SERVICE MANUAL

SERIES 5630, 5631

MODELS

CRT 5630
CRT 5631

Allison

TORQMATIC
POWERSHIFT
TRANSMISSIONS

Prepared
by

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Section I. GENERAL INFORMATION

1-1. SCOPE OF MANUAL

a. Coverage

(1) This Service Manual covers the description, operation, maintenance, and overhaul of the CRT 5630 and CRT 5631 series Torqmatic® transmissions (fig. 1-1 through 1-4).

(2) All text and illustrations in this manual are applicable to all CRT 5630 and CRT 5631 models unless specifically designated as to model.

b. Arrangement

(1) Eight sections. Eight sections make up the text of the manual. Each paragraph and illustration number is prefixed with the applicable section number.

(2) Section content. Section 1 contains general information, and specifications and data. Section 2 describes the transmission components and explains their operation. Section 3 outlines preventive maintenance procedures. Section 4 is general information needed for overhaul. Section 5 covers disassembly of the transmission into subassemblies. Section 6 covers rebuild of subassemblies. Section 7 covers assembly of transmission from subassemblies. Section 8 covers wear limits and spring specifications.

(3) Foldout illustrations. The fourteen foldout illustrations at the back of the manual include two cross-section views of the transmissions, a schematic view of the hydraulic system, and eleven exploded views, which show all parts in assembly relation.

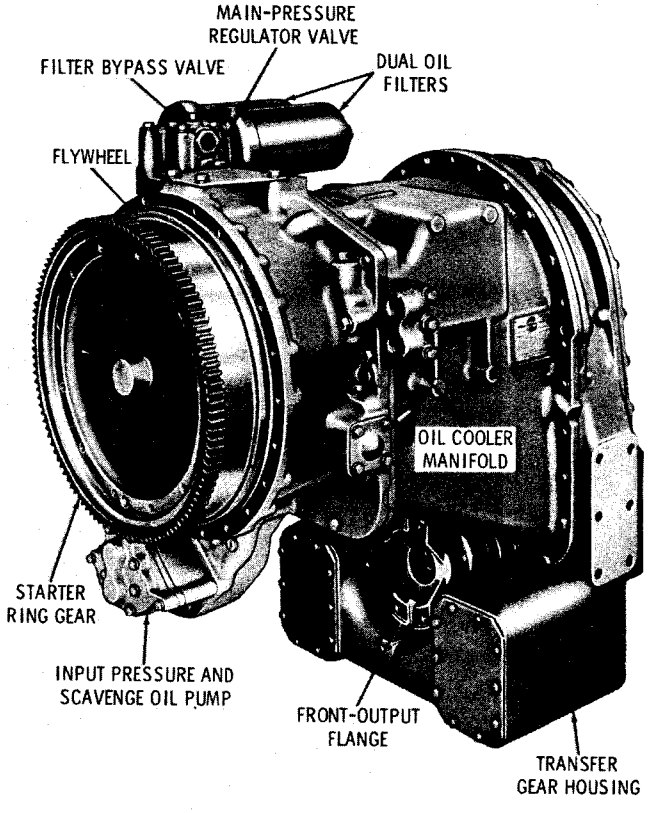

Fig. 1-1. Model CRT 5630 transmission, direct mount—left-front view

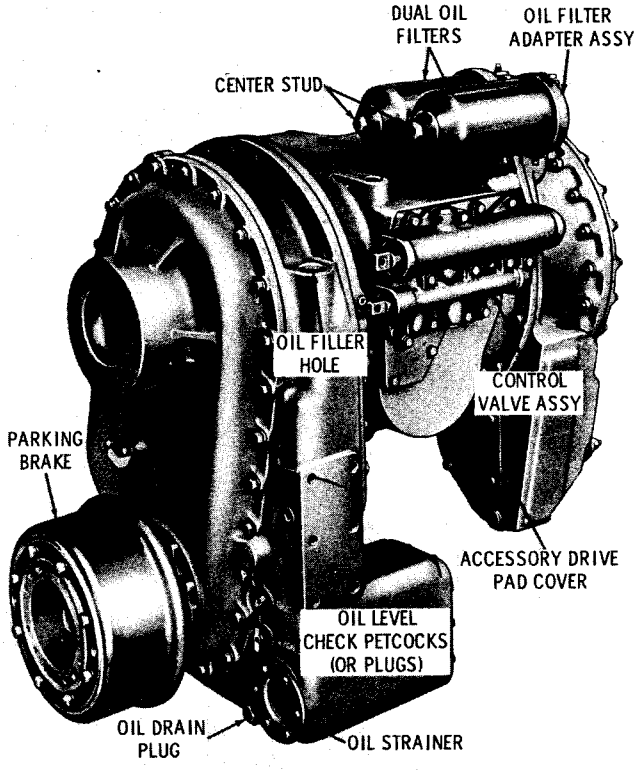

Fig. 1-2. Model CRT 5630 transmission, remote mount—right-rear view

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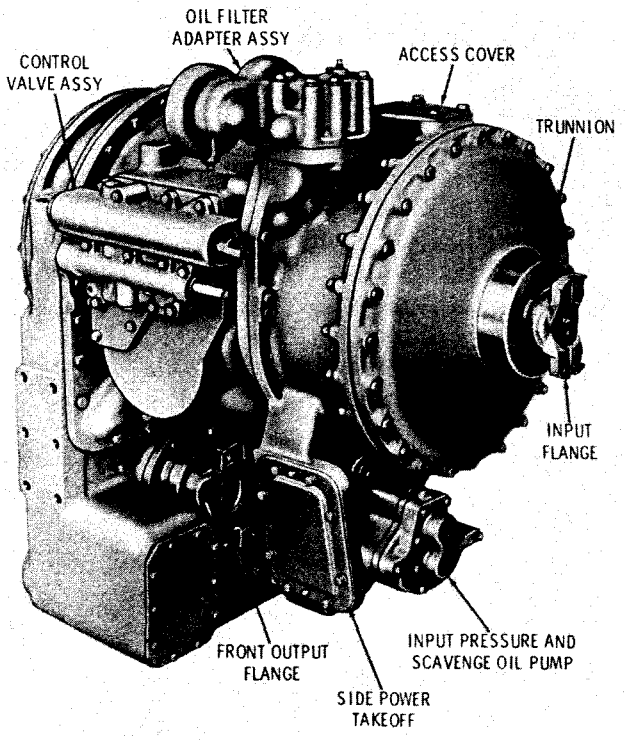


Fig. 1-3. Model CRT 5631 transmission, remote mount—right-front view

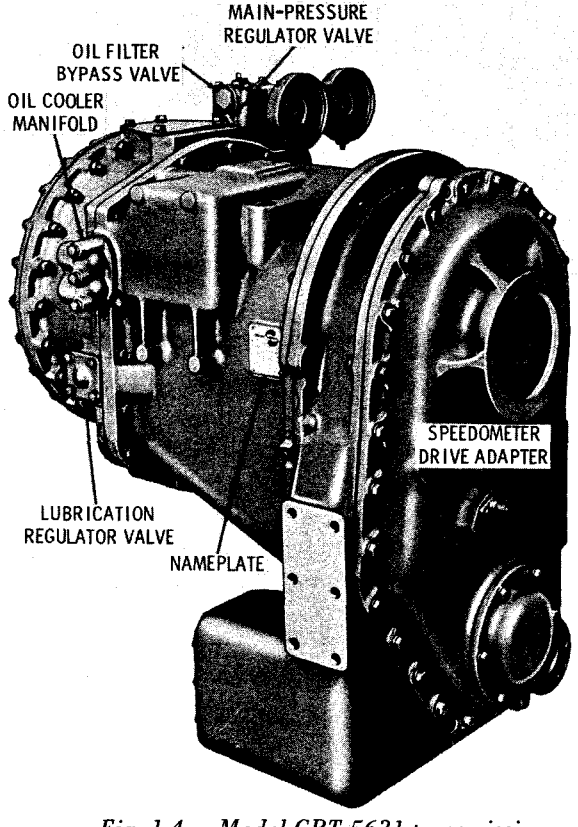


Fig. 1-4. Model CRT 5631 transmission, remote mount—left-rear view

1-2. MODEL DIFFERENCES

a. Two Basic Models. Two basic models are covered in this Service Manual. These are the CRT 5630 and the CRT 5631 models. Each of these models includes specific assemblies which differ in optional features and equipment.

b. Differences

(1) The CRT 5630 model preceded the CRT 5631 model. When major changes in design were made, transmission was redesignated as the CRT 5631. The major changes are outlined in (2) through (13), below.

(2) The stator cams were changed to accommodate 12 freewheel rollers in CRT 5631 models. Only eight rollers were used in the CRT 5630 models. Refer to 6 and 11 (A, foldout 5).

(3) The CRT 5631 models include four caged needle bearing assemblies on which the four intermediate-range planetary pinions rotate. The CRT 5630 models use 24 uncaged needle rollers in each of the four pinions. Refer to 12 and 13 (B, foldout 9).

(4) CRT 5631 models use a double-row ball bearing at the rear of the converter ground sleeve. A single-row bearing is used in CRT 5630 models. Refer to 53 and 23 (C, foldout 5).

(5) In CRT 5631 models, a snap ring is located between the forward sun gear and the ball bearing at the rear of the converter output shaft. In CRT 5630 models, the snap ring is behind the bearing. Refer to 57 and 28 (C, foldout 5).

(6) The forward sun gear in CRT 5631 models has dimensions and appearance which differ from the sun gear in CRT 5630 models. Refer to 56 and 26 (C, foldout 5).

(7) The retainer rings on both the forward and reverse planetary ring gears for CRT 5631 models are located differently from those on CRT 5630 models. Refer to 23 (A, foldout 7) and 28 (B, foldout 7) for forward ring gears, and to 14 (A, foldout 8) and 13 (B, foldout 8) for reverse ring gears.

(8) The forward and reverse clutch anchors for CRT 5631 models each include an internal snap ring groove and snap ring. The anchors in CRT 5630 models are not grooved, and do not use snap rings. Refer to 26 (A, foldout 7) and 30 (B, foldout 7) for the forward clutch anchors. Refer to 17 (A, foldout 8) and 19 (B, foldout 8) for reverse clutch anchors.

(9) The CRT 5631 models have a spring pin 29 (B, foldout 10) installed in a recess at the front of the transmission housing. CRT 5630 models do not include the spring pin.

(10) The forward-and-reverse clutch back plate 1 (B, foldout 8) for the CRT 5631 models is thicker than plate 1 (A, foldout 8) for CRT 5630 models.

(11) The spindles in the forward planetary carrier assembly in CRT 5631 models (B, foldout 7) are retained by oil collector 20 and bolts 22. The spindles in the planetary used in CRT 5630 models (A, foldout 7) are retained by snap ring 20.

(12) Lubrication oil passages in diaphragm 28 (B, foldout 8), for the CRT 5631 models, are larger than those in diaphragm 26 (A, foldout 8), for CRT 5630 models. Oil passages in some associated parts, for CRT 5631 models, also are larger.

(13) The transmission housing for CRT 5631 models is longer than the housing for the CRT 5630 models, and has other minor changes.

c. Assemblies Supplied Without Transfer Gears. Some transmissions were delivered without the transfer gear components. These assemblies are mated with the vehicle manufacturer's final drive components. This manual will cover fully the components delivered under the transmission assembly number, but will not cover those items supplied by the vehicle manufacturer.

1-3. SUPPLEMENTARY INFORMATION

Supplementary information, to be used in conjunction with this manual, will be issued to cover new models or major design changes released after the publication of this manual.

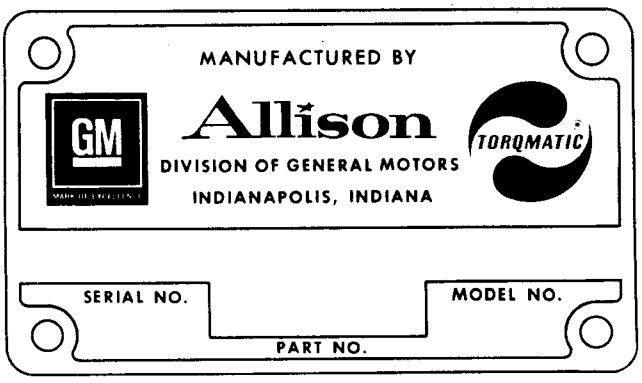


Fig. 1-5. Transmission nameplate

1-4. ORDERING PARTS

a. Transmission Nameplate. The nameplate, located on the left side of the transmission housing, gives the transmission model number, serial number, and assembly part number. To insure that the correct parts will be supplied, furnish all three of these numbers with each parts order. Also, when requesting any information, all three numbers should be supplied. Figure 1-5 illustrates the nameplate.

Note: The current nameplate is illustrated. Previous nameplates specify type C1 hydraulic transmission fluid. All transmissions now use type C2 fluid, therefore, the C1 recommendation should be disregarded.

b. Parts Catalog. All replacement parts should be ordered from your dealer. Parts are listed in the current Series 5530-5630-5631 Parts Catalog SA 1076. Do not order parts by illustration item identification in this manual.

1-5. DESIGN FEATURES

a. Torque Converter, Planetary Gearing

(1) All CRT 5630 and CRT 5631 transmissions are units combining a hydraulic torque converter and planetary gearing. Forward, reverse, low range, intermediate range and high range are controlled by hydraulic clutches. Three speeds forward, neutral, and three speeds reverse are provided.

(2) All CRT 5630 models, and early 5631 models, use a 4-element converter (foldout 1), consisting of turbine, first stator, second stator, and pump. Later CRT 5631 models use a 3-element converter (foldout 2), consisting of turbine, stator, and pump. Several torque converter ratios are used among various transmission assemblies.

(3) All gearing for forward, reverse, intermediate range and high range is constant mesh, straight tooth planetary type. Low range involves only a direct drive clutch, and derives its speed reduction from the forward or reverse gearing.

b. Input Drives, Mounting

(1) The transmission may be remote or direct mounted. Remote-mount models include transmission front cover 10 (A, foldout 4), converter drive housing 18, drive housing hub 15 and an input drive flange 5, 6 or 7. The transmission is connected to the engine by a drive shaft and universal joints.

(2) Direct-mount models include flywheel assembly 12 (B, foldout 4), which is connected to the engine crankshaft by flex disk assembly 2.

(3) Remote-mount models are supported at the front by a trunnion, concentric with the input flange. Direct-mount models are bolted directly onto the engine flywheel housing. All models are supported at the rear by a 6-bolt mounting pad at each side of the transfer gear housing.

c. Transfer Gear Housing. All models (except those mated to the vehicle manufacturer's final drive) include a transfer gear housing and gearing which drop the transmission output to 18.5 inches below the input center line. Refer to foldouts 1 and 2 for cross-section views. Refer to foldouts 12 and 13 for parts details.

d. Hydraulic System

(1) Oil for lubrication, cooling, charging the torque converter, and for all hydraulic operations is carried in the base of the transfer gear housing (sump). It is drawn from the sump by a pump 3 (A, foldout 6) driven by the transmission input rotation. A strainer 54 (foldout 12) in the sump traps any foreign matter before it can reach the pump. A rear (output) pump assembly 2 (foldout 14) is provided on some assemblies. The rear pump provides push- or tow-start capability.

(2) The pump pressure section charges the torque converter and supplies oil pressure for the clutches. A scavenge section of the pump returns excess lubricating oil in the torque converter housing to the sump.

(3) Main-pressure regulator 42 through 46 (A, foldout 6), in conjunction with the oil filter system (B, foldout 6), regulates the main oil pressure to a constant value for clutch engagement. The dual oil filters are full-flow type with standard renewable elements.

(4) A manually-shifted hydraulic control valve assembly (A and B, foldout 11) is mounted externally on the right side of the transmission. Forward or reverse, and low, intermediate and high ranges in either direction may be selected. The control valve hydraulically engages and releases the clutches. Full-power upshifts and downshifts may be made.

1-6. OPTIONS

a. Oil Filters. Oil filters may be located directly atop the transmission as shown in B, foldout 6, or may be remotely mounted and connected by flexible lines to an adapter body assembly 41 (A, foldout 6).

b. Power Takeoffs

(1) Two power takeoff mounting pads are provided on the converter housing of some transmissions. All have the pad (fig. 1-2) at the rear of the converter housing (in line with the input pressure and scavenge pump). Some assemblies include an 8-bolt pad at the lower-right side of the converter housing (fig. 1-3). Both power takeoff drives rotate at engine speed.

(2) Some assemblies include a converter-driven power takeoff mounted at the

upper-rear of the transfer gear housing cover. This arrangement includes disconnect components. Refer to items 8 through 36, foldout 14.

c. Control Valve Assemblies

(1) Control valve assemblies are provided, which may have the linkage attachment points at either the front or rear. These assemblies are illustrated in A and B, foldout 11.

(2) Control valve assemblies may include clutch cutoff valve components which are air or hydraulic operated. These components are illustrated in A and B, foldout 11.

d. Output Flanges. Several types of output flanges are provided. In some assemblies only one output flange is used. The various front output arrangements are illustrated in foldout 12. The various rear output arrangements are illustrated in foldout 13.

e. Parking Brake. An internal, expanding shoe-type parking brake is provided at the rear output of some transmissions. The brake components are illustrated in foldout 13.

f. Governor Drive. Some assemblies include a converter-driven governor drive. The governor drive components are illustrated in foldout 14 (items 37 through 51).

g. Speedometer Drive. An SAE heavy-duty speedometer drive is provided on some assemblies, at the rear of the transfer gear housing cover. These components are illustrated in foldout 14 (items 52 through 60).

1-7. OPERATING INSTRUCTIONS

a. Neutral. Always shift the range selector control to neutral while starting the vehicle engine. Always shift to neutral when the vehicle is left unattended, or while checking operation of the vehicle engine.

b. Range Selection. Range selection is the first operation (after engine is started) in getting the vehicle under way. Speed ranges are selected by moving the range selector control to low-, intermediate- or high-range position. The speed range best suited to operation will depend upon the load, terrain, and the speed of travel desired. The throttle should be closed when a range is selected while the vehicle is standing.

c. Forward, Reverse. Forward or reverse selection is the second step in getting the vehicle under way. Forward or reverse must be selected before the vehicle can be moved, even though the range selector control is shifted to a range. This is true because two clutches must be engaged before power can be transmitted through the transmission. The throttle should be closed when forward or reverse is selected.

d. Throttle Operation. The throttle is opened to get the vehicle under way. When the engine accelerates, the torque converter transmits power from the engine to the converter output shaft, through the directional gearing, through the range gearing, and to the transmission output. The throttle may be left open while upshifting the transmission. The throttle also may be left open while downshifting, but the vehicle should not be exceeding the maximum speed attainable in the lower gear being selected. The throttle should be closed when shifting the direction control.

e. Changing Direction of Travel. When shifting from forward to reverse, or from reverse to forward, the throttle should be closed and the vehicle braked to a slow (creeping) speed. Then the shift to the opposite direction may be made, and the throttle reopened when the vehicle begins to move in the opposite direction.

f. Clutch Cutoff Control. On transmissions equipped with clutch cutoff control, application of the service brakes actuates the clutch cutoff control valve. This valve movement cuts off pressure to the range clutch engaged. When the vehicle is traveling, in either direction and in any range, application of the brakes will interrupt the flow of power in the transmission. Release of the brakes restores power.

g. Sense-feel Valve Operation. The purpose of the "sense-feel" valve is to provide a definite retarding force against shifting the

direction valve from neutral to forward, or from neutral to reverse. The retarding force persists until full engagement occurs, then is automatically released. The operator has the sensation of "picking up" the load, and can more accurately gage the application of the clutch.

h. Parking Brake. The parking brake is controlled manually. It should be applied while the vehicle is left unattended. It should never be applied while the vehicle is moving.

i. Rear PTO Disconnect. To operate the PTO, place the range selector and direction controls in any travel position (para 1-7b, c). Engage the disconnect. The PTO will now operate when the vehicle travels. Shift the range selector to neutral, leaving the directional control engaged, to operate the PTO while the vehicle is standing. Shift the directional control to reverse, to reverse the PTO rotation.

j. Temperatures, Pressures. If the vehicle is equipped with transmission pressure and temperature gages, these should be observed frequently to determine if transmission operation is normal. Main pressure should be 130 to 140 psi at 1500 engine rpm when the output is stalled. Converter-out temperature should never exceed 250°F.

1-8. SPECIFICATIONS, DATA

The following specifications and data apply generally to all CRT 5630 and CRT 5631 models. When information is limited to a specific model, this is indicated.

SPECIFICATIONS AND DATA—CRT 5630, CRT 5631

Transmission type	Torque converter and planetary gear
Rating:	
max input speed	2500 rpm (2100 rpm prior to S/N 26660)
*max input torque	800 lb ft
max input power	350 hp (175-350 gross hp range)
Rotation, viewed from input end:	
input	clockwise
output, forward operation	clockwise
Mounting, input drive:	
rear	six 5/8-11 holes in side pads, each side
front, direct mount	SAE 1 flange on converter housing, bolts to engine flywheel housing; flex disk drive
front, remote mount	trunnion concentric with input shaft; converter enclosed; input flange for shaft and universal joint coupling to engine
Gear ranges, selector positions:	
forward	3 speeds
reverse	3 speeds
range control	neutral, low, intermediate, high
direction control	forward, neutral, reverse

* Restricted to 600 lb ft in certain applications

SPECIFICATIONS AND DATA—CRT 5630, CRT 5631 (cont)

Size, overall:	
length	variable (depends on options, equipment)
width	27.67 in. (add 2.31 for integral oil filters)
height	39.32 in. (add 2.40 for integral oil filters)
Weight, dry (approx—varies with options):	
CRT 5630	2315 lb
CRT 5631	2400 lb
Torque converter:	
type	single-stage, polyphase, 3- or 4-element, freewheeling stator
elements	pump, turbine, 1 or 2 stators
torque multiplication ratios:	

torque converter model	TC530	TC540	TC550	TC560
ratio	3.5:1	2.9:1	3.4:1	2.7:1
torque converter model	TC570	TC580	TC590	
ratio	3.2:1	2.6:1	2.5:1	

Gear data:	
direction and range gearing	planetary, constant mesh, straight tooth
transfer gears	in-line, straight-tooth spur
accessory gears	in-line, straight-tooth spur
Clutch data:	
type	multidisk, hydraulic-applied, spring-released, oil-cooled, automatic wear compensation
material	reaction plates—polished steel; friction plates—sintered bronze on steel
Parking brake:	
size, type	12 x 5 in., expanding shoe, mechanical
rating	90,000 in. lb (manufacturer's rating for run-in (burnished) condition)
Input, output flanges:	
input	Mechanics 7C; Spicer 1650, 1700
front output	Mechanics 8C, 9C; Spicer 1650, 1800
rear output	Mechanics 8C, 9C; Spicer 1800, 1850
converter-driven PTO	Spicer 1700
Oil system:	
input-driven pressure pump	2-gear type, positive displacement
scavenge pump (in common housing with pressure pump)	2-gear type, positive displacement
rear pump (output driven)	internal-external gear type, positive displacement
oil type: above -10°F	hydraulic transmission fluid, type C2
below -10°F	hydraulic transmission fluid, type C2 Auxiliary preheat required to raise temperature in sump and external circuit.

SPECIFICATIONS AND DATA—CRT 5630, CRT 5631 (cont)

oil capacity, U.S. gal. (excludes external circuit)	initial fill—13 gal; refill—11 1/4 gal
oil filter	dual, full flow, renewable elements, remote or integral-mounted
oil cooler	remote, supplied by customer
converter-out oil temp	250°F max
main oil pressure	130 to 140 psi
converter-out oil pressure	30 to 60 psi
lubrication oil pressure	20 to 35 psi

Accessory drives, PTO:

*right side, converter housing:	
type	SAE, 8-bolt heavy duty, modified
speed	1 x engine
rating	intermittent—500 lb ft up to 2100 rpm, 200 hp above 2100 rpm; continuous—315 lb ft up to 2100 rpm, 125 hp above 2100 rpm
*rear, converter housing:	
type	SAE size C mounting pad
speed	1 x engine
rating	same as side mounted, above
converter-driven PTO at rear:	
type	in-line, manual disconnect, with output flange
speed	1 x converter output (turbine)

Gear ratios:

range	low	intermediate	high
forward	3.04:1	1.51:1	0.76:1
reverse	3.17:1	1.57:1	0.79:1

transfer gears . . . . . 1.00:1 standard; 1.30:1 optional

Speedometer drive:

type	SAE heavy duty
speed	1 x transmission output
rotation	opposite to transmission output

Controls:

range	manual (neutral, low, intermediate, high)
direction	manual (neutral, forward, reverse)
parking brake	manual (apply, release)
rear PTO disconnect	manual (engage, disengage)
clutch cutoff	hydraulic or air—actuated by applying vehicle service brakes

*When side- and rear-mounted PTO's are operated simultaneously, a combined maximum rating of 500 lb ft or 200 hp intermittently—or 315 lb ft or 125 hp continuously—must not be exceeded.

Section 2. DESCRIPTION AND OPERATION

2-1. SCOPE OF SECTION 2

This section describes transmission components in detail, and explains component function. Covered in the same manner are the various features—for options or basic equipment, and for earlier or later models. No mention is made of the application of features except as is necessary for distinguishing similar features—such as various control valve assemblies.

2-2. MOUNTING, INPUT DRIVE

a. Remote Mounting

(1) Components used in remote-mounted transmissions are illustrated in A, foldout 4. Drive housing 18 is bolted to torque converter pump 19 (A, foldout 5), or to pump 15 (B, foldout 5). Drive housing hub 15 (A, foldout 4) is bolted to drive housing 18 and extends forward through ball bearing 12. Input flange 5, 6 or 7 provides for connection to the engine through a drive shaft and universal joints.

(2) Ball bearing 12 is lubricated by oil from the interior of the torque converter. The oil passes through a hole drilled through housing hub 15. Excess oil flows to the bottom of the torque converter housing, where the scavenge pump picks it up and returns it to the sump.

(3) A trunnion machined at the front of cover 10 supports the front of the remote-mounted transmission. A six-bolt side mounting pad on each side of transfer gear housing 29 (foldout 12) supports the rear of the transmission.

b. Direct Mounting

(1) Components used in direct-mounted transmissions are illustrated in B, foldout 4. Flywheel 14 is bolted to torque converter pump 19 (A, foldout 5), or to pump 15 (B, foldout 5). Flex disk assembly 2 (B, foldout 4) is bolted, at its outer circle, to flywheel 14 and, at its inner circle, to the engine crankshaft.

(2) Converter housing 6 (C, foldout 5) is bolted directly to the engine flywheel housing, and supports the front of direct-mounted transmissions. Side mounting pads on the transfer gear housing support the rear end of the transmission in the same manner as explained in a(3), above.

2-3. TORQUE CONVERTER

a. Two Types of Converters

(1) Two types of torque converters are used in the CRT 5630 and CRT 5631 model transmissions. The earliest type used is a 4-element converter consisting of turbine 1 (A, foldout 5), first stator assembly 5, second stator assembly 10, and torque converter pump 19. The current torque converter is a 3-element arrangement, consisting of turbine 1 (B, foldout 5), stator assembly 6 and pump 15.

(2) In the earlier type of 4-element converter, used in all CRT 5630 models, the stator assemblies freewheel on eight rollers 6 and 11 (A, foldout 5) in each stator assembly. The 4-element arrangement was continued in the earlier CRT 5631 transmissions but the number of rollers in each stator assembly was increased to twelve at serial no. 26660.

(3) Later, the 4-element torque converter was replaced by a 3-element arrangement, in which a single stator assembly 6 (B, foldout 5) freewheels on twelve rollers 10.

b. Operation of Torque Converter

(1) The torque converter is continuously filled with oil which circulates through the cooler and hydraulic system. The oil is the power transmitting medium, and carries off the heat produced in converter operation.

(2) The torque converter pump is the drive element, the turbine is the driven element, and the stator(s) is the reaction element. When the pump is driven by the engine, oil

flowing between the pump vanes is thrown into the turbine. The impact of the oil against the vanes of the turbine tends to rotate the turbine.

(3) Oil leaving the turbine flows between the vanes of the stator(s), and is directed to re-enter the pump at an angle which will assist pump rotation. The function of the stator element is the key to torque multiplication.

(4) Torque multiplication is highest when the turbine is stalled and the pump is rotating at full speed. Under these conditions, the stator locks up at its freewheel rollers and is stationary.

(5) When the turbine rotates, and begins to approach the rotational speed of the pump, the oil flow path in the turbine changes. Oil entering the stator strikes the backs of the vanes, and freewheels the stator in the direction of turbine and pump rotation. High torque multiplication is no longer required, and the freewheeling stator reduces oil turbulence and loss of power within the converter.

(6) Any load which slows the turbine to a speed significantly lower than that of the pump will cause the stator to lock in a stationary position. With the stator locked, torque is multiplied, until the speed of the turbine increases and the stator again freewheels.

2-4. FORWARD, REVERSE GEARING AND CLUTCHES

a. Planetary Gearing

(1) Minor differences exist between the forward and reverse planetary gearing in CRT 5630 models and the gearing in CRT 5631 models. These differences are explained in paragraph 1-2b(7) and (11), above. Because these differences do not bear on the functional description and operation of the gearing, all references in (2) and (3), below, are to illustrations representing only the current models.

(2) The forward planetary gearing includes forward sun gear 56 (C, foldout 5), forward planetary carrier assembly 10 (B, foldout 7) and forward ring gear 28.

(3) The reverse planetary gearing includes reverse sun gear 2 (B, foldout 8), reverse planetary carrier assembly 3, and reverse ring gear 13.

b. Clutches

(1) Minor differences exist between the forward and reverse clutches in the CRT 5630 models, and the clutches in the CRT 5631 models. These differences are explained in paragraph 1-2b(8), (9) and (10), above. Because these differences do not bear on the functional description and operation of the clutches, all references in (2) and (3), below, are to illustrations representing only the current models.

(2) The forward clutch consists mainly of piston housing 3 (B, foldout 7), piston 6, four external-splined plates 23 and 26, four internal-splined plates 24, 27 and 29, and clutch anchor 30. Fourteen springs 9 and back plate 1 (B, foldout 8) serve both the forward and reverse clutches.

(3) The reverse clutch consists mainly of back plate 1 (B, foldout 8), five internal-splined plates 12, 15 and 17, five external-splined plates 14 and 18, anchor 19, piston 25, and diaphragm 28.

c. Operation of Clutches, Planetaries

(1) In forward operation, oil pressure in housing 3 (B, foldout 7) pushes piston 6 against plate 23. Plates 23, 24, 26, 27 and 29 are compressed against back plate 1 (B, foldout 8).

(2) The external splines of alternate plates are engaged in the internal splines of anchor 30 (B, foldout 7). The internal splines of the other plates are engaged in the external splines of ring gear 28. When the plates are compressed, ring gear 28 is stationary.

(3) Forward sun gear 56 (C, foldout 5), driven by the torque converter turbine, drives pinions 16 (B, foldout 7). The pinions are forced to rotate within ring gear 28, which is stationary. The pinions, mounted in carrier 19, cause the carrier to rotate in the same direction as the sun gear, but at a reduction

in speed. Carrier 19 is splined to both the reverse carrier and the high-range carrier.

(4) When the forward clutch is released, springs 9 push piston 6 into housing 3. This frees four clutch plates 24, 27 and 29, and permits ring gear 28 to rotate freely. With the reaction member free, no power can be transmitted to carrier 19.

(5) In reverse operation, oil pressure in diaphragm 28 (B, foldout 8) pushes piston 25 forward. This compresses clutch plates 12, 14, 15, 17 and 18 against back plate 1.

(6) The external splines of plates 14 and 18 engage the internal splines of anchor 19. The internal splines of plates 12, 15 and 17 engage the external splines of reverse ring gear 13. When the clutch plates are compressed, ring gear 13 is held stationary.

(7) Reverse sun gear 2 is splined to the forward planetary ring gear. Reverse planetary carrier assembly 3 is splined to the forward planetary carrier assembly. The interconnection of the elements of the forward and reverse planetary gear sets causes an interaction called compounding.

(8) When two planetary gear sets operate in compound, the ratio and direction of rotation of the driven element is the result of the interaction of two planetary gear sets. In reverse gear, the forward and reverse gear sets interact. Actual reversing occurs in the forward planetary gears. Speed reduction occurs in the reverse planetary gear set.

(9) When the reverse clutch is released, fourteen springs 9 (B, foldout 7) push piston 25 (B, foldout 8) rearward into diaphragm 28. This frees the clutch plates, and permits ring gear 13 to rotate. With the reaction member (ring gear 13) free, no power can be transmitted to carrier assembly 3.

2-5. RANGE GEARING, CLUTCHES

a. Planetary Gearing

(1) The high-range planetary gearing includes a sun gear, which is integral with main shaft 1, 2 or 3 (A, foldout 9), high-range planetary carrier assembly 10, and high-range ring gear 24.

(2) The intermediate-range planetary gearing includes sun gear 4 (B, foldout 9), intermediate-range planetary carrier assembly 8, and intermediate-range ring gear 3.

(3) Low range does not include any gearing, being a direct drive involving only a clutch.

b. Clutches

(1) The high-range clutch mainly consists of diaphragm 28 (B, foldout 8) which jointly serves the reverse and high-range clutches, piston 7 (A, foldout 9), anchor 23, eight clutch plates 25 and 26, back plate 27, which jointly serves the high- and intermediate-range clutches, and fourteen springs 22 which jointly serve both clutches.

(2) The intermediate-range clutch consists mainly of springs 22 (A, foldout 9) and back plate 27, both of which jointly serve the high- and intermediate-range clutches, six plates 1 and 2 (B, foldout 9), anchor 17, piston 21, and piston housing 24.

(3) The low-range clutch consists mainly of clutch drum 1 (A, foldout 10), five clutch plates 2 and 3, spring 5, piston 6, and clutch hub assembly 11.

c. Operation of Clutches, Planetaries

(1) In high-range operation, oil pressure in the rear cavity of diaphragm 28 (B, foldout 8) pushes piston 7 (A, foldout 9) rearward. This compresses clutch plates 25 and 26 against back plate 27. Plates 25 are prevented from rotating by anchor 23. Plates 26 are locked by friction between plates 25 and hold ring gear 24 stationary.

(2) Carrier assembly 10 is splined to the forward planetary carrier assembly, and rotates in either the forward or reverse direction, depending upon the direction gear selected. Thus, high-range carrier 12 is the drive member. Ring gear 24 is the reaction member, and the sun gear (integral with main shaft 1, 2 or 3) is the driven member.

(3) When carrier 12 is driven, pinions 15 are forced to rotate within stationary ring gear 24. The pinions overdrive main shaft 1, 2 or 3.

(4) The combination of speed reduction, in either the forward or reverse gearing, with the overdrive, in the high-range gearing, results in a slight overdrive of the main shaft (0.76:1 in forward; 0.79:1 in reverse).

(5) In intermediate-range operation, oil pressure in piston housing 24 (B, foldout 9) pushes piston 21 forward and compresses clutch plates 1 and 2 against backplate 27 (A, foldout 9). Clutch plates 2 (B, foldout 9) are prevented from rotating by anchor 17. Clutch plates 1 are prevented from rotating by friction between plates 2.

(6) Clutch plates 1 engage the external splines of ring gear 3, and prevent its rotation. Intermediate-range planetary carrier assembly 8 is driven by high-range ring gear 24 (A, foldout 9). Intermediate-range sun gear 4 (B, foldout 9) is the driven member, and is splined to main shaft 1, 2 or 3 (A, foldout 9).

(7) Because of the interconnection of elements of the high-range and intermediate-range planetary gear sets, intermediate range is a compound arrangement. The combination of the two gear sets produces an overdrive ratio which is lower than that produced in high-range operation. Then, combining this overdrive with the reduction of either the forward or reverse gear set, produces a speed reduction ratio (1.51:1 in forward; 1.57:1 in reverse).

(8) In low-range operation, oil pressure in hub 13 (A, foldout 10) pushes piston 6 forward and compresses clutch plates 2 and 3 against clutch drum 1. The internal splines of clutch plates 2 engage the external splines of intermediate-range ring gear 3 (B, foldout 9). The external splines of clutch plates 3 (A, foldout 10) engage the internal splines of clutch drum 1. Clutch drum 1 is splined to hub 13 which is, in turn, splined to main shaft 1, 2 or 3 (A, foldout 9).

(9) Thus, when clutch plates 2 and 3 (A, foldout 10) are compressed, ring gear 3 (B, foldout 9) and main shaft 1, 2 or 3 (A, foldout 9) are forced to rotate together. This forces all elements of both the intermediate- and high-range planetary gear sets to rotate as a unit, due to the interconnection of elements as explained in b(7), above. When the low-range clutch is engaged, a direct drive occurs between the output of either the forward or reverse planetary gear set, and the main shaft. As a result, the ratio of low range is that of either the forward planetary gear set (3.04:1 speed reduction) or of the reverse gear set (3.17:1 speed reduction).

2-6. TRANSFER GEAR HOUSING, GEARS

a. Housing

(1) Transfer gear housing 29 (foldout 12) is bolted to the rear of transmission housing 8 (B, foldout 10). The gear housing provides for a drive gear, an idler gear, and a driven gear. The gears are of such size, and positioned so that the driven gear shaft (transmission output) is 18.5 inches vertically below the transmission main shaft.

(2) The transfer gear housing serves also as a reservoir (sump) for the transmission oil supply. Pads on each side of the housing support the rear of the transmission. Cover 4, 7, 12 or 13 (foldout 13) encloses the rear of the housing. The lower front of the housing, and the lower rear of the cover provides for output components which vary among models. Foldouts 12 and 13 illustrate the various options.

(3) Some transmission assemblies were supplied less the transfer gear housing components. These assemblies are coupled directly to the vehicle manufacturer's final drive components.

b. Transfer Gears

(1) Transfer drive gear 36 (foldout 12) is splined to and driven by the transmission main shaft. The gear is supported on bearings 35 and 37.

(2) Transfer idler gear 39 meshes with drive gear 36. It is supported on bearings 34

and 41. Idler gear plug 40 is included with gear 39 if the transmission has a speedometer drive.

(3) Transfer driven gear 47 meshes with idler gear 39, and is splined to output shaft 42, 43, 45 or 46. The shaft is mounted on ball bearings, and provides for the mounting of output flanges of various types on either or both ends. Refer to foldouts 12 and 13 for illustration of the various shafts, bearings and flanges.

(4) The standard transfer gearing provides a 1.00:1 ratio between the drive and driven gears. An optional arrangement provides a 1.30:1 ratio between the drive and driven gears.

2-7. PARKING BRAKE

An internal, expanding shoe-type brake is supplied on some transmissions. The brake is mechanically actuated, and linked to a hand lever on the vehicle. A star wheel adjustment is provided. The brake is mounted at the rear output, the drum being bolted to the rear output flange. Refer to items 52 through 80 (foldout 13).

2-8. OIL PUMPS

a. Input Pressure and Scavenge Pump

(1) A two-section pump, mounted on the lower-front of the torque converter housing provides hydraulic pressure and flow for all transmission functions. Pump assembly 3 (A, foldout 6) is driven at engine speed and rotates in the same direction as does the engine.

(2) A gear train consisting of gear 23 (A, foldout 5) or gear 19 (B, foldout 5), gear 33 (A, foldout 6) and gear 26 drives the pump. A splined pump drive coupling 23 adapts the splined drive shaft of the pump to pump drive hub 27.

(3) Two gears 16 and 17, working in pressure pump body 20, provide oil pressure for hydraulic application of clutches, and oil flow for filling the converter, for cooling and for lubrication. Two narrower gears 9, working in scavenge pump body 7, return oil that accumulates in the bottom of the converter housing to the transmission sump. The oil which the scavenge pump handles comes from the lubrication system serving the pump drive gears, and front bearing 12 (A, foldout 4) in remote-mount models.

b. Output Oil Pump

(1) Some transmissions include an output-driven oil pump 2 (foldout 14). This is an internal-external, gear-type pump, driven by the transmission main shaft. The output pump provides oil pressure to the system when tow- or push-starting the vehicle. In normal operation, the oil from the output pump supplements that from the input pressure pump. The oil from the output pump connects with the oil system when it passes through check valve 37 (C, foldout 5).

(2) The output pump assembly consists of body 3 (foldout 14), drive gear 4, driven gear 5, cover 6, and nine cover screws 7. The pump assembly is fitted into a bore in the transfer gear housing cover. Rotation of the pump body is prevented by a dowel pin which engages a slot in the pump body. The assembly is retained by snap ring 1.

2-9. POWER TAKEOFF PROVISIONS

a. Side PTO Mounting Pad

(1) Some transmissions include an 8-bolt modified SAE heavy-duty PTO mounting pad at the lower right side of the torque converter housing (fig. 1-3). Gear 26 (A, foldout 6) meshes with, and drives the PTO—furnished by the vehicle manufacturer.

(2) On transmissions which do not provide for a PTO at this location, the pad is not machined and is closed by a cast wall. On transmissions which provide the pad, the opening may be closed by cover 16 (C, foldout 5) and gasket 15, retained by bolts 18 and lock washers 17.

b. Implement Pump Mounting Pad

(1) All transmissions provide a 4-bolt, SAE size C mounting pad at the lower rear of

torque converter housing assembly (fig. 1-2). Any accessory mounted at this location is driven at engine speed by internal splines in pump drive hub 27 (A, foldout 6).

(2) If the pad is not used, gasket 32 (C, foldout 5) and cover 31 close the opening. The cover is retained by bolts 29 and lock washers 30.

c. Converter-driven Power Takeoff

(1) Some transmissions include power takeoff arrangement illustrated by items 8 through 36 in foldout 14. The front of drive shaft 8 is splined to the rear of forward planetary carrier 19 (A, foldout 7) or forward planetary carrier 19 (B, foldout 7).

(2) A manual disconnect is provided to engage or disengage shaft 22 (foldout 14). Output flange 29 is splined to the rear of shaft 22, for connection to the equipment to be driven.

(3) Thus, any load coupled to flange 29 may be driven by the torque converter in forward or reverse rotation, even though the vehicle is standing. Also, the load may be driven while the vehicle is traveling. The speed of flange 29, when the PTO is engaged, is always that of the forward or reverse range output.

2-10. GOVERNOR DRIVE

Some transmissions include a governor drive which rotates at torque converter turbine speed. The components which comprise this drive are illustrated in items 37 through 51 (foldout 14). Shaft assembly 37 is splined to the rear of torque converter output shaft 52 (C, foldout 5).

2-11. SPEEDOMETER DRIVE

Some transmissions include an SAE heavy-duty speedometer drive, comprised of items 52 through 60 (foldout 14) and idler gear plug 40 (foldout 12). The drive rotates at transmission output speed, in a direction opposite to transmission output rotation.

2-12. OIL STRAINER, SUCTION SCREEN

a. Strainer in Sump. Oil strainer 54 (foldout 12) is located in the lower-right side of the transfer gear housing. It is removable and cleanable, being retained by six bolts 52, lock washers 53, and sealed by gasket 55. All oil drawn into the system must pass from outside to inside of the strainer. Debris will remain outside the strainer.

b. Suction Screen in Scavenge Pump. Scavenge pump suction screen 21 (A, foldout 6), in the intake port of the scavenge pump, prevents any debris from being drawn into the scavenge pump. Any foreign matter picked up from the bottom of the torque converter housing will be trapped within the cone-shaped screen.

2-13. OIL FILTERS, ADAPTER

a. Adapter, Remote-mounted Filters

(1) When transmissions have remote-mounted oil filters, an oil filter adapter body assembly 41 (A, foldout 6) is mounted on the torque converter housing. Oil is routed to and from the oil filters through flexible tubes having fittings which are installed into tapped ports in body 47.

(2) Body assembly 41 includes main-pressure regulator valve components, items 42 through 46. The main-pressure regulator automatically maintains a uniform hydraulic system pressure. Filters, when remote mounted, are not furnished with the transmission and are not covered in this manual.

b. Oil Filters, Base (direct mount)

(1) When transmissions are equipped with full-flow, direct-mounted oil filters, the filters are included in oil filter base assembly 3 (B, foldout 6) mounted on the torque converter housing. Filter elements 17, when dirty, are replaced by new elements. New filter shell gaskets come with the new elements.

(2) Bypass valve components, items 4 through 8, allow the transmission oil to by-

pass clogged oil filter elements. Main-pressure regulator valve components, items 12 through 16, automatically maintain a uniform pressure in the hydraulic system.

2-14. LUBRICATION REGULATOR VALVE

Oil returning from oil cooler flows into the lubrication system. Pressure is limited to a maximum of 35 psi. All oil in excess of that required to maintain lubrication pressure returns to the sump, via the lubrication pressure regulator valve. Valve components are items 39 through 47, in C, foldout 5.

2-15. CONTROL VALVE ASSEMBLIES

a. Five Types

(1) Among various transmissions, five types of control valve assemblies are used. These differ only in the location of the linkage end of the range selector and direction valves, and the inclusion (or omission) of either an air- or hydraulic-actuated clutch cutoff valve.

(2) The types of control valve assemblies are as follows:

Assembly with link-ends of valves toward the front of transmission; no clutch cutoff valve

Assembly with link-ends of valves toward rear of transmission; no clutch cutoff valve

Assembly with link-ends of valves toward the front of transmission; with air-actuated clutch cutoff valve

Assembly with link-ends of valves toward the rear of transmission; with air-actuated clutch cutoff valve

Assembly with link-ends of valves toward rear of transmission; with hydraulic-actuated clutch cutoff valve

b. Direction Valve (sense-feel control)

(1) All control valve assemblies include the same forward-and-reverse control valve components. Only the position of the valve differs.

(2) Two sleeves 24 and 31 (A, foldout 11) support valve 27 in valve body 17, and provide oil passages. Piston 29, retained on valve 27 by snap rings 28 and 30, must be forced against clutch apply oil pressure during selection of forward or reverse. Final movement of the valve releases the opposing pressure. This is the sense-feel feature. Also, during engagement of the forward or reverse clutch, lubrication is directed to the clutch plates to cool them. Final positioning of the direction valve stops lubrication flow.

(3) Spring-loaded detent balls 22 accurately position valve 27 in neutral, forward or reverse position after selection.

c. Range Selector Valve

(1) All control valve assemblies include the same range selector valve components. Only the position of the valve differs.

(2) Valve assembly 12 (A, foldout 11) is closely fitted in a bore in valve body 17. The valve assembly is manually shifted lengthwise in the bore to select neutral, low range, intermediate range or high range. Spring-loaded detent balls 40 accurately position the valve at each position after selection.

(3) Lands on the valve index with ports in the valve body to charge the clutch for the selected range, while exhausting the other range clutches.

d. Clutch Cutoff Valve

(1) The clutch cutoff valve is included on some valve bodies. It may be air or hydraulic actuated. When the vehicle has air brakes, the valve is air actuated. When the vehicle has hydraulic brakes, the valve is hydraulic actuated. Both types are illustrated in B, foldout 11.

(2) The hydraulic-actuated components include valve 41, plug 42, seal ring 43, gasket 44, cup 45 and retainer 46. The air-actuated components include valve 41, plug 48, seal ring 43, gasket 44 and retainer 47.

(3) In the hydraulic-actuated arrangement, a line from the vehicle hydraulic brake

system connects to retainer 46, and hydraulic pressure works directly against cup 45. Thus, when the vehicle brakes are applied, plug 42 and valve 41 are pushed forward, against main pressure at the smaller end of valve 41.

(4) In the air-actuated arrangement, a miniature air cylinder (not furnished with transmission) is screwed into retainer 47. A line from the vehicle air brake system connects to the air cylinder. When the vehicle brakes are applied, a plunger in the air cylinder pushes plug 48 and valve 41 forward, against main pressure at the smaller end of valve 41.

(5) In either the hydraulic or air-actuated arrangement, movement of valve 41 during application of the vehicle brakes cuts off clutch apply pressure to the range clutch engaged, and exhausts clutch pressure. Thus, when brakes are applied, the range clutch releases. When the brakes are released, the range clutch re-engages.

2-16. 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 (transmission oil) is the power transmitting medium in the torque converter. Its velocity drives the torque converter turbine. Its flow lubricates and cools the transmission; its pressure applies the clutches.

b. System Schematic Illustration (foldout 3). A color-coded composite illustration, representing all features to be found in CRT 5630 and CRT 5631 transmissions, is presented at the back of this manual. It may be folded out for reference in connection with the study of text covering the hydraulic system.

c. Oil Pump, Filter Circuit (foldout 3)

(1) Oil (blue) is drawn from the transmission sump, through a wire mesh strainer, by the input-driven pressure pump. In some models, an output-driven pump is paralleled with the input-driven pump. The output-driven pump is primarily for pressurizing the system for tow or push starting. An output pump check valve prevents loss of oil from the system during reverse operation.

(2) The pump(s) deliver their output (red) to oil filters which may be integral or remote mounted. A bypass valve is located in the pump-to-filter circuit to insure oil flow should the filters clog. From the filters, oil is directed to the main-pressure regulator valve.

d. Main-pressure Regulator Valve, Converter-in Circuit (foldout 3)

(1) At the main-pressure regulator valve, pump pressure moves the spring-loaded valve toward the left until oil escapes into the converter-in circuit. When a balance is established between pump pressure and spring pressure of the regulator valve, main-pressure (red) results. All oil in excess of that required to maintain main pressure flows into the converter-in circuit (yellow).

(2) During cold-start conditions, the main-pressure regulator valve may move far enough leftward to allow additional oil to escape, through drilled passages in the valve, to the hollow interior of the valve and then to the sump. This prevents excessive pressure in the main-pressure circuit.

(3) In normal operation, oil not required in the main circuit flows to the torque converter. The converter is, thus, continuously filled. Rotation of the converter pump imparts energy to the oil, which in turn drives the converter turbine. The oil then flows between the stator vanes, and is redirected to the pump.

e. Converter-out, Cooler, Lubrication Circuit (foldout 3)

(1) Oil flowing out of the torque converter (orange) is directed to the oil cooler. The oil cooler is customer-supplied, and remote from the transmission. It is a heat exchanger in which the oil flows through water- or air-cooled passages.

(2) From the cooler, oil flows to all outlets in the lubrication circuit (green). A lubrication regulator valve, between the cooler

and lubrication circuit, opens to return oil, in excess of that required to maintain lubrication pressure, to the sump (blue).

f. Main-pressure Circuit (foldout 3). The main-pressure circuit includes all areas that are red in foldout 3, although parts of this circuit are described in c and d, above, in conjunction with other circuits. The main-pressure circuit directs oil to the forward-and-reverse selector valve, and to the range selector valve. In models that include a clutch cutoff valve, the valve is in the line which supplies the range selector valve.

g. Forward-and-Reverse Selector Valve, Circuit (foldout 3)

(1) Main pressure is directed to two points at the forward-and-reverse selector valve. The valve has three positions—forward, neutral, and reverse. In neutral, main pressure is blocked. As the valve is shifted from neutral to forward, main pressure oil flows into the area around the detent components and to the forward clutch piston. At the same time, oil flows into the area near the left side of the valve piston and to the forward clutch lubrication passages.

(2) In its movement from neutral to forward, the forward-and-reverse selector valve carries the valve piston leftward. Until the piston closes the lubrication passage, oil flows to the forward clutch area, lubricating and cooling the clutch during its application. As lubrication passage is throttled, clutch apply pressure rises and is also exerted against the valve piston. Pressure on the piston is felt as resistance to movement of the control valve.

(3) Further travel of the valve causes its center land to enter the valve sleeve, preventing oil from reaching the valve piston and exerting an opposing force. With pressure off the piston, the valve moves easily to detent position and will remain there. A diagonal passage through the valve stem provides lubrication to the reverse clutch.

(4) The hydraulic force opposing the movement of the forward-and-reverse selector valve during most of its travel is called "sense-feel." It gives the operator a realistic sensation of "picking up" the load. This sensation guides him in engaging the clutch.

(5) Shifting from neutral to reverse involves identical actions, and provides lubrication and engagement of the reverse clutch. Both the forward and reverse clutches exhaust to their respective lubricating passages when released.

h. Range Selector Valve, Circuit (foldout 2)

(1) Main pressure is directed to one point at the range selector valve. The valve has four detent positions—neutral, and low, intermediate, and high ranges. In any of these positions, oil surrounds the valve at a small diameter, and enters a drilled central passage. The central passage directs oil to an external groove in the valve.

(2) The external groove is blocked by the valve body bore when the selector valve is at neutral. At any range position, the groove registers with a passage which directs oil to the range selected. Any passage not pressurized is exhausted to the sump (blue).

i. Clutch Cutoff Valve, Circuit (foldout 3)

(1) The clutch cutoff valve is an option, and when used, is in the line supplying main pressure to the range selector valve. When the vehicle brakes are released, there is no pressure at the right end of the valve, and main pressure holds the valve rightward. In this position, the valve allows main pressure oil to flow unobstructed to the range selector valve.

(2) When the vehicle brakes are applied, hydraulic or air pressure pushes the clutch cutoff valve leftward against main pressure. The valve, in its leftward position, blocks main pressure while allowing range clutch pressure to exhaust to the sump. Release of the vehicle brakes restores main pressure to the range clutch.

(3) Thus, in any driving range, application of the vehicle brakes will release the driving clutch. With the driving clutch re-

leased, any PTO-driven equipment can be operated with vehicle stopped. It is not necessary to shift to neutral for such operation as long as the vehicle brakes are applied.

2-17. TORQUE PATHS THROUGH TRANSMISSION

a. Torque Converter (fig. 2-1)

(1) Power is transmitted hydraulically through the torque converter. The engine drives the torque converter pump. The pump throws oil against the vanes of the turbine, imparting torque to the converter output shaft. Oil flows from the turbine, between the vanes of the stator, and re-enters the pump.

(2) The torque path through the torque converter is identical in all drive situations and in neutral. When the engine is idling, impact of the oil upon the turbine vanes is negligible. When the engine is accelerated, the impact is increased and the torque produced in the converter output shaft can exceed the engine torque (by an amount equal to the torque ratio of the converter).

(3) Because torque converter torque paths are identical in all situations, the torque paths described in b through h, below, all start at the converter output shaft.

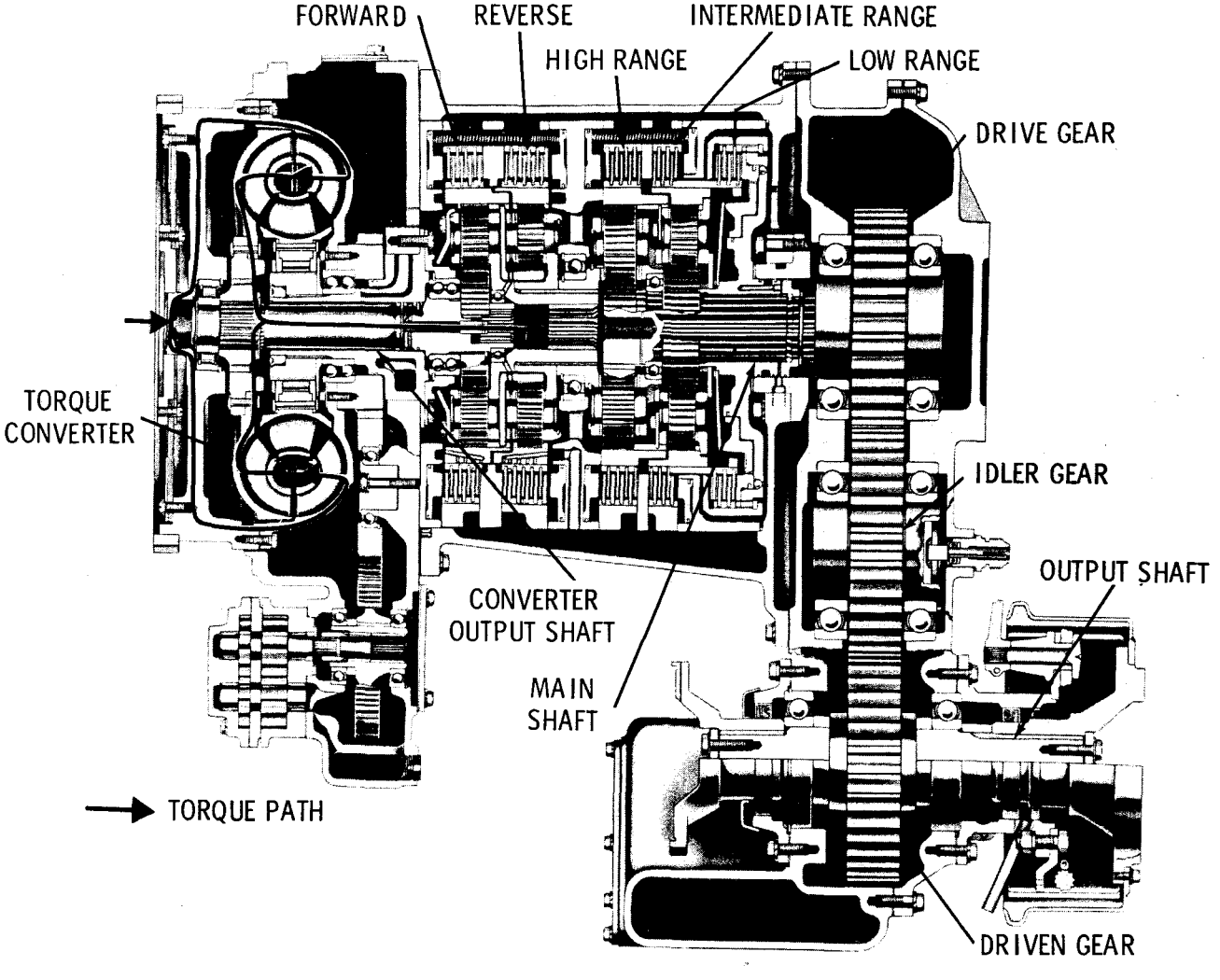


Fig. 2-1. Neutral—torque path

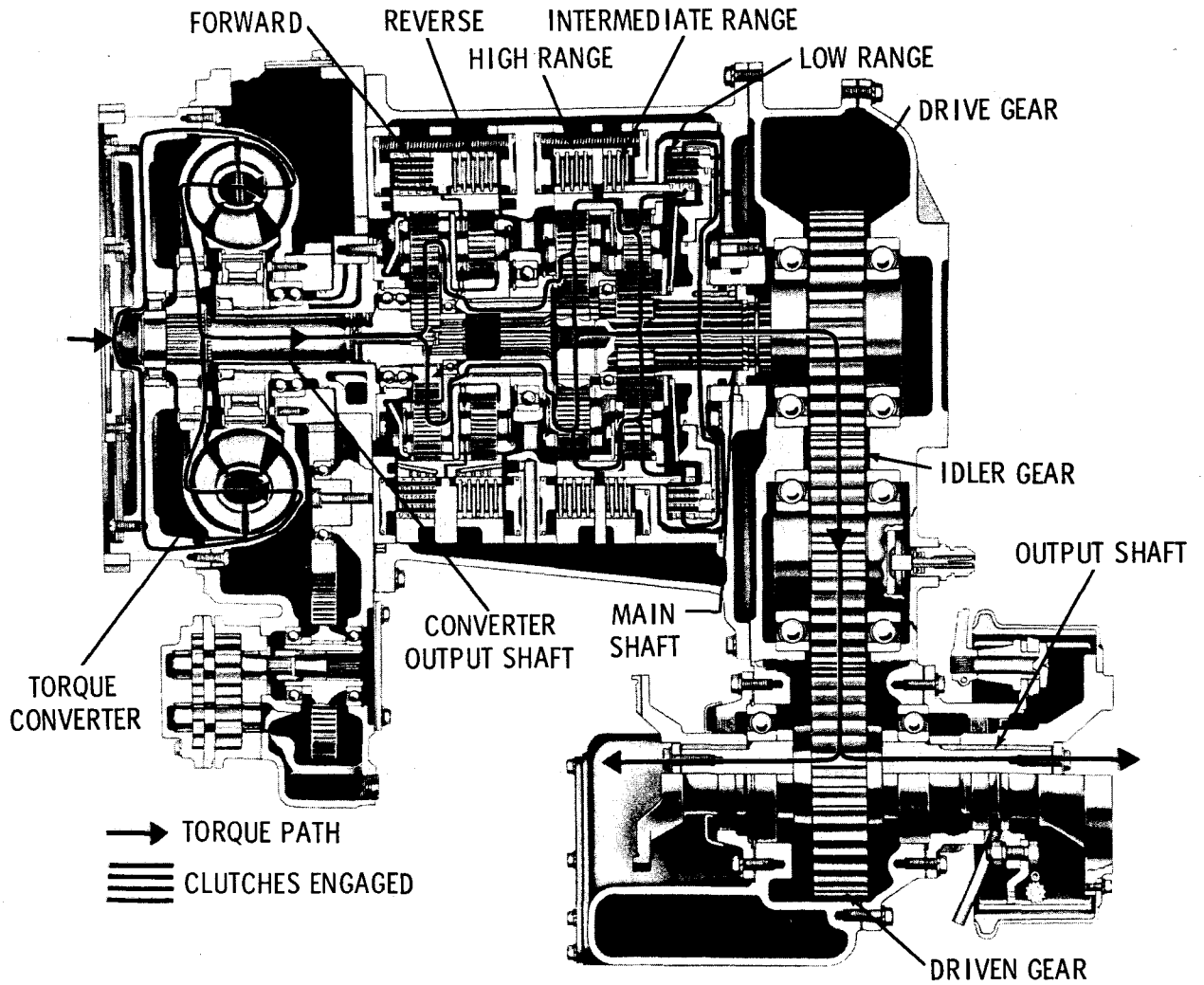


Fig. 2-2. Forward, low range—torque path

b. Neutral (fig. 2-1). Torque produced in the torque converter is not transmitted beyond the forward sun gear. This is true because no clutches are engaged, and the gearing is free to rotate.

c. Forward, Low Range (fig. 2-2)

(1) The forward and low-range clutches are engaged. The forward clutch holds the forward ring gear stationary. The torque converter output shaft drives the forward sun gear. The forward sun gear forces the forward planetary pinions, and carrier, to rotate within the stationary ring gear. The forward planetary carrier is splined to the high-range planetary carrier and drives it in the same direction as the torque converter output shaft. Speed reduction in the forward planetary gear set is 3.04 to 1.

(2) With the low-range clutch engaged, all range planetary components are locked together and rotate as a unit. Thus, the forward planetary carrier drives the range planetary components, and main shaft, at forward planetary output speed.

(3) The output transfer drive gear is splined to the transmission main shaft, and drives transfer idler gear. The idler gear, in turn, drives the output transfer driven gear. The transmission output shaft is splined to the driven gear. The standard output transfer gears have 1.00 to 1 ratio; optional gears have 1.30 to 1 ratio.

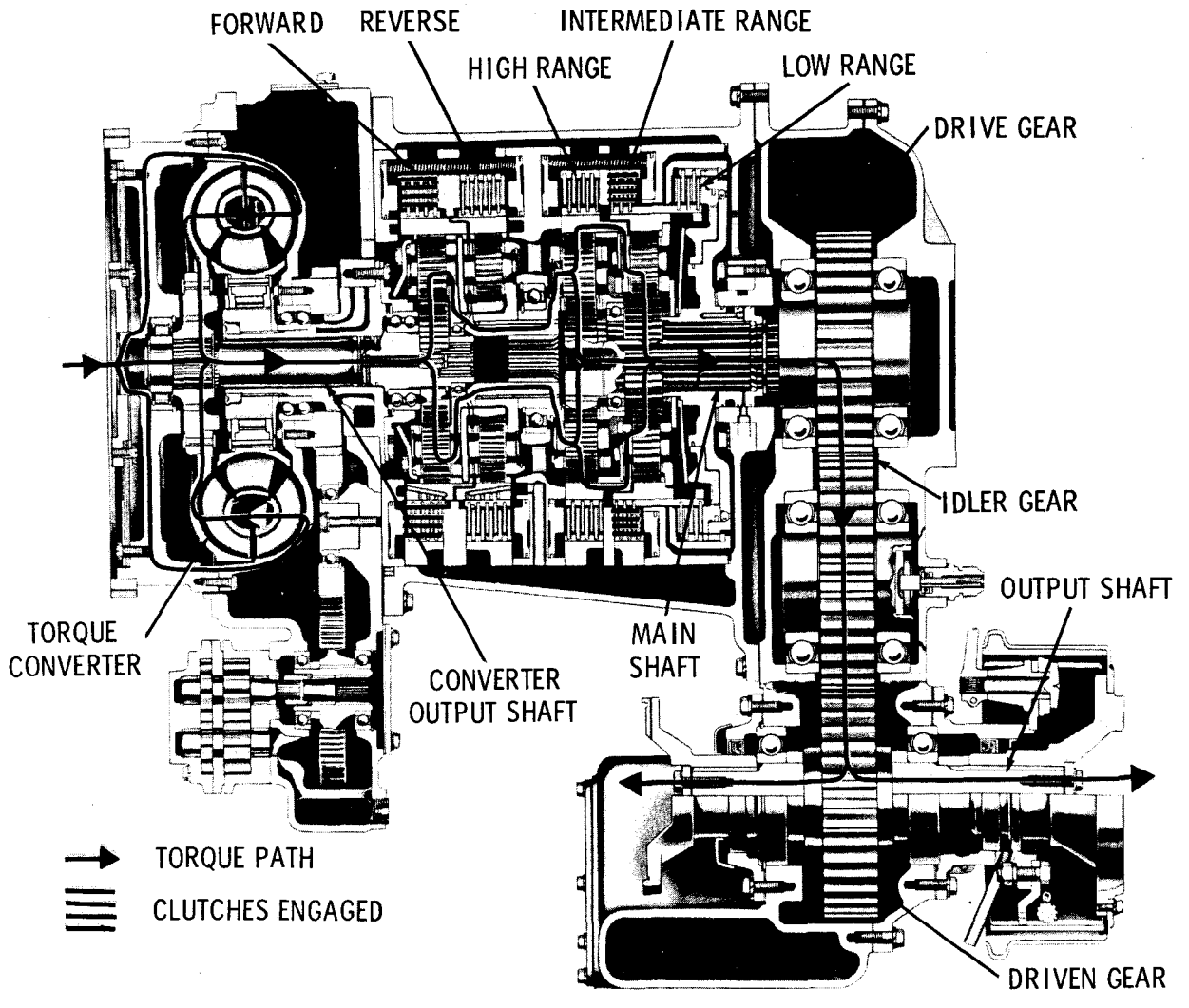


Fig. 2-3. Forward, intermediate range—torque path

(4) Thus, the overall speed reduction in standard transmissions is 3.04 to 1 (forward planetary ratio—3.04:1 x range gear ratio—1.00:1 x transfer gear ratio—1.00:1). With the optional transfer gears, the overall speed reduction ratio is 3.95 to 1 (forward planetary ratio—3.04:1 x range gear ratio—1.00:1 x transfer gear ratio—1.30:1).

d. Forward, Intermediate Range (fig. 2-3)

(1) The forward and intermediate-range clutches are engaged. Torque is transmitted to the high-range planetary carrier as explained in c(1), above, at a speed reduction of 3.04 to 1.

(2) The intermediate-range clutch holds the intermediate-range planetary ring gear stationary. This causes the intermediate- and high-range planetary gear sets to operate as a compound arrangement. The result of this action is the rotation of the intermediate-range planetary sun gear, and main shaft, at 0.496 to 1 overdrive ratio (range gear ratio).

(3) The remainder of the torque path is as explained in c(3), above. The overall speed reduction ratio in standard transmissions is 1.51 to 1 (forward planetary ratio—3.04:1 x range gear ratio—0.496:1 x transfer gear ratio—1.00:1). With the optional transfer gears, the overall speed reduction ratio is 1.96 to 1 (forward planetary ratio—3.04:1 x range gear ratio—0.496:1 x transfer gear ratio—1.30:1).

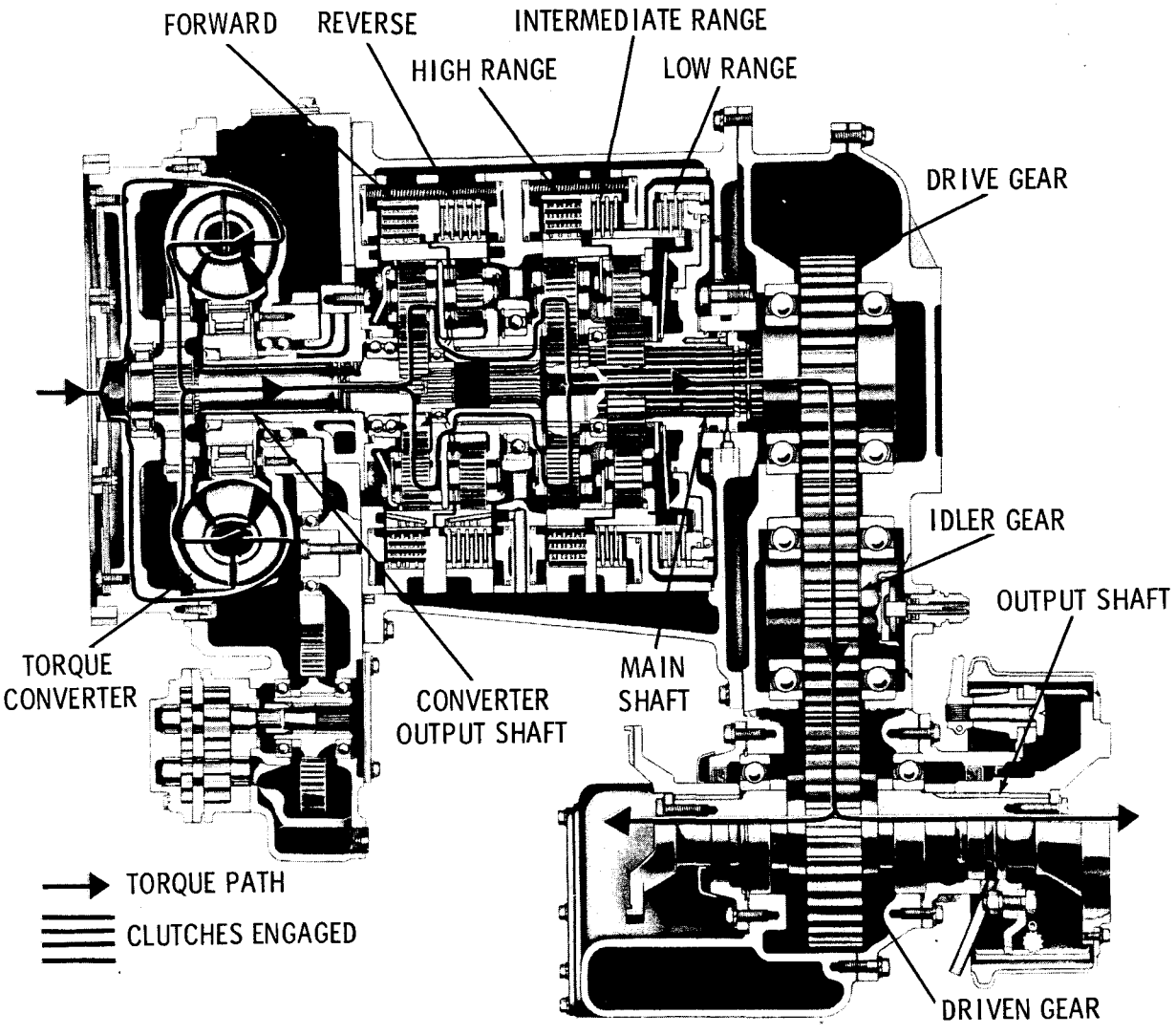


Fig. 2-4. Forward, high range—torque path

e. Forward, High Range (fig. 2-4)

(1) The forward and high-range clutches are engaged. Torque is transmitted to the high-range planetary carrier as explained in c(1), above, at a speed reduction of 3.04 to 1.

(2) The high-range clutch holds the high-range planetary ring gear stationary. The high-range planetary carrier, rotating within the stationary ring gear, overdrives the high-range planetary sun gear, and main shaft, at 0.251 to 1 ratio (range gear ratio).

(3) The remainder of the torque path is as explained in c(3), above. The overall speed increase ratio in standard transmissions is 0.76 to 1 (forward planetary ratio—3.04:1 x range gear ratio—0.251:1 x transfer gear ratio—1.00:1). With the optional transfer gears, the overall speed increase ratio is 0.99:1 (forward planetary ratio—3.04:1 x range gear ratio—0.25:1 x transfer gear ratio—1.30:1).

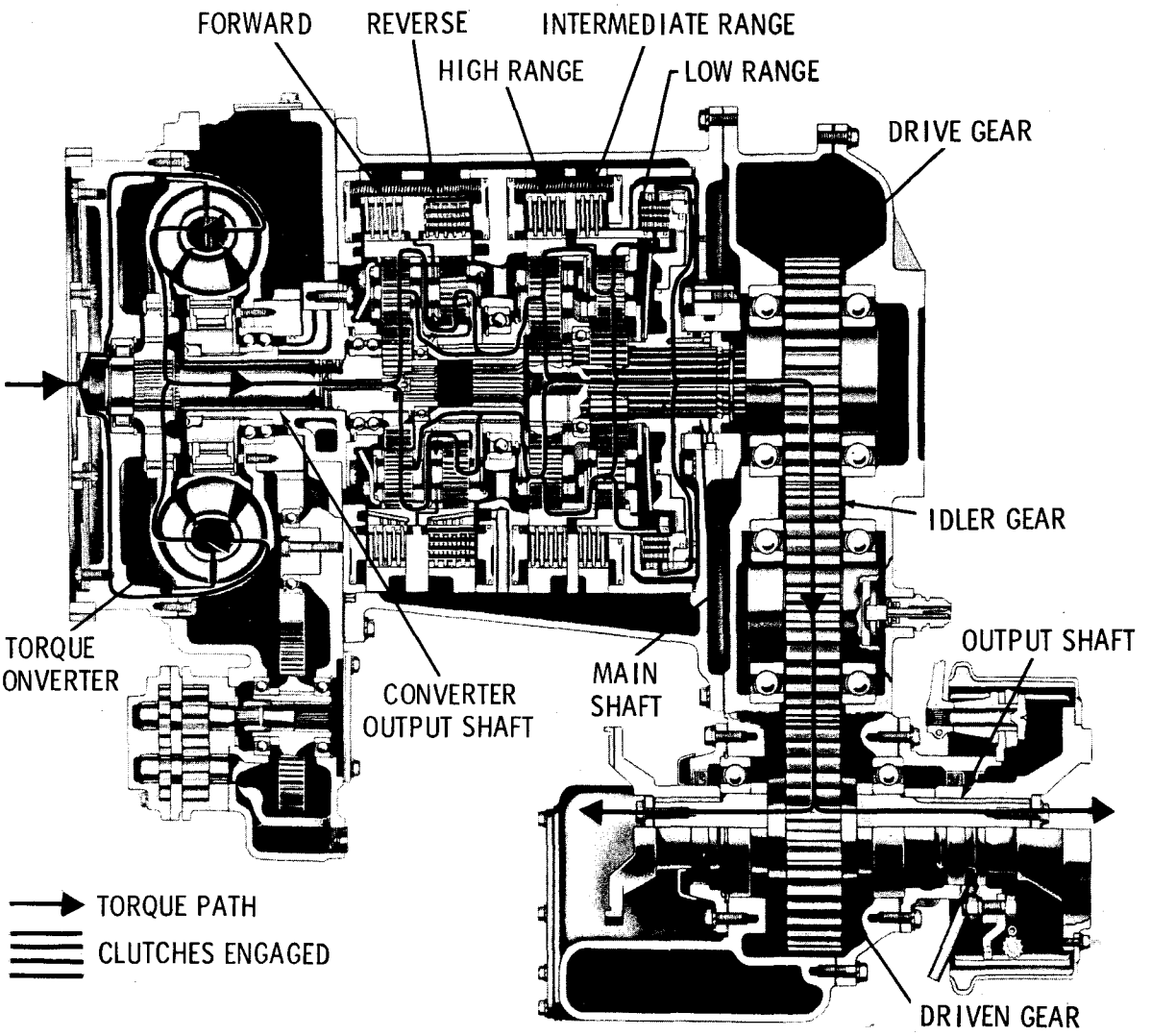


Fig. 2-5. Reverse, low range—torque path

f. Reverse, Low Range (fig. 2-5)

(1) The reverse and low-range clutches are engaged. The reverse clutch holds the reverse planetary ring gear stationary. The forward and reverse planetary gear sets operate as a compound arrangement wherein reversing actually occurs in the forward gear set, and further speed reduction occurs in the reverse gear set. The compounded gear sets have a speed reduction ratio of 3.17 to 1.

(2) The output member of the compounded gear sets is the reverse planetary carrier. The carrier is splined to forward planetary carrier, which transmits torque to the high-range planetary carrier.

(3) Torque is transmitted from the high-range planetary to the transmission output shaft, as explained in c(2) and (3), above. The overall speed reduction in standard transmissions is 3.17 to 1 (reverse planetary ratio —3.17:1 x range gear ratio—1.00:1 x transfer gear ratio—1.00:1). With the optional transfer gears, the overall speed reduction ratio is 4.12 to 1 (reverse planetary ratio—3.17:1 x range gear ratio—1.00:1 x transfer gear ratio —1.30:1).

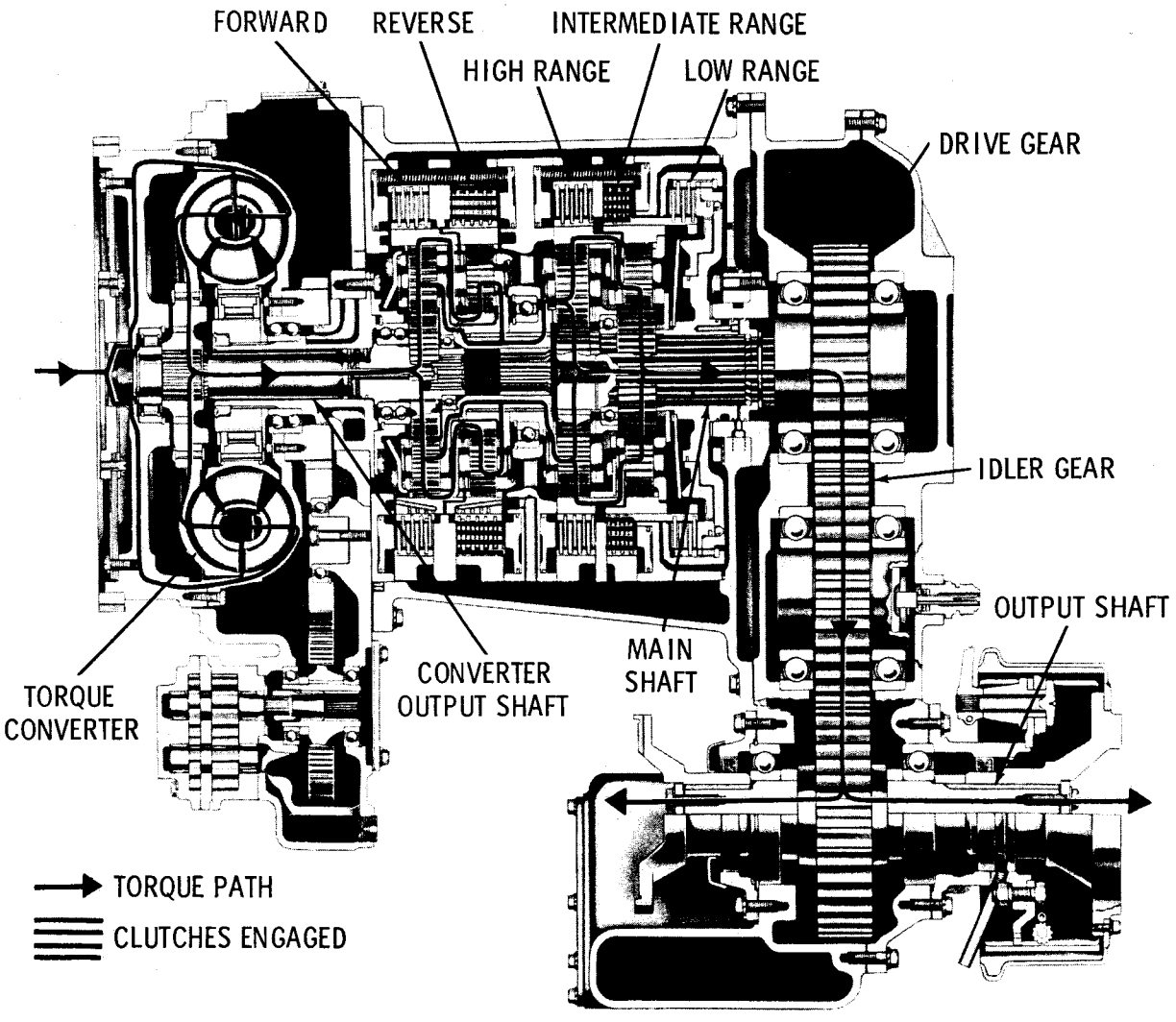


Fig. 2-6. Reverse, intermediate range—torque path

g. Reverse, Intermediate Range (fig. 2-6)

(1) The reverse and intermediate-range clutches are engaged. Torque is transmitted to the high-range planetary carrier as explained in f(1) and (2), above.

(2) Torque is transmitted from the high-range planetary carrier to the transmission output shaft as explained in d(2) and c(3), above.

(3) The overall speed reduction ratio in standard transmissions is 1.57:1 (reverse planetary ratio—3.17:1 x range gear ratio—0.496:1 x transfer gear ratio—1.00:1). With the optional transfer gears, the overall speed reduction ratio is 2.02 to 1 (reverse planetary ratio—3.17:1 x range gear ratio—0.496:1 x transfer gear ratio—1.30:1).

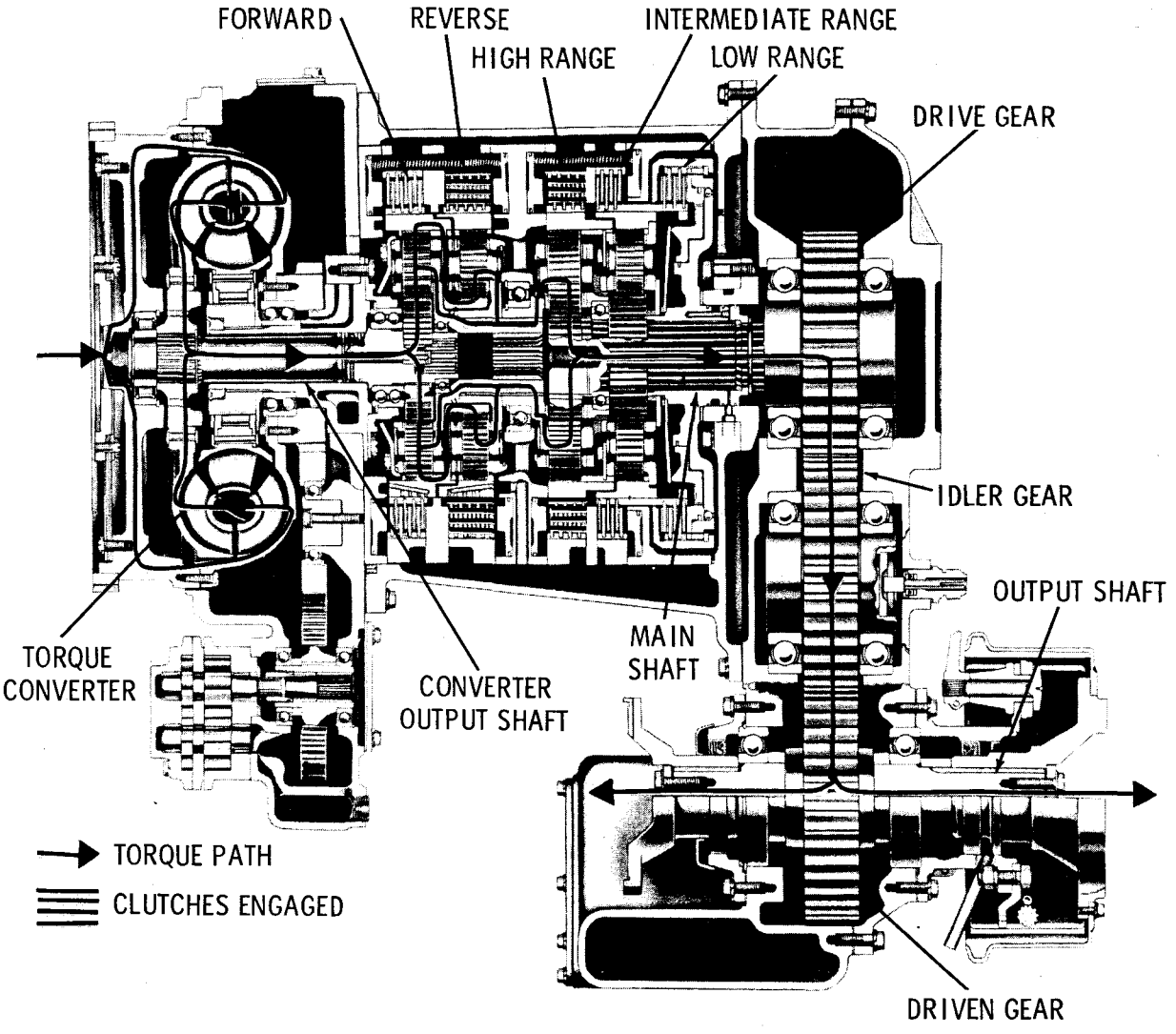


Fig. 2-7. Reverse, high range—torque path

h. Reverse, High Range (fig. 2-7)

(1) The reverse and high-range clutches are engaged. Torque is transmitted to the high-range planetary carrier as explained in f(1) and (2), above.

(2) Torque is transmitted from the high-range planetary carrier to transmission output shaft as explained in e(2) and c(3), above.

(3) The overall speed increase ratio in standard transmissions is 0.79 to 1 (reverse planetary ratio—3.17:1 x range gear ratio—0.251:1 x transfer gear ratio—1.00:1). With the optional transfer gears the overall speed reduction ratio is 1.03 to 1 (reverse planetary ratio—3.17:1 x transfer gear ratio—0.251:1 x transfer gear ratio—1.30:1).

Section 3. PREVENTIVE MAINTENANCE

3-1. SCOPE OF SECTION 3

This section outlines periodic and routine procedures required to maintain model CRT 5630 and 5631 transmissions in peak operating condition. Included are instructions for care of the oil system, adjustments of the transmission and control linkages, tests to determine condition, instructions for extended storage, and troubleshooting.

3-2. PERIODIC INSPECTIONS, CLEANING

a. Inspecting Exterior. 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 inspections. The transmission should be inspected for loose bolts, oil leaks, linkage troubles, and damaged or loose oil lines. Oil leaks that cannot be stopped by tightening parts require immediate attention. Linkage must be kept clean, properly adjusted, and 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 before removing it. Wash the breather thoroughly by agitating it in mineral spirits. Dry it with compressed air after cleaning.

Note: The breather is not furnished with the transmission, and various types may be used. If the breather manufacturer's instructions for breather care are given, follow them.

c. Water or Dirt in Oil. At each oil change, examine the oil that is drained for evidence of dirt or water. A normal amount of condensation will emulsify in the oil during operation 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 (vehicle radiator) is another sign of leakage. However, this may indicate leakage of oil from the engine into the cooling system. Any accumulation of sludge or soft dirt in the transmission sump should be removed by the use of "flushing" oil.

Note: When 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.

d. Metal Particles in Oil. Metal particles (except the usual minute particles normally trapped by the oil filters) indicate damage to transmission parts. When this condition is found, the transmission should be disassembled and closely inspected to find the source of metal particles. Metal contamination will require complete disassembly of the transmission, and cleaning of oil lines, cooler, filters, and all areas where such particles may lodge.

3-3. CHECKING OIL LEVEL

a. Cold Check. The cold check (before engine is started) is necessary to determine if there is sufficient oil in the transmission to safely start the engine. This check is especially important if the vehicle has been out of operation for a long period of time. In making the cold check, the oil level should be level with or above the Full petcock or plug (at rear of transfer gear housing - fig. 1-2).

b. Hot Check

(1) The oil level should be checked while the engine is running at 1000 rpm, after nor-

mal operating temperature (180 to 200°F) is reached. The transmission should be in neutral, and the vehicle should be standing on a level surface.

(2) Oil in the transmission sump should be level with the Full petcock or plug on the rear of the transfer gear housing (fig. 1-2). If the oil is not at the Full level, add sufficient oil to bring the level up to the Full point.

Note: In the hot check, if the oil level is above the Full level, drain the excess.

(3) Refer to paragraph 1-8 for the proper oil to be used in the transmission.

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 — indicated by discoloration and a strong odor. The breather will require more frequent cleaning when dirt and dust conditions are severe.

b. Oil Change. Generally, the oil should be changed after each 1000 hours of operation. When service is severe, refer to a, above. Refer also to paragraph 3-2, above, before changing oil. Do not operate a transmission which is filled with preservative oil except for minimum necessary time and distance (refer to para 3-9c, below).

3-5. CHANGING OIL, FILTERS

a. Draining Oil

(1) The transmission should be at operating temperature (180 to 200°F) when the oil is drained. Remove the plug at the lower rear of the transfer gear housing (fig. 1-2). When the oil has drained, remove the oil strainer from the transfer gear housing (fig. 1-2). Remove the plug near the bottom of each recess into which filter elements are installed (when filters are direct mounted). Remove the shell and stud assemblies and discard the filter elements and filter shell gaskets.

(2) Clean the oil strainer, filter shells, and other parts removed during the draining process. Install new filter elements and filter shell gaskets. Tighten the filter shell center studs to 25 to 35 pound feet torque. Install the oil strainer, using a new gasket. Retain the strainer with six 3/8-16 x 7/8-inch bolts, with lock washers. Tighten the bolts evenly to 26 to 32 pound feet torque.

(3) Install the plugs beneath the filter shells. Install the oil drain plug and gasket.

b. Filling Transmission

(1) Pour 9 to 10 gallons of the specified oil (refer to para 1-8) into the oil filler opening.

(2) Start the engine and let it run 2 minutes at idle speed. Then, with the engine still running, add sufficient oil to reach the Add (lower) petcock or plug (fig. 1-2).

(3) Operate the vehicle until normal operating oil temperature is reached. Then recheck the oil level (engine running at 1000 rpm-neutral) at the Full (upper) petcock or plug. Drain or add oil to establish the level at the Full mark.

3-6. TEMPERATURES, PRESSURES

a. Check Points. Figure 3-1 illustrates the points at which oil temperature and oil pressures may be checked. The vehicle may be equipped with a temperature gage, which indicates the converter-out oil temperature. And the vehicle may include a pressure gage, connected to the main-pressure check point. Clutch pressure, during normal operation, is approximately equivalent to main pressure. Therefore, the reading from the main-pressure gage may be considered the clutch pressures of the clutches engaged when the gage is read.

b. Normal Ranges. Refer to paragraph 1-8 for normal pressure ranges. Normal

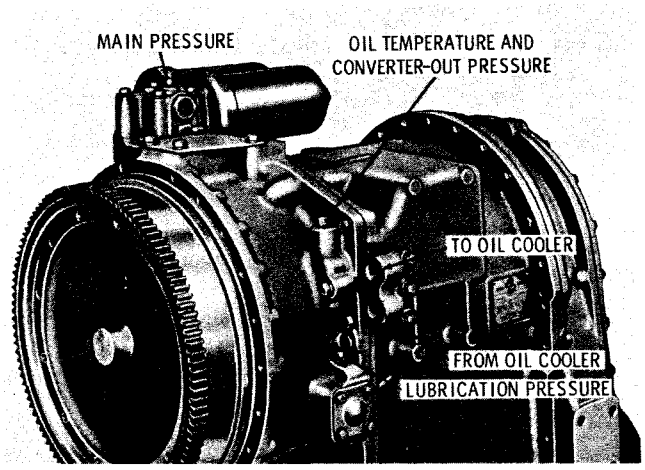


Fig. 3-1. Oil pressure, temperature and cooler check and connection points

operating temperature range is 180 to 200 degrees Fahrenheit (82 to 93 degrees Centigrade). The converter-out oil temperature should never be allowed to exceed 250°F (121°C).

c. Adjusting Main Pressure. When it is necessary to change main pressure, shims 45 (A, foldout 6) or shims 13 (B, foldout 6) may be added (to increase pressure) or removed (to reduce pressure). Install a sufficient number of shims to produce the main pressure indicated in paragraph 1-8.

3-7. LINKAGE ADJUSTMENTS

a. See Vehicle Manual. The specific design of control linkages for range selection, forward-and-reverse selection, power take-off operation, and parking brake actuation depends upon the installation. Control linkages are provided by the vehicle manufacturer. Therefore, only general instructions for linkage adjustments can be provided in this manual.

b. Forward-and-Reverse Selector Valve

(1) Some early transmissions have no detent components for positioning the forward-and-reverse selector valve. On these installations, the detents are in the vehicle linkage. To adjust the linkage, place the operator's control at neutral. Then place the control valve at a position which locates the center of the linkage pin hole in the valve stem a distance of 2.42 inches from the front (or rear) surface of the valve body (area surrounding valve oil seal). Next, adjust the linkage so that it freely connects to the control valve. Shifting to forward or reverse should then produce a lengthwise movement of the valve of 1.06 inches, in either direction from the neutral point.

(2) In later transmissions, place the operator's control at the neutral position. Place the forward-and-reverse selector valve at the neutral (center) detent position. Then adjust the linkage until it can be freely connected at the valve. Shift to forward, and then to reverse, noting if the operator's control is alined at the proper points when the forward-and-reverse detents in the control valve are engaged.

c. Range Selector Valve

(1) When the valve stem is toward the front of the transmission, push the valve all the way into the valve body, to the last detent position (neutral). Place the operator's control at the neutral position. Then adjust the linkage until it will freely connect to the control valve. Shift through all range positions, noting if the shift positions on the operator's control coincides with the control valve detent positions. The valve has 0.50-inch travel between each detent point.

(2) When the range selector valve stem is toward the rear of the transmission, the procedure is identical except that the valve is pulled all the way rearward in the valve body to reach the neutral detent point.

d. Rear-mounted PTO

(1) With linkage disconnected, push the PTO shifter shaft into the PTO housing to the "engaged" detent. Adjust the shaft lengthwise, by rotating it. Adjust the shaft until the center of the linkage pin hole is 0.83 inch from the face of the shifter shaft oil seal metal case. Then shift the operator's control to "engage," and adjust the linkage until it will freely connect to the shifter shaft.

(2) Connect the linkage, and shift from "engage" to "disengage," noting if the posi-

tions on the operator's control coincide with the detent points in the PTO.

e. Parking Brake

(1) Adjust the brake shoes for proper drum clearance by inserting a screwdriver or brake adjusting tool into a hole at the rear of the brake drum, and rotating the star wheel between the lower ends of the brake shoes. The brake linkage should be disconnected during this adjustment. The star wheel should be rotated until 0.010-inch thick feeler gages are held snugly between the adjustment ends of the shoes and the brake drum. Use two thickness gages simultaneously — one at each shoe.

(2) Adjust the vehicle brake linkage by releasing the hand lever fully, and adjusting the connecting linkage so that it can be freely connected to the apply lever on the brake. All slack should be taken out of the brake, without actually moving the brake shoes, when the linkage adjustment is made.

3-8. CHECK FOR LOCKED STATOR(S)

a. High Converter-out Temperature

(1) When the torque converter stator (or stators) is locked up, and will not freewheel, turbulence of the oil within the converter causes it to overheat. On models with two stators, the stators may be interchanged during assembly. This changes the direction of freewheel rotation, causing the stators to lock up when they should freewheel. Even when correctly installed, mechanical damage may lock the stators.

(2) In models having a single stator, the stator may be reversed during installation, preventing freewheel during low-load conditions. Or there may be mechanical damage, preventing any freewheel rotation.

b. Check Procedure

(1) Install a temperature gage in the oil temperature check point (fig. 3-1).

(2) Start the engine and allow it to idle until the transmission is warm.

(3) Stall the transmission output. If the transmission is in a vehicle, the output may be stalled by shifting to forward (or reverse) and to high range, and applying the vehicle brakes securely. Block the vehicle against movement for added safety.

(4) Increase the engine speed to full throttle and observe the temperature gage. When the temperature stabilizes at 225 to 230 degrees Fahrenheit, release the throttle momentarily and shift to neutral. Then increase engine speed again to full throttle.

Note: Do not permit converter-out temperature to exceed 250°F.

(5) After approximately 15 to 30 seconds, the temperature should drop rapidly to normal (180 to 200°F). A slow drop, or failure to drop to normal temperature indicates locked, interchanged, or reversed stator(s) as explained in a, above. A rapid drop in temperature indicates normal functioning of the stator(s).

(6) If stator trouble is indicated, refer to paragraph 3-11, Troubleshooting, below.

3-9. TRANSMISSION STALL TEST

a. Definition, Purpose

(1) A stall test determines conditions while the output shaft is prevented from rotating, and the engine is running at wide-open throttle (transmission clutches engaged). The stall test indicates whether or not the engine-transmission combination is performing satisfactorily, and will indicate which unit is malfunctioning.

(2) It will be necessary to refer to the engine-converter matched performance curve to determine the normal engine speed at stall. This data is available from either the engine manufacturer or Allison Division, GM. Stall tests may be made in any range, if necessary. However, tests in the lower ranges must be made with extreme caution because of the high torque delivered at the transmission output shaft. For this reason, a stall test should be made only in high range, unless conditions

warrant tests in other ranges. In high range, the forward-and-reverse selector valve may be in either position.

b. Procedure. With the transmission at normal operating temperature (180 to 200°F), connect a tachometer of known accuracy to the engine. Apply the vehicle brakes securely, start the engine and select either forward or reverse, and high range. Accelerate the engine to wide-open throttle. Record the engine speed at wide-open throttle, after reaching a stabilized engine rpm, and a converter-out temperature of 230 degrees Fahrenheit, minimum. Do not let converter-out temperature exceed 250 degrees Fahrenheit.

> Caution: Because of the rapid rise in oil temperature, the stall condition should not be maintained for more than 30 seconds at one time. Approximately 2 minutes should be allowed between tests for cooling. During this 2-minute period, the selector control should be moved to neutral and engine speed maintained. Momentarily throttle the engine back when shifting to neutral.

c. Results. Under stall test conditions, a comparison of the actual engine speed attained, with the established normal speed for such conditions, will indicate whether the engine or transmission is malfunctioning. To determine the desired engine speed at stall, refer to the engine-converter matched performance curve for the particular installation. Refer to paragraph 3-11, Troubleshooting, below, for possible causes of stall test deviations from normal.

> Note: Because of the effects of ambient temperature, altitude, engine accessory loss variation, etc., on power input to the converter, the actual engine stall speed may vary ± 150 rpm from the estimated value shown on the engine-converter match curve for normal installations. If variations within this range can be attributed to the variables cited above, the actual stall speed attained may be regarded as normal.

3-10. STORAGE

a. Period of Storage. The preparation to be made for storage of a transmission will depend upon the conditions under which it will be stored and the period of time involved. Under severe storage conditions, preservative measures should be used if the idle period is to exceed one week. The following procedures will give protection for 12 months. Repeat the process if the storage time exceeds this period.

b. Preservatives, Procedures. Protective oil must meet Government Specification MIL-L-21260, grade 1. Grease must meet Specification MIL-C-11796. Moisture-proof tape is required. Drain the oil while the transmission is at operating temperature (180 to 200°F). Refill the transmission with preservative oil and raise the transmission temperature to approximately 225°F. Shift the transmission through all selector positions to thoroughly distribute the oil.

> Note: Do not operate the vehicle to raise the temperature. Instead, apply the vehicle brakes securely, block the vehicle, shift to forward, high range, and run the engine at approximately 1000 rpm.

Stop the engine and allow the transmission to cool until the heat of the sump can be tolerated by hand. Tape all openings, and tape or grease all exposed metal surfaces. When outside storage is necessary, provide a ventilated, rain-proof covering.

c. Return to Service. Remove the moisture-proof tape and grease. Start the engine and run it at idle speed until the oil temperature reaches 150°F. Drain the oil, and refill, as outlined in paragraph 3-5, above.

> Note: Do not operate the vehicle while using preservative oil except for minimum necessary time and distance.

3-11. TROUBLESHOOTING

a. Importance. Troubleshooting is the systematic search for, and location of, mal-

functions 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 considered as being 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 CONVERTER-OUT PRESSURE	
1. Low oil level	1. Add oil (para 3-3)
2. External oil line leakage	2. Check, repair or replace cooler or filter lines
3. Clogged oil strainer	3. Clean strainer (para 3-5)
4. Defective oil pump	4. Repair or replace oil pump (para 5-3, 6-8, 7-3)
5. Aerated oil	5. a. Leaks in oil pump suction passages (check intake circuit) b. Improper oil level (para 3-3) c. Improper oil in system
(B) HIGH OIL TEMPERATURE	
1. Low oil level	1. Add oil (para 3-3)
2. High oil level	2. Drain excess oil (para 3-3)
3. Low water level in cooling system	3. Add water, check for leaks
4. Low converter-out pressure	4. Refer to A, above
5. Clogged or dirty cooler	5. Clean or replace cooler
6. Operating in too high range	6. Shift to next lower range
7. Stator(s) locked, reversed, interchanged	7. Refer to para 3-8. Repair converter (para 5-3, 6-11, 7-3)
8. Engine cooling system overheats	8. Refer to engine manual
(C) HIGH ENGINE SPEED AT CONVERTER STALL (refer to para 3-9 for converter stall test)	
1. Low oil level	1. Check oil (para 3-3)
2. Low converter-out pressure	2. Refer to A, above
3. High oil temperature	3. Refer to B, above
4. Slipping clutch	4. Overhaul transmission (sect. 5, 6, 7)
5. Mechanical failure	5. Overhaul transmission (sect. 5, 6, 7)

Cause	Remedy
(D) LOW ENGINE SPEED AT CONVERTER STALL (refer to para 3-9 for converter stall test)	
1. Low engine output torque or speed	1. Tune engine and check output
2. Converter element interference	2. Check for noise in converter at stall; overhaul converter (sect. 5, 6, 7)
3. Stators interchanged, reversed, or freewheel rollers not installed in stator(s)	3. Indicated by low torque at transmission output; assemble converter correctly (sect. 5, 6, 7)
(E) LOSS OF TORQUE AT TRANSMISSION OUTPUT	
1. Stators interchanged, reversed, or freewheel rollers not installed	1. Refer to D3, above
2. Low converter-out pressure	2. Refer to A, above
3. Low engine power	3. Refer to D, above
4. Clutch slipping	4. a. Check for low clutch pressure (refer to G, below) b. Check for worn piston seals (sect. 5, 6, 7)
5. Linkage not properly adjusted	5. Adjust linkage (para 3-7)
(F) NO POWER AT TRANSMISSION OUTPUT	
1. Linkage disconnected or improperly adjusted	1. Adjust linkage (para 3-7)
2. Low clutch pressure	2. Refer to G, below
3. Mechanical failure	3. Overhaul transmission (sect. 5, 6, 7)
(G) LOW CLUTCH PRESSURE	
1. Low oil level	1. Check oil (para 3-3)
2. Aerated oil	2. Refer to A5, above
3. Leakage of hydraulic system	3. Check external oil lines; check main pressure in affected range
4. Main-pressure regulator components failed or sticking	4. Replace or rebuild (para 6-3)
5. Oil pump failed	5. Replace or rebuild (para 6-8)
6. Linkage not properly adjusted	6. Adjust linkage (para 3-7)
(H) NO POWER TRANSMITTED IN ONE RANGE	
1. Low clutch pressure in one range clutch	1. Check piston seals; overhaul transmission (sect. 5, 6, 7)
2. Selector valve not shifting to range position	2. Adjust linkage (para 3-7)
3. Failed clutch or other components	3. Overhaul transmission (sect. 5, 6, 7)

Cause	Remedy
(I) HIGH CONVERTER-OUT PRESSURE	
1. Restricted oil cooler or lines	1. Check flow in cooler circuit, remove restriction
2. Lubrication regulator valve sticking	2. Inspect valve components, correct fault
(J) VEHICLE OPERATES NORMALLY IN LOW-RANGE FORWARD OR REVERSE, STALLS IN OTHER RANGES	
1. Failed low-range clutch (won't release)	1. Overhaul transmission (sect. 5, 6, 7)
(K) VEHICLE OPERATES NORMALLY IN INTERMEDIATE-RANGE FORWARD OR REVERSE, STALLS IN OTHER RANGES	
1. Intermediate-range clutch failed (won't release)	1. Overhaul transmission (sect. 5, 6, 7)
(L) VEHICLE OPERATES NORMALLY IN HIGH-RANGE FORWARD OR REVERSE, STALLS IN OTHER RANGES	
1. High-range clutch failed (won't release)	1. Overhaul transmission (sect. 5, 6, 7)
(M) VEHICLE OPERATES NORMALLY FORWARD, STALLS IN REVERSE	
1. Forward clutch failed (won't release)	1. Overhaul transmission (sect. 5, 6, 7)
(N) VEHICLE OPERATES NORMALLY IN REVERSE, STALLS IN FORWARD	
1. Reverse clutch failed (won't release)	1. Overhaul transmission (sect. 5, 6, 7)

Section 4. GENERAL OVERHAUL INFORMATION

4-1. SCOPE OF SECTION 4

This section provides information required before proceeding with the overhaul of the transmission. Tools and equipment for overhaul are discussed. Replacement parts and service kit information is provided. The importance of careful handling and cleanliness is stressed. Helpful information on cleaning and inspection is given. General information on the removal and installation of the transmission is included. Standard torque specifications for bolts and nuts are tabulated. Information on wear limits and spring specifications is referenced.

4-2. CHANGES IN MODELS, PROCEDURES

The release of new assemblies and/or product improvements may require new or different overhaul procedures. Major changes will be covered in information supplementary to this manual. Consult your dealer or distributor for the latest information. Give the model, assembly part number and serial number stamped on the transmission nameplate (refer to para 1-4).

4-3. TOOLS, EQUIPMENT

a. Special, Improvised Tools. Figure 4-1 illustrates the special and improvised tools which are helpful in the overhaul of the transmission. Clutch spring compressor J 7470, and spanner wrench J 6534 may be ordered from Kent-Moore Organization, Inc., 28635 Mound Road, Warren, Michigan 48092. Other tools in figure 4-1 may be fabricated, or similar items used or adapted for use.

b. Common Tools, Equipment. In addition to the ordinary tools which the mechanic uses, the following items should be available.

(1) Chain hoist (at least 1 1/2-ton capacity).

(2) Suitable disassembly and assembly table (fig. 4-2).

(3) Press (for removal, installation of press-fit parts).

(4) Supply of wood blocks.

(5) Clean wiping cloths (do not use linty waste).

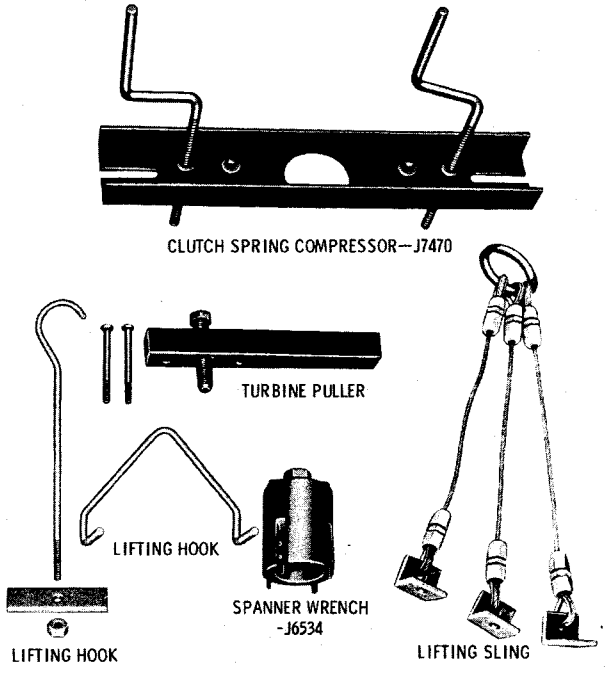


Fig. 4-1. Special and improvised tools

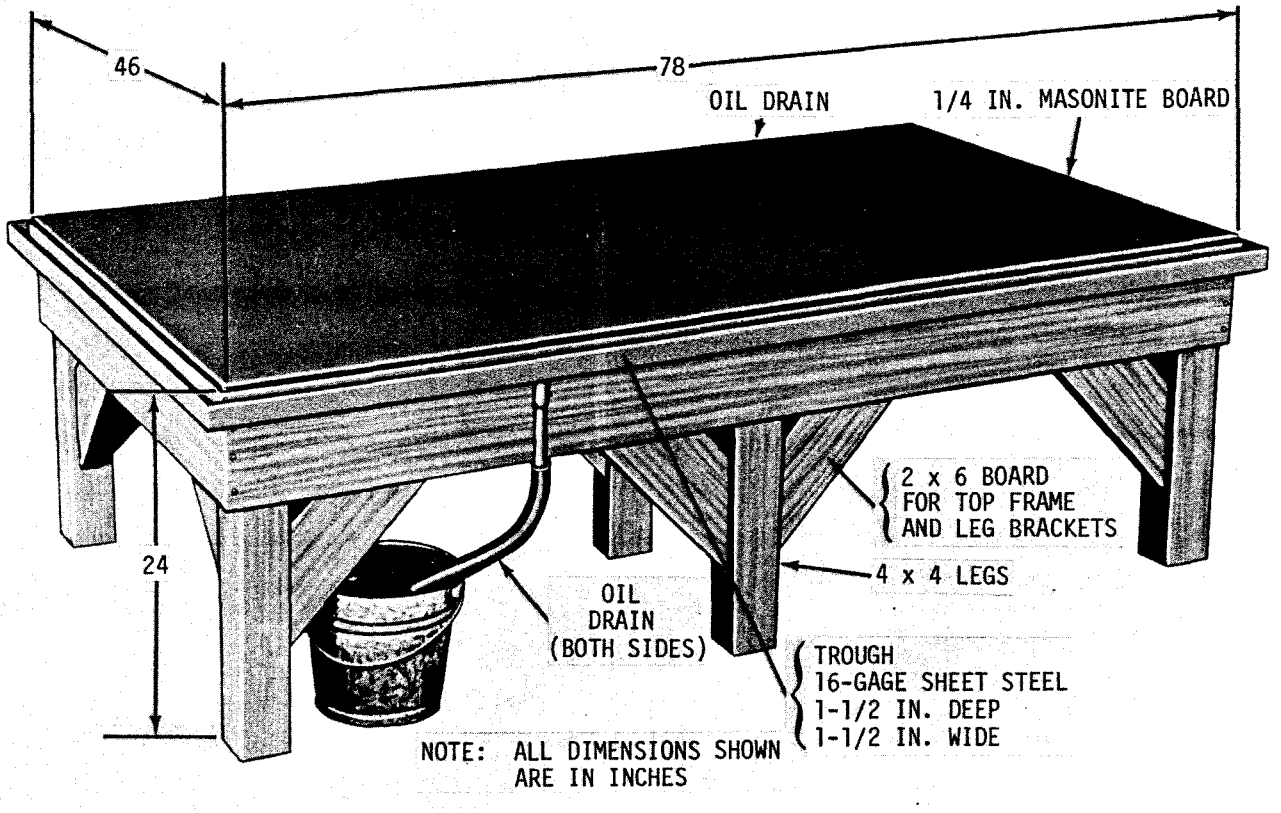


Fig. 4-2. Disassembly and assembly table

(6) Parts receptacles.

(7) Cleaning equipment (brushes, solvent, etc.).

(8) Torque wrenches.

(9) Oil-soluble grease.

(10) Dry ice (for cooling press-fit spindles, etc.).

(11) Hot plate or heating equipment to provide oil at 300°F (for heating bearings and interference-fit flanges before installation).

(12) Snap ring pliers.

(13) Gear and bearing pullers.

4-4. REPLACEMENT PARTS

a. Ordering Information. Refer to paragraph 1-4, for information on ordering parts or service kits.

b. Parts Normally Replaced. The following parts are normally replaced at each transmission rebuild.

(1) Gaskets.

(2) Cotter pins.

(3) Lock strips.

(4) Washers or snap rings damaged by removal.

(5) Oil seals (when removed).

Caution: Do not burn discarded Teflon seals; toxic gases are produced by burning.

c. Service Kits. Make use of the repair and overhaul kits which are available for certain transmissions and subassemblies. See paragraph 1-4 on how to order.

4-5. CAREFUL HANDLING

During all rebuild procedures, parts and subassemblies must be handled carefully to prevent nicking, scratching and denting. Parts which fit together closely but with operating clearance will stick if damaged only slightly. Parts which depend upon smooth surfaces for sealing may leak if scratched. Such parts should be carefully handled and protected during removal, cleaning, inspection and installation.

4-6. CLEANING, INSPECTION

a. Dirt Causes Malfunction. All parts must be clean to permit effective inspection. At assembly, it is very important that no dirt or foreign material be allowed to enter the transmission. Even minute particles can cause the malfunction of close-fit parts, such as valves.

b. Cleaning Parts

(1) All the metallic parts of the transmission except bearings should be cleaned thoroughly with volatile mineral spirits or by the steam-cleaning method. Do not use caustic soda solution for steam cleaning.

(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 wire back and forth through the passages and flushing with spirits. Dry the passages with compressed air.

(4) Examine parts, especially oil passages, after cleaning, 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 spin bearings while they are not lubricated.

d. Keeping Bearings Clean. Since the presence of dirt or grit in ball bearings is usually responsible for bearing failures, it is important to keep bearings clean during removal and installation. 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 the 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.

e. Inspecting Cast Parts, Machined Surfaces

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

(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 soft stone. If scratches are deep, replace the defective part.

(4) Inspect threaded openings for damaged threads. Chase damaged threads with the correct size used 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 the defective parts.

f. 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 a defective bearing's housing and shaft for grooved, burred or galled conditions that would indicate that the bearing has been turning in its bore 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 in an oil bath or on an electric hotplate.

Note: Bearings must be heated long enough for sufficient expansion. Heating time is determined by the size of the bearing; 45 minutes is sufficient for the largest bearing in this transmission.

Coat the mating surfaces with white lead and use the proper size installation sleeve and a press to seat the bearing.

(5) If a bearing must be removed or installed without a sleeve, 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.

g. Inspecting Bushings, Thrust Washers

(1) Inspect bushings for scores, burs, roundness, 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.

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. It is much less expensive to replace such parts than to replace converter elements or transmission gearing which can fail due to defective bearings, bushings, or thrust washers.

h. Inspecting Oil Seals, Gaskets

(1) Inspect seal rings for cuts and hardness. Replace seal rings if these defects are found.

(2) When replacing lip-type oil seals, the spring-loaded side must be 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 shaft installation and to provide lubrication during initial operation.

(3) Replace all composition gaskets.

(4) Inspect hook-type seal rings for wear, broken hooks, and distortion.

(5) Install a new hook-type seal ring if ring shows wear on outside diameter or excessive side wear.

(6) The sides of the seal ring must be smooth (0.005-inch maximum side wear). The sides of the shaft groove (or the bore) in which the seal ring fits should be smooth (50 microinches equivalent) and square with the axis of rotation within 0.002 inch. If the sides of the grooves have to be reworked, install a new seal ring.

i. Inspecting Gears

(1) Inspect gears for scuffed, nicked, burred or broken teeth. If the defect cannot be removed with a soft 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 face of gears for scores, scratches, and burs. Remove such defects with a soft stone. If scratches and scores cannot be removed with a soft stone, replace the gear.

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

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

l. Inspecting Snap Rings. Inspect all snap rings for nicks, distortion, and excessive wear. Replace snap ring if any of these defects is found. The snap ring must snap tight in its groove for proper functioning.

m. Inspecting Springs. Inspect 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. Refer to the spring chart at the end of Section 8.

n. Inspecting Clutch Plates

(1) Inspect resin-graphite or bronze-faced steel 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, distortion, imbedded metal, 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. 4-3). Discard plates having excessive cone (refer to wear limits, Section 8). When assembling a clutch pack, soak plates in type C 2 oil for at least 2 minutes and make sure that each plate is installed so that its cone is in the same direction as the cone of the adjacent plates.

4-7. REMOVING (OR INSTALLING) TRANSMISSION

a. Drain Oil. Drain the oil from the transmission before removal from vehicle. For better drainage the transmission should be warm and allowed to drain overnight. Replace the drain plug. Since applications will differ, consult the vehicle service manual for specific instructions for transmission removal and installation.

b. Check Linkages, Lines. Make sure that all linkages, controls, cooler and filter lines, temperature and pressure connections, input and output couplings, and mounting bolts are disconnected before transmission removal. Oil lines should be carefully placed out of way of damage and all openings covered to keep them clean.

c. Clean Transmission. Clean the exterior of the transmission. Steam cleaning should be followed immediately by disassembly, since condensation, allowed to remain in the transmission, could cause rust.

d. Reconnect at Installation. At installation, all items removed should be reconnected.

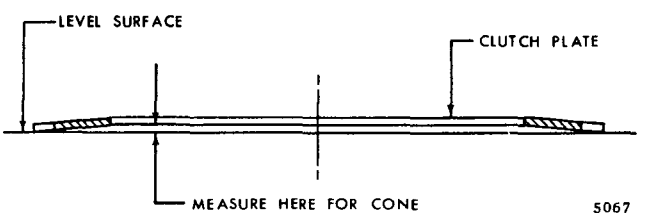


Fig. 4-3. Method of determining cone of clutch plate

Two 3/4-10 tapped openings are provided at the top of the transmission housing for lifting the assembly. Bolts or eyebolts may be installed in these openings.

4-8. REMOVING (OR INSTALLING) DRIVE FLANGES

a. Removing

(1) When interference-fit drive flanges are used, they should be removed before further disassembly is started. A heavy-duty puller kit is required. The transmission drive flanges must be prevented from rotating while the puller is used.

(2) A steel plate may be bolted to the ears of the flange to provide a grip for the puller jaws. Drill the center of the plate to let the puller screw pass through to the transmission shaft. Use bolts to fasten the plate at all bolt locations on the flange. Such a plate will prevent distortion of the flange during the pulling process. The plate should be at least 1-inch thick. It may be tapped for a puller screw in the center if a puller kit is not available. The puller screw should be at least 1 inch in diameter, should be heat treated, and have a fine thread (1-14).

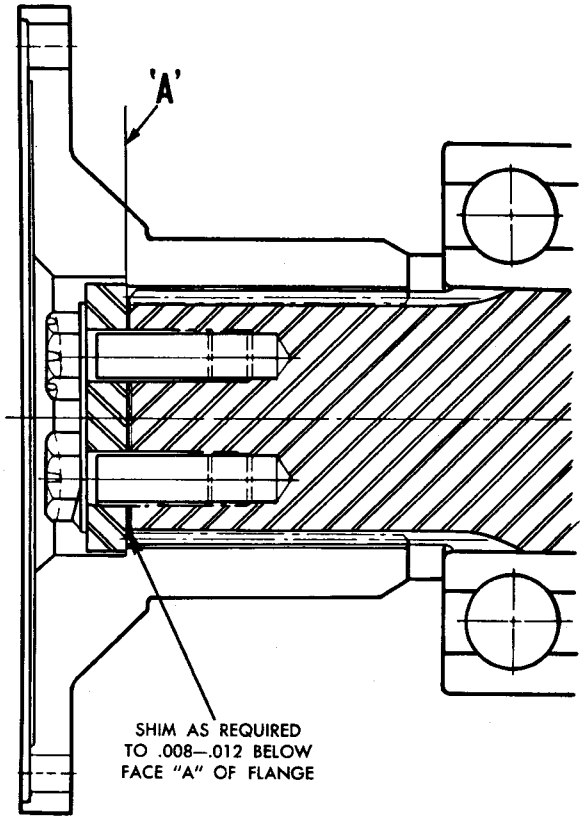


Fig. 4-4. Measurement to determine thickness of drive flange shims

b. Installing

(1) Be sure that spacers or other parts are in place on the shaft which receives the flange. Inspect the shaft and flange splines for dirt, paint, rust, burs and rough spots. Remove any of these.

(2) Coat the shaft splines with light bearing grease. Grease the oil seal lip. Heat the flange to approximately 300 degrees F for 45 minutes.

(3) While it is hot, quickly install it on the shaft. Seat it immediately and install the nut, or bolts and washer with lock strip, which retain it. Tighten the nut or bolts before the flange cools.

Note: If a nut is used to retain the flange, installation is complete at this point. If bolts retain the flange, continue with the procedures in (4) through (8), below.

(4) Remove the flange bolts and washer.

(5) Measure from the flange washer seat in the output flange (face A) to the end of the output shaft (fig. 4-4).

(6) Subtract 0.010 inch from the dimension obtained in (3), above. The remainder is the thickness of the shim pack required.

(7) Select shims which will equal this thickness (within ± 0.002 inch).

Note: Shims are available in 0.005-inch thickness (P/N 6772141), and 0.025-inch thickness (P/N 6772140). Combine these, as required, to obtain the proper pack.

(8) Install the shim pack, flange washer, lock strip, and two flange bolts. Tighten the bolts to 96 to 115 pound feet. Bend the lock strip against flats on the bolt heads.

4-9. WEAR LIMITS

Refer to Section 8 for general and specific information covering parts fits, clearances and wear limits.

4-10. SPRING SPECIFICATIONS

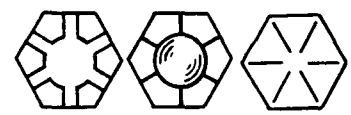
Refer to the spring chart in Section 8 for spring identification and specifications.

4-11. TORQUE SPECIFICATIONS

Unless otherwise specified in the text of Sections 5 through 7, or in figure 6-10, the torque specifications in the following chart will apply to all assembly procedures. Refer to figure 6-10 for convenient reference to the torque required to tighten all threaded items visible in the transmission cross section.

STANDARD TORQUE SPECIFICATIONS

(all torque values, given in pound feet)

Size	Threads per inch	Standard heat-treated bolts and screws	Special heat-treated bolts, screws, Allen-head screws and self-locking capscrews	Nuts
				
1/4	20	9-11	9-11	
	28	10-12	10-12	
5/16	18	13-16	17-20	
	24	14-18	19-23	
3/8	16	26-32	36-43	
	24	33-40	41-49	
7/16	14	42-50	54-65	
	20	50-60	64-77	25-30
1/2	13	67-80	81-97	
	20	83-100	96-115	
5/8	11	117-140	164-192	
	18	134-160	193-225	134-160
3/4	10	180-210	284-325	
	16	215-250	337-385	125-165

Section 5. DISASSEMBLY OF TRANSMISSION INTO SUBASSEMBLIES

5-1. SCOPE OF SECTION 5

a. Models Covered. This section describes the disassembly of CRT 5630 and CRT 5631 models into detail parts and subassemblies. Subassemblies, when necessary, are rebuilt as outlined in Section 6.

b. Disassembly Sequence

(1) The disassembly of all CRT 5630 and 5631 models, regardless of optional equipment, is combined into a single, continuous sequence. Specific models are referenced only when procedures apply to specific models. Notes and subject titles indicate optional equipment and/or component groups.

(2) Any procedure not applicable to the transmission being disassembled may be passed over, and disassembly continued with the next applicable procedure.

c. Illustrations

(1) Disassembly is referenced primarily to photographs. When necessary, procedures are references to parts exploded views (foldouts 4 through 14) at the back of the manual.

(2) In addition to the photographs in this section, and exploded views in the back of the manual, there are two cross-section views (foldouts 1 and 2) in the back of the manual. These show the assembled relationship of parts, and are helpful in determining the most expedient method of removing given components during partial disassembly.

5-2. PREPARATION FOR DISASSEMBLY

a. Drain oil from the transmission by removing the plug at the rear of the transfer gear housing (fig. 1-2). Replace the plug.

b. Clean the exterior of the transmission.

c. Refer to Section 4 for information necessary to carry out overhaul procedures.

d. Position the transmission, bottom downward, on the floor. Block it safely and securely in a level position. Use wood blocks and/or jacks as required.

5-3. DISASSEMBLY PROCEDURES

a. Removing Exterior Components

(1) Remove three bolts and lock washers which retain the oil cooler manifold. Remove the manifold and gasket (fig. 5-1).

(2) Remove four bolts and lock washers which retain the lubrication regulator valve cover. Remove the cover and gasket (fig. 5-2).

(3) Remove the valve components shown in figure 5-3. Separate the components, but tie the shims together in a pack to ensure that the same shim thickness will be used in reassembly of the transmission.

(4) Remove six bolts and lock washers which retain the oil filter base assembly. Remove the oil filter base assembly and gasket (fig. 5-4).

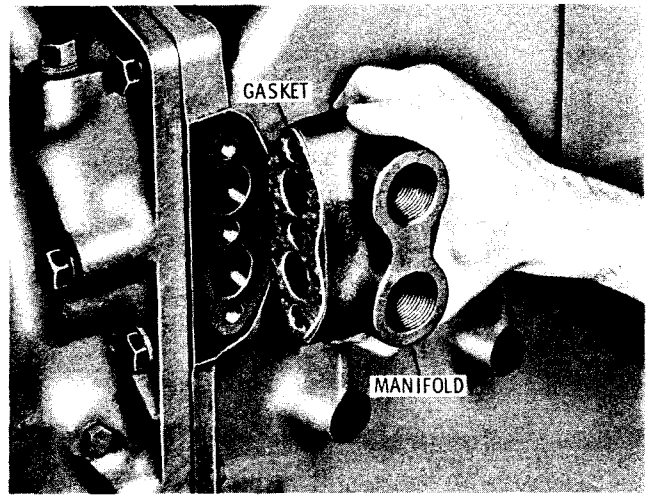


Fig. 5-1. Removing oil cooler manifold

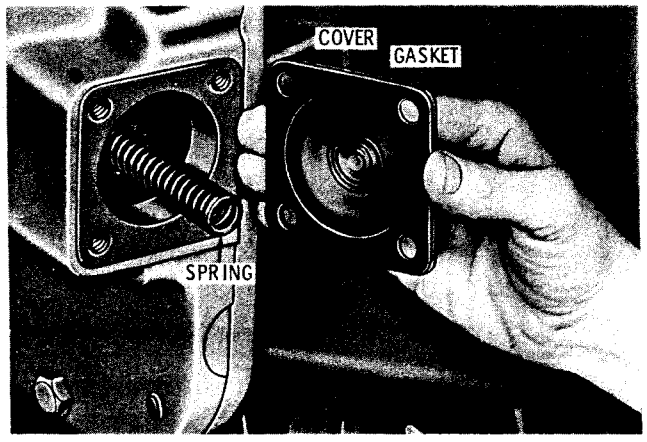


Fig. 5-2. Removing lubrication regulator valve cover

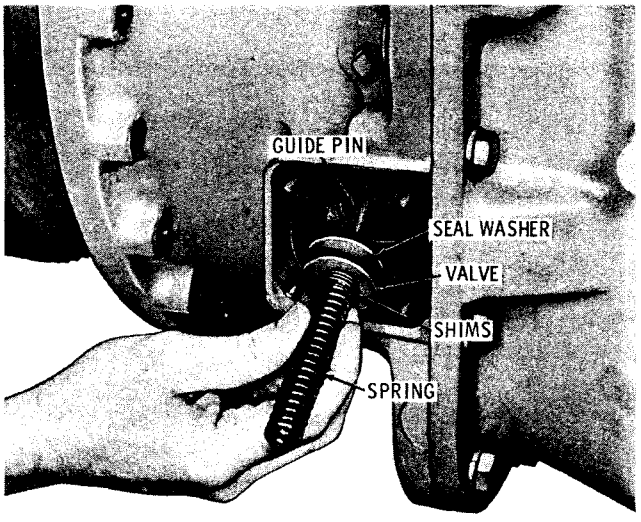


Fig. 5-3. Removing lubrication regulator valve components

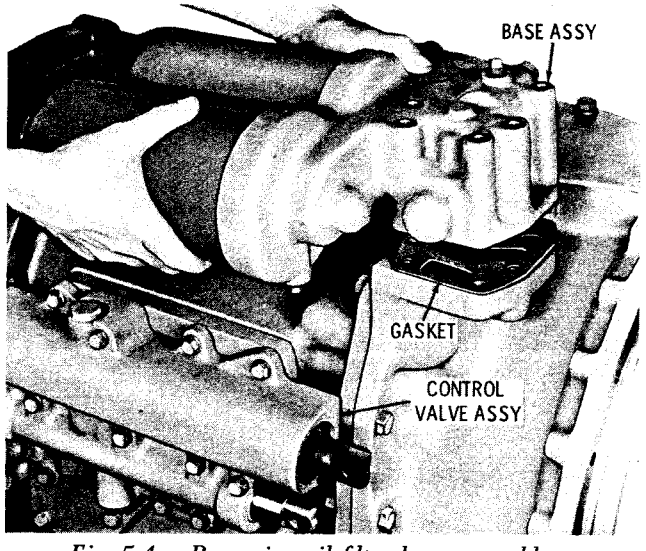


Fig. 5-4. Removing oil filter base assembly

Note: Models which have remote-mount oil filters use a filter adapter assembly at this location. It is removed in the same manner as the filter base assembly. Refer to paragraph 6-3 for rebuild of either assembly.

(5) Remove 12 bolts and lock washers which retain the control valve assembly. Remove the valve assembly and gasket (fig. 5-4). Refer to paragraph 6-4 for rebuild of the control valve assembly.

(6) Remove two bolts and lock washers which retain the oil transfer plate. Remove the transfer plate and gasket (fig. 5-5). Do not remove the two anchor bolts from the transmission housing.

(7) On models which include a governor drive (refer to items 37 through 51, foldout 14), remove bolts 48 and lock washers 47. Then remove the governor drive components and gasket 45 or 50. Refer to paragraph 6-5 for rebuild of the governor drive.

(8) On models which include a power takeoff at the rear of the transfer gear housing

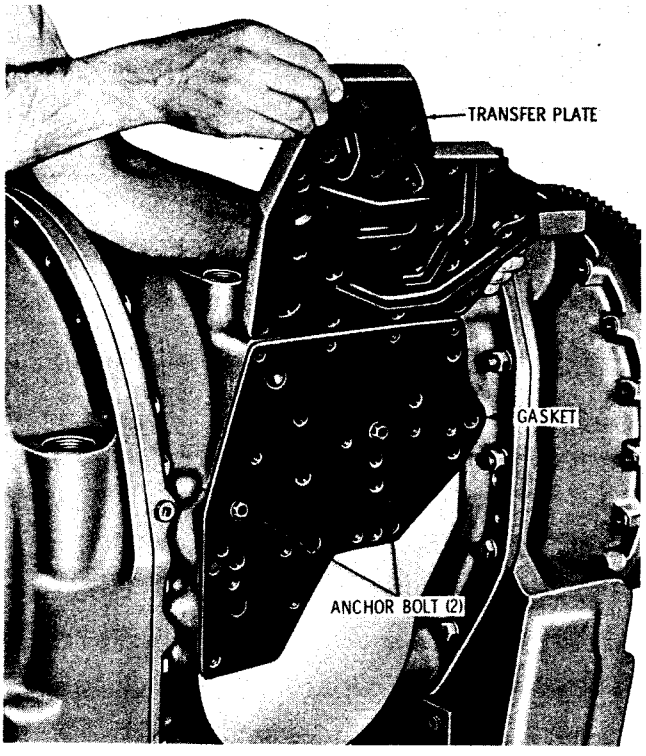


Fig. 5-5. Removing oil transfer plate

(refer to items 8 through 36, foldout 14), remove six bolts 35 and washers 36. Remove the power takeoff components and gasket 11. Refer to paragraph 6-6 for rebuild of the power takeoff.

b. Separating Transmission from Transfer Gear Housing

(1) Place a wood block at the rear of the transfer gear housing, under the brake drum (or rear output flange, or bearing retainer if not equipped with a brake), to prevent its tipping rearward (fig. 5-6).

(2) Remove 27 bolts and lock washers which attach the transmission housing to the transfer gear housing. Install two of the bolts, to be used as jackscrews, into the threaded holes in opposite sides of the transmission housing (fig. 5-6).

(3) Tighten the jackscrews to separate the transmission housing from the transfer gear housing. Attach a lifting sling as shown in figure 5-6. Support the transmission housing on the sling, and remove the blocks supporting it.

(4) Remove the suspended transmission housing from the transfer gear housing (fig. 5-7). Remove the cork gasket (prior to S/N 26374), or flat gasket (starting with S/N 26374).

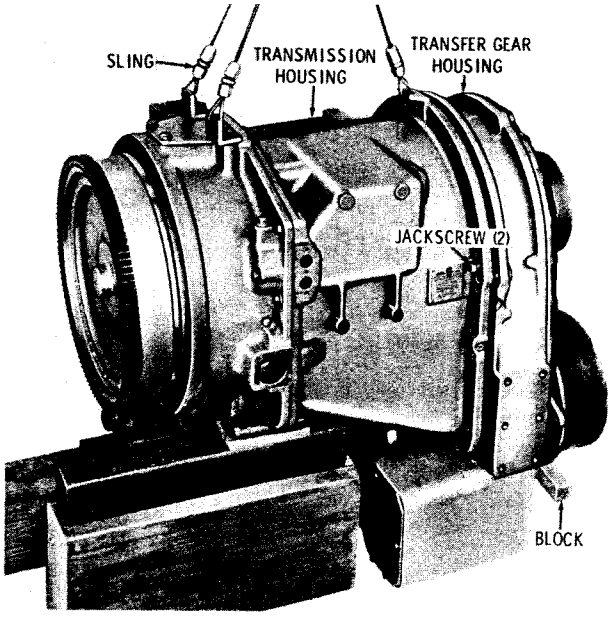


Fig. 5-6. Separating transmission housing from transfer gear housing

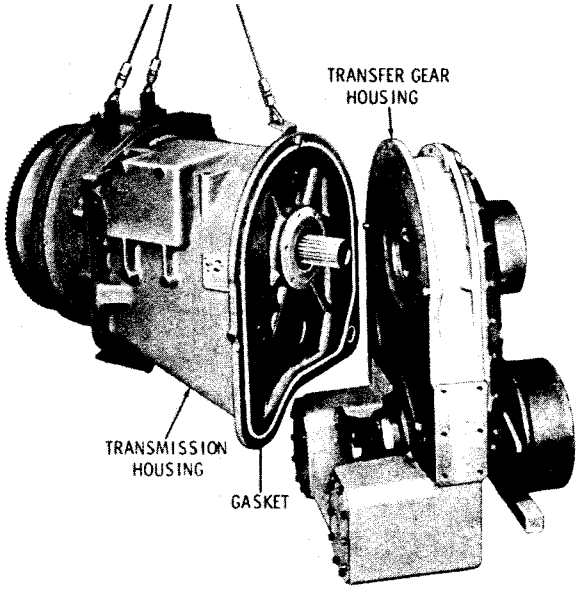


Fig. 5-7. Transmission housing separated from transfer gear housing

(5) Remove the snap ring from the main shaft (fig. 5-8). Remove the oil seal from the main shaft (fig. 5-9). Remove the seal ring from the main shaft, and the seal ring from the oil seal.

(6) On transmissions with serial numbers prior to 26374, remove the seal ring near the lower-right side of the transmission housing (fig. 5-8).

(7) Position the transmission housing, rear downward, on wood blocks so that the main shaft is clear of the work surface.

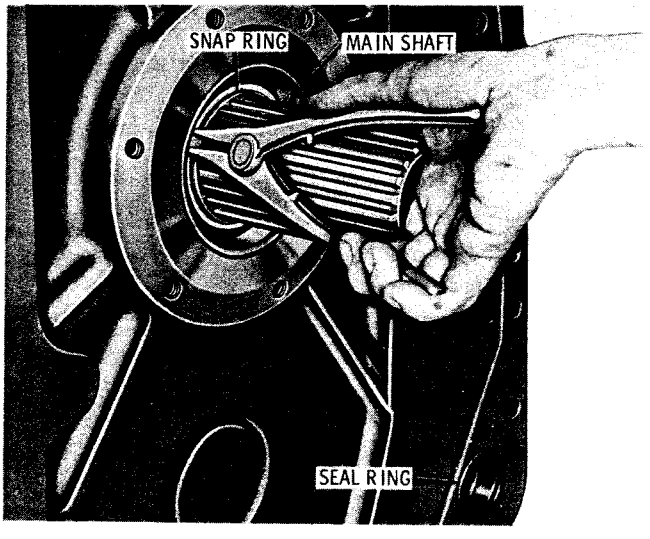


Fig. 5-8. Removing main shaft snap ring

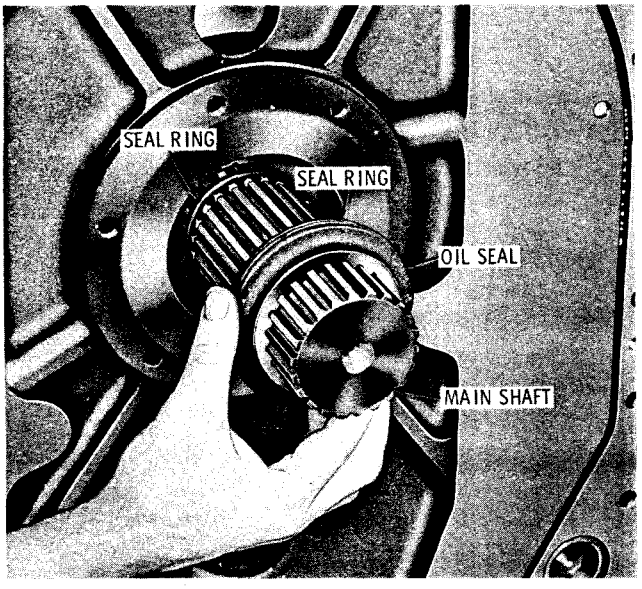


Fig. 5-9. Removing main shaft oil seal components

c. Removing Input Components (remote-mount models)

(1) Flatten the lock strip which retains the input flange bolts (fig. 5-10). Remove the bolts, lock strip, retaining washer, and shims (if used) beneath the washer.

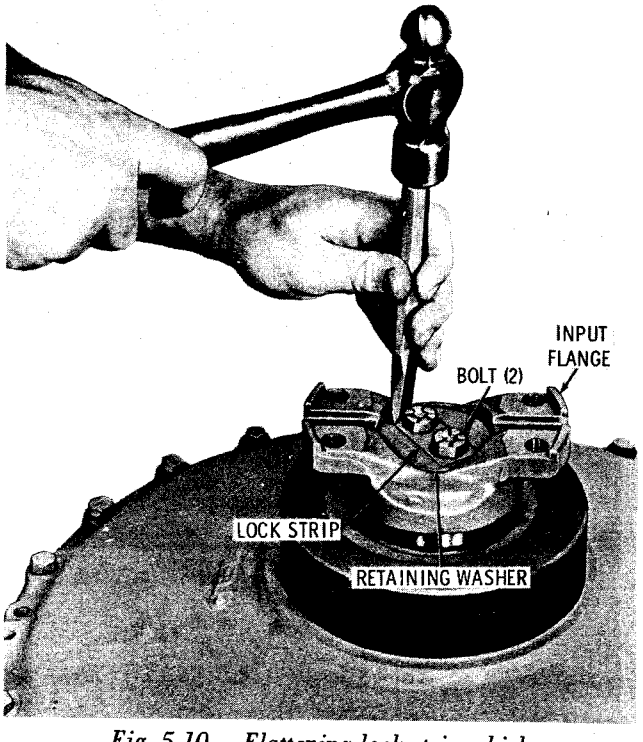


Fig. 5-10. Flattening lock strip which retains input flange bolts

(2) Remove the input flange. If the flange is interference-fitted, refer to paragraph 4-8a for removal instructions.

(3) Remove 21 nuts, lock washers and bolts which retain the transmission front cover (fig. 5-11). Install two bolts, as jackscrews, into the cover. Tighten the bolts to loosen the cover.

(4) Remove the cover and gasket (fig. 7-46). Do not remove the oil seal from the cover unless replacement is necessary. Refer to paragraph 6-7 for replacement of the cover oil seal.

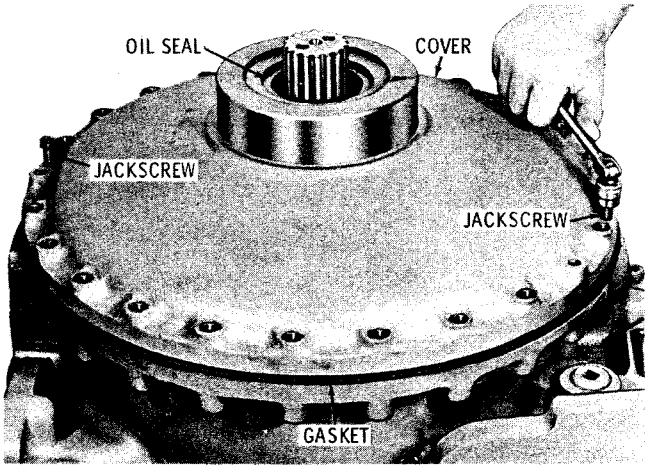


Fig. 5-11. Loosening transmission front cover

d. Removing Converter Housing, Converter Components

(1) Remove six bolts and lock washers which retain the input pressure and scavenge pump assembly. Remove the pump assembly and gasket (fig. 5-12). Refer to paragraph 6-8 for pump assembly rebuild procedures.

Note: Transmissions having serial numbers after 34818 include screen 21, (A, foldout 6), installed in the pump intake port. Remove the screen.

(2) Remove the pump drive coupling by lifting it out of the pump drive hub (fig. 5-12).

(3) Remove the four bolts and lock washers which retain the converter housing access cover (fig. 7-45). Remove the cover and gasket.

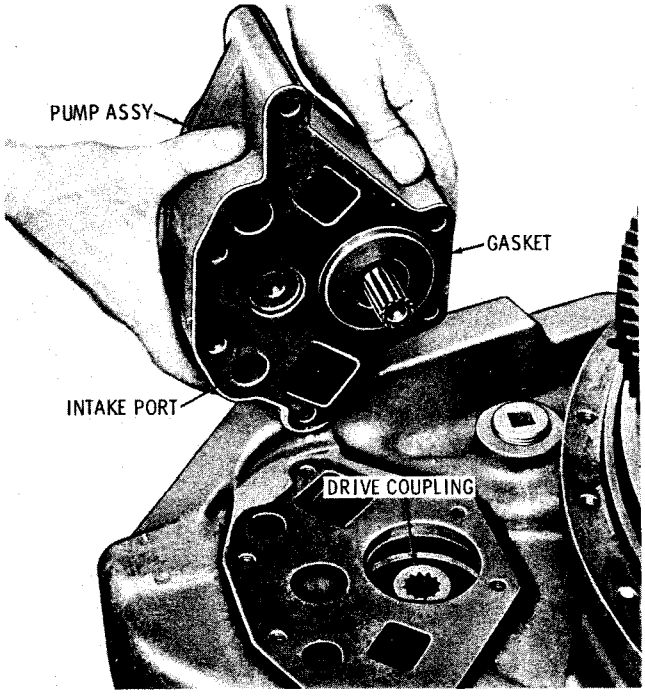


Fig. 5-12. Removing input pressure and scavenge pump assembly

(4) Working through the access opening in the converter housing, and using a 9/16-inch wrench, remove 36 self-locking bolts and flat washers which retain the flywheel or converter drive cover (fig. 5-13).

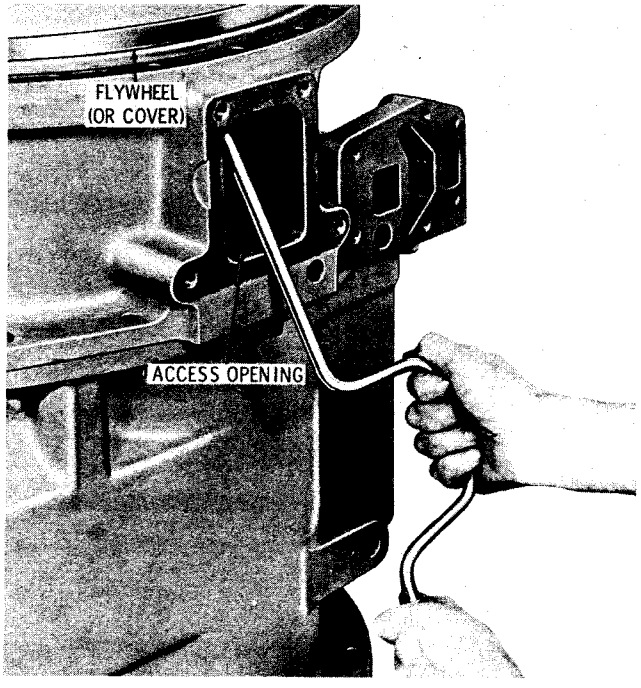


Fig. 5-13. Removing bolts which retain flywheel (or converter drive cover)

(5) Remove the flywheel (fig. 5-14) or converter drive cover (fig. 7-43). Refer to paragraph 6-9 for rebuild of the flywheel. Refer to paragraph 6-10 for rebuild of the converter drive cover.

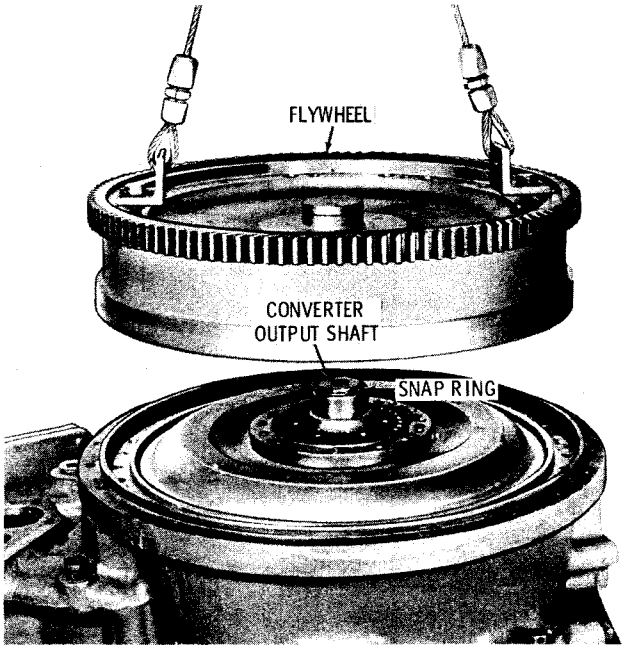


Fig. 5-14. Removing flywheel (direct-mount models)

(6) Remove the snap ring from the converter output shaft (fig. 5-14).

(7) Install the special turbine puller (refer to para 4-3a). Tighten the puller screw until the bearing inner race and turbine are pulled from the converter output shaft (fig. 5-15). Remove the puller, inner race and turbine.

Note: Three converter stator arrangements have been used among various models. All 5630 models have two stators, each mounted on eight freewheel rollers (refer to A, foldout 5, items 5 through 13). The early 5631 models have two stators, each mounted on 12 freewheel rollers (refer to A, foldout 5, items 5, 9, 10 and 24 through 31). Current 5631 models have a single stator, mounted on 12 freewheel rollers (refer to B, foldout 5, items 6 through 10).

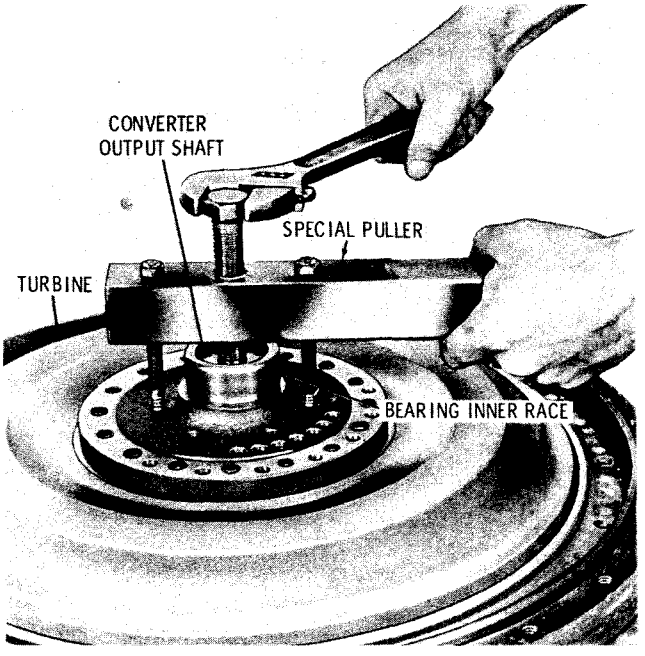


Fig. 5-15. Removing torque converter turbine

(8) Remove the snap ring from the converter output shaft (fig. 5-16). Remove the turbine thrust washer.

(9) From 5630 models and early 5631 models, remove the first-stator assembly, stator thrust washer, and second-stator assembly (fig. 5-17). Refer to paragraph 6-11 for stator rebuild procedures.

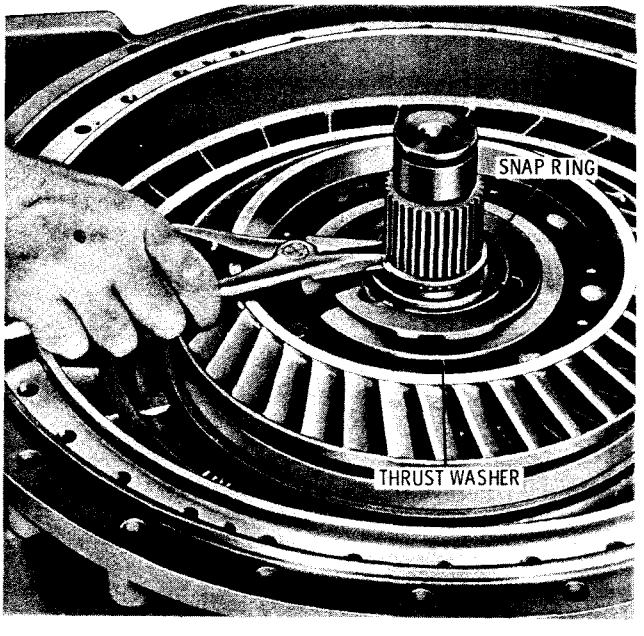


Fig. 5-16. Removing snap ring from converter output shaft

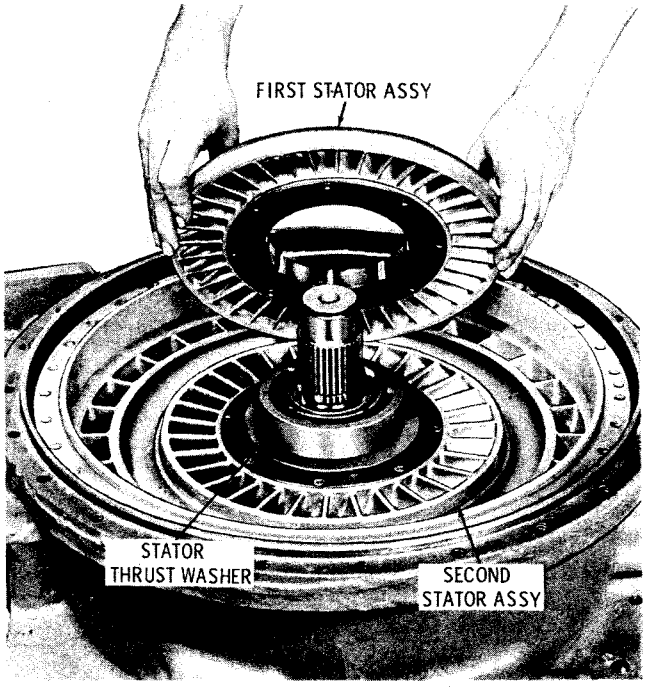


Fig. 5-17. Removing first-stator assembly (5630, early 5631 models)

(10) From later 5631 models, remove the single-stator assembly. Refer to paragraph 6-11 for rebuild procedures.

Note: Be sure that any freewheel rollers, springs, pins, etc. which drop into the converter pump when stators are removed (9, 10, above), are accounted for.

(11) Straighten the lip of the spanner nut which is locked into recesses in the freewheel roller race (fig. 5-18).

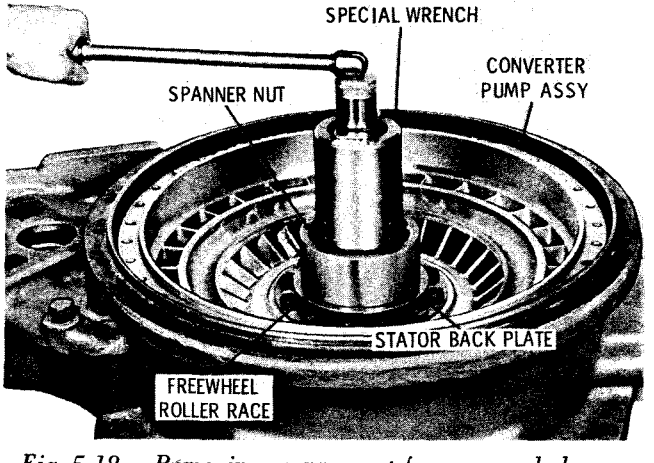


Fig. 5-18. Removing spanner nut from ground sleeve

(12) Using a special spanner nut wrench, remove the spanner nut (fig. 5-18). Remove the freewheel roller race and stator back plate.

(13) Remove the converter pump assembly (fig. 5-18). Refer to paragraph 6-12 for rebuild procedures.

(14) Remove three nuts 14 (B, foldout 10), lock washers and bolts that retain the torque converter housing (nuts are on the rear side of main housing flange). Remove the single bolt 50 (C, foldout 5) and lock washer that are at the upper-left front of the converter housing. Remove fifteen bolts 16 (B, foldout 10) and lock washers that are at the rear of the transmission housing front flange.

(15) Remove the torque converter housing assembly (fig. 5-19). Remove the gasket.

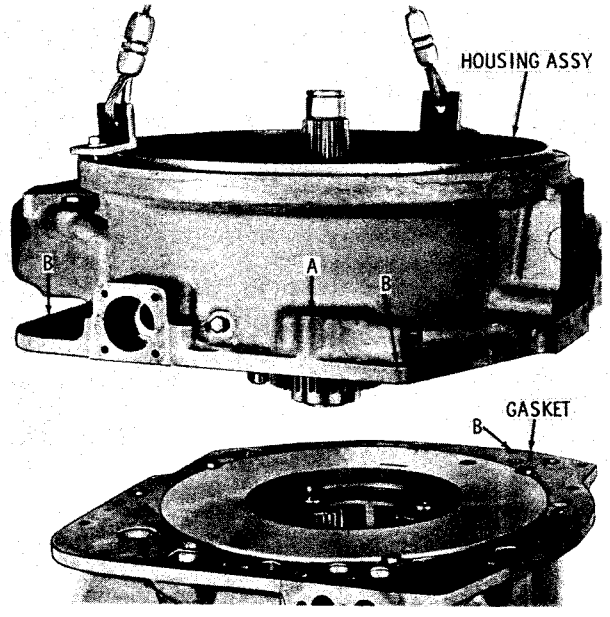


Fig. 5-19. Removing converter housing assembly

(16) Remove two seal rings from the converter ground sleeve (fig. 5-20). Remove the bolt and lock washer from the accessory idler gear spindle. Remove the spindle and gear assembly (hole in spindle is threaded for puller or slide hammer).

(17) Remove the spindle from the idler gear. If idler gear bearing must be replaced, remove the snap ring and bearing (refer to A, foldout 6, items 32 through 35).

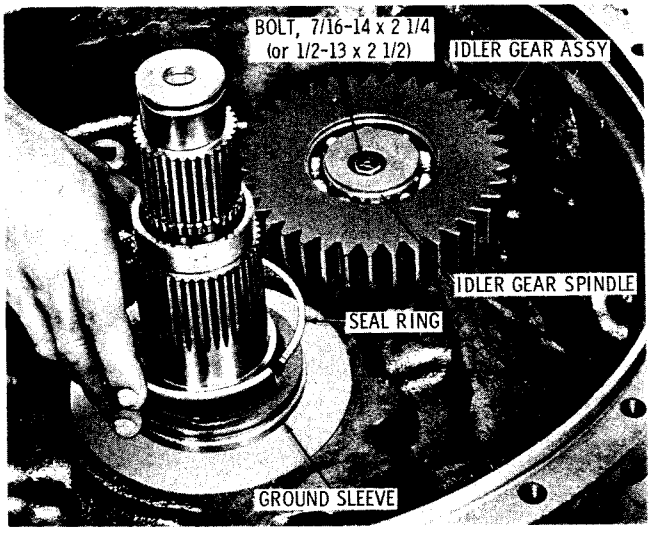


Fig. 5-20. Removing ground sleeve seal rings

(18) Remove the four bolts and lock washers which retain the accessory pad cover. Remove the cover and gasket (fig. 5-21).

(19) Remove the oil suction tube (fig. 5-22). Discard the two seal rings. Remove the snap ring which retains a ball bearing.

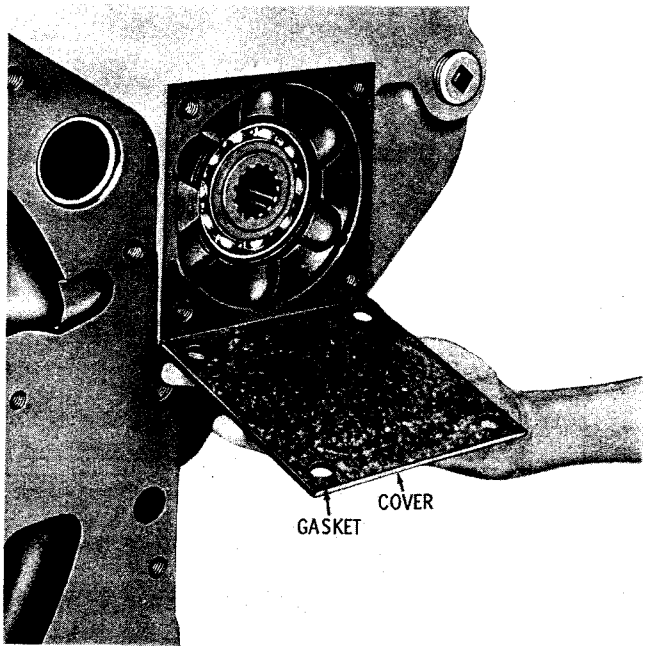


Fig. 5-21. Removing accessory pad cover

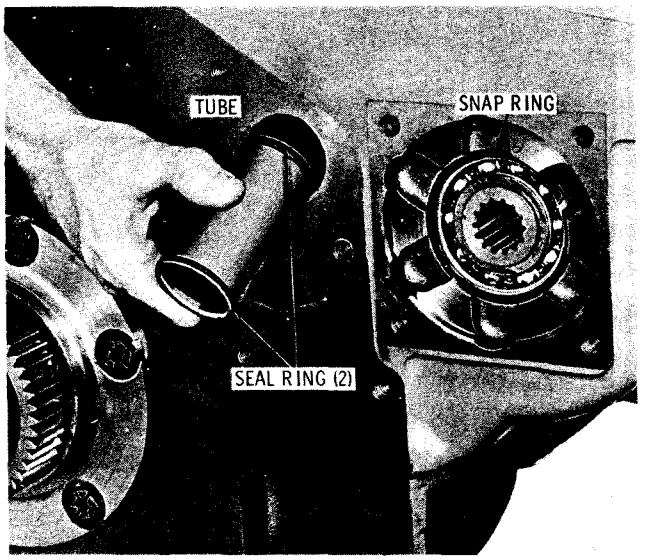


Fig. 5-22. Removing oil suction tube

Note: Removal of the oil suction tube is very important because the condition of the seal rings cannot be determined without removing the tube. The seal rings deteriorate with age and heat. If the tube cannot be readily removed, heat the inside ends of the tube with a torch.

(20) Remove the pump drive hub and rear bearing by driving the hub rearward (fig. 5-23). Remove the gear, spacer and front bearing. Remove the rear bearing from the drive hub only if replacement is necessary.

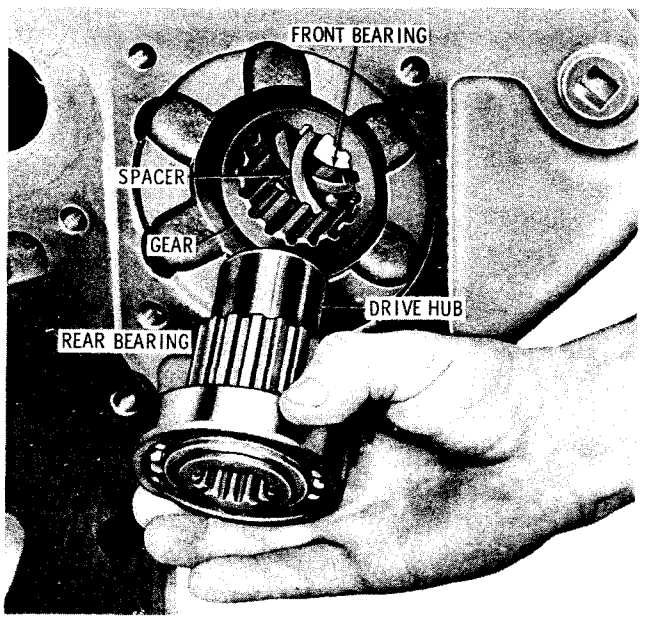


Fig. 5-23. Removing pump drive components

(21) Remove five self-locking bolts that retain the converter output shaft assembly. Remove the shaft assembly (fig. 5-24). Refer to paragraph 6-13 for rebuild procedures.

Note: Although there are differences in the construction of CRT 5630 and CRT 5631 shaft assemblies, removal procedures are identical.

(22) Further disassembly of the torque converter housing assembly is covered in the rebuild section. Refer to paragraph 6-14.

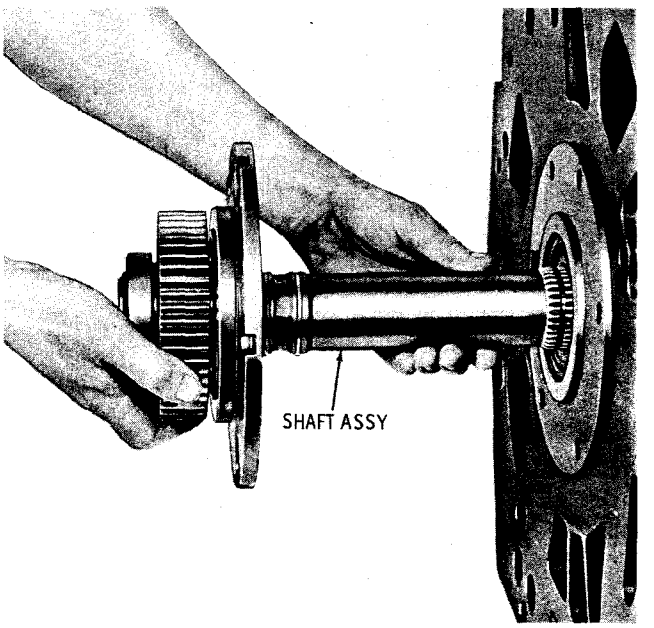


Fig. 5-24. Removing converter output shaft assembly

e. Removing Forward, Reverse Clutches, Gearing (5630 models)

(1) Remove three bolts 1 (A, foldout 7) and flat washers that retain the forward piston housing.

Note: Loosen the bolts evenly, because piston return spring pressure forces the piston housing upward.

(2) Remove the piston housing (fig. 5-25). Remove the piston from the housing. Refer to paragraph 6-15 for piston rebuild procedures.

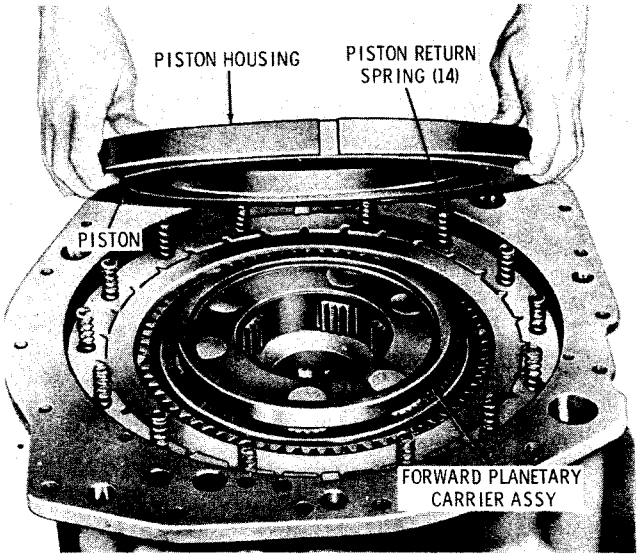


Fig. 5-25. Removing forward clutch piston housing (5630 models)

(3) Remove 14 piston return springs and the forward planetary carrier assembly (fig. 5-25). Refer to paragraph 6-16 for carrier rebuild procedures.

(4) Remove the forward clutch anchor (fig. 5-26). Remove the first five clutch plates. Remove the forward ring gear and reverse sun gear.

(5) Remove the three remaining clutch plates.

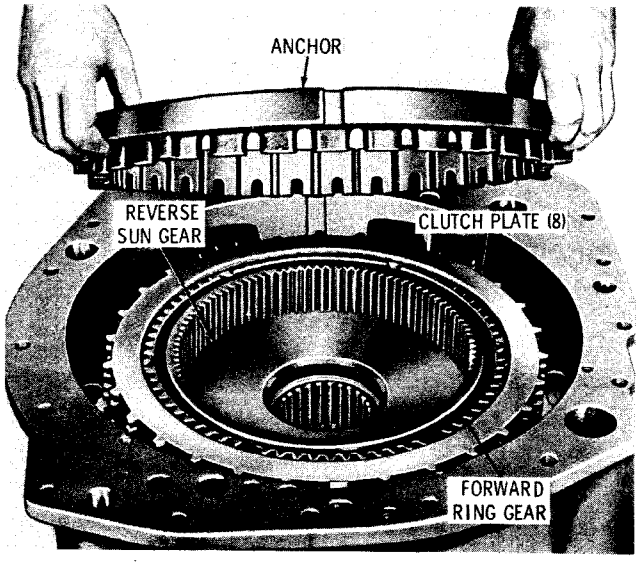


Fig. 5-26. Removing forward clutch anchor (5630 models)

(6) Remove the forward-and-reverse clutch back plate (fig. 5-27). Remove the reverse planetary carrier assembly. Remove the first six clutch plates. Remove the reverse ring gear. Refer to paragraph 6-17 for carrier rebuild procedures.

(7) Remove the four remaining clutch plates. Remove the reverse clutch anchor (fig. 5-27).

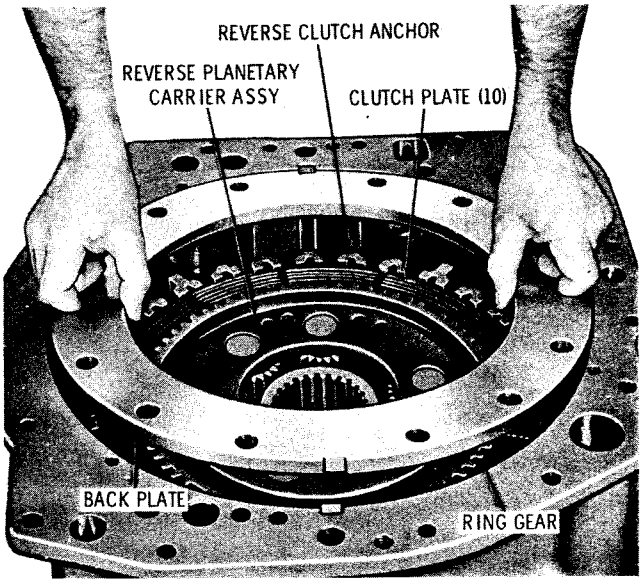


Fig. 5-27. Removing forward-and-reverse clutch back plate (5630 models)

f. Removing Forward, Reverse Clutches, Gearing (5631 models)

(1) Remove three bolts 1 (B, foldout 7) and flat washers which retain the forward clutch piston housing.

Note: Loosen the bolts evenly, because piston return spring pressure forces the piston housing upward.

(2) Remove the piston housing (fig. 5-28). Remove the spring pin from the recess in the transmission housing.

Note: Do not lose the spring pin into the transmission.

(3) Remove the piston from the piston housing (fig. 5-28). Refer to paragraph 6-15 for piston rebuild procedures.

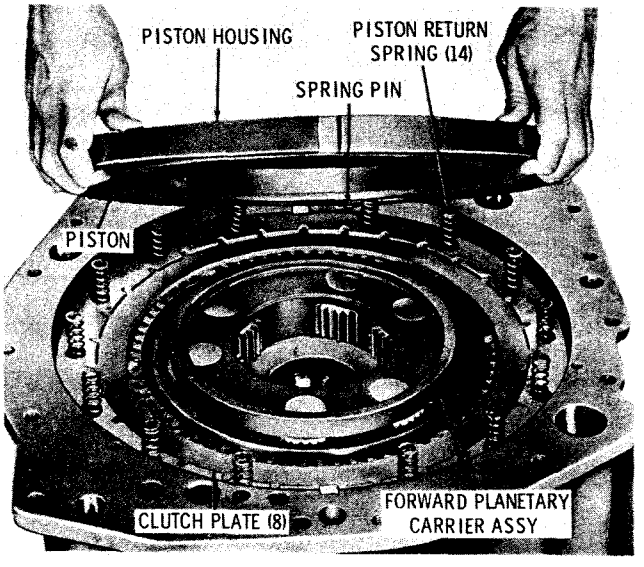


Fig. 5-28. Removing forward clutch piston housing (5631 models)

(4) Remove 14 piston return springs and the forward planetary carrier assembly (fig. 5-28). Refer to paragraph 6-16 for carrier rebuild procedures.

(5) Remove the first four clutch plates (fig. 5-28).

(6) Remove the forward clutch anchor (fig. 5-29). Remove the internal snap ring from the anchor. Remove three of the four remaining clutch plates.

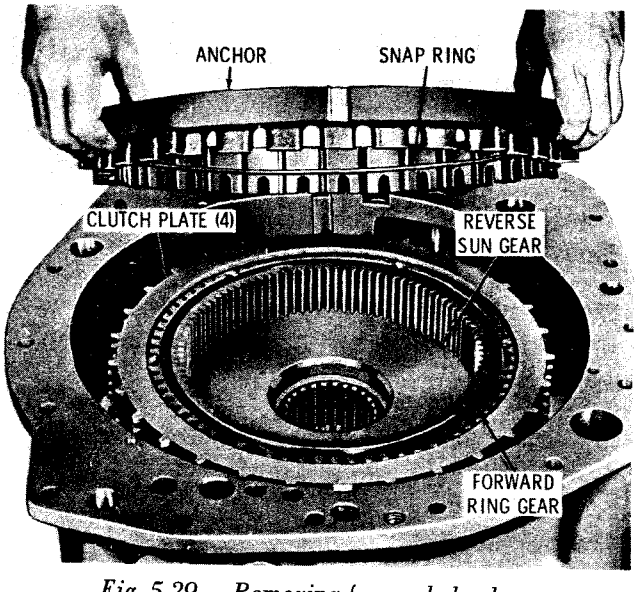


Fig. 5-29. Removing forward clutch anchor (5631 models)

(7) Remove the forward ring gear, and the reverse sun gear (fig. 5-29). Remove the remaining clutch plate.

(8) Remove the forward-and-reverse clutch back plate (fig. 5-30). Remove the reverse planetary carrier assembly. Refer to paragraph 6-17 for carrier rebuild procedures.

(9) Remove the first two clutch plates (fig. 5-30). Remove the reverse ring gear. Remove two of the eight remaining clutch plates.

(10) Remove the reverse clutch anchor (fig. 5-30). Remove the internal snap ring from the anchor. Remove the six remaining clutch plates.

g. Removing Range Clutches, Planetary Gearing

(1) Install the special spring compressor (refer to para 4-3a) onto the transmission housing. Place soft metal blocks under each compressor screw to protect the reverse clutch piston (fig. 5-31). Tighten the compressor screws. Remove the diaphragm anchor bolt and lock washer.

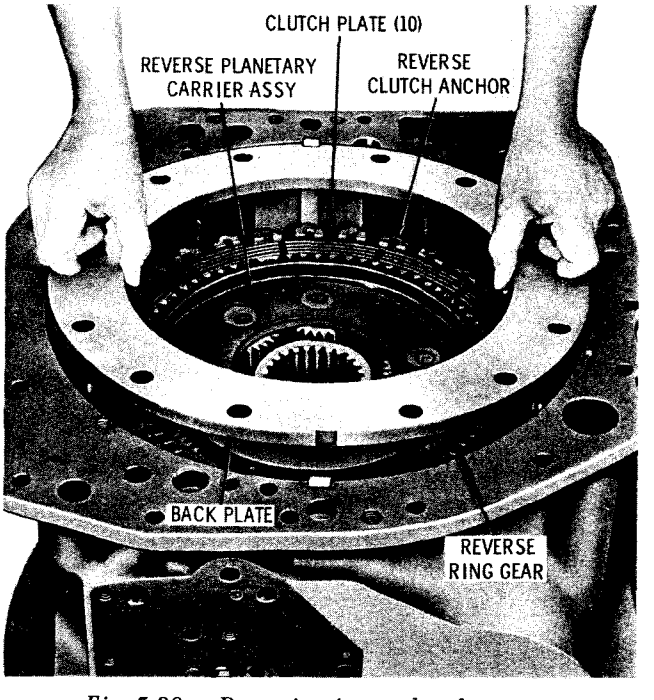


Fig. 5-30. Removing forward-and-reverse clutch back plate (5631 models)

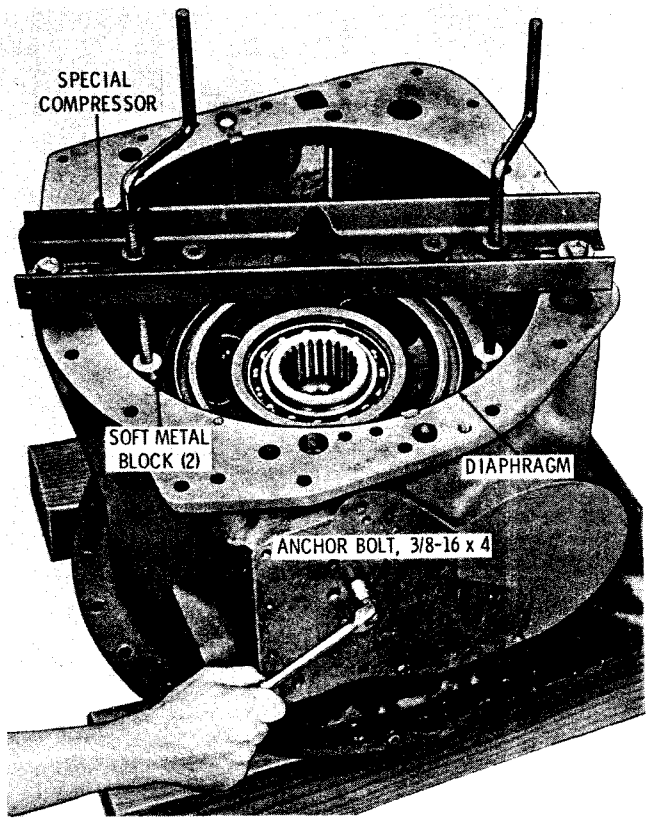


Fig. 5-31. Removing diaphragm anchor bolt

(2) Back off the compressor screws evenly until spring pressure is relieved from the diaphragm. Remove the compressor.

(3) Using the special lifting hook (refer to para 4-3a), remove the diaphragm and its attached parts (fig. 5-32).

Note: Lift the diaphragm very carefully until clear of the transmission and then support the high-range clutch piston (at rear side of diaphragm) to prevent its falling from the diaphragm.

(4) Remove the two clutch pistons from the diaphragm. Refer to paragraph 6-15 for piston rebuild procedures.

(5) Remove the snap rings which retain the high-range planetary carrier assembly and ball bearing in the diaphragm (fig. 5-32). Remove the carrier assembly. Remove the ball bearing. Refer to paragraph 6-18 for carrier assembly rebuild procedures.

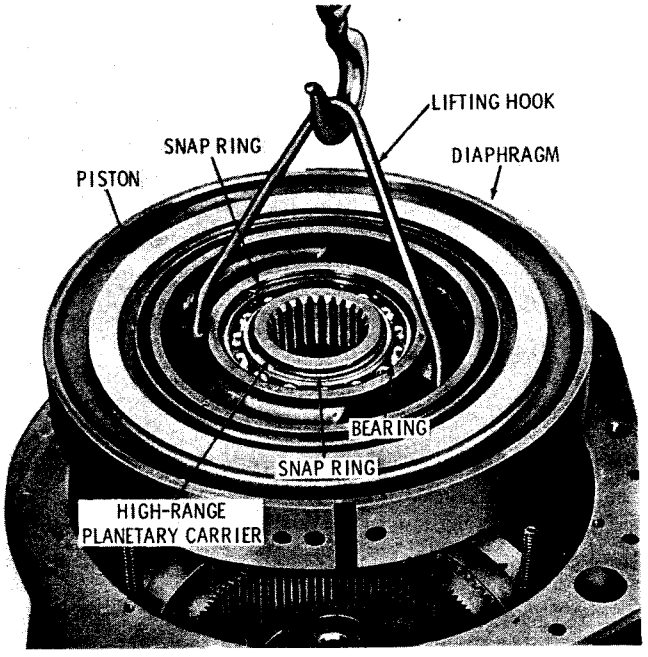


Fig. 5-32. Removing diaphragm

(6) Remove the thrust washer from the intermediate-range planetary carrier assembly (fig. 5-33).

Note: The thrust washer may have remained on the high-range planetary carrier assembly as removed in (5), above. If so, remove it.

(7) Remove the 14 clutch piston return springs (fig. 5-33). Remove the clutch anchor and eight clutch plates.

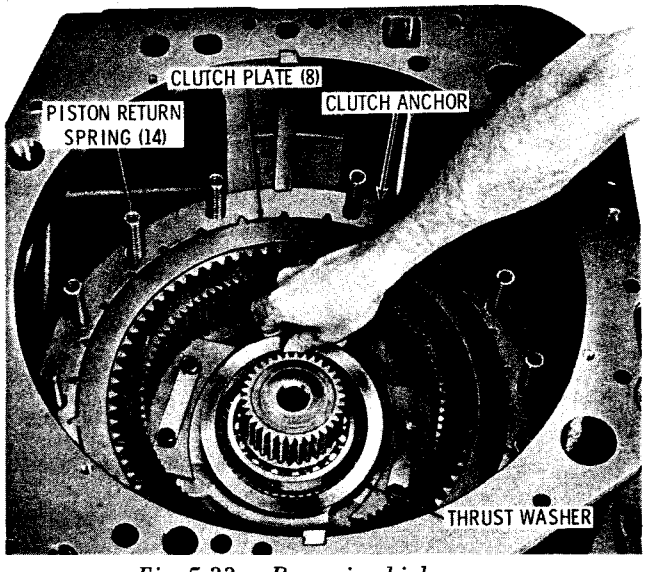


Fig. 5-33. Removing high-range planetary carrier thrust washer

(8) Remove the transmission main shaft (fig. 5-34). Remove the ball bearing from the main shaft only if replacement is necessary.

(9) Remove the intermediate-range sun gear (fig. 5-34).

(10) Flatten the corners of the two lock strips. Remove four bolts, two lock strips and two retainers (fig. 5-34). Remove the high-range ring gear.

(11) Remove the intermediate-and-reverse range clutch back plate (fig. 5-34).

(12) Remove the intermediate-range planetary carrier assembly and ring gear (fig. 5-35). Remove the ring gear from the carrier assembly. Refer to paragraph 6-19 for carrier assembly rebuild procedures.

(13) Remove the six intermediate-range clutch plates (fig. 5-35). Remove the clutch anchor.

(14) Remove the anchor bolt and lock washer which retain the intermediate-range clutch piston housing (fig. 5-36). Remove the piston housing. Remove the piston from the housing. Refer to paragraph 6-15 for piston rebuild procedures.

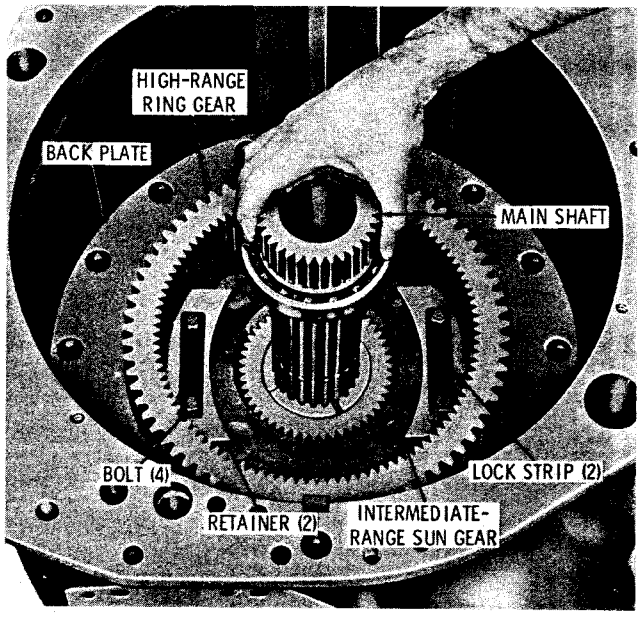


Fig. 5-34. Removing transmission main shaft

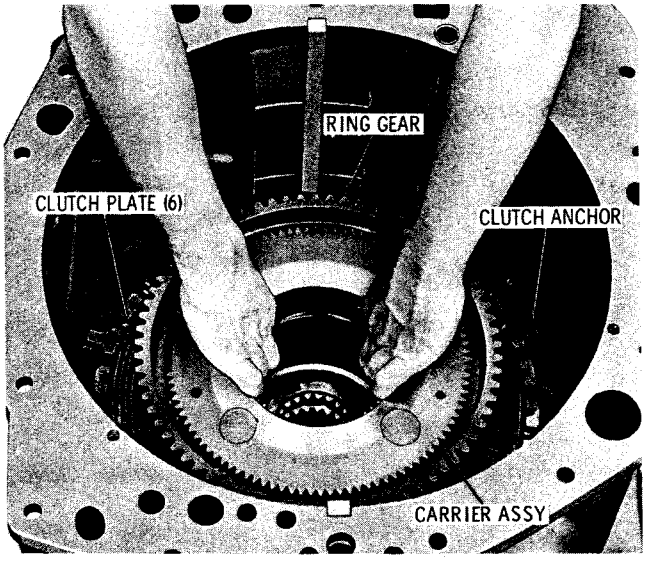


Fig. 5-35. Removing intermediate-range planetary carrier assembly and ring gear

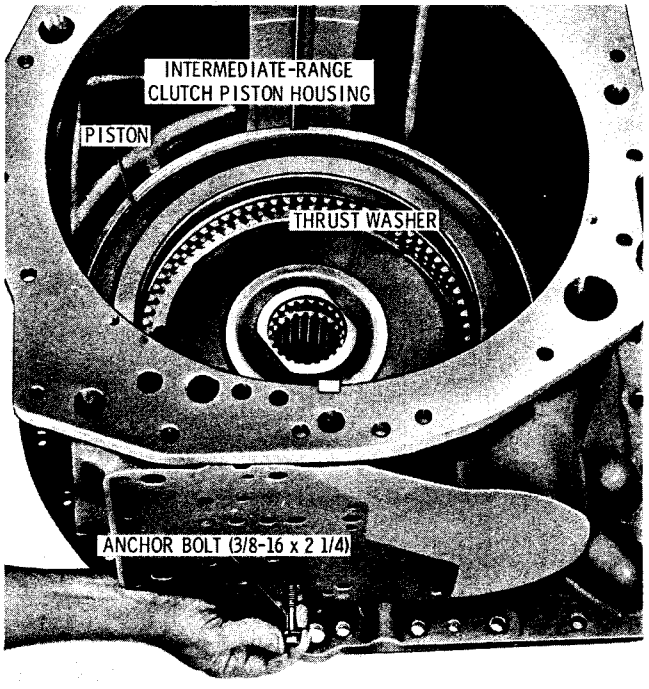


Fig. 5-36. Removing intermediate-range clutch piston housing anchor bolt

(15) Remove thrust washer (fig. 5-36).

(16) Using the special lifting hook (refer to para 4-3a), remove the low-range clutch assembly (fig. 5-37). Remove the two anchor keys. Remove and discard the compression (crush) ring. Refer to paragraph 6-20 for low-range clutch rebuild procedures. Refer to paragraph 6-21 for transmission housing rebuild procedures.

h. Removing Transfer Gear Housing Components

Note: The procedures in (1) and (2), below, apply to either front or rear components when the transmission includes a front output flange of any type, or a rear output flange, but no parking brake.

(1) Flatten the lock strip which retains the output flange bolts (fig. 5-38). Remove the two bolts, retaining washer, and shims (if used). Remove the output flange. If the flange has an interference fit, refer to paragraph 4-8a for removal instructions.

Note: Some rear flanges are retained by nut 51 (foldout 13). When the nut is used, bolts 48, lock strip 47, washer 46 and shims 45 are not used.

(2) Remove six bolts and lock washers which retain the bearing retainer. Remove the bearing retainer and gasket (fig. 5-39). If replacement is necessary, remove the oil seal from the retainer. Remove the snap ring from the bearing. Remove the retainer. Refer to paragraph 6-7 for replacement of the retainer oil seal.

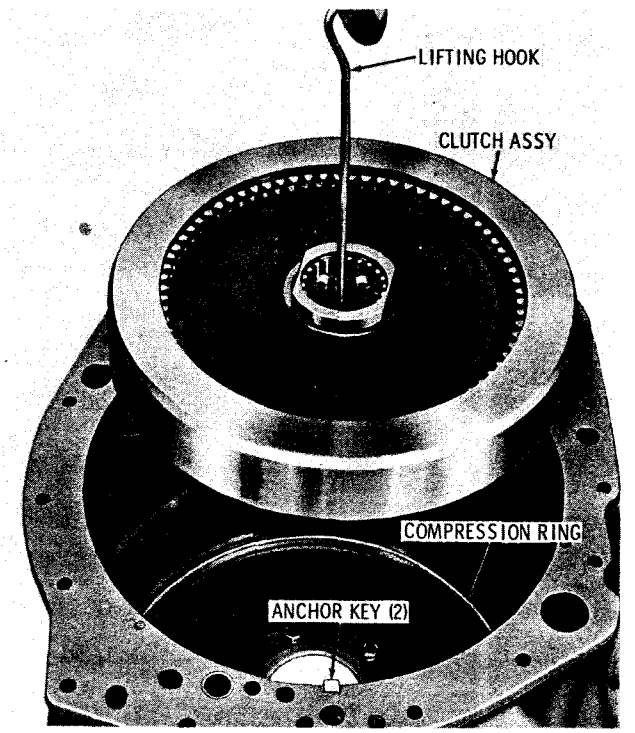


Fig. 5-37. Removing low-range clutch assembly

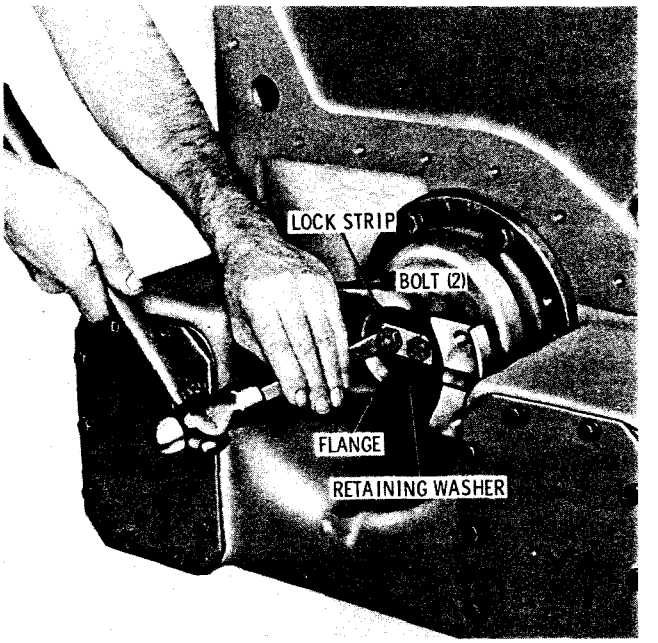


Fig. 5-38. Flattening lock strip which retains front output flange bolts

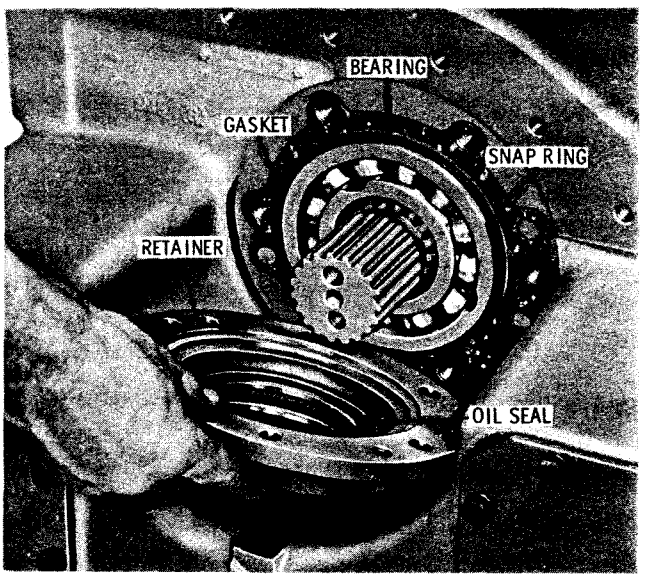


Fig. 5-39. Removing output shaft front bearing retainer

(3) On transmissions having no front output, remove six bolts 1 (foldout 12), lock washers 2, bearing retainer 3 and gasket 4. Flatten lock strip 6, remove bolts 5, lock strip 6, washer 7, and shims 8 (if used).

(4) On transmissions having no rear output, remove six bolts 26 (foldout 13), lock washers 25, retainer 24, and gasket 23. Flatten lock strip 21, and remove bolts 22, lock strip 21, washer 20 and shims 19 (if used).

(5) On transmissions having a parking brake, flatten the lock strip which retains the output flange bolts (fig. 5-40). Remove the two bolts, lock strip, retaining washer and shims (if used).

(6) Remove the brake drum and output flange. Remove the eight bolts which retain the brake drum. Remove the drum from the output flange.

Note: If the output flange has an interference fit, refer to paragraph 4-8a for removal instructions.

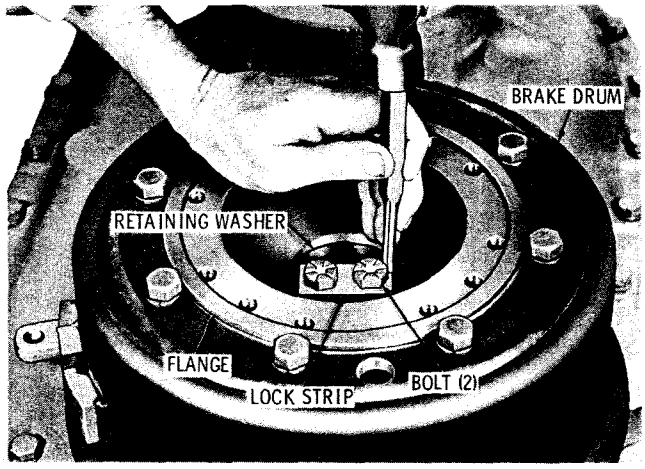


Fig. 5-40. Flattening lock strip which retains rear output flange bolts

(7) Remove the four nuts, bolts and eight flat washers which retain the parking brake shoe assembly (fig. 5-41). Remove the brake shoe assembly. Refer to paragraph 6-22 for shoe assembly rebuild procedures.

(8) Remove six bolts and lock washers which retain the rear bearing retainer. Remove the retainer (fig. 5-42). Remove the spacer from the output shaft. Remove the retainer gasket. Refer to paragraph 6-7 for retainer rebuild procedures.

(9) Remove 26 bolts and lock washers which retain the transfer gear housing cover. Install two of the cover bolts as jackscrews, and tighten them to loosen the cover (fig. 5-43). Remove the cover and remove the jackscrews from the cover. Remove the cover gasket. Refer to paragraph 6-23 for cover assembly rebuild procedures.

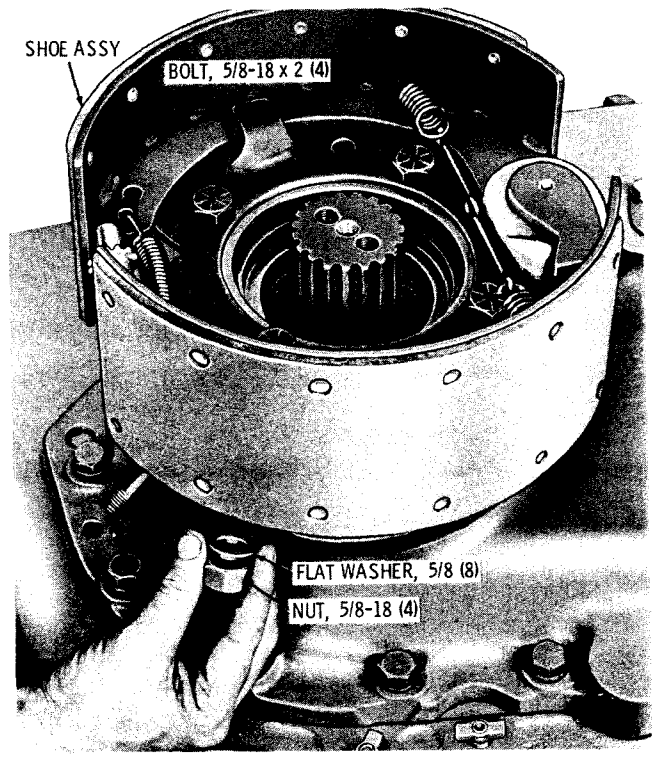


Fig 5-41. Removing nuts from bolts which retain brake shoe assembly

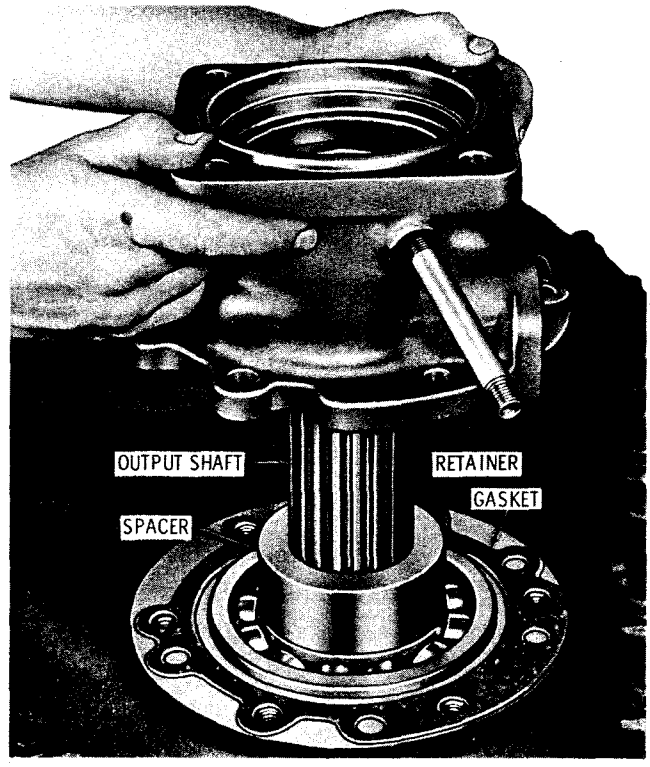


Fig. 5-42. Removing rear bearing retainer (models with parking brake)

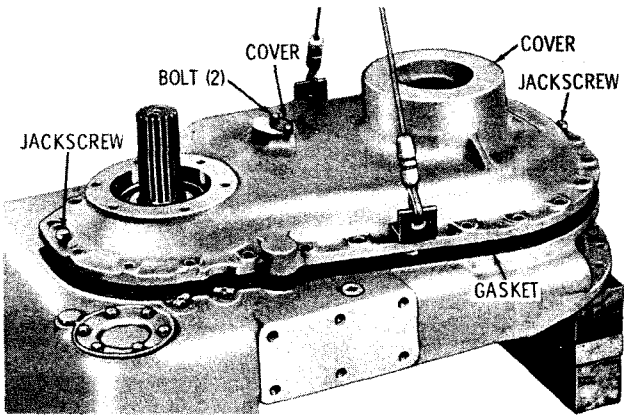


Fig. 5-43. Removing transfer gear housing cover

(10) On transmissions so equipped, remove two bolts 11 (foldout 13), washers 10, cover 9 and gasket 8.

(11) On transmissions having a speedometer drive, remove bolts 52 (foldout 14), washers 53, drive sleeve assembly 54, washer 58, gasket 59 and shaft 60. Refer to paragraph 6-24 for sleeve assembly rebuild procedures.

(12) Remove the drive gear, idler gear, driven gear and their attached parts from the transfer gear housing (fig. 5-44). Do not remove the bearings and other attached components unless parts replacement is necessary,

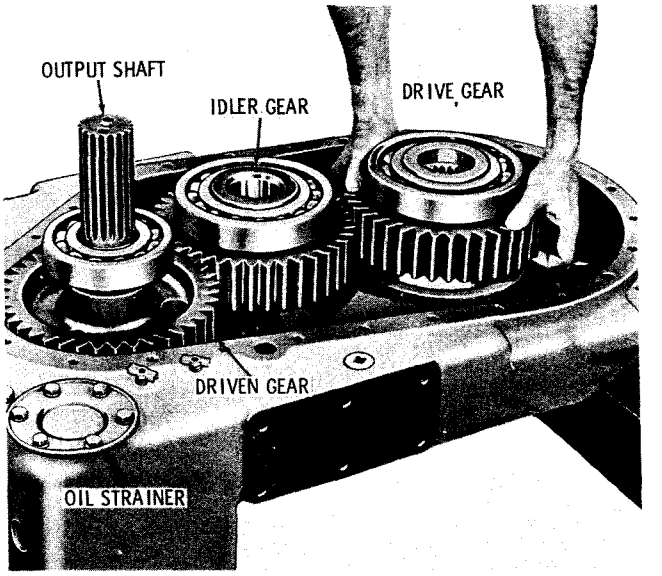


Fig. 5-44. Removing transfer drive gear

or unless magnaflux inspection is required. Refer to items 9 or 22 (foldout 12) and 34 through 48. Refer also to items 18, 27 or 33 (foldout 13).

(13) Remove the six bolts and lock washers which retain the oil strainer (fig. 5-44). Remove the strainer and gasket (fig. 7-1). Refer to paragraph 6-25 for transfer gear housing rebuild procedures.

Section 6. REBUILD OF SUBASSEMBLIES

6-1. SCOPE OF SECTION 6

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

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

6-2. SUBASSEMBLY REBUILD — GENERAL INFORMATION

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

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

c. Torque Specifications. The torque value for each threaded fastener installed in this section is given in the assembly instructions. Refer also to paragraph 4-10, and to the cross-section view (fig. 6-10) at the end of this section.

d. Wear Limits. Refer to Section 8.

e. Spring Information. Refer to paragraph 8-4 for spring information and identification.

6-3. OIL FILTER BASE, ADAPTER ASSEMBLIES

a. Disassembly (filter base — B, foldout 6)

(1) Remove shell and stud assemblies 19 by unscrewing studs 27. Discard gaskets 18 and elements 17.

(2) Disassemble shell and center stud assemblies by removing retainer rings 20.

(3) Remove plug 4, gasket 5, spring 6, valve 7 and guide 8.

(4) Remove plug 16, gasket 15, valve 14, shims 13 (if present) and spring 12.

(5) Remove plugs 10 and 11.

Note: Refer to paragraph 6-2, above.

b. Assembly (filter base — B, foldout 6)

(1) Install plugs 10 and 11.

(2) Install shims 13 (original thickness) into the recessed end of valve 14. Install spring 12 against the shims. Install these assembled parts, spring first, into filter base 9.

Note: Further shim adjustment for main-pressure regulation may be required later. Refer to paragraph 3-6c, above.

(3) Install gasket 15 (B, foldout 6) onto plug 16. Install plug 16 into filter base 9. Tighten the plug securely.

(4) Install guide 8 into filter base 9. Install valve 7, convex side first, onto guide 8. Install spring 6.

(5) Install gasket 5 onto plug 4. Install plug 4 into filter base 9. Tighten the plug securely.

(6) Install gaskets 26 onto studs 27. Install studs 27 into filter shells 23.

(7) Install springs 25, washers 24 and seals 22 onto studs 27.

(8) Install retainers 21, cupped sides first, onto studs 27. Compress the springs and install retainer rings 20. Be sure rings 20 are seated fully in the grooves in studs 27.

(9) Install new gaskets 18 into filter base 9. Install new elements 17 into filter shells 23.

(10) Install filter shell and stud assemblies, with filter elements, onto filter base 9. Tighten studs 27 (25 to 35 pound feet torque).

c. Disassembly (filter adapter — A, foldout 6)

(1) Remove plug 42, gasket 43, valve 44, shims 45 (if present) and spring 46.

(2) Remove plug 48 from body 47.

Note: Refer to paragraph 6-2, above.

d. Assembly (filter adapter — A, foldout 6)

(1) Install plug 48 into body 47.

(2) Install shims 45 (original thickness) into recessed end of valve 44. Install spring 46 against shims 45.

Note: Further shim adjustment for the pressure regulation may be required later. Refer to paragraph 3-6c, above.

(3) Install the items assembled in (2), above, spring first, into body 47.

(4) Install gasket 43 onto plug 42. Install plug 42 into body 47. Tighten the plug securely.

6-4. CONTROL VALVE ASSEMBLIES

a. Disassembly (valves with linkage at front — A, foldout 11)

(1) Remove plugs 18 and 44, gaskets 19 and 43, springs 21 and 41, pins 20 and 42, and one each of balls 22 and 40.

(2) Remove cap 32. Remove one setscrew 45 which is toward the front of valve body 17.

(3) Thoroughly clean the area around oil seal 16. Remove all dirt, paint, rust and burs.

(4) Insert a soft metal drift or hardwood dowel, slightly smaller in diameter than the exposed stem of valve 27, into the bore from which cap 32 was removed.

(5) Using light hammer blows, drive valve assembly 25 forward. Seal 16, sleeve 24, snap rings 28 and 30, and piston 29 will be driven out with the valve assembly. Separate these parts. Do not remove bushing 26 from valve 27 unless replacement is necessary.

(6) Remove the drift (or dowel). This will free the remaining ball 22, and spring 23. Remove the ball and spring.

(7) Remove the remaining setscrew 45 and tap sleeve 31 out of rear of valve body 17.

(8) Clean the exposed stem of valve 14. Remove all dirt, paint, rust and burs.

(9) Push valve assembly 12 rearward until it contacts cap 38. Then, with light hammer blows against a soft metal drift, drive the cap and valve assembly from valve body.

(10) Do not attempt to remove ball 15 from valve 14. Do not remove bushing 13 unless replacement is necessary.

(11) When valve assembly 12 is removed, the remaining ball 40, and spring 39, will be released. Remove the ball and spring from the valve body.

(12) Remove oil seal 11 from the valve body. It must be pried or driven out toward the front.

(13) On models which include a clutch cutoff valve, remove retainer 33, gasket 34, plug 36, and valve 37. Remove seal ring 35 from plug 36.

Note: Refer to paragraph 6-2, above.

b. Assembly (valves with linkage at front – A, foldout 11)

(1) On models which include a clutch cutoff valve, install valve 37, smaller end first, into the rear of valve body 17. Install seal ring 35 onto plug 36. Install plug 36, seal ring toward retainer, into retainer 33. Install gasket 34 onto retainer 33, and install the retainer into the threaded bore at the rear of valve body 17. Tighten the retainer securely.

(2) Install cap 38, flat side first, into the selector valve counterbore at the rear of valve body 17. Press the plug into the body until it bottoms in counterbore. If removed, install bushing 13 into valve 14. Center the bushing in its bore length.

(3) Install spring 39, and one ball 40 into the threaded hole at the bottom of valve body 17. While holding the ball depressed against spring 39, install valve assembly 12, plugged end first, into the front of the valve body. Push the valve assembly to one of its normal detent positions.

(4) Install oil seal 11, spring-loaded lip first, over the stem of valve 14. Press the seal into valve body 17 until it seats lightly.

(5) Install sleeve 31, larger diameter end first, into the rear of valve body 17. Aline the setscrew seat in the sleeve with the tapped hole in the valve body. Install setscrew 45, and tighten it to 1 to 2 pound feet torque.

(6) Install direction valve piston 29 onto valve 27. Retain the piston with snap rings 28 and 30. If bushing 26 was removed from valve 27, install a new bushing. Center the bushing in its bore length.

(7) Install spring 23 and one ball 22 into the threaded hole at the top of valve body 17. Depress the ball against spring 23, and install valve assembly 25, shorter land first, into the front of the valve body. Push the valve to one of its normal detent positions.

(8) Install sleeve 24, larger diameter first, into the front of valve body 17. Aline the setscrew seat in the sleeve with the setscrew hole in the valve body. Install the remaining setscrew 45, and tighten it to 1 to 2 pound feet torque.

(9) Install oil seal 16, spring-loaded lip first, over the stem of valve 27. Press it into the valve body until the front surface of the oil seal is 0.40 to 0.46 inch below the front surface of the valve body.

(10) Coat the outer surface of cap 32 with a sealer such as Loctite Stud-lock, or equivalent. Press or drive cap 32 into the rear of valve body 17. Seat the cap against the shoulder in the valve body.

(11) Install remaining ball 22, spring 21, and pin 20 into the top of the valve body. Install gasket 19 onto plug 18. Install plug 18, and tighten it securely.

(12) Install remaining ball 40, spring 41, and pin 42 into the bottom of the valve body. Install gasket 43 onto plug 44. Install plug 44 and tighten it securely.

c. Disassembly (valves with linkage at rear – B, foldout 11)

Note: Some earlier models may not include direction valve detent components (items 13 through 16, B, foldout 11). Detents are provided in the vehicle linkage when omitted from the control valve assembly.

(1) Remove plugs 11 and 36, gaskets 12 and 35, springs 14 and 33, pins 13 and 34, and one each of balls 15 and 32.

(2) Remove cap 39. Remove one setscrew 37 which is toward front of valve body 40.

(3) Thoroughly clean the stem of valve 22. Remove all dirt, paint rust and burs.

(4) Using a soft drift or hardwood dowel, slightly smaller in diameter than the stem of valve 22, drive the valve forward and out of the valve body. Sleeve 17, snap rings 18 and 20, and piston 19 will be driven out with valve assembly 21. Separate these parts. Do not remove bushing 23 from valve 22 unless replacement is necessary.

(5) Remove the drift (or dowel). This will free the remaining ball 15, and spring 16. Remove the ball and spring.

(6) Remove the remaining setscrew 37. Using a soft metal drift (or hardwood dowel), drive sleeve 24 and oil seal 25 out the rear of the valve body.

(7) Clean the exposed stem of valve 29. Remove all dirt, paint, rust and burs.

(8) Push valve assembly 27 into the valve body (forward) until it contacts cap 38. Then, with light hammer blows against a soft metal drift, drive the cap and valve assembly from the valve body.

(9) Do not attempt to remove ball 30 from valve 29. Do not remove bushing 28 from valve 29 unless replacement is necessary.

(10) When valve assembly 27 is removed, the remaining ball 32, and spring 31, will be released. Remove the ball and spring from the valve body.

(11) Remove oil seal 26 from the valve body. It must be pried or driven out toward the rear.

(12) On models which include a hydraulically-operated clutch cutoff valve, remove retainer 46, gasket 44, cup 45, plug 42 with seal ring 43, and valve 41. Remove seal ring 43 from plug 42.

(13) On models which include an air-operated clutch cutoff valve, remove retainer 47, gasket 44, plug 48 with seal ring 43, and valve 41. Remove seal ring 43 from plug 48.

Note: Refer to paragraph 6-2, above.

d. Assembly (valves with linkage at rear — B, foldout 11)

(1) On models which include an air-operated clutch cutoff valve, install valve 41, smaller end first, into the threaded opening at the rear of valve body 40. Install seal ring 43 onto plug 48. Install plug 48, seal ring toward retainer, into retainer 47. Install gasket 44 onto retainer 47. Install retainer 47 into the valve body, and tighten it securely.

(2) On models which include a hydraulically-operated clutch cutoff valve, install valve 41, smaller end first, into the threaded opening at the rear of valve body 40. Install seal ring 43 onto plug 42. Install cup 45, flat side first, onto the stem of plug 42. Install plug 42, cup first, into retainer 46. Install gasket 44 onto retainer 46. Install retainer 46 into the valve body and tighten it securely.

(3) Install cap 38, flat side first, into the front of valve body 40. Press the plug into the counterbore until it seats against the shoulder.

(4) If removed, install bushing 28 into valve 29. Center bushing in the bore length.

(5) Install spring 31 and one ball 32 into the threaded opening at the bottom of valve body 40. While holding the ball depressed against the spring, install valve assembly 27, smaller end first, into the rear of the valve body. Push the valve to one of its normal detent positions.

(6) Install oil seal 26, spring-loaded lip first, onto the stem of valve 29. Press the seal into valve body 40 until it seats lightly.

(7) Install sleeve 24, larger diameter end first, into the rear of valve body 40. Aline the setscrew seat in the sleeve with the tapped hole in the valve body. Install setscrew 37 and tighten it to 1 to 2 pound feet torque.

(8) Install direction valve piston 19 onto valve 22. Retain the piston with snap rings 18 and 20. If bushing 23 was removed, install it into valve 22. Center the bushing in the bore length.

(9) Install spring 16 and one ball 15 into the threaded hole at the top of the valve body. While holding the ball depressed against the spring, install valve 22 and its attached parts, bushed end first, into the front of the valve body. Push the valve to one of its normal detent positions.

(10) Install sleeve 17, larger diameter first, into the front of the valve body. Aline the setscrew seat in the sleeve with the tapped

hole in the valve body. Install the remaining setscrew 37, and tighten it to 1 to 2 pound feet torque.

(11) Install oil seal 25, spring-loaded lip first, over the stem of valve 22. Press the seal into the valve body until its rear face is recessed 0.40 to 0.46 inch into the valve body.

(12) Coat the outer surface of cap 39 with a sealer such as Loctite Stud-lock, or equivalent. Press or drive cap 39 into the front of the valve body until it seats.

(13) Install remaining ball 15, spring 14, and pin 13 into the threaded hole at the top of the valve body. Install gasket 12 onto plug 11. Install the plug, and tighten it securely.

(14) Install remaining ball 32, spring 33, and pin 34 into the threaded hole at the bottom of the valve body. Install gasket 35 onto plug 36. Install the plug and tighten it securely.

6-5. GOVERNOR DRIVE

a. Disassembly (foldout 14)

(1) Remove snap ring 41. Remove shaft assembly 37, with bearing 42 and snap ring 43 from adapter 46.

(2) Remove snap ring 43 and bearing 42.

(3) Remove spacer 51 and oil seal 44 from adapter 46.

(4) Do not disassemble shaft assembly 37 unless parts replacement is necessary. If disassembly is necessary, drive out pin 38, and remove coupling 40.

Note: Refer to paragraph 6-2, above.

b. Assembly (foldout 14)

(1) If shaft assembly 37 was disassembled, press a new coupling 40 into shaft 39. The coupling should be located so that the rear side of the snap ring groove in coupling 40 is 0.500-inch from the rear end surface of shaft 39.

Note: New couplings are not drilled for pin 38. Thus, a new pin hole should be drilled, at a new location, through the assembled shaft and coupling.

(2) Drill a new hole, 0.125 to 0.129-hole diameter, at a point 0.30 to 0.36-inch from the rear end of shaft 39. Do not drill through original hole in shaft 39.

(3) Press a new pin 38, into the drilled hole. Press the pin in until it does not project above the shaft surface.

(4) Install bearing 42 onto coupling 40. Retain it with snap ring 43.

(5) Press oil seal 44, spring-loaded lip last, into adapter 46, seating it lightly in the adapter.

(6) Install spacer 51 against oil seal 44. Install the shaft as assembled in (4), above, and retain it with snap ring 41.

6-6. POWER TAKEOFF

a. Disassembly (foldout 14)

(1) Flatten lock strip 32, and remove two bolts 33. Remove washer 31 and shims 30 (if used).

(2) Remove output flange 29. If the flange is interference fit, refer to paragraph 4-8a for removal procedures.

(3) Remove six bolts 27 (foldout 14) and washers 26. Remove bearing retainer 25 and gasket 24.

(4) Remove the shifter shaft (fig. 6-1).

(5) Remove the power takeoff shaft and bearing (fig. 6-2). When the shaft is removed, two detent balls and a spring are freed, remove these.

(6) Press shaft 22 (foldout 14) out of bearing 23. Remove snap ring 16, bearing inner race 17, and thrust washer 18 only if parts replacement is necessary.

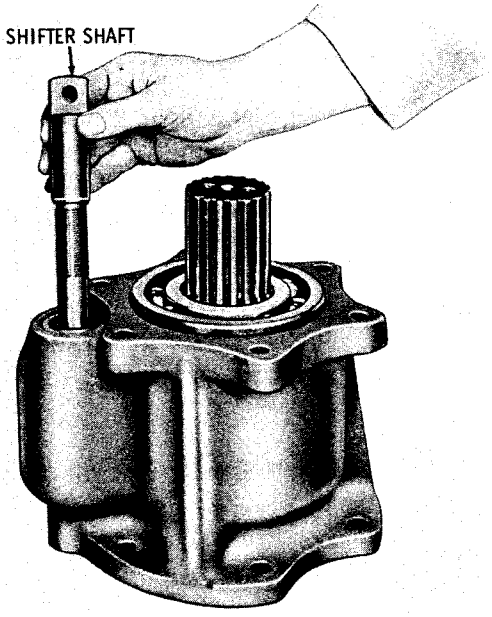


Fig. 6-1. Removing (or installing) PTO shifter shaft

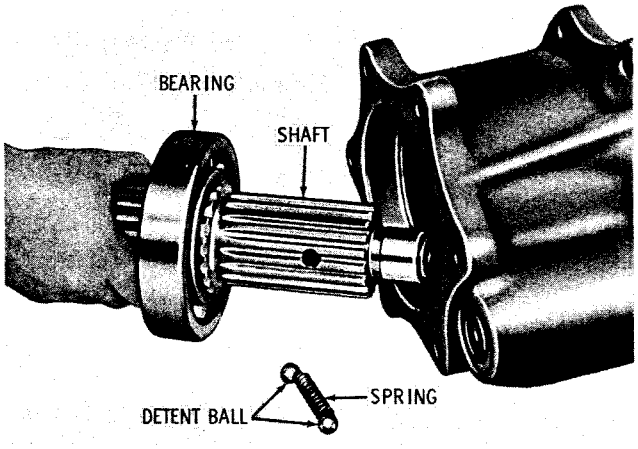


Fig. 6-2. Removing power takeoff shaft and bearing

(7) Remove the disconnect coupling (fig. 6-3).

(8) Remove the disconnect shifter fork (fig. 6-4).

(9) Do not remove oil seal 13 (foldout 14) from housing 12 unless parts replacement is necessary (removal will destroy the seal).

Note: Refer to paragraph 6-2, above.

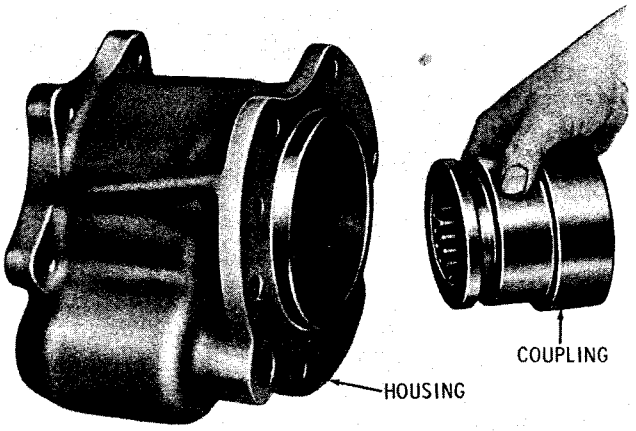


Fig. 6-3. Removing (or installing) disconnect coupling

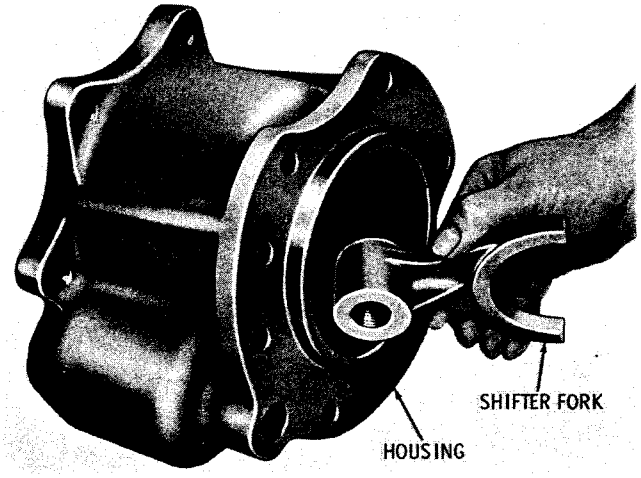


Fig. 6-4. Removing (or installing) disconnect shifter fork

b. Assembly (foldout 14)

(1) If oil seal 13 was removed from housing 12, install a new seal. Press the seal, spring-loaded lip first, into the housing until it seats lightly against the housing shoulder.

(2) Install the disconnect shifter fork (fig. 6-4).

Note: The longer side of the threaded boss must be installed toward the base of the housing.

(3) Install the disconnect coupling, grooved end toward the output (rear) end of the housing (fig. 6-3). Engage the groove in the coupling with the shifter fork.

(4) If thrust washer 18 (foldout 14), bearing inner race 17, and snap ring 16 were removed, install them onto shaft 22.

(5) Press bearing 23 onto shaft 22, and seat it firmly against the shaft shoulder.

(6) Position the housing, base downward, over small blocks or a sleeve, which will support the disconnect coupling and provide room for the shaft to be installed (fig. 6-5).

(7) Install detent spring 20 into the shaft, with detent balls at the spring ends. While holding the balls against the spring, install the shaft into the disconnect coupling splines (fig. 6-5). Push the shaft in until the coupling retains the detent balls.

(8) Seat the bearing against the shoulder in the housing bore. Install gasket 24 (foldout 14) and retainer 25.

(9) Install six 1/2-13 x 1 1/2-inch bolts 27, with lock washers 26. Tighten the bolts to 67 to 80 pound feet torque.

(10) Install output flange 29. If the flange is interference fit, refer to paragraph 4-8b for installation procedures.

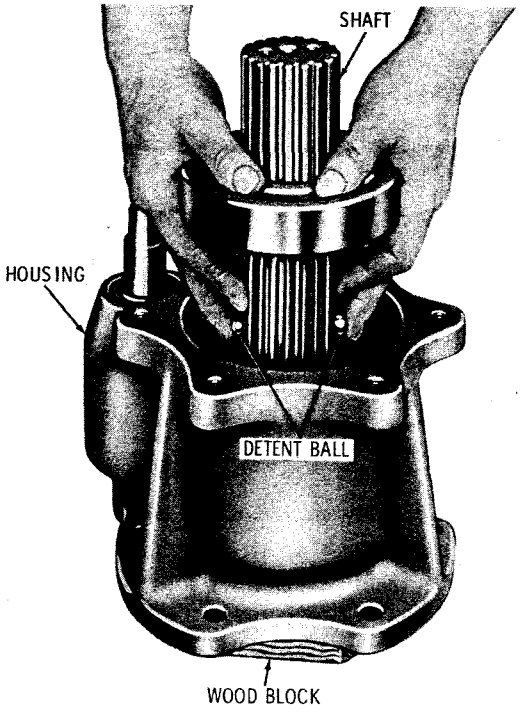


Fig. 6-5. Installing power takeoff output shaft

(11) Establish the proper thickness of shims 30, as outlined in paragraph 4-8b.

Note: The installation of this shim pack is recommended for all transmissions even though some did not originally include shims.

(12) Install shims 30, washer 31, lock strip 32, and two 1/2-20x 1 1/4-inch bolts 33. Tighten the bolts to 96 to 115 pound feet torque. Bend a corner of lock strip 32 against each bolt head.

6-7. TRANSMISSION FRONT COVER, OUTPUT SHAFT BEARING RETAINERS

a. Disassembly

(1) Drive oil seal 8 (A, foldout 4) forward and out of transmission front cover 10. Clean the bore of the cover thoroughly.

(2) Drive oil seal 21 (foldout 12) forward and out of retainer 19. Clean the bore of the retainer thoroughly.

(3) Drive oil seal 28 (foldout 13) rearward, and out of retainer 30. Clean the bore of the retainer thoroughly.

(4) Drive baffle 41 (foldout 13) rearward, and out of retainer 39. Drive oil seal 40 forward, and out of retainer 39. Remove oil drain nipple 37.

Note: Refer to paragraph 6-2, above.

b. Assembly

(1) Install the oil seal, baffle and oil drain tube into the output shaft rear bearing retainer as illustrated in figure 6-6. Note the position of the spring-loaded lip of the oil seal.

(2) Install the oil seal into the transmission front cover, or output shaft bearing retainers, as shown in figure 6-7. The oil seal should be pressed to the depth of the chamfer in the bore. Note the position of the spring-loaded lip of the oil seal.

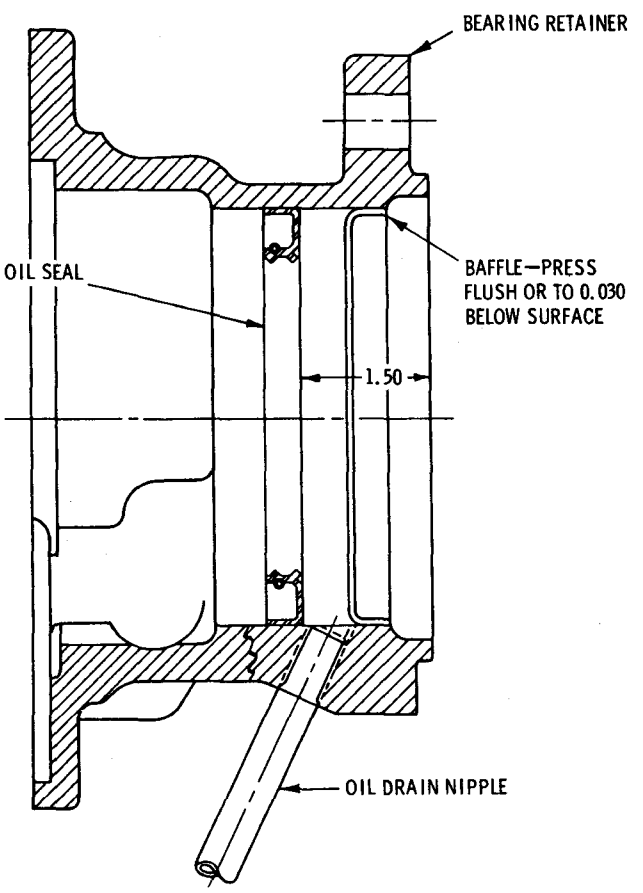


Fig. 6-6. Rear bearing retainer assembly dimensions

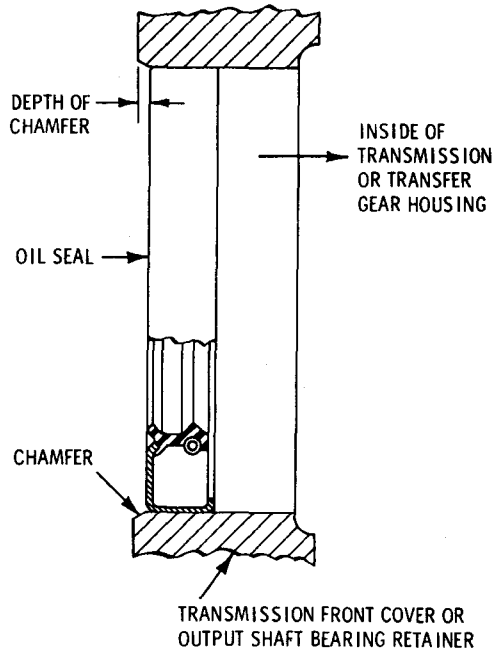


Fig. 6-7. Installation of oil seals

6-8. INPUT PRESSURE AND SCAVENGE PUMP

a. Disassembly (A, foldout 6)

(1) Remove four bolts 4 and washers 5.

(2) Remove scavenge pump body assembly 6 and gasket 10.

(3) Remove scavenge pump gears 9 and needle roller 15 (roller 15 serves as a key for the scavenge pump drive gear).

(4) Remove separating plate assembly 11 and gasket 14.

(5) Remove drive gear 16 and driven gear 17.

(6) If parts replacement is necessary, remove bearing assemblies 8 from body 7.

Note: Removal destroys bearing assemblies 8.

(7) If parts replacement is necessary, remove dowel pins 13 from plate 12.

(8) If parts replacement is necessary, press bearing assemblies 19 from body 20.

Note: Refer to paragraph 6-2, above.

b. Assembly (A, foldout 6)

(1) If bearing assemblies 19 were removed, press new bearings into body 20. Start the bearings into the inner side of the body. Press on the part-numbered ends of the bearing shells, and locate them 0.090 inch below the inner surface of body 20.

(2) If dowel pins 13 were removed, press new pins into plate 12. Leave the pins projecting 0.19 inch from the front of plate 12.

(3) If bearing assemblies 8 were removed, press new bearings into body 7. Start the bearings into the inner side of the body. Press on the part-numbered end of the bearing shells, and locate them 0.090 inch below the inner surface of body 7.

(4) Install drive gear 16, splined end first, into body assembly 18, through thicker section of the body.

(5) Install driven gear 17, shorter shaft first, into body assembly 18.

(6) Install gasket 14 and plate assembly 11 onto body assembly 18.

(7) Install needle roller 15 into the groove in the shaft of drive gear 16. Install one gear 9 onto the same shaft.

(8) Install the remaining gear 9 onto the shaft of driven gear 17.

(9) Install gasket 10 and body assembly 6 onto plate assembly 11.

(10) Install four 3/8-16 x 2 1/4-inch bolts 4, with lock washers 5. Tighten the bolts evenly to 26 to 32 pound feet torque.

Note: The pump gears must rotate, after assembly, without binding.

6-9. FLYWHEEL

a. Disassembly (B, foldout 4)

(1) The flywheel should be disassembled only if parts replacement is necessary.

(2) Remove flywheel ring gear 13 after noting on which side of the gear the teeth are chamfered.

(3) Remove snap ring 16 and the outer race and rollers of bearing assembly 15. The bearing assembly inner race was removed in paragraph 5-3d(7), above.

Note: Refer to paragraph 6-2, above.

b. Assembly (B, foldout 4)

(1) Install ring gear 13 after heating it to 400°F maximum temperature. Be sure the chamfer of the gear teeth is facing the proper direction for starter pinion engagement. Seat the gear firmly against the shoulder on the flywheel.

(2) Install the outer race and rollers of bearing assembly 15, identification marks outward, into flywheel 14. Install snap ring 16 to retain the bearing race.

6-10. CONVERTER DRIVE HOUSING

a. Disassembly (A, foldout 4)

(1) Remove ball bearing 12 from housing hub 15.

(2) Flatten lock strips 14, and remove eight bolts 13 and the four lock strips.

(3) Remove housing hub 15 from housing 18.

(4) Remove the outer race and rollers of bearing assembly 17.

Note: Refer to paragraph 6-2, above.

b. Assembly (A, foldout 4)

(1) Install the outer race and rollers of bearing assembly 17 into the front of housing 18.

(2) Install housing hub 15 onto housing 18. Aline the bolt holes of the hub with those of the housing.

(3) Install eight 1/2-20 x 1 1/4-inch bolts 13, with one lock strip 14 for each two bolts. Tighten the bolts to 83 to 100 pound feet torque. Bend a corner of each lock strip against each bolt head.

6-11. TORQUE CONVERTER STATORS

a. Disassembly (8-roller stator — prior to S/N 26660)

(1) Remove eight rollers, eight pins, and eight springs from each of two stators (fig. 6-8).

(2) Be sure that roller pockets, and the bores from which the springs and pins were removed are thoroughly clean.

Note: Refer to paragraph 6-2, above.

b. Assembly (8-roller stator — prior to S/N 26660)

Note: The procedures below apply to each of the two stator assemblies.

(1) Install eight springs onto the smaller ends of eight pins (fig. 6-8).

(2) Install the assembled springs and pins, springs first, into the stator cam (fig. 6-8).

(3) Install eight rollers into the roller pockets in the stator cam (fig. 6-8). Use a small quantity of oil-soluble grease to retain the rollers until the stators are installed.

c. Disassembly (12-roller stator — beginning with S/N 26660)

(1) Remove twelve freewheel rollers from each stator assembly (fig. 6-8)

Note: There are two stators in 4-element converters; a single stator in 3-element converters.

(2) Remove 24 cups, 12 springs and 12 needle rollers from each stator (fig. 6-8).

(3) Be sure that roller pockets, and the bores from which the springs and cups were removed are thoroughly clean.

Note: Refer to paragraph 6-2, above.

d. Assembly (12-roller stator — beginning with S/N 26660)

Note: The procedures, below, apply to both stators in a 4-element converter, or to the single stator in a 3-element converter.

(1) Assemble two cups, a spring, and a needle roller for each of the freewheel roller positions (fig. 6-8).

(2) Install each of the assemblies (made in (1), above) into its bore in the stator cam (fig. 6-8).

(3) Install a freewheel roller into each of the stator cam pockets (fig. 6-8). Use a small quantity of oil-soluble grease to retain the freewheel rollers until the stator is installed.

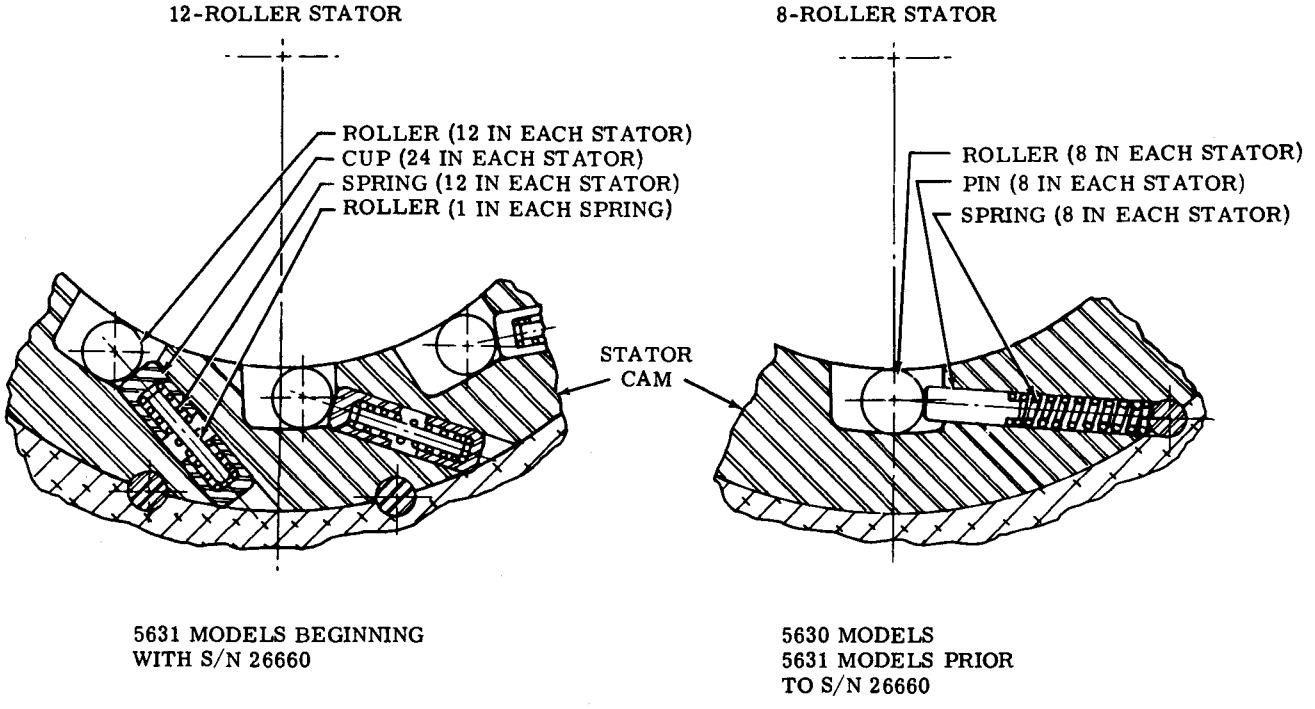


Fig. 6-8. Arrangement of stator free-wheel components—cross-section, front view

6-12. TORQUE CONVERTER PUMP

Note: The rebuild of the pump assemblies shown in A and B, foldout 5, is identical. Therefore, all references in a and b, below, are to items in A, foldout 5, only.

a. Disassembly (A, foldout 5)

(1) Flatten the corners of six lock strips 17. Remove twelve bolts 16, with the lock strips.

(2) Remove two bearing retainers 18. Tap bearing 22 rearward until it is free of pump 19.

(3) Remove the bearing 22 from drive gear 23.

Note: Refer to paragraph 6-2, above.

b. Assembly (A, foldout 5)

(1) Place drive gear 23, flat (rear) side downward. Install bearing 22, external groove upward, into gear 23.

(2) Install pump 19, rear side first, onto the assembled gear and bearing. Aline the bolt holes in pump 19 with those in gear 23.

(3) Install two retainers 18 into the groove in bearing 22. Aline the bolt holes in the retainers with those in pump 19.

(4) Install twelve 3/8-24 x 1 1/8-inch bolts, with one lock strip 17 for each two bolts. Note that two lock strips bridge the separations between retainers 18.

(5) Tighten bolts 16 (33 to 40 pound feet torque). Bend a corner of each lock strip against each bolt head.

6-13. CONVERTER OUTPUT SHAFT

a. Disassembly (5630 models — C, foldout 5)

(1) Remove snap ring 28, ball bearing 27 and sun gear 26.

(2) Remove two hook-type seal rings 21 from shaft assembly 22. Remove bearing retainer 24.

(3) Press shaft assembly 22 out of ball bearing 23. Do not remove the snap ring from the external groove in the bearing.

(4) Do not attempt to remove the orifice plug from the rear end of shaft 22.

Note: Refer to paragraph 6-2, above.

b. Assembly (5630 models — C, foldout 5)

(1) Press ball bearing 23, snap ring first, onto shaft 22.

(2) Install the shaft and bearing into bearing retainer 24. Install sun gear 26 onto shaft 22.

(3) Press bearing 27 onto shaft 22, and retain it with snap ring 28.

(4) Install two hook-type seal rings 21 into the grooves in shaft 22.

c. Disassembly (5631 models — C, foldout 5)

(1) Remove two hook-type seal rings 51 from shaft 52. Remove ball bearing 58 from shaft 52.

(2) Remove snap ring 57 and sun gear 56 from shaft 52. Remove retainer 54 from bearing 53.

(3) Press shaft 52 out of bearing 53. Do not remove the snap ring from the bearing.

(4) Do not attempt to remove the orifice plug from the rear end of shaft 52.

Note: Refer to paragraph 6-2, above.

d. Assembly (5631 models — C, foldout 5)

(1) Press ball bearing 53, snap ring first, onto shaft 52.

(2) Install the shaft and bearing into retainer 54. Install sun gear 56, and retain it with snap ring 57.

(3) Press bearing 58 onto shaft 52.

(4) Install two hook-type seal rings 51 into the grooves in shaft 52.

6-14. TORQUE CONVERTER HOUSING

a. Disassembly (C, foldout 5)

(1) If parts replacement is necessary, remove rear pump check valve guide 36, valve 37 and spring 38.

Note: Parts above are used only on transmissions which include a rear oil pump.

(2) Remove plugs 7, 8, 9, 10, 11 and 14 only as required for cleaning oil passages or for sealing against leaks.

(3) Remove dowel pins 12 and 13 only if replacement is necessary.

(4) Remove converter ground sleeve 20 only if replacement is necessary. The ground sleeve, if removed, must be pressed toward the rear of housing 6.

Note: Refer to paragraph 6-2, above.

b. Assembly (C, foldout 5)

(1) If ground sleeve 20 was removed, chill it in dry ice for at least one hour before installing it. Aline the bolt holes in the ground sleeve with those in the housing. Use one or two 1/2-13 headless guide bolts screwed into the rear of housing 6 to guide the ground sleeve. Press the sleeve firmly against the rear surface of the housing.

(2) Install plugs 7, 8, 9, 10, 11 and 14, using sealer on their threads. Tighten the plugs securely.

(3) If dowel pins 12 were removed, install new pins. Leave them projecting 0.50-inch from the rear of housing 6.

(4) If dowel pins 13 were removed, install new pins. Leave them projecting 0.45-inch from the PTO pad on housing 6.

(5) If guide 36, valve 37 and spring 38 were removed (if transmission includes these parts), replace them, using new parts. Install valve 37, convex side first, onto guide 36. Install spring 38 onto guide 36, against the concave side of valve 37. Press the guide into housing 6 until it bottoms.

6-15. CLUTCH PISTONS, SEAL RINGS

Note: It is recommended that the current Teflon seal rings and expanders be used to replace the older polyacrylate (synthetic rubber) seal rings.

a. Disassembly

(1) Remove old style polyacrylate seal rings. Remove new-style Teflon seal rings and expanders only if replacement is necessary.

Note: Do not dispose of Teflon seal rings by burning. Toxic gases are produced.

(2) Clean the seal ring grooves thoroughly and remove any nicks, burs or rough spots.

Note: Refer to paragraph 6-2, above.

b. Assembly

(1) Coil the expanders as shown in figure 6-9. Inspect the expander ends for curvature toward the bottom of the seal ring grooves (inward for external grooves; outward for internal grooves).

(2) Install the expander into the groove.

(3) Starting at a point opposite the open ends of the expander, install the Teflon seal ring. Do not stretch or deform the seal ring more than absolutely necessary for installation. Work both directions from the starting point until the seal ring is completely installed.

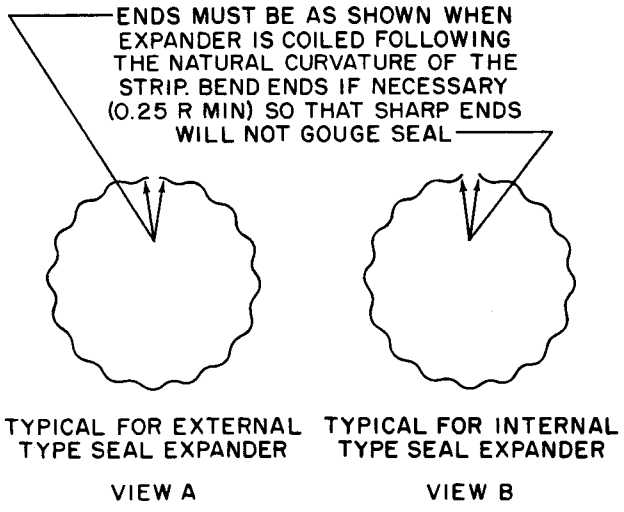


Fig. 6-9. Typical expanders for Teflon seal rings

Do not use tools to force the seal ring—use fingers only.

(4) Lubricate the seal ring, and center it radially in respect to the piston or part on which it is installed. This will aid in installation of the piston into its bore.

6-16. FORWARD PLANETARY CARRIER

a. Disassembly (5630 models — A, foldout 7)

(1) Remove internal snap ring 20 from the groove in carrier 19.

(2) Position the carrier assembly, the splined hub upward, in a press. Press six pinion spindles 14 out of the carrier assembly. Remove a ball 13 as each spindle is removed.

(3) Remove six pinion groups, each including thrust washers 11 and 18, spacers 12 and 17, pinions 16, and twenty-four needle rollers 15. Place each group in a separate container — to prevent mixing of group parts.

Note: Refer to paragraph 6-2, above.

b. Assembly (5630 models — A, foldout 7)

Note: Chill spindles 14 in dry ice for at least one hour before installation.

(1) Coat the bore of pinion 16 with oil-soluble grease. Install thrust washer 11 and spacer 12 onto spindle 14 and install the spindle into the pinion. Install twenty-four needle rollers 15 into the pinion bore, filling the space between the spindle and the pinion bore.

Note: Pinions must be replaced as matched sets — never individually.

(2) Install spacer 17 into end of pinion 16. Install thrust washer 18 onto end of pinion 16.

(3) Withdraw spindle 14 from the assembled pinion. Assemble the remaining five pinions as in (1) and (2), above. Withdraw the spindles.

(4) Position carrier 19, splined hub downward, in a press. Install the assembled pinion groups, and center them with the spindle bores in the carrier.

(5) Install each chilled spindle, plain end first (ball recess at opposite end), into the carrier. Be sure that the ball recess in each spindle is alined with the ball recess in the carrier, when the spindle is started. Insert a ball 13 into each ball recess as the spindle is pressed into the carrier. Bottom the spindles firmly in the carrier.

(6) Install snap ring 20, seating it fully in the groove in carrier 19.

c. Disassembly (5631 models — B, foldout 7)

(1) Remove nine bolts 22, and lock washers 21.

(2) Remove oil collector 20.

(3) Complete the disassembly as outlined in a(2) and (3), above.

Note: Refer to paragraph 6-2, above.

d. Assembly (5631 models — B, foldout 7)

(1) Carry out the procedures outlined in b(1) through (5), above.

(2) Install oil collector 20 onto carrier 19. Aline the bolt holes in the oil collector with those in the carrier.

(3) Install nine bolts 22, with lock washers 21. Tighten the bolts evenly to 41 to 49 pound feet torque.

6-17. REVERSE PLANETARY CARRIER

a. Disassembly (A or B, foldout 8)

(1) Remove internal snap ring 10 from carrier 11.

(2) Position the carrier assembly, internal snap ring groove downward, in a press. Press six spindles 5 out of the carrier. Remove a ball 9 from each spindle as it is removed.

(3) Remove six pinion groups, each consisting of thrust washers 4 and 8, pinion 7, and twenty-four needle rollers 6. Place each pinion group in a separate container to avoid mixing of pinion group parts.

Note: Refer to paragraph 6-2, above.

b. Assembly (A or B, foldout 8)

Note: Chill spindles 5 in dry ice at least one hour before installation.

(1) Coat the bore of a pinion 7 with oil-soluble grease. Install thrust washer 4 onto spindle 5 and install the spindle into the pinion. Install twenty-four needle rollers 6 into the space between the spindle and the pinion bore.

Note: Replace pinions only in matched sets — never individually.

(2) Install thrust washer 8 at end of pinion 7. Withdraw spindle 5.

(3) Assemble the remaining five pinion groups as outlined in (1) and (2), above.

(4) Position carrier 11, internal snap ring groove upward, in a press. Install the six assembled pinion groups, centering them with the spindle bores in carrier 11.

(5) Start the plain end of each spindle 5 into its bore in carrier 11. Aline the ball recess in each spindle with the ball recess in the carrier. Press each spindle until it bottoms solidly in the carrier, inserting a ball into each spindle as it is being installed.

(6) Install snap ring 10.

6-18. HIGH-RANGE PLANETARY CARRIER

a. Disassembly (A, foldout 9)

(1) Remove internal snap ring 11 from the groove in carrier 12. Position the carrier, snap ring groove downward, in a press.

(2) Press four pinion spindles 17 out of carrier 12. Remove a ball 20 from each spindle as it is removed.

(3) Remove four pinion groups, each consisting of two washers 13 and 19, two spacers 14 and 18, pinion 15, and twenty-eight needle rollers 16. Place each pinion group in a separate container to avoid mixing group parts.

Note: Refer to paragraph 6-2, above.

b. Assembly (A, foldout 9)

Note: Chill spindles 17 in dry ice at least one hour before installation.

(1) Coat the bore of a pinion 15 with oil-soluble grease. Install thrust washer 19 and spacer 18 onto spindle 17 and install the spindle into the pinion. Install twenty-eight needle rollers 16 into the space between the spindle and the bore of the pinion.

Note: Replace pinions only in matched sets — never individually.

(2) Install spacer 14 into end of pinion 15. Install thrust washer 13 at end of pinion 15. Withdraw the spindle from the assembled pinion group.

(3) Assemble the three remaining pinion groups as outlined in (1) and (2), above.

(4) Position carrier 12, internal snap ring groove upward, in a press. Install the four assembled pinion groups into the carrier, alining them with the carrier spindle bores.

(5) Start spindles 17, plain ends first, into the carrier. Aline the ball recesses in the spindles with those in the carrier. Press the spindles until they bottom in the carrier, installing a ball 20 into each spindle as it is installed.

(6) Install internal snap ring 11

6-19. INTERMEDIATE-RANGE PLANETARY CARRIER

a. Disassembly (B, foldout 9)

(1) Position carrier assembly 8, splined end of carrier downward, in a press. Press out four spindles 14, removing a ball 16 from each spindle as it is pressed out.

(2) Remove four pinion groups, each consisting of thrust washers 10 and 15, pinion 11, and twenty-four needle rollers 12 (or one needle bearing assembly 13). Place each pinion group in a separate container to avoid mixing group parts.

Note: Refer to paragraph 6-2, above.

b. Assembly (B, foldout 9)

Note: Chill spindles 14 in dry ice at least one hour before installation.

(1) Coat the bore of a pinion 11 with oil-soluble grease. Install thrust washer 15 onto spindle 14 and install the spindle into the pinion. Install twenty-four needle rollers 12 (or one needle bearing assembly 13) into the space between the spindle and the pinion bore.

Note: Replace pinions only in matched sets — never individually.

(2) Install thrust washer 10 at end of pinion 11. Withdraw the spindle from the assembled pinion group.

(3) Assemble the three remaining pinion groups, as outlined in (1) and (2), above.

(4) Position carrier 9, splined end upward in a press. Install the four assembled pinion groups, alining them with the carrier spindle bores.

(5) Start spindles 14, plain ends first, into carrier 9. Aline the ball recesses in the spindles with those in the carrier. Press the spindles until they bottom in the carrier, installing a ball 16 into each spindle as it is installed.

6-20. LOW-RANGE CLUTCH

a. Disassembly (A, foldout 10)

(1) Remove internal snap ring 15. Remove two step-joint seal rings 17 (or metal hook-type seal rings in older models). Remove thrust washer 16.

(2) Lift clutch hub assembly 11, and its attached parts, out of clutch drum 1. Remove five clutch plates 2 and 3 from clutch drum 1.

(3) Position clutch hub assembly 11, piston 6 upward, in a press. Depress the inner diameter of return spring 5, and remove snap ring 4.

(4) Remove piston 6 with its seal ring. Refer to paragraph 6-15, above, for rebuild of the piston. Refer to paragraph 6-15, above, for servicing the seal ring on the hub of hub assembly 11. Do not attempt to remove balls 12 or pins 14 from hub 13.

Note: Refer to paragraph 6-2, above.

b. Assembly (A, foldout 10)

(1) Install piston 6 (as rebuilt in para 6-15, above), seal ring first, into hub assembly 11 (as rebuilt in para 6-15, above). Be sure the piston splines are alined with the clutch hub splines.

(2) Place the assembled hub assembly and piston, hub assembly 11 downward, in a press. Install return spring 5, concave side next to piston 6. Depress the inner diameter of spring 5, and install snap ring 4.

(3) Position clutch drum 1, inner splines upward, on the work surface. Beginning with an internal-splined plate 2, and alternating with external-splined plates 3, install three plates 2 and two plates 3 into clutch drum 1.

(4) Install the assembled clutch hub and piston, piston first, into clutch drum 1. Install snap ring 15.

(5) Install thrust washer 17 onto hub assembly 11. Install two step-joint Teflon seal rings 17 into the grooves in hub assembly 11. Use oil-soluble grease to retain them.

Note: The use of Teflon seal rings is recommended for all transmissions even though metal hook-type seal rings may have been used originally.

6-21. TRANSMISSION HOUSING

a. Disassembly (B, foldout 10)

(1) Do not remove oil transfer hub 9 from housing 8 unless replacement is necessary. If it must be removed, remove six bolts 27 and lock washers 28. Press or drive hub 9 rearward, and out of housing 8.

(2) Remove plugs 2, 6 and 7 only if replacement is necessary. Remove tubes 3 and 4 only if replacement is necessary. Remove pin 5 only if replacement is necessary.

Note: Refer to paragraph 6-2, above.

b. Assembly (B, foldout 10)

(1) If oil transfer hub 9 was removed, chill the new hub in dry ice for two hours. Aline the bolt holes in the hub with those in housing 8. Press the hub firmly against the rear surface of housing 8.

(2) Install six 1/2-13 x 1 3/4-inch bolts 27, with lock washers 28. Tighten the bolts to 67 to 80 pound feet torque.

(3) If plugs 2 and 6 were removed, install them, with sealer. Tighten the plugs securely.

(4) If tube 3 was removed, install a new one. Recess the front end of the tube 0.03 to 0.06 inch below the front surface of 5630 model housings. Recess the same tube 0.050 to 0.053 inch in 5631 model housings.

(5) If tube 4 was removed, install a new one. In 5630 models this tube should be flush with the front of the housing, or recessed to 0.010 inch. In 5631 models, the same tube should be recessed 0.48 inch below the front of the housing.

(6) If pins 5 were removed, install new pins, with sealer, and press them flush with, to 0.03 inch below the surface.

(7) If plug 7 was removed, coat a new plug with sealer and install it, flat side first. Drive it flush with, or to 0.010 inch below the surface.

6-22. PARKING BRAKE SHOE ASSEMBLY

Note: Early 5630 models use a brake which is slightly different from the current brake. The early brake is illustrated in figure 7-5. The current brake is shown in foldout 13 (items 56 through 69). Performance and adjustment are identical for both brakes. Construction of both is essentially the same.

a. Disassembly (foldout 13)

(1) Stretch springs 69 and unhook them from the heads of anchor bolts 67. Remove the springs. Remove anchor bolt plate 68.

(2) Unhook spring 65 from brake shoe and lining assembly 61. Remove the spring, socket 62, screw 63, and nut 64.

(3) Remove brake shoe and lining assemblies 60 and 61.

(4) Do not disassemble the remainder of the assembly unless parts replacement is necessary.

(5) If necessary, remove the clamp bolt from apply lever 54. Remove the apply lever, noting its exact position relative to