

## 5000 Series Powershift Transmission

4 SPEED

**CLARK-HURTH**  
COMPONENTS

**Service Publications**  
**1293 Glenway Drive**  
**Statesville, NC 28677**

**TOWING OR PUSH STARTING**

Before towing the vehicle, be sure to lift the rear wheels off the ground or disconnect the driveline to avoid damage to the transmission during towing.

**NOTE:** If the transmission has 4 wheel drive, disconnect both front and rear drivelines. Because of the design of the hydraulic system, the engine **cannot** be started by pushing or towing.

## FOREWORD

This manual has been prepared to provide the customer and the maintenance personnel with information and instructions on the maintenance and repair of the **CLARK-HURTH COMPONENTS** product.

Extreme care has been exercised in the design, selection of materials and manufacturing of these units. The slight outlay in personal attention and cost required to provide regular and proper lubrication, inspection at stated intervals, and such adjustments as may be indicated will be reimbursed many times in low cost operation and trouble free service.

In order to become familiar with the various parts of the product, its principal of operation, trouble shooting and adjustments, it is urged that the mechanic study the instructions in this manual carefully and use it as a reference when performing maintenance and repair operations.

Whenever repair or replacement of component parts is required, only **Clark-Hurth Components**-approved parts as listed in the applicable parts manual should be used. Use of "will-fit" or non-approved parts may endanger proper operation and performance of the equipment. **Clark-Hurth Components** does not warrant repair or replacement parts, nor failures resulting from the use of parts which are not supplied by or approved by **Clark-Hurth Components**. **IMPORTANT: Always furnish the Distributor with the serial and model number when ordering parts.**

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**NOTE:** Metric Dimensions Shown in Brackets [].

**NOTE:**

1. Lubricate all piston rings and 'O' rings at assembly.
2. Use Permatex and Crane Sealer only where specified.
3. Apply very light coat of Permatex No. 2 to O.D. of all oil seals before assembly.
4. Apply light coat of Crane Sealer to all pipe plugs. After assembly of parts, using Permatex or Crane Sealer, there must be no free or excess material that could enter the oil circuit.

Torque Clutch Support bolts  
80-88 Lbs. Ft. [108,5-119,3 N-m.]  
4 supports rear side.

Torque nuts 150-175 Lbs. Ft.  
[203,4-237,2 N-m.]

Two clutches front side  
10 inner bronze plates  
9 outer steel plates  
Assemble alternately starting  
with inner bronze plate.  
8 springs and 8 pins, ends to  
rest against piston teeth  
and end plate teeth.

Torque Clutch Support bolts  
80-88 Lbs. Ft. [108,5-119,3 N-m.]

Press sleeve flush to 1/64  
[0,40 mm] below shoulder.

Torque bolts (except as shown)  
3/8 23-25 Lbs. Ft. [31,2-33,9 N-m.]  
1/2 37-41 Lbs. Ft. [50,2-55,6 N-m.]  
3/4 57-63 Lbs. Ft. [77,3-85,4 N-m.]

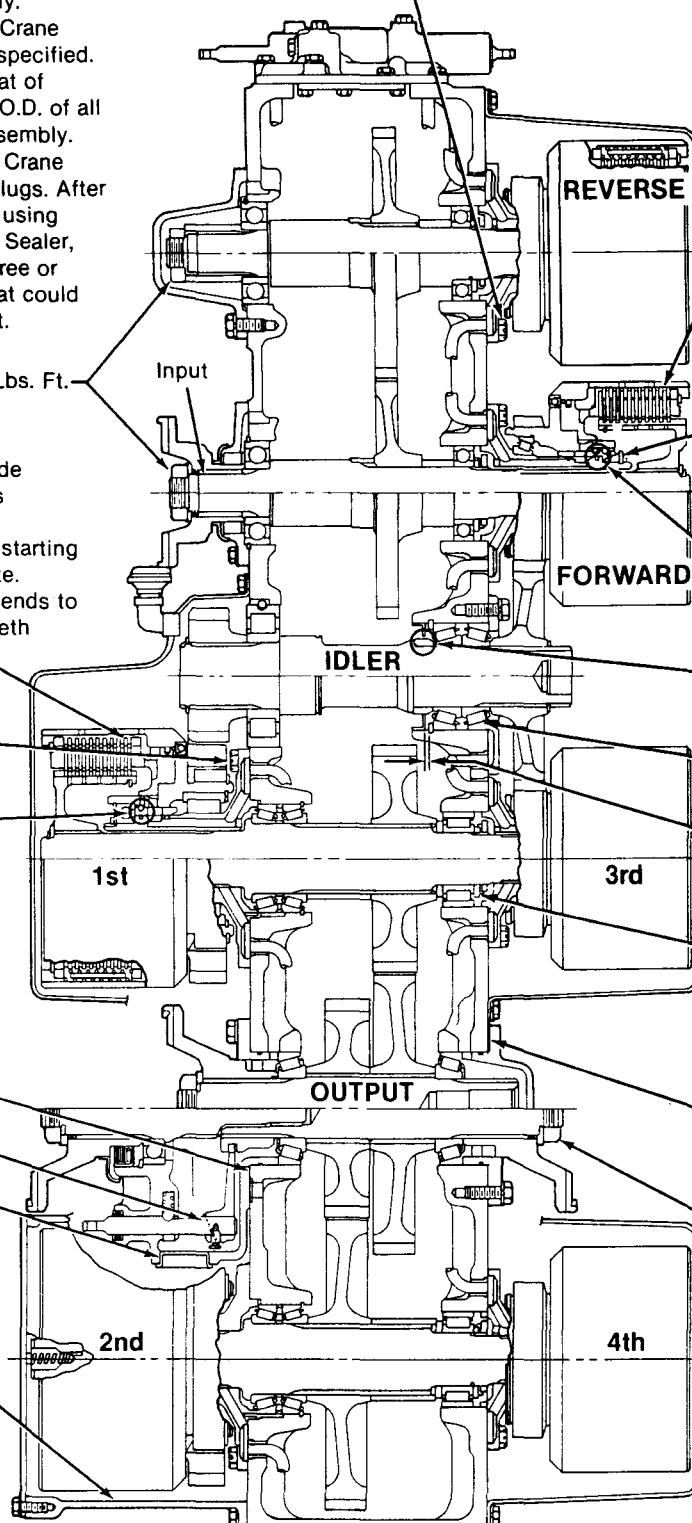
**NOTE:**

No gaskets or shims between  
disconnect housing and case.

Wire  
Apply Permatex before pressing  
into place.

If optional steel stamped cover  
is used, use locking bolts and  
belleville washers. Torque bolts  
17-20 Lbs. Ft. [23,1-27,1 N-m.]

Torque bolts in pan and covers  
17-20 Lbs. Ft. [23,1-27,1 N-m.]



Four clutches rear side  
10 inner bronze plates  
9 outer steel plates  
Assemble alternately starting  
with inner bronze plate.  
6 springs and 6 pins, ends to  
rest against piston teeth and end  
plate teeth.

Adjust Taper Bearings .000-.004  
[0,000-0,101 mm] end play by  
selecting variable thickness  
snap ring at assembly. Four  
clutches this side.

Press sleeve flush to 1/64  
[0,40 mm] below shoulder.

Note location of chamfers on  
this spacer.

Adjust taper bearings .000-.003  
[0,000-0,076 mm] end play.

Must have approx. 1/8 [3,175  
mm] gap between baffle and  
snap ring for bearing lubrication.

Torque bearing lock nuts 175-200  
Lbs. Ft. [237,3-271,1 N-m.]

**CAUTION:**  
Drive bearing in place before  
tightening locknuts.

Shim Output Shaft Bearings to  
produce 6 to 8 Lbs. In. [0,68-0,90  
N-m.] in pre-load.

Torque output shaft nuts 250-300  
Lbs. Ft. [339,0-406,7 N-m.]

**NOTE:** Metric dimensions shown  
in brackets [ ].

**FOR MODULATION CLUTCH ASSEMBLY  
SEE MODULATION SECTION**

The transmission portion of the power train enacts an important role in delivering engine power to the driving wheels. In order to properly maintain and service these units it is important to first understand their function and how they operate.

The transmission and torque converter function together and operate through a common hydraulic system. To obtain maximum serviceability they have been designed and built as separate units. It is necessary, however, to consider both units in the study of their function and operation.

To supplement the text below, and for references use therewith, the following illustrations are provided:

- |  |  |
|--|--|
| Fig. A — Front and Rear View, Shaft Identification | Fig. F — Input and Forward Drive Shaft Group—"F"       |
| Fig. B — Transmission Case and Internal Tubing     | Fig. G — Reverse Drive Shaft Group—"R"                 |
| Fig. C — Control Cover Assembly                    | Fig. H — 2nd and 4th Drive Shaft Group—"A"             |
| Fig. D — Output Shaft Group—"O"                    | Fig. I — 1st and 3rd Drive Shaft Group—"B"             |
| Fig. E — Idler Shaft Group—"I"                     | Fig. J — External Oil Flow—Converter and Transmission. |

### HOW THE UNITS OPERATE —

With the engine running, the converter charging pump draws oil from the transmission sump and directs it through oil filters to the regulating valve located on top of the transmission. From the regulating valve it is then directed through the control cover on the transmission to the converter and to the transmission clutches.

The pressure regulating valve mounted on the top of the transmission remains closed until required pressure is delivered to the transmission for actuating the direction and speed clutches. This regulator valve consists of a hardened valve spool operating in a closely fitted bore. The valve spool is backed up by a spring to hold the valve spool against its seat until the oil pressure builds up to the specified pressure. The valve spool then moves toward the spring until a port is exposed along the side of the bore. The oil can then flow through this port into a distributor which directs the oil into the converter inlet port.

After entering the converter, the oil is directed through the stator support to the converter cavity and exits between the turbine shaft and converter support. The oil then passes through an oil distributor which directs the oil out of the converter by way of a down stream regulator valve and then to the oil cooler. After leaving the cooler the oil is directed through a hose to the lubricating oil inlet on the transmission, then through a series of tubes to the transmission, bearings, and clutches. The oil then returns to the transmission sump.

A safety valve is built in the transmission control cover and will open to bypass oil only if an excessive pressure is built up due to a blocked passage.

The rear compartment of the converter unit also houses the converter output shaft. A flexible hose provides an overflow to the transmission sump.

The three members of the torque converter are composed of a series of blades. The blades are curved in such a manner as to force the oil to circulate from the impeller to the turbine, through the reaction member again into the impeller. This circulation causes the turbine to turn in the same direction as the impeller. Oil enters the inner side of the impeller and exits from the outer side into the outer side of the turbine. It then exits from the inner side of the turbine and after passing through the reaction member, again enters the inner side of the impeller.

Converter "Stall" is achieved whenever the turbine and impeller shaft are stationary and the engine is operating at full power or wide open throttle. CAUTION: Do not maintain "Stall" for more than 30 seconds at a time. Excessive heat will be generated and may cause converter or transmission seal damage.

In converters equipped with Lock-up clutches, a hydraulic clutch, similar to the transmission clutches is used to "lock" the engine mechanically to the output shaft. This is accomplished by hydraulic pressure actuating the lock-up clutch which in turn locks the impeller cover to the turbine hub. During lock-up the converter turns at 1 to 1 speed ratio.

The down stream regulator valve on the converter consists of a valve body and regulator spool. The spool is backed up by a spring to hold the valve until converter oil pressure builds up to specified pressure. The valve is used to maintain a given converter pressure to insure proper performance under all conditions.

The control valve assembly on the transmission consists of a valve body with selector valve spools connected to the steering column by exterior linkage. A detent ball and spring in the selector spool provides four positions, one position for each speed range. A detent ball and spring in the direction spool provides three positions, one each for forward, neutral, and reverse.

On certain models, this valve also contains a shut-off valve spool operated by an air or hydraulic cylinder located on the control cover. This valve is connected to the brake system by a hose line. When the wheel brakes are applied, air or hydraulic fluid enters the valve and overcomes a spring force. This forces the spool to shift over and block pressure from entering the directional clutches. In this manner a "neutral" is established without moving the control levers.

With the engine running and the directional control lever in neutral position, oil pressure is blocked at the control valve, and the transmission is in neutral. Movement of the forward and reverse spool will direct oil, under pressure, to either the forward or reverse direction clutch as desired, and the opposite one is open to relieve pressure.

The direction or speed clutch assembly consists of a drum with internal gear teeth and a bore to receive a hydraulically actuated piston. A piston is inserted into the bore of the drum. The piston is "oil tight" by the use of sealing rings. A friction disc with internal teeth is inserted into the drum and rests against the piston. Next, a disc with splines at the outer diameter is inserted. Discs are alternated until the required total is achieved. After inserting the last disc, a series of springs and pins are assembled in such a manner that these springs rest on teeth of the piston. A heavy back-up plate is then inserted and secured by a snap ring. A hub with I.D. and O.D. splines is inserted into the splines of discs with teeth on the inner diameter and a splined shaft extending through the clutch support. This hub is retained by a snap ring. The discs and inner shaft are free to increase in speed or rotated in the opposite direction as long as no pressure is present in the direction or speed clutch.

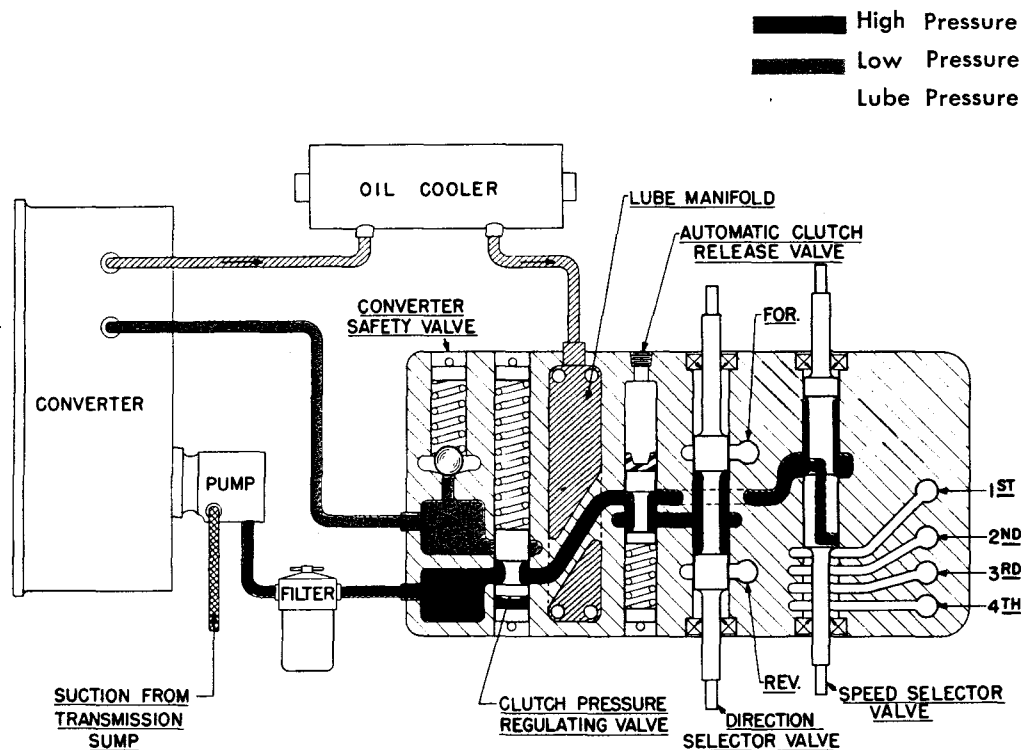
To engage the clutch, as previously stated, the control valve is placed in the desired position. This allows oil under pressure to flow from the control cover valve, through a tube in the transmission case, to a chosen clutch. Once into the drum, oil is directed through a drilled hole into the rear side of the piston bore. Pressure of the oil forces the piston and discs over against the heavy back-up plate. The discs, with teeth on the outer diameter, clamping against discs, with teeth on inner diameter, enables the clutch drum and drive shaft to be locked together and allows them to turn as a unit.

There are bleed balls in the clutch drums which allow quick escape for oil when the pressure to the piston is released.

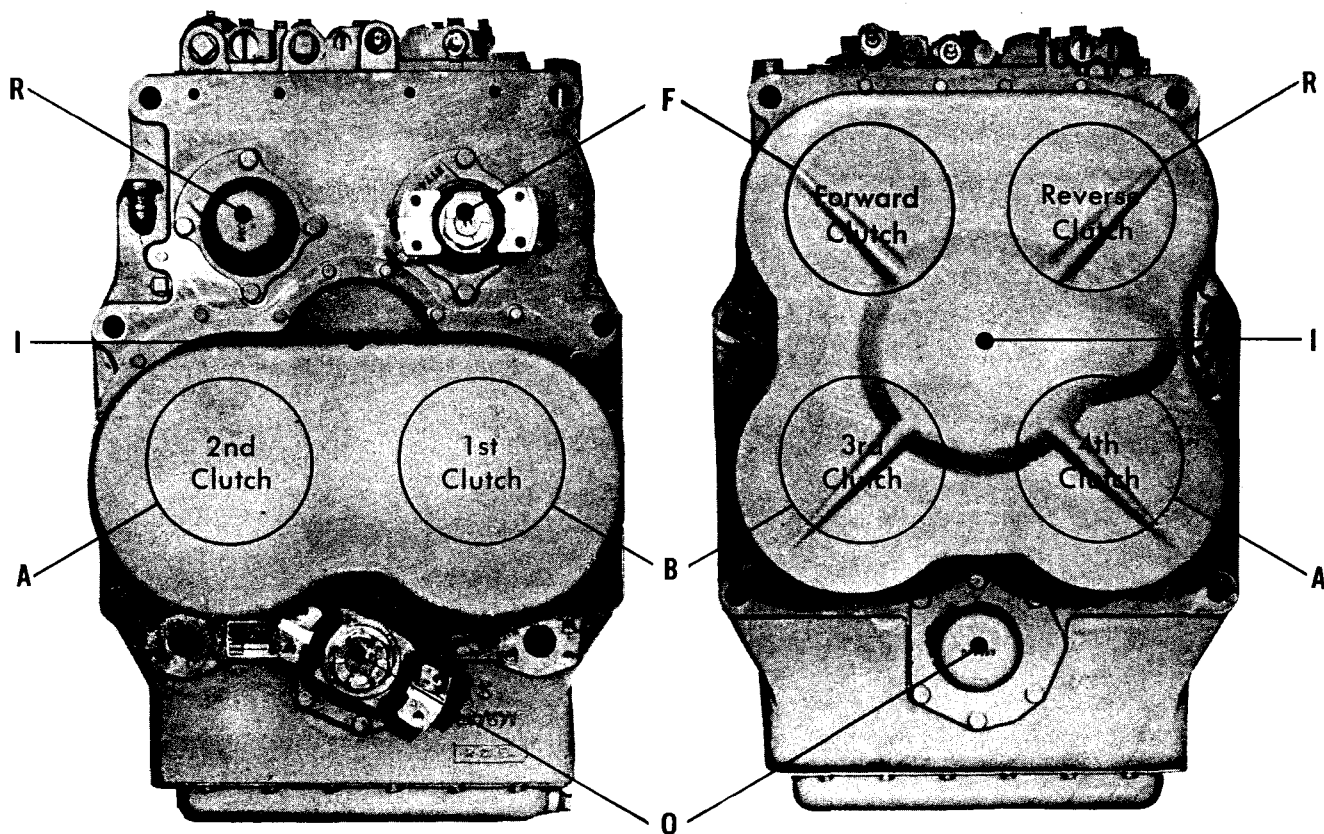
The transmission gear train consists of six shafts: (1) Input Shaft, (2) Reverse Shaft, (3) Idler Shaft, (4) First and Third Shaft, (5) Second and Fourth Shaft, (6) Output Shaft.

A screen mounted in a frame is positioned on the bottom of the transmission case, to screen out any foreign material. This screen is covered by the sump pan. This pan is provided with magnets to catch any metallic particles.

Some transmissions may have an axle declutching unit as optional equipment, this unit consists of a split output shaft with a sliding splined sleeve to engage or disengage the axle. This is accomplished by manually shifting a lever in the operator's compartment which is mechanically connected to the shift fork on the clutching unit sliding sleeve. This unit, of course, is only used on the four wheel drive machine. On the front drive only or the rear wheel drive only, the output shaft is a one piece type and an output flange assembled only on the required end.



TRANSMISSION CONTROL COVER INTERNAL OILFLOW



**FIG. A—TRANSMISSION ASSEMBLY SHAFT IDENTIFICATION**

For purpose of identification, illustration above indicates by alphabetical designation the individual shaft group location in transmisson. Code to alphabetical designation is given below.

A—Second & Fourth Drive Shaft Group

B—First & Third Drive Shaft Group

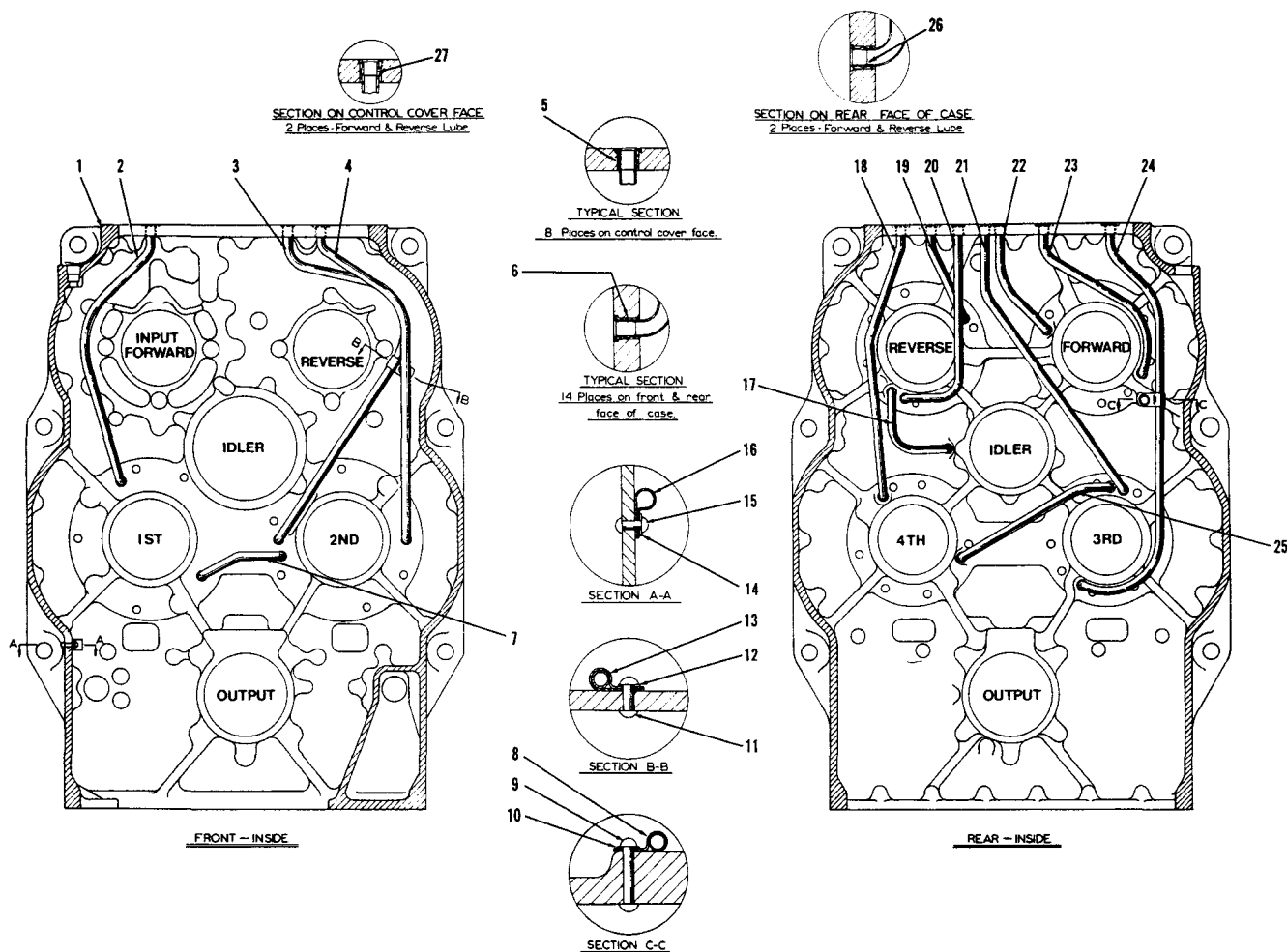
F—Input Drive Shaft & Forward Clutch Group

I—Idler Shaft Group

O— Output Shaft & Disconnect Assembly Group

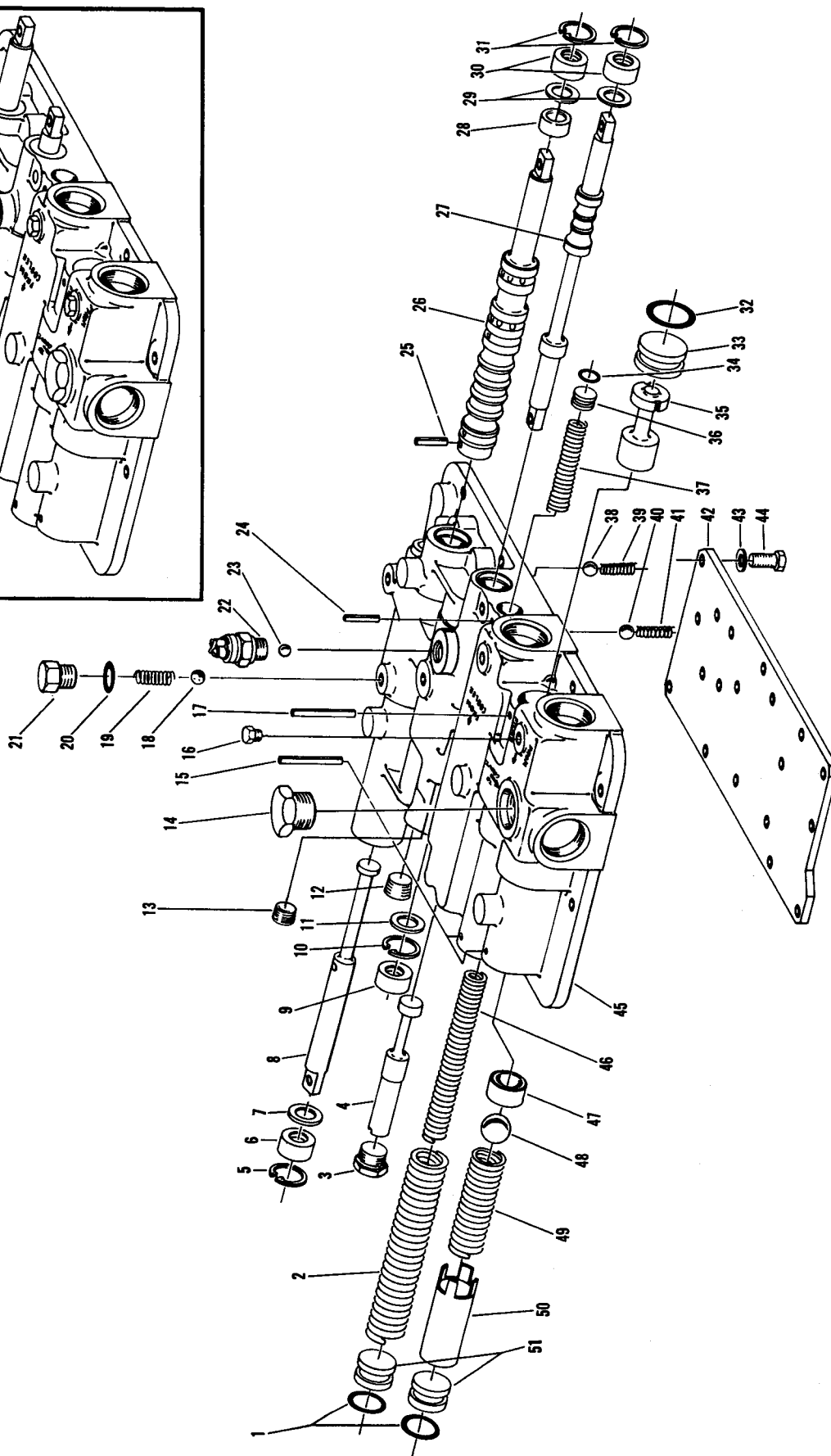
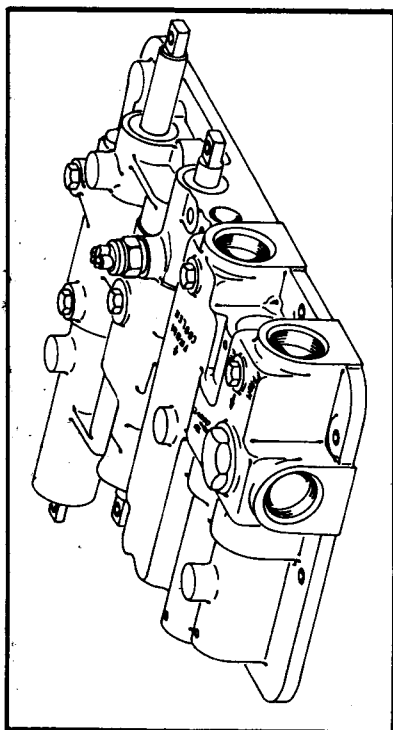
R—Reverse Drive Shaft Group





### 5000 SERIES CASE ASSEMBLY

ITEM	DESCRIPTION	QTY	ITEM	DESCRIPTION	QTY
1	Transmission Case . . . . .	1	15	Rivet . . . . .	1
2	1st Clutch Pressure Tube . . . . .	1	16	Dip Stick Tube Clip . . . . .	1
3	2nd Clutch Lube Tube . . . . .	1	17	Reverse to Idler Crossover Lube Tube . . . . .	1
4	2nd Clutch Pressure Tube . . . . .	1	18	4th Clutch Pressure Tube . . . . .	1
5	Tube Sleeve . . . . .	8	19	Reverse Clutch Pressure Tube . . . . .	1
6	Tube Sleeve . . . . .	18	20	Reverse Clutch Lube Tube . . . . .	1
7	2nd and 1st Cross Over Lube Tube . . . . .	1	21	3rd Clutch Lube Tube . . . . .	1
8	Tube Clip . . . . .	1	22	Input Lube Tube . . . . .	1
9	Rivet . . . . .	1	23	Input Clutch Pressure Tube . . . . .	1
10	Washer . . . . .	1	24	3rd Clutch Pressure Tube . . . . .	1
11	Rivet . . . . .	1	25	3rd to 4th Crossover Lube Tube . . . . .	1
12	Washer . . . . .	1	26	Tube Sleeve . . . . .	2
13	Tube Clip . . . . .	1	27	Tube Sleeve . . . . .	2
14	Washer . . . . .	1			



## CONTROL COVER ASSEMBLY

ITEM	DESCRIPTION	QTY.
1	Regulator Valve Safety Stop "O" Ring.....	2
2	Regulator Valve Spring - Outer.....	1
3	Pipe Plug (Shut-off Valve Hole) .....	1
4	Shut-off Valve Spool .....	1
5	Valve Stop Snap Ring .....	1
6	Oil Seal .....	1
7	Valve Stop Washer.....	1
8	Inner Selector Valve.....	1
9	Oil Seal .....	1
10	Valve Stop Snap Ring .....	1
11	Valve Stop Ring .....	1
12	Pipe Plug (Hi & Low Valve Bore) .....	1
13	Pipe Plug.....	1
14	Plug .....	1
15	Regulator Valve & Safety Valve Stop Roll Pin....	2
16	Plug .....	2
17	Regulator Valve & Safety Valve Stop Roll Pin....	1
18	Poppet Ball .....	1
19	Detent Spring .....	1
20	Detent Plug Washer.....	1
21	Detent Plug.....	1
22	Neutral Switch .....	1
23	Poppet Ball .....	1
24	Shut-off Valve Spool Roll Pin .....	1
25	Selector Valve Roll Pin .....	1

ITEM	DESCRIPTION	QTY.
26	Selector Valve - Outer .....	1
27	Forward & Reverse Selector Valve.....	1
28	Valve Spacer.....	1
29	Valve Stop Washer.....	2
30	Oil Seal .....	2
31	Valve Stop Snap Ring .....	2
32	Valve Stop "O" Ring .....	1
33	Regulator Valve Stop.....	1
34	Shut-off Valve Stop "O" Ring .....	1
35	Regulator Valve Spool.....	1
36	Shut-off Valve Spool Stop.....	1
37	Shut-off Valve Spool Spring .....	1
38	Poppet Ball .....	1
39	Detent Spring .....	1
40	Poppet Ball .....	1
41	Poppet Spring.....	1
42	Control Cover Plate .....	1
43	Plate to Cover Lockwasher .....	8
44	Plate to Cover Screw .....	8
45	Control Cover .....	1
46	Regulator Valve Spring - Inner .....	1
47	Safety Valve Seat .....	1
48	Safety Valve Ball.....	1
49	Safety Valve Spring .....	1
50	Safety Valve Seat Retainer Spacer.....	1
51	Regulator & Safety Valve Stop .....	2

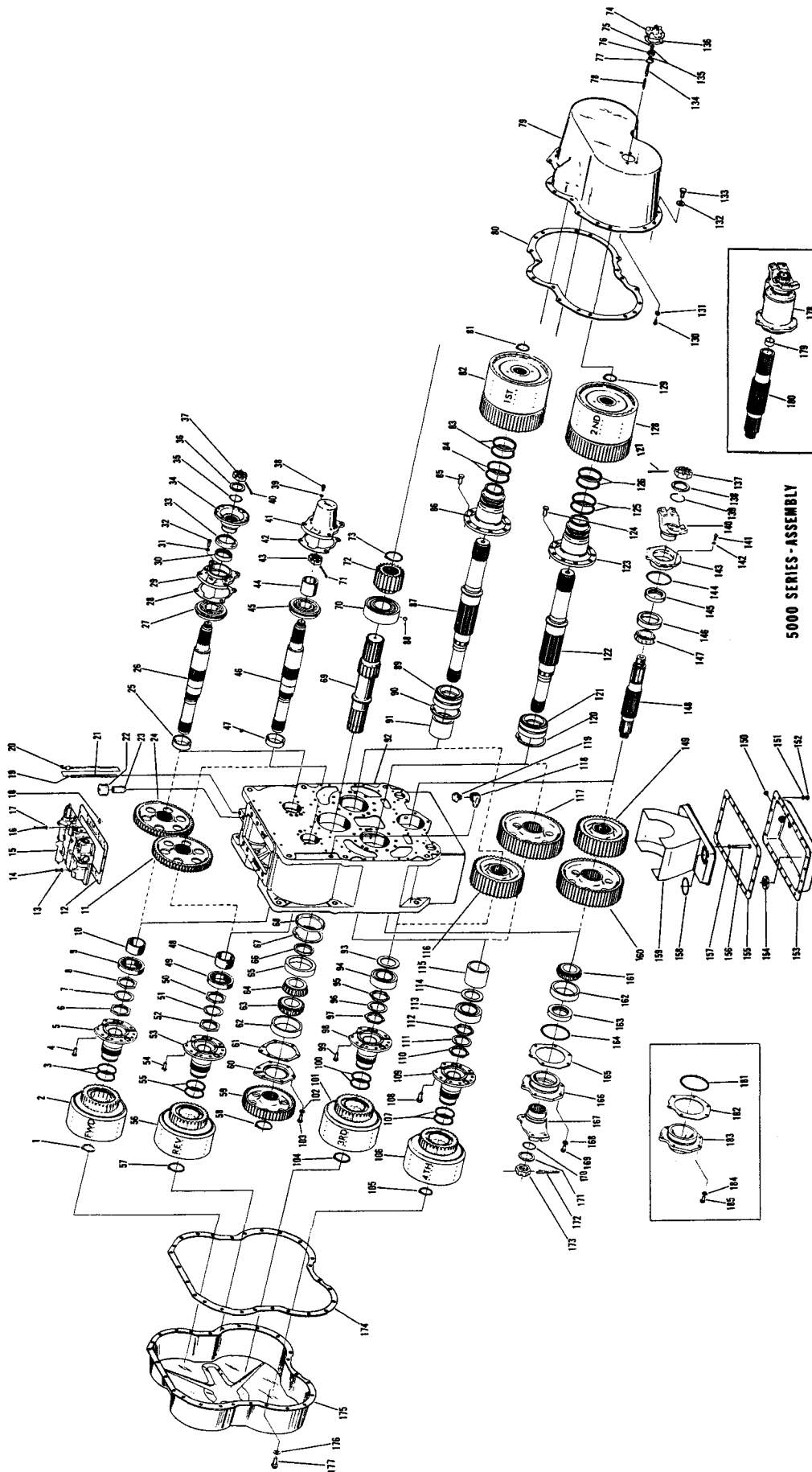


# 5000 TRANSMISSION ASSEMBLY

ITEM	DESCRIPTION	QTY
1	Disc Hub Snap Ring	1
2	Input Clutch (Forward)	1
3	Clutch Support Piston Ring	2
4	Clutch Support to Case Screw	8
5	Clutch Support & Plug Assembly	1
6 *	Input Shaft Bearing Lock Nut	1
7 *	Input Nut Lock	1
8 *	Input Shaft Bearing Lock Nut	1
9	Input Shaft Rear Bearing	1
10	Input Shaft Bearing Spacer	1
11	Reverse Shaft Gear	1
12	Valve to Case Gasket	1
13	Valve to Case Screw Lockwasher	6
14	Valve to Case Screw	6
15	Control Valve Assembly	1
16	Valve to Case Screw	6
17	Valve to Case Screw Lockwasher	6
18	Valve to Case "O" Ring	6
19	Dipstick Housing Assembly	1
20	Dipstick	1
21	Dipstick Tube	1
22	Oil Filler Pipe Cap	1
23	Oil Filler Pipe	1
24	Input Shaft Gear	1
25	Gear Spacer	1
26	Input Shaft (Forward)	1
27	Front Bearing	1
28	Bearing Cap Gasket	1
29	Input Shaft Bearing Cap	1
30	Input Shaft Oil Seal	1
31	Bearing Cap Screw Lockwasher	4
32	Bearing Capscrew	4
33	Flange Deflector	1
34	Input Flange	1
35	Flange "O" Ring	1
36	Flange Washer	1
37	Flange Nut	1
38	Bearing Cap Screw	4
39	Bearing Cap Screw Lockwasher	4
40	Cotter Pin	1
41	Reverse Shaft Bearing Cap	1
42	Reverse Shaft Bearing Cap Gasket	1
43	Nut	1
44	Bearing Spacer	1
45	Front Bearing	1
46	Reverse Shaft	1
47	Reverse Shaft Gear Spacer	1

ITEM	DESCRIPTION	QTY
48	Reverse Shaft Gear Spacer	1
49	Rear Bearing	1
50 *	Bearing Lock Nut	1
51 *	Nut Lock	1
52 *	Bearing Lock Nut	1
53	Clutch Support & Plug Assembly	1
54	Clutch Support to Case Screw	8
55	Clutch Support Piston Ring	2
56	Reverse Clutch	1
57	Disc Hub Snap Ring	1
58	Gear Snap Ring	1
59	Idler Shaft Gear - 3rd-4th	1
60	Idler Shaft Bearing Cap	1
61	Idler Shaft Bearing Cap Shim	AR
62	Bearing Cup	1
63	Bearing Cone	1
64	Bearing Cone	1
65	Bearing Cup	1
66	Bearing Spacer	1
67	Bearing Snap Ring	1
68	Oil Baffle	1
69	Idler Shaft	1
70	Front Bearing	1
71	Cotter Pin	1
72	Idler Shaft Gear - 1st-2nd	1
73	Idler Shaft Gear Snap Ring	1
74	Speedometer Drive Housing	1
75	Oil Seal	1
76	Speedometer Drive Bearing	1
77	Bearing to Housing Snap Ring	1
78	Speedometer Drive Spring	1
79	1st and 2nd Clutch Cover	1
80	1st and 2nd Clutch Cover Gasket	1
81	Disc Hub Snap Ring	1
82	1st Clutch	1
83	Clutch Support Piston Ring	2
84	Piston Ring Expander Spring	2
85	Clutch Support to Case Screw	8
86	Clutch Support & Plug Assembly	1
87	Shaft (1st and 3rd)	1
88	Idler Bearing Lock Ball	1
89	Tapered Bearing Assembly	1
90	Bearing Snap Ring	1
91	Spacer	1
92	Transmission Case Assembly	1
93	Spacer	1
94	Roller Bearing	1

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5000 SERIES - ASSEMBLY

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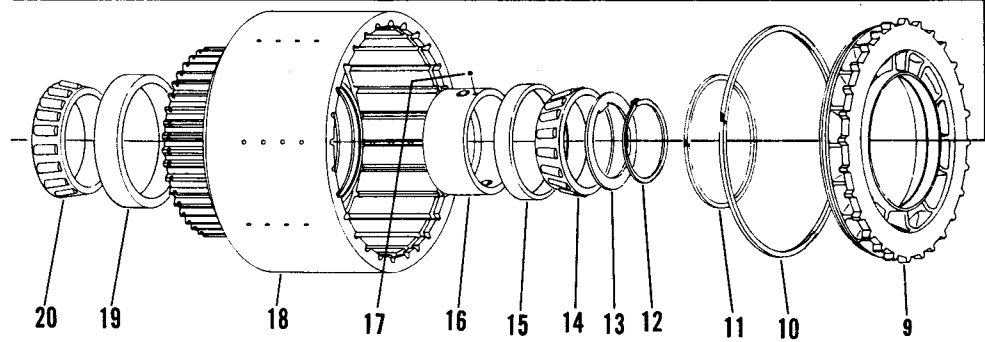
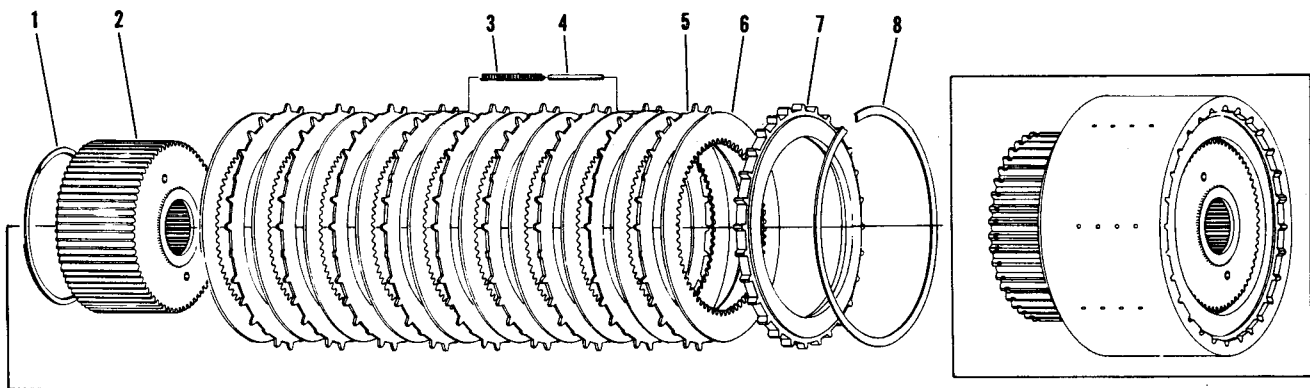
ITEM	DESCRIPTION	QTY
95 *	Bearing Lock Nut	1
96 *	Nut Lock	1
97 *	Bearing Lock Nut	1
98	Clutch Support and Plug Assembly	1
99	Clutch Support to Case Screw	8
100	Clutch Support Piston Ring	2
101	3rd Clutch	1
102	Bearing Cap Screw Lockwasher	5
103	Bearing Cap Screw	5
104	Disc Hub Snap Ring	1
105	Disc Hub Snap Ring	1
106	4th Clutch	1
107	Clutch Support Piston Ring	2
108	Clutch Support to Case Screw	8
109	Clutch Support and Plug Assembly	1
110 *	Bearing Lock Nut	1
111 *	Bearing Nut Lock	1
112 *	Bearing Lock Nut	1
113	Roller Bearing	1
114	Spacer	1
115	Spacer	1
116	Gear (1st and 3rd)	1
117	Gear (2nd and 4th)	1
118	Air Breather Street Elbow	1
119	Air Breather - some air breathers are located on 1st and 2nd clutch cover	1
120	Bearing Snap Ring	1
121	Tapered Bearing Assembly	1
122	Shaft (2nd and 4th)	1
123	Clutch Support and Plug Assembly	1
124	Clutch Support to Case Screw	8
125	Piston Ring Expander Spring	2
126	Clutch Support Piston Ring	2
127	Flange Cotter Pin	1
128	2nd Clutch	1
129	Disc Hub Snap Ring	1
130	Speedometer Attaching Bolt	4
131	Speedometer Bolt Lockwasher	4
132	Clutch Cover Screw Washer	20
133	Clutch Cover Screw	20
134	Speedometer Drive Shaft	1
135	Speedometer Bearing Snap Ring	2
136	Speedometer Housing Gasket	1
137	Flange Nut	1
138	Flange Washer	1
139	Flange "O" Ring	1
140	Output Flange	1

ITEM	DESCRIPTION	QTY
141	Bearing Cap Screw	6
142	Bearing Cap Screw Lockwasher	6
143	Output Bearing Cap	1
144	Bearing Cap "O" Ring	1
145	Bearing Cap Oil Seal	1
146	Bearing Cup	1
147	Bearing Cone	1
148	Output Shaft	1
149	Output Shaft Gear	1
150	Drain Plug	2
151	Oil Sump Screw Belleville Washer	18
152	Oil Sump Screw	18
153	Oil Sump Assembly	1
154	Sump Magnet	2
155	Oil Sump Gasket	1
156	Screen Assembly to Case Screw	3
157	Screen Assembly to Case Screw Lockwasher	3
158	Oil Sump Frame Gasket	1
159	Oil Sump Frame and Screen Assembly	1
160	Output Shaft Gear	1
161	Bearing Cone	1
162	Bearing Cup	1
163	Output Shaft Oil Seal	1
164	Bearing Cap "O" Ring	1
165	Bearing Cap Shim	AR
166	Output Bearing Cap	1
167	Output Flange	1
168	Bearing Cap Screw Lockwasher	6
169	Bearing Cap Screw	6
170	Flange "O" Ring	1
171	Flange Washer	1
172	Flange Cotter Pin	1
173	Flange Nut	1
174	Clutch Cover Gasket	1
175	Forward & Reverse, 3rd & 4th Clutch Cover	1
176	Clutch Cover Screw Washer	26
177	Clutch Cover Screw	26
178	Disconnect Assembly (optional)	1
179	Disconnect Bushing	1
180	Disconnect Shaft	1
181	Capped Bearing Cap "O" Ring	1
182	Bearing Cap Gasket	1
183	Capped Bearing Cap (optional)	1
184	Bearing Cap Washer	6
185	Bearing Cap Screw	6

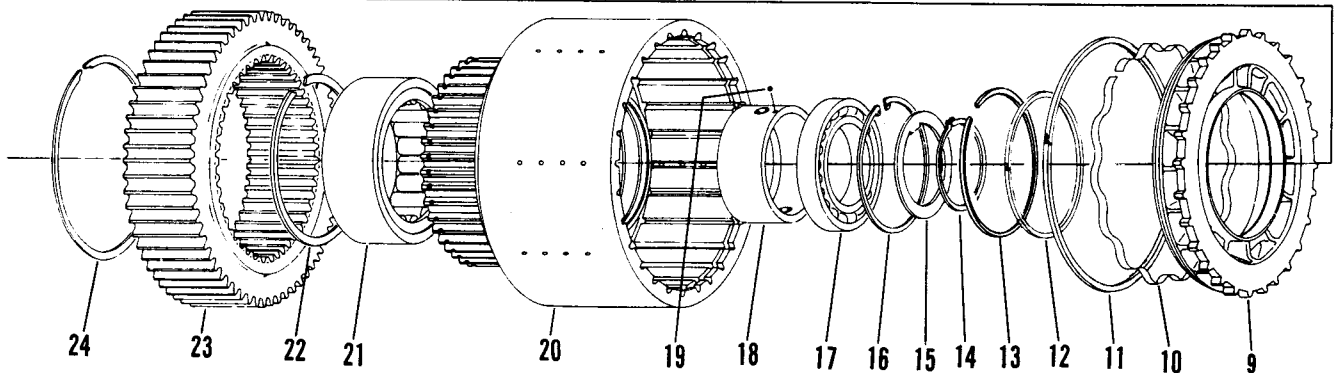
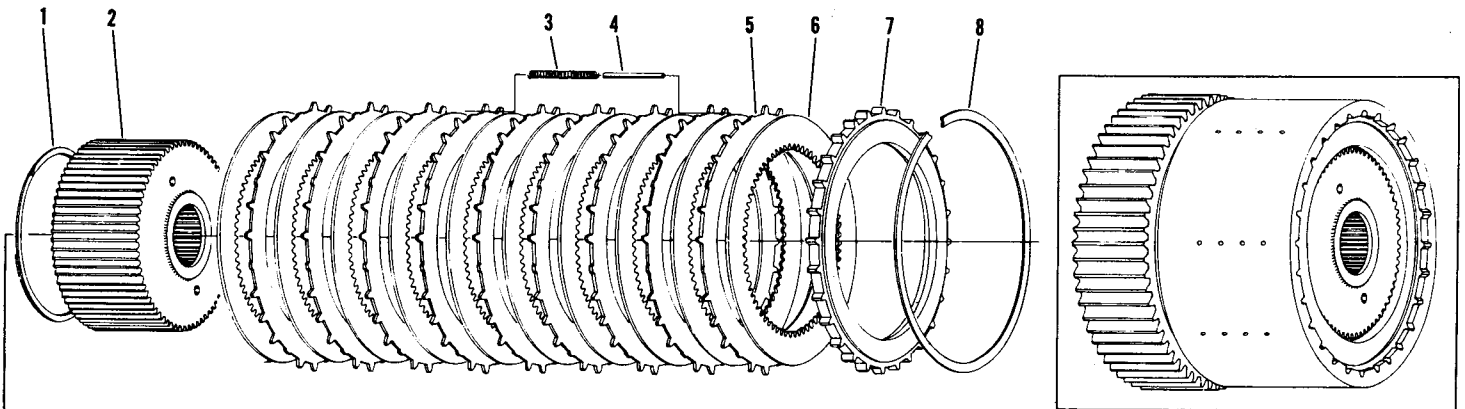
AR - As Required

\*On the input, reverse, 3rd and 4th clutch, some units will have a double locknut with a tanged washer and some units will have a single elastic lock nut.

# **INPUT, REVERSE, 3rd & 4th CLUTCH GROUP**



## **1st & 2nd CLUTCH GROUP**





### INPUT, REVERSE, 3RD & 4TH CLUTCH GROUP

ITEM	DESCRIPTION	QTY	ITEM	DESCRIPTION	QTY
1	Disc Hub Oil Baffle Ring .....	1	12	Snap Ring - selected at assembly variable thickness snap ring and tanged washer are used to assure proper taper bearing tightness .....	AR
2	Disc Hub Assembly .....	1	13	Tanged Washer .....	1
3	Disc Spring .....	6	14	Taper Roller Bearing Cone - Outer .....	1
4	Disc Spring Pin .....	6	15	Taper Roller Bearing Cup - Outer .....	1
5	Outer Disc .....	9	16	Piston Ring Outer Race .....	1
6	Inner Disc .....	10	17	Outer Race Ball .....	1
7	End Plate .....	1	18	Clutch Drum Assembly .....	1
8	End Plate Snap Ring .....	1	19	Support Bearing Cup - Inner .....	1
9	Piston .....	1	20	Support Bearing Cone - Inner .....	1
10	Piston Outer Piston Ring .....	1			
11	Piston Inner Piston Ring .....	1			

AR - As Required.

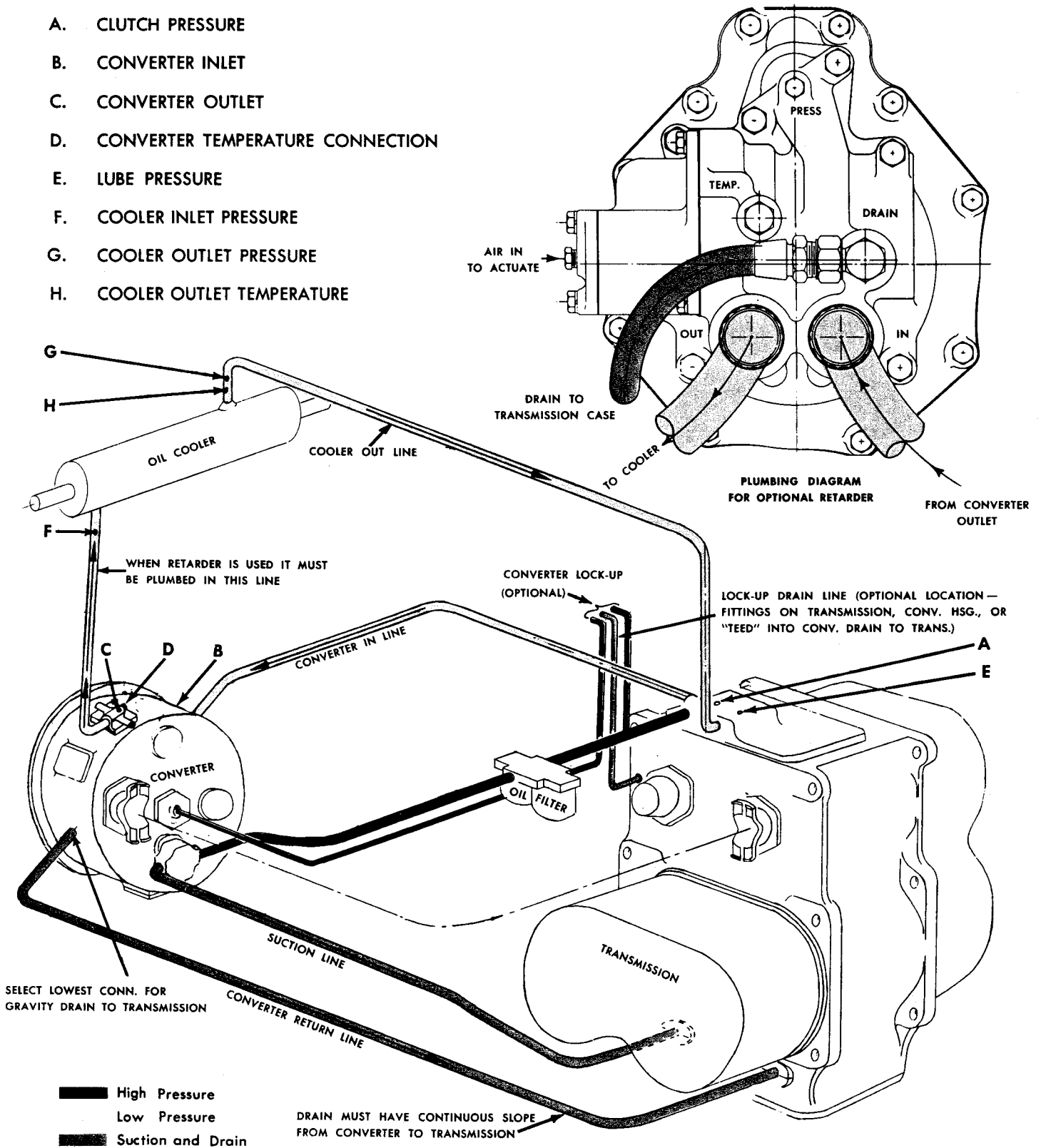
### 1ST & 2ND CLUTCH GROUP

ITEM	DESCRIPTION	QTY	ITEM	DESCRIPTION	QTY
1	Disc hub Oil Baffle Ring .....	1	15	Tanged Washer .....	1
2	Disc Hub Assembly .....	1	16	Bearing Snap Ring .....	1
3	Disc Spring .....	8	17	Support Ball Bearing .....	1
4	Disc Spring Pin .....	8	18	Piston Ring Outer Race .....	1
5	Outer Disc .....	9	19	Outer Race Ball .....	1
6	Inner Disc .....	10	20	Clutch Drum Assembly .....	1
7	End Plate .....	1	21	Support Roller Bearing .....	1
8	End Plate Snap Ring .....	1	22	Bearing Snap Ring .....	1
9	Piston .....	1	23	Clutch Drum Hub Gear .....	1
10	Outer Piston Ring Expander Spring .....	1	24	Gear Snap Ring .....	1
11	Clutch Piston Outer Seal .....	1			
12	Clutch Piston Inner Seal .....	1			
13	Inner Piston Ring Expander Spring .....	1			
14	Snap Ring - selected at assembly variable thickness snap ring and tanged washer are used to assure proper taper bearing tightness .....	AR			

AR - As Required.

FIG J CHECK POINTS

- A. CLUTCH PRESSURE
- B. CONVERTER INLET
- C. CONVERTER OUTLET
- D. CONVERTER TEMPERATURE CONNECTION
- E. LUBE PRESSURE
- F. COOLER INLET PRESSURE
- G. COOLER OUTLET PRESSURE
- H. COOLER OUTLET TEMPERATURE

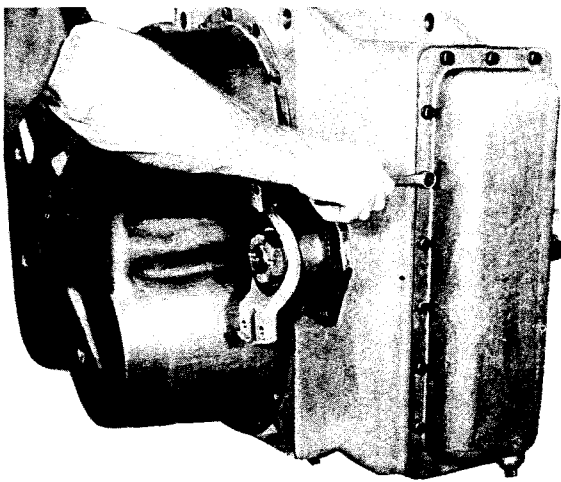


## OVERHAUL OF TRANSMISSION ASSEMBLY

**CAUTION:** Cleanliness is of extreme importance and an absolute must in the repair and overhaul of this unit. Before attempting any repairs, the exterior of the unit must be thoroughly cleaned to prevent the possibility of dirt and foreign matter entering the mechanism.

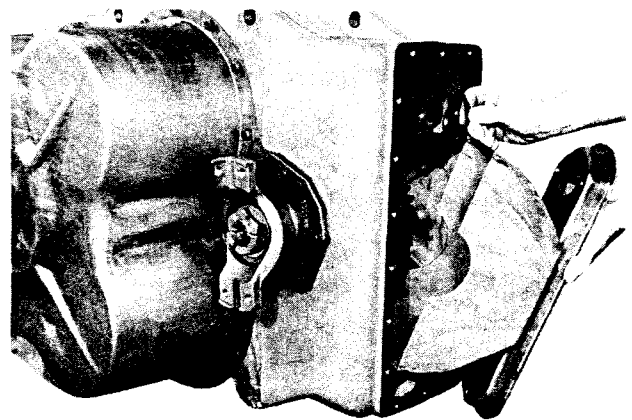
The instructions contained herein cover the disassembly and reassembly of the transmission in a sequence that would normally be followed after the unit has been removed from the machine and is to be completely overhauled.

### DISASSEMBLY OF THE TRANSMISSION



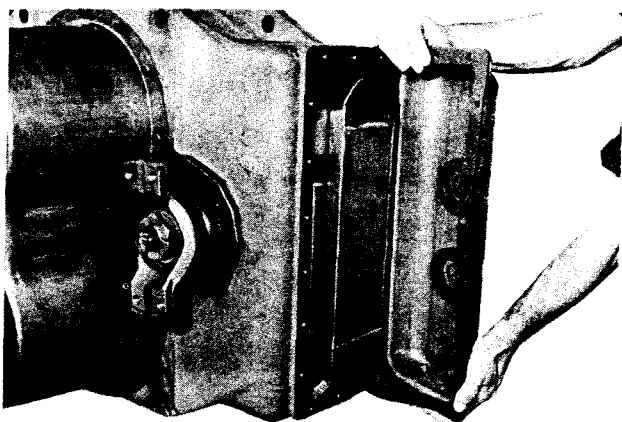
**Figure 1**

Remove sump pan bolts.



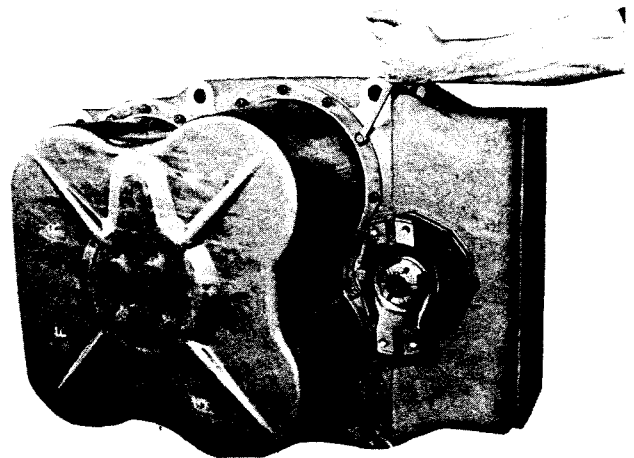
**Figure 3**

Remove sump screen bolts and sump screen.



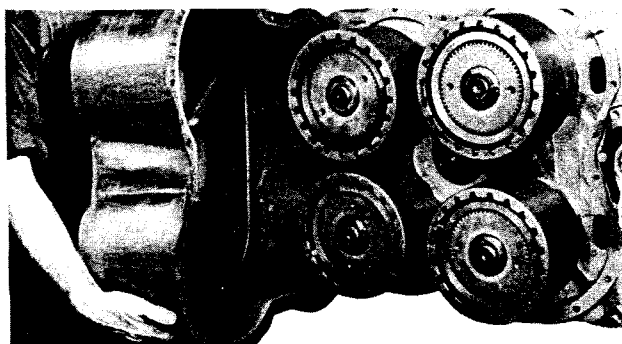
**Figure 2**

Remove sump pan and magnets.



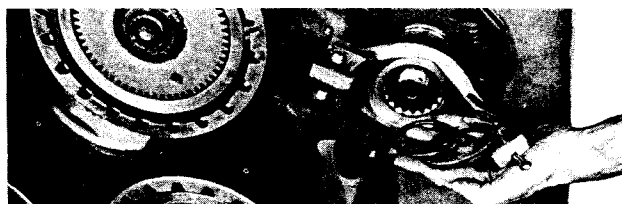
**Figure 4**

Remove forward, reverse, 3rd and 4th clutch cover bolts.



**Figure 5**

Remove clutch cover.



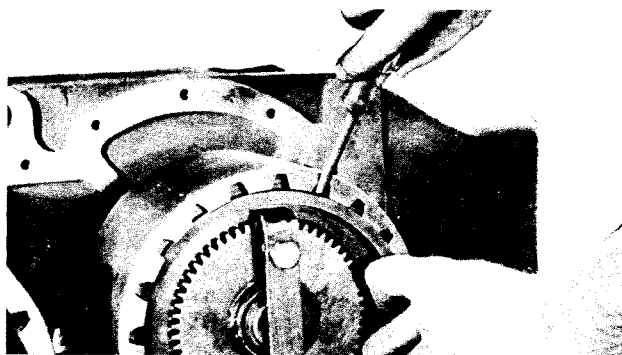
**Figure 6**

Lock transmission gears with a soft bar and remove output flange nut, "O" ring, washer and flange.

### CLUTCH DISASSEMBLY

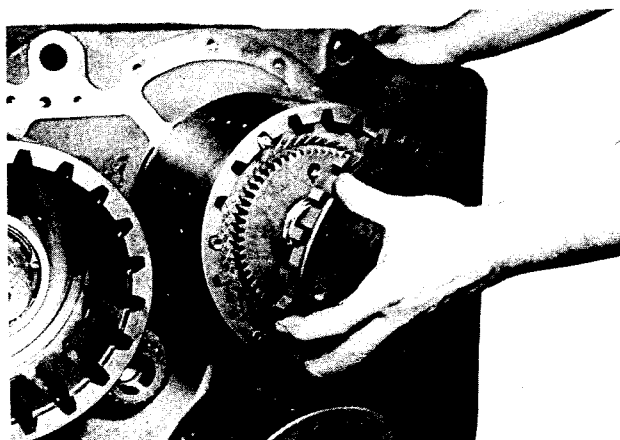
A product improvement has been made that incorporates taper bearings in the input, reverse, 3rd and 4th clutch drums. Follow the same procedure as explained in Figures 7 thru 13 to disassemble input, reverse, 3rd and 4th clutch. If taper roller bearings are used, mark each part removed to match with the clutch support. These parts must be reassembled on the same support they were removed from. If taper bearings, clutch support or clutch drum are to be replaced, reassemble with new parts as explained on pages 49 and 50. If ball bearings are used follow procedure explained in the service manual.

**NOTE:** All clutches are disassembled in a similar manner. Clutch shown being disassembled is 4th speed.



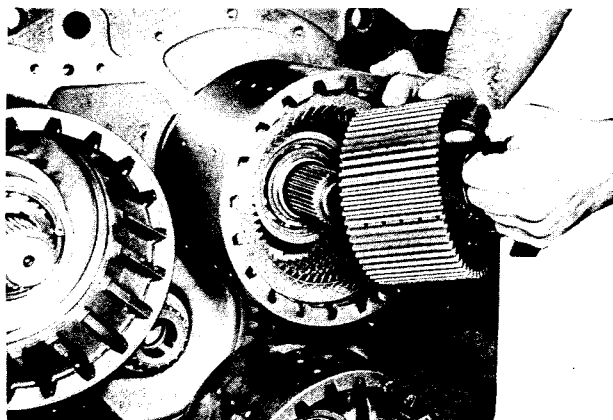
**Figure 7**

Depress end plate and remove retainer ring.



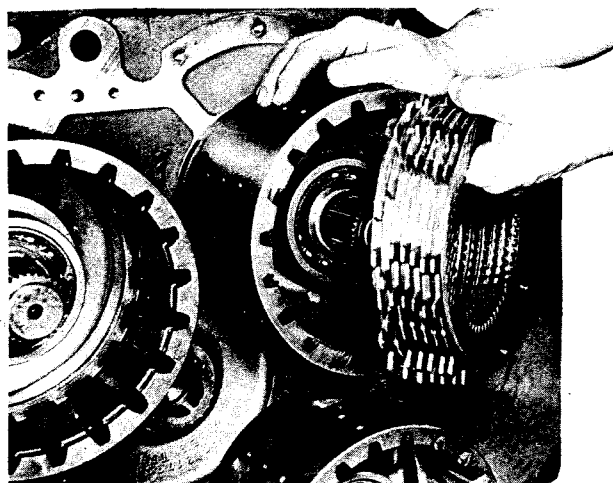
**Figure 8**

Remove end plate.



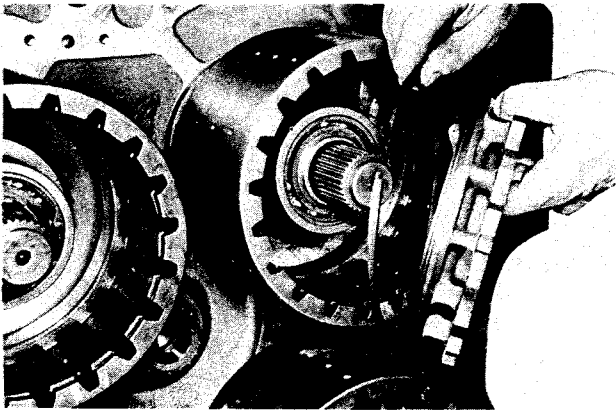
**Figure 9**

Remove clutch disc hub retainer ring. Remove clutch disc hub.



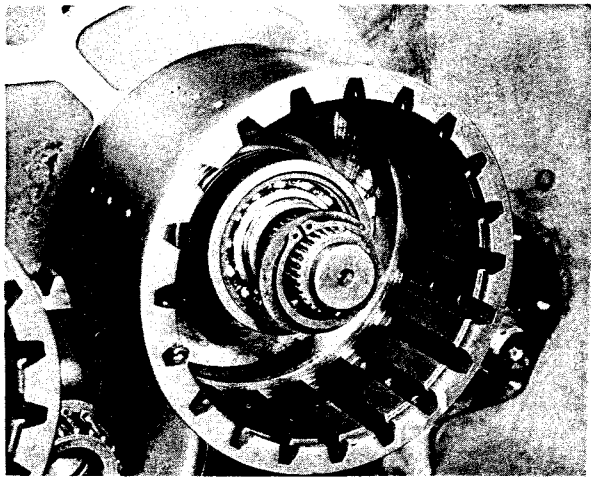
**Figure 10**

Remove release springs, guide pins, and inner and outer clutch disc.



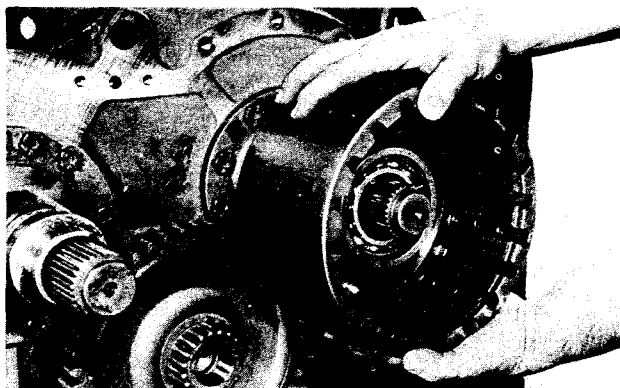
**Figure 11**

Remove clutch piston and piston outer sealing ring.



**Figure 12**

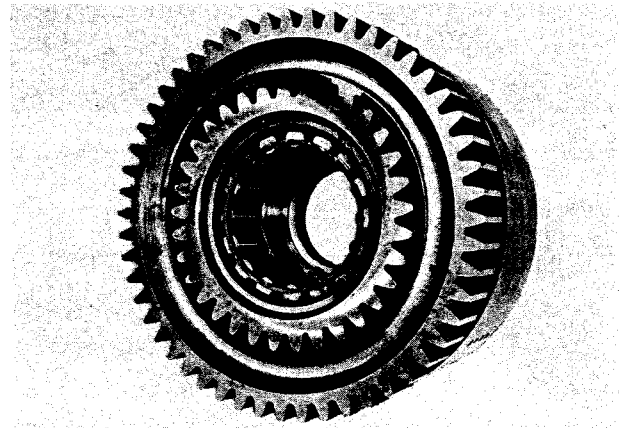
Remove clutch drum retainer ring and retainer washer.



**Figure 13**

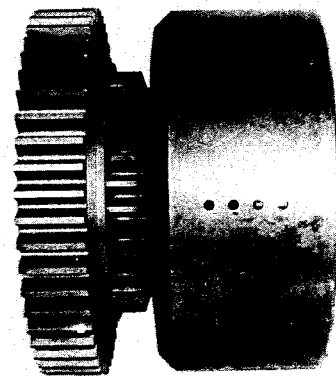
Remove clutch drum and bearing assembly.

**NOTE:** If clutch drum hub gear, support bearings, or piston ring outer race, are to be replaced, use Figure 14 through 18; if replacement is not necessary disregard and continue on with Figure 19.



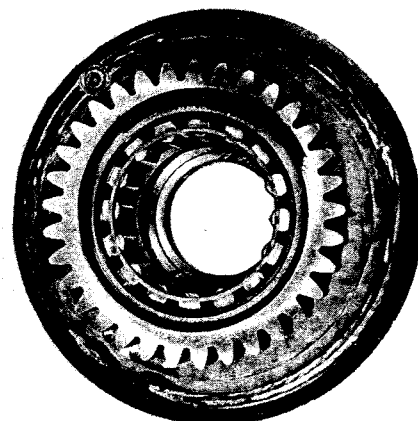
**Figure 14**

Remove clutch drum hub gear retainer ring. (1st and 2nd clutch only.)



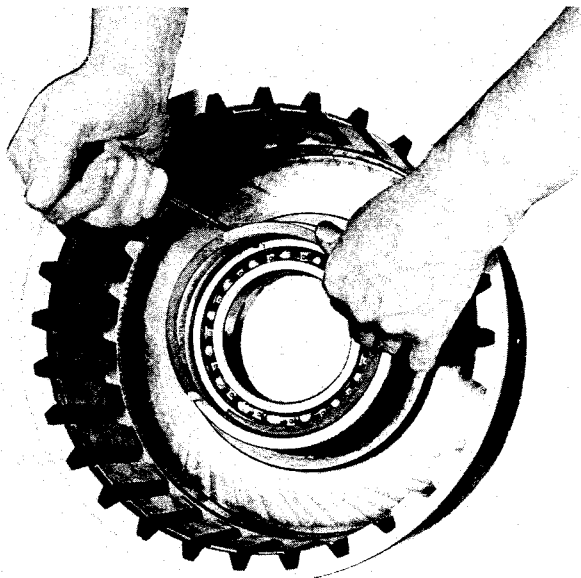
**Figure 15**

Remove clutch drum hub gear (1st and 2nd clutch only).



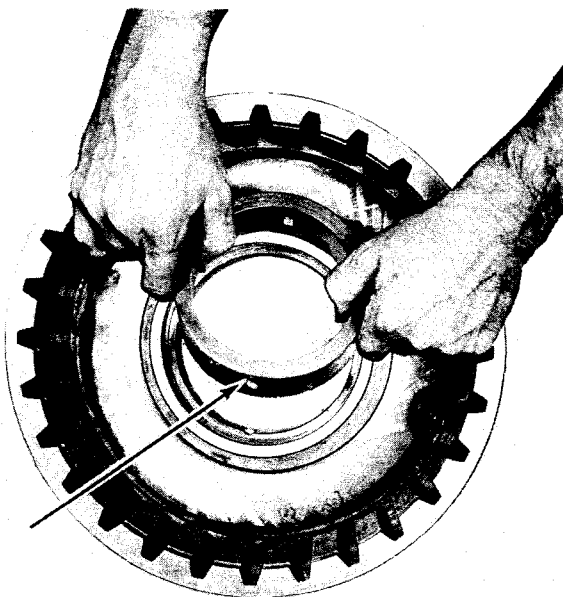
**Figure 16**

Remove drum support roller bearing retainer ring.



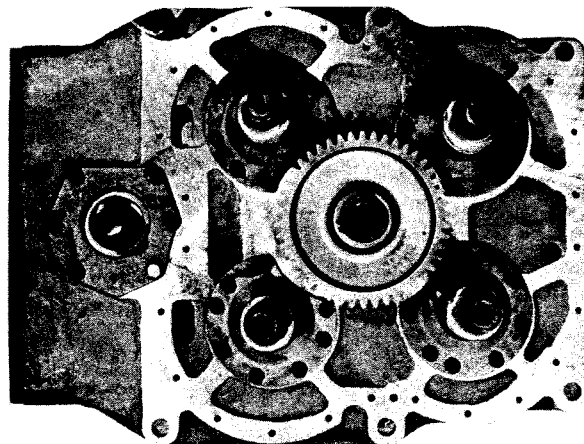
**Figure 17**

Remove drum support ball bearing retainer ring. Press or drive roller and ball bearing from clutch drum.



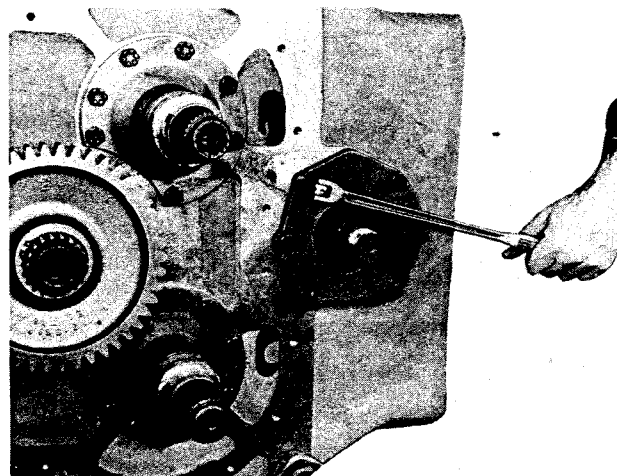
**Figure 18**

Press piston ring outer race from clutch drum. **CAUTION:** Do not lose lock ball (see arrow).



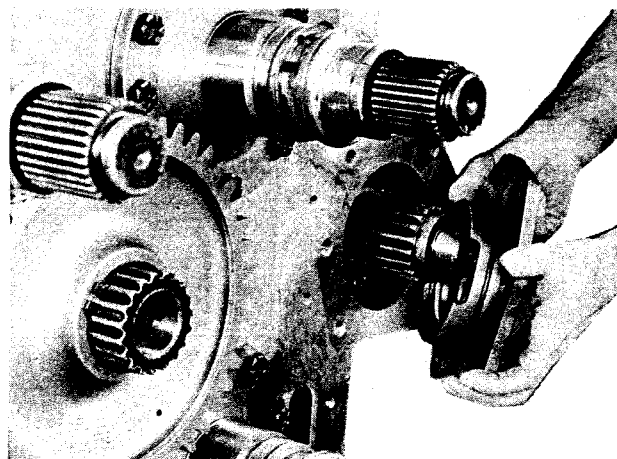
**Figure 19**

Idler gear and clutch support access.



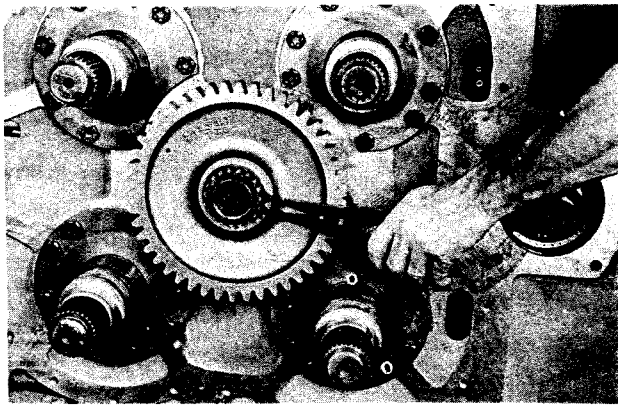
**Figure 20**

Remove output shaft bearing cap bolts.



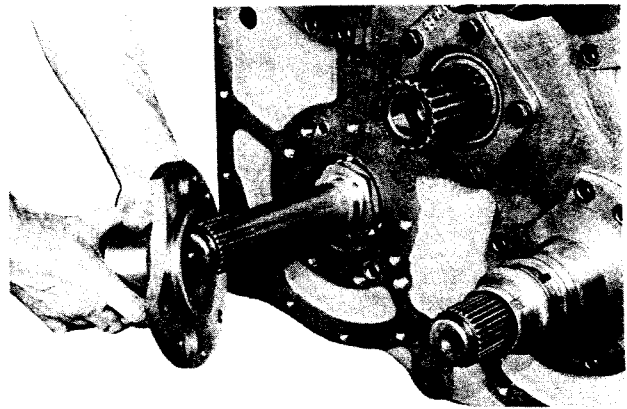
**Figure 21**

Remove output shaft bearing cap.



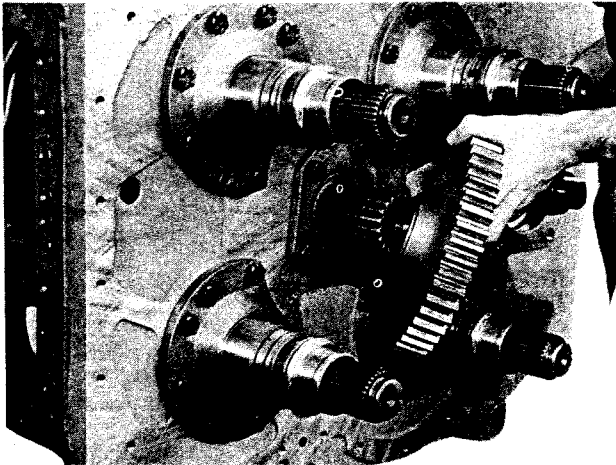
**Figure 22**

Remove idler gear retainer ring.



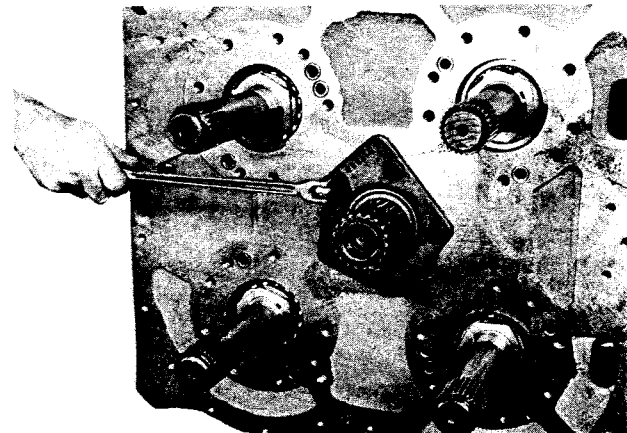
**Figure 25**

Remove clutch support.



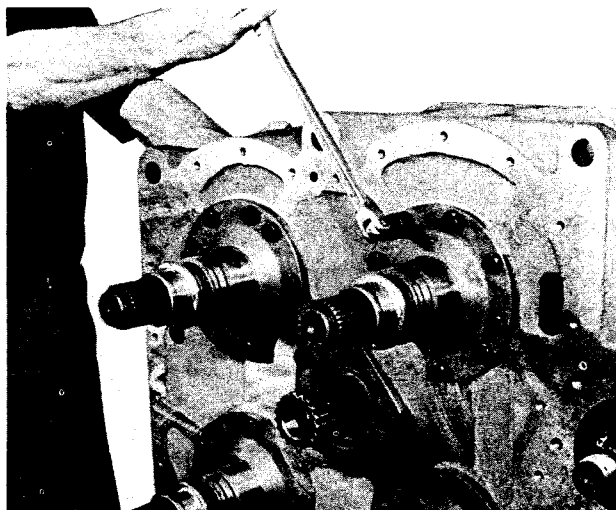
**Figure 23**

Remove idler gear.



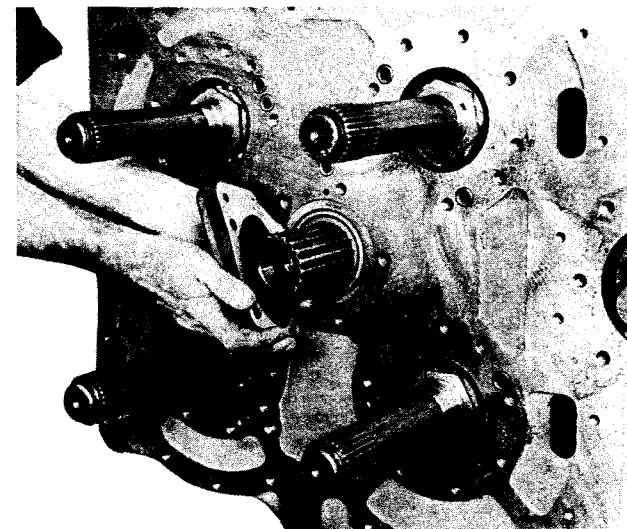
**Figure 26**

Remove idler shaft bearing cap bolts.



**Figure 24**

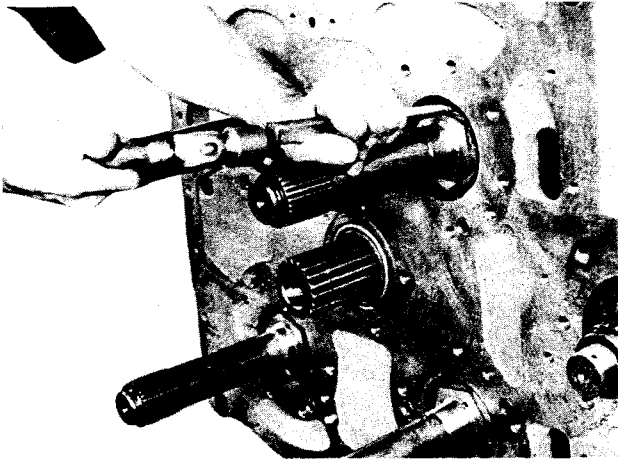
Remove clutch support bolt.



**Figure 27**

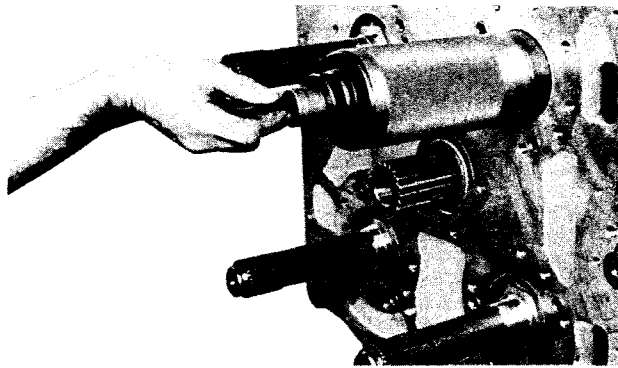
Remove idler shaft bearing cap and shims.





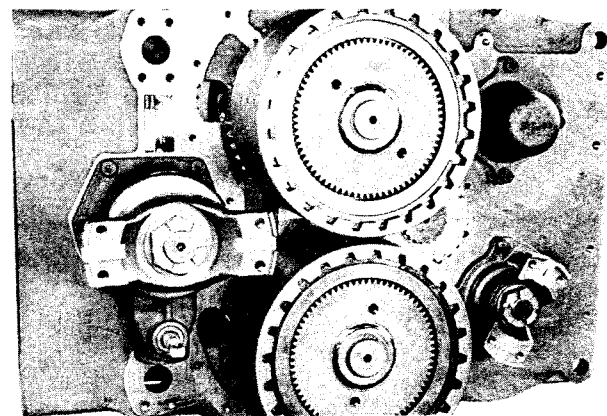
**Figure 28**

Straighten tangs on bearing nut lock. (See note after Figure 84).



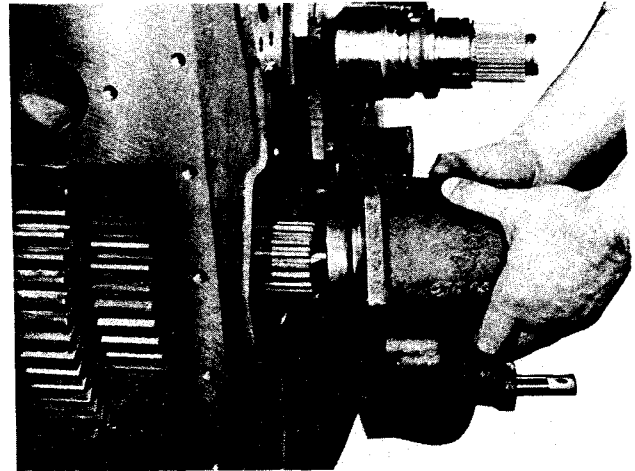
**Figure 29**

Lock transmission gears with a soft bar and remove the outer lock nut, nut lock, and inner lock nut. (See note after Figure 84).



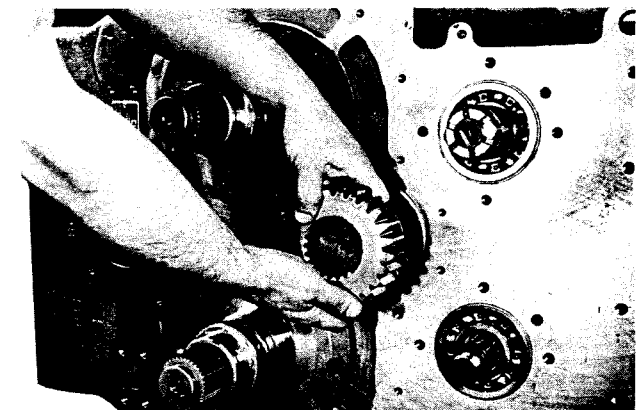
**Figure 30**

1st and 2nd clutch cover removed. Proceed with clutch disassembly as explained in previous text (Figure 7 through Figure 18).



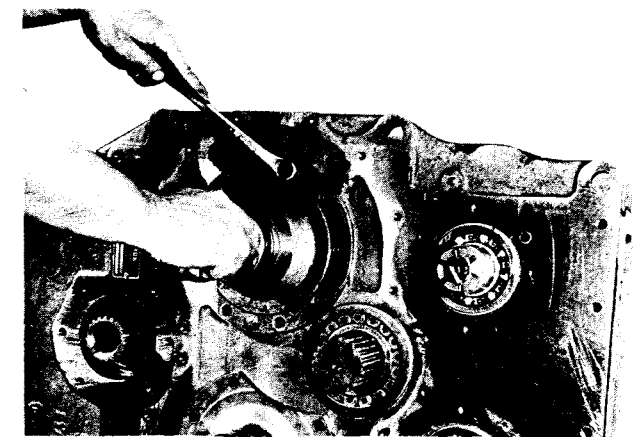
**Figure 31**

Remove disconnect housing bolts and housing assembly.



**Figure 32**

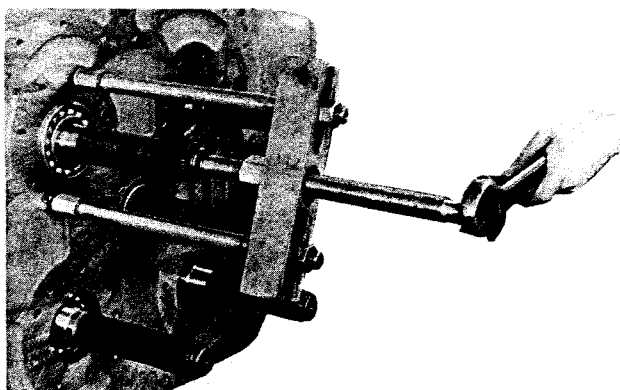
Remove idler gear retainer rings and idler gear.



**Figure 33**

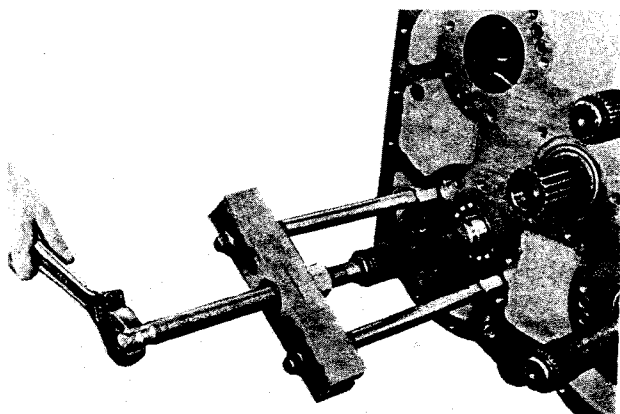
Remove 1st and 2nd clutch support bolts and clutch supports.





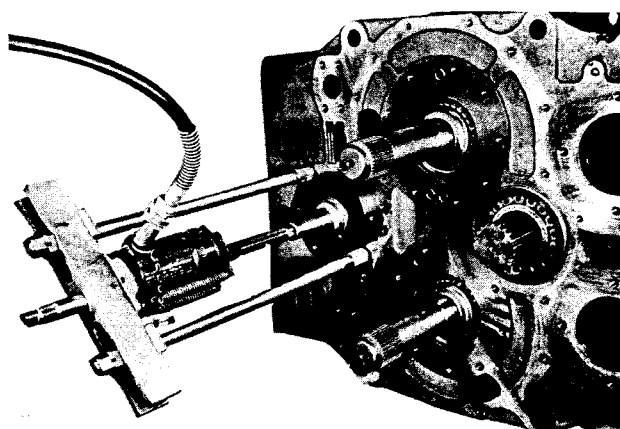
**Figure 34**

Using a suitable pusher tool, remove the reverse shaft, pushing from the lock nut side. Remove gears and spacers from inside case.



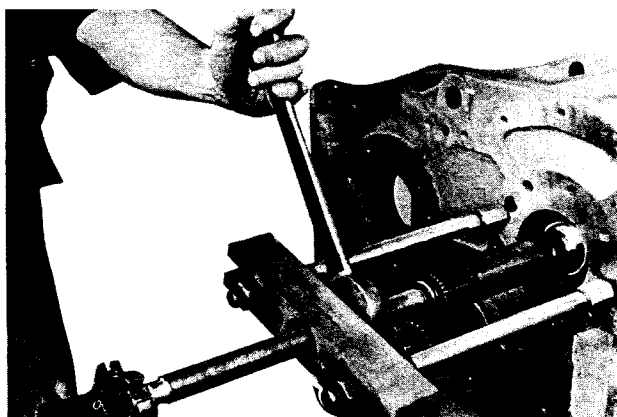
**Figure 35**

Using a suitable pusher tool, remove the input shaft, pushing from the lock nut side. Remove gears and spacers from inside case.



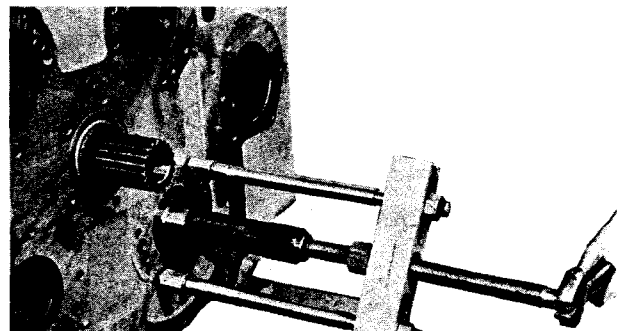
**Figure 36**

Press output shaft from case. Output shaft may be removed from either side.



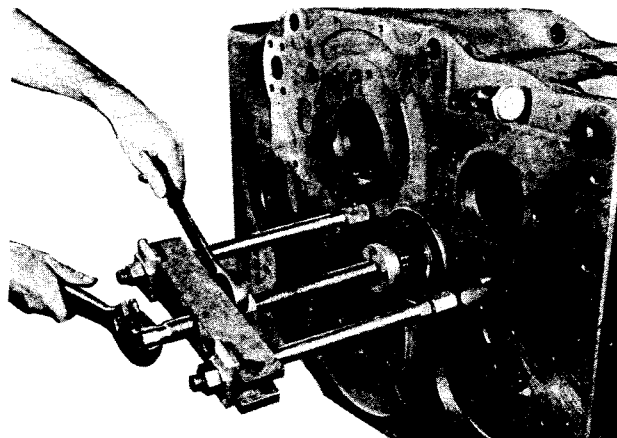
**Figure 37**

Using a suitable pusher tool, remove the 2nd and 4th shaft, pushing from the lock nut side. Before pushing on shaft, block gears inside of case to prevent internal tube damage. Remove gears and spacers from inside of case.



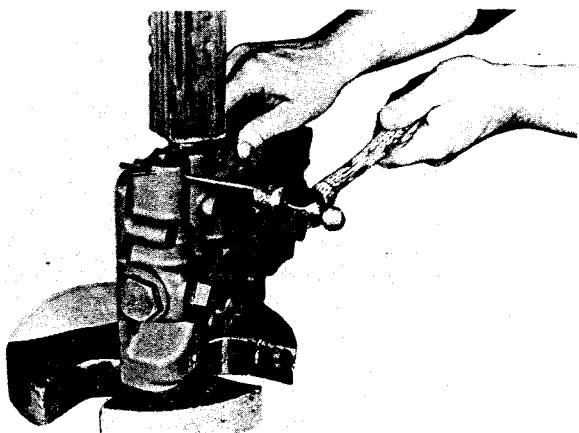
**Figure 38**

Using a suitable pusher tool, remove the 1st and 3rd shaft, pushing from the lock nut side. Before pushing on shaft, block gears inside of case to prevent internal tube damage. Remove gears and spacers from inside of case.



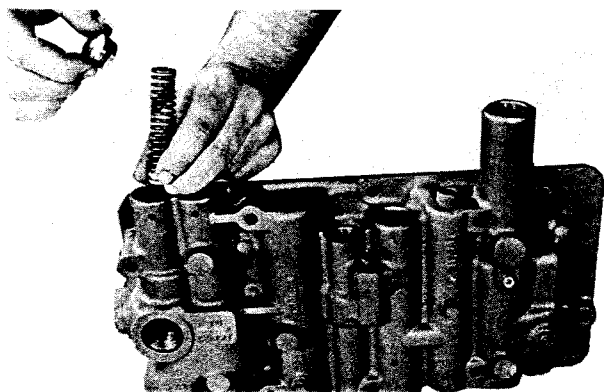
**Figure 39**

Remove idler shaft by blocking front bearing from inside of case to prevent bearing from moving with shaft and push shaft until double cone bearing and outer bearing race are exposed on opposite side.



**Figure 52**

Depress safety valve spring and spring stop.



**Figure 53**

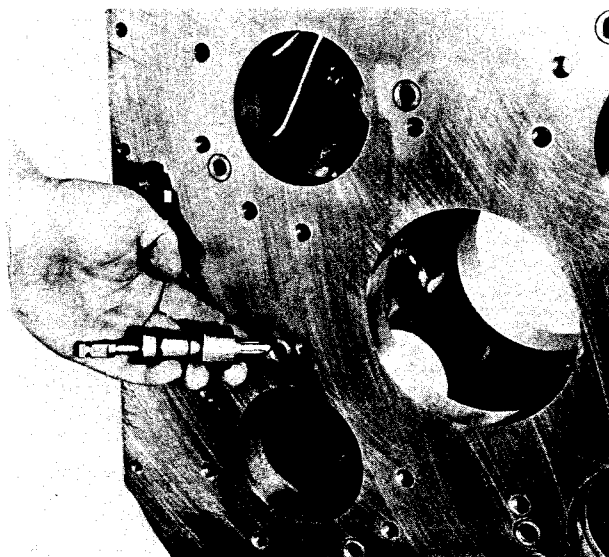
—Remove safety valve spring stop, valve spring, and safety ball valve.

## TRANSMISSION INTERNAL TUBING

These tubes are not to be removed unless damaged. They should, however, be cleaned and checked for leaks when transmission is disassembled. The tubes are divided into two groups. The high pressure or clutch pressure lines and the low or lubricating pressure lines.

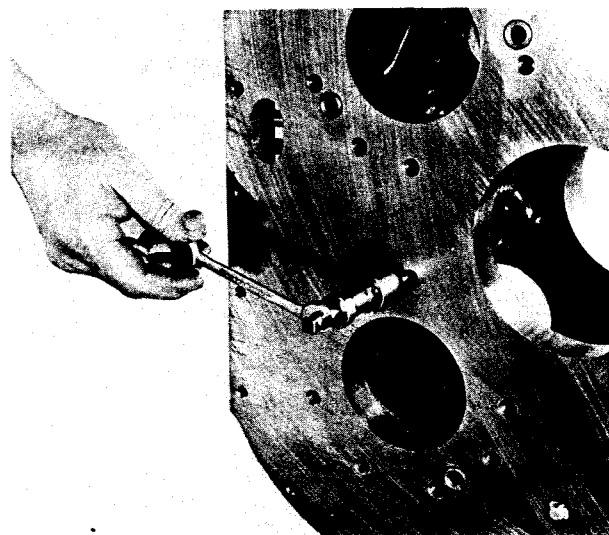
When necessary to replace any tubes, tool CE-805 is required. The procedure for using tool is as follows:

1. Install tubing in housing with end flush with case.
2. Slide collar over end of tube and press into bore of case.



**Figure 54**

Pull mandrel on tool all the way back and insert tool in tube.



**Figure 55**

Turn mandrel with hand until tool is firmly seated in tube. Using a 3/8" wrench, turn mandrel as far as possible.

Use this procedure to install all tubes in housing.

### Principle of Tool

Tool has roller which expands when mandrel is inserted. As mandrel is turned, the rollers expand against the internal bore of tubing. This forces tube to expand against collar which has a groove on inside diameter. When tube is expanded into this groove it is locked into position.

## Cleaning and Repair of Tool

This tool is a precision instrument and must be treated as such. After each use, remove mandrel and rollers and flush tool with cleaning solvent. Inspect rollers and mandrel for chips and flaking. If rollers or mandrel need to be replaced, they may be purchased from **Air Tool Division, Dresser Industries, Inc., 302 S. Center St., Springfield, Ohio 45501. Phone 513-323-4981. Attn: Order Dept.**

## CLEANING AND INSPECTION

### CLEANING

Clean all parts thoroughly using solvent type cleaning fluid. It is recommended that parts be immersed in cleaning fluid and slushed up and down slowly until all old lubricant and foreign material is dissolved and parts are thoroughly cleaned.

**CAUTION:** Care should be exercised to avoid skin rashes, fire hazards and inhalation of vapors when using solvent type cleaners.

### Bearings

Remove bearings from cleaning fluid and strike larger side of cone flat against a block of wood to dislodge solidified particles of lubricant. Immerse again in cleaning fluid to flush out particles. Repeat above operation until bearings are thoroughly clean. Dry bearings using moisture-free compressed air. Be careful to direct air stream across bearing to avoid spinning. Do not spin bearings when drying. Bearings may be rotated slowly by hand to facilitate drying process.

### Housings

Clean interior and exterior of housings, bearing caps, etc., thoroughly. Cast parts may be cleaned in hot solution tanks with mild alkali solutions providing these parts do not have ground or polished surfaces. Parts should remain in solution long enough to be thoroughly cleaned and heated. This will aid the evaporation of the cleaning solution and rinse water. Parts cleaned in solution tanks must be thoroughly rinsed with clean water to remove all traces of alkali. Cast parts may also be cleaned with steam cleaner.

**CAUTION:** Care should be exercised to avoid inhalation of vapors and skin rashes when using alkali cleaners.

All parts cleaned must be thoroughly dried immediately by using moisture-free compressed air or soft, lintless absorbent wiping rags free of abrasive materials such as metal filings, contaminated oil or lapping compound.

### INSPECTION

The importance of careful and thorough inspection of all parts cannot be overstressed. Replacement of all parts showing indication of wear or stress will eliminate costly and avoidable failures at a later date.

### Bearings

Carefully inspect all rollers, cages and cups for wear, chipping or nicks to determine fitness of bearings for further use. Do not replace a bearing cone or cup individually without replacing the mating cup or cone at the same time. After inspection, dip bearings in Automatic Transmission Fluid and wrap in clean lintless cloth or paper to protect them until installed.

## Oil Seals, Gaskets, Etc.

Replacement of spring load oil seals, "O" rings, metal sealing rings, gaskets and snap rings is more economical when unit is disassembled than premature overhaul to replace these parts at a future time. Further loss of lubricant through a worn seal may result in failure of other more expensive parts of the assembly. Sealing members should be handled carefully, particularly when being installed. Cutting, scratching, or curling under of lip of seal seriously impairs its efficiency. Apply a thin coat of Permatex No. 2 on the outer diameter of the oil seal to assure an oil tight fit into the retainer. When assembling new metal type sealing rings, same should be lubricated with coat of chassis grease to stabilize rings in their grooves for ease of assembly of mating members. Lubricate all "O" rings and seals with Automatic Transmission Fluid before assembly.

### Gears and Shafts

If magna-flux process is available, use process to check parts. Examine teeth on all gears carefully for wear, pitting, chipping, nicks, cracks or scores. If gear teeth show spots where case hardening is worn through or cracked, replace with new gear. Small nicks may be removed with suitable hone. Inspect shafts and quills to make certain they are not sprung, bent, or splines twisted, and that shafts are true.

### Housing, Covers, etc.

Inspect housings, covers and bearing caps to be certain they are thoroughly cleaned and that mating surfaces, bearing bores, etc., are free from nicks or burrs. Check all parts carefully for evidence of cracks or condition which would cause subsequent oil leaks or failures.

---

## REASSEMBLY OF TRANSMISSION

Instructions given below on reassembly of components of transmission assembly are given in the sequence that must be followed in rebuilding. Principle of operations cited and views shown are similar and parallel on all shafts. The various drive shafts are assembled in the following order:

1. Idler Shaft—"I"
2. First and Third Shaft—"B"
3. Second and Fourth Shaft—"A"
4. Output Shaft—"O"
5. Reverse Shaft—"R"
6. Input Shaft—"F"

## REASSEMBLY OF IDLER SHAFT

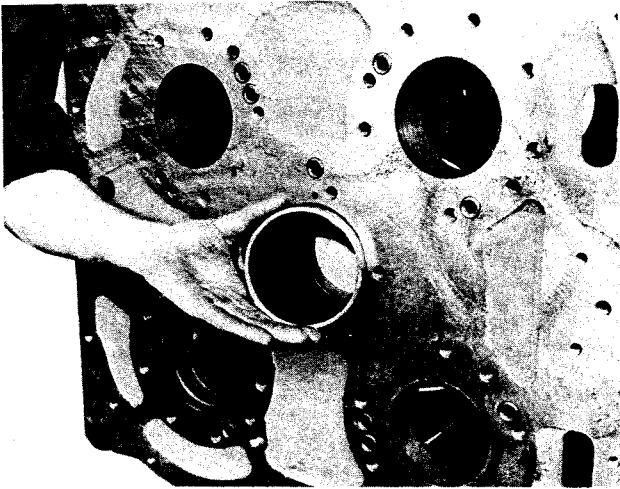


Figure 56

If transmission case was changed, install idler bearing cup locating ring. Install oil baffle in idler bearing bore. This must be done from inside the case and flange of the oil baffle must be 1/8" [3, 175mm] from the bearing cup locating ring. Install idler shaft inner cone bearing cup in transmission case.

Press roller bearing on idler shaft. Install bearing and shaft in case, opposite side of inner bearing cup. On taper bearing end of shaft install bearing spacer.

**CAUTION:** This spacer has a taper on the outer edge. This taper must go toward taper bearing. If installed wrong the large idler gear snap ring will not seat in ring groove.

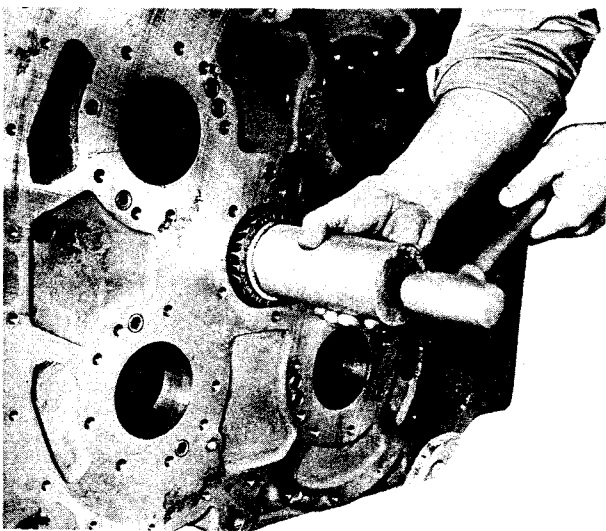


Figure 57

Install inner taper bearing on shaft with large diameter of taper outward.

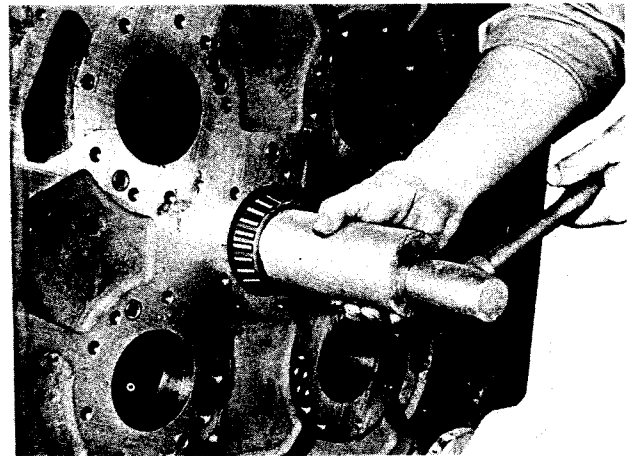


Figure 58

Install outer taper bearing on shaft with large diameter inward.

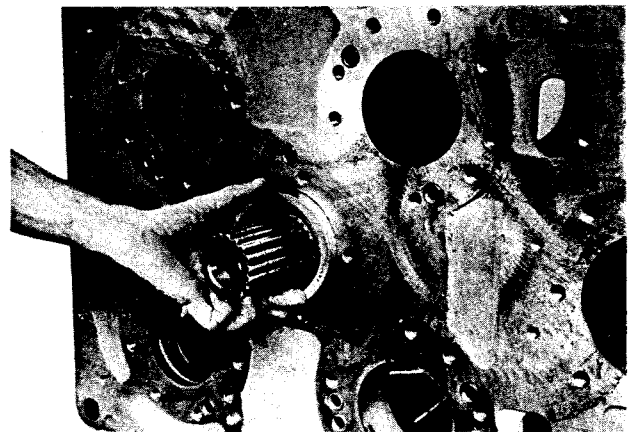


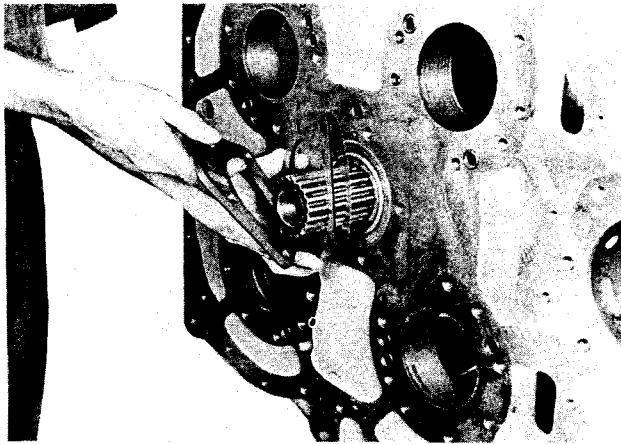
Figure 59

Install outer taper bearing cup on idler shaft.



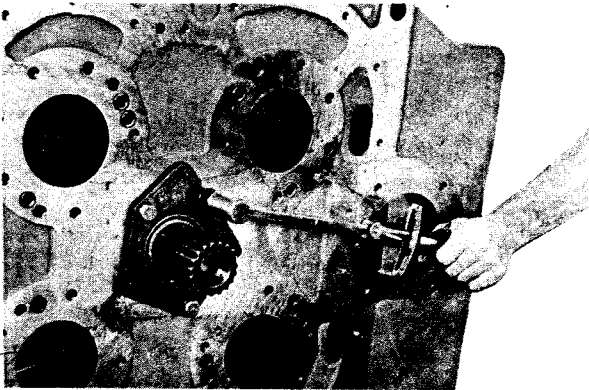
Figure 60

Drive outer taper bearing cup against outer taper bearing.



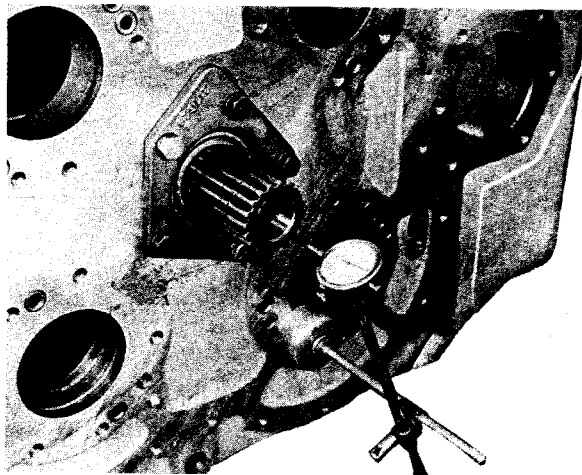
**Figure 61**

Install idler shaft bearing cap and shims.



**Figure 62**

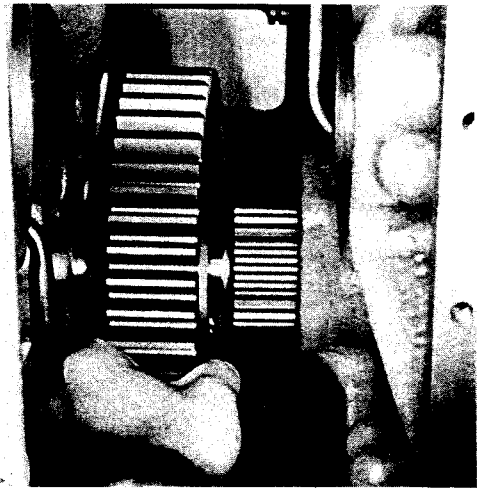
Install bearing cap bolts, torque bolts 57 to 63 ft. lbs. [77,3 - 85,4 N.m.]



**Figure 63**

Adjust idler shaft taper bearing by adding or omitting shims. Check adjustment as shown in Figure 63. Adjust taper bearings .0 to .003 [0,000 - 0,076 mm] end play.

## REASSEMBLY OF 1st AND 3rd SHAFT

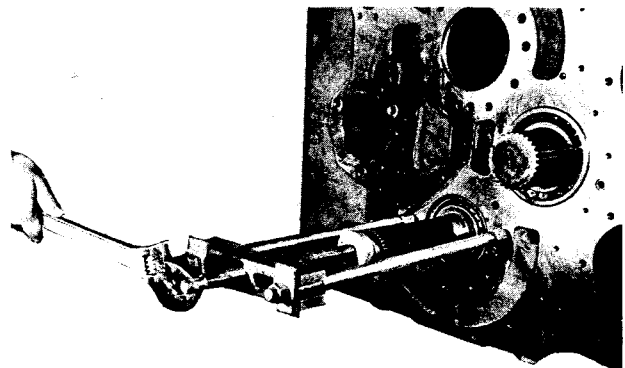


**Figure 64**

Press 1st and 3rd double taper bearing assembly on 1st and 3rd shaft. **CAUTION:** These bearings are in matched sets and under no circumstances can any of the four (4) parts be changed or mixed up with another bearing.

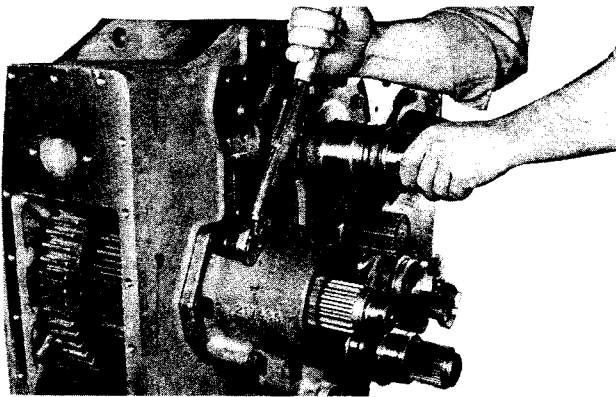
Position 1st and 3rd gear in transmission case. Install long gear spacer on shaft and against taper bearing assembly.

Insert shaft into bore of case and through 1st and 3rd gear. See Figure 64.



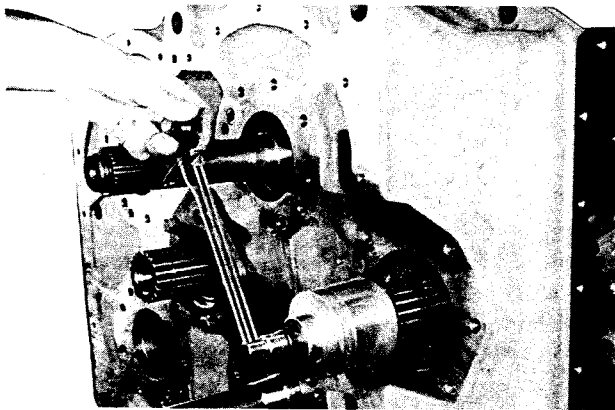
**Figure 65**

Push shaft assembly in case until taper bearing shoulders against locating ring in bore of case. Do not remove shaft pusher.



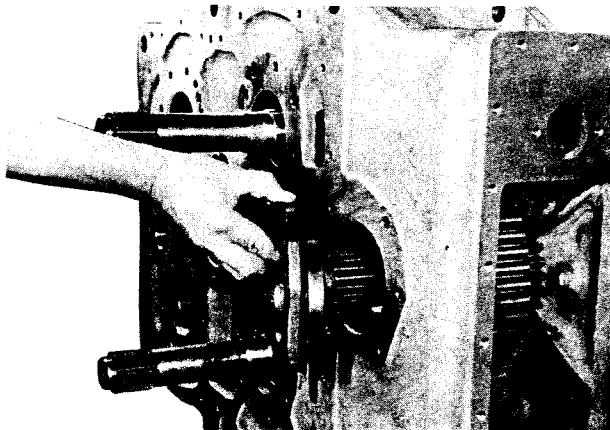
**Figure 74**

Secure disconnect assembly to transmission case with bolts and lockwashers. Tighten 57 to 63 ft. lbs. torque [77,3 - 85,4 N.m.]



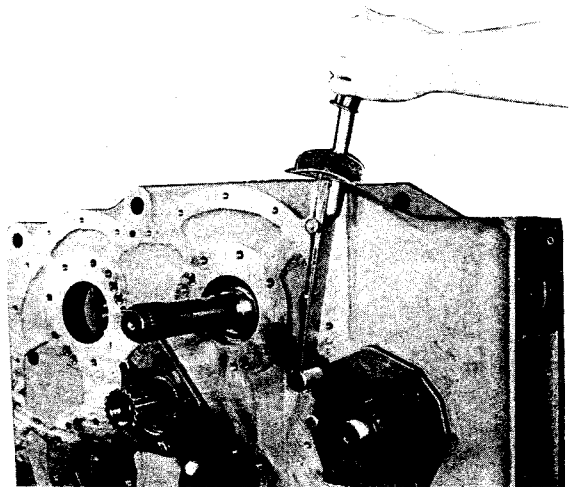
**Figure 75**

Install flange nut on threaded end of output shaft. Use an inch lb. torque wrench on the flange nut. Determine the amount of torque required to turn output shaft and gear train.



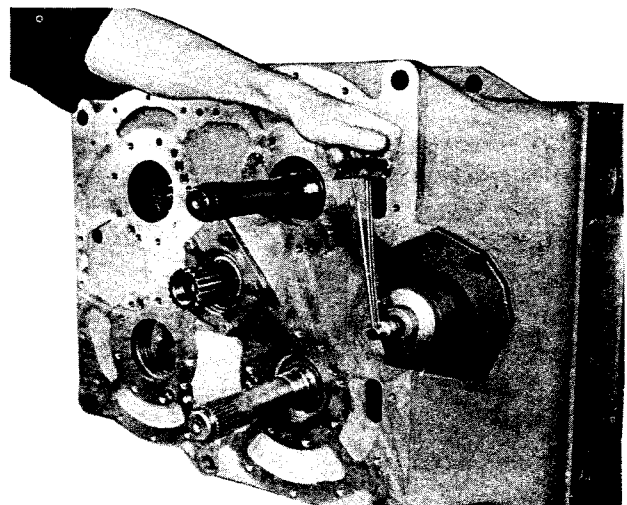
**Figure 76**

Install bearing cap, "O" ring and shims to transmission case.



**Figure 77**

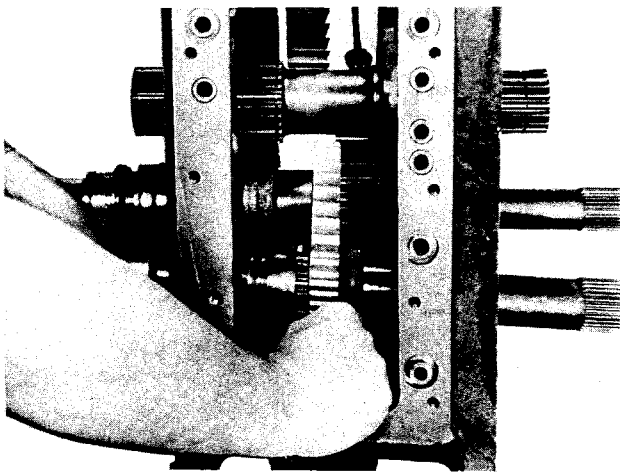
Install bearing cap bolts and lock washers. Tighten 57 to 63 ft. lbs. torque [77,3 - 85,4 N.m.]



**Figure 78**

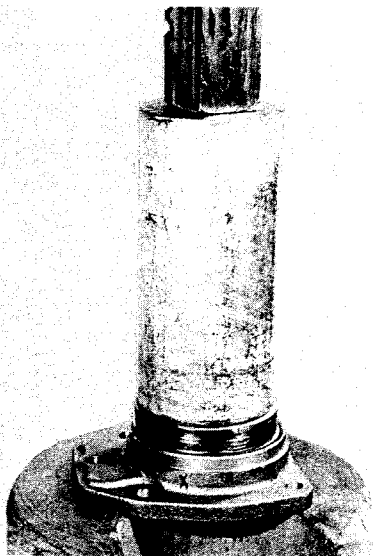
With an inch lb. torque wrench turn output shaft and gear train. Add or remove bearing cap shims to adjust preload. When bearings are properly adjusted, it will take 6 to 8 inch lbs. [0,70 - 0,90 N.m.] more to turn gear train than it did before bearing cap was installed.

## REASSEMBLY OF INPUT AND REVERSE SHAFT



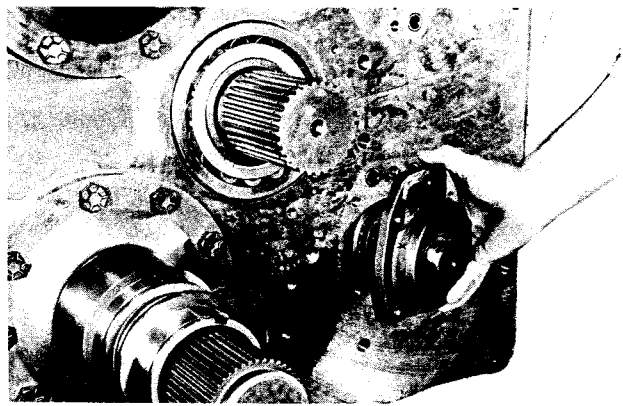
**Figure 79**

Press roller bearing on threaded end of input shaft. Install short spacer on shaft opposite threaded end. Position input gear in case with longer offset of gear to the rear. Install input shaft and bearing into front case bore and through input gear. Push bearing and shaft in case bore until bearing snap ring shoulders against transmission case. Do not remove shaft pusher. Install large spacer on shaft against input gear. Drive rear roller in place. **NOTE:** Bearing must be driven in tight. Check gear spacer on shaft. When spacer can not be turned by hand, stack up between input gear spacer and rear roller bearing is tight. **DO NOT** attempt to draw bearings up tight with bearing lock nuts. Remove shaft pusher.



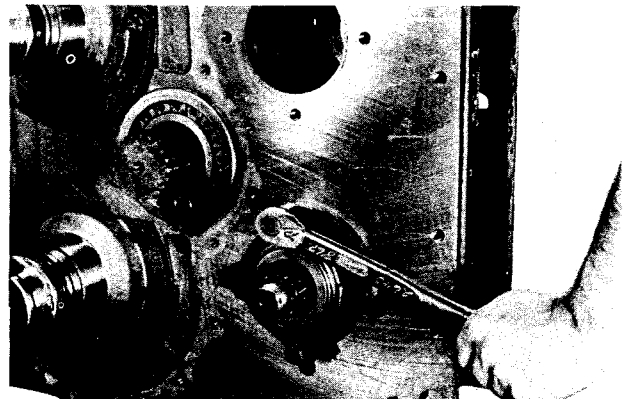
**Figure 80**

Apply a thin coat of Permatex No. 2 on the outer diameter of the input shaft oil seal. Press seal, lip of seal inward, into input shaft bearing cap.



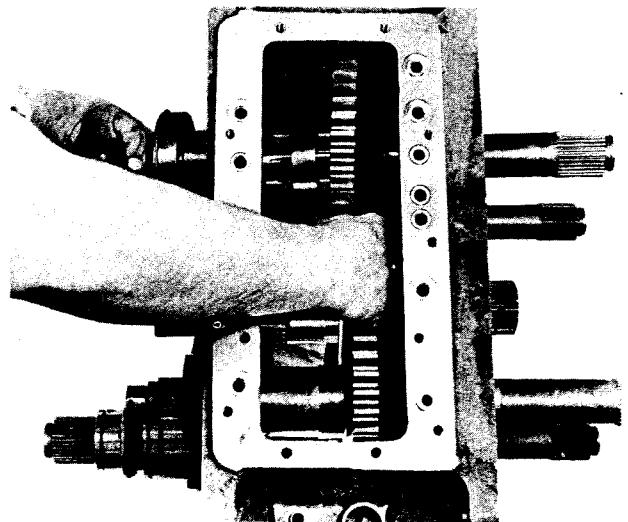
**Figure 81**

Install bearing cap and seal assembly on input shaft.



**Figure 82**

Install bearing cap bolts and lock washers. Torque bolts 57 to 63 ft. lbs. torque [77,3 - 85,4 N.m.] Install companion flange, flange "O" ring, washer and flange nut. Tighten nut 150 to 175 ft. lbs. torque [203,4 - 237,2 N.m.]



**Figure 83**



Assemble the reverse shaft the same as the input shaft (Fig. 79). Install reverse shaft bearing spacer, washer and nut. Lock gears with a soft bar and tighten reverse nut 150 to 175 ft. lbs. torque [203,4 - 237,2 N.m.] Install nut cotter. Place new gasket on reverse shaft. Install bolts and lock washers, tighten 57 to 63 ft. lbs. torque [77,3 - 85,4 N.m.]

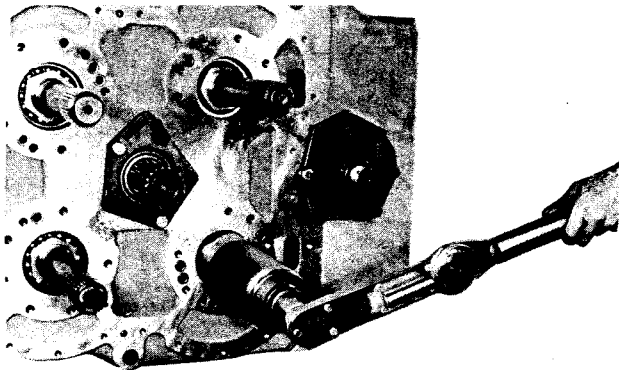


Figure 84

**NOTE:** On the input, reverse, 3rd and 4th clutch, some units will have a double locknut with a tanged washer and some units will have a single elastic locknut. The tightening torque is the same on both style nuts.

Lock gears using a soft bar, and install bearing inner lock nut (see note above). Tighten lock nuts 175 to 200 ft. lbs. torque [237,3 - 271,1 N.m.]. Install nut locks and outer lock nuts. Tighten outer lock nuts 175 to 200 ft. lbs. torque [237,3 - 271,2 N.m.].

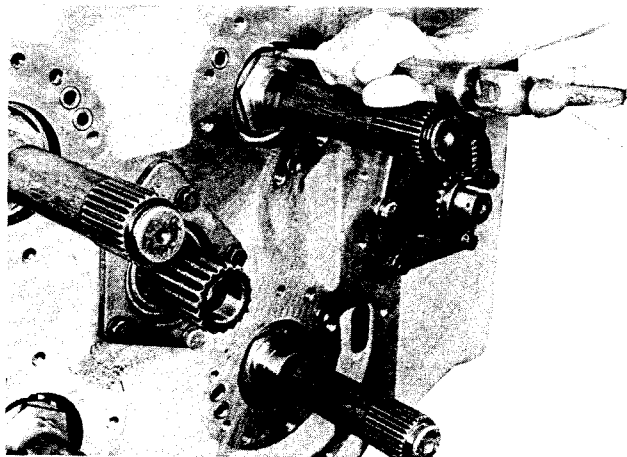


Figure 85

Bend a portion of the nut lock over one flat of the inner lock nut. Bend a portion of the nut lock over one flat of the outer lock nut.

If taper roller bearings are used in the input, reverse, 3rd and 4th clutch drums, follow procedure explained on pages 49 and 50 before installing clutch supports.

If ball bearings are used, proceed with Figure 86.

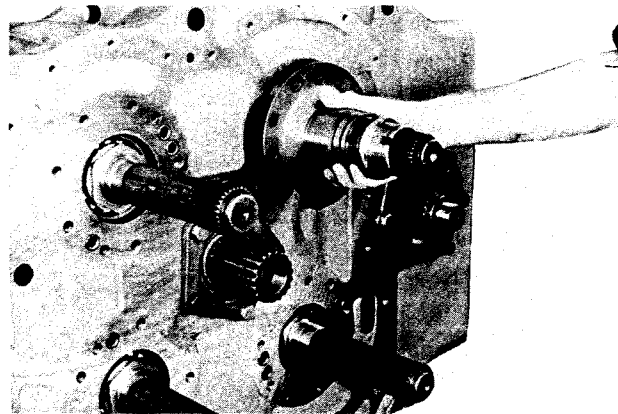


Figure 86

Install clutch supports. Align holes in clutch supports with holes in transmission case and install self locking bolts.

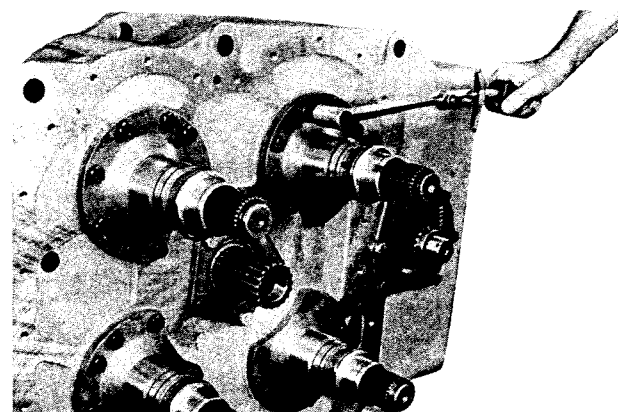


Figure 87

Tighten bolts 80 to 88 ft. lbs. torque [108,5 - 119,3 N.m.]. (See note after Figure 70).

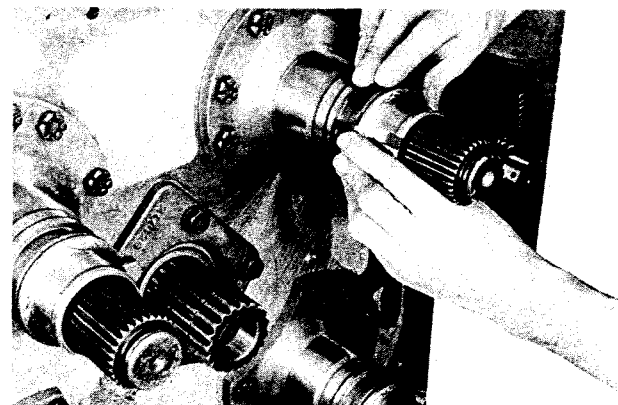
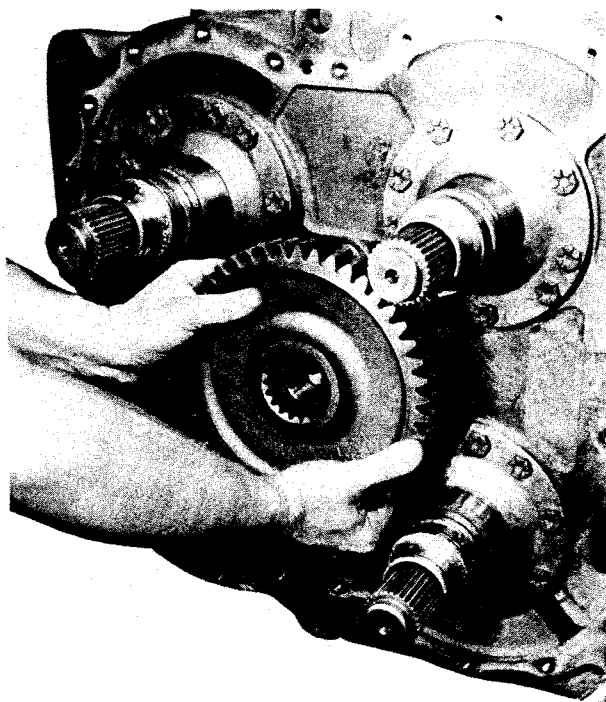


Figure 88

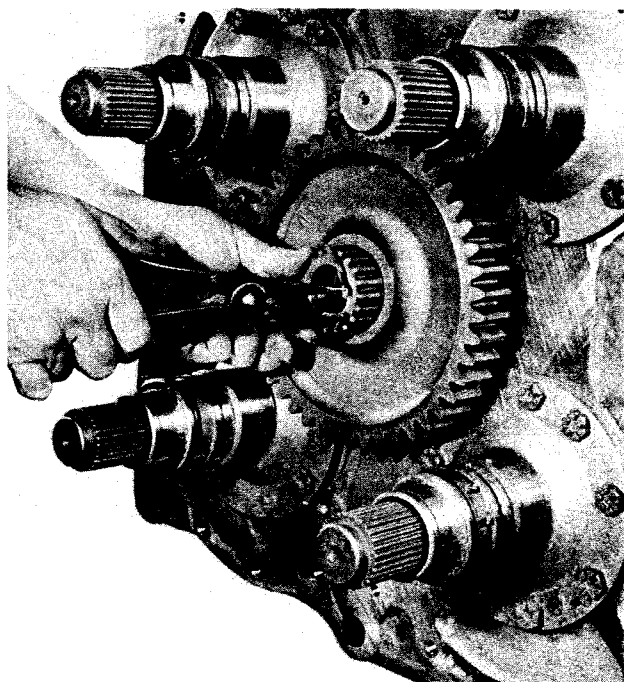
Install new clutch support piston rings. Lock rings in position. Lubricate piston rings with automatic transmission fluid. **NOTE:** Some clutch supports will have an expander spring and oil sealing ring on the support. Expander spring gap to be 180° from sealing hook joint.





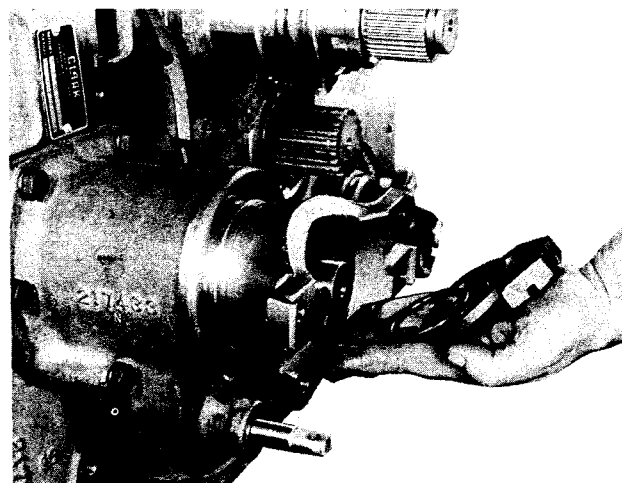
**Figure 89**

Install large idler gear on idler shaft with longer offset of gear hub inward.



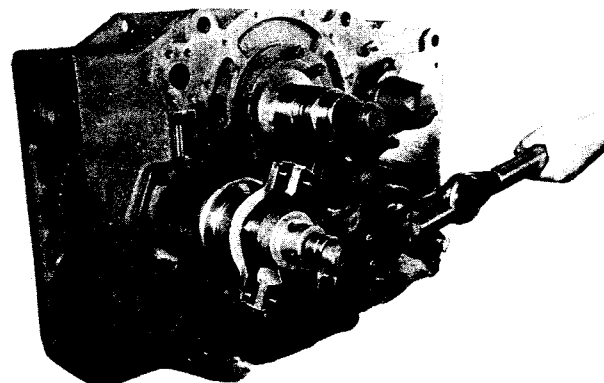
**Figure 90**

Install idler gear retainer ring.



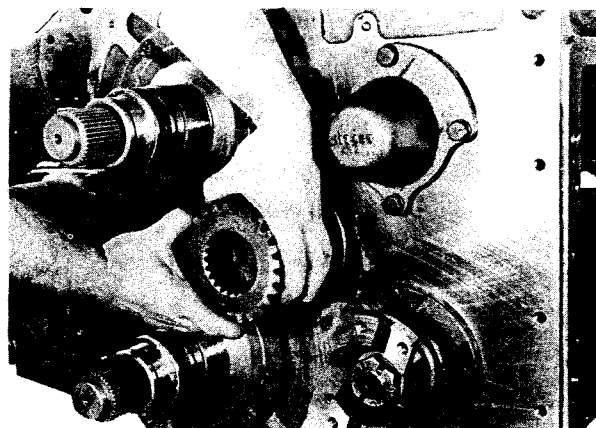
**Figure 91**

Install disconnect flange nut "O" ring, nut washer and flange nut.



**Figure 92**

Lock gears with a soft bar and tighten flange nut 250 to 300 ft. lbs torque [339,0 - 406,7 N.m.]



**Figure 93**

Install small idler gear on idler shaft with longer offset of gear inward.

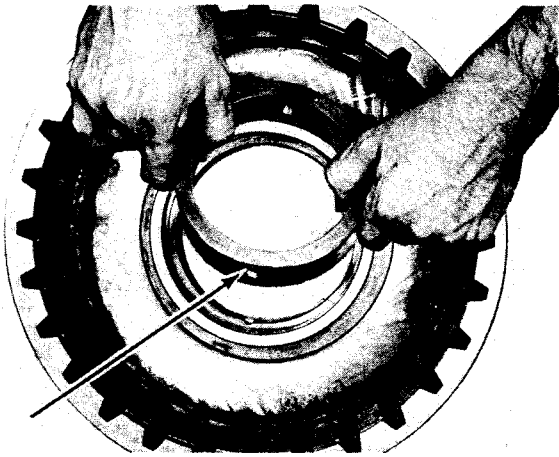
## REASSEMBLY OF CLUTCHES

**NOTE:** All clutches are assembled in a similar manner. However, the 1st and 2nd speed clutches have a clutch drum hub gear and retainer ring.

For input, reverse, 3rd and 4th clutch drum taper bearing installation see pages 49 and 50.

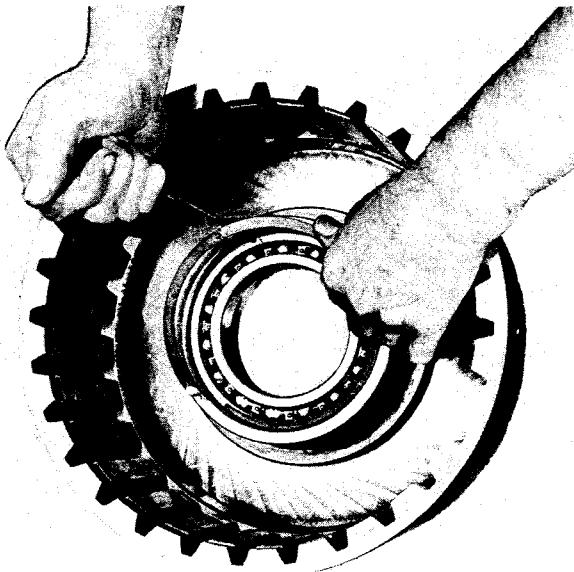
For input (forward) and reverse modulation see page 51.

Clutch being assembled in the following illustrations is the 1st speed.



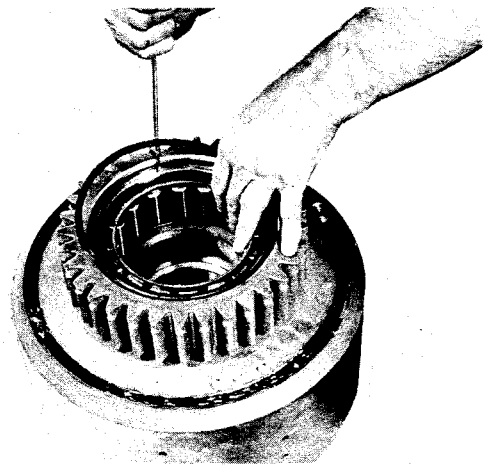
**Figure 94**

Insert lock ball in clutch piston ring outer race. Press outer race and ball in clutch drum. Outer race must be pressed from flush to 1/64" [0, 40 mm] below shoulder in clutch drum.



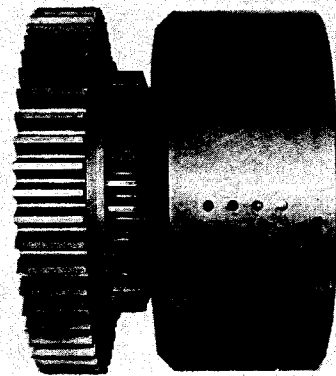
**Figure 95**

Press support ball bearing in clutch drum and secure with bearing retainer ring.



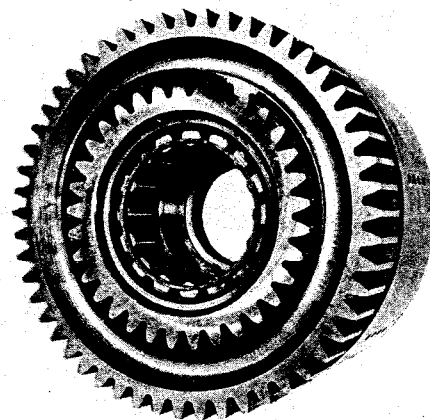
**Figure 96**

From rear end of clutch drum, press support roller bearing in drum. Secure with retainer ring.



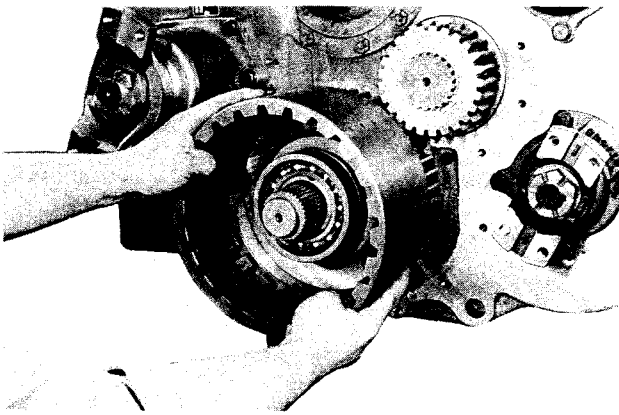
**Figure 97**

Press clutch drum hub gear on clutch drum with longer offset of gear hub inward. **NOTE:** Clutch drum hub gear is used only on the 1st and 2nd clutch.



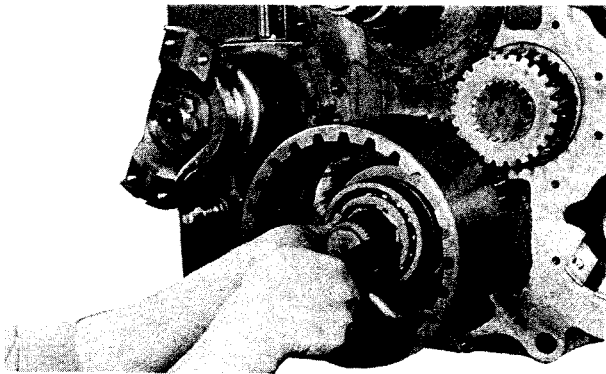
**Figure 98**

Secure clutch drum hub gear with retainer ring.



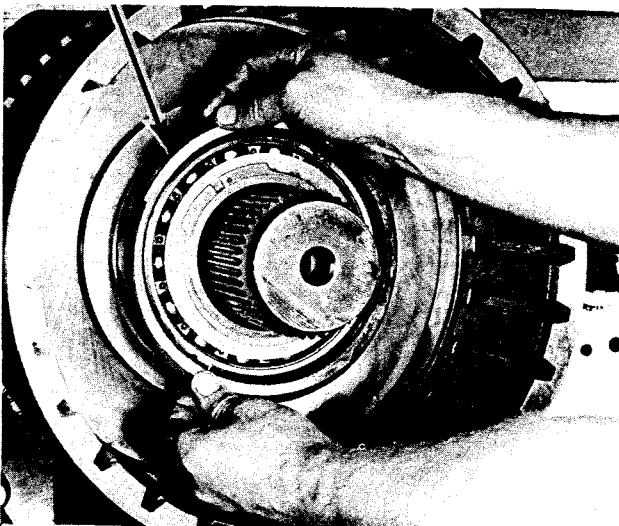
**Figure 99**

Install clutch drum assembly on clutch support. **CAUTION:** Do not damage clutch support piston rings.



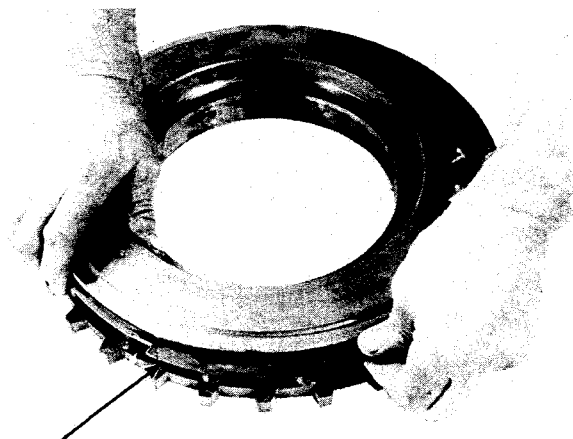
**Figure 100**

Install clutch drum hub bearing washer and washer retainer ring.



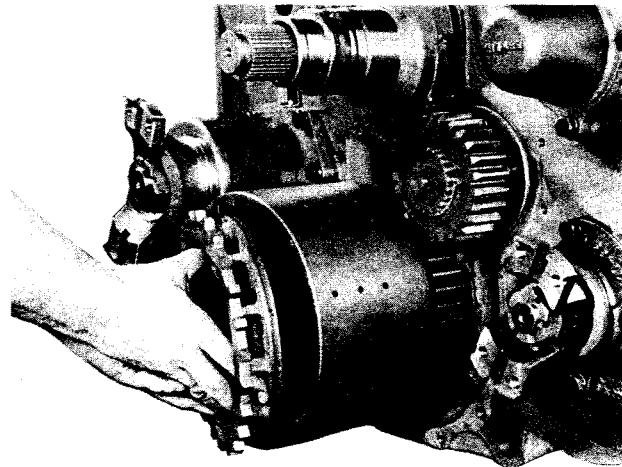
**Figure 101**

Install clutch piston inner sealing ring and expander spring. Lubricate piston ring with automatic transmission fluid. Expander spring may not be used on all clutches.



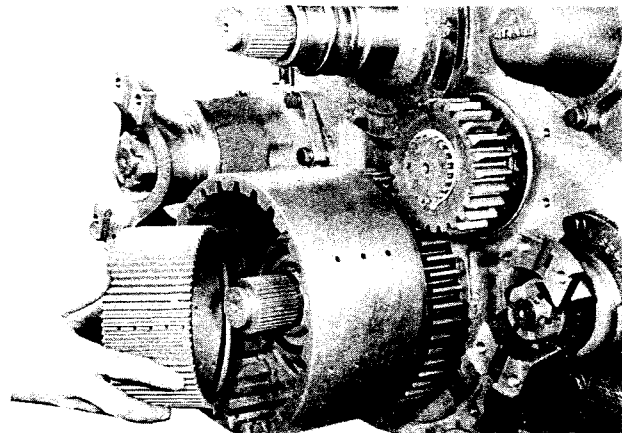
**Figure 102**

Install clutch piston outer piston ring and expander spring. Lubricate piston ring with automatic transmission fluid. Expander spring may not be used on all clutches.



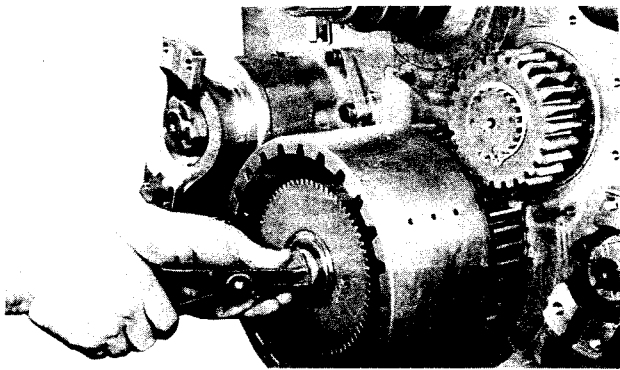
**Figure 103**

Slide clutch piston into position in clutch drum. **CAUTION:** Do not damage inner and outer piston rings.



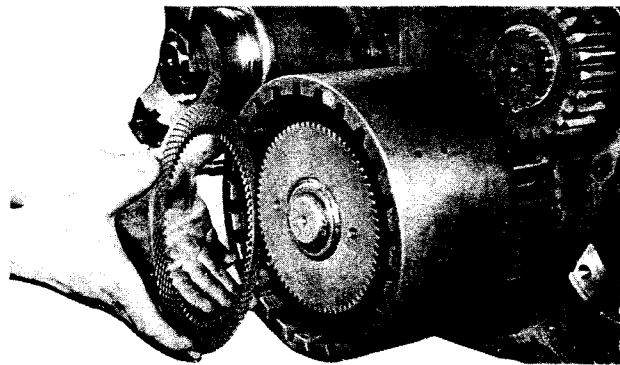
**Figure 104**

Install clutch disc hub in clutch drum.



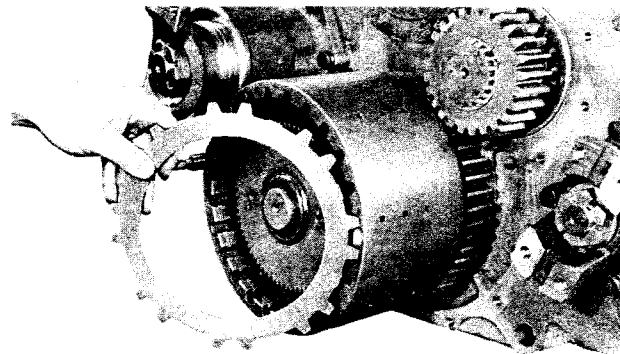
**Figure 105**

Install disc hub retainer ring.



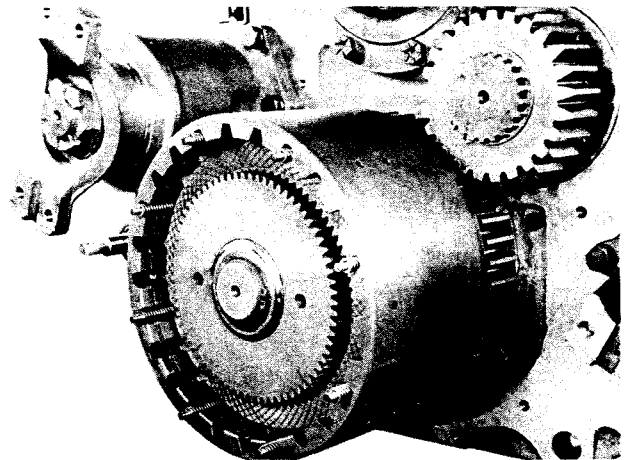
**Figure 106**

Install one inner clutch disc (spline teeth on inner diameter) on disc hub and against the clutch piston.



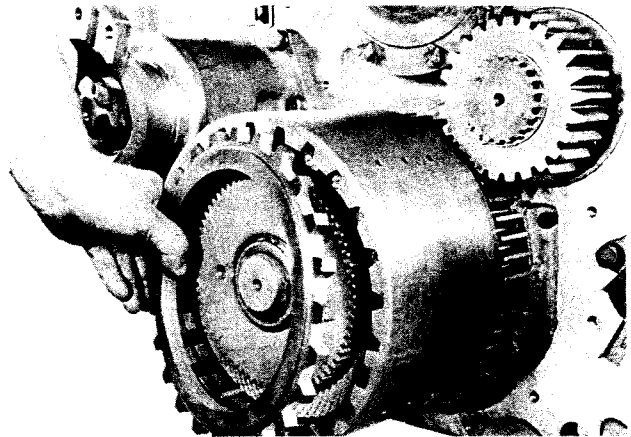
**Figure 107**

Install one outer clutch disc (spline teeth on outer diameter) in clutch drum. **NOTE:** The outer disc has teeth missing on the outer diameter. This is to allow passage for the clutch release springs. Insert two or more release springs in drum and against the teeth of the clutch piston. Install next inner disc. Alternate clutch discs, outer against inner, and always align the teeth on each outer disc with the teeth on the preceding outer disc. If assembly is correct each release spring is against a tooth on the clutch piston and you start with an inner disc and end with an inner disc.



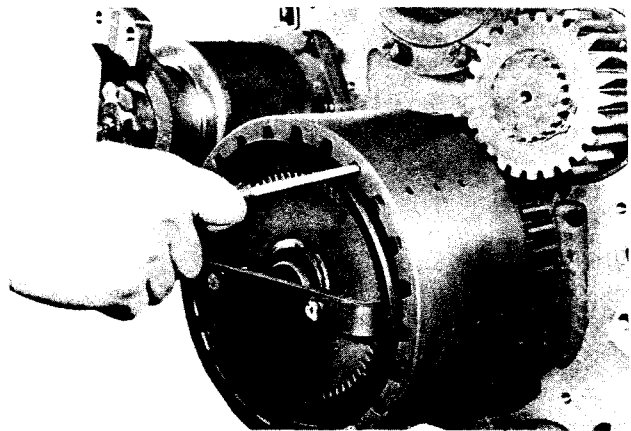
**Figure 108**

Insert all release springs and guide pins in clutch drum.



**Figure 109**

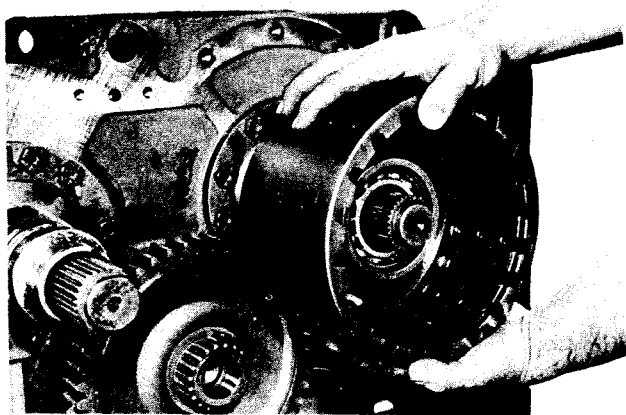
Install clutch disc end plate.



**Figure 110**

Compress clutch disc end plate and install end plate retainer ring.

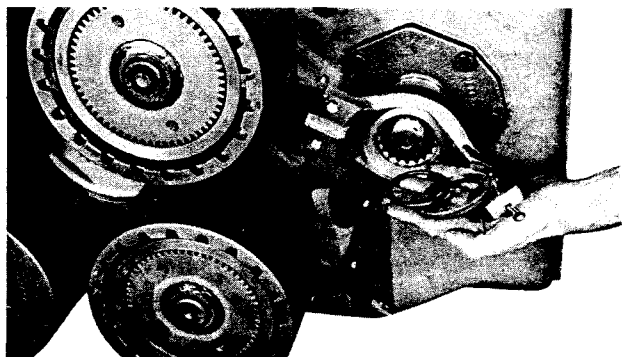
Use the same procedure to assemble all clutches.



**Figure 111**

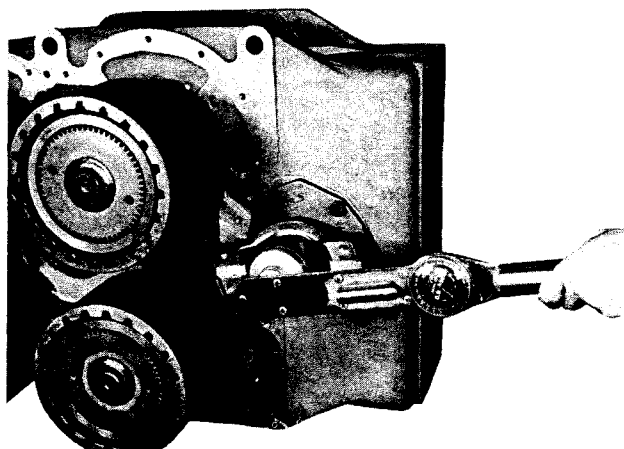
Install input, reverse, 3rd and 4th clutches as explained in Figures 94 through 96 and 99 through 110.

**NOTE:** If clutch drum taper bearings are used, install drum, selected washer and snap ring on the specific drum support these parts were matched with, then proceed with Figures 99 thru 110.



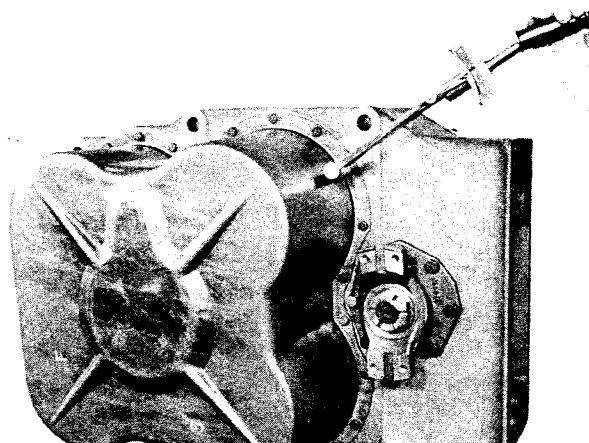
**Figure 112**

Install companion flange, flange "O" ring, washer and nut.



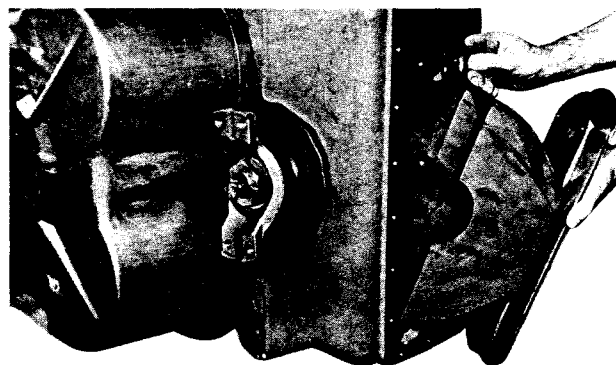
**Figure 113**

Tighten flange nut 250 to 300 ft. lbs. torque. [339,0 - 406,7 N.m.]



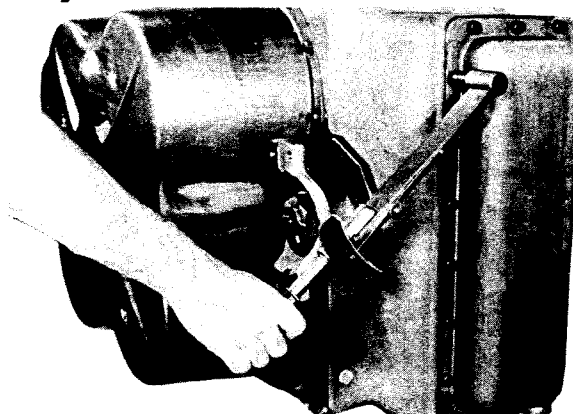
**Figure 114**

Install new gaskets on clutch covers. Align holes in clutch covers with holes in transmission case. Install bolts and lockwashers. Tighten 17 to 20 ft. lbs. torque [23,1 - 27,1 N.m].



**Figure 115**

Install new gasket on sump screen opening. Install sump screen in case and secure with bolts and lockwashers. Tighten 17 to 20 ft. lbs. torque [23,1 - 27,1 N.m.]



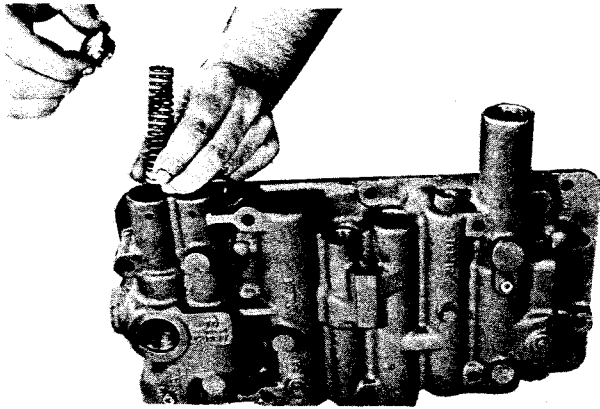
**Figure 116**

Install new gasket on sump pan. Set pan magnets over welded washers in sump pan. Install sump pan bolts and tighten 17 to 20 ft. lbs. torque [23,1 - 27,1 N.m.]

## REASSEMBLY OF CONTROL COVER

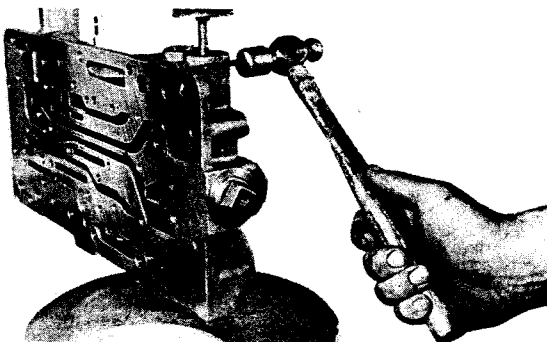
See page 8 for sequence of parts and parts identification.

**NOTE:** Lubricate all valves, springs, "O" rings, sleeves and oil seals with a light coat of automatic transmission fluid.



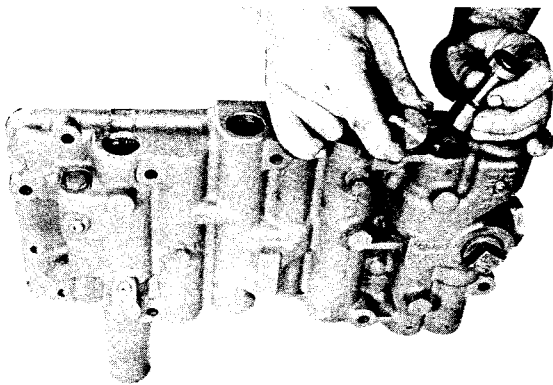
**Figure 117**

Install safety valve ball and spring in cover. With new "O" ring in position install spring stop on spring.



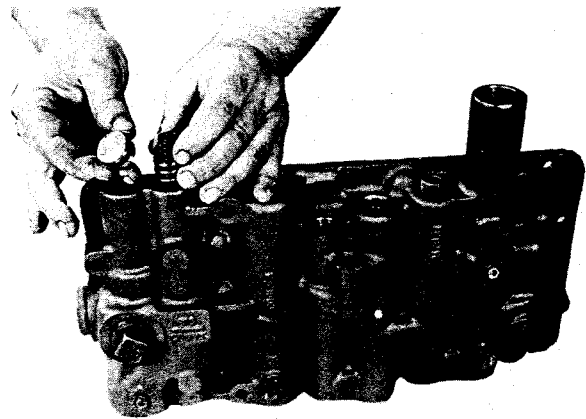
**Figure 118**

Depress spring stop and spring. Install spring stop roll pin.



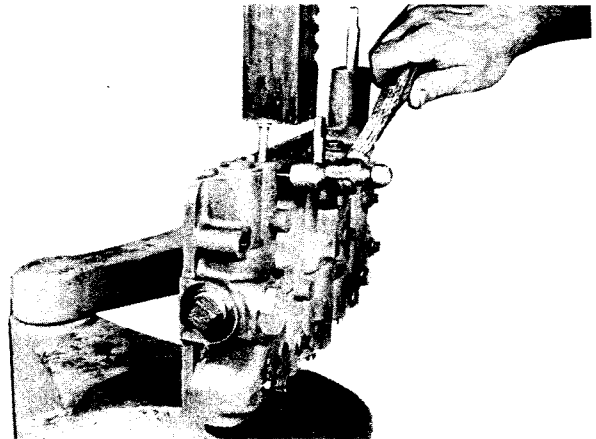
**Figure 119**

Install regulating valve spool in valve cover. Install new "O" ring on valve stop. Install valve stop in cover and retain with roll pin.



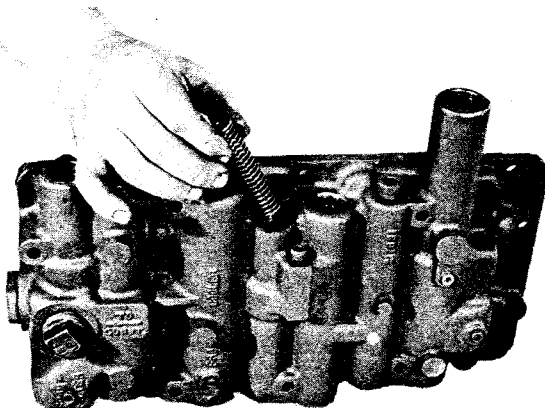
**Figure 120**

At opposite end of regulating valve install inner and outer valve spring. Install new "O" ring on spring stop. Install spring stop on springs.



**Figure 121**

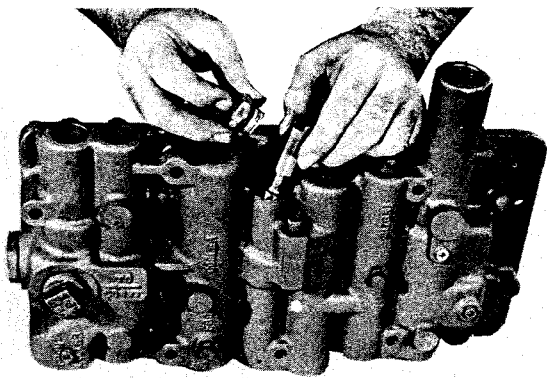
Depress spring stop and spring. Install spring stop roll pin.



**Figure 122**

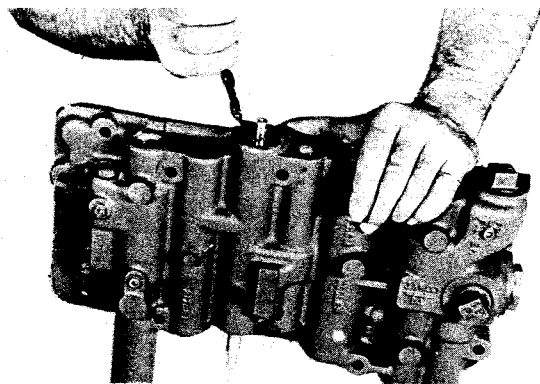
Install shut-off valve spring.





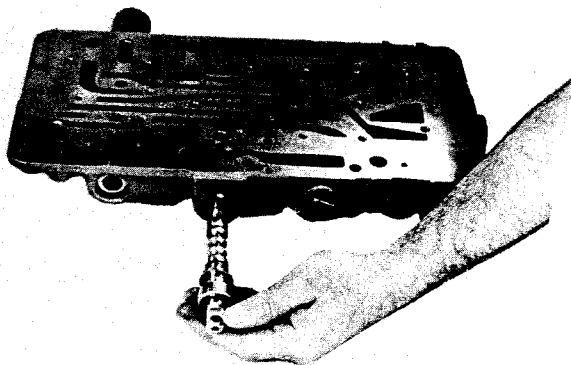
**Figure 123**

Install shut-off valve in housing. Depress valve and spring with valve plug. Tighten plug securely.



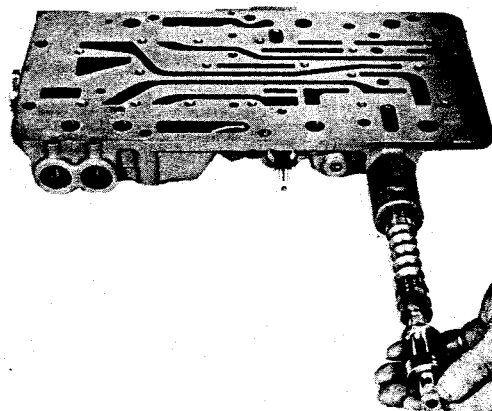
**Figure 126**

Install oil seal retainer ring.



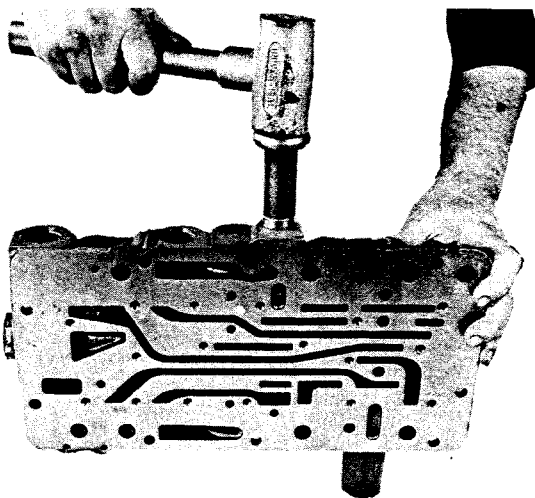
**Figure 124**

Install forward and reverse selector valve in housing. Install selector valve stop washer and oil seal on selector valve.



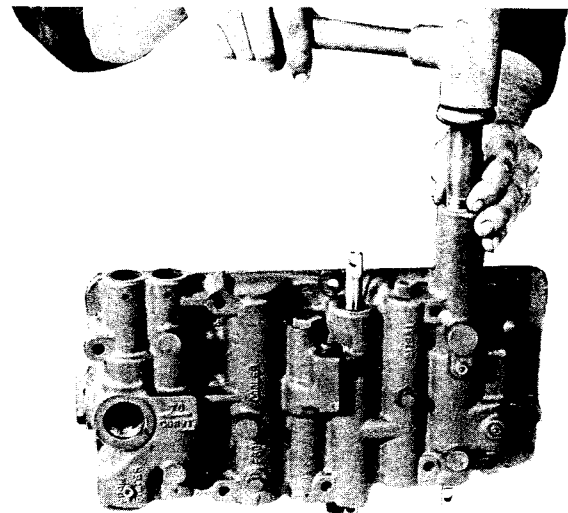
**Figure 127**

Install speed selector valve in housing. Install selector valve stop washer and oil seal on selector valve.



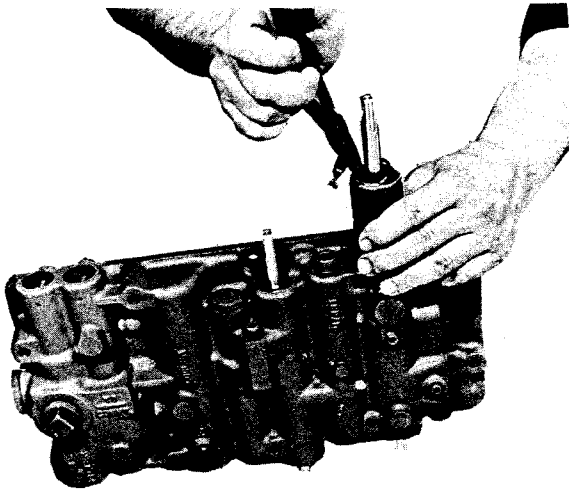
**Figure 125**

Apply a light coat of Permatex No. 2 in valve housing. Install oil seal in housing.

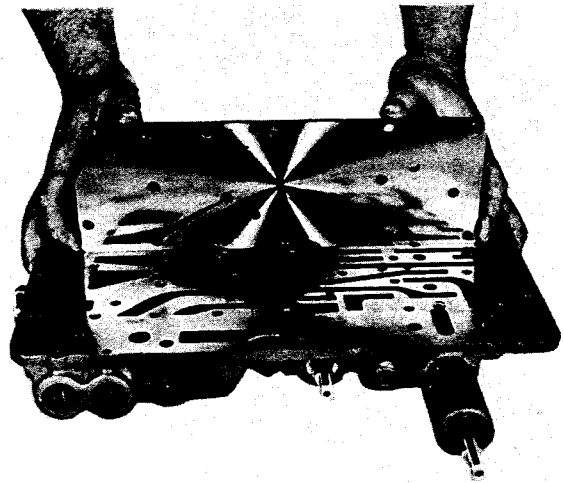


**Figure 128**

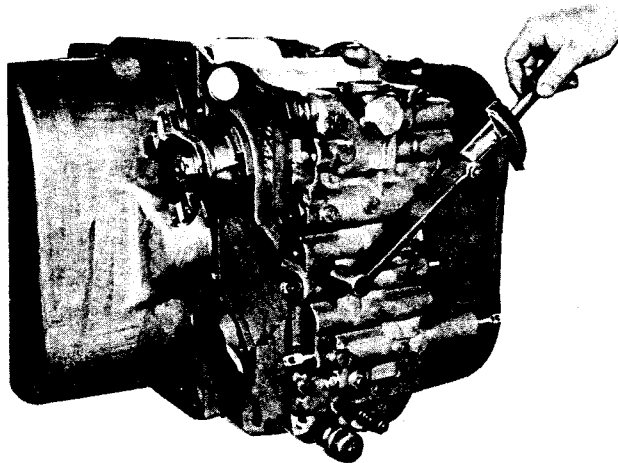
Apply a light coat of Permatex No. 2 in valve housing. Install oil seal in housing.



**Figure 129**  
Install oil seal retainer ring.



**Figure 130**  
Install poppet balls and poppet springs in drilled ports in control cover. Install control cover plate. Secure with bolts and external shake proof washers. Tighten 12 to 16 ft. lbs. torque [16,3 - 21,7 N.m.]



**Figure 131**  
Using new control valve to case "O" rings and new gasket, install control cover assembly on transmission case. Secure with bolts and lockwashers. Tighten 23 to 25 ft. lbs. torque [31,2 - 33,9 N.m.]



## SERVICING MACHINE AFTER TRANSMISSION OVERHAUL

The transmission, torque converter, and its allied hydraulic system are important links in the drive line between the engine and the wheels. The proper operation of either unit depends greatly on the condition and operation of the other; therefore, whenever repair or overhaul of one unit is performed, the balance of the system must be considered before the job can be considered completed.

After the overhauled or repaired transmission has been installed in the machine, the oil cooler, and connecting hydraulic system must be thoroughly cleaned. This can be accomplished in several manners and a degree of judgment must be exercised as to the method employed.

The following are considered the minimum steps to be taken:

1. Drain entire system thoroughly.
2. Disconnect and clean all hydraulic lines. Where feasible, hydraulic lines should be removed from machine for cleaning.
3. Replace oil filter elements, cleaning out filter cases thoroughly.
4. The oil cooler must be thoroughly cleaned. The cooler should be "back flushed" with oil and compressed air until all foreign material has been removed. Flushing in direction of normal oil flow will not adequately clean the cooler. If necessary, cooler assembly should be removed from machine for cleaning, using oil, compressed air and steam cleaner for that purpose. **DO NOT** use flushing compounds for cleaning purposes.

5. On remote mounted torque converters remove drain plug from torque converter and inspect interior of converter housing, gears, etc. If presence of considerable foreign material is noted, it will be necessary that converter be removed, disassembled and cleaned thoroughly. It is realized this entails extra labor; however, such labor is a minor cost compared to cost of difficulties which can result from presence of such foreign material in the system.

6. Reassemble all components and use only type oil recommended in lubrication section. Fill transmission through filler opening until fluid comes up to **LOW** mark on transmission dipstick. **NOTE:** If the dipstick is not accessible oil level check plugs are provided.

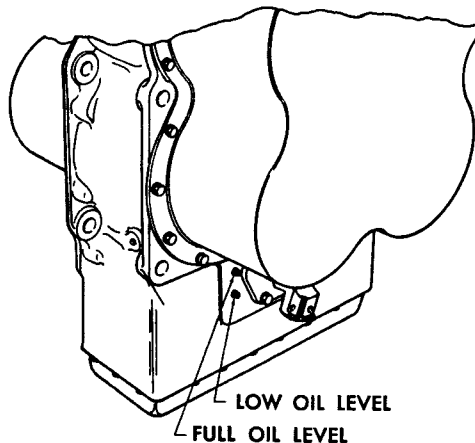
Remove **LOWER** check plug, fill until oil runs from **LOWER** oil hole. Replace filler and level plug.

Run engine two minutes at 500-600 RPM to prime torque converter and hydraulic lines. Recheck level of fluid in transmission with engine running at idle (500-600 RPM).

Add quantity necessary to bring fluid level to **LOW** mark on dipstick or runs freely from **LOWER** oil level check plug hole. Install oil level plug or dipstick. Recheck with hot oil (180-200° F.) [82, 2-93, 3° C].

Bring oil level to **FULL** mark on dipstick or runs freely from **UPPER** oil level plug.

7. Recheck all drain plugs, lines, connections, etc., for leaks and tighten where necessary.



## SPECIFICATIONS AND SERVICE DATA—POWER SHIFT TRANSMISSION AND TORQUE CONVERTER

CONVERTER OUT PRESSURE	Converter outlet oil temp. 180° - 200° F. [82,3° - 93,3° C]. Transmission in <b>NEUTRAL</b> . Operating specifications: 55 psi [379,3 kPa] minimum pressure at 2000 R.P.M. engine speed <b>AND</b> a maximum of 70 psi [482,6 kPa] outlet pressure with engine operating at no-load governed speed.	OIL FILTRATION	Full flow oil filter safety by-pass, also strainer screen in sump at bottom of transmission case.
CONTROLS	Forward and Reverse — Manual Speed Selection — Manual	CLUTCH PRESSURE	180-220 psi [1241,1 - 1516,8 kPa] — With parking brake set (see note), oil temperature 180° - 200° F. [82,2° - 93,3° C], engine at idle (400 to 600 RPM), shift thru direction and speed clutches. All clutch pressure must be equal within 5 psi, [34,5 kPa] if clutch pressure varies in any one clutch more than 5 psi, [34,5 kPa] repair clutch.
CLUTCH TYPE	Multiple discs, hydraulically actuated, spring released, automatic wear compensation and no adjustment. All clutches oil cooled and lubricated.	<b>NOTE: Never use service brakes while making clutch pressure checks. Units having brake actuated declutching in forward and/or reverse will not give a true reading.</b> <b>ALWAYS USE PARKING BRAKE WHEN MAKING CLUTCH PRESSURE CHECKS.</b>	
CLUTCH INNER DISC	Friction.		
CLUTCH OUTER DISC	Steel.		

## LUBRICATION

TYPE OF OIL See Lube Chart.

CAPACITY Consult Operator's Manual on applicable machine model for system capacity. Torque Converter, Transmission and allied hydraulic system must be considered as a whole to determine capacity.

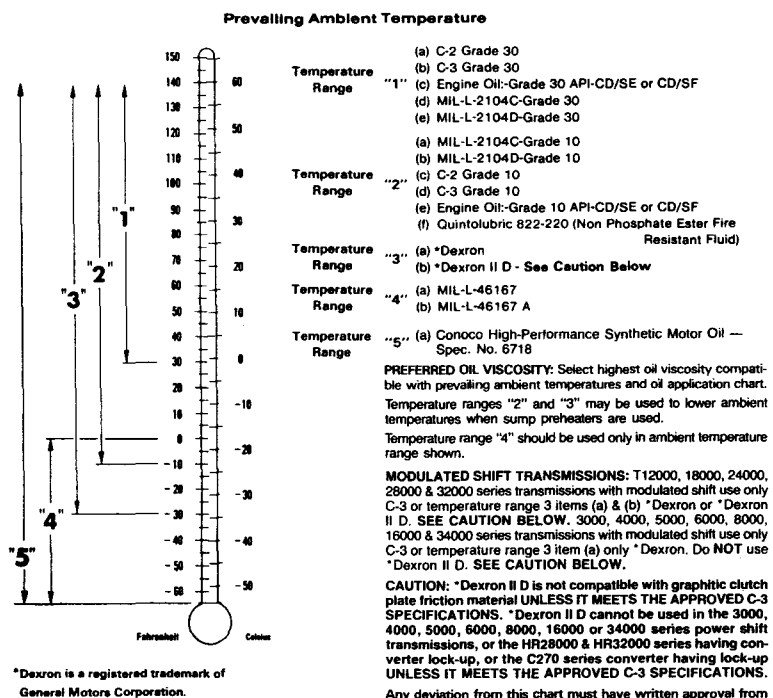
CHECK PERIOD Check oil level DAILY with engine running at 500-600 RPM and oil at 180° to 200° F. [82,2 - 93,3° C]. Maintain oil level to FULL mark.

NORMAL \* DRAIN PERIOD Every 500 hours, change oil filter element.  
Every 1000 hours, drain and refill system as follows: Drain with oil at 150° to 200° F. [65,6 - 93,3° C].

**NOTE: It is recommended that filter elements be changed after 50 and 100 hours of operation on new and rebuilt or repaired units.**

- (a) Drain transmission and remove sump screen. Clean screen thoroughly and replace, using new gaskets.
- (b) Drain oil filters, remove and discard filter elements. Clean filter shells and install new elements.
- (c) Refill transmission to **LOW** mark.
- (d) Run engine at 500-600 RPM to prime converter and lines.
- (e) Recheck level with engine running at 500 - 600 RPM and add oil to bring level to **LOW** mark. When oil temperature is hot (180-200° F.) [82,2-93,3° C] make final oil level check. **BRING OIL LEVEL TO FULL MARK.**

### RECOMMENDED LUBRICANTS FOR CLARK-HURTH COMPONENTS POWER SHIFTED TRANSMISSION AND TORQUE CONVERTERS

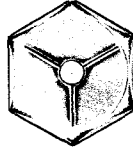


**\* Normal drain periods and filter change intervals are for average environmental and duty-cycle conditions. Severe or sustained high operating temperatures or very dusty atmospheric conditions will cause accelerated deterioration and contamination. For extreme conditions judgment must be used to determine the required change intervals.**

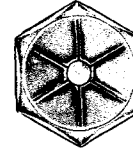
## TORQUE IN (FT.—LBS.) BOLTS, CAPSCREWS, STUDS AND NUTS

Grade 5 Identification, 3 Radial  
Dashes 120° Apart on Head of Bolt

Grade 8 Identification, 6 Radial  
Dashes 60° Apart on Head of Bolt



Grade 5



Grade 8

LUBRICATED OR PLATED

Nominal Size	Fine Thread Torque Lbs. Ft./N.m.	Course Thread Torque Lbs. Ft./N.m.	Fine Thread Torque Lbs. Ft./N.m.	Course Thread Torque Lbs. Ft./N.m.
.2500	9-11 [12,2-14,9]	8-10 [10,8-13,6]	11-13 [14,9-17,6]	9-11 [12,2-14,9]
.3125	16-20 [21,7-27,1]	12-16 [16,3-21,7]	28-32 [38,0-43,4]	26-30 [35,3-40,7]
.3750	26-29 [35,3-39,3]	23-25 [31,2-33,9]	37-41 [50,2-55,6]	33-36 [44,7-48,8]
.4375	41-45 [55,6-61,0]	37-41 [50,2-55,6]	58-64 [78,6-86,8]	52-57 [70,5-77,3]
.5000	64-70 [86,8-94,9]	57-63 [77,3-85,4]	90-99 [122,0-134,2]	80-88 [108,5-119,3]
.5625	91-100 [123,4-135,6]	82-90 [111,2-122,0]	128-141 [173,5-191,2]	115-127 [156,0-172,2]
.6250	128-141 [173,5-191,2]	113-124 [153,2-168,1]	180-198 [244,0-268,4]	159-175 [215,6-237,3]

### PRESSURE AND OIL FLOW CHECK SPECIFICATIONS. ALL CHECKS MADE WITH HOT OIL (180 - 200° F.) [82,2 - 93,3° C.]

A. Clutch Pressure at Transmission Control Cover	See Specifications and Service Data.
B. Transmission to Converter Line	See External Oil Flow Diagram.
C. Converter-Out Pressure	See Pressure and Oil Flow Checks.
D. Temperature Gauge Connection	See External Oil Flow Diagram.
E. Lubricating Pressure	25 p.s.i. [172,4 kPa] Maximum at High Free Idle.
Converter Return Line	See External Oil Flow Diagram.
Converter Pump Output	See Pump Chart.

### TROUBLE SHOOTING GUIDE

The following data is presented as an aid to locating the source of difficulty in a malfunctioning unit. It is necessary to consider the torque converter charging pump, transmission, oil cooler and connecting oil lines as a complete system when running down the source of trouble since the proper operation of any unit therein depends greatly on the condition and operation of the others. By studying the principles of operation together with data in this section, it may be possible to correct any malfunction which may occur in the system.

TROUBLE SHOOTING PROCEDURE BASICALLY CONSISTS OF TWO CLASSIFICATIONS: MECHANICAL AND HYDRAULIC.

#### MECHANICAL CHECKS

Prior to checking any part of the system from a hydraulic standpoint, the following mechanical checks should be made.

1. A check should be made to be sure all control lever linkage is properly connected and adjusted at all connecting points.
2. Check shift levers and rods for binding or restrictions in travel that would prevent full engagement. Shift levers by hand at transmission case, if full engagement cannot be obtained, difficulty may be in control cover and valve assembly.

#### HYDRAULIC CHECKS

Before checking on the torque converter, transmission and allied hydraulic systems for pressures and rate of oil flow, it is essential that the following preliminary checks be made.

1. Check oil level in transmission. This should be done with oil temperatures of 180-200 F. [82,2-93,3° C.]. DO NOT ATTEMPT THESE CHECKS WITH COLD OIL. To bring the oil temperature to this specification it is necessary to either work the machine or "stall" out the converter. Where the former means is impractical, the latter means should be employed as follows:

Engage shift levers in forward and high speed and apply brakes. Accelerate engine half to three-quarter throttle.

Hold stall until desired converter outlet temperature is reached. CAUTION: FULL THROTTLE STALL SPEEDS FOR AN EXCESSIVE LENGTH OF TIME WILL OVERHEAT THE CONVERTER.

## PRESSURE AND OIL FLOW CHECKS

Whenever improper performance is evident the following basic pressure and oil flow checks should be performed and recorded. It is also recommended that these checks be taken periodically as a preventative maintenance measure. Doing so will permit possible detection of difficulties in advance of actual breakdown, thus permitting scheduling of repair operation. Likewise, repair of minor difficulties can be made at considerably less cost and down-time than when delayed until major and complete breakdowns occur.

Analyzing the results of these checks by comparison with specifications and with each other will indicate in most cases the basic item or assembly in the system as the source of difficulty. Further checking of that assembly will permit isolation of the specific cause of trouble.

(SEE PLUMBING AND CHECK POINT DIAGRAM)

### OIL PRESSURE AT CONVERTER OUT PORT.

Install hydraulic pressure gauge at **PRESSURE** connection on Converter Regulator Valve or at **CONVERTER OUT** pressure tap. (All models do not have pressure regulating valves.) Check and record oil pressure at 2000 RPM and at maximum speed (engine at full throttle) (see instructions on Stalling Converter previously listed).

CONVERTER MODEL	MINIMUM CONVERTER OUT PRESSURE	MAXIMUM CONVERTER OUT PRESSURE
C-5000.....	55 p.s.i. [379,3 kPa]	70 p.s.i. [482,6 kPa]
C-8000.....	55 p.s.i. [379,3 kPa]	70 p.s.i. [482,6 kPa]
C-16000.....	55 p.s.i. [379,3 kPa]	70 p.s.i. [482,6 kPa]

If a flow meter is available, install in line between converter charging pump and oil filters. Flow meter must be able to withstand 300 p.s.i. [2068,4 kPa].

Disconnect hose between pump and filter at filter end and using suitable fittings connect to pressure port of tester. Install hose between filter and tester, connecting same to reservoir port of tester.

DO NOT USE TESTER LOAD VALVE AT ANY TIME DURING TEST. When taking flow reading, all readings should be taken on the first (left) half of flow gauge. Whenever the needle shows on the right half of gauge, correct by switching to higher scale.

If a flow meter is not available for checking converter pump output, proceed with manual transmission and converter checks. If the converter shows leakage within specifications and clutch pressures (180 to 220 p.s.i.) [1241,1 - 1516,8 kPa] are all equal within 5 p.s.i. [34,5 kPa] refer to paragraph on Low Converter Charging Pump Output.

PUMPS ARE RATED AT 2000 RPM — Refer to Vehicle Manufacture Manual for specific pump output.

NOMINAL PUMP RATINGS:	C-5000	C-8000	C-16000
	21 G.P.M.	21 G.P.M.	40 G.P.M.
	31 G.P.M.	31 G.P.M.	50 G.P.M.
		40 G.P.M.	65 G.P.M.

Pump output listed applies to a new pump in each case. A 20% tolerance below this figure is permissible; however, if pump output is more than 20% below specification the pump must be replaced or rebuilt.

## TRANSMISSION CLUTCH LEAKAGE

Check clutch pressures at low engine idle with oil at operating temperatures 180 - 200° F. [82, 2 - 93, 3° C]. Engine speed must remain constant during entire leakage check. Shift lever into forward 4 or 8 speeds. Record pressures. Shift lever in reverse and 1st. Record pressure. All pressure must be equal within 5 p.s.i. [34,5 kPa]. If clutch pressure varies in any one clutch more than 5 p.s.i. [34,5 kPa], repair clutch.

If a flow meter is available install in line coming out of converter pump. See flow diagram for location of pressure on flow checks. Check pump volume at 2000 RPM and at low engine idle. Record readings. See pump volume specifications at 2000 RPM.

Install flow meter in the line coming from transmission to converter. Check oil volume at 2000 RPM and at low idle in the following speed selections. Record readings.

Forward — Low speed thru High

Reverse — Low speed

Subtract readings in each speed from pump volume reading to get transmission clutch leakage.

Example:	Pump Volume at idle	8 gal.	Pump volume	8 gal.
	Forward—Low speed thru High	6 gal.	Forward — Low speed	6 gal.
	Reverse—Low speed	6 gal.	Clutch leakage	2 gal.

If clutch leakage varies more than 1 gal. from one clutch to another, repair clutch.

### LEAKAGE IN TRANSMISSION CLUTCHES

Leakage in 3000 series must not exceed 4 gal. max.  
Leakage in 5000 series must not exceed 4 gal. max.  
Leakage in 8000 series must not exceed 6 gal. max.  
Leakage in 16000 series must not exceed 7 gal. max.

## CONVERTER LUBE FLOW

Disconnect CONVERTER DRAIN BACK line at transmission with engine running at 2000 RPM and measure oil into a gallon container. Measure oil leakage for 15 seconds and multiply the volume of oil by four to get gallons per minute leakage.

### LEAKAGE IN CONVERTER

Leakage in C270 series not to exceed 2 gal. max.  
Leakage in C5000 series not to exceed 3 gal. max.  
Leakage in C8000 series not to exceed 5 gal. max.  
Leakage in C16000 series not to exceed 5 gal. max.

### LOW CLUTCH PRESSURE WITH NORMAL CLUTCH LEAKAGE

CAUSE	REMEDY
1. Low Oil Level.	1. Fill to proper level.
2. Broken spring in transmission regulator valve.	2. Replace spring.
3. Clutch pressure regulator valve spool stuck in open position.	3. Clean valve spool and sleeve.
4. Faulty charging pump.	4. See paragraph on charging pump output.

### LOW CLUTCH PRESSURE WITH EXCESSIVE CLUTCH LEAKAGE

1. Broken or worn clutch piston sealing rings.	1. Replace sealing rings.
2. Clutch drum bleed valve ball stuck in open position.	2. Clean bleed valve thoroughly.
3. Broken or worn sealing rings on clutch support.	3. Replace sealing rings.
4. Low converter charging pump output.	4. See paragraph on charging pump output.

### LOW CONVERTER CHARGING PUMP OUTPUT

#### CAUSE

1. Low oil level.
2. Sump screen plugged.
3. Air leaks at pump intake hose and connections or collapsed hose.
4. Defective oil pump.

#### REMEDY

1. Fill to proper level.
2. Clean screen and sump.
3. Tighten all connections or replace hose if necessary.
4. Replace pump.

### LOW FLOW THROUGH COOLER WITH LOW CONVERTER IN PRESSURE

1. Defective safety by-pass valve spring.
2. Converter by-pass valve partially open.
3. Excessive converter internal leakage. See paragraph E, check converter lube flow.
4. Broken or worn sealing rings in transmission clutches.

1. Replace spring.
2. Check for worn by-pass ball seat.
3. Remove, disassemble, and rebuild converter assembly, replacing all worn or damaged parts.
4. See paragraph on Clutch leakage.

### LOW FLOW THROUGH COOLER WITH HIGH CONVERTER OUT PRESSURE

1. Plugged oil cooler. Indicated if transmission lube pressure is low.
2. Restricted cooler return line.
3. Lube oil ports in transmission plugged. Indicated if transmission lube pressure is high.

1. Back flush and clean oil cooler.
2. Clean out lines.
3. Check lube lines for restrictions.

### OVERHEATING

1. Worn oil sealing rings. See paragraph E.
2. Worn oil pump.
3. Low oil level.
4. Pump suction line taking air.

1. Remove, disassemble, and rebuild converter assembly.
2. Replace.
3. Fill to proper level.
4. Check oil line connections and tighten securely.

### NOISY CONVERTER

1. Worn coupling gears.
2. Worn oil pump.
3. Worn or damaged bearings.

1. Replace.
2. Replace.
3. A complete disassembly will be necessary to determine what bearing is faulty.

### LACK OF POWER

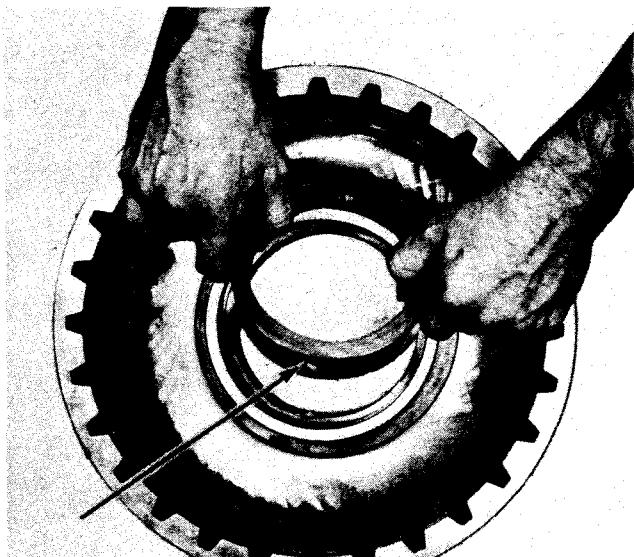
1. Low engine RPM at converter stall.
2. See "Over-heating" and make same checks.

1. Tune engine check governor.
2. Make corrections as explained in "Over-Heating."

The following information must be used in conjunction with the maintenance and service manual.

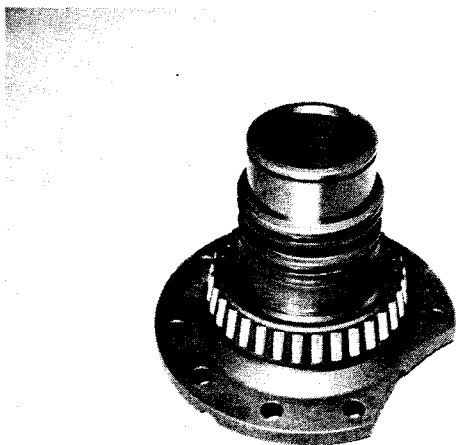
Forward, reverse, 3rd and 4th clutch drum taper bearing installation for the 5000 series power shift transmission.

**NOTE:** Do not install clutch support on transmission housing until proper stack up of parts in the clutch drum is achieved.



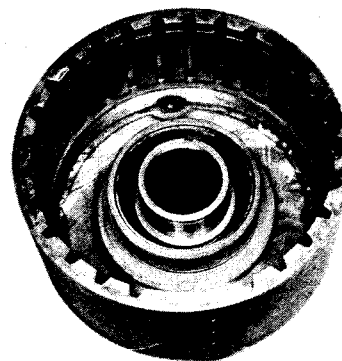
**Figure A**

Insert lock ball in clutch piston ring outer race. Press outer race and ball in clutch drum. Outer race must be pressed from flush to 1/64" below shoulder in clutch drum. Install the inner and outer taper bearing cups in the clutch drum.



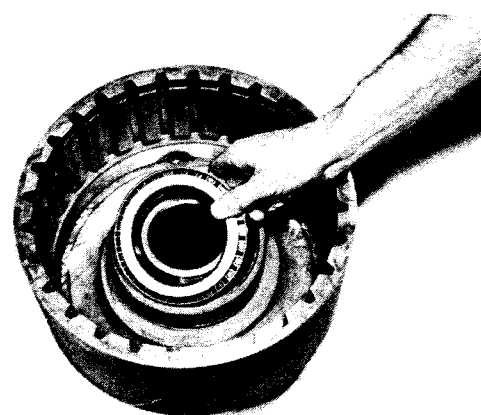
**Figure B**

Press inner taper bearing on clutch support.



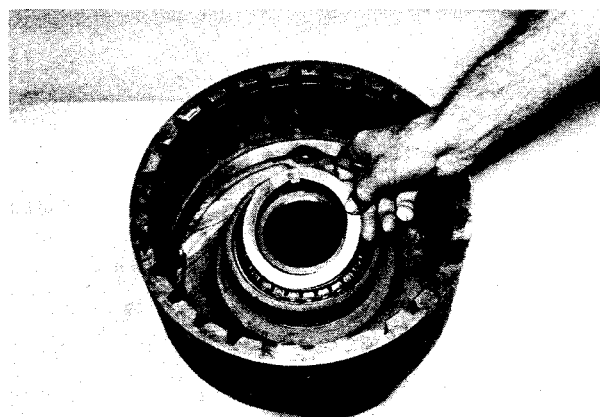
**Figure C**

Position clutch drum and cup assembly on clutch support.



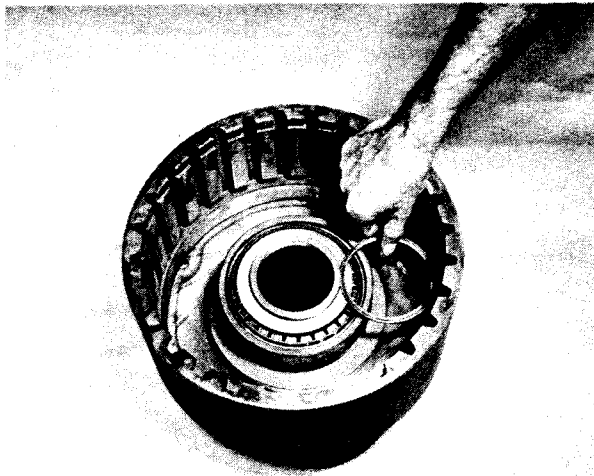
**Figure D**

Install outer taper bearing.



**Figure E**

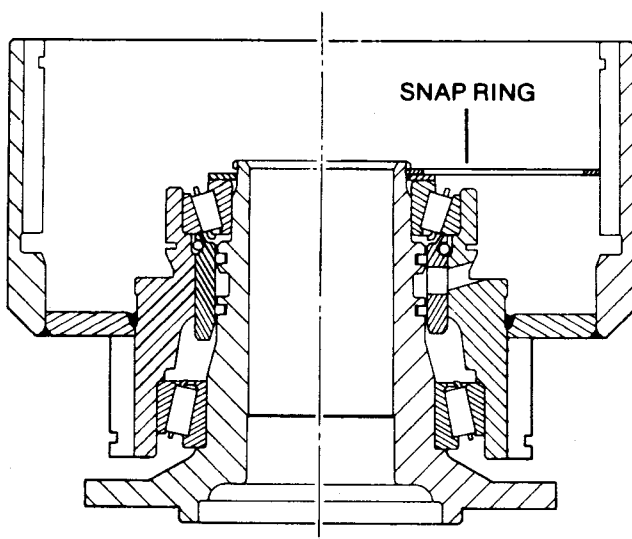
Position outer bearing retainer washer on clutch support aligning tang on washer with notch on support. (See page 52 and 53 for proper selection of washer).



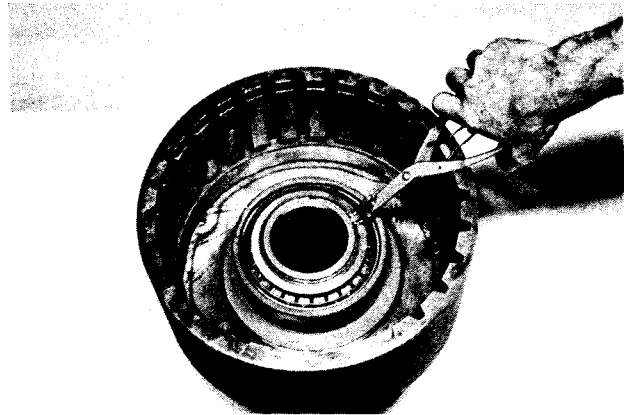
**Figure F**

Clutch drum snap ring is selected at assembly for proper thickness. Variable thickness rings are used in snap ring grooves to assure proper taper bearing tightness. Check ring as shown for tight ring to bearing fit. (See pag 52 and 53 for proper selection of snap ring).

SELECT A VARIABLE THICKNESS SNAP RING AND WASHER AT ASSEMBLY TO ASSURE A TIGHT STACK UP OF PARTS.

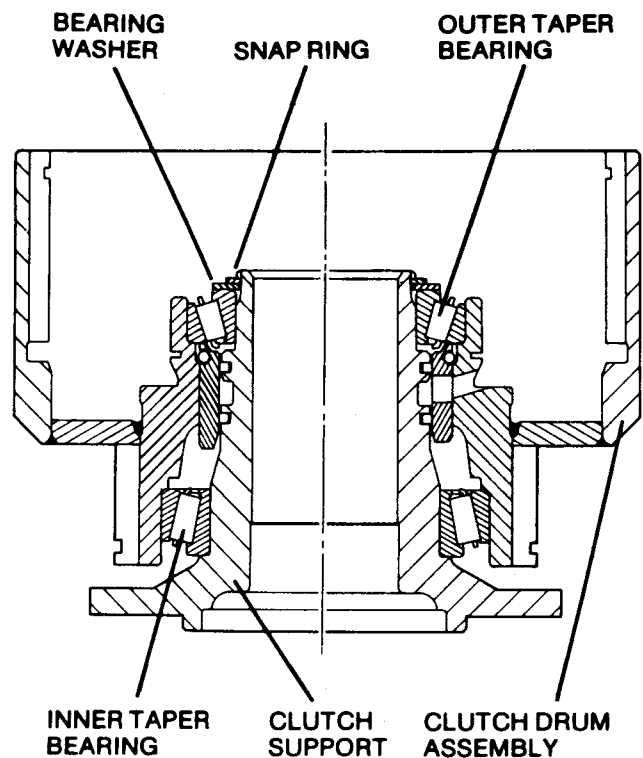


**Figure G**



**Figure H**

Install retainer ring, being certain ring is in full position in ring groove. **NOTE:** Use ring that will give the tightest fit between washer and snap ring groove.



**Figure I**

**CAUTION:** After parts have been matched with each other do not mix with other clutch parts.

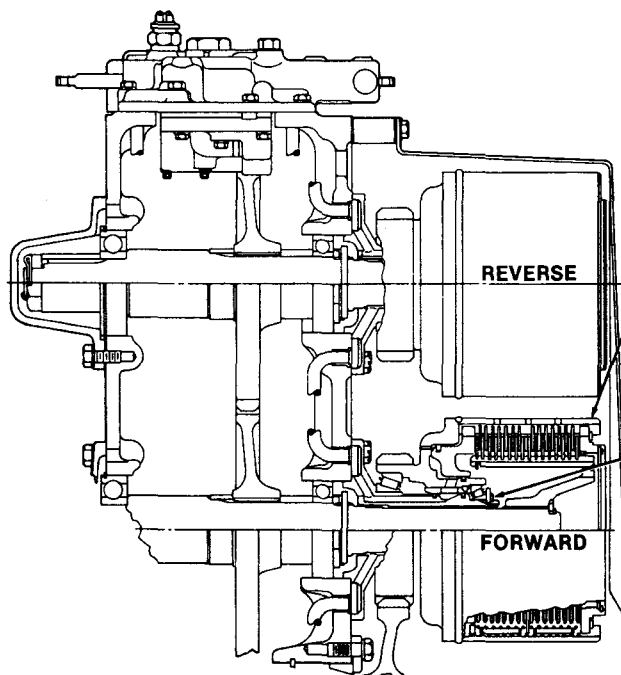
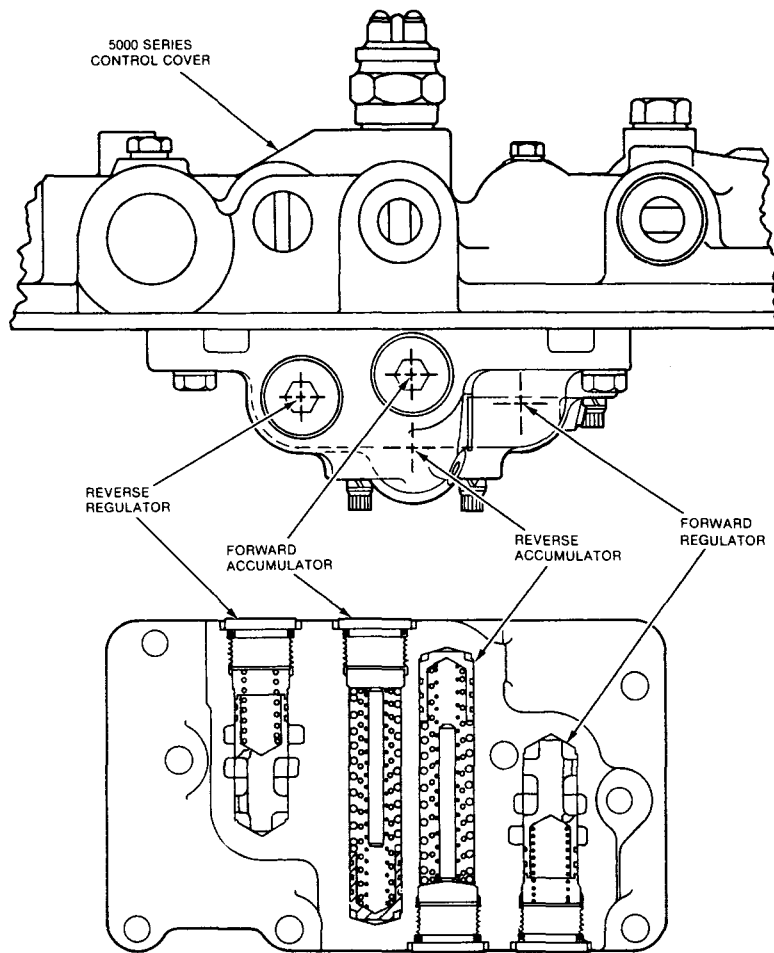
Remove retainer ring and washer. Remove drum assembly from clutch drum support.

Assemble clutch support on transmission housing as prescribed in the applicable maintenance manual. Assemble the clutch drum on the support using the same retainer washer and selected retainer ring that was chosen on the bench assembly.

Follow the manual for clutch reassembly.



# 5000 SERIES MODULATION



## 5000 SERIES

Two clutches rear side Forward and Reverse.  
Sixteen inner graphitic plates.  
Fifteen outer steel plates.  
Assemble alternately starting  
with inner graphitic plate.  
12 springs and 12 pins in 6 spaces.  
Ends to rest against piston teeth  
and end plate teeth.  
Rotate 8th outer plate one tooth,  
to act as spring separator.

Adjust taper bearings 0.000 to 0.004  
[0.00 to 0.12] end play by selecting  
variable thickness snap ring  
at assembly. Typical four  
clutches this side.

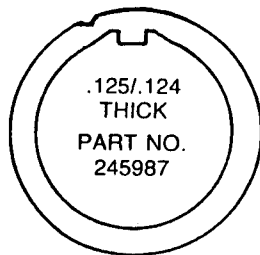
# 5000 SERIES POWER SHIFT TRANSMISSION CLUTCH TAPER BEARING ADJUSTMENT

## 9.25 DIA. 1ST & 2ND CLUTCH KIT 802313

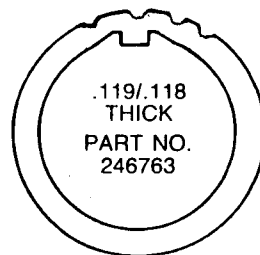
Select a variable thickness  
snap ring and variable thick-  
ness tapered washer to be  
assured of the tightest stack  
up of parts from .0000 (line to  
line) to a max. of .0040 loose  
(end play).

## 7.75 DIA. FWD., REV., 3RD & 4TH CLUTCHES KIT 802314

1 NOTCH



4 NOTCHES



NO NOTCH



2 NOTCHES



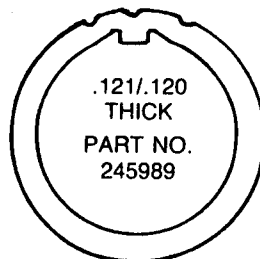
5 NOTCHES



1 NOTCH



3 NOTCHES



6 NOTCHES



3 NOTCHES



1 NOTCH



4 NOTCHES



NO NOTCH



2 NOTCHES



5 NOTCHES



1 NOTCH



3 NOTCHES



6 NOTCHES



3 NOTCHES



## ASSEMBLY INSTRUCTIONS

1st, 2nd, Forward, Reverse, 3rd and 4th clutch drum taper bearing installation for the 5000 series power shift transmission

NOTE: Do not install clutch support on transmission housing until proper stack up of parts in the clutch drum is achieved. The following information must be done on the bench before installation on the transmission.

### SUBJECT: Procedure for Clutch Taper Bearing Adjustment

Prior to selecting washer and snap ring, assure that bearings are seated by tapping outer cone assembly and rotating drum assembly on support.

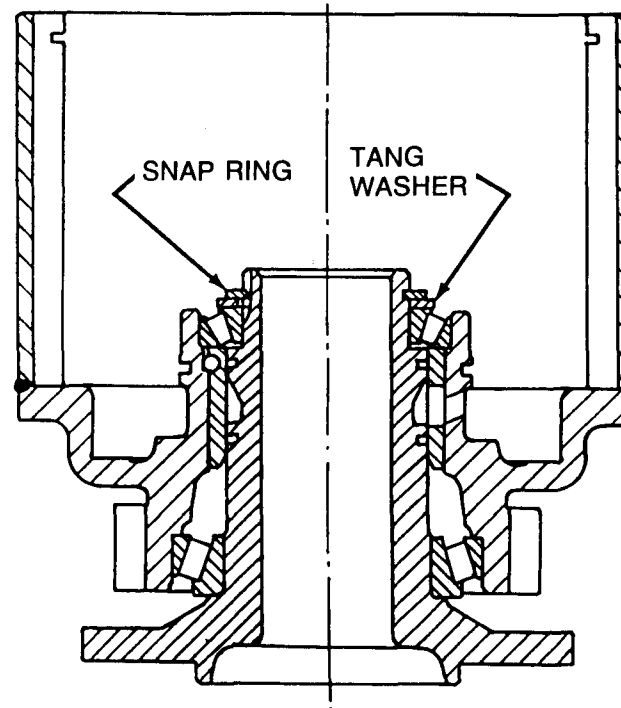
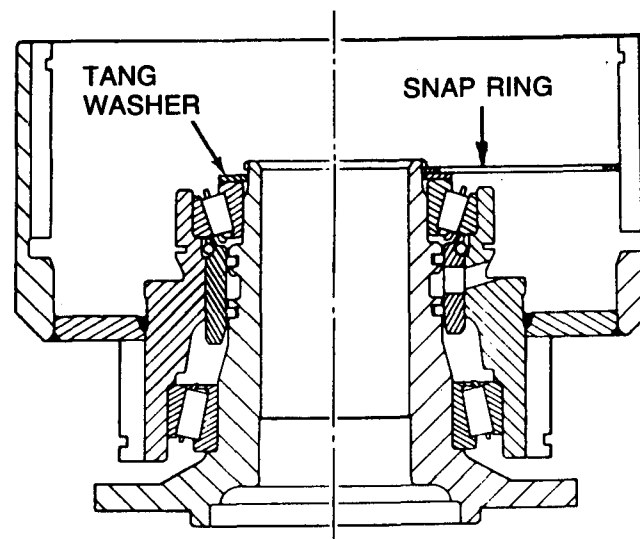
1. Select the thickest snap ring (with no notches) and try each tang washer in sequence from the thickest to the thinnest (one notch through six notches).
2. If above will not assemble, select next thinnest snap ring, with one notch, and repeat the trial of the tang washers from the thickest to the thinnest.
3. If above step 2 will not assemble, select the thinnest snap ring with 3 notches, and repeat the trial of the tang washers from the thickest to the thinnest.

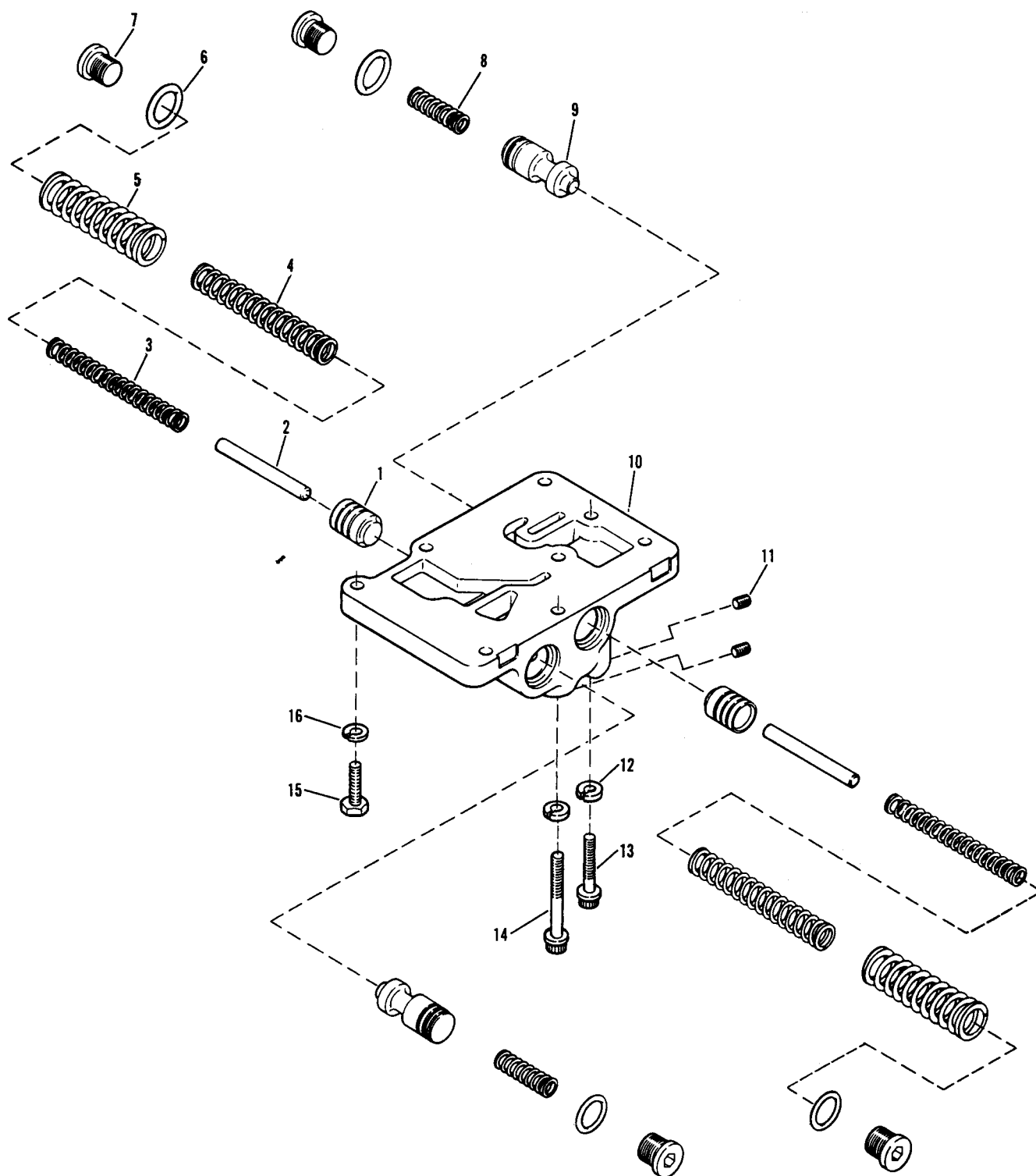
Above procedure will set the taper bearing preload from .0000 (line to line) to a maximum .0040 loose (end play).

CAUTION: After parts have been matched with each other, do not mix with other clutch parts.

Remove retainer ring and washer. Remove drum assembly from clutch drum support.

Assemble clutch support on transmission housing as prescribed in the applicable maintenance manual. Assemble the clutch drum on the support using the same selected tang washer and selected retainer ring that was chosen on the bench assembly.





ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	Accumulator Valve . . . . .	2	9	Regulator Spool . . . . .	2
2	Accumulator Stop Pin . . . . .	2	10	Modulator Valve Housing . . . . .	1
3	Accumulator Spring - Inner . . . . .	2	11	Plug . . . . .	2
4	Accumulator Spring - Middle . . . . .	2	12	Modulator to Cover Screw Lockwasher . . . . .	3
5	Accumulator Spring - Outer . . . . .	2	13	Modulator to Cover Screw . . . . .	1
6	Spool Stop Plug "O" Ring . . . . .	4	14	Modulator to Cover Screw . . . . .	2
7	Spool Stop Plug . . . . .	4	15	Modulator to Cover Screw . . . . .	6
8	Regulator Spring . . . . .	2	16	Modulator to Cover Screw Lockwasher . . . . .	6