TM 9-2520-234-35

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

FIELD AND DEPOT MAINTENANCE MANUAL

FOR

POWER TRAIN ASSEMBLY

(8351100)

(ALLISON MODEL XTG-411-2A)

COMPOSED OF:

TRANSFER ASSEMBLY, TRANSMISSION INPUT,
(2520-894-9535)

TRANSMISSION ASSEMBLY,
(2520-894-9533)

DRIVE ASSEMBLY, TRANSMISSION OUTPUT,
VEHICLE LEFT
(2520-894-9534)

DRIVE ASSEMBLY, TRANSMISSION OUTPUT,
VEHICLE RIGHT

*C2 (See Change 2)

This copy is a reprint with changes 1 and 2, which includes pen and ink changes as well as remove and insert pages.

HEADQUARTERS, DEPARTMENT OF THE ARMY

05 JULY 1962

CHANGE

NO. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C. 31 August 1992

TECHNICAL MANUAL

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

POWER TRAIN ASSEMBLY (8351100) (ALLISON MODEL XTG-411-2A)
POWER TRAIN ASSEMBLY (11650290) (ALLISON MODEL XTG-411-4)

TM 9-2520-234-35, 5 July 1962, is changed as follows:

1. New or changed material is indicated by a vertical bar in the margin of the page.

2. Make a pen-and-ink change to the cover of this manual to add the XTG-411-4 model.

3. Cross out the listed End Item Applications which appear on the inside front cover. This material has been moved to the new pages a and b to be inserted as directed in paragraph 5.

4. Pen-and-ink changes to be made are listed on pages (1 of 13) through (13 of 13/(14 blank). Fasten these pages to the inside front cover. If there is not room in the basic manual to add pen-and-ink changes, asterisk the basic pages to indicate there is new or revised material which must be referred to when doing maintenance procedures.

5. Remove old pages and insert new pages as indicated below:

Remove Pages	Insert Pages
None	Warning pages a and b
Table of Contents pages	i thru iii/(iv blank)
1 thru 24	1 thru 24
27 and 28	27 and 28
None	28.1 /(28.2 blank)
63 thru 68	63 thru 67/(68 blank)
69 and 70	69 and 70
73 thru 76	73 thru 76
None	76.1 and 76.2
111 thru 118	111 thru 118
195 thru 198	195 thru 198
231 thru 238	231 thru 238
None	238.1 thru 238.3/(238.4 blank)
None	239.1 /(239.2 blank)
None	241.1 /(241.2 blank)

None	243.1/(243.2 blank)
None	245.1/(245.2 blank)
None	247.1/(247.2 blank)
None	249.1/(249.2 blank)
None	251.1/(251.2 blank)
None	253.1/(253.2 blank)
None	255.1/(255.2 blank)
None	257.1/(257.2 blank)
None	259.1/(259.2 blank)
None	261.1/(261.2 blank)
None	263.1/(263.2 blank)
None	265.1/(265.2 blank)
None	267.1/(267.2 blank)

File this change sheet in front of the publication for reference purposes.

By Order of the Secretary of the Army

GORDON R. SULLIVAN
General, United States Army
Chief of Staff

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Secretary of the Army
02511

Distribution:
To be distributed in accordance with DA Form 12-37-E (Block 1663) Direct and General Support maintenance requirements for TM9-2520-234-35.

REQUIRED CHANGES

NOTE

Place an asterisk by each of the referenced paragraphs in the basic manual to show that there is a change. While using the TM, you will then be alerted by the asterisks that you need to refer to the pen and ink changes portion (pages 1 of 13 thru 3 of 13/(14 blank)) of Change 2 package for changed or additional information.

Page 46 is changed as follows.

Paragraph 40a. is changed to read:

a. When it is necessary to start the vehicle engine by towing or pushing the vehicle (refer to the applicable TM manual, ref. Appendix A), the manual selector valve must be placed in second gear position.

Page 62 is changed as follows.

Change Chapter 3 heading to read:

PARTS, SPECIAL TOOLS, IMPROVISED TOOLS, AND EQUIPMENT FOR DS & GS MAINTENANCE

Change Paragraph 60 to read:

Repair parts supplied for the XTG 411-2A, -4 power trains are listed in TM 9-2520-234-34P.

Change Paragraph 61 to read:

For standard and commonly used tools and equipment having general application to this material, refer to the Appendix B, Section 2.

Change the last sentence in Paragraph 62a to read:

For replacements, refer to TM 9-2520-234-34P.

Page 77 is changed as follows.

Paragraph 72q is now followed by new Paragraph r:

r. Pipe Plugs. When replacing pipe plugs, coat all pipe plugs that are not pre-coated with sealing compound MIL-S-45180, Type III before installing new plugs.

Change the first sentence in Paragraph 73a to read as follows:

a. This section presents the complete disassembly of the XTG 411-2A, -4 transmissions, input transfer assembly and output drive assemblies.

Add the following NOTE after Paragraph 73b:

Note. There are Change 2 supplements immediately following each fold-out. Refer to these supplements to note where changes have been made for later models. Do not use the part numbers listed on fold-outs 2 through 15. These part numbers have been superseded by TM 9-2520-234-34P.

Page 78 is changed as follows.

The part number for the bracket shown in Figure 39 (Step 1) is 8355697.

For later models, the lock strips shown in Figure 40 (Step 2) are superseded by lock washers.

Note: When doing Figure 40 (Step 2) and Figure 41 (Step 3), take note of the size and location of the bolts, lock washers and spacers (if present). Make a sketch so that the same sizes and locations are used at assembly. Models vary configuration at this location and it is important that the same size and location of parts is maintained.

In Step 2, also remove spacers 157 (Fig. 373.1, fold-out 2), if present.

For all models, change Step 3 to read:

Using a 5/8-inch wrench, remove four input transfer-to-converter housing bolts and lock washers (A). Using a 3/4-inch wrench, remove six input transfer-to-converter housing bolts and lock washers (A). Remove engine coupling shaft (B).

For later models, the 10 bolts removed in Step 3 are:

1/2-13 X 5-1/4 (2)
1/2-13 X 6 (4)
7/16-14 X 1/2 (4)

Page 79 is changed as follows.

Figure 44 (Step 6) pertains to earlier models. For later models, lock strip (A) has been superseded by two lock washers.

Page 80 is changed as follows.

Add to Figure 50 (Step 12):

Take care not to remove freewheel race from stator assembly as this will dislodge twelve rollers and twelve springs contained within.

Page 81 is changed as follows.

The last sentence in Figure 53 (Step 15) should read as follows:

Remove seal ring (E) and expander from the lockup clutch piston.

Page 82 is changed as follows.

Figure 58 (Step 20) pertains to earlier models. For later models, lock strip (A) has been superseded by two lock washers.

Page 88 is changed as follows.

In Figure 82 (Step 18), coupling (C) will only be present on some models.

Page 91 is changed as follows.

For later models, skip Figure 92 (Step 28). Later models are not equipped with accumulator valves.

Page 95 is changed as follows.

In Figure 110 (Step 46), screws are shown at locations (A). In later models there are bolts at locations (A).

Page 96 is changed as follows.

The part number for the 3/4 lifting eye shown in Figure 114 (Step 50) is 7083672.

Page 99 is changed as follows.

Reverse Figure 125 (Step 61) with Figure 126 (Step 62).

Change Step 62 to read:

Block up the turbine shaft with a wooden block (A). Using a 7/16-inch wrench, remove one self-locking bolt (B) and flat washer and loosen the other. Using loosened bolt, turn pitot tube so that it clears collector ring on high clutch assembly. Remove remaining self-locking bolt (B) and flat washer.

Page 102 is changed as follows.

Add this information to Figure 137 (Step 9):

Later models also may have shims under lock plate (C). If present, remove the shims.

Page 105 is changed as follows.

The part number for the wrench in Figure 144 and in Step 83a(5) is 8355764.

Page 106 is changed as follows.

Delete Paragraph 83b (5).

Page 107 is changed as follows.

Delete Paragraph 86b (1) and the Note following it.

Page 108 is changed as follows.

Paragraph 88 is changed to read:

a. Do not remove oil seal 22 or sleeve 18 (Fig. 373, fold-out 2) from flange adapter 19 unless replacement is necessary. If necessary, drive the oil seal out of the adapter.

b. If necessary to remove sleeve 18 from flange adapter 19, drill out pins 17. Use a drill bit slightly larger than 3/16-inch and drill only deep enough to free the sleeve. Press the sleeve from the housing.

Add Paragraph 91c as follows:

c. If sleeve 18 (Fig. 373, fold-out 2) was removed, install new replacement as follows:

(1) Mark the locations of the three original pin holes, in the sleeve bore, on the bolt hole circle of the housing.

(2) The pin holes to be drilled for the new sleeve should be located 60 degrees clockwise or counterclockwise from the original pin holes. The two alternate pin locations are indicated by the broken line in Fig. 149.1.

(3) Install sleeve 18 (Fig. 373, fold-out 2), pressing it flush with the housing outer surface.

(4) Using a 1.1855-0.1875 drill, drill a hole 0.410 to 0.470-inch deep at one of the alternate locations chosen. This hole should be 0.250-inch inward from the cover mounting surface and at a 30 degree angle to the cover mounting surface. Refer to Figure 149.1.

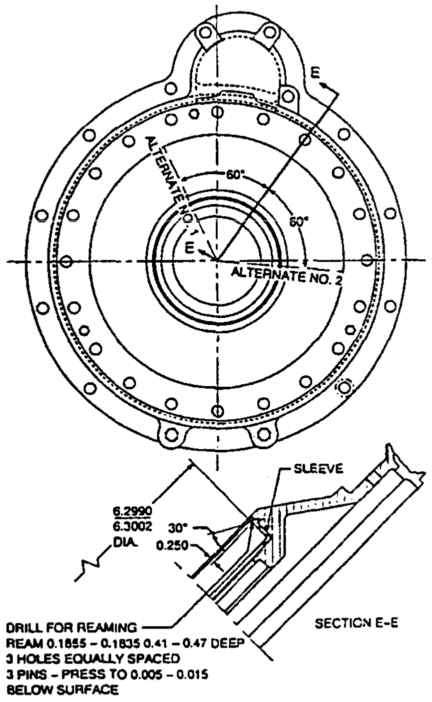


Figure 149.1. Location of sleeve retainer pins

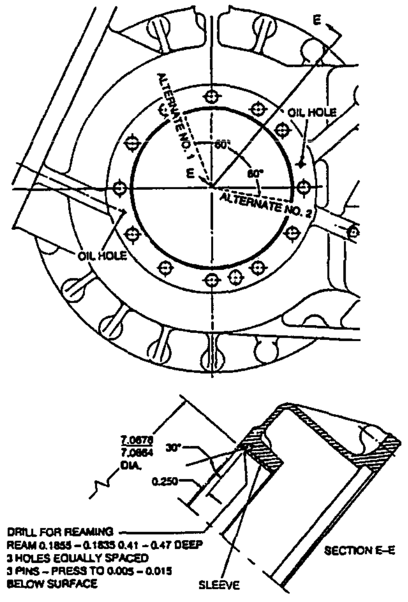


Figure 151. Location of input transfer drive gear support sleeve retainer pins

(5) Drill the remaining two dowel pin holes, spacing them 120 degrees apart.

(6) Install the three pins (Fig. 149.1), driving them 0.005 to 0.015-inch below the sleeve surface.

(7) Line bore sleeve 18 (Fig. 373, fold-out 2) to 6.2990-6.002 inches diameter, with a finish of 100 RMS (Fig. 149.1).

Page 110 is changed as follows.

Change Paragraph 98c to read:

c. Do not remove inserts 137,140,112,113 and 122 (Fig. 373, fold-out 2), or sleeves 119,120,134, 136 or 139 from input transfer housing assembly 111 unless replacement is necessary. If necessary to remove a bushing or insert, refer to par. 72 for the proper procedure. If present, do not remove bushing assembly 118.

Figure 151 is changed as follows:

Dimension for line bore should be added to read 7.0864-7.0876 inch diameter.

Page 121 is changed as follows.

Change Paragraph 141a to read:

a. Install 1-1/4 inch plugs 35 or 36 if they were removed. Torque plugs 35 and 36 to 90-110 pound-feet. Install 1-inch plugs 33, 39 or 41 if they were removed. Torque plugs 33, 39 and 41 to 70-90 pound-feet. Install 1-1/2 inch plugs 40 if they were removed. Torque plugs 40 to 110-130 pound-feet.

Page 123 is changed as follows.

Add following sentence to Paragraph 143u:

Note that later models have plugs located differently from that shown in figure 161.

Page 124 is changed as follows.

Paragraph 146a is changed to read:

a. If removed, install 1/4-inch plugs 49 and 50. Torque plugs 49 and 50 to 96-120 pound-inches. Install preformed packing 59 into end cover 48.

Page 127 is changed as follows.

Output coupling and coupling retainer as shown in Figures 172 and 173 and as addressed in Steps s and t are present only in earlier models.

Step u is for XTG 411-2A models. For XTG 411-4 models, install 11 internal and 11 external-splined brake plates and disks, beginning with an extemal-splined brake plate (Fig. 174).

Page 128 is changed as follows.

Paragraph 148c is changed to read:

c. For earlier models, using l/2-inch wrench, remove self-locking bolt 51 securing drive gear shroud 48 and shroud plate 50 to the pump. Remove the shroud and plate. Straighten and remove lock pin 42 from gear 49. Remove the gear.

Paragraph 148e is changed to read:

e. Do not remove the needle bearing assemblies 29 and 45 or dowel pins 31 and 46 from covers 30 and 47.

Paragraphs 15lb and c are deleted.

Page 129 is changed as follows.

Delete Paragraph 151 m. The shroud is no longer required.

Page 134 is changed as follows.

Paragraph 153at is changed to read:

at. Remove left-brake apply cam stationary ring (fig. 190). Remove ring seal and expander from ring.

Paragraph 153au is changed to read:

au. Remove right-brake applv cam stationary ring (fig. 191). Remove ring seal and expander from ring.

Paragraph 156a is changed to read:

a. Install any plugs in transmission rear housing 25 that were removed for cleaning purposes. Torque 3/8-inch plug 22 (fig. 379, fold-out 8) to 12-16 pound-feet. Torque l-inch plug 27 to 70-90 pound-feet.

Paragraph 156b is changed to read:

b. Install new ring seal and expander onto right-brake apply cam stationary ring (fig. 191).

Paragraph 156d is changed to read:

d. Install new ring seal and expander onto left-brake apply cam stationary ring (fig. 190).

Page 138 is changed as follows.

Paragraph 156ag is changed to read:

ag. Install the left-follower link shaft plug (fig. 198). Torque the 3/8-inch plug to 12-16 pound-feet.

Paragraph 156aj is changed to read:

aj. Install the right-follower link shaft plug (fig. 200). Torque the plug to 12-16 pound-feet.

Page 139 is changed as follows.

Paragraph 156ap is changed as follows:

ap. Install the brake coolant pump idler gear shaft and secure with one 3/8-16 x 3-1/4 cap screw (fig. 176). Torque the cap screw to 26-32 pound-feet.

Add the following Note immediately below Paragraph 158 heading:

Note. The pinions in this planetary carrier are a matched set. Therefore, failure of one pinion requires replacement of the complete set.

Page 141 is changed as follows.

Change Note following Paragraph 161 heading to read:

Note. Chill steer planetary carrier spindles 11 (fig. 378, fold-out 7) in dry ice for approximately one hour prior to installation. Handle chilled parts with gloves.

Add this Note following Paragraph 161k.

Note. Chilling of spindles results in "frost" initially which ultimately is moisture. If a rebuilt carrier assembly is not being installed in a transmission in the near future, apply a coating of oil around spindle locations to avoid rust oxidation.

Page 144 is changed as follows.

The part number for the compressing tool in Figure 210 is 8355784.

Delete both Notes from Page 144 following Steps k and 1.

Page 145 is changed as follows.

Delete Note following Paragraph 173a (l).

Page 147 is changed as follows.

Add this Note immediately following the heading for Paragraph 178:

> Note. The pinions in this planetary carrier are a matched set. Therefore, failure of one pinion requires replacement of the complete set.

Change Paragraph 178e to read:

e. Position the reverse-range planetary carrier assembly in a press. Using a suitable pressing tool, remove six carrier spindles (fig. 214). Remove the pinions 14 (fig. 377, fold-out 6), thrust washers 8 and 15, spacers 13, 9 and 11, if present, and roller bearings 10 and 12, if present.

Change Note following Paragraph 181 heading to read:

> Note. Chill spindles 7 in dry ice approximately on hour prior to installation. Handle chilled parts with gloves.

Page 148 is changed as follows.

Change Paragraph 181c to read:

c. Insert 22 new spindle rollers into one end of the pinion bore (fig. 215).

Delete Paragraph 181f.

Delete loose rollers shown in Figure 216.

Page 149 is changed as follows.

Change Paragraph 18ll_to read:

1. Install the remaining five spindles 7 (fig. 377, fold-out 6) and pinions 14, with rollers 10, thrust washers 8 and 15, lock pins 16 and spacers 9 and 13 in the same manner as described in b through k. above.

Add this Note following Paragraph 181l:

> Note. Chilling of spindles results in "frost" initially which ultimately is moisture. If a rebuilt carrier assembly is not being installed in a transmission in the near future, apply a coating of oil around spindle locations to avoid rust oxidation.

Delete the Note following Paragraph 183g.

The part number for the compressing tool in Figure 218 is 8355784.

Page 150 is changed as follows.

Add this Note immediately following the heading for Paragraph 188:

> Note. The pinions in this planetary carrier are a matched set. Therefore, failure of one pinion requires replacement of the complete set.

Change Note following heading for Paragraph 191 to read:

> Note. Chill spindles 34 in dry ice for approximately one hour prior to installation. Handle chilled parts with gloves.

Page 152 is changed as follows.

Add this Note after Paragraph 191k.

> Note. Chilling of spindles results in "frost" initially which ultimately is moisture. If a rebuilt carrier assembly is not being installed in a transmission in the near future, apply a coating of oil around spindle locations to avoid rust oxidation.

Add this Note immediately following the heading Paragraph 193:

Note. The pinions in this planetary carrier are a matched set. Therefore, failure of one pinion requires replacement of the complete set.

Change Paragraph 193d to read:

d. Remove planetary carrier pinions, thrust washers, and bearings from the carrier (fig. 225).

Page 153 is changed as follows.

Change the Note following the heading of Paragraph 196 to read:

Note. Chill spindles 19 in dry ice for approximately one hour prior to installation. Handle chilled parts with gloves.

Change Paragraph 196c to read:

c. Install one thrust washer 25 (fig. 376.1, fold-out 5.1) and one caged bearing 65 onto alining tool 8351208.

Delete Paragraph 196d.

Page 154 is changed as follows.

Change Paragraph 196f to read:

f. Place thrust washer 20 over the other end of alining tool. Remove alining tool.

Change Paragraph 196g to read:

g. Slide the pinion, with its related parts, into the location in the carrier 18 from which it was removed. Using alining tool 8351208, aline the pinion, bearing and washers. Refer to fig. 221. Remove the alining tool.

Change Paragraph 196k to read:

k. Install the remaining three spindles 19 (fig. 376.1, fold-out 5) and pinions 64, with bearings 65 and thrust washers 20 and 25, and lock pins 17 in the same manner as described in b through j, above.

Add this Note following Paragraph 196k:

Note. Chilling of spindles results in "frost" initially which ultimately is moisture. If a rebuilt carrier assembly is not being installed in a transmission in the near future, apply a coating of oil around spindle locations to avoid rust oxidation.

Page 155 is changed as follows.

The part number for the compressing tool in Figure 229 is 8355784.

Change Paragraph 198g to read:

g. Remove the seal ring and expander from the outside diameter of the piston.

Page 156 is changed as follows.

Change Paragraph 201e to read:

e. Install new seal ring and expander onto high-range clutch piston.

Delete Note following Paragraph 201e.

Change Paragraph 201i to read:

i. Using compressing tool 8355784 (fig. 36), compress piston return springs and install the retaining ring that retains the retainer (fig. 229).

Step k is for XTG 411-2A models. For XTG 411-4 models, install five internal- and five external-splined high-range clutch plates, beginning with an external-splined plate (fig. 227).

Page 157 is changed as follows.

Paragraph 203i and Figure 233 are for earlier models. Later models do not have accumulator valves.

Page 158 is changed as follows.

Paragraph 206a is changed to read:

a. If 1/8-inch hex-socket plug 18 was removed, install it. Torque plug 18 to 50-60 pound-inches. If 1/4-inch hex-head plugs 25 were removed, install them. Torque plugs 25 to 96-120 pound-inches. If 3/8-inch square-socket plugs 26 were removed, install them. Torque plugs 26 to 12-16 pound-feet. If 1/16-inch hex-head plug 26A (fig. 375.1) was removed, install it. Torque plug 26A to 35-50 pound-inches. If 3/8-inch hex-head plug 27 was removed, install it. Torque plug 27 to 12-16 pound-feet.

Page 159 is changed as follows.

Paragraph 206e is changed to read:

e. Position the transmission housing on its bottom side. For earlier models, install the accumulator body and gasket. Secure the body with four 3/8-16 x 1-1/2 and two 3/8-16 x 2-1/2-inch cap screws with lock washers (fig. 233). Torque cap screws to 26-32 pound-feet.

Paragraph 206f is changed to read:

f. Install the oil filler tube assembly and gasket. Secure the assembly with four 3/8-16 x 1 cap screws with lock washers. Install the gage rod cap. Torque cap screws to 26-32 pound-feet.

Paragraph 206h is changed to read:

h. Install the diaphragm clamp plate over the hub of the diaphragm assembly (fig. 232). Aline the bolt holes in the plate with the diaphragm assembly. Install four 3/8-24 x 2-1/2-inch self-locking diaphragm bolts (fig. 233). Torque the four bolts to 41-49 pound-feet.

Page 160 is changed as follows.

Add this Note immediately following the heading for Paragraph 213:

Note. The pinions in this planetary carrier are a matched set. Therefore, failure of one pinion requires replacement of the complete set.

Page 161 is changed as follows.

Add this Note following Paragraph 216a (11):

Note. Chilling of spindles results in "frost" initially which ultimately is moisture. If a rebuilt carrier assembly is not being installed in a transmission in the near future, apply a coating of oil around spindle locations to avoid rust oxidation.

Change Paragraph 221a (2) to read:

(2) If plugs 36 and 37 were removed, install new replacements. Torque plugs 36 and 37 to 96-120 pound-inches.

Page 162 is changed as follows.

The part number for the bearing remover in Figure 238 is 8355744.

The part number for the replacer in Figure 239 is 8351932.

Page 163 is changed as follows.

Add Paragraph 226a (5):

(5) Install three pipe plugs (fig. 237). Torque the pipe plugs to 10-12 pound-feet.

Change Note following Paragraph 227 heading to read:

Note. The following assembly steps for the XTG 411-2A, -4 transmissions are to be used in the same manner as the disassembly steps. Refer to par. 73a and b.

Page 172 is changed as follows.

Add this NOTE below Figure 277 (Step 38).

Note. Figure 277 (Step 38) is for XTG 411-2A models. For XTG 411-4 models, install eleven external-(A) and eleven internal-splined (B) left-brake plates alternately, beginning with an external-splined plate (A).

Page 175 is changed as follows.

Add this NOTE below Figure 287 (Step 48).

Note. In Figure 287 (Step 48), later models do not have the shroud over the gear.

Page 177 is changed as follows.

Add this NOTE below Figure 295 (Step 56).

Note. For later models, skip Figure 295 (Step 56). Later models do not have accumulator valves.

Page 182 is changed as follows.

Change Step 78 to read:

Install nine 3/8-16 x 3-1/4 (A), five 3/8-16x 4-1/2 (B), one 3/8-16 x 2-1/2 (C), nine 3/8-16 x 2-3/4-inch (D) and four 3/8-16 x 4 bolts (E) with lock washers to retain relay valve body assembly (F). Using a 9/16-inch wrench, torque bolts to 20-26 pound-feet.

Page 186 is changed as follows.

Add this NOTE below Figure 333 (Step 6).

Note. Figure 333 (Step 6) are for earlier models. The lock strip is no longer used at this location. It has been superseded by two lock washers.

Page 188 is changed as follows.

Change Step 11 to read:

Install scavenge oil pump screen (A) and plug (B) with gasket (C). Torque plug (B) to 90-100 pound-feet.

Page 190 is changed as follows.

Add this NOTE below Figure 349 (Step 22).

Figure 349 (Step 22) is for earlier models. The lock strip is no longer used at this location. It has been superseded by two lock washers.

Page 191 is changed as follows.

Add this NOTE below Figure 353 (Step 26).

Figure 353 (Step 26) is for earlier models.

For later models, add Figure 353.1 (Step 26.1):

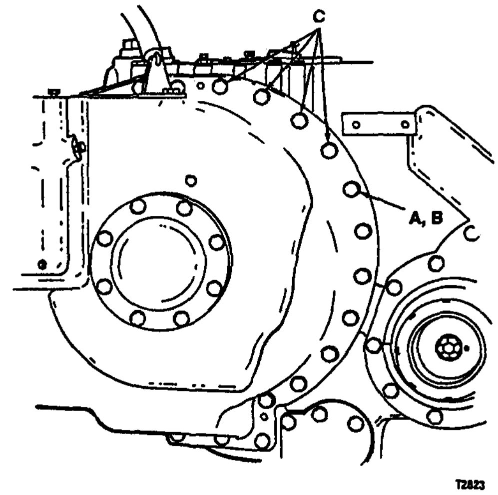


Figure 353.1 (Step 26.1)

For later models, install twelve 7/16-14 x 1-1/2 converter housing-to-input transfer housing assembly bolts (A) with lock washers (B). At locations (C), install four 7/16-14 x 1-5/8 bolts 155 (fig. 373.1, foldout 2.1), lock washers 156 and spacers 157. Torque the 7/16-inch bolts to 42-50 pound-feet.

Page 192 is changed as follows.

Step 27 is changed as follows:

Install engine coupling shaft (A). For later models, install two 1/2-13 x 5-1/4 bolts (B), four 1/2-13 x 6 bolts (C) and four 7/16-14 x 1-1/2 bolts (D) with lock washers. Torque 1/2-inch bolts (B) and (C) to 67-80 pound-feet. Torque 7/16-inch bolts (D) to 42-50 pound-feet.

Page 193 is changed as follows.

Add Step 3.1:

Install lock plate (A) (fig. 359) [without lock strips (B)] and four 5/8-18 x 2-1/2 bolts (C). Using a 15/16-inch wrench, torque the bolts to 134-160 pound-feet to seat all the parts.

Add Step 3.2:

Remove the four 5/8-18 x 2-1/2 bolts (C) and lock plate (A). Measure the gap shown in Figure 358.1

Add Step 3.3:

If necessary, add shims 51 (fig. 385.1., foldout 14.1) so that the gap after shim installation is 0.008-0.012 inch. Leaving selected shims installed, go on to Step 4.

Page 202 is changed as follows.

Change paragraph 235d to read:

d. Standard Torque Listings. For torque values, refer to the individual procedure steps.

Pages 203 through 229 are changed as follows.

The far right column marked "Depot Maint." is no longer used at this repair level.

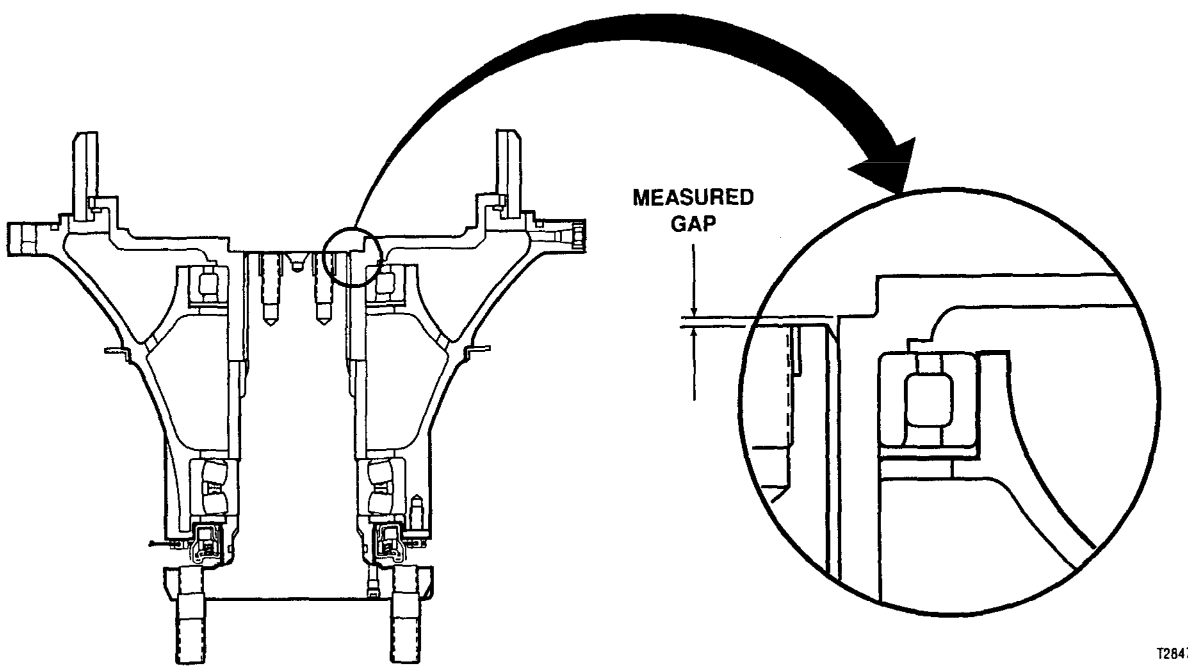


Figure 358.1 (Step 3.2)

Reference Fig.	Reference Item	Point of Measurement	Size and Fit of New Parts	Wear Limits Field Maint.
Changes to Page 205				
373	81a	Inside diameter of washer	3.2950 to 3.2970	3.2980
373	81b	Thickness of washer	0.7480 to 0.7520	0.7460
Changes to Page 207				
374	5a	Data pertains to earlier models		
374	55a	Spring no longer used (reference fig. 374.1)		
Changes to Page 208				
374	56a	Spring no longer used (reference fig. 374.1)		
375	8a	Change item in chart to read 6a		
375	8b	Change item in chart to read 6b		
Changes to Page 209				
375	56a	Thickness of plate	0.1890 to 0.1970	0.1700
375	59a	Thickness of plate, XTG 411-2A	0.4580 to 0.4620	0.4570
		Thickness of plate, XTG 411-4	0.8950 to 0.8990	0.4190
375	68b	Thickness of piston, XTG 411-2A	0.9950 to 0.9990	0.9940
		Thickness of piston, XTG 411-4	0.8950 to 0.8990	0.8940
Change to Page 210				
376	4a	Thickness of plate	0.1970 to 0.2050	0.1800
Changes to Page 211				
376	21a	Data pertains to earlier models		
376	22a	Data pertains to earlier models		
376	23a	Data pertains to earlier models		
376	24a	Data pertains to earlier models		
376	45a	Thickness of plate	0.1970 to 0.2050	0.1800
Add items:				
376.1	64a	Inside diameter of pinion	1.0070 to 1.0075	1.0085
376.1	65a	Inside diameter of bearing assembly (installed)	0.7570 to 0.7577	0.7595

Reference		Point of Measurement	Size and Fit of New Parts	Wear Limits
Fig.	Item			Field Maint.
Changes to Page 212				
377	2a	Thickness of plate	0.1970 to 0.2050	0.1800
377	11a	Data pertains to earlier models		
377	12a	Data pertains to earlier models		
Change to Page 213				
377	47a	Thickness of plate	0.1150 to 0.1240	0.1010
Change to Page 214				
377	63a	Thickness of plate	0.1580 to 0.1630	0.1430
Changes to Page 215				
378	17a	Thickness of plate	0.1166 to 0.1226	0.1166
378	18a	Thickness of plate	0.1580 to 0.1630	0.1430
Change to Page 217				
379	73a, 74a	All measurements are made to item 72; not a serviceable subassembly (5 places on this page)		
Changes to Page 218				
380	19a	Thickness of plate	0.1580 to 0.1630	0.1430
380	20a	Thickness of plate	0.1166 to 0.1226	0.1166
Change to Page 219				
381	16a	Thickness of plate	0.1580 to 0.1630	0.1430
Change to Page 220				
381	32a	Thickness of plate	0.1150 to 0.1240	0.1010

Reference Fig.	Item	Point of Measurement	Size and Fit of New Parts	Wear Limits Field Maint.
Changes to Page 221				
381	78a	Data pertains to earlier models (3 places on this page)		
382	15a	All measurements are made to item 14; not a serviceable subassembly (2 places on this page)		
Change to Page 223				
383	18a, 18b	All measurements are made to item 14; not a serviceable subassembly (4 places on this page)		
Changes to Page 224				
383	18a, 18b	All measurements are made to item 14; not a serviceable subassembly (2 places on this page)		
383	24a	All measurements are made to item 23; not a serviceable subassembly (3 places on this page)		
Change to Page 225				
383	64a	All measurements are made to item 63; not a serviceable subassembly (3 places on this page)		
Change to Page 227				
384	45a, 47a	All measurements are made to item 44; not a serviceable subassembly (6 places on this page)		

Page 230 is deleted.

CHANGE No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON DC, *25 September 1981*

FIELD AND DEPOT MAINTENANCE MANUAL FOR POWER TRAIN ASSEMBLY (8351100) (ALLISON MODEL XTG-411-2A) COMPOSED OF: TRANSFER ASSEMBLY, TRANSMISSION INPUT, (2520-00-894-9535) TRANSMISSION ASSEMBLY, (2520-00-894-9533) DRIVE ASSEMBLY, TRANSMISSION OUTPUT, VEHICLE LEFT (2520-00-894-9534) DRIVE ASSEMBLY, TRANSMISSION OUTPUT, VEHICLE RIGHT (2520-00-894-9532)

TM 9-2520-234-35, 5 July 1962, is changed as follows:

Cover 2 (inside front cover) is changed as follows:

END ITEM APPLICATION

GUN, FIELD ARTILLERY, SELF-PROPELLED:
FULL TRACKED, 175 MM, M107
(TM 9-2300-216)

HOWITZER, LIGHT, SELF-PROPELLED:
105 MM, M108
(TM 9-2350-217)

HOWITZER, MEDIUM, SELF-PROPELLED:
155 MM, M109
(TM 9-2350-217)

HOWITZER, MEDIUM, SELF-PROPELLED:
155 MM, M109A1
(TM 9-2350-217)

HOWITZER, MEDIUM, SELF-PROPELLED:
155 MM, M109A2
(TM 9-2350-303)

HOWITZER, HEAVY, SELF-PROPELLED:
FULL TRACKED 8-INCH M110
(TM 2300-216)

HOWITZER, HEAVY, SELF-PROPELLED:
8-INCH, M110A1
(TM 9-2300-216)

HOWITZER, HEAVY, SELF-PROPELLED:
8-INCH, M110A2
(TM 9-2350-304)

RECOVERY VEHICLE, FULL TRACKED:
LIGHT, ARMORED, M578
(TM 9-2350-238)

*C1

Title page.
Add the following before table of contents:

REPORTING OR ERRORS
You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter or DA Form 2028 (Recommended changes to Publications and Blank Forms) directly to Commander, US Army Tank-Automotive Command, ATTN: DRSTA-MBC, Warren, MI 48090. A reply will be furnished to you.

Add the following at bottom of first page (title page):
All depot level coverage contained in this manual is superseded by data contained in the Commodity Command DMWR (DMWR 9-2520-234).
Page 3. Paragraph *g* is superseded as follows:
g. Reporting Equipment Improvement Recommendations (EIR). EIRs will be prepared using a SF 368 (Quality Deficiency Report). Instructions for preparing EIRs are provided in TM 38-750, (Army Maintenance Management System). EIRs should be mailed directly to: Commander US Army Tank-Automotive Command, ATTN: DRSTA-MP, Warren, MI 48090. A reply will be furnished to you.
Paragraph *h* is superseded as follows:
h. Lubrication. Refer to the vehicle operator manual and lubrication order for instructions.
Paragraph *i* is superseded as follows:
i. Maintenance Instructions. Refer to the Vehicle Organizational or Direct Support/General Support Maintenance Manual.
Paragraph 2 is superseded as follows:
2. FIELD AND DEPOT MAINTENANCE ALLOCATION
Refer to the maintenance allocation chart in the Vehicle Organizational Maintenance Manual.

Paragraph 3 is superseded as follows:
3. FORMS, RECORDS AND REPORTS
Department of the Army Forms and procedures used for equipment maintenance will be those prescribed by TM 38-750, (Army Maintenance Management System (TAMMS)).
Page 6. Paragraph 5 is superseded as follows:
5. DRIVING INSTRUCTIONS
Refer to the vehicle operator manual for instructions.
Paragraph 6. Line 14 is changed to read: "Refer to the operator manual for procedures to be followed in checking the oil level and for changing the oil in the XTG-411-2A power train."
Page 99. Reverse figure 125 (step 61) with figure 126 (step 62).
Page 182, figure 317 (step 78). Line no. 6 is changed to read: "torque bolts to 20-26 pound-feet."
Page 215, figure no. 378, item 18a. Thickness of plate (Internal-splined clutch) is changed as follows:

	Wear Limits	
Size and Fit of New Parts	*Field Maint.*	*Depot Maint.*
0.1580 to 0.1630	0.1480	

By Order of the Secretary of the Army:

E. C. MEYER
General, United States Army
Chief of Staff

Official:

ROBERT M. JOYCE
Brigadier General, United States Army
The Adjutant General

Distribution:
To be distributed in accordance with DA Form 12-37, Direct and General Support Maintenance requirements for Gun, Howitzer, 105mm M108; 155mm, M109, M109A1, M109A2 and M109A3; 8 inch, M110, M110A1, M110A2; 175mm, M107 and Recovery Vehicle, Light Armored. M578.

LIST OF WARNINGS

- White lead is toxic. To avoid injury, do not use white lead.

- Transmission and transmission components are heavy and can crush you. Have a ground guide check slings and lifting devices for cuts, breaks or wear before and during hoisting. Slings and lifting devices can break and cause injury or death. To avoid injury, do not stand under transmission or components when lifting them.

- Fumes from burning Teflon can cause serious injury or death. Because clutch piston seal rings and step-joint seal rings are made of Teflon, do not get rid of them by burning.

- Compressed shop air will not exceed 30 psi (pounds per square inch). Regulator assembly must be attached to compressor. To avoid injury, use only with effective chip-guarding and personal protective equipment (goggles/faceshield, gloves, etc.).

- Dry Cleaning Solvent P-D-680 is toxic and flammable. To avoid injury, wear protective goggles and gloves and use in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Do not use near open fire or excessive heat. The flash point for Type I dry cleaning solvent is 100°F (38°C), and for Type II is 138°F (50°C). If you become dizzy while using dry cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

END ITEM APPLICATION

HOWITZER, HEAVY, SELF-PROPELLED:
8-INCH, M110A2
(TM 9-2350-304)

RECOVERY VEHICLE, FULL TRACKED:
LIGHT, ARMORED, M578
(TM 9-2350-238)

HOWITZER, MEDIUM, SELF-PROPELLED:
155mm, M109A2, A3, A4 AND A5
(TM 9-2350-311)

CARRIER, AMMUNITION, TRACKED:
M992
(TM 9-2350-267)

Technical Manual
No. 9-2520-234-35

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC 5 July 1962

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE INSTRUCTIONS FOR

POWER TRAIN ASSEMBLY (8351100) (ALLISON MODEL XTG411-2A)
POWER TRAIN ASSEMBLY (8355953) (ALLISON MODEL XTG411-2A)
POWER TRAIN ASSEMBLY (8351763) (ALLISON MODEL XTG411-2A)
POWER TRAIN ASSEMBLY (11650290) (ALLISON MODEL XTG411-4)
POWER TRAIN ASSEMBLY (11650289) (ALLISON MODEL XTG411-4)
POWER TRAIN ASSEMBLY (11650300) (ALLISON MODEL XTG411-4)

REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or know of a way to improve procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual, directly to: Commander, U.S. Army-Automotive Command, ATTN: AMSTA-MBC, Warren, MI 48397-5000. A reply will be furnished to you.

TABLE OF CONTENTS

Approved for public release; distribution is unlimited.

*All Depot level coverage has been superseded by DMWR 9-2520-234.

TECHNICAL MANUAL No. 9-2520-234-35

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington 25, D.C., 5 July 1962

POWER TRAIN ASSEMBLY (8351100)
(ALLISON MODEL XTG-411-2A)

(Continued on next page)

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. SCOPE

a. Overall Contents. This technical manual contains instruction for Direct Support and General Support maintenance of the Allison Model XTG 411-2A and XTG 411-4 power trains (figs. 1 through 4). Included are descriptions of components and procedures for disassembly, inspection, repair, rebuild and assembly of the complete power train.

b. Chapters 1 through 4. General information, description and tabulated data are given in Chapter 1. Chapter 2 contains more detailed description and explanation of the operation of the components and the hydraulic system, and traces the torque paths. Chapter 3 deals with parts, special tools and equipment, including tool lists. Chapter 4 covers troubleshooting procedures, including a troubleshooting chart.

c. Chapter 5 for Repair and Rebuild

(1) Chapter 5 covers disassembly and assembly of the power train and rebuild of subassemblies.

(2) The disassembly and assembly instructions are presented in a pictorial step-by-step manner, designed to portray graphic and easy-to-follow instructions. There is a picture in correct sequence for every main step in the disassembly and assembly procedures. In addition to figure number, each pictorial step is identified by its step number. Other sections of the manual are compiled in the paragraph-outline style.

d. Chapter 6 for Standards. Chapter 6 covers repair and rebuild standards and includes a tabulation of wear limits.

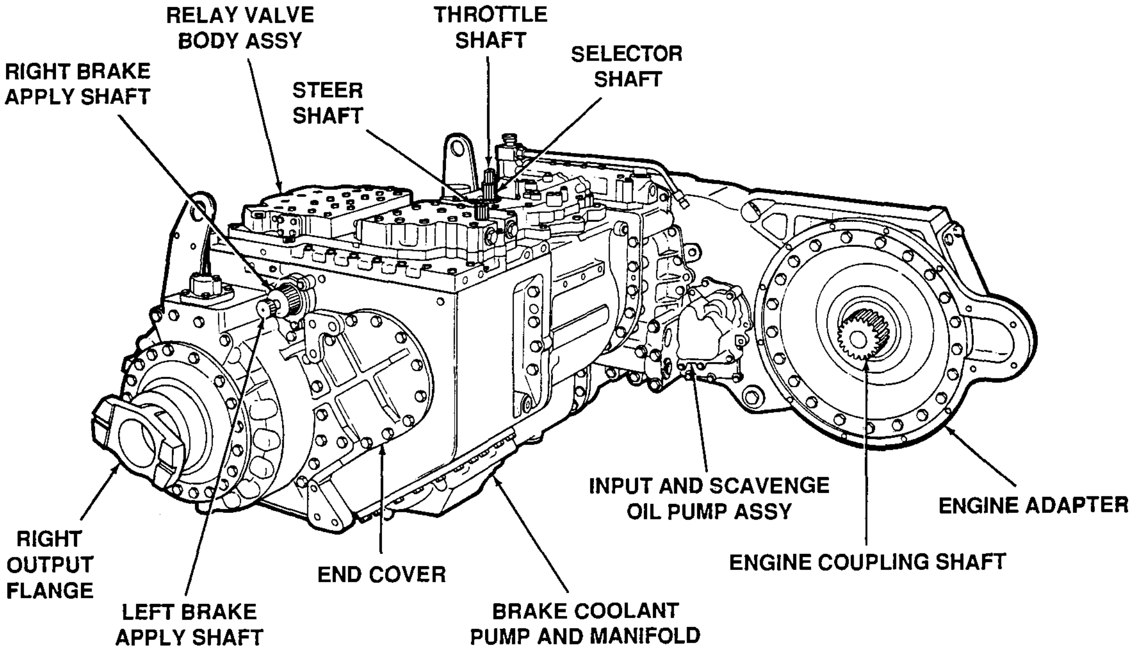


Figure 1. Model XTG 411-2A, XTG 411-4 power train -- right-front view (with output flanges)

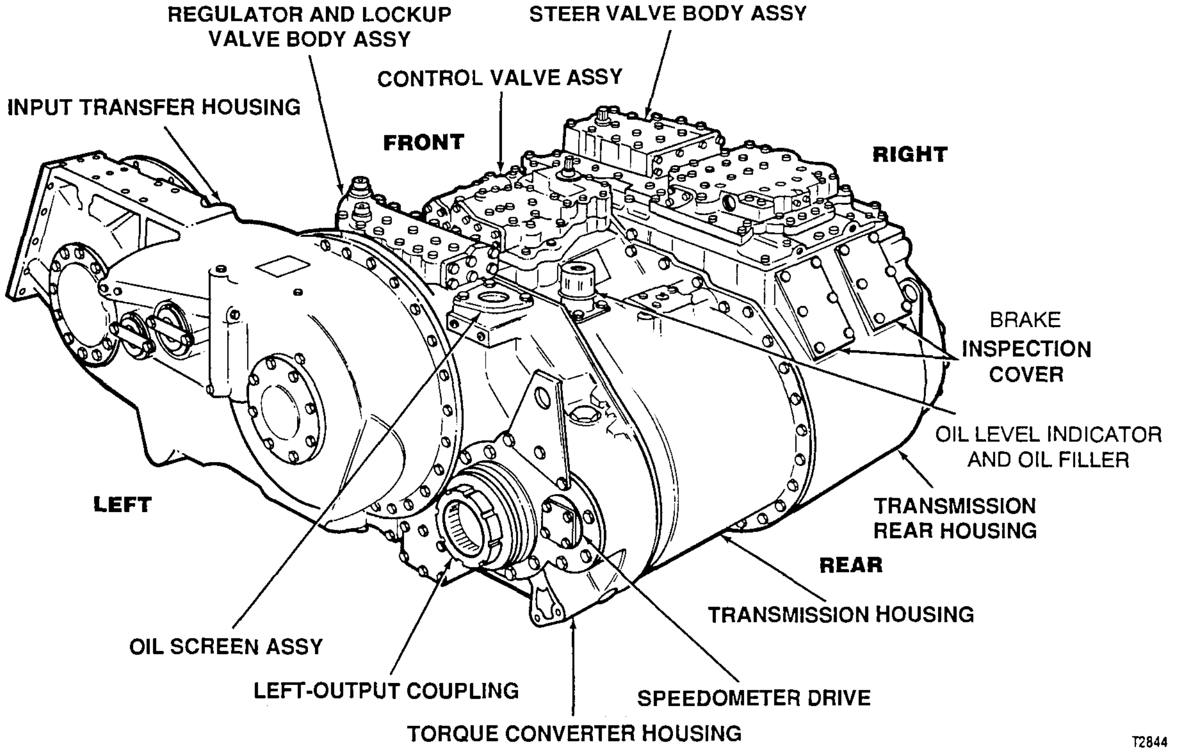


Figure 2. Model XTG 411-2A, XTG 411-4 power train -- left-rear view (with output couplings)

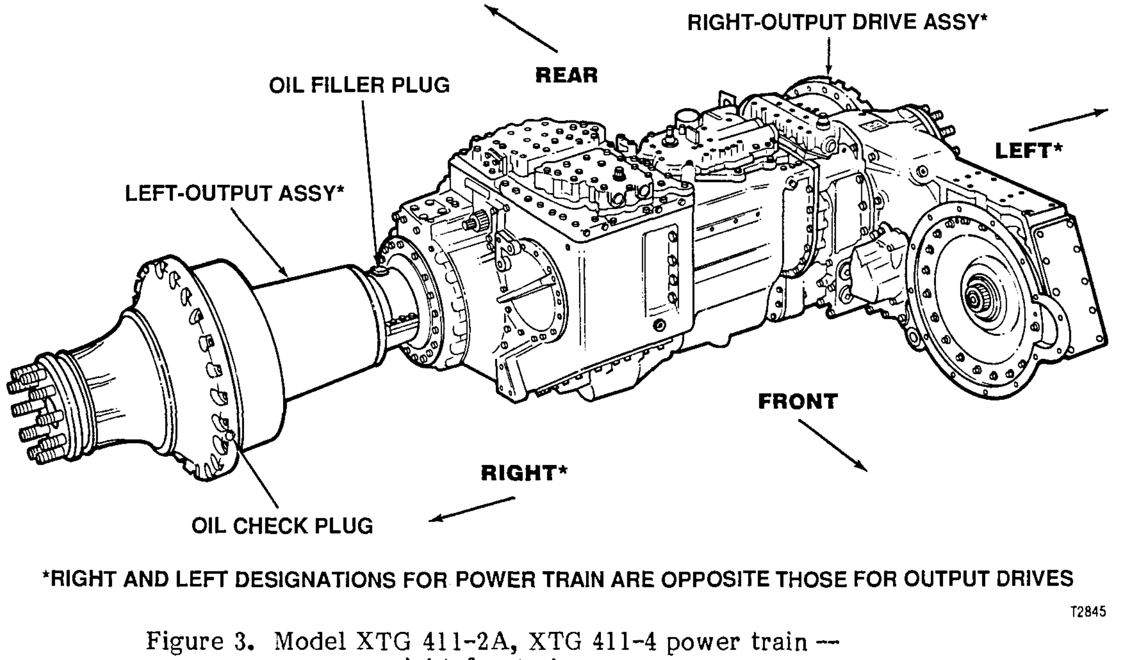


Figure 3. Model XTG 411-2A, XTG 411-4 power train -- right-front view

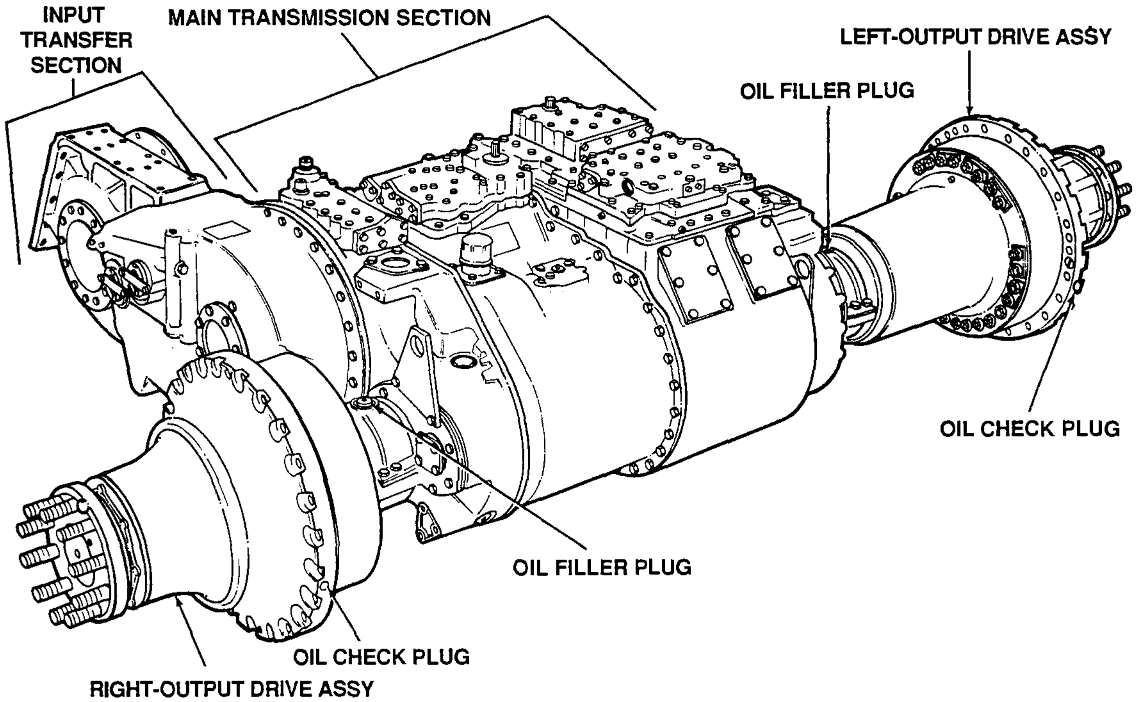


Figure 4. Model XTG 411-2A, XTG 411-4 power trains -- left-rear view (with output final drives)

e. Appendices and Index. Following Chapter 6 are Appendix A and Appendix B and the book index. Appendix A contains a list of current references, including supply manuals, forms, technical manuals and other available publications applicable to the XTG 411 power trains. Appendix B tabulates the expendable supplies and materials needed for the repair tasks in this manual.

f. Fold-out Illustrations. The 15 fold-out pages and 15 supplement pages at the end of the book include a schematic view of the hydraulic system (fig. 372 and 372.1) and 14 exploded views of the power train components (figs. 373 through 386.1). These pages may be folded out so that the entire view extends beyond the right edge of other pages in the book, making the view completely visible while reading paragraphs concerning it.

*C1 g. Reporting Equipment Improvement Recommendations (EIR). EIRs will be prepared using a SF 368 (Quality Deficiency Report). Instructions for preparing EIRs are provided in DA PAM 738-750 (Army Maintenance Management System). EIRs should be mailed directly to: Commander, U.S. Army Tank-Automotive Command, ATTN: AMSTA-QRT, Warren, MI 48397-5000. A reply will be furnished to you.

*C1 h. Lubrication. Refer to the vehicle operator manual and lubrication order for instructions.

*C1 i. Maintenance Instructions. Refer to the Vehicle Organizational or Direct Support/General Support Maintenance Manual.

*C1 2. FIELD AND DEPOT MAINTENANCE ALLOCATION

Refer to the maintenance allocation chart in the Vehicle Organizational Maintenance Manual.

*C1 3. FORMS, RECORDS AND REPORTS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 738-750 (Army Maintenance Management System) (TAMMS).

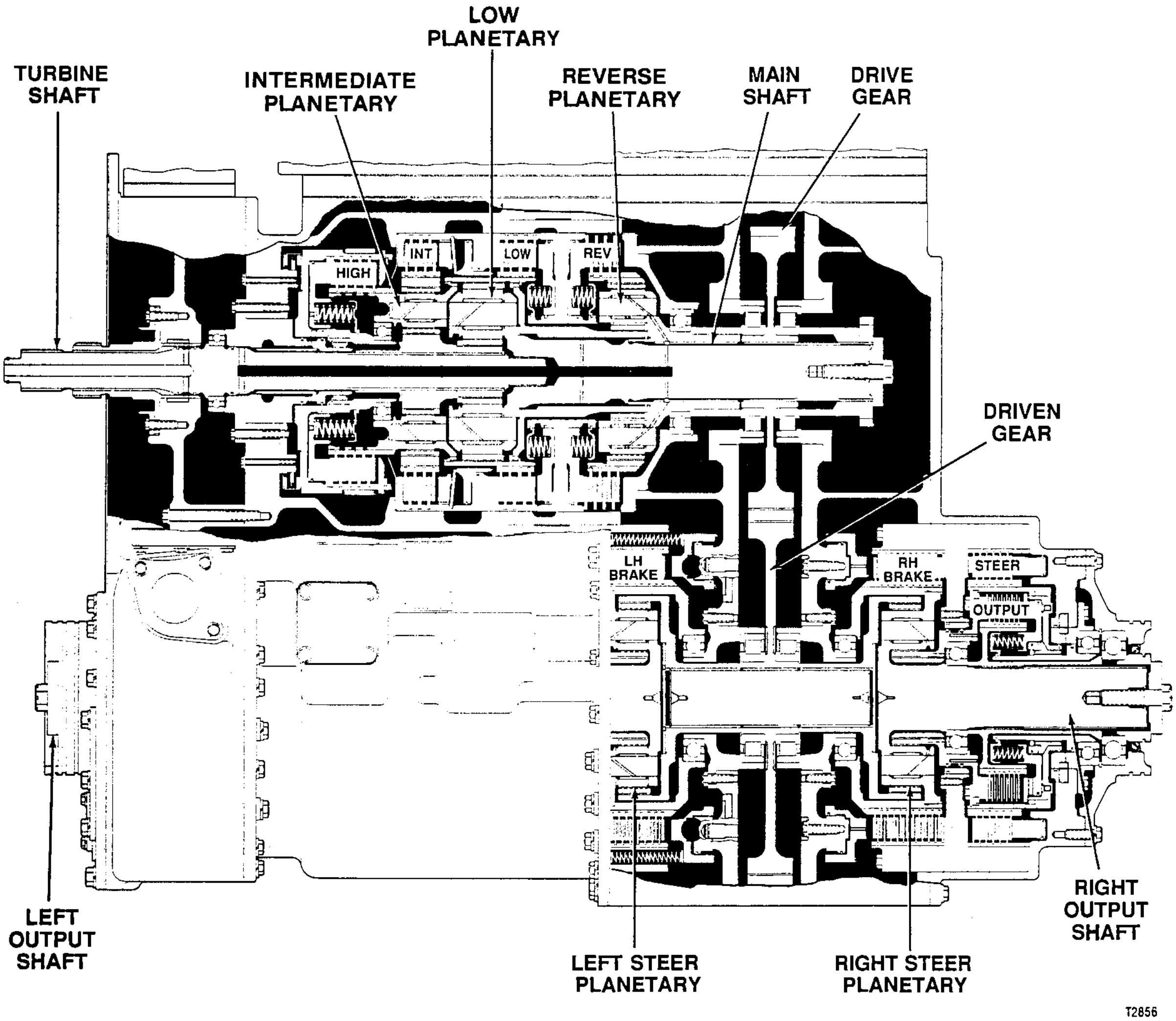


Figure 5A. Model XTG 411-4 transmission cross section

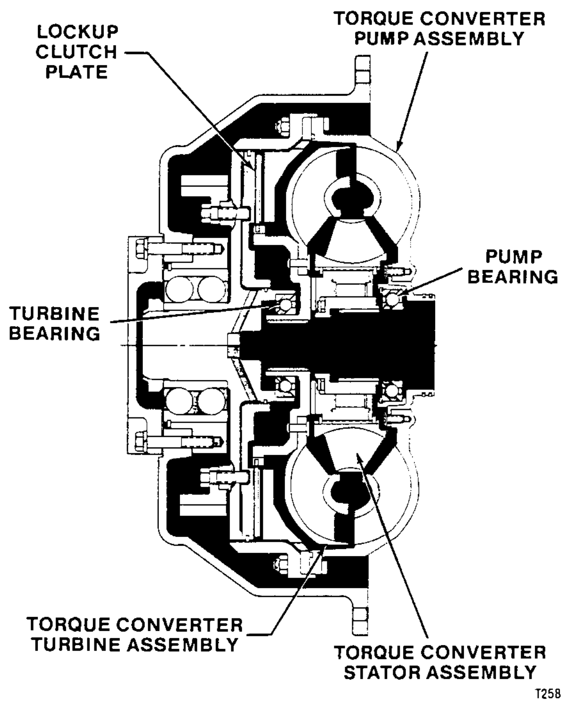


Figure 5B. Model XTG 411-2A, XTG 411-4 torque converter cross section

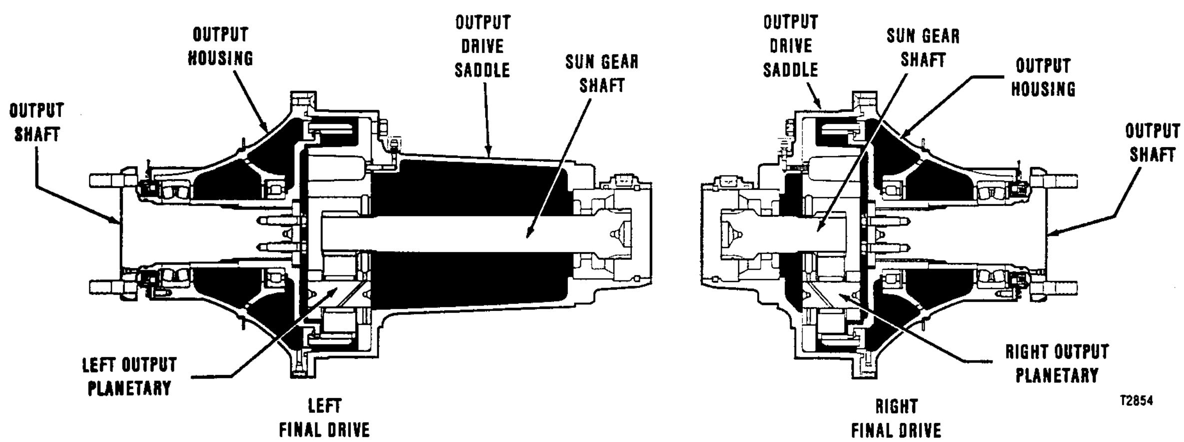


Figure 5C. Model XTG 411-2A, XTG 411-4 final drive cross sections

Section II. GENERAL DESCRIPTION AND DATA

4. DESCRIPTION

a. General. The Allison Model XTG 411-2A and XTG 411-4 power trains (figs. 1 through 4) are each a combination of an input transfer (drive) section and a main transmission section. Right- and left-output drive assemblies are available and are discussed in this publication. The input transfer section includes a torque converter and transmits engine rotation to the main transmission section. The main transmission section includes range clutches and gearing, steer clutches, steer planetary gearing and vehicle brakes. The output drive assemblies include reduction gear planetaries and provide reverse-rotating drives to the vehicle tracks. Four forward and two reverse speeds are manually selected. The axes of the engine, main transmission and output drives are parallel.

b. Definition of Locational and Directional Terms

(1) Locational terms used in describing the power train, are front, rear, right and left. The input transfer section and main transmission section locational terms do not always correspond to vehicle locational terms, while those of the output drive assemblies do correspond. In the vehicle application for which this manual is written, the power train is front-mounted and the locational terms for the input transfer and main transmission sections are opposite those for the vehicle and output drive assemblies (fig. 3).

(2) The front of the transmission is always the location adjacent to the engine regardless of the manner of mounting in the vehicle. The rear is the location at which the brake inspection covers are mounted. The left is the side to which the input transfer housing is attached. The right is the side on which the brake apply shafts are located (figs. 2 and 3).

(3) Locational terms for the output drive assemblies correspond to front, rear, left and right of the vehicle.

(4) Rotational terms (clockwise or counterclockwise) will be established by references in text, or by the viewer's position in illustrations.

c. Transmission Component Groups. The main components of the power train are identified in figs. 5A, 5B and 5C. Chapter 2 covers the description and operation of all components in detail.

*C1

5. DRIVING INSTRUCTIONS

Refer to the vehicle operator manual for instructions.

6. TRANSMISSION OIL

Oil may be considered as the lifeblood of a hydraulic transmission. The use of proper oil, and attention to keeping the oil clean, is of paramount importance. The proper oil level must be maintained in the transmission to obtain maximum performance. Check the oil level regularly. Clean the oil screens at specified intervals. Be very careful that no foreign matter enters the power train system at any time. When changing or adding oil, use only that specified (see "Oil specifications" Table I, TABULATED DATA, par. 7, below). Refer to the operator manual for procedures to be followed in checking the oil level and for changing the oil.

7. TABULATED DATA

The following table covers technical data applicable to the Allison XTG 411-2A and XTG 411-4 power trains.

Table I. TABULATED DATA

Manufacturer	Allison Transmission Division, General Motors Corporation	
Models	XTG 411-2A, XTG 411-4	
Type	X-drive, torque converter, planetary gear, all-torque shifting	
	XTG 411-2A	XTG 411-4
Weight, dry:	Pounds	Pounds
Input transfer section	405	405
Main transmission section	1,985	2,045
Right-output drive assembly	635	635
Left-output drive assembly	720	720
Total	3,745	3,805
Overall dimensions (with output drives):		
Length	73.02 in.	
Width (between output drive-to-hull mounting faces)	83.00 in.	
Width (between track sprocket hub mounting faces)	112.11 in.	
Height	26.07 in.	
Name plate locations (model, serial number, part number):		
Input transfer section	Top, near rear of the transfer housing	
Main transmission section	Top, center of main housing	
Output drive assemblies (right or left)	Lower rear of saddle, below saddle cap	
Suspension	Adapter bolts to engine flywheel housing; output drive assemblies bolt to vehicle hull and support rear of main transmission section; tie bar between engine and transmission	
Rating	XTG 411-2A	XTG 411-4
Maximum input torque	880 lb ft	1200 lb ft
Maximum input speed	2300 rpm	2500 rpm
Maximum net input horsepower	360 hp	575 hp
Rotation:		
Input (viewing mounting face of engine adapter)	Clockwise	
Output (viewing right of power train):		
Main transmission (forward ranges)	Clockwise	
(reverse range)	Counterclockwise	
Output drive assemblies (forward ranges)	Counterclockwise	
(reverse range)	Clockwise	
Drive ranges (manually selected)	Four forward, two reverse	

Table I. TABULATED DATA - Continued

Torque converter . . . . 3-element, single-stage, polyphase, with automatic lockup clutch

Clutches . . . . Multiplate, wet, hydraulic-applied

Gearing (constant mesh throughout):
- Input transfer gearing . . . . 6-pitch, straight-cut, in-line spur
- Range gearing
  - Low and reverse ranges . . . . 8-pitch, straight-cut, planetary
  - Intermediate range . . . . 10-pitch, straight-cut, planetary
- Output transfer gearing . . . . 4-pitch, straight-cut, in-line spur
- Steer gearing . . . . S-pitch, straight-cut, planetary
- Output drive gearing . . . . 5-pitch, straight-cut, planetary

Brakes (service and parking) . . . . Multiplate, wet, mechanically applied, sintered bronze on steel

Control (range selection, steering, brakes):
- External . . . . Manual
- Internal (except brakes) . . . . Hydraulic

Torque multiplication ratios:	XTG 411-2A	XTG 411-4
Torque converter (maximum at stall).	3.3:1	3.2:1
Complete power train (input transfer section and main transmission section).	See table below	

Power train ratios:

Gear Range	Input Transfer	Range	output Transfer	Steer Planetary	Total Mechanical	XTG 411-2A Torque Converter	XTG 411-4 Torque Converter
First	0.611:1	4.00:1	1.30:1	1.477:1	4.690:1	3.3:1	3.2:1
Second	0.611:1	4.00:1	1.30:1	1.000:1	3.178:1	3.3:1	3.2:1
Third	0.611:1	2.00:1	1.30:1	1.000:1	1.589:1	3.3:1	3.2:1
Fourth	0.611:1	1.00:1	1.30:1	1.000:1	0.794:1	3.3:1	3.2:1
Reverse 1	0.611:1	4.77:1	1.30:1	1.477:1	5.60:1	3.3:1	3.2:1
Reverse 2	0.611:1	4.77:1	1.30:1	1.000:1	3.79:1	3.3:1	3.2:1

Steering:
- Type:
  - First, reverse 1 ranges . . . . Clutch brake
  - Third, fourth, reverse 2 ranges. . . . . Geared
  - Second. . . . . Optional
- Ratios:
  - Clutch brake . . . . Infinite
  - Geared . . . . 1.477.1 maximum
- Control. . . . . Manually controlled by operator, steer brakes and clutches hydraulically applied

Table I. TABULATED DATA - Continued

Power take-offs (XTG 411-2A, 2 on input transfer housing):	
Number 1 on front of input transfer housing. . .	Employs input transfer drive gear as PTO drive gear (6-pitch, 68-teeth, 200 pressure angle); drive gear rotates at engine speed and direction
Number 2 on centerline of engine	Rotates counterclockwise (facing mount) at engine speed; employs internal spline of engine coupling as PTO drive (16/32-pitch, 16-teeth, 30° pressure angle)
Power take-offs (XTG 411-4, 3 on input transfer housing):	
Number 1 on front of input transfer housing. . .	Employs input transfer drive gear as PTO drive gear (6-pitch, 68-teeth, 20° pressure angle); drive gear rotates at engine speed and direction
Number 2 on centerline of engine	Rotates counterclockwise (facing mount) at engine speed; employs internal spline of engine coupling as PTO drive (16/32-pitch, 16-teeth, 30° pressure angle)
Number 3 on centerline of torque converter (optional)	Rotates clockwise (facing mount) at 1.64 x engine speed employs internal spline of converter cover as PTO drive (16/32-pitch, 16-teeth, 30° pressure angle)
Oil pumps (5, in 3 assemblies):	
Type	Positive displacement, spur gear
Oil system:	
Capacity, initial fill	Approx 20 U.S. gal
Capacity, refill	Approx 12 U.S. gal
Capacity, right-output drive	1-3/4 U.S. gal
Capacity, left-output drive	3-1/4 U.S. gal
Oil specifications	MIL-L-2104D; See vehicle lubrication order for approved grades
Main screen	Integral wire mesh
Control pressures:	
Main pressure (in converter operation):	
Neutral, first, second, third	190 to 240 psi
Fourth	118 to 160 psi
Reverse l, reverse 2	300 to 360 psi
Main pressure (in lockup operation):	
Neutral, first, second, third, fourth	118 to 160 psi
Lockup and range clutch apply pressure	Same as main pressure for applicable range

Table I. TABULATED DATA - Continued

Steer clutch and steer brake apply pressure	60 to 130 psi
Governor (pitot) pressure	80 to 88 psi at 2600 rpm of converter turbine
Lubrication pressure	18 to 45 psi at 1825 to 1925 engine rpm
Brake coolant pressure	Unregulated
Governor pressure at lockup engagement (full TV) (throttle valve)	75 to 89 psi
Output speed at lockup engagement (at output couplings):	
Third gear	...0 910 to 1080 rpm
Fourth gear	..1820 to 2160 rpm
Output speed limits at which downshifts can be made:	
Fourth to third	930 to 1410 rpm
Second to first	780 to 1225 rpm
First to neutral	600 to 1180 rpm
Temperatures (to cooler):	
Normal	Approx 220 degrees F
Maximum	Approx 305 degrees F
Tachometer drive:	
Location	Left side of transmission, behind left output
Rotation	Counterclockwise (facing pad)
Ratio	Rotates at speed equal to output

CHAPTER 2

DESCRIPTION AND OPERATION

Section I. DESCRIPTION AND OPERATION OF INPUT TRANSFER ASSEMBLY

8. INPUT TRANSFER GEARING

a. Input Transfer Gearing Components (fig. 373, fold-out 2)

(1) A cast aluminum transfer housing 126 encloses and supports the transfer gearing. A cast aluminum flange adapter 19 connects the vehicle engine flywheel housing to the transfer gear housing. The rear of transfer housing 126 is bolted to the torque converter housing.

(2) A splined engine coupling shaft 23 delivers engine torque to the gear train. The gear train consists of a 68-tooth drive gear 25, a 52-tooth idler cluster gear 34, a 34- and 54-tooth cluster gear 41, and a 66-tooth converter pump cover drive gear 67. These gears have 6-pitch teeth. The drive gear is supported in housing 126 and adapter 19 by single-row ball bearings 24 and 27. Idler gear 34 is supported on a spindle 5 by a double-row ball bearing 35. Idler cluster gear 41 is supported on spindle 153 by two straight roller bearings 38 and 40. Converter pumpcover drive gear 67 is bolted to converter cover assembly 68. Idler gear 34 includes a 36-tooth oil pump drive gear. The 29-tooth oil pump driven gear 109 is supported by a single-row ball bearing 110.

b. Operation of Input Transfer Gearing (fig. 20)

(1) Engine rotation is transmitted to the 68-tooth transfer drive gear by a splined coupling shaft. The drive gear drives the 52-tooth gear which, in turn, meshes with the 34-tooth gear on the cluster idler gear. The 54-tooth gear on the cluster idler gear drives the 66-tooth converter pump cover drive gear.

(2) The converter cover is thus driven in a direction opposite to that of the engine and at a speed 1.64 times greater than engine speed. Rotation of the converter is clockwise, viewed from the left side of the power train. The oil pump driven gear is driven counterclockwise at 1.62 times engine speed.

9. TORQUE CONVERTER AND LOCKUP CLUTCH

a. Torque Converter Components (fig. 373, fold-out 2)

(1) The torque converter consists mainly of three cast aluminum elements: pump assembly 82, stator assembly 94 and turbine assembly 79. These, and related minor components, are enclosed and supported by the input transfer housing 126 and converter housing 31 (fig. 374, fold-out 3).

(2) Pump assembly 82 (fig. 373, fold-out 2) has radial vanes cast into one side surface. It is machined at the center and bolted to a steel hub 88. The hub is supported by a single-row ball bearing 91 which, in turn, is mounted on a stationary ground sleeve 26 (fig. 374, fold-out 3). The ground sleeve is rigidly mounted in converter housing 31. The outside diameter of pump assembly 82 (fig. 373, fold-out 2) is bolted to converter cover assembly 68.

(3) The stator assembly is a vaned reaction member. It includes stator 94, freewheel race 101, freewheel bearings 97, springs 98, cam 99 and various minor components. This assembly mounts on the splined outside diameter of the ground sleeve 26 (fig. 374, fold-out 3). The stator can freewheel in the direction of converter rotation but will lock up if an attempt is made to rotate it in the opposite direction.

(4) Turbine assembly 79 (fig. 373, fold-out 2) is a vaned casting similar to pump assembly 82. It is riveted to a steel hub which has internal splines which engage turbine shaft 2 (fig. 375, fold-out 4). A single-row ball bearing 73 (fig. 373,

fold-out 2) supports the turbine assembly in the converter cover assembly 68.

b. Lockup Clutch Components (fig. 373, fold-out 2). The lockup clutch includes converter cover assembly 68, piston 74, clutch plate 77, reaction plate 78 and related minor components. Cover assembly 68 serves jointly as the input drive for the torque converter as well as a cylinder for lockup piston 74. Clutch plate 77 is faced on both sides with a friction material. It has splines on its internal diameter which engage splines on the hub of turbine 79. Reaction plate 78 is a steel ring which includes one clutch friction surface. Its outer diameter is held between pump assembly 82 and cover assembly 68 by bolts 86 and nuts 71.

c. Operation of Torque Converter and Lockup Clutch

(1) The torque converter and lockup clutch are combined in a compact subassembly which serves as the input member for the main transmission section. This combination acts as a torque multiplier, a fluid coupling or a direct-drive coupling — depending upon the requirement at any particular time.

(2) Engine torque is delivered to converter cover 69 by transfer gear 67. Converter cover, lockup clutch piston 74, reaction plate 78 and converter pump assembly 82 rotate as a unit and constitute the drive members. Stator assembly 94 is located between pump assembly 82 and turbine assembly 79. The stator is the reaction member. Turbine assembly 79 and lockup clutch plate 77 rotate as a unit and with converter turbine shaft 2 (fig. 375, fold-out 4). This group constitutes the driven members.

(3) The cavity within the assembled components is kept charged with oil which continually circulates for cooling and lubrication. Rotation of the converter pump while the vehicle engine is at idle speed will not transmit a significant amount of power hydraulically to the converter turbine. Thus, during engine idle, the converter acts as a disengaged clutch. The pressure of the oil in the converter cavity keeps the lockup clutch piston pushed to its released position except when a higher pressure is applied to the opposite side of the piston. This occurs only at higher speeds.

(4) When the engine is accelerated, the vanes of the converter pump throw oil radially outward and into the blades of the turbine. The impact of this oil against the turbine blades causes the turbine to rotate. Oil leaves the vanes of the turbine at a point near the turbine hub but flowing in a direction opposite to converter rotation. This flow in an opposite direction is most pronounced at lower turbine speeds. At higher turbine speeds, the flow changes and is more toward the direction of rotation.

(5) To return to the converter pump, the oil must pass between the stator vanes. At low turbine speeds, the oil strikes the concave sides of the stator vanes. This tends to drive the stator in a direction opposite to converter rotation. The stator locks up, however, and the stator blades turn the flow of oil and direct it in the same direction as the converter pump rotates. The unexpended energy of the oil is thus added to the movement of the pump. This is the key to torque multiplication.

(6) When turbine speed preaches pump speed, the direction of oil flow from turbine to pump changes. The returning oil strikes the convex sides of the stator vanes, causing the stator to freewheel. Under these conditions, the torque converter acts as a fluid coupling. There is no multiplication of torque.

(7) When the converter reaches sufficient speed, and there is no further need for either torque multiplication or fluid drive, automatic valves direct pressure to the lockup clutch piston. The piston compresses the lockup clutch plate against the back plate, locking the converter turbine to the converter cover assembly. Therefore, during lockup, the converter turbine is driven directly from the engine. There is no hydraulic action within the torque converter because the pump and turbine rotate as a unit. The stator freewheels to prevent any hydraulic drag. There is no loss from slippage, which

is inherent with fluid drives and torque converters without lockup.

10. INPUT PRESSURE AND SCAVENGE OIL PUMP ASSEMBLY

a. Components (fig. 373, fold-out 2)

(1) A 2-section, gear-type pressure and scavenge oil pump 45 is located on the input transfer housing. It is driven by the input transfer gears and rotates at any time the vehicle engine rotates. One section is the input pressure pump. The other (smaller) section is the scavenge pump. The assembly includes a pump drive gear 57, pump idler gear 58, two scavenge pump gears 55 and 56, pressure pump body 61, scavenge pump body 47, four needle bearings 53, 54, 59 and 60, and separator plate 50.

(2) Pump drive gear 57 and idler gear 58 are the input pressure pump elements. Scavenge pump gear 56 is keyed to the shaft of the drive gear 57 by key 51. Gear 55 is mounted on shaft of gear 58. The drive and driven gears are supported in the pump bodies 47 and 61. Separator plate 50 divides the pump sections.

b. Operation

(1) The input pressure section of the pump supplies oil under pressure to the power train for control, lubrication and converter charging. This oil is picked up from the sump of the main transmission section and pumped into the hydraulic system, passing first through the main oil screen assembly.

(2) The scavenge section of the pump picks up oil which collects in the input transfer gear housing and converter housing, and returns it to the sump of the main transmission section. The source of this oil is lubrication of the input transfer gears and bearings.

(3) The pump assembly rotates at approximately 1.62 times engine speed and in the same direction as the engine.

Section II. DESCRIPTION AND OPERATION OF MAIN TRANSMISSION ASSEMBLY

11. HIGH-RANGE CLUTCH AND GOVERNOR

a. High-range Clutch and Governor Components (fig. 375, fold-out 4)

(1) The high-range clutch includes a housing assembly 73, a piston assembly 67, four (XTG 411-2A) or five (XTG 411-4) plates 57, five plates 56, reaction plate 59, return springs 66 and retainer 65. The high-range clutch hub is integral with the intermediate-range carrier assembly 16 (fig. 376, fold-out 5). A governor ring is riveted or welded to the clutch housing assembly 73 (fig. 375, fold-out 4).

(2) Pitot tube 76 is a governor component. It is mounted by two bolts 14 to transmission housing 17. The high-range clutch and governor ring rotate.

b. Operation of High-range Clutch and Governor (fig. 375, fold-out 4)

(1) The high-range clutch transmits torque at 1:1 ratio from the converter turbine shaft to the high-range clutch hub and, in turn, through the low- and intermediate-range planetaries, which are locked together, to the transmission output shaft. When hydraulic pressure is directed to the cavity between piston assembly 67 and housing assembly 73, the piston compresses internal-splined 56 and external-splined 57 plates against reaction plate 59. This locks the high-range clutch hub (located on the intermediate-range planetary carrier) to the clutch housing, and transmits converter output torque directly to the transmission range output shaft.

(2) When hydraulic pressure is exhausted from the clutch cavity, springs

66 push piston assembly 67 into housing assembly 73, allowing the clutch plates to separate and slip freely.

(3) The governor is a “fluid velocity” type. The governor ring, riveted or welded to the left end of housing 73, is kept filled with oil, retained in the ring by centrifugal force during rotation. The oil thus moves at virtually the same speed as does the ring. The pitot tube 76 is positioned so that its open end faces against the movement of the oil in the governor ring. The opposite end of the pitot tube connects with the hydraulic control system. Pressure in the governor line thus varies with the speed at which oil is thrown into the pitot tube by the rotating ring.

12. INTERMEDIATE-RANGE CLUTCH AND PLANETARY GEARING

a. Intermediate-range Clutch Components (fig. 376, fold-out 5)

(1) Intermediate-range clutch includes a clutch housing 3, four internal-splined 4 and three external-splined 5 plates, apply plate 7, spring 8 piston 9 and piston housing 14. External splines on ring gear assembly 6 serve as the clutch hub.

(2) Clutch housing 3 is anchored, against rotation, in the transmission housing. Plates 5 and apply plate 7 engage slots in housing 3. Plates 4 engage external splines on ring gear assembly 6. Piston housing 14 is anchored in transmission housing by bolt 42 (fig. 375, fold-out 4). Piston 9 (fig. 376, fold-out 5) works in a bore of housing 14 on ring seals 11 and 12.

b. Intermediate-range Planetary Gearing Components (fig. 376, fold-out 5)

(1) Planetary gearing for this range includes carrier 18, four 18-tooth pinions 22, spindles 19, a 36-tooth sun gear 61 (fig. 375, fold-out 4) and a 72-tooth ring gear assembly 6 (fig. 376, fold-out 5).

(2) Pinions 22 or 64 rotate on bearings 23 or 65 and are supported by spindles 19 in the carrier. Sun gear 61 (fig. 375, fold-out 4) is splined to turbine shaft 2. Ring gear 6 (fig. 376, fold-out 5) has internal teeth and external splines. Carrier 18 is supported by bearing 55 (fig. 375, fold-out 4) at one end and is splined to low-range ring gear 38 (fig. 376, fold-out 5) at the opposite end.

c. Operation of Intermediate-range Clutch and Planetary Gearing (fig. 376, fold-out 5)

(1) When hydraulic pressure is directed to the cavity between piston 9 and housing 14, the piston moves against spring 8 and apply plate 7 and compresses internal-splined 4 and external-splined 5 plates against housing 3. This locks ring gear assembly 6 against rotation. Sun gear 61 (fig. 375, fold-out 4) is the driving member of the planetary. Its rotation drives pinions 22 or 64 (fig. 376, fold-out 5) counterclockwise (viewed from left of transmission) while causing carrier 18 to rotate clockwise. Stationary ring gear assembly 6 is the reaction member and carrier 18 is the driven member.

(2) When hydraulic pressure is exhausted from the clutch cavity, spring 8 pushes piston 9 into housing 14. This allows the clutch plates to separate and have running clearance, releasing the clutch.

(3) The intermediate-range planetary gearing is compounded with the low-range planetary gearing to obtain the desired ratio. The rotation of carrier 18 is imparted to low-range ring gear 38. Low-range sun gear 62 (fig. 375, fold-out 4) is splined to the same shaft as is intermediate-range sun gear 61. Thus, the rotations, at different speeds, of ring gear 38 (fig. 376, fold-out 5) and sun gear 62 (fig. 375, fold-out 4) impart rotation to the low-range shaft and carrier which is the transmission out put shaft. The resulting combined reduction of the two planetary systems is 2 to 1.

13. LOW-RANGE CLUTCH AND PLANETARY GEARING

a. Low-range Clutch Components (fig. 376, fold-out 5)

(1) The low-range clutch includes clutch housing 44, four internal -splined

45, four external-tanged 46 plates, piston 50, springs 49 and retainer 48. Housing 55, in which piston 50 operates, serves both the low- and reverse-range clutches. Low-range planetary ring gear 38 serves as the hub of the clutch.

(2) Clutch housing 44 is anchored to the transmission housing by anchor bolt 43. External tangs on plates 46 engage slots in housing 44. Internal splines on plates 45 engage external splines on ring gear 38. Piston housing 55 is anchored to the transmission housing by bolt 42 (fig. 375, fold-out 4). Spring retainer 48 (fig. 376, fold-out 5) and springs 49 push the piston into housing 55 when the clutch is released.

b. Low-range Planetary Gearing Components (fig. 376, fold-out 5)

(1) The low-range planetary gearing includes a 60-tooth ring gear 38, four 20-tooth pinions 30, a 20-tooth sun gear 62 (fig. 375, fold-out 4), four spindles 34 (fig. 376, fold-out 5) and shaft and carrier assembly 27. The pinions rotate on needle bearing rollers 31 on the spindles mounted in the carrier.

(2) Low-range ring gear 38 is splined to intermediate-range carrier assembly 16 and retained by retaining ring 15. Sun gear 62 (fig. 375, fold-out 4) is splined to turbine shaft 2 and retained by retaining ring 63. The transmission range output shaft is an integral part of carrier 27 (fig. 376, fold-out 5). The carrier is supported by reverse-range carrier assembly 6 (fig. 377, fold-out 6) and the output transfer drive gear.

c. Operation of Low-range Clutch and Planetary Gearing (fig. 376, fold-out 5)

(1) When hydraulic pressure is directed to the cavity between piston 50 and housing 55, the piston moves against clutch plates 45 and 46. This compresses the plates against clutch housing 44 and locks the clutch plates together. Ring gear 38 is thus prevented from rotating and becomes the reaction member of the planetary gear set.

(2) Sun gear 62 (fig. 375, fold-out 4), driven by the turbine shaft, imparts rotation to pinions 30 (fig. 376, fold-out 5). The pinions, in mesh with the internal teeth of ring gear 38, are forced to rotate within the stationary ring gear. This action causes low-range planetary shaft and carrier 27 to rotate. The speed reduction ratio is 4 to 1.

(3) When hydraulic pressure is released from the piston, springs 49 push the piston into housing 55. This allows the clutch plates to separate and rotate freely, releasing the clutch.

14. REVERSE-RANGE CLUTCH AND PLANETARY GEARING

a. Reverse-range Clutch Components (fig. 377, fold-out 6)

(1) The reverse-range clutch includes support 18, four plates 1 and 3, four plates 2 and 5, piston 60 (fig. 376, fold-out 5), springs 61 and retainer 62. These parts, except support 18 (fig. 377, fold-out 6) are identical to the 10 low-range clutch components. Housing 55 (fig. 376, fold-out 5) serves the low- and reverse-range clutches jointly.

(2) Support 18 (fig. 377, fold-out 6) is anchored, by integral lugs, in slots in the rear transmission housing to prevent rotation. Two screws 19 position it temporarily during assembly. External splines on ring gear assembly 4 serve as the clutch hub.

b. Reverse-range Planetary Gearing Components (fig. 377, fold-out 6)

(1) The reverse-range planetary gearing includes a 75-tooth ring gear assembly 4, six 18-tooth pinions 14, a 39-tooth sun gear 39 (fig. 376, fold-out 5), six spindles 7 (fig. 377, fold-out 6) and a carrier 17. The pinions rotate on needle hearing rollers on the spindles which are mounted in the carrier.

(2) Sun gear 39 (fig. 376, fold-out 5) is splined to low-range ring gear 38 and retained by retaining ring 40. Carrier 17

(fig. 377, fold-out 6) is splined to low-range planetary shaft and carrier 27 (fig. 376, fold-out 5) which is supported by ball bearing 20 (fig. 377, fold-out 6) in support 18.

c. Operation of Reverse-range Clutch and Planetary Gearing (fig. 377, fold-out 6)

(1) When hydraulic pressure is directed to the cavity between piston 60 (fig. 376, fold-out 5) and housing 55, the piston moves against clutch plates 1, 2, 3, and 5 (fig. 377, fold-out 6). This compresses the plates against support 18 and locks the clutch plates together. Ring gear assembly 4 is thus prevented from rotating and becomes the reaction member of the planetary gear set.

(2) The reverse-range gearing is compounded with the low-range gearing to obtain the desired direction of rotation and speed reduction. The reversing of rotation occurs in the low-range gear set, with some speed reduction. Further speed reduction occurs in the reverse-range gearing. This is because reverse-range sun gear 39 (fig. 376, fold-out 5), being the driving member of the reverse-range gear set, must first be rotated. It is rotated by low-range ring gear 38 to which it is connected. In turn, low-range ring gear 38 derives its rotation (reversed) from low-range pinions 30 which are driven by low-range sun gear 62 (fig. 375, fold-out 4). The reaction member in the low-range gear set under these conditions is the moving carrier 27 (fig. 376, fold-out 5). Speed reduction is 4.77 to 1.

(3) When hydraulic pressure is released from the piston, springs 61 push the piston into housing 55. This allows the clutch plates to separate and rotate freely, releasing the clutch.

15. OUTPUT TRANSFER GEARS AND SHAFT

a. Components (figs. 377, 378, 379 and 380, fold-outs 6, 7, 8 and 9). The output transfer gearing includes a 50-tooth output transfer drive gear 26 (fig. 377, fold-out 6), a 65-tooth output transfer driven gear 49 (fig. 379, fold-out 8) and a driven gear shaft 4 (fig. 380, fold-out 9). The drive gear has internal splines which engage the low-range planetary carrier shaft. The driven gear has internal splines which engage shaft 4. Both gears are supported by straight roller bearings 25 (fig. 377, fold-out 6), 27, 35 (fig. 378, fold-out 7) and 1 (fig. 380, fold-out 9). The bearings are retained by supports 24 (fig. 377, fold-out 6), 28, 34 (fig. 378, fold-out 7) and 2 (fig. 380, fold-out 9) which are bolted to the transmission rear housing.

b. Operation (figs. 377, 378, 379, 380, fold-outs 6, 7, 8 and 9). Output transfer drive gear 26 (fig. 377, fold-out 6) is rotated clockwise (viewed from the left of the transmission). Driven gear 49 (fig. 379, fold-out 8) is meshed with drive gear 26 (fig. 377, fold-out 6) and rotates counterclockwise. This rotation is transmitted to the geared steer planetary ring gears splined to each end of shaft 4 (fig. 380, fold-out 9). Thus the output of the range gearing is reversed and transmitted to the geared steer planetary gear sets at the left and right of the transmission. The speed reduction in the output transfer gearing is 1.3 to 1.

16. RIGHT- AND LEFT-GEARED STEER PLANETARIES, OUTPUT CLUTCHES AND STEER CLUTCHES

a. Geared Steer Planetary Components (figs. 377, 378, 380 and 381, fold-outs 6, 7, 9 and 10)

Note. All key numbers, below, refer to figs. 377 and 378, fold-outs 6 and 7, which illustrate the left components. The right components are identical and are illustrated in figs. 380 and 381, fold-outs 9 and 10.

The geared steer planetary includes ring gear 14 (fig. 378, fold-out 7), four pinions 6, sun gear assembly 52 (fig. 377, fold-out 6), four spindles 11 (fig. 378, fold-out 7) and carrier 3. Ring gear 14 is splined to driven gear shaft 4 (fig. 380, fold-out 9). Pinions 6 (fig. 378, fold-out 7) rotate on needle bearing rollers 7 on spindles 11 which are mounted in carrier 3. Sun gear assembly 52 (fig. 377, fold-out 6) is splined to clutch hub assembly 35 in such a way that it can be locked to shaft and carrier 2 (fig. 378, fold-out 7) or locked in stationary position.

b. Output Clutch Components (fig. 377, fold-out 6). Output clutch includes hub 46, seven internal-splined 47, and seven external-splined 48 plates, hub assembly 35, piston assembly 40, springs 44 and retainer 43. Hub 46 is splined to shaft and carrier assembly 2 (fig. 378, fold-out 7). Plates 47 (fig. 377, fold-out 6) have internal splines which engage external splines on hub 46. Plates 48 have external splines which engage internal splines in hub assembly 35. Hub 35 is supported at one end by ball bearing 95 (fig. 375, fold-out 4) and, at the other end by sun gear assembly 52 (fig. 377, fold-out 6), which rotates on ball bearing 50. Piston assembly 40 operates in a bore in hub assembly 35. Springs 44, retained by retainer 43, push the piston to released position.

c. Geared Steer Clutch Components (fig. 377, fold-out 6). The geared steer clutch includes six disks 63, seven plates 62, piston 61 and anchor 65. The internal splines on disks 63 engage external splines on hub assembly 35. The external splines on plates 62 engage internal splines on anchor 65. Piston 61 operates in a bore of the transmission housing (right piston operates in a bore of the end cover). Anchor 65 is held stationary by bolts. Clutch reaction plate assembly 66 serves the steer clutch and brake jointly and is anchored by the same bolts which retain anchor 65. -

d. Operation of Geared Steer Planetary, Output Clutch and Geared Steer Clutch (figs. 374. 377, 378, fold-outs 3, 6, 7)

(1) Planetary gearing and two clutches operate in two ways to transmit rotation to output shaft 18 (fig. 374, fold-out 3). Under one condition, torque is transmitted at a 1 to 1 ratio. Under the other condition, there is a speed reduction [from transfer driven gear shaft 4 (fig. 380, fold-out 9) to output shaft 18 (fig. 374, fold-out 3)] of 1.477 to 1. The right and left systems have identical and simultaneous functions during straight travel of the vehicle. They operate separately during steer.

(2) During straight travel in all gears, except first and reverse 1, drive is direct. In first gear forward and reverse 1, there is a speed reduction through the system. This applies to the right and left out puts simultaneously during straight travel. During steer, drive is transmitted to one output while the other output is either stopped or slowed. The vehicle steers toward the stopped or slowed side.

(3) Two methods of steering are employed — clutch-brake steer (first, second and reverse 1 gears) and geared steer (third, fourth and reverse 2 gears). In clutch brake steer, one output drives while the other is disengaged and braked. In geared steer, one output is slowed by speed reduction in the steer planetary while the other output continues to drive at 1 to 1 ratio. Thus, during geared steer, the right- and left-output clutches and geared steer clutches operate singly. A geared steer clutch is applied at one side of the transmission while an output clutch is applied at the opposite side.

(4) When hydraulic pressure is applied to the output clutch, the piston assembly 40 (fig. 377, fold-out 6) compresses plates 47 and 48 against the reaction plate surface of sun gear assembly 52. This locks sun gear 52 and shaft and carrier assembly 2 (fig. 378, fold-out 7) together. Ring gear 14 then drives the carrier at 1 to 1 ratio. When hydraulic pressure is applied to the geared steer clutch, piston 61 (fig. 377, fold-out 6) compresses plates 62 and disks 63 against reaction plate assembly 66. This locks sun gear assembly 52 stationary. Ring gear 14 (fig. 378, fold-out 7) then drives shaft and carrier assembly 2, at reduced speed, around the stationary sun gear. Speed reduction (from output transfer driven gear to transmission output coupling) is 1.477 to 1. When either clutch is released, springs push its piston to released position.

17. RIGHT AND LEFT BRAKES AND APPLY CAMS

a. Components (figs. 377 and 378, fold-outs 6 and 7)

(1) Right and left brakes and apply components are identical except that certain items must be made to right or left configuration. This is true of components such as cam rings. Operation of brake components is identical for both right and left sides. Because of the close similarity of one side to the other, only the left side components are described.

(2) The brake and apply components include cam stationary ring 28 (fig. 378, fold-out 7), twelve steel balls 27, cam rotating ring 19, hub 15, anchor ring 74 (fig. 377, fold-out 6), nine pins 78, nine springs 77, ten plates 17 (fig. 378, fold-out 7) and ten disks 18. Cam stationary ring 29 is mounted on the transmission rear housing by dowels and bolts 30, Cam rotating ring 19 is installed on stationary ring 28 after balls 27 are positioned in inclined pockets of the stationary cam. Matching inclined pockets in the rotating cam also index with the balls. The cavity between the cams is sealed by ring seals 26 and 32.

(3) Hub 15 is supported at one end by ball bearing 16 and splined, at the opposite end, to the steer planetary carrier 2. Brake disks 18 have internal splines which engage external splines on the hub. Brake plates 17 have external splines which engage internal splines in anchor ring 74 (fig. 377, fold-out 6) which is stationary. Pins 78 and springs 77 are installed in holes in anchor ring 74 and retained by retaining rings 73. Reaction plate assembly 66 serves the brake and geared steer clutch jointly.

b. Operation (figs. 377 and 378, fold-outs 6 and 7)

(1) The brakes are used for two purposes. When applied simultaneously by the mechanical linkage, they serve as vehicle service and parking brakes. When the vehicle is steered in first, second and reverse 1 gears, the brakes apply independently and hydraulically.

(2) When applied mechanically, the brake linkage rotates cam ring 19 (fig. 378, fold-out 7) on cam stationary ring 28. The inclined ball pockets in the cams roll on balls 27, causing the rotating cam to move away from the stationary cam and toward brake plates 17 and disks 18. After running clearance is taken up, the plates are compressed against reaction plate assembly 66 (fig. 377, fold-out 6). This locks hub 15 (fig. 378, fold-out 7) to anchor ring 74 (fig. 377, fold-out 6) and slows or stops the rotation of the geared steer planetary carrier 2 (fig. 378, fold-out 7). Thus the transmission output is slowed or stopped.

(3) During steer (in first, second and reverse 1), hydraulic pressure is directed to the cavity between cam rings 19 and 28. This pressure applies the brake. Note that, during steer, cam ring 19 moves away from cam ring 28 without rotation.

18. BRAKE LINKAGE AND AIR VALVES

a. Components (fig. 379, fold-out 8)

(1) The linkage components by which the service and parking bakes are applied include spindle assembly 77, cage assembly 72, right-brake apply shaft 97, left-brake apply shaft 84, right-brake apply cam assembly 83, left-brake apply cam assembly 75, shafts 2 and 65, cam followers 6 and 62, cam follower links 3 and 60, link assemblies 10 and 69, adjusting nuts 20 (fig. 378, fold-out 7) and 14 (fig. 380, fold-out 9), ratchets 21 (fig. 378, fold-out 7) and 15 (fig. 380, fold-out 9), springs 22 (fig. 378, fold-out 7) and 16 (fig. 380, fold-out 9) and retainer assembly 87 (fig. 379, fold-out 8).

(2) Retainer assembly 87, spindle assembly 77 and cage assembly 72 support brake apply shafts 84 and 97 in the transmission rear housing. Brake apply cam assemblies 75 and 83 are splined to their respective brake apply shafts. Cam follower links 3 and 60 are pivoted at their upper ends on shafts 2 and 65, installed in the transmission rear housing. Link assemblies 10 and 69 connect to the lower ends of the cam follower links. The cam followers 6 and 62 rotate in the cam follower links. The threaded ends of link assem-

blies 10 and 69 are installed through lugs on the rotating brake apply cams. Adjusting nuts 20 (fig. 378, fold-out 7) and 14 (fig. 380, fold-out 9) are installed on the threaded ends of link assemblies 10 and 69 (fig. 379, fold-out 8). Ratchets 21 (fig. 378, fold-out 7) and 15 (fig. 380, fold-out 9) are held in engagement with the adjusting nuts by springs 22 (fig. 378, fold-out 7) and 16 (fig. 380, fold-out 9), washers 23 (fig. 378, fold-out 7) and 17 (fig. 380, fold-out 9), and pins 24 (fig. 378, fold-out 7) and 18 (fig. 380, fold-out 9).

(3) Two air valve plate assemblies 36 and 43 (fig. 379, fold-out 8) are pivoted on pin 45 in bracket 40. Springs 39 and 42 hold the valves in a closed position over passages in the transmission rear housing when the brakes are mechanically applied.

b. Operation (fig. 379, fold-out 8)

(1) When either of brake apply shafts 84 or 97 are rotated (clockwise viewed from right of transmission), brake apply cam 75 or 83 moves the cam follower 6 or 62 and cam follower link 3 or 60 forward. Link assembly 10 or 69, being connected to the cam follower link, moves forward. This rotates the rotating brake cam clockwise, applying the brake.

(2) Simultaneous with rotation of the brake cam to apply position, brake air valve 36 or 43 is forced to closed position by its spring. Note that the valves are held open (upward) against spring pressure (by the brake cam extensions) when the brakes are released. The air valves control the admission of air to the intake side of the brake coolant pump. Thus, when brakes are applied, no air is admitted and oil is pumped. When brakes are released, air is admitted, preventing the pumping of oil.

(3) Brake adjustment is made by rotating the brake adjusting nuts. A large screwdriver can be inserted in radial slots in the nuts. The spring-loaded ratchets retain the nuts in the position to which they are adjusted.

19. RELAY VALVE BODY ASSEMBLY

a. Components (fig. 382, fold-out 11)

(1) The relay valve body assembly includes valve body 73, cover assembly 60, cover 68, plug 78, springs 66 and 75, pin 74 and valves 64, 65 and 76. In addition, bolts, gaskets, plugs, washers and minor parts are included. Valves 64, 65 and 76 are identical. Springs 66 and 75 are identical. The valves and valve body are aluminum.

(2) Valves 64 and 65 are installed in a common bore in valve body 73. The short stem ends of these valves butt together and both valves move lengthwise as a unit in their bore. Spring 66 moves them to one end of the bore when no hydraulic pressure acts at that end. Cover 68 closes the spring end of the bore. Cover assembly 60 closes the opposite end.

(3) Valve 76 is installed in another bore which is parallel to the first bore. Spring 75 moves the valve to the end of the bore opposite the spring when no hydraulic pressure acts at that end. Pin 74 limits the movement of the valve against spring 75. Plug 78 closes the bore.

(4) The bores in which the valves operate have annular channels which receive oil from or direct oil to passages which register with passages in oil transfer plate 79 upon which the valve body assembly is mounted. Transfer plate 79 is, in turn, mounted upon transmission rear housing cover 95 and directs oil to various passages in the cover.

(5) Valves 64, 65 and 76 each have five lands which separate the various oil passages. Lengthwise movements of the valves interconnect certain passages when the valves are at one end of the bore, and other when at the opposite end.

b. Operation (fig. 372, fold-out 1 and fig. 382, fold-out 11)

(1) Valve 76 is the drive clutch relay valve. Its position in the valve body bore determines whether the output clutches or the geared steer clutches are

engaged as drive clutches. When the range selector valve (refer to par. 21, below) is in first gear, neutral or reverse 1 gear position, a signal pressure is directed to the end of the valve opposite spring 75. This moves the valve against spring 75 and pin 74. In this position, the hydraulic circuit engages the right- and left-geared steer clutches and exhausts the right- and left-output clutches.

(2). When the selector valve is in second, third, fourth or reverse 2 gear position, the signal pressure is exhausted and spring 75 moves the valve to the opposite end of its bore. In this position, the hydraulic circuit engages the output clutches and exhausts the geared steer clutches.

(3) Valves 64 and 65 are the steer relay valves. Their position in the valve body bore determines whether clutch brake steer or geared steer is effective. When the range selector valve is in first or second gear, neutral or reverse 1 position, no signal pressure is present at the end of the valve bore opposite the spring end. As a result, spring 66 moves both valves to the end of the bore opposite the spring. In this position, the hydraulic circuit connects the steer valves (refer to par. 20, below) to the brakes and the effective drive clutches. Thus, the hydraulic circuit is arranged for clutch-brake steer.

(4) When the range selector valve is in third, fourth or reverse 2 gear position, a signal pressure at the end of the bore opposite the spring pushes the valves against spring 66. In this position, the hydraulic circuit connects the steer valves to the output clutches and geared steer clutches. Thus, the hydraulic circuit is arranged for geared steer. Movement of the steer valves, while operating with clutch-brake steer, will release a driving clutch (right or left, depending upon direction of steer applied) and apply the brake at the same side. This causes a turn toward the side at which the brake is applied.

(5) Movement of the steer valves, while operating with geared steer, will release an output clutch (right or left, depending upon direction of steer applied) and engage a geared steer clutch on the same side. This slows the affected side and causes the vehicle to steer toward that side.

20. STEER VALVE BODY ASSEMBLY

a. Components (fig. 382, fold-out 11)

(1) The steer valve body assembly includes body 40, steer valve assemblies 24 through 30 and 33 through 39, plugs 31 and 32, valve assembly 14, springs 12 and 13, cover 10, shaft assembly 45 and indicator 21. Steer valve assemblies 24 through 30 and 33 through 39 operate in bores of valve body 40. Steer pressure regulator valve assembly 14 operates in a bore of the valve body. Plugs 31 and 32 close the steer valve bores. Cover 10 closes the opposite ends of the steer valve bores and compresses springs 12 and 13 against regulator valve assembly 14.

(2) Shaft assembly 45 has two lugged fingers which engage grooves at the ends of steer valves 29 and 34. A splined shaft extends through the top of the valve body and a steer indicator is installed on the splines. A detent ball 43 and spring 42 stabilizes the valves in “no steer” position.

b. Operation (fig. 372, fold-out 1 and fig. 382, fold-out 11)

(1) Steer pressure regulator valve assembly 14, moving lengthwise against springs 12 and 13, produces a constant pressure (reduced from main) to apply steer clutches or brakes (depending upon method of steer being used). Steer valves 29 and 34 are moved simultaneously lengthwise in opposite directions to direct steer pressure to the proper clutch or brake. This movement results from rotation of steer shaft assembly 45.

(2) The direction of movement of the valves determines the direction of steer. The degree of movement of the steer valves determines the degree of steer application. Each steer valve assembly constitutes a pressure regulator. Thus, a slight movement of a steer valve assembly will direct a greatly reduced pressure to the steer clutch or brake being applied. Greater movement will increase the pressure. Full movement

will result in maximum pressure. Steer valves 29 and 34, and passages in valve body 40, are so constructed that either valve, moving toward cover 10, directs pressure to the clutch or brake being applied while exhausting the clutch which must be released at the same side of the transmission. Movement of either valve 29 or 34 toward the opposite end of its bore has no effect on the brake or clutch which it supplies or exhausts. Movement of either steer regulator valve 26 or 37 away from cover 10 will direct coolant to the steering member (brake or clutch) being applied for steer.

21. CONTROL VALVE BODY ASSEMBLY

a. Components (fig. 383, fold-out 12)

(1) The control valve body assembly includes valves and other components which perform four different functions. All of these components are installed in a common valve body 54. The range selector valve group includes valve assembly 75, selector shaft assembly 56, indicator 49, ball 59 and spring 60. Valve assembly 75 operates in a bore of the valve body. Its lengthwise movements are manually controlled by shaft assembly 56 which engages a slot in the stem of the valve. Ball 59 and spring 60 retain the lever in any position to which it is manually shifted.

(2) Lockup cutoff valve 80 is a simple, spool-type valve which moves lengthwise in its bore. Its movement is controlled entirely by hydraulic pressures to which it is subjected.

(3) The downshift inhibitor group includes inhibitor plunger 79, spring 78 and valve 76. Plunger 79 is fitted in a bore of the valve body which is alined with a stepped projection on shaft assembly 56. Spring 78 is installed on plunger 79 and acts against retaining ring 77 on the plunger. The plunger seats against valve 76.

(4) The throttle valve 61 and throttle regulator valve assembly 63 fit into a common bore and are separated by spring 62. Both valves act against spring 68. Both valves are moved lengthwise toward spring 68 by shaft assembly 58.

b. Operation (fig. 372, fold-out 1 and fig. 383, fold-out 12)

(1) For range selection, the vehicle operator shifts the range selector control to the desired range. Selector shaft assembly 56, being linked to the operator's control, moves to a corresponding position. In each range position, hydraulic pressure is directed to the range clutch to be applied. Simultaneously, other range clutches are exhausted through passages controlled by valve 75.

(2) When any shift from one range to another occurs, the oil required to apply the oncoming clutch must pass through the bore in which lockup clutch cutoff valve 80 operates. This flow moves the valve to a position which interrupts the flow of oil to the lockup clutch and exhausts the lockup clutch pressure. When the oncoming range clutch fills, the rising pressure returns valve 80 to its original position and restores pressure to the lockup clutch.

(3) Governor pressure acts against shift inhibitor valve 76. When the speed of the turbine shaft is sufficient, governor pressure will overcome the resistance of spring 78. Valve 76 then pushes plunger 79 into the path of the stepped lug on shaft 56, preventing its movement to a lower range position.

(4) Throttle valve 61 and throttle regulator valve assembly 63 are acted upon by three forces. Throttle valve shaft assembly 58 pushes throttle valve 61 into its bore. Throttle regulator valve assembly 63 is, in turn, pushed by spring 62 against spring 68. Hydraulic pressure reacts against the throttle regulator valve. Two control pressures (T and TV) arise in the action of these two valves. TV pressure results from the position of throttle regulator valve assembly 63 and compression of spring 62. T pressure results from the position of throttle valve 61. TV pressure varies according to throttle opening, beginning early in throttle movement and continuing through full throttle. T pressure is merely TV pressure introduced to the hydraulic system during the late phases of throttle opening.

22. MAIN-PRESSURE REGULATOR AND LOCKUP SHIFT VALVE BODY ASSEMBLY

a. Components (fig. 383, fold-out 12)

(1) This valve body assembly includes the main-pressure regulator valve group, lubrication pressure regulator valve group and the lockup shift valve group. The main-pressure regulator group includes valve assembly 14, plug 13, springs 20 and 21 and plug 19. The lubrication pressure regulator valve group includes valve 9, spring 10 and plug 7. The lockup shift valve group includes valve 26 and spring 27. The lockup shift valve and main-pressure regulator valve groups are retained in the valve body 12 by cover assembly 23.

(2) Valve assembly 14 and valves 9 and 26 are spool-type valves which move lengthwise in their bores. All movement is automatic and influenced by spring pressures and hydraulic pressures. Passages in valve body 12 receive oil from or direct oil to passages in oil transfer plate 3. The oil transfer plate, in turn, connects these passages with passages in converter housing 31 (fig. 374, fold-out 3).

b. Operation (fig. 372 fold-out 1 and fig.383, fold-out 12)

(1) Main pressure supplied by the input and output driven pressure pumps is directed into a cavity between two lands of different diameter. Pressure in this area moves valve assembly 14 toward springs 20 and 21. In its movement, the valve uncovers a port which directs oil to the input side of the torque converter. In the absence of any modulating pressures (lockup, high-range or reverse) the valve assumes a position wherein main pressure balances the compression of springs 20 and 21.

(2) When the reverse-range clutch is applied, reverse-range clutch pressure acts against plug 19. This action assists the springs 20 and 21 and raises main pressure. When the high-range clutch is applied, high-range clutch pressure acts against plug 13. This action pushes the valve against springs 20 and 21, lowering main pressure. When the lockup clutch is applied, lockup clutch pressure acts against the smaller end of valve assembly 14. This action pushes the valve toward springs 20 and 21, lowering main pressure.

(3) Oil returning from the oil cooler acts against the stem end end of lubrication regulator valve 9, pushing it against spring 10. The valve moves toward the spring and uncovers a port which directs oil to transmission sump. The resulting pressure at the stemmed end of the valve supplies the lubrication system while the bulk of the oil returning from the cooler flows to the sump.

(4) The lockup shift valve 26 has two functions. It controls the application and release of the lockup clutch and it regulates the volume of oil flowing to the torque converter. Three hydraulic pressures and spring 27 control the movement of the valve. When only spring pressure is acting, the valve directs a large volume of oil to the torque converter and allows the lockup clutch to release by exhausting its apply line.

(5) Governor pressure acts against one end of the lockup shift valve and pushes the valve against spring 27. When turbine speed is sufficient, governor pressure moves the valve against the spring. When this occurs, oil is directed to the lockup clutch, applying it. Simultaneously, the passage of oil to the torque converter is reduced. T and TV pressures act against the spring-loaded end of the lockup shift valve. These pressures, when present, modulate the effect of governor pressure at the opposite end of the valve. At closed throttle, T and TV are absent. At light throttle, TV is present. At full throttle, both are present. Thus, the governor pressure (and turbine shaft speed) required to cause lockup will vary with the degree of throttle opening.

23. OUTPUT PRESSURE OIL PUMP ASSEMBLY

a. Components (fig. 384, fold-out 13)

(1) The pump assembly includes gear 11, gear 14, needle bearings 7, 13 and 17, shaft 10, body 8 and cover 19. Gear 11

is the driving member. It meshes with and drives gear 14. Gear 14 rotates on a needle bearing 13, and is supported by shaft 10. Gear 11 rotates on needle bearings 7 and 17, supported by body 8 and cover 19. Ball 9 anchors shaft 10 against rotation. Pins 18 and screws 15 aline and retain cover 19.

(2) The pump assembly mounts in the converter housing near the transmission left-output coupling. Four self-locking bolts 1 retain it. The pump is driven by a gear splined to the transmission output shaft and in mesh with gear 5, which is keyed to gear 11.

b. Operation (fig. 384, fold-out 13)

(1) This pump assembly is a conventional spur gear type. It supplies oil to the hydraulic system when the vehicle is moving forward. In reverse, a spring-loaded check valve 63 (fig. 374, fold-out 3) prevents oil from returning to the intake side of the pump.

(2) The oil pumped augments that supplied by the input-driven pump. It is the only source of oil pressure if the vehicle is towed or pushed while the engine is not operating.

24. BRAKE COOLANT OIL PUMP ASSEMBLY AND MANIFOLD

a. Components (fig. 384, fold-out 13)

(1) The pump assembly includes drive gear 49, shaft 40, two gears 21 and 26, two gears 33 and 43, shaft 22, separator plate assemblies 23 and 36, cover assembly 44, body 32 and cover assembly 28. The gears and shafts are steel. The body and covers are cast iron.

(2) The pump consists of two separate pumping sections — one for each of the brakes. Each pump has a separate pair of gears. A common housing and common shafts serve both pump sections. The pairs of gears are separated by two plate assemblies 23 and 36. Driving gears 33 and 43 are keyed to shaft 40. Idler gears 21 and 26 are not keyed. Shafts 22 and 40 each rotate on three needle bearing assemblies.

(3) Manifold 56 serves as a base and mounting pad for the pump assembly. The manifold includes passages for separate intake ports for each pump section and provides m cans for two intake check valves.

b. Operation (fig. 384, fold-out 13)

(1) The pump is driven by a gear splined to the low-range carrier shaft and in mesh with gear 53 (fig. 379, fold-out 8), which, in turn, drives gear 49 (fig. 384, fold-out 13). The pump rotates any time the vehicle moves. During forward movement, when brakes are released, air is drawn into the pump through open air valves (refer to par. 18b(2), above). During reverse movement (brakes released), air is expelled through the air valves.

(2) When brakes are applied, the air valves are closed. The pump then draws oil through check valve washer assembly 67. Each section of the pump then delivers oil to a brake. The right section supplies the right brake; the left section supplies the left brake.

25. OIL FILTER AND SCREENS

a. Components (fig. 373 and 374, Told-outs 2 and 3)

(1) All oil in the system must pass through screens before it is directed into its various circuits. The scavenge pump must draw oil through screen 107 (fig. 373, fold-out 2) before returning it to the transmission sump. The input- and output-driven pressure pumps draw oil through screen assembly 23 (fig. 374, fold-out 3) before sending it into the system. The brake coolant pump must draw oil through the same screen. These two screens are simple, cylindrical wire mesh screens.

(2) Oil filter assembly (fig. 153), capable of screening finer particles from the oil, is located in the circuit which directs the output of the pressure oil pumps into the hydraulic system. The assembly includes a filter head assembly and filter element.

b. Operation

(1) Oil from the pressure pumps is directed through the oil filter element and then back into the system.

(2) Foreign matter in the oil collects in the filter element.

Section III. DESCRIPTION AND OPERATION OF RIGHT- AND LEFT-OUTPUT DRIVE ASSEMBLIES

26. RIGHT-OUTPUT DRIVE ASSEMBLY

a. Components (fig. 386, fold-out 15)

(1) The right-output drive assembly includes shaft 39, carrier assembly 41, internal gear 23, output shaft assembly 1, bearings 12 and 17, seal assembly 5, retainer 10, housing assembly 14, saddle assembly 35 and saddle cap 28.

(2) Shaft 39 is the driving member which connects the transmission left-output coupling to the right-output drive. It is splined at the transmission end and includes an integral 17-tooth sun gear at the opposite end. Planetary carrier assembly 41 includes carrier 43, three 37-tooth pinions 47 and three spindles 42. The pinions rotate on needle bearing rollers 46 on the spindles mounted in the carrier. The carrier is stationary and is the reaction member.

(3) Internal gear 23 is the driven member and has 91 internal teeth. A splined hub on the ring gear meshes with the splined end of output drive shaft 4. Roller bearing 12 supports the outer end of the output shaft in housing assembly 14, while roller bearing 17 supports the inner end. Retainer 10 positions the bearing and houses oil seal 5. Ten studs are fitted in the outer flange of the output shaft, for attaching the track sprocket hub.

(4) Housing assembly 14 houses and supports the output drive outer components. Saddle 37 houses and supports the output drive inner components and provides a mount for the rear of the transmission. The carrier assembly is anchored to the saddle assembly by 24 bolts 33. The housing assembly and saddle assembly are held together by three slotted machine screws 30. When mounted in the vehicle hull, 24 bolts pass through holes in both the housing and saddle to anchor the complete output drive assembly to the vehicle.

(5) A hub on the transmission is positioned between the saddle and saddle cap 28. Seals are provided at this connection to prevent leakage of oil. The output drive has its own oil supply. A plug 26 on the saddle cap is the oil filler plug. Plug 13 at the bottom of housing assembly 14 is the drain plug. Front and rear check plugs 15 are installed angularly from the drain plug. Lubrication within the output drive is the splash system.

b. Operation (fig. 386, fold-out 15)

(1) The transmission left output is coupled to the splined end of shaft 39. Shaft 39 rotates within pinion assembly 47. The carrier is stationary, causing the pinions to rotate in a direction opposite to that of shaft 39. The pinions are in mesh with internal gear 23 which also must rotate in a direction opposite to that of shaft 39. The rotation of internal gear 23 is transmitted to output drive shaft 4 and, in turn, to the vehicle tracks.

(2) The output drive thus reverses the direction of rotation available at the transmission output. Speed reduction within the output drive is 5.35:1.

27. LEFT-OUTPUT DRIVE ASSEMBLY

a. Components (fig. 385, fold-out 14). The left-output drive components are identical to those of tine right-output drive except for shaft 16 and saddle 8. These components are longer in the left- output drive.

b. Operation (fig. 385, fold-out 14). The operation of the left-output drive assembly is identical to the right assembly.

Section IV. OPERATION OF HYDRAULIC SYSTEM

28. PRELIMINARY INSTRUCTIONS

a. Hydraulic Schematics
(figs. 6 through 19, and fig. 372- fold-out 1)

(1) The hydraulic system, because of its importance to the operation of the power train, should be carefully studied and understood. There are 14 partial hydraulic schematics in color (figs. 6 through 19) and a fold-out hydraulic schematic (fig. 372). The colored schematics show positions of valves and moving components, and the various hydraulic circuits as indicated by the captions. The fold-out schematic, in black and white, shows the entire hydraulic system.

(2) Hydraulic schematic views (figs. 6 through 18) parallel the torque path schematic views (figs. 22 through 34) in Section III of this chapter. The hydraulic schematic views illustrate what happens hydraulically, while the torque path schematic views illustrate what happens mechanically.

b. Explanations of Hydraulic System

(1) In the schematic views, a particular color or color variation in figs. 6 through 18, is continued in the system until it passes through a regulator or an orifice which changes the pressure of the oil.

(2) To avoid needless repetition, references are made to initial explanations. To link the hydraulic action with the corresponding mechanical action, references are made to the paragraphs explaining the mechanical actions.

29. GENERAL INFORMATION

a. Torque Converter and Lockup Drive. Regardless of gear or steer condition, drive from the vehicle engine to the range gearing is either hydraulic (torque converter) or mechanical (lockup clutch engaged).

b. Transmission Oil Levels

(1) The hydraulic system is designed so that after the vehicle engine has been operating a short time, two distinct oil levels are established in the transmission. The oil level in the transmission rear housing is comparatively low (fig. 19). The other is in the transmission sump, which surrounds (but is separated from) the range gear section in the main transmission housing. The two levels guarantee a sufficient oil reserve, while maintaining the most efficient oil level in the operating sections of the transmission.

(2) Two oil levels exist because air pumped by the scavenge pump is discharged into the transmission rear housing. This creates a constant air pressure on the oil in this housing. The air pressure forces the oil level down, pushing the oil into the reservoir, until air can escape into the reservoir. The upper areas of the input transfer housing and the main transmission housing are connected. A breather, located near the top of the input transfer housing, allows atmospheric pressure to be present in these housings.

30. HYDRAULIC SYSTEM FUNCTION – NEUTRAL RANGE (fig. 6)

Note. Refer to par. 46 and fig. 22 for the torque path through the power train.

a. In neutral range, main pressure is supplied only by the input pressure pump (pump not shown in fig. 6; see fig. 372, fold-out 1). This oil is directed to four points at all times. These points are: the main-pressure regulator valve, the lockup cutoff valve, the throttle and throttle regulator valves, and the steer pressure regulator valve. This part of the hydraulic circuit always is charged when the power train is operating.

b. At the main-pressure regulator valve, oil enters the valve bore at two points. The upper connection directs the oil between two of the valve lands. It surrounds the valve stem and flows into holes drilled in the stem, which carry the oil through a spring-loaded ball check valve to the cavity above the large

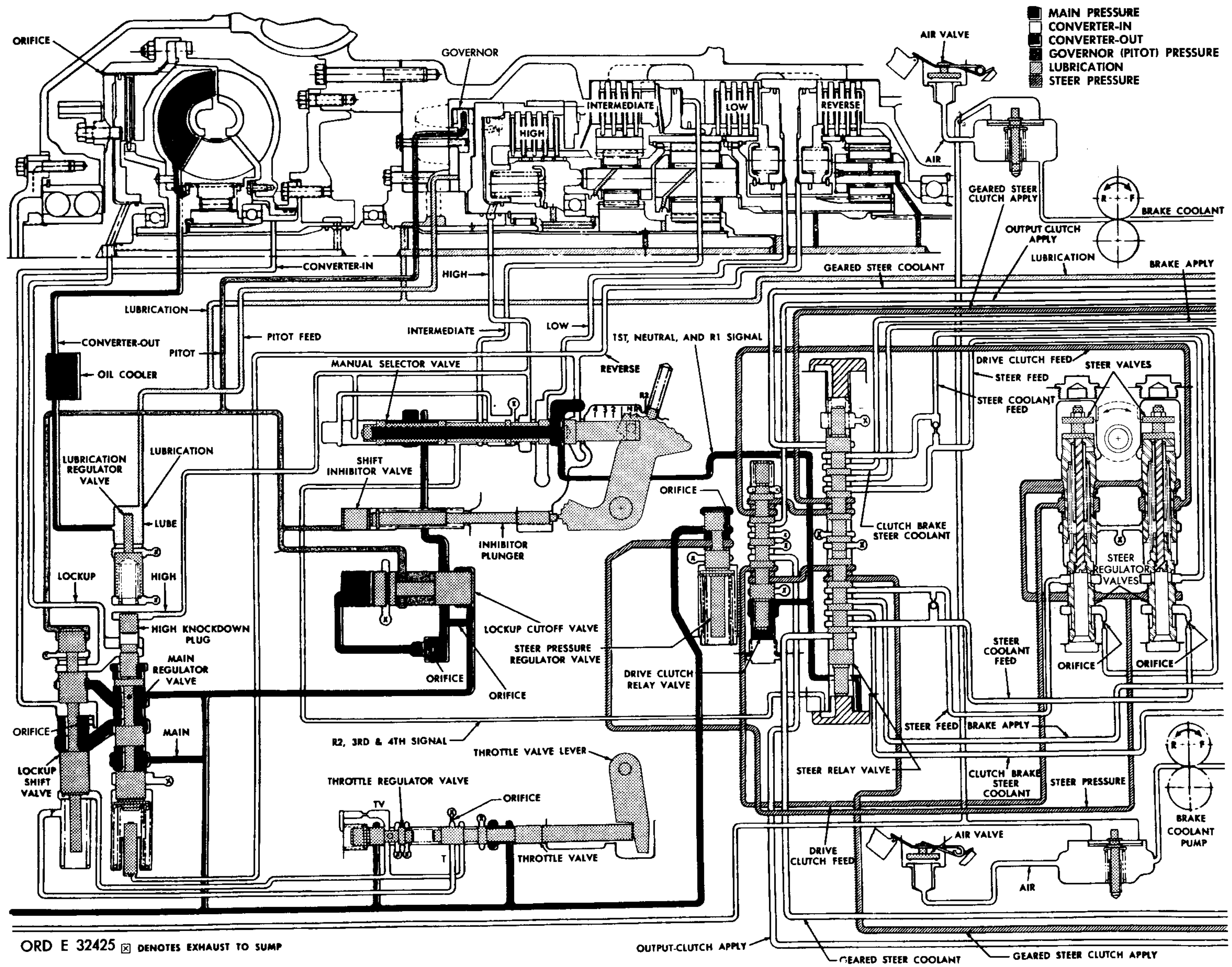


Figure 6. Hydraulic system, neutral range — schematic view

top land. Pressure in this cavity pushes the valve downward against a spring at its lower end. As the valve moves downward, it uncovers a port which admits oil to the lockup shift valve bore. When the lockup shift valve is held upward by its spring, the oil flows unrestricted to the torque converter and keeps it charged. When the valve is in the downward position, flow to the converter is limited by an orifice. Another passage is blocked by the middle land of the lockup shift valve.

c. Oil entering the main-pressure regulator bore at the lower connection flows into a cavity between the two larger lower lands of tine valve. If the oil is cold or the speed of the pump is sufficient, the oil flow may exceed the capacity of the converter. The pressure then rises and causes the valve to move downward, uncovering a port through which part of the flow exhausts to the sump.

d. Main-pressure regulation in neutral (converter operation) is maintained only by the compression of the springs at the lower end of the valve. Should engine speed be increased sufficiently to cause lockup (increased pitot pressure forces the lockup shift valve downward), main pressure would flow to the lockup clutch. At the same time, a branch from the lockup clutch line directs pressure to the area between the top of the lockup shift valve and the bottom of the high knockdown plug. Thus, in neutral lockup, main pressure is lowered because more oil is allowed to escape into the converter feed line (and, in some instances, to the sump).

e. At the lockup cutoff valve, oil is directed to two points. One point is the right end of the valve. The other is through an orifice (earlier models; later models have no orifice) to a passage which feeds the manual selector valve. When no shifts are being made, the lockup cutoff valve remains in the position shown. From the lockup cutoff valve, main pressure is directed to the manual selector valve. This valve is in neutral position and does not direct pressure to any of the range clutches. It does, however, direct pressure to the first, neutral and reverse 1 signal line (through the hollow center of the valve). Pressure in the signal line pushes the drive clutch relay valve upward against its stop, alining the hydraulic circuit for drive by means of the geared steer clutches.

f. At the throttle and throttle regulator valves, main pressure is supplied to two points. The left connection is blocked at closed throttle. When the throttle is opened, the throttle valve lever moves the throttle valve to the left. The spring between the throttle valve and throttle regulator valve transmits this movement to the throttle regulator valve. When the throttle regulator valve moves to the left, a port is uncovered, allowing oil to flow to the TV line. A branch of the TV line directs oil, through an orifice, to the left end of the throttle regulator valve where it exerts sufficient pressure to balance the compression of the TV spring and regulate TV pressure. Thus, the greater the movement of the throttle valve to the left, the greater is the compression of the TV spring and, consequently, the greater the pressure in the TV line. TV pressure is directed to the 10 lower side of the lockup shift valve, where it inhibits the initial downward movement of the valve.

g. When the lockup shift valve moves downward against TV pressure far enough to close the TV pressure passage, it no longer is opposed by TV pressure (except at full throttle, h, below) and rapidly completes its downward stroke. The cavity below the valve exhausts through the T pressure line and an orifice shown above the throttle valve.

h. When the throttle is completely open, the throttle valve moves far enough to the left to uncover the T pressure port.

TV pressure at this time is at maximum and can flow into the T pressure line. T pressure is connected to the area below the lockup shift valve, as is TV pressure. The effect of T pressure is to delay the downward movement of the lockup shift valve. Thus, at full throttle, governor (pitot) pressure must be higher to cause lockup. Higher governor pressure requires higher turbine shaft speed.

i. The main pressure line entering the throttle valve bore at the right has no function.

j. At the steer pressure regulator valve, main pressure is reduced and regulated, and produces steer pressure.

> Note: The pressure which applies the output clutches, geared steer clutches and brakes — whether for steer operation or straight travel — is always designated "steer pressure ."

Steer pressure is constant, regardless of fluctuations in main pressure.

k. Steer pressure is directed to the steer valves. In neutral, it simply flows through passages surrounding the steer valves, and is directed by two drive clutch feed lines to the drive clutch relay valve. The drive clutch relay valve, held upward by signal pressure, directs steer pressure to the right- and left-geared steer clutches, These clutches are the drive clutches in first gear. Thus, in neutral, they are engaged and ready to transmit drive when a shift is made to first gear.

1. Governor (pitot) pressure is produced in a fluid velocity-type governor. This consists of only two main components: a governor ring and a pitot tube. The ring is a rotating channel, open at its inner circumference. It is attached to the high-range clutch housing and rotates with the turbine output shaft. Oil is constantly fed to it from the lubrication system and centrifugal force retains the oil. Tine pitot tube is L-shaped and its open end is immersed in the oil in the governor ring. The open end of the tube faces against the rotation of the ring. The oil, moving at virtually the same speed as the ring, is thrown into the pitot tube and is directed to the top of the lockup shift valve, the left end of the shift inhibitor valve, and to the area between the lands of the lock-up cutoff valve. Governor pressure varies with the speed of the turbine output shaft.

m. At the top of the lockup shift valve, governor pressure pushes downward on the valve. At closed throttle condition, pressure sufficient to overcome only the lockup shift valve spring will force the valve downward. At part throttle condition, spring pressure plus TV pressure (initially) must be overcome. At full throttle condition, spring pressure plus maximum TV pressure and T pressure must be overcome.

n. At the shift inhibitor valve, governor pressure pushes the valve toward the right. A spring resists this movement. When governor pressure is sufficient, the right end of the inhibitor plunger will be pushed against the longest projection on the manual selector valve lever. In neutral, this is not significant.

o. At the lockup cutoff valve, governor pressure is blocked except for brief intervals during shifting. When shifts are made, the lockup cutoff valve moves rapidly to the left and exhausts governor pressure to the sump. This destroys governor pressure and allows the lockup shift valve, if downward, to move upward and release the lockup clutch. This feature ensures that the lockup clutch will be released every time a range clutch engages.

p. Oil returning from the torque converter passes through an (external) oil cooler and flows into the area above the lubrication regulator valve. The pressure maintained at this point is sufficient to balance the compression of the spring pushing the valve upward. This pressure forces oil through the lubrication passages. Oil flow in excess of lubrication requirements returns to the sump through an exhaust port at the right side of the valve bore.

31. HYDRAULIC SYSTEM FUNCTION – FIRST GEAR (fig. 7)

Note: Refer to par. 47 and fig. 23 for the torque path through the power train.

a. Functions in first gear are the same as those described for neutral in par. 30, above, except that the low-range clutch is engaged and the vehicle is moving.

b. When the manual selector valve is moved to first gear position, a port is uncovered which directs main pressure to the low-range clutch Movement of the manual selector valve lever puts a lug on the lever in a position which will allow the shift inhibitor plunger to extend and prevent shifting to neutral or reverse at higher speeds.

c. When the vehicle is moving forward with the brakes released, the brake air valves (text continues on page 31)

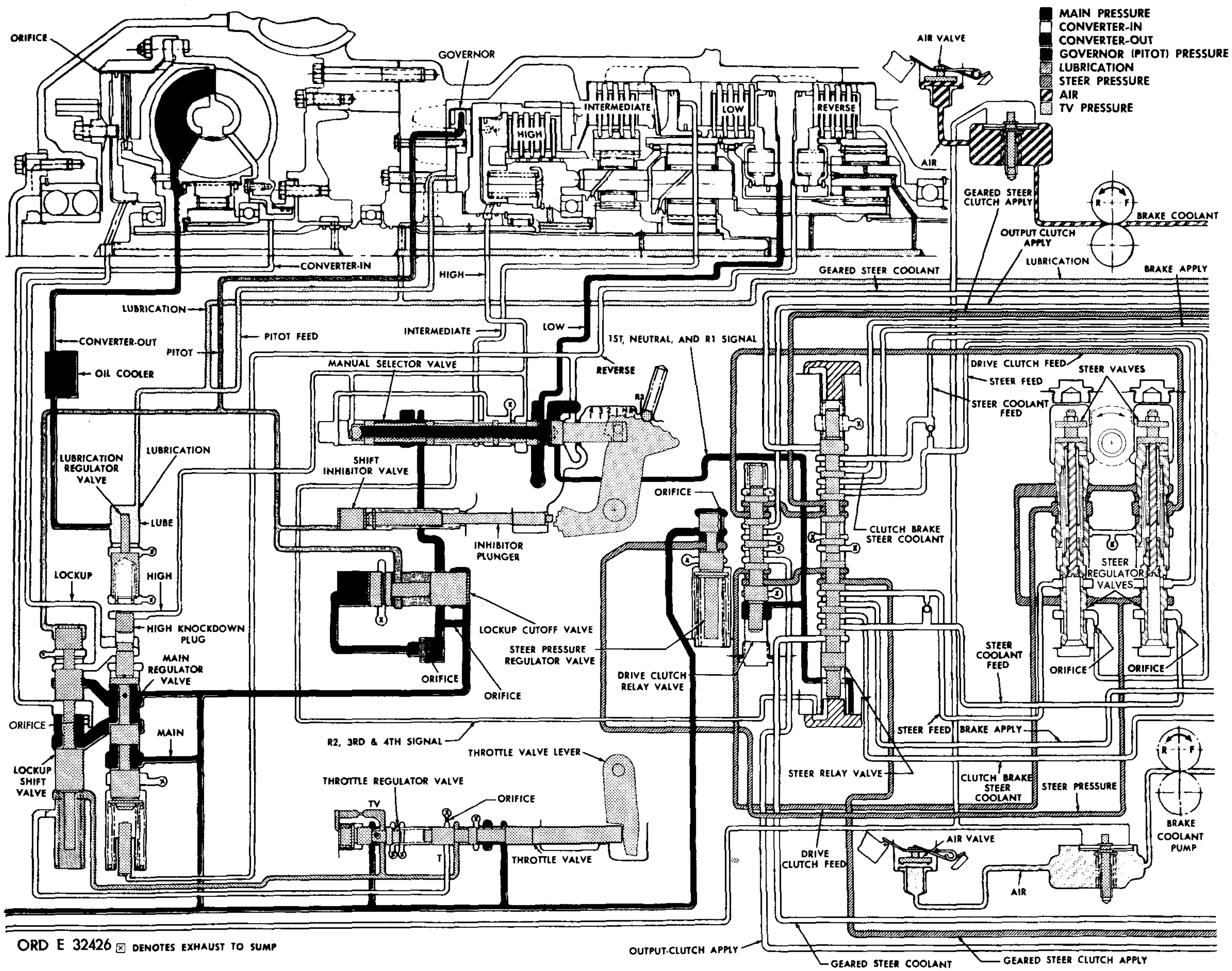


Figure 7. Hydraulic system, first gear — schematic view

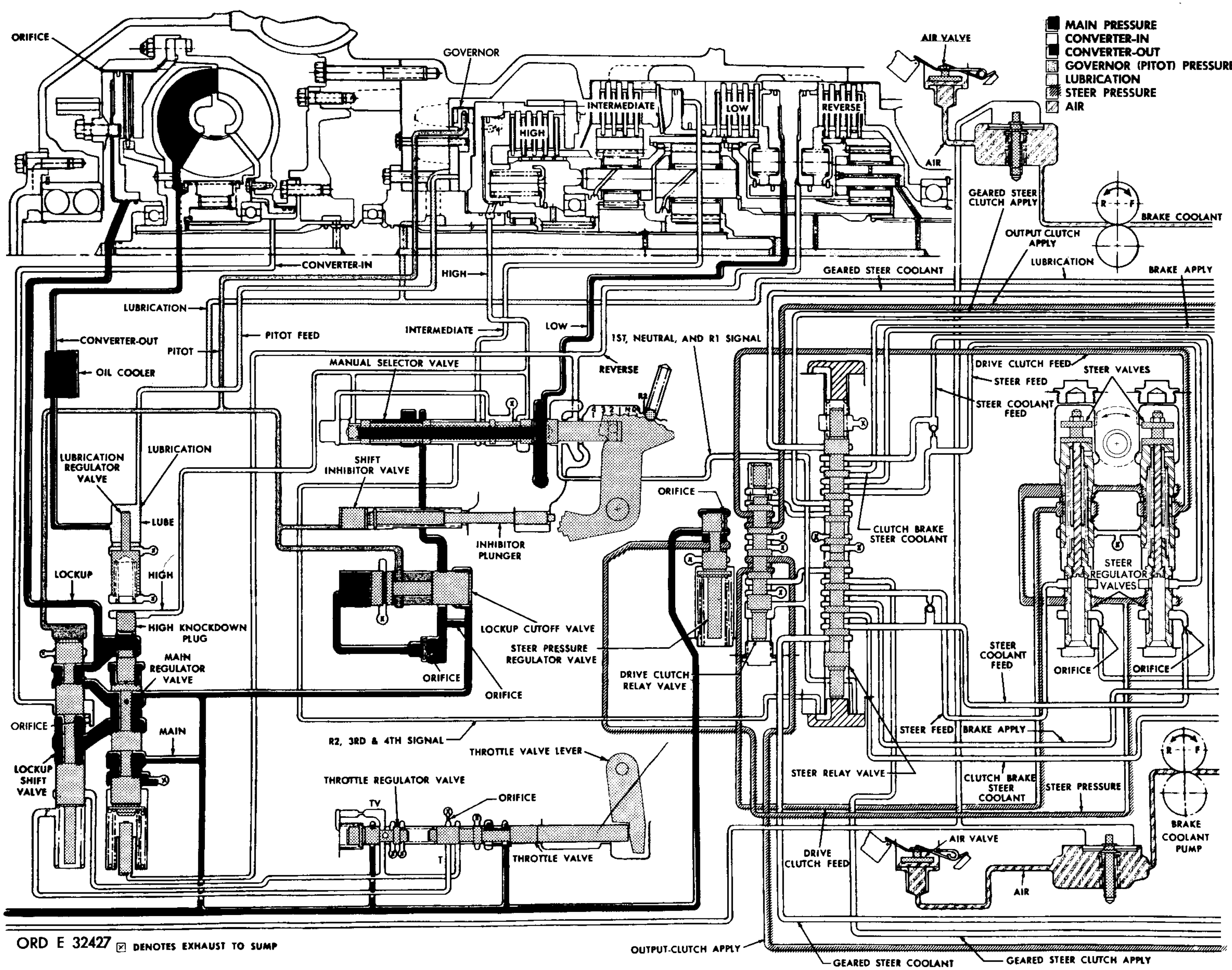


Figure 8. Hydraulic system, second gear — schematic view

are open. The brake coolant pump is operating but air is being drawn through the open air valves and directed to the brakes. If the brakes are applied (except hydraulically in steering), the air valves close and oil is drawn from the sump, through check valves, and delivered to the brake plates.

d. Fig. 7 illustrates partial opening of the throttle which produces TV pressure at the throttle regulator valve. Refer to par. 30f, g, h, and i, above, for a complete explanation of the function of the throttle and throttle regulator valves.

32. HYDRAULIC SYSTEM FUNCTION-SECOND GEAR (fig. 8)

Note. Refer to par. 48 and fig. 24 for the torque path through the power train.

a. The function of the hydraulic system in second gear is the same as that in first gear except that drive to the power train outputs is through the output clutches rather than through the geared steer clutches.

b. When the manual selector valve is shifted to the second gear position, the low-range clutch is engaged but no signal pressure is present. Because no signal pressure exists, the drive clutch relay valve is held downward by the spring at its upper end. This alines the hydraulic system to direct steer pressure to the right- and left -output clutches.

c. Fig. 8 illustrates the lockup shift valve in its downward position and shows main pressure applying the lockup clutch. Note the branch of the lockup clutch line that directs pressure to the top of the main-pressure regulator valve. Downward movement of the valve exhausts oil to the sump, reducing main pressure.

Note. If pump speed is not sufficient to provide a larger volume of oil than that flowing to the converter and lost by leakage, the main-pressure regulator valve may not move downward sufficiently to exhaust oil.

d. At higher speeds, the shift inhibitor plunger is extended and prevents shifting to first, neutral or reverse gears.

33. HYDRAULIC SYSTEM FUNCTION - THIRD GEAR (fig. 9)

Note. Refer to par. 49 and fig. 25 for the torque path through the power train.

a. In third gear, the hydraulic system operates as in second gear except that main pressure applies the intermediate-range clutch and that reverse 2, third and fourth signal pressure is directed to the lower end of the steer relay valve.

b. When the manual selector valve is in third-gear position, the intermediate-range clutch is charged and signal pressure is directed to the steer relay valve. Signal pressure pushes the valve upward against spring pressure and a1ines the steer circuit for geared steer.

c. At higher speeds, the shift inhibitor plunger wi11 extend and prevent shifting to lower gears, neutral and reverse gears.

34. HYDRAULIC SYSTEM FUNCTION – FOURTH GEAR (fig. 10)

Note. Refer to par. 50 and fig. 26 for the torque path through the power train.

a. Conditions in the hydraulic system during fourth-gear operation are the same as in third gear except that the high-range clutch is engaged instead of the intermediate-range clutch. The only valve at a different position is the manual selector valve.

b. When in the fourth gear position, the manual selector valve lever will permit the shift inhibitor plunger to extend, at higher speeds, and block any shift from fourth gear.

c. Full-throttle opening is illustrated, showing how both T and TV pressures are produced. Note that T pressure is equal to maximum TV pressure but that T pressure is directed to a different area.

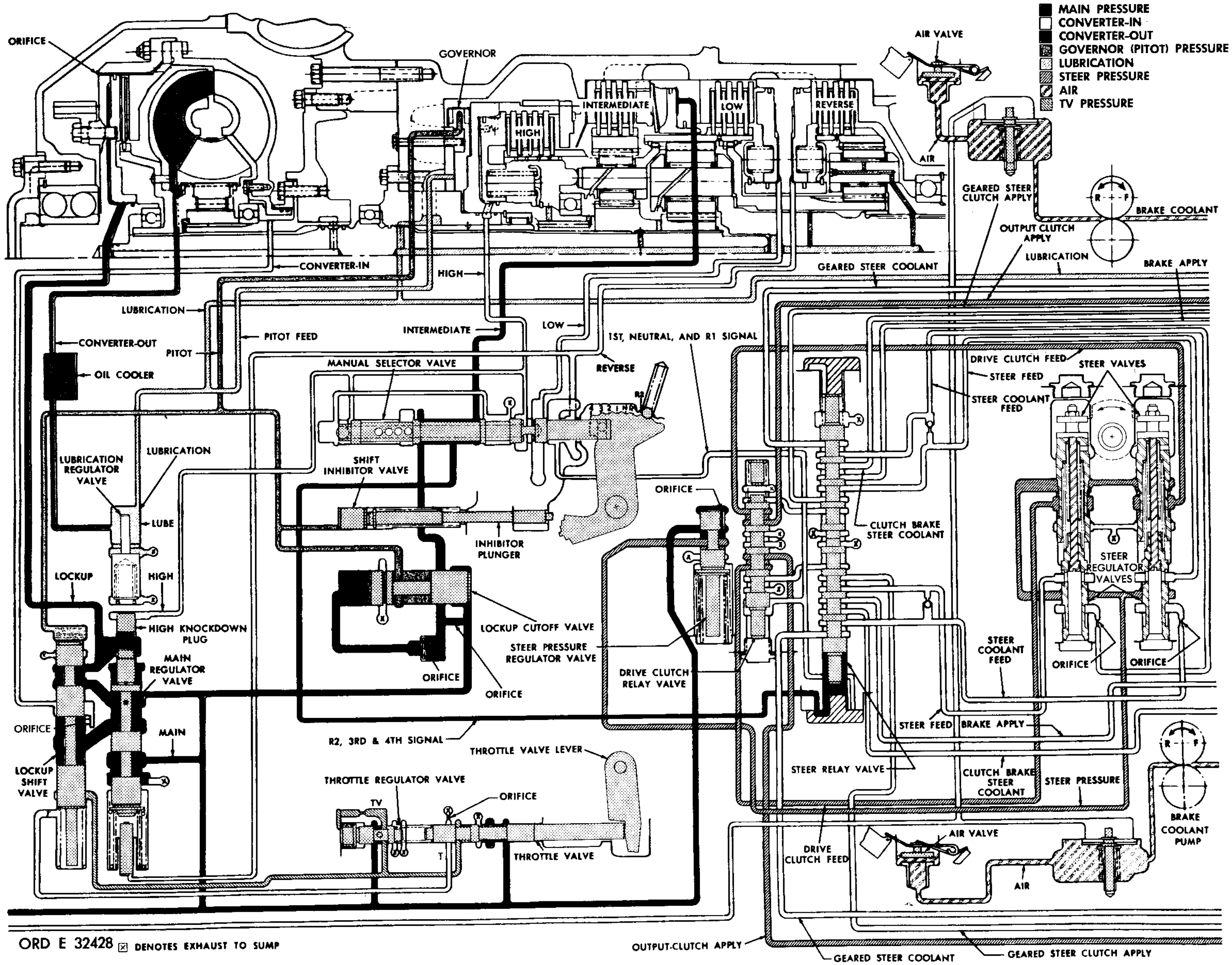


Figure 9. Hydraulic system, third gear — schematic view

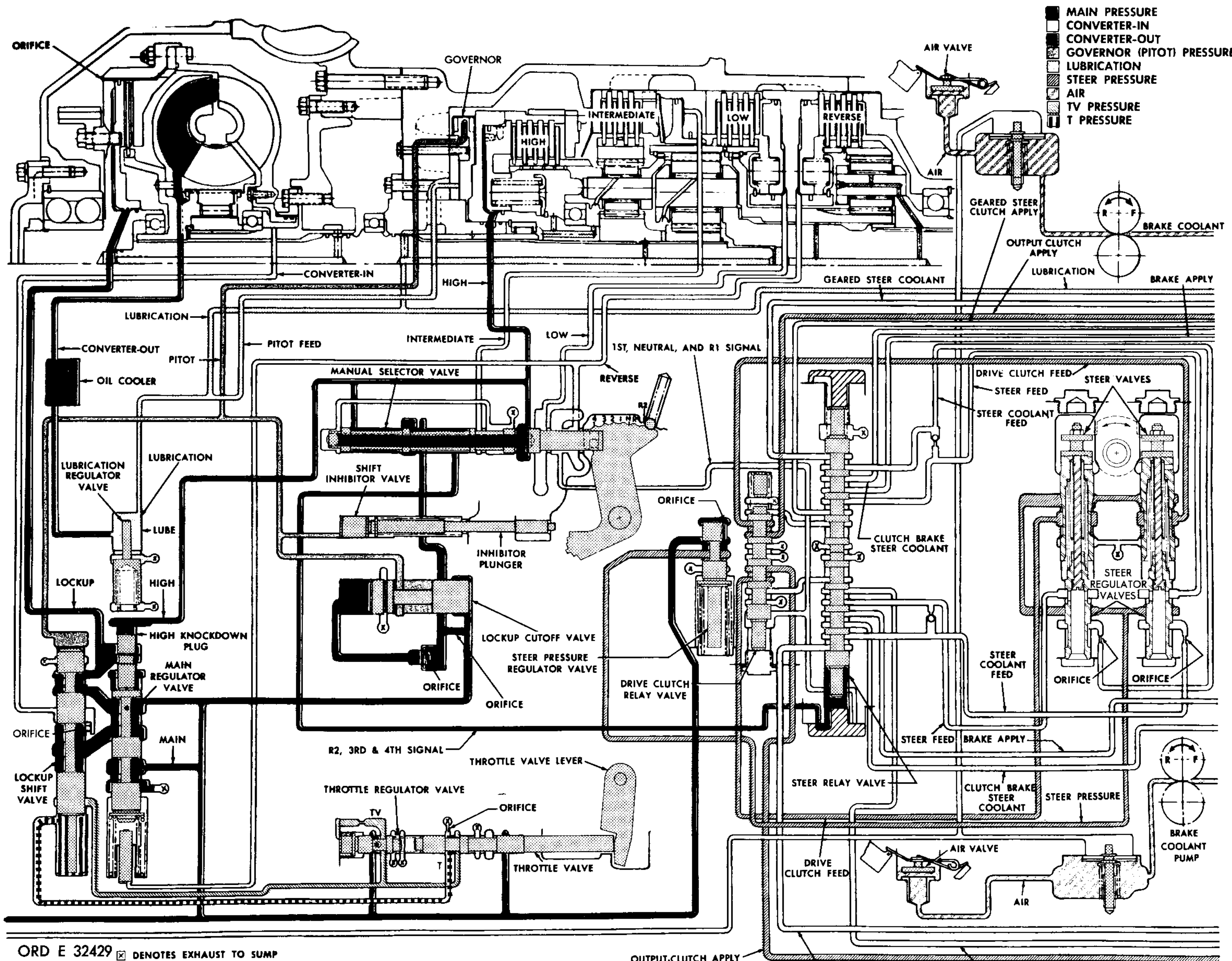


Figure 10. Hydraulic system, fourth gear — schematic view

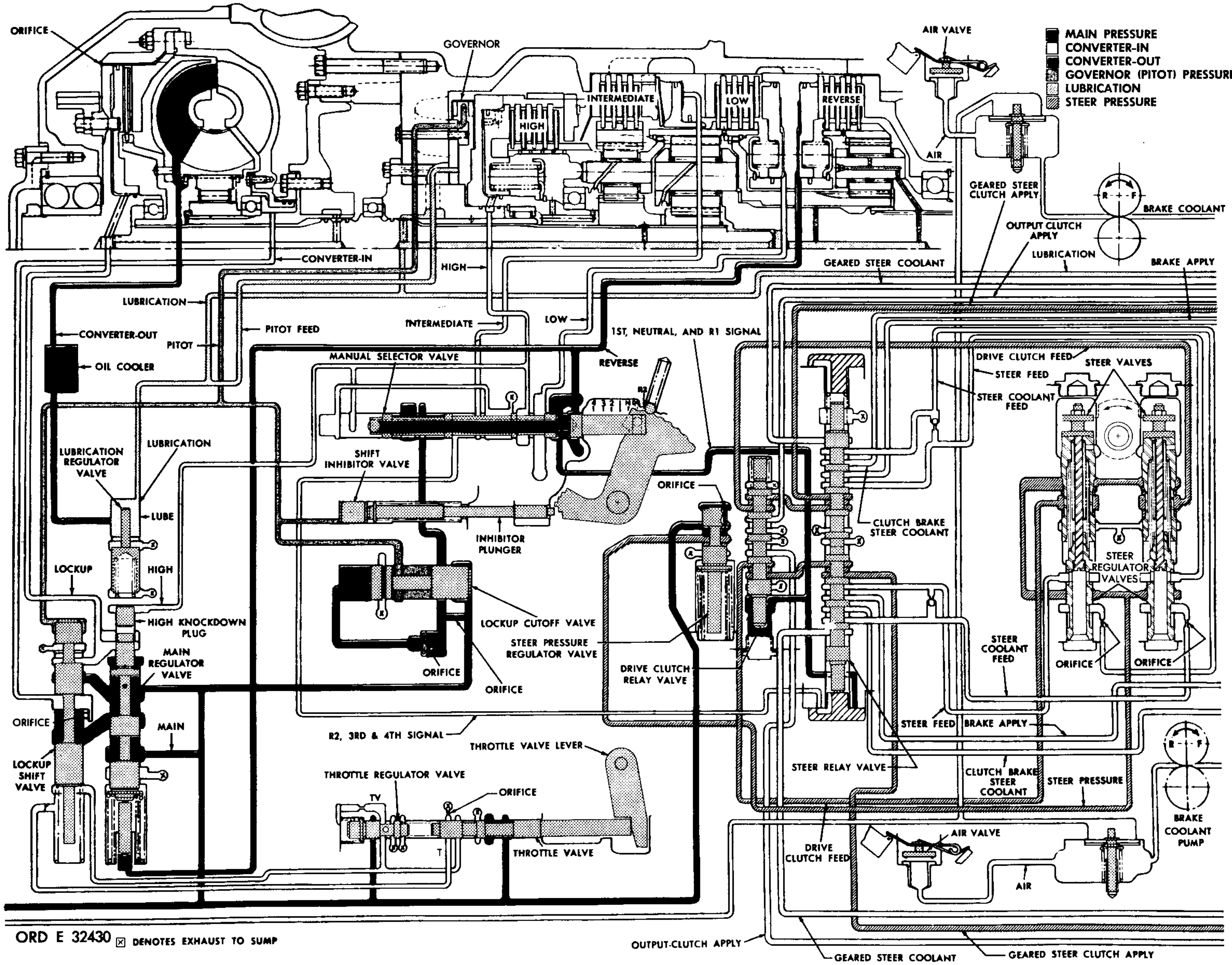


Figure 11. Hydraulic system, reverse 1 gear — schematic view

d. In fourth gear, main pressure is directed to the top of the high knockdown plug. Pressure at this point pushes the high knockdown p1ug downward against the top of the main-pressure regulator valve. There is no effect on main pressure when lockup is engaged because lockup apply pressure (main) is already exerting an equal downward force on the main-pressure regulator valve. However, if the lockup clutch should disengage, the high knockdown plug would continue to push downward on the main-pressure regulator valve. Thus, main pressure is the same in fourth gear whether operation is lockup or converter. This is the only gear in which this is true. In all other gears, lockup operation causes a lowering of main pressure.

35. HYDRAULIC SYSTEM FUNCTION – REVERSE 1 GEAR (fig. 11)

Note. Refer to par. 51 and fig. 27 for the torque path through the power train.

a. Hydraulic system conditions in reverse 1 gear are the same as described for neutral in par. 30, above, and illustrated in fig. 6, except that the reverse-range clutch is engaged and the vehicle is moving in reverse.

b. When the manual selector valve is in reverse 1 position, the reverse-range clutch is engaged and a branch of the clutch apply line directs main pressure to the lower end of the regulator plug. This pressure pushes upward on the regulator plug which, in turn, pushes upward on the main-pressure regulator valve. Thus, the plug's upward force assists the regulator valve springs and increases main pressure.

c. At higher speeds, the shift inhibitor plunger wi11 extend and block any shift to neutral or a forward gear.

d. In reverse gear, the brake coolant pump rotates in a reverse direction. Thus, no brake coolant can be pumped.

36. HYDRAULIC SYSTEM FUNCTION – REVERSE 2 GEAR (fig. 12)

Note. Refer to par. 52 and fig. 28 for the torque path through the power train.

a. Hydraulic system conditions in reverse 2 gear are the same as those for reverse 1 gear except that the power train output drive is through the output clutches rather than through the geared steer clutches.

b. In reverse 2 gear, no signal pressure exists under the drive clutch relay valve. Spring pressure holds the valve downward, in which position steer pressure is directed to the right- and left-output clutches. Reverse 2, third and fourth signal pressure is directed to the lower side of the steer relay valve. This pushes the valve upward against spring pressure and alines the steer circuit for geared steer.

37. HYDRAULIC SYSTEM FUNCTION - LOW RANGE, STEER

a. First Gear, Full-right Steer (fig. 13)

Note. Refer to par. 53 and fig. 29 for the torque path through the power train.

(1) The hydraulic system will function in first-gear steer in the same manner as described for first-gear straight travel in par. 31, above, except for the position of the steer valves and the flow of oil to the drive clutches and brakes.

(2) In right steer, the steer control shaft is rotated clockwise. This rotation moves the right- steer valve downward while the left-steer valve moves upward. The downward movement of the right-steer valve blocks the flow of steer pressure (in the upper passage), preventing its being directed to the right-drive clutch feed line. In the lower steer pressure passage, a port is uncovered which allows steer pressure to enter the steer regulator valve bore and to flow to the right-steer feed line. The pressure in the right-steer feed line is regulated by the action of the lower part of the steer valve assembly. When steer pressure enters the right-steer valve bore, it exerts an upward pressure on the steer regulator valve. Upward movement of the steer regulator valve throttles the in-flow of steer pressure. Thus, the degree of downward movement of a steer valve determines steer

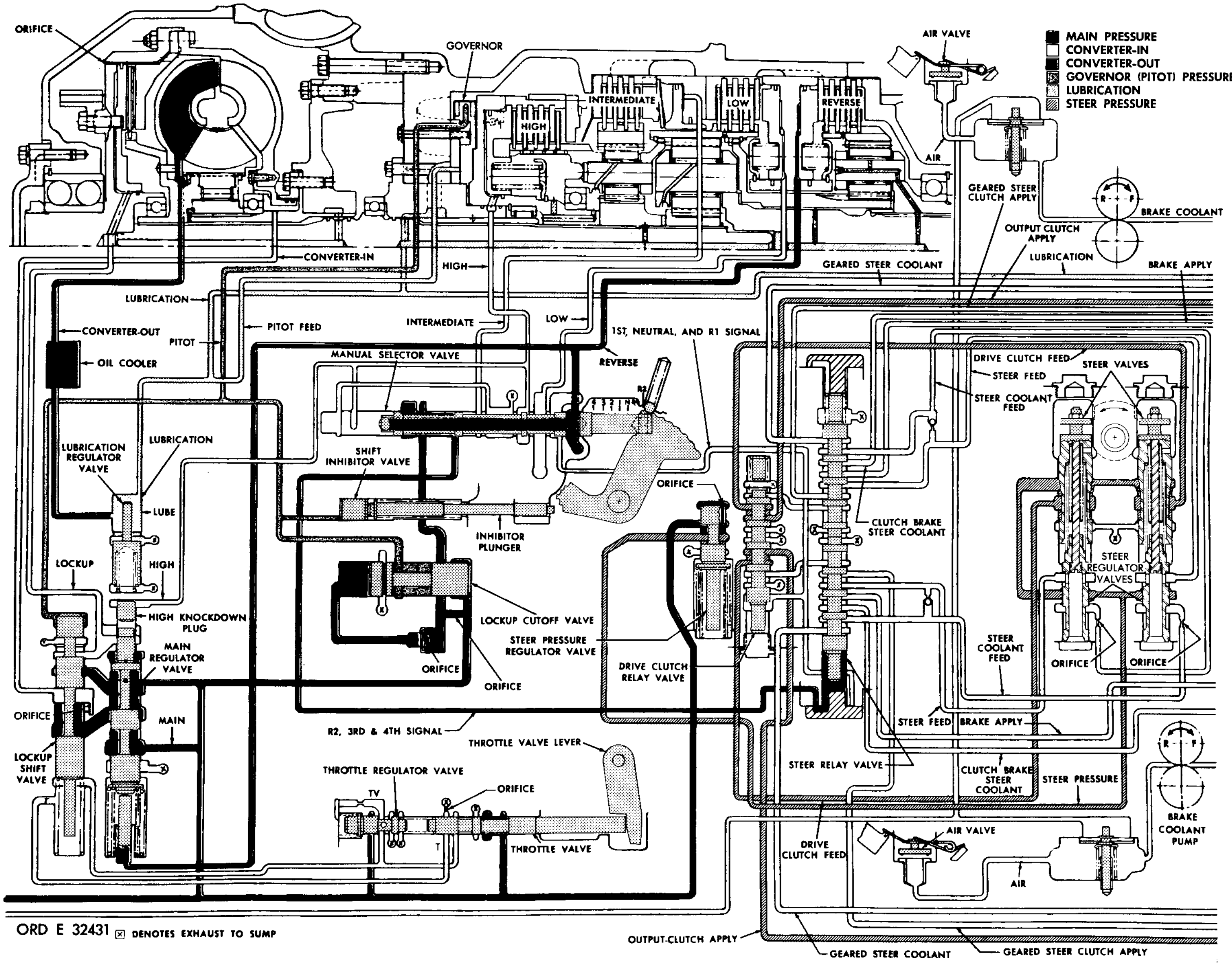


Figure 12. Hydraulic system, reverse 2 gear — schematic view

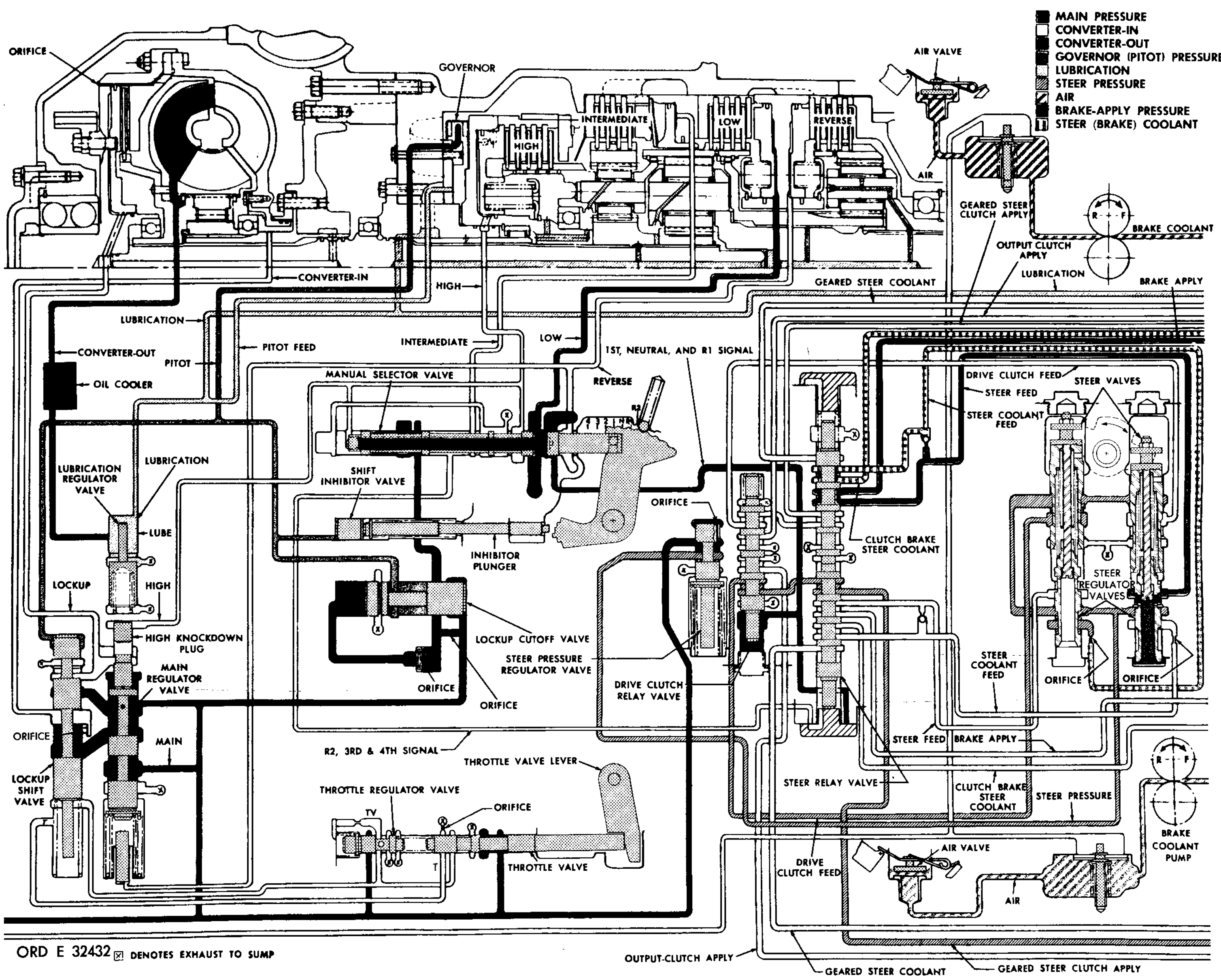


Figure 13. Hydraulic system, first gear, right steer — schematic view

feed pressure. Maximum downward movement will produce maximum steer feed pressure.

(3) Right-steer feed pressure flows to the steer relay valve which directs it to the right brake. The clutch-brake method is used for first-gear steer. In right steer, the right brake is applied. Full-right steer stops the right output of the power train. Partial-right steer slows the right output.

(4) Upward movement of the left-steer valve does not interrupt the flow of steer pressure to the left-drive clutch (geared steer clutch). This upward movement, however, does open a passage through which oil can flow, through an orifice, to the steer coolant feed line. The steer coolant feed line carries oil to the steer relay valve, where it is sent to the right brake, through the clutch-brake steer coolant line.

(5) A ball-type check valve is located between each of the steer feed lines and steer coolant feed lines. The upper check valve opens when the application of right steer is discontinued, and allows the brake apply pressure to exhaust through the clutch-brake steer coolant line.

(6) In right steer in first gear, the right-drive clutch (geared steer clutch) is released, the right brake is applied and cooled, and the left-drive clutch (geared steer clutch) remains engaged and continues to drive.

b. Second Gear, Full-left Steer (fig. 14)

Note. Refer to par. 54 and fig. 30 for the torque path through the power train.

(1) The hydraulic system will function in second gear steer in the same manner as described for second-gear straight travel in par. 32, above, except for the position of the steer valves and the flow of oil to the drive clutches and brakes.

(2) In left steer, the steer control shaft is rotated counterclockwise. This rotation moves the right- steer valve upward while, the left-steer valve moves downward. Flow to the left-drive clutch (output clutch) is blocked. A regulated steer feed pressure is sent to the steer relay valve. The steer relay valve sends oil to the left brake through the left-brake apply line.

(3) The flow to the right-drive clutch (output clutch) is not interrupted and the clutch continues to drive the right output. The right-steer valve supplies steer coolant feed to the left brake. The left-brake apply pressure can exhaust through the lower check valve (between steer feed and steer coolant feed lines) and the clutch-brake steer coolant line, when application of steer is discontinued.

38. HYDRAULIC SYSTEM FUNCTION – THIRD AND FOURTH GEARS, STEER

a. Third Gear, Full-right Steer (fig. 15)

Note. Refer to par. 55 and fig. 31 for the torque path through the power train.

(1) The hydraulic system will function in third-gear steer in the same manner as described in par. 33, above, except for the position of the steer valves and the flow of oil to the drive clutches and steer clutches.

(2) Downward movement of the right-steer valve and the resulting oil flow is described in par. 37a(2), above.

(3) Right-steer feed pressure flows to the steer relay valve which directs it to the right- geared steer clutch, through the geared steer clutch apply line. The geared steer method is used in third-gear steer. In right steer, the right-geared steer clutch is applied. Full-right steer fully applies the steer clutch so that no slippage occurs. Partial-right steer allows the steer clutch to slip somewhat.

(4) Upward movement of the left-steer valve does not interrupt the flow of steer pressure to the left-drive clutch (output clutch). This upward movement, however, does open a passage through which oil can flow, through an orifice, to the steer coolant feed line. The steer coolant feed line carries oil to the steer

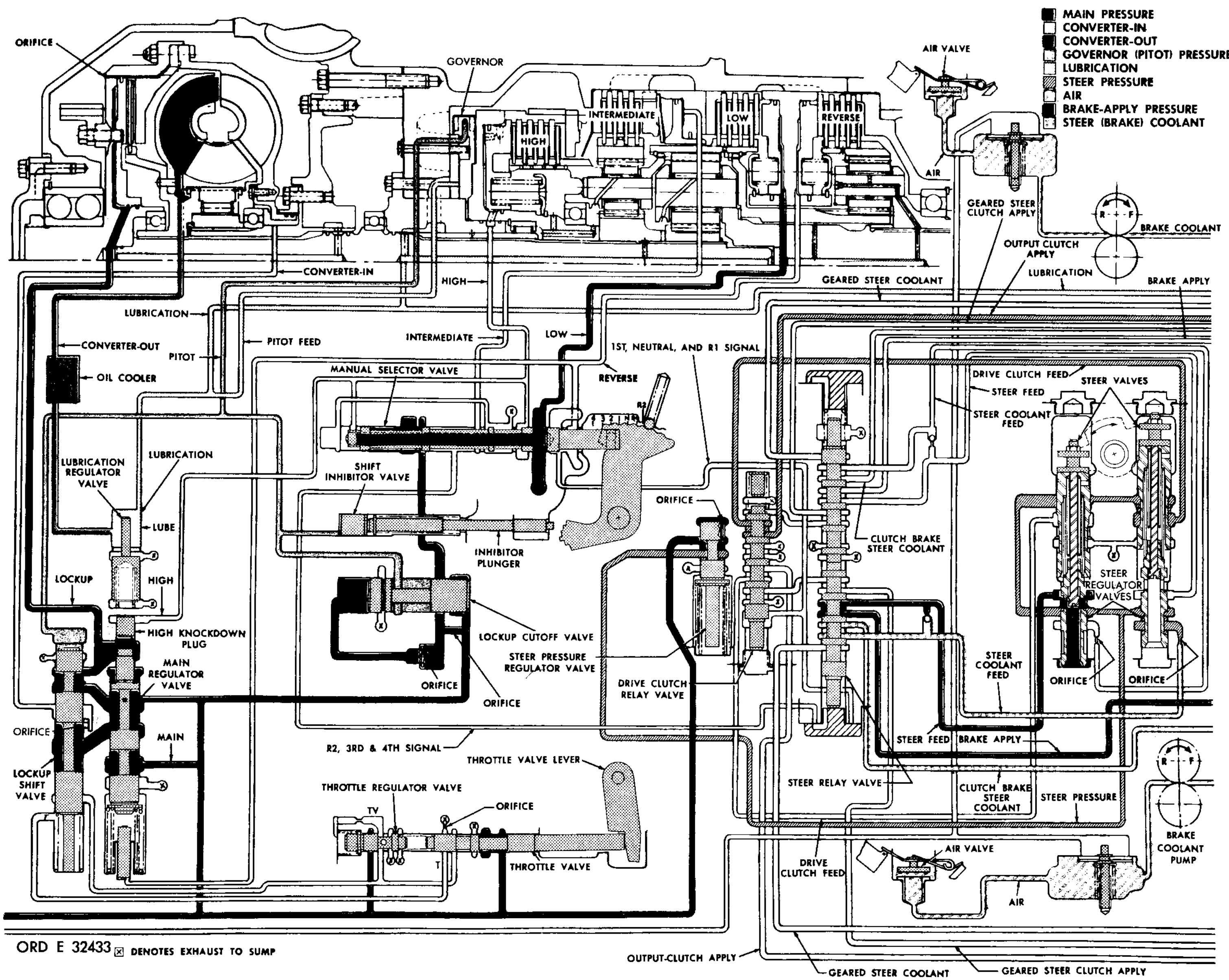


Figure 14. Hydraulic system, second gear, left steer — schematic view

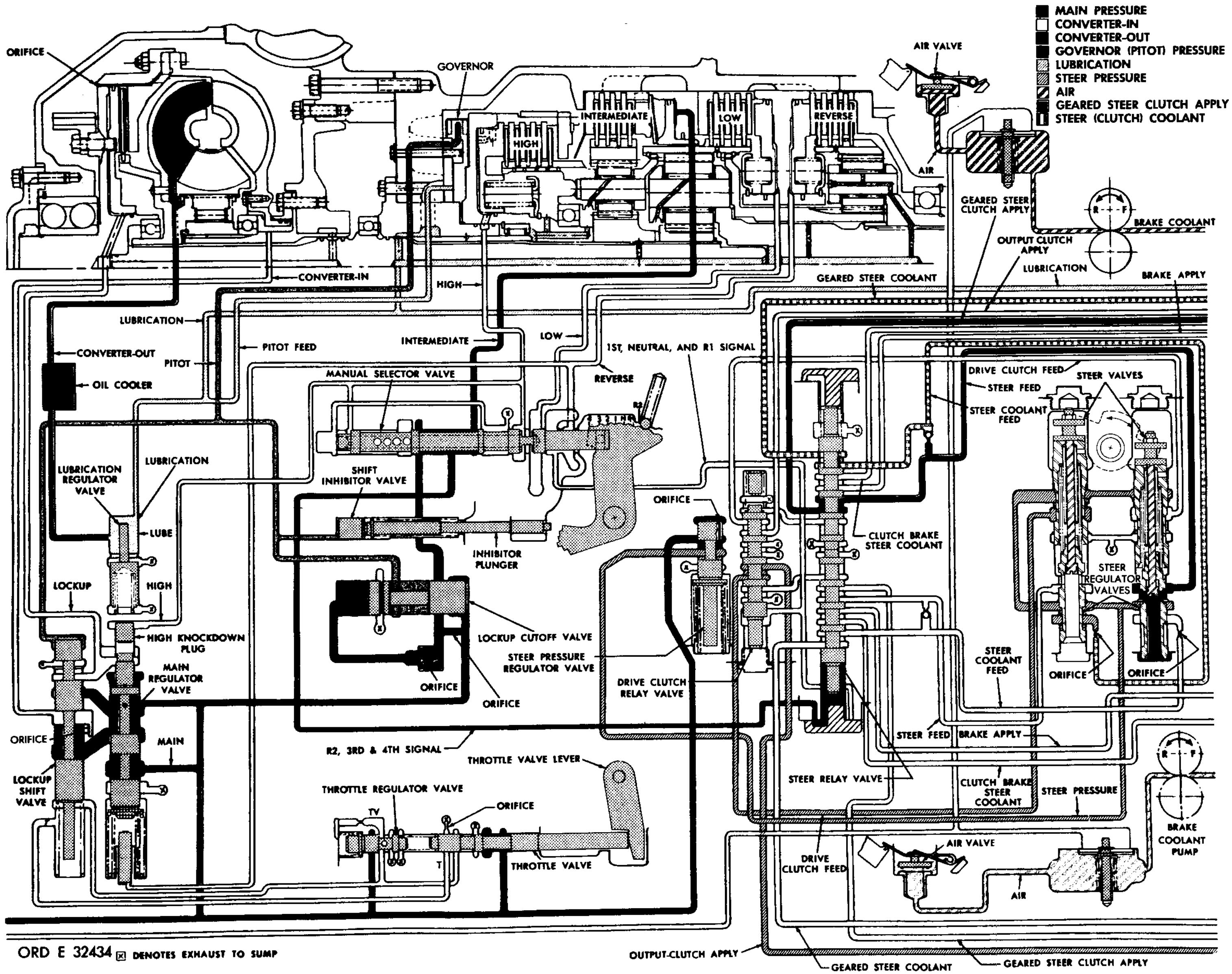


Figure 15. Hydraulic system, third gear, right steer — schematic view

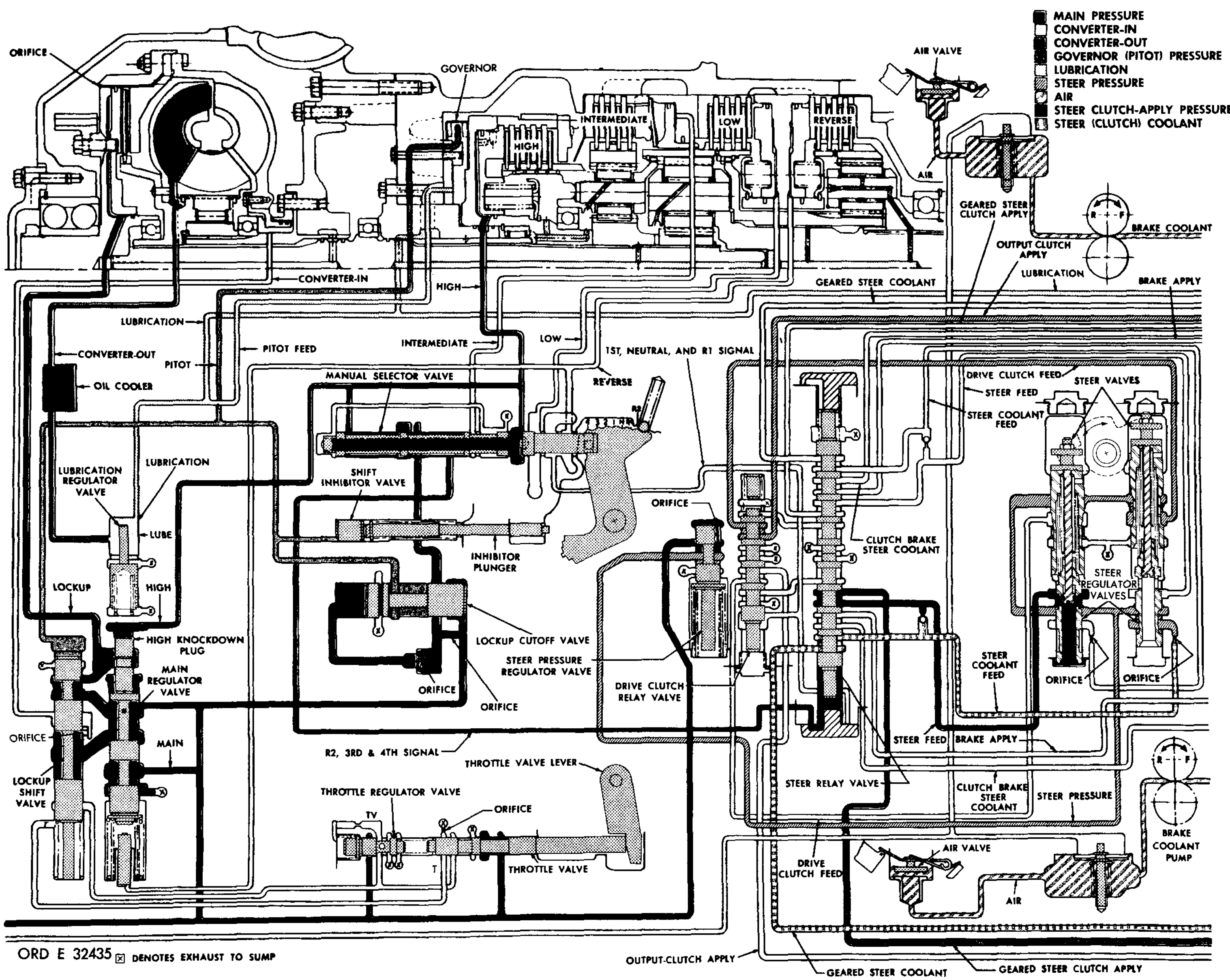


Figure 16. Hydraulic system, fourth gear, left steer — schematic view

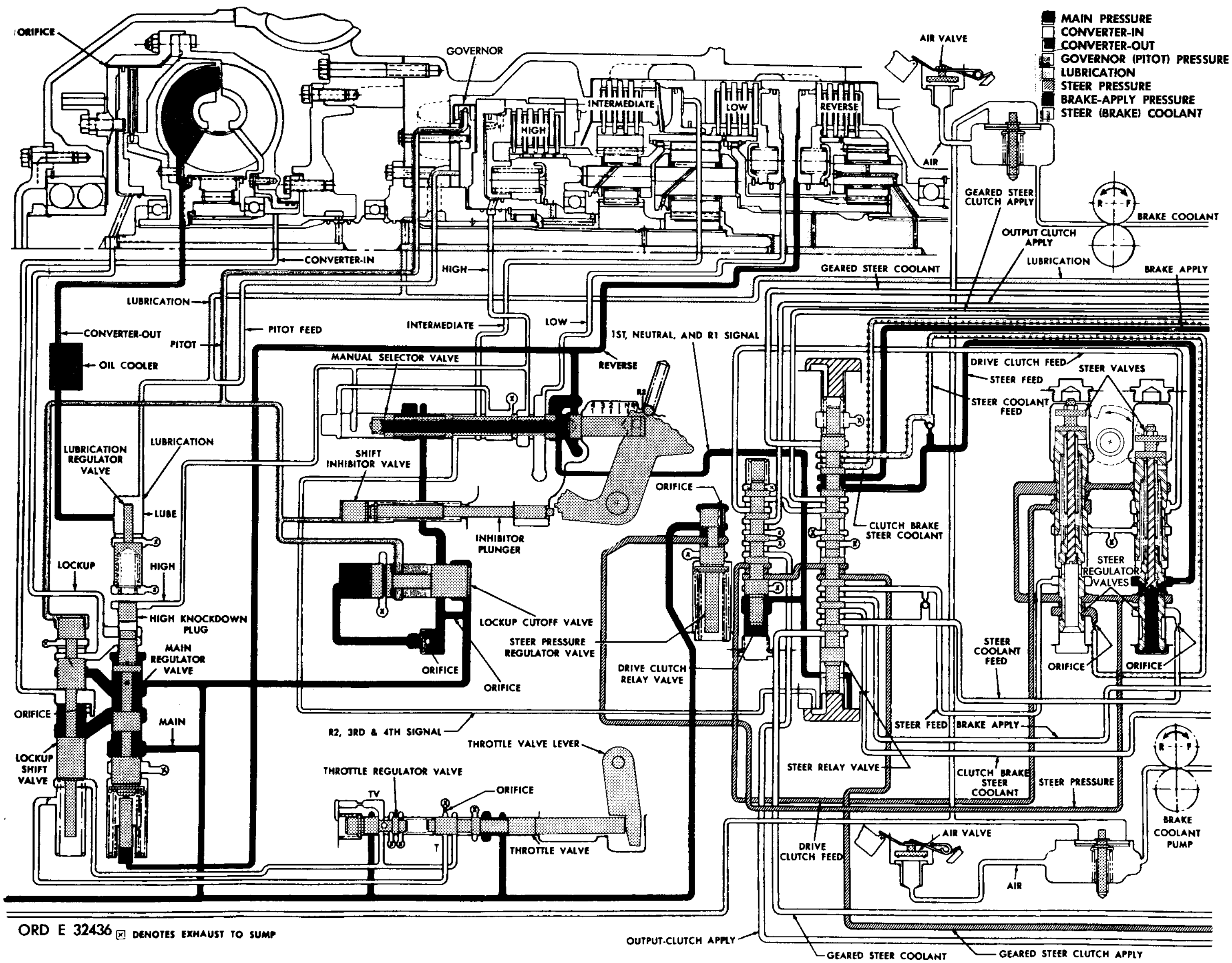


Figure 17. Hydraulic system, reverse 1 gear, right steer — schematic view

relay valve, where it is sent to the right-geared steer clutch, through the geared steer coolant line.

(5) The right-geared steer clutch is exhausted, after use, through the ball check valve (upper) located between the steer feed and steer coolant feed lines.

(6) In right steer in third gear, the right-drive clutch (output clutch) is released, the right-geared steer clutch is engaged and supplied with coolant, and the left-drive clutch (output clutch) is engaged and continues to drive.

b. Fourth Gear, Full-left Steer (fig. 16)

Note. Refer to par. 56 and fig. 32 for the torque path through the power train.

(1) The hydraulic system will function in fourth gear steer in the same manner as described for fourth gear straight travel in par. 34, above, except for the position of the steer valves and the flow of oil to the drive clutches and steer clutches.

(2) In left steer, the steer control shaft is rotated counterclockwise. This rotation moves the right-steer valve upward while the left-steer valve moves downward. Flow to the left-drive clutch (output clutch) is blocked. A regulated steer feed pressure is sent to the steer relay valve. The steer relay valve sends oil to the left-geared steer clutch, through the left-geared steer clutch apply line.

(3) The flow to the right-drive clutch (output clutch) is not interrupted and the clutch continues to drive the right output. The right-steer valve supplies steer coolant feed to left-geared steer clutch. The left-geared steer clutch apply pressure can exhaust through the lower check valve (between steer feed and steer coolant feed lines) and the geared steer coolant line, when application of steer is discontinued.

39. HYDRAULIC SYSTEM FUNCTION - REVERSE RANGE, STEER

a. Reverse 1 Gear, Full-right Steer (fig. 17)

Note. Refer to par. 57 and fig. 33 for the torque path through the power train.

(1) The hydraulic system will function in reverse 1-gear steer in the same manner as described for reverse l-gear straight travel in par. 35, above, except for the position of the steer valves and the flow of oil to the drive clutches and brakes.

(2) Refer to par. 37a(2) through (5), above, for an explanation of the function of the steer valves and oil flow to the drive clutches and brakes.

(3) In reverse 1 gear, right steer, the right-drive clutch (geared steer clutch) is released, the right brake is applied and supplied with coolant, and the left-drive clutch (geared steer clutch) continues to drive the left-output.

b. Reverse 2 Gear, Full-left Steer (fig. 18)

Note. Refer to par. 58 and fig. 34 for the torque path through the power train.

(1) The hydraulic system will functioning reverse 2-gear steer in the same manner as described for reverse 2-gear straight travel in par. 36, above, except for the position of the steer valves and oil flow to the drive clutches (output clutches) and geared steer clutches.

(2) Refer to par. 38b(2) and (3), above, for an explanation of the function of the steer valves and oil flow to the drive clutches and geared steer clutches.

(3) In reverse 2 gear, left steer, the left-drive clutch (output clutch) is released, the left-geared steer clutch is applied and supplied with coolant, and the right-drive clutch continues to drive the right output.

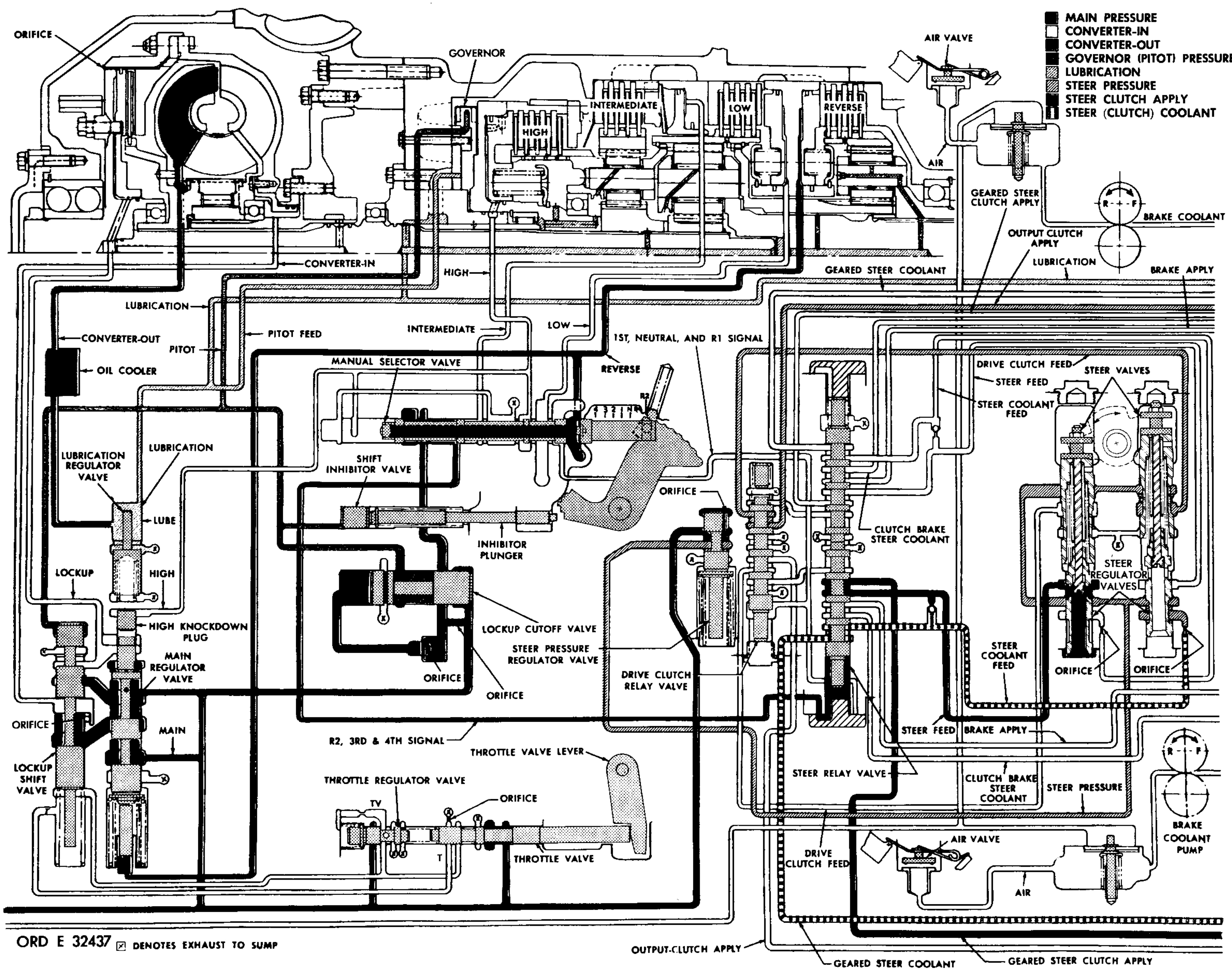


Figure 18. Hydraulic system, reverse 2 gear, left steer — schematic view

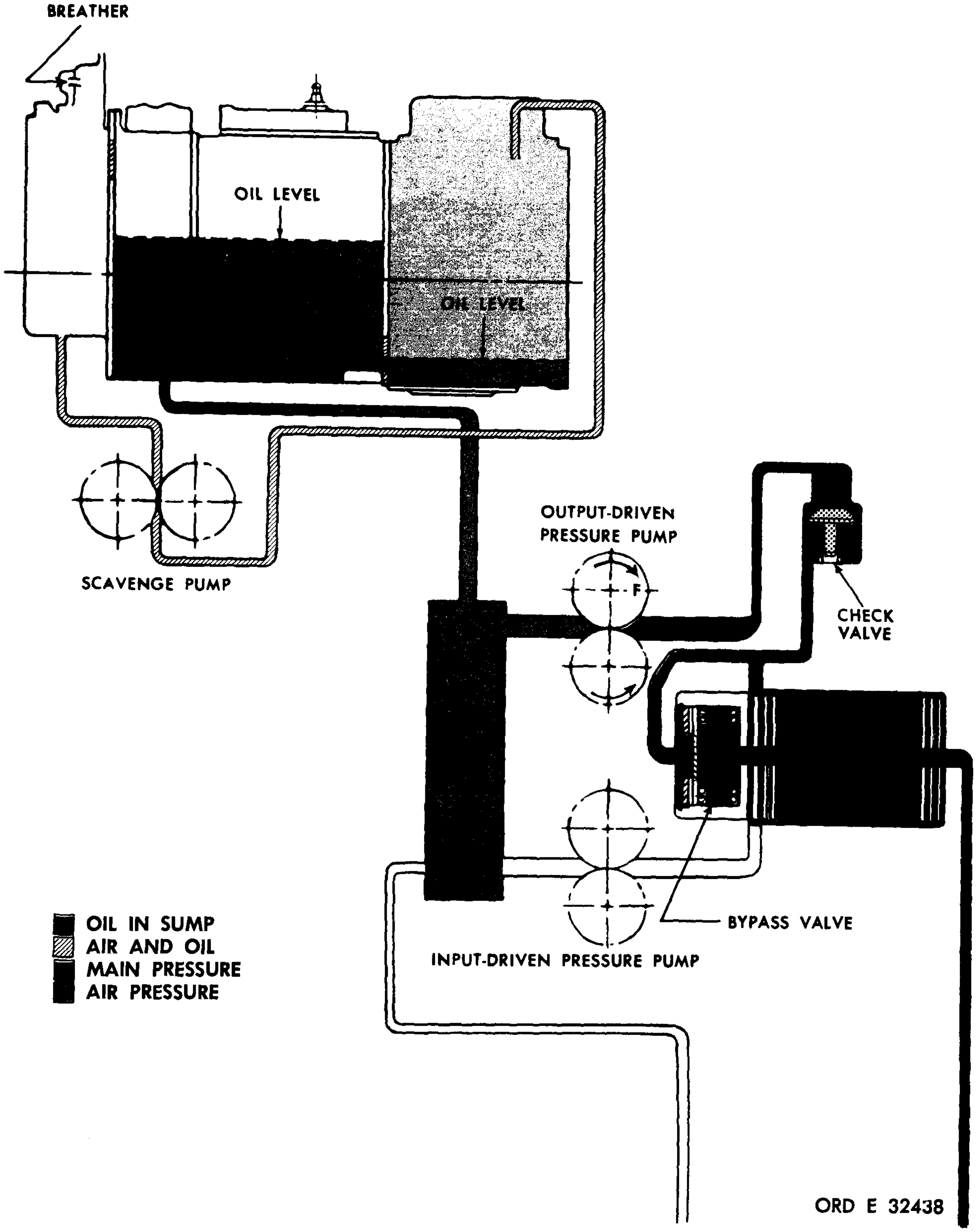


Figure 19. Hydraulic system, second gear tow or push starting — schematic view

40. HYDRAULIC SYSTEM FUNCTION - DURING TOW OR PUSH STARTS OF VEHICLE (fig. 19)

*C2

a. When it is necessary to start the vehicle engine by towing or pushing the vehicle (refer to TM 9-2300-216-10), the manual selector valve must be placed in second gear position.

b. The function of the hydraulic system in second gear during a tow- or push -starting operation is the same as that described for second gear in par. 32, above, and illustrated in fig. 8. However, during such an operation (until the engine begins to rotate), the input driven pressure pump can not supply main pressure to the system. The output driven pressure pump must supply main pressure until the clutches (output and low range) engage and until torque is transmitted to the vehicle engine.

c. The output driven pressure pump draws oil, through the sump screen, from the power train sump. The output of the oil pump unseats a check valve and flows into the cavity surrounding the main oil screen assembly. Thereafter, the oil flow is the same as main pressure oil flow for second gear under any other condition.

d. The purpose of the check valve in the output driven pressure pump output line is to prevent a back flow of main pressure into the output driven pump. In neutral, the output driven pump is not rotating and there is some loss by leakage through the pump. In reverse gears, the pump rotates in a reverse direction and would (except for the check valve) actually pump oil out of the main pressure line and return it to the sump.

Section V. TORQUE PATHS THROUGH POWER TRAIN

41. GENERAL

a. Figure 20 is a schematic view of the power train without the output drive assemblies. All of the principal components through which torque flows are identified. Figure 21 is a cutaway view of the left-output drive assembly, colored to indicate the torque path. Subsequent figures, 22 through 34, are colored schematic views, illustrating the torque paths for the conditions indicated in each view. Arrows on components indicate the direction of rotation of such components.

b. Explanations of hydraulic actions under corresponding conditions are in pars. 28 through 40 of this chapter.

c. To avoid needless repetition, references are made to preceding explanations where applicable.

42. TORQUE PATH - INPUT TRANSFER GEARING (fig. 20)

Torque is transmitted from the engine to the input transfer gearing by a splined coupling shaft. Two idler gears transmit torque from the input transfer drive gear to the converter cover drive gear. The input rotation (at coupling shaft) is counterclockwise when viewed from the left side of the power train. Rotation of the torque converter is clockwise, There is a speed increase ratio of 0.611 to 1.000 between the engine and torque converter.

43. TORQUE PATHS - TORQUE CONVERTER AND LOCKUP CLUTCH (fig. 20)

a. Torque is transmitted from the input transfer gearing to the range gearing by either the torque converter or lockup clutch. When the lockup clutch is released, torque is trans-

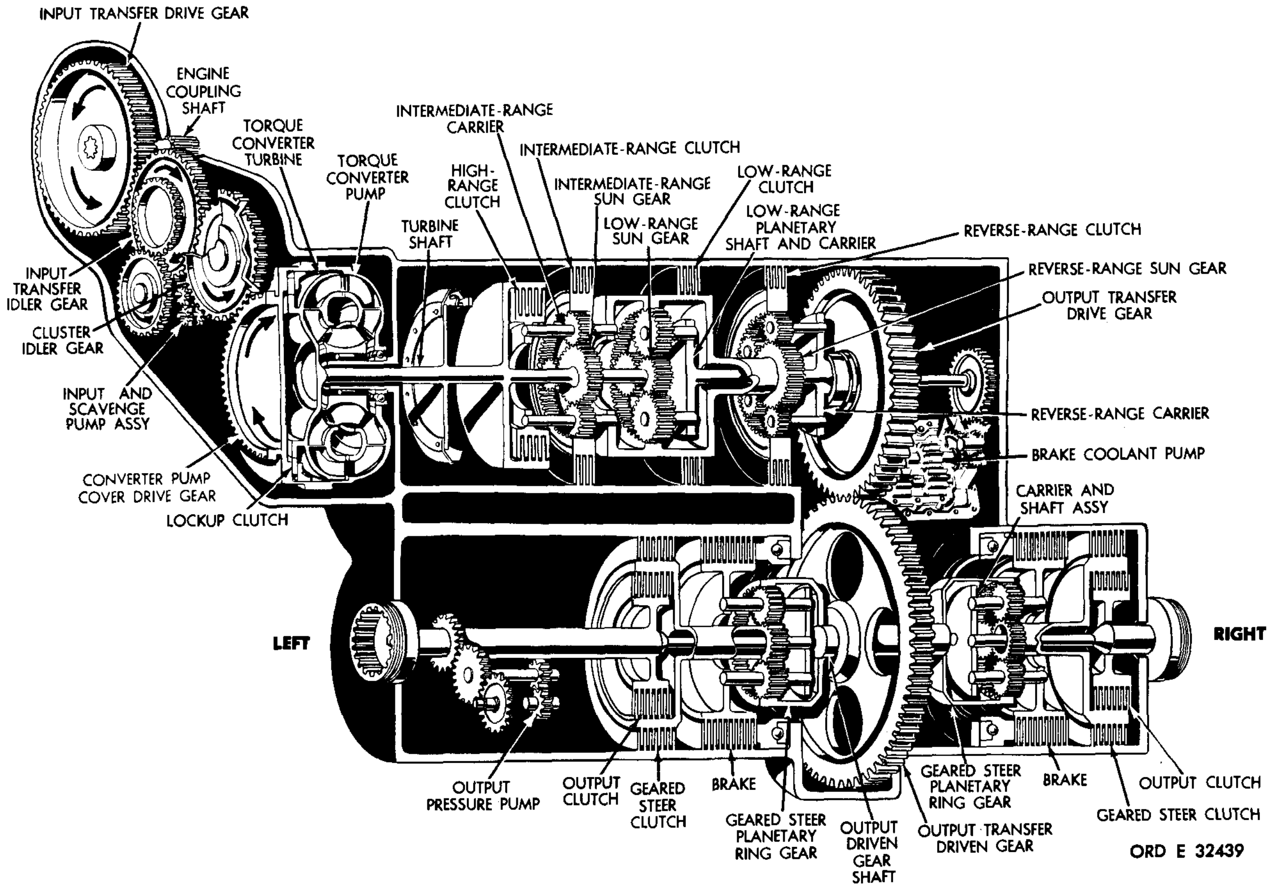


Figure 20. Gearing and clutches in power train — schematic view

mitted hydraulically from the converter pump to the converter turbine. When the lockup clutch is engaged, the pump and turbine are locked together and torque is transmitted mechanically.

b. When transmitted hydraulically, the torque maybe multiplied as much as 3.3 times (at turbine stall). When transmitted mechanically, torque leaving the converter is equal to that entering it. The lockup clutch engages and releases automatically.

c. At lower speeds, when high torque is required, the lockup clutch is released. At higher speeds, when less torque is required, the lockup clutch is engaged. Lockup engagement can occur in every gear range and in neutral. In figures 22 through 34 the converter output is indicated by yellow when the lockup clutch is released; by red when engaged.

44. TORQUE PATH - OUTPUT TRANSFER GEARING (fig. 20)

a. Two gears makeup the output transfer gearing. The drive gear is splined to the low-range carrier shaft which is the range gearing output for the power train regardless of which gear is engaged. The drive gear meshes with the driven gear and imparts opposite rotation.

b. The driven gear transmits torque, through a splined shaft, to the steer planetary ring gears on either side of the driven gear. The speed reduction, and corresponding torque increase, is 1.30 to 1.00.

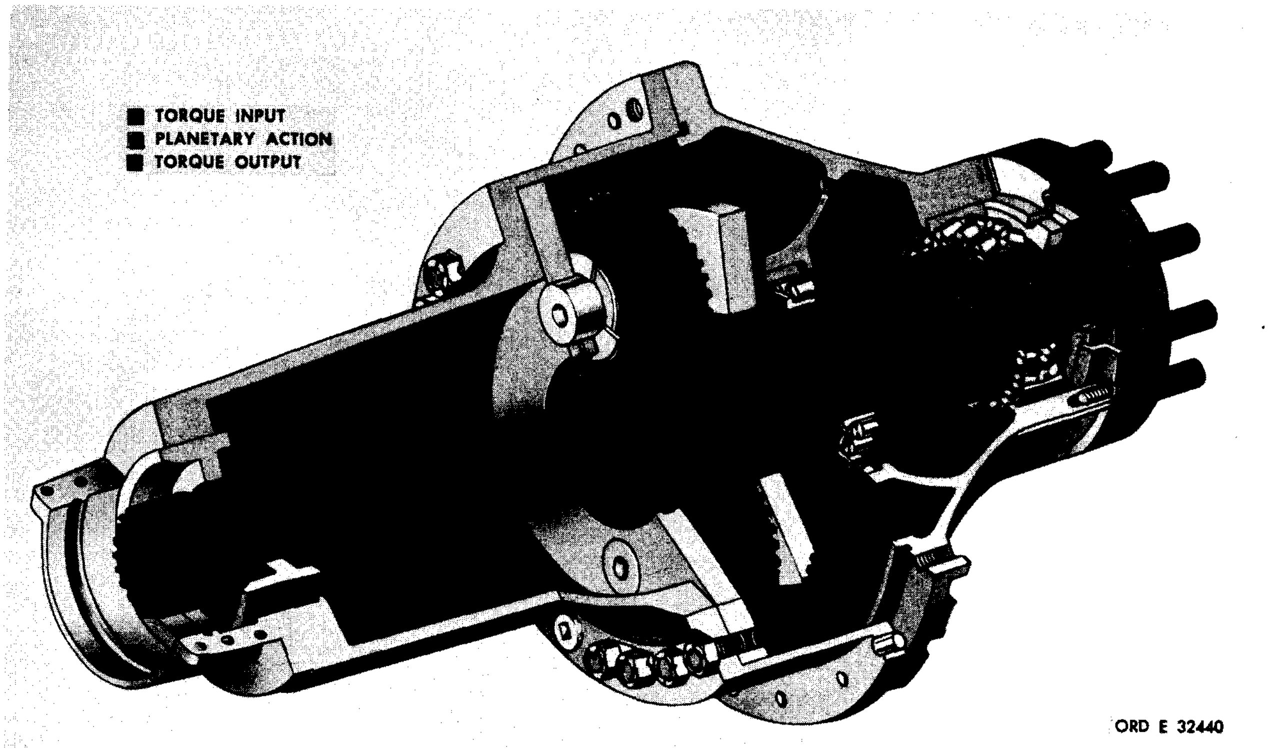


Figure 21. Output drive torque path

45. TORQUE PATH – OUTPUT DRIVES (fig. 21)

a. Figure 21 is a cutaway view of the left-output drive (mounts at right side of power train). The construction of the right assembly is identical except for length; operation is identical.

b. Torque is transmitted from the main transmission section output to the output drive assembly by the output drive sun gear shaft. The integral sun gear imparts torque to the planetary pinions which are mounted in a stationary carrier. In turn, the pinions transmit torque to the ring gear. The ring gear, splined to the output shaft, transmits torque to the output shaft.

c. Arrows indicating the direction of rotation illustrate conditions when the power train is operating in a forward gear. In a reverse gear, all rotations would reverse. Note that the output drive output rotation is opposite that of the output drive input because the reaction member (stationary member) is the planetary carrier.

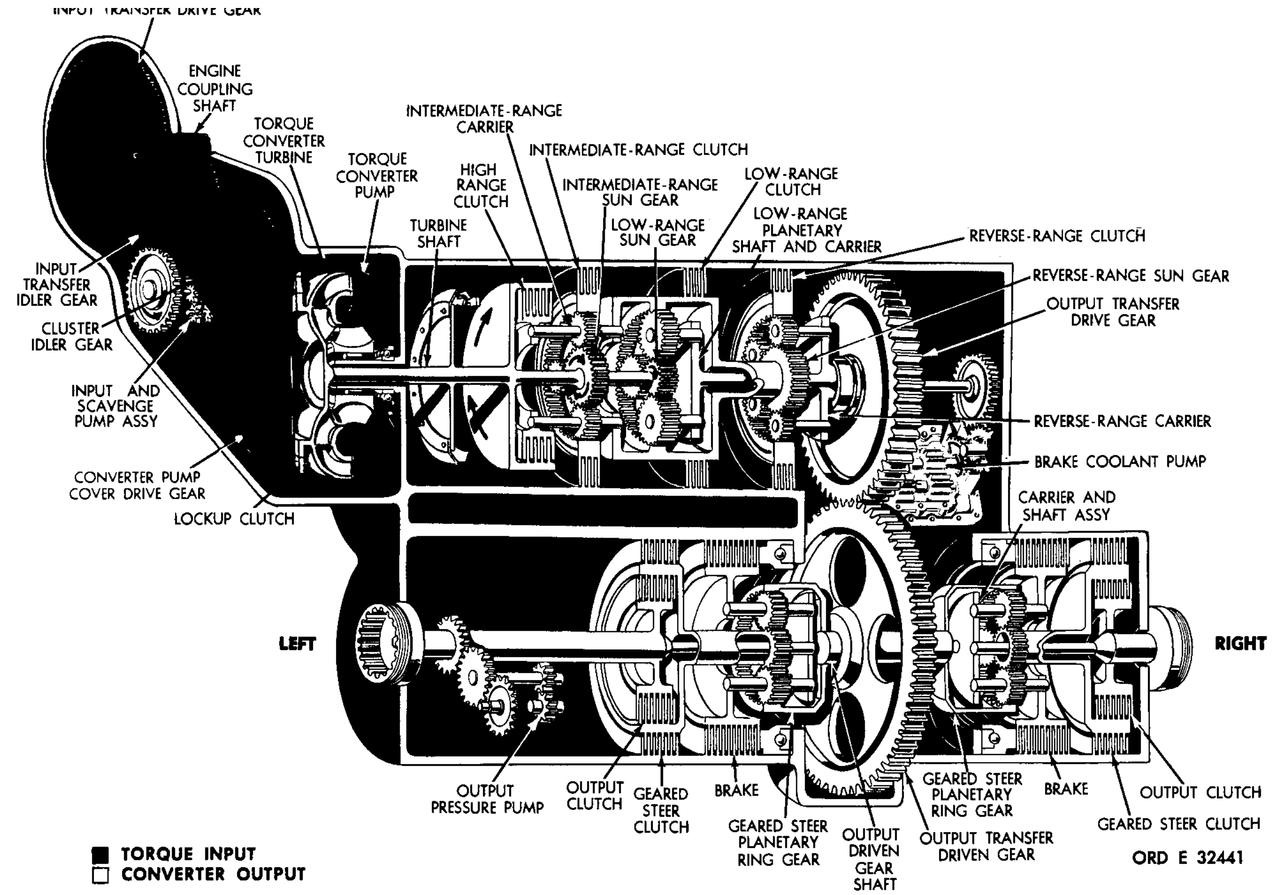


Figure 22. Neutral torque path

46. TORQUE PATH - NEUTRAL (fig. 22)

In neutral, torque is transmitted to the turbine shaft through the input transfer gears and torque converter (or lockup clutch). Refer to pars. 42 and 43, above. Since clutches are not applied, no torque is transmitted beyond the low- and intermediate-range sun gears. Some of the range gears rotate freely, but, since there is no reaction, no torque is transmitted.

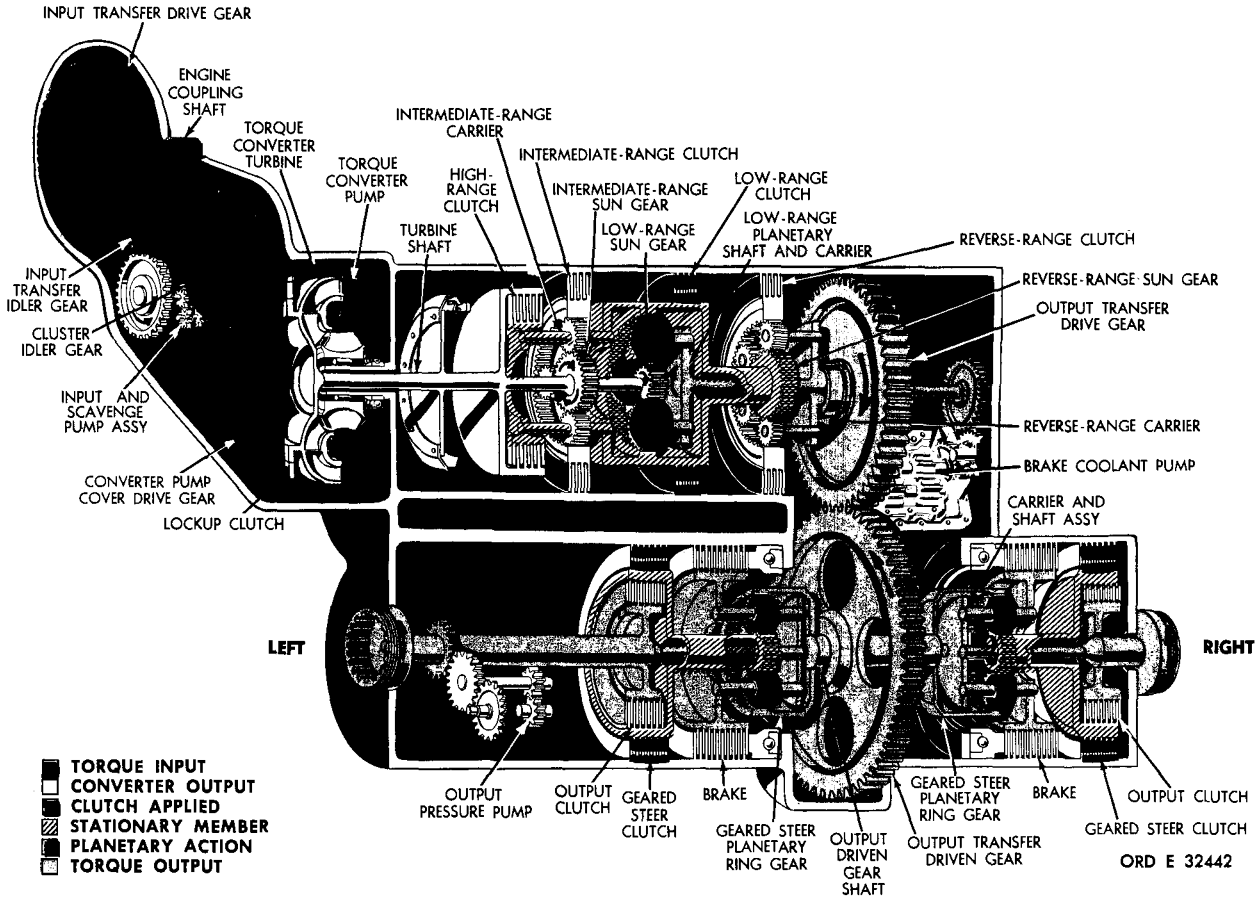


Figure 23. First-gear torque path, converter operation

47. TORQUE PATH – FIRST GEAR, CONVERTER OPERATION (fig. 23)

a. In first gear, torque is transmitted to the turbine shaft through the input transfer gearing and the torque converter (or lockup clutch). The low-range sun gear is splined to the turbine shaft and imparts torque to the low-range planetary pinions. The low-range clutch is engaged, holding the low-range ring gear stationary. Thus, the low--range planetary pinions must rotate within the stationary ring gear. This drives the low-range planetary carrier and shaft in the same direction as the turbine shaft but at reduced speed.

b. The low-range carrier shaft drives the output transfer drive gear. In turn, the drive gear transmits torque to the output transfer driven gear, causing it to rotate in the opposite direction. The driven gear transmits torque to the right- and left-geared steer planetary ring gears.

c. The right- and left-geared steer clutches are engaged, holding the geared steer sun gears stationary. The geared steer planetary pinions, meshed with both the sun gears and ring gears, are forced to rotate around the stationary sun gears. The carrier thus becomes the output member of the geared steer planetary. Rotation at reduced speed is transmitted to the right- and left-output couplings. Refer to par. 7 for gear ratios applicable to first gear.

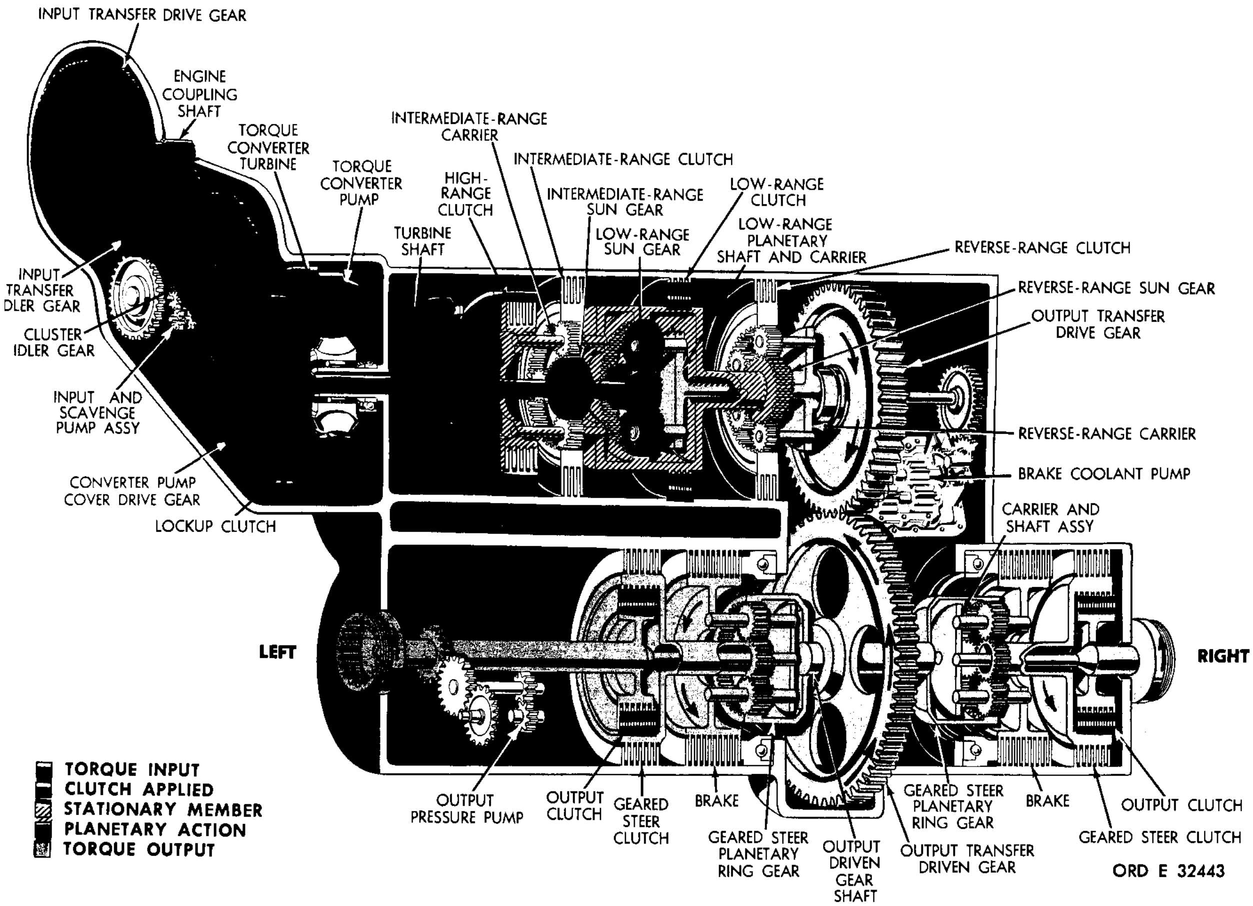


Figure 24. Second-gear torque path, lockup operation

48. TORQUE PATH – SECOND GEAR, LOCKUP OPERATION (fig. 24)

The torque path in second gear is identical to that for first gear until it leaves the geared steer planetary ring gears (refer to 47a and b, above). In second gear, the right- and left-output clutches are engaged. This locks the geared steer planetary carriers and sun gears together. When these components are locked together, the ring gears drive them as units. The output speed is thus equal to the speed of the ring gears. Refer to TABULATED DATA, par. 7, for gear ratios applicable to second gear.

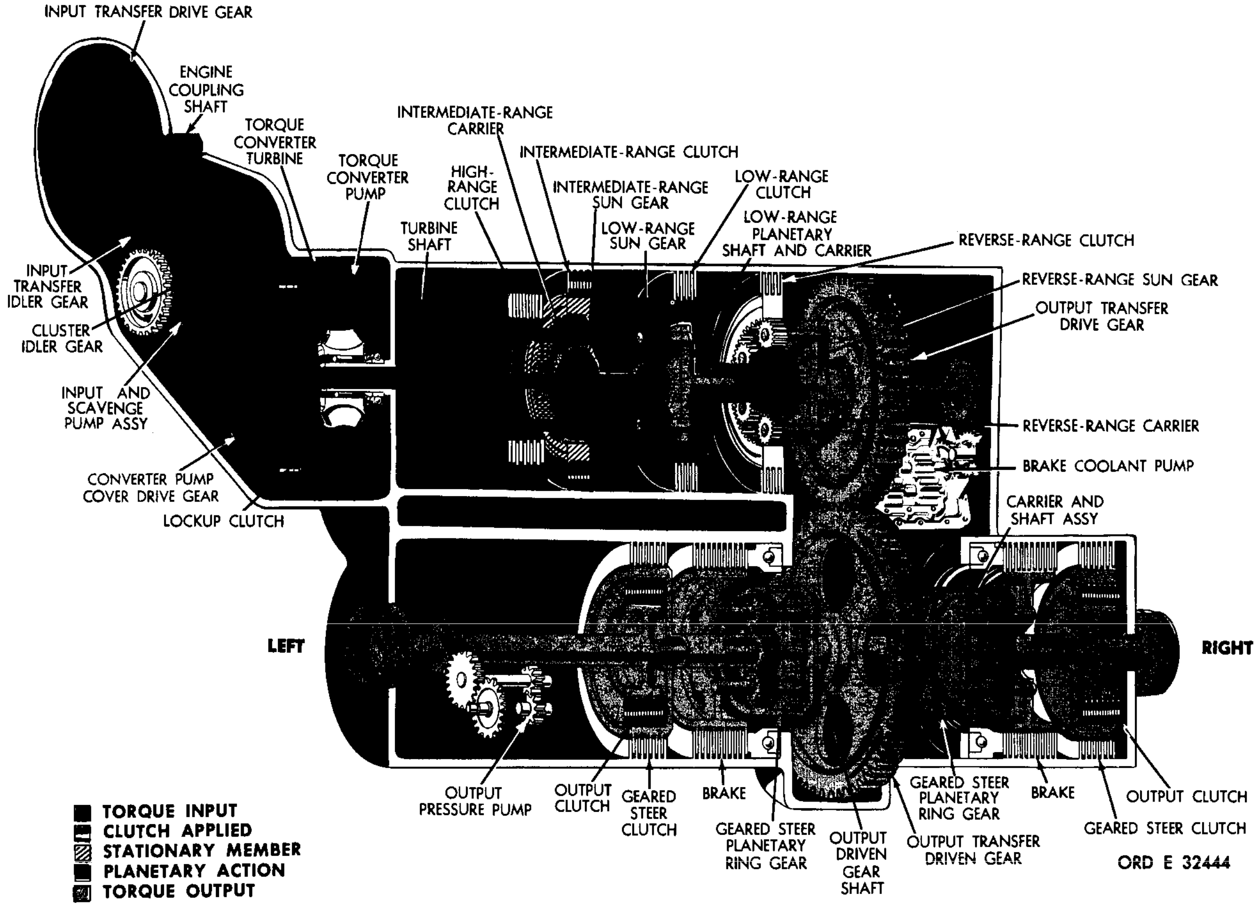


Figure 25. Third-gear torque path, lockup operation

49. TORQUE PATH – THIRD GEAR, LOCKUP OPERATION (fig. 25)

a. Torque is transmitted to the low- and intermediate-range planetary sun gears in the manner described in pars. 42 and 43, above. In third gear, the low- and intermediate-range planetary gears are compounded to produce the desired speed reduction ratio. The intermediate-range clutch is engaged, holding the intermediate-range ring gear stationary. The intermediate-range planetary pinions, meshed with the intermediate-range sun gear, which is rotating, and the stationary ring gear, must rotate within the ring gear. This action drives the intermediate-range planetary carrier.

b. The low-range planetary ring gear is attached to the intermediate-range carrier and rotates at a slower speed than the low-range sun gear. Thus, the faster moving sun gear, and slower moving ring gear, combine to drive the low-range planetary pinions. The output member of this compound arrangement is the low-range planetary carrier and shaft.

c. The remainder of the torque path is identical to that described for second gear (par. 48, above). Refer to **TABULATED DATA,** par. 7, for gear ratios applicable to third gear.

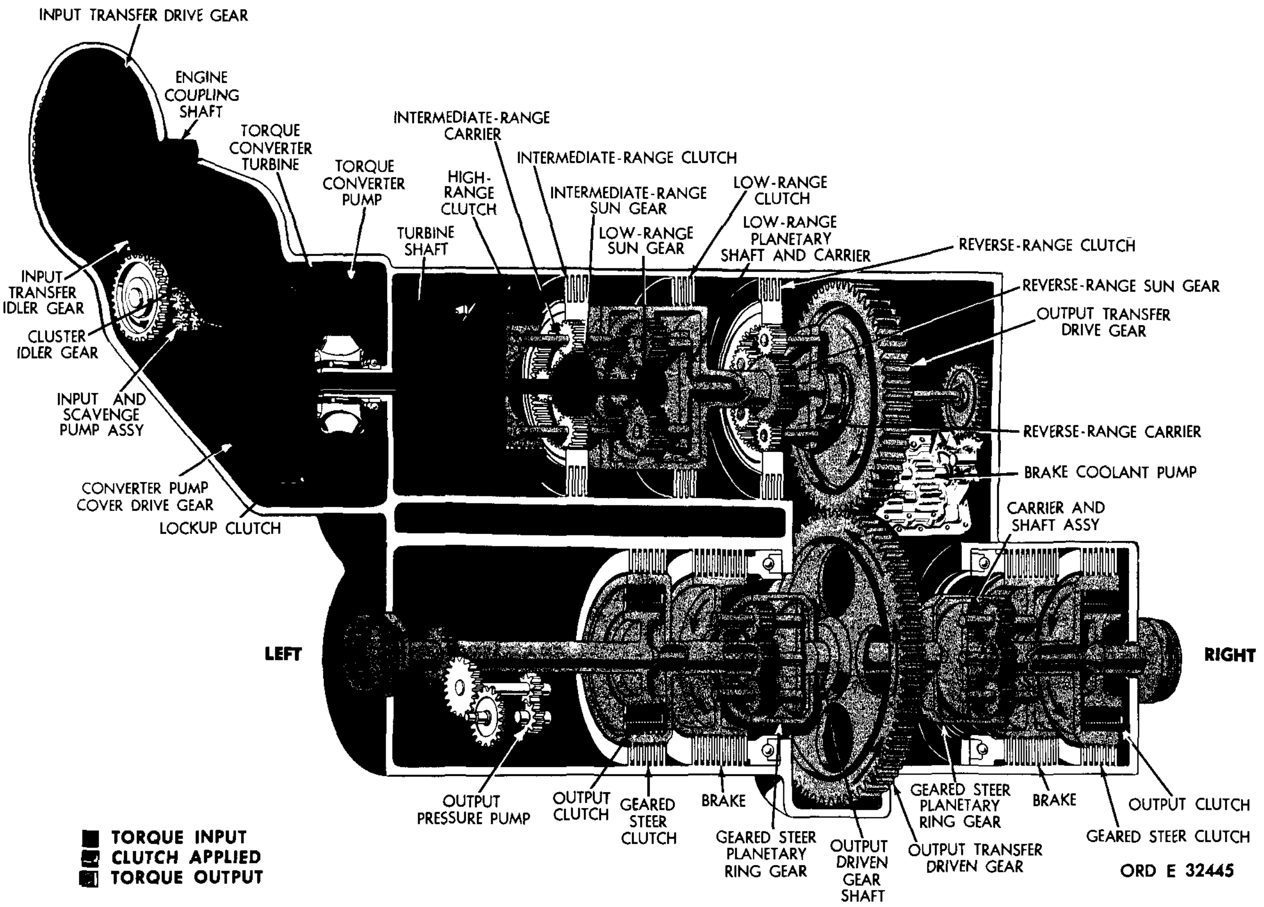


Figure 26. Fourth-gear torque path, lockup operation

50. TORQUE PATH – FOURTH GEAR, LOCKUP OPERATION (fig. 26)

a. Torque is transmitted to the turbine shaf in the manner described in pars. 42 and 43, above. In fourth gear, torque is transmitted directly by the high-range clutch and there is no planetary gear action. Engagement of the high-range clutch locks the turbine shaft and high-range clutch hub together. The high-range clutch hub is integral with the intermediate-range planetary carrier. The intermediate-range sun gear is splined to the turbine shaft. Therefore, the intermediate-range planetary gearing is locked and rotates as a unit.

b. The low-range ring gear is attached to the intermediate-range planetary carrier. As a result, when the turbine shaft rotates, all members of all range planetary sets rotate with the turbine shaft, at the same speed. Thus, torque is transmitted from the turbine shaft to the output transfer drive gear at 1 to 1 ratio.

c. The remainder of the torque path is identical to that for third gear. For gear ratios applicable to fourth gear, refer to **TABULATED DATA,** par. 7.

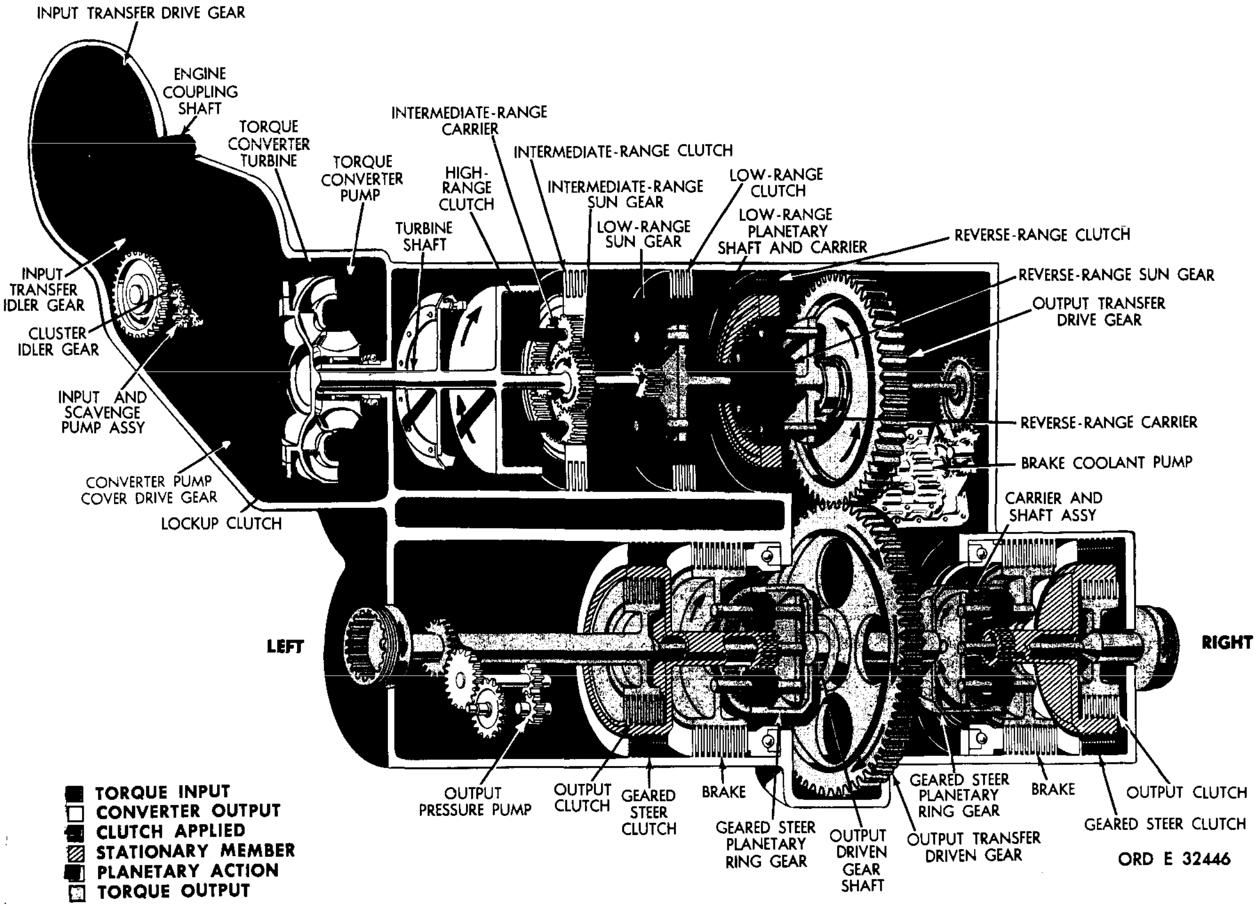


Figure 27. Reverse 1-gear torque path, converter operation

51. TORQUE PATH – REVERSE 1 GEAR, CONVERTER OPERATION (fig. 27)

a. Torque is transmitted to the turbine shaft in the manner described in pars. 42 and 43, above. In reverse range, torque is transmitted from the turbine shaft to the output transfer drive gear by a compound arrangement of the reverse-range and low-range planetary gears.

b. The input member of this compound arrangement is the low-range sun gear. Torque is transmitted to the low-range pinions which rotate in the direction opposite the sun gear. The slower moving, low-range carrier, although it is rotating, is a reaction member. The low-range ring gear, meshed with its pinions, rotates in the direction opposite the sun gear. Thus, the reversal of rotation actually occurs in the low-range planetary.

c. The reverse-range sun gear is attached to the low-range ring gear and rotates with it. The reverse-range clutch is engaged, holding the reverse-range ring gear stationary. The reverse-range planetary pinions are in mesh with both the ring gear and sun gear. The rotation of the reverse-range sun gear forces the pinions to rotate within the stationary ring gear. This drives the reverse-range carrier in the same direction as, but at a slower speed than, the sun gear. The reverse-range carrier, splined to the low-range planetary carrier shaft, drives the output transfer drive gear.

d. The remainder of the torque path is identical to that described for first gear in par. 47b and c. above. Refer to TABULATED DATA, par. 7, for gear ratios applicable to reverse 1 gear.

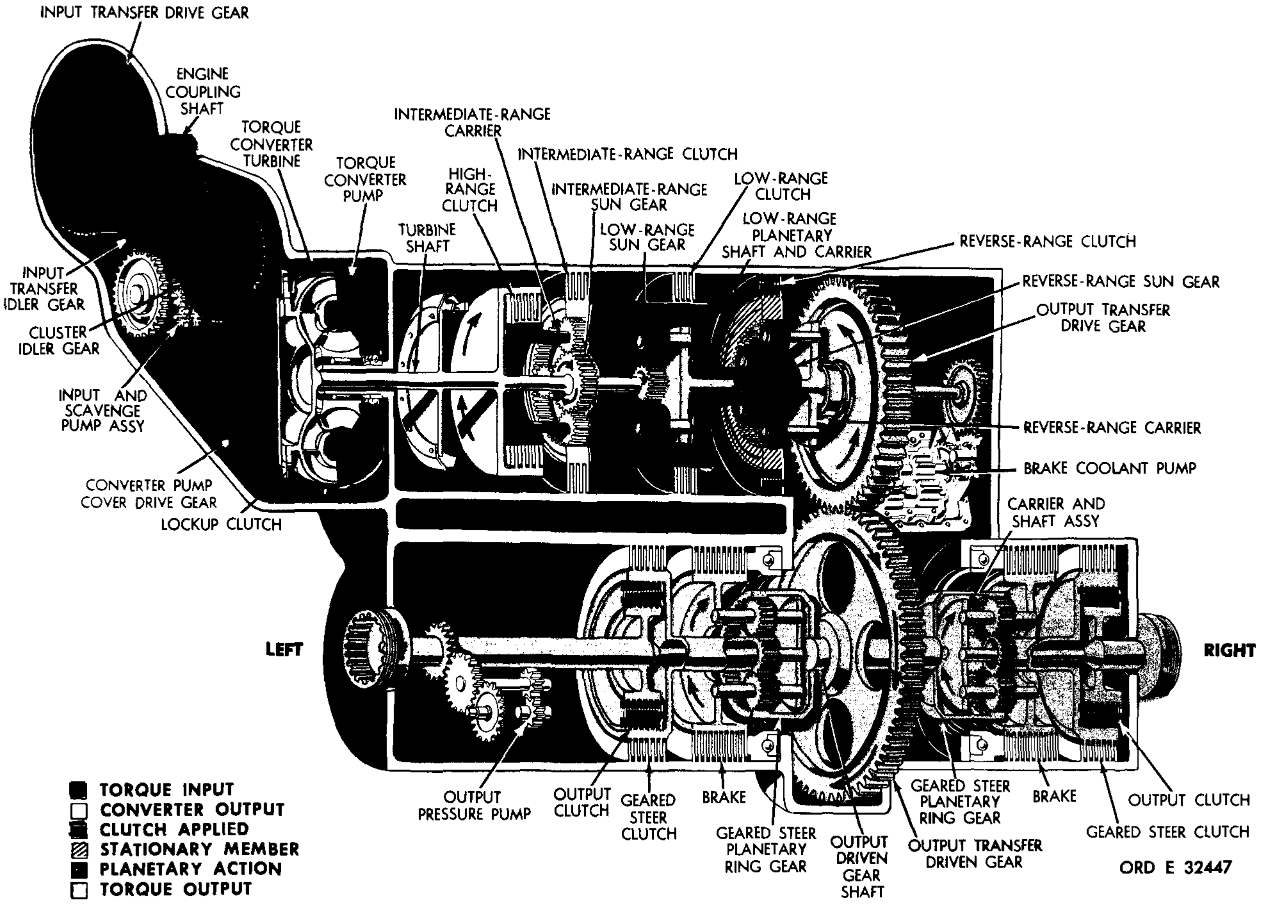


Figure 28. Reverse 2-gear torque path, converter operation

52. TORQUE PATH - REVERSE 2 GEAR, CONVERTER OPERATION (fig. 28)

Torque is transmitted to the turbine shaft as described in pars. 42 and 43, above. Torque is transmitted through the range gearing to the output transfer drive gear as described in par. 51c and d, above. The remainder of the torque path is identical to that described in par. 48, above, for second gear. Refer to TABULATED DATA, par. 7, for gear ratios applicable to reverse 2 gear.

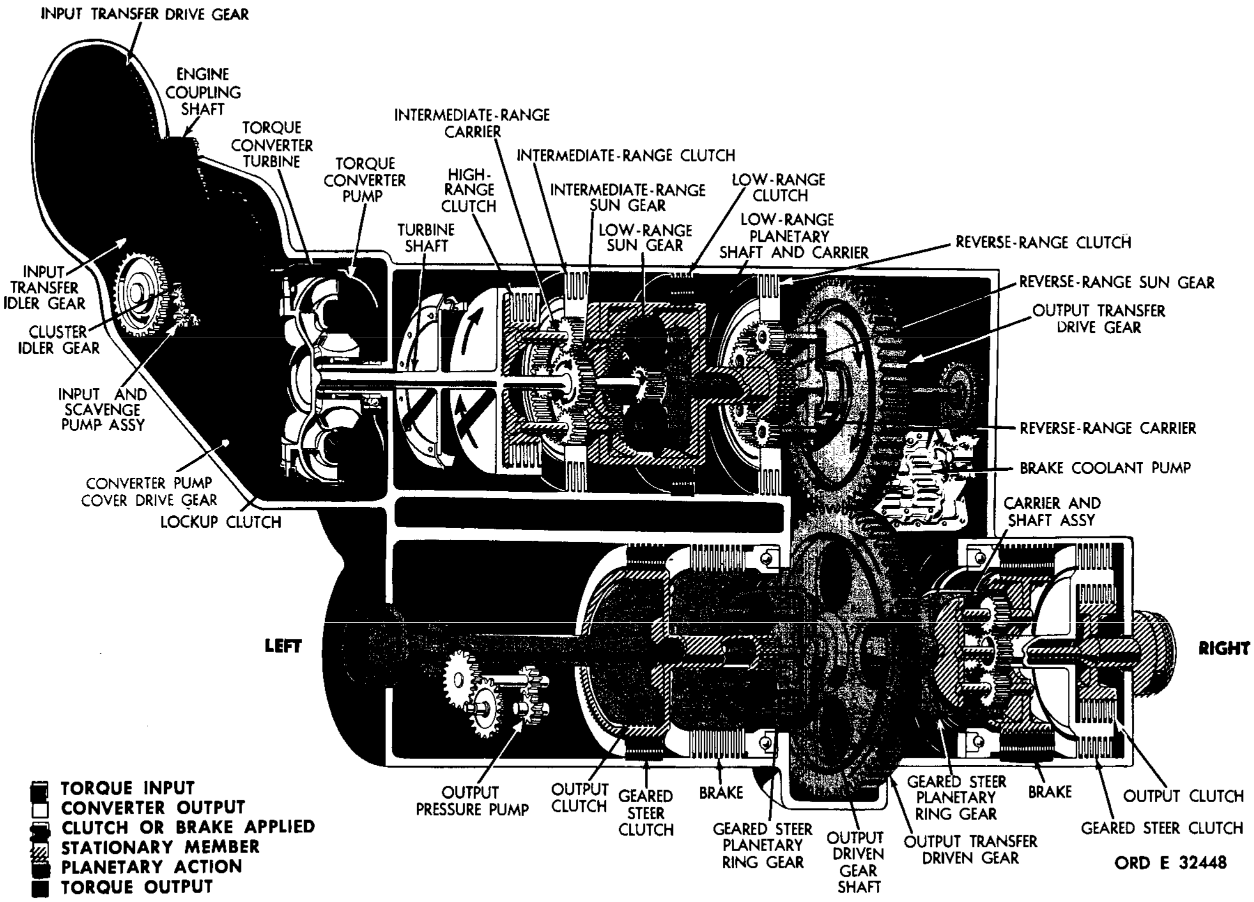


Figure 29. First-gear, full-right-steer torque path, converter operation

53. TORQUE PATH – FIRST GEAR, FULL-RIGHT STEER, CONVERTER OPERATION (fig. 29)

a. Torque is transmitted to the steer planetary ring gears in the same manner as that for first gear, as described in par. 47a and b, above. From this point, to the power train outputs, the torque paths for the right and left sides are different.

b. The clutch-brake method is used for first-gear steer. Steering results when the brake is applied at one side while the drive clutch is engaged at the opposite side. The drive clutch is the geared steer clutch. The vehicle steers toward the braked side.

c. In right steer, in first gear, the right brake is applied while the right-drive clutch is released. The drive clutch on the left side is still engaged and continues to drive. Hydraulic action, controlled by the steer control valve, releases the drive clutch and applies the brake. An opposite movement of the steer control valve will release the left-geared steer clutch (the drive clutch), apply the left brake, and result in left steer.

d. In full steer, the applied brake locks the steer planetary carrier and rotation stops at that side. In partial steer, the applied brake only slows the side toward which the turn is made. The degree of steer is controlled by the degree of movement of the steer control. Refer to TABULATED DATA, par. 7, for the gear ratios which apply to first gear, full-right steer.

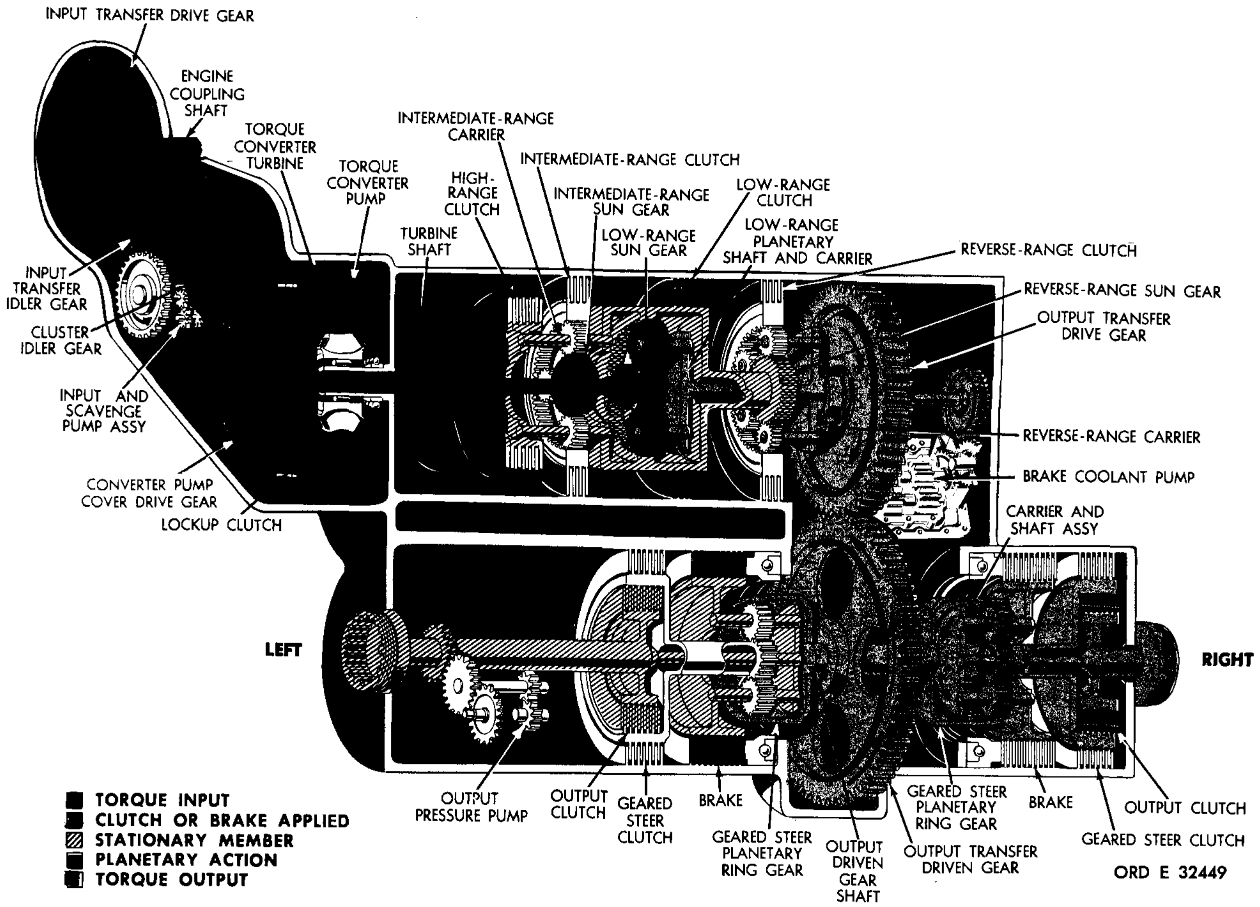


Figure 30. Second-gear, full-left-steer torque path, lockup operation

54. TORQUE PATH – SECOND GEAR, FULL-LEFT STEER, LOCKUP OPERATION (fig. 30)

a. Torque is transmitted to the steer planetary ring gears in the same manner as that for first gear, as described in par. 47a and b, above. From this point, to the power train outputs, the torque paths for the right and left sides are different.

b. The clutch-brake method is used for second-gear steer. In this method, steering results when the brake is applied at one side while the drive clutch is engaged at the opposite side. In second gear, the drive clutch is the output clutch. The vehicle steers toward the side on which the brake is applied.

c. In left steer, in second gear, the left brake is applied while the left-output clutch is released. The drive clutch (output clutch) on the right side is still engaged and continues to drive. Hydraulic action, controlled by the steer control valve, releases the drive clutch and applies the brake. An opposite movement of the steer control valve will release the right-output clutch, apply the right brake, and result in right steer.

d. Full and partial steer in second gear is controlled as explained in par. 53d, above. Refer to **TABULATED DATA,** par. 7, for gear ratios applicable to second gear, left steer.

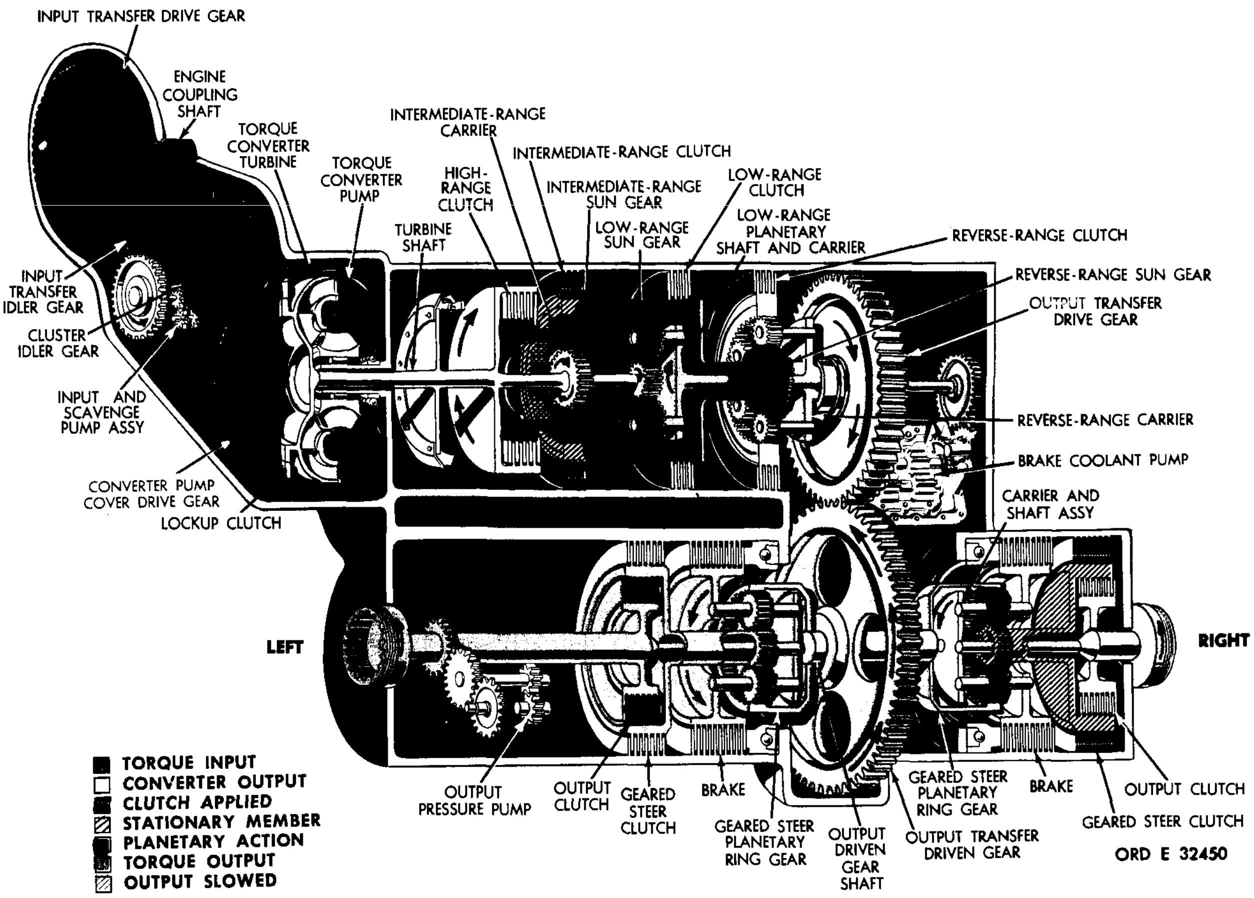


Figure 31. Third-gear, full-right-steer torque path, converter operation

55. TORQUE PATH – THIRD GEAR, FULL-RIGHT STEER, CONVERTER OPERATION (fig. 31)

a. Torque is transmitted to the steer planetary ring gears in the same manner as described in par. 49a and b. above. From this point, to the power train outputs, the torque paths for the right and left sides are different.

b. The geared steer method is used for third-gear steer. In this method, steering results when the geared steer clutch is engaged at one side while the drive clutch (output clutch) is applied at the opposite side. The vehicle steers toward the side on which the geared steer clutch is engaged.

c. In right steer, in third gear, the right-geared steer clutch is applied while the right-output clutch is released. The drive clutch on the left side is still engaged and continues to drive. Hydraulic action, controlled by the steer control valve, releases the drive clutch and applies the geared steer clutch. An opposite movement of the steer control valve will release the left-output clutch, engage the left-geared steer clutch, and result in left steer.

d. In full steer, the applied geared steer clutch locks the geared steer planetary sun gear and slows the geared steer planetary carrier. In partial steer, the geared steer clutch is only partially applied and slows the output to a lesser degree. The degree of steer is controlled by the degree of movement of the steer control. Refer to TABULATED DATA, par. 7, for the gear ratios applicable to third gear, right steer.

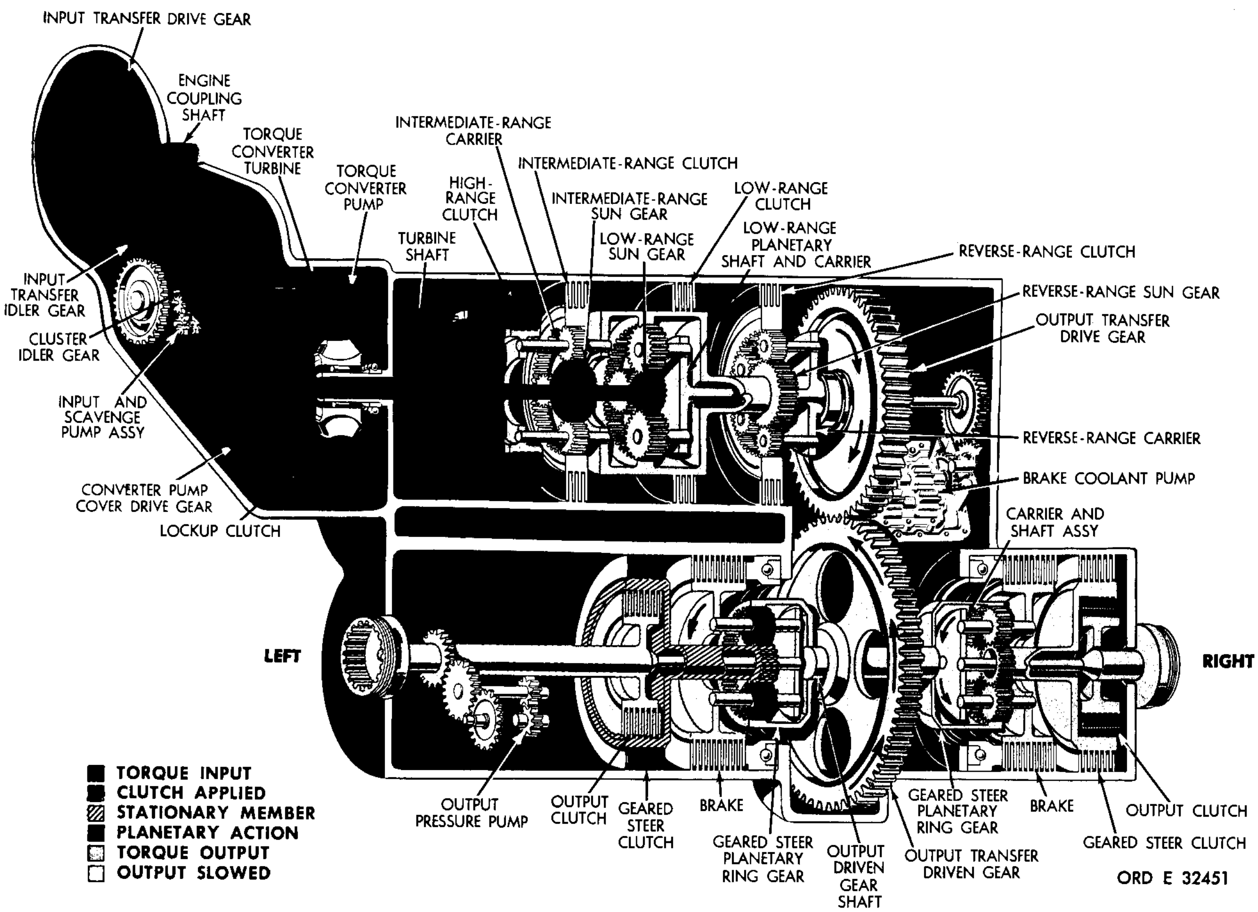


Figure 32. Fourth-gear, full-left-steer torque path, lockup operation

56. TORQUE PATH – FOURTH GEAR, FULL-LEFT STEER, LOCKUP OPERATION (fig. 32)

a. Torque is transmitted to the steer planetary ring gears in the same manner as described in par. 50a and b, above. From this point, to the power train outputs, the torque paths for the right and left sides are different.

b. In fourth gear, steering is identical to that for third gear, as described in par. 55b, c and d, above. Refer to ABULATED DATA, par. 7, for gear ratios applicable to fourth gear, right steer.

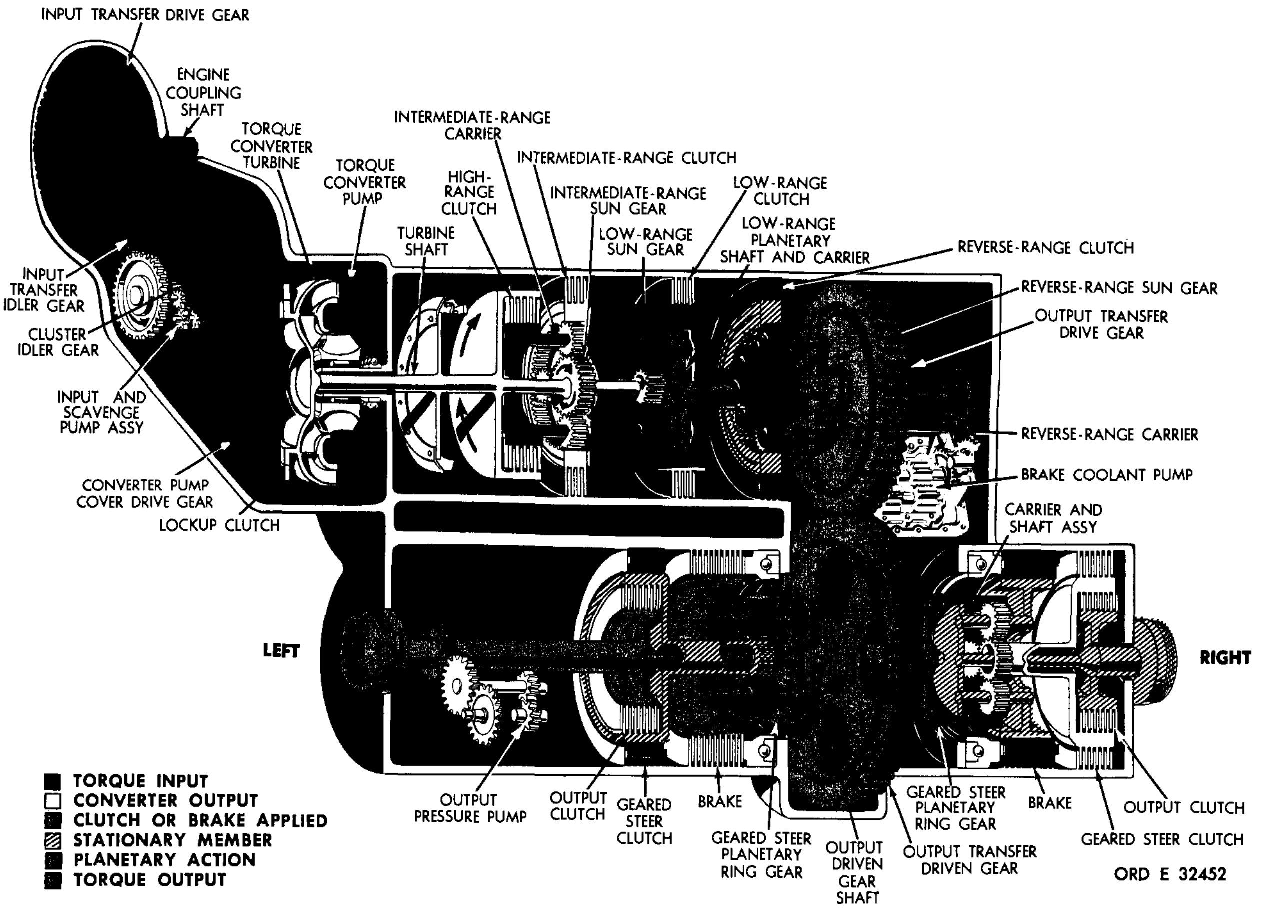


Figure 33. Reverse 1-gear, full-right-steer torque path, converter operation

57. TORQUE PATH – REVERSE 1 GEAR, FULL-RIGHT STEER, CONVERTER OPERATION (fig. 33)

The torque path from the engine to the geared steer planetary ring gears is identical to that for reverse 1 gear, as described in par. 51a, b and c, above. From this point, to the power train outputs, the torque path is as described for first-gear steer (par. 53b, c and d, above) except that rotations of the components are opposite. Refer to **TABULATED DATA,** par. 7, for gear ratios applicable to reverse 1 gear, right steer.

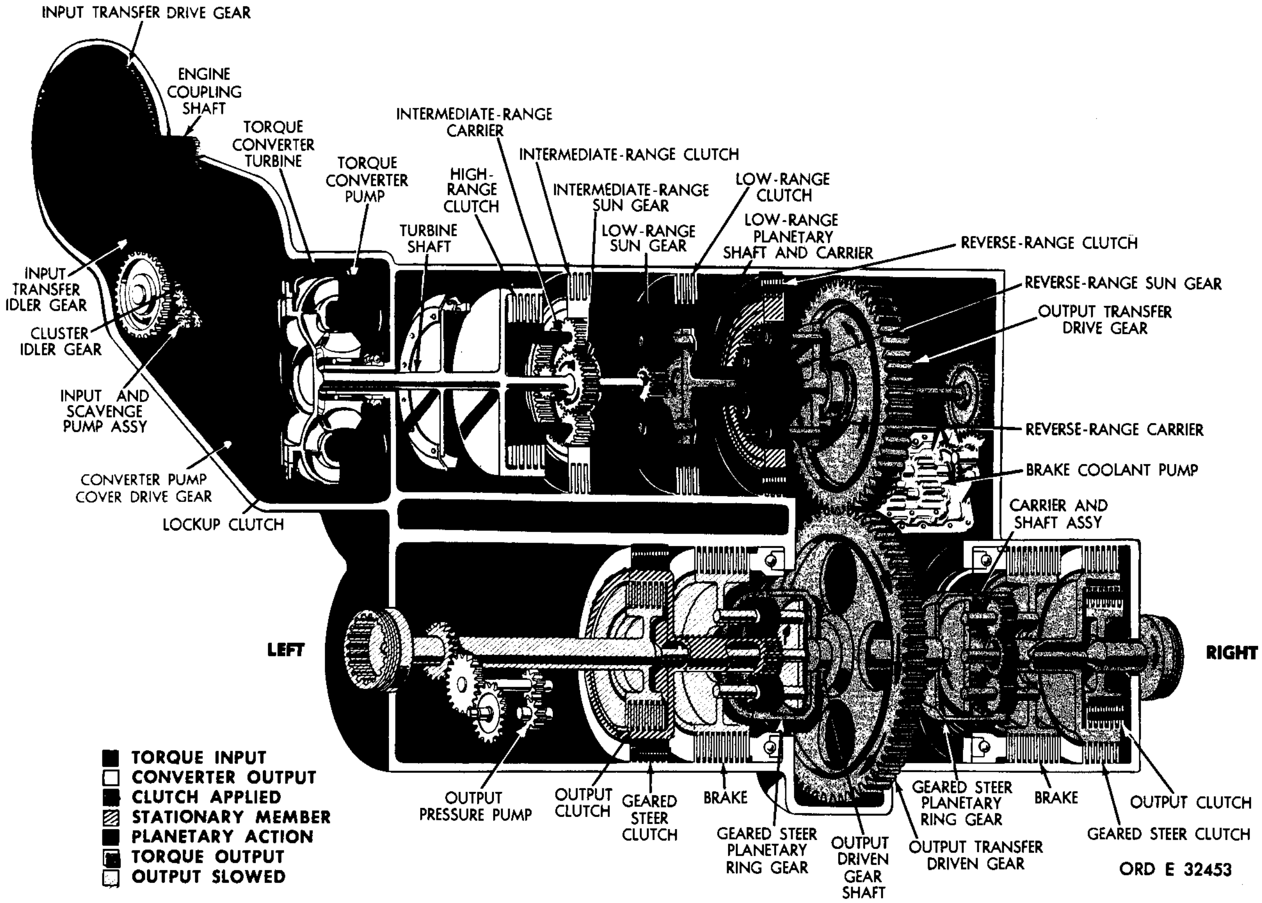


Figure 34. Reverse 2-gear, full-left-steer torque path,converter operation

58. TORQUE PATH – REVERSE 2 GEAR, FULL-LEFT STEER, CONVERTER OPERATION (fig. 34)

The torque path from the engine to the steer planetary ring gears is identical to that for reverse 1 gear as described in par. 51a, b and c, above. From this point, to the power train outputs, the torque path is the same as described for third gear (par. 55b, c and d, above) except that rotations are opposite and that the steering action is on the left side of the power train instead of the right side as described for third gear. Refer to **TABULATED DATA,** par. 7, for gear ratios applicable to reverse 2 gear, left steer.

CHAPTER 3

*C2 PARTS, SPECIAL TOOLS, IMPROVISED TOOLS, AND EQUIPMENT FOR FIELD AND DEPOT MAINTENANCE

59. GENERAL

Tools and equipment and maintenance parts, over and above those available to the using organization, are supplied to Ordnance field maintenance units and depot shops for maintaining, repairing, and/or rebuilding the materiel.

60. REPAIR PARTS

*C1 Repair parts supplied for the XTG-411-2A power train are listed in TM 9-2520-234-35P.

61. COMMON TOOLS AND EQUIPMENT

*C2 Standard and commonly used tools and equipment having general application to this materiel are listed in ORD 6 SNL J-8, section 18; ORD 6 SNL J-9, sections 2 and 9; SM 9-4-4910-J8-13; SM 9-4-4910-J9-1, -8, -15, -16, -17, -21, -27 and -44; and SM 9-4-5180-A58, and are authorized for issue by TA and TOE.

62. SPECIAL AND IMPROVISED TOOLS AND EQUIPMENT

a. Special Tools and Equipment (figs. 35 and 36). Certain tools and equipment specifically designed for field and depot maintenance, repair, and general use with the materiel are listed in Table II, below, for identification only. This list is not to be used for requisitioning replacements. * For replacements, refer to TM 9-2520-234-35P. C2

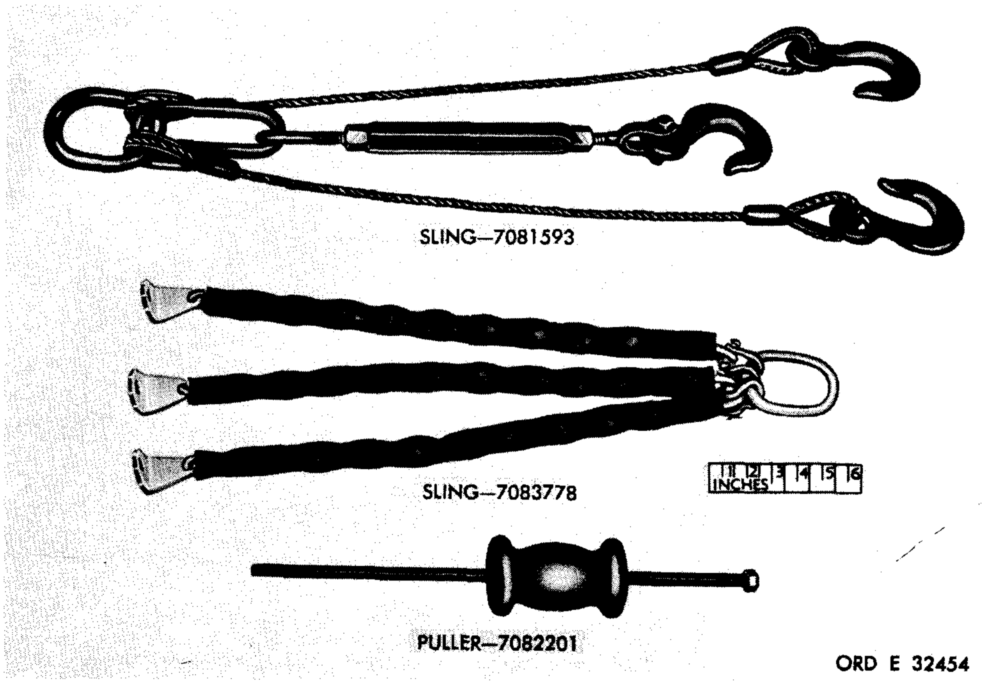


Figure 35. Power train special tools — group 1

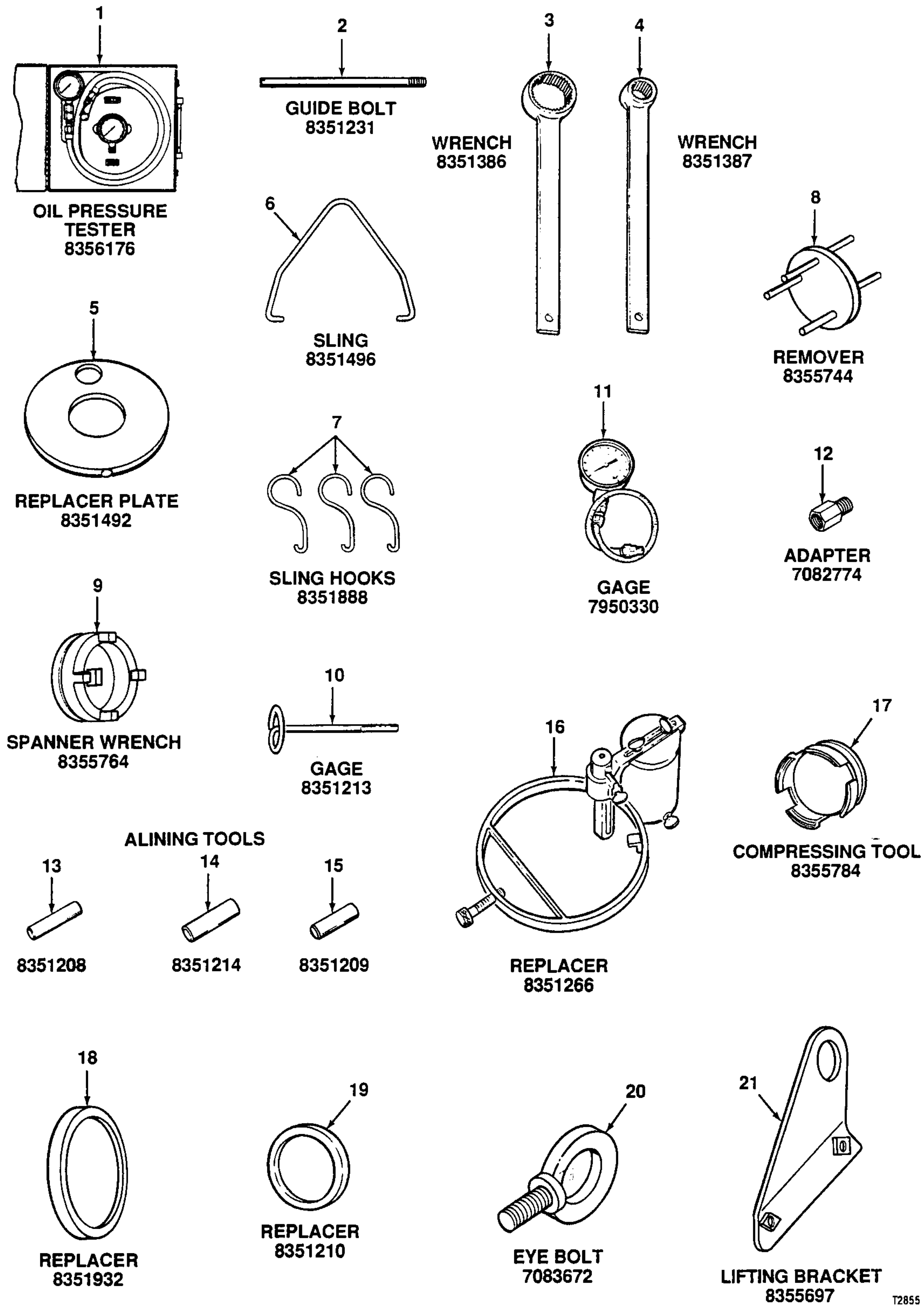


Figure 36. Power train special tools — Group 2

b. Improvised Tools and Equipment (figs. 37 and 38). Certain improvised tools and equipment, helpful in DS & GS maintenance are listed in Table II. Principal dimensions and details are supplied to permit fabrication of these items. These tools are not available for issue.

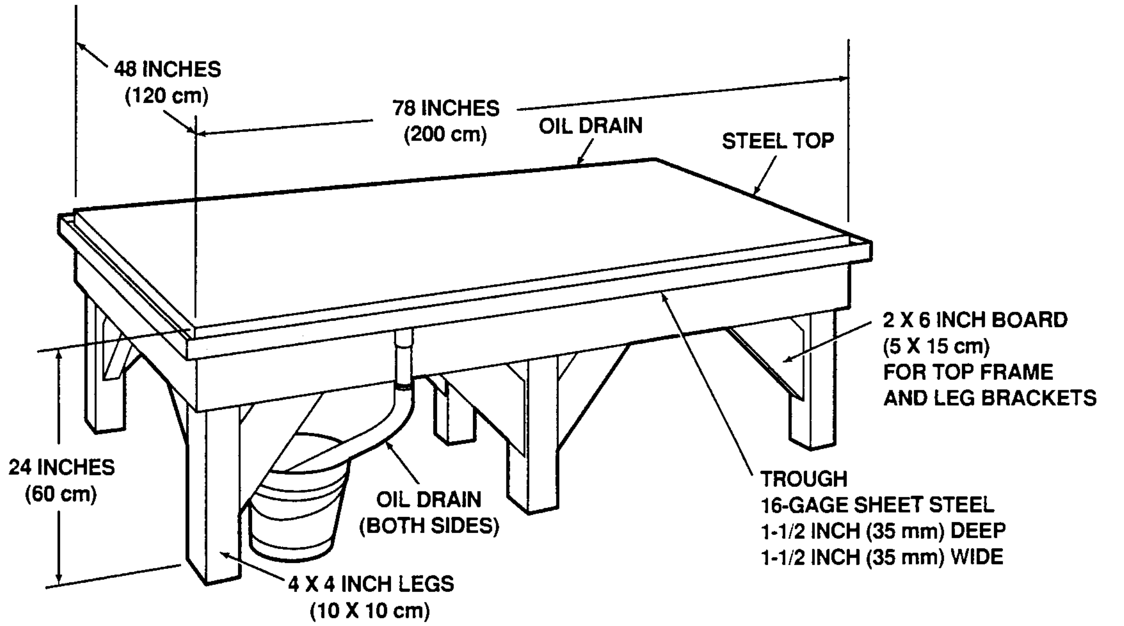


Figure 37. Power train disassembly and assembly table

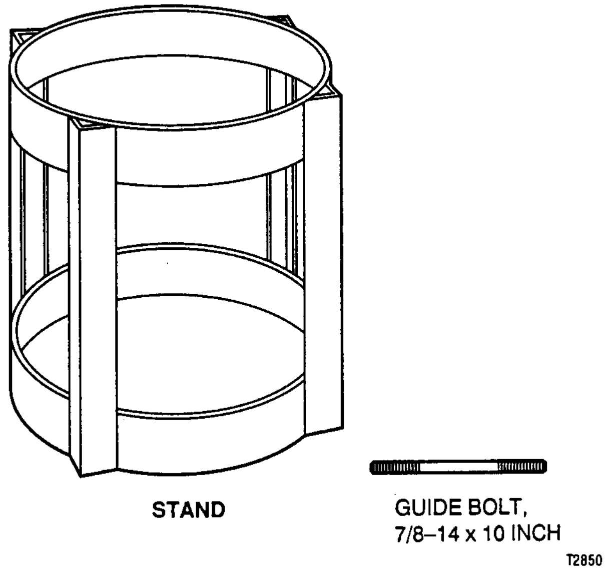


Figure 38. Power train improvised tools

Table II. SPECIAL TOOLS AND EQUIPMENT

Fig. No.	Item No.	Item Name	Part NO. (CAGEC) NSN	Use	Fig. Ref.	Para. Ref.
35		Lifting sling	7081593 (19207) 4910-00-473-7556	Lifting transmission	39	74
35		Lifting sling	7083778 (19207) 4910-00-708-3778	Lifting transmission components	40, 49, 55, 89, 96, 101	74, 75, 76, 227, 228, 229
35		Mechanical puller attachment	7082201 (19207) 5120-00-473-7352	Removing spindles from input transfer housing	59, 62	74
36	1	Pressure oil tester	8356176 (19207) 6685-00-572-8612	Check oil pressures	368, 369	231, 232 233
36	2	Guide bolt	8351231 (19207) 5120-00-722-3917	Alining brake and geared steer clutch anchor rings	164, 170	146, 227
36	3	Splined wrench, brake adjusting	8351386 (19207) 5210-00-733-8909	Applying right brake	91, 297	75, 227, 234
36	4	Splined wrench, brake adjusting	8351387 (19207) 5210-00-733-8912	Applying left brake	81, 298	75, 227, 234
36	5	Spindle replacer plate	8351492 (19207) 4910-00-757-1960	Adapting 5120-00-733-8908 replacer to geared steer planetary carrier	205	158, 161
36	6	Output carrier sling	8351496 (19207) 4910-00-757-1959	Lifting right-and left-output carriers	104, 157, 171	75, 143, 146, 227
36	7	Sling chain hooks	8351888 (19207) 4030-00-757-1961	Lifting low- and reverse-range clutch piston housing	49, 125, 244, 260	74, 75, 227
36	8	Bearing remover	8355744 (19207) 5120-00-034-0873	Removing roller bearing from output drive output shaft	238	223
36	9	Face spanner wrench	8355764 (19207) 5120-00-950-9566	Removing or replacing converter carrier bearing retaining nut	144	83, 86

Table II. SPECIAL TOOLS AND EQUIPMENT (cont)

Fig. No.	Item No.	Item Name	Part NO. (CAGEC) NSN	Use	Fig. Ref.	Para. Ref.
36	10	Brake adjusting gage	8351213 (19207) 5210-00-733-5005	Gaging brake clearance	296	234
36	11	Dial pressure gage	7950330 (19207) 6620-00-795-0330	Checking oil pressures		232
36	12	Mechanical adapter	7082774 (19207) 5120-00-708-2774	Used with 5120-00-473-7352 puller		
36	13	Headless straight pin	8351208 (19207) 5315-00-733-8904	Alining intermediate- and reverse-range planetary carrier pinions and rollers; used with 5120-00-733-8908 replacer	219, 221	181, 196
36	14	Pinion alining tool	8351214 (19207) 5120-00-738-1644	Alining steer planetary carrier pinions and rollers; used with 5120-00-733-8908 replacer	215	161
36	15	Headless straight pin	8351209 (19207) 5315-00-733-8905	Alining low-range planetary carrier pinions and rollers; used with 5120-00-733-8908 replacer	215	191
36	16	Spindle replacer	8351266 (19207) 5120-00-733-8908	Removing or installing pinion spindles in low-, intermediate-, reverse-range and output planetary carriers; used with 4910-60-757-1960 plate, 5120-00-733-8904 alining tool, 5120-00-733-8905 alining tool and 5120-00-738-1644 alining tool	205, 217, 222, 226	158, 161, 181, 191, 196

Table II. SPECIAL TOOLS AND EQUIPMENT (cont)

Fig. No.	Item No.	Item Name	Part No. (CAGEC) NSN	Use	Fig. Ref.	Para. Ref.
36	17	Spring compressing tool	8355784 (19207) 5120-00-996-2119	Compressing springs and retainers in reverse-, low-, high-range and output clutches	210, 218, 229	168, 171, 183, 186, 198, 201
36	18	Plain encased seal replacer	8351932 (19207) 5120-00-034-0872	Installing output drive output shaft oil seal	239	226
36	19	Oil seal replacer	8351210 (19207) 5120-00-893-3745	Installing transmission output shaft and input transfer adapter oil seals	149, 162	91, 131, 146, 206
36	20	Eye bolt	7083672 (19207) 5306-00-708-3672	Removing low-range planetary carrier and related components	114	75
36	21	Transmission lifting bracket	8355697 (19207) 4910-00-977-5580	Lifting transmission; used with 4910-00-473-7556 lifting sling	39	74
37		Disassembly and assembly table	Fabricated	Disassembling and assembling power train and subassemblies		74, 75, 227, 228
38		Output final drive repair stand	Fabricated	Supporting output final drive during rebuild operations	358	229
38		Headless guide bolt, 7/8-14 x 10-inch	Fabricated	Alining final drive saddle and planetary carrier	160	229

Table III deleted)

CHAPTER 4

TROUBLESHOOTING

Section I. GENERAL

63. PURPOSE

Note: Information in this chapter is for use by Ordnance maintenance personnel, in conjunction with and as a supplement to the troubleshooting section in the applicable TM-20 manual. It provides continuation of instructions where a remedy in the Unit level maintenance manual refers to Ordnance maintenance personnel for corrective action.

Operation of a deadlined vehicle without a preliminary examination can cause further damage to a disabled component and possible injury to personnel. By careful inspection and troubleshooting, such damage and injury can be avoided. In addition, the causes of faulty operation of a vehicle or component can often be determined without extensive disassembly.

64. GENERAL INSTRUCTIONS AND PROCEDURES

Note: This chapter contains inspection and troubleshooting procedures to be performed while a disabled component is still mounted in the vehicle as well as after it has been removed.

a. The inspections made while the component is mounted in the vehicle are, for the most part, visual and are to be performed before attempting to operate the vehicle. The object of these inspections is to determine the condition of these components and, if found defective, to take precautions to prevent any further damage.

b. The troubleshooting performed while the component is mounted in the vehicle is that which is beyond the scope of the using organization. Check the troubleshooting section of the applicable TM-20 manual, then proceed as outlined in this chapter.

c. If the component alone is received by the Ordnance establishment, inspection is performed to verify the diagnosis made when the component was in the vehicle, to uncover further defects, or to determine malfunctions. This inspection is particularly important because it is often the only means of determining the malfunction without completely disassembling the component.

Section II. TROUBLESHOOTING PROCEDURES

65. OPERATING CHARACTERISTICS

To perform effective troubleshooting, the mechanic must have a thorough knowledge of the construction features and operating characteristics of the power train. Particular attention should be accorded to the subjects outlined below.

a. Construction Features. Refer to pars. 8 through 27 for description and operation of transmission components.

b. Functions of Components. Refer to pars. 28 through 58 for explanations of power train hydraulic operations and power flow through the power train components.

c. Operating Instructions. Refer to the applicable TM-10 manual for instructions on operating the transmission while driving the vehicle in which it is installed.

d. Oil Supply. Refer to par. 6 for oil supply information.

e. Power Train Adjustments. Refer to par. 234 for adjustment procedures.

f. Oil Pressures. Refer to TABULATED DATA in par. 7 for the power train oil pressure schedule.

66. TROUBLESHOOTING – BEFORE REMOVAL OR OPERATION

a. Do not operate the vehicle prior to completing the procedures described in this paragraph. Refer to par. 63, above, for the purpose of these inspections. Inspect for oil leakage. Visually inspect all split lines, connections, valve bodies, and plugs for oil leaks. Oil leakage at split lines may be caused by loose mounting bolts or defective gaskets. Tighten all bolts where leakage is found. If mounting bolts are tight and oil continues to leak, install a new gasket.

Note: Inspect power train again for oil leakage after starting the vehicle engine. Refer to par. 67, below.

b. Inspect the power train for loose components and linkage. Inspect for damaged or broken external components. Check for the proper operation of steer, range selector and brake controls before starting the vehicle engine. Refer to par. 234.

67. TROUBLESHOOTING – BEFORE REMOVAL AND DURING OPERATION

a. General. If the inspection in par. 66, above, does not reveal the cause of the failure, and the vehicle is operable, further troubleshooting is necessary. Do not remove the power train from the vehicle until the causes of trouble, listed in Table IV, TROUBLESHOOTING, below, are checked. Refer to par. 63, above, for the purpose and scope of these troubleshooting procedures. In order to make a thorough test of the power train while it is mounted in the vehicle, be sure that the engine is properly tuned and that the oil level in the power train is correct (refer to par. 6). Inspect again for oil leaks after starting the engine.

b. Troubleshooting Table. This troubleshooting information will assist mechanics in diagnosing and correcting power train malfunctions. Use Table IV, TROUBLESHOOTING, below, in conjunction with pars. 233 and 234, TESTS AND ADJUSTMENTS. In Table IV, the letters shown opposite the malfunction indicate the probable causes of trouble in the order in which they should be checked. The instructions in the last column are to be followed in correcting the malfunction.

68. TROUBLESHOOTING TESTS

All of the test prescribed after rebuild may be applied to a power train in which a malfunction is suspected (par. 233).

69. TROUBLESHOOTING – POWER TRAIN REMOVED FROM VEHICLE

When the malfunction of a power train is not ascertained by tests before removal from the vehicle, the power train should be mounted in a test stand and checked. Refer to pars. 233 and 234. Particular attention should be given to correct adjustment and proper oil level in every power train test.

Table IV. TROUBLESHOOTING

Malfunction	Probable Causes	Corrective Action
1. Power train will not operate in any range	a. Shift control linkage broken or disconnected	a. Check linkage from operator's control to power train. Connect or repair linkage (par. 234c)
	b. Power train oil level very low	b. Check oil level and add oil as required (par. 6)
	c. External oil leakage	c. Check external lines, plugs, valve bodies, and split lines. Repair or replace leaking components.
	d. Low main pressure	d. Check main pressure (par. 233e)
	e. Internal oil leakage	e. Rebuild main transmission section (pars. 70-75 and 227, 228)
	f. Mechanical failure in power train	f. Overhaul failed unit (pars. 70-76 and 227-229)
2. Power train will operate in only one range regardless of position of shift control	a. Shift control linkage broken or disconnected	a. Check linkage from operator's control to power train. Connect or repair linkage (par. 234c)
3. Power train will operate in only one range but stalls in other ranges except neutral (in which vehicle moves)	a. Clutch failure in range which operates. Clutch not releasing	a. Overhaul main transmission section (pars. 70-75 and 227, 228)
4. Power train operates properly in all ranges except one	a. Clutch failure in range which does not operate. Clutch not engaging	a. Overhaul main transmission section (pars. 70-75 and 227, 228)
5. Excessive oil temperature (above 285° F)	a. High oil level	a. Drain to proper level (par. 6)
	b. Low oil level	b. Add oil to proper level (par. 6)
	c. Brake linkage or brake clearance improperly adjusted (brakes dragging)	c. Adjust brake linkage or brake clearance properly (par. 234a)
	d. External oil cooler clogged externally or not receiving air	d. Clean cooler or restore air flow (refer to vehicle TM)
	e. External oil cooler or oil lines clogged internally	e. Clean cooler or oil lines (refer to vehicle TM)

(Continued on next page)

Table IV - Continued

Malfunction	Probable Causes	Corrective Action
5. Excessive oil temperature (above 285° F) (cont'd)	f. Low main oil pressure. Main pressure regulator valve sticking	f. Check main pressure (par. 233e)
	g. Clutch slippage	g. If oil pressures are correct, trouble is internal. Rebuild main transmission section (pars. 70-75 and 227, 228)
	h. Failed input pressure pump	h. Rebuild input pressure pump (pars. 77-81)
6. Power train will not go into lockup	a. Improperly adjusted throttle valve linkage	a. Adjust throttle valve linkage properly (par. 234e)
	b. Low governor pressure	b. Check governor pressure (par. 233e)
	c. Sticking lockup shift valve.	c. Rebuild valve assembly (pars. 102-106)
	d. Lockup clutch piston seal ring leaking	d. Replace seal ring (pars. 70-74, 82-86 and 228)
	e. Leakage at seal rings on turbine shaft	e. Replace seal rings (pars. 70-75 and 227, 228)
	f. Sticking lockup cutoff valve	f. Rebuild valve assembly (pars. 107-111)
7. Power train goes into or out of lockup at improper speeds	a. Improperly adjusted or disconnected throttle valve linkage	a. Connect and/or properly adjust linkage (par. 234e)
	b. Lockup shift valve spring weak or broken	b. Rebuild valve assembly (pars. 102-106)
	c. Sticking lockup shift valve	c. Rebuild valve assembly (pars. 102-106)
	d. Sticking lockup cutoff valve	d. Rebuild valve assembly (pars. 107-111)
	e. Low governor pressure	e. Check governor pressure (par. 233e)
8. Shift control will not move to range desired	a. Improperly adjusted or binding linkage	a. Adjust or repair linkage (par. 234c)
9. Power train operates in range different from that selected	a. Improperly adjusted linkage	a. Adjust linkage (par. 234c)
10. Vehicle pulls to one side when no steer is applied	a. Steer linkage improperly adjusted	a. Adjust steer linkage properly (par. 234d)
	b. Drive clutch (output or geared steer) slipping	b. Check apply pressure (par. 233e)
	c. Failed component in vehicle track	c. Check vehicle TM
	d. Mechanical failure in output section of transmission or in output drive assembly	d. Overhaul failed unit (pars. 75, 76, 227 and 229)

(Continued on next page)

Table IV - Continued

Malfunction	Probable Causes	Corrective Action
11. Vehicle steers properly to only one side in first and second gears and reverse 1	a. Steer control linkage improperly adjusted b. Brake clearance excessive on side which fails to steer c. Brake seal ring failed on side which fails to steer d. Failed brake plates	a. Adjust linkage properly (par. 234d) b. Adjust brake clearance and linkage (par. 234a and b) c. Check brake apply pressure (par. 233e). Replace failed seal ring (pars. 75, 227) d. Replace brake plates (pars. 75, 142 through 146 and 227)
12. Vehicle steers properly to only one side in third and fourth gears and reverse 2	a. Steer control linkage improperly adjusted b. Geared steer clutch piston seal ring leaking on side which steers improperly c. Output clutch piston seal ring leaking on side which steers properly d. Failed steer clutch plates	a. Adjust linkage properly (par. 234d) b. Replace seal ring (pars. 75, 227) c. Replace seal ring (pars. 75, 227) d. Replace steer clutch plates (pars. 75, 142 through 146, and 227)
13. Vehicle will not steer in either direction	a. Steer control linkage broken or disconnected b. Excessive leakage of steer pressure	a. Repair or connect linkage (see vehicle TM) b. Check steer pressures at brakes, output clutches and geared steer clutches (par. 233e)
14. Shift control sticks in one position	a. Linkage binding b. Downshift inhibitor valve or plunger sticking, or spring is faulty	a. Inspect linkage and correct binding b. Rebuild control valve body assembly (pars. 107-111)
15. Brakes do not stop or hold vehicle properly	a. Brake clearance or linkage improperly adjusted b. Brake plates failed or worn	a. Adjust clearance and linkage properly (par. 234a and b) b. Replace brake plates (pars. 75, 227)

CHAPTER 5

REPAIR AND REBUILD

Section I. PRELIMINARY INSTRUCTIONS FOR POWER TRAIN OVERHAUL

70. GENERAL

a. Provide Proper Equipment. Proper equipment must be available before rebuild is started. This equipment includes a hoist of at least 2-ton capacity, adequate hand tools (par. 62) (and improvised tools, where available). wood blocks. receptacles for small parts, lint-free wiping cloths, oil-soluble grease and nonhardening gasket cement. Refer to Table II and par. 62 for listing of special and improvised tools.

WARNINGS

- White lead is toxic. To avoid injury, do not use white lead.
- Transmission and transmission components are heavy and can crush you. Have a ground guide check slings and lifting devices for cuts, breaks or wear before and during hoisting. Slings and lifting devices can break and cause injury or death. To avoid injury, do not stand under transmission or components when lifting them.
- Fumes from burning Teflon can cause serious injury or death. Because clutch piston seal rings and step-joint seal rings are made of Teflon, do not get rid of them by burning.

b. Parts to Discard. At transmission assembly, all piston seals, seal rings, packings, lock washers, lock nuts, cotter pins, lock wires, lock strips and gaskets should be removed and discarded. New parts should always be supplied to replace such items.

c. Avoid Component Damage. Use care avoid damage to transmission components during disassembly, cleaning, inspection, repair and reassembly. Nicks, scratches and dents resulting from careless handling may cause oil leakage or improper functioning. This could result in transmission failure. All defective parts must be replaced. Handling of heavy components with slings and hooks, and blocking the transmission for support in various positions, is important for safety and to prevent damage.

d. Torque. All plugs, bolts, nuts and screws must be installed at the prescribed torque tightness to ensure proper assembly. Proper use of a torque wrench, and careful attention to prescribed torque, will help prevent distortion, oil leaks and stripped threads. All torque requirements for plugs, bolts, screws and nuts are found in the pertinent rebuild section and in the assembly step procedures (sec. XXXIII) which follow.

71. CLEANING RECOMMENDATIONS

a. General. Cleanliness is of paramount importance in servicing a transmission. All components must be thoroughly cleaned and kept clean throughout the rebuild process. Dirt can cause malfunction and possible failure of the transmission. Refer to the Appendix A, Section 4b.

b. Cleaning Parts

WARNING

Compressed shop air will not exceed 30 psi (pounds per square inch). Regulator assembly must be attached to compressor. To avoid injury, use only with effective chip-guarding and personal protective equipment (goggles/faceshield, gloves, etc.).

WARNING

Dry Cleaning Solvent P-D-680 is toxic and flammable. To avoid injury, wear protective goggles and gloves and use in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Do not use near open fire or excessive heat. The flash point for Type I dry cleaning solvent is 100°F (38°C), and for Type II is 138°F (50°C). If you become dizzy while using dry cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical air immediately.

(1) Every component should be thoroughly cleaned after the transmission is disassembled. Cleaning is necessary to ensure effective inspection for wear, damage and serviceability of components.

(2) Abrasives, files, scrapers, wire brushes and sharp tools should never be used on surfaces where finish is important to the operation or sealing of parts, except where specifically recommended.

(3) Gum or varnish deposits may be removed by soaking in dry cleaning solvent or mineral spirits and using a soft-bristle brush. Crocus cloth may be used to remove minor surface irregularities. Lapping compound may be used, if required, in valve body bores to prevent valves from sticking. Clean thoroughly to remove compound after use.

(4) A soft wire (brass or copper) may be used to clean oil passages. Always flush such passages thoroughly after cleaning.

(5) If steam cleaning is used, dry the cleaned parts immediately with compressed air and apply a film of oil to prevent rusting. Never use lye or caustics which will corrode or etch metal surfaces.

(6) Do not clean the lubricant from new bearings. Keep new bearings wrapped until they are to be installed. Soak bearings which have been in service in dry cleaning solvent or mineral spirits to loosen deposits of dirt. Do not spin the bearings during cleaning or drying. After cleaning, turn the bearings by hand and note any evidence of grit. Reclean them if grit is present. Refer to TM 9-214 for further information on cleaning bearings.

72. INSPECTION AND REPAIR RECOMMENDATIONS

Note. Just before or during assembly, lubricate all seals, shafts, gears, bearings, valves, and other moving parts with transmission oil. This lubrication will protect the parts during storage and at initial start-up.

a. Castings, Forgings, Machined Surfaces

(1) Inspect all castings and forgings for breaks, cracks and wear or scoring that would impair serviceability. Remove nicks and small surface irregularities with crocus cloth or a soft stone.

(2) Inspect all oil passages for obstructions and dirt. Reclean passages if necessary.

(3) Inspect mounting faces for nicks, scratches and scores. Remove minor defects with crocus cloth or a soft honing stone. Replace any parts in which defects that cannot be corrected will impair the operation of the transmission.

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

Note. A new tap will cut oversize. If threads are stripped, discard the part unless it can be satisfactorily repaired by installing an insert.

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

b. Roller or Ball Bearings. Refer to TM 9-214 for proper cleaning and inspection procedures.

c. Needle-type Roller Bearings. Inspect the bearings for free and smooth rotation, broken or missing rollers, and tightness of fit in the bore. If defects are found, replace the bearing using the proper replacer.

Note. Do not remove needle bearings unless replacement is necessary, since removal usually results in destruction of the bearing.

d. Bushings, Bushing-type Bearings and Thrust Washers

(1) Inspect bushings and bushing-type bearings for size, scoring and out-of-roundness, burrs, sharp edges and evidence of seizing. Minor scores, sharp edges and scratches may be removed with crocus cloth. Out-of-round, deeply scored or worn parts should be discarded.

Note. Do not remove bushings bushing-type bearings unless replacement is necessary, as removal usually damages these parts.

(2) Remove bushings and bushing-type bearings by using a puller or press when possible. Bushings in blind holes may require removal by sawing or the use of a narrow cape chisel.

Caution. If necessary to cut out a bushing, do not damage the bore into which it fits.

(3) Inspect thrust washers for wear, distortion, scores and burrs. Correct minor defects but replace parts that are worn, scored or deformed.

e. Oil Seals, Preformed Packings and Gaskets

(1) Inspect hook-type seal rings for wear, distortion and broken hooks. Replace defective seal rings. Install a new hook-type seal ring if the ring shows any wear on the outside circumference, or if there is excessive side wear. The sides of the seal ring must be smooth within 0.005-inch maximum side wear. The sides of the shaft groove (or the bore) into which the seal ring fits should be smooth within 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.

(2) Inspect metal-encased lip-type seals for cracks, wear, cuts and brittleness. Inspect springs and seal shells. Replace any seals found defective.

Note. Any time a metal-encased lip-type seal is removed, it must be replaced with a new seal.

f. Gears

(1) Inspect gears for burrs, wear, pitting and broken teeth at tooth contact areas.

(2) Inspect bores of planetary pinions for wear and pitting of bearing contact areas.

(3) Remove burrs using a soft honing stone. Replace gears that are excessively worn or pitted.

g. Splined Parts

(1) Inspect splined parts for twisted or broken splines, burrs and excessive wear.

(2) Remove burrs using a soft honing stone. Replace parts which have twisted or broken splines and excessive wear.

h. Clutch Plates

(1) Inspect friction-faced steel plates for burrs, embedded metal particles, severely pitted faces, excessive wear, cracks, distortion and damaged splined teeth. Remove burrs using a soft honing stone. Replace plates which have other defects.

(2) Inspect steel plates for burrs, scoring, excessive wear, distortion, embedded metal, galling, cracks, breaks and damaged spline teeth. Remove burrs and minor surface irregularities using a soft honing stone. Replace plates which have other defects.

i. Threaded Parts

(1) Inspect all threaded parts for stripped or damaged threads and burrs.

(2) Replace all parts which have stripped threads or damage which cannot be repaired by chasing the threads with a tap or die of the proper size.

Note. Chase threads with a used tap or die. A new tap may cut oversize, while a new die may cut undersize.

j. Snap Rings. Inspect snap rings for nicks, burrs, distortion and wear. Discard defective snap rings.

k. Springs. Inspect springs for wear, distortion, breaks, evidence of overheating, and loss of tension or compression. Discard defective springs.

l. Shafts and Spindles

(1) Inspect shafts and spindles for excessive wear, bending, scores, cracks, burrs and obstructed oil passages.

(2) Remove burrs and minor surface irregularities with crocus cloth or a soft honing stone. Remove obstructions by probing with soft wire or with compressed air. Discard defective parts.

m. Ball-type Valves

(1) Inspect balls for rust, pitting or grooving. Discard balls which will not seat properly.

(2) Inspect ball seats for wear and pitting. Reseat by lapping with the proper size ball. Discard parts in which the seat cannot be restored.

n. Spool-type Valves

(1) Inspect valves for wear, burrs, scoring and evidence of sticking. Try valves in their bores. All valves should move in their bores by their weight alone. Do not force valves.

(2) Inspect the edges of all valve lands. All edges should be square and sharp. Do not destroy these sharp edges in cleaning or repair operations. The sharp edges help prevent the accumulation of substances which might cause the valve to stick in its bore.

(3) Remove burs with a soft honing stone. Reclean valves if necessary to remove gum or dirt deposits. Discard defective valves.

o. Sheet Metal Parts

(1) Inspect sheet metal parts for bends, cracks, distortion, interference with adjacent parts, and loose-welded points.

(2) Straighten bent parts. Weld cracks or loose welds.

(3) Discard governor oil collector ring if any damage is evident.

p. Threaded Inserts

(1) Inspect insert for stripped or damaged threads and burs.

(2) If necessary to remove an insert, the bolt which was removed from the insert can be used with a nut of the same size.

(3) Grind a shoulder on one end of the nut wide enough to allow the nut to seat against the insert and not contact the adjacent mounting surface.

(4) Thread the nut onto the bolt, shoulder side of the nut away from the bolt head, and install the bolt into the insert to be removed.

(5) Lock the bolt to the insert by tightening the nut against the insert. Turn the bolt to remove the insert.

q. Dowel Pins

(1) Inspect pins for excessive wear, bending or burs.

(2) Remove burs and minor surface irregularities with crocus cloth or a soft honing stone. Discard pins with other defects.

(3) To remove a dowel pin, drill and tap a hole in the dowel to be removed.

(4) Obtain a sleeve which will extend about an inch above the top of the dowel when the sleeve is placed over the dowel. The sleeve must have square ends and the inside diameter of the sleeve must be slightly larger than the outside diameter of the dowel pin.

(5) Place the sleeve over the dowel to be removed and install a washer on the sleeve.

(6) Using a bolt and nut the same size as the threaded hole in the dowel, install the nut on the bolt and thread the bolt into the dowel pin.

(7) Hold the bolt and turn the nut against the washer to remove the dowel.

*C2

Section II. DISASSEMBLY OF POWER TRAIN INTO SUBASSEMBLIES

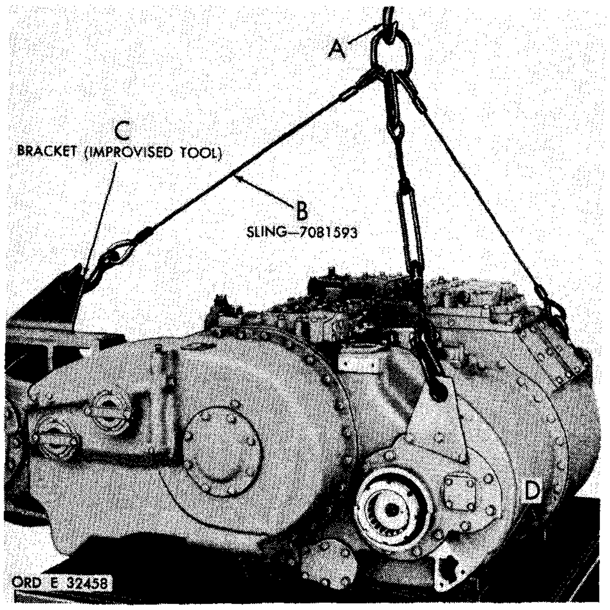
73. GENERAL,

*C2 a. This section presents the complete disassembly of the XTG-411-2A transmission, input transfer assembly and output drive assemblies. The disassembly procedures are presented in pictorial step-by-step illustrations. Directly beneath each picture are simple disassembly instructions, keyed to the pictures by letter callouts.

b. Refer to figs. 373 through 386 (foldouts 2 through 15 in back of manual) for parts identification and location.

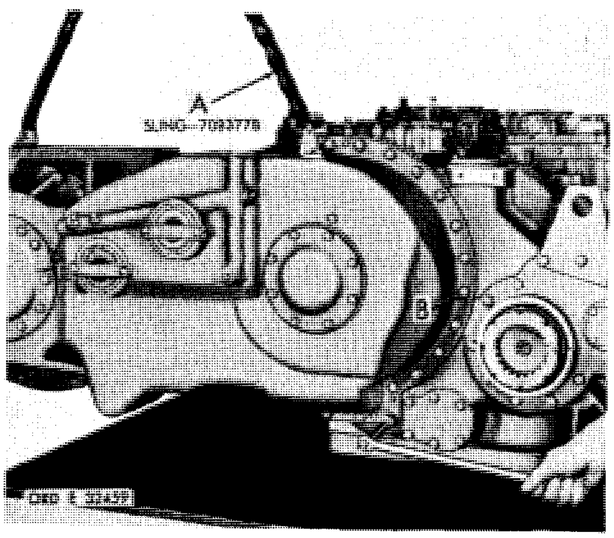
*C2 c. Drain the transmission oil. Refer to TM 9-2300-216-10 for draining procedures

74. DISASSEMBLY STEPS – INPUT TRANSFER ASSEMBLY



*C2 Figure 39 (Step 1)

Using hoist (A), sling (B), and bracket (C), position the power train assembly on blocks (D) on the floor or disassembly table, Remove the sling and bracket.



*C2 Figure 40 (Step 2)

Attach sling (A) to the input transfer housing. Using a 5/8-inch wrench, remove 16 input transfer-to-converter housing bolts and lock washers (B).

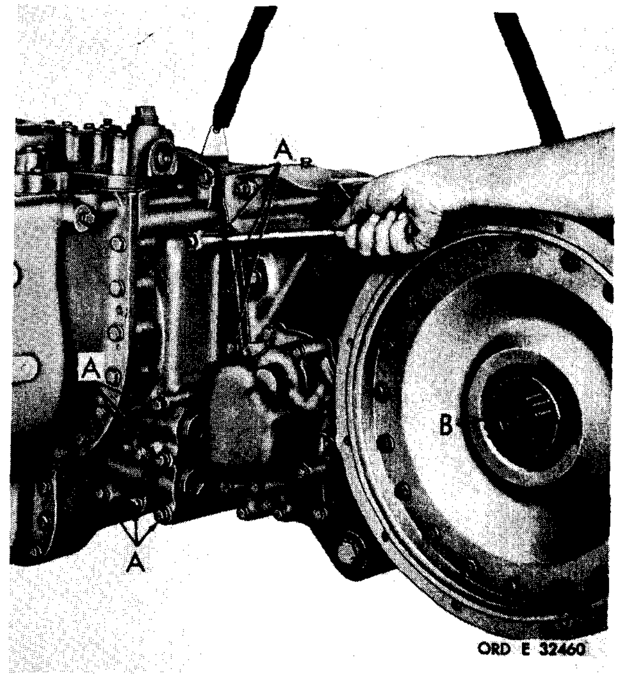


Figure 41 (Step 3)

Using a 5/8-inch wrench, remove 10 input transfer-to-converter housing bolts and 10 lock washers (A). Remove engine coupling shaft (B).

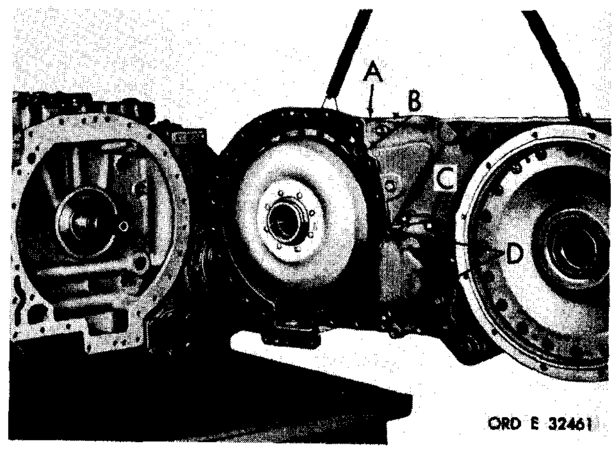


Figure 42 (Step 4)

Remove input transfer assembly (A) and gasket (B). Using a 9/16-inch wrench, remove 11 bolts and lock washers (C) retaining input and scavenge oil pump assembly. If necessary, use two mounting bolts as jackscrews, in holes (D).

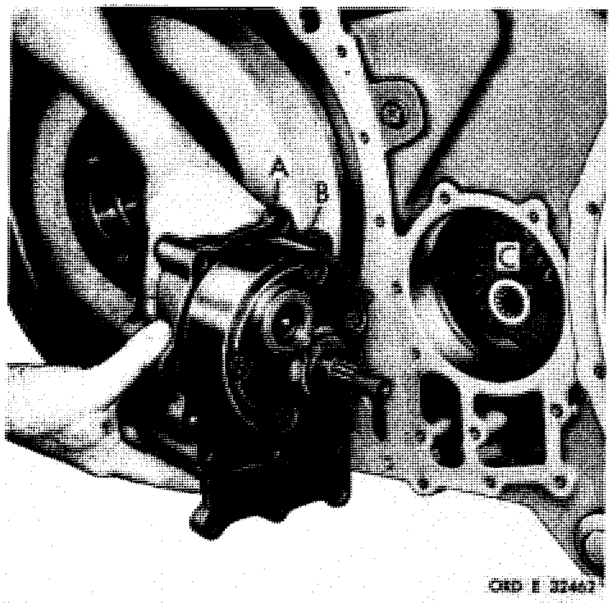
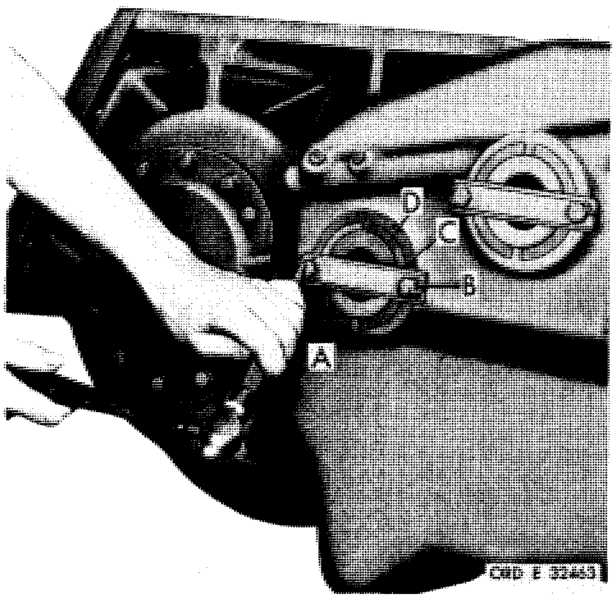


Figure 43 (Step 5)

Remove input and scavenge oil pump assembly (A) and gasket (B). Remove seal ring (C) from input transfer housing assembly.



*C2 Figure 44 (Step 6)

Straighten corners of lock strip (A). Using a 9/16-inch wrench, remove two bolts (B). Remove lock strip (A) and strap (C) retaining idler cluster gear spindle (D).

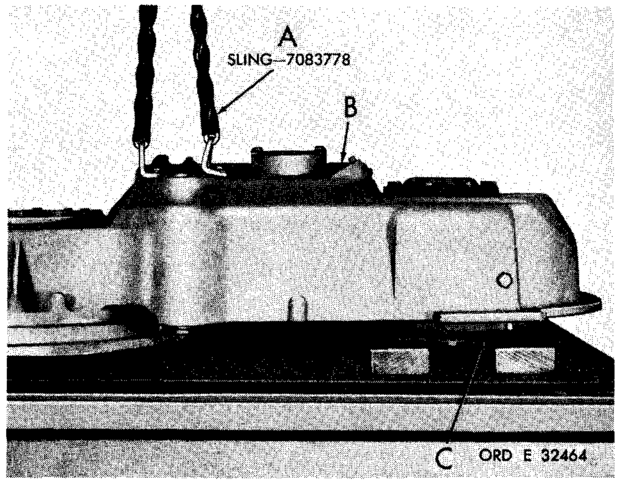


Figure 45 (Step 7)

Using two 3/8-16 bolts and flat washers, attach sling (A) to input transfer housing (B). Position the housing assembly on the disassembly table, supporting torque converter (C), and keeping the transfer housing assembly level.

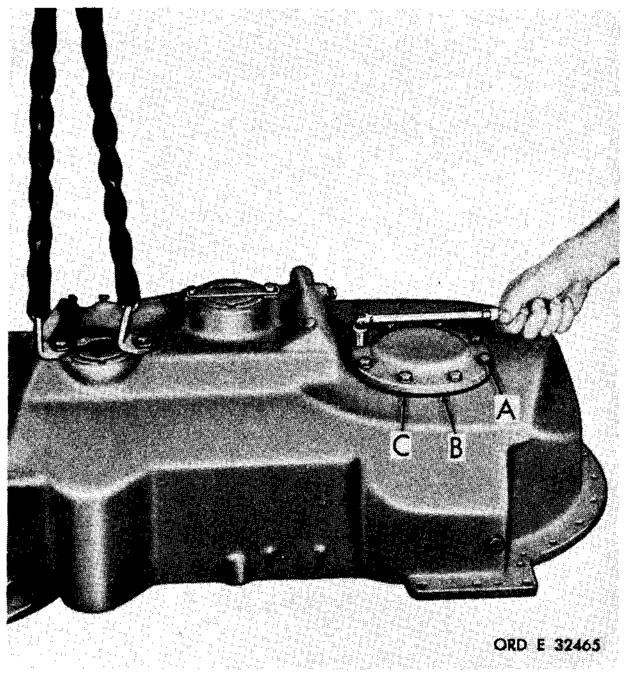


Figure 46 (Step 8)

Using a 9/16-inch wrench, remove eight bolts and lock washers (A) from converter bearing cover (B). Remove cover (B) and gasket (C).

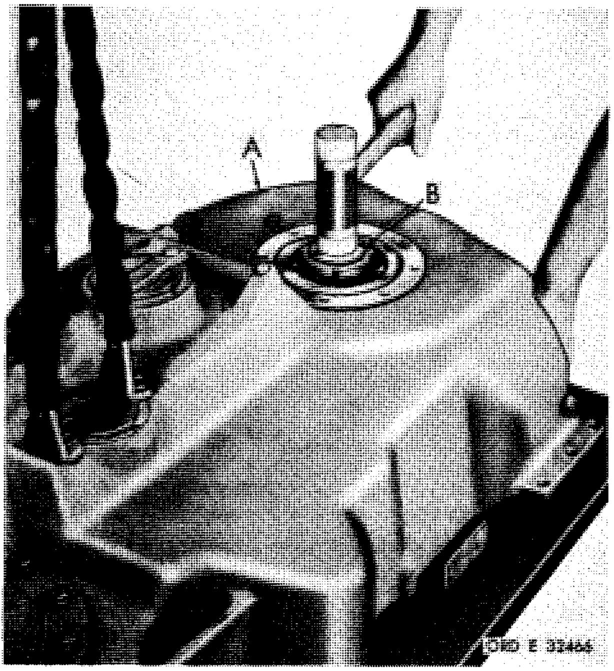


Figure 47 (Step 9)

Using a soft hammer, and while raising transfer housing (A), tap lightly on the torque converter assembly (B) to remove it from the housing.

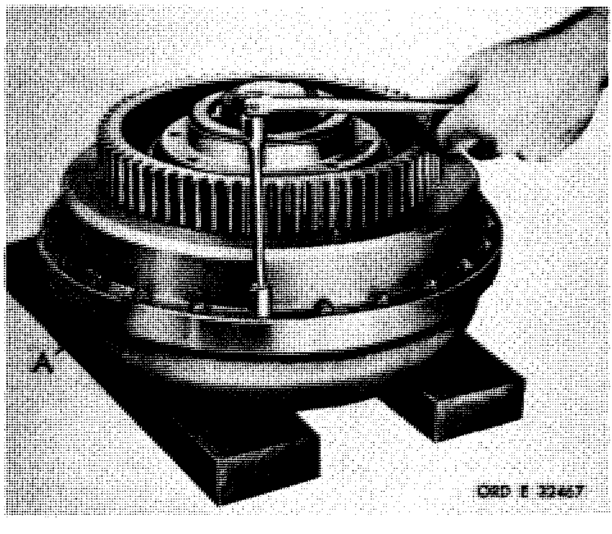


Figure 48 (Step 10)

Using a 1/2-inch wrench, loosen 24 torque converter cover-to-pump assembly nuts (A), and remove all but two, 180 degrees apart.

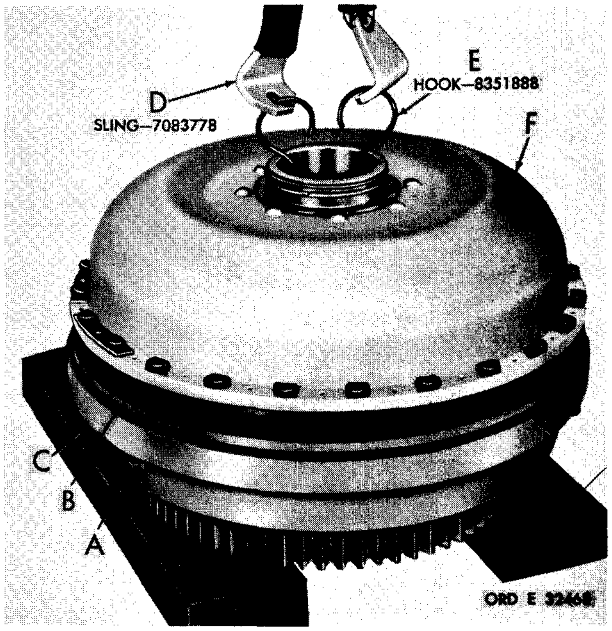


Figure 49 (Step 11)

Turn the converter over and remove the two remaining nuts. Using three 3/8-24 bolts (A) as jacks crews, separate lockup clutch reaction plate (B) from cover (C). Using sling (D) and hooks (E), remove pump assembly (F).

Figure 50 (Step 12)

*C2

Remove torque converter stator assembly (A).

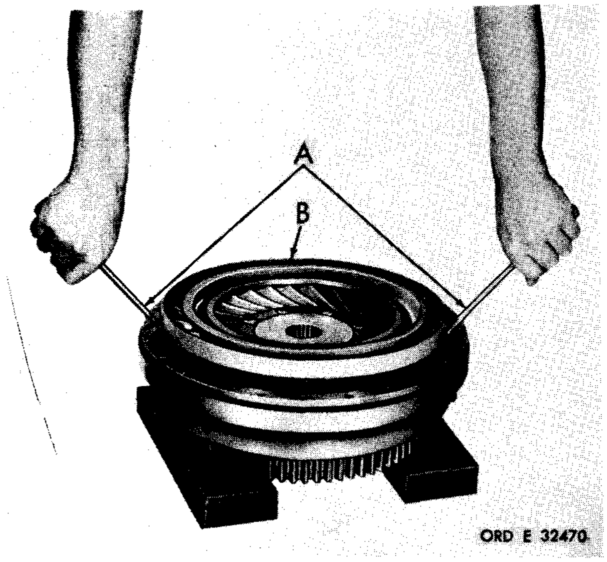


Figure 51 (Step 13)

Using two screwdrivers (A), remove torque converter turbine assembly (B).

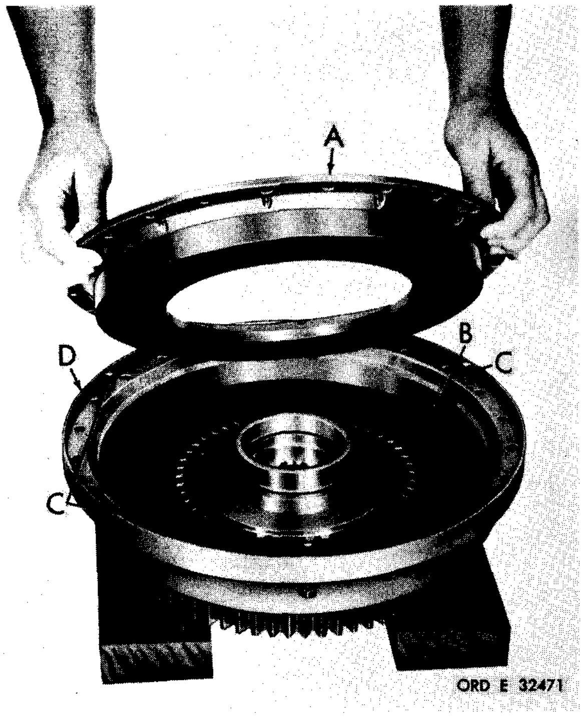


Figure 52 (Step 14)

Remove lockup clutch reaction plate (A), lockup clutch plate (B) and three jackscrews (C) from converter cover assembly (D).

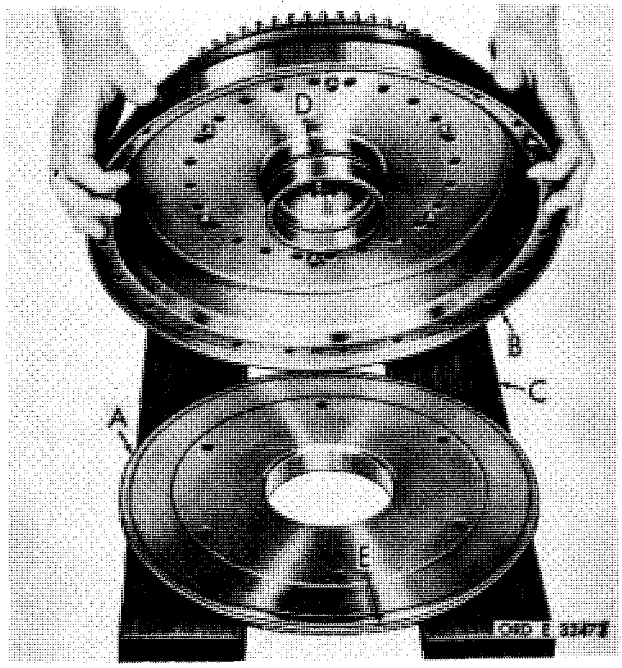


Figure 53 (Step 15)

Remove lockup clutch piston (A) by bumping converter cover assembly (B) lightly on wooden blocks (C). Remove hook-type seal ring (D) from hub of the cover assembly. * Do not remove seal ring (E) and expander from the lockup clutch piston un1ess replacement is necessary. cz

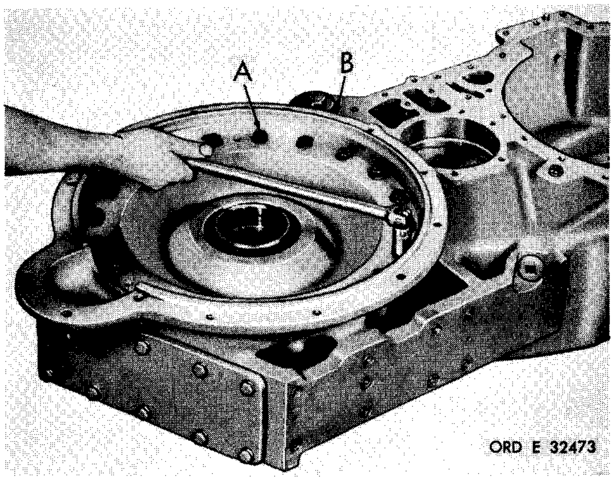


Figure 54 (Step 16)

Using a 5/8-inch wrench, remove 20 self-locking bolts (A) and flat washers retaining flange adapter (B).

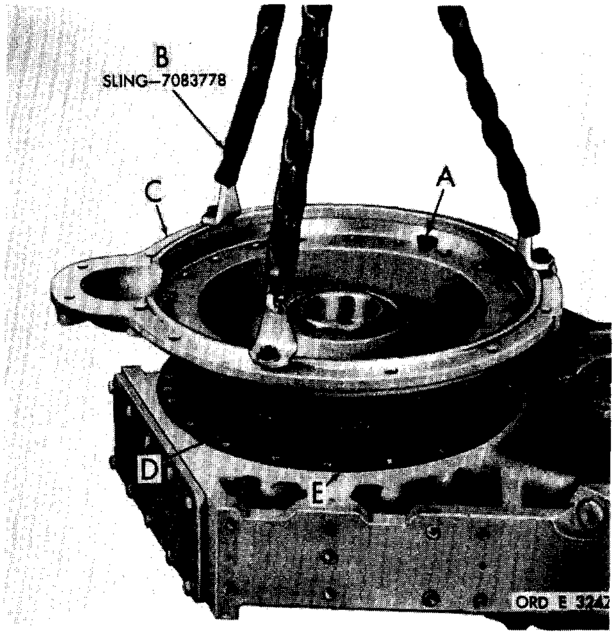


Figure 55 (Step 17)

Install three mounting bolts (A) in jackscrew holes. Attach sling (B) and remove adapter (C) and gear (D). Remove gasket (E). Caution: While lifting adapter, be careful to prevent gear from dropping.

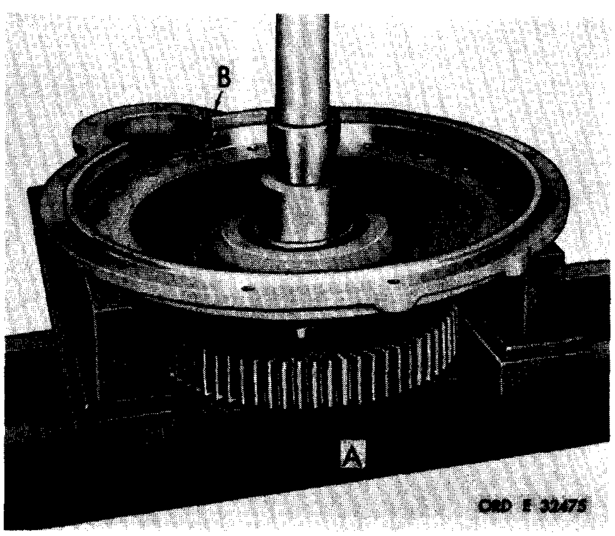


Figure 56 (Step 18)

If input transfer drive gear (A) remained with flange adapter assembly (B), position the assembly in a press. Press gear (A) and its bearings, as an assembly, from the adapter.

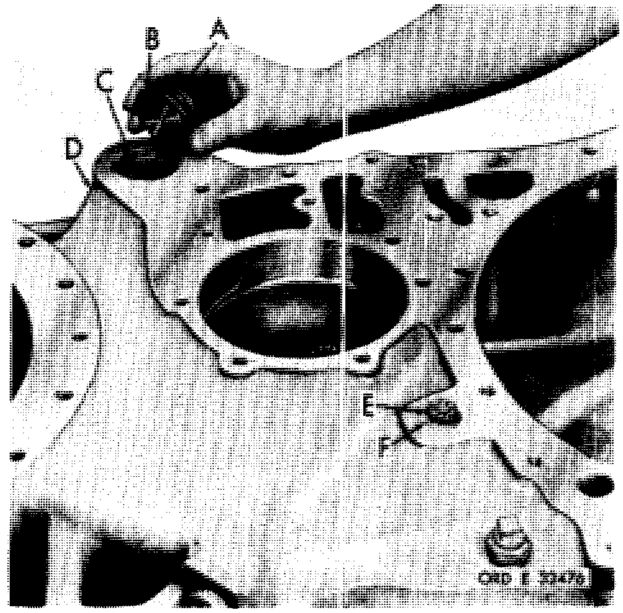
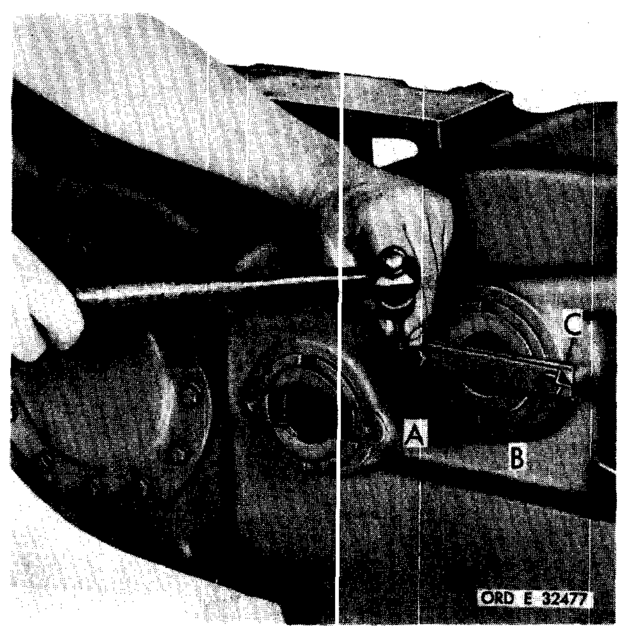


Figure 57 (Step 19)

Remove plug (A), gasket (B) and oil screen (C) from input transfer housing (D). Using a 5/8-inch wrench, remove self- locking bolt (E) and flat washer (F).



*C2 Figure 58 (Step 20)

Using a hammer and chisel, straighten lock strip (A). Remove two bolts (B), lock strip (A) and strap (C).

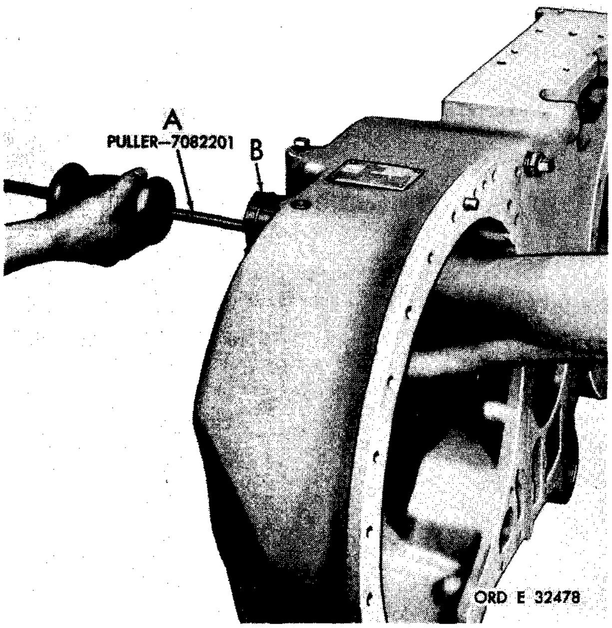


Figure 59 (Step 21)

Using puller (A), remove cluster gear spindle (B). Note. Support the cluster gear in the transfer housing when removing spindle (B).

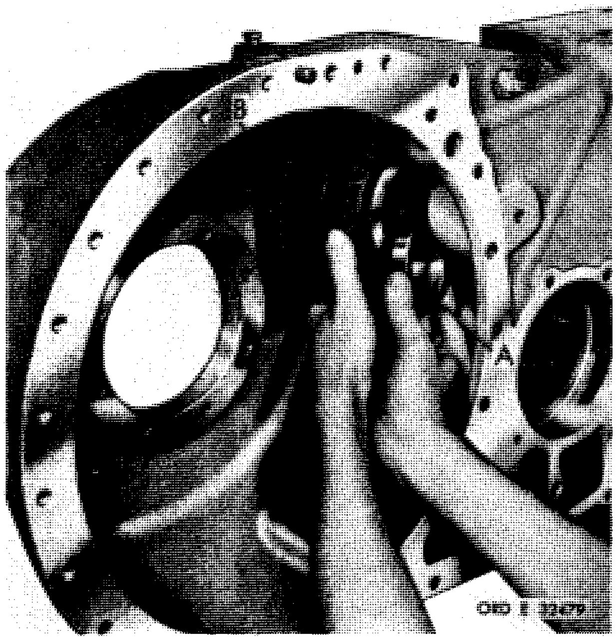


Figure 60 (Step 22)

Remove spacer (A) and cluster gear and bearing assembly (B).

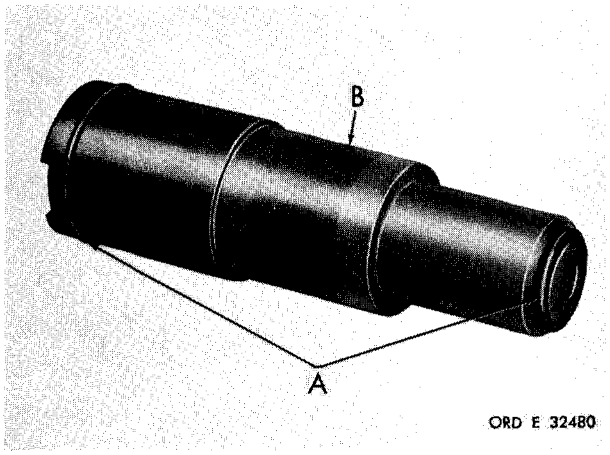


Figure 61 (Step 23)

Remove seal rings (A) from input transfer cluster gear spindle (B).

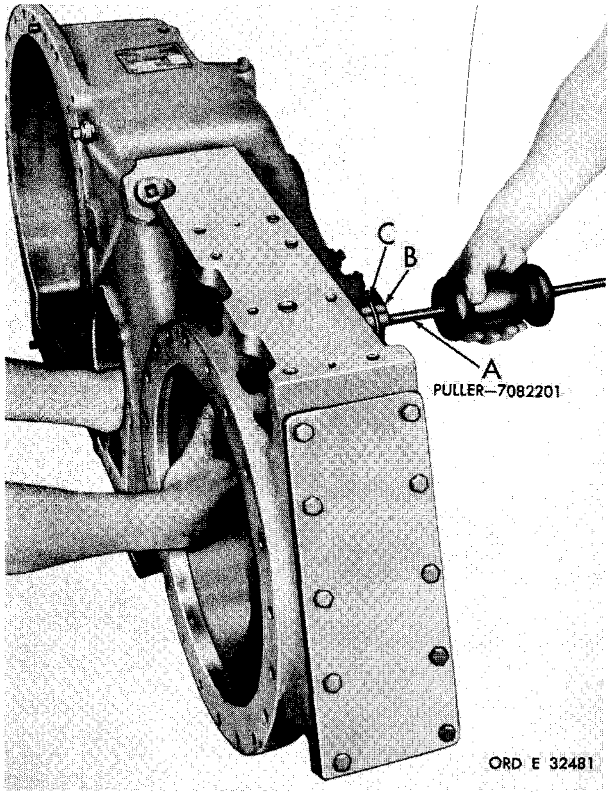


Figure 62 (Step 24)

Using puller (A), remove idler cluster gear spindle (B). Remove seal ring (C) from spindle (B). Note. Support the idler cluster gear assembly when removing the spindle.

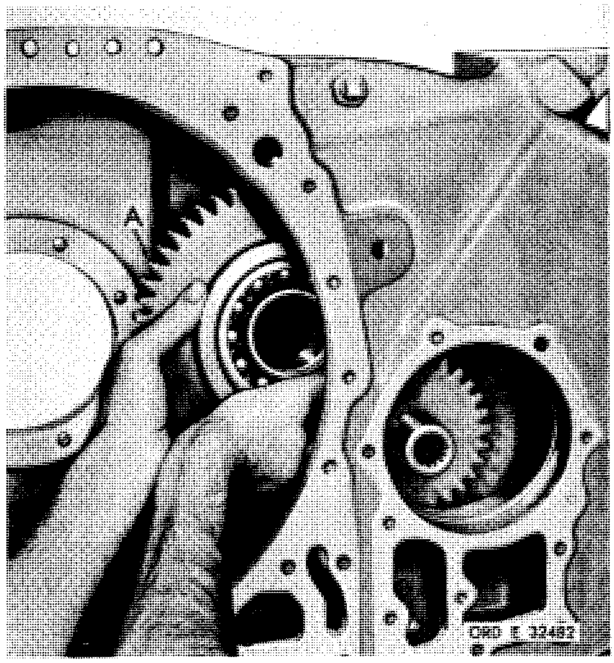


Figure 63 (Step 25)

Remove idler cluster gear and bearing assembly (A).

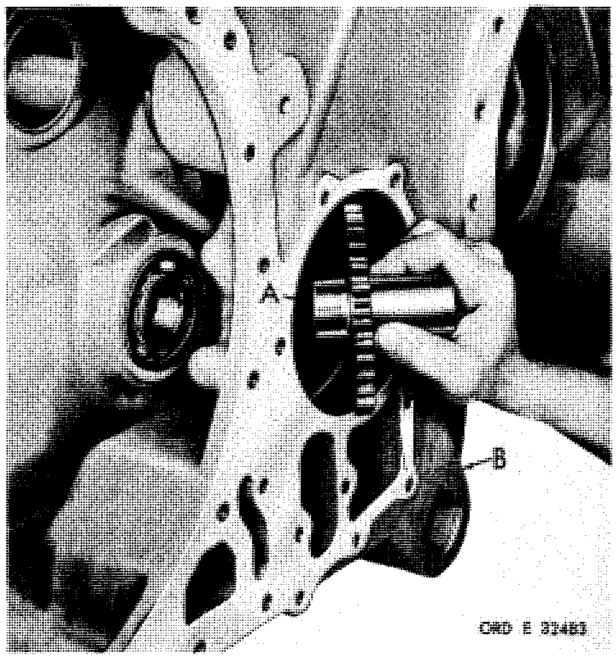


Figure 64 (Step 26)

Remove input oil pump drive gear (A) from housing (B).

75. DISASSEMBLY STEPS – MAIN TRANSMISSION ASSEMBLY

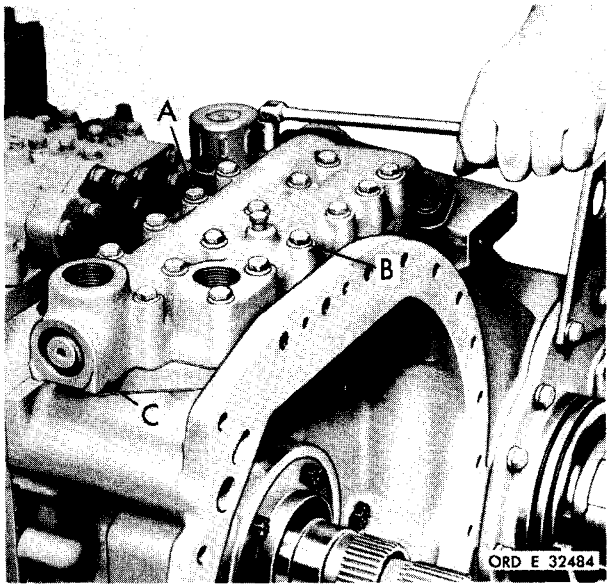


Figure 65 (Step 1)

Using a 1/2-inch wrench, remove 18 bolts (A) and flat washers (B) retaining regulator and lockup shift control valve body assembly (C).

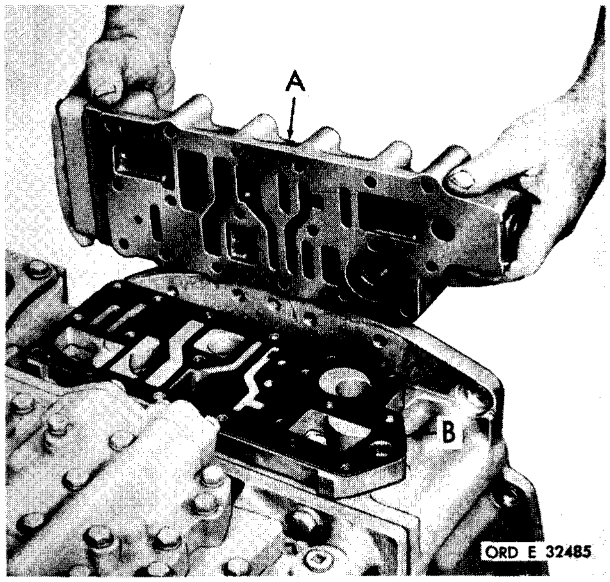


Figure 66 (Step 2)

Remove regulator and lockup shift control valve body assembly (A) and gasket (B).

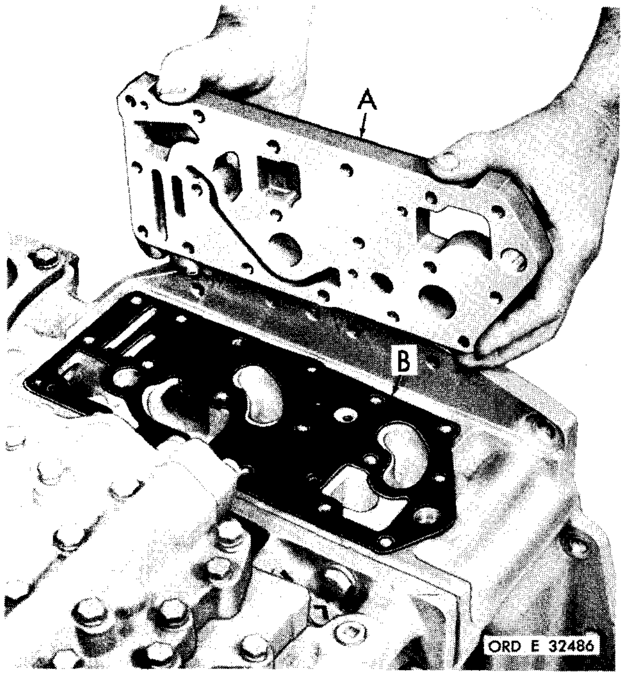


Figure 67 (Step 3)

Remove regulator and lockup shift control valve body oil transfer plate (A) and gasket (B).

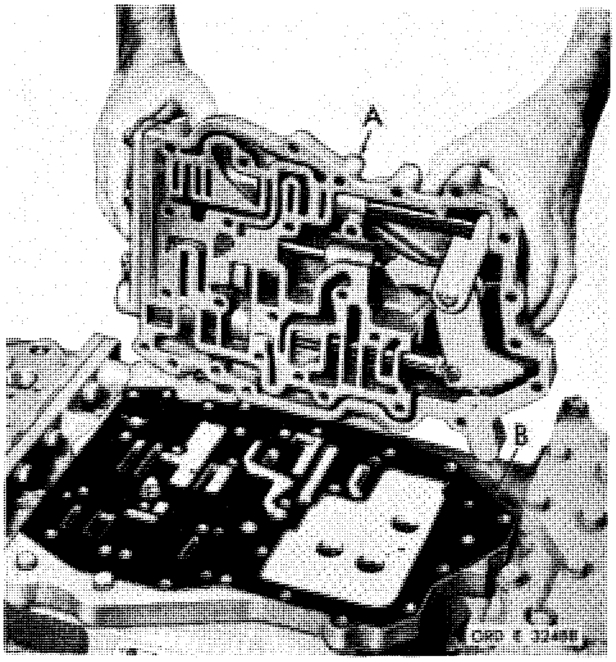


Figure 69 (Step 5)

Remove main control valve body assembly (A) and gasket (B).

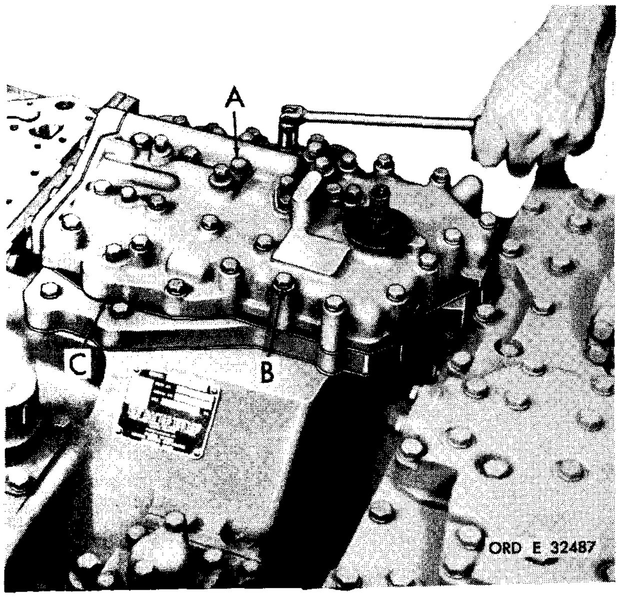


Figure 68 (Step 4)

Using a l/2-inch wrench, remove 28 bolts (A) and lock washers (B) retaining main control valve body assembly (C).

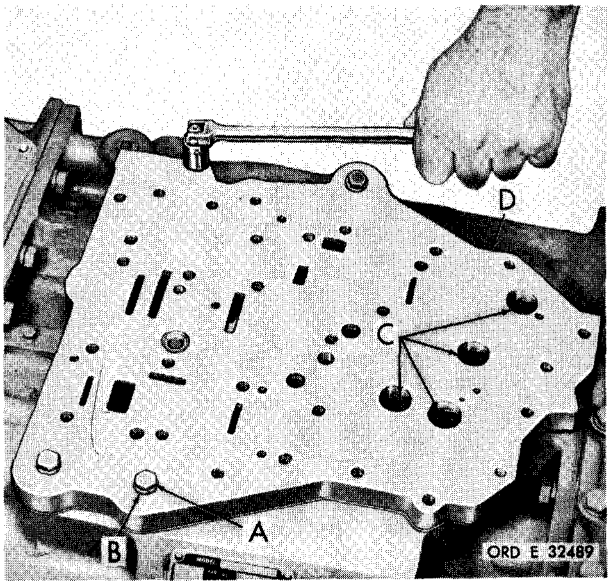


Figure 70 (Step 6)

Using a l/2-inch wrench, remove four bolts (A) and lock washers (B) and four self-locking bolts (C) with flat washers retaining main control valve body oil transfer plate assembly (D).

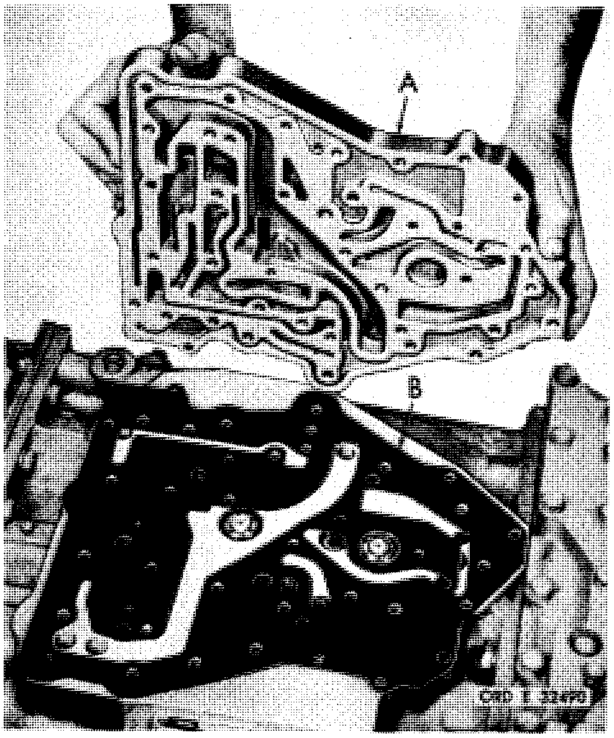


Figure 71 (Step 7)

Remove control valve body oil transfer plate assembly (A) and gasket (B).

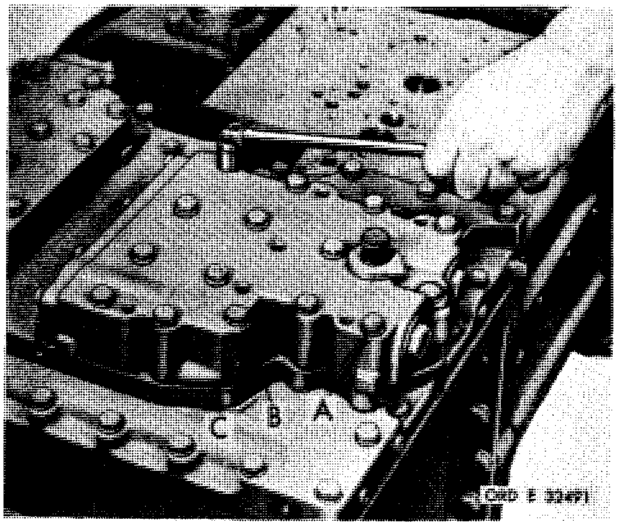


Figure 72 (Step 8)

Using a 9/16-inch wrench, remove 15 bolts (A) and lock washers (B) retaining steer control valve body assembly (C).

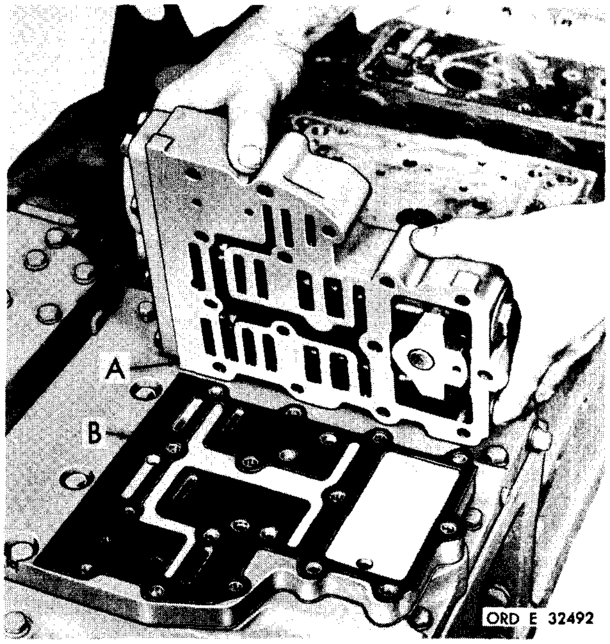


Figure 73 (Step 9)

Remove steer control valve body assembly (A) and gasket (B).

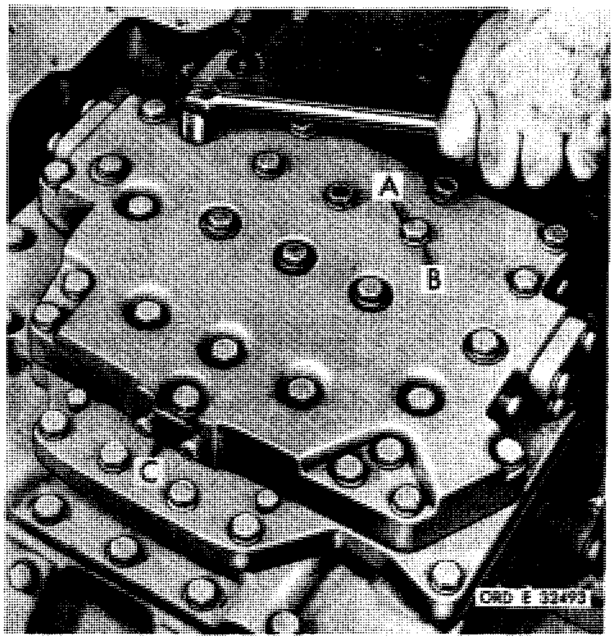


Figure 74 (Step 10)

Using a 9/16-inch wrench, remove 28 bolts (A) and lock washers (B) retaining relay valve body assembly (C).

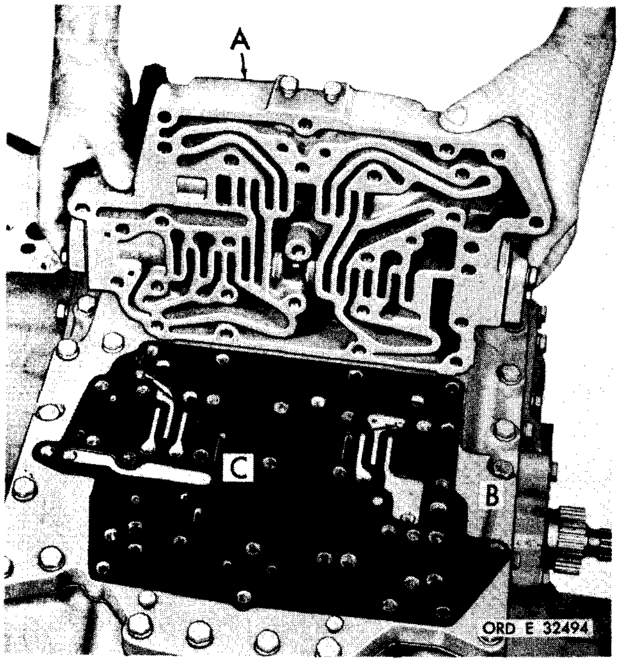


Figure 75 (Step 11)

Remove relay valve body assembly (A), gasket (B) and two nylon balls (C).

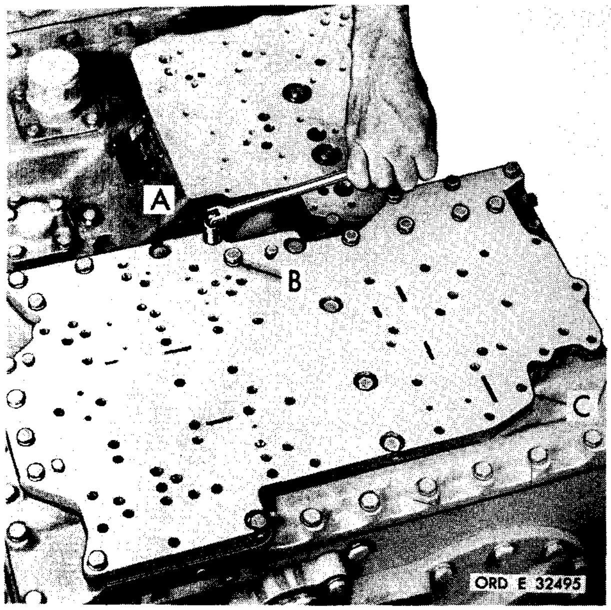


Figure 76 (Step 12)

Using a 9/16-inch wrench, remove 22 bolts (A) and lock washers (B), retaining relay valve body oil transfer plate (C).

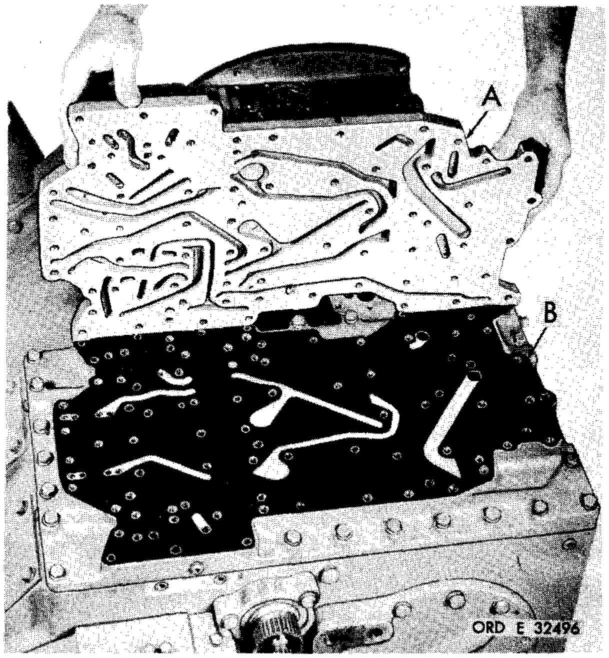


Figure 77 (Step 13)

Remove oil transfer plate (A) and gasket (B).

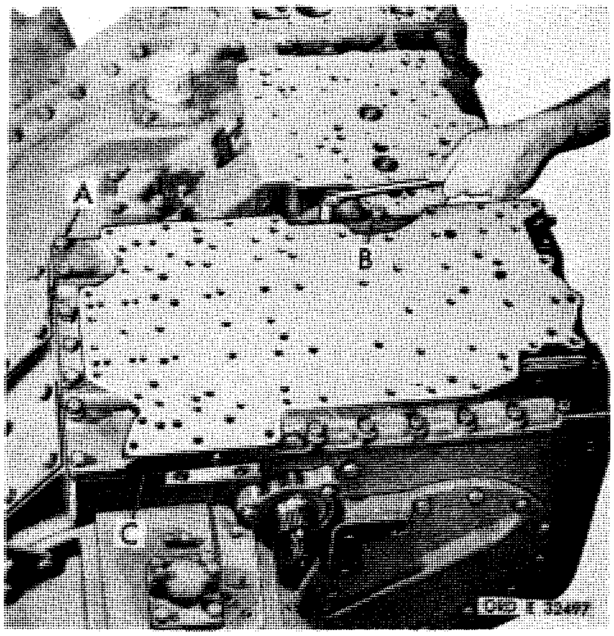


Figure 78 (Step 14)

Using a 9/16-inch wrench, remove 20 bolts (A) and lock washers (B) retaining transmission top cover plate (C).

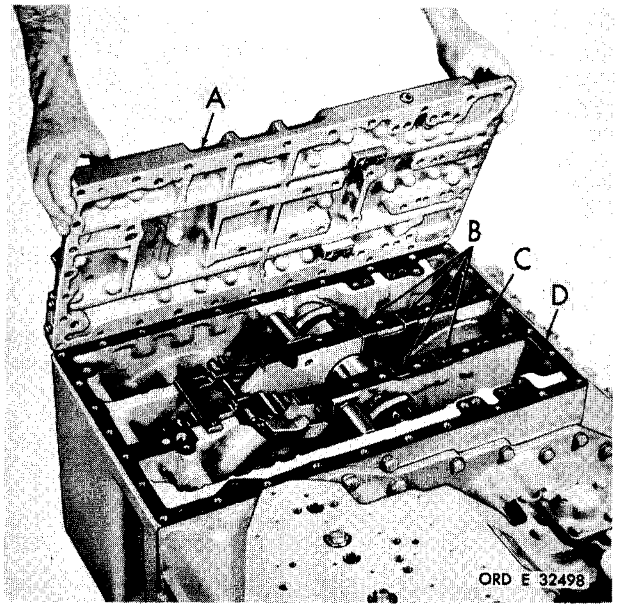


Figure 79 (Step 15)

Remove transmission top cover plate (A). Remove four self-locking bolts (B), baffle (C) and gasket (D).

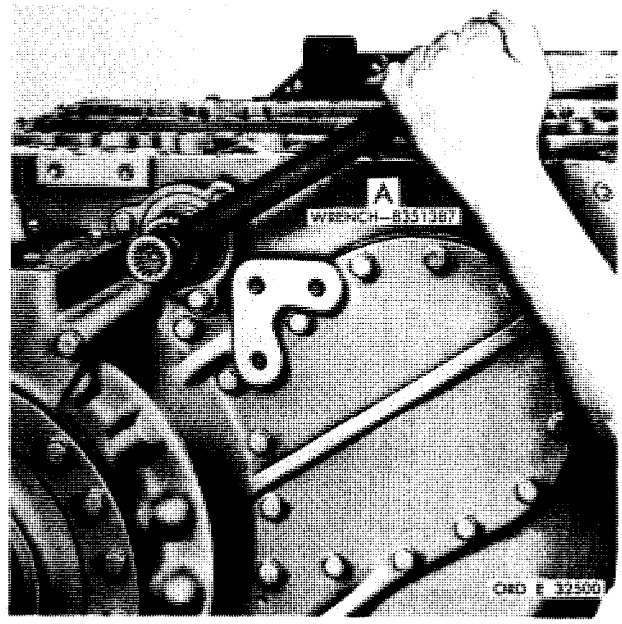


Figure 81 (Step 17)

Using wrench (A), apply the transmission left brake.

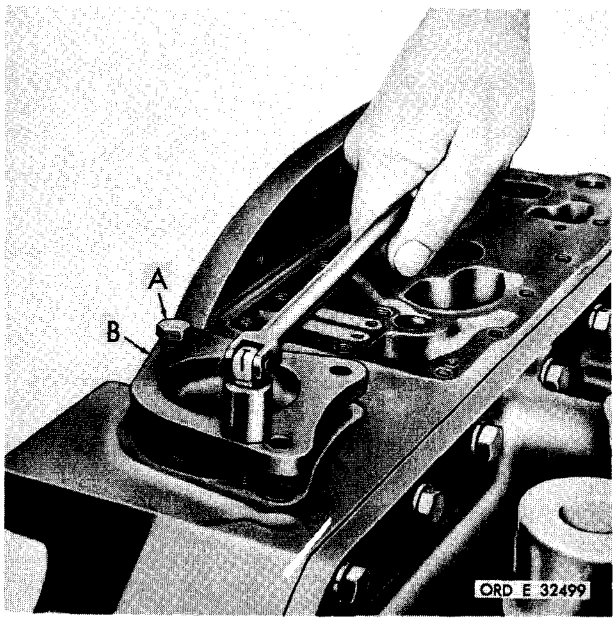


Figure 80 (Step 16)

Using a 9/16-inch wrench, remove three bolts (A) and lock washers retaining oil screen assembly (B). Using two bolts (A) as jacks crews, loosen and remove screen assembly (B).

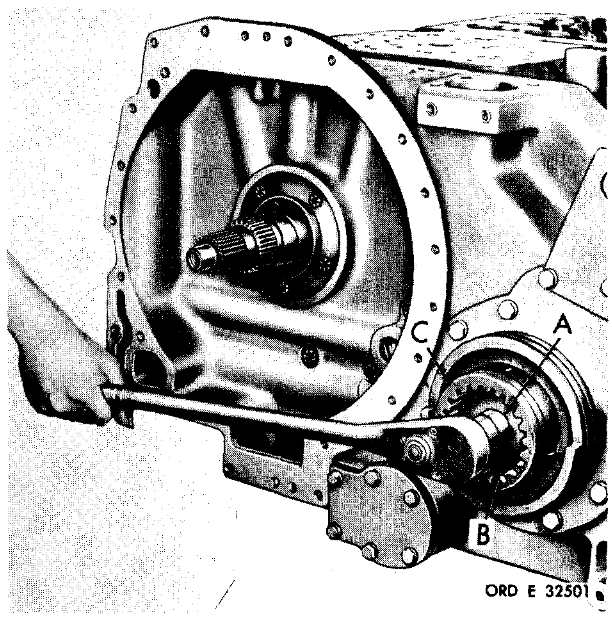


Figure 82 (Step 18)

Using a 1-inch wrench, and with the left brake applied,remove the left-output shaft self-locking bolt (A). Remove lock plate (B) and coupling (C).

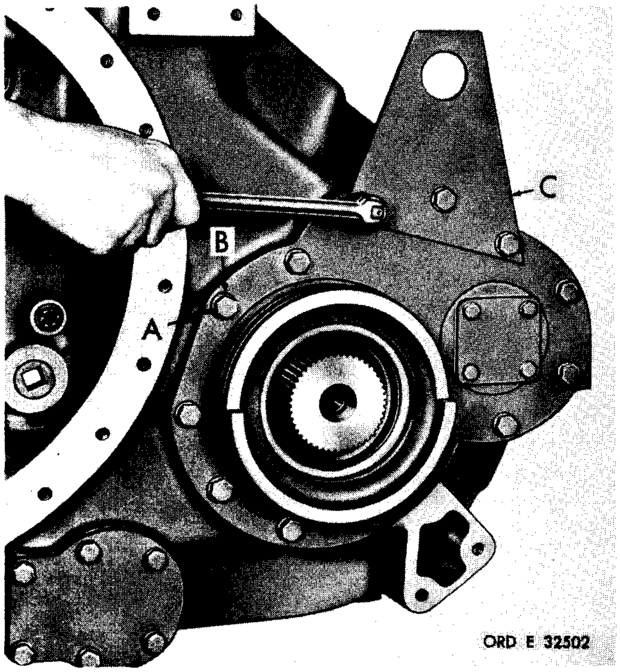


Figure 83 (Step 19)

Using a 5/8-inch wrench, remove 13 bolts (A), lock washers (B) and lifting bracket (C).

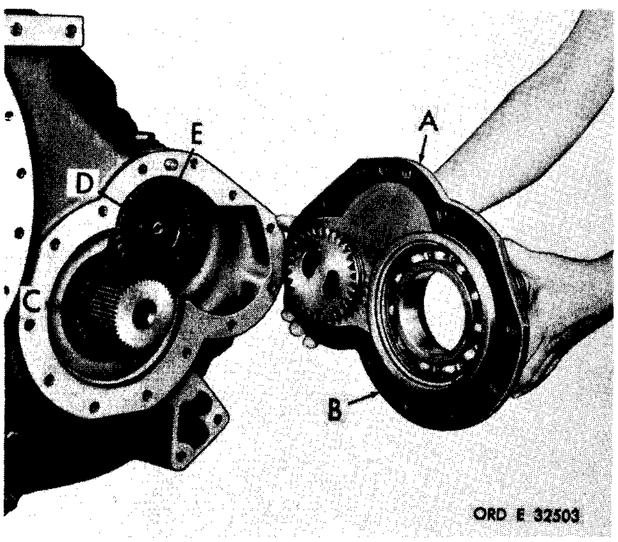


Figure 84 (Step 20)

Remove left-output support assembly (A), gasket (B) and output oil pump drive gear (C). Remove snap ring (D) retaining oil pump driven gear (E).

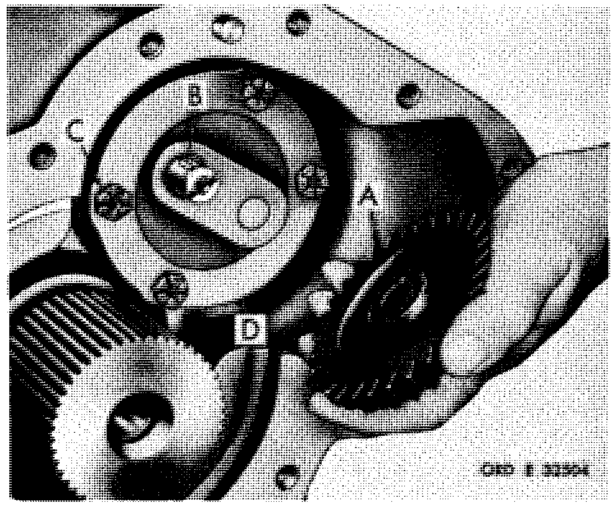


Figure 85 (Step 21)

Remove output oil pump driven gear (A) and key (B). Using a 9/16-inch wrench, remove four self-locking bolts (C) retaining oil pump (D). Remove oil pump (D).

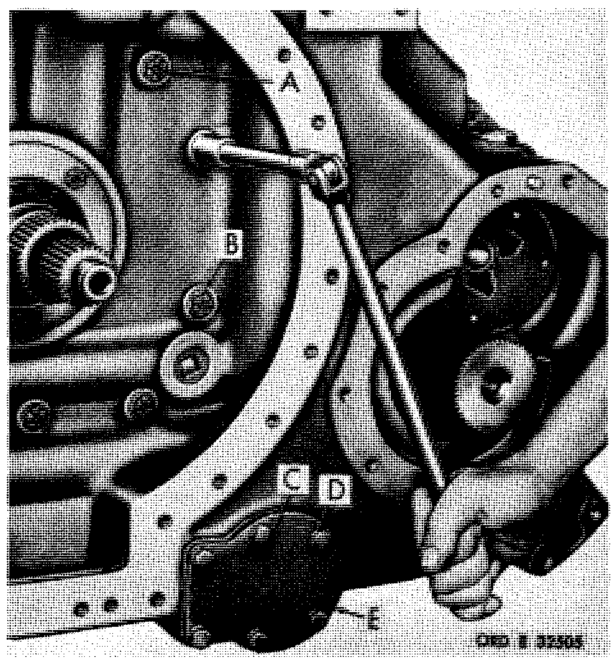


Figure 86 (Step 22)

Using a 5/8-inch wrench, remove five converter-to-main transmission housing assembly bolts (A) and flat washers (B). Using a 9/16-inch wrench, remove six bolts (C) and lock washers (D) retaining oil screen cover (E).

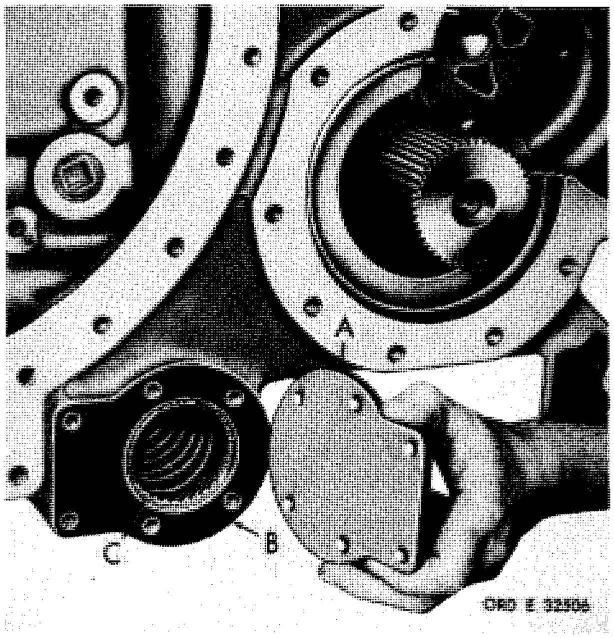


Figure 87 (Step 23)

Remove screen cover (A), gasket (B) and oil screen (C).

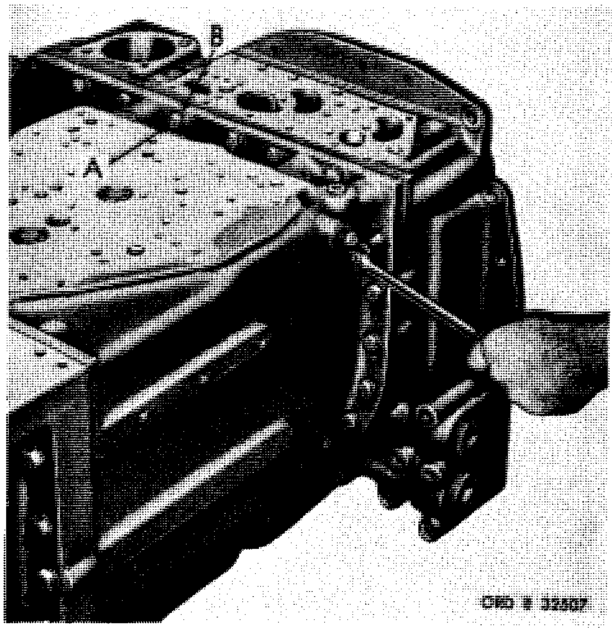


Figure 88 (Step 24)

Using a 5/8-inch wrench, remove the remaining converter-to-main transmission housing bolts (A) and lock washers (B).

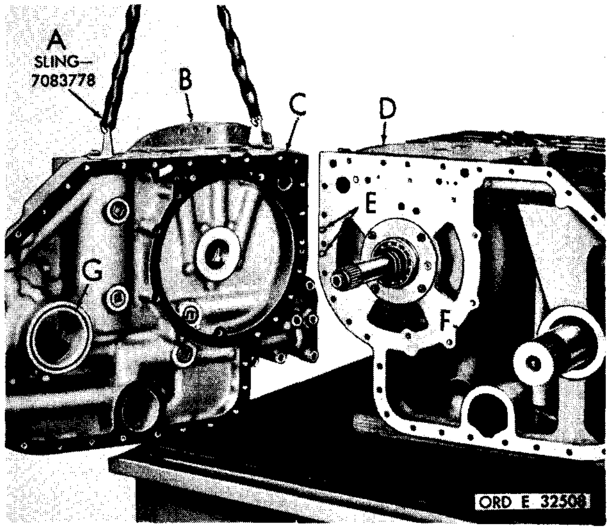


Figure 89 (Step 25)

Using lifting sling (A), remove converter housing assembly (B) and gasket (C) from transmission housing (D). Use jackscrews (E), to separate housings Remove transmission left-output shaft (F). Remove O-ring seal (G) from housing (B).

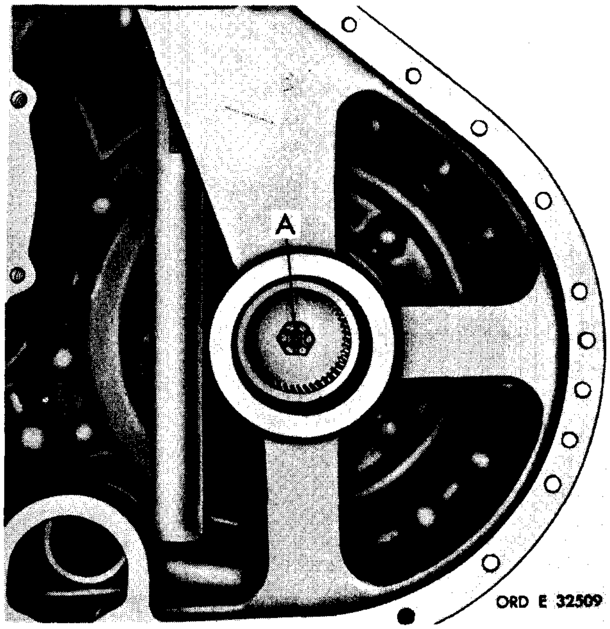


Figure 90 (Step 26)

Using a 1-inch wrench, and while applying the left brake, loosen bolt (A).

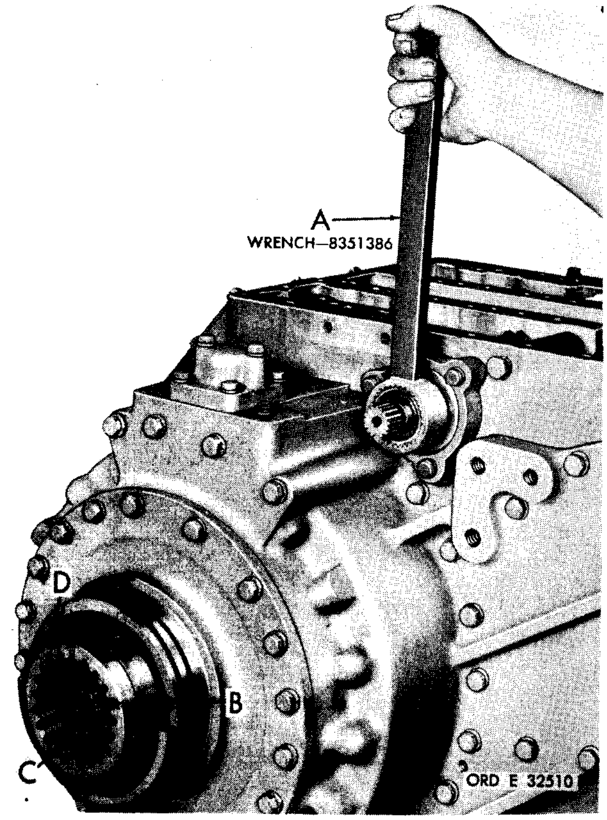
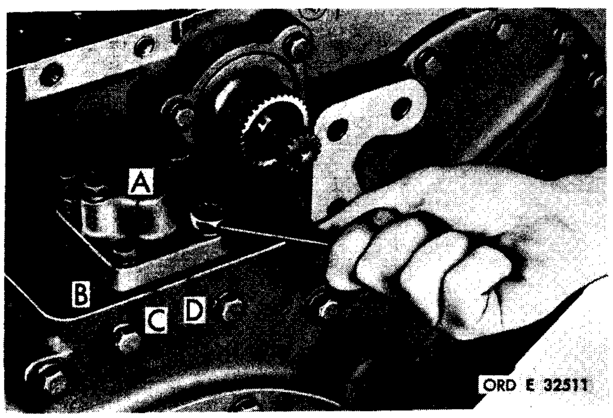


Figure 91 (Step 27)

Using wrench (A), apply transmission right brake. Using a l-inch wrench, remove bolt (B), lock plate (C) and output coupling (D).



*C2 Figure 92 (Step 28)

Using a 9/16-inch wrench, remove six bolts (A) and lock washers (B) retaining accumulator body (C). Remove accumulator body and gasket (D).

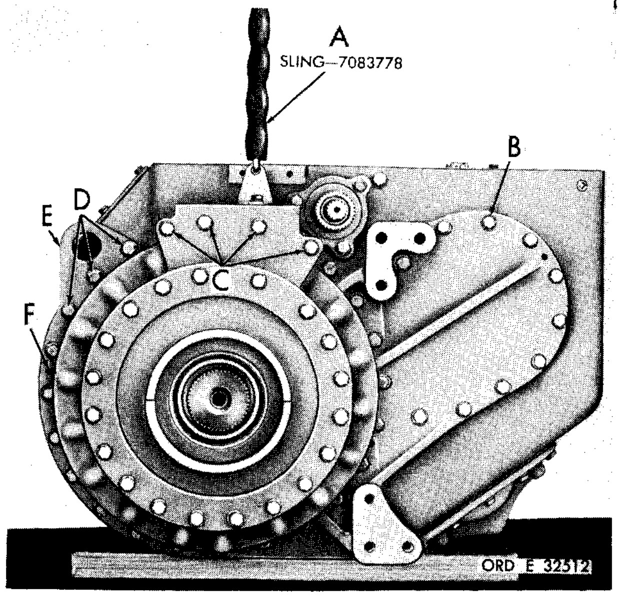


Figure 93 (Step 29)

Attach sling (A), and, using a 5/8-inch wrench, remove 27 bolts (B), four bolts (C) and three bolts (D) and 34 lock washers. Remove lifting bracket (E). Use three bolts (B) as jack-screws in holes (F), to loosen output housing.

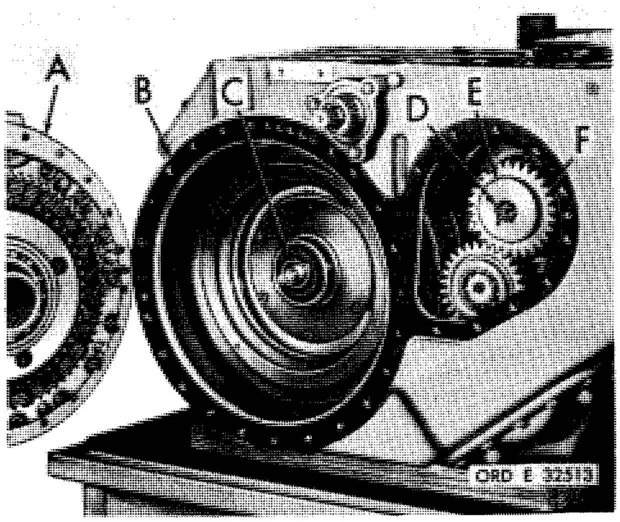


Figure 94 (Step 30)

Remove right-output housing assembly (A) and gasket (B). Remove out put transfer drive shaft (C). Using a 1-inch wrench, remove bolt (D) and lock plate (E) retaining brake coolant oil pump drive gear (F).

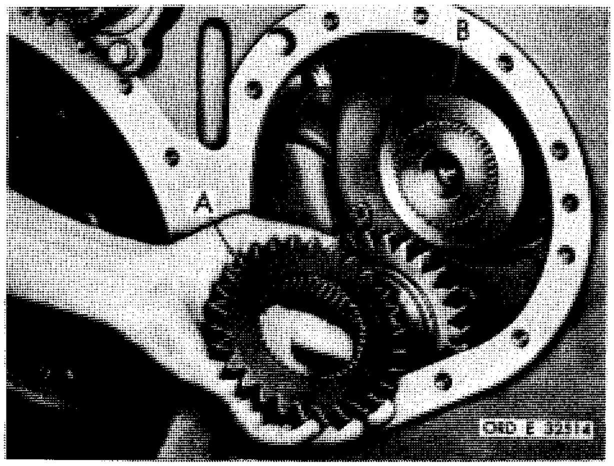


Figure 95 (Step 31)

Remove brake coolant oil pump drive gear (A) and spacer (B).

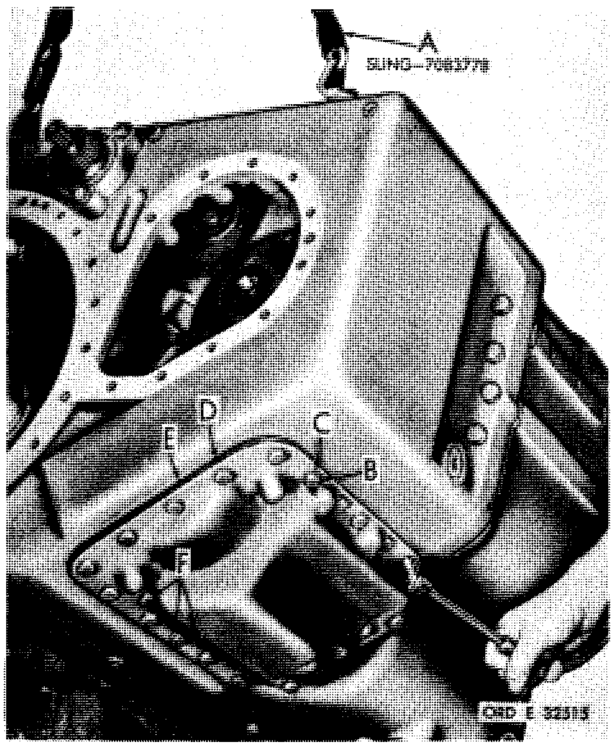


Figure 96 (Step 32)

Using sling (A), raise the transmission and block it as shown. Using a 9/16-inch wrench, remove 19 bolts (B) and lock washers (C) retaining brake coolant oil pump and manifold assembly (D). Remove assembly (D) and gasket (E). Do not remove three bolts (F).

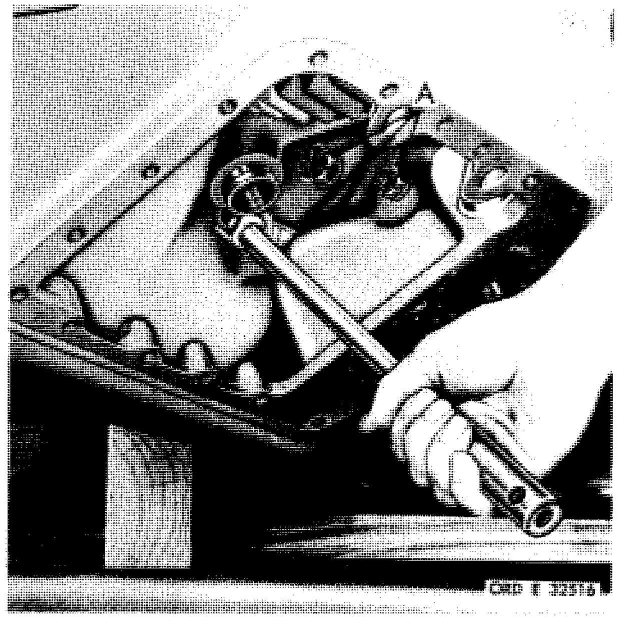


Figure 97 (Step 33)

Remove three rear-to-main transmission housing bolts (A) and flat washers.

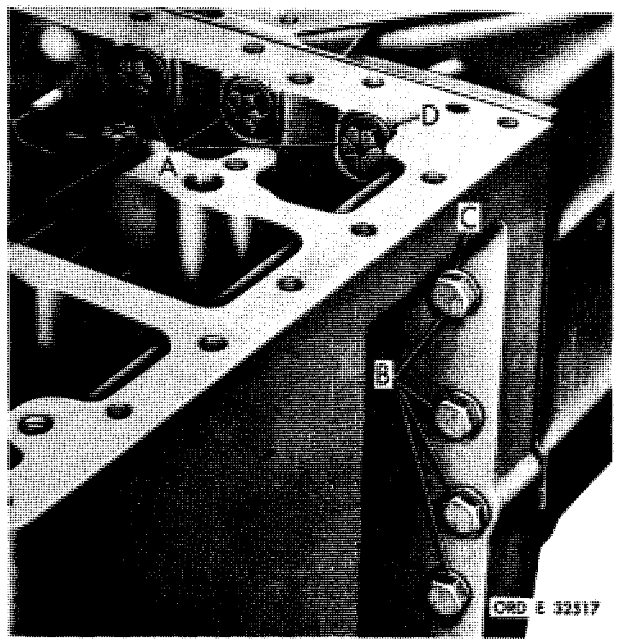


Figure 98 (Step 34)

Using a 3/4-inch wrench, remove three self-locking (A) and four standard (B) rear-to-main transmission housing bolts with lock washers (C) and flat washers (D).

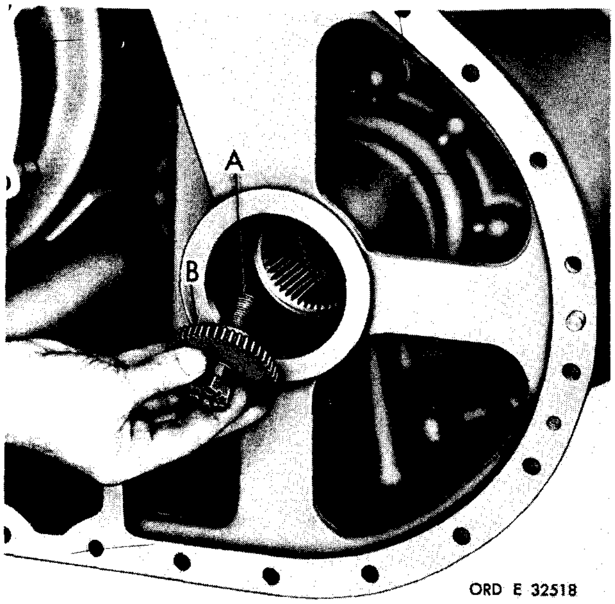


Figure 99 (Step 35)

Remove left-steer planetary retaining bolt (A) and lock plate (B).

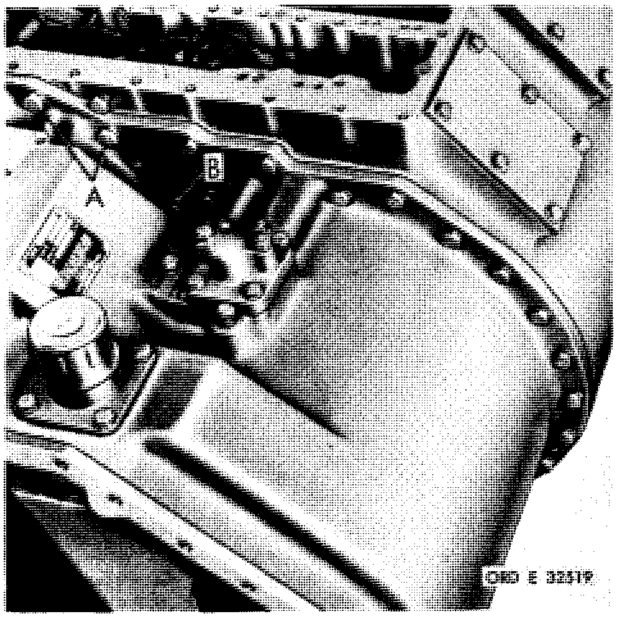


Figure 100 (Step 36)

Remove remaining rear-to-main transmission housing bolts and lock washers. Two bolts (A) require a 3/4-inch wrench. Bolt (B) requires a 15/16-inch wrench. The remainder will require a 5/8-inch wrench.

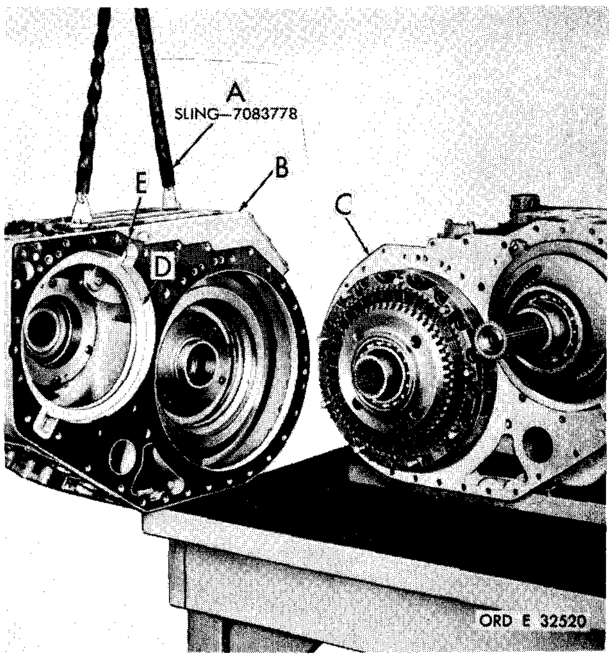


Figure 101 (Step 37)

Using sling (A), remove transmission rear housing (B) from main transmission housing (C). Remove shims (D) and gasket (E).

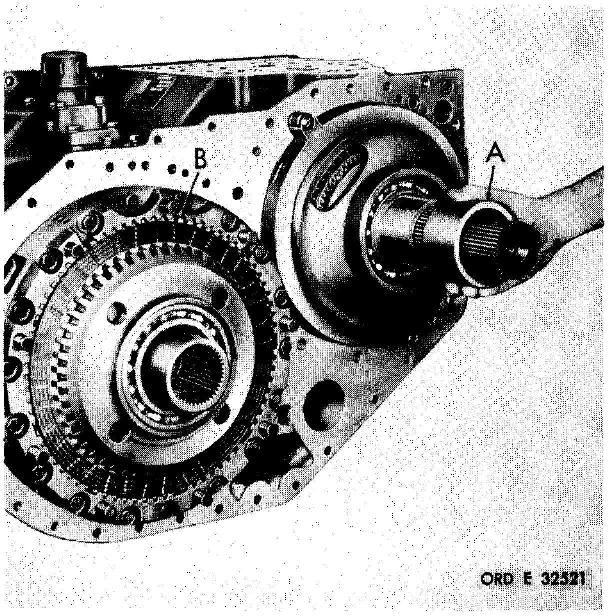


Figure 102 (Step 38)

Remove spacer (A). Remove twenty left-brake plates (B).

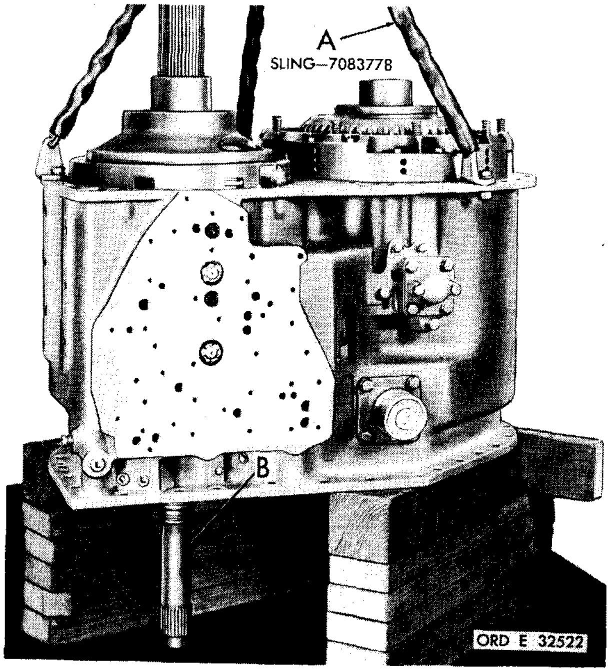


Figure 103 (Step 39)

Using sling (A), position transmission main housing on disassembly table, blocking assembly so turbine shaft (B) clears the table.

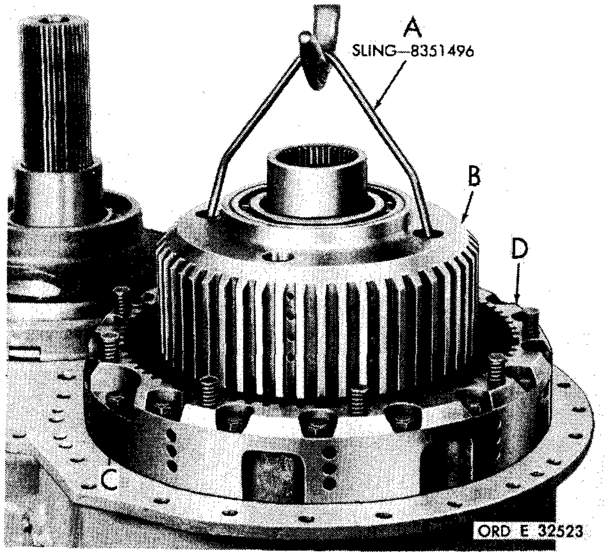


Figure 104 (Step 40)

Using hoist and sling (A), remove the left-brake hub and steer planetary assembly (B). Using a 5/8-inch wrench, remove 18 bolts (C) from left-brake anchor (D).

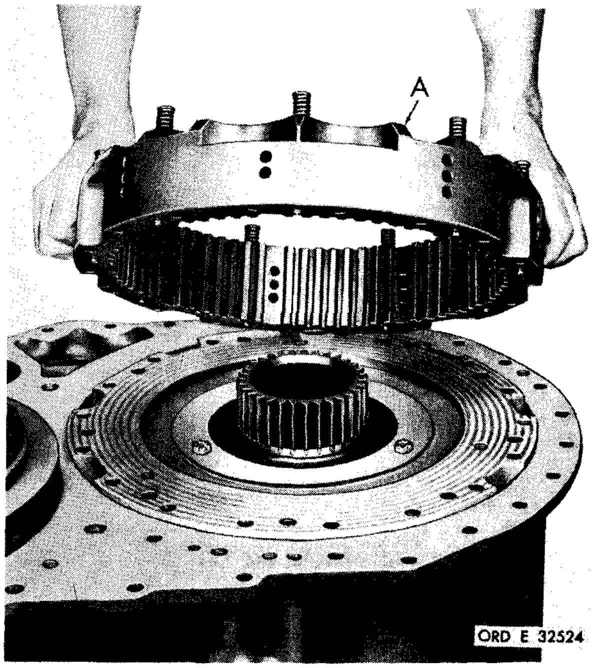


Figure 105 (Step 41)

Remove left-brake anchor assembly (A),

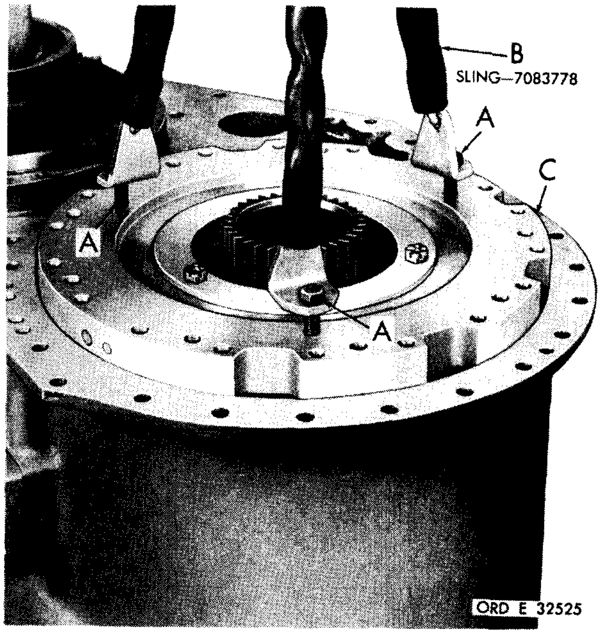


Figure 106 (Step 42)

Using three 7/16-14-inch bolts (A), attach sling (B) to left-clutch reaction plate assembly (C). Remove the reaction plate assembly.

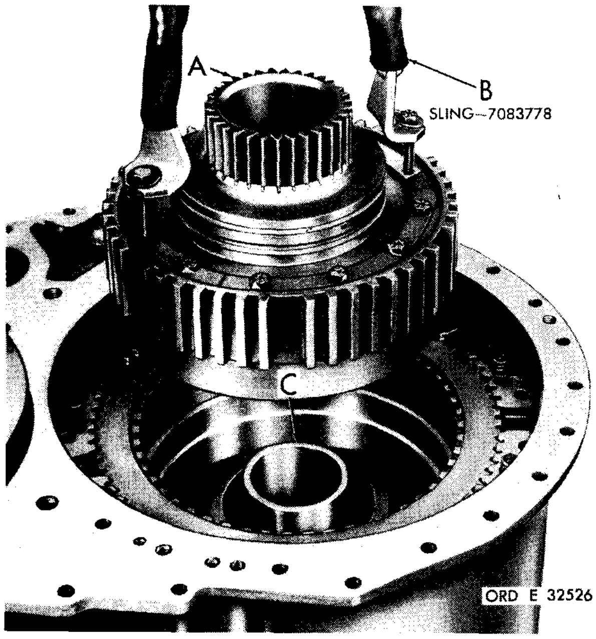


Figure 107 (Step 43)

Remove two bolts 180° apart, from left-output clutch assembly (A). Attach sling (B) and remove left-output clutch assembly (A). Remove spacer (C).

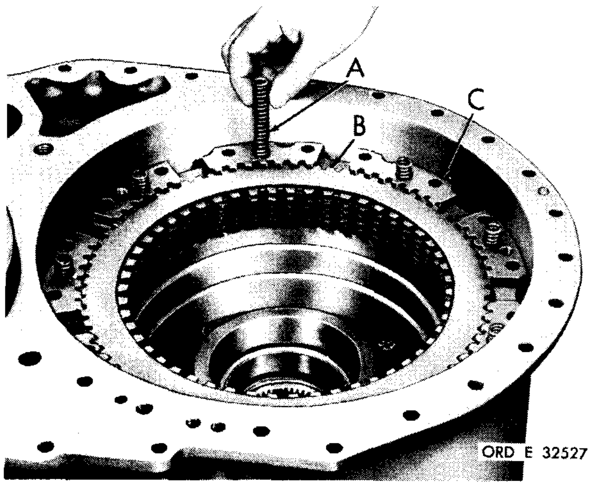


Figure 108 (Step 44)

Remove nine steer clutch release springs (A), clutchplates (B). Attach lifting sling 7083778 at three holes (C) in steer clutch anchor. Remove the anchor.

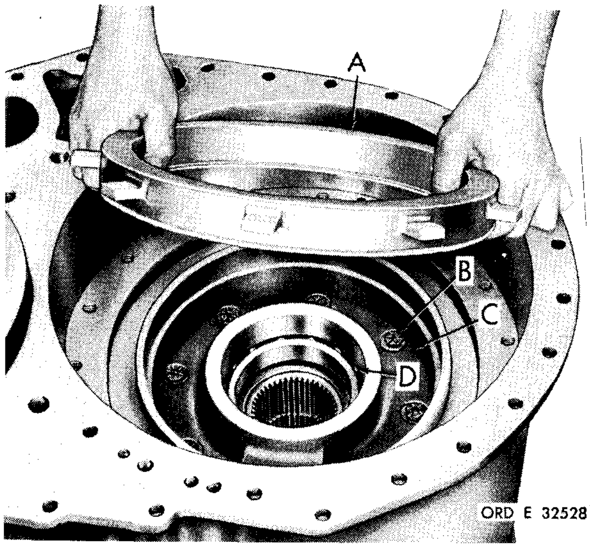


Figure 109 (Step 45)

Remove left-steer clutch piston (A). Using a 9/16-inch wrench, remove eight self-locking bolts (B) from output bearing retainer (C). Remove retainer (C) and bearing assembly (D). Remove bearing (D) from retainer.

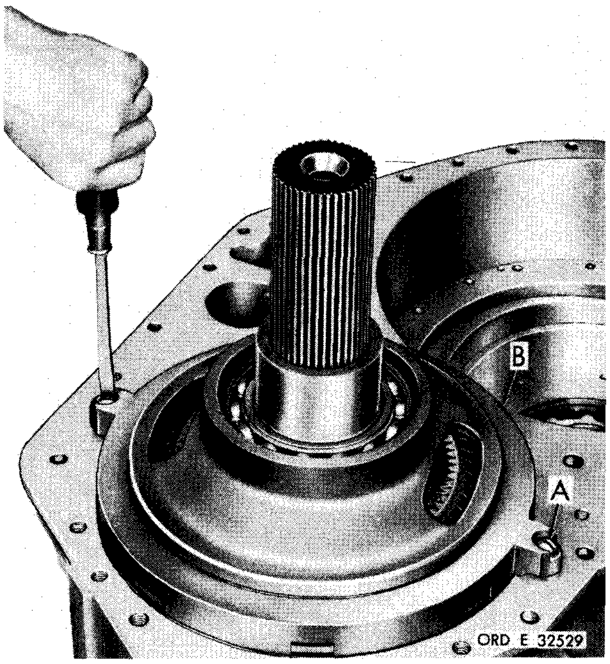


Figure 110 (Step 46) *C2

Remove two screws (A) retaining reverse-range bearing support and carrier (B).

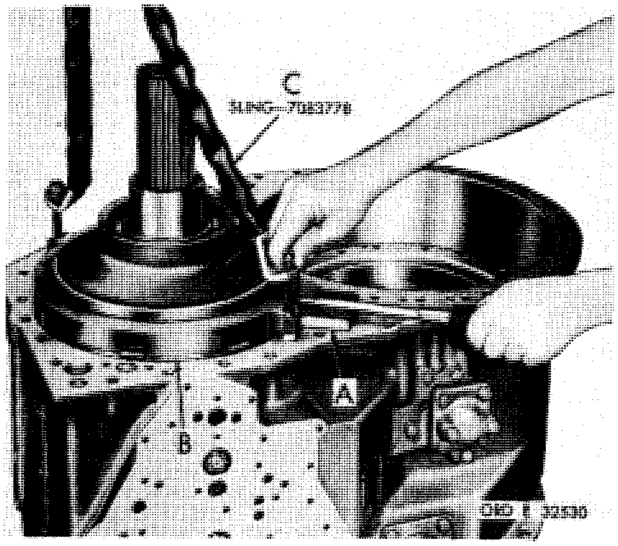


Figure 111 (Step 47)

Using a wooden block (A) and screwdriver, pry up on reverse-range support housing and carrier assembly (B) enough to attach sling (C) with two bolts and nuts. Remove support housing and carrier assembly (B).

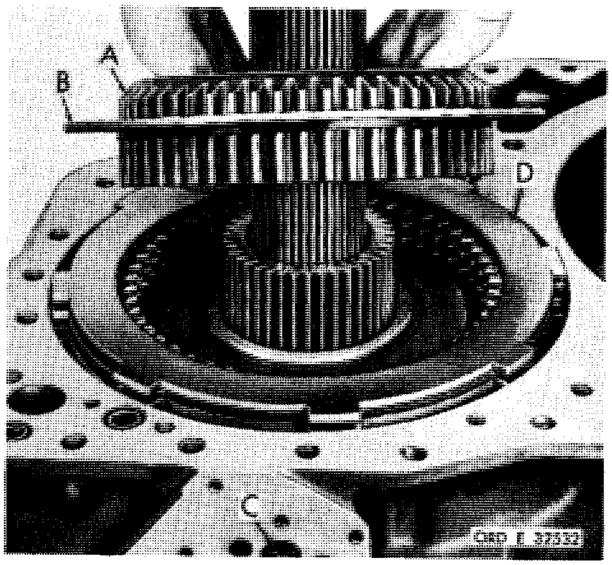


Figure 113 (Step 49)

Remove reverse-range ring gear assembly (A) and one internal-splined clutch plate (B) Using a 9/16-inch wrench, remove reverse-rance anchor bolt (C), and lock washer and flat washer. Remove remaining reverse-range clutch plates (D)

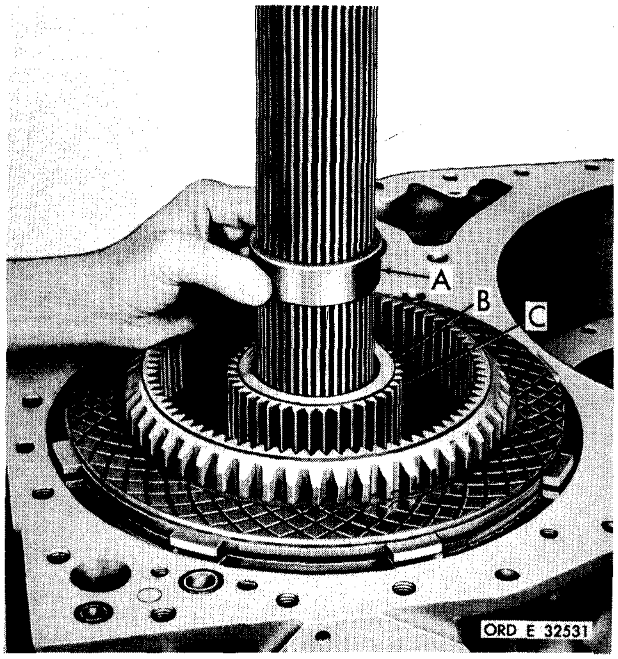
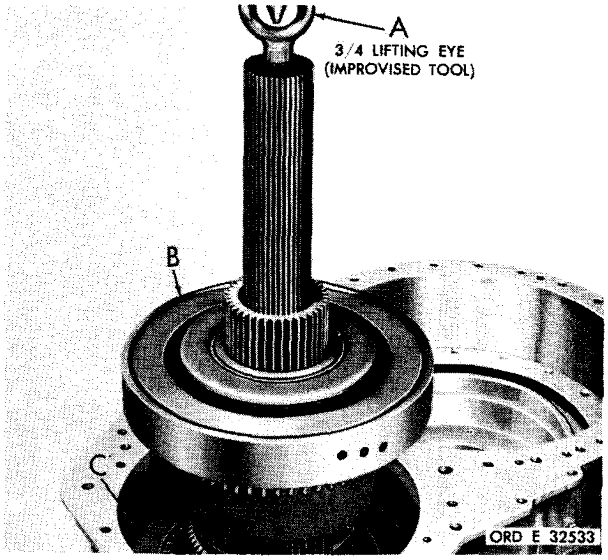


Figure 112 (Step 48)

Remove spacer (A) and thrust washer (B) from reverse-range sun gear (C).



*C2 Figure 114 (Step 50)

Using hoist and lifting eye (A), remove low- and intermediate-range carriers, and low and reverse-range clutch piston housing as an assembly (B). Caution: Be careful that low-range clutchplates (C) do not fall out with removal of assembly (B).

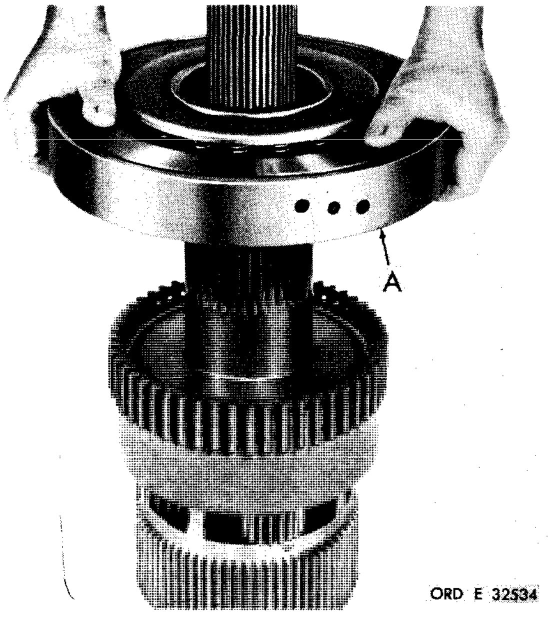


Figure 115 (Step 51)

Position the assembly on the disassembly table and remove the hoist and lifting eye. Remove low- and reverse-range clutch piston housing assembly (A).

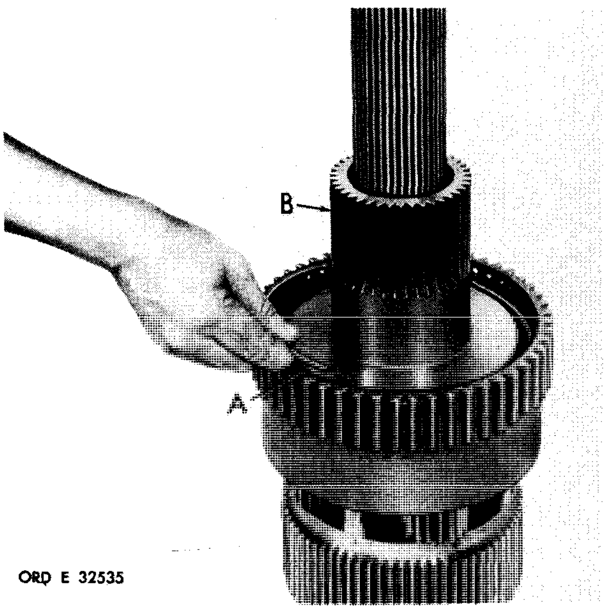


Figure 116 (Step 52)

Remove snap ring (A) retaining reverse-range sun gear (B). Remove reverse-range sun gear.

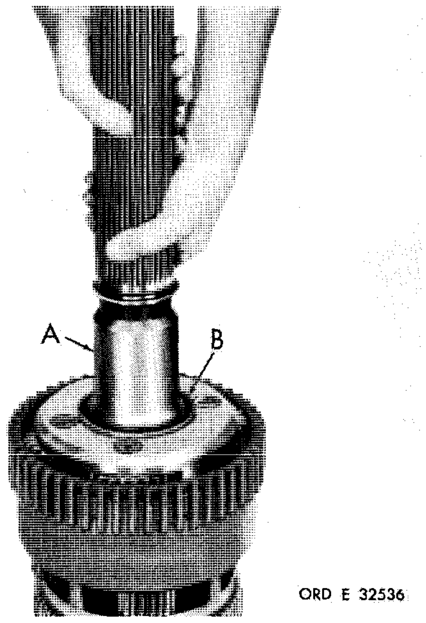


Figure 117 (Step 53)

Remove low-range carrier and shaft assembly (A). Remove thrust washer (B) from carrier.

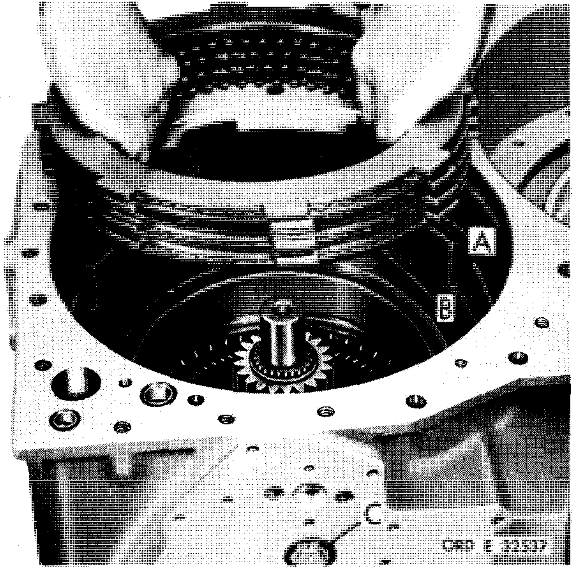


Figure 118 (Step 54)

Remove four external- (A) and four internal- (B) splined low-range clutch plates. Using a 15/16-inch wrench, remove low-range clutch anchor nut (C) and flat washer.

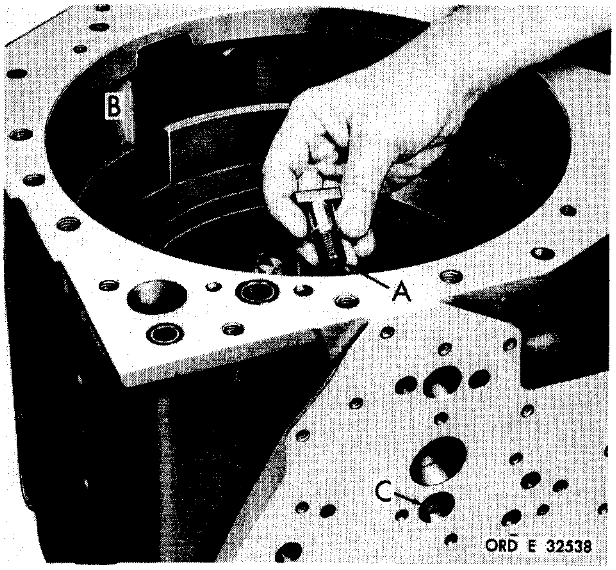


Figure 119 (Step 55)

Remove low-range clutch anchor bolt (A). Remove clutch anchor (B). Using a 9/16-inch wrench, remove intermediate-range clutch anchor bolt (C), lock washer and flat washer.

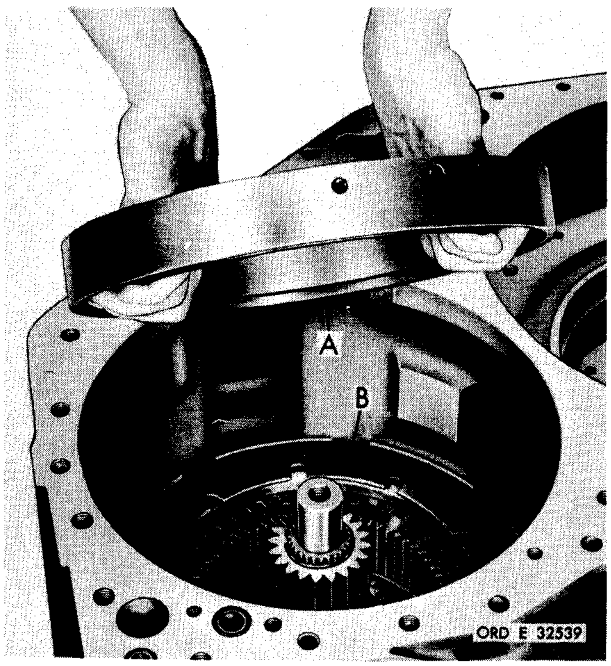


Figure 120 (Step 56)

Remove intermediate-range clutch piston housing assembly (A) and Belleville spring (B).

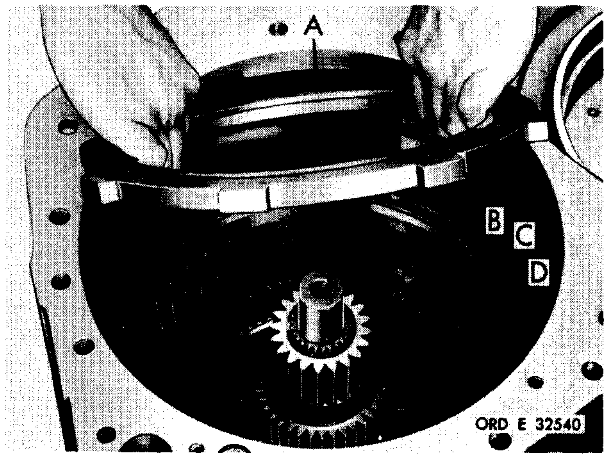


Figure 121 (Step 57)

Remove intermediate-range clutch apply plate (A). Remove ring gear assembly (B) with one external-splined (C) and one internal-splined (D) clutch plate.

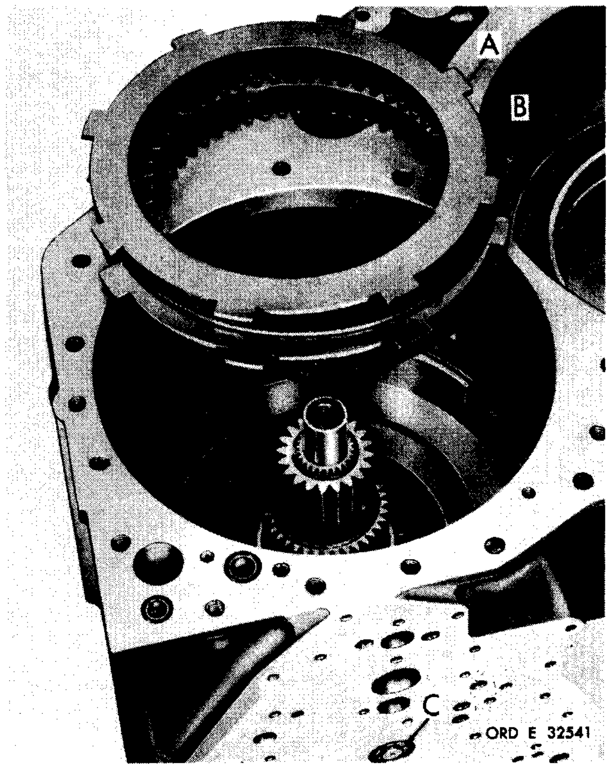


Figure 122 (Step 58)

Remove remaining two external-splined (A) and internal--splined (B) clutch plates. Using a 15/16-inch wrench, remove intermediate-range clutch anchor nut (C) and flat washer.

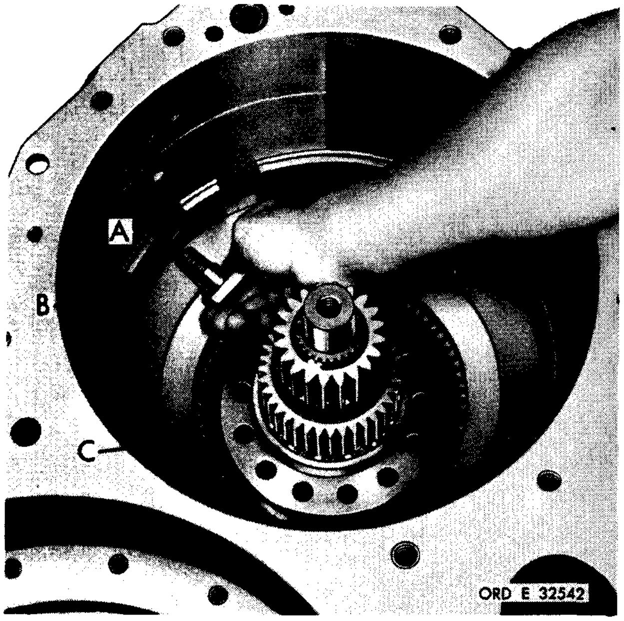
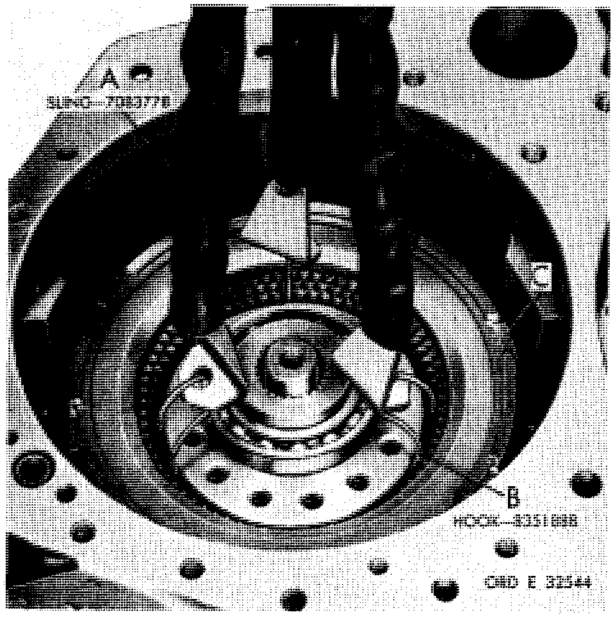


Figure 123 (Step 59)

Remove intermediate-range clutch anchor bolt (A). Remove clutch anchor (B) and oil collector (C).



*C2 Figure 125 (Step 61)

Using sling (A) and hooks (B), remove high-range clutch assembly (C).

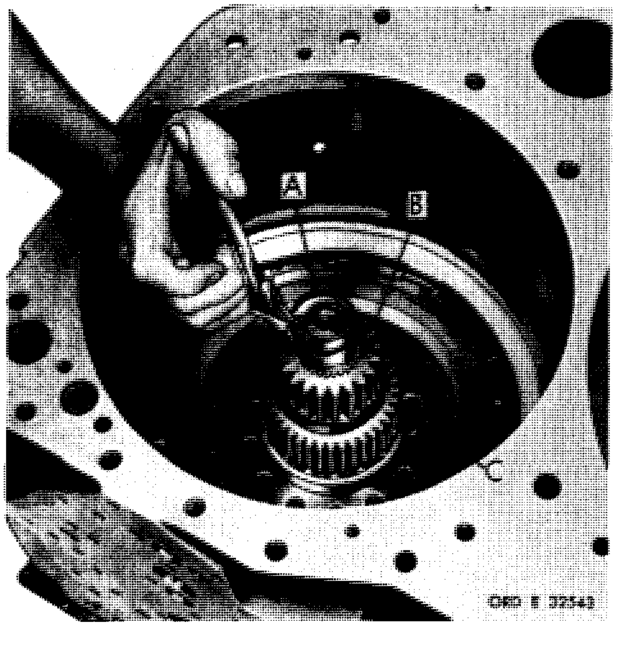
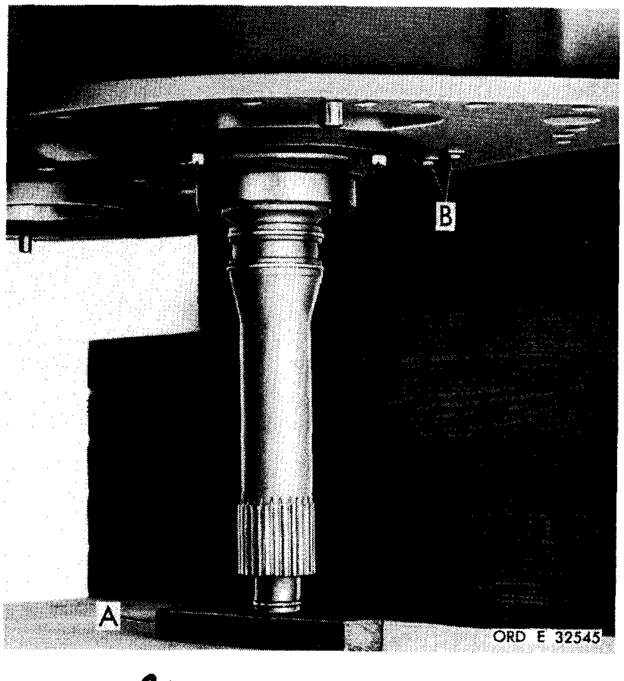


Figure 124 (Step 60)

Remove snap ring (A) retaining low-range sun gear (B). Remove low- (B) and intermediate- (C) range sun gears.



* C2 Figure 126 (Step 62)

C2

Block up the turbine shaft with a wooden block (A). Using a 7/16-inch wrench, remove two self-locking bolts (B) and flat washers.

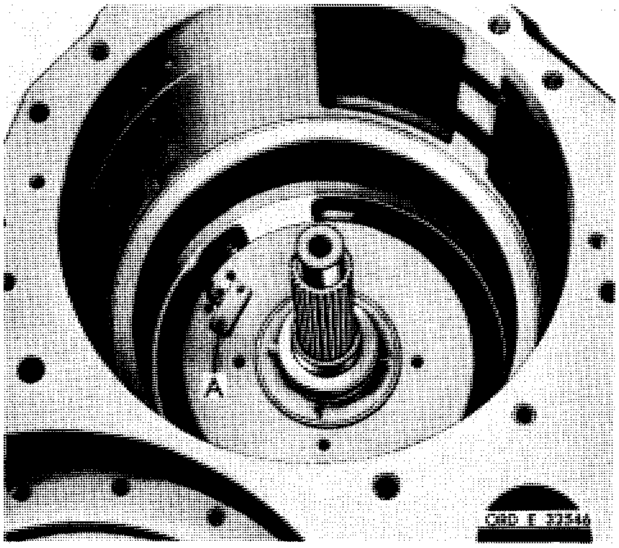


Figure 127 (Step 63)

Remove pitot tube assembly (A).

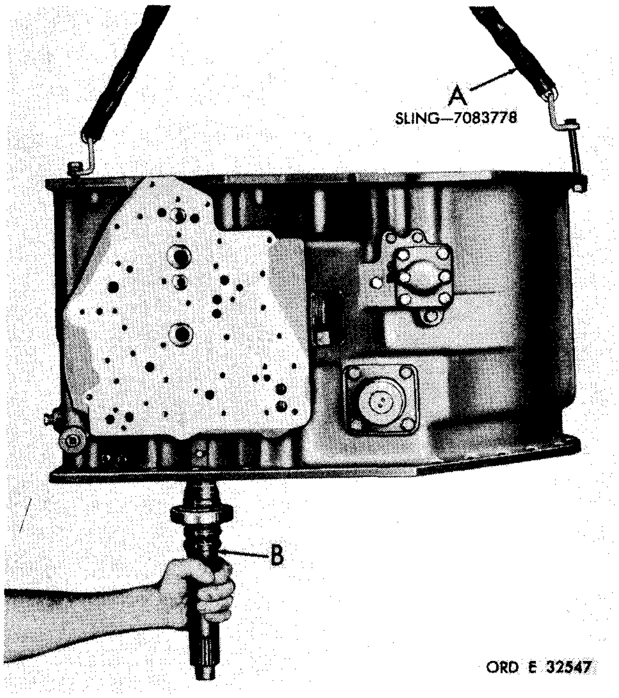


Figure 128 (Step 64)

Using sling (A), lift the transmission housing and remove converter turbine shaft assembly (B). Position the transmission housing on its bottom side.

76. **DISASSEMBLY STEPS – LEFT- AND RIGHT-OUTPUT DRIVE ASSEMBLIES**

Note. The left- and right-output drive assemblies are identical with the exception of the length of two components. The left-input shaft and left-saddle assembly are longer than the corresponding components of the right-output drive assembly. The disassembly procedures are the same for both assemblies. With the exception of Step 2, the following illustrations show the disassembly procedures for the right-output drive assembly. Step 2 illustrates the left-output drive assembly, and shows the difference in size of the input shafts and saddle assemblies of the right- and left-output assemblies.

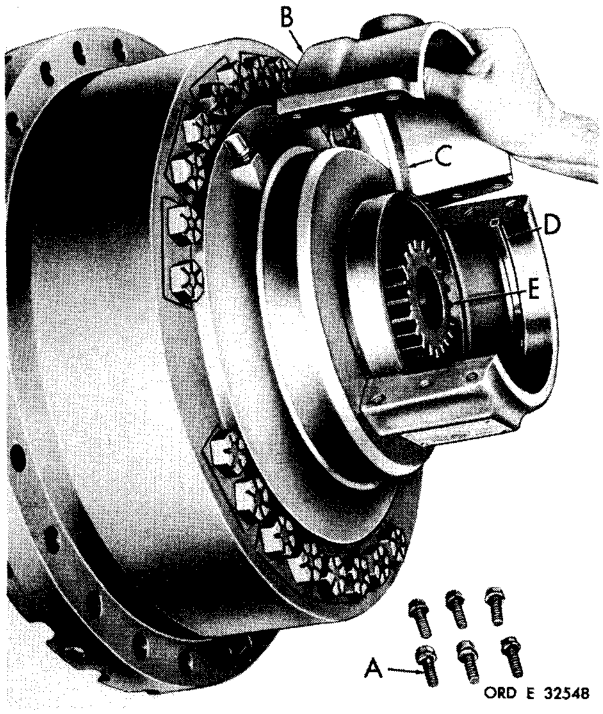


Figure 129 (Step 1)

Using a 9/16-inch wrench, remove six bolts (A) and lock washers. Remove output drive coupling cap (B). Remove seal (C) from cap (B). Remove alinement ring (D) and input shaft (E).

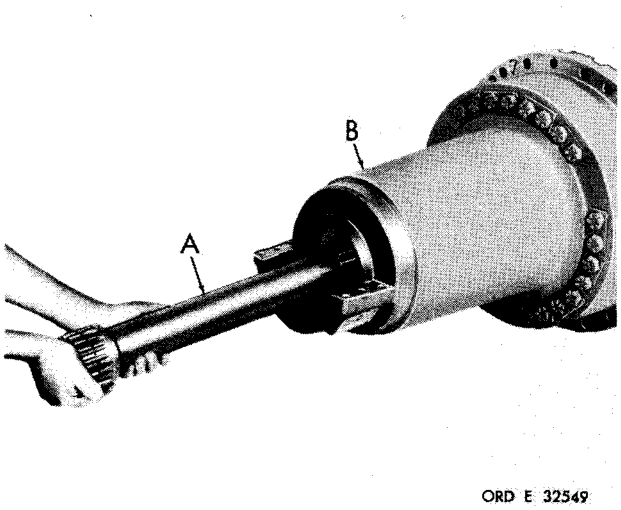


Figure 130 (Step 2)

Remove the input shaft (A) from left-output drive assembly (B).

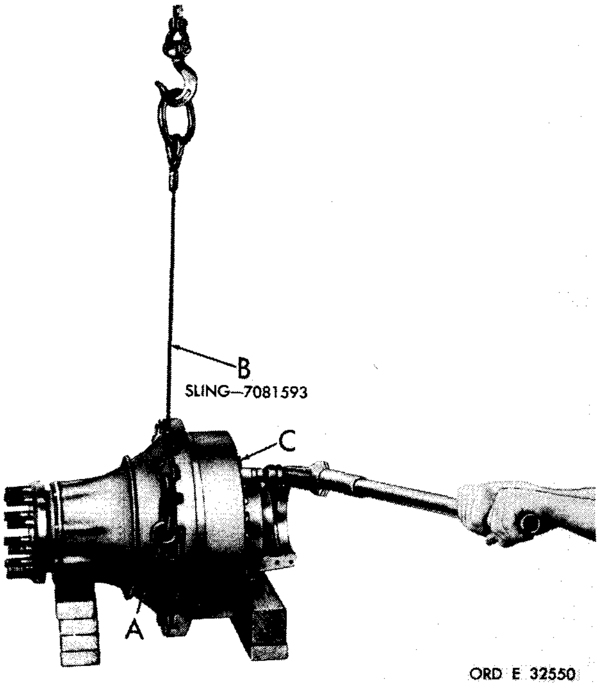


Figure 131 (Step 3)

Using lifting eye (A) and sling (B) to prevent the drive assembly from turning, and using a 1-1/8-inch wrench, loosen 24 bolts (C).

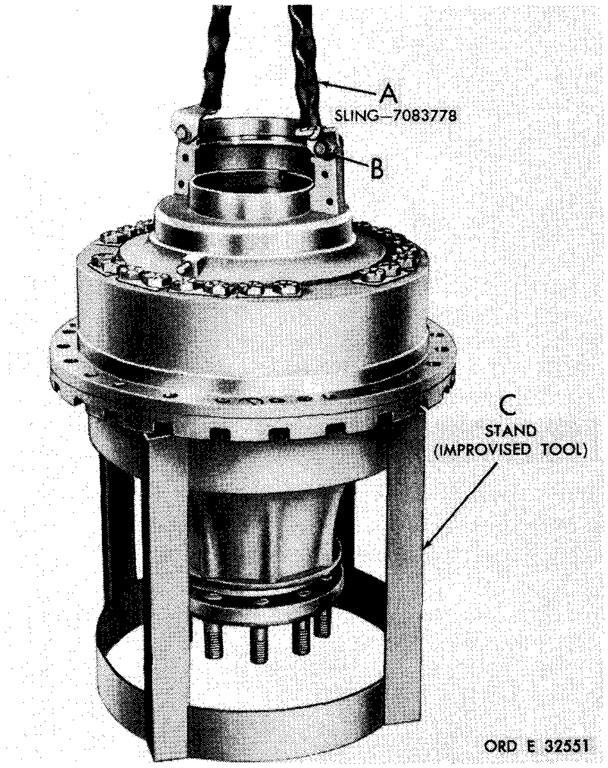


Figure 132 (Step 4)

Using sling (A) and two 3/8-24 x 1 bolts (B) and flat washers, place the assembly in an improvised stand (C).

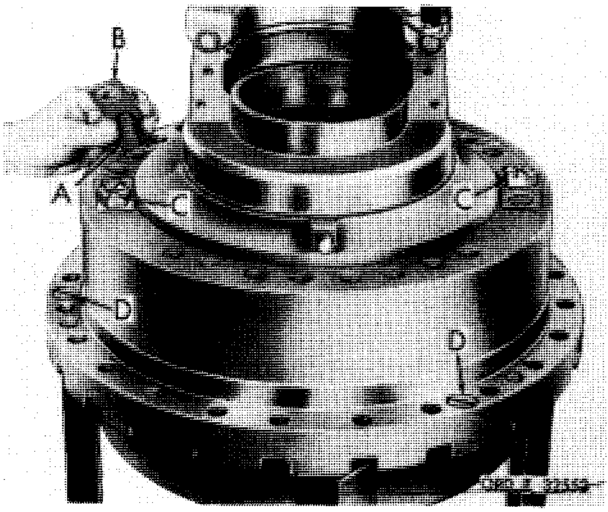


Figure 133 (Step 5)

Remove twenty-two bolts (A) and washers (B), leaving two of the bolts (C), 180 degrees apart. Remove three screws (D).

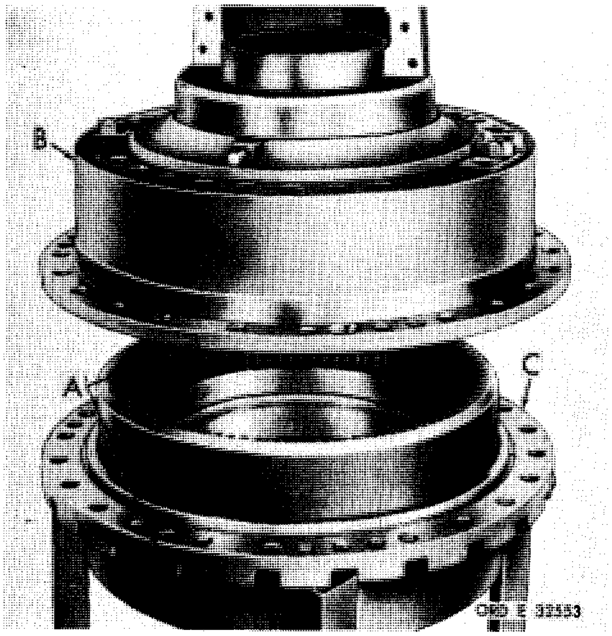


Figure 134 (Step 6)

Place an index mark (A) across output drive saddle (B)-to-housing (C) split line. Remove saddle (B).

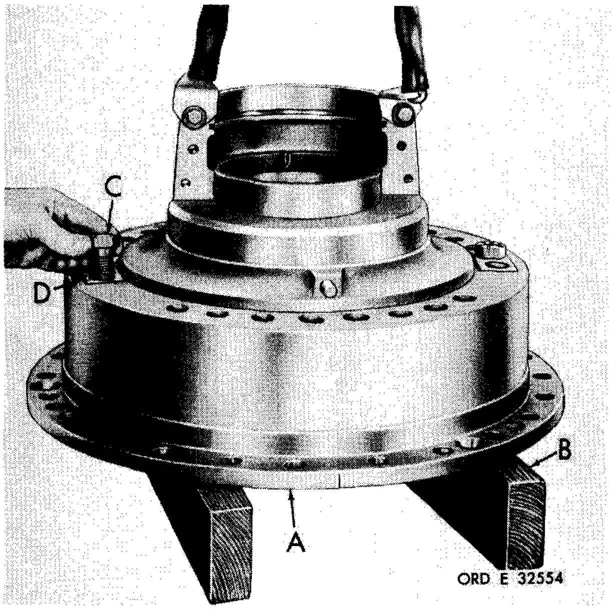


Figure 135 (Step 7)

Position output drive saddle assembly (A) on wooden blocks (B). Remove remaining two bolts (C) and washers (D).

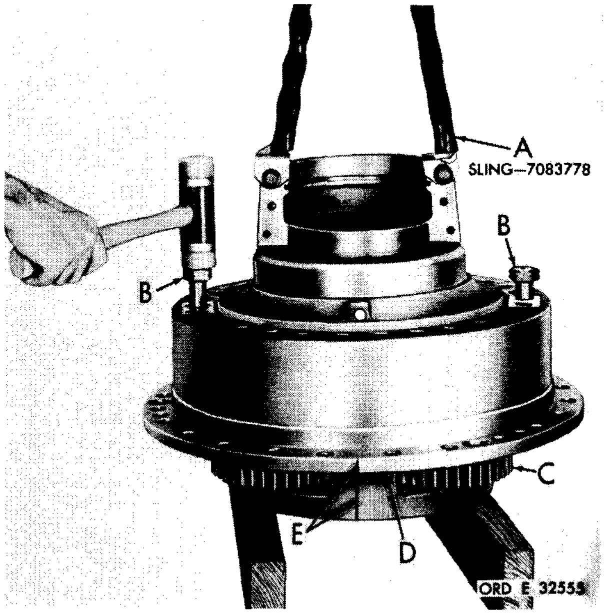
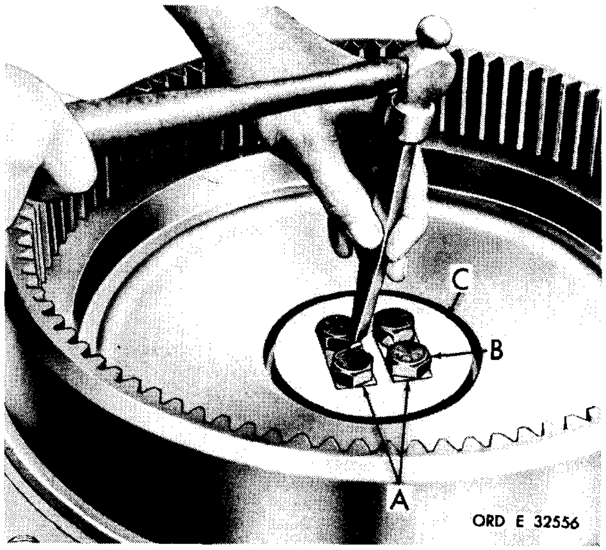


Figure 136 (Step 8)

Using sling (A) and two 7/8-14 x 6-inch bolts (B), raise the assembly and drive output drive planetary carrier (C) from saddle assembly (D). Place index marks (E) on the saddle and carrier assembly, then remove saddle assembly (D).



*C2 Figure 137 (Step 9)

Straighten the tabs on lock strips (A). Using a 15/16-inch wrench, remove four bolts (B), lock strips (A) and lock plate (C).

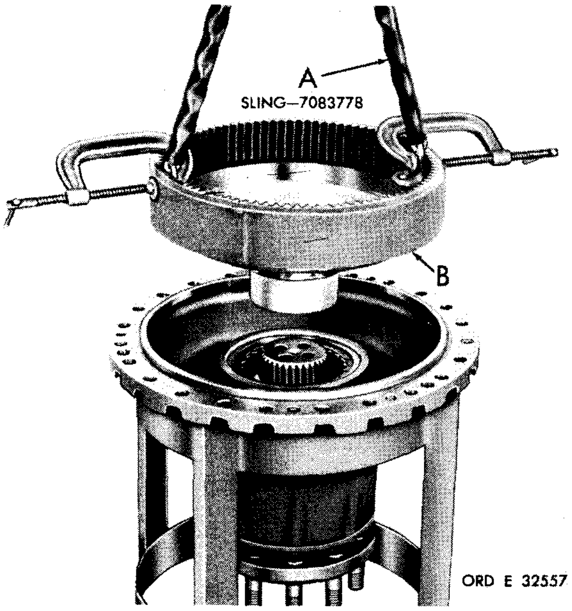


Figure 138 (Step 10)

Attach sling (A) to the output drive planetary carrier ring gear assembly (B) and remove the assembly.

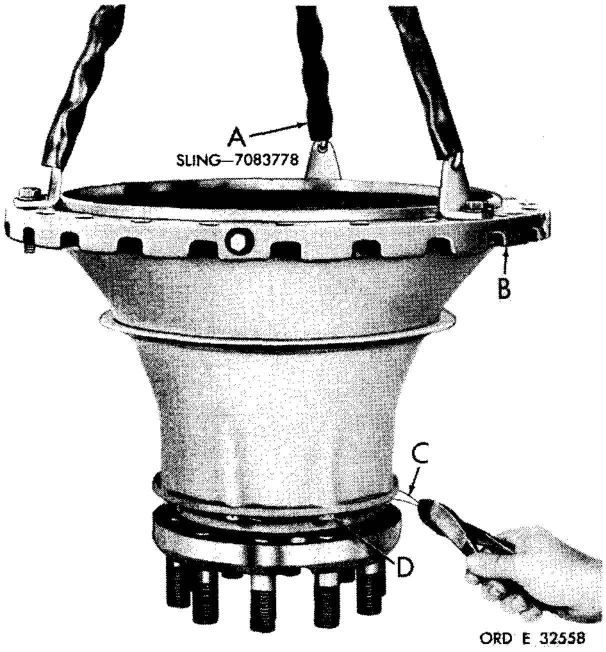


Figure 139 (Step 11)

Attach sling (A) to output drive housing (B). Remove lock wire (C) from bolts (D).

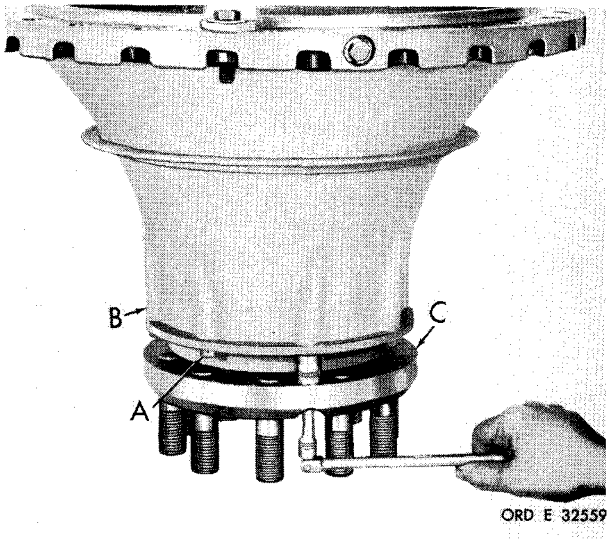


Figure 140 (Step 12)

Using a 5/8-inch wrench, remove eight bolts (A) from output housing (B) through hole provided in output shaft assembly (C).

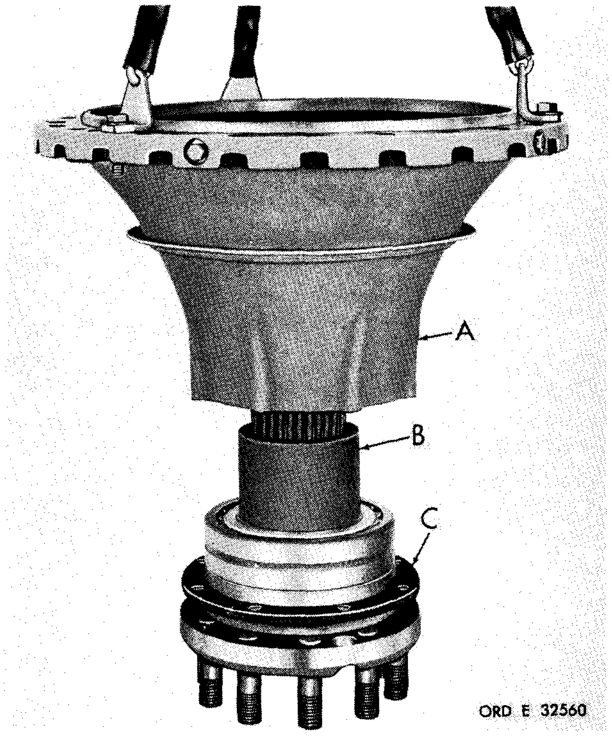


Figure 141 (Step 13)

Remove output drive housing assembly (A). Remove spacer (B) and gasket (C).

Section III, INPUT PRESSURE AND SCAVENGE OIL PUMP ASSEMBLY—REBUILD

77. DESCRIPTION

Refer to par. 10 for description of the input pressure and scavenge oil pump assembly.

78. DISASSEMBLY (fig. 373, fold-out 2)

a. Using a 9/16-inch wrench, remove four self-locking bolts 52 from pump assembly 45.

b. Remove scavenge oil pump body 47, gears 55 and 56 and Woodruff key 51.

c. Do not remove the two needle bearings 53 and 54 from scavenge pump body 47 unless replacement is necessary. Remove bearings with an expanding slide hammer remover tool. If such a tool is not available, the bearings will have to be cut out with a burr gun.

d. Remove pump separator plate assembly 48.

e. Remove pressure pump drive gear 57 and idler gear 58 from pump body 61.

f. Do not remove the two needle bearings 59 and 60 from the pressure pump body 61 unless replacement is necessary. Remove bearings with an expanding slide hammer remover tool. Refer to c. above.

g. Do not remove the two dowel pins 49 from the pump separator plate 50 unless replacement is necessary. If necessary, remove the dowels.

79. CLEANING

Refer to par. 71 for cleaning recommendations.

80. INSPECTION AND REPAIR

Refer to par. 72 for general inspection and repair recommendations. Repair and rebuild points of measurement for fits, clearances and wear limits are indicated by small, lower case letters in fig, 373, fold-out 2. Refer to par. 236 for wear limits information.

81. ASSEMBLY (fig. 373, fold-out 2)

a. If the two dowel pins 49 were removed from–pump separator plate 50, press in new pins, leaving one end of each within 0.420 inch of the plate surface.

b. If the two needle bearings 59 and 60 were removed from pressure pump body 61, install new replacements. Press the bearing, against the numbered side of the bearing cage, 0.060 to 0.100 inch below the surface adjacent to the bearing bore.

c. If the two needle bearings 53 and 54 were removed from scavenge pump body 47, install new replacements. Press the bearing, against the numbered side of the bearing cage and from the inside of the body, 0.010 to 0.040 inch below the surface adjacent to the bearing bore.

d. Install input pressure pump drive gear 57 and idler gear 58 into input pressure pump body 61.

e. Install pump separator plate assembly 48.

f. Install Woodruff key 51 onto input pressure pump drive gear 57.

g. Install scavenge pump gears 55 and 56 onto input pump drive gear 57 and idler gear 58.

h. Install scavenge pump body assembly 47 and secure with four 3/8-16 x 2-1/4 self-locking bolts 52. Torque the bolts to 36-43 pound-feet. After assembly, the pump should rotate freely.

Section IV. TORQUE CONVERTER—REBUILD

82. DESCRIPTION

Refer to par. 9 for description of the torque converter assembly.

83. DISASSEMBLY (fig. 373, fold-out 2)

Note. All related items not covered in a through d, below, were removed from the transmission as outlined in par. 74, steps 1 through 25. No further disassembly of those parts is required.

a. Torque Converter Cover

(1) Using a 5/8-inch wrench, remove 24 self-locking bolts retaining the input drive transfer gear (fig. 142). Remove the gear.

(2) Remove the retaining ring from the torque converter support bearing.

(3) Remove the bearing support sleeve.

(4) Using a hammer and punch, bend the lip of the converter lock nut away from the notches in the hub of the torque converter cover (fig. 143).

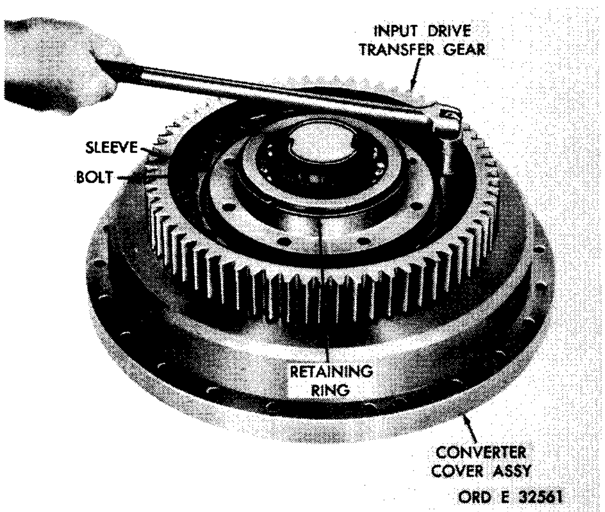


Figure 142. Removing (or installing) input drive transfer gear

(5) Using spanner wrench 8351495, remove the converter lock nut (fig. 144).

(6) Remove the double-row ball bearing from the hub of the converter cover.

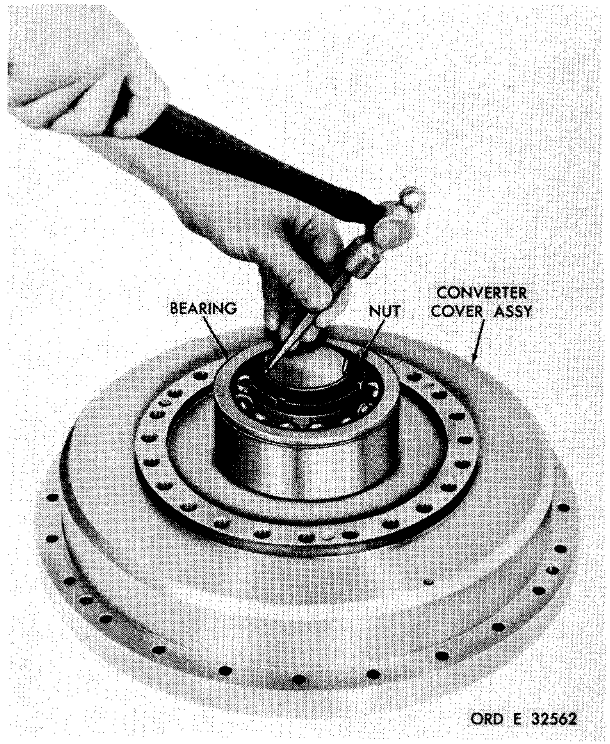


Figure 143. Straightening lip of torque converter lock nut

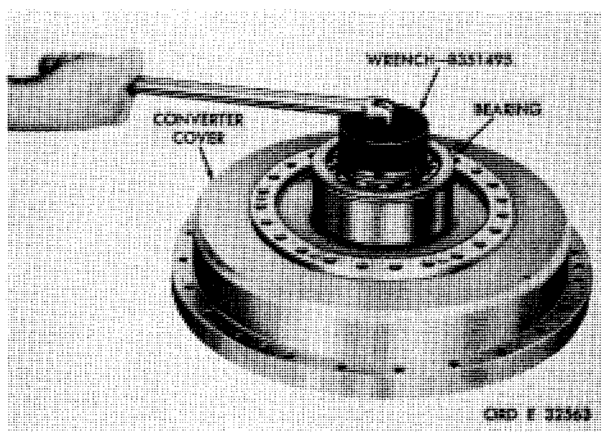


Figure 144. Removing (or installing) converter lock nut

*C2

b. Torque Converter Pump

(1) Straighten the tabs of lock strips on the converter pump hub (fig. 145).

(2) Using a 7/16-inch wrench, remove eight self-locking bolts and four lock strips retaining the torque converter pump hub in the converter pump. Remove the hub.

(3) Remove two hook-type seal rings 87 (fig. 373, fold-out 2) from pump nub 88.

(4) Remove retaining ring 92 retaining bearing 91 in converter pump hub 88. Press the bearing from the hub.

*C2 (5) Do not remove screw 85 and bolt 86 and weights 84 from the outer circumference of torque converter pump 83, unless replacement is necessary. If bolts and weights are removed, identify weights with their locations on the pump, prior to removal.

c. Torque Converter Turbine

(1) Do not remove the ball bearing from the turbine assembly, unless replacement is necessary (fig. 146).

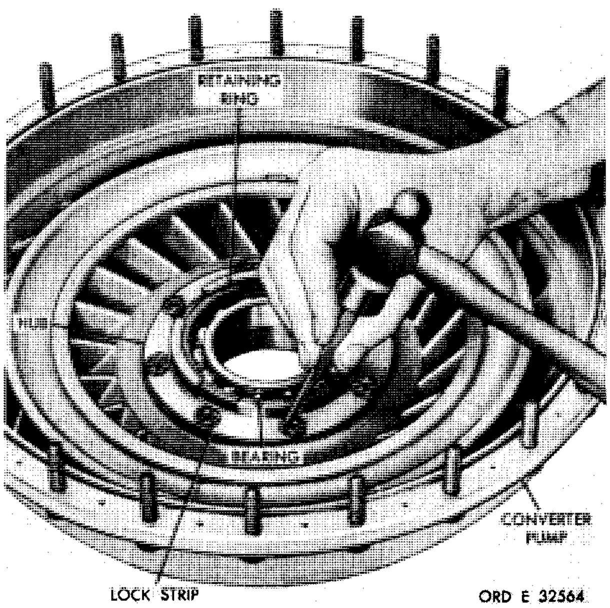


Figure 145. Straightening corners of converter pump hub lock strip

(2) If necessary to remove the bearing, pry it from the turbine hub.

d. Torque Converter Stator

(1) Rotating the stator freewheel race in a clockwise direction, remove it from the stator assembly (fig. 147).

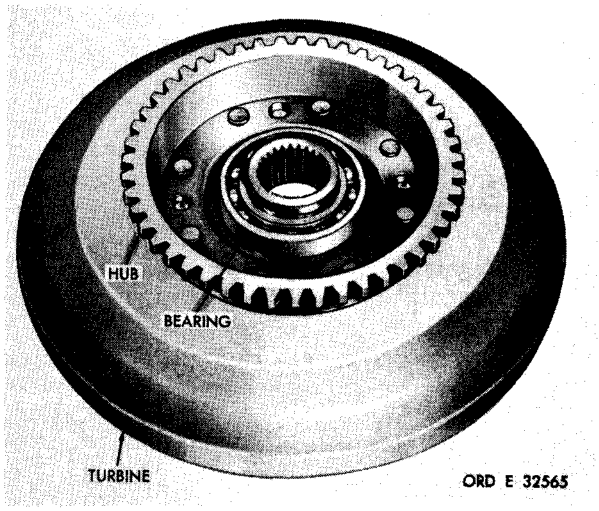


Figure 146. Torque converter turbine assembly

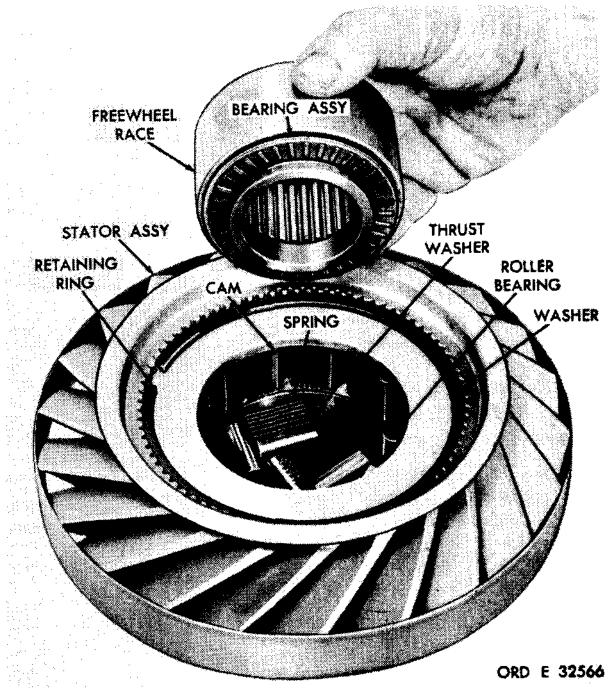


Figure 147. Removing stator freewheel race and thrust bearing assembly from stator

(2) Remove 12 stator roller bearings and springs from the stator (fig. 147).

(3) Remove the roller thrust bearing assembly from the freewheel race. Remove roller thrust washer from the stator (fig. 147). If either bearing or thrust washer is damaged, replace both parts.

(4) Remove the front and rear retaining rings, two large thrust washers and two small thrust washers from the stator assembly. Mark the stator cam and stator assembly for reference in reassembly. Press out the cam.

84. CLEANING

Refer to par. 71 for cleaning recommendations.

85. INSPECTION AND REPAIR

Refer to par. 72 for general inspection and repair recommendations. Repair and rebuild points of measurement for fits, clearances and wear limits are indicated by small, lower case letters in fig. 373, fold-out 2. Refer to par. 236 for wear limits information.

86. ASSEMBLY

a. Torque Converter Cover (fig. 373, fold-out 2)

(1) Install double-row ball bearing 143, retaining ring groove outward, on the hub of torque converter cover 69. Press the bearing until it is firmly seated on the hub.

(2) Using spanner wrench 8351495 (fig. 36), install converter lock nut 144 (fig. 373, fold-out 2). Torque the nut to 75 pound-feet. Deform the lip of the nut into the two grooves in the hub of converter cover 69.

(3) Install bearing support sleeve 104. Install the retaining ring on the bearing.

(4) Install the input drive transfer gear and, using a 5/8-inch wrench, secure it with twenty-four 7/16-20 x 1 self-locking bolts (fig. 142). Tighten the bolts to 64-77 pound-feet torque.

b. Torque Converter Pump (fig. 373, fold-out 2)

*C2 (1) If screw 85 and bolt 86 or weights 84 were removed from the converter pump, install new replacements.

*C2 Note. Be sure to install correct weights at the locations previously identified.

(2) Install ball bearing 91 in converter pump hub 88.

(3) Install retaining ring 92, retaining bearing 91 in pump hub 88.

(4) Install two hook-type seal rings 87 on converter pump hub 88.

(5) Install converter pump hub 88 with component parts in converter pump 83 and secure with four lock strips 89 and eight self-locking bolts 90. Tighten the bolts to 9-11 pound-feet torque. Bend a corner of each lock strip 89 against the head of each bolt 90.

c. Torque Converter Turbine. If ball bearing (fig. 146) was removed, press a new bearing on the hub of the converter turbine. Be sure the bearing is firmly seated on the hub.

d. Torque Converter Stator

(1) Install retaining ring 93 (fig. 373, fold-out 2) into stator assembly 94. This ring must be installed into the groove at the rear of the stator (rear identified by the sharp edges of stator vanes).

(2) Install rear washer 95, pushing it through the stator until it seats on the retaining ring. Install thrust washer 96, seating it on the inward surface of washer 95.

(3) Press stator cam 99 into the stator, positioning it to match the marks made at disassembly.

Note. Cam 99 must be installed in the same position it had prior to removal. The stator assembly must freewheel in the direction of converter rotation.

(4) Install thrust washer 100 and front-washer assembly 81. Install retaining ring 80.

(5) Install thrust washer 103 into the stator assembly.

(6) Install thrust bearing assembly 102 onto freewheel race 101, using oil-soluble grease to retain it.

(7) Using a heavy oil-soluble grease to retain them, position the 12 bearings and springs in the 12 stator cam pockets. Fig. 148 shows the location of the bearings and springs in respect to the stator assembly. Install a spring into the deep end of the cam pocket. Place a bearing in the shallow end of the cam pocket beside the spring. Install remaining 11 bearings and springs in the same manner.

(8) Install freewheel race 101 (fig. 373, fold-out 2) with bearing 102 into the stator assembly.

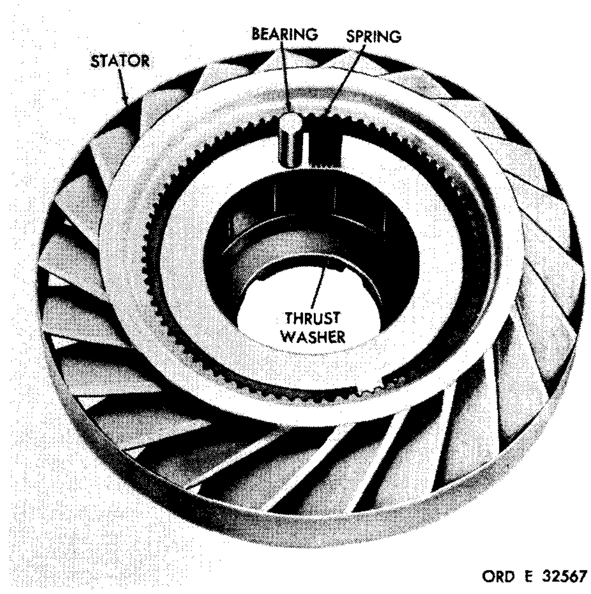


Figure 148. Torque converter stator

Section V. FLANGE ADAPTER ASSEMBLY—REBUILD

87. DESCRIPTION

Refer to par. 8 for the description of the flange adapter assembly.

88. DISASSEMBLY

Do not remove oil seal 22 (fig. 373, fold-out 2) from flange adapter 19 unless replacement is necessary. If necessary, drive the oil seal out of the adapter.

89. CLEANING

Refer to par. 71 for cleaning recommendations.

90. INSPECTION AND REPAIR

Refer to par. 72 for general inspection and repair recommendations. Repair and rebuild points of measurement for fits, clearances and wear limits are indicated by small letters in fig. 373, fold-out 2. Refer to par. 236 for wear limits information.

91. ASSEMBLY

a. If the oil seal was removed from the flange adapter, install a new replacement using oil seal replacer 8351210 (fig. 149).

b. Install oil seal, lip side down, pressing the seal until it is seated against its shoulder in the adapter (fig. 149).

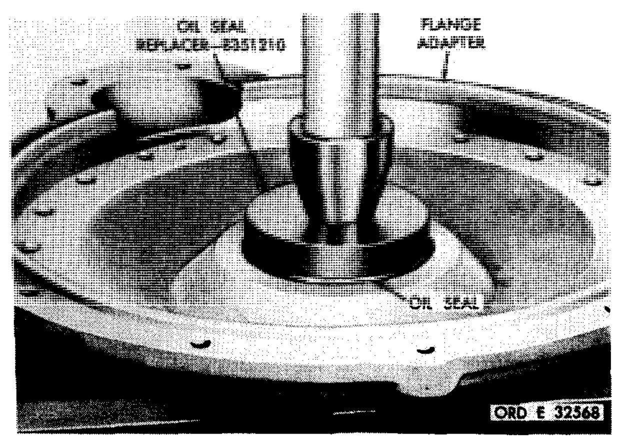


Figure 149. Installing oil seal in flange adapter

Section VI. INPUT TRANSFER GEARING—REBUILD

92. DESCRIPTION

Refer to par. 8 for the description of the input transfer gearing.

93. DISASSEMBLY

a. Drive Gear Assembly
(fig. 373, fold-out 2)

(1) Do not remove single-row ball bearings 24 and 27 from input transfer drive gear 25 unless replacement is necessary.

(2) If necessary, use a bearing puller to remove the two bearings 24 and 27 from drive gear 25.

b. Cluster Idler Gear Assembly
(fig. 373, fold-out 2)

(1) Do not remove double-row ball bearing 35 from idler cluster gear 34 unless replacement is necessary.

(2) If necessary to remove bearing 35, remove retaining ring 36 and press bearing out of gear 34.

c. Cluster Gear Assembly
(fig. 373, fold-out 2)

(1) Do not remove roller bearings 38 and 40 from input transfer cluster gear 41 unless replacement is necessary.

(2) If necessary to remove bearings 38 and 40, remove retaining ring 37 and press bearings 38 and 40 and spacer 39 from cluster gear 41.

94. CLEANING

Refer to par. 71 for cleaning recommendations.

95. INSPECTION AND REPAIR

Refer to par. 72 for general inspection and repair recommendations. Repair and rebuild points of measurements for fits, clearances and wear limits are indicated by small, lower case letters in fig. 373, fold-out 2. Refer to par. 236 for wear limits information.

96. ASSEMBLY

a. Drive Gear Assembly
(fig. 373, fold-out 2)

(1) Install single-row ball bearing 24 on the input transfer drive gear, pressing against the numbered side of the bearing cage. Be sure bearing is firmly seated against its shoulder on gear 25.

(2) Install single-row ball bearing 27 on the input transfer drive gear, pressing on the numbered side of the bearing cage. Be sure the bearing is firmly seated against its shoulder on gear 25.

b. Cluster Idler Gear Assembly
(fig. 373, fold-out 2)

(1) Install double-row ball bearing 35 into the input transfer cluster idler gear, pressing against the numbered side of the bearing on the outer race. Be sure the bearing is firmly seated against its shoulder in gear 34.

(2) Install retaining ring 36.

c. Cluster Gear Assembly
(fig. 373, fold-out 2)

(1) Install roller bearing 40 into cluster gear 41, pressing against the numbered side of the bearing cage. Be sure the bearing is seated firmly against its shoulder in the gear.

(2) Install spacer 39.

(3) Install bearing 38, pressing against the side opposite the numbered side of the bearing cage.

(4) Install retaining ring 37.

Section VII. INPUT TRANSFER HOUSING—REBUILD

97. DESCRIPTION

Refer to par. 8 for the description of the input transfer housing.

98. DISASSEMBLY (fig. 373, fold-out 2)

a. Using a 9/16-inch wrench, remove 10 bolts and lock washers that retain the power take-off cover (fig. 150). Remove the cover and gasket.

b. Using 9/16-inch wrench, remove twelve 3/8-24 x 1-1/4-inch bolts with lock washers. Remove transfer housing cover and gasket (fig. 150).

C2

c. Do not remove inserts 137, 140, 112, 113 and 122 (fig. 373, fold-out 2), bushing assembly 118, or sleeves 119, 120, 134, 136, or 139 from input transfer housing assembly 111, unless replacement is necessary. If necessary to remove a bushing or insert, refer to par. 72 for the proper procedure. Bushing assembly 118 is threaded and may be removed with a wrench.

d. If it is necessary to remove sleeves, remove all of the sleeves in the housing, by pressing or cutting out, except sleeve 139.

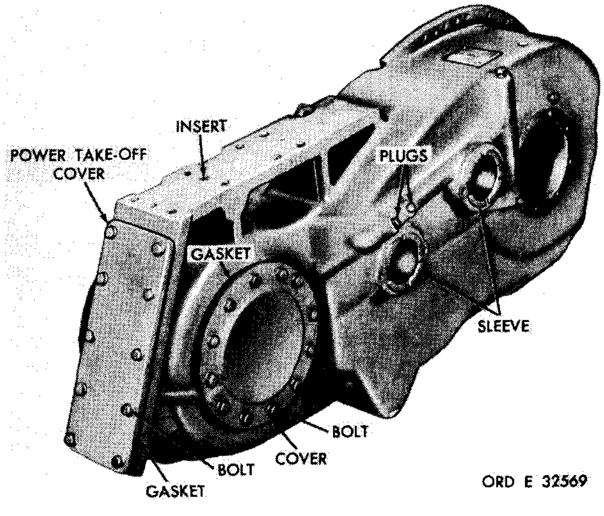


Figure 150. Input transfer housing

e. If necessary to remove the input transfer drive gear support sleeve 139, drill out pins 138. Use a drill bit slightly larger than 3/16-inch and drill only deep enough to free the sleeve. Press the sleeve from the housing.

f. Remove any pipe plugs (fig. 150), if necessary, to aid in the cleaning of the oil passages in the housing.

99. CLEANING

Refer to par. 71 for cleaning recommendations.

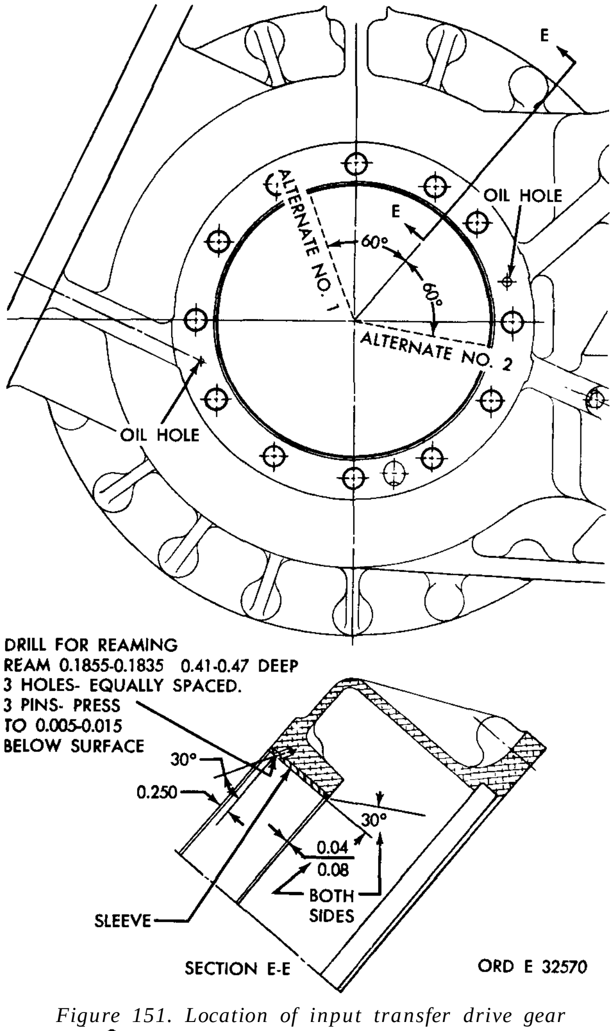


Figure 151. Location of input transfer drive gear support sleeve retaining pins

C2

100. INSPECTION AND REPAIR

Refer to par. 72 for general inspection and repair recommendations. Repair and rebuild points of measurements for fits, clearances and wear limits are indicated by small, lower case letter in fig. 373, fold-out 2. Refer to par. 236 for wear limits information.

101. ASSEMBLY (fig. 373, fold-out 2)

a. Install new replacement inserts 137, 140, 112, 113 and 122 from 0.005-inch to one turn below the housing surface.

b. If 1-inch plug 114 was removed, install it. Torque plug 114 to 70-90 pound-feet. If 1/8-inch plug(s) 115, 116 or 131 were removed, install them. Torque plugs 115, 116 and 131 to 50-60 pound-inches. If l/4-inch plug(s) 117 or 123 were removed, install them. Torque plugs 117 and 123 to 96-120 pound-inches. If 1/16- inch plug 9 was removed, install it. Torque plug 9 to 35-50 pound-inches.

c. Install sleeves 119, 120, 134 and 136, pressing them until they are firmly seated against the housing.

d. If input transfer drive gear bearing support sleeve 139 was removed, install new replacement as follows:

(1) Mark the locations of the three original pin holes, in the sleeve bore, on the bolt hole circle of the housing.

(2) The pin holes to be drilled for the new sleeve should be located 60 degrees clockwise or counterclockwise from the original pin holes. The two alternate pin locations are indicated by the broken line in fig. 151.

Note. Be sure that the pin holes to be drilled do not interfere with the oil holes located on the knit hole circle (fig. 151).

(3) Install sleeve 139 (fig. 373, fold-out 2), pressing it flush with the housing outer surface.

(4) Using a 0.1855-0.1875 drill, drill a hole 0.410 to 0.470-inch deep at one of the alternate locations chosen. This hole should be 0.250-inch inward from the cover mounting surface and at a 30 degree angle to the cover mounting surface. Refer to figure 151.

(5) Drill the remaining two dowel pin holes, spacing them 120 degrees apart.

(6) Install the three pins (fig. 151), driving them 0.005 to 0.015-inch below the sleeve surface.

(7) Line bore sleeve 139 (fig. 373, fold-out 2) to 7.0864-7.0876 inches diameter, with a finish of 100 RMS (fig. 151).

e. Install the power take-off cover (fig. 150) and gasket. Secure the cover with ten 3/8-24 x 1-1/4 bolts and lock washers. Torque the bolts to 33-40 pound-feet.

Section VIII. MAIN-PRESSURE REGULATOR AND LOCKUP SHIFT VALVE ASSEMBLY–REBUILD

102. DESCRIPTION

Refer to par. 22 for the description of the main-pressure regulator and lockup shift valve assembly.

103. DISASSEMBLY (fig. 383, fold-out 12)

a. Remove retaining ring 6 that retains valve retainer plug 7.

b. Remove plug 7, valve 9 and spring 10.

c. Remove seal ring 8 from plug 7.

d. Using a l/2-inch socket wrench, remove six bolts 29 and lock washers 28 retaining valve cover assembly 23.

e. Remove cover assembly 23 and gasket 22. Remove plug 19 from cover assembly 23.

f. Remove lockup shift valve spring 27 and valve 26.

g. Remove main-pressure regulator valve springs 20 and 21 and valve assembly 14. Remove plug 13.

h. Remove hexagon-head plug 11 from valve body 12.

104. CLEANING

Refer to par. 71 for cleaning recommendations.

105. INSPECTION AND REPAIR

Refer to par. 72 for general inspection and repair recommendations. Repair and rebuild points of measurement for fits, clearances and wear limits are indicated by small, lower case letters in fig. 383, fold-out 12. Refer to par. 246, for wear limits information.

106. ASSEMBLY (fig. 383, fold-out 12)

a. Install high-range knockdown plug 13, plain end first, into the largest of the three bores in the main-pressure regulator and lockup shift valve body 12. Position it in the small bore at the bottom of the large bore.

b. Into the same bore, install main-pressure regulator valve 14, smaller end first.

c. Install two main-pressure regulator valve springs 20 and 21.

d. Install lockup shift valve 26, short land end first, into valve body 12.

e. Install lockup shift valve spring 27.

f. Install plug 19 into sleeve 24. Install-valve body cover assembly 23 and gasket 22 and secure with six 5/16-18 bolts 29 and lock washers 28. Torque bolts 29 to 13-16 pound-feet.

g. Install l/8-inch hexagon-head plug 11. Torque plug 11 to 10-12 pound-feet.

h. Install seal ring 8 on valve retainer plug 7.

i. Install lube regulator valve spring 10, valve 9 (large land end first) and plug 7.

j. Install retaining ring 6.

Section IX. CONTROL VALVE ASSEMBLY AND OIL TRANSFER PLATE—REBUILD

107. DESCRIPTION

Refer to par. 21 for the description of the control valve assembly and oil transfer plate.

108. DISASSEMBLY (fig. 383, fold-out 12)

a. Remove bolt 45, washer 46 and retaining ring 47 from throttle valve shaft assembly 58.

b. Remove throttle valve shaft assembly 58 from valve body 54.

c. Remove seal ring 57 from shaft assembly 58.

d. Remove retaining ring 48 from selector shaft assembly 56.

e. Lift off shift indicator 49 and indicator spacer 50.

f. Remove selector shaft assembly 56, detent ball 59 and detent spring 60 from valve body 54.

g. Remove preformed packing 51 from valve body 54.

h. Using a 1/2-inch wrench, remove nine bolts 70 and 71, and lock washers 69 and 72 retaining control valve body cover 73.

i. Remove valve body cover 73 and gasket 74.

j. Remove throttle regulator valve spring 68, valve assembly 63, throttle valve spring 62 and throttle valve 61.

k. Remove shift inhibitor valve 76, spring 78 and plunger 79.

l. Remove retaining ring 77 from inhibitor plunger 79.

m. Remove lockup cutoff valve 80.

n. Remove selector valve assembly 75.

o. Do not remove needle bearing assemblies 53 and 55 from control valve body 54 unless replacement is necessary. If necessary, press bearing assemblies out of the valve body.

p. Remove any pipe plugs 81 from the control valve body, if necessary, to aid in cleaning.

q. If present, do not remove check valve 41 from oil transfer plate 43.

r. Plug 42 may be removed, if necessary, for cleaning purposes.

109. CLEANING

Refer to par. 71 for cleaning recommendations.

110. INSPECTION AND REPAIR

Refer to par. 72 for general inspection and repair recommendations. Repair and rebuild points of measurement for fits, clearances and wear limits are indicated by small, lower case letters in fig. 383, fold-out 12. Refer to par. 246 for wear limits information.

111. ASSEMBLY (fig. 383, fold-out 12)

a. If needle bearing assemblies 53 and 55 were removed from control valve body 54, install new replacements.

b. Install bearing assembly 53, pressing against the numbered side of the bearing cage, 0.200-inch below the surface adjacent to the bearing bore.

c. Install bearing assembly 55 from the inside of the valve body, pressing against the numbered side of the bearing cage, 0.050-inch below the surface adjacent to the bearing bore.

d. Install any pipe plugs 81 removed from control valve body 54 for cleaning purposes. Torque pipe plugs 81 to 50-60 pound-inches.

e. Install selector valve assembly 75, long stem end first, into control valve body 54.

f. Install lockup cutoff valve 80, long land end first, into the valve body.

g. Install retaining ring 77 onto shift inhibitor plunger 79.

h. Install spring 78 onto plunger 79.

i. Install the plunger and related parts into the valve body.

j. Install throttle valve 61, long stem end first, into the valve body.

k. Install throttle valve spring 62.

l. Install throttle regulator valve assembly 63 and spring 68.

m. Install control valve body cover 73 and gasket 74. Secure the cover with seven 5/16-18 bolts 70, two bolts 71 and lock washers 69 and 72. Torque the bolts to 13-16 pound-feet.

n. Install preformed packing 51 into control valve body 54.

o. Install selector shaft assembly 56, detent spring 60 and ball 59, at the same time engaging the shaft assembly 56 with the selector valve assembly 75.

p. Install spacer 50 and indicator 49 onto selector shaft 56.

q. Install retaining ring 48.

r. Install seal ring 57 onto throttle valve shaft assembly 58.

s. Install throttle valve shaft assembly 58, engaging it with throttle valve 51, into valve body 54 and secure with retaining ring 47. Install washer 46 and bolt 45. Torque bolt 45 to 19-23 pound-feet.

Section X. STEER VALVE BODY ASSEMBLY–REBUILD

t. Install plug 42, if removed, into oil transfer plate 43. Torque plug 42 to 35-50 pound-inches.

112. DESCRIPTION

Refer to par. 20 for the description of the steer valve body assembly.

113. DISASSEMBLY (fig. 382, fold-out 11)

a. Remove retaining rings 22 an 23 from steer shaft assembly 45.

b. Remove steer indicator 21 and preformed packing 20.

c. Remove steer shaft assembly 45, detent ball 43 and spring 42.

d. Remove steer valve cover plugs 31 and 32.

e. Remove the right- and left-steer valve assemblies 24 through 30 and 33 through 39, as assemblies.

f. Do not disassemble steer valve assemblies unless parts replacement is necessary. If necessary, hold the slotted end of the steer valve stem 25 or 38 with a screwdriver and remove nut 30 or 33 from the opposite end.

g. Remove stem 25 or 38 and the steer regulator valve 26 or 37 from the steer valve 29 or 34.

h. Remove seal 24 or 39 from stem 25 or 38.

i. Remove internal valve spring 28 or 35 and external valve spring 27 or 36.

j. Using a 9/16-inch wrench, remove eight cap screws 8 and lock washers 9 retaining steer valve cover 10. Remove cover 10 and gasket 11.

k. Remove two steer pressure regulator valve springs 12 and 13.

l. Remove steer pressure regulator valve assembly. 14.

m. Deleted.

n. Do not remove tube 41 from steer valve body 40 unless replacement is necessary. If necessary, collapse the tube and remove it from the valve body.

o. Do not remove needle bearings 19 and 44 from steer valve body 40 unless replacement is necessary. If necessary, drive the bearings from the valve body.

114. CLEANING

Refer to par, 71 for cleaning recommendations.

115. INSPECTION AND REPAIR

Refer to par. 72 for general inspection and repair recoin inundations. Repair and rebuild points of measurement for fits, clearances and wear limits are indicated by small, lower case letters in fig. 382, fold-out 11. Refer to par. 245, for wear limits information.

116. ASSEMBLY (fig. 382, fold-out 11)

a. If needle bearings 19 and 44 were removed from the steer valve body, install new bearings, pressing against the numbered side of the bearing cage. Press bearing 19, from the top side of the valve body, 0.200-inch below the surface adjacent to the bearing bore.

b. Install bearing 44, from the bottom side of the valve body, 0.150-inch below the surface adjacent to the bearing bore.

c. If tube 41 was removed from steer valve body 40, install new replacement. Press tube into body, 0.241-0.251 inch below the machined mounting surface of the valve body.

d. Deleted.

e. If the two steer valves, removed as assemblies (24 through 30 and 33 through 39), were disassembled, install the internal valve spring 28 or 35 and external valve spring 27 or 36 into steer valve 29 or 34.

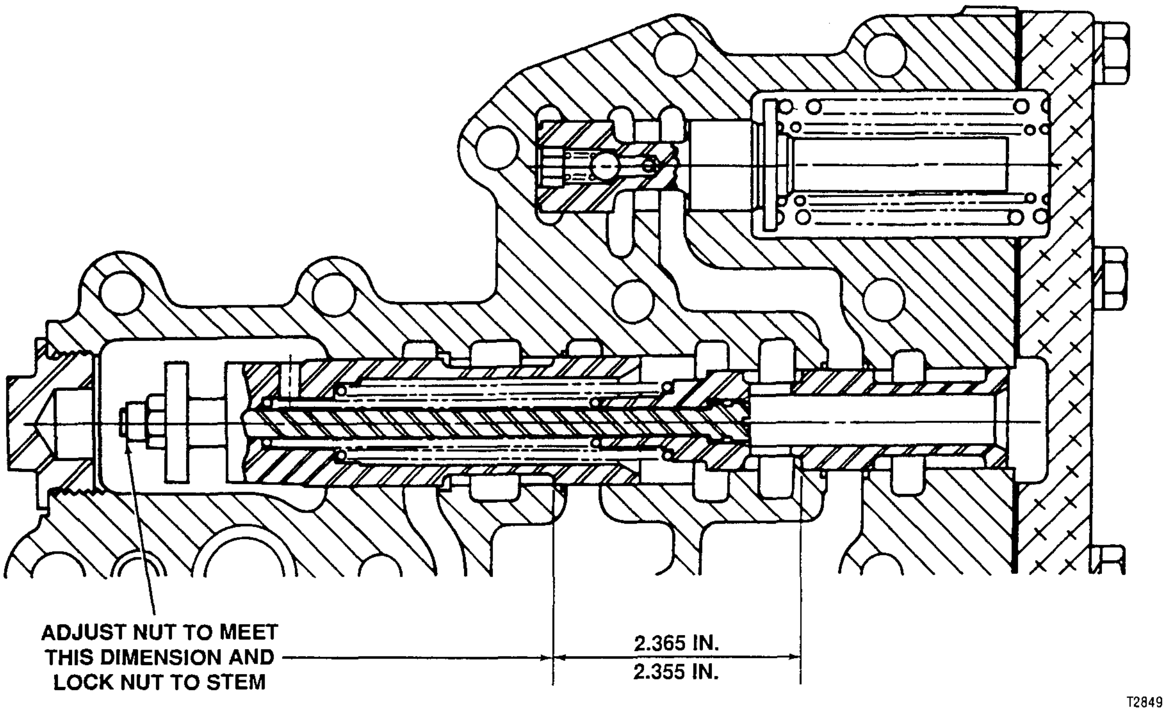


Figure 152. Steer valve adjustment

f. Install steer regulator valve 26 or 37 and steer valve stem 25 or 38 with seal 24 or 39 into the steer valve.

g. Install nut 30 or 33 onto the valve stem. Adjust the nut to the dimension shown in fig. 152.

h. Using a vise, squeeze the shoulder of the nut against the flat side of the stem.

i. Install each steer valve assembly into the valve bore from which it was removed.

j. Install the two steer valve cover plugs 31 and 32. Torque plugs 31 and 32 to 100-150 pound-feet.

k. Using oil-soluble grease to retain it, install detent spring 42 into its bore (tube) in the bottom of the valve body.

l. Install detent ball 43 into its recess on steer shaft assembly 45 and install the shaft assembly into the bottom of the valve body.

m. Install preformed packing 20 and steer indicator 21 onto the top of the steer shaft assembly.

n. Secure the assembly with retaining rings 22 and 23.

o. Install steer pressure regulator valve assembly 14 and two springs 12 and 13 into the valve body.

p. Install steer valve cover 10 and gasket 11. Secure the cover with eight screws 8 and lock washers 9. Torque the bolts to 26-32 pound-feet.

Section XI. RELAY VALVE BODY ASSEMBLY—REBUILD

117. DESCRIPTION

Refer to par. 19 for the description of the relay valve body assembly.

118. DISASSEMBLY (fig. 382, fold-out 11)

a. Using a l/2-inch wrench, remove three cap screws 70 and lock washers 69 from relay valve body 73.

b. Remove relay valve cover 68 and gasket 67.

c. Remove two steer clutch relay valves 64 and 65 and spring 66.

d. Remove drive clutch relay valve plug 78 and gasket 77.

e. Remove drive clutch relay valve 76, spring 75 and pin 74.

f. Using a l/2-inch wrench, remove three cap screws 58 and lock washers 59. Remove cover assembly 60 and gasket 63.

g. Plugs 71 and 72 may be removed to aid in cleaning, if necessary.

119. CLEANING

Refer to par. 71 for cleaning recommendations.

120. INSPECTION AND REPAIR

Refer to par. 72 for general inspection and repair recommendations. Repair and rebuild points of measurement for fits, clearances and wear limits are indicated by small, lower case letters in fig. 382, fold-out 11. Refer to par. 245 for wear limits information.

121. ASSEMBLY (fig. 382, fold-out 11)

a. Install plug 71 if it was removed. Torque plug 71 to 96-120 pound-inches. Install plugs 72 if they were removed. Torque plugs 72 to 50-60 pound-inches.

b. Install cover assembly 60 and gasket 63. Secure the cover with three 5/1 6-18 cap screws 58 and lock washers 59. Torque the screws to 13-16 pound-feet.

c. Install steer clutch relay valve 64, long stem end first, into relay valve body 73.

d. Install the other steer clutch relay valve 65, short stem end first, into the valve body.

e. Install the steer clutch relay valve spring 66.

f. Install cover 68 and gasket 67. Secure the cover with three 5/16-1 8 cap screws 70 and lock washers 69. Torque the screws to 13-16 pound-feet.

g. Install drive clutch relay valve pin 74 and spring 75 into valve body.

h. Install drive clutch relay valve 76, short stem end first, into the valve body.

i. Install gasket 77 and plug 78. Torque plug 78 to 40-50 pound-feet.

Section XII. OIL SCREEN ASSEMBLY–REBUILD

122. DESCRIPTION

Refer to par. 25 for the description of the oil screen assembly.

123. DISASSEMBLY (fig. 374.1, fold-out 3.1)

a. Remove nut 85 from oil filter head 83 and remove filter element 84.

b. Remove preformed packing 86 from–filter head 83.

124. CLEANING

Refer to par. 71 for cleaning recommendations.

125. INSPECTION AND REPAIR

Refer to par. 72 for general inspection and repair recommendations.

126. ASSEMBLY (fig. 374.1, fold-out 3.1)

a. Install new preformed packing 86 onto filter head 83.

b. Install new filter element 84 and nut 85. Torque nut 85 to 25-50 inch-pounds.

DELETED

Figure 153. Deleted

Section XIII. OUTPUT SUPPORT ASSEMBLY—REBUILD

127. DESCRIPTION

The output support is a machined steel casting. It serves as a support for the transmission output drive assembly.

128. DISASSEMBLY (fig. 374, fold-out 3)

a. Remove two preformed packings from hub of the output support assembly (fig. 154).

b. Do not remove oil seal unless replacement is necessary (fig. 154). If necessary, hook it out with a “heeled” tool.

c. Using a 7/16-inch socket wrench, remove four bolts and lock washers from the speedometer drive cover (fig. 154).

Note. This cover not used when the speedometer is connected.

d. Remove speedometer drive cover and gasket (fig. 154).

e. Remove retaining ring that retains output support bearing (fig. 155). Remove bearing from the support.

f. Remove retaining ring that retains speedometer gear assembly and bearing in the output support assembly (fig. 155). Tap the gear assembly and bearing out of the support.

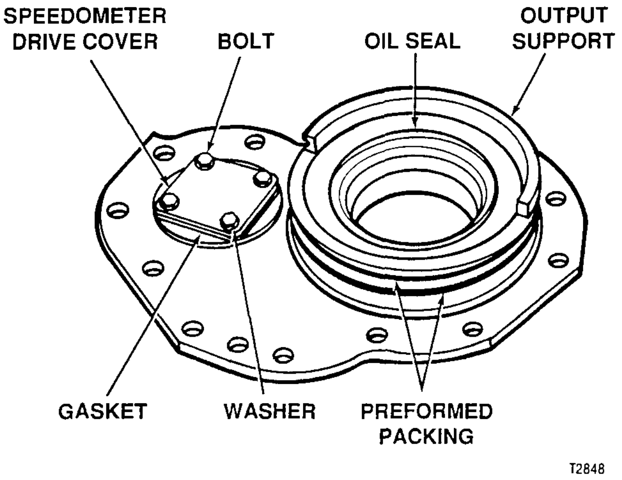


Figure 154. Output support assembly -- outer side

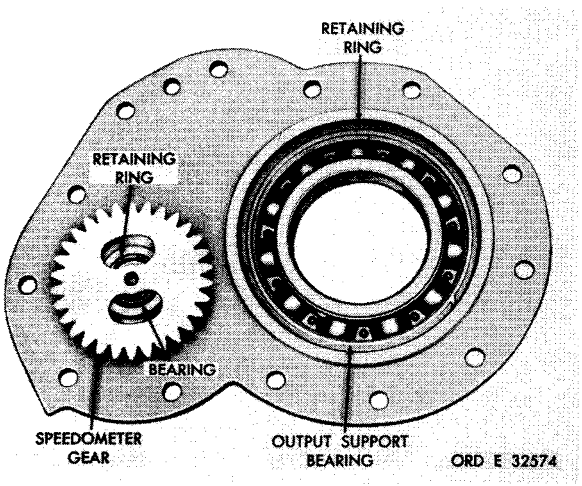


Figure 155. Output support assembly—inner side

g. Remove retaining ring 71 (fig. 374, fold-out 3) that retains bearing 69 on speedometer gear assembly 65. Remove the bearing from the gear.

h. Remove retaining ring 70 that retains adapter 74 in output support 8.

i. Press adapter 74 and locating ball 73 from the support.

j. Do not remove oil seal 75 from adapter 74 unless replacement is necessary. If necessary, tap the oil seal from the adapter.

129. CLEANING

Refer to par. 71 for cleaning recommendations.

130. INSPECTION AND REPAIR

Refer to par. 72 for general inspection and repair recommendations. Repair and rebuild points of measurement for fits, clearances and wear limits are indicated by small, lower case letters in fig. 374, fold-out 3. Refer to par. 236 for wear limits information.

131. ASSEMBLY (fig. 374, fold-out 3)

a. If oil seal 75 was removed from adapter 74, press a new seal, lip side first, into the adapter. Seat the seal firmly against its shoulder in the adapter.

b. Install adapter 74 and locating ball 73 into output support 8 and secure with retaining ring 70.

c. Place retaining ring 68 on the shaft of gear assembly 65, next to the gear web. Install bearing 69 onto speedometer gear assembly 65 and secure with retaining ring 71.

d. Install speedometer gear with bearing and retaining ring into support adapter and secure with the retaining ring (fig. 155).

e. Install the output support bearing and secure with the retaining ring (fig. 155).

f. Install speedometer drive cover and gasket on output support (fig. 154). Secure the cover with four 1/4-20 bolts and lock washers. Tighten the bolts to 9-11 pound-feet torque.

g. If oil seal was removed, install new replacement, lip side of the seal toward the inside of the support (fig. 154). Use replacer 8351210 and press the new seal in until it is seated firmly against its shoulder in the support.

h. Install two preformed packings on the hub of the support (fig. 154).

Section XIV. OUTPUT PRESSURE OIL PUMP—REBUILD

132. DESCRIPTION

Refer to par. 23 for the description of the output pressure oil pump.

133. DISASSEMBLY (fig. 384, fold-out 13)

a. Using a screwdriver, remove two screws 15 retaining pump cover assembly 16.

b. Remove cover assembly 16.

c. Do not remove needle bearing 17 or dowel pin 18 from cover assembly 16 unless replacement is necessary. If necessary, drive the bearing or dowel pin out of cover 19.

d. Remove oil pump drive gear 11 and idler gear assembly 12.

e. Do not remove needle bearing 13 from idler gear 14 unless replacement is necessary. If necessary, press the bearing from the gear.

f. Remove idler gear shaft 10 and ball 9 from pump body 8.

g. Do not remove needle bearing 7 from pump body 8, unless replacement is necessary. If necessary, press the bearing from the body.

134. CLEANING

Refer to par. 71 for cleaning recommendations.

135. INSPECTION AND REPAIR

Refer to par. 72 for general inspection and repair recommendations. Repair and rebuild points of measurements for fits, clearances and wear limits are indicated by small letters in fig. 384, fold-out 13. Refer to par. 247 for wear limits information.

136. ASSEMBLY (fig. 384, fold-out 13)

a. If bearing 7 was removed from the pump body, install a new replacement.

b. Pressing against the numbered side of the bearing cage, install bearing, from the outer side of the pump body, 0.060 to 0.100 inch below the surface adjacent to the bearing bore.

c. If bearing 17 was removed from pump cover 19, install a new replacement. Pressing against the numbered side of the bearing cage, install the bearing, from the outer side of the cover, 0.060 to 0.100 inch below the surface adjacent to the bearing bore.

d. If dowel pin 18 was removed from pump cover 19, install a new replacement. Press pin in, from the inside of the cover, leaving 0.220 inch of the pin protruding.

e. If bearing 13 was removed from pump idler gear 14, install a new replacement. Pressing against the numbered side of the bearing cage, install the bearing 0.060 inch below the side surface of the gear.

f. Using a light coat of oil-soluble grease, place ball 9 onto pump idler gear shaft 10.

g. Indexing ball 9 on shaft 10, with the slot in the shaft bore of the pump body 8, press the shaft into the body until it is properly positioned.

h. Install idler gea assembly 12 onto idler gear shaft 10.

i. Install pump drive gear 11 into pump body 8.

j. Install pump cover assembly 16 and secure with two screws 15.

Section XV. TORQUE CONVERTER HOUSING—REBUILD

137. DESCRIPTION

Refer to par. 9 for the description of the torque converter housing.

138. DISASSEMBLY (fig. 374, fold-out 3)

a. Using a 1-1/2-inch wrench, remove output oil pump check valve plug, washer, valve and spring (fig. 156).

b. Using a 9/16-inch wrench, remove five self-locking bolts retaining seal ring retainer (fig. 156). Remove the retainer.

c. Do not remove the torque converter ground sleeve unless replacement is necessary (fig. 156). If necessary, press the sleeve from the housing toward the front side.

d. Remove any plugs in the housing if necessary to aid in the cleaning of oil passages.

Note. If necessary to remove inserts or dowels, refer to par. 72 for inspection and repair recommendations.

139. CLEANING

Refer to par. 71 for cleaning recommendations.

140. INSPECTION AND REPAIR

Refer to par. 72 for general inspection and repair recommendations. Repair and rebuild points of measurement for fits, clearances and wear limits are indicated by small, lower case letters in fig. 374, fold-out 3. Refer to par. 237 for wear limits information.

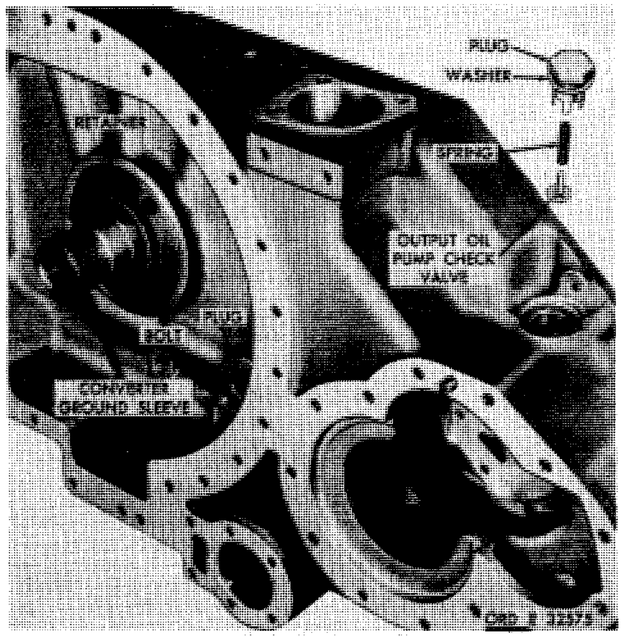


Figure 156. Torque converter housing and related parts

141. ASSEMBLY (fig. 374, fold-out 3)

C2 a. Install any plugs in housing which were removed to aid in the cleaning of the torque converter housing (fig. 156).

b. If the converter ground sleeve was removed, install a new replacement ground sleeve (fig. 156). Press sleeve into housing until firmly seated, being sure that the bolt holes in the housing and sleeve are properly indexed.

c. Install the seal ring retainer and secure with five 3/8-16 self-locking bolts (fig. 156). Torque the bolts to 36-43 pound-feet.

d. Install output oil pump valve, spring, washer and plug (fig. 156).

Section XVI. RIGHT-OUTPUT SUBASSEMBLY—REBUILD

142. DESCRIPTION

Refer to par. 16 for description of the right-output subassembly.

143. DISASSEMBLY (fig. 381, fold-out 10)

a. Using hoist and sling 8351496, remove the right-steer planetary carrier and brake hub assembly (fig. 157). Refer to pars. 157 through 161 for rebuild of the steer planetary carrier and brake hub assembly.

> Note. If carrier and brake hub assembly cannot be removed easily, block up under the end of the carrier shaft, and strike the brake anchor ring to free the assembly.

b. Remove the right brake plates and disks (fig. 157).

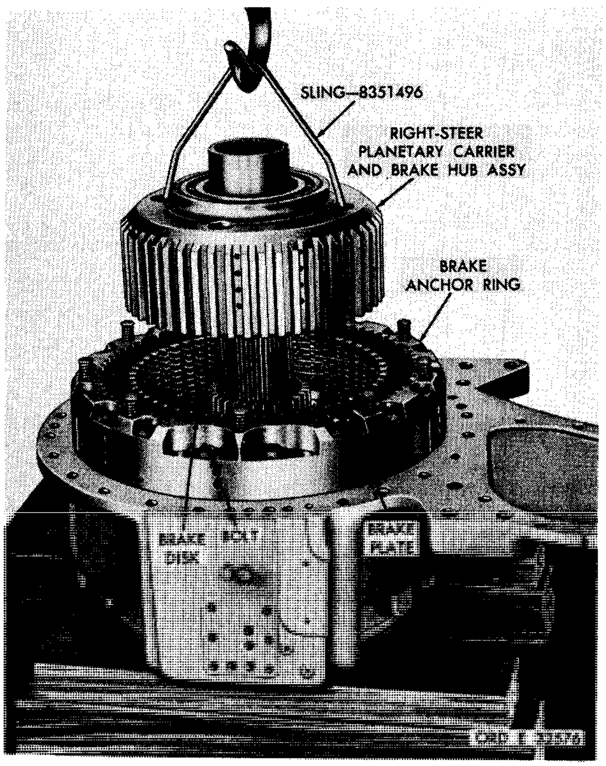


Figure 157. Removing (or installing) right-steer planetary carrier and brake hub assembly

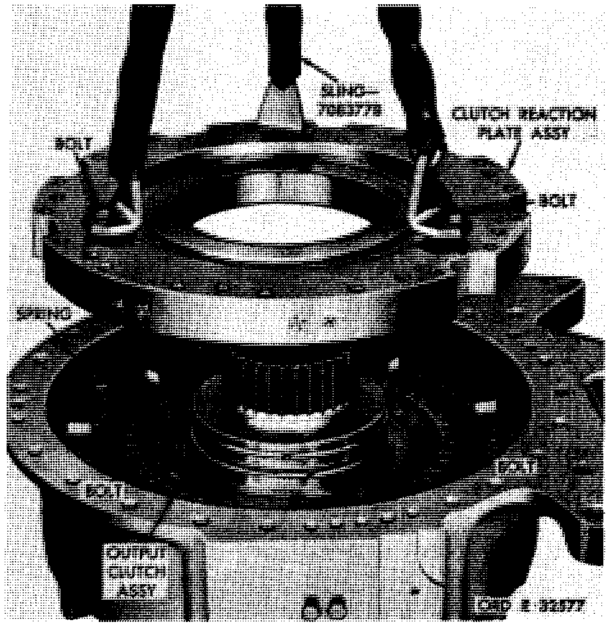


Figure 158. Removing (or installing) clutch reaction plate assembly

c. Remove 18 bolts (two different lengths), using a 5/8-inch wrench, retaining the brake anchor ring (fig. 157).

d. Remove brake anchor ring (fig. 157).

> Note. Refer to pars. 162 through 166 for rebuild of the right-brake anchor ring assembly.

e. Using sling 7083778 and three 7/16-14 bolts, remove the clutch reaction plate assembly (fig. 158). Mark the plate and end cover for reference at reassembly.

f. Remove nine steer c1utch release springs (fig. 158).

g. Remove two bolts from the output clutch assembly (fig. 158).

h. Using sling 7083778 and two 5/16-24 bolts, remove the output clutch assembly (fig. 159).

> Note. Refer to pars. 167 through 171 for rebuild of output clutch assembly.

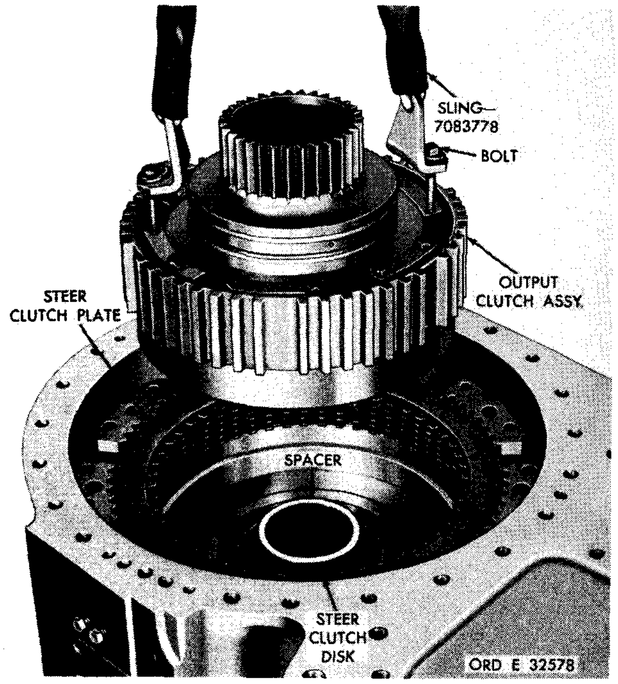


Figure 159. Removing (or installing) output clutch assembly

i. Remove steer clutch plates and disks (fig. 159).

j. Remove spacer (fig. 159).

k. Using sling 7083778 and three 7/16-14 bolts, remove steer clutch anchor (fig. 160).

l. Remove steer clutch piston (fig. 160).

Note. Refer to pars. 172 through 176 for rebuild of the steer clutch piston assembly.

m. Using 5/8-inch wrench, remove 19 bolts and lock washers that retain the end cover hub (fig. 161).

n. Remove the hub and gasket from the end cover (fig. 161).

o. Remove two preformed packings from the hub (fig. 161).

p. Remove retaining ring 71 (fig. 381, fold-out 10) that retains bearing 72 in hub 73.

q. Remove bearing 72 from hub 73.

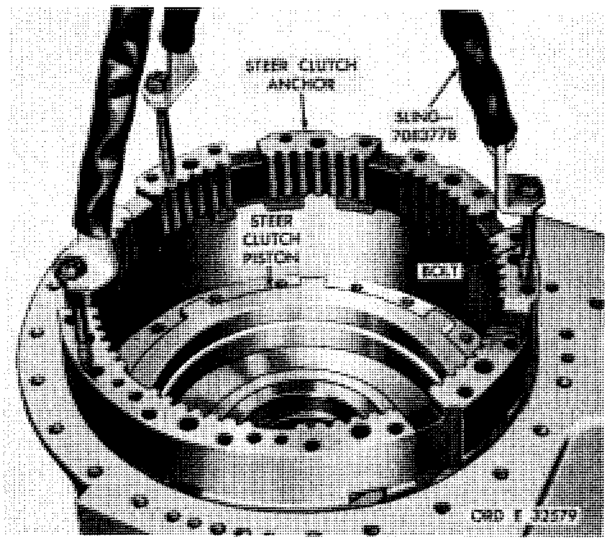


Figure 160. Removing steer clutch anchor

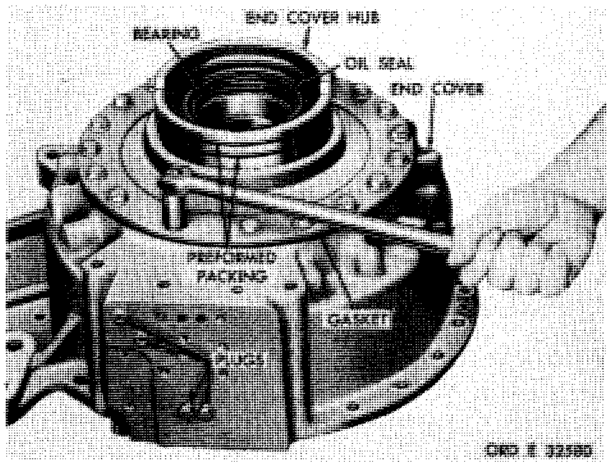


Figure 161. Removing end cover hub

r. Do not remove the oil seal from the hub, unless replacement is necessary (fig. 161). If necessary, drive the oil seal out toward the outside of the hub.

s. Using a 9/16-inch wrench, remove eight self-locking bolts 62 (fig. 381, fold-out 10) that retain sleeve 61. Remove sleeve 61, gasket 60 and preformed packing 59.

t. Remove the bearing 70 from sleeve 61.

yes u. The various plugs may be removed from the end cover to aid in cleaning and inspection of oil passages (fig. 161).

144. CLEANING

Refer to par. 71 for cleaning recommendations.

145. INSPECTION AND REPAIR

Refer to par. 72 for general inspection and repair recommendations. Repair and rebuild points of measurement for fits, clearances and wear limits are indicated by small, lower case letters in fig. 381, fold-out 10. Refer to pars. 243 and 244 for wear limits information.

146. ASSEMBLY (fig. 381, fold-out 10)

*C2

a. Install any plugs that were removed from the end cover (fig. 161). Install preformed packing 59 (fig. 381, fold-out 10) into end cover 48.

b. Install bearing 70 into sleeve 61.

c. Install sleeve 61 with bearing 70 and gasket 60 into end cover 48. Secure retainer with eight 3/8-16 x 1 self-locking bolts 62.

d. Install bearing assembly 72 into the end cover hub 73. Be sure the bearing is firmly seated in the hub.

e. Install retaining ring 71 that retains bearing 72.

f. Install two preformed packings on end cover hub (fig. 162).

g. Using seal replacer 8351210, install oil seal in end cover hub (fig. 162).

> Note. Spring side of oil seal should be toward the inside of the hub. Be sure seal is seated.

h. Install hub assembly and gasket onto end cover. Secure the hub with nineteen 7/16-14 x 1-1/2 cap screws and lock washers (fig. 163). Tighten the cap screws to 42-50 pound-feet torque.

i. Install steer clutch piston assembly, alining the bleed hole as shown. Install guide bolt 8351231 (fig. 164).

j. Using sling 7083778 and three 7/16-14 bolts, install the steer clutch anchor (fig. 165).

> Note. Oil holes in anchor and end cover must be alined as shown.

k. Install the spacer (fig. 166).

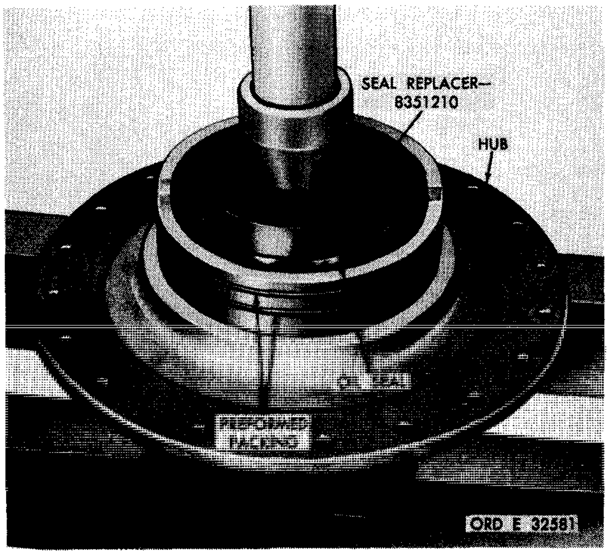


Figure 162. Installing oil seal in end cover hub

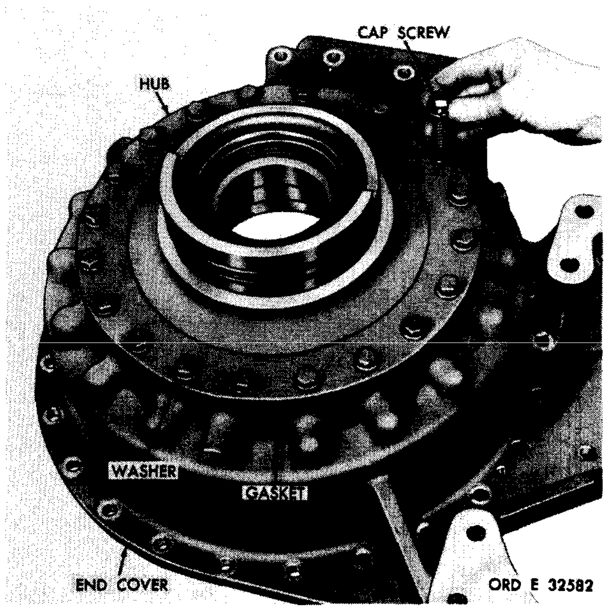


Figure 163. Installing end cover hub

l. Using sling 7083778 and two 5/16-24 bolts, install the output clutch assembly (fig. 166). Remove sling and lifting bolts and install the two remaining 5/16-24 x 5/8 output clutch assembly bolts (fig. 167). Tighten the bolts to 14-18 pound-feet torque and bend corners of the lock strips against them.

m. Install six internal- and seven external splined steer clutch disks and plates, beginning with an external-splined clutch plate (fig. 167).

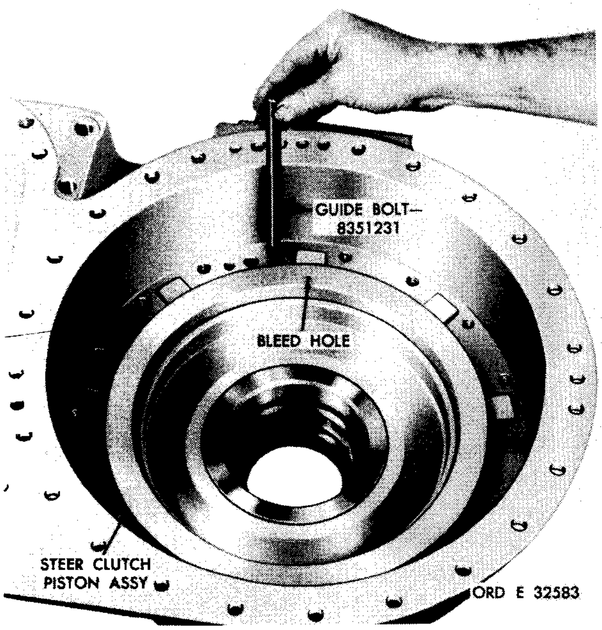


Figure 164. Installing guide bolt used to aline geared steer clutch and brake components

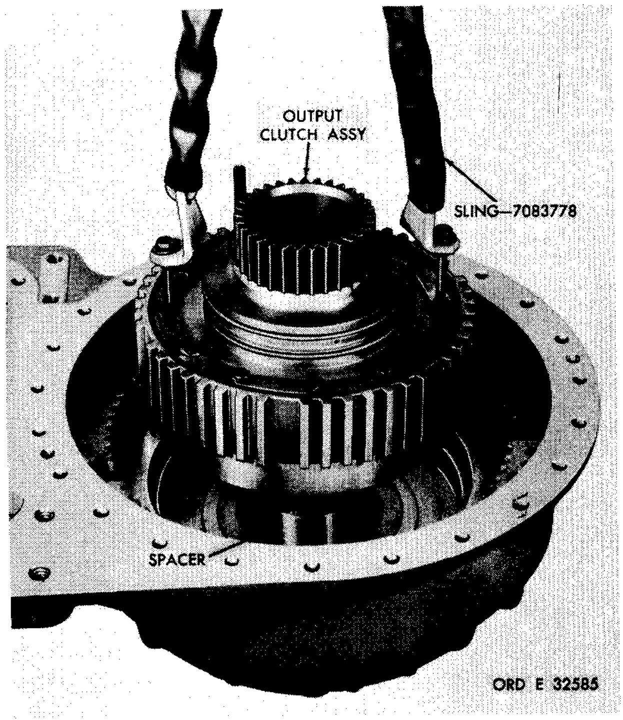


Figure 166. Installing output clutch assembly

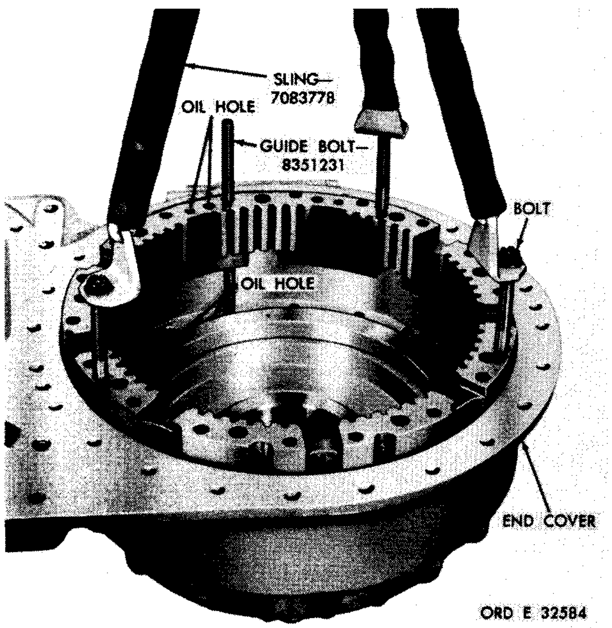


Figure 165. Installing steer clutch anchor

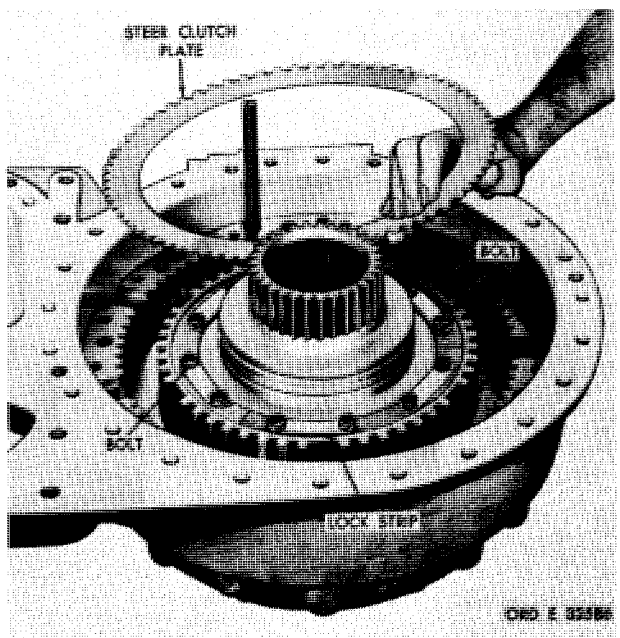


Figure 167. Installing steer clutch plates

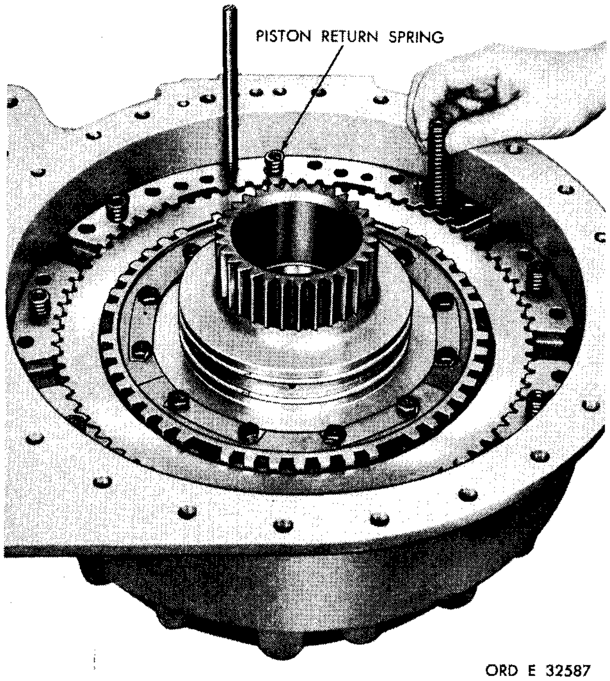


Figure 168. Installing steer clutch piston return springs

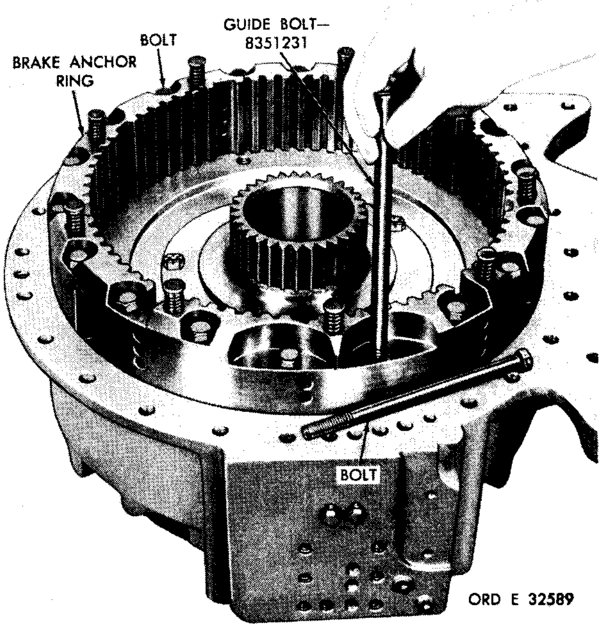


Figure 170. Removing geared steer clutch and brake components guide bolt

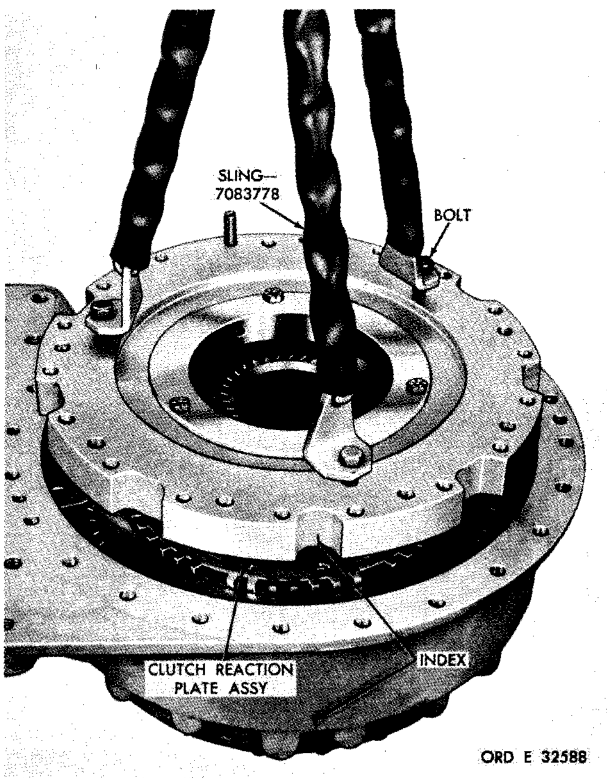


Figure 169. Installing clutch reaction plate assembly

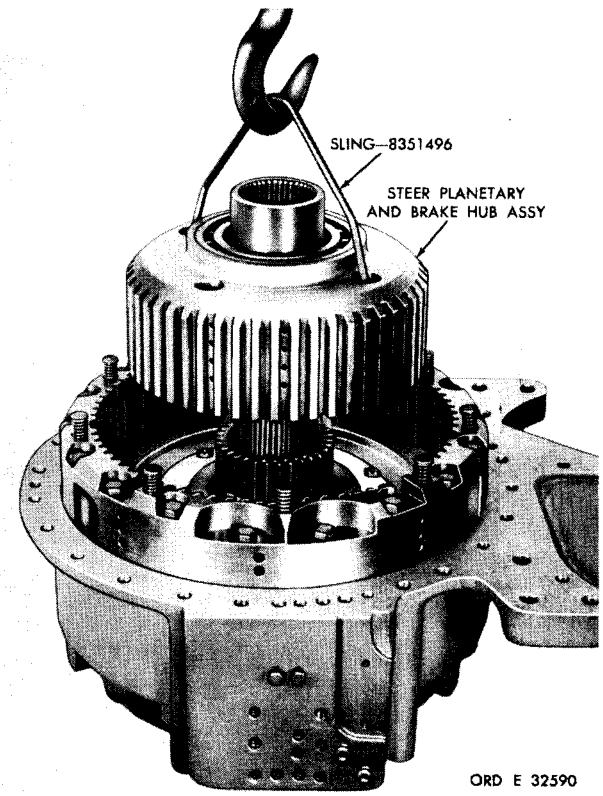
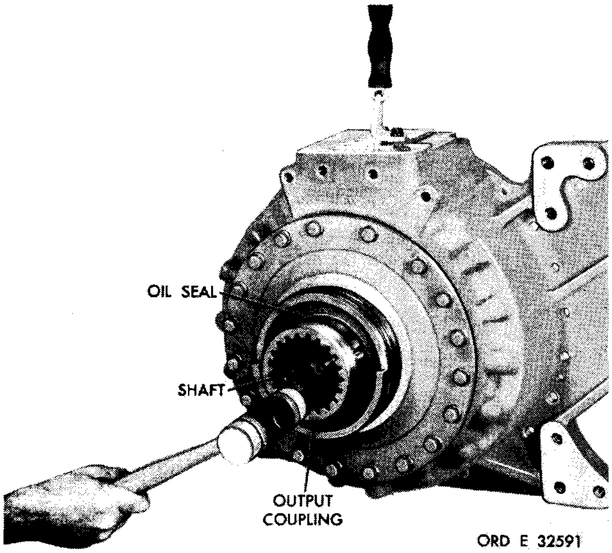


Figure 171. Installing right-steer planetary and brake hub assembly



C2 Figure 172. Installing output coupling

n. Install nine steer clutch piston return springs (fig. 168).

o. Using sling 7083778 and three 7/16-14 bolts, install clutch reaction plate assembly (fig. 169).

Note. Aline index mark on plate with mark on end cover.

p. Install the right-brake anchor ring (fig. 170).

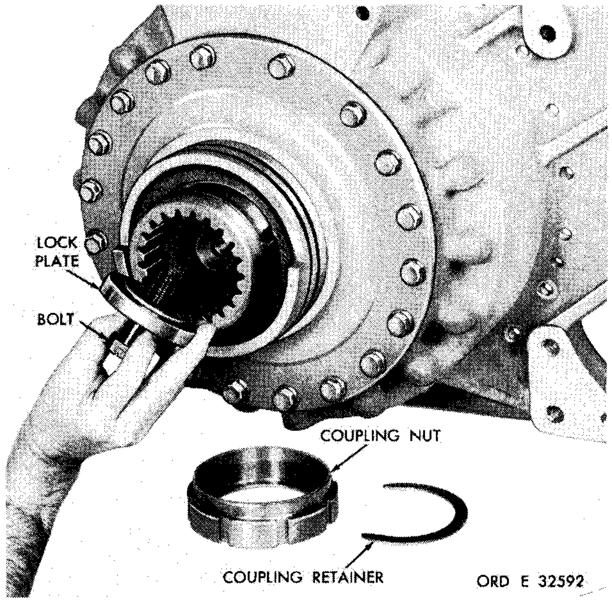
q. Install 18 bolts (two different lengths) that retain the brake anchor ring (fig. 170). Remove guide bolt 8351231 and install remaining bolt. Torque the bolts to 42-50 pound-feet.

r. Using hoist and sling 8351496, install the right-steer planetary carrier and brake hub assembly (fig. 171).

s. Install output coupling onto carrier output shaft (fig. 172).

Caution: Rotate output shaft and tap coupling lightly with soft mallet, being careful not to damage the oil seal.

*C2 t. Install lock plate and 3/4-16 x 2-3/4 self-locking bolt (fig. 173). Tighten bolt only finger-tight at this time. Temporarily install coupling retainer and coupling nut.



*C2 *Figure 173. Installing output coupling lock plate and retaining bolt*

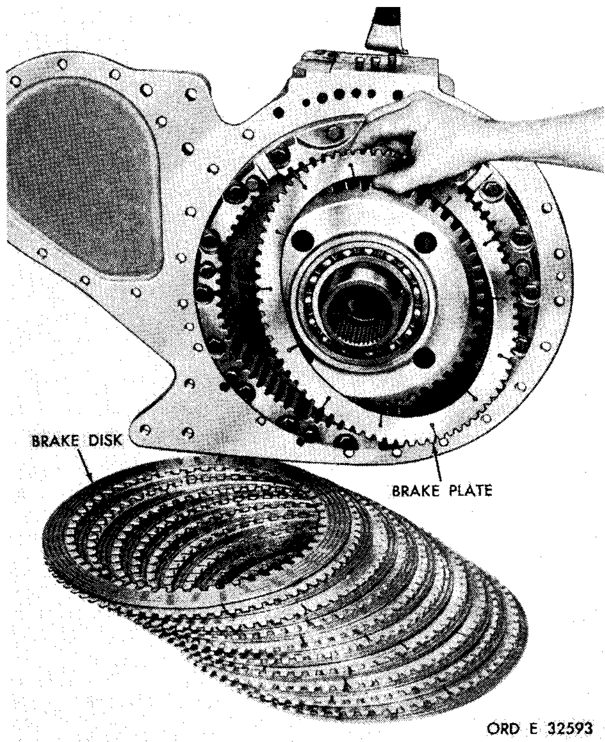


Figure 174. Installing right-brake plates and disks

*C2 u. Install 10 internal- and 10 external-splined brake plates and disks, beginning with an external-splined brake plate (fig. 174).

Section XVII. BRAKE COOLANT OIL PUMP—REBUILD

147. DESCRIPTION

Refer to par. 24 for description of the brake coolant oil pump.

148. DISASSEMBLY (fig. 384, fold-out 13)

a. Using a 9/16-inch wrench, remove three cap screws 60 with three lock washers 59 and three self-locking bolts 53 securing the brake coolant pump assembly 20 to the brake coolant pump manifold 56. Remove the pump assembly and gasket 54.

b. Remove two sets of brake coolant oil check valve components (64 through 68).

*C2 c. Using l/2-inch wrench, remove self-locking bolt 51 securing drive gear shroud 48 and shroud plate 50 to the pump. Remove the shroud and plate. Straighten and remove lock pin 42 from gear 49. Remove the gear.

d. Using a l/2-inch wrench, remove 14 self-locking bolts 27 and 52, securing the two cover assemblies 28 and 44 to the coolant oil pump body 32. Remove the cover assemblies.

*C2 e. Do not remove the needle bearing assemblies 29 and 45 or dowel pins 31 and 46 from covers 30 and 47 unless replacement is necessary. If necessary, press or drive out the bearings or pins.

f. Remove, as a unit, idler gear shaft 22, pump drive shaft 40, two oil pump idler gears 21 and 26, two drive gears 33 and 43, and the two oil pump separator plate assemblies 23 and 36 from the pump body.

g. Remove idler gears 21 and 26 from their shaft 22.

h. Remove oil pump drive gears 33 and 43 and keys 34 and 41 from the pump drive shaft 40.

i. Remove two retaining rings 35 from oil oil pump idler 22 and drive 40 gear shafts.

j. Remove separator plate assemblies 23 and 36 from shafts 22 and 40.

k. Do not remove needle bearings 25 and 37 from separator plates 24 and 38 unless replacement is necessary. If necessary, press bearings from plates.

l. Do not remove retaining rings 39 from oil pump idler 22 and drive 40 gear shafts unless replacement is necessary.

149. CLEANING

Refer to par. 71 for cleaning recommendations.

150. INSPECTION AND REPAIR

Refer to par. 72 for general inspection and repair recommendations. Repair and rebuild points of measurement for fits, clearances and wear limits are indicated by small, lower case letters in fig. 384, fold-out 13. Refer to par. 247 for wear limits information.

151. ASSEMBLY (fig. 384, fold-out 13)

a. If needle bearings 25 and 37 were removed from separator plates 24 and 38, install replacements 0.320-inch below the surface adjacent to the bearing bores. Press on the numbered side of the bearing cage.

*C2 ~~b. If needle bearing 29, or dowel pin 31 were removed from cover 30, install the replacement dowel pin to within 0.220 inch of the machined surface side of the cover. Press bearing 29 in, from the machined surface side, 0.010 to 0.040 inch below the surface adjacent to the bearing bores. Press against the numbered side of the bearing cage.~~

*C2 ~~c. If needle bearing 45, or dowel pin 46 were removed from cover 47, install the replacement dowel pin to within 0.220 inch of the machined surface side of the cover. Press bearing 45 into the pump drive gear bore location, from the machined surface side of the cover, 0.180 to 0.220 inch below the cover inner surface. Install the other bearing 45 from the same side, 0.010 to 0.040 inch below the cover inner surface.~~

d. Position oil separator plate assembly 36 on pump drive shaft 40 and retain it with two retaining rings 35 and 39.

e. Insert key 34 in its groove on drive shaft 40, at the end opposite the splined end. Install drive gear 33.

f. Place pump cover assembly 28 on the assembly table, inside up, and install the assembled shaft, plate assembly and gear in the cover.

g. Install the remaining separator plate assembly 23 on idler gear shaft 22 and retain it with two retaining rings 35 and 39.

h. Position the idler gear 26 over theremaining bearing bore in the cover and install the assembled idler gear shaft and plate assembly.

i. Install the remaining idler gear 21 on shaft 22, and drive gear 43 and key 41 on the drive shaft 40.

j. Install pump cover assembly 44 on pump body 32, indexing dowel pins 46 with their holes.

k. Install the assembled cover assembly 44 and body 32 over shafts, gears and separator plates onto cover assembly 28. Install seven bolts 27 and 52 to retain each cover assembly. Torque them to 17-20 pound-feet.

l. Install brake coolant oil pump drive gear 49 on the splined end of pump drive shaft 40. Install lock pin 42 through the gear and bend the ends of the pin to lock it.

#C2 m. Position drive gear shroud 48 and shroud plate 50 on the assembled pump and secure with a 5/16-18 self-locking bolt 51. Torque the bolt to 17-20 pound-feet.

n. Assemble both sets of brake coolant oil check valve components 64 through 68 on brake coolant pump manifold 56.

o. Install pump assembly 20 and gasket 54 on manifold 56 and secure with three 3/8-16 bolts 60 with lock washers 59 and three 3/8-16 self-locking bolts 53. Torque the cap screws 60 to 26-32 pound-feet. Torque tine self-locking bolts 53 to 36-43 pound-feet.

Section XVIII. REAR HOUSING ASSEMBLY—REBUILD

152. DESCRIPTION

Refer to pars. 17 and 18 for the description of the rear housing components.

153. DISASSEMBLY (figs. 377, 378, 379, 380, fold-outs 6, 7, 8, 9)

a. Using a 9/16-inch wrench, remove two self-locking bolts that retain brake air valve assembly (fig. 175). Remove the valve assembly.

b. Remove the retaining ring on the air valve assembly (fig. 175).

c. Remove the pin, and disassemble the air valve assembly (fig. 175).

d. Using a 9/16-inch wrench, remove 12 cap screws and lock washers retaining brake inspection covers. Remove the two covers with gaskets (fig. 175).

e. Remove the retaining ring that retains brake coolant pump idler gear and bearing on the idler gear shaft (fig. 176). Remove gear and bearing.

f. Remove the retaining ring that retains the bearing in the brake coolant idler gear (fig. 176). Remove the bearing from the gear.

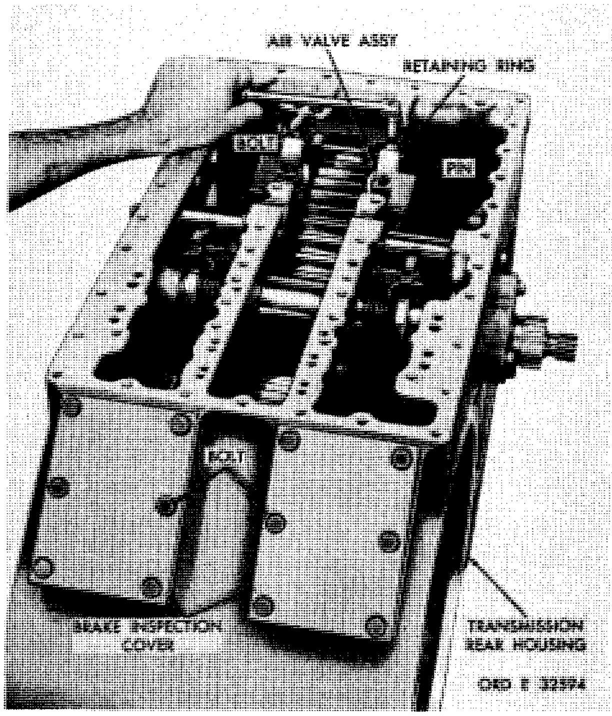


Figure 175. Removing transmission brake air valve assembly

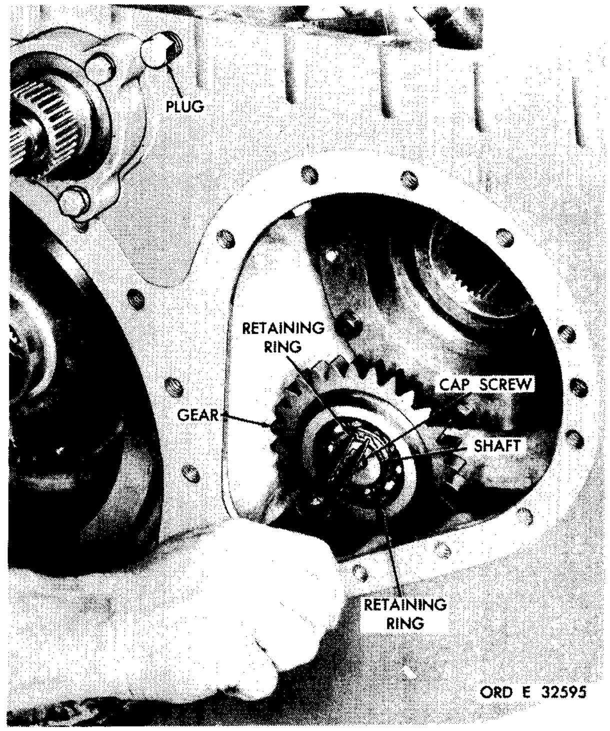


Figure 176. Removing (or installing) snap ring which retains brake collant pump idler gear

g. Using a 9/16-inch wrench, remove the shaft retaining cap screw (fig. 176). Using a slide hammer remover, remove the brake coolant pump idler gear shaft.

h. Using a square 5/16-inch wrench, remove the socket-head plug (fig. 176).

i. Using 11/16-inch wrench, remove the hexagon-head plug (fig. 177).

j. Straighten the pin on each brake apply link assembly and remove the pins, washers, springs, ratchets and adjusting nuts (fig. 177).

k. Remove the right-cam follower link shaft (fig. 178).

l. Remove the left-cam follower link shaft (fig. 178).

m. Remove the left-cam follower and brake apply link assembly (fig. 179).

n. Remove retaining ring 14 (fig. 379, fold-out 8) that retains pin 8 in left-cam follower link 3.

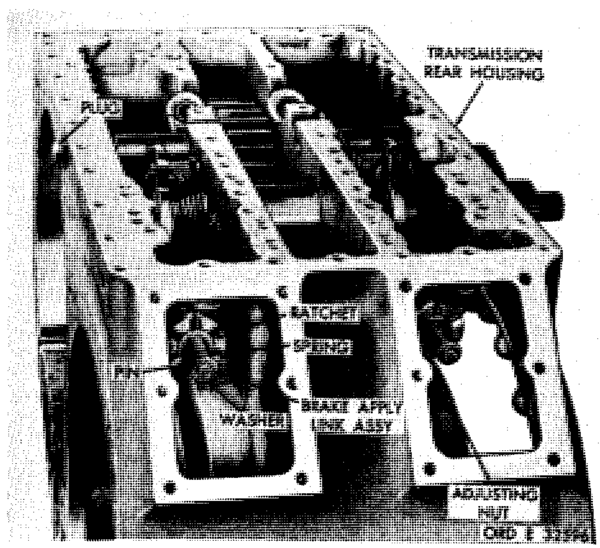


Figure 177. Transmission rear housing and component parts

o. Remove pin 8, cam follower 6, bearing rollers 5 and washers 4 and 7 from cam follower link 3.

p. Remove retaining ring 13 that retains brake apply link pin 9.

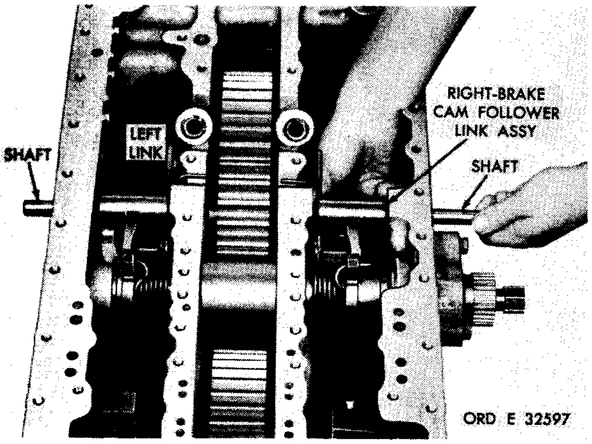


Figure 178. Removing right-cam follower link assembly shaft

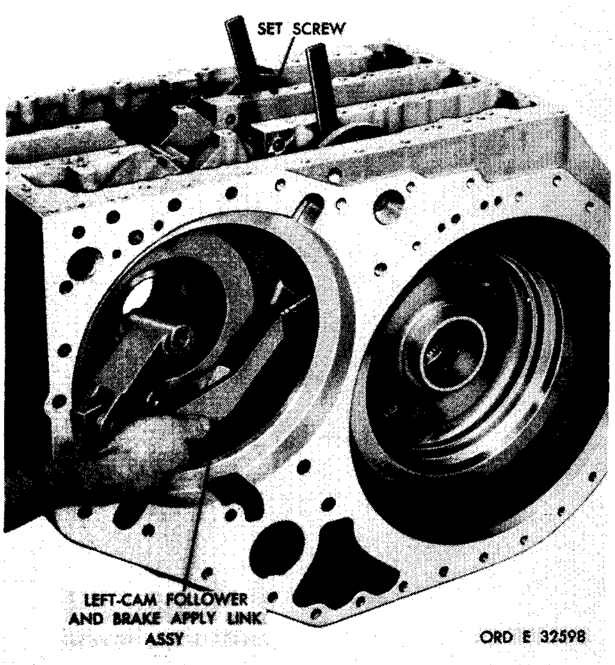


Figure 179. Removing (or installing) left-cam follower and brake apply link assembly

q. Remove pin 9, bearing 12 and brake apply link 11 from cam follower link 3.

r. Remove the left-brake apply cam rotating ring 19 (fig. 378, fold-out 7) and 12 balls 27. Remove ring seal 26 and expander 25 from cam ring 19 only if replacement is necessary.

s. Remove set screw (fig. 179).

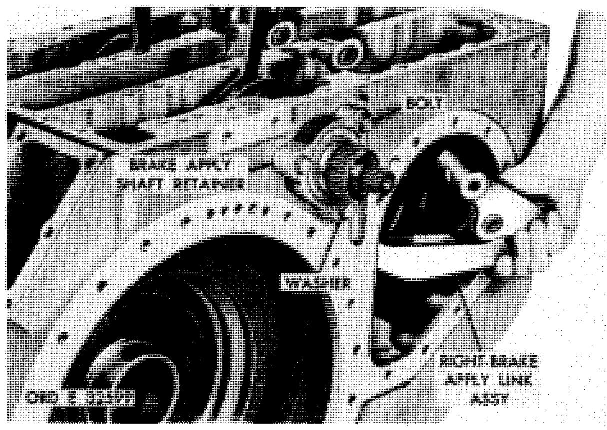


Figure 180. Removing (or installing) right-cam follower and brake apply link assembly

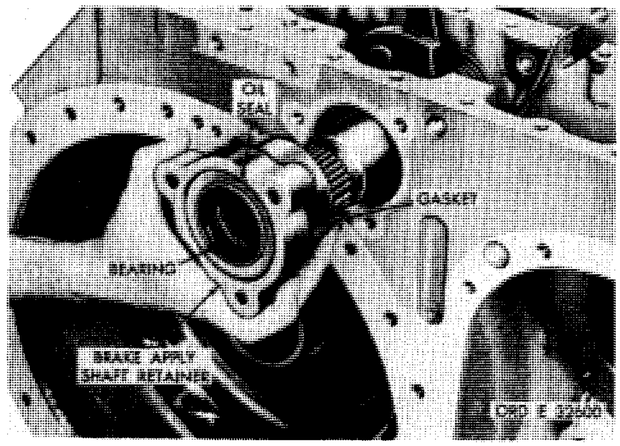


Figure 181. Removing brake apply shaft retainer and gasket

t. Remove the right-cam follower and brake apply link assembly (fig. 180).

u. Remove retaining ring 67 (fig. 379, fold-out 8) that retains pin 59 in right-cam follower link 60.

v. Remove pin 59, cam follower 62, bearing rollers 63 and washers 61 and 64 from cam follower link 60.

w. Remove retaining ring 68 that retains brake apply link pin 58.

x. Remove pin 58, bearing 70 and brake apply link 71 from cam follower link 60.

y. Remove right-brake apply rotating cam ring 13 (fig. 380, fold-out 9) and 12 balls

10. Remove ring seal 11 and expander 12 from cam ring only if replacement is necessary.

z. Using a 9/16-inch wrench, remove three bolts and lock washers retaining the brake apply shaft retainer (fig. 180).

aa. Remove brake apply shaft retainer and gasket (fig. 181).

ab. Do not remove oil seal or bearing from shaft retainer, unless replacement is necessary (fig. 181). If necessary, drive the seal and bearing from the retainer.

Remove the left- and right-brake apply shafts (fig. 182).

ad. Remove the right-brake cam assembly and spring (fig. 182). Remove the spring from the brake cam.

ae. Separate the right-brake apply shaft from the left-brake apply shaft (fig. 183).

af. Remove washer and retaining ring from the right-brake apply shaft (fig. 183).

ag. Do not remove the oil seal or bearing from the right-brake apply shaft unless replacement is necessary (fig. 183). If necessary, remove the seal and bearing.

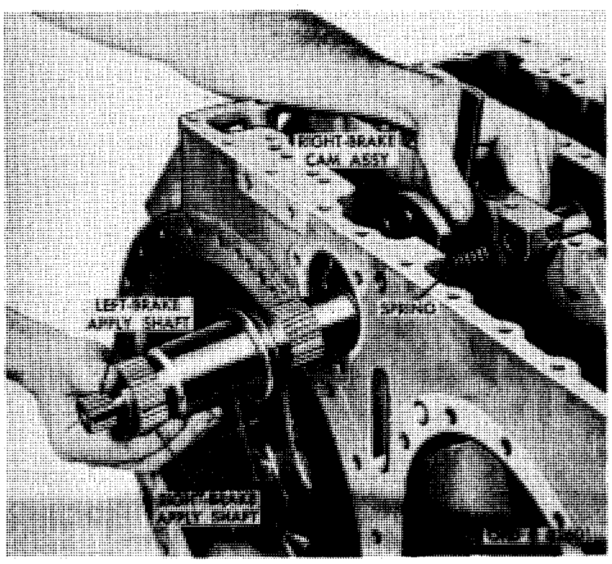


Figure 182. Removing left- and right-brake apply shafts

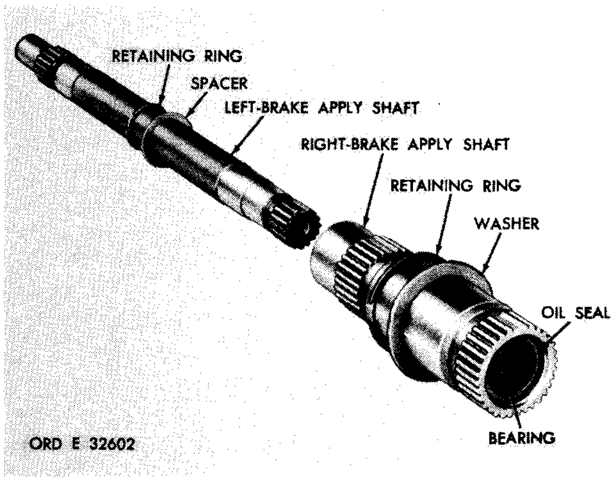


Figure 183. Left- and right-brake apply shafts and component parts

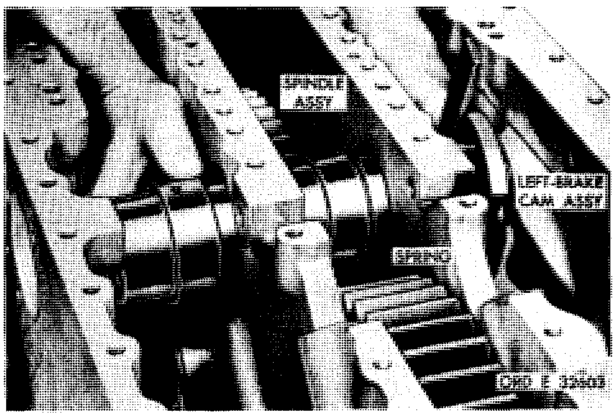


Figure 184. Removing spindle assembly, left-brake cam assembly and spring

ah. Remove spacer and retaining ring from the left-brake apply shaft (fig. 183).

ai. Remove the spindle assembly, left-brake cam assembly and spring from the transmission rear housing (fig. 184). Remove the spring from the brake cam.

aj. Do not remove bearings 78 and 80 (fig. 379, fold-out 8) from spindle 79 unless replacement is necessary. If necessary, remove the bearings.

ak. Using a 9/16-inch wrench, remove five self-locking bolts that retain the left-steer clutch support. Use two of these bolts as jacks crews to loosen the support (fig. 185). Remove the support (fig. 185).

al. Using a 9/16-inch wrench, remove five self-locking bolts that retain, the output drive gear bearing support (fig. 185). Use two of the bolts as jackscrews to loosen the support. Remove the support.

am. Position the transmission rear housing on its left side (fig. 186).

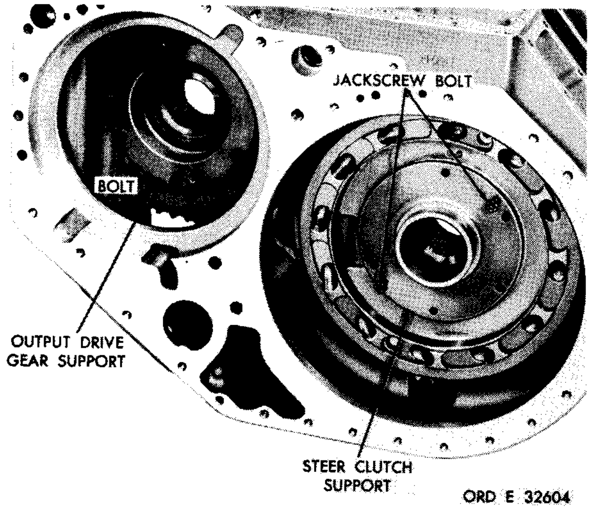


Figure 185. Transmission rear housing — left-side view

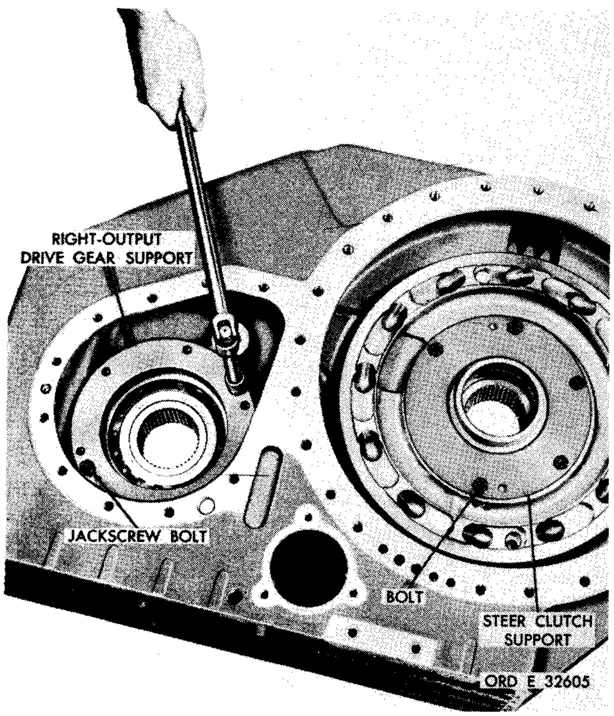


Figure 186. Removing output drive gear support

an. Using a 9/16-inch wrench, remove five self-locking bolts retaining the output drive gear bearing support. Use two of the bolts as jackscrews to loosen the support (fig. 186). Remove the support.

ao. Using a 9/16-inch wrench, remove five self-locking bolts that retain the right steer clutch support (fig. 186). Use two of the bolts as jackscrews to loosen the support. Remove the support.

ap. If bearings 25 and 27 (fig. 377, fold-out 6) or bearing assembly 35 (fig. 378, fold-out 7) or bearing assembly 1 (fig. 380, fold-out 9) need to be replaced, remove bearing races from supports 24 and 28 (fig. 377, fold-out 6) and supports 34 (fig. 378, fold-out 7) and 2 (fig. 380, fold-out 9).

aq. Remove the output drive gear with inner-bearing assemblies (fig. 187). Do not remove the inner bearing assemblies from the gear unless replacement is necessary.

ar. Remove the output driven gear with inner bearing assemblies (fig. 188). Do not remove the inner bearing assemblies from the gear, unless replacement is necessary.

as. Using a 9/16-inch wrench, remove four self-locking bolts and flat washers that

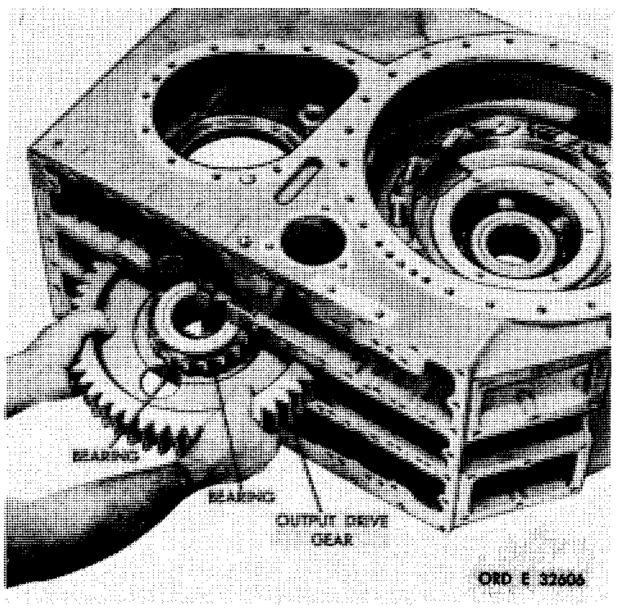


Figure 187. Removing (or installing) output drive gear

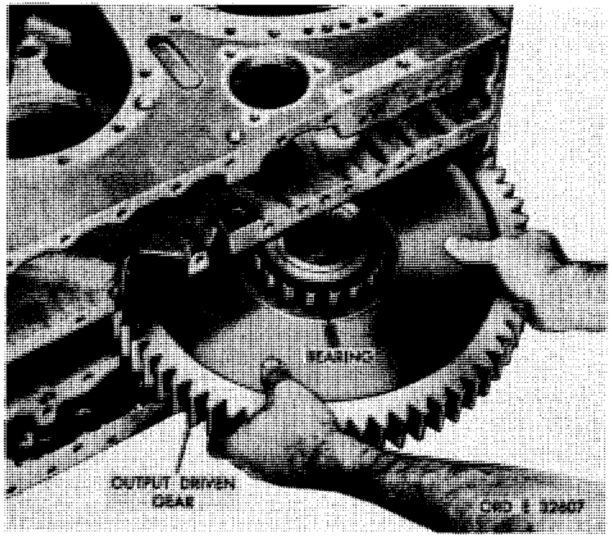


Figure 188. Removing output driven gear

retain the right- and left-brake apply cam stationary rings (fig. 189).

*C2 at. Remove left-brake apply cam stationary ring (fig. 190). Do not remove ring seal and expander from ring unless replacement is necessary.

*C2 au. Remove right-brake apply cam stationary ring (fig. 191). Do not remove ring seal and expander from ring, unless replacement is necessary.

av. No further disassembly of the rear transmission housing is necessary. If necessary, the various plugs in the housing may be removed to aid in cleaning the housing.

154. CLEANING

Refer to par. 71 for cleaning recommendations.

155. INSPECTION AND REPAIR

Refer to par. 72 for general inspection and repair recommendations. Repair and rebuild points of measurement for fits, clearances and wear limits are indicated by small, lower case letters in figs. 377, 378, 379 and 380, fold-outs 6, 7, 8 and 9. Refer to pars. 240 through 243 for wear limits information.

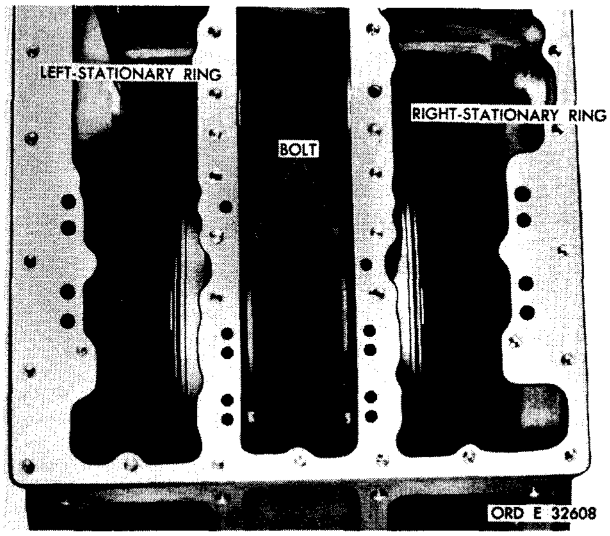


Figure 189. Top view of transmission rear housing, showing bolts which retain brake apply cam stationary rings

156. ASSEMBLY (figs. 377, 378, 379 and 380, fold-outs 6, 7, 8 and 9)

*C2 a. Install any plugs in transmission rear housing 25 that were removed for cleaning purposes.

*C2 b. If ring seal and expander were removed from right-brake apply cam stationary ring, install new replacements (fig. 191).

c. Install rightbrake apply cam stationary ring in the transmission rear housing (fig. 191).

*C2 d. If ring seal and expander were removed from left-brake apply cam stationary ring, install new replacements (fig. 190).

e. Install the left-brake apply cam stationary ring in the transmission rear housing (fig. 190).

f. Install four 3/8-24 self-locking, bolts with flat washers (fig. 189). Torque the bolts to 41-49 pound-feet.

g. If bearings were removed from output driven gear 49 (fig. 379, fold-out 8) install an inner bearing race assembly on each side of the gear (fig. 188). Press the bearing until firmly seated on the gear.

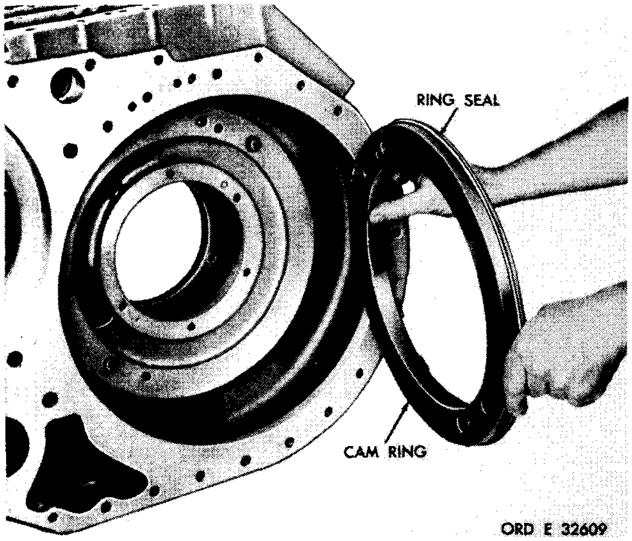


Figure 190. Removing (or installing) left-brake apply cam stationary ring

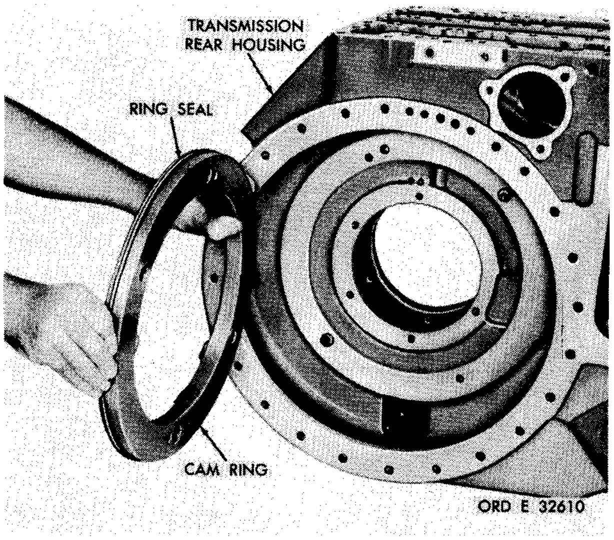


Figure 191. Removing (or installing) right-brake apply cam stationary ring

h. Install the output driven gear with bearing inner race assemblies into tine rear housing (fig. 188).

i. If bearings were removed from the output drive gear, install an inner-bearing race assembly on each side of the gear (fig. 187). Press bearings until they are firmly seated on the gear.

j. Install the output drive gear with the bearing inner-race assemblies into the rear housing (fig. 187).

k. If bearing outer races were removed from supports 24 and 28 (fig. 377, fold-out 6) and 34 and 2 (figs, 378 and 380, fold-outs 7 and 9), install outer bearing races in the supports.

l. Install the right-steer clutch support and secure with five 3/8-16 self-locking bolts (fig. 186). Torque the bolts to 36-43 pound-feet.

m. Install the right-output drive gear support and secure with five 3/8-16 self-locking bolts (fig. 186). Torque the bolts to 36-43 pound-feet.

n. Install the left-output drive gear support and secure with five 3/8-16 self-locking bolts (fig. 185). Torque the bolts to 36-43 pound-feet.

o. Install the left-steer clutch support and secure with five 3/8-16 self-locking bolts (fig, 185). Torque bolts to 36-43 pound-feet.

p. If bearings 78 and 80 (fig. 379, fold-out 8) were removed from spindle 79, install the bearings, pressing against the numbered side of the bearing cage. Press each bearing, 0.120 inch below the end of the spindle.

q. Install the left-brake cam assembly, spring and spindle assembly in rear housing. Install the spring on the brake cam and position these parts in the housing, then install the spindle assembly as shown (fig. 184).

r. Install the retaining ring and spacer on left-brake apply shaft (fig. 183).

s. If bearing or oil seal was removed, install in right-brake apply shaft (fig. 183). Install bearing, pressing against the numbered side of the cage, 0.960 inch below the end of the shaft. Install the new replacement oil seal, lip side of seal toward the inside, into the shaft end until it is firmly seated against its shoulder in the shaft.

t. Install the washer and retaining ring on the right-brake apply shaft (fig. 183).

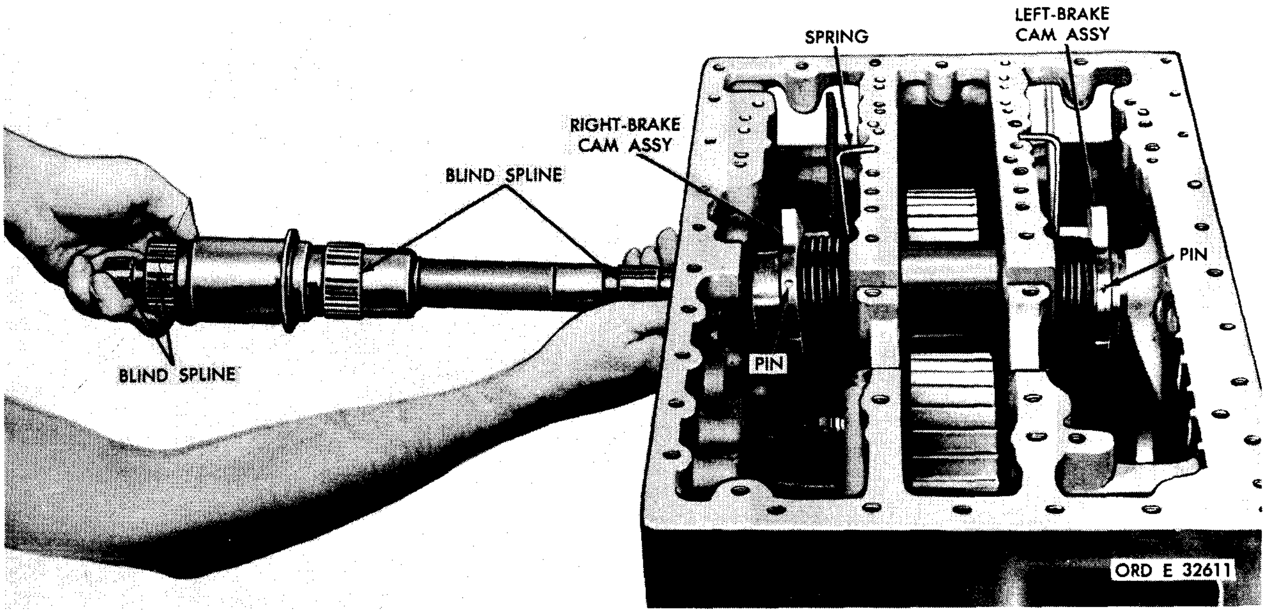


Figure 192. Installing right- and left-brake apply shafts

u. Install the right-brake apply shaft assembly onto left-brake apply shaft (fig. 183).

> Note. Be careful to avoid damaging the oil seal in the right apply shaft on the splines of the left apply shaft (fig. 183).

v. Install the spring on the right-brake cam assembly and position in the transmission rear housing (fig. 192).

w. Install the right- and left-brake apply shafts, indexing the blind splines on the shafts with the two pins located in the right- and left-brake cam assemblies (fig. 1 2).

x. Install brake apply shaft retainer and gasket (fig. 181).

y. Secure with three 3/8-16 bolts and lock washers. Torque to 26-32 pound-feet.

z. Position the rear housing on its left side and install 12 steel balls in the right-stationary cam ring (fig. 193).

aa. Install right-brake apply cam rotating ring (fig. 193).

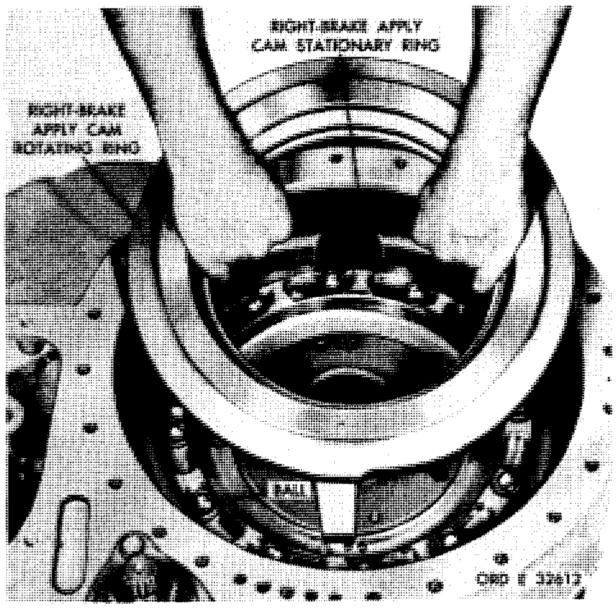


Figure 193. Installing right-brake apply cam rotating ring

ab. Install a wood block in the rear housing, to retain the right-brake apply cam rotating ring temporarily (fig. 194).

ac. Turn the rear housing over to rest on its right side. Block the housing as neces-

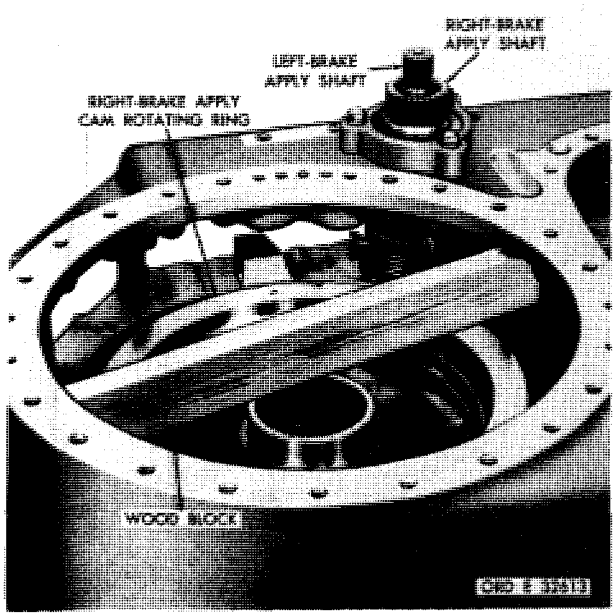


Figure 194. Wood block installed to temporarily retain cam rotating ring

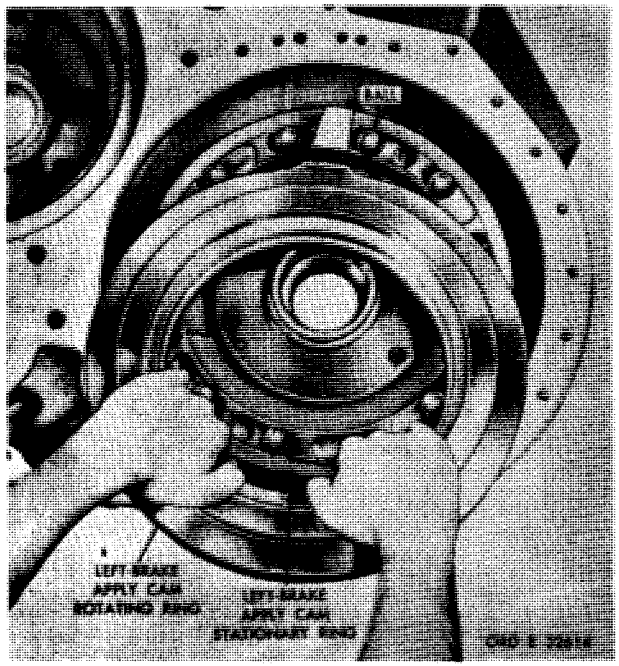


Figure 195. Installing left-brake apply cam rotating ring

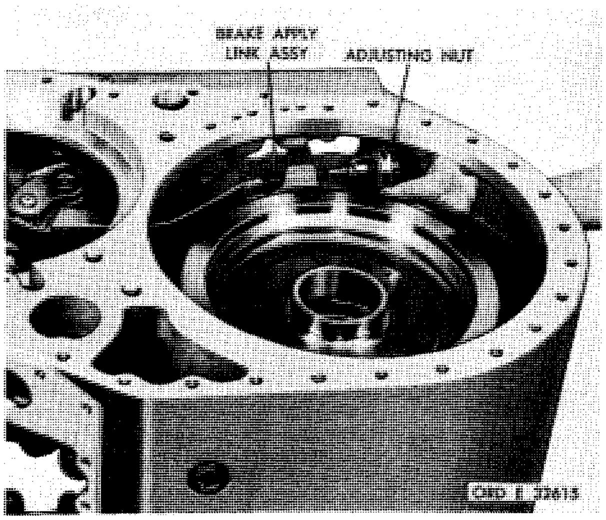


Figure 196. Installing left-brake adjusting nut

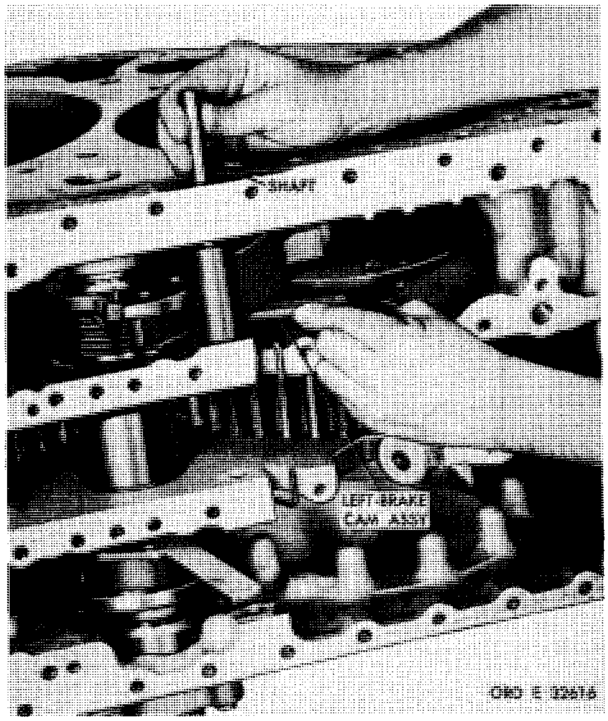


Figure 197. Installing left-follower link shaft

sary to prevent damaging the right- and left-brake apply shafts (fig. 194).

ad. Install 12 steel balls in the left-brake apply cam stationary ring. Install rotating ring (fig. 195).

ae. Assemble items 3 through 14 (fig. 379, fold-out 8) and install as in fig. 196. Install brake adjusting nut on the brake link, approximately 1/2 inch (fig. 196).

af. While holding the left-brake cam assembly against spring pressure, install the follower link shaft (fig. 197).

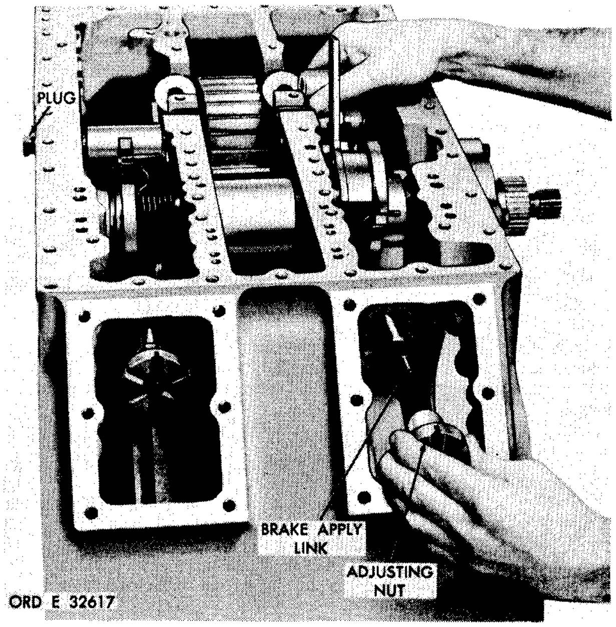


Figure 198. Installing right-brake adjusting nut

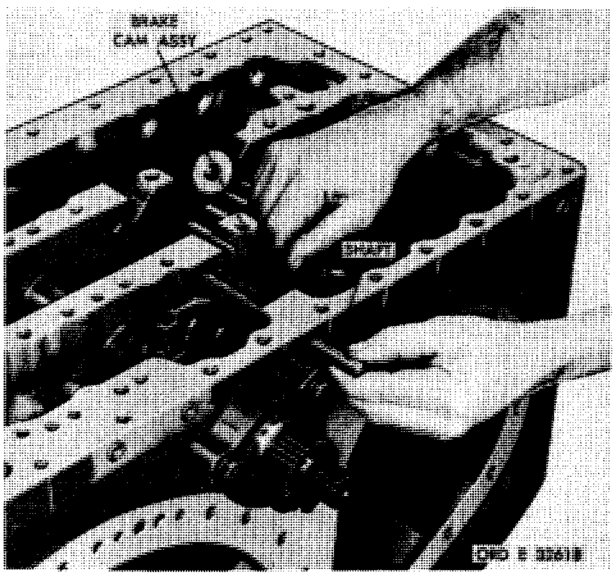


Figure 199. Installing right-follower link shaft

*C2 ag. Install the left-follower link shaft plug (fig. 198).

ah. Position the rear housing upright on assembly table. Assemble items 58 through 71 (fig. 379, fold-out 8) and install as in fig. 198. Install brake, adjusting nut on the right-brake apply link, approximately 1/2 inch (fig. 198).

ai. While holding the right-brake cam assembly against spring pressure, install the follower link shaft (fig. 199).

*C2 aj. Install the right-follower link shaft plug (fig. 200).

ak. Tighten brake adjusting nuts until they are finger tight (fig. 200). Do not tighten the nuts enough to move the rotating cam rings.

al. Install ratchets onto brake links (fig. 200).

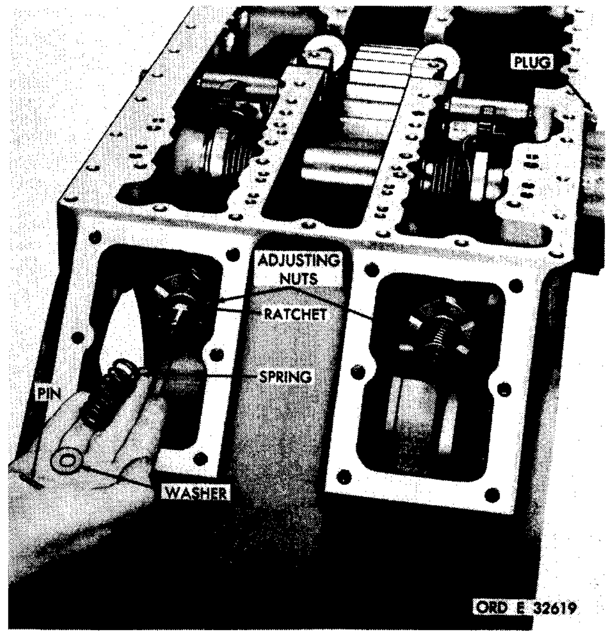


Figure 200. Right-and left-brake adjusting nuts and component parts

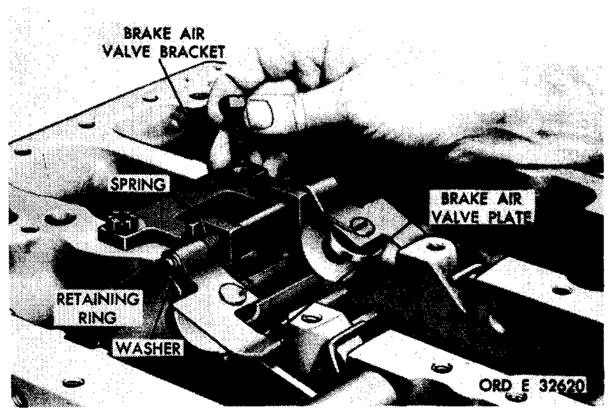


Figure 201. Installing transmission brake air valve assemblies

am. Install springs and washers and secure with pins (fig. 200). Bend the ends of the pins to retain them.

an. Install retaining rings, brake air valve plates and springs on brake air valve bracket as shown (fig. 201).

ao. Install right- and left-air valve plate assemblies with bracket and secure with two 3/8-16 self-locking bolts. Torque bolts to 36-43 pound-feet.

*C2 ap. Install the brake coolant pump idler gear shaft and secure with one 3/8-16 x 3-1/4 bolt (fig. 176). Torque the bolt to 26-32 pound-feet.

aq. Install the bearing in the brake pump idler gear and secure with the snap ring (fig. 176).

ar. Install the idler gear with the bearing onto the shaft and secure it with the snap ring (fig. 176).

Section XIX. LEFT- AND RIGHT-STEER PLANETARIES—REBUILD

157. DESCRIPTION

Refer to par. 16 for the description of the left- and right-steer planetaries.

158. DISASSEMBLY (figs, 378 and 380, fold-outs 7 and 9)

*C2 Note. All related items not covered in a through i, below, were removed from the transmission as outlined in par. 75, steps 27 through 30 and 40 through 54. No further disassembly of those parts is required. The left- and right- steer planetary assemblies are identical; therefore, the following disassembly steps apply to both assemblies.

a. Remove the retaining ring that retains the steer planetary shaft and carrier assembly in the brake hub (fig. 202).

b. Remove the steer planetary shaft and carrier assembly (fig. 202).

c. Remove the steer planetary ring gear from the brake hub (fig. 203).

d. Remove the thrust washer from the ring gear assembly (fig. 203).

e. Remove the retaining ring from the ring gear assembly (fig. 203).

f. Press or drive the bearing out of the brake hub (fig. 203).

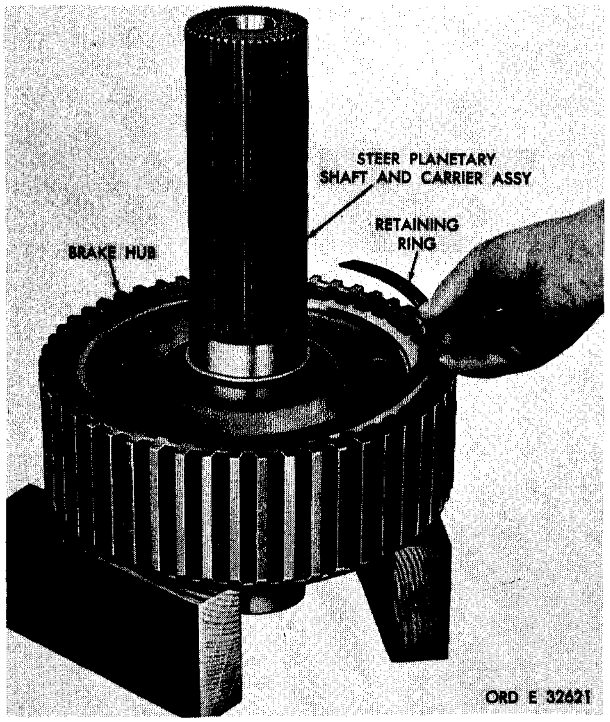


Figure 202. Removing (or installing) steer planetary carrier and shaft retaining ring

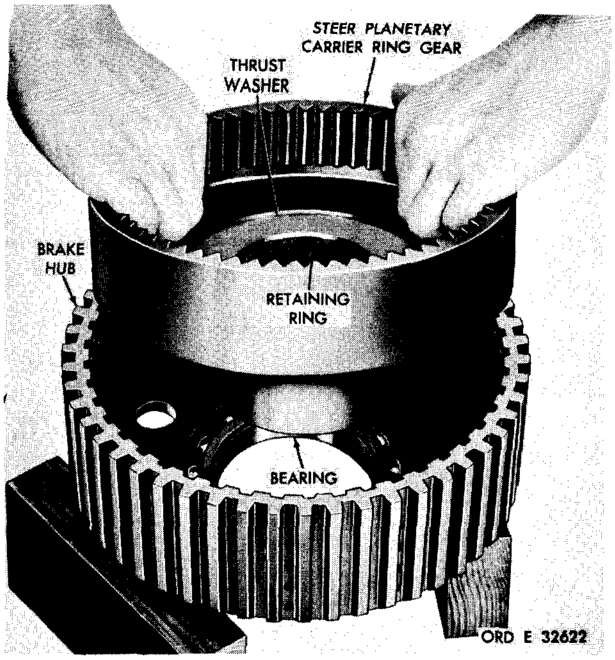


Figure 203. Removing (or installing) steer planetary carrier ring gear assembly

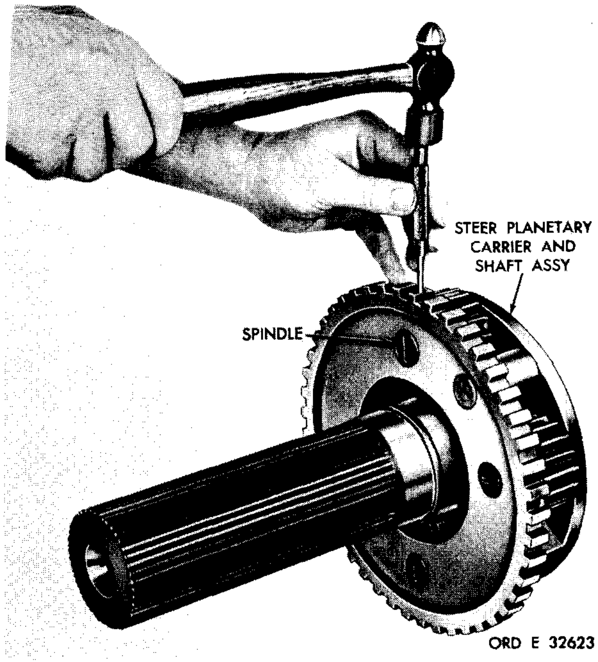


Figure 204. Removing (or installing) spindle lock pin

g. Using a hammer and punch, remove four steer planetary carrier spindle lock pins (fig. 204).

h. Using replacer plate 8351492, replacer 8351266 and a suitable press tool, press four spindles from the planetary shaft and carrier assembly (fig. 205).

i. Remove the steer planetary carrier pinions (6, fig. 378, fold-out 7), roller bearings 7, spacers 5 and 8, and thrust washers 4 and 9 from carrier 3.

159. CLEANING

Refer to par. 71 for cleaning recommendations.

160. INSPECTION AND REPAIR

Refer to par. 72 for general inspection and repair recommendations. Repair and rebuild points of measurement for fits, clearances and wear limits are indicated by small, lower case letters in figs. 378 and 380, fold-outs 7 and 9. Refer to pars. 241 and 243 for wear limits information.

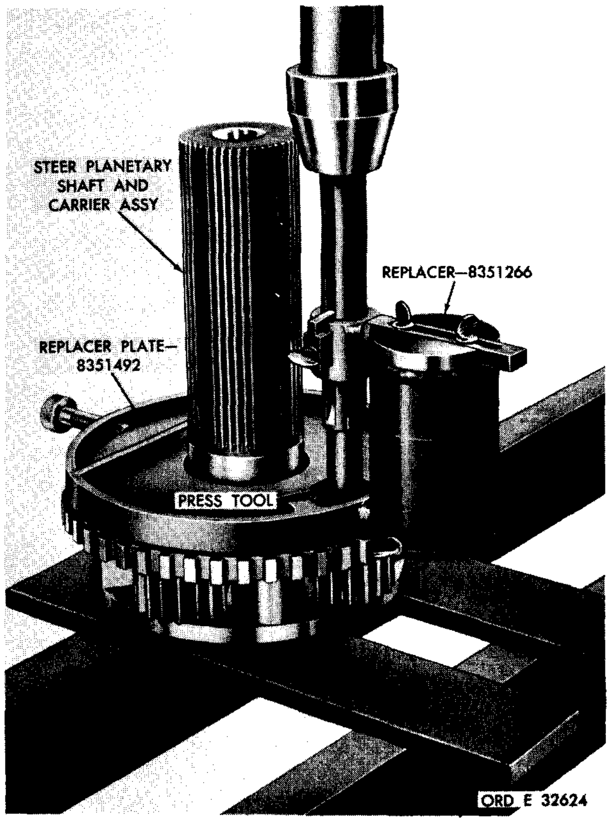


Figure 205. Removing steer planetary carrier and shaft assembly spindle

161. ASSEMBLY (figs. 378 and 380, fold-outs 7 and 9)

*C2 Note. Chill steer planetary carrier spindles 11 (fig. 378, fold-out 7) in dry ice for approximately one hour, prior to installation.

a. Place steer planetary shaft and carrier, shaft end up, in a press.

b. Grease the inside diameter of the planetary carrier pinion 6.

c. Insert 25 spindle bearing rollers 7 into the pinion bore. Refer to fig. 215.

d. Place a thrust washer 4 and a spacer 5 on alining tool 8351214. Refer to fig. 215.

e. Insert alining tool 8351214 with washer and spacer into the pinion. Refer to fig. 215.

f. Install spacer 8 and thrust washer 9 (fig. 378, fold-out 7) over the alining tool. Remove the alining tool.

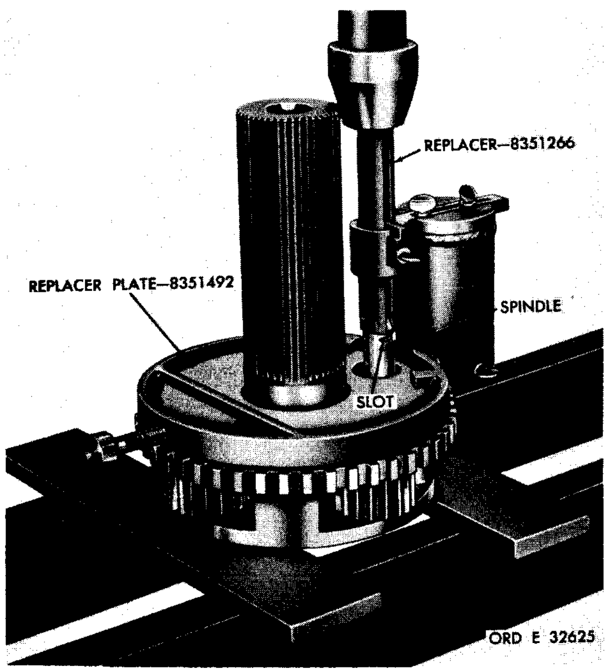


Figure 206. Installing steer planetary carrier and shaft spindle

g. Slide the pinion and its related parts into its location in the planetary carrier assembly 3 from which it was removed. Using alining tool 8351214, aline the pinion and related parts in the carrier. Refer to fig. 221. Remove the alining tool.

h. Install the replacer plate 8351492 and spindle replacer 8351266 on the carrier and position the planetary carrier spindle for installation (fig. 206).

Note. Be sure that the slot on the spindle is indexed properly with its lock pin bore in the carrier (fig. 206).

i. Using a press, install the planetary carrier spindle in the carrier (fig. 206). Spindle replacer 8351266 will bottom against the carrier when the spindle is properly positioned in the carrier.

j. Install lock pin 10 (fig. 378, fold-out 7) using a hammer and punch. Drive lock pin in 0.030 to 0.060 inch below the carrier surface (fig. 204). Stake metal over the pin.

*C2 **k. Install the remaining three spindles 11 (fig. 378, fold-out 7) and pinions 6 with rollers 7, thrust washers 4 and 9, spacers 5 and 8 and lock pins 10 in the same manner as described in b through j, above.**

l. Install the bearing in the brake hub (fig. 203). Press in the bearing until it bottoms.

m. Install the thrust washer in the ring gear (fig. 203).

n. Install the internal-snap ring in the ring gear (fig. 203).

o. Install the steer planetary carrier ring gear in the brake hub (fig. 203).

p. Install the steer planetary shaft and carrier assembly (fig. 202).

q. Install the retaining ring that retains the steer planetary shaft and carrier assembly (fig. 202).

Section XX. LEFT- AND RIGHT-BRAKE ANCHOR RING AND CLUTCH REACTION PLATE ASSEMBLIES—REBUILD

162. DESCRIPTION

Refer to pars. 16 and 17 for the description of the left- and right-brake anchor ring and clutch reaction plate assemblies.

163. DISASSEMBLY (figs. 377 and 381, fold-outs 6 and 10)

a. Left- and Right-brake Anchor Ring Assemblies

Note. The left- and right-brake anchor ring assemblies are identical, therefore, the following disassembly procedures apply to either assembly.

(1) With the aid of a C-clamp, compress the brake release springs, and remove two retaining rings from the brake return guide pins (fig. 207).

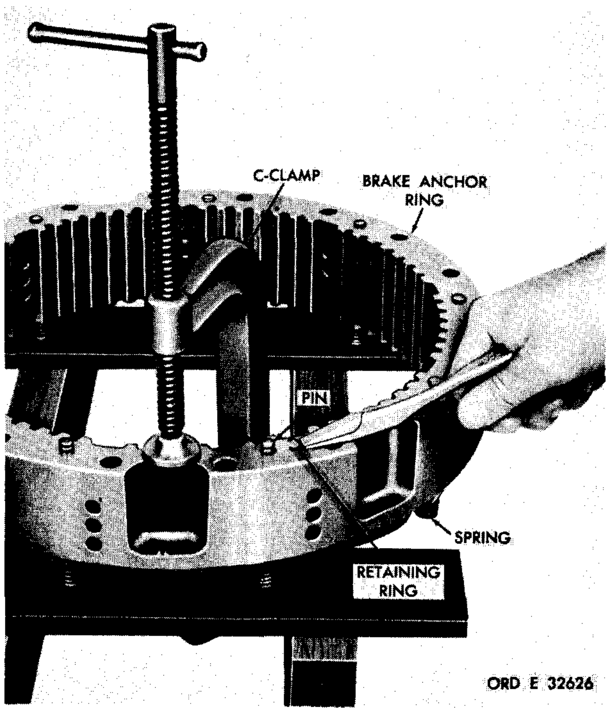


Figure 207. Removing (or installing) brake return guide pin retaining ring

(2) Remove the guide pins and return springs (fig. 207).

(3) Remove the remaining seven retaining rings, springs and guide pin, in the same manner as described in (1) and (2), above.

b. Left- and Right-clutch Reaction Plate Assemblies

Note. The left- and right-clutch reaction plate assemblies are identical, therefore, the following disassembly procedures apply to either assembly. The following describes the disassembly of the left-clutch reaction plate assembly.

(1) Do not disassemble clutch reaction plate assembly unless replacement of parts is necessary. If necessary, remove three self-locking bolts 72 (fig. 377, fold-out 6), using a 1/2-inch wrench.

(2) Remove sleeve 71.

(3) Remove two preformed packings 70 from sleeve 71.

164. CLEANING

Refer to par. 71 for cleaning recommendations.

165. INSPECTION AND REPAIR

Refer to par. 72 for general inspection and repair recommendations. Repair and rebuild points of measurement for fits, clearances and wear limits are indicated by small, lower case letters in figs. 377 and 381, fold-outs 6 and 10. Refer to pars. 240 and 244 for wear limits information.

166. ASSEMBLY (figs. 377 and 381, fold-outs 6 and 10)

a. Left- and Right-brake Anchor Ring Assemblies

Note. The left- and right-brake anchor ring assemblies are identical, therefore the following assembly procedures apply to either assembly.

(1) Install the brake return guide pin and spring in the brake anchor ring (fig. 207).

(2) Using a C-clamp, compress the brake return spring, and install the retaining ring (fig. 207).

(3) Install the remaining eight brake return guide pins, springs and retaining rings in the same manner as described in (1) and (2), above.

b. Left- and Right-clutch Reaction Plate Assemblies

Note. The left- and right-clutch reaction plate assemblies are identical, therefore the following assembly procedures apply to either assembly. However, the following describes the assembly of the left-clutch reaction plate assembly.

(1) Install two preformed packings 70 (fig. 377, fold-out 6) on sleeve 71.

(2) Install sleeve 71 with preformed packings 70 in clutch reaction plate 67.

(3) Secure sleeve 71 with three 5/16-18 x 1 self-locking bolts 72. Torque the bolts to 17-20 pound-feet.

Section XXI. LEFT- AND RIGHT-OUTPUT CLUTCHES — REBUILD

167. DESCRIPTION

Refer to par. 16 for the description of the left- and right-output clutches.

168. DISASSEMBLY (figs. 377 and 381, fold-outs 6 and 10)

Note. The left- and right-output clutch assemblies are identical, therefore the following disassembly procedures apply to either assembly. All references to exploded views are to fig. 377, fold-out 6, illustrating the left assembly.

a. Remove two hook-type seal rings from the hub of the output clutch assembly (fig. 208).

b. Using a hammer and punch, flatten the corners of the lock plates on the output clutch assembly (fig. 208).

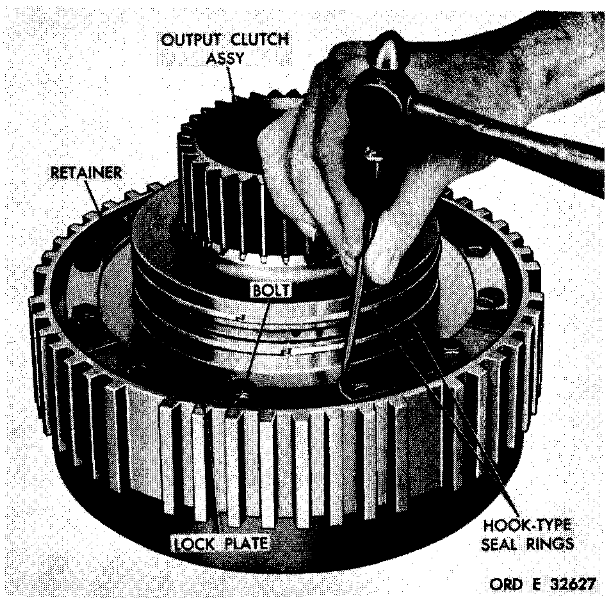


Figure 208. Straightening corners of output clutch lock plates

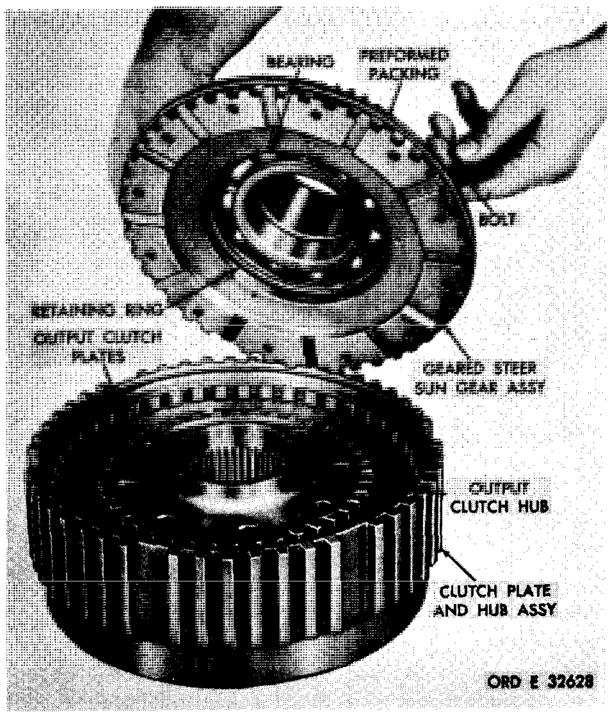


Figure 209. Removing (or installing) geared steer sun gear assembly

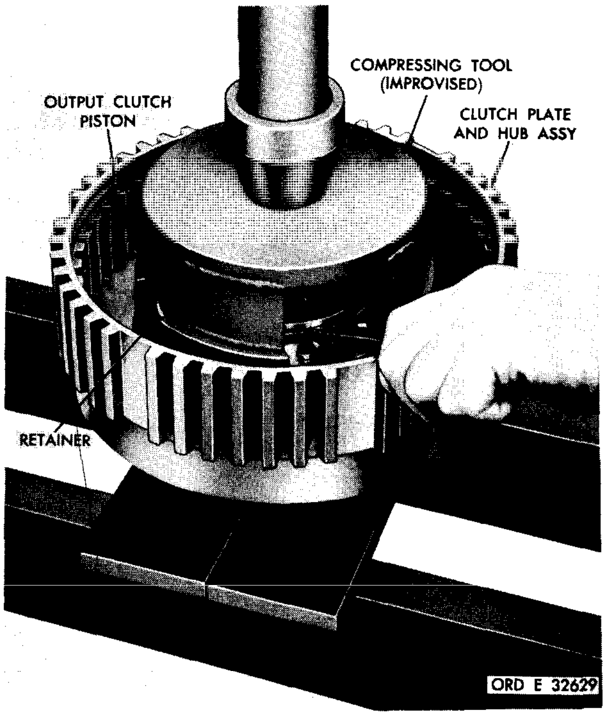


Figure 210. Removing (or installing) retaining ring for
*C2 *piston return spring retainer*

c. Using a 1/2-inch wrench, remove 12 bolts, six lock plates and three retainers from the clutch assembly (fig. 208).

d. Using two 5/16-24 bolts, remove the geared steer sun gear assembly from the clutch plate and hub assembly (fig. 209).

Note. The sun gear assembly may bind in the hub, due to the preformed packing. If so, pry it loose.

e. Remove the preformed packing from geared steer sun gear assembly (fig. 209).

f. Do not remove the bearing and retaining ring from the sun gear assembly unless replacement of the bearing is necessary (fig. 209). If necessary, remove the retaining ring and press out the bearing.

g. Remove the output clutch hub and clutch plates from the clutch plate hub assembly (fig. 209).

h. Using a hydraulic press and compressing tool (fig. 38) against the piston return spring retainer, compress the springs and remove the retaining ring (fig. 210).

i. Remove retainer 43 (fig. 377, fold-out 6) and eighteen piston return springs 44.

j. Turn the clutch plate and hub assembly over, and bump the clutch piston from the hub (fig. 210).

k. Remove ring seal 38 and expander 39 (fig. 377, fold-out 6) from clutch piston 41.

C*2 **Note. If expander is not damaged it may be ~~reused.~~ However, replace ring seal at every ~~rebuild.~~**

l. Remove ring seal 37 and expander 36 from clutch plate and hub assembly 35.

*C2 **~~Note. If expander~~ is not damaged it may be reused. However, ~~replace~~ ring seal at every rebuild.**

169. CLEANING

Refer to par. 71 for cleaning recommendations.

170. INSPECTICON AND REPAIR

Refer to par. 72 for general inspection and repair recommendations. Repair and rebuild points of measurement for fits, clearances and wear limits are indicated by small, lower case letters in figs. 377 and 381, fold-outs 6 and 10. Refer to pars. 240 and 244 for wear limits information.

171. ASSEMBLY (figs. 377 and 381, fold-outs 6 and 10)

Note. The left- and right-output clutches are identical, therefore the following assembly procedures apply to either assembly.

a. Install expander 36 and ring seal 37 on clutch plate and hub assembly 35.

b. Install expander 39 and ring seal 38 on clutch piston 41.

c. Install the clutch piston in the clutch plate and hub assembly (fig. 210).

d. Install eighteen piston return springs 44 (fig. 377, fold-out 6) and retainer 43.

e. Using a hydraulic press and compressing tool (fig. 38) against the spring retainer, compress the piston return springs and install the retaining ring (fig. 210).

f. Install the output clutch hub (fig. 209).

g. Install seven internal- and seven external-splined output clutch plates alternately, beginning with an internal-splined clutch plate (fig. 209).

h. If the bearing was removed from the geared steer sun gear, press in a new bearing until firmly seated. Install the retaining ring (fig. 209).

i. Install the preformed packing on the geared steer sun gear assembly (fig. 209).

j. Using two 5/16-24-inch bolts, install the geared steer sun gear assembly (fig. 209).

k. Install three retainers and six lock plates (fig. 208).

l. Install twelve 5/16-24 bolts. Torque the bolts to 14-18 pound-feet. Bend corners of the lock strips against the heads of the bolts (fig. 208).

m. Install two hook-type seal rings on the hub of the output clutch assembly (fig. 208).

Section XXII. CLUTCH PISTONS AND HOUSINGS — REBUILD

172. DESCRIPTION

Refer to par. 12 for the description of the intermediate-range piston assembly and par. 16 for the description of the steer clutch piston assembly.

173. DISASSEMBLY (figs. 376, 377 and 381, fold-outs 5, 6 and 10)

a. Right- or Left-steer Clutch Piston Assembly

Note. The right- and left-steer clutch piston assemblies are identical. The following describes the disassembly of the left assembly.

(1) Remove two expanders 58 and 60 and ring seals 57 and 59 (fig. 377, fold-out 6) from steer clutch piston 61.

1C2 ~~Note.~~ If expanders are not damaged, they may be reused. ~~The ring~~ seals should always be replaced.

(2) Check the small hole through the piston. It must be clean.

b. Intermediate-range Piston and Housing (fig. 211)

(1) Remove the intermediate-range piston from the piston housing.

(2) Remove ring seal and expander from the piston.

(3) Remove ring seal and expander from the piston housing.

174. CLEANING

Refer to par. 71 for cleaning recommendations.

175. INSPECTION AND REPAIR

Refer to par. 72 for general information and repair recommendations. Repair and rebuild points of measurement for fits, clearantes and wear limits are indicated by small, lower case letters in figs. 376, 377 and 381, fold-outs 5, 6 and 10. Refer to pars. 239, 240 and 244 for wear limits information.

176. ASSEMBLY (figs. 376, 377 and 381, fold-outs 5, 6 and 10)

a. Right- or Left-steer Clutch Piston Assembly

Note. The right- and left-steer clutch piston assemblies are identical. The following describes the assembly of the left assembly.

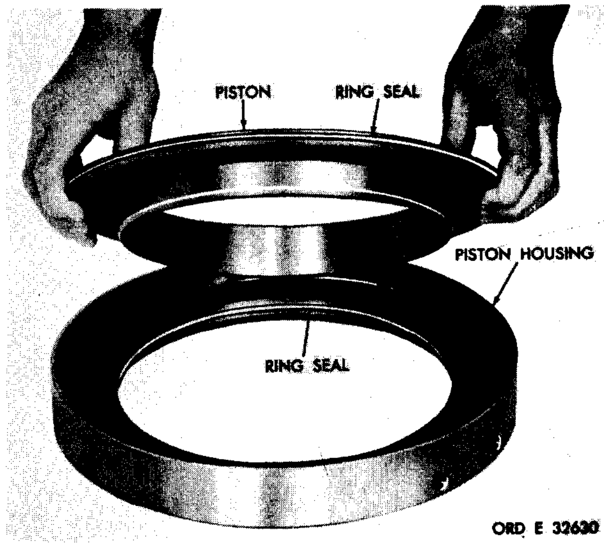


Figure 211. Removing (or installing) intermediate-range piston

(1) Install expander 60 (fig. 377, fold-out 6) and ring seal 59 onto the steer clutch piston 61.

(2) Install expander 58 and ring seal 57 onto piston 61.

b. Intermediate-range Piston and Housing (fig. 376, fold-out 5)

(1) Install ring seal 12 and expander 13 in the intermediate-range piston housing 14.

(2) Install expander 10 and ring seal 11 onto the piston.

(3) Install the intermediate-range piston into the piston housing 14.

Section XXIII. REVERSE-RANGE PLANETARY AND SUPPORT ASSEMBLY — REBUILD

177. DESCRIPTION

Refer to par. 14 for description of the reverse-range planetary and support assembly.

178. DISASSEMBLY (fig. 377, fold-out 6)

*C2

a. Using a press, remove the reverse-range planetary carrier assembly from its support (fig. 212).

b. Remove the retaining ring retaining the bearing in the carrier support (fig. 212).

c. Using a press, remove the bearing from the carrier support (fig. 212).

d. Using a hammer and punch, remove six lock pins retaining the planetary carrier spindles (fig. 213).

*C2 e. Position the reverse-range planetary carrier assembly in a press. Using a suitable pressing tool, remove six carrier spindles (fig. 214). Remove the pinions 14 (fig. 377, fold-out 6), thrust washers 8 and 15, spacers 9, 11 and 13, and roller bearings 10 and 12.

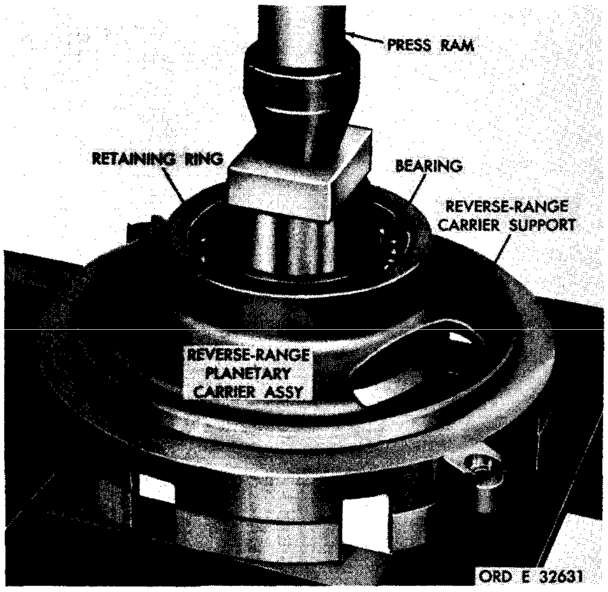


Figure 212. Removing reverse-range planetary carrier assembly

179. CLEANING

Refer to par. 71 for cleaning recommendations.

180. INSPECTION AND REPAIR

Refer to par. 72 for general inspection and repair recommendations. Repair and rebuild points of measurement for fits, clearances and wear limits are indicated by small, lower case letters in fig. 377, fold-out 6. Refer to par. 240 for wear limits information.

181. ASSEMBLY (fig. 377, fold-out 6)

*C2 Note. Chill spindles 7 in dry ice for approximately one hour, prior to installation.

a. Place reverse-range planetary carrier 17, hub side down, in a press.

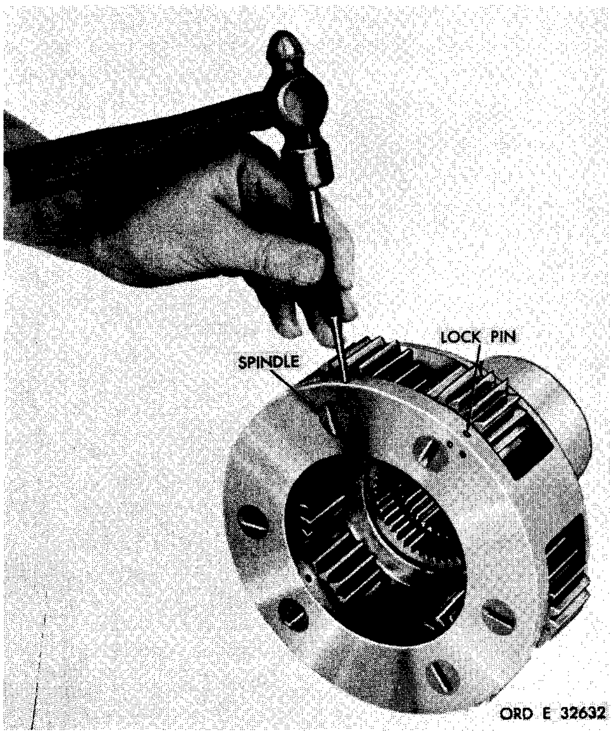


Figure 213. Removing (or installing) spindle lock pins

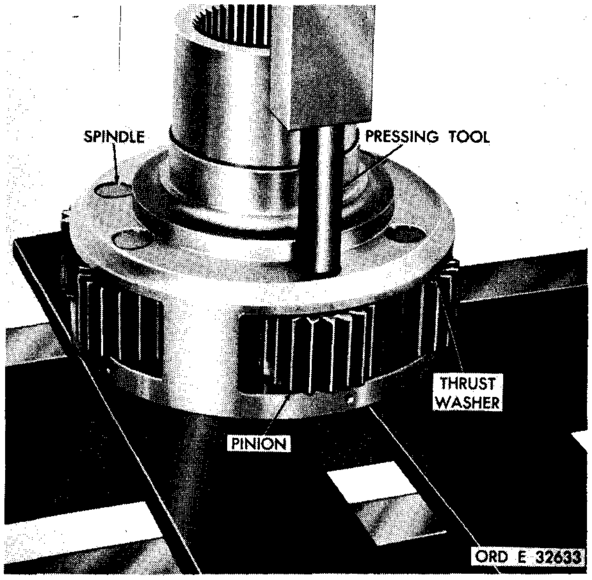


Figure 214. Removing planetary carrier spindles

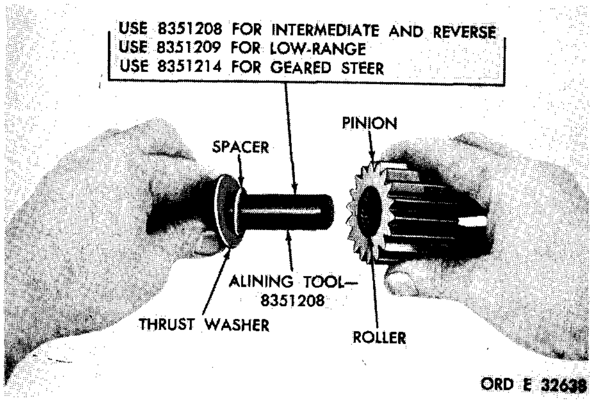


Figure 215. Assembling planetary carrier pinion components

b. Grease the inside diameter of planetary carrier pinion (fig. 215).

*C2 c. Insert 22 spindle rollers into one end of the pinion bore (fig. 215).

d. Place a thrust washer and spacer on alining tool 8351208 (fig. 215).

e. Insert the alining tool 8351208, with spacer and thrust washer, into the pinion.

*C2 **f. Place a spacer over the alining tool, and into the pinion, then install 22 additional spindle rollers (fig. 216).**

g. Install a spacer and then a thrust washer over the alining tool. Remove the alining tool (fig. 216).

h. Slide the pinion and its related parts into the location in the carrier from which it was removed (fig. 217). Using alining tool 8351208, aline the pinion, washers and rollers. Remove the alining tool.

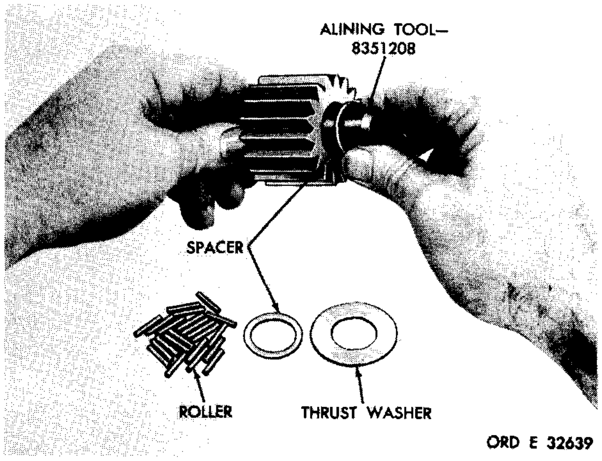


Figure 216. Installing planetary carrier pinion spacer

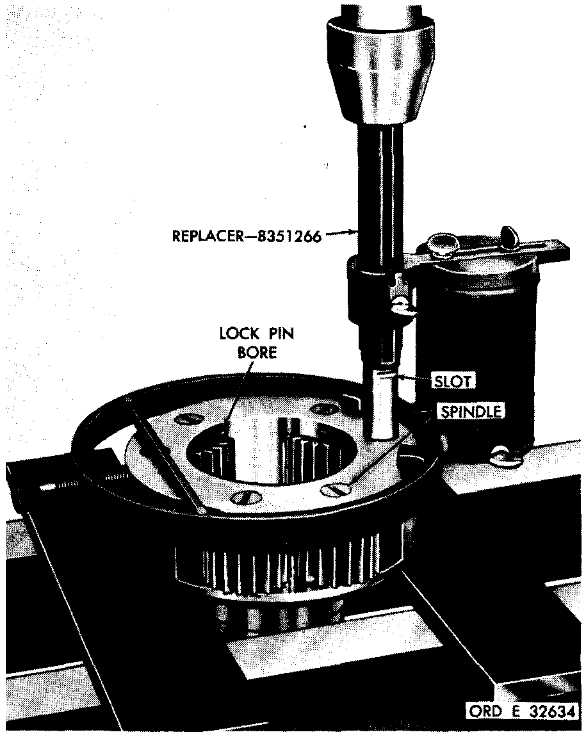


Figure 217. Installing planetary carrier spindle

i. Install spindle replacer 8351266 on the planetary carrier and position the spindle for installation (fig. 217).

> Note. Be sure that the slot on the spindle is indexed properly with its lock pin bore in the carrier (fig. 217).

j. Using a press and spindle replacer 8351266, install the planetary carrier spindle (fig. 217). The spindle replacer will bottom against the carrier when the spindle is properly positioned in the carrier.

k. Install the lock pin, using a hammer and punch (fig. 213). Drive the lock pin flush to 0.030-inch below the carrier surface.

*C2 l. Install the remaining five spindles 7 (fig. 377, fold-out 6) and pinions 14, with rollers 10 and 12, thrust washers 8 and 15, lock pins 16 and spacers 9, 11 and 13 in the same manner as described in b through k, above.

*C2 m. Install bearing 20 in reverse-range carrier support 18. Install retaining ring 21.

n. Install reverse-range planetary carrier assembly 6 in the carrier support 18. Press on the carrier assembly until it bottoms in the support.

Section XXIV. LOW- AND REVERSE-RANGE PISTONS AND HOUSING — REBUILD

182. DESCRIPTION

The low- and reverse-range clutch pistons are contained in a common, machined steel housing. The pistons, piston return springs, retainers, ring seals, seal ring expanders and retainer rings contained in this housing for low- and reverse-range are identical and interchangeable.

183. DISASSEMBLY (fig. 376, fold-out 5)

a. Position the low- and reverse-range clutch piston housing assembly in a press (fig. 218).

b. Using a compressing tool (fig. 38), remove the retaining ring retaining the piston return spring retainer (fig. 218). Remove the retainer.

c. Install eighteen piston return springs 49 (fig. 376, fold-out 5).

d. Remove the low-range clutch piston (fig. 218).

e. Remove ring seal 52 and expander 51 (fig. 376, fold-out 5) from low-range clutch piston 50.

f. Remove ring seal 53 and expander 54 from piston housing 55.

g. Remove reverse-range clutch piston 60, piston return springs 61, retainer 62, retaining ring 63, ring seals 57 and 58, and expanders 56 and 59 in the same manner as described for low-range in b through f, above.

*C2 **Note. Low and reverse expanders 51, 54, 56 and 59 may be reused if not damaged. All ring seals 52, 53, 57 and 58 should be replaced.**

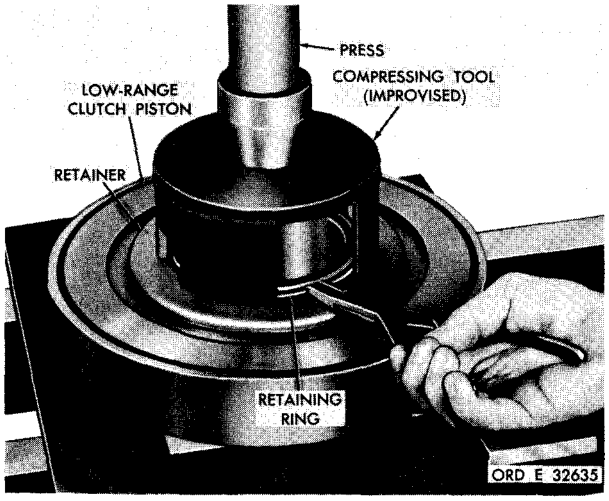


Figure 218. Removing (or installing) retaining ring for low-range piston return spring retainer

184. CLEANING

Refer to par. 71 for cleaning recommendations.

185. INSPECTION AND REPAIR

Refer to par. 72 for general inspection and repair recommendations. Repair and rebuild points of measurement for fits, clearances and wear limits are indicated by small, lower case letters in fig. 376, fold-out 5. Refer to par. 239 for wear limits information.

186. ASSEMBLY (fig. 376, fold-out 5)

a. Install expander 54 and ring seal 53 in low- and reverse-range clutch piston housing 55.

b. Install expander 51 and ring seal 52 onto low-range clutch piston 50.

c. Install low-range clutch piston 50 into housing 55.

d. Install eighteen piston return springs 49 onto piston 50.

e. Install piston return spring retainer 48.

f. Position assembly in a press and using a compressing tool, compress piston springs and install retaining ring (fig. 218).

g. Install reverse-range clutch piston 60 (fig. 376, fold-out 5) and related parts in housing 55, in the same manner, as described for low-range in a through f. above.

Section XXV. LOW-RANGE PLANETARY AND OUTPUT SHAFT — REBUILD

187. DESCRIPTION

Refer to par. 13 for description of the low-range planetary and output shaft assembly.

188. DISASSEMBLY (fig. 376, fold-out 5)

*C2

a. Using a hammer and punch, remove the four planetary spindle lock pins retaining the planetary spindles (fig. 219).

b. Using a press, and a suitable press tool, remove four planetary carrier spindles (fig. 220).

c. Remove planetary pinion 30 (fig. 376, fold-out 5), spacers 32 and 29, thrust washers 33 and 28, and rollers 31.

d. Remove the three remaining planetary pinions 30 and related parts.

189. CLEANING

Refer to par. 71 for cleaning recommendations.

190. INSPECTION AND REPAIR

Refer to par. 72 for general inspection and repair recommendations. Repair and rebuild points of measurement for fits, clearances and wear limits are indicated by small, lower case letters in fig. 376, fold-out 5. Refer to par. 239 for wear limits information.

191. ASSEMBLY (fig. 376, fold-out 5)

*C2 Note. Chill spindles 34 in dry ice for approximately one hour prior to installation.

a. Place low-range shaft and carrier 27 in a press.

b. Grease the inside diameter of planetary carrier pinion assembly 30.

c. Insert 20 spindle rollers into the pinion bore. Refer to fig. 215.

d. Place a thrust washer and spacer on alining tool 8351209. Refer to fig. 215.

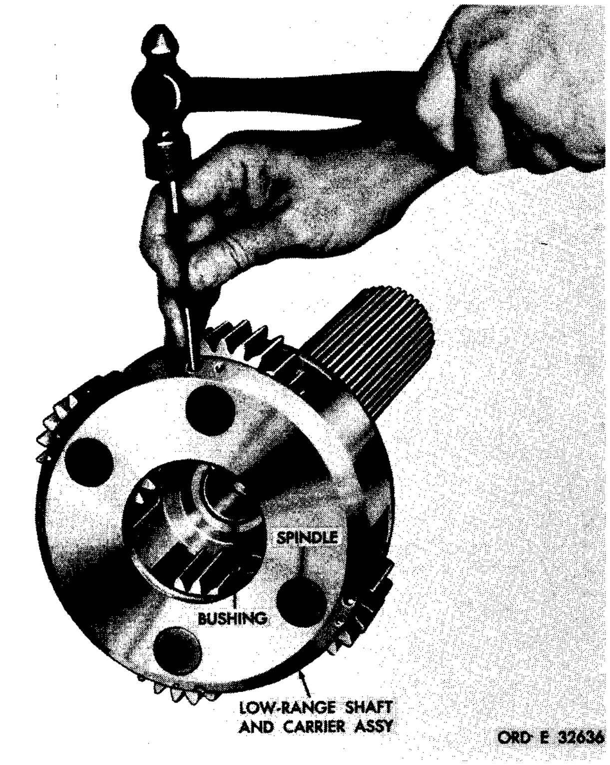


Figure 219. Removing spindle lock pin

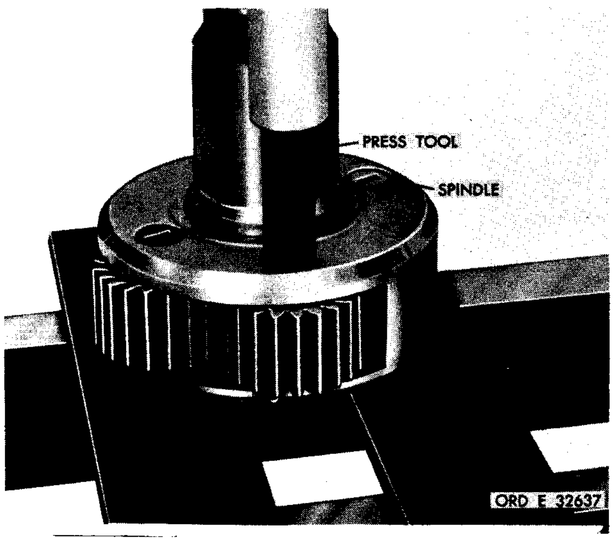


Figure 220. Removing planetary carrier spindle

e. Insert alining tool 8351209, with washer and spacer, into the pinion.

f. Install a spacer 29 or 32 (fig. 376, fold-out 5) over the alining tool, then a thrust washer 28 or 33. Remove the alining tool.

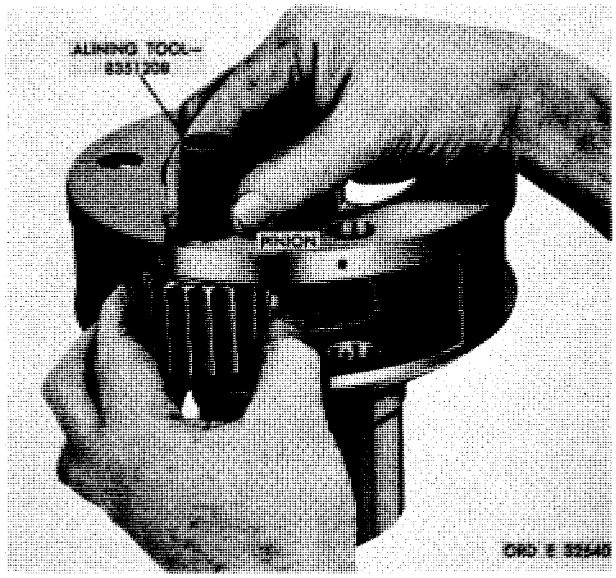


Figure 221. Alining pinion and component parts in planetary carrier

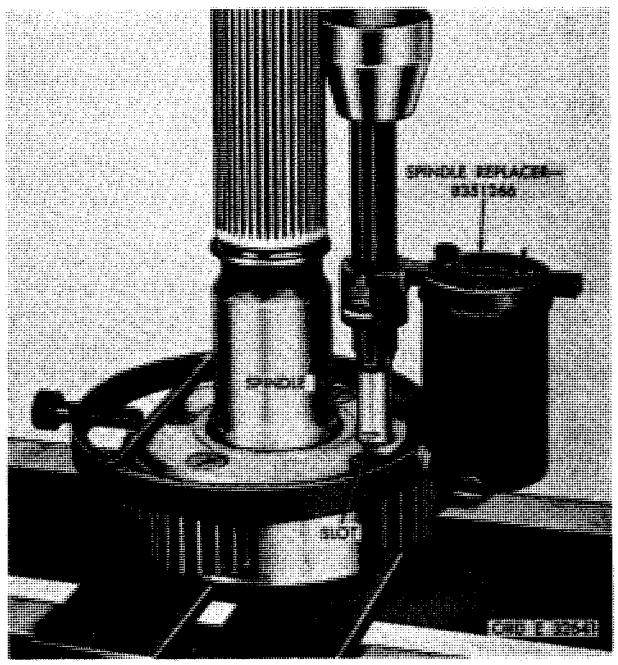


Figure 222. Installing planetary carrier spindle

g. Slide pinion 30 and its related parts into location in carrier 27 from which it was removed. Using alining tool 8351209, aline the pinion, washers and rollers. Refer to fig. 221. Remove the alining tool.

h. Install spindle replacer 8351266 on

the planetary carrier and position the spindle for installation. See fig. 222.

Note. Be sure that the slot on the spindle is indexed properly with its lock pin bore in the carrier.

i. With a press and spindle replacer 8351266, install planetary carrier spindle (fig. 222). The spindle replacer will bottom against the carrier when the spindle is properly positioned in the carrier.

j. Using a hammer and punch, install the planetary carrier spindle lock pin (fig. 219). Drive the pin in 0.030 to 0.060 below the surface of the carrier. Stake metal over the pin.

*C2

k. Install the remaining three spindles 34 (fig. 376, fold-out 5) and pinions 30, with rollers 31, spacers 32 and 29, lock pins 36 and thrust washers 28 and 33 in the same manner as described in b through j, above.

Section XXVI. INTERMEDIATE-RANGE PLANETARY AND LOW-RANGE RING GEAR — REBUILD

192. DESCRIPTION

Refer to pars. 12 and 13 for the description of the intermediate-range planetary and low-range ring gear.

193. DISASSEMBLY (fig. 376, fold-out 5)

*C2

Note. All related items not covered in a through d, below, were removed from the transmission as outlined in par. 75, steps 116, 123 and 124. No further disassembly of these parts is required.

a. Remove retaining ring that retains the intermediate-range planetary carrier assembly in the low-range ring gear (fig. 223). Remove the carrier assembly.

b. Using a hammer and punch, remove four planetary carrier spindle lock pins (fig. 224).

c. Using a press and a piece of 3/8-inch drill rod approximately 6 inches long, or other suitable press tool, remove four planetary spindles from the carrier (fig. 225).

*C2

d. Remove planetary carrier pinions, spacers, thrust washers and bearing rollers from the carrier (fig. 225).

194. CLEANING

Refer to par. 71 for cleaning recommendations.

195. INSPECTION AND REPAIR

Refer to par. 72 for general inspection

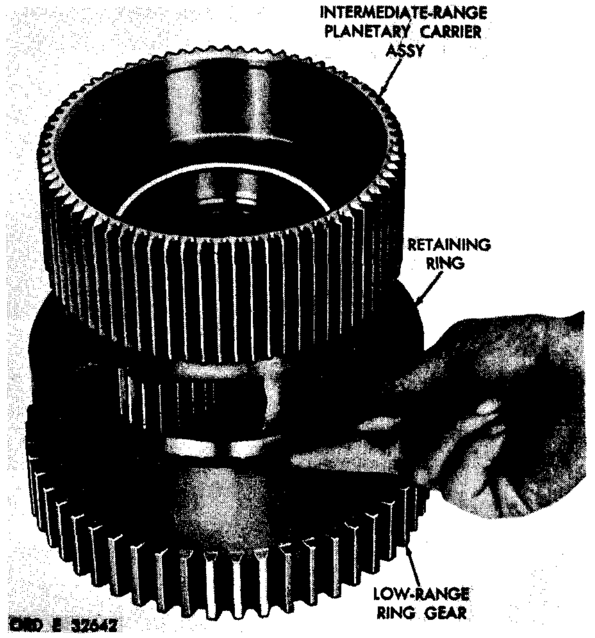


Figure 223. Removing (or installing) retaining ring that retains intermediate-range planetary carrier assembly

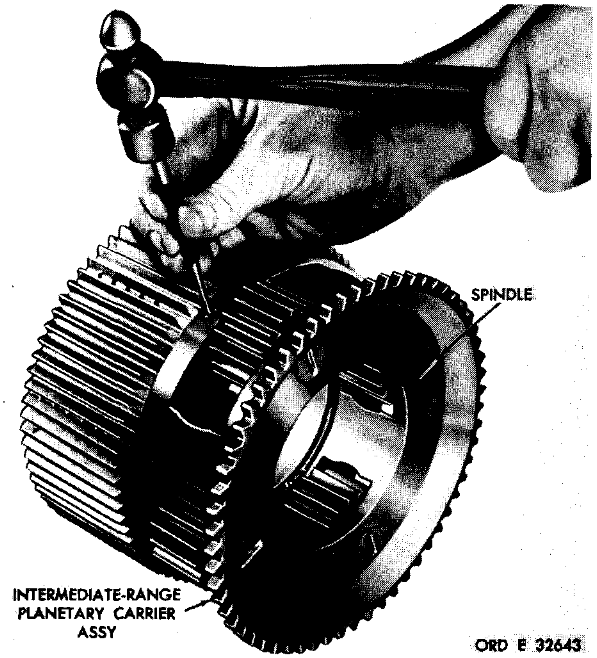


Figure 224. Removing spindle lock pin

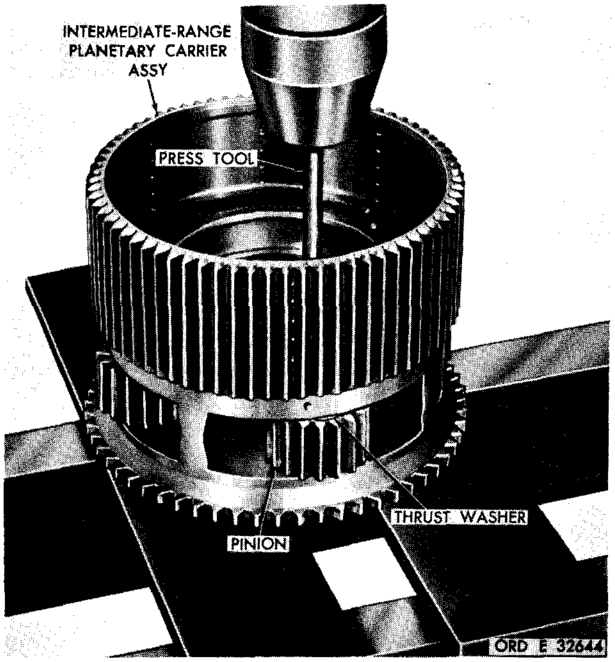


Figure 225. Removing intermediate-range planetary carrier spindle

and repair recommendations. Repair and rebuild points of measurement for fits, clearances and wear limits are indicated by small, lower case letters in fig. 376, fold-out 5. Refer to par. 239 for wear limits information.

196. ASSEMBLY (fig. 376, fold-out 5)

*C2

Note. Chill spindles 19 in dry ice for approximately one hour, prior to installation.

a. Place intermediate-range planetary carrier, long-splined end down, in a press (fig. 226).

b. Grease the inside diameter of planetary carrier pinion 22, fig. 376, fold-out 5.

*C2

c. Insert 22 spindle rollers 23 into the pinion bore. Refer to fig. 215.

*C2

d. Place spacer 21 or 24 ~~and washer 20~~ or 25 on one end ~~of alining tool 8351208~~. Refer to ~~fig. 215~~.

e. Insert alining tool 8351208 through the pinion.

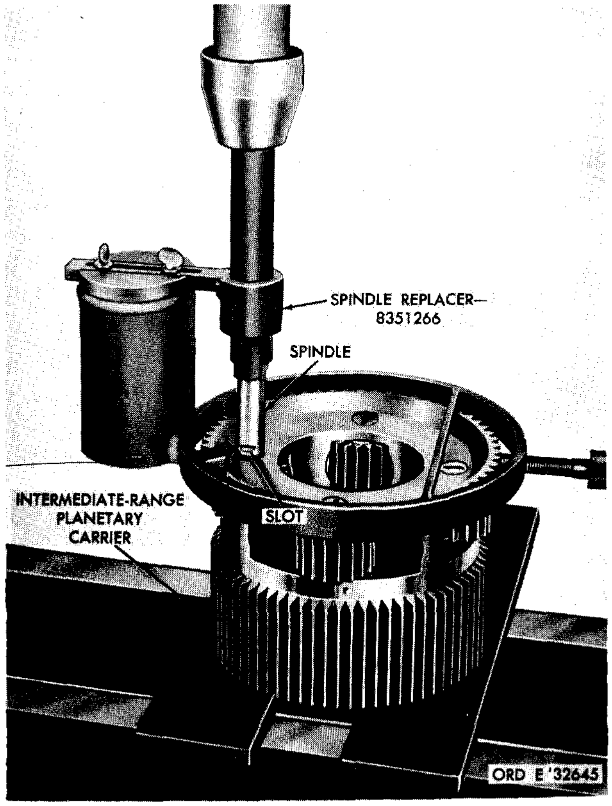


Figure 226. Installing intermediate-range planetary carrier spindle

*C2 f. Place a spacer 21 or 24 and thrust washer 20 or 25 over the other end of alining tool. Remove alining tool.

*C2 g. Slide the pinion, with its related parts into the location in the carrier 18 from which it was removed. Using alining tool 8351208, aline the pinion, rollers, spacers and washers. Refer to fig. 221. Remove the alining tool.

h. Install spindle replacer 8351266 on the planetary carrier and position the spindle for installation (fig. 226).

Note. Be sure that the slot on the spindle is indexed properly with its lock pin bore in the carrier (fig. 226).

i. With a press and spindle replacer 8351266, install the planetary carrier spindle (fig. 226). Press in the spindle to within 0.010 inch of the carrier surface.

j. Install a lock pin, using a hammer and punch (fig. 224). Drive the pin 0.030 to 0.060 below the adjacent carrier surface. Stake metal over the pin.

*C2 k. Install the remaining three spindles 19 (fig. 376, fold-out 5) and pinions 22, with rollers 23, spacers 21 and 24, thrust washers 20 and 25 and lock pins 17 in the same manner as described in b through j, above.

*C2 l. Install the intermediate-range planetary carrier assembly onto the low-range ring gear. Install the retaining ring (fig. 223).

Section XXVII. HIGH-RANGE CLUTCH — REBUILD

197. DESCRIPTION

Refer to par. 11 for the description of the high-range clutch.

198. DISASSEMBLY (fig. 375, fold-out 4)

Note. All related items not covered in a through i, below, were removed from the transmission as outlined in par. 75, steps 126 and 127. No further disassembly of these parts is required.

a. Remove the retaining ring that retains the high-range clutch reaction plate (fig. 227). Remove the reaction plate.

b. Remove the high-range clutch plates (fig. 227).

c. Using bearing puller, remove the bearing from the hub of the high-range clutch housing (fig. 228).

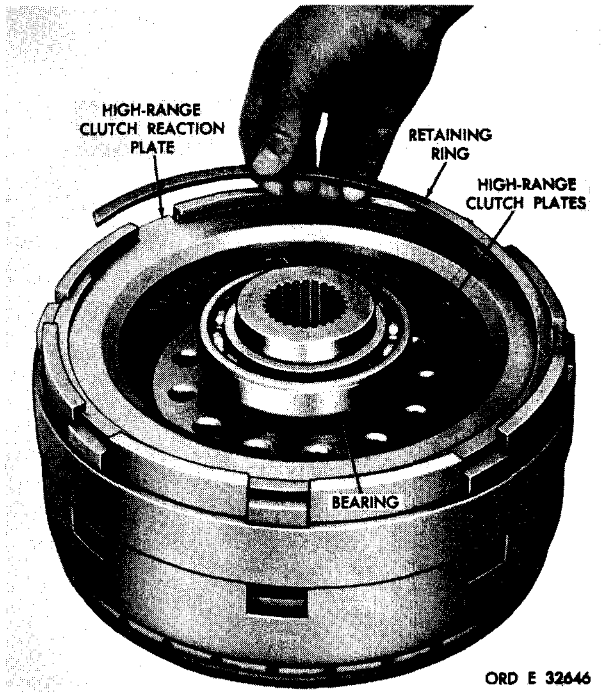


Figure 227. Removing (or installing) retaining ring that retains high-range clutch reaction plate

d. Using a compressing tool, compress the high-range clutch piston return spring retainer, and remove the retaining ring (fig. 229).

e. Remove the retainer (fig. 229) and 13 high-range clutch piston return springs from the clutch housing.

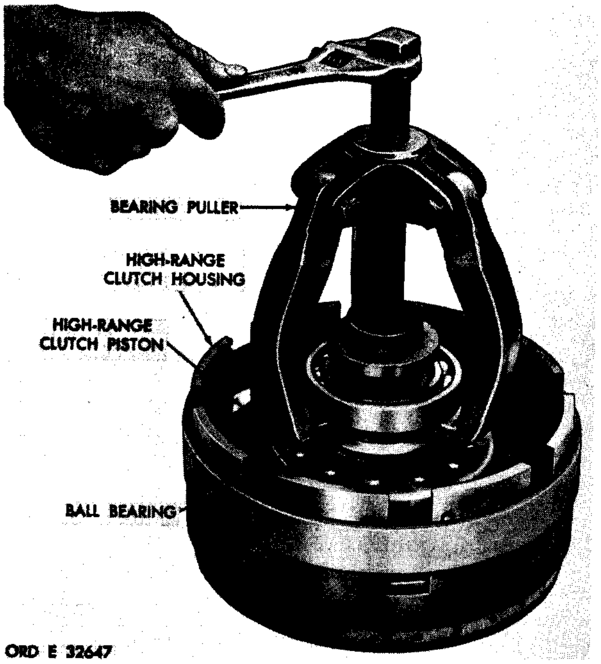


Figure 228. Removing bearing from high-range clutch housing

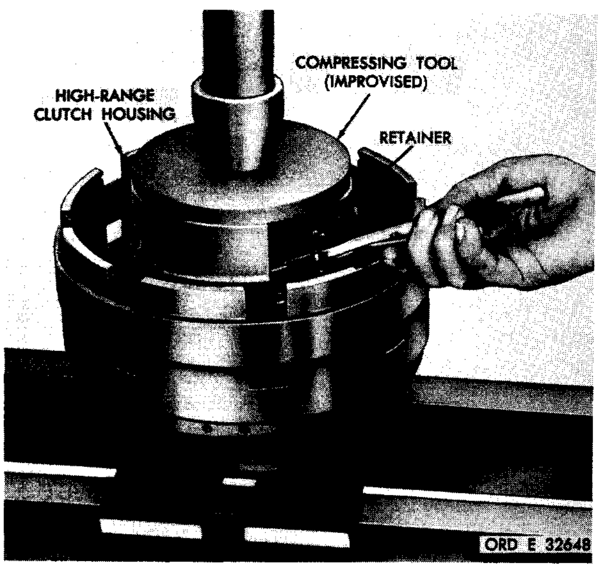


Figure 229. Removing (or installing) retaining ring that retains piston return spring retainer

*C2

f. Remove the high-range clutch piston from the clutch housing (fig. 230).

*C2 g. Do not remove the seal ring and expander from the outside diameter of the piston unless replacement is necessary.

h. Remove the hook-type seal ring from the hub of the high-range clutch housing (fig. 230). Do not remove the sleeve from the clutch housing unless replacement is necessary.

i. Do not remove the roller bearing from the clutch housing, unless parts replacement is necessary. If necessary, remove the retaining ring and "hook" the bearing out (fig. 231).

Note. The bearing assembly will be destroyed if removed from the housing. The bearing rollers maybe removed by removing the roller retaining ring (fig. 231).

199. CLEANING

Refer to par. 71 for cleaning recommendations.

Figure 230. Removing (or installing) piston from high-range clutch housing

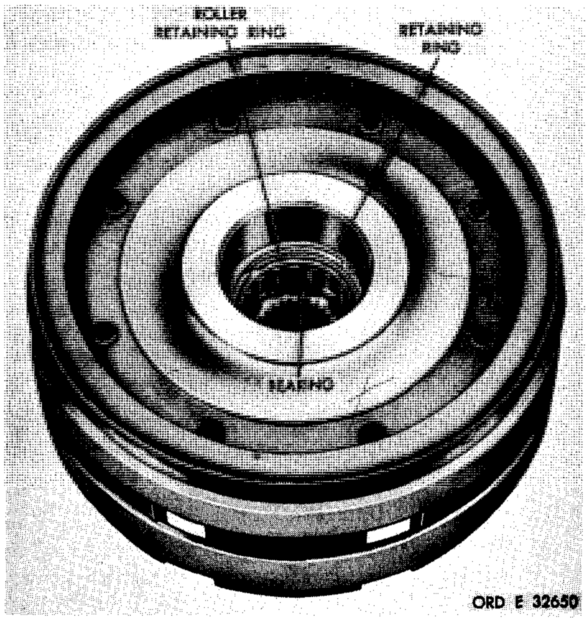


Figure 231. High-range clutch housing

200. INSPECTION AND REPAIR

Refer to par. 72 for general inspection and repair recommendations. Repair and rebuild points of measurement for fits, clearantes and wear limits are indicated by small, lower case letters in fig. 375, fold-out 4. Refer to par. 238 for wear limits information.

201. ASSEMBLY (fig. 375, fold-out 4)

a. If the bearing was removed from the high-range clutch housing, install a new replacement. Press the bearing in until firmly seated in the housing. Install the retaining ring (fig. 231).

b. If only bearing rollers were removed from the clutch housing for cleaning, grease the rollers lightly and install in the bearing race. Install the roller retaining ring (fig. 231).

c. If the sleeve was removed from the clutch housing, install the sleeve 3/4-inch below the top edge of the housing (fig. 230).

d. Install a hook-type seal ring on the hub of the high-range clutch housing (fig. 230).

*C2 e. If seal ring and expander were removed from high-range clutch piston, install new replacements (fig. 230).

*C2 **Note. The piston seal ~~expander 71 (fig. 375, fold-out 4) may~~ be used again if it appears ~~there~~ is no damage. The seal ~~ring~~ 72, if removed from the piston, should always be discarded.**

f. Install the piston in the high-range clutch housing (fig. 230).

g. Install 13 clutch piston return springs 66 (fig. 375, fold-out 4).

h. Install the high-range clutch piston return spring retainer (fig. 229).

*C2 i. Using a compressing tool (fig. 38), compress piston return springs and install the retaining ring that retains the retainer (fig. 229).

j. Install the bearing on the hub of the high-range clutch housing (fig. 227). Press the bearing inner race until it is firmly seated on the hub.

k. Install five internal- and four external-splined high-range clutch plates, beginning with an internal-splined plate (fig. 227).

l. Install the high-range clutch reaction plate (fig. 227).

m. Install the retaining ring that retains high-range clutch reaction plate (fig. 227).

Section XXVIII. TRANSMISSION HOUSING — REBUILD

202. DESCRIPTION

The transmission main housing is a cast aluminum alloy housing. It houses and supports the range gearing, range clutches, left-steer planetary carrier, brake, steer clutch and output clutch assemblies. The main housing also serves as the oil sump for the transmission.

203. DISASSEMBLY (fig. 375, fold-out 4)

a. Remove two hook-type seal rings from the hub of the diaphragm (fig. 232).

b. Remove the thrust washer (fig. 232).

c. Remove two preformed packings from the transmission housing (fig. 232).

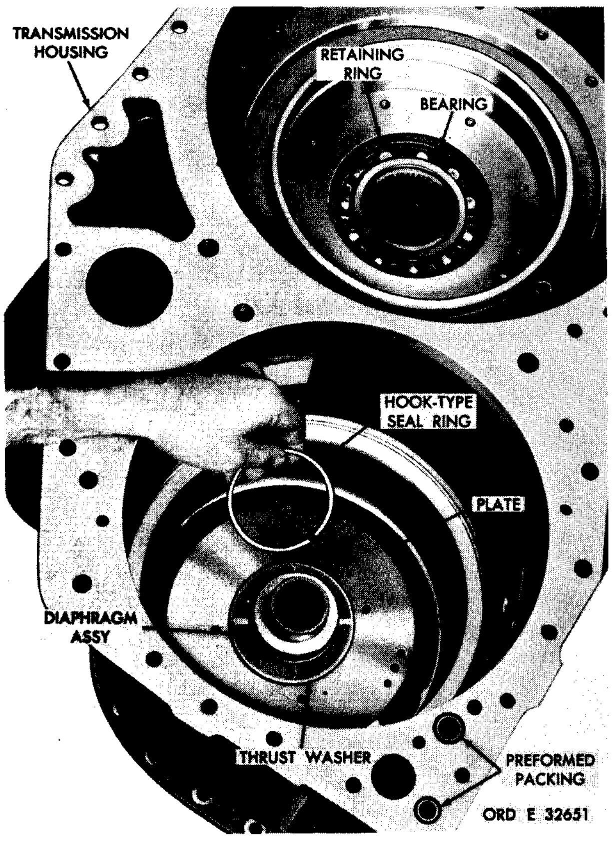


Figure 232. Removing hook-type seal ring from hub of diaphragm assembly

d. Remove retaining ring that retains bearing (fig. 232).

e. If necessary to remove the diaphragm assembly, use a 9/16-inch wrench to remove four self-locking bolts retaining diaphragm. Position housing in a press, and press out the diaphragm. Refer to fig. 233.

f. If the diaphragm assembly was removed, remove the diaphragm clamp plate. Refer to fig. 232.

g. Remove the gage rod cap from the oil filler assembly. Refer to fig. 233.

h. Using a 9/16-inch wrench, remove four bolts and lock washers from the oil filler tube assembly. Remove the oil filler tube assembly. Refer to fig. 233.

*C2 i. Using a 9/16-inch wrench, remove six cap screws (two different lengths) and lock washers that retain the accumulator body. Remove the accumulator body. Refer to fig. 233.

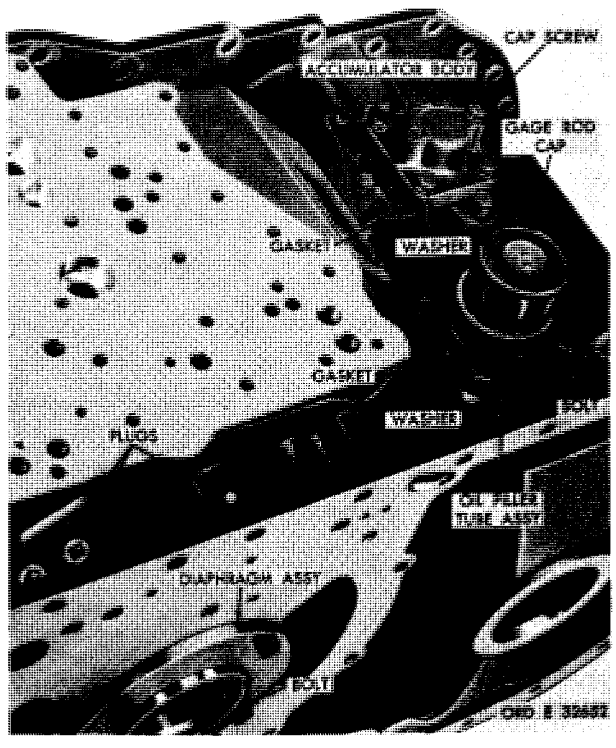


Figure 233. Transmission main housing

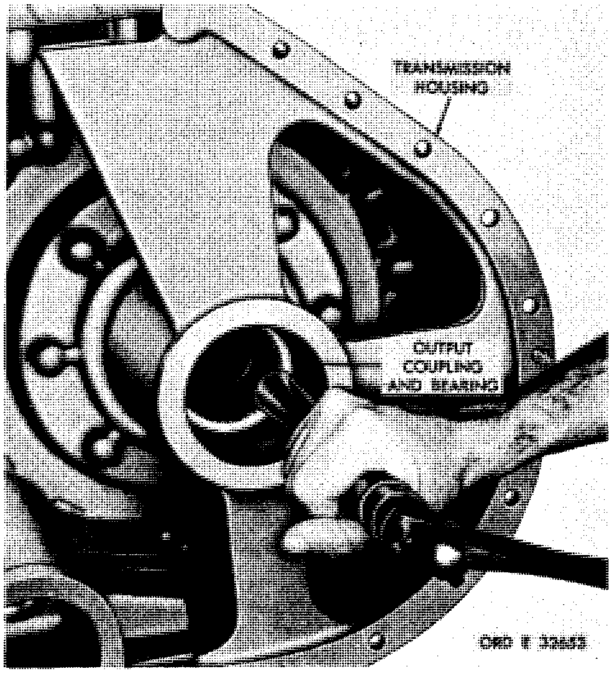


Figure 234. Removing transmission output coupling and bearing

j. Position the transmission housing to rest on its bottom. Using a hammer and soft drift, drive out the output coupling and ball bearing (fig. 234).

k. Remove the bearing from the output coupling (fig. 235).

l. Do not remove the internal-retaining ring from the output coupling unless replacement is necessary (fig. 235). If necessary, remove the retaining ring.

m. Do not remove the oil seal from the transmission housing unless replacement is necessary (fig. 235). If necessary, drive the oil seal out of the housing.

n. If necessary, the various plugs may be removed from the housing to aid in the cleaning of the oil passages in the housing (figs. 233 and 235).

204. CLEANING

Refer to par. 71 for cleaning recommendations.

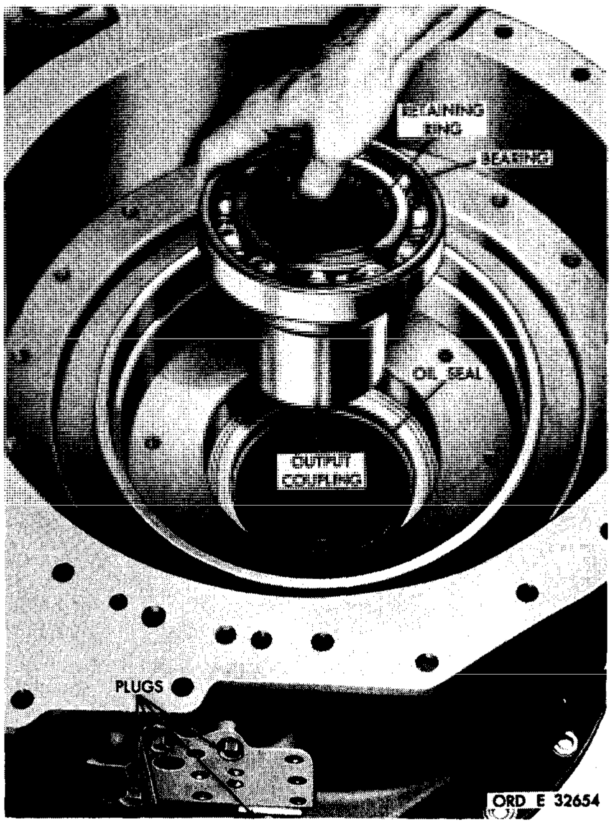


Figure 235. Transmission output coupling and bearing removed

205. INSPECTION AND REPAIR

Refer to par. 72 for general inspection and repair recommendations. Repair and rebuild points of measurement for fits, clearances and wear limits are indicated by small, lower case letters in fig. 375. fold-out 4. Refer to par. 238 for wear limits information.

206. ASSEMBLY (fig. 375, fold-out 4)

*C2 a. Install any plugs removed from the transmission main housing (figs. 233 and 235).

b. Position the transmission housing on its side. Using replacer 8351210, install the oil seal, lip side up, in its transmission housing bore (fig. 235). Be sure the seal is firmly seated against its shoulder in the housing.

c. Install the bearing onto the output coupling (fig. 235).

d. Install the output coupling with the bearing into the transmission housing. Install the retaining ring (fig. 232).

*C2 e. Position the transmission housing on its bottom side. Install the accumulator body and gasket. Secure the body with four 3/8- 16 x 1-1/2 and two 3/8-16 x 2-1/2-inch cap screws with lock washers (fig. 233).

*C2 f. Install the oil filler tube assembly and gasket. Secure the assembly with four 3/8- 16 x 1 cap screws with lock washers. Install the gage rod cap.

g. Install the diaphragm assembly in its housing bore (fig. 233).

*C2 h. Install the diaphragm clamp plate over the hub of the diaphragm assembly (fig. 232). Aline the bolt holes in the plate with the diaphragm assembly. Install four 3/8-24 x 2-1/2-inch self -locking diaphragm bolts (fig. 233).

i. Install two preformed packings on transmission housing (fig. 232).

j. Install two hook-type seal rings on hub of diaphragm assembly (fig. 232).

Section XXIX. TURBINE SHAFT — REBUILD

207. DESCRIPTION

The turbine shaft, of machined steel, serves as the torque converter output shaft. It is the input drive member to the transmission range gearing, and is splined to the high-range clutch hub, intermediate-range and low-range sun gears. The shaft is splined to the turbine of the torque converter assembly.

208. DISASSEMBLY (fig. 375, fold-out 4)

a. Remove four seal rings 1 and 3 from turbine shaft 2.

b. Using a sleeve which will contact the inner race of the bearing, support the assembly in a press. Press the shaft out of the bearing (fig. 236).

209. CLEANING

Refer to par. 71 for cleaning recommendations.

210. INSPECTION AND REPAIR

Refer to par. 72 for general inspection and repair recommendations. Repair and rebuild points of measurement for fits, clearances and wear limits are indicated by small, lower case letters in fig. 375, fold-out 4. Refer to par. 238 for wear limits information.

211. ASSEMBLY (fig. 375, fold-out 4)

a. Install bearing 5 onto turbine shaft 2. Press the bearing inner race until it is firmly seated against its shoulder on the shaft.

b. Install three hook-type seal rings 3 and one seal ring 1 onto turbine shaft 2.

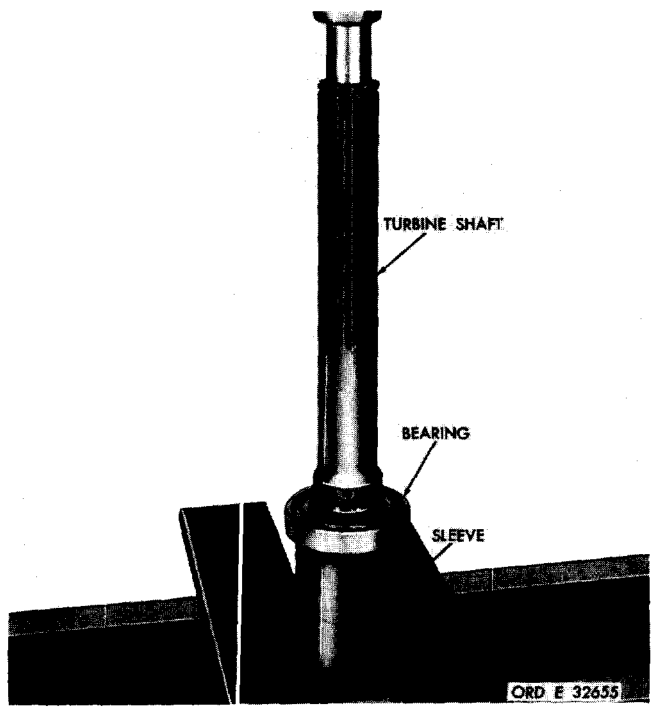


Figure 236. Removing bearing from turbine shaft

Section XXX. LEFT- AND RIGHT-OUTPUT DRIVE PLANETARY ASSEMBLIES — REBUILD

212. DESCRIPTION

Refer to pars. 26 and 27 for the description of the output drive planetary assemblies.

213. DISASSEMBLY

*C2

a. Left-output Drive Planetary Carrier Assembly (18, fig. 385, fold-out 14)

(1) Remove three spindle lock pins 21 from output drive planetary carrier 20. Drive pins toward the center of the carrier.

(2) Using a suitable pressing tool, remove three spindles 19 from carrier 20.

(3) Remove three planetary carrier pinions 24, with washers 22 and 27, spacers 23 and 26 and rollers 25. Place parts in separate containers and identify them with their location in carrier 20. Place the spindles in the same containers.

b. Right-output Drive Planetary Carrier Assembly (41, fig. 386, fold-out 15). The left- and right-output drive planetary assemblies are identical, therefore the disassembly procedure is the same as described in a(1) 'bough a(3), above.

214. CLEANING

Refer to par. 71 for cleaning recommendations.

215. INSPECTION AND REPAIR

Refer to par. 72 for general inspection and repair recommendations. Repair and rebuild points of measurements for fits, clearances and wear limits are indicated by small letters in figs. 385 and 386, fold-outs 14 and 15. Refer to par. 248 and 249 for wear limits information.

216. ASSEMBLY

a. Left-output Drive Planetary Carrier Assembly (18, fig. 385, fold-out 14)

Note. Chill spindles 19 in dry ice for one hour, if possible, prior to assembly.

(1) Coat the bores of pinions 24 with grease.

Note. If any one of the pinions must be replaced because of defects or damage, it will be necessary to replace all three pinions with a new matched assembly.

(2) Install a pinion alining tool into a pinion 24.

Note. A suitable alining tool can be improvised by grinding an unserviceable spindle to 0.005 inch undersize and brazing a handle to one end.

(3) Place a spacer 23 and thrust washer 22 on one side of pinion 24.

(4) Install 20 needle rollers 25 into the pinion bore in the space around the alining toed.

(5) Install a second spacer 26 and thrust washer 27. Remove the alining tool.

(6) Install the pinion, with the two spacers, two washers and 20 rollers into the carrier. Aline its bore with the spindle bore in the carrier, using the alining tool.

(7) Place the carrier in a press, with the larger outside diameter side of the carrier up. Remove the alining tool.

(8) Start a spindle 19 into the bore of the carrier. The spindle must be accurately alined so that its lock pin groove will be parallel with the lock pin hole in the carrier.

(9) Press spindle 19 into carrier 20 until it is flush to 0.010 inch below the carrier surface.

(10) Install spindle lock pin 21. Drive the pin in below the top edge of the bore.

(11) Install the remaining two pinions with component parts as outlined in a(1) through a(10), above.

*C2 b. Right-output Drive Planetary Carrier Assembly (41, fig. 386, fold-out 15). The left- and right-output drive planetary assemblies are identical, therefore the assembly procedure is the same as described in a(1) through a(11), above.

Section XXXI. LEFT- and RIGHT-OUTPUT DRIVE HOUSINGS -- REBUILD

217. DESCRIPTION

Refer to pars. 26 and 27 for the description of the output drive housings.

218. DISASSEMBLY

a. Left-output Drive Housing Assembly (38, fig. 385, fold-out 14)

(1) Remove gasket 17 from housing assembly 38.

(2) Do not remove outer race of roller bearing 34 unless replacement is necessary. If necessary, drive the race from the housing assembly.

Note. If outer race of roller bearing 34 is removed, the bearing inner race also will have to be replaced.

(3) Do not remove plugs 36 and 37 unless replacement is necessary. If necessary, remove the plugs.

b. Right-output Drive Housing Assembly (14, fig. 386, fold-out 15). The left- and right-output drive housing assemblies are identical, therefore the disassembly procedure is the same as described in a(1) through a(3), above.

219. CLEANING

Refer to par. 71 for cleaning recommendations.

220. INSPECTION AND REPAIR

Refer to par. 72 for general inspection and repair recommendations. Repair and rebuild points of measurements for fits, clearances and wear limits are indicated by small letters in figs. 385 and 386, fold-outs 14 and 15. Refer to pars. 248 and 249 for wear limits information.

221. ASSEMBLY

*C2 a. Left-output Drive Housing Assembly (38, fig. 385, fold-out 14)

(1) If outer race of roller bearing 34 was removed from housing assembly 38, install a new replacement. Press the race in housing until it is flush with the top of its bore.

Note. Install inner race of replacement roller bearing 34 on output hub 32. Press on race until firmly seated.

(2) If plugs 36 and 37 were removed, install new replacements.

(3) Install gasket 17 into its groove in housing assembly 38.

b. Right-output Drive Housing Assembly (14, fig. 386, fold-out 15). The left- and right-output drive housing assemblies are identical, therefore the assembly procedure is the same as described in a(1) through a(3), above.

Section XXXII. LEFT- AND RIGHT-OUTPUT SHAFT ASSEMBLY -- REBUILD

222. DESCRIPTION

Refer to pars. 26 and 27 for description of the left- and right-output shaft assemblies.

223. DISASSEMBLY

a. Left - output Shaft Assembly (fig. 385, fold-out 14)

(1) Using a 3/16-inch hexagon wrench, remove three pipe plugs from output shaft assembly (fig. 237).

(2) Using a bearing remover, remove the output shaft bearing and related parts (fig. 238). Use the short-pin side of the special tool first, then the long-pin side, to complete the removal of the bearing.

(3) Remove seal 46 (fig. 385, fold-out 14) and preformed packing 45 from spacer 44.

b. Right-output Shaft Assembly. The left - and right- output shaft assemblies are identical, therefore the disassembly procedure is the same as described in a(1) through a(3), above.

224. CLEANING

Refer to par, 71 for cleaning recommendations.

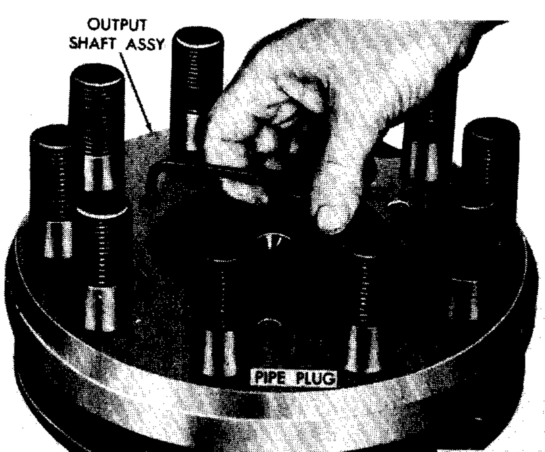
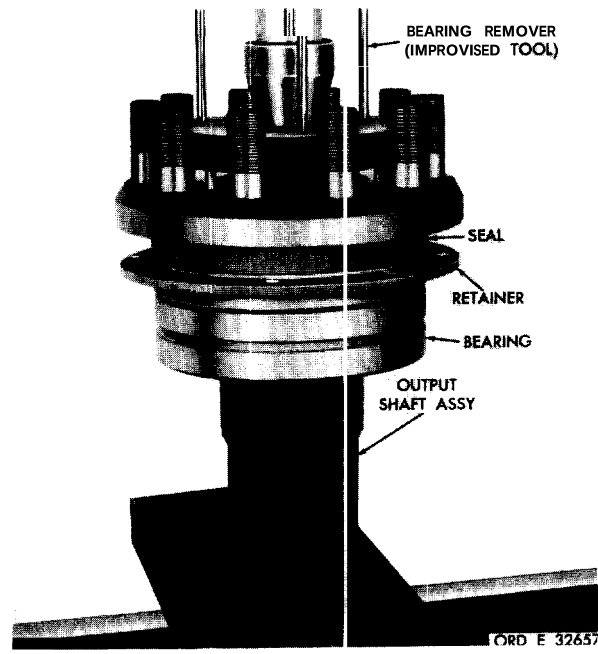


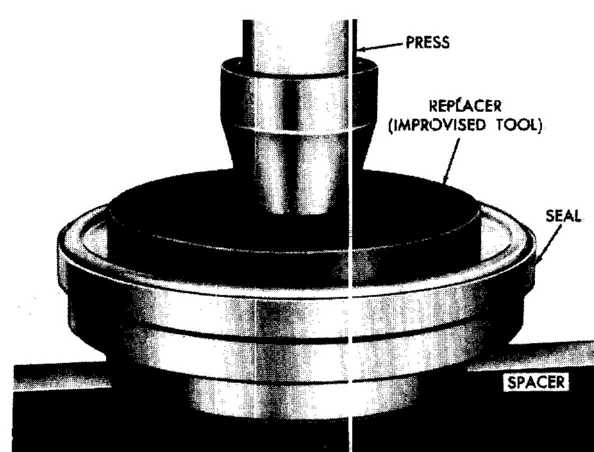
Figure 237. Removing pipe plugs from output shaft assembly

225. INSPECTION AND REPAIR

Refer to par. 72 for general inspection and repair recommendations. Repair and rebuild points of measurements for fits, clearances and wear limits are indicated by small letters in figs. 385 and 386, fold-outs 14 and 15. Refer to pars, 248 and 249 for wear limits information.



C2 Figure 238. Removing bearing, retainer and seal from output shaft assembly



C2 Figure 239. Installing seal onto output shaft spacer

226. ASSEMBLY

a. Left-output Shaft Assembly

(1) Install preformed packing 45 (fig. 385, fold-out 14) into spacer 44.

(2) Using an oil Seal replacer and a press, install the seal onto the output shaft spacer (fig. 239).

(3) Install preformed packing 45 (fig. 385, fold-out 14) and spacer 44 with seal 46 into retainer 41.

Note. Press on the extreme outer diameter of seal 46 when installing into retainer 41. Install packing 45, seal 46, spacer 44 and retainer 41 as a unit onto output shaft assembly 47.

(4) Install roller bearing 39 onto shaft assembly 47, pressing the bearing until it is firmly seated.

b. Right-output Shaft Assembly. The left- and right-output shaft assemblies are identical, therefore the assembly procedure is the same as described in a(1) through a(4), above.

*C2

Section XXXIII. ASSEMBLY OF POWER TRAIN FROM SUBASSEMBLIES

227. ASSEMBLY STEPS – MAIN TRANSMISSION ASSEMBLY

*C2 Note. The following assembly steps for the XTG-411-2A power train are to be used in the same manner as the disassembly steps, Refer to par, 73a and b.

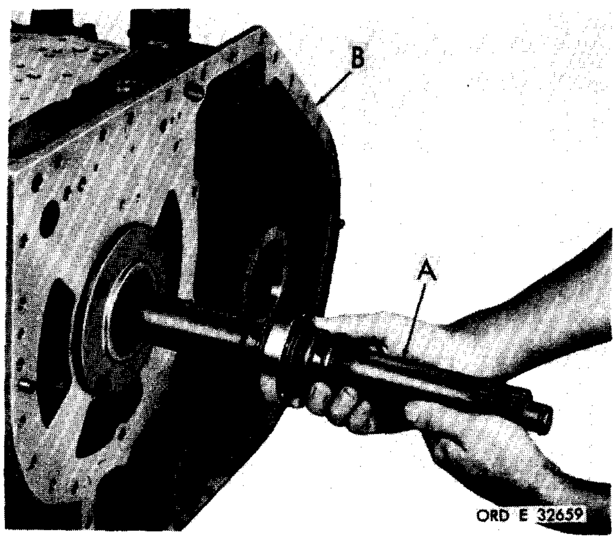


Figure 240 (Step 1)

Install turbine shaft assembly (A) into main transmission housing (B).

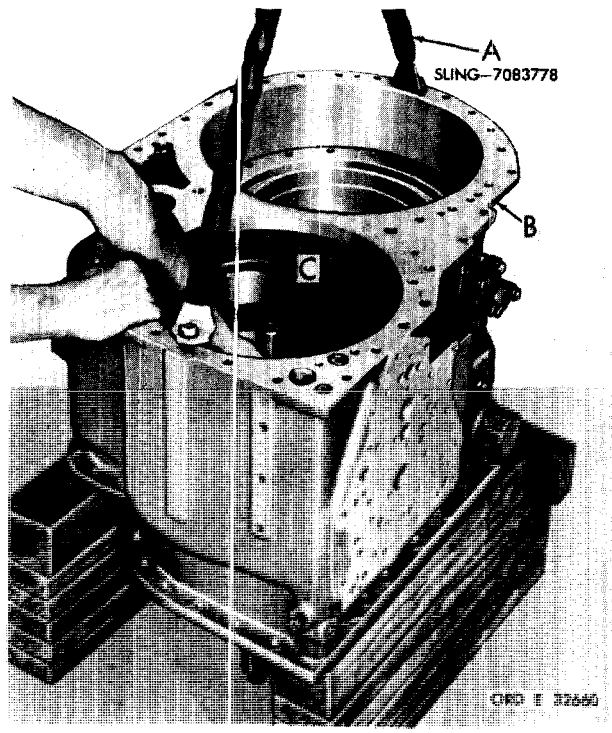


Figure 241 (Step 2)

Using sling (A), raise the transmission housing (B), holding onto the turbine shaft (C). Block the housing high enough for turbine shaft to clear the assembly table. Then block under the turbine shaft.

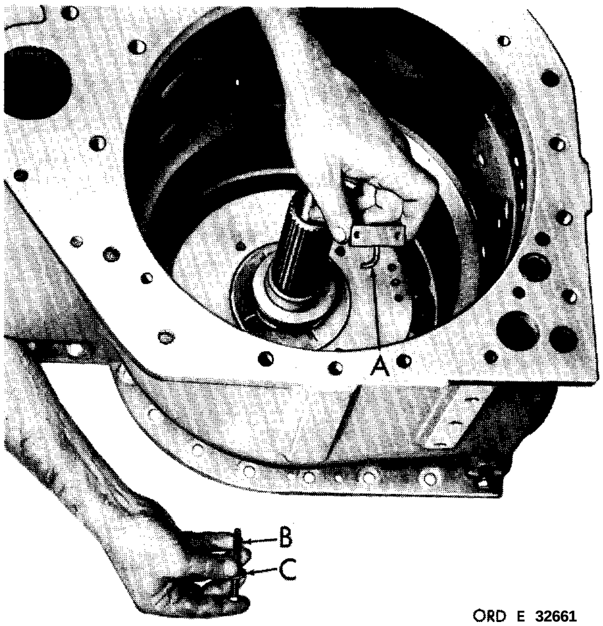


Figure 242 (Step 3)

Install pitot tube assembly (A) and retain with one of two 1/4-28 x 2- 1/2 self-locking bolts (B) and flat washers (C). Leave the bolt 1/8-inch loose.

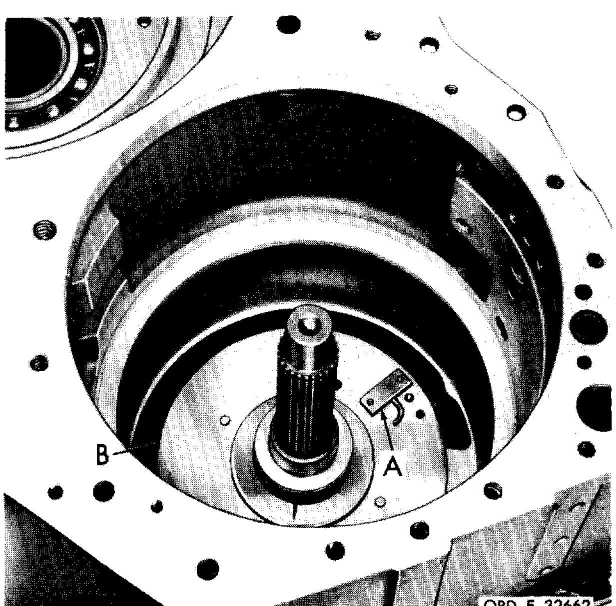


Figure 243 (Step 4)

Position pitot tube assembly (A), as shown, on diaphragm clamp plate (B).

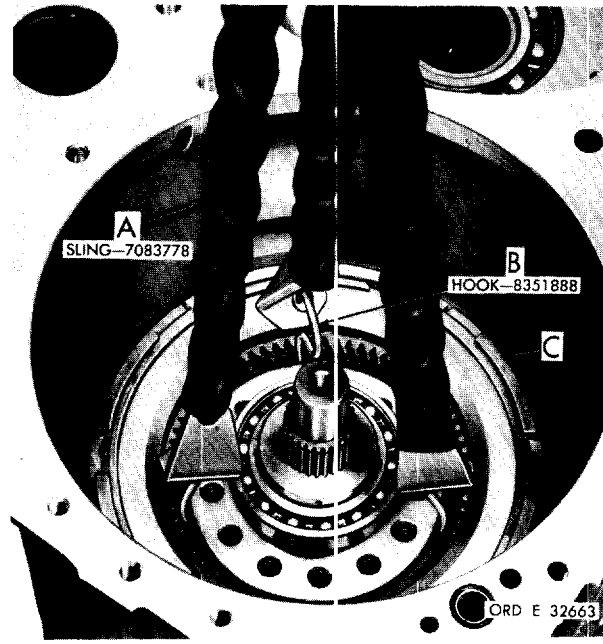


Figure 244 (Step 5)

Using sling (A) and hooks (B), install high-range clutch assembly (C).

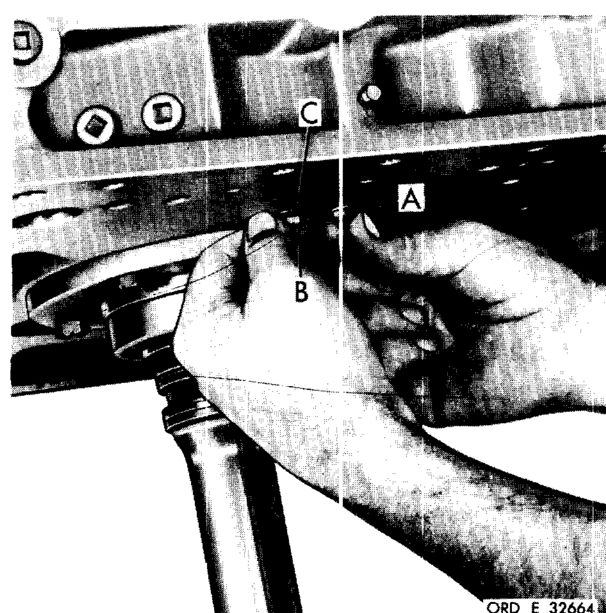


Figure 245 (Step 6)

While turning bolt (A) clockwise to properly position the pitot tube assembly, install bolt (B) and flat washer (C). Using a 7/16 -inch wrench, torque both bolts to 10-12 pound-feet.

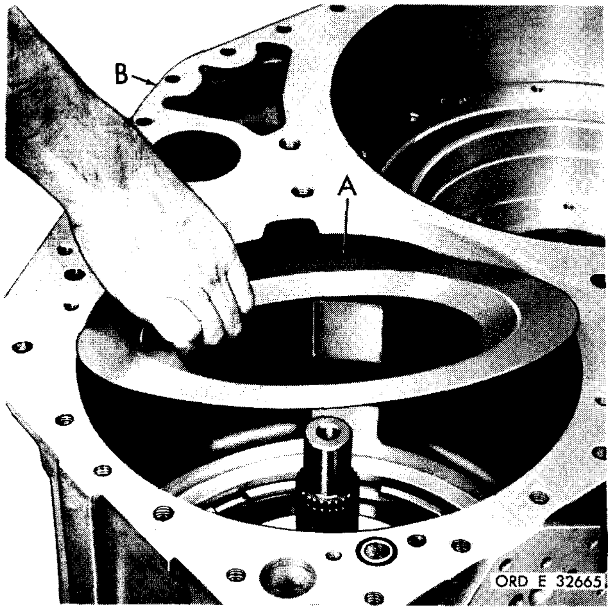


Figure 246 (Step 7)

Install oil collector (A) into transmission housing (B).

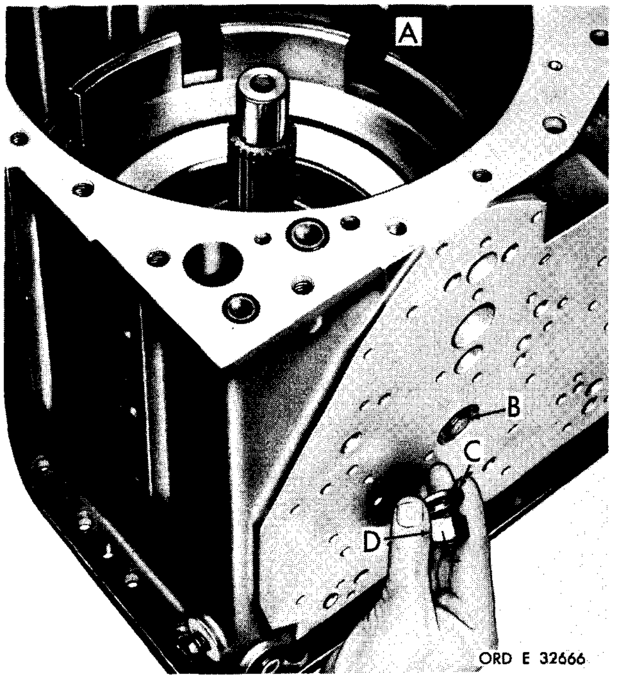


Figure 247 (Step 8)

Install intermediate-range clutch anchor (A). Install anchor bolt (B). Install washer (C) and nut (D). Tighten nut only finger-tight.

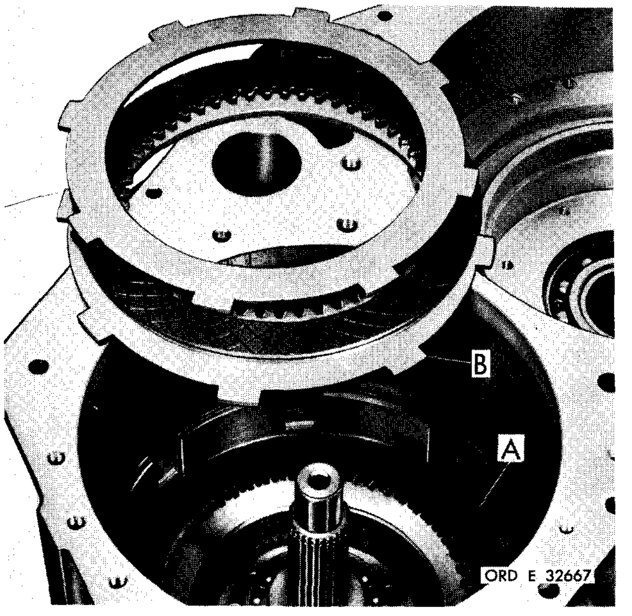


Figure 248 (Step 9)

Install two internal- (A) and two external- (B) splined intermediate-range clutch plates, beginning with an internal-splined plate.

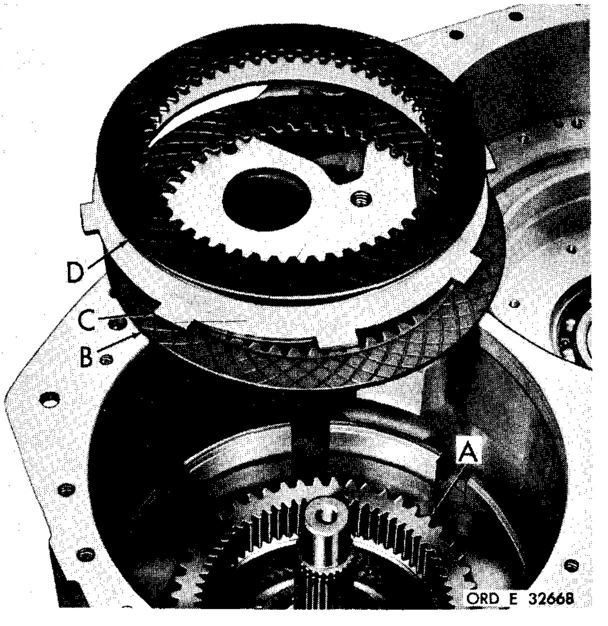


Figure 249 (Step 10)

Install intermediate-range ring gear assembly (A). Install an internal- (B), an external- (C) and the remaining internal-splined (D), intermediate-range clutch plates.

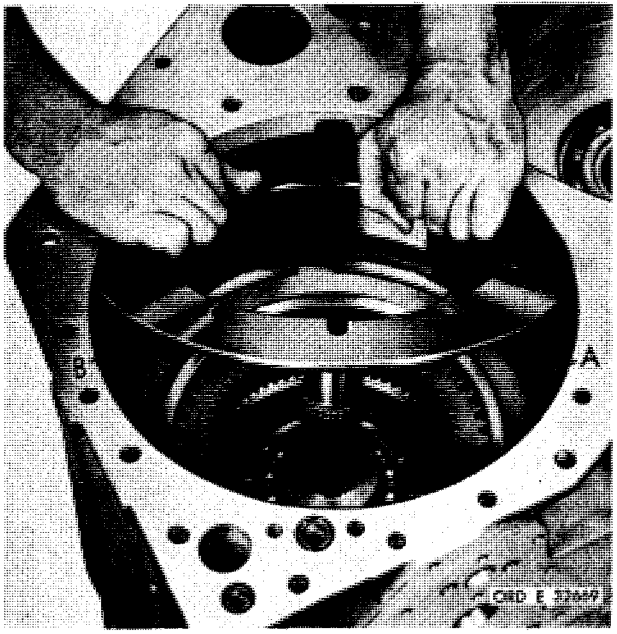


Figure 250 (Step 11)

Install intermediate-range clutch back plate (A), contour side up. Install Belleville spring (B), convex side up, centering it on plate (A).

Figure 251 (Step 12)

Install intermediate-range sun gear (A), flat side down. Install low-range sun gear (B).

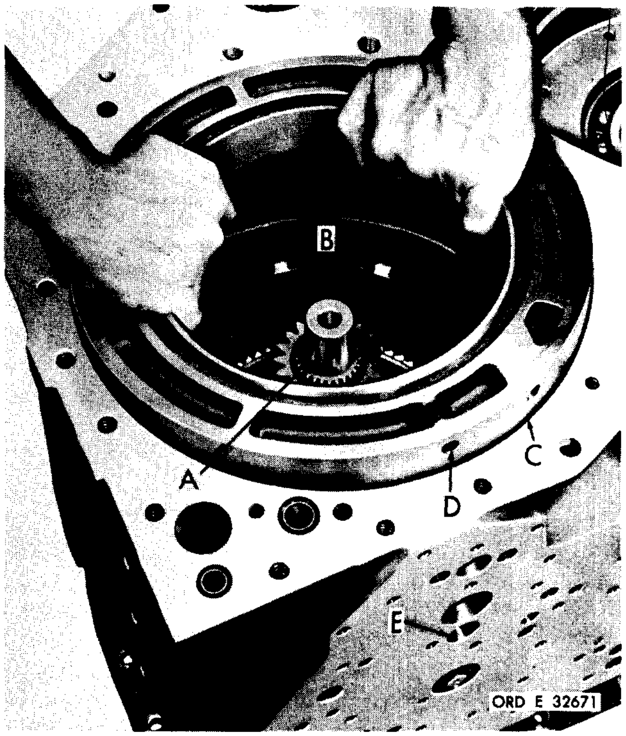


Figure 252 (Step 13)

Install snap ring (A) onto turbine shaft (B). Install intermediate-range piston and piston housing assembly (C), indexing hole (D) with hole (E).

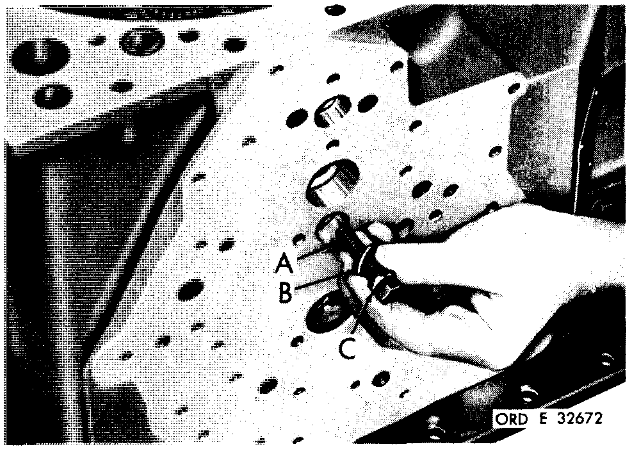


Figure 253 (Step 14)

Install 3/8-16 x 1-3/4 intermediate-range piston housing bolt (A), flat washer (B) and lock washer (C). Tighten bolt only finger-tight at this time.

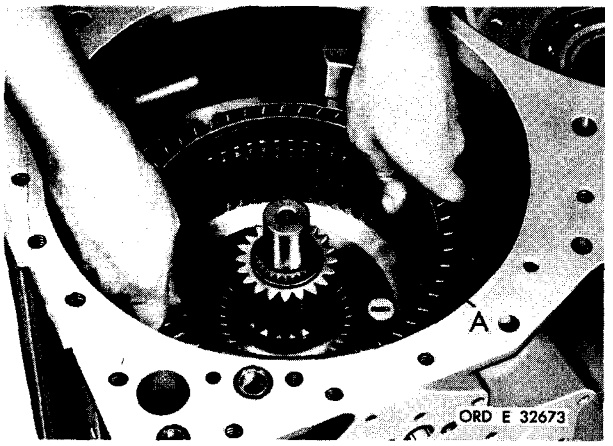


Figure 254 (Step 15)

Install the intermediate-range carrier and low-range ring gear assembly (A). This assembly will have to engage all high-range clutch plates and intermediate-range ring gear while being installed. Assembly is properly installed when external splines of the assembly touch, or nearly touch, the intermediate-range piston.

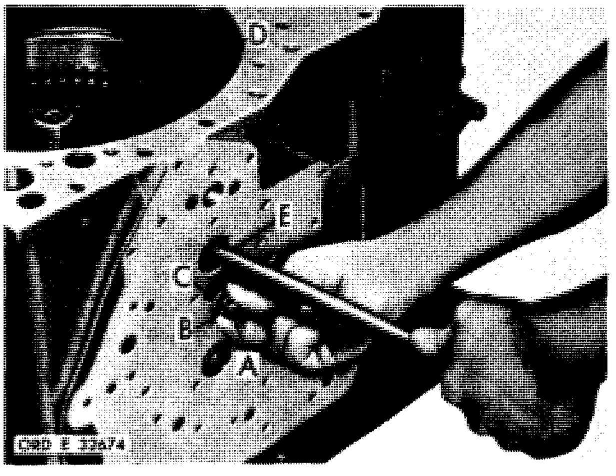


Figure 255 (Step 16)

Remove intermediate-range piston housing 3/8-16 x 1-3/4 bolt (A), lock washer (B) and flat washer (C). Install low-range clutch anchor (D). Using a pry bar (E), depress anchor (D) and install bolt (A), washer (B) and washer (C). Tighten the bolt (A) and then loosen slightly. Note. Place a piece of soft metal between the end of bar (E) and the contact surface of anchor (D).

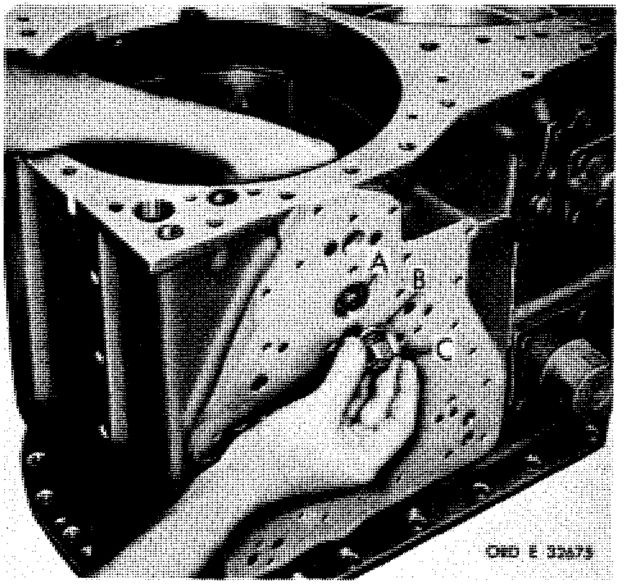


Figure 256 (Step 17)

Install low-range clutch anchor bolt (A), washer (B) and 5/8-18 nut (C). Tighten nut only finger-tight at this time.

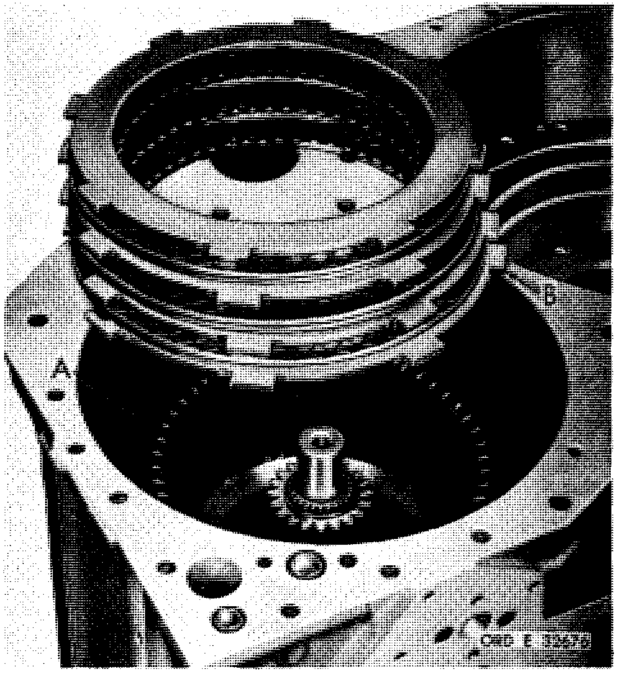


Figure 257 (Step 18)

Install four internal- (A) and four external-splined (J) low-range clutch plates alternately, beginning with an internal-splined plate (A).

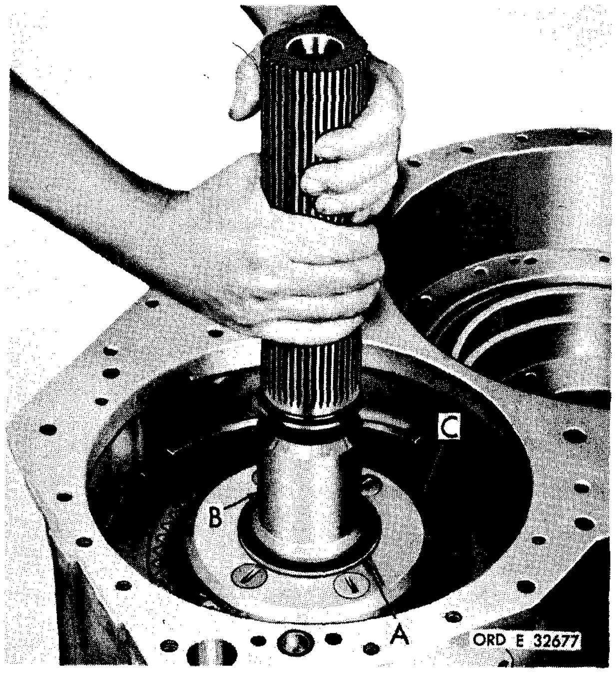


Figure 258 (Step 19)

Install thrust washer (A) onto low-range carrier and shaft assembly (B). Install assembly into low-range ring gear (C).

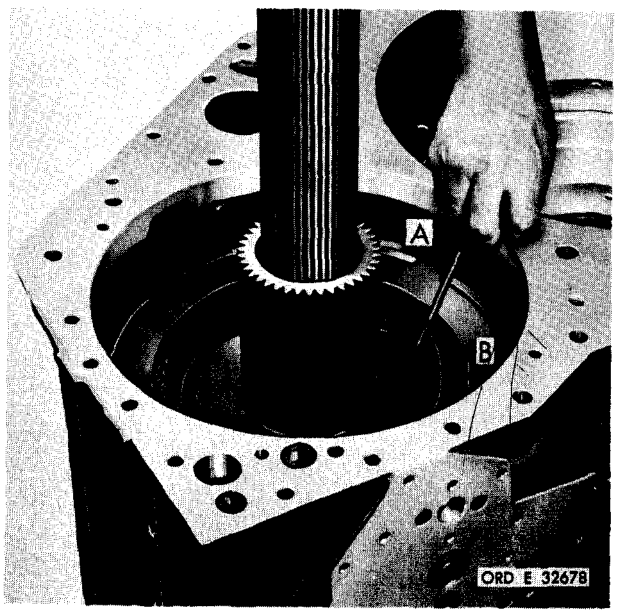


Figure 259 (Step 20)

Install reverse-range sun gear (A) and secure with snap ring (B).

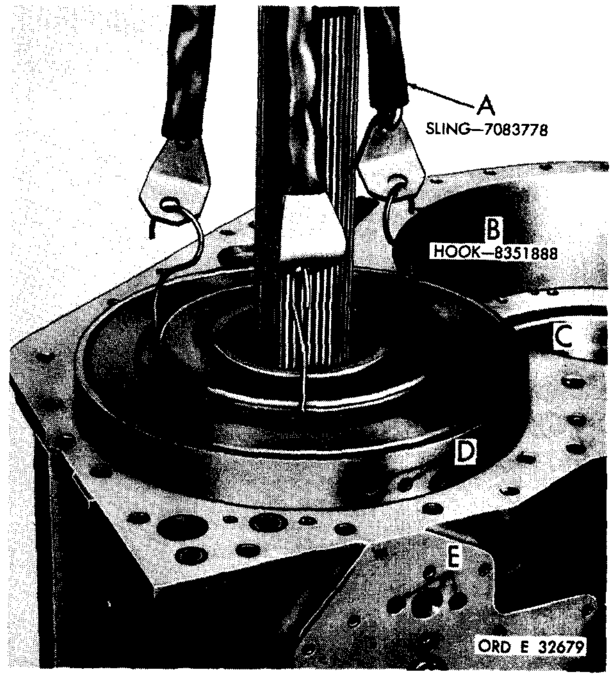


Figure 260 (Step 21)

Using sling (A) and hooks (B), install low- and reverse-range clutch piston and piston housing assembly (C). Index holes (D) with holes (E).

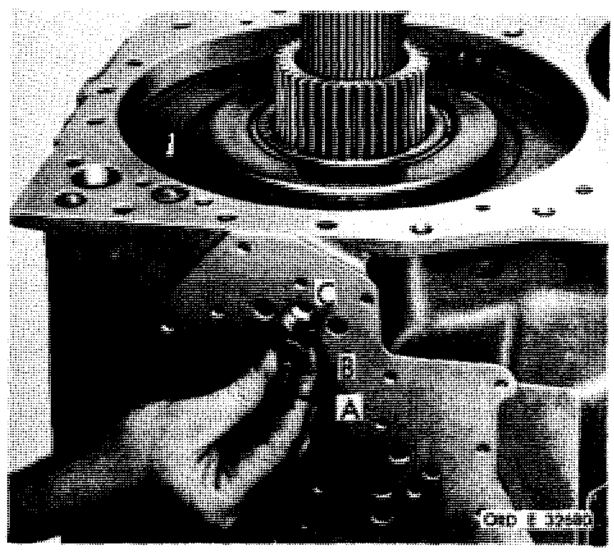


Figure 261 (Step 22)

Install low- and reverse-range clutch piston housing bolt (A), lock washer (B) and flat washer (C). Tighten the bolt only finger-tight at this time.

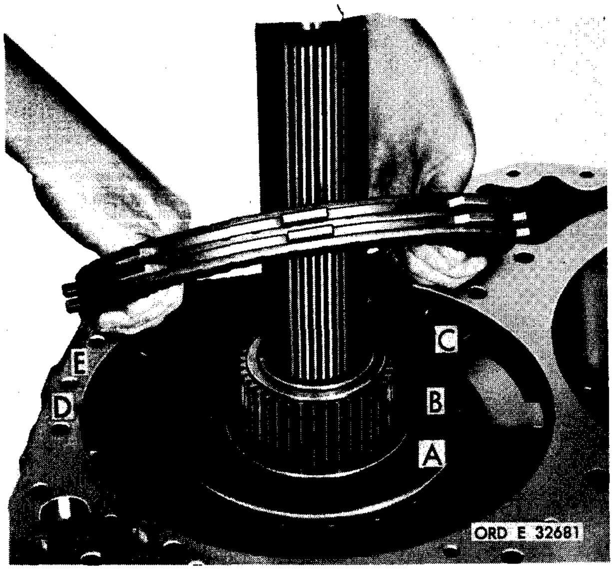


Figure 262 (Step 23)

Install thrust washer (A) and sleeve (B) onto low-range carrier and shaft assembly (C). Alternately install three external- (D) and three internal-splined (E), reverse-range clutch plates, beginning with an external-splined plate (D).

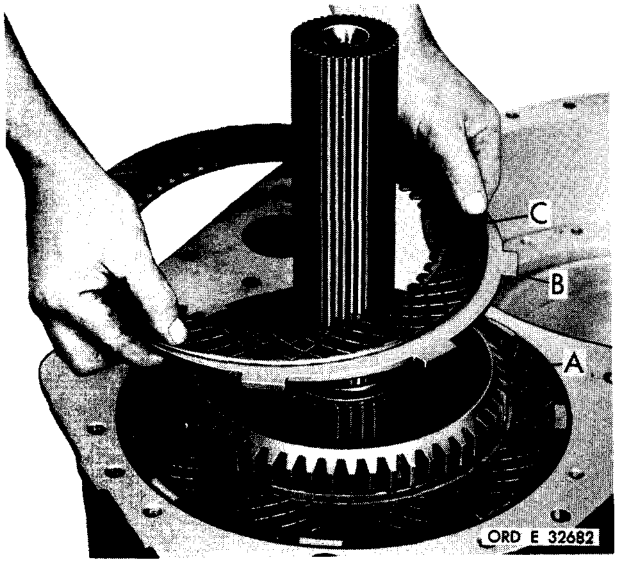


Figure 263 (Step 24)

Install reverse-range ring gear assembly (A), chamfered side up. Install an external-splined (B) and the remaining internal-splined (C), reverse-range clutch plate. Aline the tangs of plates (B) and center the plates carefully.

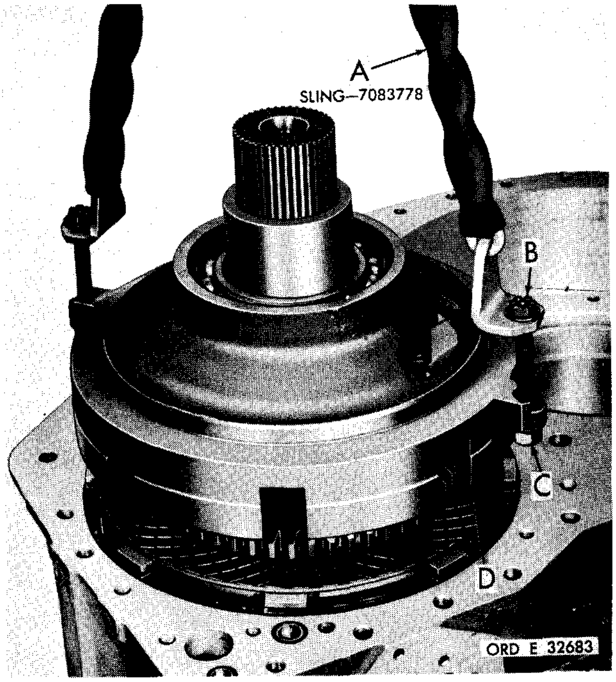


Figure 264 (Step 25)

Using sling (A) and two 7/16-14 bolts (B) and nuts (C), install reverse-range carrier and support housing assembly (D).

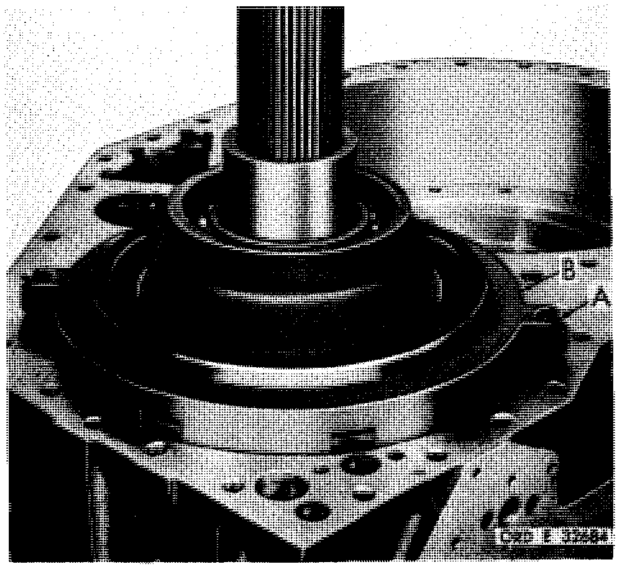


Figure 265 (Step 26)

Install two 3/8-16 screws (A) that retain reverse-range carrier support housing (B). Tighten screws evenly until housing (B) is firmly seated.

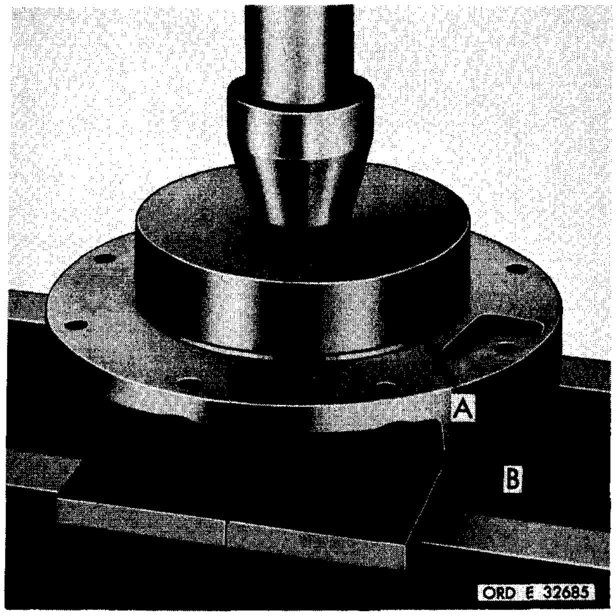


Figure 266 (Step 27)

Press left-output clutch support bearing (A) into support (B).

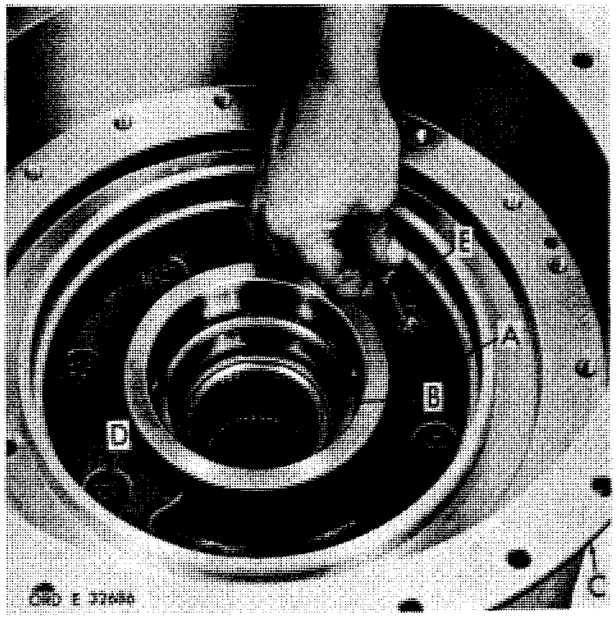


Figure 267 (Step 28)

Install support (A) and bearing (B) into transmission housing (C). Secure sleeve with one 3/8-16 x 2 (D) and seven 3/8-16 x 1-1/4 (E) self-locking bolts. Using a 9/16-inch wrench, torque bolts to 36-43 pound-feet.

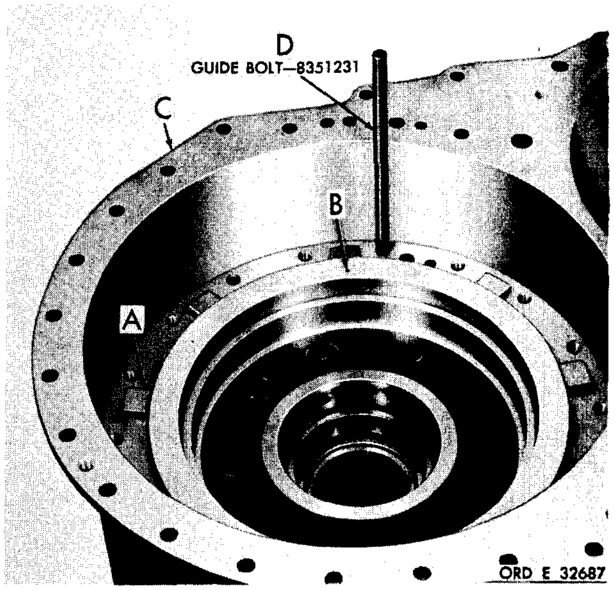


Figure 268 (Step 29)

Install steer clutch piston assembly (A), locating oil hole (B) in the assembly in relation to transmission housing (C), as shown. Install guide bolt (D).

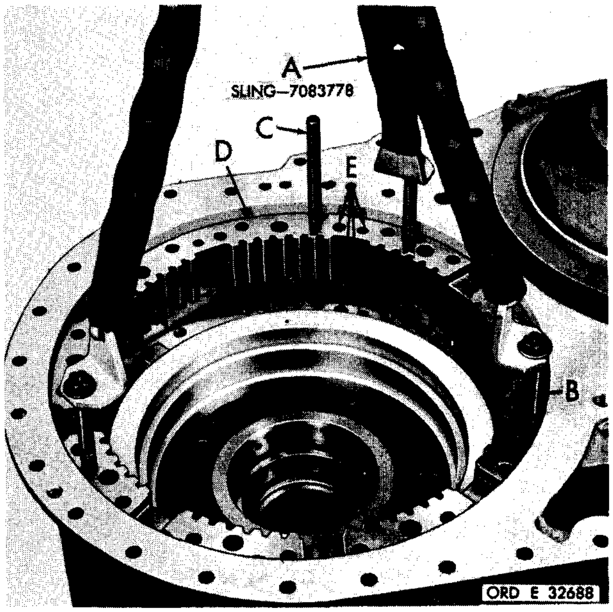


Figure 269 (Step 30)

Using sling (A), three 7/16-14 x 5 bolts (B) and guide bolt (C), install steer clutch anchor (D). Index holes (E) of the anchor with the holes in the transmission housing.

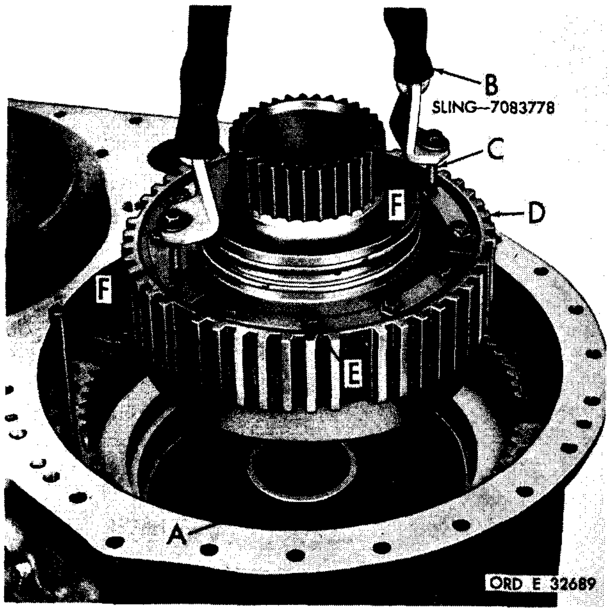


Figure 270 (Step 31)

Install spacer (A), flanged end down. Using sling (B) and two 5/16-24 bolts (C), install the left-output clutch assembly (D). Remove sling, and tap the assembly down while rotating it. Install two remaining 5/16-24 x 5/8 bolts (E). Using a 1/2-inch wrench, torque the bolts to 14-18 pound-feet. Bend corners of lock strips (F) against bolt heads.

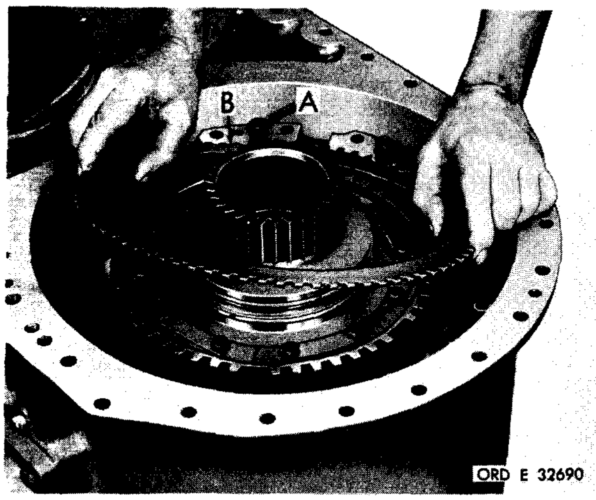


Figure 271 (Step 32)

Install nine geared steer clutch piston return springs (A). Install an external-splined steer clutch plate (B).

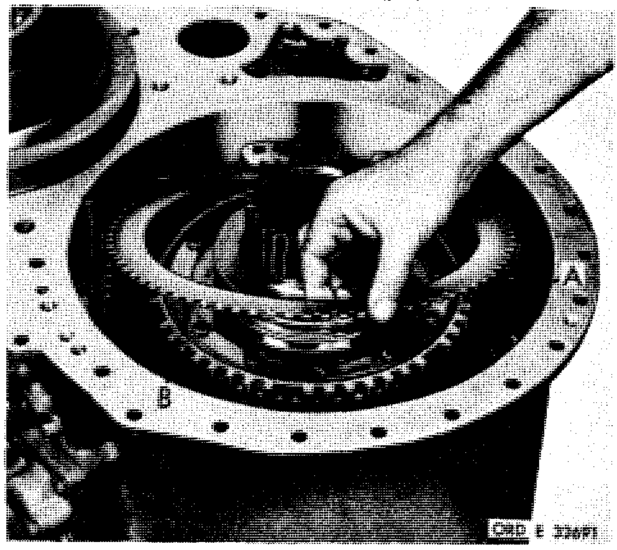


Figure 272 (Step 33)

Alternately install the remaining six internal- (A) and six external-splined (B) steer clutch plates, beginning with an internal-splined plate.

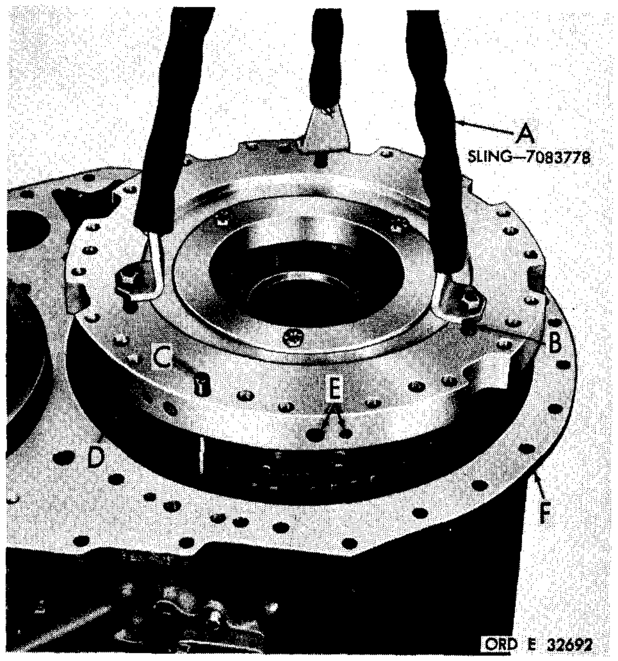


Figure 273 (Step 34)

Using sling (A), three 7/16-14 bolts (B) and the guide bolt (C), install the reaction plate assembly (D). Note the location of the plugs (E) in the assembly in relation to the housing (F).

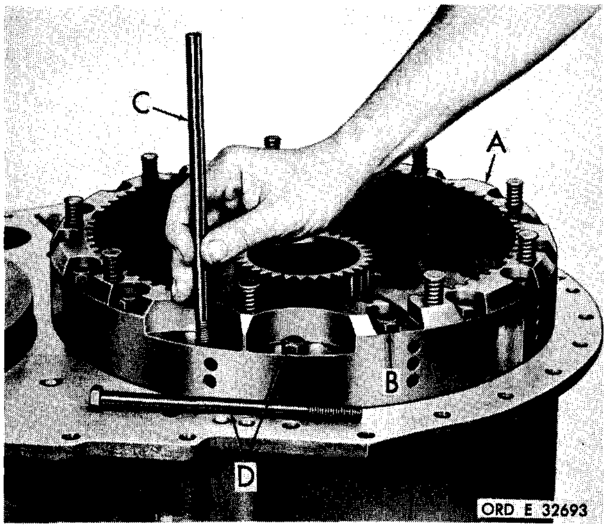


Figure 274 (Step 35)

Install brake anchor assembly (A). Install sixteen 7/16- 14x 7-1/2 bolts (B) and one 7/16- 14 x 7 bolt (D). Remove guide bolt (C) and install remaining 7/16- 14 x 7 bolt (D). Using a 5/8-inch wrench, torque the eighteen bolts to 42-50 pound-feet.

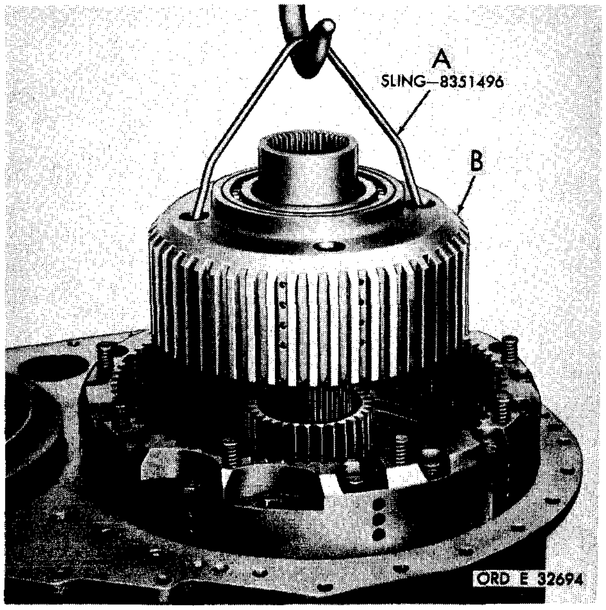


Figure 275 (Step 36)

Using hoist and sling (A), install the geared steer planetary carrier and shaft assembly (B). Remove the sling and tap the assembly down while rotating it.

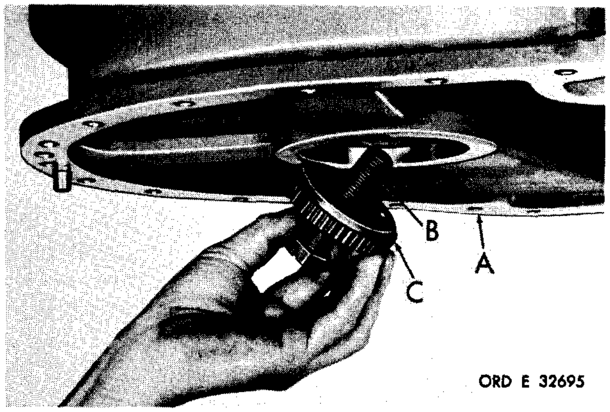


Figure 276 (Step 37)

Raise the transmission housing (A) and install 3/4-16 self-locking bolt (B) and lock plate (C) into the end of the steer planetary carrier and shaft assembly. Tighten bolt only finger-tight at this time.

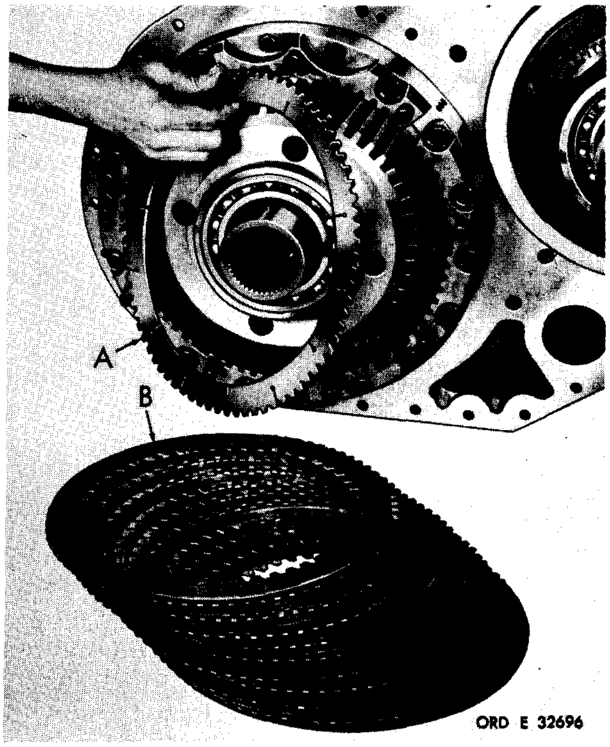


Figure 277 (Step 38)

Position the transmission housing on its bottom. Install 10 external- (A) and 10 internal-splined (B) left-brake plates alternately, beginning with an external-splined plate (A).

*C2

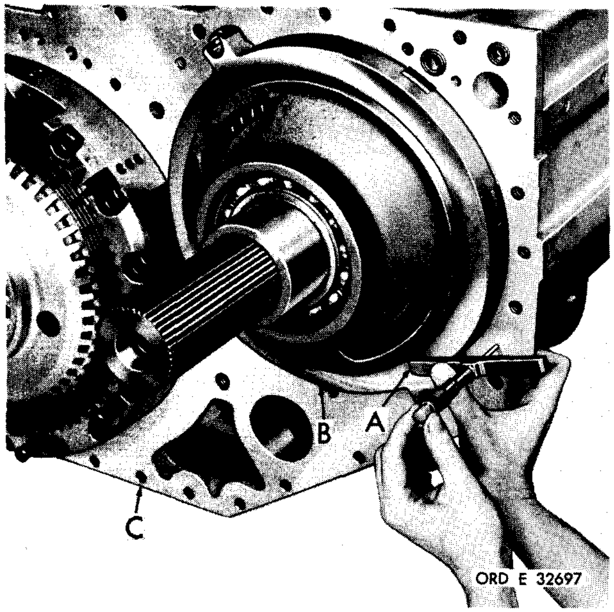


Figure 278 (Step 39)

Using a micrometer depth gage (A), measure the distance from the reverse-range support housing (B) surface to the transmission housing (C) split-line surface. Record this dimension.

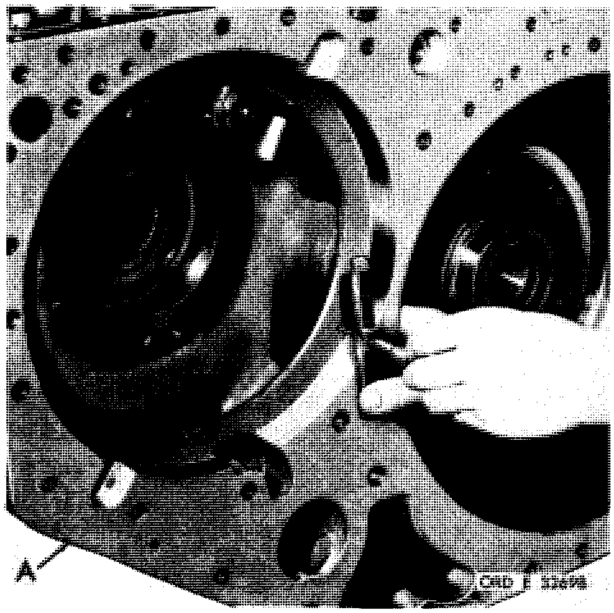


Figure 279 (Step 40)

Measure the depth of the counterbore in the transmission rear housing (A). Record this dimension.

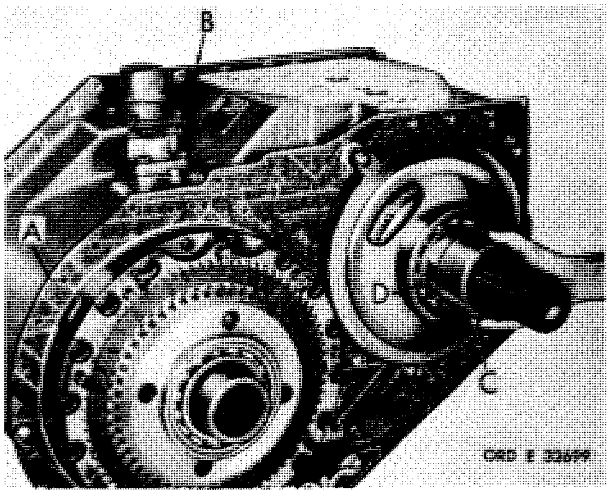


Figure 280 (Step 41)

Using a micrometer, measure the thickness of the transmission housing-to-rear housing gasket (A). Record this dimension. Install gasket (A) on housing (B). Install spacer (C) on hub of reverse-range carrier assembly (D).

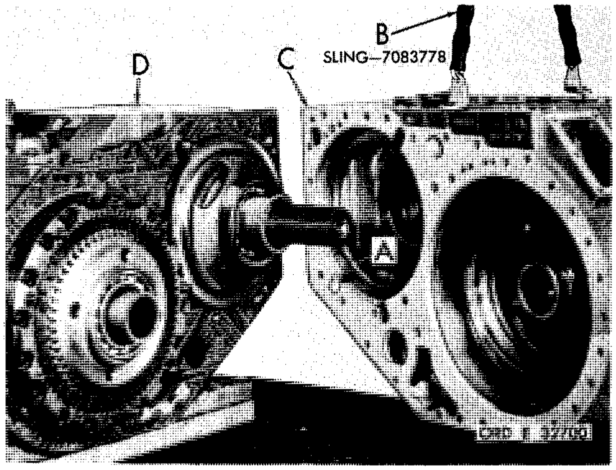


Figure 281 (Step 42)

To obtain shim pack (A) thickness, add the dimensions obtained above in Steps 40 and 41. Add an additional 0.012-inch. From the resulting figure, subtract the dimension obtained in Step 39. This difference is the thickness of the shim pack required. Three shim thicknesses are available (0.008, 0.010, 0.012 approx.) Install the number of shims (A) required. Using sling (B), install rear housing assembly (C) onto transmission main housing assembly (D).

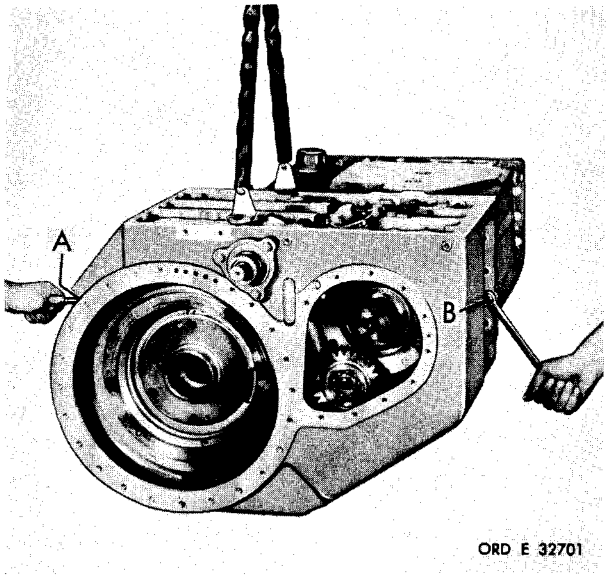


Figure 282 (Step 43)

Install a 7/16-14 x 1-1/2 bolt (A) and a lock washer at the rear of the transmission main-to-rear housing split line. Install a 1/2-13 x 2-3/4 bolt (B) at the front. Tighten the two evenly to draw the housings together.

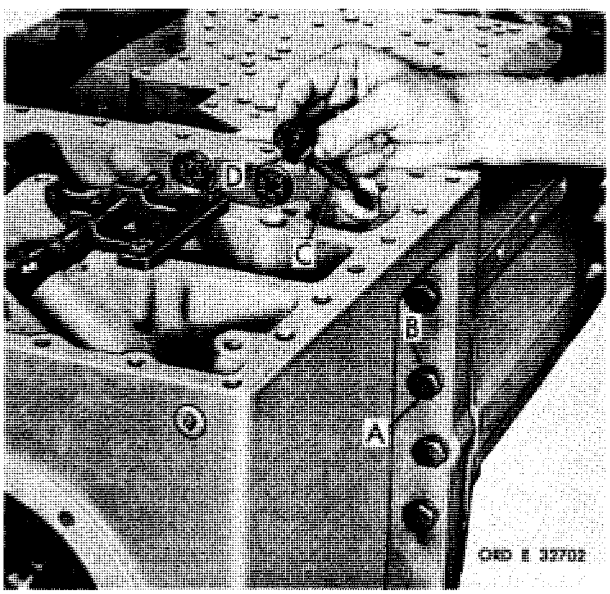


Figure 283 (Step 44)

Install the remaining three 1/2-13 x 2-3/4 bolts (A) with lock washers (B) and three l/2-13 x 2-3/4 self-locking bolts (C) with flat washers (D). Do not tighten bolts at this time.

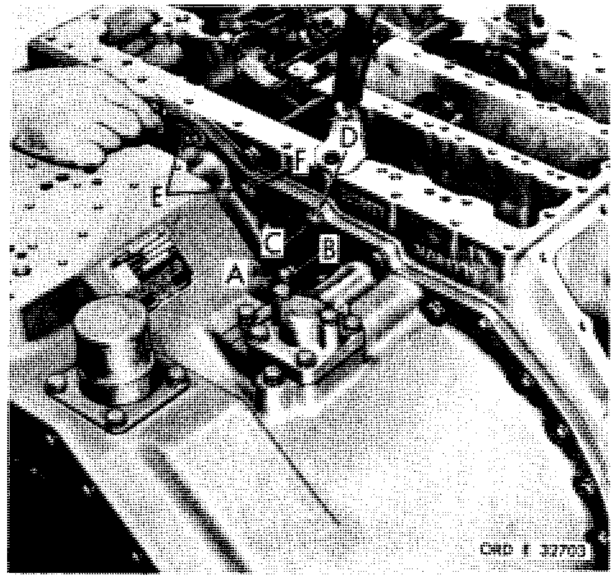


Figure 284 (Step 45)

Install one 5/8-11 x 2 bolt (A) with lock washer (B), fourteen 7/16-14 x 1-1/2 bolts (C) with lock washers (D), and two 1/2-13 x 1-3/4 bolts (E) with lock washers (F). Do not tighten bolts at this time.

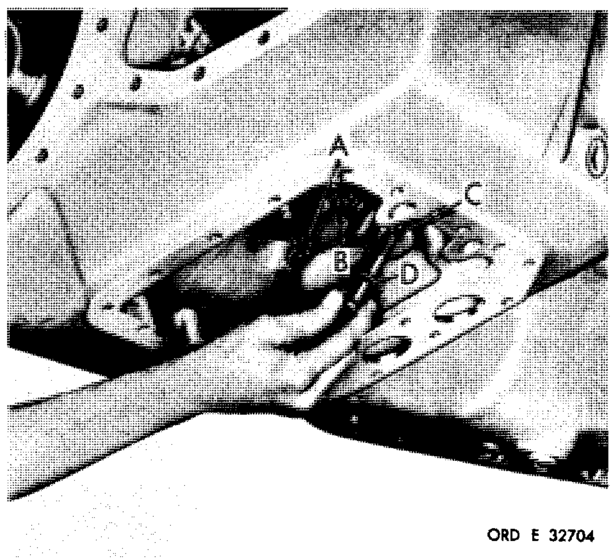


Figure 285 (Step 46)

Install two 5/8-11 x 3 self-locking bolts (A) and flat washers (B). Install one 1/2-13 x 4 bolt (C) with flat washers (D). Tighten bolts (A) to 164-192 pound-feet. Tighten bolt (C) to 81-97 pound-feet.

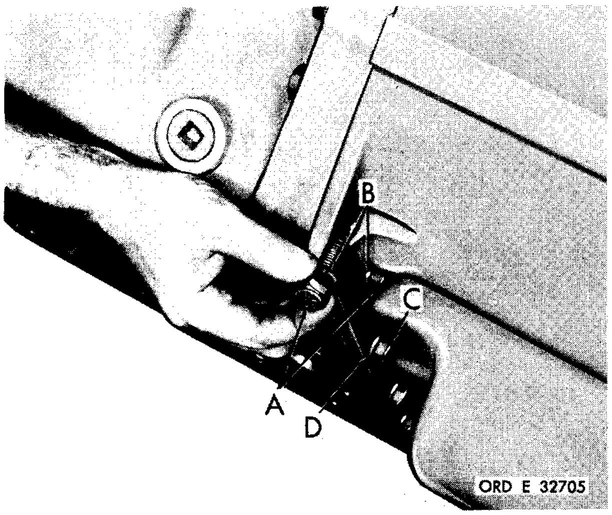


Figure 286 (Step 47)

Install two 1/2-13 x 1-3/4 bolts (A) and lock washers (B). Install the remaining 7/16-14 x 1-1/2 bolts (C) and lock washers (D). Tighten all split line bolts. Torque 7/16, 1/2, and 5/8 bolts to 42-50, 67-80 and 117-140 pound-feet, respectively.

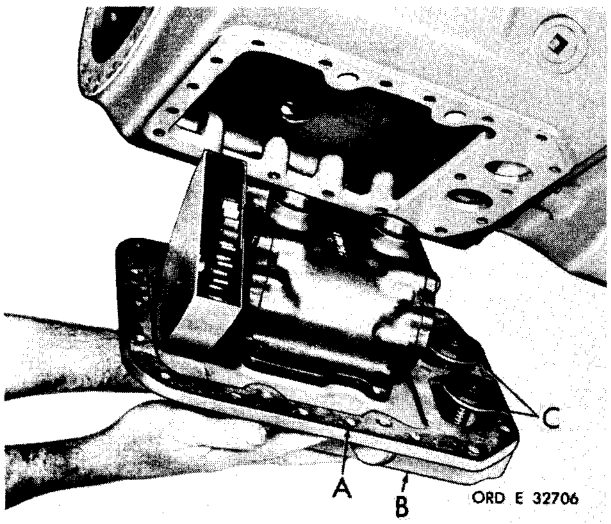


Figure 287 (Step 48)

Install gasket (A) on brake coolant oil pump and manifold assembly (B). Note. Be sure that valves (C) remain in proper position during installation of assembly (B). Install two 3/8-16 x 1-3/8 mounting bolts with lock washers to initially retain the pump and manifold assembly.

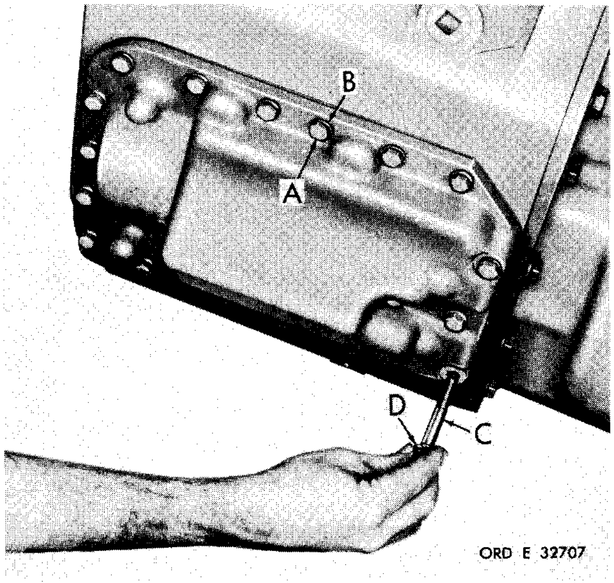


Figure 288 (Step 49)

Install the remaining thirteen 3/8-16 x 1-3/8 bolts (A) with lock washers (B) and four 3/8-16 x 2-1/2 bolts (C) with lock washers (D). Using a 9/16-inch wrench, torque all of the bolts to 26-32 pound-feet.

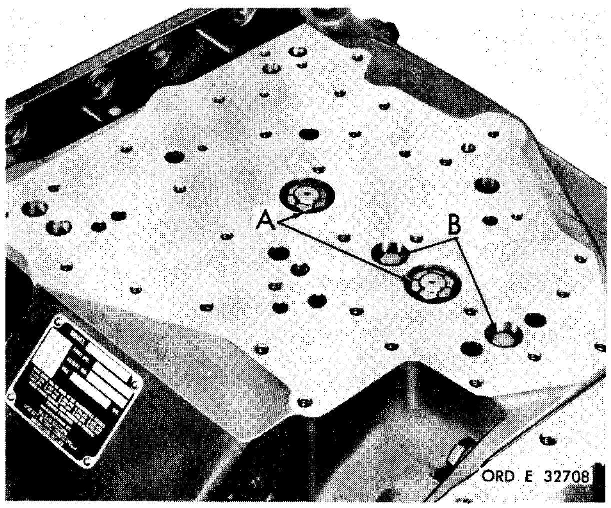


Figure 289 (Step 50)

Using a 15/16-inch socket wrench, tighten the intermediate- and low-range clutch housing nuts (A) to 134-160 pound-feet torque. Using a 9/16-inch wrench, tighten the intermediate-, and low- and reverse-range clutch piston housing bolts (B) to 26-32 pound-feet torque.

*C2

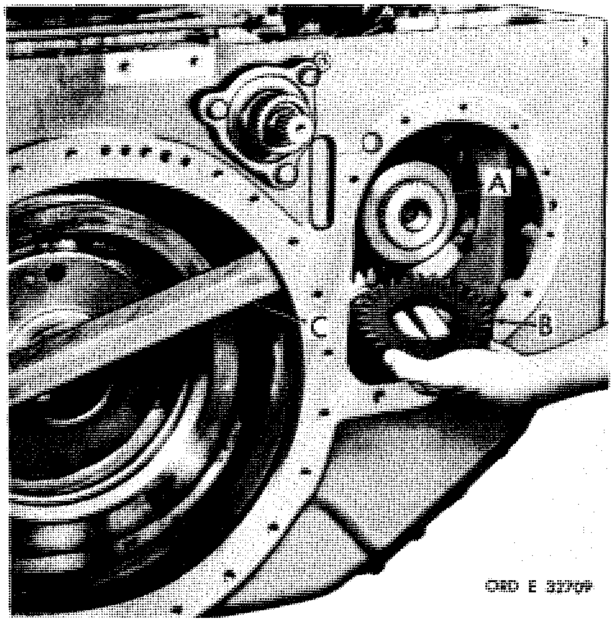


Figure 290 (Step 51)

Install spacer (A) and brake coolant oil pump drive gear (B). Remove wooden block (C) from housing

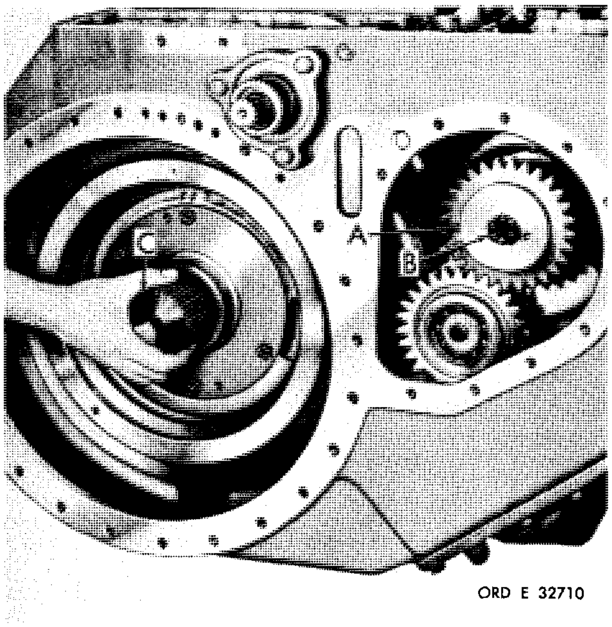


Figure 291 (Step 52)

Install lock plate (A) and 3/4-16 x 2-3/4 self-locking bolt (B), finger-tight at this time. Install output driven gear shaft (C).

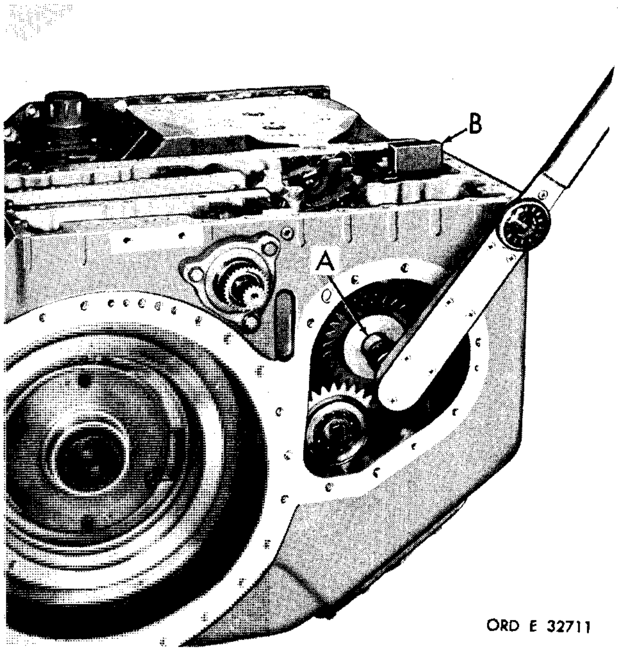


Figure 292 (Step 53)

Using a l-inch wrench, tighten brake coolant pump drive gear retaining self-locking bolt (A) to 337-385 pound-feet torque. Use a block (B) of soft metal between the output transfer drive gear and rear housing to prevent rotation.

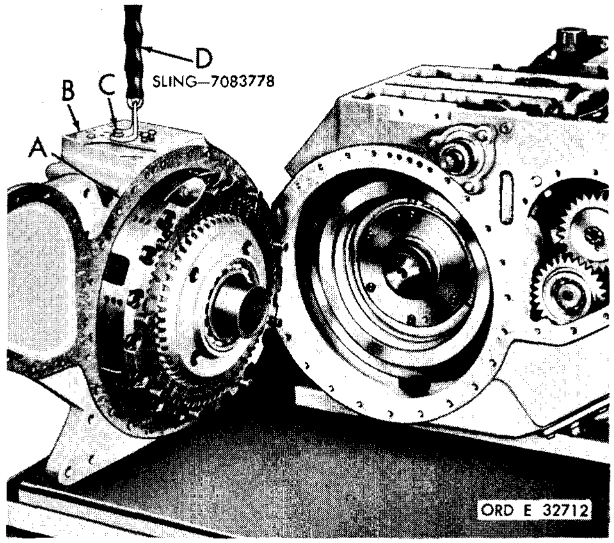


Figure 293 (Step 54)

Install gasket (A) on right- output subassembly (B). Using a 3/8-16 x 1-1/2 bolt (C) and sling (D), install subassembly (B).

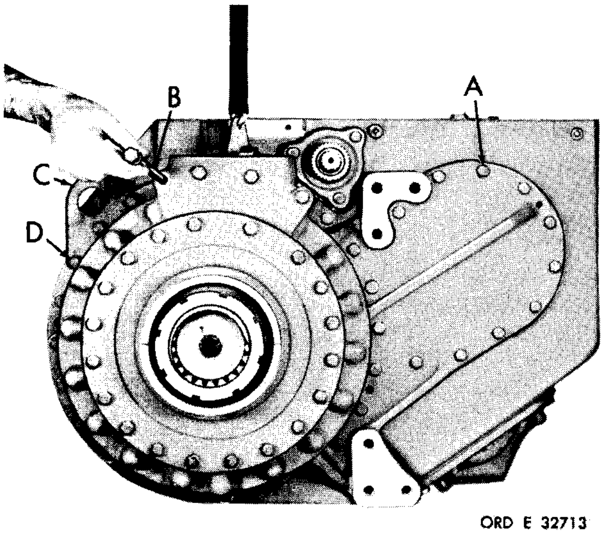


Figure 294 (Step 55)

Install twenty-seven 7/16-14 x 1-1/2 (A), and four 7/16-14 x 7-1/2 (B) bolts with lock washers. Install lifting bracket (C) and three 7/16-14 x 1-3/4 bolts (D) with lock washers. Using a 5/8-inch wrench, torque all bolts to 42-50 pound-feet.

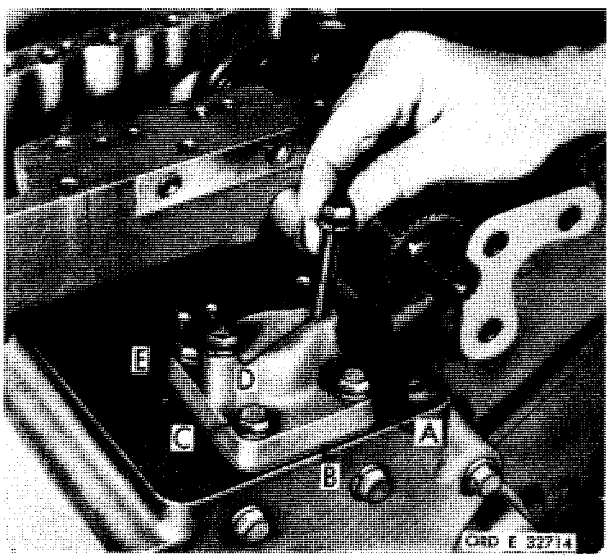


Figure 295 (Step 56)

Install accumulator body (A) and gasket (B). Secure body with four 3/8-16 x 1-1/2-inch (C) and two 3/8-16 x 2-1/2 bolts (D) and six washers (E). Using a 9/16-inch wrench, torque all bolts to 26-32 pound-feet.

*C2

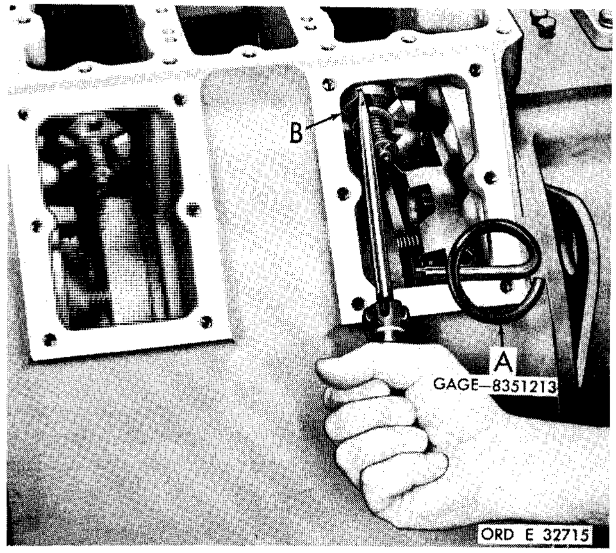


Figure 296 (Step 57)

Make a preliminary brake assembly adjustment at this time. Insert gage (A) between rotating cam and first plate. Turn brake adjusting nut (B) clockwise, until brake plate clearance equals the gage thickness. Adjust the left-brake assembly clearance in the same manner.

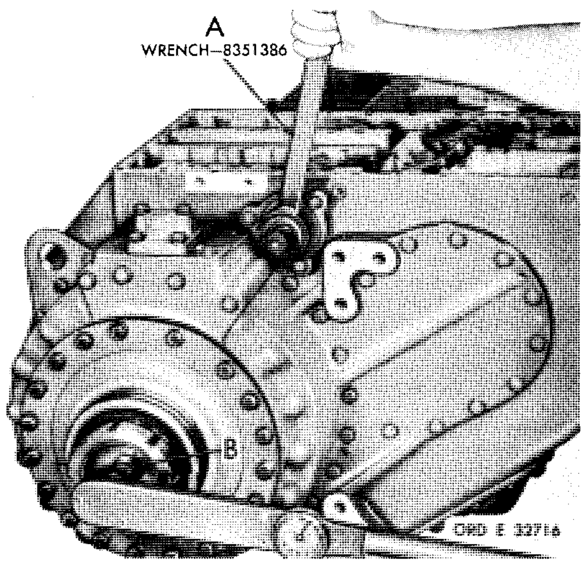


Figure 297 (Step 58)

Using wrench (A), apply the right brake. Using a 1-inch wrench, tighten right-output coupling bolt (B) to 337-385 pound-feet torque.

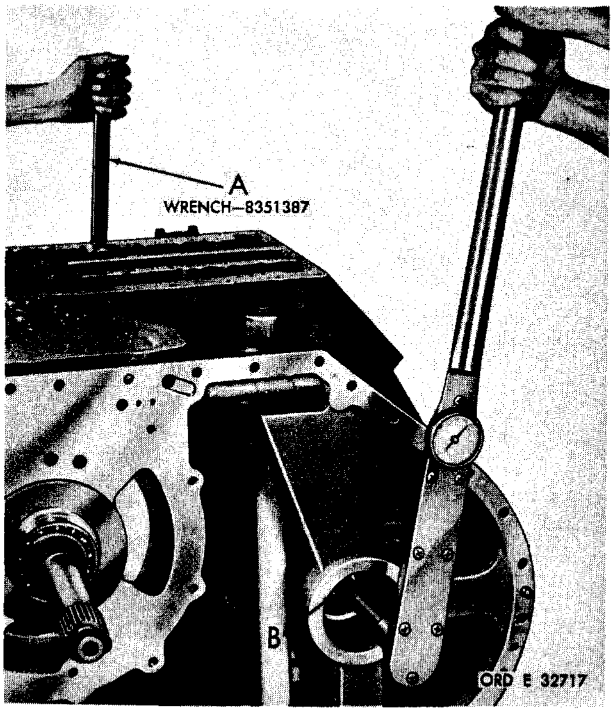


Figure 298 (Step 59)

Using wrench (A), apply the left brake. Using a 1-inch wrench, tighten left-inner coupling bolt (B) to 337-385 pound-feet torque.

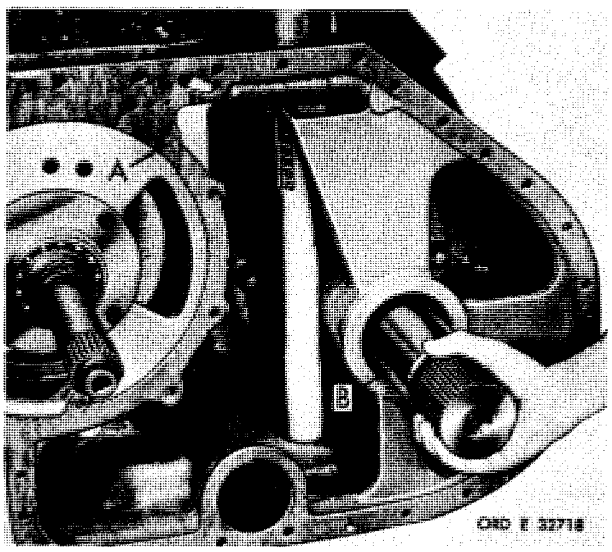


Figure 299 (Step 60)

Install transmission-to-converter housing gasket (A). Install left-output shaft (B), short-splined end first.

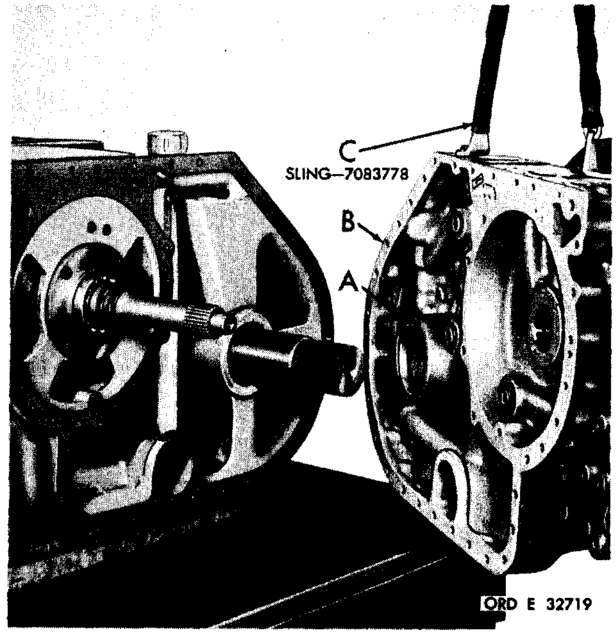


Figure 300 (Step 61)

Install seal ring (A) in converter housing assembly (B). Using sling (C), install converter housing assembly (B).

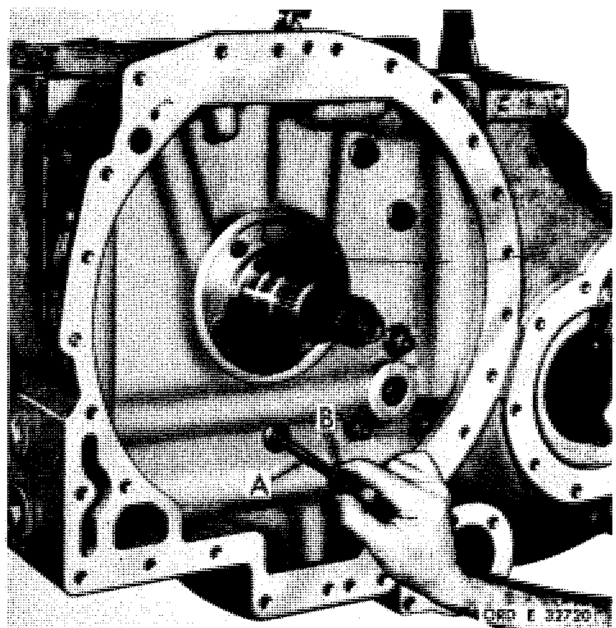


Figure 301 (Step 62)

Install five 7/16-14 x 4 self-locking bolts (A) and flat washers (B), finger tight.

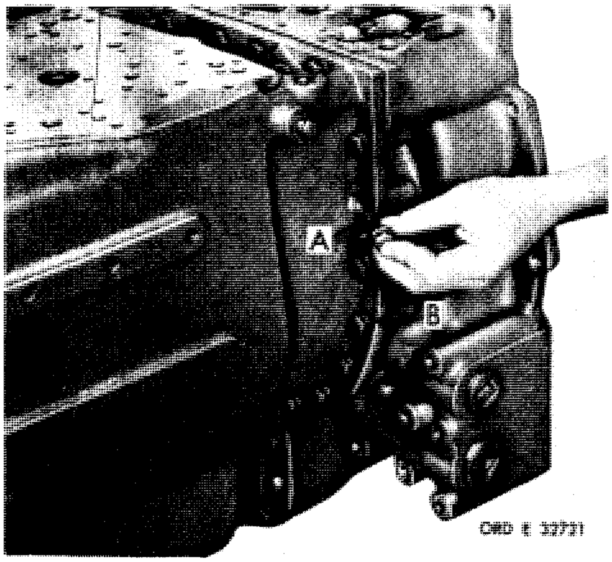


Figure 302 (Step 63)

Install thirty-three 7/16-14 x 1-1/2 bolts (A) and lock washers (B). Using a 5/8-inch wrench, torque bolts to 42-50 pound-feet.

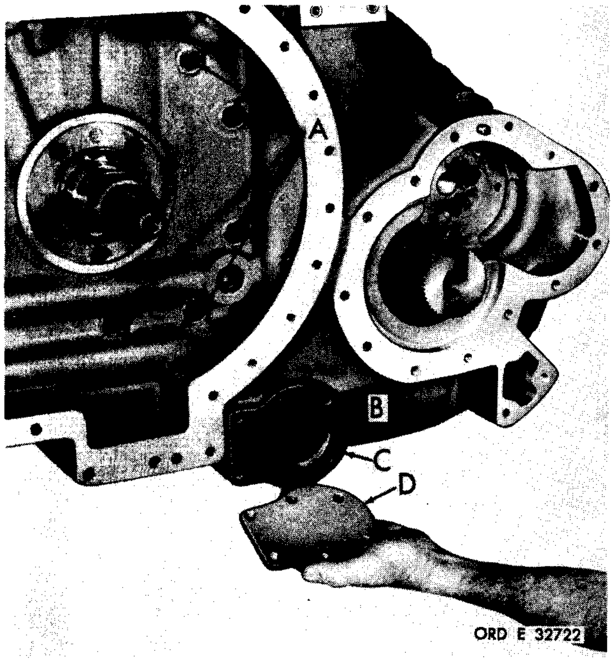


Figure 303 (Step 64)

Using a 5/8-inch wrench, tighten five 7/16-14 x 4 self-locking bolts (A) to 54-65 pound-feet torque. Install oil screen (B), gasket (C) and cover (D).

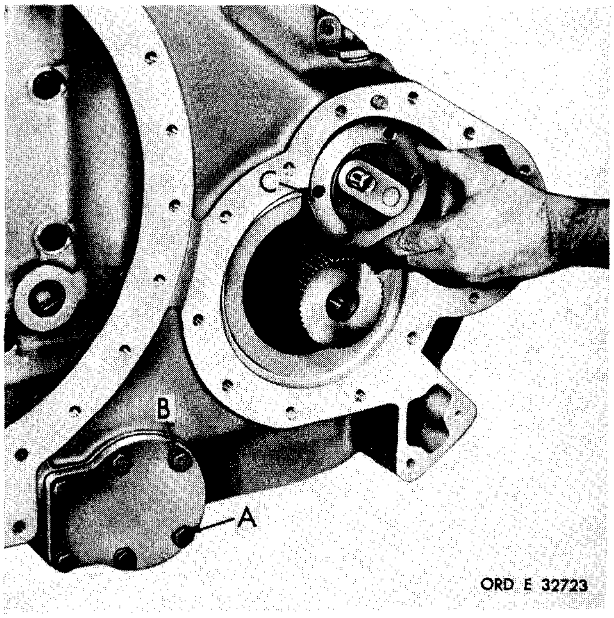


Figure 304 (Step 65)

Install six 3/8-16 x 1-1/8 bolts (A) and lock washers (B). Using a 9/16-inch wrench, torque bolts to 26-32 pound-feet. Install output oil pump assembly (C).

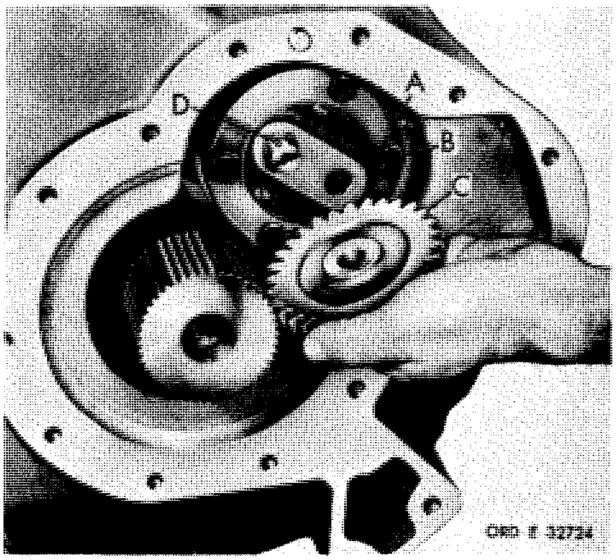


Figure 305 (Step 66)

Secure output oil pump assembly (A) with four 3/8-16 x 2 self-locking bolts (B). Using a 9/16-inch wrench, torque the bolts to 36-43 pound-feet. Install oil pump driven gear (C) and key (D).

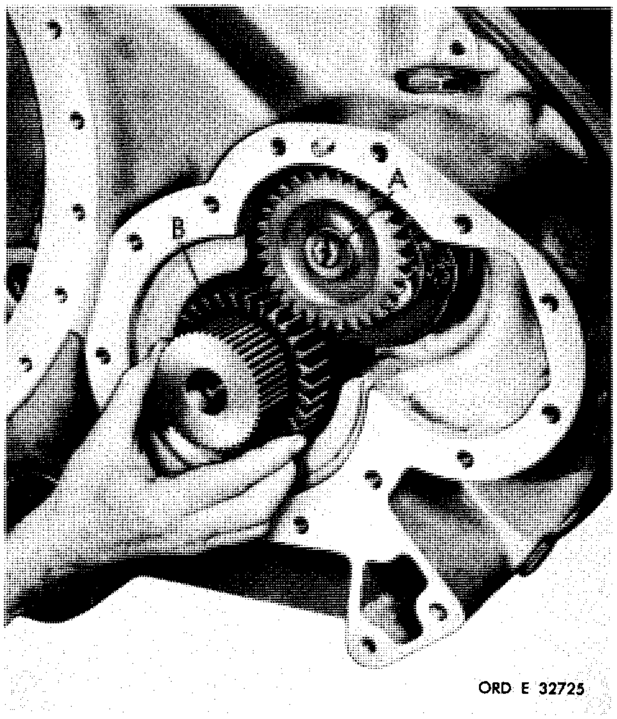


Figure 306 (Step 67)

Install snap ring (A). Install output oil pump drive gear (B), flat side out.

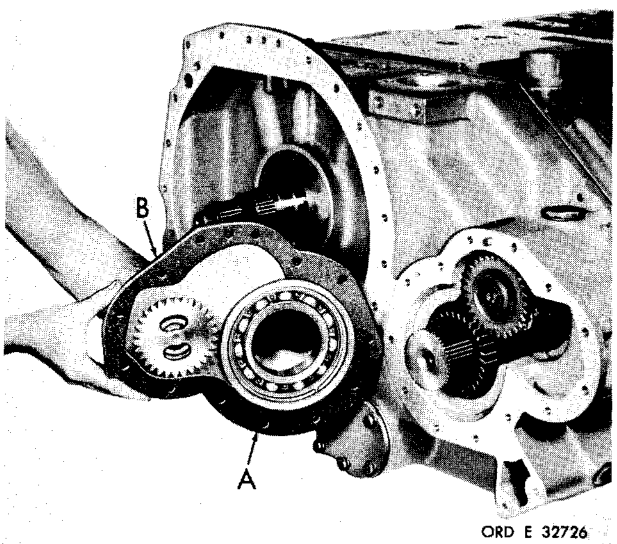


Figure 307 (Step 68)

Install gasket (A) on left-output support assembly (B). Install support assembly.

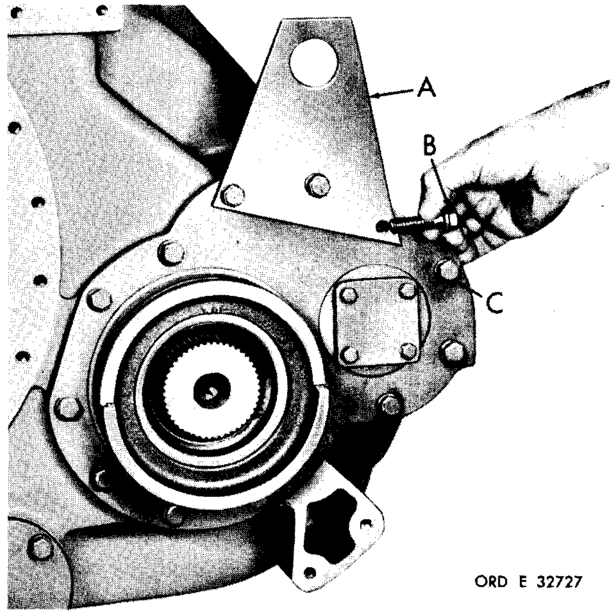


Figure 308 (Step 69)

Install lifting bracket (A), three 7/16-14 x 1-3/4 (B) and ten 7/16-14 x 1-1/2 bolts (C) with lock washers. Using a 5/8-inch wrench, torque bolts to 42-50 pound-feet.

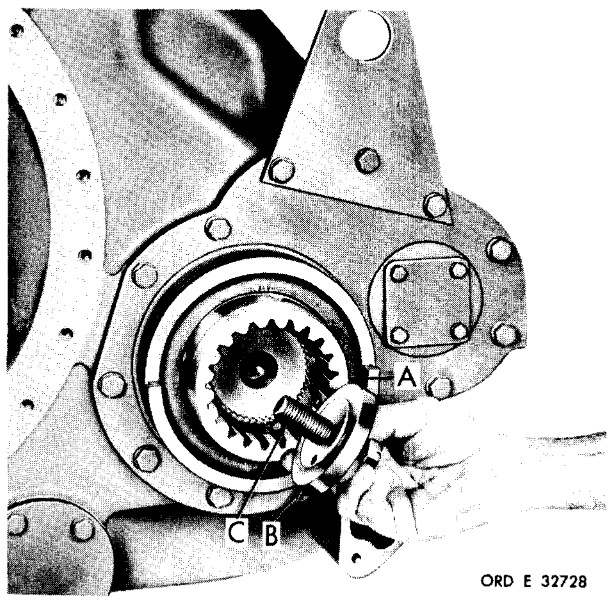


Figure 309 (Step 70)

Install left-output coupling (A). Install lock plate (B) and 3/4-16 x 2-3/4 bolt (C), finger tight.

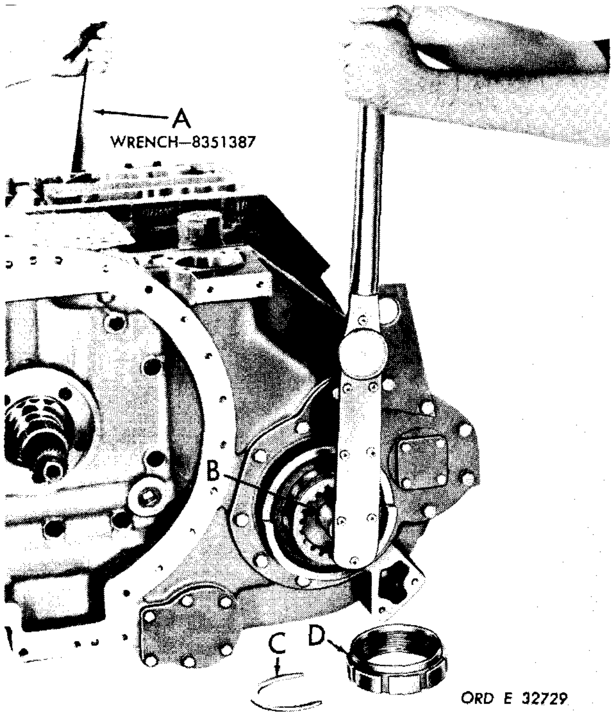


Figure 310 (Step 71)

Using wrench (A), apply the left brake. Using a 1-inch wrench, tighten left-output coupling bolt (B) to 337-385 pound-feet torque. Install lock ring (C) and coupling nut (D) temporarily.

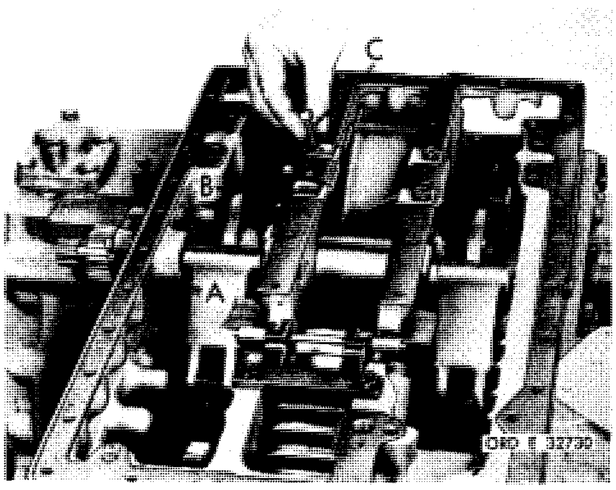


Figure 311 (Step 72)

Install gasket (A). Install oil baffle (B) and secure with four 3/8-16 x 1 bolts (C). Using a 9/16-inch wrench, torque bolts to 36-43 pound-feet.

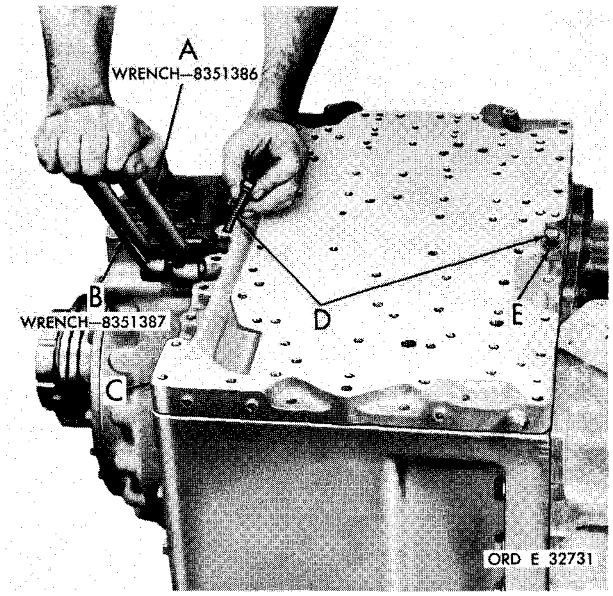


Figure 312 (Step 73)

Using wrenches (A) and (B), apply the transmission right and left brakes slightly. Install transmission rear housing cover (C) and two 3/8-16 x 2-1/4 bolts (D) with lock washers (E), at opposite sides.

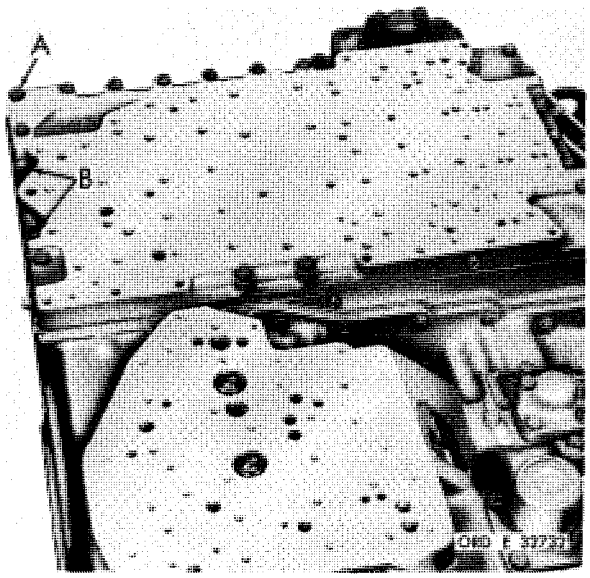


Figure 313 (Step 74)

Install eighteen 3/8-16 x 2-1/4 (A) and two 3/8-16 x 1-3/8 bolts (B) with lock washers. Using a 9/16-inch wrench, torque bolts to 26-32 pound-feet.

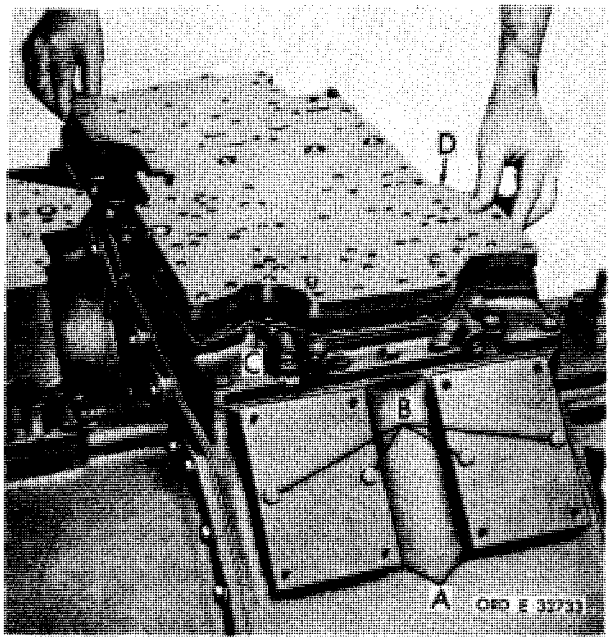


Figure 314 (Step 75)

Install brake inspection covers (A) and temporarily retain with four 3/8-16 x 1-1/8 bolts (B). Install oil transfer plate assembly gasket (C) and plate assembly (D).

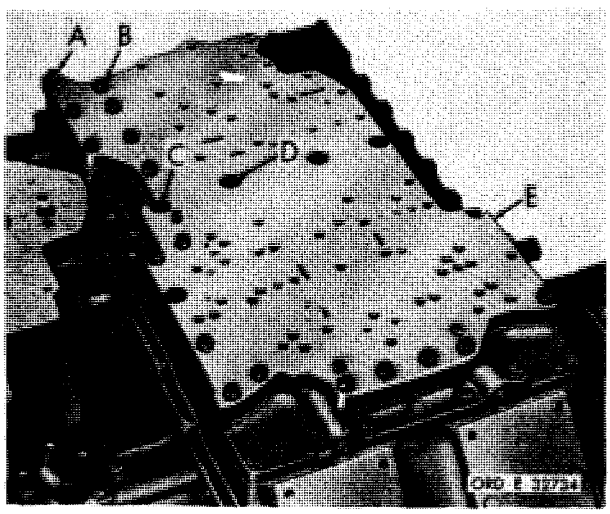


Figure 315 (Step 76)

Install eight 3/8-16 x 3 (A), nine 3/8-16 x 1-5/8 (B), two 3/8-16 x 1-1/8 (C) and four 3/8-16 x 2-1/2 bolts (D) with lock washers to retain oil transfer plate assembly (E). Using a 9/16-inch wrench, torque all bolts to 26-32 pound-feet.

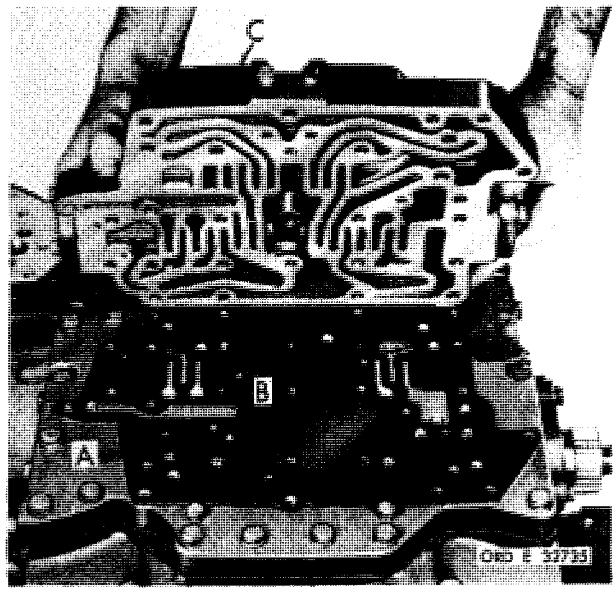


Figure 316 (Step 77)

Install relay valve body assembly gasket (A) and two nylon balls (B). Install valve body assembly (C).

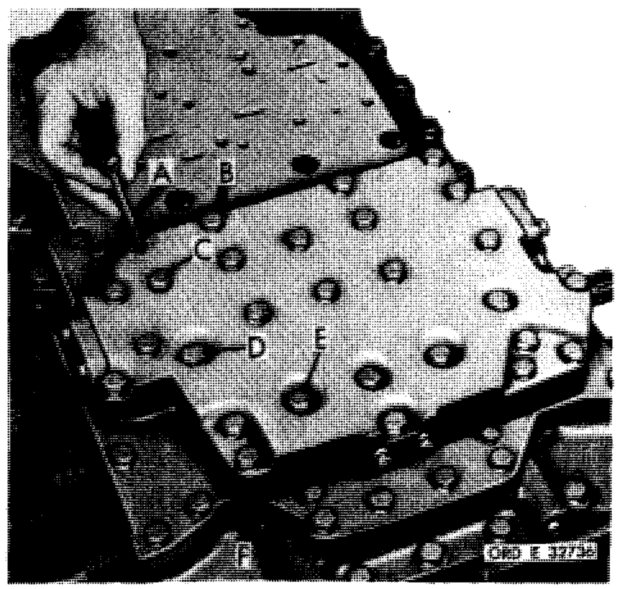


Figure 317 (Step 78)

Install nine 3/8-16 x 3-1/4 (A), five 3/8-16 x 4-1/2 (B), one 3/8-16 x 2-1/2 (C), nine 3/8-16 x 2-3/4-inch (D) and four 3/8-16 x 4 bolts (E) with lock washers to retain relay valve body assembly (F). Using a 9/16-inch wrench, torque bolts to 26-32 pound-feet.

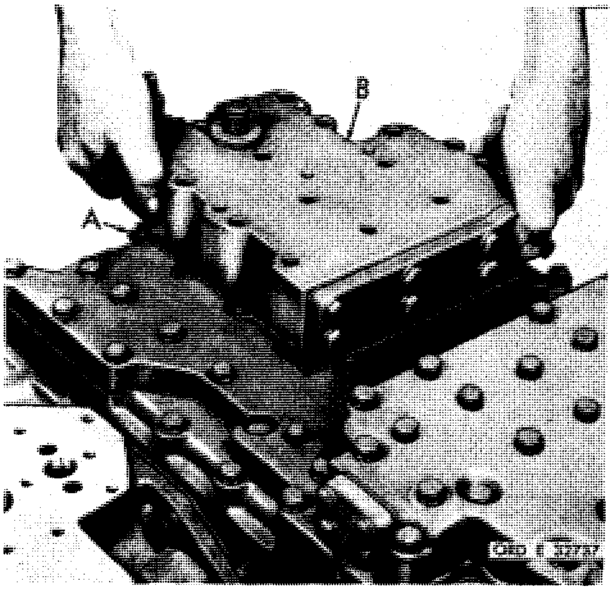


Figure 318 (Step 79)

Install steer valve body assembly gasket (A) and body assembly (B).

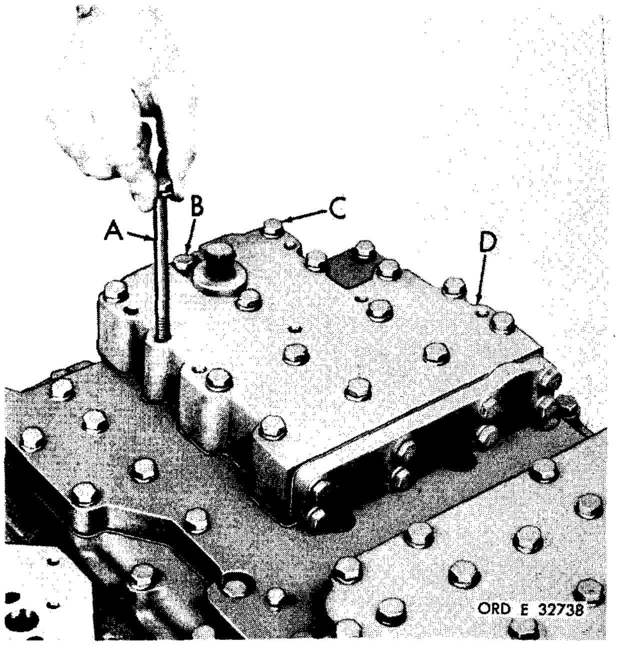


Figure 319 (Step 80)

Install one 3/8-16 x 4-3/4 (A), one 3/8-16 x 4-1/4 (B) and thirteen 3/8-16 x 3-1/2 bolts (C) with lock washers to retain steer valve body assembly (D). Using a 9/16-inch wrench, torque bolts to 26-32 pound-feet.

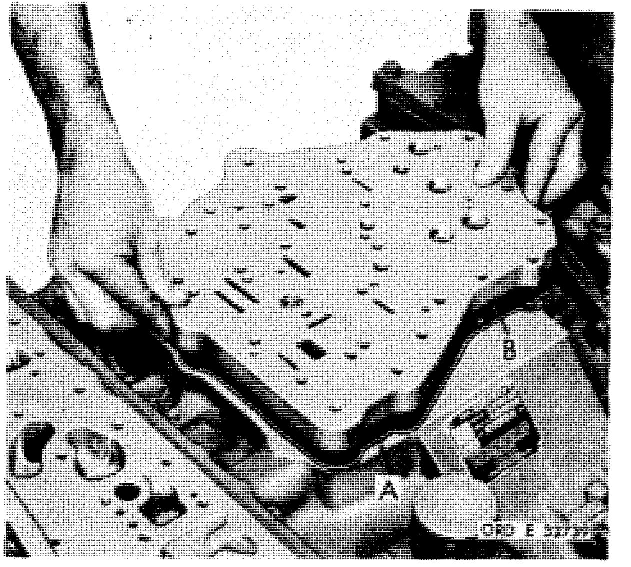


Figure 320 (Step 81)

Install oil transfer plate assembly gasket (A) and plate assembly (B).

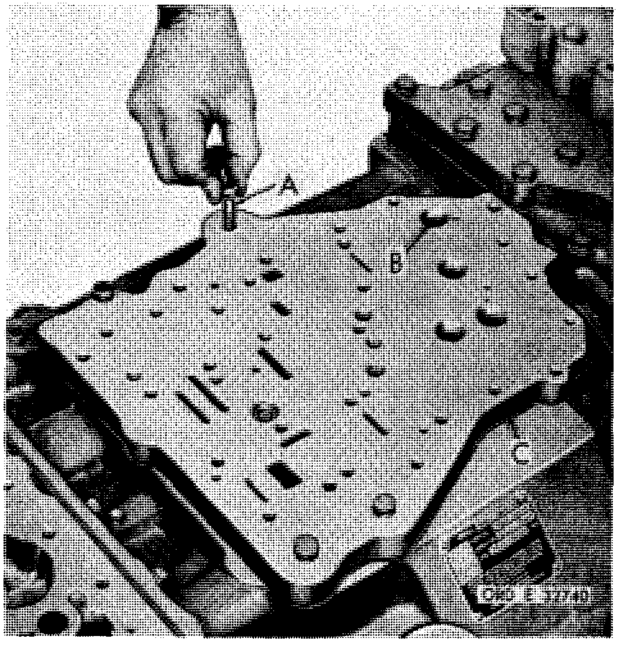


Figure 321 (Step 82)

Install four 5/16-18 x 1-1/2 bolts (A) with lock washers and four 5/16-18 x 1-1/8 bolts (B) with flat washers to retain oil transfer plate assembly (C). Using a 1/2-inch wrench, torque bolts (A) to 13-16 pound-feet and bolts (B) to 17-20 pound-feet.

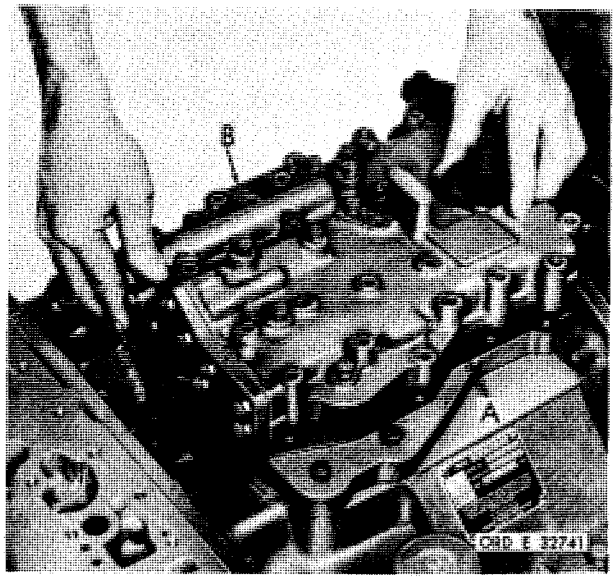


Figure 322 (Step 83)

Install main control valve body assembly gasket (A) and body assembly (B).

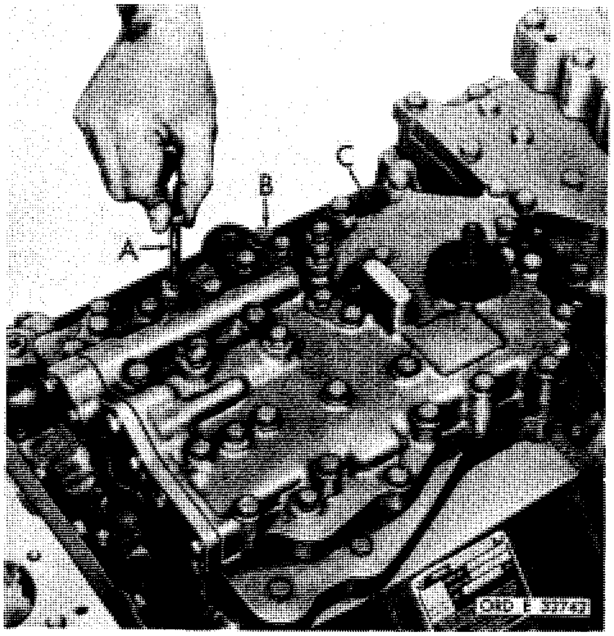


Figure 323 (Step 84)

Install six 5/16-18 x 2-1/2 (A) and twenty-two 5/16-18 x 2-1/4-inch bolts (B) with lock washers to retain main control valve body assembly (C). Using a 1/2-inch wrench, torque bolts to 13-16 pound-feet.

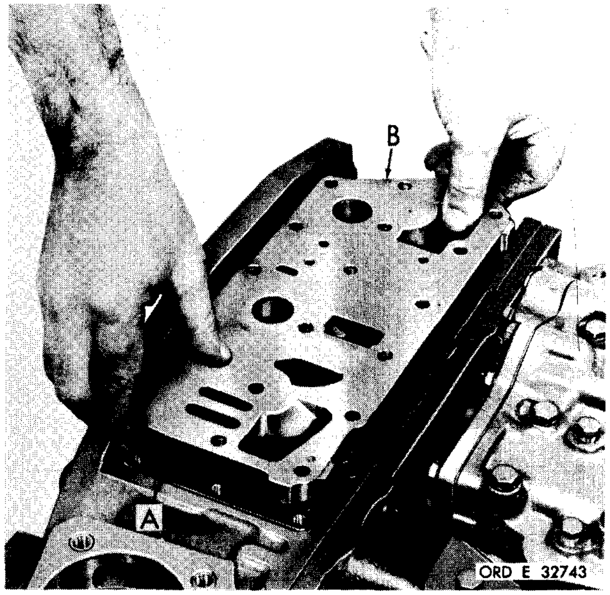


Figure 324 (Step 85)

Install lockup shift and pressure regulator valve body oil transfer plate gasket (A) and plate (B).

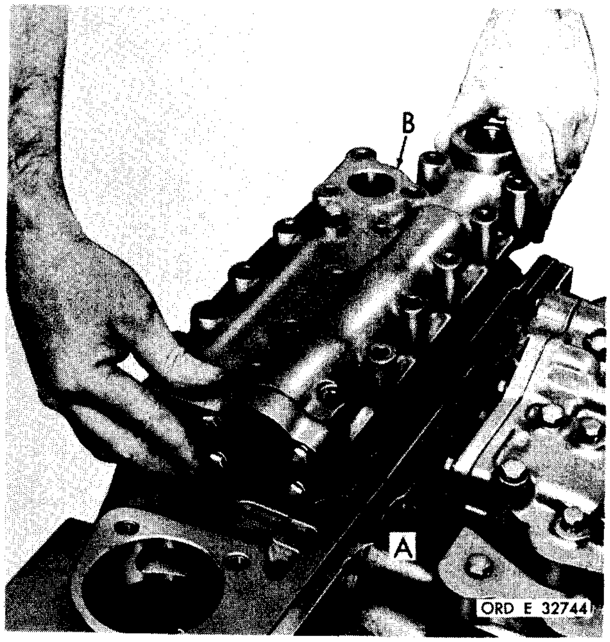


Figure 325 (Step 86)

Install lockup shift and pressure regulator valve body assembly gasket (A) and body assembly (B).

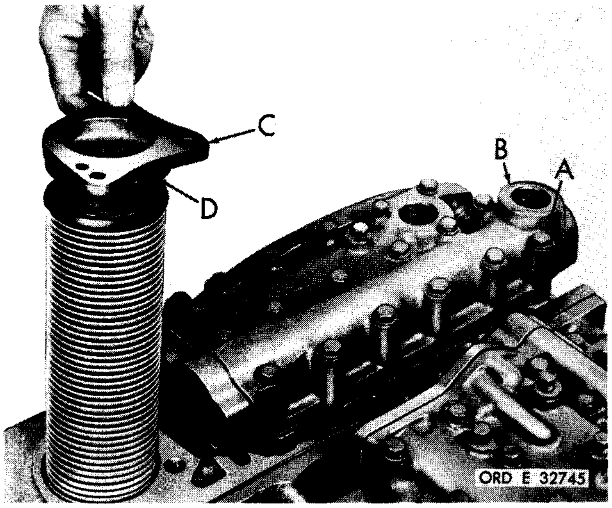


Figure 326 (Step 87)

Install eighteen 5/16-18 x 3-1/4 bolts (A) with flat washers to retain lockup shift and pressure regulator valve body assembly (B). Using a 1/2-inch wrench, torque bolts to 13-16 pound-feet. Install main oil screen assembly (C). Be sure that oil seal ring (D) is in place.

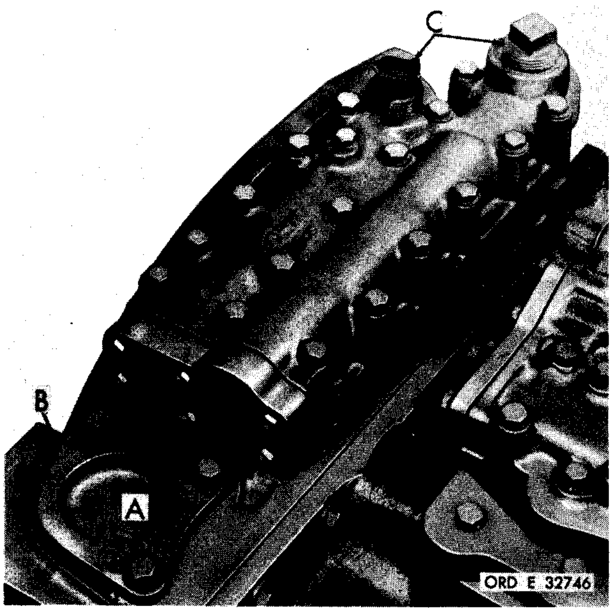


Figure 327 (Step 88)

Install three 3/8-24 x 1-1/8 bolts (A) with lock washers to retain main oil screen assembly (B). Using a 9/16-inch wrench, torque bolts to 33-40 pound-feet. For cleanliness, temporarily install two 1-inch pipe plugs (C).

228. ASSEMBLY STEPS – INPUT TRANSFER ASSEMBLY

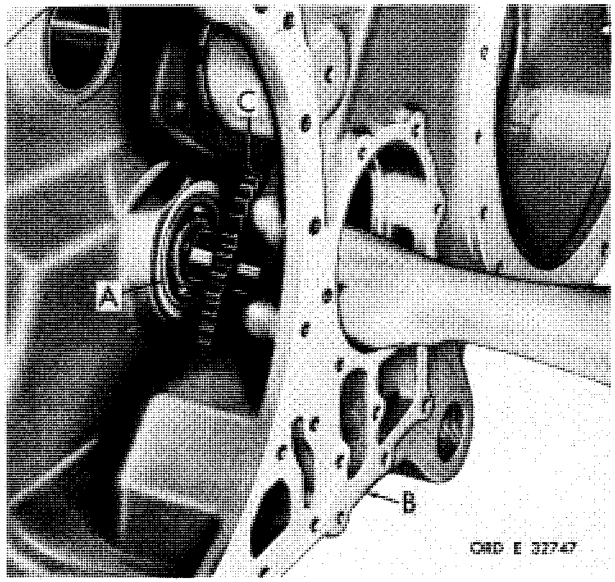


Figure 328 (Step 1)

Install bearing assembly (A) in input transfer housing (B). Install input oil pump drive gear (C).

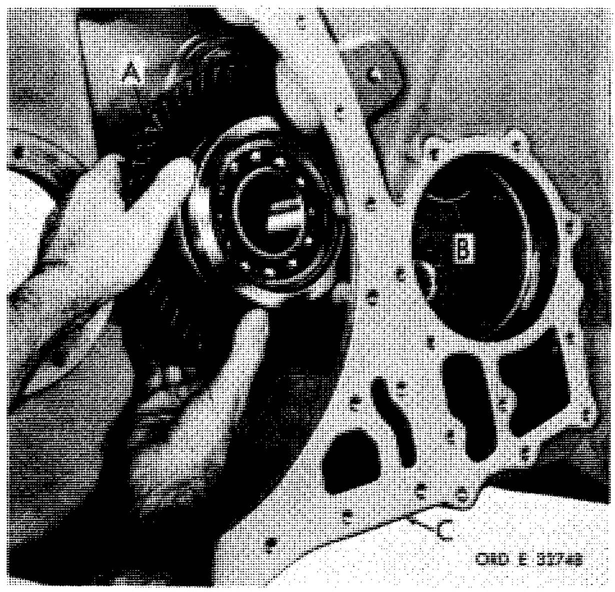


Figure 329 (Step 2)

Install input transfer idler cluster gear and bearing assembly (A), alining it with spindle bore (B) in housing (C).

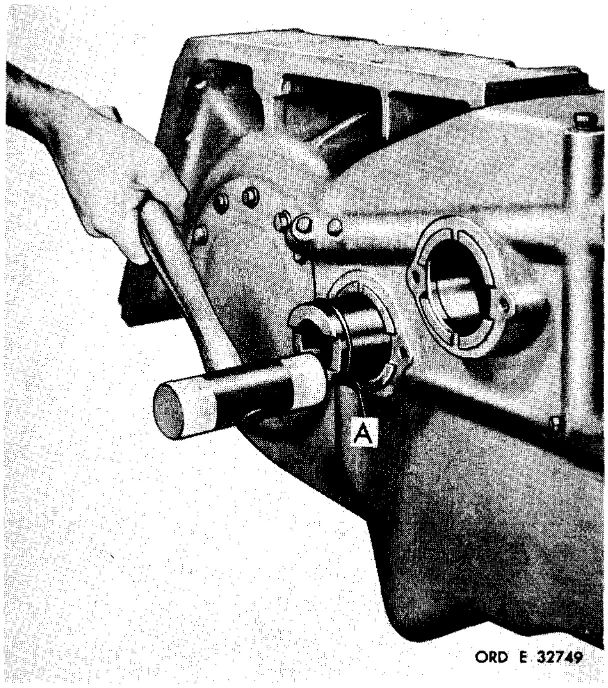


Figure 330 (Step 3)

Install idler cluster gear spindle assembly (A).

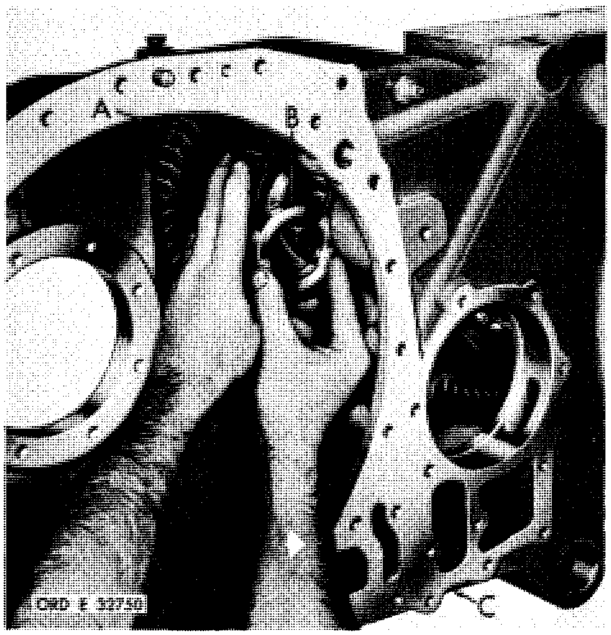


Figure 331 (Step 4)

Install input transfer cluster gear and bearing assembly (A) and spacer (B), alining parts with the spindle bore in housing (C).

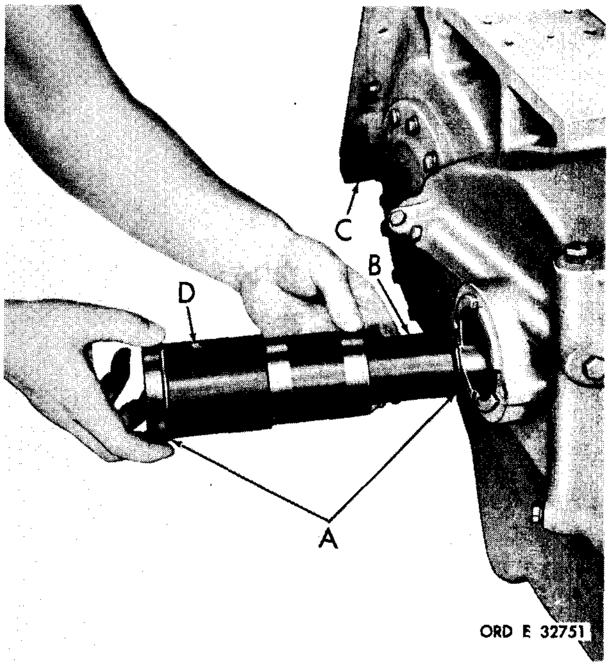


Figure 332 (Step 5)

Install O-ring seals (A) onto cluster gear spindle (B). Install spindle (B) with seals (A) into housing (C), and cluster gear and bearing assembly. Be sure that oil hole (D) in spindle is up.

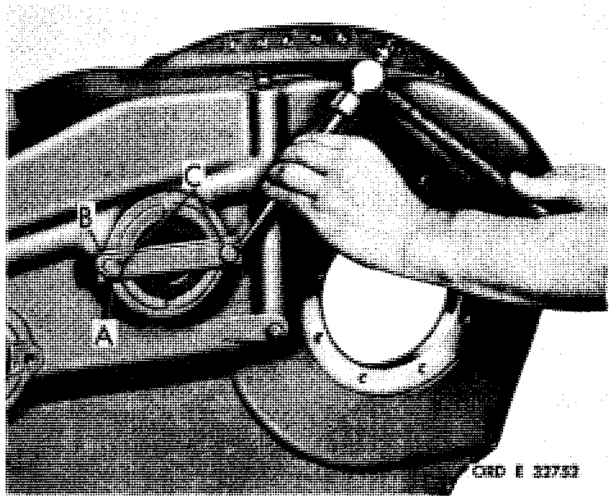


Figure 333 (Step 6)

Install lock strap (A), lock strip (B) and two 3/8-16 x 1 bolts (C). Using a 9/16-inch wrench, torque bolts to 26-32 pound-feet. Bend corners of strip (B) against the bolt heads.

*C2

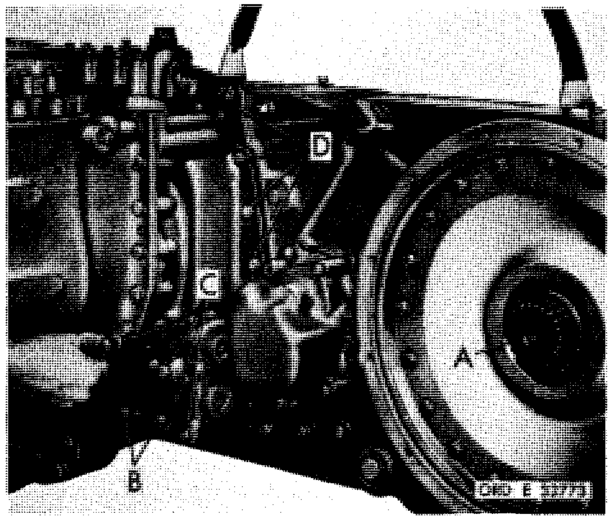


Figure 354 (Step 27)

Install engine coupling shaft (A). Install two 7/16-14 x 5-1/4 (B), four 7/16-14 x 6 (C) and four 7/16-14 x 1-1/2 converter housing-to-input transfer housing bolts (D) with lock washers. Using a 5/8-inch wrench, torque bolts to 42-50 pound-feet.

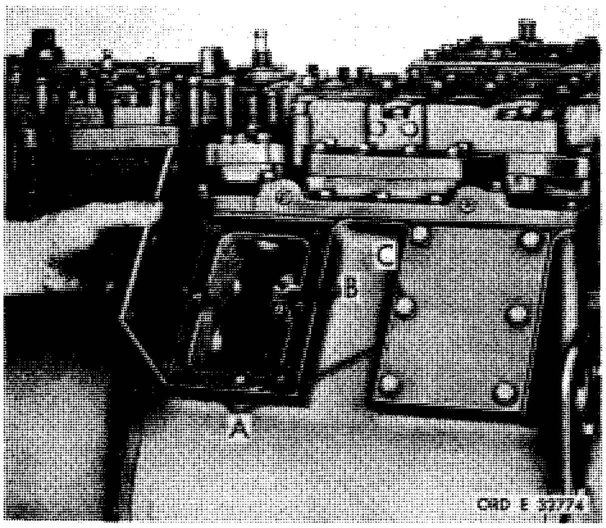


Figure 355 (Step 28)

Remove brake inspection covers (A) which were temporarily installed. Refer to sec. XXXIV, par. 234 for a final brake adjustment. Install gaskets (B) and covers (A). Secure covers with twelve 3/8-16 x 1-1/8 bolts (C) with lock washers. Using a 9/16-inch wrench, torque bolts to 26-32 pound-feet.

229. ASSEMBLY STEPS – LEFT- AND RIGHT-OUTPUT DRIVE ASSEMBLIES

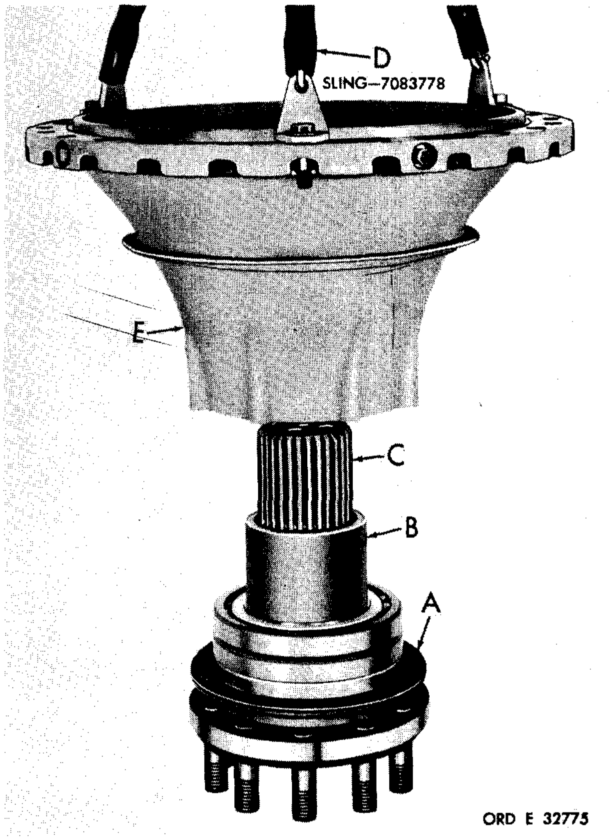


Figure 356 (Step 1)

Install gasket (A) and sleeve (B) onto output shaft assembly (C). Using sling (D), install output drive housing (E).

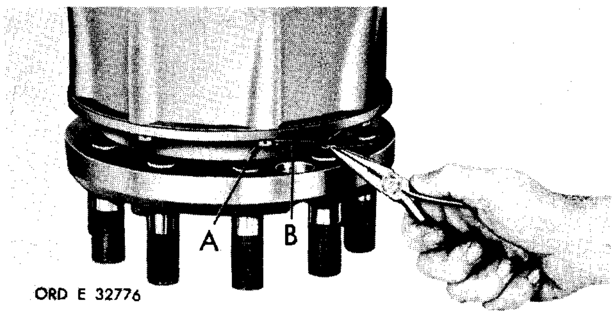


Figure 357 (Step 2)

Install eight 7/16-20 x 1-1/4 bolts (A). Using a 5/8-inch wrench, torque bolts to 50-60 pound-feet. Install lock wire (B) through bolts (A).

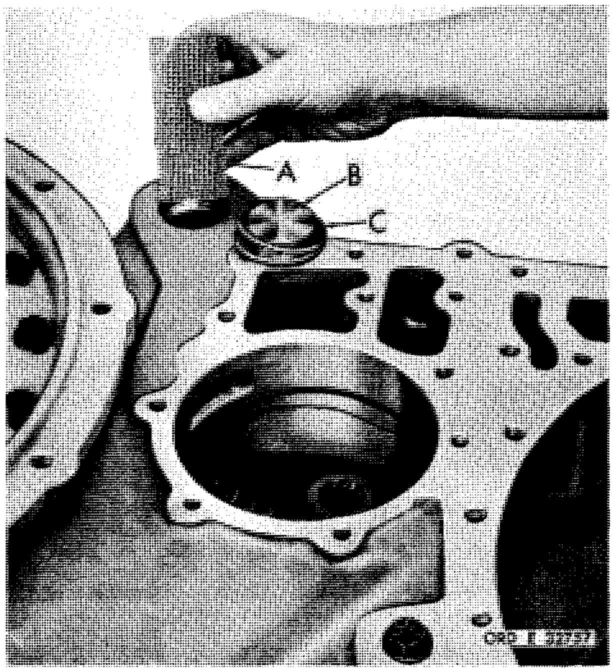


Figure 338 (Step 11)

Install scavenge oil pump screen (A) and plug (B) with gasket (C).

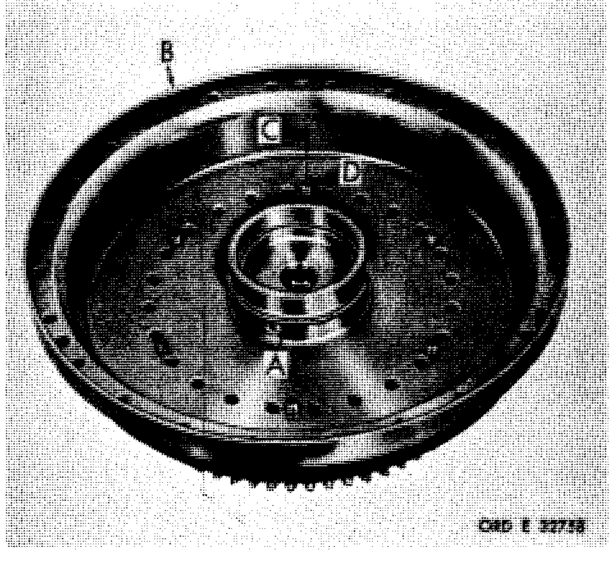


Figure 339 (Step 12)

Install hook-type seal ring (A) onto hub of converter pump cover (B). Place an index mark (C) on the cover, alined with dowel pin (D) as shown.

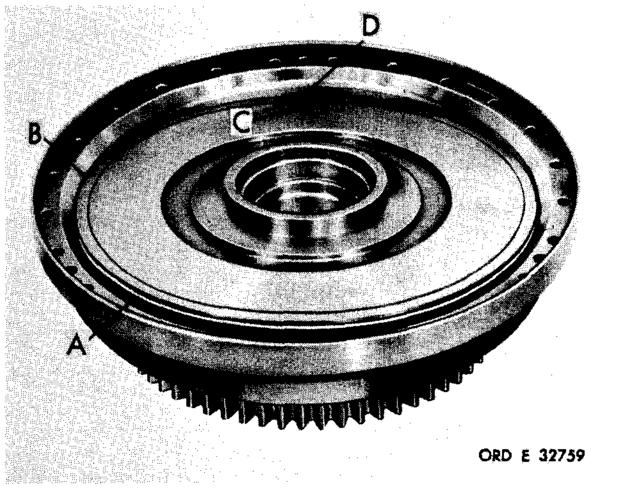


Figure 340 (Step 13)

Install seal and expander (A) on lockup clutch piston (B). Place an index mark (C) on piston (B) in line with a dowel pinhole on the opposite side. Install piston, alining index marks (C) and (D).

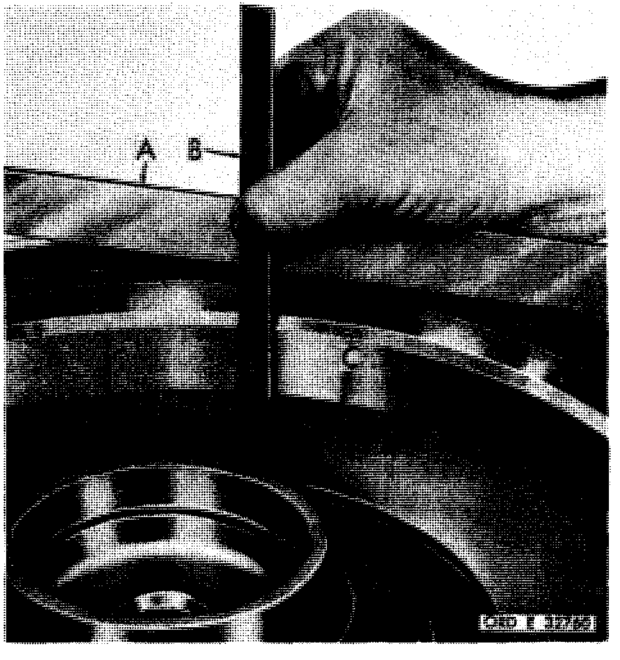


Figure 341 (Step 14)

Using a straightedge (A) and scale (B), measure depth of lockup clutch piston (C) in converter cover (D). Measurement should read approximately 2-1/16 inches when piston is properly installed.

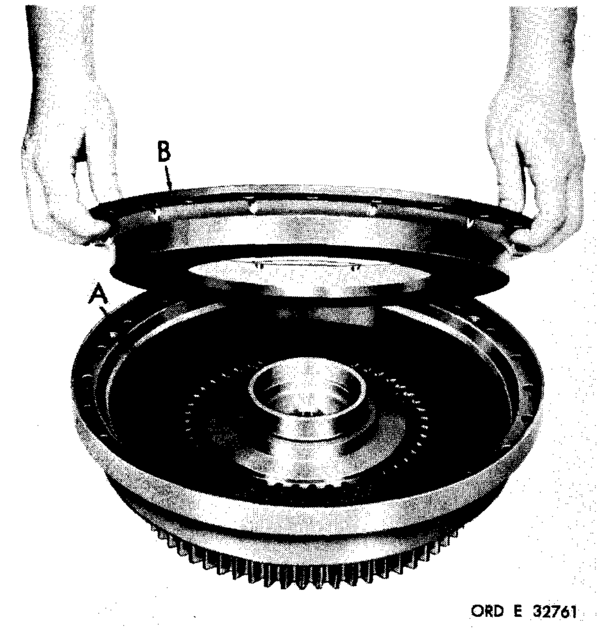


Figure 342 (Step 15)

Install lockup clutch plate (A). Install lockup clutch back plate (B). Aline bolt holes.

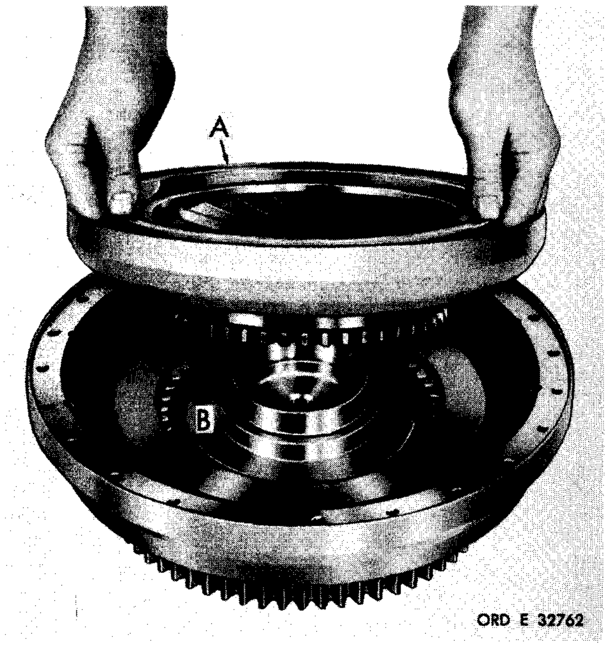


Figure 343 (Step 16)

Install torque converter turbine assembly (A), meshing the splines of the turbine hub with those of lockup clutch plate (B).

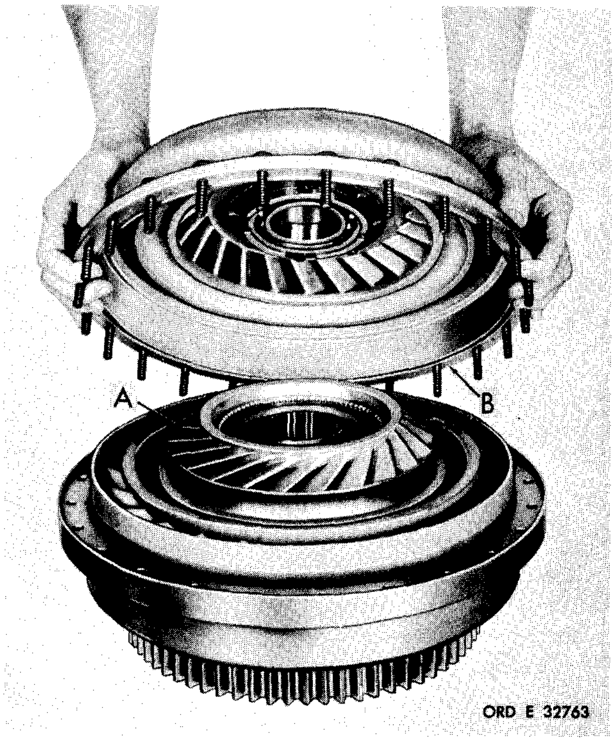


Figure 344 (Step 17)

Install stator assembly (A). Install torque converter pump assembly (B). Install two 5/16-24 nuts, 180° apart, to hold converter assembly together. Turn assembly over on assembly table.

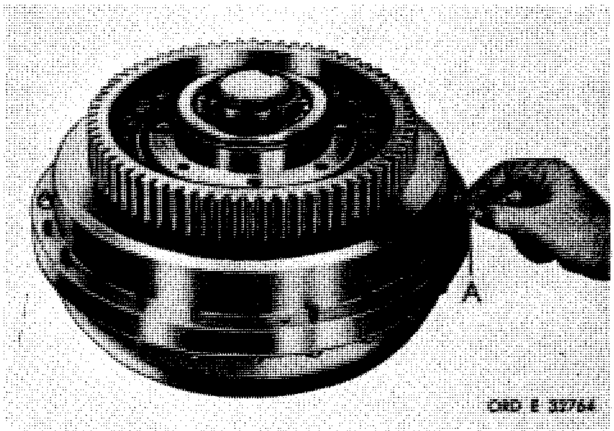


Figure 345 (Step 18)

Install the remaining twenty-two 5/16-24 nuts (A). Using a 1/2-inch wrench, torque all of the nuts, alternately and evenly, to 19-23 pound-feet.

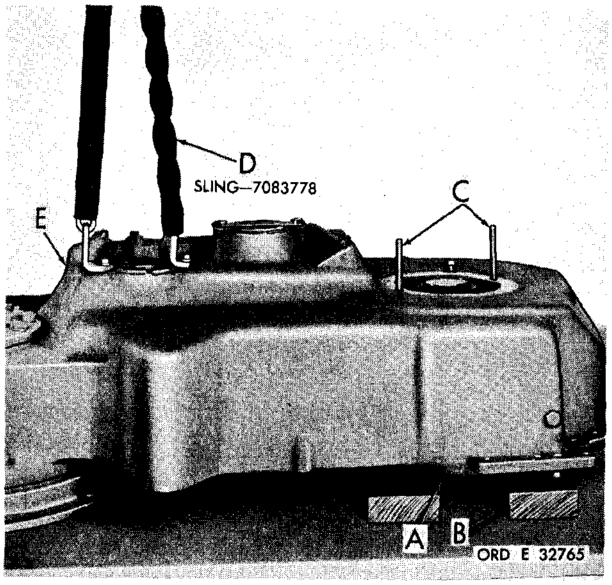


Figure 346 (Step 19)

Position torque converter assembly (A) on the assembly table, leveling it on wooden blocks (B). Install two 3/8-24 headless guide bolts (C) in assembly (A). Using sling (D), lower input transfer gear housing assembly (E) onto converter assembly (A). After installation, level housing assembly (E) with wooden blocks.

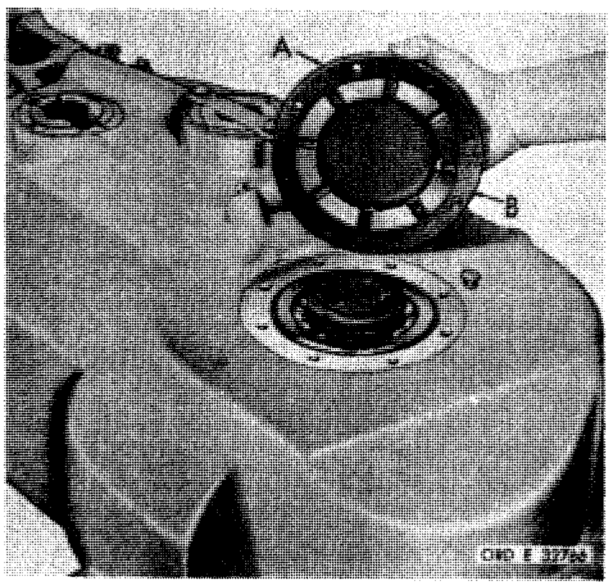


Figure 347 (Step 20)

Remove headless guide bolts. Install torque converter bearing cover (A) and gasket (B).

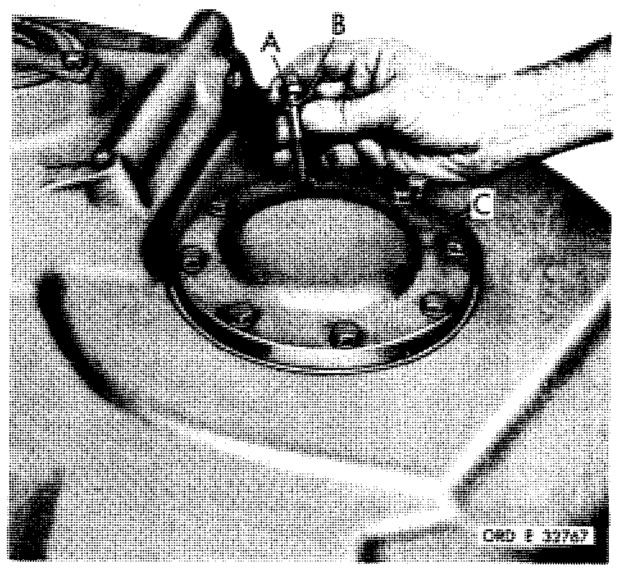


Figure 348 (Step 21)

Install eight 3/8-24 x 2-1/4 bolts (A) and lock washers (B) to retain converter bearing cover (C). Using a 9/16-inch wrench, torque bolts to 33-40 pound-feet.

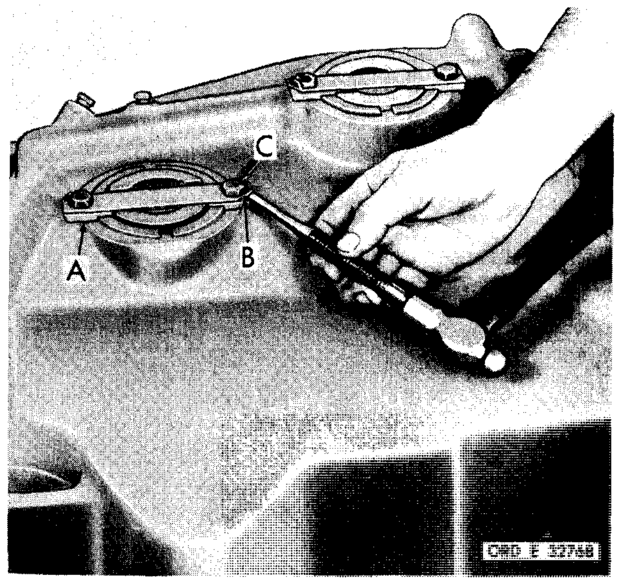


Figure 349 (Step 22)

Install transfer idler cluster gear spindle lock strap (A), lock strip (B) and two 3/8-16 x 1 bolts (C). Using a 9/16-inch wrench, torque bolts to 26-32 pound-feet. Bend corners of strip (B) against bolt heads.

*C2

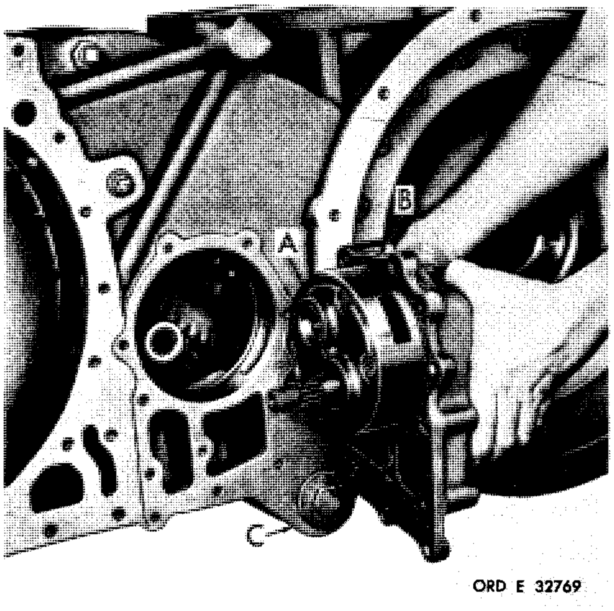


Figure 350 (Step 23)

Install input oil pump assembly (A) and gasket (B) into transfer housing (C).

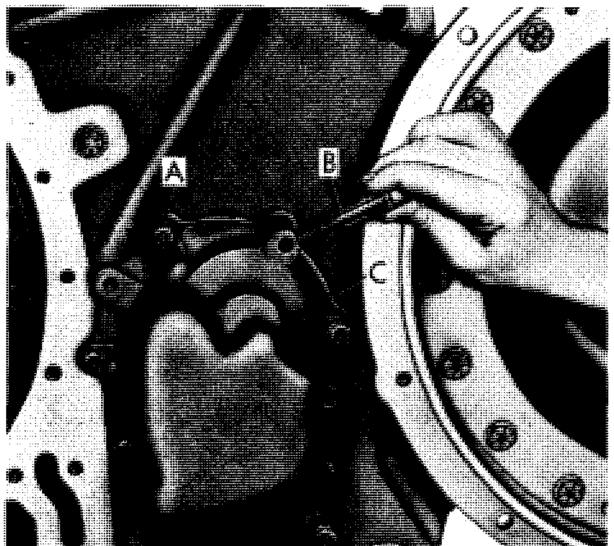


Figure 351 (Step 24)

Install six 3/8-16 x 1-1/2 (A) and five 3/8-16 x 3-3/4 bolts (B) with lock washers to retain input oil pump assembly (C). Using a 9/16-inch wrench, torque bolts to 26-32 pound-feet.

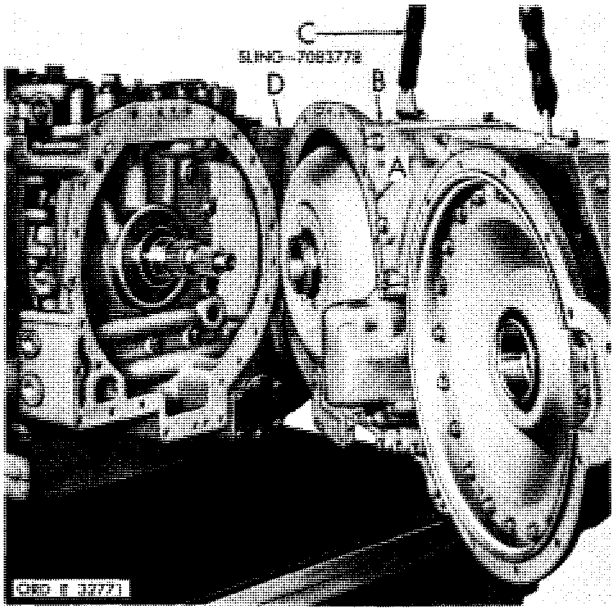


Figure 352 (Step 25)

Install gasket (A) on input transfer housing assembly (B). Using sling (C) install housing assembly (B) onto transmission assembly (D).

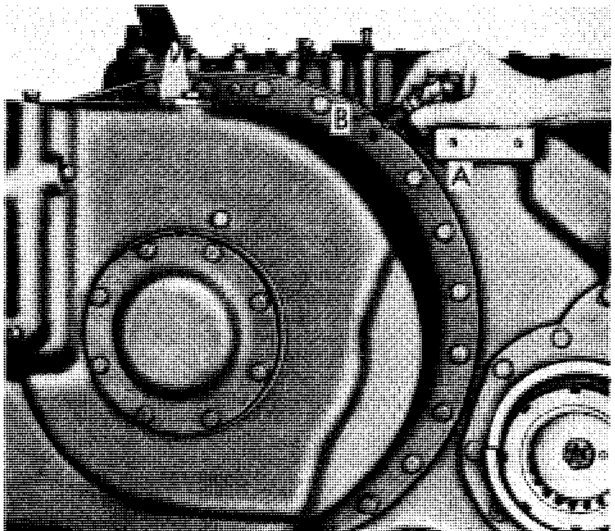


Figure 353 (Step 26)

Install sixteen 7/16-14 x 1-1/2 converter housing-to-input transfer housing assembly bolts (A) with lock washers (B). Using a 5/8-inch wrench, torque bolts to 42-50 pound-feet.

*C2

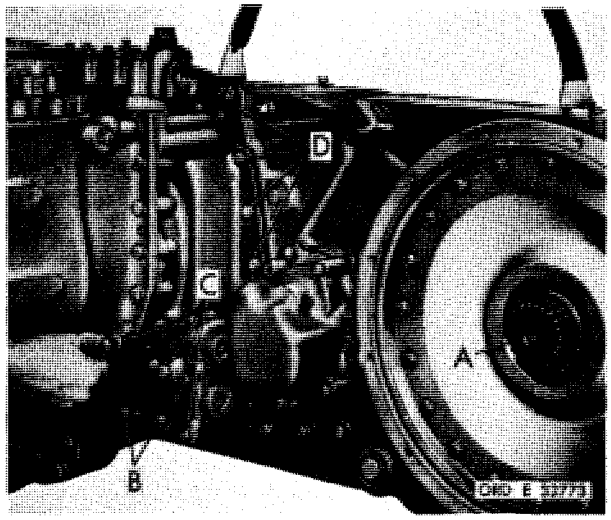


Figure 354 (Step 27)

Install engine coupling shaft (A). Install two 7/16-14 x 5-1/4 (B), four 7/16-14 x 6 (C) and four 7/16-14 x 1-1/2 converter housing-to-input transfer housing bolts (D) with lock washers. Using a 5/8-inch wrench, torque bolts to 42-50 pound-feet.

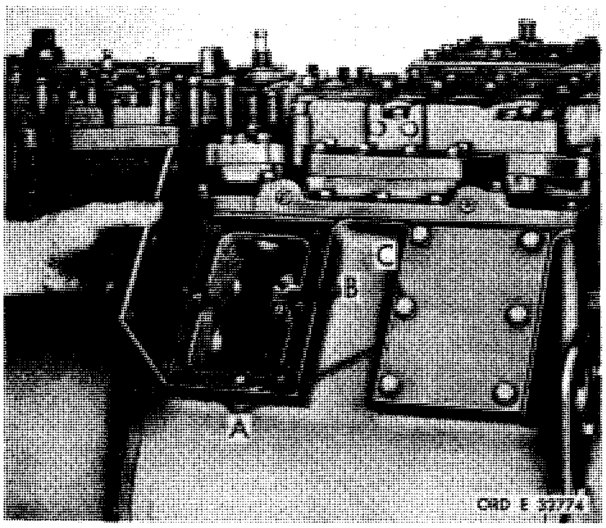


Figure 355 (Step 28)

Remove brake inspection covers (A) which were temporarily installed. Refer to sec. XXXIV, par. 234 for a final brake adjustment. Install gaskets (B) and covers (A). Secure covers with twelve 3/8-16 x 1-1/8 bolts (C) with lock washers. Using a 9/16-inch wrench, torque bolts to 26-32 pound-feet.

229. ASSEMBLY STEPS – LEFT- AND RIGHT-OUTPUT DRIVE ASSEMBLIES

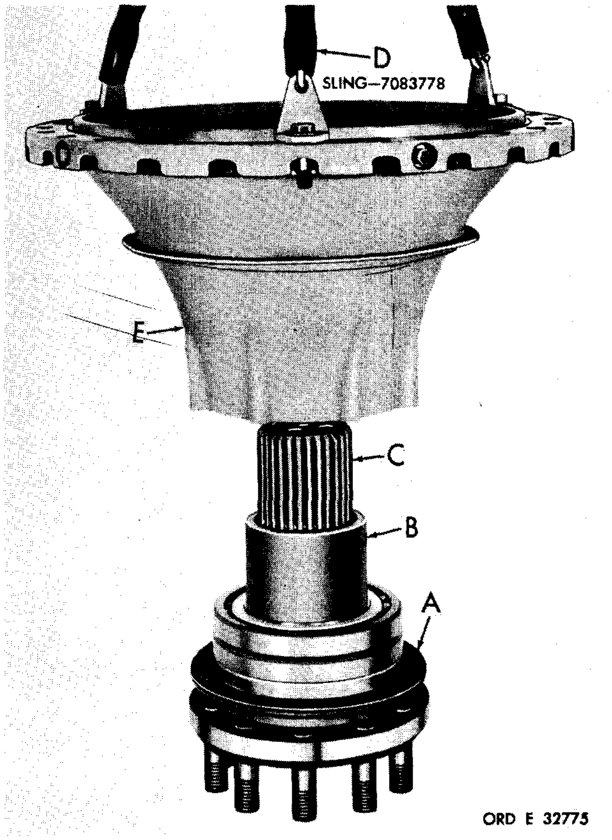


Figure 356 (Step 1)

Install gasket (A) and sleeve (B) onto output shaft assembly (C). Using sling (D), install output drive housing (E).

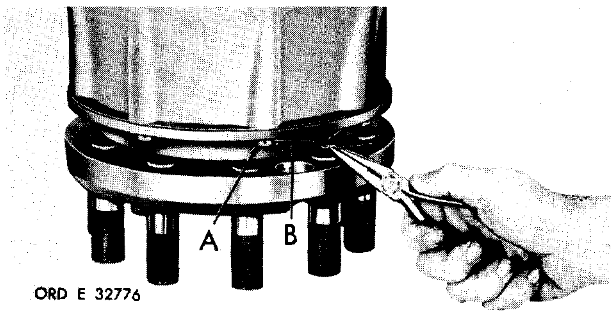


Figure 357 (Step 2)

Install eight 7/16-20 x 1-1/4 bolts (A). Using a 5/8-inch wrench, torque bolts to 50-60 pound-feet. Install lock wire (B) through bolts (A).

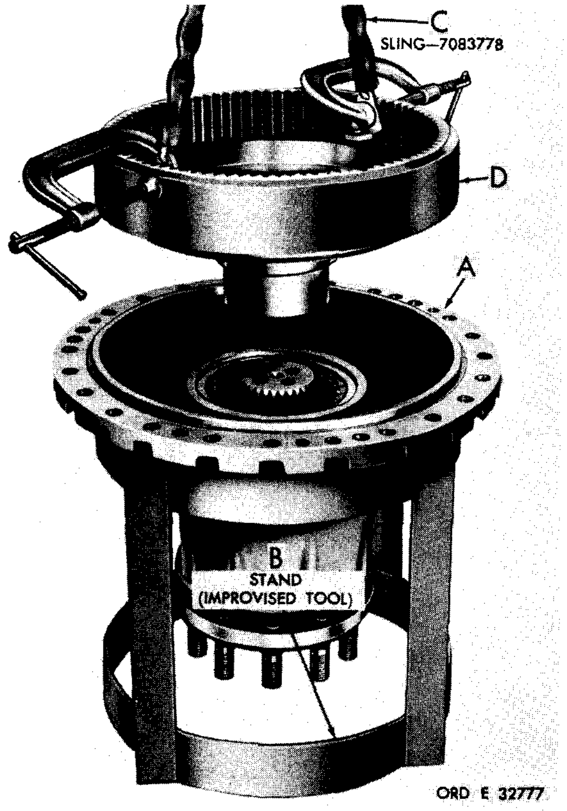


Figure 358 (Step 3)

Position assembled housing (A) on stand (B). Using sling (C),install output drive planetary ring gear (D).

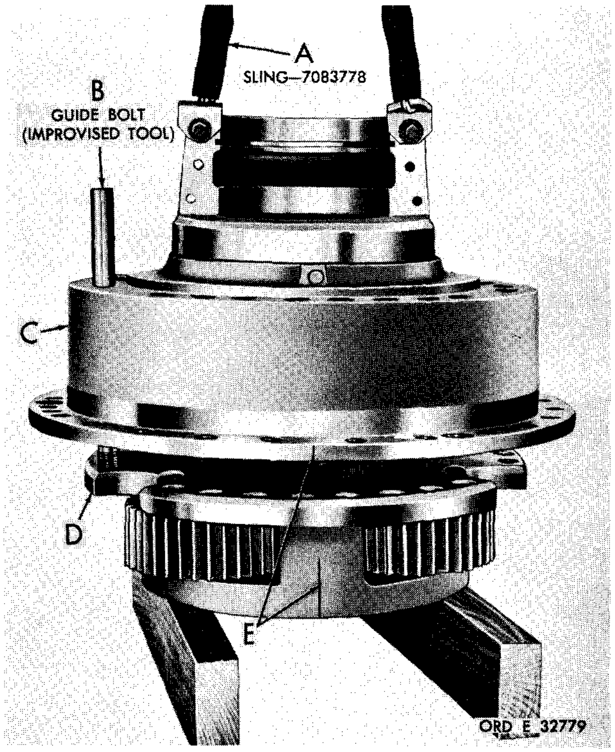


Figure 360 (Step 5)

Using sling (A) and a headless 7/8-14 guide bolt (B), install saddle assembly (C) onto planetary carrier assembly (D), alining index marks (E).

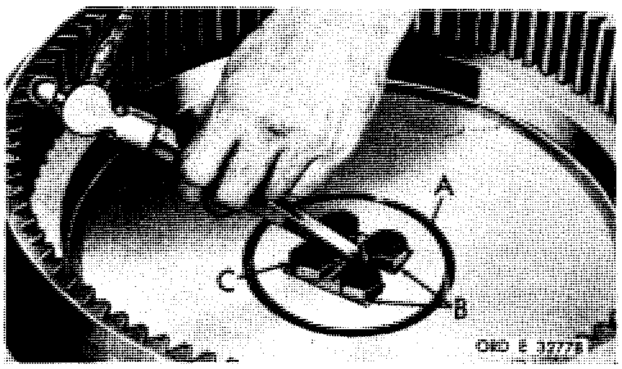


Figure 359 (Step 4)

Install lock plate (A) and secure with two lock strips (B) and four 5/8-18 x 2-1/2 bolts (C). Using a 15/16-inch wrench, torque the bolts to 134-160 pound-feet. Bend a tab of lock strips (B) against the head of each bolt (C).

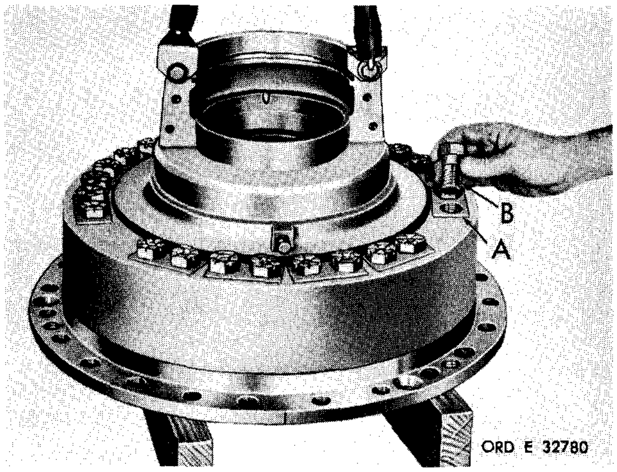


Figure 361 (Step 6)

Remove headless guide bolt.
ers (A) and 24 bolts (B). Do
at this time.

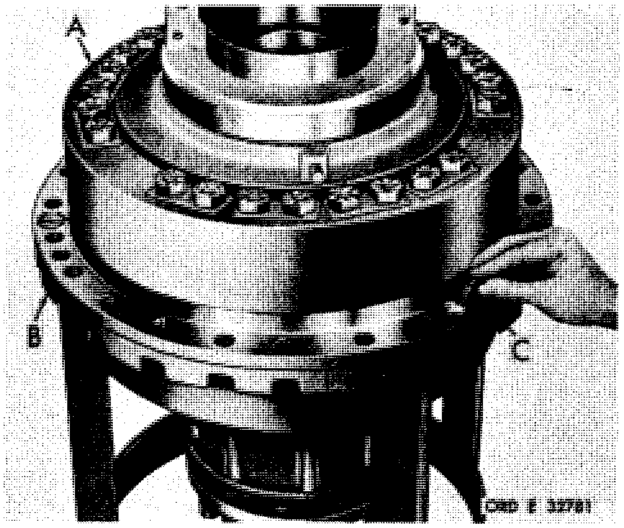


Figure 362 (Step 7)

Install saddle and planetary assembly (A) onto output drive housing (B), alining index marks Install three 5/8-18 x 1-1/4 screws (C).

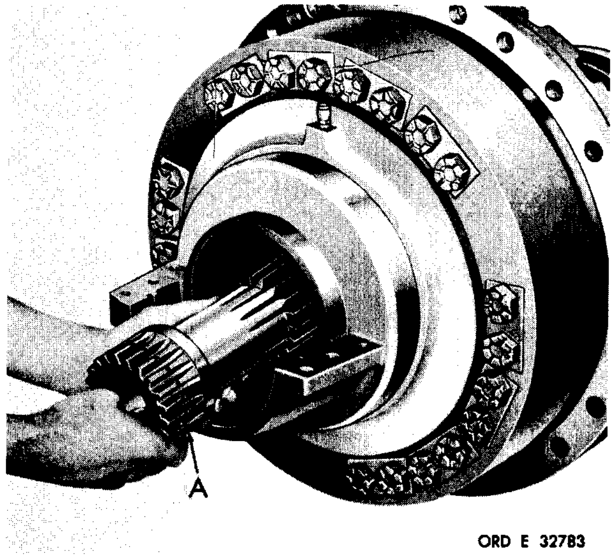


Figure 364 (Step 9)

Install input shaft (A), meshing it with the planetary pinions.

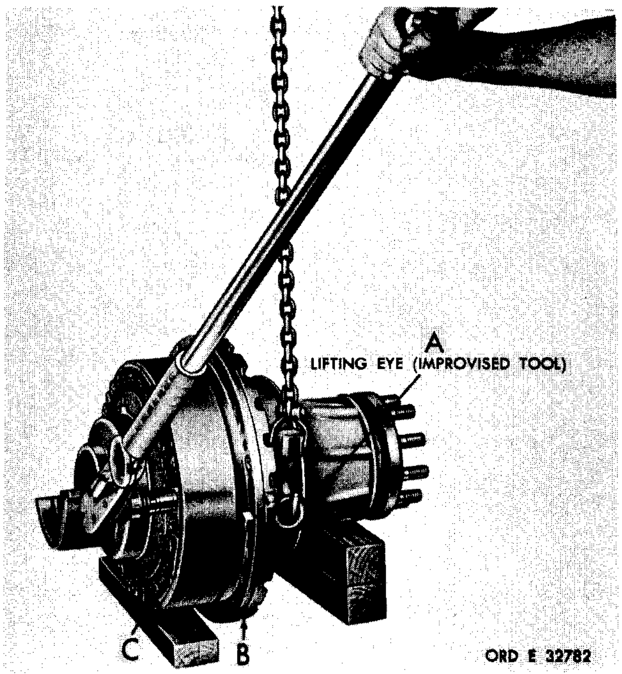


Figure 363 (Step 8)

Using lifting eye (A) and hoist to prevent output drive assembly (B) from turning, tighten 24 bolts (C). Using a 1-1/8-inch wrench, torque the bolts to 575-650 pound-feet.

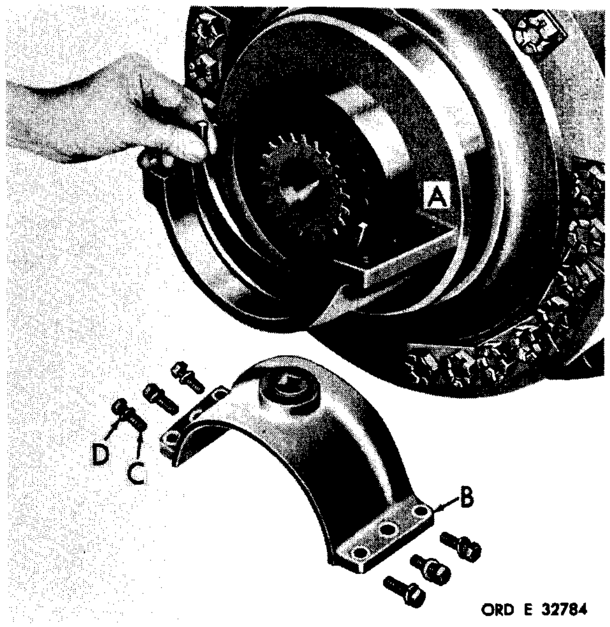


Figure 365 (Step 10)

Install alinement ring (A). Install saddle cap assembly (B). Install loosely six 3/8-24 x 1-1/4 bolts (C) with lock washers (D), since cap assembly is removed when unit is installed in vehicle. Note. Alinement ring (A) is used on only the right (shorter) assembly.

Section XXXIV. TEST AND ADJUSTMENTS

230. GENERAL

a. The tests described in this section will determine if the functional operation of the transmission is satisfactory. These tests may be made after rebuild or at any time to determine the condition of the transmission. The tests may be made while the transmission is installed in a vehicle or on a properly equipped test stand.

b. These tests will determine whether or not the clutches, torque converter, gearing and hydraulic system are performing properly.

c. Adjustments of transmission components and control linkage must be correct when tests are performed (or corrected during tests). When tests are made in the vehicle, the vehicle engine must be properly adjusted and performing efficiently. Refer to the engine technical manual for engine test and adjustment procedures. Refer to pars. 233 and 234, below, for transmission test and adjustment procedures.

231. TEST EQUIPMENT

a. Transmission Installed in Vehicle. The following equipment is required when testing the transmission while it is installed in a vehicle.

(1) Tachometer to indicate engine speed (transmission input speed) in revolutions per minute.

(2) Oil pressure gage with a range from 0 to 500 psi.

b. Transmission Installed on Test Stand. In addition to a properly equipped test stand with a means for driving a transmission (motor or engine of approximately 275 horsepower) and the equipment listed in a. above, the following equipment is required:

(1) Shift selector linkage and manual control for shifting through all ranges.

(2) Steer control linkage and manual control for operating steer control valve.

(3) External oil cooler.

(4) Control for varying the transmission input speed (engine throttle or variable speed electric motor control).

c. Test Data Log Sheet. A simple test data log sheet for recording transmission performance is illustrated in fig. 367.

232. OIL PRESSURE READINGS

Use the oil pressures listed in the test data log sheet as normal values in testing the transmission.

233. TESTS

a. Preliminary Instructions. When testing the transmission in a vehicle, the left-output and the right-output drive assemblies will have to be

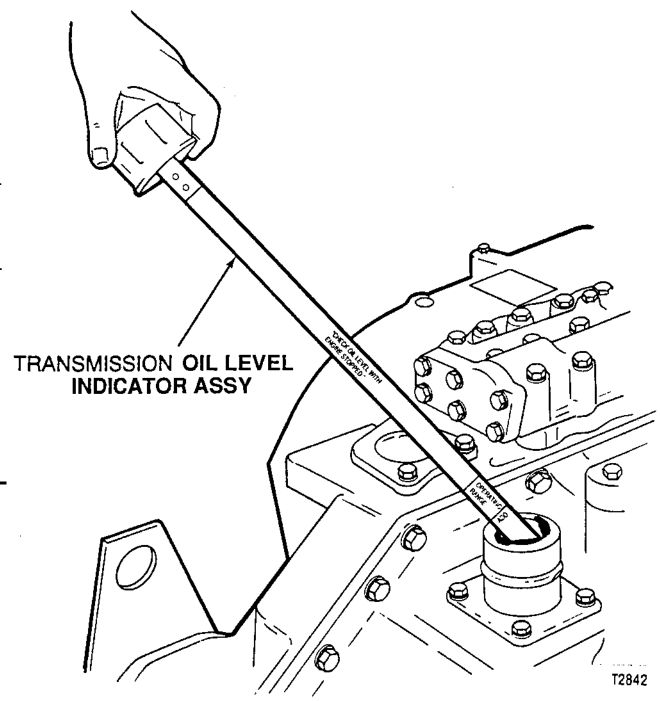


Figure 366. Measuring transmission oil level

	RPM	Reading	Neutral	1st Gear	2nd Gear	3rd Gear	4th Gear	Reverse 1	Reverse 2	Right Steer	Left Steer
Main pressure in converter	1000 to 1500	Normal	190-240	190-240	190-240	190-240	118-160	300-360	300-360	Same as range reading	
		Actual									
Main pressure in lockup	1000 to 1500	Normal	118-160	118-160	118-160	118-160	118-160	160-190	160-190	Same as range reading	
		Actual									
Lockup and range clutch apply pressure	1000 to 1500	Normal		Same as main pressure for applicable range							
		Actual									
1st, neutral and reverse 1 signal pressure	1000 to 1500	Normal		Same as main pressure for applicable range							
		Actual									
3rd, 4th and reverse 2 signal pressure	1000 to 1500	Normal		Same as main pressure for applicable range							
		Actual									
Geared steer apply pressure (no steer)	1000 to 1500	Normal	160-210	160-210	0	0	0	160-210	0	0	0
		Actual									
Geared steer apply pressure (during steer)	1000 to 1500	Normal	0	0	0	0	0	0	0	60-130	60-130
		Actual									
Brake apply pressure	1000 to 1500	Normal	0	0	0	0	0	0	0	60-130	60-130
		Actual									
Geared steer and brake coolant pressure	1000 to 1500	Normal	0	0	0	0	0	0	0	8-12	8-12
		Actual									
Output clutch pressure	1000 to 1500	Normal	0	0	165-210	165-210	118-160	0	165-210	0*	0*
		Actual									
Governor pressure (pitot) at lockup engagement	Full throttle	Normal	75-89	75-89	75-89	75-89	75-89	75-89	75-89	75-89	75-89
		Actual									
Lubrication pressure	1835 to 1900	Normal	18-45	18-45	18-45	18-45	18-45	18-45	18-45	15-35	15-35
		Actual									
Throttle (T) pressure	Full throttle	Normal	32-40	32-40	32-40	32-40	32-40	32-40	32-40	32-40	32-40
		Actual									
Throttle valve (TV) pressure	Full throttle	Normal	32-40	32-40	32-40	32-40	32-40	32-40	32-40	32-40	32-40
		Actual									

* On side toward which turn is made.

Figure 367. Test data log

disconnected. Follow the procedures outlined below for both sides of the transmission.

(1) Disengage right-output drive assembly (fig. 386, fold-out 15).

- Using a 9/16-inch wrench, remove six cap screws 24 and lock washers 25.

- Remove saddle cap 28. Remove coupling nut 80 (fig. 381, fold-out 10) and remove coupling retainer 79.

- Disengage shaft 39 (fig. 386, fold-out 15) by sliding it toward the output drive assembly.

- Reinstall the retainer and nut. Tighten the nut and install cap 28, washers 25 and cap screws 24. Tighten bolts to 33-40 pound-feet.

(2) Disengage the left-output drive assembly (fig. 385, fold-out 14). The left-output assembly is disengaged in the same manner as described for the right side in (1), above.

b. Warm Up

(1) Check the transmission oil level (fig. 366). Add oil as required to obtain the correct oil level for a safe start.

(2) Start the engine (or test stand motor) and shift the transmission into 4th gear. Apply the brakes, and allow the transmission to operate at an input speed of 1200 to 1500 rpm for 3 to 8 minutes, until normal operating temperature (approximately 220 degrees F) is reached.

(3) Shift through all ranges several times to insure that the hydraulic system is fully charged. Reduce the input speed to make shifts from a forward range to a reverse range, or from reverse range to a forward range.

(4) Shift the transmission to neutral range, apply the brakes, and increase the input speed to 1200-1500 rpm and maintain for three minutes. stop engine, wait twenty minutes, then check the transmission oil level. Add or drain the oil until oil level is at the top of the OPERATING RANGE marking on the indicator (fig. 366).

c. Leak Check. During the warm-up period, inspect the transmission for oil leaks at split lines and around bolts and plugs. If leakage is present, check bolts and plugs for tightness. If leakage continues, replace gaskets where required. Leakage of oil, in many cases, can cause faulty operation of the transmission.

d. Oil Pressures. All necessary oil pressure tests can be made during the functional tests outlined in e. below, and in fig. 367. Fig. 368 illustrates and identifies the transmission oil pressure check points.

e. Functional Tests

(1) The test data log sheet (fig. 367) can be used as a guide for making the proper tests, as well as providing spaces to record actual tests results. In addition, the normal pressures are included for comparison with test results.

(2) In all tests, the transmission oil must be at normal operating temperature (approximately 220 degrees F). Connect the pressure gage to the check point indicated, for the test being made (fig. 369).

(3) Reduce the speed of the transmission input to engine idle speed before engaging the desired range. Then slowly increase the speed to the desired input speed. Record the readings for each test.

(4) Do not attempt to remove or install gages while the transmission is operating. Reinstall plugs immediately upon removing the gage.

(5) When making the tests for steer clutch pressure, move the steer control from Center to Full steer slowly while observing the pressure rise. It should rise to maximum as the control is moved fully to steer position.

(6) In tests for lockup engagement, increase speed slowly until lockup apply pressure registers. Record lockup pressure and input speed. Record governor pressure at lockup engagement (full TV).

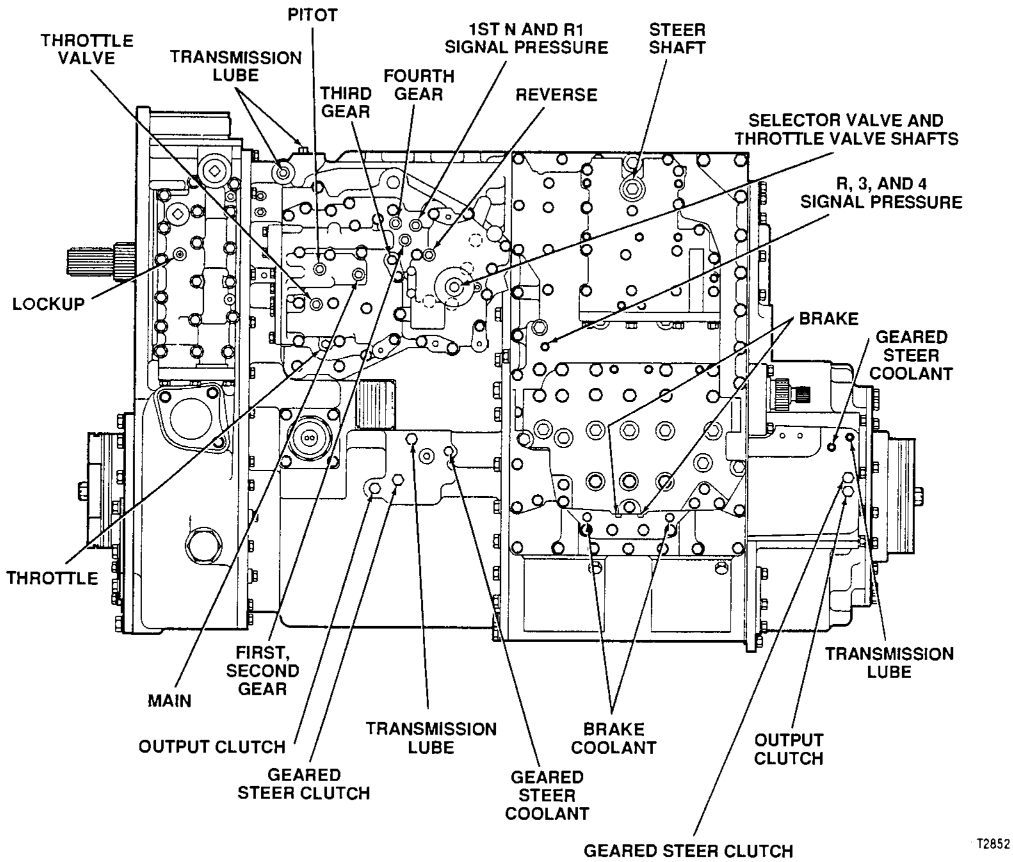


Figure 368. Transmission oil pressure check points and controls

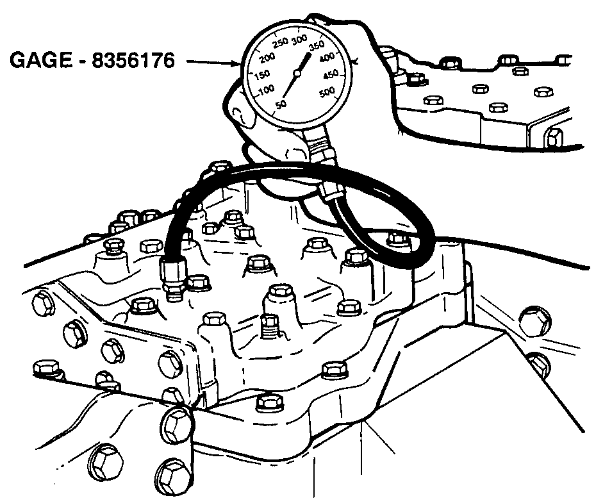


Figure 369. Checking transmission oil pressure

(7) In tests for lockup release, first increase the input speed to above the Point where lockup occurs. Then slowly reduce the speed, while observing lockup clutch apply pressure, until lockup pressure drops quickly. At this moment, record governor pressure and input speed.

(8) During all tests, when the output couplings at the right and left sides of the power train are disconnected from the output drive assemblies, observe the couplings to check their rotation. Rotation should be as outlined in f. below.

f. Rotation of Power Train Outputs

(1) In all forward and reverse gears, both the output couplings will tend to rotate even at engine idle speeds. A light application of the

brakes will stop such rotation when the power train is functioning properly.

(2) In all four forward gears, when no steer is applied, the power train outputs should rotate clockwise, as viewed from the right side of the power train.

(3) In both reverse gears, when no steer is applied, the power train outputs should rotate counterclockwise, as viewed from the right side of the power train.

(4) In forward gears (first and second), in clutch-brake full-right steer, the right power train output should stop while the left-output rotates clockwise, as viewed from the right side of the power train.

(5) In forward gears (first and second), in clutch-brake full-left steer, the left-power train output should stop while the right output rotates clockwise, as viewed from the right side of the power train.

(6) In forward gears (third and fourth), in geared full-right steer, both power train outputs should rotate clockwise, as viewed

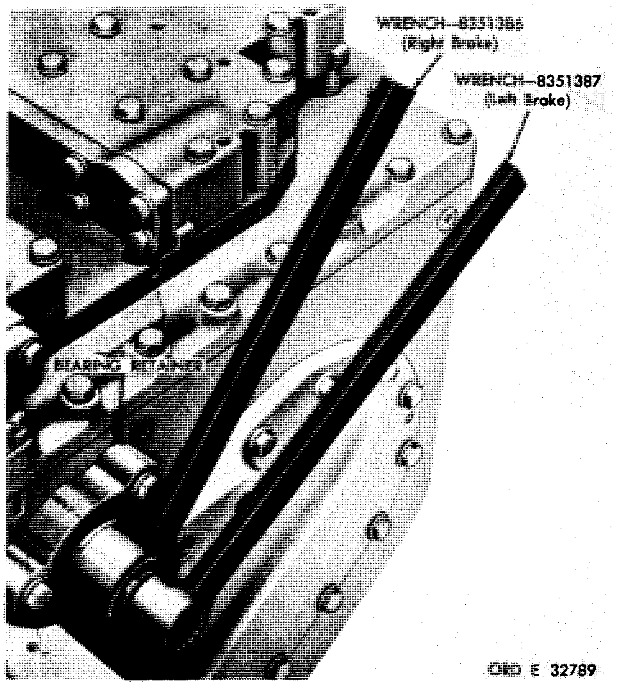


Figure 370. Right- and left-brake adjusting wrenches, properly positioned

from the right side of the power train. The left output should rotate 0.477 times faster than the right.

(7) In forward gears (third and fourth), in geared full-left steer, both power train outputs should rotate clockwise, as viewed from the right side of the power train. The right output should rotate 0.477 times faster than the left.

(8) In reverse 1, clutch-brake full-steer, the right output should stop when steering right. The left output should stop when steering left. The opposite output should rotate counterclockwise, as viewed from the right side of the power train.

(9) In reverse 2, geared full-steer, the right output should slow during right steer. The left output should slow during left steer. Rotation of both outputs should be counterclockwise, as viewed from the right side of the power train.

234. ADJUSTMENTS

a. Brake Linkage

(1) Disconnect the vehicle brake linkage from the transmission. Check vehicle linkage to see that it is not binding.

(2) Position the vehicle brake control in fully released position. Adjust vehicle linkage until it can be freely connected to the transmission. Secure the linkage.

b. Brakes

(1) Power train installed in vehicle and in service.

(a) Brake linkage must be properly adjusted as outlined in a. above, before attempting this brake adjustment when the brake apply levers (components of brake linkage) are connected.

(b) If brake apply levers are connected, permanently scribe or temporarily mark both levers so that the marks aline with the Release mark on the bearing retainer (fig. 370).

(c) With the brakes fully applied, observe the position of the marks on the levers in relation to the marks on the bearing retainer.

(d) If the index marks on the levers rotate to the Apply mark on the retainer but not to the Readjust mark, the brakes are satisfactorily adjusted.

(e) If the index marks on the levers do not rotate to the Apply mark or if they rotate to the Readjust mark, the brakes must be readjusted.

(f) To adjust the brakes, remove the inspection covers at the rear of the transmission rear housing and rotate the adjusting nuts by inserting a screwdriver in the slots in the nuts (refer to fig. 371). Clockwise rotation will shorten the lever travel (tighten brakes). Counterclockwise rotation will lengthen the lever travel (loosen brakes). Adjust both brakes uniformly so that, with brakes fully applied, both marks on the levers aline with the Apply mark on the bearing retainer. Replace inspection covers.

Note. If the brake linkage is not installed, the brakes may be adjusted using the same procedures as outlined in (a) through (f), above, except that wrenches 8351386 and 8351387 may be used to apply the brakes (fig. 370). The brakes should be applied with approximately 90 pound-feet torque.

(2) New or rebuilt power train not in vehicle.

(a) Remove inspection covers from the rear of the transmission rear housing.

(b) Insert gage 8351213 into the slot in the brake anchor, ring, and between the brake apply-rotating ring and the first brake plate (fig. 371).

(c) Rotate the adjusting nut until gage 8351213 is snug between the apply ring and brake plate. The adjustment must neither bind the gage nor leave it loose. Adjust both brakes by this method.

(d) Install inspection cover gaskets, inspection covers, lock washers and bolts.

c. Shift Control Linkage

(1) The linkage, connecting the selector valve shaft (fig. 368) with the operator's shift control, should be adjusted carefully. When the detent in the control valve assembly is seated, the power train is in the range to which the shift indicator points. The operator's control must be in a corresponding position.

(2) To adjust the linkage, disconnect it at one point. Place the control valve in neutral so that the detent seats and place the operator's shift control in neutral position. Adjust the linkage so that it can be reconnected without moving either the control valve or operator's shift control. Try the control through all range positions, making sure that the detent seats in each.

d. Steer Control Linkage

(1) Proper adjustment of the steer link-

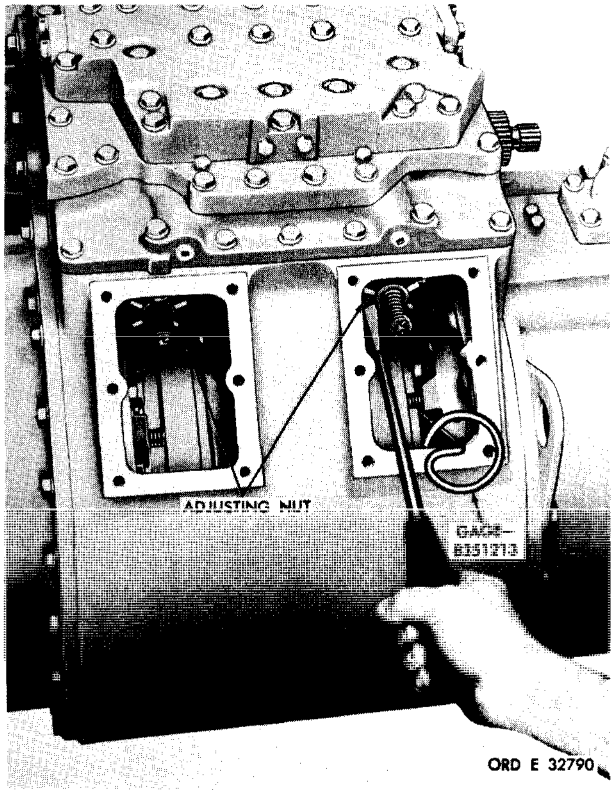


Figure 371. Adjusting transmission brake

age will insure that the operator's steer control will have full and equal travel for right and left steer.

(2) The steer valve body assembly includes a detent arrangement which seats only when the steer valve is in the No Steer position. The operator's control wheel (or T bar) must be in a central, or No Steer position, at that time. Adjust the linkage so that it can be connected with the control and valve in the No Steer position. Check to see that full travel for right and left steer can be obtained.

e. Throttle Valve Linkage. To obtain maximum performance and fuel economy, the throttle valve linkage must be properly adjusted. The throttle lever moves 17° 48' from a closed-throttle position to full-throttle position. A positive stop, located in the selector valve body, indicates a full-throttle valve travel (fig. 372, fold-out 1). To properly adjust the throttle linkage, proceed as follows:

(1) With the rod end disconnected at the throttle valve lever, rotate the throttle valve lever clockwise until rotation is stopped. (An internal machined stop is provided in the valve body.)

(2) While holding the throttle valve lever at full clockwise rotation, move the engine throttle linkage to the full-throttle position (engine governor).

(3) Adjust linkage to provide full rotation of the throttle valve lever at full-engine throttle by alining the hole in the rod end with the hole in the throttle valve lever.

(4) Prior to connecting the linkage check to insure:

(a) That full-engine throttle is obtained. (Additional travel should be available by utilizing the throttle control yield link.)

(b) That the throttle valve lever will allow the linkage to return to the closed-throttle position.

(5) Connect linkage.

CHAPTER 6
REPAIR AND REBUILD STANDARDS

235. GENERAL

a. Wear Limits and Points of Measurement. Data covering the sizes and fits of new parts and wear limits information, is given in pars. 236 through 249, below. Points of measurement of all critical dimensions are indicated by small letters in the exploded view parts groups, figs. 373 through 386, fold-outs 2 through 15.

b. T-Tight, L-Loose. The "Size and Fit of New Parts" column includes the manufacture dimensions and tolerances, and the fits of mating parts. T denotes a tight (interference) fit; L denotes a loose (clearance) fit.

c. Meaning of Wear Limits

(1) The wear limits indicate the dimensions to which a part may wear before it must be replaced. Normally, any part not worn beyond its wear limit will be approved for continued use, if it is not otherwise damaged.

(2) A single asterisk (*) in the wear limits column indicates that the part should be replaced when worn beyond the limits stated in "Size and Fit of New Parts" column.

(3) A double asterisk (**) indicates a limit applying to the fit between mating parts. In such cases, wear is allowed on either or both mating parts so long as the fit is within the specified limit.

d. Standard Torque Listings. Standard torque to which bolts, nuts and screws are to be tightened is listed in par. 250 under Table V. STANDARD TORQUE SPECIFICATIONS. These are normal torque values – special torques are listed in the copy pertinent to the applicable parts.

236. INPUT TRANSFER HOUSING. TORQUE CONVERTER, AND INPUT PRESSURE AND SCAVENGE OIL PUMP – REPAIR AND REBUILD STANDARDS

Reference		Point of Measurement	Size and fit of new parts	Wear Limits	
Fig.	Item			Field Maint.	Depot Maint. *C2
373	5a	Outside diameter at bearing surface of spindle	2.1643 to 2.1649	2.1640	2.1640
373	35b	Inside diameter of bearing	2.1648 to 2.1654	*	*
373	5a, 35b	Fit of bearing on spindle	0.0001T to 0.0011L		
373	5b	Outside diameter at sleeve surface of spindle	1.9365 to 1.9368	1.9360	1.9360
373	5c	Outside diameter at sleeve surface of spindle	2.7735 to 2.7738	2.7730	2.7730
373	18a	Inside diameter at bearing surface of flange adapter sleeve	6.2990 to 6.3002	6.3008	6.3008
373	24b	Outside diameter of bearing	6.2982 to 6.2992	*	*
373	18a, 24b	Fit of bearing in flange adapter sleeve	0.0002T to 0.002L		
373	24a	Inside diameter of bearing	4.1331 to 4.1339	*	*
373	25b	Outside diameter at bearing surface of gear	4.1337 to 4.1347	4.1332	4.1332
373	24a, 25b	Fit of bearing on gear	0.0016T to 0.0002L		
373	24b	Listed with item 18a, above			
373	25a	Outside diameter at bearing surface of gear	3.9368 to 3.9378	3.9363	3.9363
373	27b	Inside diameter of bearing	3.9362 to 3.9370	*	*
373	25a, 27b	Fit of bearing on gear	0.0016T to 0.0002L		
373	25b	Listed with item 24a, above			
373	25c	Outside diameter at oil seal surface of gear	3.8750 to 3.8800	3.8730	3.8740
373	27a	Outside diameter of bearing	7.0856 to 7.0866	*	*
373	139a	Inside diameter at bearing surface of housing sleeve	7.0864 to 7.0874	7.0879	7.0879
373	27a, 139a	Fit of bearing in sleeve	0.0002T to 0.0018L		
373	27b	Listed with item 25a, above			
373	34a	Inside diameter at bearing surface of gear	4.7235 to 4.7245	4.7250	4.7250
373	35a	Outside diameter of bearing	4.7238 to 4.7244	*	*
373	34a, 35a	Fit of bearing in gear	0.0009T to 0.0007L		

* Must be within new parts dimensions.

Reference		Point of Measurement	Size and fit of new parts	Wear Limits	
Fig.	Item			Field Maint.	Depot Maint.
373	35a	Listed with item 34a, above			*C 2
373	35b	Listed with item 5a, above			
373	38a	Outside diameter of bearing	4. 3301 to 4. 3307	*	*
373	41a	Inside diameter at bearing surface of gear	4. 3289 to 4. 3301	4. 3307	4. 3307
373	38a, 41a	Fit of bearing in gear	0. 0018T to 0. 0000		
373	40a	Outside diameter of bearing	4. 3301 to 4. 3307	*	*
373	41a	Inside diameter at bearing surface of gear	4. 3289 to 4. 3301	4. 3307	4. 3307
373	40a, 41a	Fit of bearing in gear	0. 0018T to 0. 0000		
373	41a	Listed with items 38a and 40a, above			
373	42a	Thickness of spacer	0. 5180 to 0. 5220	0. 5175	0. 5175
373	47a	Inside diameter at bearing surface of pump body	1. 3120 to 1. 3130	1. 3135	1. 3135
373	53a	Outside diameter of bearing	To press fit 1. 3120 to 1. 3130 bore	*	*
373	47a, 53a	Fit of bearing in body	To press fit 1. 3120 to 1. 3130 bore		
373	53a	Listed with item 47a, above			
373	54a, 59a, 60a	Outside diameter of bearings	To press fit 1. 3120 to 1. 3130 bore		
373	61a, 47a	Inside diameter at bearing surface of scavenge and pressure pump body	1. 3120 to 1. 3130	1. 3135	1. 3135
373	54a, 59a, 60a, 61a, 47a	Fit of bearings in body	To press fit 1. 3120 to 1. 3130 bore		
373	57a	Outside diameter at bearing surface of gear	0. 9995 to 1. 0000	0. 9992	0. 9993
373	58a	Outside diameter at bearing surface of gear	0. 9995 to 1. 0000	0. 9992	0. 9993
373	59a	Listed with item 54a, above			
373	60a	Listed with item 54a, above			
373	61a	Listed with item 54a, above			

* Must be within new parts dimensions.

*C2

Reference		Point of Measurement	Size and fit of new parts	Wear Limits	
Fig.	Item			Field Maint.	Depot Maint.
373	69a	Inside diameter at bearing surface of cover	3.5431 to 3.5441	3.5451	3.5451
373	73b	Outside diameter of bearing	3.5427 to 3.5433	*	*
373	69a, 73b	Fit of bearing in cover	0.0002T to 0.0014L		
373	69b	Inside diameter at lockup clutch seal surface of cover	13.000 to 13.006	13.010	13.009
373	69c	Inside diameter at turbine seal surface of cover	0.9990 to 1.0010	1.0030	*
373	69d	Outside diameter at bearing surface of cover	2.3619 to 2.3629	2.3614	2.3614
373	143a	Inside diameter of bearing	2.3616 to 2.3622	*	*
373	69d, 143a	Fit of bearing on cover	0.0006T to 0.0012L		
373	73a	Inside diameter of bearing	2.1648 to 2.1654	*	*
373	79a	Outside diameter at bearing surface of turbine	2.1653 to 2.1659	2.1650	2.1650
373	73a, 79a	Fit of bearing on turbine	0.0011T to 0.0001L		
373	73b	Listed with item 69a, above			
373	74a	Thickness of piston	0.3400 to 0.3500	0.3370	0.3380
373	74b	Inside diameter at seal surface of piston	4.0000 to 4.0020	4.0040	*
373	77a	Thickness of plate	0.2450 to 0.2550	0.2250	0.2350
373	78a	Thickness of plate	1.2500 to 1.2600	1.2470	1.2480
373	79a	Listed with item 73a, above			
373	79b	Thickness of turbine at thrust washer surface	0.3390 to 0.3430	0.3370	0.3380
373	81a	Inside diameter of washer	3.2950 to 3.2960	3.2970	3.2970
373	81b	Thickness of washer	0.7480 to 0.7520	0.7480	0.7490
373	88a	Inside diameter at bearing surface of hub	3.7394 to 3.7404	3.7409	3.7409
373	91a	Outside diameter of bearing	3.7396 to 3.7402	*	*
373	88a, 91a	Fit of bearing in hub	0.0008T to 0.0008L		
373	91a	Listed with item 88a, above			

* Must be within new parts dimensions.

Reference Fig.	Reference Item	Point of Measurement	Size and fit of new parts	Wear Limits Field Maint.	Wear Limits Depot Maint.
373	91b	Inside diameter of bearing	2.3616 to 2.3622	*	*C2 *
374	26a	Outside diameter at bearing surface of sleeve	2.3609 to 2.3619	2.3624	2.3624
373, 374	91b, 26a	Fit of bearing on sleeve	0.0003T to 0.0013L		
373	95a	Inside diameter of washer	3.2970 to 3.3010	3.3020	3.3020
373	96a	Thickness of washer	0.0200 to 0.0240	0.0180	0.0190
373	97a	Outside diameter of roller (If one is replaced, replace all rollers)	0.3748 to 0.3750	0.3746	0.3746
373	98a	Free length of spring	0.6390 to 0.6410	*	*
373	99a	Inside diameter of cam (under 0.3750 dia. rollers)	3.2480 to 3.2500	*	*
373	101a	Outside diameter of race	3.2907 to 3.2917	3.2897	3.2897
373	101b	Length of race	1.8490 to 1.8530	1.8500	1.8500
373	103a	Thickness of race	0.0300 to 0.0320	*	*
373	104a	Inside diameter of sleeve	5.1175 to 5.1185	5.1190	5.1190
373	143b	Outside diameter of bearing	5.1173 to 5.1181	*	*
373	104a, 143b	Fit of bearing in sleeve	0.0013T to 0.0003L		
373	109a	Outside diameter at bearing surface of gear	1.3779 to 1.3784	1.3777	1.3777
373	110b	Inside diameter of bearing	1.3775 to 1.3780	*	*
373	109a, 110b	Fit of bearing on gear	0.0009T to 0.0001L		
373	110a	Outside diameter of bearing	3.1491 to 3.1496	*	*
373	126a	Inside diameter at pump driven gear bearing surface of housing	3.1495 to 3.1505	3.1510	3.1510
373	110a, 126a	Fit of bearing in housing	0.0001T to 0.0014L		
373	110b	Listed with item 109a, above			
373	119a	Inside diameter of sleeve	1.9370 to 1.9375	1.9380	*
373	120a	Inside diameter of sleeve	1.9370 to 1.9375	1.9380	*
373	126a	Listed with item 110a, above			

* Must be within new parts dimensions.

Reference Fig.	Item	Point of Measurement	Size and fit of new parts	Wear Limits Field Maint.	Depot Maint.
373	134a	Inside diameter of sleeve	2.7500 to 2.7505	2.7510	*C2 *
373	136a	Inside diameter of sleeve	2.7500 to 2.7505	2.7510	*
373	139a	Listed with item 27a, above			
373	143a	Listed with item 69d, above			
373	143b	Listed with item 104a, above			
373	153a	Outside diameter at bearing surface of spindle	2.5646 to 2.5653	*	*
373	153b	Length of bearing surface of spindle	2.8820 to 2.8860	2.8815	2.8815
373	153c	Outside diameter at sleeve surface of spindle	1.9365 to 1.9368	1.9360	1.9360
373	153d	Outside diameter at sleeve surface of spindle	2.7735 to 2.7738	2.7730	2.7730

237. TORQUE CONVERTER HOUSING, OIL SCREEN ASSEMBLY, AND LEFT-OUTPUT DRIVE COUPLING – REPAIR AND REBUILD STANDARDS

374	5a	Outside diameter at bearing surface of coupling	3.3450 to 3.3460	3.3445	C2 3.3445
374	15b	Inside diameter of bearing	3.3457 to 3.3465	*	*
374	5a, 15b	Fit of bearing on coupling	0.0003T to 0.0015L		
374	8a	Inside diameter at bearing surface of support	5.9046 to 5.9056	5.9061	5.9061
374	15a	Outside diameter of bearing	5.9047 to 5.9055	*	*
374	8a, 15a	Fit of bearing in support	0.0009T to 0.0009L		
374	8b	Outside diameter of support	6.7400 to 6.7430	6.7340	6.7380
374	15a	Listed with item 8a, above			
374	15b	Listed with item 5a, above			
374	26a	Listed with item 91b, fig. 373, par. 236			
374	27a	Inside diameter of retainer	3.5000 to 3.5020	3.5030	3.5030
374	55a	Free length of spring Length under load	1.68 0.8125 at 18 to 20 lb	* 0.8125 at 17.5 lb	* 0.8125 at 17.5 lb

* Must be within new parts dimensions.

Reference Fig.	Reference Item	Point of Measurement	Size and fit of new parts	Wear Limits Field Maint.	Wear Limits Depot Maint.
374	56a	Free length of spring	1.812	*	*C2 *
		Length under load	0.8125 at 15 to 17 lb	0.8125 at 14.5 lb	0.8125 at 14.5 lb
374	62a	Free length of spring	1.750	*	*
		Length under load	1.56 at 1.8 to 2.2 lb	1.56 at 1.7 lb	1.56 at 1.7 lb
374	69a	Outside diameter of bearing	1.3775 to 1.3780	*	*
374	74a	Inside diameter at bearing surface of adapter	1.3779 to 1.3789	1.3794	1.3794
374	69a, 74a	Fit of bearing in adapter	0.0001T to 0.0014L		
374	74a	Listed with item 69a, above			

238. TRANSMISSION HOUSING, AND HIGH-RANGE CLUTCH–REPAIR AND REBUILD STANDARDS

Reference Fig.	Reference Item	Point of Measurement	Size and fit of new parts	Wear Limits Field Maint.	Wear Limits Depot Maint.
375	2a	Outside diameter at bushing surface of shaft	1.2475 to 1.2485	1.2465	1.2465
376	35a	Inside diameter of bushing	1.2500 to 1.2520	1.2540	1.2530
375, 376	2a, 35a	Fit of shaft in bushing	0.0015L to 0.0045L		
375	2b	Outside diameter at bearing surface of shaft	2.1651 to 2.1661	2.1646	2.1646
375	5a	Inside diameter of bearing	2.1648 to 2.1654	*	*
375	2b, 5a	Fit of bearing on shaft	0.0013T to 0.0003L		
375	5a	Listed with 2b, above			
375	8a	Outside diameter at bearing surface of diaphragm	2.0815 to 2.0820	2.08125	2.08125
375	8b	Outside diameter at housing surface of diaphragm	2.9560 to 2.9640	2.9520	2.9540
375	9a	Thickness of washer	0.0920 to 0.0940	0.089	0.089
375	17a	Inside diameter at steer clutch seal surface of housing	12.500 to 12.506	12.510	12.509
375	17b	Outside diameter at steer clutch seal surface of housing	10.621 to 10.625	10.617	10.618

* Must be within new parts dimensions.

Reference		Point of Measurement	Size and fit of new parts	Wear Limits	
Fig.	Item			Field Maint.	Depot Maint.
				*	C2
375	17c	Inside diameter at bearing surface of housing	5.9053 to 5.9063	5.9048	5.9048
375	92a	Outside diameter of bearing	5.8947 to 5.9055	*	*
375	17c, 92a	Fit of bearing in housing	0.0002T to 0.0116L		
375	55a	Inside diameter of bearing	2.7553 to 2.7559	*	*
375	73d	Outside diameter at bearing surface of housing	2.7556 to 2.7566	2.7551	2.7551
375	55a, 73d	Fit of bearing on housing	0.0013T to 0.0003L		
375	55b	Outside diameter of bearing	4.3301 to 4.3307	*	*
376	18a	Inside diameter at bearing surface of carrier	4.3306 to 4.3316	4.3321	4.3321
375, 376	55b, 18a	Fit of bearing in carrier	0.0001T to 0.0015L		
375	56a	Thickness of plate	0.1900 to 0.1960	0.1700	0.1800
375	57a	Thickness of plate	0.1970 to 0.2010	*	*
375	59a	Thickness of plate	0.4580 to 0.4620	0.4570	*
375	66a	Free length of spring	2.137		
		Length under load	1.5 at 98 to 118 lb	1.5 at 93 lb	1.5 at 93 lb
375	68a	Inside diameter of piston at seal surface	3.7500 to 3.7520	3.7540	*
375	68b	Thickness of piston	0.9950 to 0.9990	0.9940	*
375	73a	Inside diameter of housing at piston seal surface	9.7500 to 9.7560	9.7600	9.7590
375	73b	Inside diameter of housing at seal surface	3.0000 to 3.0020	3.0040	*
375	73c	Inside diameter at bearing surface of housing	2.9514 to 2.9523	2.9527	2.9527
375	74a	Outside diameter of bearing	2.9523 to 2.9528	*	*
375	73c, 74a	Fit of bearing in housing	0.0014T to 0.0000		
375	73d	Listed with item 55a, above			
375	74a	Listed with item 73c, above			
375	89a	Outside diameter at seal surface of coupling	3.8750 to 3.8800	3.8730	3.8740

* Must be within new parts dimensions.

Reference Fig.	Reference Item	Point of Measurement	Size and fit of new parts	Wear Limits Field Maint.	Wear Limits Depot Maint.
					*C 2
375	89b	Outside diameter at bearing surface of coupling	3.3463 to 3.3473	3.3458	3.3458
375	92b	Inside diameter of bearing	3.3457 to 3.3465	*	*
375	89b, 92b	Fit of bearing on coupling	0.0014T to 0.0002L		
375	92a	Listed with item 17c, above			
375	92b	Listed with item 89b, above			
375	95a	Inside diameter of bearing	3.9362 to 3.9370	*	*
377	35b	Outside diameter at bearing surface of hub	3.9355 to 3.9365	3.9350	3.9350
375, 377	95a, 35b	Fit of bearing on hub	0.0003T to 0.0015L		
375	95b	Outside diameter of bearing	5.9047 to 5.9055	*	*
375	96a	Inside diameter at bearing surface of support	5.9046 to 5.9056	5.9061	5.9061
375	95b, 96a	Fit of bearing in support	0.0009T to 0.0009L		
375	96a	Listed with item 95b, above			

239. INTERMEDIATE- AND LOW-RANGE CLUTCHES AND PLANETARIES - REPAIR AND REBUILD STANDARDS

Reference Fig.	Reference Item	Point of Measurement	Size and fit of new parts	Wear Limits Field Maint.	Wear Limits Depot Maint.
376	3a	Thickness of housing	0.3340 to 0.3380	0.3330	*
376	4a	Thickness of plate	0.2000 to 0.2040	0.1800	0.1900
376	5a	Thickness of plate	0.1970 to 0.2020	*	*
376	7a	Thickness of plate	0.498 to 0.5020	0.4970	*
376	8a	Free height of spring	0.3990 to 0.4290	0.3840	0.3840
376	9a	Outside diameter at seal surface of piston	8.8710 to 8.8750	8.8690	8.8690
376	14a	Inside diameter at seal surface of housing	11.7500 to 11.7560	11.7600	11.7590
376	18a	Listed with item 55b, fig. 375, par. 238			
376	19a	Outside diameter of spindle	0.7563 to 0.7565	0.7553	0.7558
376	20a	Thickness of washer	0.0615 to 0.0635	0.0575	0.0575

* Must be within new parts dimensions.

Reference		Point of Measurement	Size and fit of new parts	Wear Limits	
Fig.	Item			Field Maint.	Depot Maint.
376	21a	Thickness of spacer	0.0600 to 0.0650	0.0550	C2 0.0550
376	22a	Inside diameter of pinion	1.0070 to 1.0075	1.0085	1.0080
376	23a	Outside diameter of needle	0.1248 to 0.1250	0.1245	0.1245
376	24a	Thickness of spacer	0.0600 to 0.0650	0.0550	0.0550
376	25a	Thickness of washer	0.0615 to 0.0635	0.0575	0.0575
376	28a	Thickness of washer	0.0615 to 0.0635	0.0575	0.0575
376	29a	Thickness of spacer	0.0600 to 0.0650	0.0550	0.0550
376	30a	Inside diameter of pinion	1.3925 to 1.3930	1.4003	1.3980
376	31a	Outside diameter of roller	0.1873 to 0.1875	0.1870	0.1870
376	32a	Thickness of spacer	0.0600 to 0.0650	0.0550	0.0550
376	33a	Thickness of washer	0.0615 to 0.0635	0.0575	0.0575
376	34a	Outside diameter of spindle	1.0168 to 1.0170	1.0164	1.0166
376	35a	Listed with item 2a, fig. 373, par. 236, above			
376	37a	Thickness of washer	0.0920 to 0.0940	0.0890	0.0890
376	41a	Thickness of washer	0.0920 to 0.0940	0.0890	0.0890
376	44a	Thickness of housing	0.3340 to 0.3380	0.3330	*
376	45a	Thickness of plate	0.2000 to 0.2040	0.1800	0.1900
376	46a	Thickness of plate	0.1970 to 0.2020	*	*
376	49a	Free length of spring Length under load	1.4480 0.950 at 22.8 to 25.2 lb	 0.950 at 22.2 lb	 0.950 at 22.2 lb
376	50a	Inside diameter of piston	5.0000 to 5.0060	5.0100	5.0009
376	50b	Thickness of piston	0.6560 to 0.6600	0.6550	*
376	55a	Inside diameter at low and reverse piston surface of housing	11.7500 to 11.7560	11.7600	11.7590

* Must be within new parts dimensions.

Reference		Point of Measurement	Size and fit of new parts	Wear Limits	
Fig.	Item			Field Maint.	Depot Maint.
376	60a	Inside diameter of piston	5.0000 to 5.0060	5.0100	*C-2 5.0009
376	60b	Thickness of piston	0.6560 to 0.6600	0.6550	*
376	61a	Free length of spring Length under load	1.4480 0.950 at 22.8 to 25.2 lb	0.950 at 22.2 lb	0.950 at 22.2 lb

240. REVERSE-RANGE CLUTCH AND PLANETARY, LEFT- STEER AND OUTPUT CLUTCHES - REPAIR AND REBUILD STANDARDS

*C-2

377	1a	Thickness of plate	0.1970 to 0.2020	*	*
377	2a	Thickness of plate	0.2000 to 0.2040	0.1800	0.1900
377	7a	Outside diameter of spindle	0.7563 to 0.7565	0.7559	0.7561
377	8a	Thickness of washer	0.6150 to 0.06350	0.0575	0.0575
377	9a	Thickness of spacer	0.0600 to 0.0650	0.0550	0.0550
377	10a	Outside diameter of roller	0.1248 to 0.1250	0.1245	0.1245
377	11a	Thickness of spacer	0.0600 to 0.0650	0.0550	0.0550
377	12a	Outside diameter of roller	0.1248 to 0.1250	0.1245	0.1245
377	13a	Thickness of spacer	0.0600 to 0.0650	0.0550	0.0550
377	14a	Inside diameter of pinion	1.0070 to 1.0075	1.0085	1.0080
377	15a	Thickness of washer	0.0615 to 0.0635	0.0575	0.0575
377	17a	Outside diameter at bearing surface of carrier	3.5431 to 3.5441	3.5426	3.5426
377	20a	Inside diameter of bearing	3.5425 to 3.5433	*	*
377	17a, 20a	Fit of bearing on carrier	0.0016T to 0.0004L		
377	18a	Thickness of support	1.714 to 1.718	1.719	*
377	18b	Inside diameter at bearing surface of support	5.5116 to 5.5126	5.5131	5.5131
377	20b	Outside diameter of bearing	5.5110 to 5.5118	*	*
377	18b, 20b	Fit of bearing in support	0.0002T to 0.0016L		
377	20a	Listed with item 17a, above			
377	20b	Listed with item 18b, above			

* Must be within new parts dimensions.

Reference		Point of Measurement	Size and fit of new parts	Wear Limits	
Fig.	Item			Field Maint.	Depot Maint.
					*C-2
377	24a	Inside diameter at bearing surface of support	5.9047 to 5.9061	5.9068	5.9068
377	25b	Outside diameter of bearing	5.9047 to 5.9055	*	*
377	24a, 25b	Fit of bearing in support	0.0008T to 0.0014L		
377	25a	Inside diameter of bearing	3.3457 to 3.3465	*	*
377	26a	Outside diameter at bearing surface of gear	3.3474 to 3.3482	3.3470	3.3470
377	25a, 26a	Fit of bearing on gear	0.0009T to 0.0025T		
377	25b	Listed with item 24a, above			
377	26a	Listed with item 25a, above and item 27a, below			
377	27a	Inside diameter of bearing	3.3457 to 3.3465	*	*
377	26a	Outside diameter at bearing surface of gear	3.3474 to 3.3482	3.3470	3.3470
377	27a, 26a	Fit of bearing on support	0.0009T to 0.0025T		
377	27b	Outside diameter of bearing	5.9047 to 5.9055	*	*
377	28a	Inside diameter at bearing surface of support	5.9047 to 5.9061	5.9068	5.9068
377	27b, 28a	Fit of bearing in support	0.0008T to 0.0014L		
377	28a	Listed with item 27b, above			
377	35a	Inside diameter at seal surface of hub	8.7500 to 8.7560	8.7600	8.7590
377	35b	Listed with item 95a, fig. 375, par. 238			
377	41a	Thickness of piston	0.7980 to 0.8020	0.7970	*
377	41b	Inside diameter at seal surface of piston	5.0000 to 5.0060	5.0100	5.0090
377	44a	Free length of spring	1.8200		
		Length under load	1.415 at 15.3 to 18.7 lb	1.415 at 14.45	1.415 at 14.45
377	47a	Thickness of plate	0.1180 to 0.1240	0.1010	0.1110
377	48a	Thickness of plate	0.0950 to 0.0980	*	*

* Must be within new parts dimensions.

Reference		Point of Measurement	Size and fit of new parts	Wear Limits	
Fig.	Item			Field Maint.	Depot Maint.
377	50a	Inside diameter of bearing	2.9522 to 2.9528	*	*C2 *
378	3a	Outside diameter at bearing surface of carrier	2.9513 to 2.9523	2.9508	2.9508
377, 378	50a, 3a	Fit of bearing on carrier	0.0001T to 0.0015L		
377	50b	Outside diameter of bearing	5.1173 to 5.1181	*	*
377	52a	Inside diameter at bearing surface of gear	5.1172 to 5.1182	5.1187	5.1187
377	50b, 52a	Fit of bearing in gear	0.0009T to 0.0009L		
377	52a	Listed with item 50b, above			
377	62a	Thickness of plate	0.1200 to 0.1250	*	*
377	63a	Thickness of plate	0.1630 to 0.1680	0.143	0.153
377	64a	Free length of spring	2.98		
		Length under load	2.42 at 25.2 to 30.8 lb	2.42 at 23.8 lb	2.42 at 23.8 lb
377	71a	Inside diameter at seal surface of sleeve	6.2500 to 6.2520	6.2530	6.2530
377	77a	Free height of spring	4.0980		
		Length under load	3.53 at 38.03 to 46.47 lb	3.53 at 35.82 lb	3.53 at 35.82 lb

241. LEFT-STEER PLANETARY, AND BRAKE-REPAIR AND REBUILD STANDARDS

378	3a	Listed with item 50a, fig. 377, par. 240			*C2
378	4a	Thickness of washer	0.0615 to 0.0635	0.0575	0.0575
378	5a	Thickness of spacer	0.0600 to 0.0650	0.0550	0.0550
378	6a	Inside diameter of pinion	1.1303 to 1.1308	1.1318	1.1313
378	7a	Outside diameter of roller	0.1248 to 0.1250	0.1245	0.1245
378	8a	Thickness of spacer	0.0600 to 0.0650	0.0550	0.0550
378	9a	Thickness of washer	0.0615 to 0.0635	0.0575	0.0575
378	11a	Outside diameter of spindle	0.8796 to 0.8798	0.8792	0.8794
378	12a	Thickness of washer	0.0220 to 0.1260	0.1180	0.1180

*Must be within new parts dimensions.

Reference Fig.	Reference Item	Point of Measurement	Size and fit of new parts	Wear Limits Field Maint.	Wear Limits Depot Maint.
378	15a	Inside diameter at bearing surface of hub	5.7078 to 5.7088	5.7073	*C2 5.7073
378	16b	Outside diameter of bearing	5.7079 to 5.7087	*	*
378	15a, 16b	Fit of bearing in hub	0.0009T to 0.0009L		
378	16a	Inside diameter of bearing	3.7394 to 3.7402	*	*
378	34b	Outside diameter at bearing surface of support	3.7387 to 3.7397	3.7382	3.7382
378	16a, 34b	Fit of bearing on support	0.0003T to 0.0015L		
378	16b	Listed with item 15a, above			
378	17a	Thickness of plate	0.1200 to 0.1250	*	*
378	18a	Thickness of plate	0.1630 to 0.1680	0.1635	0.1645
378	19a	Inside diameter at seal surface of cam	13.875 to 13.878	13.880	13.8790
378	19b	Thickness of cam	1.4390 to 1.4490	1.4340	*
378	28a	Inside diameter at seal surface of cam	10.500 to 10.502	10.5040	10.5030
378	34a	Inside diameter at bearing surface of support	5.9047 to 5.9061	5.9068	5.9068
378	35b	Outside diameter of bearing	5.9047 to 5.9055	*	*
378	34a, 35b	Fit of bearing in support	0.0008T to 0.0014L		
378	34b	Listed with item 16a, above			
378	35a	Inside diameter of bearing	3.3457 to 3.3465	*	*
379	49a	Outside diameter at bearing surface of gear	3.3474 to 3.3482	3.3470	3.3470
378, 379	35a, 49a	Fit of bearing on gear	0.0009T to 0.0025L		
378	35b	Listed with item 34a, above			

242. TRANSMISSION REAR HOUSING AND RELATED PARTS - REPAIR AND REBUILD STANDARDS

379	2a	Outside diameter of shaft	0.5600 to 0.5610	0.5590	0.5590
379	3a	Inside diameter at shaft bore of link	0.5620 to 0.5670	0.5690	0.5680

* Must be within new parts dimensions.

Reference		Point of Measurement	Size and fit of new parts	Wear Limits	
Fig.	Item			Field Maint.	Depot Maint.
379	5a	Outside diameter of roller	0.0936 to 0.0938	0.0933	#C-2 0.0933
379	6a	Inside diameter of follower	0.8761 to 0.8766	0.8776	0.8771
379	8a	Outside diameter of pin	0.6875 to 0.6880	0.6865	0.6870
379	9a	Outside diameter of pin	0.4985 to 0.4990	0.4980	0.4980
379	12a	Inside diameter of bushing	0.4995 to 0.5000	0.5005	0.5005
379	9a, 12a	Fit of pin in bushing	0.0005L to 0.0015L		
379	39a	Deflection of spring	53° at 3.18 to 3.88 lb	53° at 3.01 lb	53° at 3.01 lb
379	42a	Deflection of spring	53° at 3.18 to 3.88 lb	53° at 3.01 lb	53° at 3.01 lb
379	49a	Listed with item 35a, fig. 378, par. 241			
379	51a	Outside diameter at bearing surface of support	1.1801 to 1.1811	1.1797	1.1797
379	54b	Inside diameter of bearing	1.1807 to 1.1811	*	*
379	51a, 54b	Fit of bearing on shaft	0.0004T to 0.0010L		
379	53a	Inside diameter at bearing surface of gear	2.4403 to 2.4409	2.4412	2.4412
379	54a	Outside diameter of bearing	2.4404 to 2.4409	*	*
379	53a, 54a	Fit of bearing in gear	0.0005T to 0.0006L		
379	54a	Listed with item 53a, above			
379	54b	Listed with item 51a, above			
379	58a	Outside diameter of pin	0.4985 to 0.4990	0.4980	0.4980
379	70a	Inside diameter of bushing	0.4995 to 0.5000	0.5005	0.5005
379	58a, 70a	Fit of pin in bushing	0.0005L to 0.0015L		
379	59a	Outside diameter of pin	0.6875 to 0.6880	0.6865	0.6870
379	60a	Inside diameter of link	0.5620 to 0.5670	0.5690	0.5680
379	65a	Outside diameter of shaft	0.5600 to 0.5610	0.5590	0.5590
379	60a, 65a	Fit of shaft in link	0.0010L to 0.0070L		
379	62a	Inside diameter of follower	0.8761 to 0.8766	0.8776	0.8771
379	63a	Outside diameter of roller	0.0936 to 0.0938	0.0933	0.0933
379	65a	Listed with item 60a, above			

* Must be within new parts dimensions.

Reference Fig.	Reference Item	Point of Measurement	Size and fit of new parts	Wear Limits Field Maint.	Wear Limits Depot Maint.
379	70a	Listed with item 58a, above			*C-2
379	73a	Inside diameter of cage	1.2495 to 1.2505	2.2510	2.2510
379	74a	Outside diameter of bearing	1.2495 to 1.2505	*	*
379	73a, 74a	Fit of bearing in cage	Press fit		
379	74a	Listed with item 73a, above			
379	76a	Deflection of spring	81° at 27 to 33 lb	81° at 25.5 lb	81° at 25.5 lb
379	78a	Outside diameter of bearing	1.4995 to 1.5005	*	*
379	79b	Inside diameter at bearing surface of sleeve	1.4995 to 1.5005	1.5010	1.5010
379	78a, 79b	Fit of bearing in sleeve	Press fit		
379	79a	Inside diameter at bearing surface of sleeve	2.1245 to 2.1255	2.1260	2.1260
379	80a	Outside diameter of bearing	2.1245 to 2.1255	*	*
379	79a, 80a	Fit of bearing in sleeve	Press fit		
379	79a	Listed with item 78a, above			
379	80a	Listed with item 79a, above			
379	82a	Deflection of spring	81° at 27 to 33 lb	81° at 25.5 lb	81° at 25.5 lb
379	84a	Outside diameter at bearing surface of shaft	0.9960 to 0.9965	0.9955	0.9960
379	84b	Outside diameter at bearing surface of shaft	1.2495 to 1.2500	1.2493	1.2493
379	84c	Outside diameter at bearing surface of shaft	1.1242 to 1.1247	1.1240	1.1240
379	84d	Outside diameter at seal surface of shaft	1.0570 to 1.0620	1.0550	1.0560
379	89a	Inside diameter at bearing surface of retainer	2.4995 to 2.5005	2.5010	2.5010
379	90a	Outside diameter of bearing	2.4995 to 2.5005	*	*
379	89a, 90a	Fit of bearing in retainer	Press fit		
379	90a	Listed with item 89a, above			

* Must be within new parts dimensions.

Reference		Point of Measurement	Size and fit of new parts	Wear Limits	
Fig.	Item			Field Maint.	Depot Maint.
379	96a	Outside diameter of bearing	1.3745 to 1.3755	*	C2 *
379	97a	Inside diameter at bearing surface of shaft	1.3745 to 1.3755	1.3760	1.3760
379	96a, 97a	Fit of bearing in shaft	Press fit		
379	97a	Listed with item 96a, above			
379	97b	Outside diameter at bearing surface of shaft	1.7500 to 1.7505	1.7498	1.7498
379	97c	Outside diameter at bearing surface of sleeve	2.1250 to 2.1256	2.1247	2.1247

243. RIGHT BRAKE, AND STEER PLANETARY - REPAIR AND REBUILD STANDARDS

Fig.	Item	Point of Measurement	Size and fit of new parts	Field Maint.	Depot Maint.
380	1a	Inside diameter of bearing	3.3457 to 3.3465	*	C2 *
379	49a	Outside diameter at bearing surface of gear	3.3474 to 3.3482	3.3470	3.3470
380, 379	1a, 49a	Fit of bearing on gear	0.0009T to 0.0025T		
380	1b	Outside diameter of bearing	5.9047 to 5.9055	*	*
380	2a	Inside diameter at bearing surface of support	5.9047 to 5.9061	5.9068	5.9068
380	1b, 2a	Fit of bearing in support	0.0008T to 0.0014L		
380	2a	Listed with item 1b, above			
380	2b	Outside diameter at bearing surface of support	3.7387 to 3.7397	3.7382	3.7382
380	21a	Inside diameter of bearing	3.7394 to 3.7402	*	*
380	2b, 21a	Fit of bearing in support	0.0003T to 0.0015L		
380	9a	Inside diameter at seal surface of cam	10.5000 to 10.5020	10.5040	10.5030
380	13a	Inside diameter at seal surface of cam	13.8750 to 13.8780	13.8800	13.8790
380	13b	Thickness of cam	1.4390 to 1.4490	1.4340	*
380	19a	Thickness of plate	0.1630 to 0.1680	0.143	0.153
380	20a	Thickness of plate	0.1200 to 0.1250	*	*
380	21a	Listed with item 2b, above			

* Must be within new parts dimensions.

Reference		Point of Measurement	Size and fit of new parts	Wear Limits	
Fig.	Item			Field Maint.	Depot Maint.
380	21b	Outside diameter of bearing	5.7079 to 5.7087	*	*C 2 *
380	22a	Inside diameter at bearing surface of hub	5.7078 to 5.7088	5.7073	5.7073
380	21b, 22a	Fit of bearing in hub	0.0009T to 0.0009L		
380	22a	Listed with item 22a, above			
380	25a	Thickness of washer	0.1220 to 0.1260	0.1180	0.1180
380	27a	Outside diameter at bearing surface of carrier	2.9513 to 2.9523	2.9508	2.9508
381	29a	Inside diameter of bearing	2.9522 to 2.9528	*	*
380, 381	27a, 29a	Fit of bearing on carrier	0.0001T to 0.0015L		
380	29a	Thickness of washer	0.0615 to 0.0635	0.0575	0.0575
380	30a	Thickness of spacer	0.0600 to 0.0650	0.0550	0.0550
380	31a	Inside diameter of pinion	1.1303 to 1.1308	1.1318	1.1313
380	32a	Outside diameter of roller	0.1248 to 0.1250	0.1245	0.1245
380	33a	Thickness of spacer	0.0600 to 0.0650	0.0550	0.0550
380	34a	Thickness of washer	0.0615 to 0.0635	0.0575	0.0575
380	35a	Outside diameter of spindle	0.8798 to 0.8796	0.8792	0.8794

244. RIGHT-STEER CLUTCH, OUTPUT CLUTCH, AND END COVER - REPAIR AND REBUILD STANDARDS

381	2a	Free length of spring Length under load	4.0980 3.53 at 38.03 to 46.47 lb	 3.53 at 35.82 lb	 3.53 at 35.82 lb
381	8a	Inside diameter at seal surface of sleeve	6.2500 to 6.2520	6.2530	6.2530
381	15a	Thickness of plate	0.1200 to 0.1250	*	*
381	16a	Thickness of plate	0.1630 to 0.1680	0.143	0.153
381	17a	Free length of spring Length under load	2.98 2.42 at 25.2 to 30.8 lb	 2.42 at 23.8 lb	 2.43 at 23.8 lb

* Must be within new parts dimensions.

Reference Fig.	Reference Item	Point of Measurement	Size and fit of new parts	Wear Limits Field Maint.	Wear Limits Depot Maint.
					*C-2
381	27a	Inside diameter at bearing surface of gear	5.1172 to 5.1182	5.1187	5.1187
381	29b	Outside diameter of bearing	5.1173 to 5.1181	*	*
381	27a, 29b	Fit of bearing in gear	0.0009T to 0.0009L		
381	29a	Listed with item 27a, fig. 380, par. 243			
381	29b	Listed with item 27a, above			
381	31a	Thickness of plate	0.0950 to 0.0980	*	*
381	32a	Thickness of plate	0.1180 to 0.1240	0.1010	0.1110
381	36a	Free length of spring	1.820		
		Length under load	1.4150 at 15.3 to 18.7 lb	1.4150 at 14.45 lb	1.4150 at 14.45 lb
381	39a	Thickness of piston	0.7980 to 0.8020	0.7970	*
381	39b	Inside diameter at seal surface of piston	5.0000 to 5.0060	5.0100	5.0090
381	44a	Inside diameter at seal surface of hub	8.7500 to 8.7560	8.7600	8.7590
381	44b	Outside diameter at bearing surface of hub	3.9355 to 3.9365	3.9350	3.9350
381	70a	Inside diameter of bearing	3.9362 to 3.9370	*	*
381	44b, 70a	Fit of bearing on hub	0.0003T to 0.0015L		
381	48a	Inside diameter at piston seal surface of cover	12.5000 to 12.5060	12.5100	12.509
381	48b	Outside diameter at piston seal surface of cover	10.6210 to 10.6250	10.6170	10.6180
381	61a	Inside diameter at seal surface of sleeve	4.7500 to 4.7520	4.7530	4.7530
381	61b	Inside diameter at bearing surface of sleeve	5.9046 to 5.9056	5.9061	5.9061
381	70b	Outside diameter of bearing	5.9047 to 5.9055	*	*
381	61b, 70b	Fit of bearing in sleeve	0.0009T to 0.0009L		
381	70a	Listed with item 44b, above			
381	70b	Listed with item 61b, above			

* Must be within new parts dimensions.

Reference Fig.	Reference Item	Point of Measurement	Size and fit of new parts	Wear Limits Field Maint.	Wear Limits Depot Maint.
381	72a	Outside diameter of bearing	5.8947 to 5.9055	*	*C-2 *
381	73a	Inside diameter at bearing surface of hub	5.9046 to 5.9056	5.9061	5.9061
381	72a, 73a	Fit of bearing in hub	0.0009T to 0.0109L		
381	72b	Inside diameter of bearing	3.3457 to 3.3465	*	*
381	78a	Outside diameter at bearing surface of coupling	3.3450 to 3.3460	3.3445	3.3445
381	72b, 78a	Fit of bearing on coupling	0.0003T to 0.0015L		
381	73a	Listed with item 72a, above			
381	73b	Outside diameter of hub	6.7400 to 6.7430	6.7340	6.7380
381	78a	Listed with item 72b, above			

245. STEER, AND RELAY VALVE BODY ASSEMBLIES - REPAIR AND REBUILD STANDARDS

Reference Fig.	Reference Item	Point of Measurement	Size and fit of new parts	Wear Limits Field Maint.	Wear Limits Depot Maint.
382	12a	Free length of spring	4.22		
		Length under load	2.480 at 95 to 105 lb	2.480 at 92.5 lb	2.480 at 92.5 lb
382	13a	Free length of spring	3.680		
		Length under load	2.480 at 30.4 to 33.6 lb	2.480 at 29.6 lb	2.480 at 29.6 lb
382	15a	Outside diameter of valve	0.8730 to 0.8735		
382	40d	Inside diameter of valve bore in body	0.8745 to 0.8755		
382	15a, 40d	Fit of valve in body	0.0010L to 0.0025L	**0.0045L	**0.0040L
382	19a	Outside diameter of bearing	0.9995 to 1.0005	*	*
382	40a	Inside diameter of valve bore in body	0.9995 to 1.0005	1.0010	1.0010
382	19a, 40a	Fit of bearing in body	Press fit		
382	26a	Outside diameter of valve	0.9355 to 0.9360		
382	40c	Inside diameter of small valve bore in body	0.9370 to 0.9380		
382	26a, 40c	Fit of valve in body	0.0010L to 0.0025L	**0.0045L	**0.0040L
382	27a	Free length of spring	3.430		
		Length under load	3.25 at 9 to 11 lb	3.25 at 8.5 lb	3.25 at 8.5 lb

* Must be within new parts dimensions.
** Wear is allowed on either or both mating parts so long as fit is within the specified limit.

Reference Fig.	Reference Item	Point of Measurement	Size and fit of new parts	Wear Limits Field Maint.	Wear Limits Depot Maint.
					*C-2
382	28a	Free length of spring	2.83 to 2.85		
		Length under load	2.69 at 24 to 29.4 lb	2.69 at 22.7 lb	2.69 at 22.7 lb
382	29a	Outside diameter of valve	1.1855 to 1.1860		
382	40b	Inside diameter at larger valve bore of body	1.1870 to 1.1880		
382	29a, 40b	Fit of valve in body	0.0010L to 0.0025L	**0.0045L	**0.0040L
382	34a	Outside diameter of valve	1.1855 to 1.1860		
382	40b	Inside diameter at larger valve bore in body	1.1870 to 1.1880		
382	34a, 40b	Fit of valve in body	0.0010L to 0.0025L	**0.0045L	**0.0040L
382	35a	Free length of spring	2.83 to 2.85		
		Length under load	2.69 at 24 to 29.4 lb	2.69 at 22.7 lb	2.69 at 22.7 lb
382	36a	Free length of spring	3.43		
		Length under load	3.25 at 9 to 11 lb	3.25 at 8.5 lb	3.25 at 8.5 lb
382	37a	Outside diameter of valve	0.9355 to 0.9360		
382	40c	Inside diameter of small valve bore of body	0.9370 to 0.9380		
382	37a, 40c	Fit of valve in body	0.0010L to 0.0025L	**0.0045L	**0.0040L
382	40a	Listed with item 19a, above			
382	40b	Listed with items 29a and 34a, above			
382	40c	Listed with items 26a and 39a, above			
382	40d	Listed with item 15a, above			
382	42a	Free length of spring	1.161		
		Length under load	0.758 at 18 to 22 lb	0.758 at 17 lb	0.758 at 17 lb
382	45a	Outside diameter of lever	0.7500 to 0.7499	0.7497	0.7498
382	64a, 65a, 76a	Outside diameter of valves	0.8730 to 0.8735		
382	73a	Inside diameter of valve bores of body	0.8745 to 0.8755		
382	64a, 65a, 76a, 73a	Fit of valves in body	0.0010L to 0.0025L	**0.0045L	**0.0040L

* Must be within new parts dimensions.
** Wear is allowed on either or both mating parts so long as fit is within the specified limit.

Reference		Point of Measurement	Size and fit of new parts	Wear Limits	
Fig.	Item			Field Maint.	Depot Maint.
382	65a	Listed with item 64a, above			*C-2
382	66a	Free length of spring Length under load	2.70 1.580 at 12.6 to 15.4 lb	1.580 at 11.9 lb	1.580 at 11.9 lb
382	73a	Listed with item 64a, above			
382	75a	Free length of spring Length under load	2.70 1.580 at 12.6 to 15.4 lb	1.580 at 11.9 lb	1.580 at 11.9 lb
382	76a	Listed with item 64a, above			

246. MAIN-PRESSURE REGULATOR AND LOCKUP SHIFT, AND CONTROL VALVE BODY ASSEMBLIES - REPAIR AND REBUILD STANDARDS

Fig.	Item	Point of Measurement	Size and fit of new parts	Field Maint.	Depot Maint.
383	9a	Outside diameter of valve	0.9980 to 0.9985		
383	12e	Inside diameter of valve bore in body	0.9995 to 1.0005		
383	9a, 12e	Fit of valve in body	0.0010L to 0.0025L	**0.0045L	**0.0040L
383	10a	Free length of spring Length under load	2.077 1.550 at 18 to 22 lb	1.550 at 17 lb	1.550 at 17 lb
383	12a	Inside diameter of valve bore in body	0.9995 to 1.0005		
383	26a	Outside diameter of valve	0.9980 to 0.9985		
383	12a, 26a	Fit of valve in body	0.0010L to 0.0025L	**0.0045L	**0.0040L
383	12b	Inside diameter of valve bore in body	1.0307 to 1.0317		
383	26b	Outside diameter of valve	1.0292 to 1.0297		
383	12b, 26b	Fit of valve in body	0.0010L to 0.0025L	**0.0045L	**0.0040L
383	12c	Inside diameter of small bore in body	0.6558 to 0.6568		
383	13a	Outside diameter of plug	0.6543 to 0.6548		
383	18a	Outside diameter of valve	0.6543 to 0.6548		
383	12c, 13a, 18a	Fit of plug and valve in body	0.0010L to 0.0025L	**0.0045L	**0.0040L
383	12d	Inside diameter of large bore in body	1.0620 to 1.0630		
383	18b	Outside diameter of valve	1.0605 to 1.0610		
383	12d, 18b	Fit of valve in body	0.0010L to 0.0025L	**0.0045L	**0 0040L

** Wear is allowed on either or both mating parts so long as fit is within the specified limit

Reference		Point of Measurement	Size and fit of new parts	Wear Limits	
Fig.	Item			Field Maint.	Depot Maint.
383	12e	Listed with item 9a, above			*C-2
383	13a	Listed with item 12c, above			
383	18a	Listed with item 12c, above			
383	18b	Listed with item 12d, above			
383	19a	Outside diameter of plug	0.4822 to 0.4827		
383	24a	Inside diameter of sleeve	0.4837 to 0.4847		
383	19a, 24a	Fit of plug in sleeve	0.0010L to 0.0025L	**0.0045L	**0.0040L
383	20a	Free length of spring	4.280		
		Length under load	2.190 at 39 to 43 lb	2.190 at 38 lb	2.190 at 38 lb
383	21a	Free length of spring	4.250		
		Length under load	2.190 at 80 to 88 lb	2.190 at 78 lb	2.190 at 78 lb
383	24a	Listed with item 19a, above			
383	26a	Listed with item 12a, above			
383	26b	Listed with item 12b, above			
383	27a	Free length of spring	3.870		
		Length under load	2.430 at 37 to 39 lb	2.430 at 36.5 lb	2.430 at 36.5 lb
383	53a	Outside diameter of bearing	1.1245 to 1.1255	*	*
383	54a	Inside diameter of bearing bore in body	1.1245 to 1.1255	1.1260	1.1260
383	53a, 54a	Fit of bearing in body	Press fit		
383	54a	Listed with item 53a, above			
383	54b	Inside diameter at valve bore of body	0.8745 to 0.8755		
383	75a	Outside diameter of valve	0.8735 to 0.8740		
383	54b, 75a	Fit of valve in body	0.0005L to 0.0020L	**0.0045L	**0.0040L
383	54c	Inside diameter of valve bore in body	1.2495 to 1.2505		
383	80a	Outside diameter of valve	1.2480 to 1.2485		
383	54c, 80a	Fit of valve in body	0.0010L to 0.0025L	**0.0045L	**0.0040L

* Must be within new parts dimensions.
** Wear is allowed on either or both mating parts so long as fit is within the specified limit.

Reference		Point of Measurement	Size and fit of new parts	Wear Limits	
Fig.	Item			Field Maint.	Depot Maint.
					*C-2
383	54d	Inside diameter of valve bore in body	1.1870 to 1.1880		
383	80b	Outside diameter of valve	1.1850 to 1.1855		
383	54d, 80b	Fit of valve in body	0.0015L to 0.0030L	**0.0045L	**0.0040L
383	54e	Inside diameter at plunger bore of body	0.3730 to 0.3740		
383	79a	Outside diameter of plunger	0.3680 to 0.3700		
383	54e, 79a	Fit of plunger in body	0.0030L to 0.0060L	**0.0100L	**0.0080L
383	54f	Inside diameter of valve bore in body	0.7495 to 0.7505		
383	76a	Outside diameter of valve	0.7480 to 0.7485		
383	54f, 76a	Fit of valve in body	0.0010L to 0.0025L	**0.0045L	**0.0040L
383	54g	Inside diameter of valve bores in body	0.6245 to 0.6255		
383	61a	Outside diameter of valve	0.6230 to 0.6235		
383	64a	Outside diameter of valve	0.6230 to 0.6235		
383	54g, 61a, 64a	Fit of valves in body	0.0010L to 0.0025L	**0.0045L	**0.0040L
383	55a	Outside diameter of bearing	1.1245 to 1.1255	*	*
383	54a	Inside diameter at bearing surface of body	1.1245 to 1.1255	1.1260	1.1260
383	55a, 54a	Fit of bearing in body	Press fit		
383	56a	Outside diameter of shaft	0.8750 to 0.8755	0.8748	0.8748
383	56b	Inside diameter of shaft	0.6195 to 0.6205	0.6210	0.6210
383	58a	Outside diameter of shaft	0.6170 to 0.6175	0.6165	0.6165
383	56b, 58a	Fit of shaft through shaft	0.0020L to 0.0035L		
383	58a	Listed with item 56b, above			
383	60a	Free length of spring	2.08		
		Length under load	1.65 at 13 to 15 lb	1.65 at 12.5 lb	1.65 at 12.5 lb
383	61a	Listed with item 54g, above			
383	62a	Free length of spring	2.00		
		Length under load	0.96 at 15.9 to 16.5 lb	0.96 at 15.75 lb	0.96 at 15.75 lb
383	64a	Listed with item 54g, above			

* Must be within new parts dimensions.
** Wear is allowed on either or both mating parts so long as fit is within the specified limit.

Reference		Point of Measurement	Size and fit of new parts	Wear Limits	
Fig.	Item			Field Maint.	Depot Maint.
383	68a	Free length of spring Length under load	1.81 0.54 at 4.9 to 5.1 lb	0.54 at 4.9 lb	*C-2 0.54 at 4.9 lb
383	75a	Listed with item 54b, above			
383	76a	Listed with item 54f, above			
383	78a	Free length of spring Length under load	3.53 2.57 at 18.9 to 20.9 lb	2.57 at 18.4 lb	2.57 at 18.4 lb
383	79a	Listed with item 54e, above			
383	80a	Listed with item 54c, above			
383	80b	Listed with item 54d, above			

247. OUTPUT PRESSURE, AND BRAKE COOLANT OIL PUMP ASSEMBLIES - REPAIR AND REBUILD STANDARDS

384	7a	Outside diameter of bearing	To fit 0.8120 to 0.8130 housing bore	*	*
384	8a	Inside diameter of bearing bore in body	0.8120 to 0.8130	0.8135	0.8135
384	7a, 8a	Fit of bearing in body	Press fit		
384	8a	Listed with item 7a, above			
384	10a	Outside diameter of shaft	0.6247 to 0.6250	0.6246	0.6246
384	11a	Outside diameter of shaft	0.6247 to 0.6250	0.6246	0.6246
384	13a	Outside diameter of bearing	To press fit 0.8075 to 0.8080 housing bore		
384	14a	Inside diameter of gear	0.8075 to 0.8080	0.8082	0.8082
384	13a, 14a	Fit of bearing in gear	Press fit		
384	14a	Listed with item 13a, above			
384	17a	Outside diameter of bearing	To press fit 0.8120 to 0.8130 housing bore		
384	19a	Inside diameter of bore in cover	0.8120 to 0.8130	0.8135	0.8135
384	17a, 19a	Fit of bearing in cover	Press fit		
384	19a	Listed with item 17a, above			

* Must be within new parts dimensions.

Reference Fig.	Reference Item	Point of Measurement	Size and fit of new parts	Wear Limits Field Maint.	Wear Limits Depot Maint.
384	22a	Outside diameter of shaft	0.9995 to 1.0000	0.9993	*C-2 0.9993
384	24a, 38a	Inside diameter of bearing bore in plate	1.2495 to 1.2505	1.2510	1.2510
384	25a, 37a	Outside diameter of bearing	To press fit 1.2495 to 1.2505 housing bore		
384	24a, 38a, 25a, 37a	Fit of bearing in plate	Press fit		
384	25a	Listed with item 24a, above			
384	29a, 45a	Outside diameter of bearings	To press fit 1.2495 to 1.2505 housing bore		
384	30a, 47a	Inside diameter at bearing surface of covers	1.2495 to 1.2505	1.2510	1.2510
384	29a, 45a, 30a, 47a	Fit of bearings in covers	Press fit		
384	30a	Listed with item 29a, above			
384	37a	Listed with item 24a, above			
384	38a	Listed with item 24a, above			
384	40a	Outside diameter of shaft	0.9995 to 1.0000	0.9993	0.9993
384	45a	Listed with item 29a, above			
384	47a	Listed with item 29a, above			
384	65a	Free length of spring Length under load	2.090 1.345 at 4.5 to 5.5 lb	 1.345 at 4.25 lb	 1.345 at 4.25 lb

248. LEFT-OUTPUT DRIVE ASSEMBLY - REPAIR AND REBUILD STANDARDS *C 2

385	8a	Inside diameter of saddle	6.7450 to 6.7500	6.7550	6.7520
385	19a	Outside diameter of spindle	2.0276 to 2.0281	2.0272	2.0274
385	22a	Thickness of washer	0.0910 to 0.0950	0.0860	0.0860
385	23a	Thickness of spacer	0.1220 to 0.1260	0.1170	0.1170
385	24a	Inside diameter of pinion	2.7786 to 2.7791	2.7801	2.7796
385	25a	Outside diameter of roller	0.3748 to 0.3750	0.3745	0.3745

*C-2

Reference Fig.	Reference Item	Point of Measurement	Size and fit of new parts	Wear Limits Field Maint.	Wear Limits Depot Maint.
385	26a	Thickness of spacer	0.1220 to 0.1260	0.1170	0.1170
385	27a	Thickness of washer	0.0910 to 0.0950	0.0860	0.0860
385	32a	Outside diameter at bearing surface of gear	5.1194 to 5.1204	5.1189	5.1189
385	34b	Inside diameter of bearing	5.1171 to 5.1181	*	*
385	32a, 34b	Fit of bearing on gear	0.0013T to 0.0033T		
385	34a	Outside diameter of bearing	7.8728 to 7.8740	*	*
385	38b	Inside diameter at bearing surface of housing	7.8732 to 7.8746	7.8753	7.8753
385	34a, 38b	Fit of bearing in housing	0.0008T to 0.0018L		
385	34b	Listed with item 32a, above			
385	38a	Inside diameter of bearing bore in housing	7.8740 to 7.8755	7.8762	7.8762
385	39a	Outside diameter of bearing	7.8728 to 7.8740	*	*
385	38a, 39a	Fit of bearing in housing	0.0000 to 0.0027L		
385	38b	Listed with item 34a, above			
385	39a	Listed with item 38a, above			
385	39b	Inside diameter of bearing	4.3299 to 4.3307	*	*
385	49a	Outside diameter at bearing surface of shaft	4.3318 to 4.3328	4.3313	4.3313
385	39b, 49a	Fit of bearing on shaft	0.0011T to 0.0029T		
385	49a	Listed with item 39b, above			

249. RIGHT-OUTPUT DRIVE ASSEMBLY - REPAIR AND REBUILD STANDARDS

*C-2

386	4a	Outside diameter at bearing surface of shaft	4.3318 to 4.3328	4.3313	4.3313
386	12b	Inside diameter of bearing	4.3299 to 4.3307	*	*
386	4a, 12b	Fit of bearing on shaft	0.0011T to 0.0029T		
386	12a	Outside diameter of bearing	7.8728 to 7.8740	*	*
386	14a	Inside diameter of bearing bore in housing	7.8740 to 7.8755	7.8762	7.8762
386	12a, 14a	Fit of bearing in housing	0.0000 to 0.0027L		
386	12b	Listed with item 4a, above			
386	14a	Listed with item 12a, above			

* Must be within new parts dimensions.

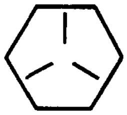
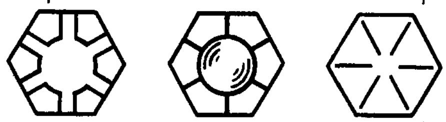
Reference		Point of Measurement	Size and fit of new parts	Wear Limits	
Fig.	Item			Field Maint.	Depot Maint.
				*	C2
386	14b	Inside diameter of bearing bore in housing	7.8732 to 7.8746	7.8753	7.8753
386	17a	Outside diameter of bearing	7.8728 to 7.8740	*	*
386	14b, 17a	Fit of bearing in housing	0.0008T to 0.0018L		
386	17a	Listed with item 14b, above			
386	17b	Inside diameter of bearing	5.1171 to 5.1181	*	*
386	19a	Outside diameter at bearing surface of gear	5.1194 to 5.1204	5.1189	5.1189
386	17b, 19a	Fit of bearing on hub	0.0013T to 0.0033T		
386	19a	Listed with item 17b, above			
386	37a	Inside diameter of saddle	6.7450 to 6.7500	6.7550	6.7520
386	42a	Outside diameter of spindle	2.0276 to 2.0281	2.0272	2.0274
386	44a	Thickness of washer	0.0910 to 0.0950	0.0860	0.0860
386	45a	Thickness of spacer	0.1220 to 0.1260	0.1170	0.1170
386	46a	Outside diameter of roller	0.3748 to 0.3750	0.3745	0.3745
386	47a	Inside diameter of pinion	2.7786 to 2.7791	2.7801	2.7796
386	48a	Thickness of spacer	0.1220 to 0.1260	0.1170	0.1170
386	49a	Thickness of washer	0.0910 to 0.0950	0.0860	0.0860

* Must be within new parts dimensions.

250. TORQUE SPECIFICATIONS

Following are the standard torque specifications for bolts, nuts and screws. Special torque specifications are included in applicable rebuild and assembly sections.

Table V. STANDARD TORQUE SPECIFICATIONS

Size	Threads	Torque value in pound-feet		
		Standard heat-treated bolts and screws 	Special heat-treated, self-locking bolts and Allen-head screws 	Nuts on Studs
1/4	20	9-11	9-11	
	28	10-12	10-12	
5/16	18	13-16	17-20	
	24	14-18	19-23	14-18
3/8	16	26-32	36-43	
	24	33-40	41-49	
7/16	14	42-50	54-65	
	20	50-60	64-77	
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	16	215-250	337-385	215-250

APPENDIX A

REFERENCES

1. PUBLICATION INDEXES

The following index should be consulted frequently for latest changes or revisions of reference given in this appendix and for new publications relating to material covered in this manual.

Consolidated Index of Army Publications and Blank Forms. . . . . DA Pam 25-30

2. SUPPLY MANUALS

a. Repair or Rebuild

Automotive Maintenance and Repair (4910-00-919-0076). . . . . . SC 4910-95-A31
Automotive Maintenance and Repair Supplement No. 1
(4910-00-754-0706) . . . . SC 4910-95-A62
Automotive Maintenance and Repair Supplement No. 2
(4910-00-919-0093) . . . . SC 5180-95-A63
Tool Kit, Master Mechanic (5180-00-699-5273) . . . . SC 5180-90-N05
Tool Kit, Gen Mechanic Automotive (5180-00-177-7033) . . . . . . SC 5180-90-N26

b. Vehicle and Transmission Repair Parts Manuals

Transmission, XTG 411-2A and XTG 411-4 Models. . . . . TM 9-2520-234-34P
Howitzer, Medium, Self-Propelled, 155mm, M109A2/A3/A4/A5 . TM 9-2350-311-24P-1
Howitzer, Heavy, Self-Propelled, 8-Inch, M110A2. . . . . TM 9-2350-304-24P-1
Recovery Vehicle, Full Tracked, Light, Armored, M578. . . . . . . TM 9-2350-238-24P-1
Carrier, Ammunition, Tracked, M992 (FAASV) . . . . TM 9-2350-267-24P

3. FORMS

Exchange Tag. . . . . DA Form 2402
Equipment Inspection and Maintenance Worksheet. . . . . DA Form 2404
Maintenance Request Register. . . . . DA Form 2405
Maintenance Request . . . . DA Form 2407
Recommended Changes to Technical Manuals. . . . . DA Form 2028
Report of Discrepancy . . . . SF 364
Discrepancy in Shipment . . . . SF 361

4. OTHER PUBLICATIONS

a. General

Authorized Abbreviations and Brevity Codes. . . . . AR 310-50
Dictionary of United States Army Terms . . . . AR 310-25
Principles of Automotive Vehicles . . . . TM 9-8000

b. Cleaning, Inspection, Repair, and Painting

Inspection, Care and Maintenance of Antifriction Bearings . . . . TM 9-214
Welding Theory and Application. . . . . TM 9-237
Materials Used for Cleaning, Preserving, Abrading and
Cementing Ordnance Material. . . . . TM 9-247
Use and Care of Hand Tools . . . . TM 9-243
Painting Instructions for Field Use. . . . . TM 43-0139

c. Shipment and Limited Storage

Instruction Guide: Ordnance Preservation, Packaging,
Packing, Storage and Shipping. . . . . TM 9-200
Preservation, Packaging and Packing of Military Supplies
and Equipment . . . . TM 38-230-1 and -2

APPENDIX B

EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

1. SCOPE

This appendix lists expendable supplies and material you will need to operate and maintain the transmission. These items are authorized to you by CTA 50-970, Expendable Items (Except Medical, Class V, Repair Parts and Heraldic Items).

2. EXPLANATION OF COLUMNS

a. Column (1) - Item Number. This number is assigned to the entry in the listing and may be referenced to identify the material (e.g., "Petrolatum [Item 14, Appendix C]").

b. Column (2) - Level. This item identifies the lowest level of maintenance that requires the listed item.

F - Direct Support Maintenance
H - General Support Maintenance

c. Column (3) - National Stock Number. This is the National Stock Number assigned to the item; use it to request or requisition the item.

d. Column (4) - Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Commercial and Government Entity Code (CAGEC) in parentheses followed by the part number.

e. Column (5) - Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., EA, IN, PR). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	F		Blocks, wooden, 2 x 4 x 16 inches Make from item 11	EA
2	F		Blocks, wooden, 4 x 4 x 16 inches Make from item 12	EA
3	H	6830-00-247-0619	Carbon Dioxide, technical (dry ice) (81348), BB-C-104	LB
4	F	5350-00-221-0872	Cloth, abrasive, crocus, 50 sheet pkg (81348), P-C-458	SH
5	F	8305-00-286-5461	Cloth, batiste, lint-free, white, 39-1/2 inches wide (81349), MIL-C-4919	YD
6	F	6850-90-285-8011	Dry-cleaning Solvent, Type II (813481, P-D-680	GL
7		8010-01-053-2647	Epoxy, gloss, white (CARC) (81349), MIL-C-22750	QT
8		8010-01-309-0328	Epoxy Primer Coating (CARC) (813491, MIL-P-53022	KT
9	F	9150-00-944-8953	Grease, aircraft (81349), MIL-G-3545A	LB
10	F	9150-00-189-6727	Lubricating Oil, engine (81349), MIL-L-2104D	QT
11	F	5510-00-220-6194	Lumber, softwood, 2 x 4 x 8 ft (81348), MM-L-751	BF
12	F	5510-00-220-6178	Lumber, softwood, 4 x 4 x 8 ft (81348), MM-L-751	BF
13	F	9150-00-250-0926	Petrolatum, technical (petroleum jelly) (81348), VV-P-236	LB
14	F	7920-00-205-1711	Rag, wiping, 50-lb bale (58536), A-A-531	YD
15	F	8030-00-291-1787	Sealing Compound, gasket, hydrocarbon, fluid and water resistant (813491, MIL-S-45180	OZ

INDEX

MODEL XTG 411-2A and XTG 411-4

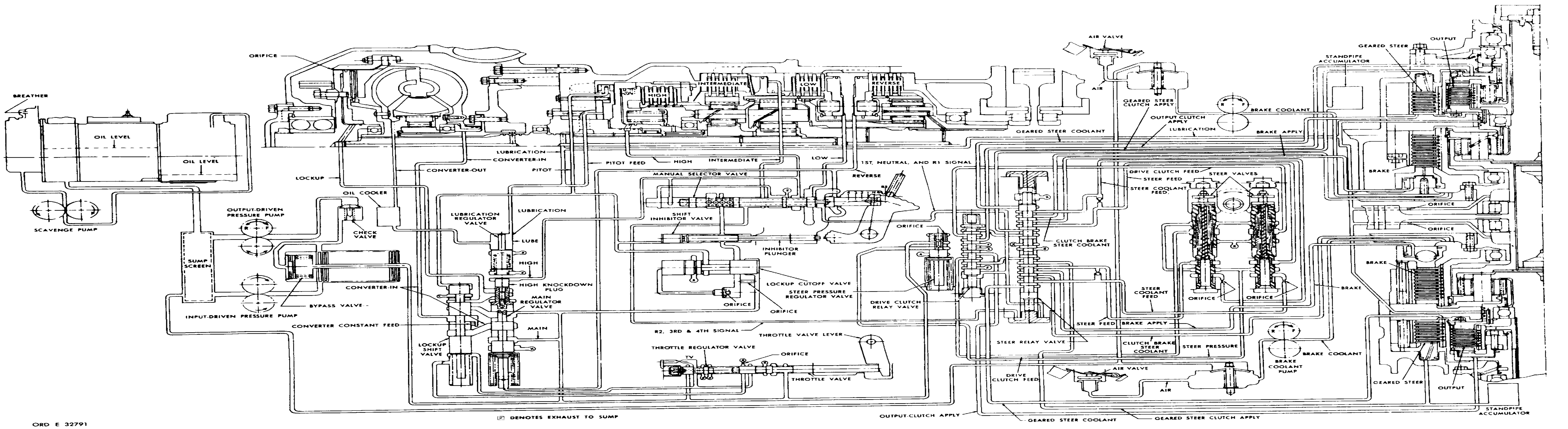


Figure 372. Fold-out 1 — Model XTG-411-2A hydraulic system — schematic view.

Addendum to Fold-out 1

The hydraulic system for later models of XTG 411-2A and XTG 411-4 is the same as shown in Figure 372 (fold-out 1) except as shown in Figure 372.1.

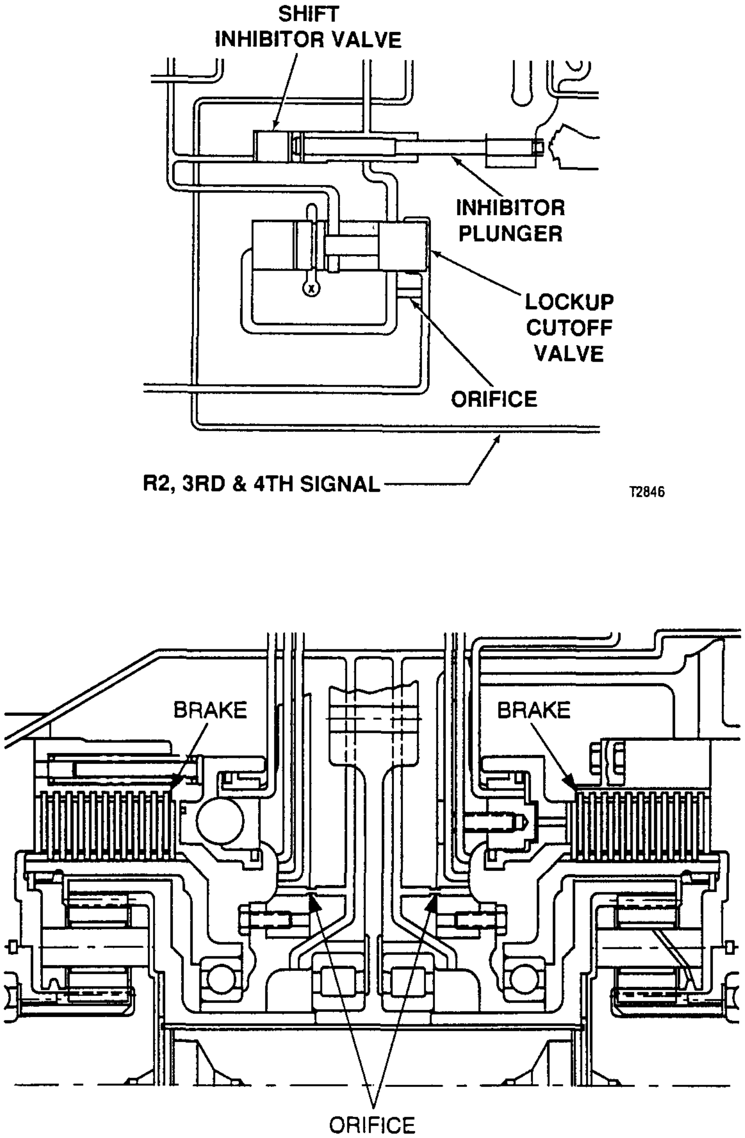


Figure 372.1. Model XTG 411-4 transmission and later models of XTG 411-2A — area of hydraulic system changes.

1—Hexagon-head cap screw (2)—96906-35295-60
2—Lock strip—8351741
3—Spindle lock strap—8351740
4—Preformed packing—8351278
5—Input transfer spindle—8351268
6—Hexagon-head cap screw (12)—96906-35296-62
7—Lock washer (12)—96906-35338-8
8—Transfer housing cover—8351273
9—Pipe plug—444682
10—Transfer housing cover gasket—8351277
11—Hexagon-head bolt (10)—96906-35296-62
12—Lock washer (10)—96906-35338-8
13—Power take-off cover—8351751
14—Power take-off cover gasket—8351752
15—Adapter gasket—8351748
16—Flange adapter assembly—8351460
17—Pin (3)—110409
18—Sleeve—8351415
19—Flange adapter—8351322
20—Flat washer (20)—96906-15795-16
21—Hexagon-head, self-locking bolt (20)—7532487
22—Oil Seal—8351582
23—Engine coupling shaft—8351749
24—Ball bearing—907715
25—Input transfer drive gear—8351746
26—Retaining ring—8351735
27—Ball bearing—907389
28—Drive screw (4)—142862
29—Name plate—7767270
30—Lock washer (10)—96906-35338-9
31—Hexagon-head cap screw (4)—96906-35295-89
32—Hexagon-head cap screw (2)—187425
33—Hexagon-head cap screw (4)—187136
34—Idler cluster gear—8351745
35—Double-row ball bearing—8351887
36—Retaining ring—8351736
37—Retaining ring—7374496
38—Roller bearing—10910988
39—Bearing spacer—8351742
40—Roller bearing—10910988
41—Cluster gear—8351744
42—Cluster idler spacer—8351270
43—Flat washer—96906-15795-16
44—Hexagon-head, self-locking bolt—9409049
45—Pressure and scavenge oil pump assembly—8351750
46—Scavenge pump body assembly—8351728
47—Scavenge pump body—8351727
48—Pump separator plate assembly—8351715
49—Dowel pin (2)—141203
50—Pump separator plate—8351713
51—Woodruff key—96906-35756-6
52—Hexagon-head, self-locking bolt (4) 8675777
53—Needle bearing—10906265
54—Needle bearing—713819
55—Scavenge pump gear—7709846
56—Scavenge pump gear—7709846
57—Pump drive gear—8351730
58—Pump idler gear—8351716
59—Needle bearing—713819
60—Needle bearing—713819
61—Pressure pump body—8351726
62—Hexagon-head cap screw (5)—96906-35295-69
63—Hexagon-head cap screw (6)—96906-35295-64
64—Lock washer (11)—96906-35338-8
65—Pressure and scavenge oil pump gasket—8351731
66—Hexagon-head, self-locking bolt (24)—9409047
67—Converter pump cover drive gear—8351743
68—Converter cover assembly—8351489
69—Converter cover—8351407
70—Pin (6)—8351734
71—Hexagon, self-locking nut (24)—442812
72—Seal ring—8351398
73—Ball bearing—10910983
74—Lockup clutch piston—8348770
75—Seal ring expander—8351914
76—Preformed packing—8351905
77—Lockup clutch plate—8351722
78—Lockup clutch reaction plate—8351721
79—Torque converter turbine assembly—8351724
80—Retaining ring—7709185
81—Front-washer assembly—8351476
82—Torque converter pump assembly—8351732
83—Torque converter pump—6759973
84—Balance weight (AR)—6756790, 6756791, 6757501
85—Screw (AR)—145067
86—Converter pump bolt (24)—7710728
87—Seal ring (2)—8351400
88—Pump hub—8351405
89—Lock strip (4)—8351733
90—Hexagon-head, self-locking bolt (8)—9409072
91—Ball bearing—906729
92—Retaining ring—8351755
93—Retaining ring—7709185
94—Stator assembly—8351754
95—Rear washer—8351717
96—Thrust washer—8351718
97—Stator roller bearing (12)—7707842
98—Stator roller spring (12)—8351366
99—Stator cam—8351725
100—Thrust washer—8351718
101—Stator freewheel race—8351474
102—Needle thrust bearing assembly—8351473
103—Thrust washer—8351472
104—Converter bearing support sleeve—8351757
105—Plug—7767855
106—Gasket—96906-35769-49
107—Scavenge suction screen—8351891
108—Preformed packing—7376758
109—Pump driven gear—8351747
110—Ball bearing—907050
111—Transfer housing assembly—8351293
112—Insert (8)—96906-35914-14
113—Insert—96906-35914-17
114—Plug—444680
115—Plug—444612
116—Plug—444612
117—Plug—444618
118—Breather bushing assembly—8348570
119—Inner sleeve—8351275
120—Inner sleeve—8351275
121—Dowel pin—141262
122—Insert—MS-35914-17
123—Plug—444618
124—Dowel pin—141262
125—Plug—444626
126—Transfer housing—8351294
127—Plug—444654
128—Plug—444618
129—Tube—8375745
130—Plug—444654
131—Plug—444612
132—Plug—444612
133—Preformed packing—8351364
134—Outer sleeve—8351274
135—Preformed packing—8351364
136—Outer sleeve—8351274
137—Insert (12)—96906-35914-14
138—Pin (3)—110409
139—Sleeve—8351416
140—Insert (10)—96906-35914-14
141—Lock washer (16)—96906-35338-9
142—Hexagon-head cap screw (16)—96906-35295-89
143—Double-row ball bearing assembly—907390
144—Converter lock nut—8351739
145—Converter bearing cover gasket—8351863
146—Converter bearing cover—8351756
147—Lock washer (8)—96906-35338-8
148—Hexagon-head cap screw (8)—96906-35296-67
149—Hexagon-head cap screw (2)—96906-35295-60
150—Lock strip—8351741
151—Spindle lock strap—8351740
152—Preformed packing—8351278
153—Cluster gear spindle—8351269
154—Preformed packing—8351962

Small lower case letters, in the exploded view at right, refer to repair and rebuild points of measurement for fits, clearances and wear limits. See Chapter 6.

FIGURE 373 (fold-out 2)

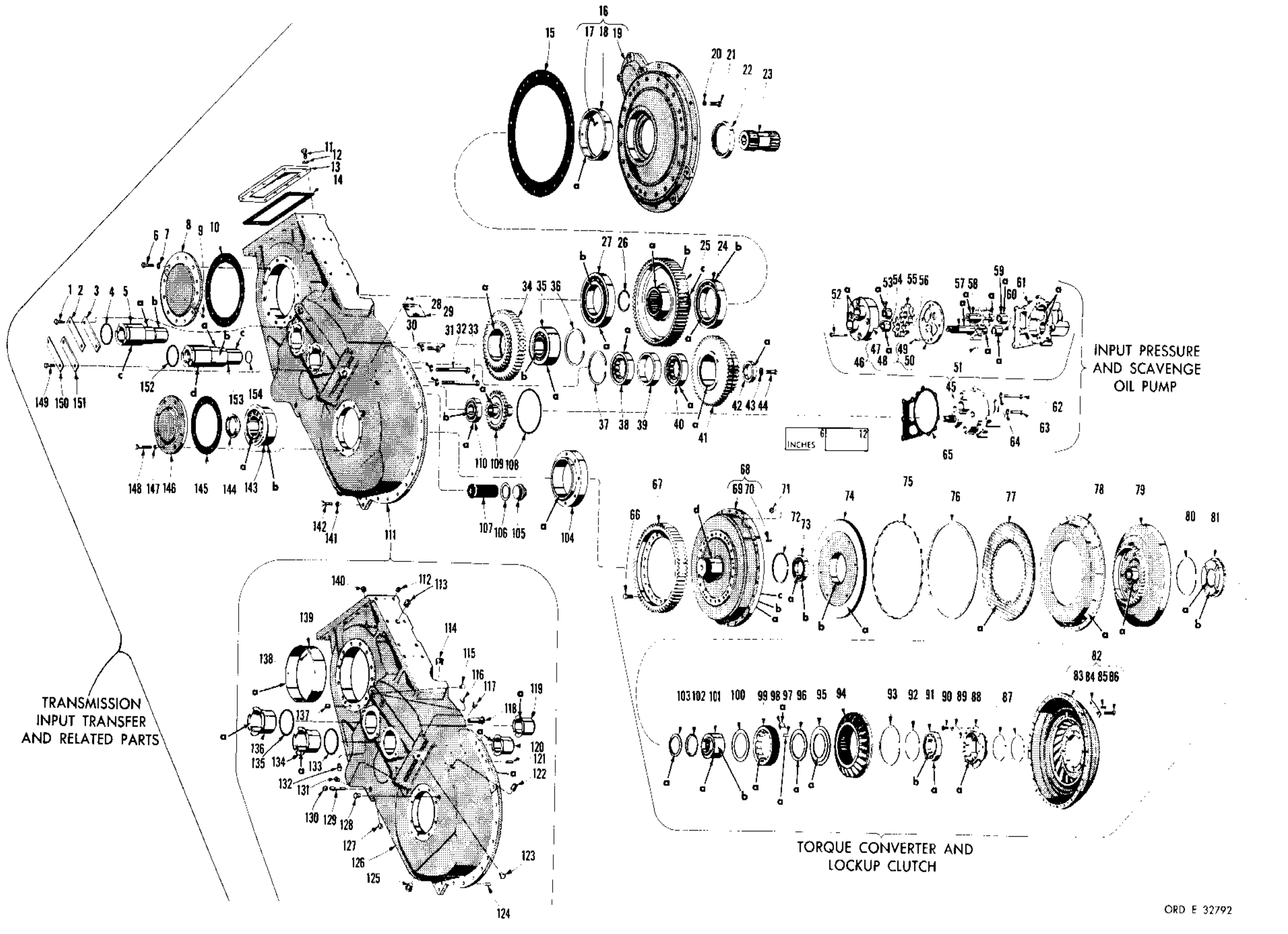


Figure 373. Fold-out 2 — Transmission input transfer assembly — exploded view

Addendum to Fold-out 2

For latest part numbers, refer to TM 9-2520-234-34P.

Changes to Figure 373 (fold-out 2) are as follows:

2-Change to Lock washer (2) for later models (see Fig. 373.1)
30-Lock washers -Change quantity from (10) to (4) (ship loose)
83-Deleted (not a serviceable subassembly)
84-Deleted (not a serviceable subassembly)
85-Deleted (not a serviceable subassembly)
86-Deleted (not a serviceable subassembly)
118-Change to pipe plug (shipping only)
125-Deleted for later models
127-Deleted for later models
128-Deleted for later models
129-Deleted for later models
130-Deleted for later models
132-Deleted for later models
141-Lockwasher-Change quantity from (16) to (12) (ship loose)
142-Capscrew-Change quantity from (16) to (12) (ship loose)
150-Change to Lock washer (2); for later models (see Fig. 373.1)
155-Add Hexagon cap screw (ship loose) (4) (see Fig. 373.1)
156-Add Lock washer (ship loose) (4) (see Fig. 373.1)
157-Add Spacer (ship loose) (4) (see Fig. 373.1)

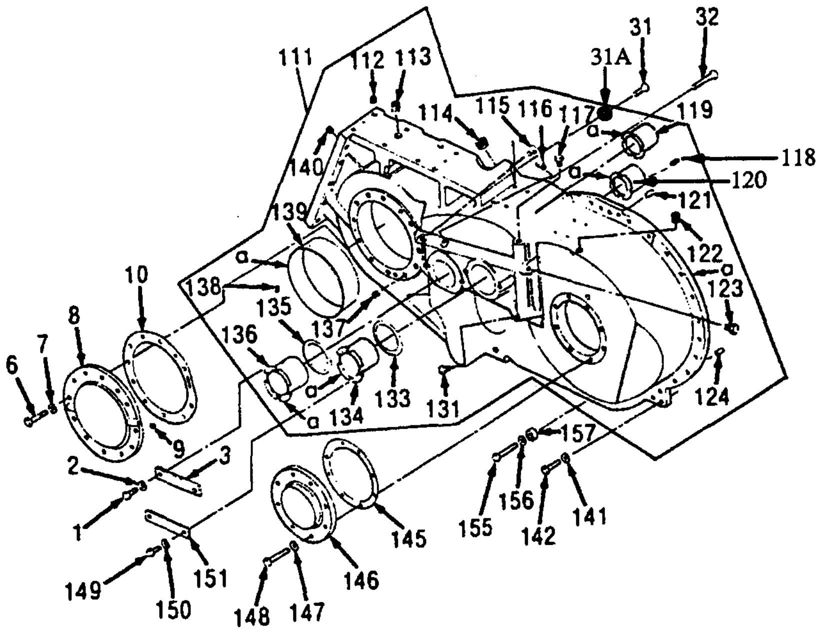


Figure 373.1. Addendum to Figure 373 (fold-out 2)

1—Self-locking bolt—7748645
2—Lock plate—8351609
3—Coupling nut—8351573
4—Coupling retainer—8351568
5—Output drive coupling—8351567
6—Oil seal—8351582
7—Preformed packing (2)—8351031
8—Output drive coupling support—8351556
9—Hexagon-head cap screw (10)—96906-35295-89
10—Lock washer (10)—96906-35338-9
11—Hexagon-head cap screw (3)—96906-35295-90
12—Lock washer (3)—96906-35338-9
13—Bracket—8350070
14—Coupling support gasket—8351620
15—Ball bearing—10910986
16—Retaining ring—8351583
17—Output pump drive gear—8351571
18—Transmission output shaft—8351597
19—Hexagon-head cap screw (6)—96906-35295-61
20—Lock washer (6)—96906-35338-8
21—Oil screen cover—8351281
22—Oil screen cover gasket—8351284
23—Oil screen assembly—8351280
24—Flat washer (5)—96906-15795-16
25—Hexagon-head, self-locking bolt (5)—8351980
26—Converter ground sleeve—8351271
27—Seal ring retainer—8351276
28—Hexagon-head, self-locking bolt (5)—9409030
29—Converter-to-transfer housing gasket—8351282
30—Converter housing assembly—8351286
31—Converter housing—8351302
32—Dowel pin—141262
33—Plug—444680
34—Insert (2)—96906-35914-14
35—Plug—8351287
36—Plug—7767863
37—Insert (3)—96906-35914-14
38—Output pump check valve seat—8351529
39—Plug (2)—444680
40—Plug (2)—444680
41—Plug—444680
42—Preformed packing—6761626
43—Lock washer (3)—96906-35338-8
44—Hexagon-head cap screw (3)—96906-35296-61
45—Main-oil screen assembly—8348991
46—Tube and cover assembly—8348903
47—Pack assembly filter (22)—7707862
48—Washer (22)—7374145
49—Pack assembly filter (22)—7707862
50—Washer (22)—7374145
51—Guide plate—6765749
52—Washer (AR)—7374145
53—Nut—6761492
54—Relief valve retainer—6768095
55—Relief valve inner spring—7709664
56—Relief valve outer spring—7709665
57—Relief valve—6768094
58—Relief valve seat—6768096
59—Spring retainer plate retaining ring—6762222
60—Plug—8351532
61—Flat washer—8351758
62—Output pump check valve spring—8351533
63—Output pump check valve—8348312
64—Seal—8351640
65—Speedometer drive gear assembiy—8351615
66—Pin—141234
67—Speedometer gear—8351712
68—Retaining ring—593359
69—Ball bearing—8351889
70—Retaining ring—8358107
71—Retaining ring—96906-16624-56
72—Alinement ring—8351618
73—Ball—453605
74—Adapter—8351633
75—Oil seal—7710663
76—Cover gasket—7707729
77—Cover—7708126
78—Lock washer (4)—96906-35338-6
79—Machine bolt (4)—181313

Small lower case letters, in the exploded view at right, refer to repair and rebuild points of measurement for fits, clearances and wear limits. See Chapter 6.

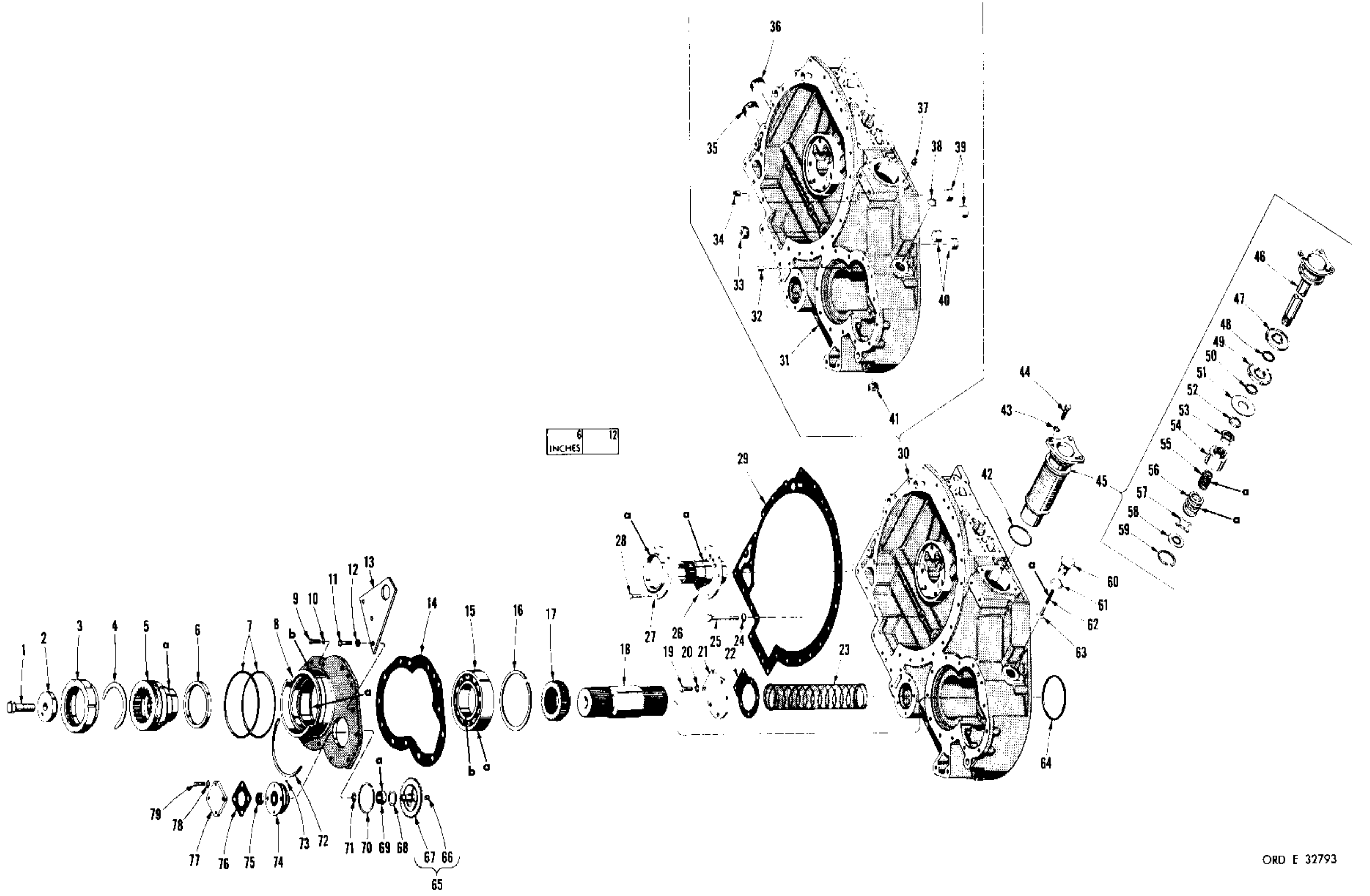


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Figure 374. Fold-out 3 — Torque Converter housing and related parts — exploded view

Addendum to Fold-out 3

For latest part numbers, refer to TM 9-2520-234-34P.

Changes to Figure 374 (fold-out 3) are as follows:

3— Deleted for later models
4— Deleted for later models
5— Deleted for later models
42— Superseded (see fig. 374.1)
43— Superseded (see fig. 374.1)
44— Superseded (see fig. 374.1)
45— Superseded (see fig. 374.1)
46— Superseded (see fig. 374.1)
47– Superseded (see fig. 374.1)
48– Superseded (see fig. 374.1)
49– Superseded (see fig. 374.1)
50— Superseded (see fig. 374.1)
51— Superseded (see fig. 374.1)
52– Superseded (see fig. 374.1)
53— Superseded (see fig. 374.1)
54— Superseded (see fig. 374.1)
55– Superseded (see fig. 374.1)
56— Superseded (see fig. 374.1)
57– Superseded (see fig. 374.1)
58— Superseded (see fig. 374.1)
59— Superseded (see fig. 374. 1)
72— Deleted for later models
80– Add Hexagon-head cap screw (3) (see fig. 374.1)
81— Add Lock washer (3) (see fig. 374.1)
82– Add Fluid pressure filter (see fig. 374.1)
83– Add Filter head (see fig. 374.1)
84— Add Filter element (see fig. 374.1)
85– Add Self-locking nut (see fig. 374.1)
86– Add Preformed packing (see fig. 374.1)

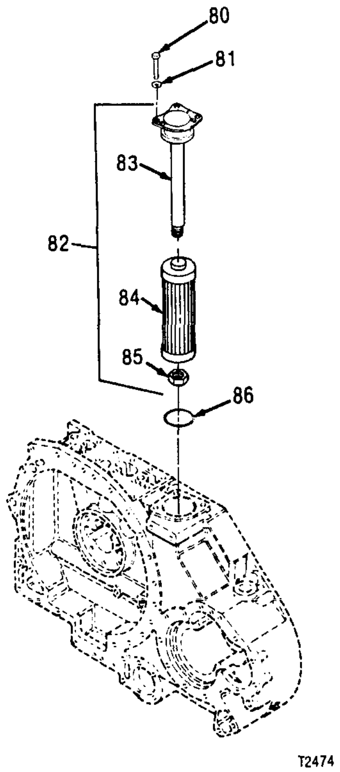

Figure 374.1. Addendum to Figure 374 (fold-out 3)

1—Seal ring—7710025
2—Turbine shaft—8351406
3—Seal ring (3)—8351399
4—Hexagon-head, self-locking bolt (4)—9409041
5—Ball bearing—10910983
6—Diaphragm assembly—8351662
7—Sleeve—8351719
8—Diaphragm—8351660
9—Thrust washer—6771864
10—Seal ring (2)—8351397
11—Converter-to-transmission housing gasket—8351283
12—Hexagon-head cap screw (4)—96906-35295-114
13—Lock washer (4)—96906-35338-10
14—Hexagon-head, self-locking bolt (2)—9409065
15—Flat washer (2)—96906-15795-10
16—Transmission housing assembly—8351359
17—Transmission housing—8351299
18—Plug—8350829
19—Plug—444680
20—Dowel pin—141262
21—Plug—444680
22—Dowel pin—141191
23—Dowel pin—141262
24—Dowel pin—141275
25—Plug—444618
26—Plug (3)—444660
27—Plug—444606
28—Sleeve—8348265
29—Sleeve—8350522
30—Plug (2)—444618
31—Plug—444660
32—Plug (2)—444612
33—Gage rod cap—8351686
34—Oil filler tube screen assembly—8351861
35—Seal—7708123
36—Hexagon-head cap screw (4)—96906-35295-60
37—Lock washer (4)—96906-35338-8
38—Tube assembly—8351862
39—Gasket—8350176
40—Hexagon, self-locking nut—126023
41—Flat washer—8351303
42—Hexagon-head cap screw (2)—96906-35295-65
43—Hexagon, self-locking nut—126023
44—Flat washer—8351303
45—Lock washer (2)—96906-35338-8
46—Flat washer (2)—96906-15795-14
47—Preformed packing—7521420
48—Preformed packing—8350826
49—Accumulator gasket—8351551
50—Accumulator body—8351549
51—Lock washer (2)—96906-35338-8
52—Hexagon-head cap screw (2)—96906-35295-68
53—Lock washer (4)—96906-35338-8
54—Hexagon-head cap screw (4)—96906-35295-64
55—Ball bearing—10910987
56—Internal-splined clutch plate (5)—6771533
57—External-splined clutch plate (4)—6771858
58—High-range clutch sleeve—8351608
59—Clutch reaction plate—6772339
60—Retaining ring—8351569
61—Intermediate-range sun gear—8351570
62—Low-range sun gear—6772326
63—Retaining ring—8348837
64—Retaining ring—7710277
65—Spring retainer—6772320
66—Piston return spring (13)—7708973
67—High-range clutch piston assembly—8351645
68—High-range clutch piston—8351542
69—Ball (4)—145639
70—Seal ring—8348849
71—Seal ring expander—8351913
72—Seal ring—8351901
73—High-range clutch housing assembly—8351629
74—Roller bearing—10900542
75—Retaining ring—96906-16625-300
76—Pitot tube assembly—6758766
77—Diaphragm clamp plate—8351661
78—Drive screw (4)—142862
79—Name plate—7767270
80—Lock washer—96906-35338-12
81—Hexagon-head cap screw—96906-35295-164
82—Hexagon-head, self-locking bolt—7748645
83—Lock plate—8351659
84—Magnetic drain plug—7376357
85—Gasket—96906-35769-21
86—Lock washer (33)—96906-35338-9
87—Hexagon-head cap screw (55)—96906-35295-89
88—Lock washer (22)—96906-35338-9
89—Output coupling—8351600
90—Retaining ring—8351617
91—Oil seal—8351582
92—Ball bearing—10910986
93—Retaining ring—8351583
94—Gear steer spacer—8351572
95—Ball bearing—10910984
96—Geared steer bearing support—8351668
97—Hexagon-head, self-locking bolt—9409031
98—Hexagon-head, self-locking bolt (7)—9409030

Small lower case letters, in the exploded view at right, refer to repair and rebuild points of measurement for fits, clearances and wear limits. See Chapter 6.

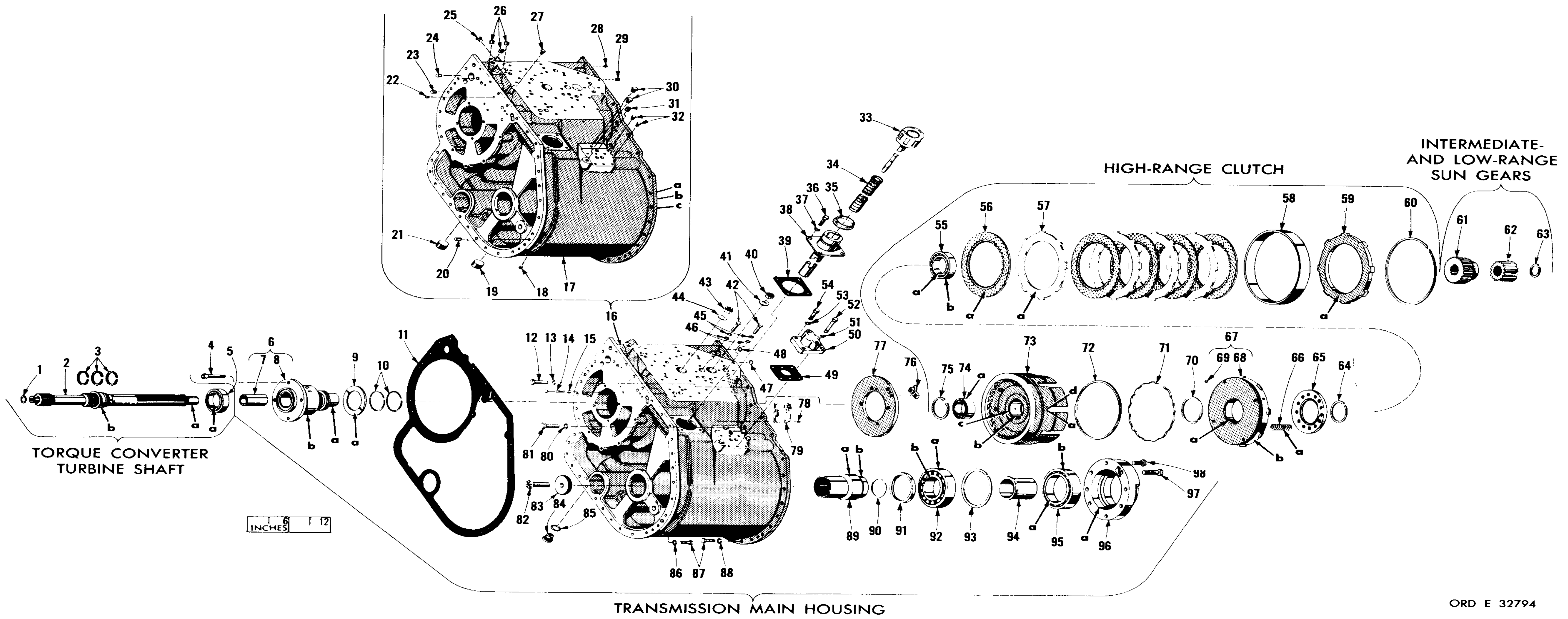

Figure 375. Fold-out 4 — Transmission housing assembly and related parts — exploded view

Addendum to Fold-out 4

For latest part numbers, refer to TM 9-2520-234-34P.

Changes to Figure 375 (fold-out 4) are as follows:

7– Deleted (not a serviceable subassembly)
8— Deleted (not a serviceable subassembly)
19— Deleted for later models
21— Deleted for later models
26– Change qty to (2) (see fig. 375.1)
26A– Change Pipe plug (see fig. 375.1)
30– Change qty to (3) (see fig. 375.1)
32— Change qty to (1) (see fig. 375.1)
34— Deleted for later models
49— Deleted for later models
50— Deleted for later models
51— Deleted for later models
52— Deleted for later models
53— Deleted for later models
54— Deleted for later models
57– Change qty to (4, XTG 411-2A; 5, XTG 411-4)
99— Add Spacer (5) (see fig. 375.1)
100– Add Lockwasher (5) (see fig. 375.1)
101— Add Hexagon Head Cap Screw,
7/16-14 UNC - 2A x 1-3/4 inch (5) (see fig. 375.1)

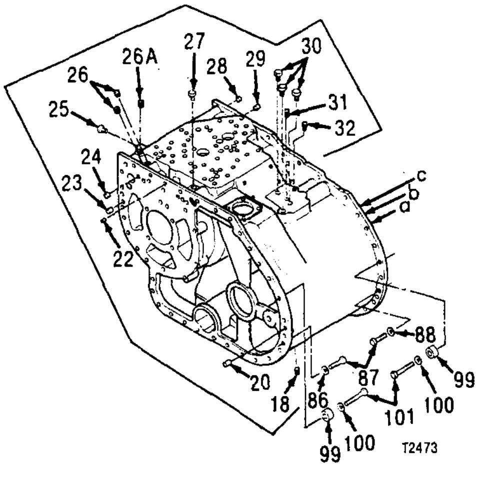

Figure 375.1. Addendum to Figure 375 (fold-out 4)

1—Oil collector—8351759
2—Anchor bolt—6771898
3—Intermediate-range clutch housing—8351684
4—Internal-splined clutch plate (4)—6771491
5—External-splined clutch plate (3)—6771489
6—Intermediate-range ring gear assembly—8351625
7—Clutch apply plate—8351545
8—Piston return spring—6771048
9—Intermediate-range clutch piston—6772349
10—Seal ring expander—8351912
11—Ring seal—8351900
12—Ring seal—8351904
13—Seal ring expander—8351915
14—Intermediate-range clutch piston housing—6772350
15—Retaining ring—8351599
16—Intermediate-range carrier assembly—8351630
17—Pin (4)—96906-35671-32
18—Intermidate-range carrier—8351547
19—Spindle (4)—6772436
20—Thrust washer (4)—6769475
21—Needle bearing spacer (4)—6769474
22—Pinion assembly (matched set)—8350384
23—Needle bearing roller (88)—7709958
24—Needle bearing spacer (4)—6769474
25—Thrust washer (4)—6769475
26—Low-range planetary shaft and carrier assembly—8351636
27—Low-range planetary shaft and carrier—8351555
28—Thrust washer (4)—6758707
29—Needle bearing spacer (4)—6768695
30—Pinion assembly (matched set)—8351632
31—Needle bearing roller (80)—7710642
32—Needle bearing spacer (4)—6768695
33—Thrust washer (4)—6758707
34—Spindle (4)—8351554
35—Sleeve bearing—6758897
36—Pin (4)—96906-35671-32
37—Thrust washer—8351610
38—Low-range ring gear—8351596
39—Reverse-range sun gear—8351552
40—Retaining ring—8351599
41—Thrust washer—8348813
42—Spacer—8351760
43—Anchor bolt—6771898
44—Low-range clutch housing—8351709
45—Internal-splined clutch plate (4)—6771491
46—External-splined clutch plate (4)—6771489
47—Retaining ring—8351621
48—Spring retainer—8351536
49—Piston return spring (18)—8351508
50—Low-range clutch piston—8351535
51—Seal ring expander—8351912
52—Ring seal—8351900
53—Ring seal—8351899
54—Seal ring expander—8351911
55—Low- and reverse-range clutch piston housing—8351537
56—Seal ring expander—8351911
57—Ring seal—8351899
58—Ring seal—8351900
59—Seal ring expander—8351912
60—Reverse-range clutch piston—8351535
61—Piston return spring (18)—8351508
62—Spring retainer—8351536
63—Retaining ring—8351621

Small lower case letters, in the exploded view at right, refer to repair and rebuild points of measurement for fits, clearances and wear limits. See Chapter 6.

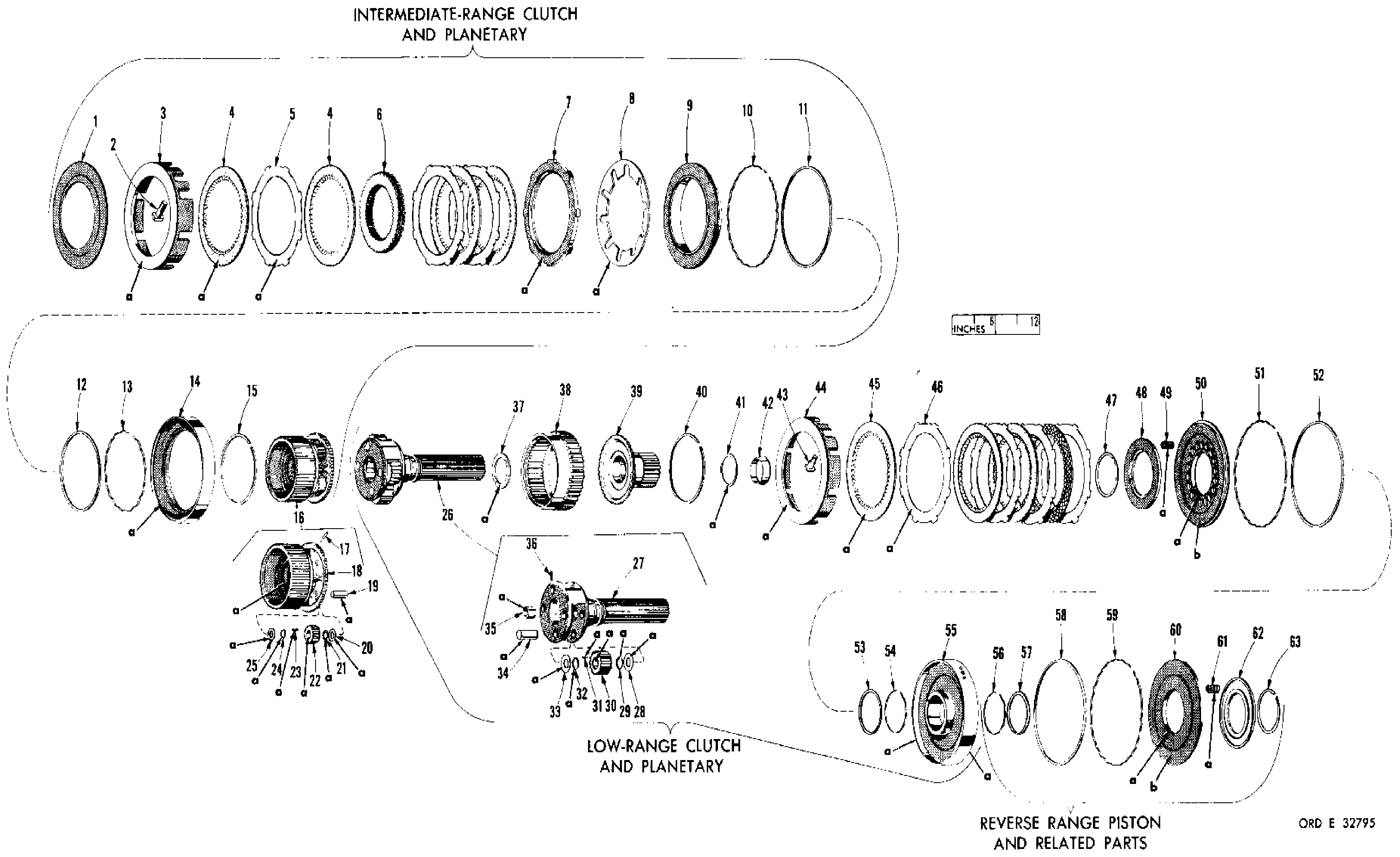

Figure 376. Fold-out 5 — Intermediate- and low-range clutches and planetaries — exploded view

Addendum to Fold-out 5

For latest part numbers, refer to TM 9-2520-234-34P.

Changes to Figure 376 (fold-out 5) are as follows:

21— Earlier models only
22— Earlier models only
23— Earlier models only
24— Earlier models only
64- Add Pinion assembly (matched set of 4) (later models) (see fig. 376.1)
65– Add Roller bearing assembly (4) (later models) (see fig. 376.1)

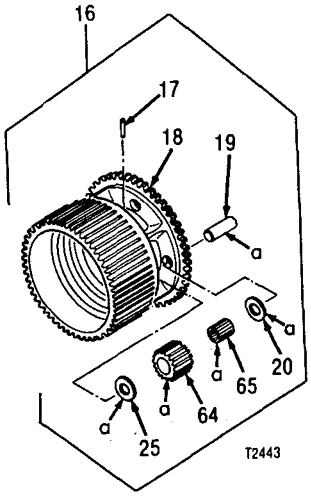

Figure 376.1. Addendum to Figure 376 (fold-out 5)

1—External-splined clutch plate (3)—6771489
2—Internal-splined clutch plate (3)—6771491
3—External-splined clutch plate—6771489
4—Reverse-range ring gear assembly—8351643
5—Internal-splined clutch plate—6771491
6—Reverse-range carrier assembly—8351465
7—Spindle (6)—6770963
8—Thrust washer (6)—6769475
9—Needle bearing spacer (6)—6769474
10—Needle bearing roller (132)—8351462
11—Needle bearing spacer (6)—6769474
12—Needle bearing roller (132)—8351462
13—Needle bearing spacer (6)—6769474
14—Pinion assembly (matched set)—8351464
15—Thrust washer (6)—6769475
16—Pin (6)—96906-35671-32
17—Reverse-range carrier—8351459
18—Reverse-range carrier support—8351543
19—Slotted, round-head screw (2)—114707
20—Ball bearing—10910985
21—Retaining ring—7708877
22—Spacer—8351611
23—Hexagon-head, self-locking bolt (5)—9409029
24—Drive gear bearing support—8351558
25—Roller bearing—8351879
26—Output transfer drive gear—8351601
27—Roller bearing—8351879
28—Drive gear bearing support—8351558
29—Hexagon-head, self-locking bolt (5)—9409029
30—Spacer—8351612
31—Brake coolant pump drive gear—8351622
32—Lock plate—8351609
33—Hexagon-head, self-locking bolt—7748645
34—Seal ring (2)—8351602
35—Output clutch plate and hub assembly—8351593
36—Seal ring expander—8351911
37—Ring seal—8351899
38—Ring seal—8351894
39—Seal ring expander—8351906
40—Output clutch piston assembly—8351673
41—Clutch piston—8351553
42—Pin (2)—141246
43—Spring retainer—8351588
44—Piston return spring (18)—8351580
45—Retaining ring—8351581
46—Output clutch hub—8351576
47—Internal-splined clutch plate (7)—8351531
48—External-splined clutch plate (7)—8349941
49—Retaining ring—7709185
50—Ball bearing—8351883
51—Preformed packing—7710027
52—Sun gear assembly—8351584
53—Retainer (3)—7709993
54—Lock plate (6)—8349783
55—Hexagon-head bolt (12)—96906-35296-31
56—Piston ring (2)—8351603
57—Ring seal—8351896
58—Seal ring expander—8351908
59—Ring seal—8351897
60—Seal ring expander—8351909
61—Geared steer clutch piston—8351546
62—External-splined clutch plate (7)—7709353
63—Internal-splined clutch disk (6)—8351184
64—Piston return spring (9)—8351666
65—Geared steer anchor—8351550
66—Steer clutch reaction plate assembly—8351698
67—Clutch reaction plate—8351688
68—Plug (2)—7709399
69—Dowel pin (2)—141380
70—Preformed packing (2)—7374263
71—Sleeve—8351577
72—Hexagon head, self-locking bolt (3)—9409011
73—Retaining ring (9)—96906-16632-31
74—Brake anchor ring—8351687
75—Hexagon-head cap screw (2)—7748676
76—Hexagon-head bolt (16)—8351646
77—Piston return spring (9)—8351503
78—Pin (9)—8351681

Small lower case letters, in the exploded view at right, refer to repair and rebuild points of measurement for fits, clearances and wear limits. See Chapter 6.

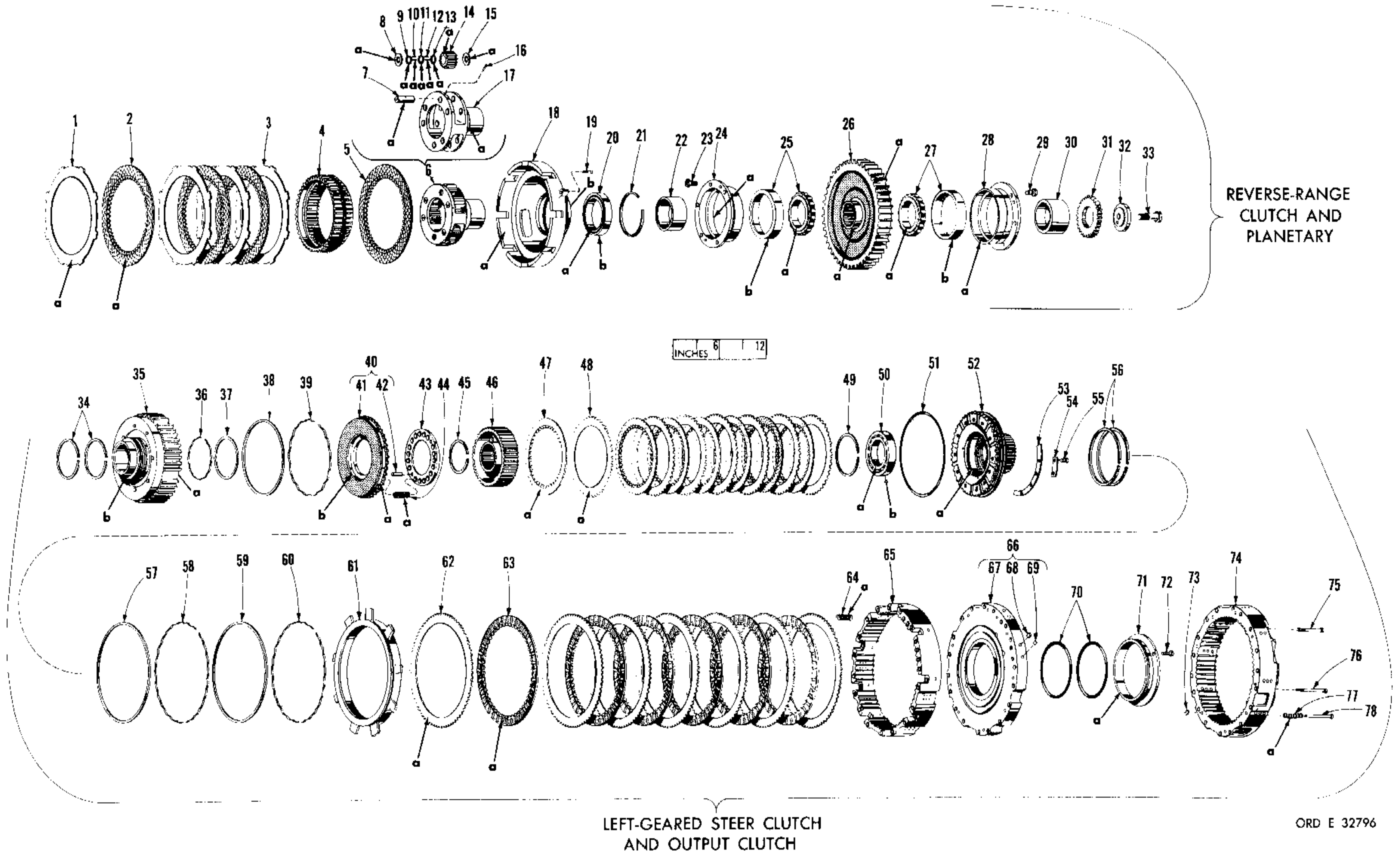

Figure 377. Fold-out 6 — Reverse-range clutch and planetary; left steer and output clutches exploded view

Addendum to Fold-out 6

For latest part numbers, refer to TM 9-2520-234-34P.

Changes to Figure 377 (fold-out 6) are as follows:

11— Not used in later models. Note that only two spacers are used per pinion in this planetary in later models (see fig. 377.1)
12— Not used in later models. Note that there are 22 needle bearing rollers per pinion in this planetary in later models (see fig. 377.1)
67— Deleted (not a serviceable subassembly)
68— Deleted (not a serviceable subassembly)
9— Deleted (not a serviceable subassembly)

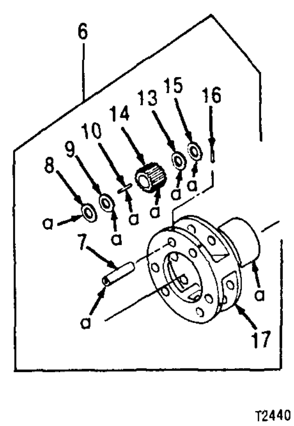

Figure 377.1. Addendum to Figure 377 (fold-out 6)

1—Retaining ring—8348801
2—Shaft and carrier assembly—8351592
3—Carrier assembly—8351595
4—Thrust washer (4)—6758828
5—Needle bearing spacer (4)—6769473
6—Pinion assembly (matched set)—8351589
7—Needle bearing roller (100)—7709958
8—Needle bearing spacer (4)—6769473
9—Thrust washer (4)—6758828
10—Pin (4)—96906-35671-32
11—Spindle (4)—6758742
12—Thrust washer—8351579
13—Retaining ring—8351626
14—Gear—8351594
15—Brake hub—8351587
16—Ball bearing—8351885
17—External-splined clutch (brake) plate (10)—8349197
18—Internal-splined clutch (brake) disk (10)—8351184
19—Left-brake apply cam rotating ring—8351560
20—Brake adjusting nut—7710134
21—Adjusting nut ratchet—7710137
22—Spring—7707994
23—Flat washer—96906-15795-14
24—Pin—8348316
25—Seal ring expander—8351907
26—Ring seal—8351895
27—Ball (12)—147499
28—Left-brake apply cam stationary ring—8351562
29—Flat washer (2)—96906-15795-14
30—Hexagon-head, self-locking bolt (2)—9409038
31—Seal ring expander—8351910
32—Ring seal—8351898
33—Hexagon-head, self-locking bolt (5)—9409029
34—Steer clutch support—8351557
35—Roller bearing assembly—8351879

Small lower case letters, in the exploded view at right, refer to repair and rebuild points of measurement for fits, clearances and wear limits. See Chapter 6.

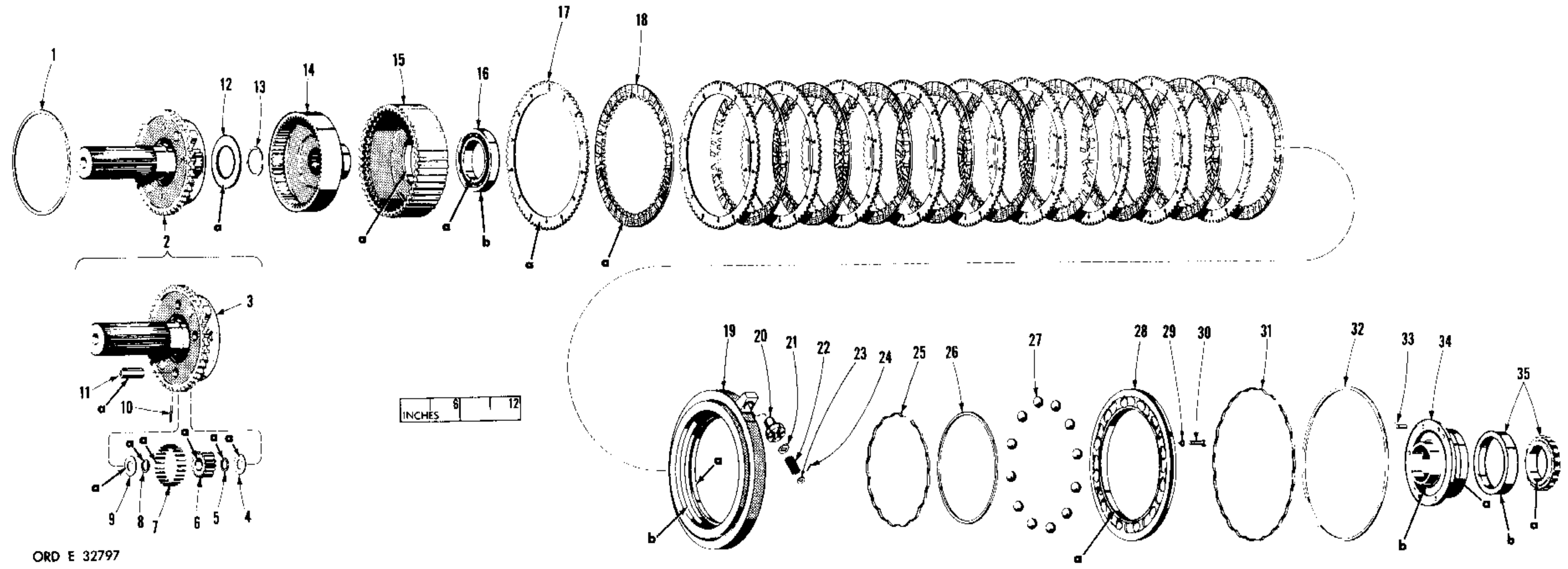

Figure 378. Fold-out 7 — Left-steer planetary, and brake — exploded view

Addendum to Fold-out 7

For latest part numbers, refer to TM 9-2520-234-34P.

There are no changes to Figure 378 (fold-out 7).

1—Plug—444626
2—Shaft—8349574
3—Cam follower link—8351619
4—Flat washer—8349701
5—Needle bearing roller (26)—8349809
6—Cam follower—8349811
7—Flat washer—8349701
8—Pin—8351670
9—Pin—8351669
10—Brake apply link assembly—8349613
11—Brake apply link—8349601
12—Bearing—7710091
13—Retaining ring—96906-16624-50
14—Retaining ring—96906-16624-68
15—Housing gasket—8351711
16—Shim (AR)—7710070
17—Shim (AR)—7710071
18—Shim (AR)—8351530
19—Annular gasket—96906-35769-21
20—Magnetic drain plug—7376357
21—Transmission rear-housing assembly—8351305
22—Plug (4)—444660
23—Insert (2)—96906-35914-14
24—Pin (4)—187464
25—Transmission rear housing—8351198
26—Sleeve (2)—8348827
27—Plug—444680
28—Flat washer (2)—96906-15795-20
29—Hexagon-head, self-locking bolt (2)—7532486
30—Flat washer—96906-15795-18
31—Hexagon-head cap screw—96906-35295-123
32—Lock washer (4)—96906-35338-10
33—Hexagon-head cap screw (4)—96906-35295-118
34—Flat washer (3)—96906-15795-18
35—Hexagon-head, self-locking bolt (3)—8575776
36—Left-air valve plate assembly—8349599
37—Retaining ring—587895
38—Flat washer—446187
39—Left-air valve spring—8349597
40—Air valve bracket—8349594
41—Hexagon-head, self-locking bolt (2)—9409030
42—Right-air valve spring—8349596
43—Right-air valve plate assembly—8349600
44—Flat washer—446187
45—Air valve plate pin—7710128
46—Retaining ring—587895
47—Hexagon-head, self-locking bolt (4)—9409028
48—Drive gear baffle—8351682
49—Output transfer driven gear—8351598
50—End cover gasket—8351677
51—Idler shaft—8351707
52—Retaining ring—8348139
53—Brake coolant pump idler gear—8348727
54—Ball bearing—8351881
55—Retaining ring—8348139
56—Retaining ring—96906-16624-118
57—Hexagon-head cap screw—96906-35295-71
58—Pin—8351669
59—Pin—8351670
60—Cam follower link—8351619
61—Flat washer—8349701
62—Cam follower—8349811
63—Needle bearing roller (26)—8349809
64—Flat washer—8349701
65—Shaft—8349574
66—Plug—444660
67—Retaining ring—96906-16624-68
68—Retaining ring—96906-16624-50
69—Brake apply link assembly—8349613
70—Bearing—7710091
71—Brake apply link—8349601
72—Cage assembly—7710811
73—Cage—7710138
74—Bearing—6751189
75—Left-brake apply cam assembly—8351680
76—Left-brake cam spring—8349602
77—Center-support spindle assembly—8348949
78—Bearing—709435
79—Center-support spindle—8348921
80—Bearing—709474
81—Set screw—139798
82—Right-brake cam spring—8349603
83—Right-brake apply cam assembly—8351679
84—Left-brake apply shaft—7710101
85—Lock washer (3)—96906-35338-8
86—Hexagon-head cap screw (3)—96906-35295-66
87—Brake apply shaft bearing retainer assembly—7710145
88—Seal—7710085
89—Retainer—7710135
90—Bearing—712030
91—Gasket—8351675
92—Washer—7710072
93—Retaining ring—7709192
94—Right-brake apply shaft assembly—7710122
95—Seal—7710078
96—Bearing—709432
97—Right-brake apply shaft—7710088
98—Spacer—8348862
99—Retaining ring—7768006
100—Hexagon-head cap screw (6)—96906-35295-61
101—Lock washer (6)—96906-35338-8
102—Inspection cover—7710683
103—Inspection cover gasket—7710684
104—Hexagon-head cap screw (6)—96906-35295-61
105—Lock washer (6)—96906-35338-8
106—Inspection cover—7710683
107—Inspection cover gasket—7710684

Small lower case letters, in the exploded view at right, refer to repair and rebuild points of measurement for fits, clearances and wear limits. See Chapter 6.

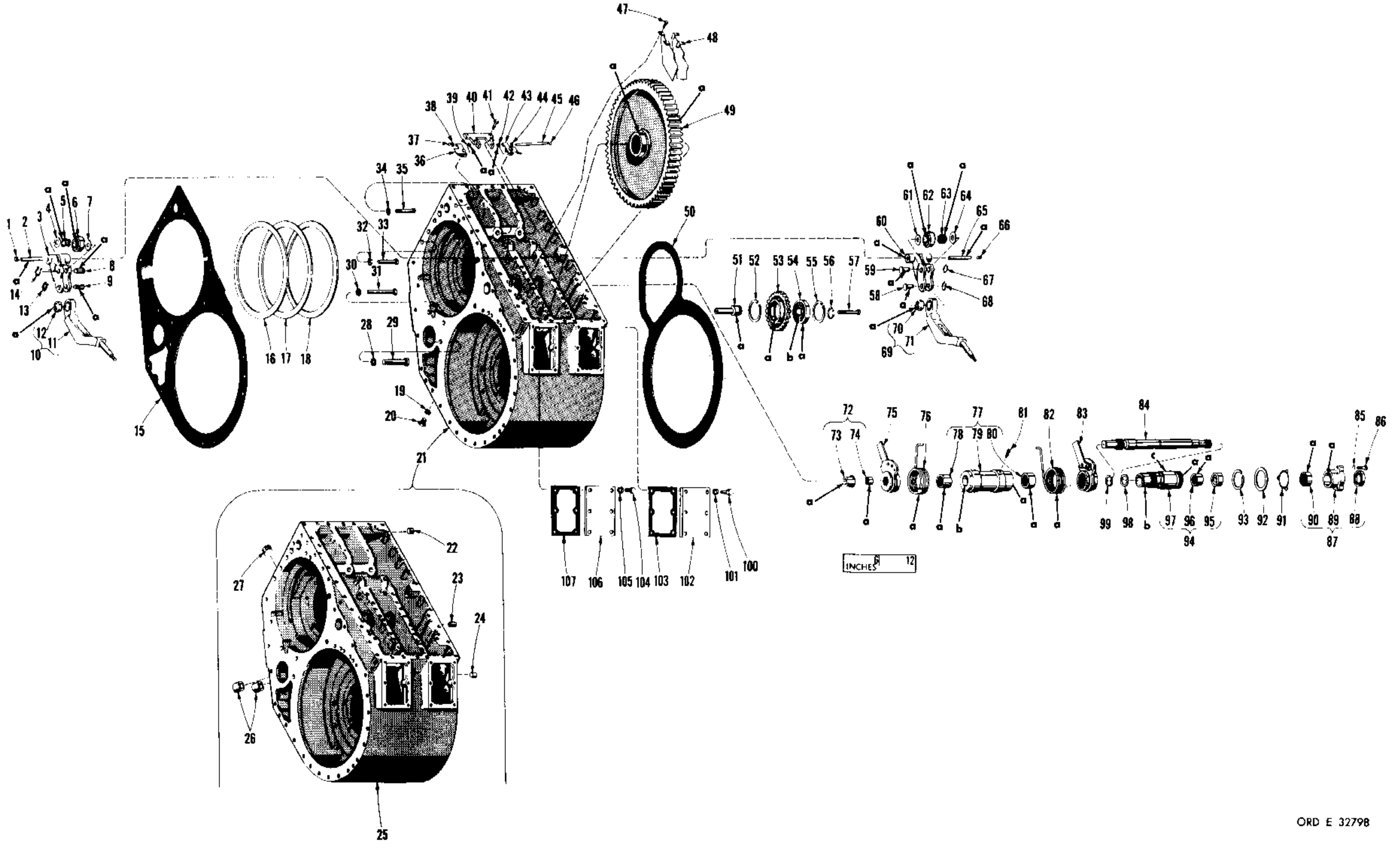

Figure 379. Fold-out 8 — Transmission rear housing and related parts — exploded view

Addendum to Fold-out 8

For latest part numbers, refer to TM 9-2520-234-34P.

Changes to Figure 379 (fold-out 8) are as follows:

22— Change qty to (1)
23— Deleted for later models
56— Deleted for later models
73— Deleted (not a serviceable subassembly)
74— Deleted (not a serviceable subassembly)

1—Roller bearing assembly—8351879
2—Steer clutch support—8351557
3—Hexagon-head, self-locking bolt (5)—9409029
4—Shaft—8351566
5—Ring seal—8351898
6—Seal ring expander—8351910
7—Hexagon-head, self-locking bolt (2)—9409038
8—Flat washer (2)—96906-15795-14
9—Right-brake apply stationary cam ring—8351563
10—Ball (12)—147499
11—Ring seal—8351895
12—Seal ring expander—8351907
13—Right-brake apply rotating cam ring—8351561
14—Brake adjusting nut—7710134
15—Adjusting nut ratchet—7710137
16—Spring—7707994
17—Flat washer—96906-15795-14
18—Pin—8348316
19—Internal-splined clutch (brake) disk (10)—8351184
20—External-splined clutch (brake) plate (10)—8349197
21—Ball bearing—8351885
22—Brake hub—8351587
23—Ring gear—8351594
24—Retaining ring—8351626
25—Thrust washer—8351579
26—Shaft and carrier assembly—8351592
27—Carrier assembly—8351595
28—Pin (4)—96906-35671-32
29—Thrust washer (4)—6758828
30—Spacer (4)—6769473
31—Pinion assembly (matched set)—8351589
32—Needle bearing roller (100)—7709958
33—Spacer (4)—6769473
34—Thrust washer (4)—6758828
35—Spindle (4)—6758742
36—Retaining ring—8348801

Small lower case letters, in the exploded view at right, refer to repair and rebuild points of measurement for fits, clearances and wear limits. See Chapter 6.

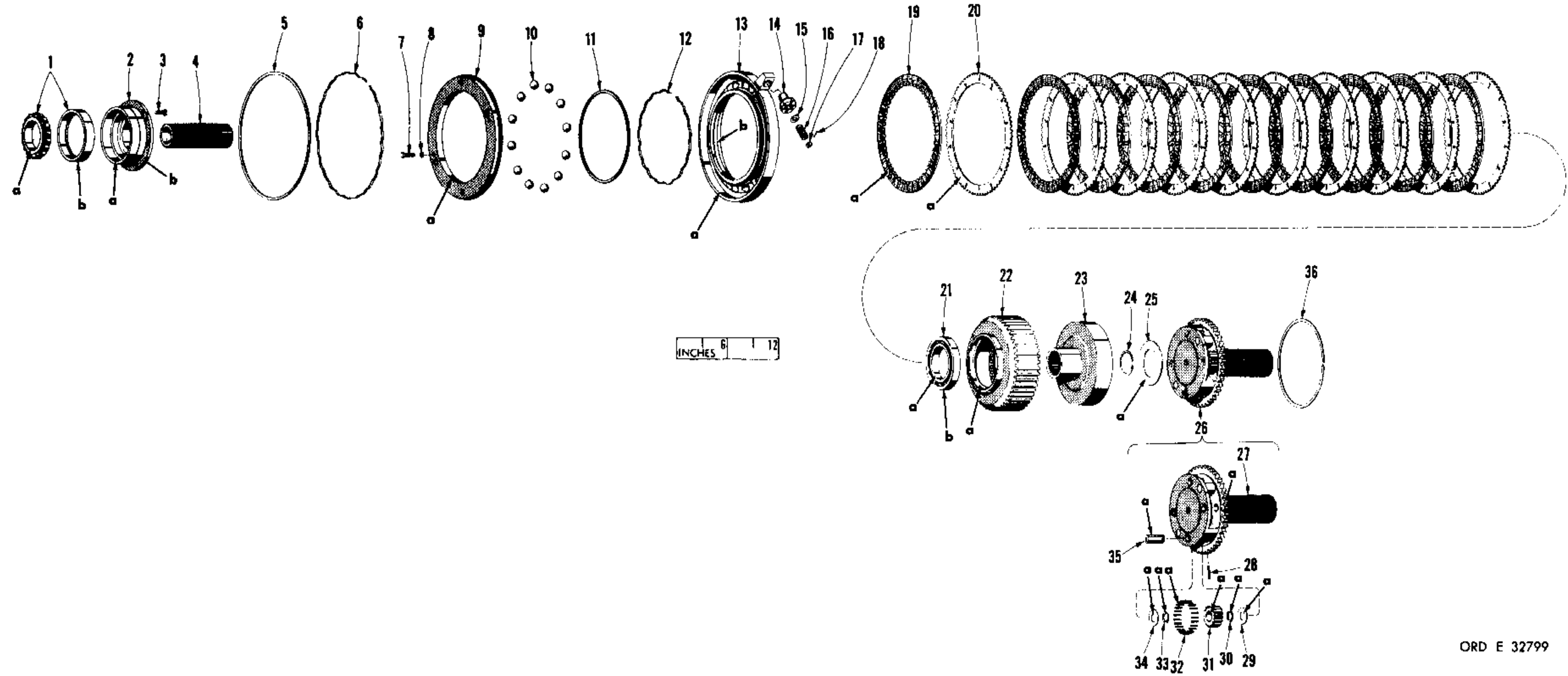

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Figure 380. Fold-out 9 — Right brake, and steer planetary — exploded view

Addendum to Fold-out 9

For latest part numbers, refer to TM 9-2520-234-34P.

There are no changes to Figure 380 (fold-out 9).

1—Pin (9)—8351681
2—Piston return spring (9)—8351503
3—Hexagon-head machine bolt (16)—8351646
4—Hexagon-head cap screw (2)—7748676
5—Brake anchor ring—8351687
6—Retaining ring (9)—96906-16632-31
7—Hexagon-head, self-locking bolt (3)—9409011
8—Sleeve—8351577
9—Preformed packing (2)—7374263
10—Steer clutch reaction plate assembly—8351698
11—Clutch reaction plate—8351688
12—Plug (2)—7709399
13—Dowel pin (2)—141380
14—Steer clutch anchor—8351550
15—External-splined clutch plate (7)—7709353
16—Internal-splined clutch disk (6)—8351184
17—Piston return spring (9)—8351666
18—Steer clutch piston—8351546
19—Seal ring expander—8351909
20—Ring seal—8351897
21—Seal ring expander—8351908
22—Ring seal—8351896
23—Piston ring (2)—8351603
24—Hexagon-head cap screw (12)—96906-35296-31
25—Locking plate (6)—8349783
26—Retainer (3)—7709993
27—Sun gear assembly—8351584
28—Preformed packing—7710027
29—Ball bearing—8351883
30—Retaining ring—7709185
31—External-splined clutch plate (7)—8349941
32—Internal-splined clutch plate (7)—8351531
33—Output clutch hub—8351576
34—Retaining ring—8351581
35—Spring retainer—8351588
36—Piston return spring (18)—8351580
37—Output clutch piston assembly—8351673
38—Pin (2)—141246
39—Clutch piston—8351553
40—Seal ring expander—8351906
41—Ring seal—8351894
42—Ring seal—8351899
43—Seal ring expander—8351911
44—Output clutch plate and hub assembly—8351593
45—Piston ring (2)—8351602
46—End-cover assembly—8351930
47—Dowel pin (2)—141262
48—End cover—8351928
49—Plug (2)—444612
50—Plug (2)—444691
51—Lock washer (4)—96906-35338-8
52—Hexagon-head cap screw (4)—96906-35295-64
53—Hexagon-head cap screw (2)—96906-35295-68
54—Lock washer (2)—96906-35338-8
55—Accumulator body—8351549
56—Accumulator body gasket—8351551
57—Lock washer (4)—96906-35338-9
58—Hexagon-head machine bolt (4)—8351646
59—Preformed packing—8347821
60—Gasket—8351929
61—Sleeve—8351925
62—Hexagon-head, self-locking bolt (8)—9409028
63—Hexagon-head cap screw (3)—96906-35295-90
64—Lock washer (3)—96906-35338-9
65—Lifter bracket—8348817
66—Hexagon-head cap screw (27)—96906-35295-89
67—Lock washer (27)—96906-35338-9
68—Spacer—8351572
69—Gasket—8351676
70—Ball bearing—10910984
71—Retaining ring—8351583
72—Ball bearing—10910986
73—End cover hub—8351927
74—Lock washer (19)—96906-35338-9
75—Hexagon-head cap screw (19)—96906-35295-89
76—Preformed packing (2)—8351031
77—Oil seal—-8351582
78—Output coupling—8351567
79—Coupling retainer—8351568
80—Coupling nut—8351573
81—Lock plate—8351609
82—Hexagon-head, self-locking bolt—7748645

Small lower case letters, in the exploded view at right, refer to repair and rebuild points of measurement for fits, clearances and wear limits. See Chapter 6.

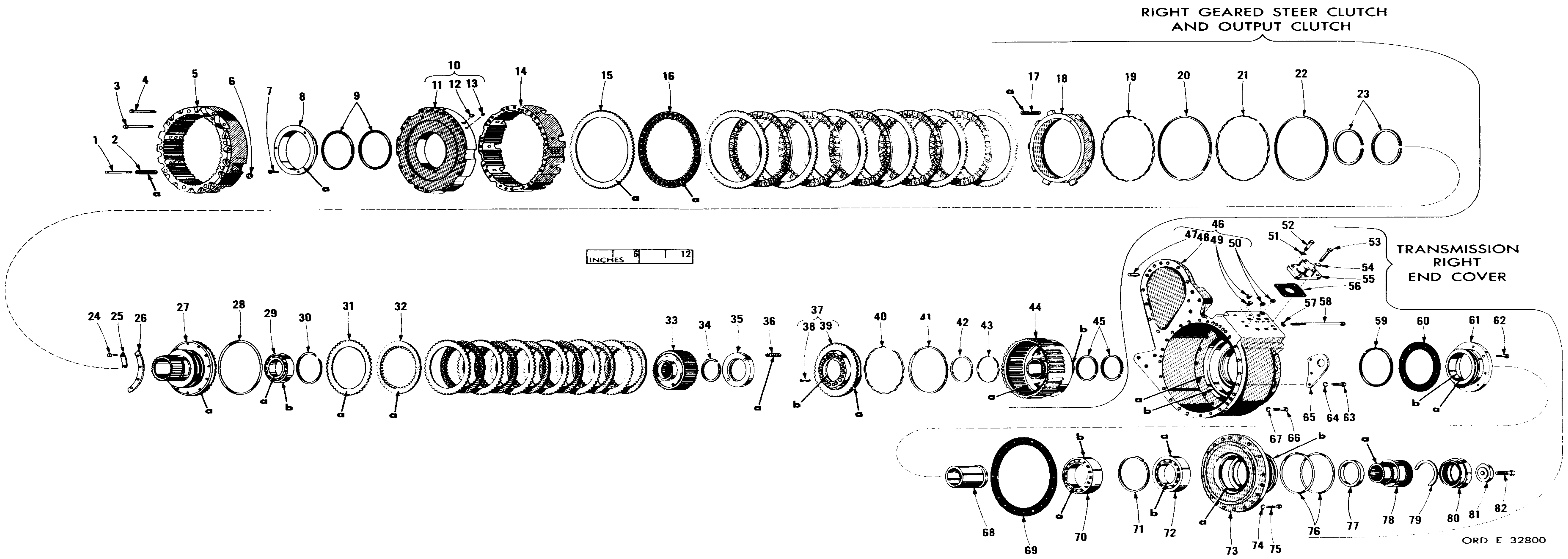

Figure 381. Fold-out 10 — Right-steer clutch, output clutch and end cover — exploded view

Addendum to Fold-out 10

For latest part numbers, refer to TM 9-2520-234-34P.

Changes to Figure 381 (fold-out 10) are as follows:

11— Deleted (not a serviceable subassembly)
12— Deleted (not a serviceable subassembly)
13— Deleted (not a serviceable subassembly)
47— Not serviceable
49, 50— In later models, all four plugs are the same part number
51— Deleted for later models
52–– Deleted for later models
53— Deleted for later models
54–– Deleted for later models
55— Deleted for later models
56–– Deleted for later models
78— Deleted for later models
79–– Deleted for later models
80— Deleted for later models

FIGURE 382 (fold-out 11)

1—Lock washer (2)—96906-35338-8
2—Hexagon-head cap screw—450517
3—Hexagon-head bolt—8351710
4—Hexagon-head cap screw (13)—96906-35295-72
5—Lock washer (13)—96906-35338-8
6—Steer valve body gasket—8351298
7—Steer valve body assembly—8351304
8—Hexagon-head cap screw (8)—96906-35295-62
9—Lock washer (8)—96906-35338-8
10—Steer valve cover—8351296
11—Valve cover gasket—8351301
12—Outer spring—8351652
13—Inner spring—8351651
14—Steer pressure regulator valve assembly—8351585
15—Steer pressure regulator valve—8351649
16—Ball—145639
17—Spring—8351525
18—Retainer—6757428
19—Needle bearing assembly—709514
20—Preformed packing—8347819
21—Steer indicator—8349548
22—Retaining ring—8349231
23—Retaining ring—8349231
24—Seal—8349474
25—Steer valve stem—8349410
26—Steer regulator valve—8351644
27—External spring—8349424
28—Internal spring—8349386
29—Steer valve—8351501
30—Self-locking nut—7708035
31—Steer valve cover plug—8351674
32—Steer valve cover plug—8351674
33—Self-locking nut—7708035
34—Steer valve—8351501
35—Internal spring—8349386
36—External spring—8349424
37—Steer regulator valve—8351644
38—Steer valve stem—8349410
39—Seal—8349474
40—Steer valve body—8351285
41—Detent guide tube—8349550
42—Detent spring—6756907
43—Detent ball—453612
44—Needle bearing—709514
45—Steer shaft assembly—8349553
46—Relay valve body gasket—8351696
47—Lock washer (9)—96906-35338-8
48—Hexagon-head cap screw (9)—96906-35295-71
49—Lock washer (5)—96906-35338-8
50—Hexagon-head cap screw (5)—96906-35295-76
51—Lock washer—96906-35338-8
52—Hexagon-head cap screw—96906-35295-68
53—Hexagon-head cap screw (9)—96906-35295-69
54—Lock washer (9)—96906-35338-8
55—Hexagon-head cap screw (4)—96906-35295-74
56—Lock washer (4)—96906-35338-8
57—Relay valve body assembly—8351694
58—Hexagon-head cap screw (3)—96906-35295-35
59—Lock washer (3)—96906-35338-7
60—Valve cover assembly—8351938
61—Valve cover—8351690
62—Pin—141107
63—Cover gasket—8351691
64—Steer clutch relay valve—8351605
65—Steer clutch relay valve—8351605
66—Spring—8349545
67—Cover gasket—8351691
68—Valve cover—8351689
69—Lock washer (3)—96906-35338-7
70—Hexagon-head cap screw (3)—96906-35295-35
71—Plug—444618
72—Plug (2)—444612
73—Relay valve body—8351699
74—Pin—141281
75—Spring—8349545
76—Drive clutch relay valve—8351605
77—Annular gasket—96906-35769-21
78—Plug—7709239
79—Oil transfer plate—8351295
80—Lock washer (5)—96906-35338-8
81—Hexagon-head cap screw (5)—179844
82—Plug (2)—444612
83—Ball (2)—7710550
84—Lock washer (4)—96906-35338-8
85—Hexagon-head cap screw (4)—96906-35295-68
86—Lock washer (2)—96906-35338-8
87—Hexagon-head cap screw (2)—96906-35295-61
88—Hexagon-head cap screw (8)—96906-35295-70
89—Lock washer (8)—96906-35338-8
90—Oil transfer plate gasket—8351297
91—Hexagon-head cap screw (18)—96906-35295-67
92—Hexagon-head cap screw (2)—96906-35295-63
93—Lock washer (20)—96906-35338-8
94—Top-cover plate assembly—8351697
95—Top-cover plate—8351701
96—Plug (7)—444654
97—Plug—444660
98—Brake cam stop (2)—8349576
99—Lock strip (2)—8349586
100—Hexagon-head cap screw (4)—96906-35295-62
101—Top-cover gasket—8351657

Small lower case letters, in the exploded view at right, refer to repair and rebuild points of measurement for fits, clearances and wear limits. See Chapter 6.

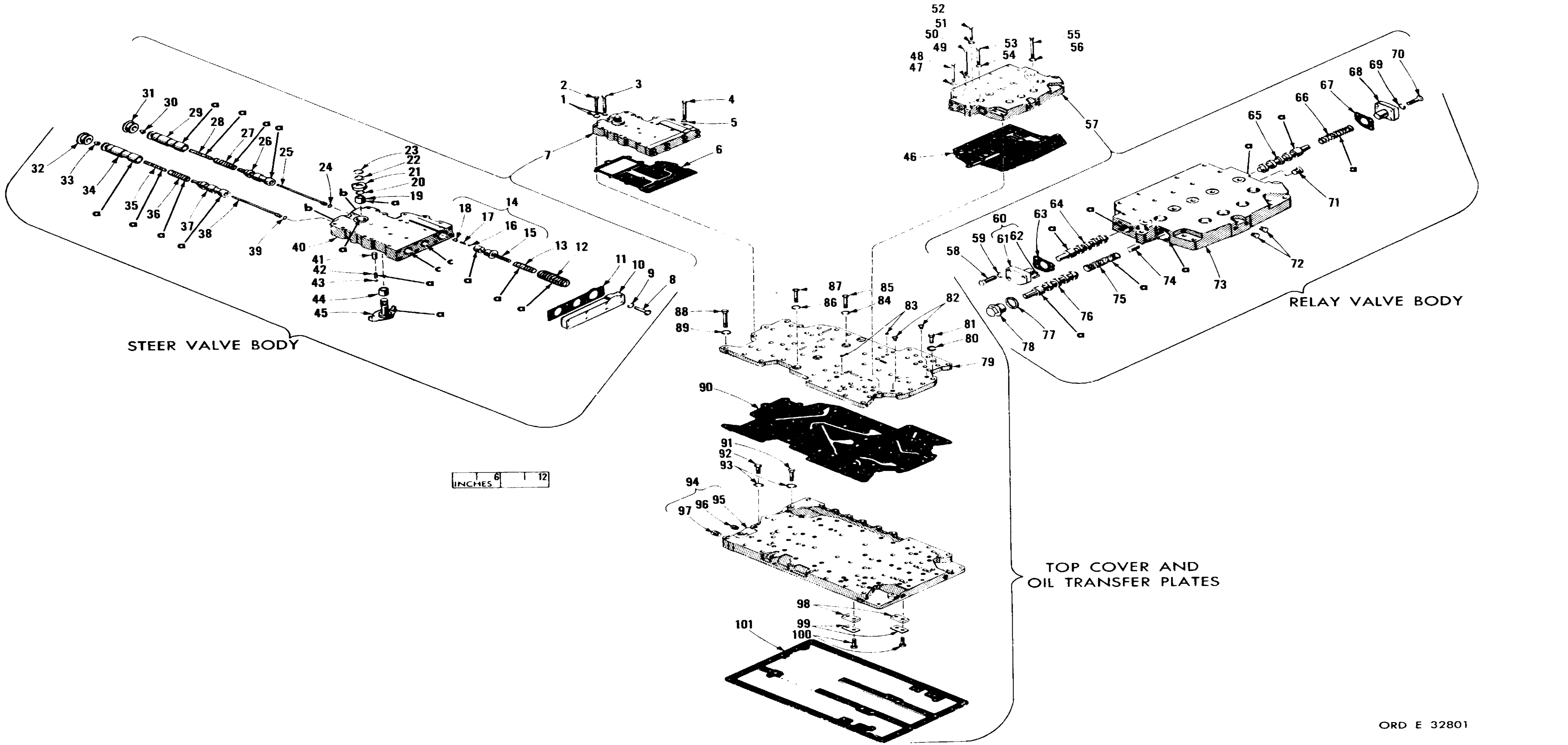

Figure 382. Fold-out 11 — Steer, and relay valve body assemblies — exploded view

Addendum to Fold-out 11

For latest part numbers, refer to TM 9-2520-234-34P.

Changes to Figure 382 (fold-out 11) are as follows:

15— Deleted (not a serviceable subassembly)
16— Deleted (not a serviceable subassembly)
17— Deleted (not a serviceable subassembly)
18– Deleted (not a serviceable subassembly)
61— Deleted (not a serviceable subassembly)
62— Deleted (not a serviceable subassembly)

1—Hexagon-head bolt (18)—96906-35295-45
2—Top plate gasket—8351638
3—Oil transfer plate—8351272
4—Bottom plate gasket—8351279
5—Regulator and lockup shift valve body assembly —8351654
6—Retaining ring—96906-16625-3137
7—Valve retainer plug—7710801
8—Seal ring—7710908
9—Lubrication regulator valve—7710781
10—Lubrication regulator valve spring—7710797
11—Plug—444612
12—Valve body—8351544
13—High-range knockdown plug—8351512
14—Main-pressure regulator valve assembly—8351656
15—Plug—8351513
16—Spring—7707853
17—Ball—96906-134354
18—Main-pressure regulator valve—8351614
19—Main-pressure regulator valve plug—8351631
20—Inner spring—8351624
21—Outer spring—8351623
22—Valve cover gasket—8351628
23—Valve cover assembly—8351658
24—Sleeve—8351637
25—Valve cover—8351559
26—Lockup shift valve—8351511
27—Spring—8351692
28—Lock washer (6)—96906-35338-7
29—Hexagon-head bolt (6)—96906-35295-38
30—Oil transfer plate gasket—8351695
31—Lock washer (4)—96906-35338-7
32—Hexagon-head bolt (4)—96906-35295-38
33—Control valve gasket—8351653
34—Lock washer (6)—96906-35338-7
35—Hexagon-head bolt (6)—96906-35295-42
36—Hexagon-head bolt (22)—96906-35295-45
37—Lock washer (22)—96906-35338-7
38—Hexagon-head, self-locking bolt (4)—9409013
39—Flat washer (4)—96906-15795-12
40—Oil transfer plate assembly—8351700
41—Check valve—5636119
42—Plug—444564
43—Oil transfer plate—8351703
44—Control valve assembly—8351693
45—Hexagon-head, self-locking bolt—7748677
46—Flat washer—96906-15795-12
47—Retaining ring—7767532
48—Retaining ring—96906-16632-87
49—Shift indicator—8351522
50—Spacer—7376763
51—Preformed packing—7374401
52—Control valve body assembly—8351704
53—Needle bearing assembly—709467
54—Control valve body—8351702
55—Needle bearing assembly—709467
56—Selector shaft assembly—8351520
57—Seal ring—7767758
58—Throttle valve shaft assembly—8351523
59—Detent ball—96906-134361
60—Detent spring—8351534
61—Throttle valve—8351519
62—Throttle valve spring—8351528
63—Throttle regulator valve assembly—8351514
64—Throttle regulator valve—8351509
65—Ball—145639
66—Spring—8351525
67—Retainer—6757428
68—Throttle regulator valve spring—8351527
69—Lock washer (7)—96906-35338-7
70—Hexagon-head bolt (7)—96906-35295-35
71—Hexagon-head bolt (2)—179823
72—Lock washer (2)—96906-35338-7
73—Valve body cover—8351515
74—Cover gasket—8351518
75—Selector valve assembly—8351505
76—Shift inhibitor valve—8351526
77—Retaining ring—8344147
78—Shift inhibitor spring—8349035
79—Inhibitor plunger—8351517
80—Lockup cutoff valve—8351524
81—Plug (9)—444612

Small lower case letters, in the exploded view at right, refer to repair and rebuild points of measurement for fits, clearances and wear limits. See Chapter 6.

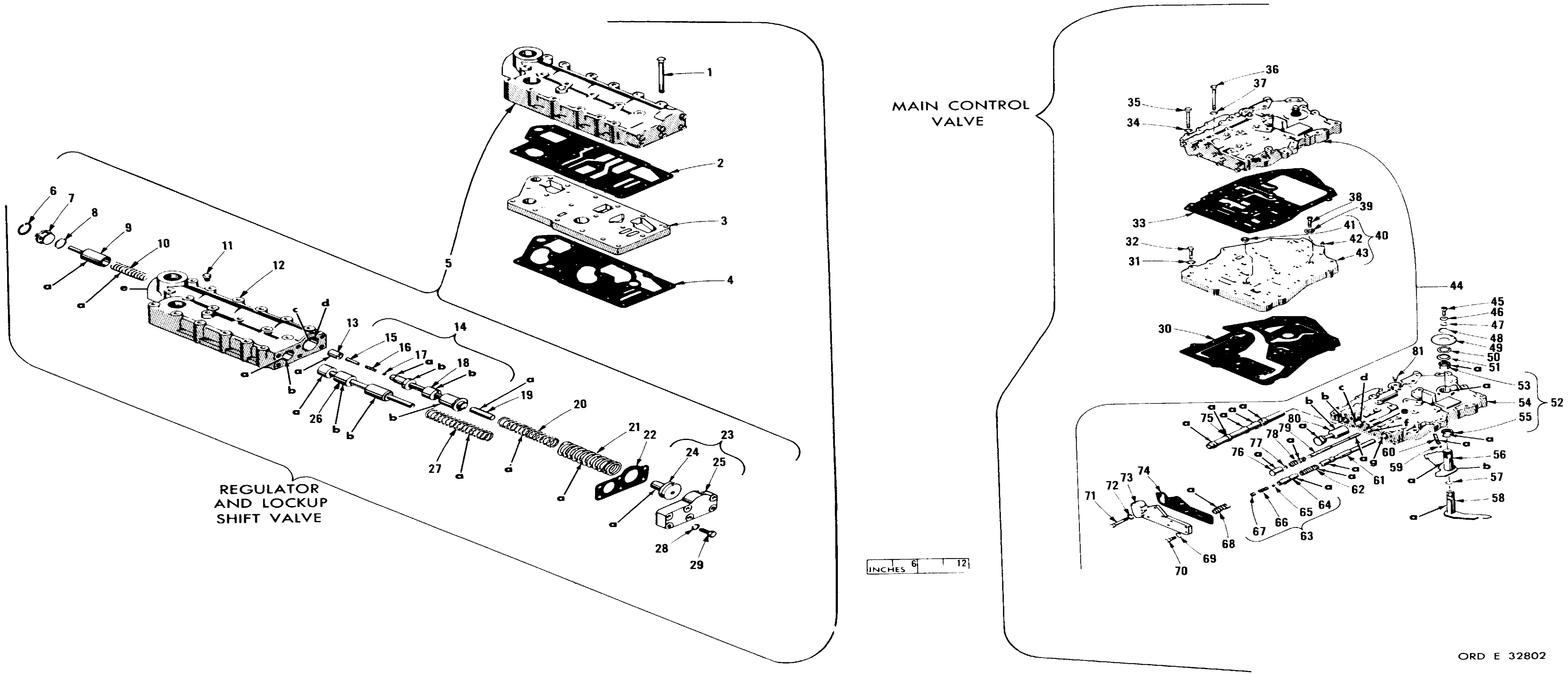

Figure 383. Fold-out 12 — Main-pressure regulator and lockup shift, and control valve body assemblies — exploded view

Addendum to Fold-out 12

For latest part numbers, refer to TM 9-2520-234-34P.

Changes to Figure 383 (fold-out 12) are as follows:

15— Deleted (not a serviceable subassembly)
16— Deleted (not a serviceable subassembly)
17— Deleted (not a serviceable subassembly)
18— Deleted (not a serviceable subassembly)
24— Deleted (not a serviceable subassembly)
25— Deleted (not a serviceable subassembly)
41— Deleted for later models
64— Deleted (not a serviceable subassembly)
65— Deleted (not a serviceable subassembly)
66— Deleted (not a serviceable subassembly)
67— Deleted (not a serviceable subassembly)

FIGURE 384 (fold-out 13)

1—Hexagon-head, self-locking bolts (4) —9409031
2—Snap ring—7708032
3—Roller—8348540
4—Pump drive gear—8351604
5—Output pressure pump assembly—8351672
6—Pump body assembly—8351650
7—Needle roller bearing—709414
8—Pump body—8351642
9—Ball—453606
10—Shaft—7710734
11—Oil pump drive gear—8351671
12—Oil pump idler gear assembly—8347878
13—Needle roller bearing—713822
14—Oil pump idler gear—8347877
15—Round-head screw (2)—113956
16—Pump cover assembly—8351641
17—Needle roller bearing—709414
18—Pin—443767
19—Pump cover—8351634
20—Brake coolant pump assembly—8351507
21—Pump idler gear—7709985
22—Idler gear shaft—7709994
23—Pump separator plate assembly—7710132
24—Pump separator plate—7709988
25—Needle roller bearing—709428
26—Pump idler gear—7709985
27—Hexagon-head, self-locking bolt (7) —9409012
28—Pump cover assembly—7710144
29—Needle roller bearing (2) —709488
30—Pump cover—7709989
31—Dowel pin (2) —443767
32—Pump body—8351506
33—Pump drive gear—7709986
34—Key—96906-35756-17
35—Retaining ring (2)—7710031
36—Pump separator plate assembly—7710132
37—Needle roller bearing—709428
38—Pump separator plate—7709988
39—Retaining ring (2)—7710031
40—Pump drive shaft—7709997
41—Key—96906-35756-17
42—Lock pin—141123
43—Pump drive gear—7709986
44—Pump cover assembly—7710148
45—Needle roller bearing (2) —709428
46—Dowel pin (2) —443767
47—Pump cover—7709991
48—Pump drive gear shroud—7710212
49—External-drive gear—7710141
50—Gear shroud plate—7710821
51—Hexagon-head, self-locking bolt—9409010
52—Hexagon-head, self-locking bolt (7) —9409012
53—Hexagon-head, self-locking bolt (3) —9409030
54—Pump bottom gasket—8351708
55—Pump manifold gasket—8351678
56—Pump manifold—7710210
57—Lock washer (15)—96906-35338-8
58—Hexagon-head cap screw (15)—96906-35295-63
59—Lock washer (3) —96906-35338-8
60—Hexagon-head cap screw (3) —96906-35295-61
61—Hexagon-head cap screw (4)—96906-35295-68
62—Lock washer (4) —96906-35338-8
63—Sleeve (2) —8349855
64—Valve stem (2)—8350513
65—Check valve spring (2)—8351502
66—Washer (2)—8351705
67—Check valve washer assembly (2) —8350531
68—Check valve grommet (2) —8347930

Small lower case letters, in the exploded view at right, refer to repair and rebuild points of measurement for fits, clearances and wear limits. See Chapter 6.

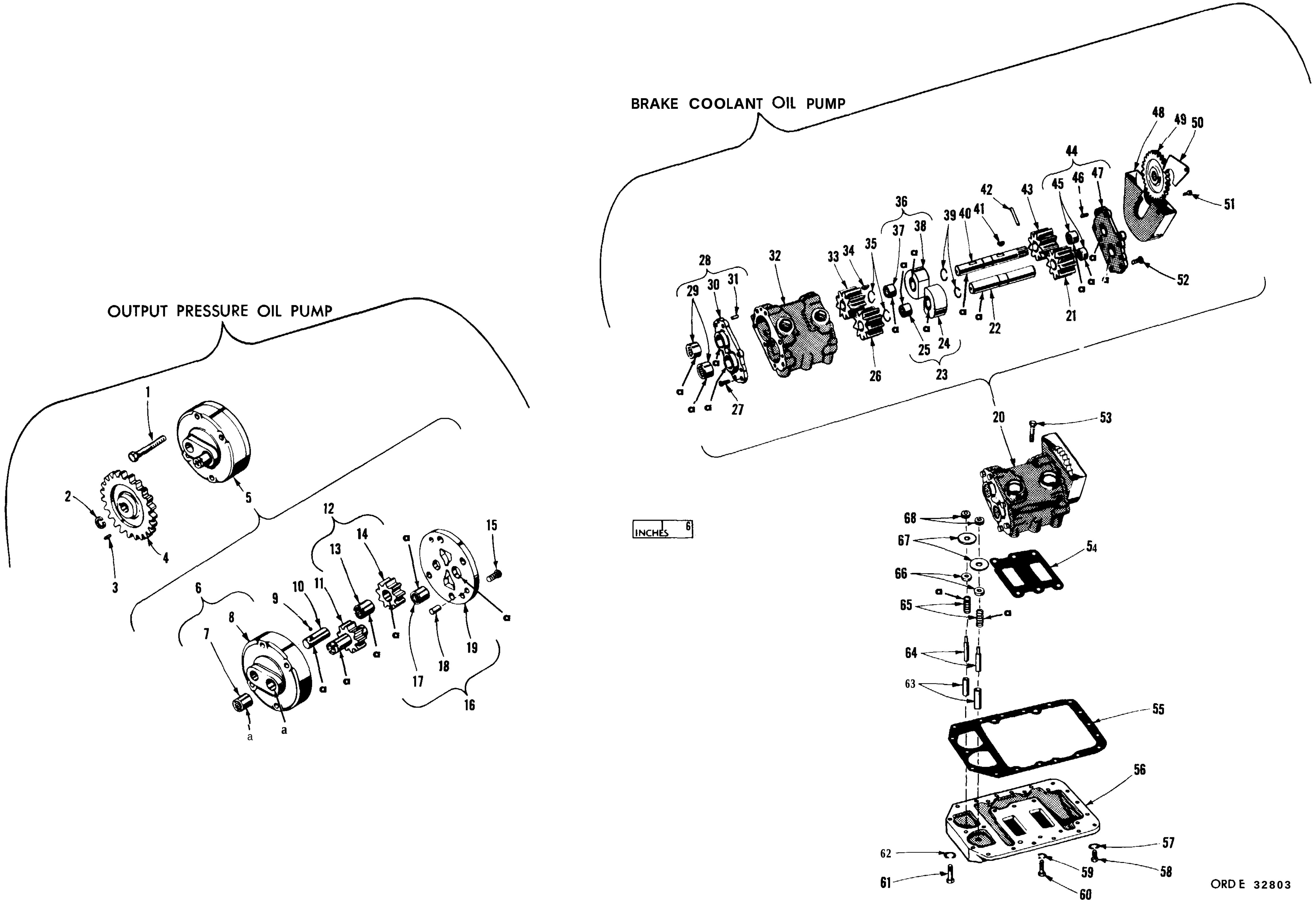

Figure 384. Foldout 13 Output pressure and brake coolant oil pump assemblies exploded view

Addendum to Fold-out 13

For latest part numbers, refer to TM 9-2520-234-34P.

Changes to Figure 384 (fold-out 13) are as follows:

20— Later models do not include shroud 48
29– Deleted (not a serviceable subassembly)
30— Deleted (not a serviceable subassembly)
31– Deleted (not a serviceable subassembly)
45— Deleted (not a serviceable subassembly)
46— Deleted (not a serviceable subassembly)
47— Deleted (not a serviceable subassembly)
48— Deleted for later models
50— Deleted for later models
51— Deleted for later models
68— Deleted for later models

1—Coupling cap seal—8351831
2—Lock washer (6)—96906-35338-8
3—Hexagon-head cap screw (6)—96906-35296-62
4—Mounting saddle cap—8351829
5—Pipe plug—444677
6—Left-output drive saddle assembly—8351839
7—Sleeve—8351830
8—Saddle—8351837
9—Slotted pin—9417731
10—Slotted machine screw (3)—96906-35244-165
11—Vent assembly—7338100
12—Drive screw (4)—142862
13—Name plate—8350068
14—Hexagon-head, self-locking bolt (24)—10906698
15—Lock plate (12)—8351848
16—Pinion shaft—8351834
17—Gasket strip cork—8350152
18—Planetary carrier assembly—8351845
19—Spindle (3)—8351842
20—Carrier—8351841
21—Spindle lock pin (3)—8350032
22—Thrust washer (3)—8351843
23—Needle bearing spacer (3)—8351844
24—Matched set pinion assembly—8351846
25—Needle bearing roller (60)—7709313
26—Needle bearing spacer (3)—8351844
27—Thrust washer (3)—8351843
28—Internal gear—8350129
29—Hexagon-head cap screw (4)—96906-35302-166
30—Lock plate (2)—7710738
31—Retainer—8350146
32—Output hub—8351832
33—Internal-snap ring—8350148
34—Roller bearing—10906249
35—Bearing spacer—8351833
36—Pipe plug—444618
37—Pipe plug (2)—444618
38—Output drive housing assembly—8351847
39—Roller bearing—10906280
40—Bearing retainer gasket—8350168
41—Bearing retainer—8350132
42—Hexagon-head machine bolt (8)—7710913
43—Lock wire (AR)—6704501
44—Bearing spacer—8351827
45—Preformed packing—8351854
46—Oil seal—8349984
47—Output shaft assembly—8351828
48—Stud (10)—8351875
Oversize stud (AR)—8351876
Oversize stud (AR)—8351877
49—Output drive shaft—8351826
50—Pipe plug (3)—8350829

Small lower case letters, in the exploded view at right, refer to repair and rebuild points of measurement for fits, clearances and wear limits. See Chapter 6.

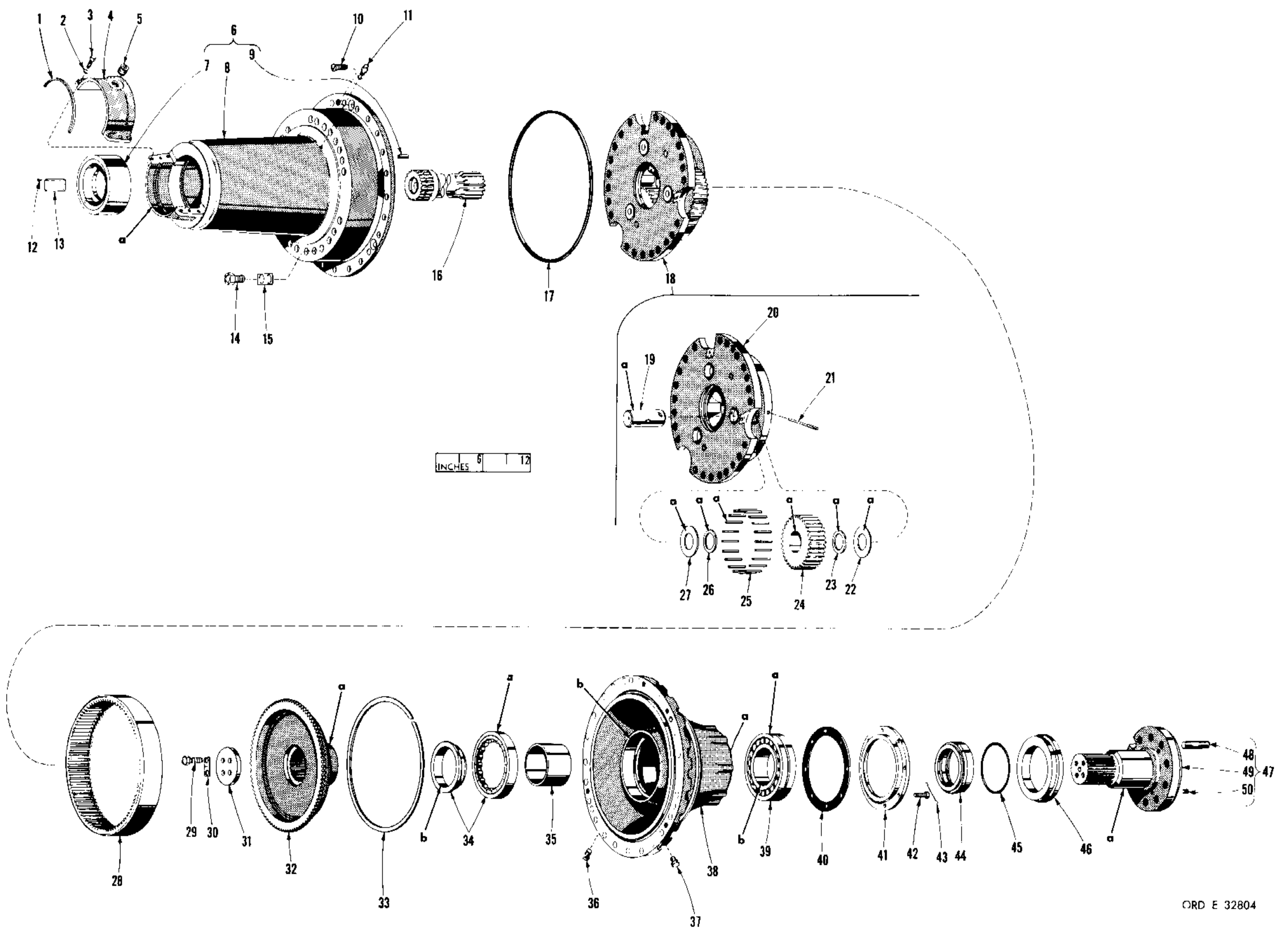

Figure 385. Fold-out 14 Left-output drive assembly exploded view

Addendum to Fold-out 14

For latest part numbers, refer to TM 9-2520-234-34P.

Changes to Figure 385 (fold-out 14) are as follows:

1-5, 10, 11— Refer to fig. 385.1 for missing art callouts
51–– Add Shim (see fig. 385.1)

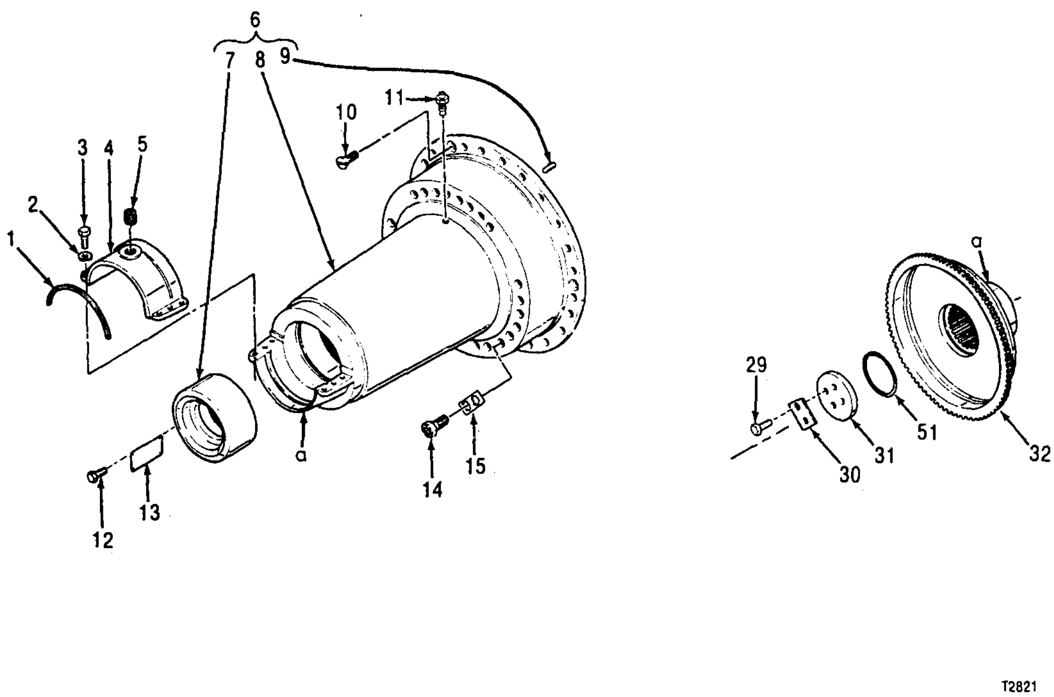

Figure 385.1. Addendum to Figure 385 (fold-out 14)

1—Output shaft assembly—8351828
2—Stud (10)—8351875
   Oversize stud (AR)—8351876
   Oversize stud (AR)—8351877
3—Pipe plug (3)—8350829
4—Output drive shaft—8351826
5—Oil seal—8349984
6—Preformed packing—8351854
7—Bearing spacer—8351827
8—Lock wire (AR)—6704501
9—Hexagon-head machine bolt (10)—7710913
10—Bearing retainer—8350132
11—Bearing retainer gasket—8350168
12—Roller bearing—10906280
13—Pipe plug—444618
14—Output drive housing assembly—8351847
15—Pipe plug (2)—444618
16—Bearing spacer—8351833
17—Roller bearing—10906249
18—Internal-snap ring—8350148
19—Output hub—8351832
20—Retainer—8350146
21—Lock plate (2)—7710738
22—Hexagon-head cap screw (4)—96906-35302-166
23—Internal gear—8350129
24—Hexagon-head cap screw (6)—96906-35296-62
25—Lock washer (6)—96906-35338-8
26—Pipe plug—444677
27—Coupling cap seal—8351831
28—Mounting saddle cap—8351829
29—Vent assembly—7338100
30—Slotted machine screw (3)—96906-35244-165
31—Drive screw (4)—142862
32—Name plate—8350068
33—Hexagon-head, self-locking bolt (24)—10906698
34—Lock plate (12)—8351848
35—Right-output drive saddle assembly—8351840
36—Slotted pin—9417731
37—Saddle—8351838
38—Sleeve—8351830
39—Pinion shaft—8351835
40—Gasket strip cork—8350152
41—Planetary carrier assembly—8351845
42—Spindle (3)—8351842
43—Carrier—8351841
44—Thrust washer (3)—8351843
45—Needle bearing spacer (3)—8351844
46—Needle bearing roller (60)—7709313
47—Matched set pinion assembly—8351846
48—Needle bearing spacer (3)—8351844
49—Thrust washer (3)—8351843
50—Spindle lock pin (3)—8350032

Small lower case letters, in the exploded view at right, refer to repair and rebuild points of measurement for fits, clearances and wear limits. See Chapter 6.

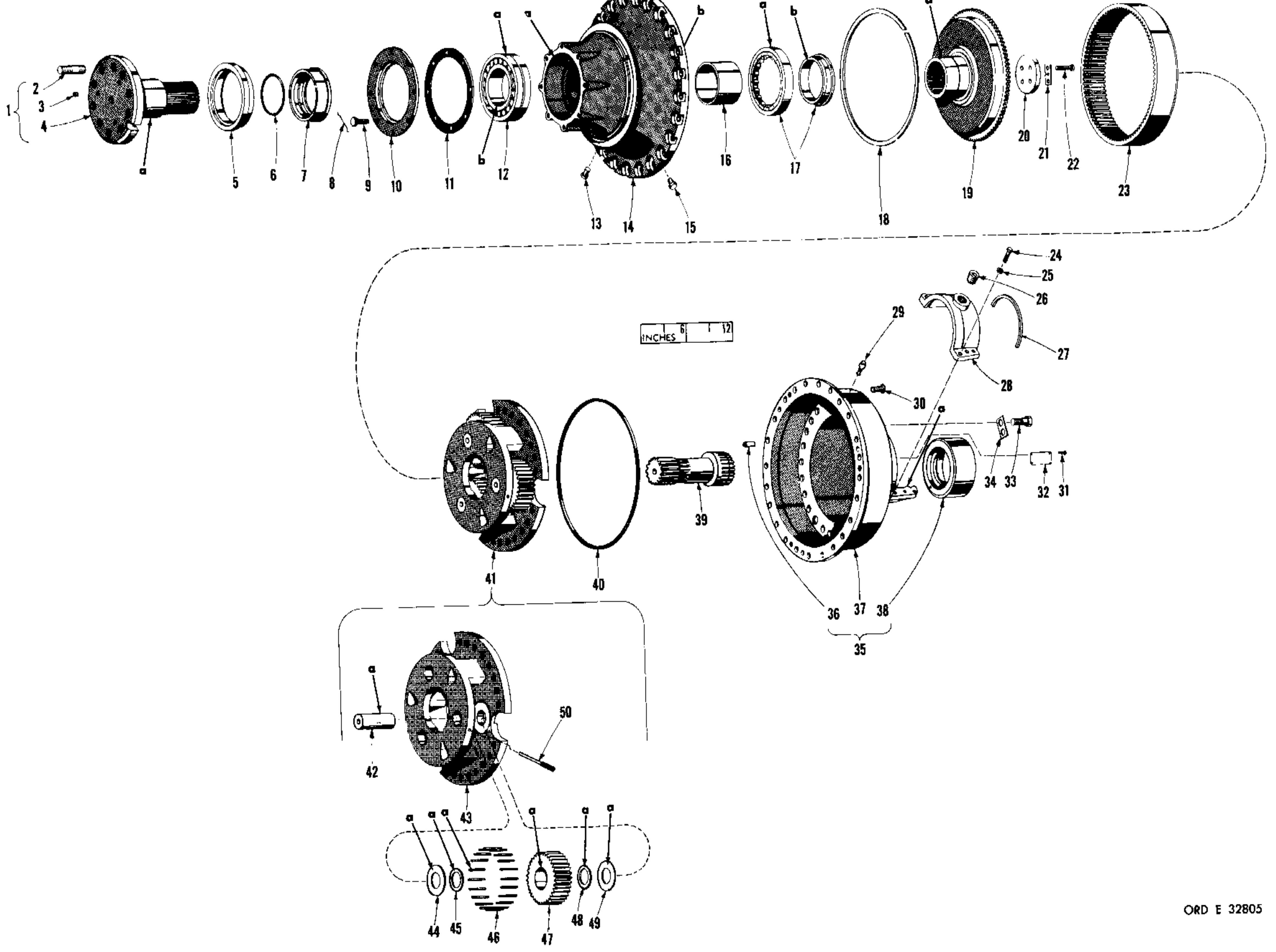

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Figure 386. Fold-out 15 — Right-output drive assembly — exploded view

Addendum to Fold-out 15

For latest part numbers, refer to TM 9-2520-234-34P.

Changes to Figure 386 (fold-out 15) are as follows:

51– Add Shim (see fig. 386.1)

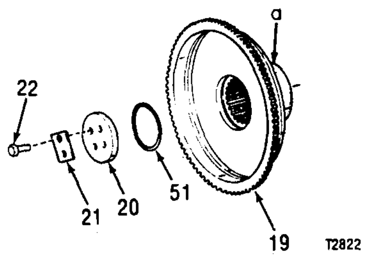

Figure 386.1. Addendum to Figure 386 (fold-out 15)

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'NEAR MEASURE

. Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

'EIGHTS

Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 lb.
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

TEMPERATURE

5/9(°F - 32) = °C
212° Fahrenheit is evuivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5C° + 32 =°F

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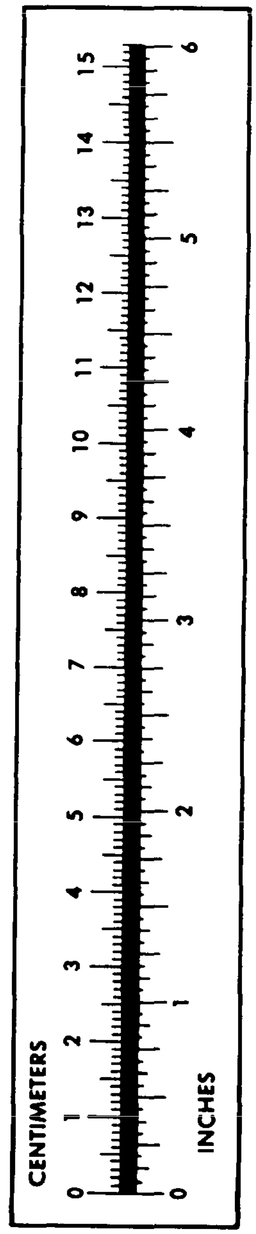
TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
ıts	Liters	0.473
arts	Liters	0.946
.allons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
'ers	Gallons	0.264
.ms	Ounces	0.035
.ograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pounds-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
'lometers per Liter	Miles per Gallon	2.354
›meters per Hour	Miles per Hour	0.621



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