the swaging at the opposite end of spindle. The pinions must rotate freely after assembly.

(6) Swage the remaining three spindles in the same manner as described in (5), above.

(7) If chilled spindles were installed into the rebuilt carrier, and the carrier will not be installed into a transmission in the near future, apply a coating of oil around the spindle locations to prevent rust.

6-17. OIL PUMP

a. Disassembly (B, foldout 8)

(1) Remove the pump cover 7 and cover gasket 8 from pump body 18 (fig. 6-16).

(2) Remove drive gear 12 (B, foldout 8) and two driven gear assemblies 9 and 13.

(3) Inspect roller bearings 11 and 15. If replacement is necessary, remove them from the driven gears.

(4) Inspect oil seal 20. If replacement is necessary, remove the seal by driving or pressing it toward the rear of the pump. If driven gear shaft 17 or 19, pump body 18, drive gear 12, or driven gears 10 or 14 required replacement, a new pump assembly must be used.

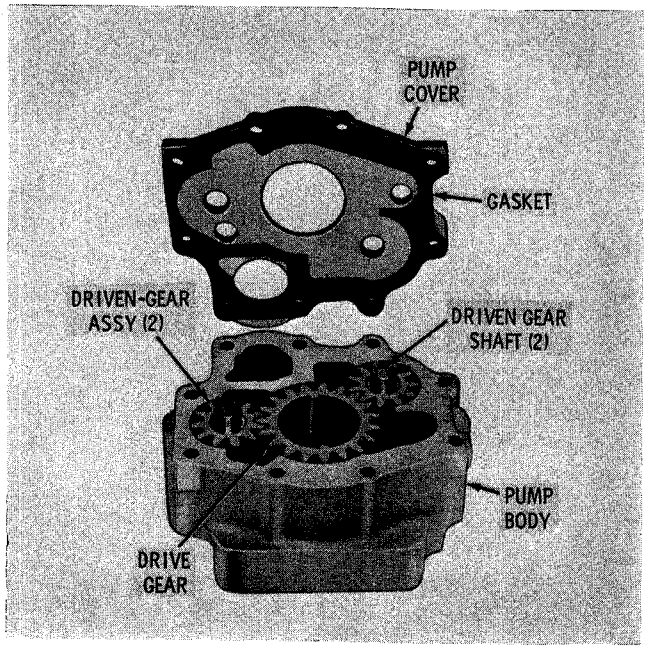


Fig. 6-16. Oil pump assembly, with cover and gasket removed

NOTE

Refer to paragraph 6-2, above.

b. Assembly (B, foldout 8)

(1) If the oil seal was removed, install a new seal, spring-loaded lip first, into the pump body (see para 4-6**h** (2) for seal preparation). Press the seal until it seats lightly against the shoulder in the bore.

(2) If roller bearings were removed from the driven gears, install new bearings. Position each bearing so that the replacer tool drives against the numbered end of the bearing cage. Press each bearing flush with, to 0.020 inch (0.50 mm) below the end surface of the gear.

(3) Install each driven gear assembly onto a gear shaft making sure that they are properly seated in the pump body. Install the drive gear.

NOTE

The end faces of the three gears must project 0.002 to 0.003 inch (0.05 to 0.07 mm) above the front surface of the pump body (measured before gasket is installed). If the end faces are below the flush line of the pump body, the pump will not perform satisfactorily, and should be replaced.

(4) Apply a liberal amount of transmission fluid onto the pump gears, and install cover gasket 8 and cover 7. Position the pump assembly front upward until ready for installation onto the transmission housing.

6-18. TRANSMISSION HOUSING

a. Disassembly (B, foldout 5)

(1) Remove six bolts 14 and lockwashers 13, and remove core hole cover 12 and gasket 11.

(2) Remove plug 8, but do not remove filter plug 7 unless replacement is necessary. If necessary, measure and record the depth of installed plug 7, prior to removal of plug.

(3) Remove breather 10.

(4) Remove oil level plugs 24 and 25 from the front face of housing 9.

(5) Remove accessory drive orifice plug 6 (A, foldout 5) and cup plug 7 on transmissions not equipped with PTO, only if replacement is necessary.

b. Assembly (B, foldout 5)

(1) Install breather 10 and tighten it sufficiently to prevent leakage.

(2) If plug 7 was removed, apply nonhardening sealant onto the outstide diameter of the new plug. Install the new plug, closed end first, into the passage. Press the plug to the exact depth recorded prior to removal (**a** (2), above). Install plug 8 and tighten it sufficiently to prevent leakage.

(3) If plug 6 (A, foldout 5) was removed, install a new plug, closed end first, and drive it flush with, to 0.200 inch (5.08 mm) below the surface. If plug 7 was removed, apply nonhardening sealer to the outer circumference of the new plug and install it, closed end first, into the bore. Drive the plug against the shoulder in the bore.

(4) Install core hole cover 12 (B, foldout 5) and gasket 11, and retain them with six 3/8-16 x 7/8-inch bolts 14 and lockwashers 13. Tighten the bolts to 26 to 32 pound feet (35 to 43 Nm) torque.

6-19. TORQUE VALUES — ILLUSTRATED

Figure 6-17, which follows, shows the torque values for the threaded fasteners visible in the illustration.

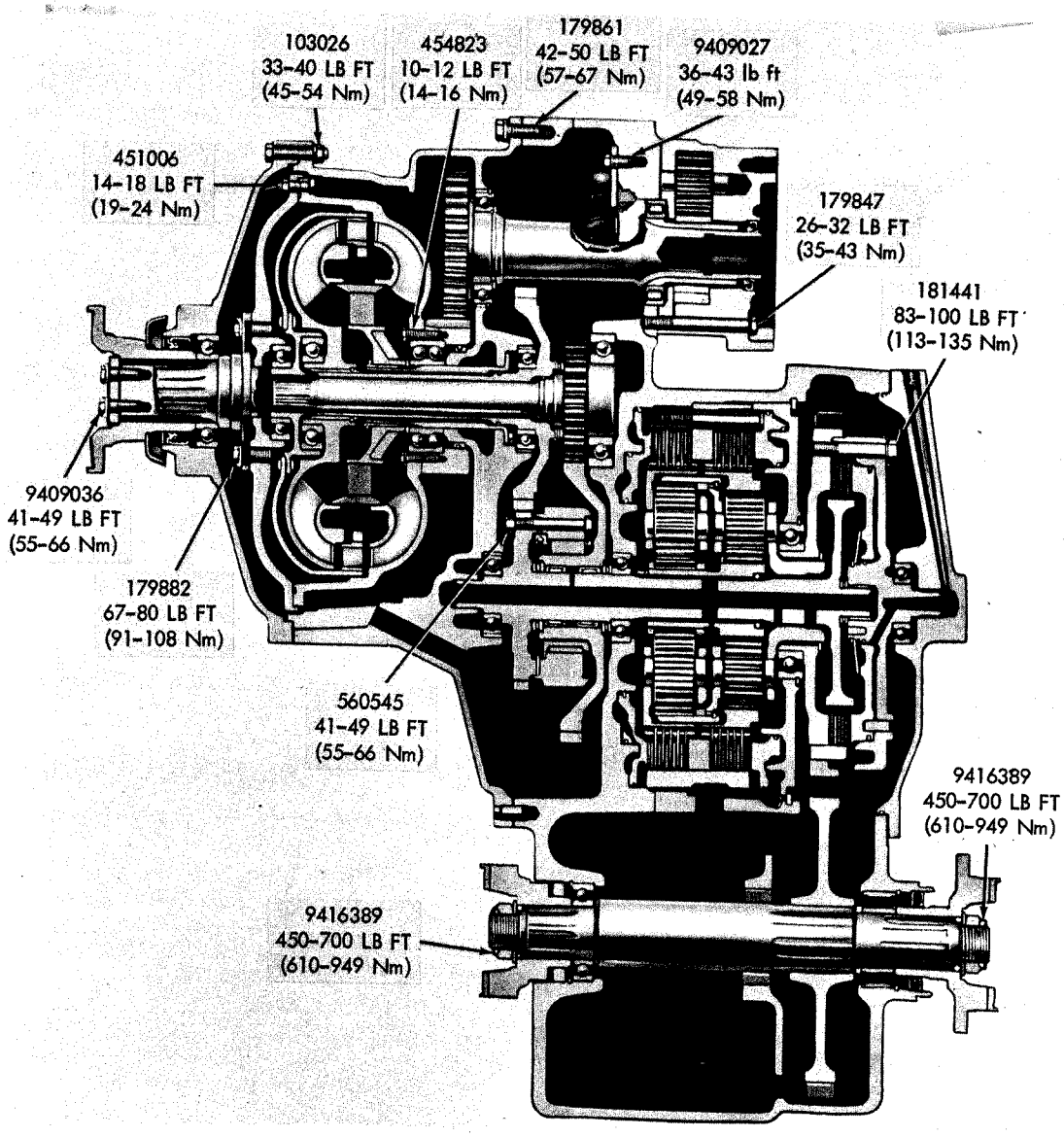


Fig. 6-17. Torque values for threaded fasteners

Section 7. ASSEMBLY OF TRANSMISSION FROM SUBASSEMBLIES

7-1. SCOPE OF SECTION 7

a. The procedures in this section describe the assembly of the transmission from the parts removed in Section 5 and the subassemblies rebuilt in Section 6.

b. Whenever possible, the sequence of assembly is presented in reverse order of the removal sequence in Section 5. Procedures also are presented for installation of components in a vehicle-mounted transmission.

7-2. .GENERAL INFORMATION FOR FINAL ASSEMBLY

a. Tools, Parts, Methods. Refer to paragraphs 4-3 through 4-5.

b. Cleaning, Inspection. Refer to paragraph 4-6.

c. Torque Specifications. The specific torque value for each threaded fastener installed in this section is stated in the applicable paragraph. Torque values are also presented in paragraphs 4-10 and 6-19.

d. Lubrication

(1) Soak each friction (faced) clutch plate in transmission fluid for at least two minutes prior to assembly.

(2) Use oil-soluble grease with a low melting point (petroleum jelly) when it is required to facilitate assembly.

(3) Pack the inside diameter groove of the metal-encased, lip-type oil seals with high-temperature grease (MIL-G-3545A, or equivalent).

(4) During final assembly, lubricate all moving parts with transmission fluid. The lubricant film will protect the friction surfaces and ferrous metals until the transmission is in service.

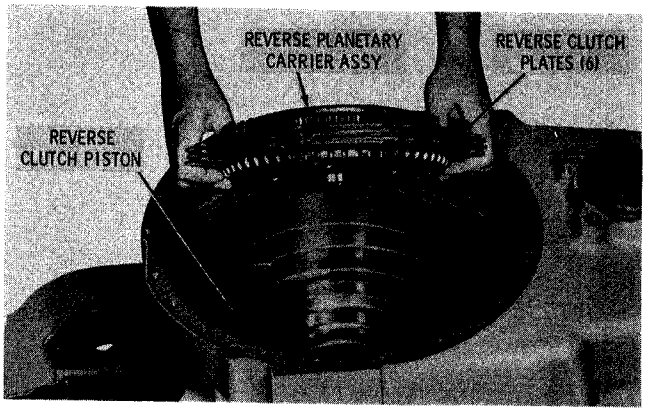
e. Component Cleanliness. Continually check each of the components during assembly to ensure that they are free of lint, dirt, and foreign particles.

7-3. INSTALLATION OF RANGE CLUTCHES, GEARING

a. Reverse-range Clutch, Planetary

(1) Position the transmission housing on blocks on its front splitline. Install the reverse-range clutch piston 4 (A, foldout 6) (as assembled in para 6-13) into the transmission housing.

(2) Beginning with an internal-splined clutch plate, alternately install three internal-splined clutch plates and three external-tanged clutch plates onto the front of the reverse-planetary carrier assembly (fig. 7-1). Install the reverse-range planetary carrier assembly, with clutch plates, onto the piston (fig. 7-1).



S4108

Fig. 7-1. Installing reverse planetary carrier assembly

(3) Beginning with an external-tanged clutch plate, alternately install two external-tanged plates and two internal-splined plates onto the rear of the reverse-range planetary carrier assembly.

(4) Install the reverse-and-low-range sun gear (fig. 7-2). Install with the small gear first to mesh with the reverse-range planetary gears.

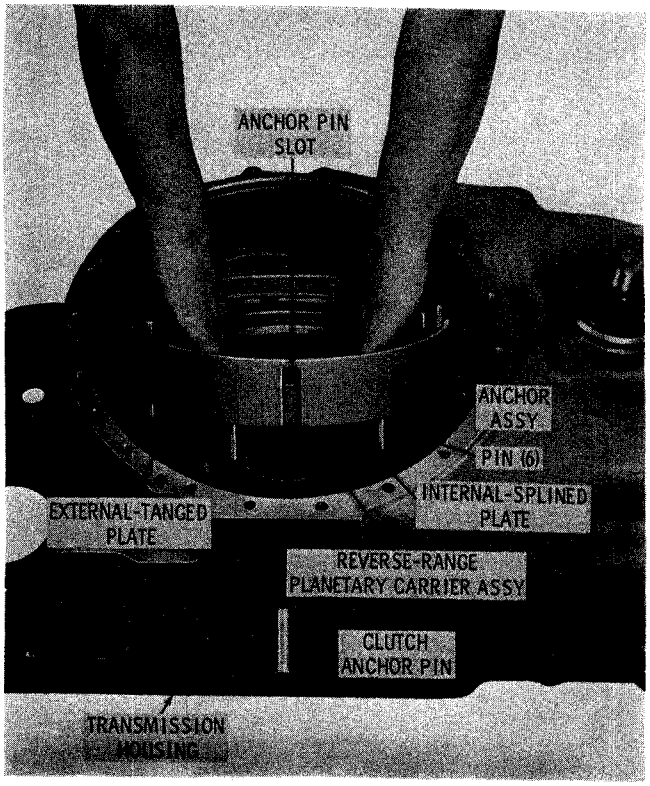
(5) Aline the slots of the five reverse-range, external-tanged clutch plates to receive the pins in the clutch anchor assembly (fig. 7-3). Install the clutch anchor pin into the control valve mounting pad on the left side of the transmission housing. Alining the anchor pin slot with the clutch anchor pin hole within the transmission housing, install the reverse-and-

low-range clutch anchor assembly, extended pins downward, and engage the slots of the five external-tanged clutch plates. Be sure that the eight notches of the five external-tanged plates are engaged by the eight anchor pins in the anchor assembly.

(6) Push the clutch anchor pin into the slot in the reverse-and-low-range clutch anchor assembly (fig. 7-4). Temporarily install a 3/8-16 x 1-inch bolt and flat washer to retain the anchor pin during subsequent assembly operations.

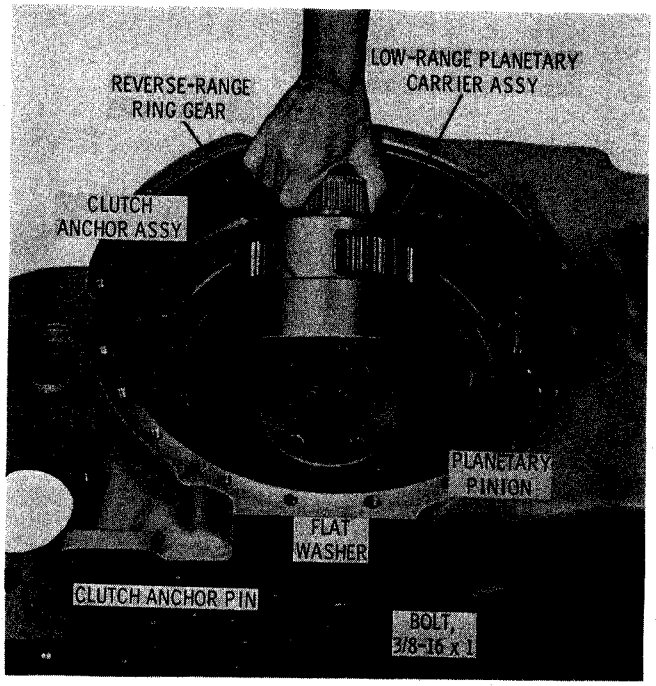
S4109

Fig. 7-2. Installing reverse- and low-range sun gear



S2595

Fig. 7-3. Installing reverse- and low-range clutch anchor assembly



S2596

Fig. 7-4. Installing low-range planetary carrier assembly with reverse ring gear

b. Low-range Clutch and Planetary

(1) Assemble the low-range planetary carrier assembly onto the reverse-range ring gear (fig. 5-33). Install the snapring.

(2) Install the assembled reverse-range ring gear and low-range planetary carrier, engaging the reverse-range ring gear teeth with the planetary pinion teeth (fig. 7-4).

(3) Install one external-tanged plate and one internal-splined plate onto the low-range ring gear (fig. 7-5). Install the assembled clutch plates and ring gear onto the low-range planetary carrier assembly, and engage the slots of the external-tanged plate with the eight clutch anchor pins.

(4) Starting with an internal-splined clutch plate, alternately install four internal-splined clutch plates and four external-tanged clutch plates onto the low-range ring gear.

(5) Install the fifteen piston return springs and spring guide pins into the holes in the clutch anchor assembly (fig. 7-6).

(6) If insert 17 (B, foldout 6) was removed from low-range clutch piston housing 18, replace it.

(7) Install low-range clutch piston 12 (B, foldout 6) and sealrings 13, 14 and 15 (as assembled in para 6-13) into the piston housing (fig. 7-7). Install the assembled housing and

piston, piston downward, alining the anchor key slots (fig. 7-8). Install anchor key 16 (B, foldout 6). Using a suitable compressor, compress the piston housing sufficiently against the springs to expose the snapring groove in the transmission housing (fig. 5-31). Install the snapring to retain the piston housing.

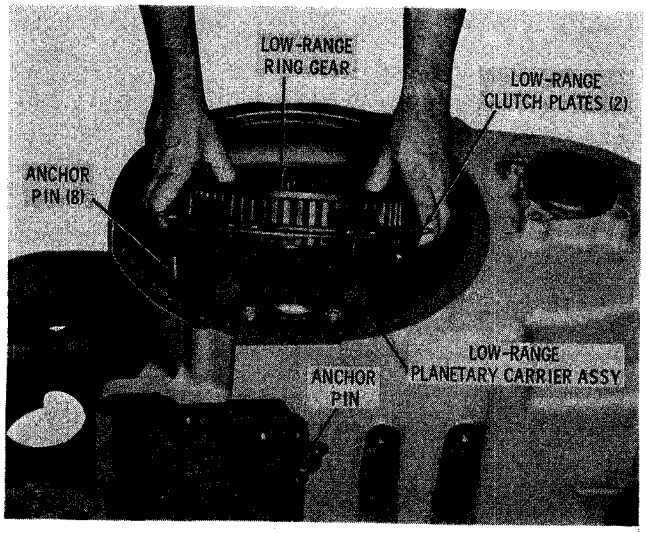
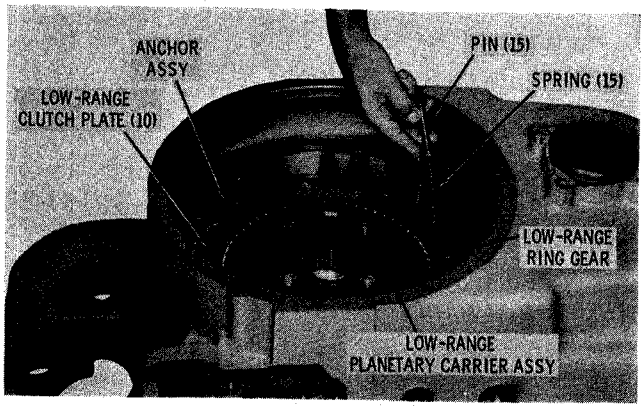


Fig. 7-5. Installing low-range ring gear S4110



S4111

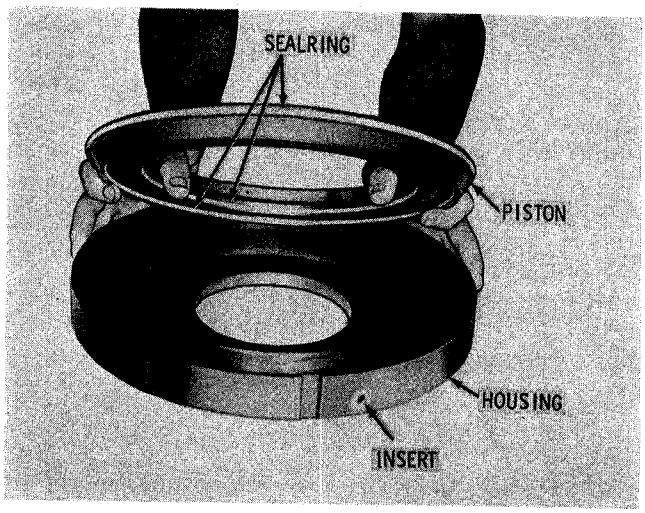
Fig. 7-6. Installing piston return springs and guide pins

7-4. INSTALLATION OF OUTPUT COMPONENTS, TRANSFER GEARS

a. One-piece Output Shaft (A, foldout 8)

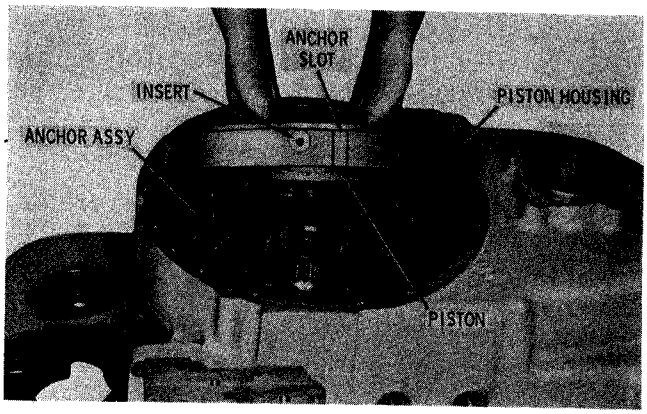
(1) Install the transfer driven gear into the rear of the housing (fig. 7-9).

(2) If the shifter shaft hole plug 21 (A, foldout 8) was removed, install a new plug (fig. 7-10). Apply nonhardening sealant onto the outside diameter of the new plug. Install the plug, closed end first, and seat it against the shoulder in the housing bore.



S4112

Fig. 7-7. Installing low-range clutch piston



S4113

Fig. 7-8. Installing low-range clutch piston housing

(3) Install output shaft 22 (A, foldout 8), double-splined end first, through the front of the housing and through the splined hub of the transfer driven gear (fig. 7-10).

(4) Start bearing 3 (A, foldout 8), shield side last, into the front bore of the housing.

(5) Install spacer 12 onto the rear end of the output shaft (fig. 7-11). Start the double-row rear bearing into its bore in the housing, pushing the spacer toward the transfer gear hub.

(6) Supporting the shaft at the front end surface, drive the rear housing and spacer forward until they are firmly seated against the transfer gear hub.

(7) At the front of the transmission housing, drive the bearing rearward and set it firmly against the shoulder in the bore. Install the snapring to retain the bearing (fig. 7-12).

(8) Reseat the rear bearing, if necessary.

(9) Apply nonhardening sealant onto the outside diamter of lip-type oil seal 1 (A, foldout 8), and install the seal, spring-loaded lip first, into the front output bore. Press or drive the seal squarely but lightly against the counterbore in the housing.

(10) Apply nonhardening sealant onto the outside diameter of lip-type oil seal 20 (A, foldout 8), and install the seal, spring-loaded lip first, into the rear output bore. Press or drive the seal squarely but lightly against the counterbore in the housing.

b. Two-piece Output Shaft

(1) If the front output shaft bearing was removed, install it, unshielded side first, onto the shaft. Press it against the shaft shoulder.

(2) Install one ball 5 (A, foldout 8), spring 6, and other ball 5 into front output shaft 4. While holding these balls against the spring pressure, slide disconnect coupling 7, grooved end first, onto shaft 4 until the rear end of the coupling is flush with the shaft rear splines.

(3) If the shifter shaft oil seal was removed, apply nonhardening sealant onto the outside diameter of a new seal. Install the seal, spring-loaded lip first, and press it squarely into the bore at the front of the housing, until it is lightly seated against the counterbore shoulder (fig. 7-13).

(4) Install the assembled shaft (fig. 7-13). Install the snapring that retains the front bearing. Tap progressively around the circle of the snapring to position the bearing so that the snapring will seat in its groove.

(5) Apply nonhardening sealant onto the outside diameter of a new seal. Install the seal, spring-loaded lip first, and press it quarely into the bore until it is lightly seated against the counterbore shoulder (fig. 7-18).

(6) Install the output shaft center bearing, loading notch first, into the web of the transmission housing (fig. 7-15). Press or tap on the bearing outer race to seat it against the shoulder in the housing web bore.

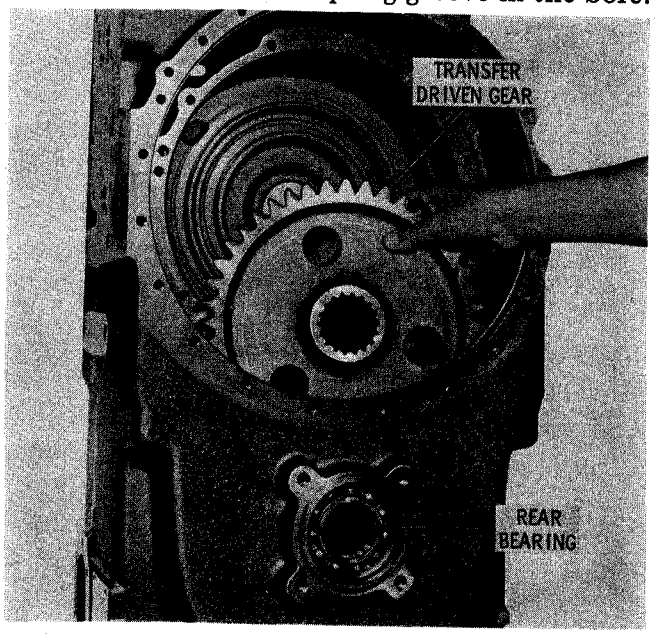
(7) Install the transfer driven gear (fig. 7-14).

(8) If bushing 15 (A, foldout 8) was removed from the rear output shaft 16, install a new bushing. Press the bushing into the front bore of the shaft until it is recessed 0.160 to 0.200 inch (4.06 to 5.08 mm) below the shaft end surface.

(9) Install spacer 12 in front of the transfer drive gear (fig. 7-16). Install spacer 17 (A, foldout 8) and bearing 18, loading notch last, onto shaft 16. Seat the bearing firmly against the spacer.

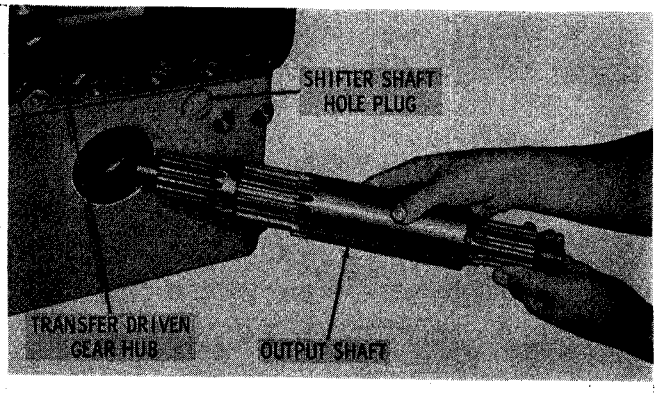
(10) Install the assembled rear output shaft, splined end first, through the splined hub of the gear, the spacer, and the center support bearing (fig. 7-16).

(11) Support the transfer driven gear and drive the rear output shaft assembly and bearing forward (fig. 7-17). If necessary, reseat the rear bearing by driving on its innter race until the outer race clears the snapring groove in the bore.



S2560

Fig. 7-9. Installing transfer driven gear (one-piece shaft)



S2585

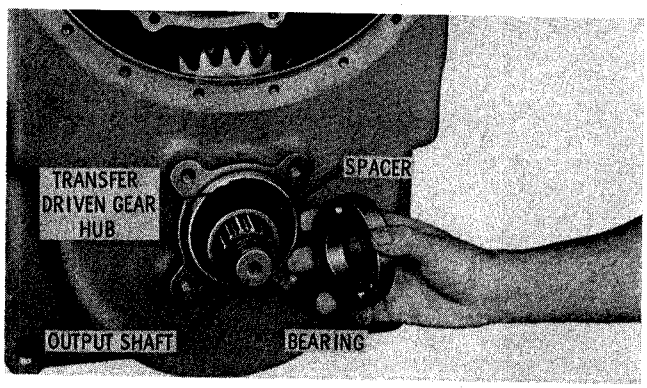
Fig. 7-10. Installing one-piece output shaft

(12) Install snapring 19, and tap progressively around its circumference until it snaps into place against the bearing.

(13) Apply nonhardening sealant onto the outside diameter of a new lip-type oil seal 20.

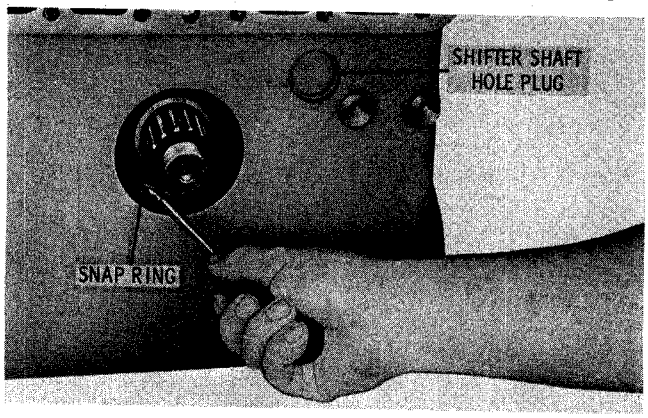
Install the new seal, spring-loaded lip first, and press it squarely into the bore until it is lightly seated against the counterbore shoulder.

(14) Position the disconnect shifter fork in the groove of the disconnect coupling (fig. 7-18). While holding the fork in position, install the shifter fork shaft, threaded end first, through the oil seal in the front of the housing and fully engage the threads in the shifter fork. Refer to paragraph 3-7**b** for final adjustment of the shifter fork shaft.



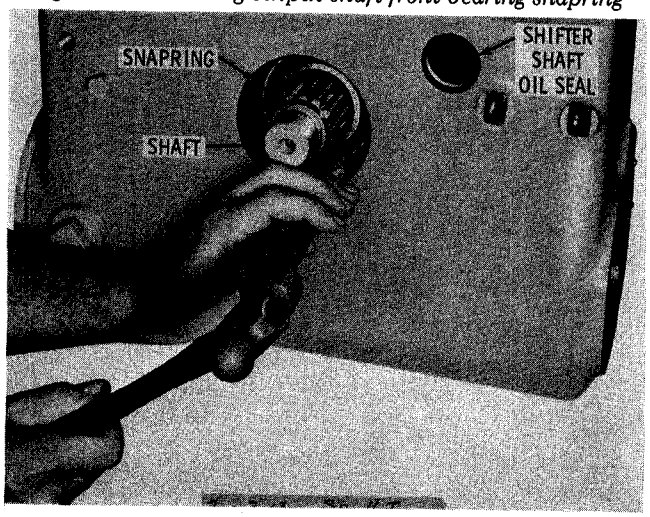
S2586

Fig. 7-11. Installing output shaft rear spacer and bearing



S1453

Fig. 7-12. Installing output shaft front bearing snapring



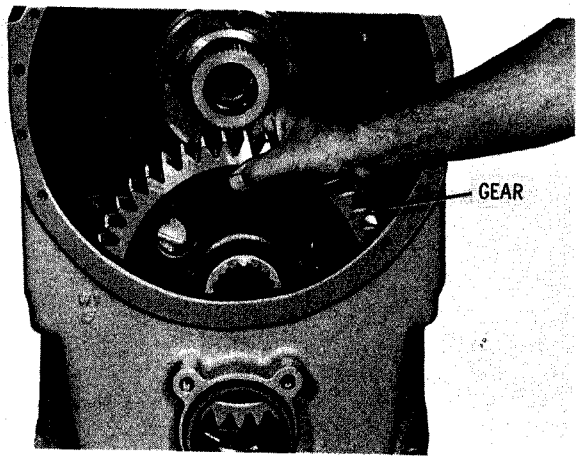
S4140

Fig. 7-13. Seating front bearing snapring

c. Transfer Drive Gear

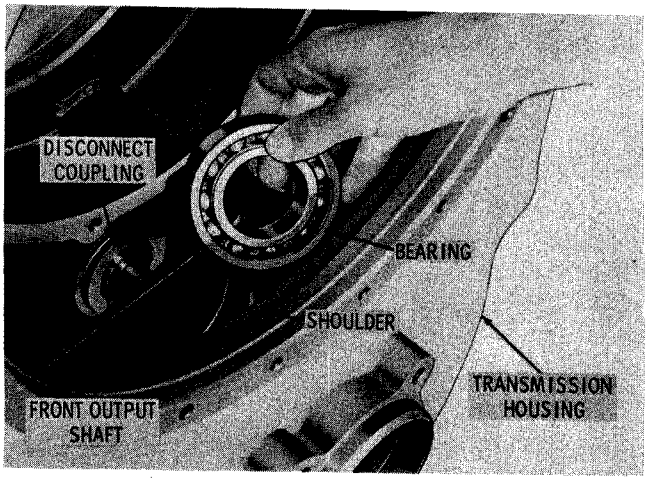
(1) Install the transfer drive gear (as assembled in para 6-12), bearing first, onto the splined hub of the low-range planetary carrier (fig. 7-19).

(2) Using a suitable hook-type tool, raise the low-range planetary carrier sufficiently to expose the snapring groove in the splined hub, and install the snapring (fig. 7-20).



S4088

Fig. 7-14. Installing transfer driven gear



S2589

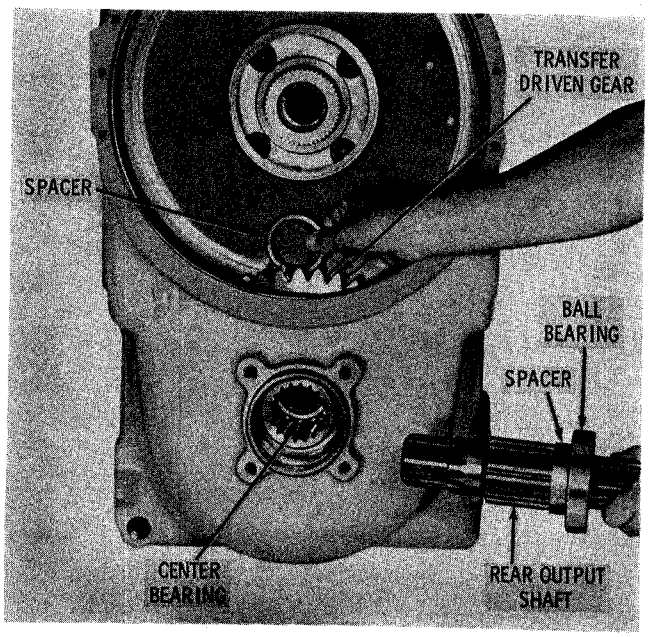
Fig. 7-15. Installing output shaft center bearing

7-5. INSTALLATION OF HIGH-RANGE CLUTCH, REAR COVER

a. High-range Clutch

(1) Install snapring 6 (A, foldout 7) onto clutch hub 9. Install the high-range ctutch hub onto the transfer drive gear (fig. 7-21). Install thrust bearing and races as shown in figure 7-21.

(2) Beginning with an internal-splined clutch plate, alternately install three internal-splined clutch plates and two external-tanged clutch plates. Install the five clutch plates onto the high-range clutch hub (fig. 7-22). The external tangs must engage the six pins in the transfer drive gear assembly (fig. 7-22).



S4105

Fig. 7-16. Installing transfer driven gear front spacer

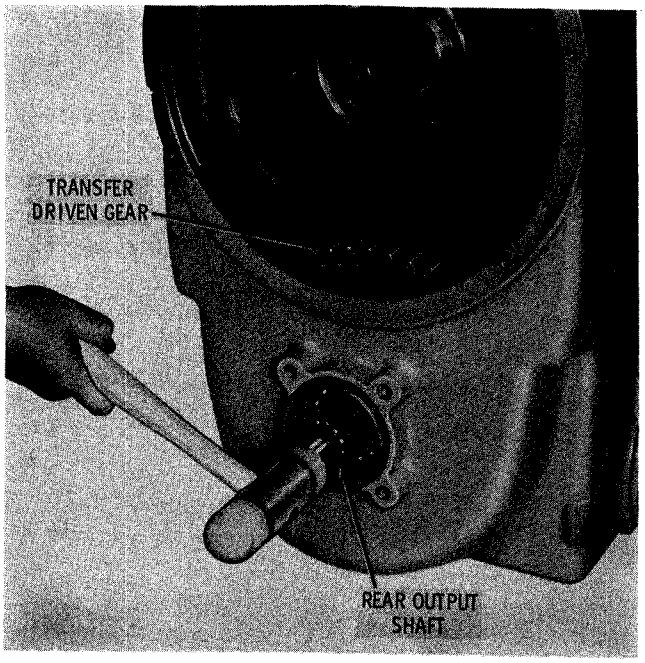
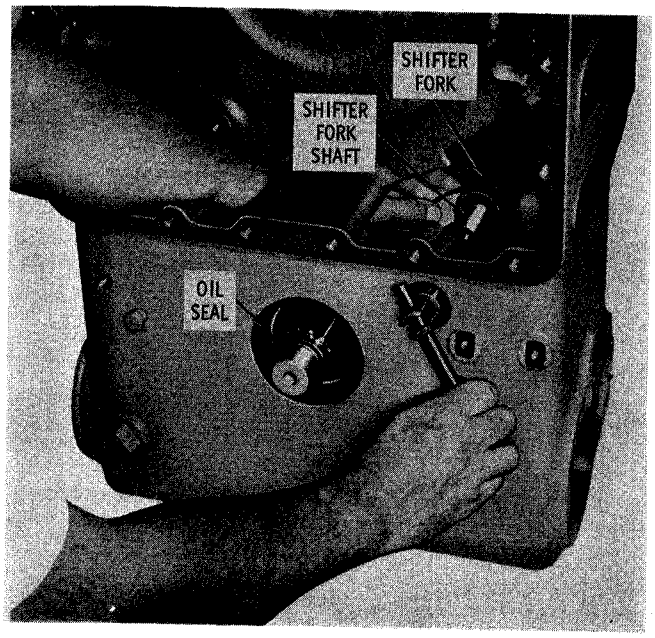
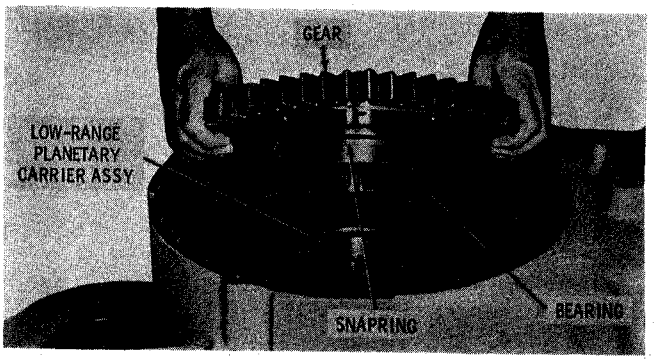


Fig. 7-17. Driving rear output shaft into center bearing



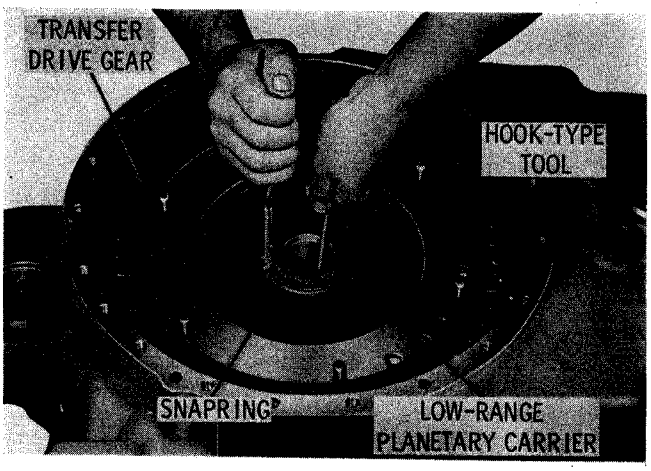
S4107

Fig. 7-18. Installing shifter fork shaft and fork



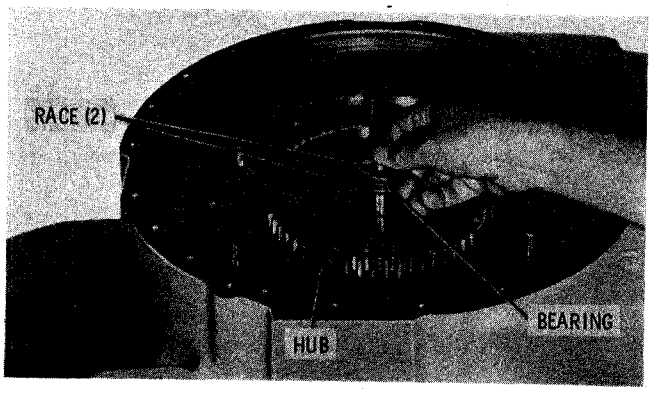
S4114

Fig. 7-19. Installing transfer drive gear



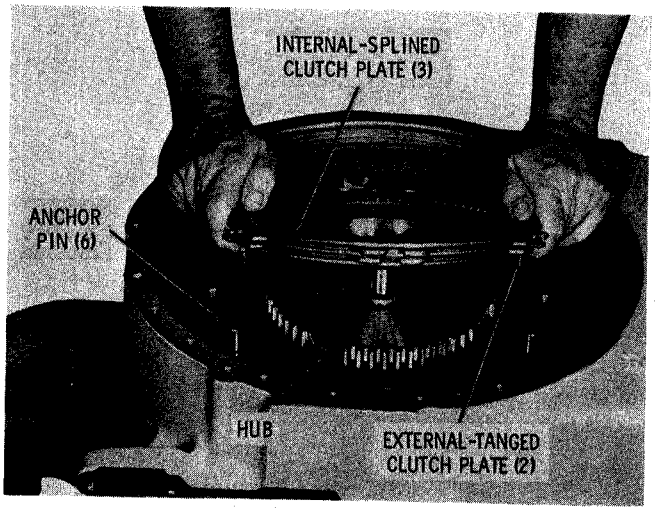
S2602

Fig. 7-20. Installing transfer drive gear snapring



S4115

Fig. 7-21. Installing high-range clutch hub bearing and races



S4116

Fig. 7-22. Installing high-range clutch plates

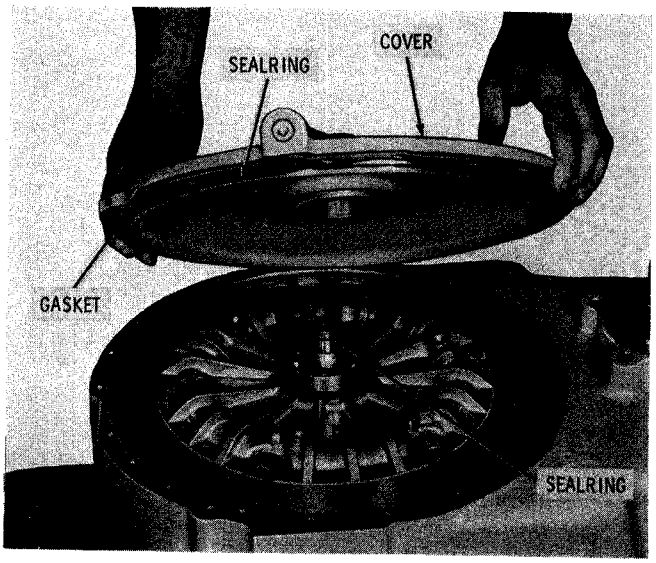
(3) Install the high-range clutch piston housing and attached parts (as assembled in para 6-11) onto the transfer drive gear (fig. 7-23). During installation, aline and engage the recesses in the piston with the drive pins in the transfer drive gear.

(4) Using a soft hammer, seat the piston housing in the counterbore of the drive gear, and install the six locktabs and six 1/2-20 x 2-3/4-inch bolts (fig. 7-23). Tighten the bolts to 83 to 100 pound feet (113 to 135 Nm) torque. Bend the lock tabs against the bolt heads (fig. 7-23).

b. Rear Cover (B, foldout 6)

(1) If pipe plug 3 was removed from the rear cover, replace it (fig. 7-23). Apply non-hardening sealant onto the plug threads and install the plug into the rear cover.

(2) Lubricate the sealring 2 and install it into the groove in the rear cover (fig. 7-23). Apply oil-soluble grease onto the gasket and install the gasket onto the rear cover.



S4117

Fig. 7-23. Installing transmission rear cover

(3) Install the rear cover onto the transmission housing (fig. 7-23) and retain it with sixteen 3/8-16 x 1-1/8-inch bolts and lockwashers. Tighten the bolts to 26 to 32 pound feet (35 to 43 Nm) torque.

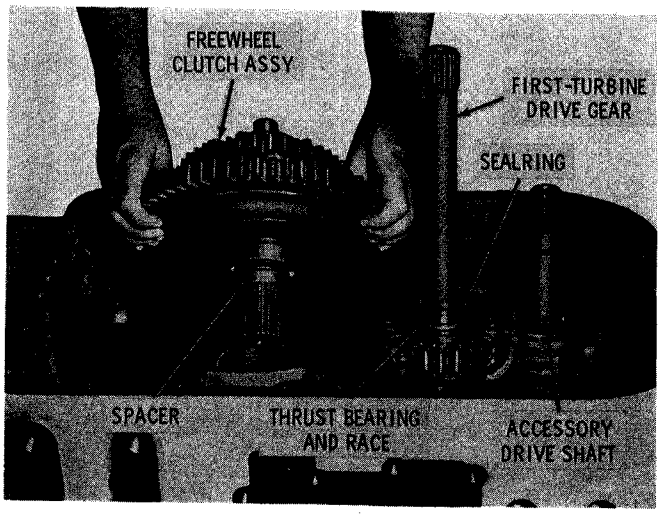
7-6. INSTALLATION OF TURBINE GEARING

a. Accessory Drive Shaft Assembly (A, foldout 5)

(1) If bearing 5 was removed from accessory drive shaft 4, replace it.

(2) Install bearing 5 onto drive shaft 4 and seat the bearing firmly against the shaft shoulder. Apply Molykote Type G grease, or equivalent, to the drive splines of the shaft.

(3) Install the accessory drive shaft and bearing into the transmission housing (fig. 7-24).



S4118

Fig. 7-24. Installing freewheel clutch assembly

b. Turbine Gears, Freewheel Clutch
(A and B, foldout 4)

(1) Install the first turbine drive gear 25 (A, foldout 4) and bearing 26 (as assembled in paragraph 6-10) as a unit (fig. 7-24). Install the step-joint sealring into the groove in the drive gear hub. Use oil-soluble grease to retain the sealring in its groove. Install rear thrust bearing race 24 (A, foldout 4) and the roller bearing 23 onto the drive gear.

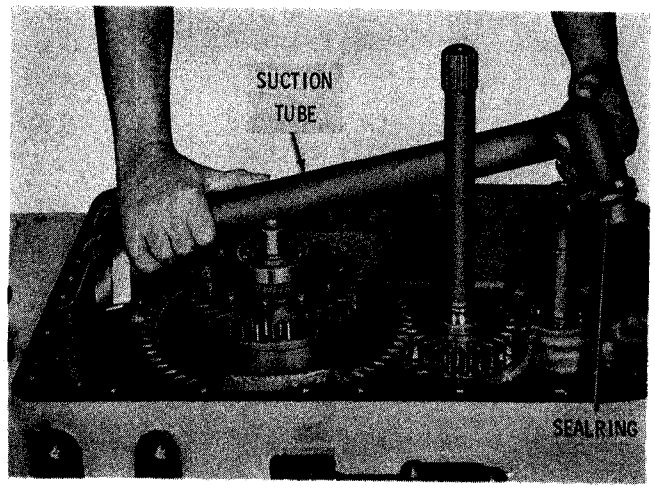
(2) Install spacer 23 (B, foldout 4) onto the shaft of the freewheel unit. Install the turbine-driven gears and freewheel clutch assembly (as assembled in paragraph 6-9) as a unit (fig. 7-24). Rotate the assembly to engage the second-turbine driven gear splines and those of the reverse-and-low-range sun gear.

(3) Install seal 5 (B, foldout 5) onto suction tube 4. Install the suction tube (fig. 7-25). Retain the tube with bolts 1, 2 and 3 (B, foldout 5). Tighten the bolts to 36 to 43 pound feet (49 to 58 Nm) torque.

(4) Install lubrication tube assembly 26 (B, foldout 5). Retain the tube with bolt 27. Tighten the bolt to 36 to 43 pound feet (49 to 58 Nm) torque (fig. 5-14).

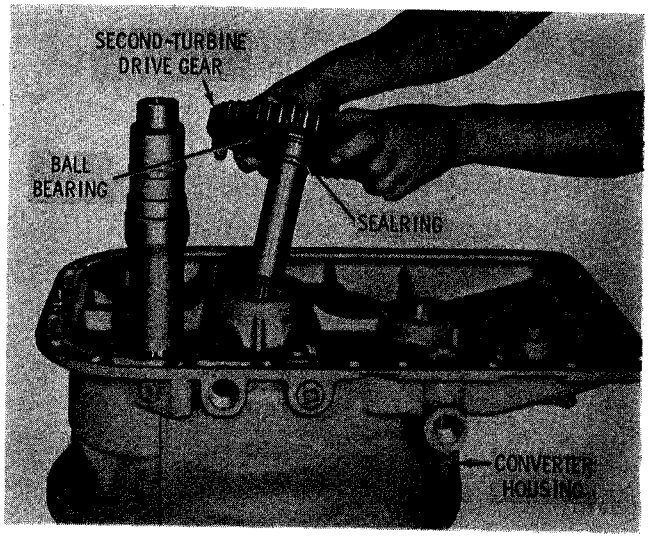
(5) Install the oil strainer and gasket (fig. 5-2). Secure the oil strainer with six 3/8-16 x 7/8-inch bolts 18 (B, foldout 5) and lockwashers 19. Tighten the bolts to 26 to 32 pound feet (35 to 43 Nm) torque. Install drain plug 15 and tighten it sufficiently to prevent leakage.

(6) Press bearing 19 (A, foldout 4) onto the front shaft of gear 20. Seat it against the gear shoulder. Install hook-type sealring 18 onto the gear shaft. Install gear 20, with bearing and



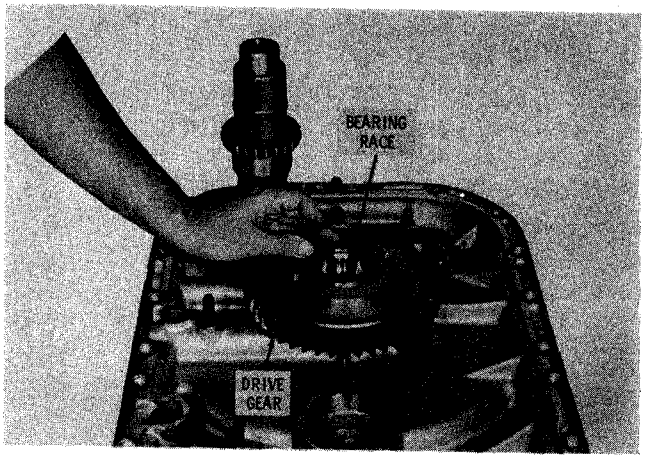
S4119

Fig. 7-25. Installing oil suction tube



S4120

Fig. 7-26. Installing second-turbine drive gear



S4121

Fig. 7-27. Installing bearing race onto second-turbine drive gear

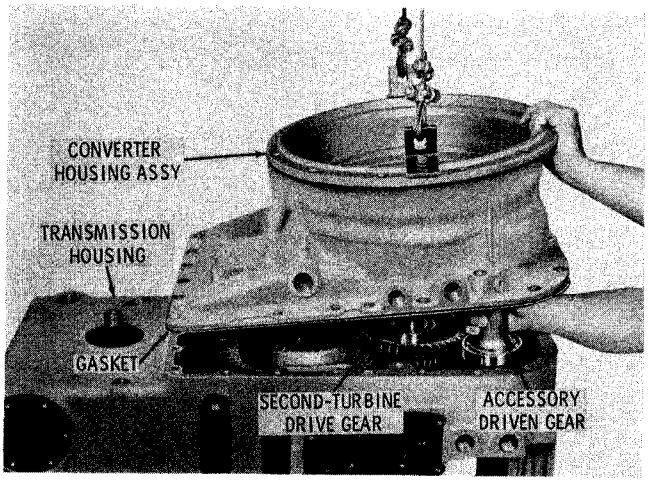
sealring, into the converter housing (fig. 7-26). Install thrust bearing race 22 (A, foldout 4), onto second-turbine drive gear 20. Use oil-soluble grease to retain the bearing race on the drive gear.

(7) Install bearing race 19 (B, foldout 4) onto the hub of second-turbine drive gear (fig. 7 27).

7-7. INSTALLATION OF CONVERTER HOUSING, CONVERTER COMPONENTS

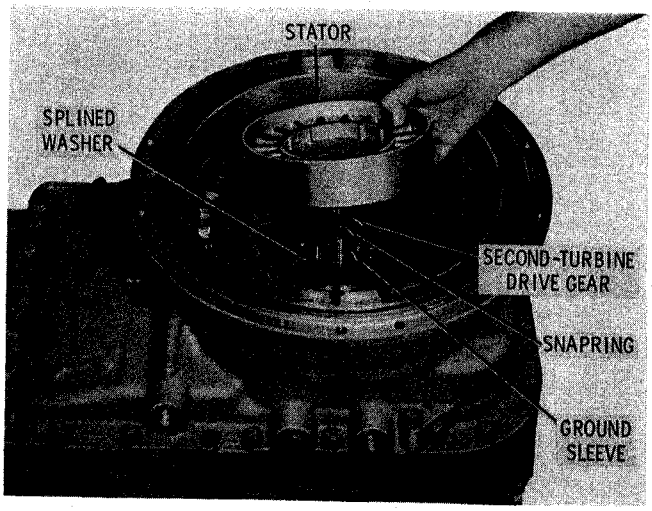
a. Converter Housing

(1) Install the converter housing gasket onto the transmission housing (fig. 7-28). Use oil-soluble grease to retain the gasket during in-



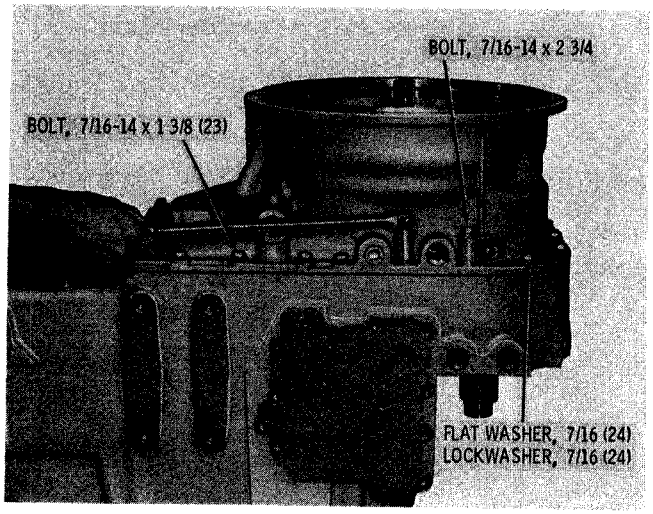
S1497

Fig. 7-28. Installing torque converter housing assembly



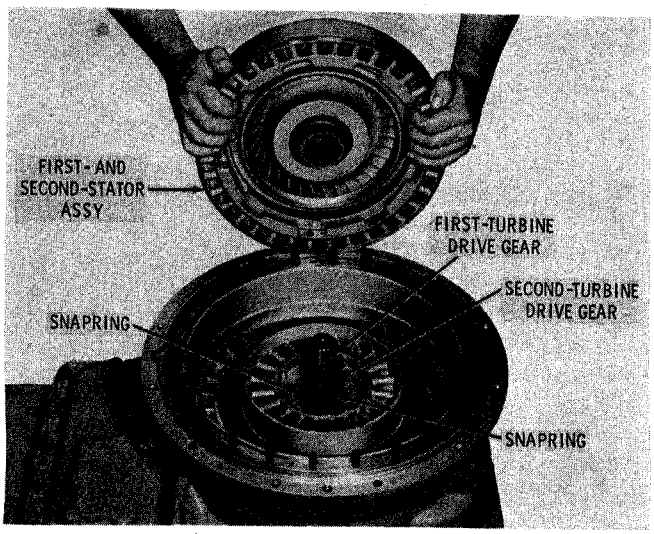
S4123

Fig. 7-30. Installing torque converter stator



S4122

Fig. 7-29. Installing torque converter housing bolts



S4124

Fig. 7-31. Installing first- and second-turbine assembly

stallation of the housing. Attach a sling to the housing front flange and, while lowering the converter housing (as assembled in para 6-8) onto the transmission housing, guide the accessory driven gear into place in the transmission housing.

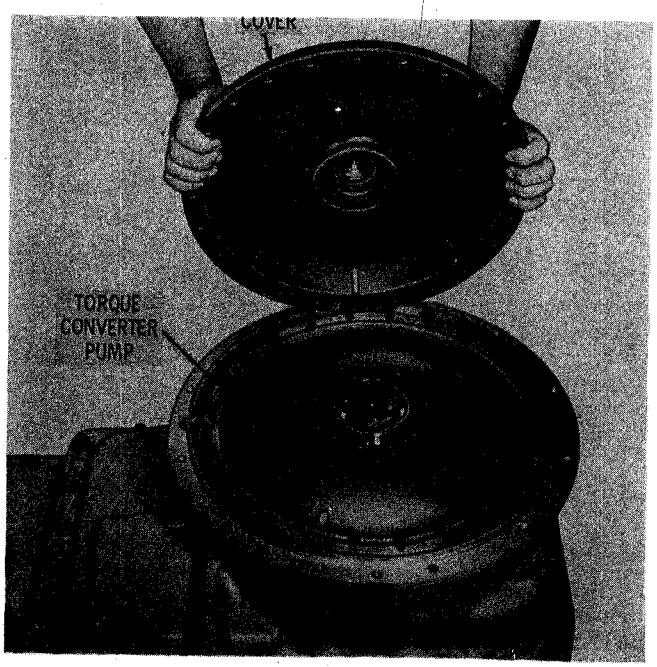
(2) To attach the converter housing, install one 7/16-14 x 2-3/4-inch bolt, twenty-three 7/16-14 x 1-3/8-inch bolts, twenty-four 7/16-inch flat washers, and twenty-four 7/16-inch lockwashers (fig. 7-29). Tighten the bolts to 42 to 50 pound feet (57 to 67 Nm) torque.

b. Converter Components

(1) Check to insure that the sealring (installed in para 6-8) is firmly seated in the converter housing ground sleeve.

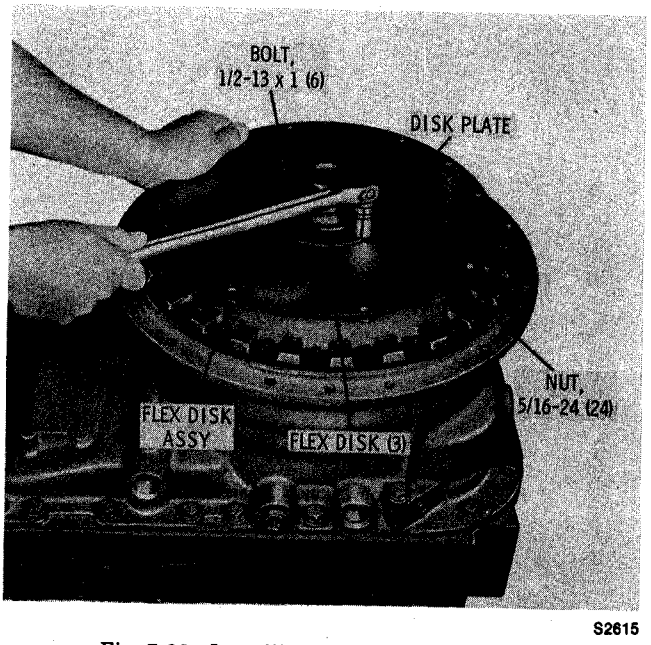
(2) Install the torque converter pump (as assembled in para 6-7) onto the converter ground sleeve (fig. 7-30). Install the splined, flat stator spacer and stator, hub projection first, onto the ground sleeve.

(3) Install snapring 8 (B, foldout 3) onto the converter ground sleeve to retain the stator (fig. 7-31). Install the first- and second-turbine assembly (as assembled in para 6-6) onto the turbine drive gear shafts (fig. 7-31).



S4125

Fig. 7-32. Installing torque-converter drive cover



S2615

Fig. 7-33. Installing flex disk assembly

7-8. INSTALLATION OF INPUT COMPONENTS

a. Direct Mount

(1) Install torque converter drive cover (fig. 7-32).

(2) Install twenty-four 5/16-24, self-locking nuts to retain the cover (fig. 7-33). Tighten the nuts to 14 to 18 pound feet (19 to 24 Nm) torque.

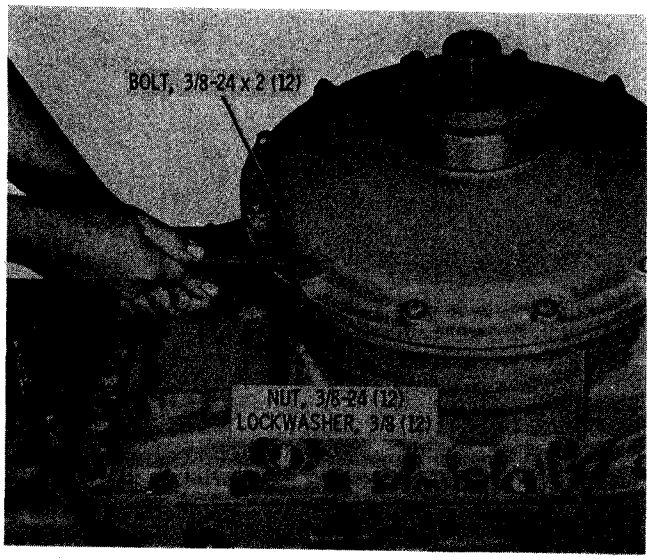
(3) Install the flex disk and washer assembly, washer side first, onto the hub of the converter cover (fig. 7-33). Assemble the three flex disks so that the cone (if coned) of each will be parallel to the flex disk and washer assembly and install the three disks as a unit. Install the disk plate and aline all the disk holes with the tapped holes in the converter drive cover. Install six 1/2-13 x 7/8-inch, self-locking bolts, and tighten them to 81 to 97 pound feet (110 to 131 Nm) torque.

b. Remote Mount

(1) Install torque converter drive cover 10 (B, foldout 2) and attached parts (as assembled in para 6-5) onto the converter pump. Install twenty-four 5/16-24 self-locking nuts 9 to retain the cover. Tighten the nuts to 14 to 18 pound feet (19 to 24 Nm) torque.

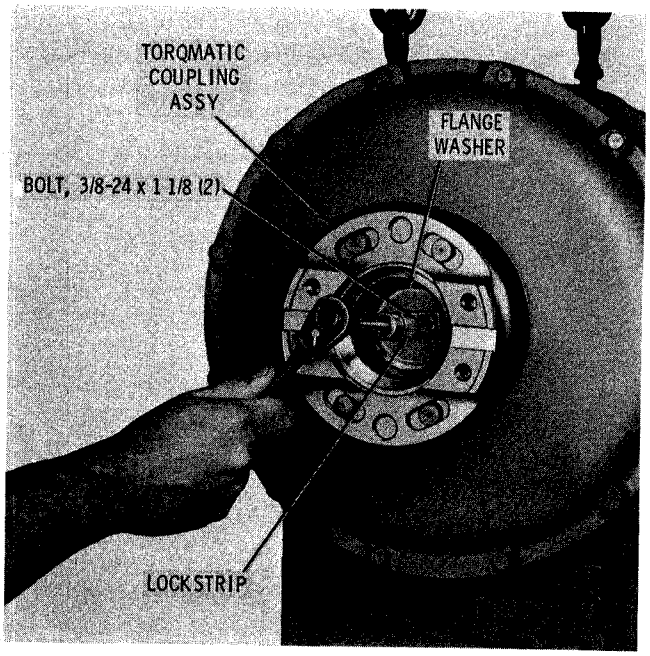
(2) Install gasket 4 onto the converter housing front splitline. Install transmission front cover 3 and oil seal 1 (as assembled in para 6-4) and secure it with twelve 3/8-24 x 2-inch bolts 2, lockwashers 11, and 3/8-24 nuts 12. Tighten the nuts to 33 to 40 pound feet (45 to 54 Nm) torque (fig. 7-34).

(3) Install Torqmatic coupling assembly 6 (A, foldout 2) onto the input shaft (fig. 7-35). Refer to paragraph 4-8**b**. Add shims 4 or 5 (A, foldout 2). Refer to figure 3-2. A combination of shims 4 and 5 is required in the space between the front of the input shaft and the rear face of washer 3. The thickness of the shim pack should



S4126

Fig. 7-34. Installing front cover bolts



S4127

Fig. 7-35. Installing input coupling bolts

be 0.007 inch (0.17-0.18 mm) less than the space measured with a depth micrometer. Install the shims and washer 3. Install lockstrip 2 and secure the coupling assembly with two 3/8-24 x 1-1/8-inch bolts 1. Tighten the bolts to 41 to 49 pound feet (56 to 66 Nm) torque (fig. 7-35). Bend corners of the lockstrip against the bolt heads.

7-9. INSTALLATION OF EXTERIOR COMPONENTS

a. Oil Pump

(1) Install outer bearing race of roller bearing 15 (A, foldout 4) into the transmission housing (fig. 7-36).

(2) Install two 3/8-16 x 5-inch guide studs into the transmission housing (fig. 7-37).

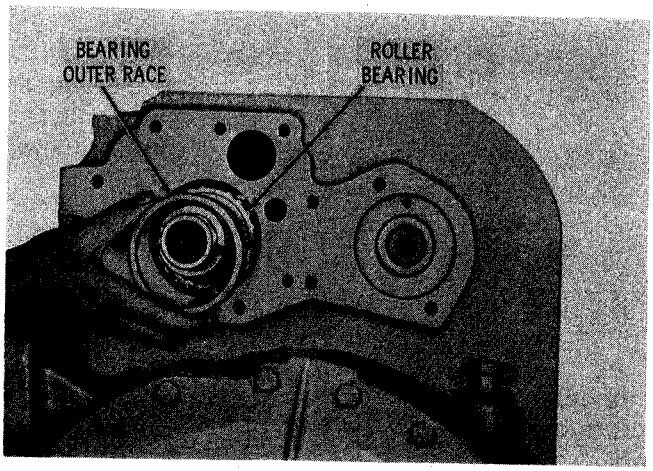
(3) Install the oil pump gasket and the oil pump assembly onto the pump mounting pad (fig. 7-37).

(4) Remove the 3/8-16 x 5-inch guide studs.

(5) Retain the pump with seven 3/8-16 x 4-inch bolts and lockwashers and two 3/8-16 x 2-inch bolts and lockwashers. Tighten the bolts to 26 to 32 pound feet (35 to 43 Nm) torque.

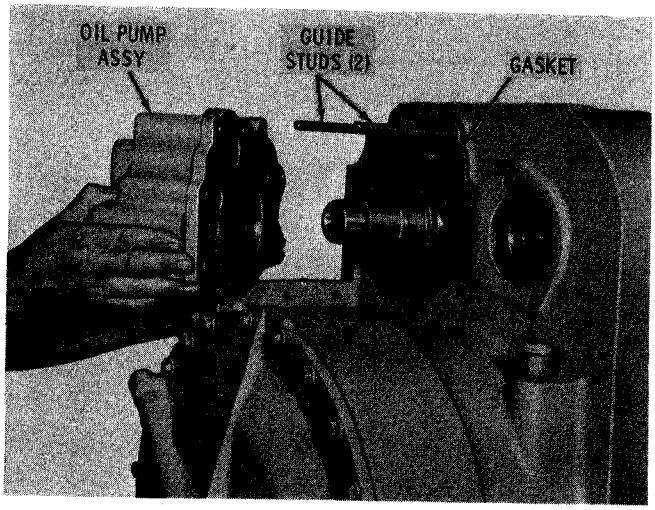
b. Control Valve Body

(1) Remove the temporarily-installed bolt and washer from the valve body mounting pad (para 7-4a(5)). Install the valve body gasket and retain it with oil-soluble grease (fig. 7-38). Install the control valve body assembly.



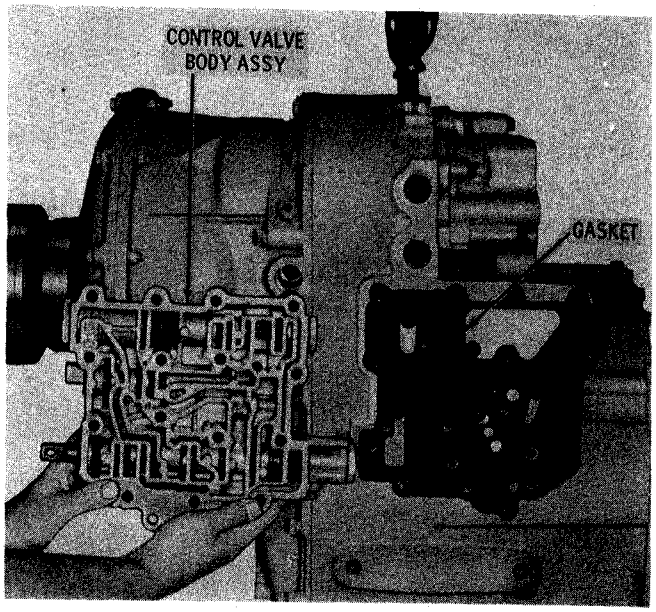
S4128

Fig. 7-36. Installing accessory drive bearing outer race



S4129

Fig. 7-37. Installing oil pump assembly



S4130

Fig. 7-38. Installing control valve body assembly

(2) Install fifteen 3/8-16 x 2-1/2-inch bolts, one 3/8-16 x 1-inch bolt, and sixteen 3/8-inch lockwashers (fig. 5-4). Progressing from the center of the valve body outward, tighten the bolts evenly to 26 to 32 pound feet (35 to 43 Nm) torque.

c. Parking Brake, Output Flanges

(1) Install parking brake assembly 1 (A, foldout 9) onto its mounting pad. Secure it with four 1/2-13 x 7/8-inch, self-locking bolts. Tighten the bolts to 81 to 97 pound feet (110 to 131 Nm) torque.

(2) Install rear output flange 19 (A, foldout 2). Install shaft sealring 18 making sure that it is well seated in the cavity between the shaft and flange. Refer to para 4-8**b** for flange installation procedure.

(3) Apply molybdenum disulfide grease (Molykote Type G, or equivalent) onto the threads of 1-1/4-12 flange retaining nut 21 (A, foldout 2) and install washer 20 and nut 21 onto the output shaft. Attach an improvised holder to the flange ears, and tighten the nut to 450 to 700 pound feet (610 to 949 Nm) torque.

(4) Install the brake drum onto the output flange. Attach the brake drum with six self-locking bolts. Tighten the bolts to 41 to 49 pound feet (56 to 66 Nm) torque.

(5) Install front output flange 16 (A, foldout 2). Install shaft sealring 17 (A, foldout 2) making sure that it is well seated in the cavity between the shaft and flange. Apply molybdenum disulfide grease (Molykote Type G, or equivalent) onto the threads of 1-1/4-12 flange retaining nut 14 and install washer 15 and nut 14 onto the output shaft.

(6) Using an improvised holder and torque wrench, tighten the nut to 450 to 700 pound feet (610 to 949 Nm) torque.

7-10 ASSEMBLY PROCEDURES FOR VEHICLE-MOUNTED TRANSMISSION

a. Similar Procedures. Components are installed into the transmission in the vehicle by methods similar to those used when the transmission is removed. The methods and sequence outlined in the manual are a general guide, but may require some variation because of positioning and space limitations.

b. Clutch Installations

Special care is required to install clutch assemblies into a transmission mounted in the vehicle. Make sure that all clutch plates are properly engaged with their mating components, and that all clutch springs are properly positioned.

Section 8. WEAR LIMITS AND SPRING DATA

8-1. WEAR LIMITS DATA

a. Maximum Variations. The wear limits information in this section shows the maximum wear at which components are expected to function satisfactorily.

b. Cleaning, Inspection. Parts must be clean to permit effective inspection for wear or damage. Refer to paragraph 4-6, above.

c. Bearings, Bearing Journals, Bores. The application of bearings to any product is based on the recommendations of the bearing manufacturer and, therefore, no diametral dimensional deviation should be permitted in the bearing or mated parts. Bearings should be carefully checked for signs of distress before reinstalling in the transmission.

d. Gears. Gears should be inspected for load pattern and signs of distress. Any distress indicates a possible future failure, and the reuse of such gears should be the decision of the individual customer, based on experience. Backlash cannot be used to establish critical wear of a gear. The backlash tolerances are of such nature that a gear usually pits, scuffs, scores, or galls long before the gear wear becomes critical.

e. Splines. Unless severe, spline wear is not considered detrimental except where it affects tightness of an assembly such as a driveline flange. Here, again, backlash cannot be used to establish critical wear because both mating parts must be concentrically located to obtain accurate measurement of backlash.

f. Hook-type Sealrings. Sides of sealring should be smooth (maximum wear 0.005 inch (0.12 mm)). The sides of the groove into which the sealrings fit should be smooth (50 micro inch (1.25 μm) equivalent), and square with the axis of rotation within 0.002 inch (0.05 mm). A new sealring should be installed if grooves are reworked, or sealring outside diameter wear causes the possibility of a closed gap between sealring hooks when the ring is installed.

8-2. WEAR LIMITS CHART

The chart which follows lists the wear limits data and is referenced to the exploded views (foldouts 2 through 9) in the back of the manual. The millimeter equivalent is shown parenthetically after the inch valve.

8-3. SPRING DATA

Springs must be clean to permit effective inspection. Springs should be replaced if there are signs of overheating, wear due to rubbing adjacent parts, or permanent set. Discard springs which do not meet the load-height specifications in the spring chart.

8-4. SPRING CHART

Inspection criteria (load versus height) and identification characteristics of the springs are presented in the chart following the wear limits chart. The spring chart data are keyed to the exploded views (foldouts 2 through 9) in the back of the manual.

WEAR LIMIT CHARTS

Illustration	Description	Part Number	Wear Limit in.	(mm)
A, foldout 4	TORQUE CONVERTER HOUSING AND TURBINE DRIVE GEARS			
22	Thrust bearing race thickness	8619652	0.028	(0.71) min
24	Thrust bearing race thickness	8619650	0.120	(3.05) min
B, foldout 4	TURBINE DRIVEN GEARS AND FREEWHEEL CLUTCH			
4,6	Bearing thrust race	9436605	0.121	(3.07) min
11	*Freewheel roller diameter	6770574	0.498	(12.65) min
12	*Freewheel cam surface wear	6880504	0.005	(0.12) max
18	*First-turbine driven gear hub outside diameter	6880502	3.0327	(77.02) min
A, foldout 6	REVERSE-RANGE CLUTCH AND PLANETARY			
5	Clutch plate thickness	6839914	0.1066	(2.708) min
	Cone		0.015	(0.38) max
6	Clutch plate thickness	6830293	0.130	(3.30) min
	Cone		0.015	(0.38) max
	**Minimum clutch pack thickness		1.183	(30.05) min
9	Thrust washer thickness	6830225	0.060	(1.52) min
10	Pinion end play in carrier	6880514	0.050	(1.27) max
15	Clutch anchor face wear	6880523		
	reverse-range face		0.010	(0.25) max
	low-range face		0.010	(0.25) max
B, foldout 6	LOW-RANGE CLUTCH AND PLANETARY			
5	Thrust washer thickness	6830225	0.060	(1.52) min
7	Pinion end play in carrier 3	6835181	0.050	(1.27) max
9	Clutch plate thickness	6830293	0.130	(3.30) min
	Cone		0.015	(0.38) max
10	Clutch plate thickness	6839914	0.1066	(2.708) min
	Cone		0.015	(0.38) max
	**Minimum clutch pack thickness		1.183	(30.05) min

* Total wear of freewheel parts (2 x roller wear + sum of cam surface wear at two opposing points + gear hub wear) must not exceed 0.010 inch (0.25 mm). (Determine cam surface wear by measuring depth of groove caused by roller contact in the cam pocket.)

** Total of individual plate thicknesses. Replace plates having the most wear with new plates to increase pack thickness.

WEAR LIMITS CHART (Cont'd)

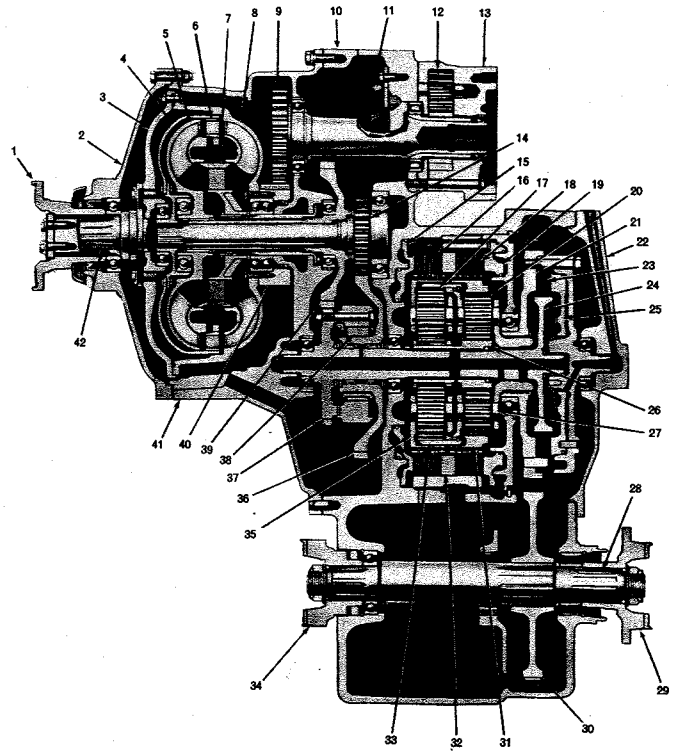
Illustration	Description	Part Number	Wear Limit in.	(mm)
A, foldout 7	HIGH-RANGE CLUTCH AND PISTON HOUSING			
3	Transfer gear clutch face wear	6880533	0.010	(0.25) max
7	Clutch plate thickness	6830221	0.130	(3.30) min
	Cone		0.015	(0.38) max
8	Clutch plate thickness	6837690	0.097	(2.46) min
	Cone		0.015	(0.38) max
	**Minimum clutch pack thickness		0.584	(14.83) min
	Diametral Clearance between:			
9	high-range clutch hub and	6880536		
	bushing in piston housing 20	6883736	0.010	(0.25) max
10, 12	Bearing thrust race thickness	9425295	0.090	(2.286) min
16	Piston face wear	6839403	0.010	(0.25) max
A, foldout 8	OUTPUT SHAFTS AND DISCONNECT ASSEMBLY			
	Diametral clearance between:			
4	front output shaft	6880537		
15	and bushing in output shaft 16	6756835	0.010	(025) max
B, foldout 8	OIL PUMP ASSEMBLY			
7	Cover	6838646	(no scoring permissible)	
17	Driven gear shaft OD	6776428	0.749	(19.02) min
18	Body	6839464	(no scoring or wear permissible)	
19	Driven gear shaft OD	6838636	0.749	(19.02) min
B, foldout 9	CONTROL VALVE ASSEMBLY			
8	Valve clearance in body 9	6831187	0.004	(0.10) max
16	Plug clearance in body 9	6835502	0.0035	(0.09) max
20	Valve clearance in body 9	6880946	0.004	(0.10) max
21	Valve plug clearance in plug 24	6758305	0.04	(0.10) max
25	Valve clearance in body 9	6839891	0.003	(0.07) max

** Total of individual plate thicknesses. Replace plates having the most wear with new plates to increase pack thickness.

SPRING CHART

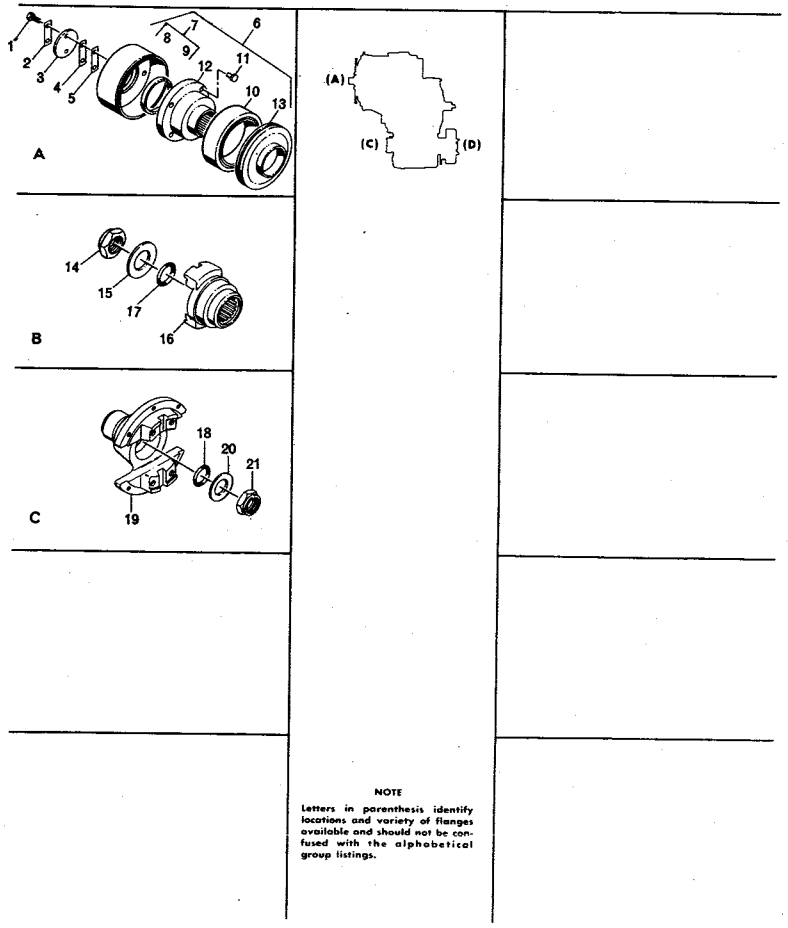
Foldout	Ref	Spring	Part No.	No. Coils	Diameter of wire		Outside diameter		Free length		Length under load			
					Inches	Millimetres	Inches	Millimetres	Inches	Millimetres	Inches	Millimetres	Pounds	Newtons
4A	28	Lubrication pressure regulator valve	6773689	13.5	0.047	(1.19)	0.403	(10.23)	1.44	(36.57)	1.00	(25.4)	5.58 to 6.82	(24.8-30.3)
	31	Converter pressure regulator valve	6773551	10	0.080	(2.03)	0.468	(11.88)	1.206	(30.63)	1.00	(25.4)	23.4 to 28.6	(104.1-127.2)
4B	9	Freewheel clutch	6835343	27	0.033	(0.83)	0.185	(4.69)	1.58	(40.13)	1.14	(28.95)	6.05 to 7.25	(26.91-32.2)
6A	17	Reverse-, low-range clutch piston return	6880526	35.5	0.105	(2.67)	0.625	(15.87)	5.55	(141)	4.30	(109.22)	44.9 to 49.7	(199.7-221.06)
7A	14	High-range clutch piston return	6756134	----	Belleville spring		5.14	(130.55)	0.275	(6.98)	----	----	----	----
8A	6	Disconnect detent	6773464	14	0.062	(1.57)	0.353	(8.96)	1.32	(33.52)	1.15	(29.21)	11.88 to 14.52	(52.8-64.6)
9B	14	Main-pressure regulator valve	6835705	16	0.1250	(3.175)	0.787	(19.98)	3.60	(91.44)	2.50	(63.50)	96 to 106	(427-471.5)
	15	Trimmer	6830365	8	0.128	(3.25)	1.110	(28.19)	2.58	(65.53)	1.43	(36.32)	72.20 to 82.20	(321.2-365.6)
	19	Clutch cutoff valve	6765710	18.5	0.080	(2.03)	0.625	(15.87)	3.04	(76.30)	2.08	(52.83)	18.9 to 23.1	(84.1-102.7)
	30	Selector valve detent	6833934	10	0.054	(1.37)	0.490	(12.45)	1.47	(37.30)	0.80	(20.30)	11.90 to 13.10	(53-58)

1 - Input flange
2 - Front cover
3 - Converter drive cover
4 - First-turbine support
5 - Second turbine
6 - First turbine
7 - Stator
8 - Converter pump
9 - Accessory driven gear
10 - Transmission housing
11 - Oil suction tube
12 - Oil pump gears
13 - Oil pump assembly
14 - First-turbine drive gear
15 - Reverse clutch piston
16 - Reverse clutch
17 - Reverse planetary pinion
18 - Low-range clutch
19 - Low-range clutch piston
20 - Low-range planetary pinion
21 - Transfer drive gear
22 - Rear cover
23 - High-range clutch
24 - High-range clutch hub
25 - High-range clutch piston
26 - Reverse- and low-range sun gear
27 - Low-range planetary carrier
28 - Output shaft
29 - Rear output flange
30 - Transfer driven gear
31 - Low-range ring gear
32 - Reverse- and low-range clutch anchor
33 - Reverse ring gear
34 - Front output flange
35 - Reverse planetary carrier
36 - First-turbine driven gear
37 - Second-turbine driven gear
38 - Freewheel roller
39 - Second-turbine drive gear
40 - Accessory drive gear
41 - Torque converter housing
42 - Input shaft



Foldout 1. TT 3420-1 transmission—cross-section view

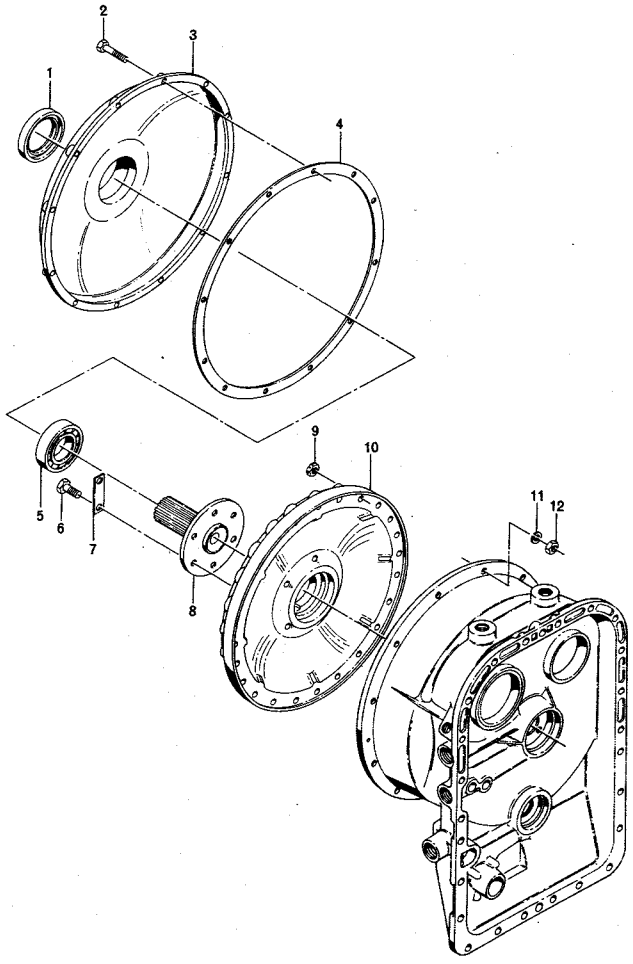
A



14551

A, foldout 2. Input, output flanges

B



14507

B, foldout 2. Input components, remote mount

A

GROUP A — LOCATION A

1 - Bolt, 3/8-24 x 1-1/8 (2)
2 - Locking strip
3 - Washer
4 - Shim, 0.025 (as required)
5 - Shim, 0.005 (as required)
6 - Torqmatic coupling flange assembly
7 - Flange and bushing assembly
8 - Flange
9 - Bushing
10 - Coupling
11 - Dowel pin
12 - Hub
13 - Retainer

GROUP B — LOCATION C

14 - Flange retaining nut
15 - Flange washer
16 - Output flange
17 - Oil Seal

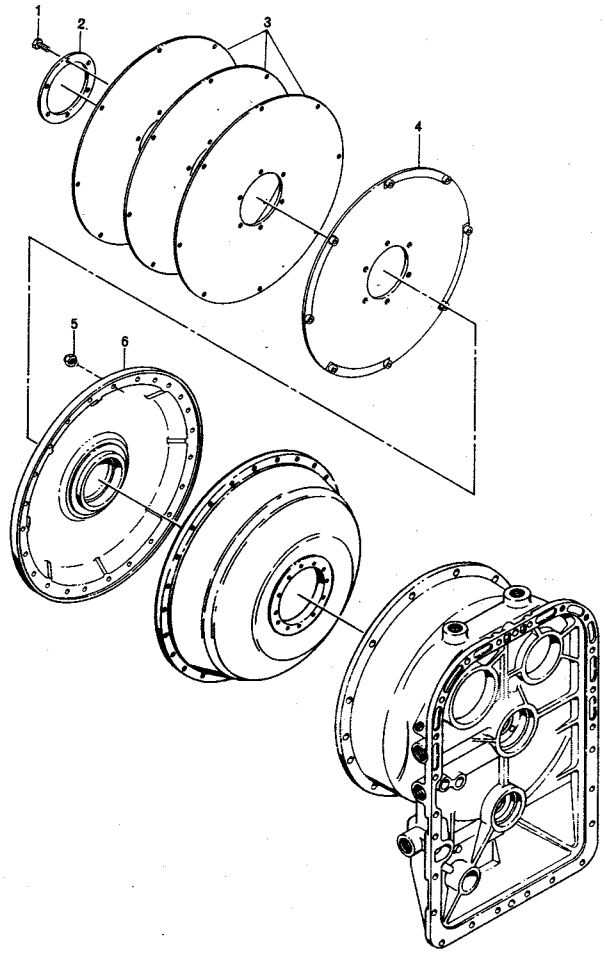
GROUP C — LOCATION D

18 - Oil seal
19 - Output flange
20 - Flange retaining washer
21 - Flange retaining nut

B

1 - Oil Seal
2 - Bolt, 3/8-24 x 2 (12)
3 - Transmission front cover
4 - Front cover gasket
5 - Ball Bearing
6 - Bolt, 1/2-13 x 1-1/8 (6)
7 - Lockstrip (3)
8 - Input shaft
9 - Self-locking nut, 5/16-24 (24)
10 - Torque converter drive cover
11 - Lockwasher, 3/8 (12)
12 - Nut, 3/8-24 (12)

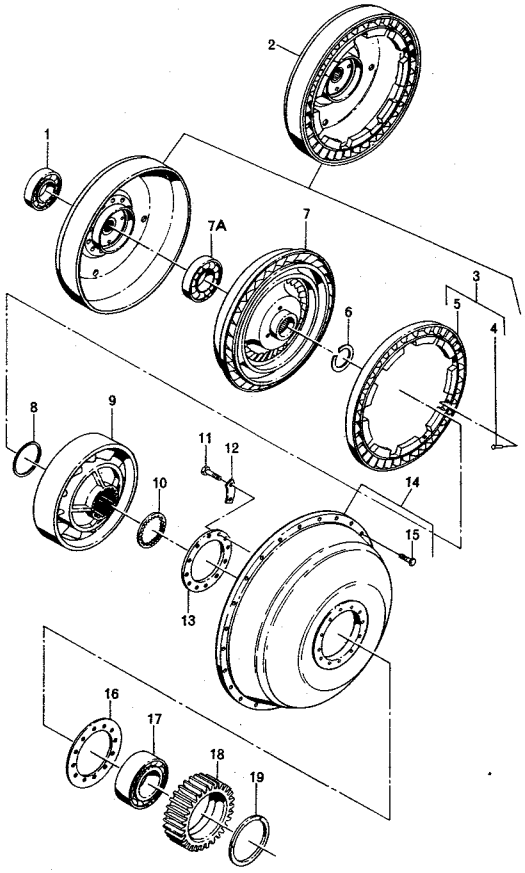
A



14525

A, foldout 3. Input components, direct mount

B



14510

B, foldout 3. Torque converter

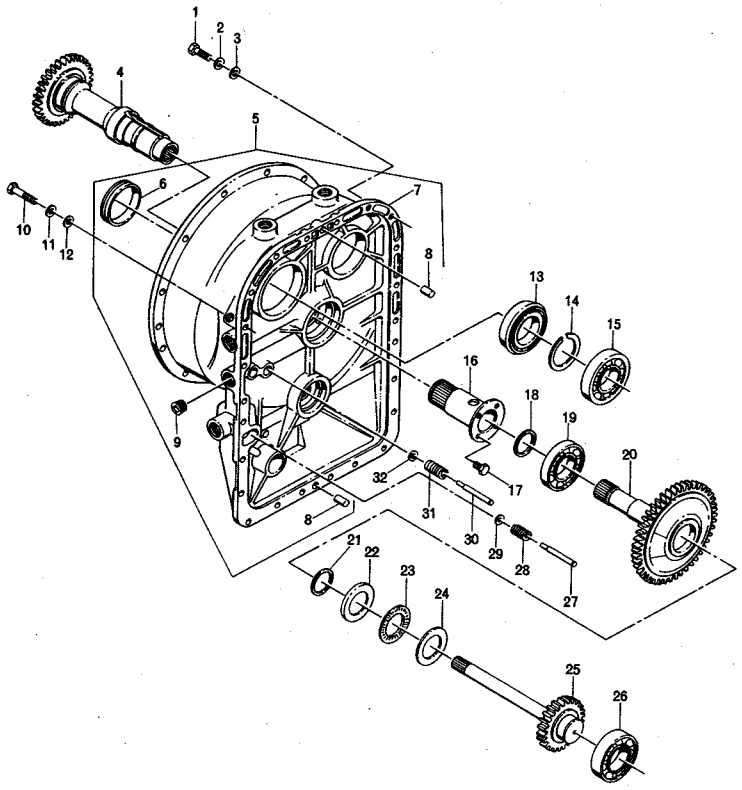
A

1 - Self-locking bolt, 1/2-13 x 7/8 (6)
2 - Flex disk plate
3 - Flex disk (3)
4 - Flex disk and washer assembly
5 - Nut, 5/16-24 (24)
6 - Torque converter drive cover

B

1 - Ball bearing
2 - First turbine and support assembly
3 - First turbine assembly
4 - First-turbine retaining pin (6)
5 - First turbine
6 - Internal snapring
7 - Second turbine
7A - Ball bearing
8 - External snapring
9 - Torque Converter stator
10 - Spacer
11 - Self-locking bolt, 1/4-28 x 1-1/4 (12)
12 - Lockstrip (6)
13 - Torque converter pump retainer
14 - Torque converter pump assembly
15 - Bolt, 5/16-24 x 1.30 (24)
16 - Torque converter pump gasket
17 - Double-row ball bearing
18 - Input accessory drive gear
19 - Sealring

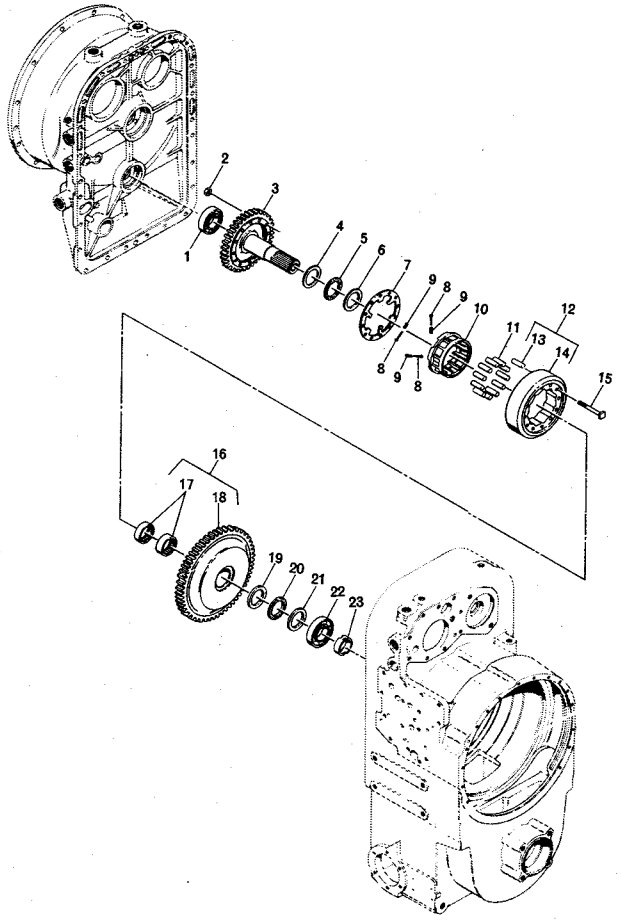
A



14504

A, foldout 4. Torque converter housing, gearing

B



14522

B, foldout 4. Freewheel components

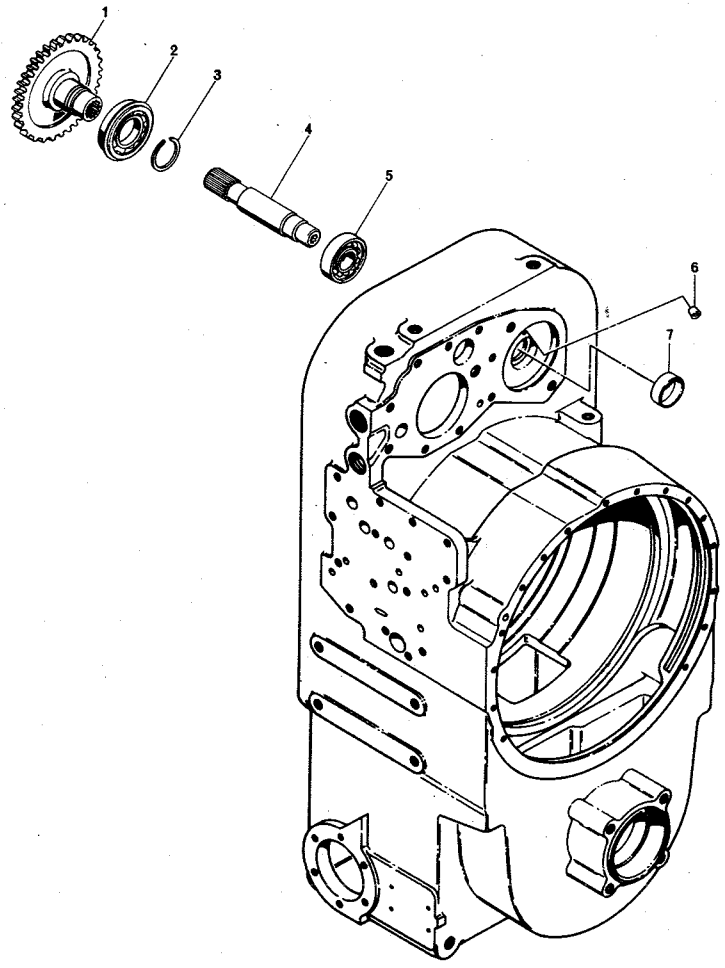
A

1 - Bolt, 7/16-14 x 1-3/8 (23)
2 - Lockwasher, 7/16 (23)
3 - Flat washer, 7/16 (23)
4 - Accessory driven gear
5 - Converter housing assembly
6 - Converter housing sleeve
7 - Converter housing
8 - Dowel pin (2)
9 - Pipe plug, 3/4 NPTF
10 - Bolt, 7/16-14 x 2-3/4
11 - Lockwasher, 7/16
12 - Flat washer, 7/16
13 - Ball bearing
14 - External snapring
15 - Ball bearing
16 - Converter ground sleeve
17 - Self-locking bolt, 5/16-18 x 3/4 (4)
18 - Sealring
19 - Ball Bearing
20 - Second-turbine drive gear
21 - Sealring
22 - Thrust race
23 - Thrust roller bearing
24 - Thrust race
25 - First-turbine drive gear
26 - Ball Bearing
27 - Lubrication regulator valve guide pin
28 - Lubrication regulator valve spring
29 - Lubrication regulator valve
30 - Converter pressure regulator valve guide pin
31 - Converter pressure regulator valve spring
32 - Converter pressure regulator valve

B

1 - Ball bearing
2 - Self-locking nut, 3/8-24 (12)
3 - Second-turbine driven gear
4 - Bearing thrust race
5 - Thrust bearing
6 - Bearing thrust race
7 - Freewheel retainer spring plate
8 - Freewheel spring pin (3)
9 - Freewheel spring (3)
10 - Freewheel roller cage
11 - Freewheel roller (15)
12 - Freewheel cam assembly
13 - Freewheel cam pin
14 - Freewheel cam
15 - Bolt, 3/8-24 x 3-1/16 (12)
16 - First-turbine driven gear assembly
17 - Roller bearing (2)
18 - First-turbine driven gear
19 - Thrust bearing race
20 - Thrust bearing
21 - Thrust bearing race
22 - Ball bearing
23 - Spacer

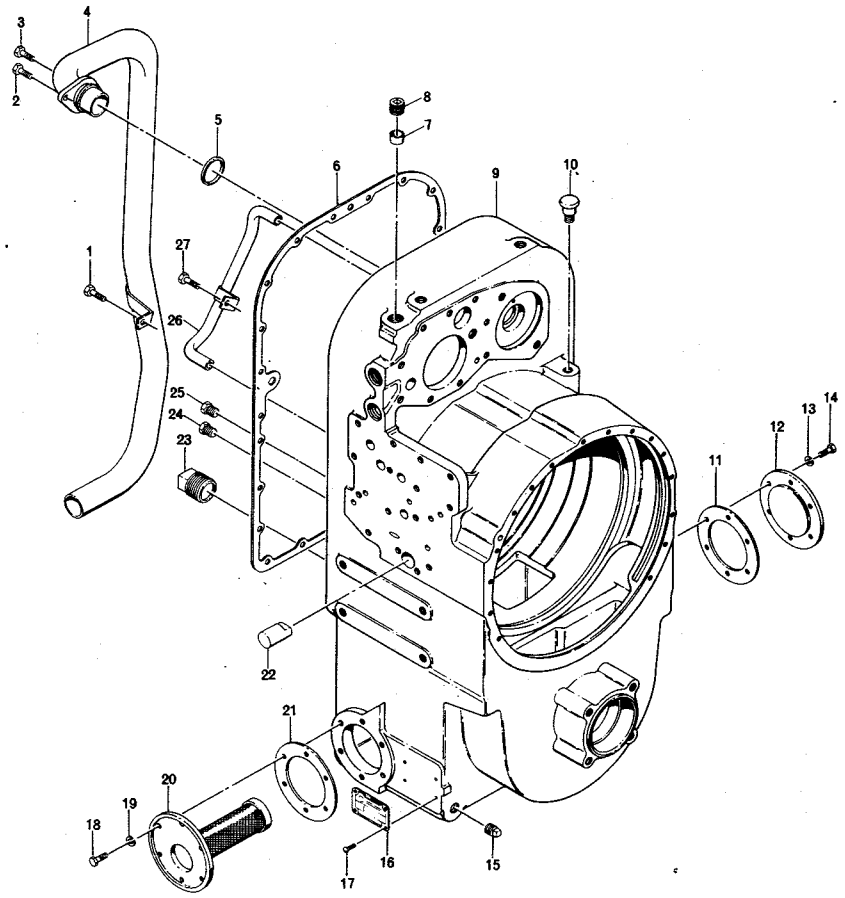
A



14548

A, foldout 5. Accessory drive

B



14518

B, foldout 5. Transmission housing

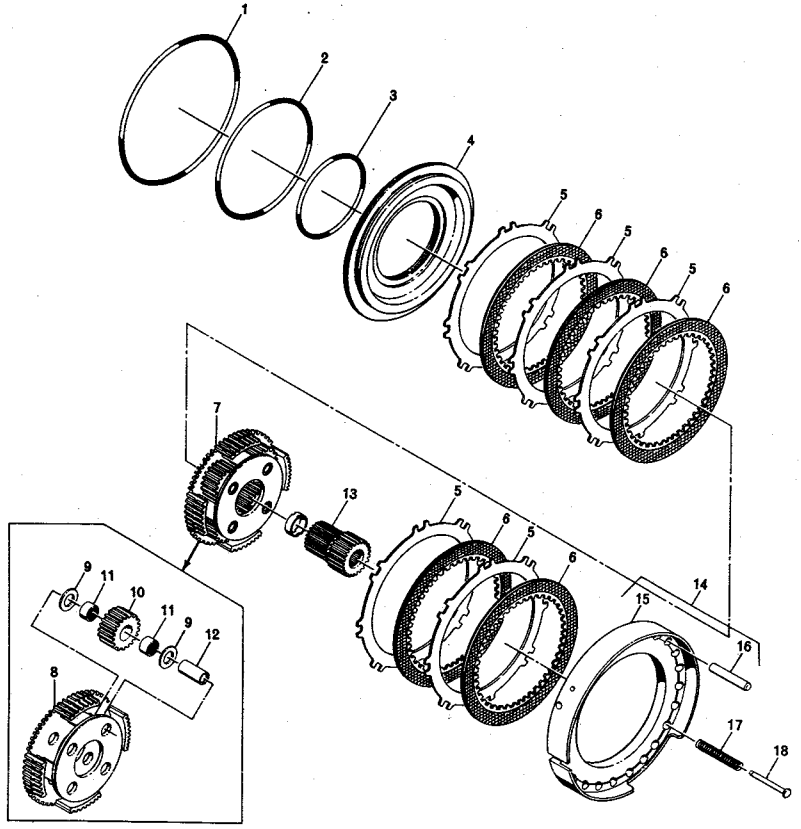
A

1 - Accessory driven gear
2 - Ball bearing
3 - Snapring
4 - Accessory drive shaft
5 - Ball bearing
6 - Plug
7 - Cup plug

B

1 - Bolt, 3/8-16 x 3/4
2 - Bolt, 3/8-16 x 3/4
3 - Bolt, 3/8-16 x 3/4
4 - Suction tube
5 - Suction tube seal
6 - Transmission housing gasket
7 - Remote filter plug
8 - Plug
9 - Transmission housing
10 - Breather
11 - Core hole cover gasket
12 - Core hole cover
13 - Lockwasher, 3/8 (6)
14 - Bolt, 3/8-16 x 7/8 (6)
15 - Drain plug
16 - Nameplate
17 - Drive screw, no. 4 x 1/4 (
18 - Bolt, 3/8-16 x 7/8 (6)
19 - Lockwasher, 3/8 (6)
20 - Oil Strainer
21 - Oil strainer gasket
22 - Anchor pin
23 - Oil filler plug
24 - Add-level oil plug
25 - Full-level oil plug
26 - Auxiliary lubrication tube
27 - Bolt, 3/8-16 x 3/4

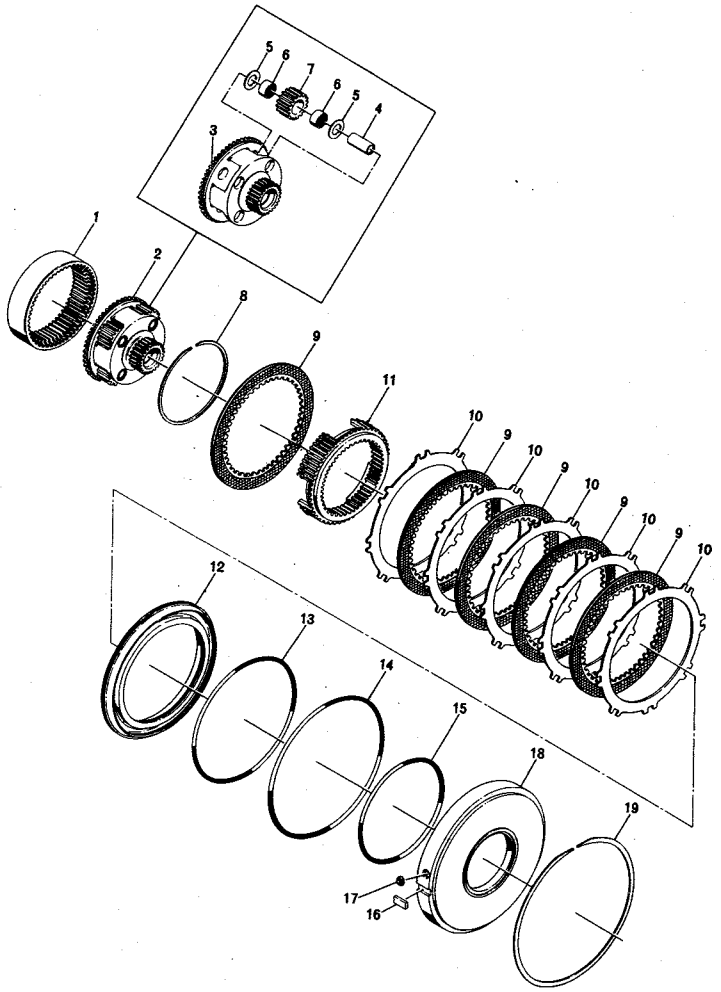
A



14523

A, foldout 6. Reverse clutch, planetary

B



14546

B, foldout 6. Low-range clutch, planetary

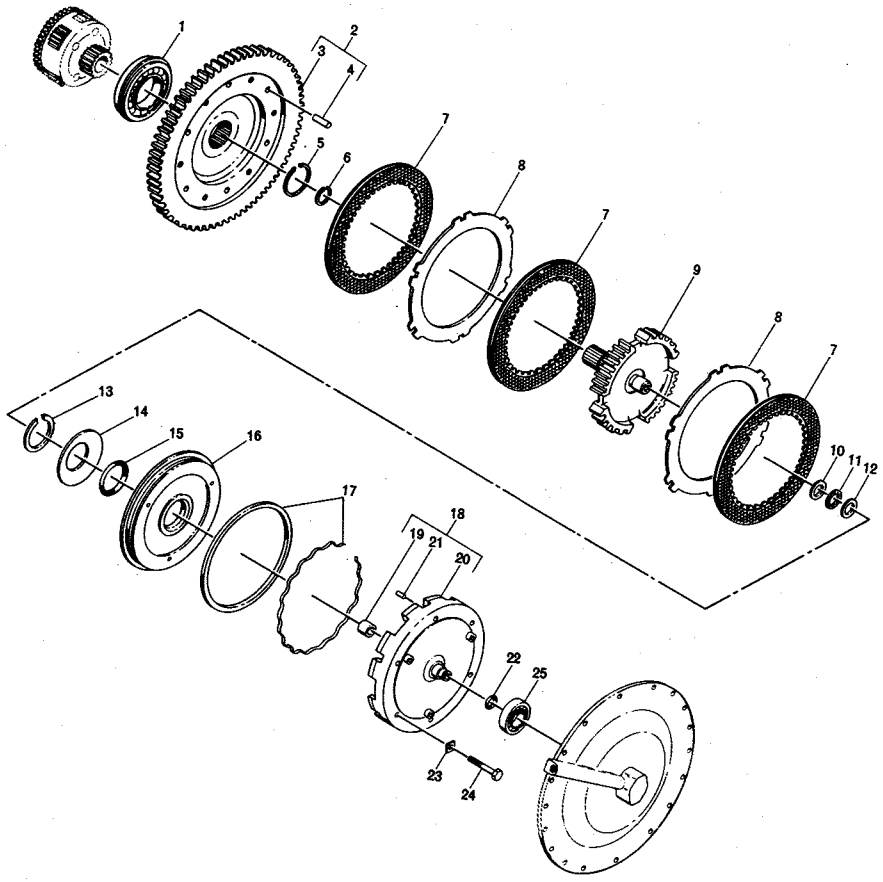
A

1 - Lip type sealring
2 - Lip type sealring
3 - Lip type sealring
4 - Reverse piston assembly
5 - External-splined clutch plate (5)
6 - Internal-splined clutch plate (5)
7 - Reverse planetary carrier assembly
8 - Reverse planetary carrier
9 - Thrust washer (8)
10 - Planetary pinion (matched set of 4)
11 - Bearing assembly (8)
12 - Spindle (4)
13 - Reverse-and-low-range sun gear
14 - Reverse-and-low-range clutch anchor assembly
15 - Reverse-and-low-range clutch anchor
16 - Anchor pin (8)
17 - Piston return spring (15)
18 - Return spring guide pin (15)

B

1 - Reverse ring gear
2 - Low-range planetary carrier assembly
3 - Low-range planetary carrier
4 - Spindle (4)
5 - Thrust washer (8)
6 - Planetary pinion roller bearing assembly (8)
7 - Planetary pinion (4)
8 - Snapring
9 - Internal-splined clutch plate (5)
10 - External-splined clutch plate (5)
11 - Low-range ring gear
12 - Low-range clutch piston
13 - Lip type sealring
14 - Lip type sealring
15 - Lip type sealring
16 - Anchor key
17 - Low-range clutch piston housing insert
18 - Low-range clutch piston housing
19 - Snapring

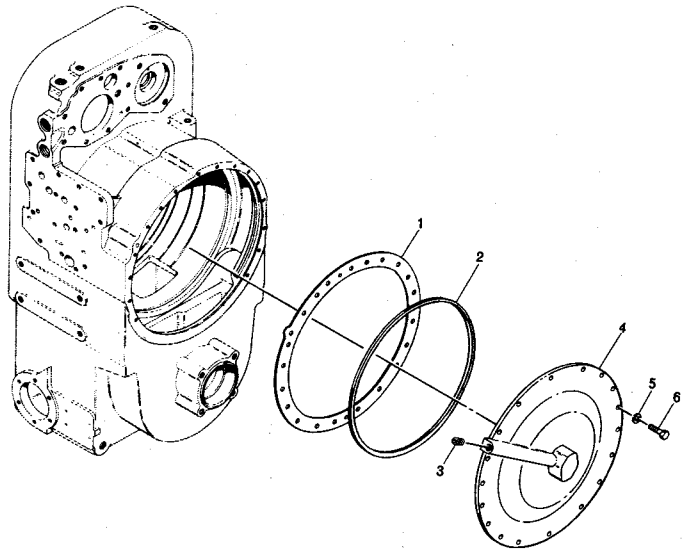
A



14515

A, foldout 7. High-range clutch, transfer drive gear

B



14524

B, foldout 7. Rear cover

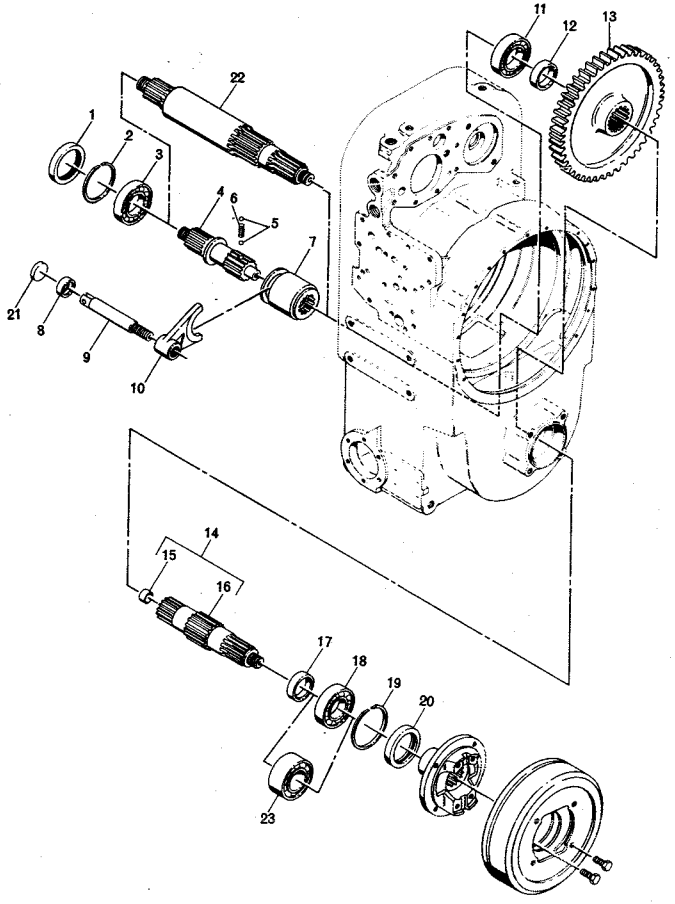
A

1 - Ball bearing
2 - Transfer drive gear assembly
3 - Transfer drive gear
4 - Pin (6)
5 - External snapring
6 - External snapring
7 - Internal-splined clutch plate (3)
8 - External-tanged clutch plate (2)
9 - High-range clutch hub
10 - Thrust bearing race
11 - Thrust bearing
12 - Thrust bearing race
13 - External snapring
14 - Piston return spring
15 - Sealring
16 - High-range clutch piston
17 - Seal and expander kit
18 - High-range clutch housing assen
19 - Bushing
20 - High-range clutch piston housi
21 - Pin (3)
22 - Sealring
23 - Locktab (6)
24 - Bolt, 1/2-20 x 2-3/4 (6)
25 - Ball bearing

B

1 - Rear cover gasket
2 - Sealring
3 - Plug
4 - Rear cover
5 - Lockwasher, 3/8 (16)
6 - Bolt, 3/8-16 x 1-1/8 (16)

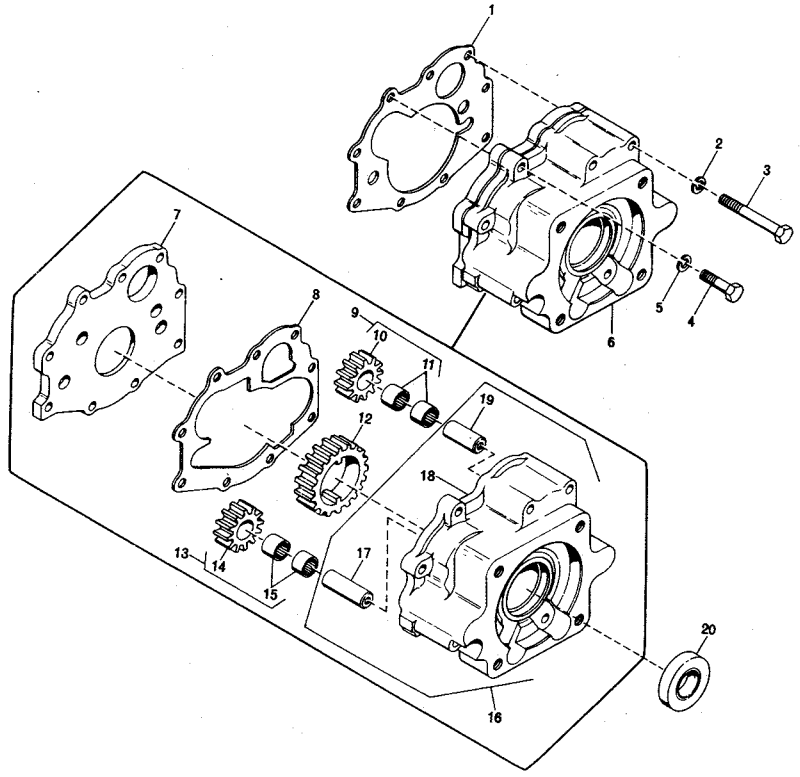
A



14519

A, foldout 8. Transfer driven gear, output shafts

B



14506

B, foldout 8. Oil pump assembly

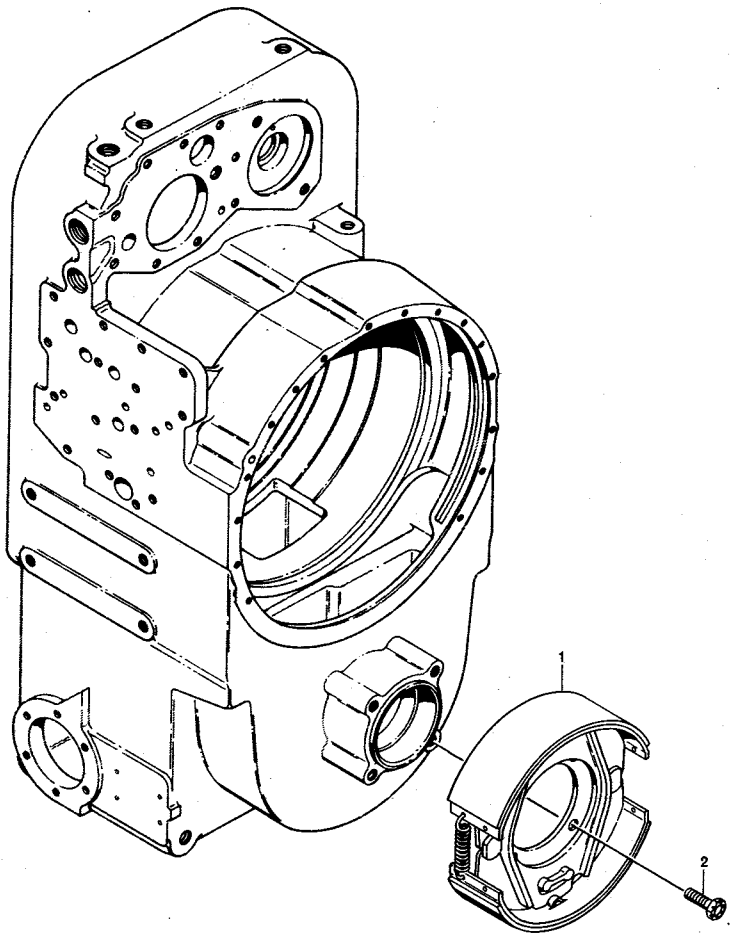
A

1 - Oil seal
2 - Internal snapring
3 - Ball bearing
4 - Front output shaft
5 - Detent ball (2)
6 - Detent spring
7 - Disconnect coupling
8 - Oil Seal
9 - Shifter fork shaft
10 - Shifter fork
11 - Ball bearing
12 - Spacer
13 - Transfer driven gear
14 - Rear output shaft assembly
15 - Bushing
16 - Rear output shaft
17 - Spacer
18 - Ball bearing
19 - Internal snapring
20 - Oil seal
21 - Cap
22 - Front and rear output shaft
23 - Double-row ball bearing

B

1 - Oil pump gasket
2 - Lockwasher, 3/8 (7)
3 - Bolt, 3/8-16 x 4 (7)
4 - Bolt, 3/8-16 x 2 (2)
5 - Lockwasher, 3/8 (2)
6 - Oil pump assembly
7 - Oil pump cover
8 - Oil pump cover gasket
9 - Driven gear assembly
10 - Driven gear
11 - Roller bearing (2)
12 - Drive gear
13 - Driven gear assembly
14 - Driven gear
15 - Roller bearing (2)
16 - Oil pump body assembly
17 - Driven gear shaft
18 - Oil pump body
19 - Driven gear shaft
20 - Oil seal

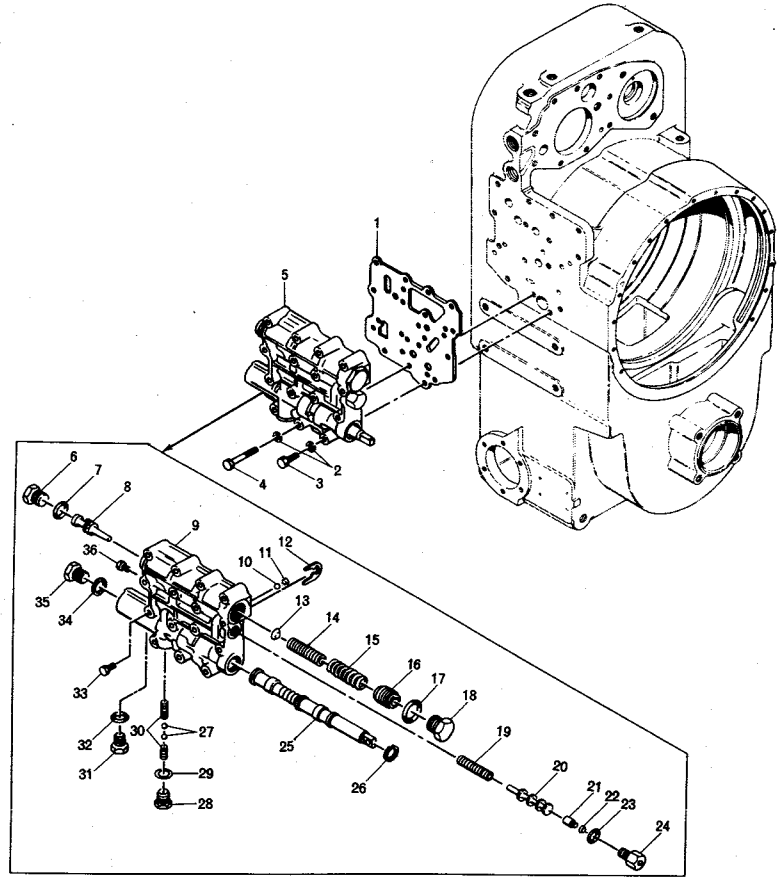
A



14552

A, foldout 9. Parking brake

B



14549

B, foldout 9. Control valve assembly

A

1 - Brake shoe and lining (2)
2 - Self-locking bolt, 1/2-13 x 7/8 (4)

B

1 - Control valve body gasket
2 - Lockwasher, 3/8 (16)
3 - Bolt, 3/8-16 x 1
4 - Bolt, 3/8-16 x 2-1/2 (15)
5 - Control valve body assembly
6 - Plug
7 - Gasket
8 - Main-pressure regulator valve
9 - Control valve body
10 - Ball
11 - Ball retainer plug
12 - Valve stop
13 - Spring retainer
14 - Main-pressure regulator spring
15 - Trimmer spring
16 - Trimmer plug
17 - Gasket
18 - Plug
19 - Clutch cutoff valve spring
20 - Clutch cutoff valve
21 - Plug
22 - Sealring
23 - Gasket
24 - Cutoff valve plug
25 - Manual range selector valve
26 - Oil seal
27 - Detent ball (2)
28 - Plug
29 - Gasket
30 - Detent spring (2)
31 - Plug (neutral switch hole)
32 - Gasket
33 - Plug
34 - Gasket
35 - Plug
36 - Plug