

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 Power Shift Transmission**.

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 transmission, its principle 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-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. The Clark Equipment Company does not warrant repair or replacement parts, nor failures resulting from the use thereof, which are not supplied by or approved by the Clark Equipment Company. **IMPORTANT: Always furnish the Distributor with the transmission serial and model number when ordering parts.**

TABLE OF CONTENTS

HOW THE UNITS OPERATE	
SECTIONAL VIEWS AND PARTS IDENTIFICATION	
Basic Design Silhouette	Fig. A
R-28000 Case and Front Cover Group	Fig. B
Four Speed Case and Clutch Group	Fig. C
Clutch Group	Fig. D
Control Valve Assembly	Fig. E
Axle Disconnect and Mechanical Parking Brake	Fig. F
Typical 28,000 Cross Section	Fig. G
External Plumbing Diagram	Fig. H
Typical Four Speed Power Flow	Fig. I
28000 Four Speed Clutch and Gear Arrangement	Fig. J
Ring Gear Installation	Fig. J
Shielded Bearing Installation	Fig. K
DISASSEMBLY OF TRANSMISSION	1
CLEANING AND INSPECTION	10-11
REASSEMBLY OF TRANSMISSION	11
SERVICING MACHINE AFTER TRANSMISSION OVERHAUL	22
SPECIFICATION AND SERVICE DATA	23
LUBRICATION	23
TROUBLE SHOOTING GUIDE	24
28000 FOUR SPEED CLUTCH AND GEAR ARRANGEMENT	27

NOTE: Metric Dimensions Shown in Brackets [].

TRANSMISSION ASSEMBLY

The transmission and hydraulic torque portion of the power train enacts an important role in transmitting 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. It is necessary to consider both units in the study of their function and operation.

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

Basic Design Silhouette.....	Fig. A
R-28000 Case and Front Cover Group.....	Fig. B
Four Speed Case and Clutch Group.....	Fig. C
Clutch Group.....	Fig. D
Control Valve.....	Fig. E
Axle Disconnect and Mechanical Parking Brake.....	Fig. F
Typical 28000 Cross Section.....	Fig. G
External Plumbing Diagram.....	Fig. H
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28000 Four Speed Clutch and Gear Arrangement.....	Fig. J
Ring Gear Installation	Fig. J
Shielded Bearing Installation.....	Fig. K

The R, HR, and MHR Model Transmissions are of three basic designs.

The R Model consists of a separate torque converter, mounted to the engine with the powershift transmission remotely mounted and connected to the torque converter with a drive shaft.

The HR Model consists of a torque converter and powershifted transmission in one package mounted directly to the engine.

The MHR version is a mid-mount torque converter and transmission assembly connected to the engine by means of a drive shaft. (See Fig. A for basic design silhouette.)

The shift control valve assembly may be mounted directly on the side of the converter housing or front transmission cover, or remote mounted and connected to the transmission by means of flexible hoses. The function of the control valve assembly is to direct oil under pressure to the desired directional and speed clutch. A provision is made on certain models to neutralize the transmission when the brakes are applied. This is accomplished through use of a brake actuated shutoff valve. The speed and direction clutch assemblies are mounted inside the transmission case and are connected to the output shaft of the converter either by direct gearing or drive shaft. The purpose of the speed or directional clutches is to direct the power flow through the gear train to provide the desired speed range and direction.

An axle disconnect is optional and is located on the output shaft. The drive to the front or rear axle can be disconnected or connected by manual shifting.

HOW THE UNITS OPERATE

With the engine running, the converter charging pump draws oil from the transmission sump through the removable oil suction screen and directs it through the pressure regulating valve and oil filter.

The pressure regulating valve maintains pressure to the transmission control cover for actuating the direction and speed clutches. This requires a small portion of the total volume of oil used in the system. The remaining volume of oil is directed through the torque converter circuit to the oil cooler and returns to the transmission for positive lubrication. This regulator valve consists of a hardened valve spool operating in a closely fitted bore. The valve spool is spring loaded to hold the valve in a closed position. When a specific pressure is achieved, the valve spool works against the spring until a port is exposed along the side of the bore. This sequence of events provides the proper system pressure.

After entering the converter housing the oil is directed through the stator support to the converter blade cavity and exits in the passage between the turbine shaft and converter support. The oil then flows out of the converter to the oil cooler. After leaving the cooler, the oil is directed to a lubricating fitting on the transmission and through a series of tubes and passages lubricates the transmission bearings and clutches. The oil then gravity drains to the transmission sump.

The hydraulic torque converter consists basically of three elements and their related parts to multiply engine torque. The engine power is transmitted from the engine flywheel to the impeller element through the impeller cover. This element is the pump portion of the hydraulic torque converter and is the primary component which starts the oil flowing to the other components which results in torque multiplication. This element can be compared to a centrifugal pump in that it picks up fluid at its center and discharges at its outer diameter.

The torque converter turbine is mounted opposite the impeller and is connected to the output shaft of the torque converter. This element receives fluid at its outer diameter and discharges at its center. Fluid directed by the impeller out into the particular design of blading in the turbine and reaction member is the means by which the hydraulic torque converter multiplies torque.

The reaction member of the torque converter is located between and at the center or inner diameters of the impeller and turbine elements. Its function is to take the fluid which is exhausting from the inner portion of the turbine and change its direction to allow correct entry for recirculation into the impeller element.

The torque converter will multiply engine torque to its designed maximum multiplication ratio when the output shaft is at zero RPM. Therefore, we can say that as the output shaft is decreasing in speed the torque multiplication is increasing.

The shift control valve assembly consists of a valve body with selector valve spools. A detent ball and spring in the selector spool provides 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.

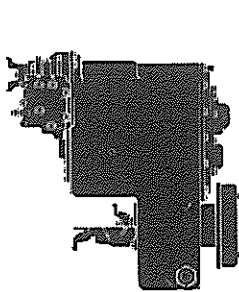
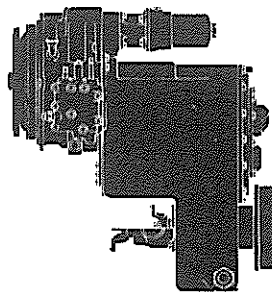
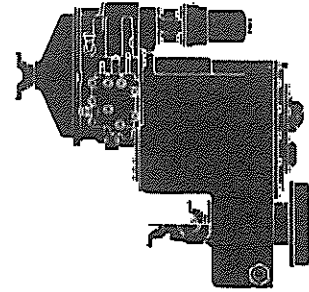
With the engine running and the directional control lever in neutral position, oil pressure from the regulating valve is blocked at the control valve, and the transmission is in neutral. Movement of the forward and reverse spool will direct oil, under pressure to either the forward or reverse direction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

When either directional clutch is selected the opposite clutch is relieved of pressure and vents back through the direction selector spool. The same procedure is used in the speed selector.

The direction or speed clutch assembly consists of a drum with internal splines and a bore to receive a hydraulically actuated piston. The piston is "oil tight" by the use of sealing rings. A steel disc with external splines is inserted into the drum and rests against the piston. Next, a friction disc with splines at the inner diameter is inserted. Discs are alternated until the required total is achieved. A heavy back-up plate is then inserted and secured with a snap ring. A Hub with O.D. splines is inserted into the splines of discs with teeth on the inner diameter. The discs and hub are free to increase in speed or rotate in the opposite direction as long as no pressure is present in that specific 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 valve, through a tube, to a chosen clutch shaft. This shaft has a drilled passageway for oil under pressure to enter the shaft. Oil pressure sealing rings are located on the clutch shaft. These rings direct oil under pressure to a desired clutch. Pressure of the oil forces the piston and discs against the heavy back-up plate. The discs, with teeth on the outer diameter, clamping against discs with teeth on the inner diameter, enables the hub and clutch shaft to be locked together and allows them to drive as a unit.

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

**R-28000****HR-28000****MHR-28000****FIG. A**

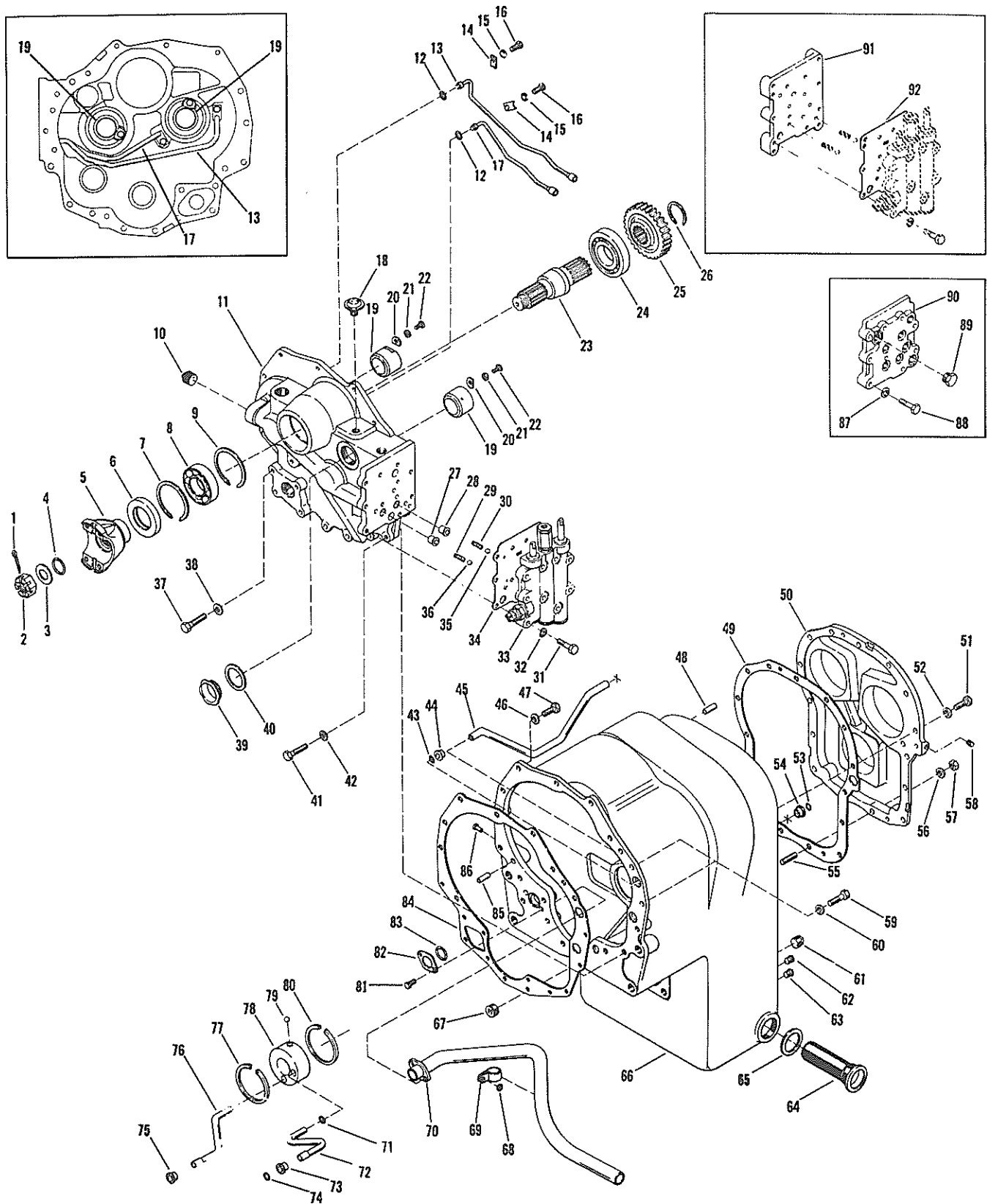


Figure B

R 28000 CASE AND FRONT COVER GROUP

ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	Input Flange Nut Cotter.....	1	47	Front Cover to Case Screw.....	5
2	Flange Nut.....	1	48	Rear Cover Dowel Pin.....	2
3	Flange Nut Washer.....	1	49	Rear Cover to Transmission Case Gasket.....	1
4	Input Flange "O" Ring.....	1	50	Rear Cover.....	1
5	Input Flange.....	1	51	Rear Cover to Transmission Case Screw.....	13
6	Flange Oil Seal.....	1	52	Rear Cover to Transmission Case Screw Lockwasher.....	13
7	Input Shaft Front Bearing Retainer Ring.....	1	53	Clutch Pressure Tube "O" Ring.....	1
8	Input Shaft Front Bearing.....	1	54	Tube Sleeve.....	1
9	Input Shaft Front Bearing Retainer Ring.....	1	55	Rear Cover to Case Stud.....	2
10	Pipe Plug.....	1	56	Rear Cover to Case Stud Lockwasher.....	2
11	Front Cover and Tube Assembly.....	1	57	Rear Cover to Case Stud Nut.....	2
12	"O" Ring.....	2	58	Rear Cover Pipe Plug.....	1
13	3rd Speed Tube Assembly.....	1	59	Front Cover to Transmission Case Screw.....	5
14	Tube Clip.....	2	60	Front Cover to Transmission Case Screw Lockwasher.....	5
15	Tube Clip Screw Lockwasher.....	2	61	Magnetic Drain Plug.....	1
16	Tube Clip Screw.....	2	62	Oil Level Plug.....	1
17	Reverse Tube Assembly.....	1	63	Oil Level Plug.....	1
18	Breather Assembly.....	1	64	Screen Assembly.....	1
19	Front Cover Sleeve.....	2	65	Screen Assembly Gasket.....	1
20	Front Cover Sleeve Lock.....	2	66	Transmission Case and Tube Assembly.....	1
21	Sleeve Lock Screw Lockwasher.....	2	67	Plug.....	1
22	Sleeve Lock Screw.....	2	68	Tube Clip Washer.....	1
23	Input Shaft.....	1	69	Suction Line Tube Clip.....	1
24	Input Shaft Rear Bearing.....	1	70	Suction Tube Assembly.....	1
25	Input Shaft Gear.....	1	71	Pressure Tube "O" Ring.....	1
26	Input Shaft Gear Retainer Ring.....	1	72	4th Speed Pressure Tube.....	1
27	Tube Sleeve.....	1	73	Tube Sleeve.....	1
28	Tube Sleeve.....	1	74	Pressure Tube "O" Ring.....	1
29	Detent Spring.....	1	75	Tube Sleeve.....	1
30	Detent Spring.....	1	76	4th Speed Clutch Lube Tube.....	1
31	Valve to Housing Screw.....	9	77	Oil Distributor Retainer Ring.....	1
32	Valve to Housing Screw Lockwasher.....	9	78	4th Clutch Front Oil Distributor.....	1
33	Control Valve Assembly.....	1	79	Locking Ball.....	1
34	Control Valve Gasket.....	1	80	Oil Distributor Retainer Ring.....	1
35	Detent Ball.....	1	81	Suction Line Screw.....	2
36	Detent Ball.....	1	82	Suction Line Washer.....	1
37	Front Cover to Transmission Case Screw.....	4	83	Suction Line "O" Ring.....	1
38	Front Cover to Transmission Case Screw Lockwasher.....	4	84	Front Cover Gasket.....	1
39	Front Cover Plug.....	1	85	Front Cover Dowel Pin.....	2
40	Front Cover Plug Gasket.....	1	86	Rivet.....	1
41	Front Cover to Transmission Case Screw.....	4	87	Remote Valve Plate Screw Lockwasher.....	9
42	Front Cover to Transmission Case Screw Lockwasher.....	4	88	Remote Valve Plate Screw.....	9
43	Clutch Pressure Tube "O" Ring.....	1	89	Valve Plate Plug.....	1
44	Tube Sleeve.....	1	90	Valve Plate.....	1
45	Low Speed Clutch Pressure Tube.....	1	91	Control Valve Remote Mounting Plate.....	1
46	Front Cover to Case Screw Lockwasher.....	5	92	Control Valve to Plate Gasket.....	1

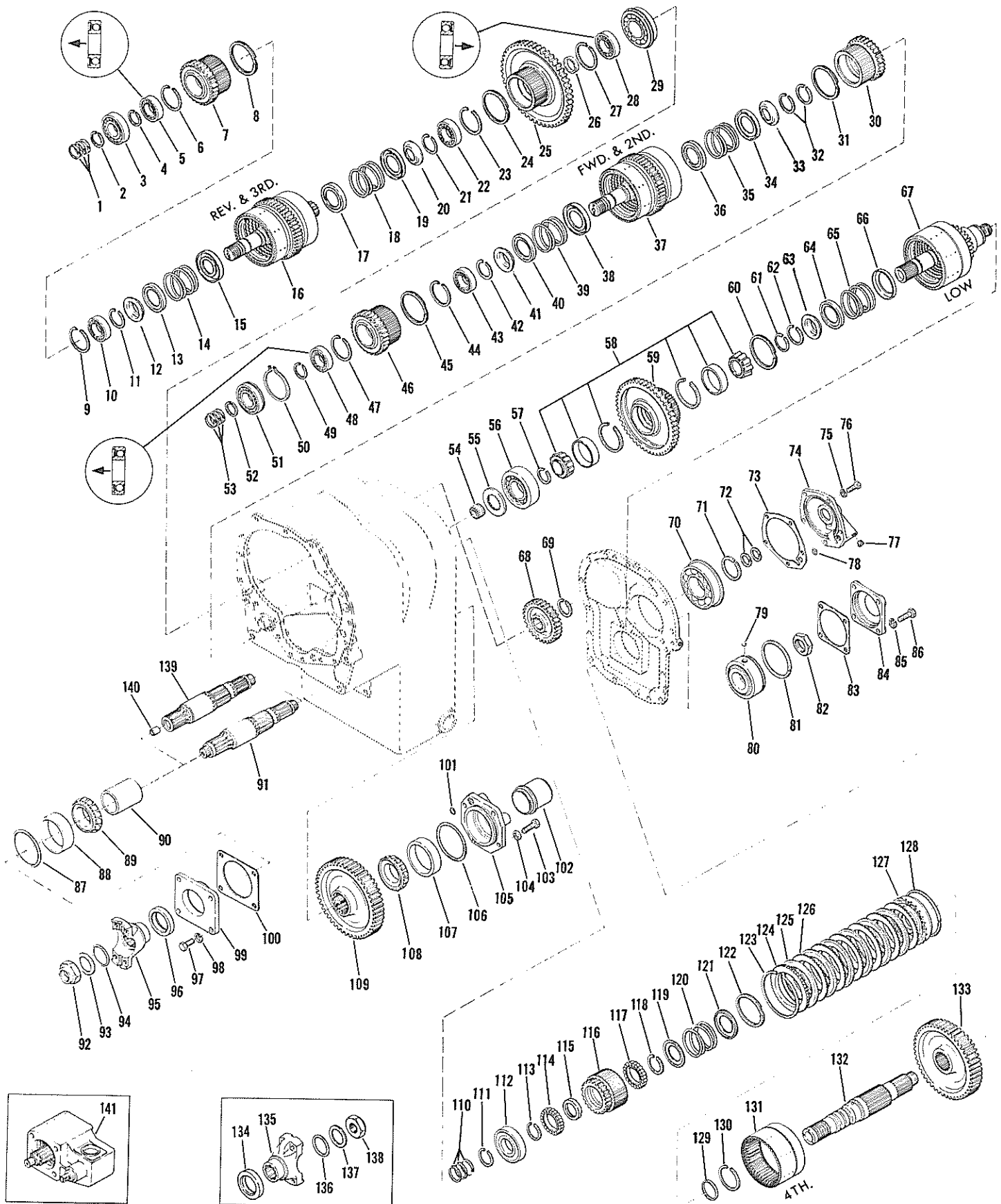
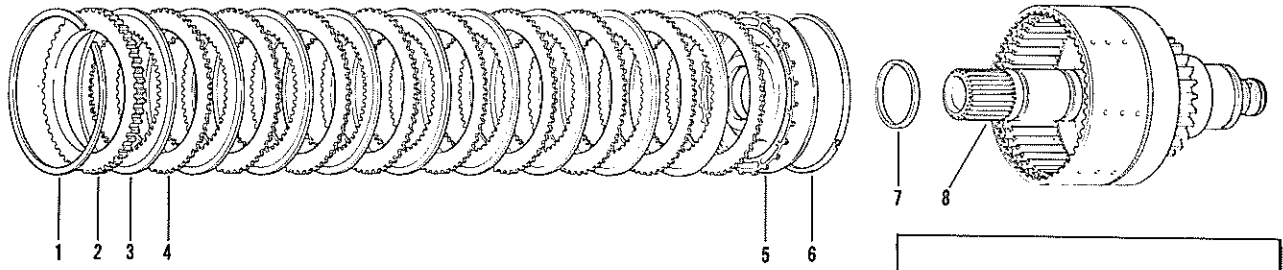


Figure C

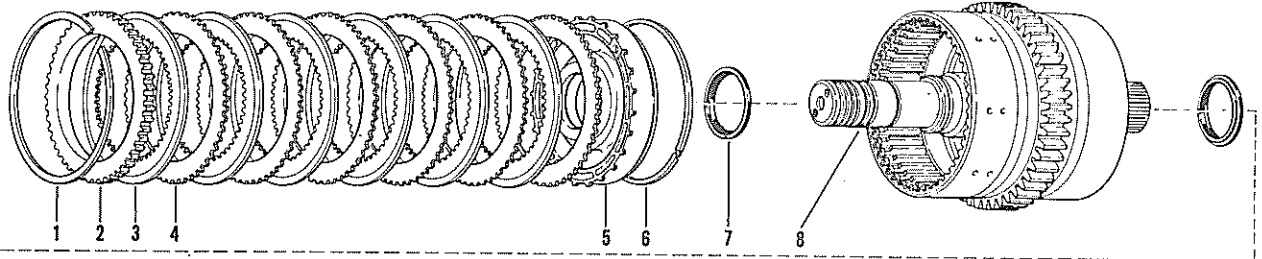
28000 FOUR SPEED CASE AND CLUTCH GROUP

Item No.	Description	No. Req'd
1	Reverse and 3rd Clutch Shaft Piston Ring	3
2	Front Bearing Retainer Ring	1
3	Reverse and 3rd Shaft Front Bearing	1
4	Front Bearing Retainer Ring	1
5	Clutch Driven Gear Bearing	1
6	Clutch Driven Gear Bearing Snap Ring	1
7	Clutch Driven Gear	1
8	Clutch Hub Oil Baffle Ring	1
9	Clutch Driven Gear Bearing Snap Ring	1
10	Clutch Driven Gear Bearing	1
11	Spring Retainer Snap Ring	1
12	Snap Ring Retainer	1
13	Spring Retainer	1
14	Piston Return Spring	1
15	Spring Retainer	1
16	Reverse & 3rd Clutch Shaft & Drum Assembly	1
17	Spring Retainer	1
18	Piston Return Spring	1
19	Spring Retainer	1
20	Snap Ring Retainer	1
21	Spring Retainer Snap Ring	1
22	3rd Gear Bearing	1
23	3rd Gear Bearing Snap Ring	1
24	Clutch Hub Oil Baffle Ring	1
25	3rd Gear	1
26	3rd Gear Bearing Spacer	1
27	3rd Gear Bearing Snap Ring	1
28	3rd Gear Bearing	1
29	Reverse and 3rd Shaft Rear Bearing	1
30	2nd Gear	1
31	Clutch Hub Oil Baffle Ring	1
32	Gear & Spring Retainer Snap Ring	2
33	Snap Ring Retainer	1
34	Spring Retainer	1
35	Return Spring	1
36	Spring Retainer	1
37	Forward & 2nd Clutch Shaft & Drum Assembly	1
38	Spring Retainer	1
39	Return Spring	1
40	Spring Retainer	1
41	Snap Ring Retainer	1
42	Spring Retainer Snap Ring	1
43	Clutch Driven Gear Bearing	1
44	Clutch Driven Gear Bearing Snap Ring	1
45	Clutch Hub Oil Baffle Ring	1
46	Clutch Driven Gear	1
47	Clutch Driven Gear Bearing Snap Ring	1
48	Clutch Driven Gear Bearing	1
49	Front Bearing Retainer Ring	1
50	Front Bearing Locating Ring	1
51	Forward and 2nd Shaft Front Bearing	1
52	Front Bearing Retainer Ring	1
53	Forward and 2nd Shaft Piston Ring	3
54	Low Speed Clutch Shaft Pilot Bearing	1
55	2nd Gear Bearing End Plate	1
56	2nd Gear Bearing	1
57	Low Speed Gear Bearing Retainer Ring	1
58	Low Speed Gear Bearing Assembly	1
59	Low Speed Gear	1
60	Clutch Hub Oil Baffle Ring	1
61	Bearing Retainer Ring	1
62	Spring Retainer Snap Ring	1
63	Snap Ring Retainer	1
64	Spring Retainer	1
65	Piston Return Spring	1
66	Spring Retainer	1
67	Low Speed Clutch Shaft & Drum Assembly	1
68	Low & 4th Clutch Drive Gear	1
69	Gear Retaining Ring	1
70	Low Speed Shaft Rear Bearing	1

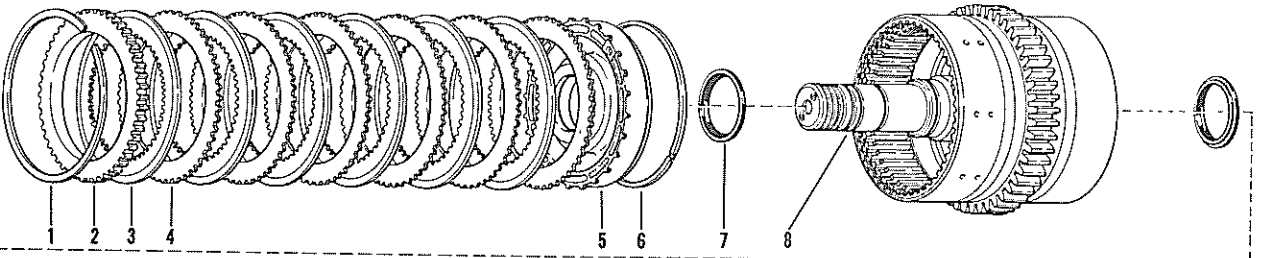
Item No.	Description	No. Req'd
71	Rear Bearing Retaining Ring	1
72	Clutch Shaft Piston Ring	2
73	Rear Bearing Cap Gasket	1
74	Rear Bearing Cap	1
75	Bearing Cap Screw Washer	5
76	Bearing Cap Screw	5
77	Bearing Cap Plug	1
78	Bearing Cap "O" Ring	1
79	Idle Shaft Rear Bearing Lock Ball	1
80	Idle Shaft Rear Bearing Assembly	1
81	Rear Bearing Locating Ring	1
82	Idle Shaft Nut	1
83	Bearing Cap Gasket	1
84	Rear Bearing Cap	1
85	Rear Bearing Cap Screw Washer	4
86	Bearing Cap Screw	4
87	Bearing Cap "O" Ring	1
88	Front Bearing Cup	1
89	Front Bearing Cone	1
90	Output Shaft Gear Spacer	1
91	Output Shaft	1
92	Flange Nut	1
93	Flange Washer	1
94	Flange "O" Ring	1
95	Output Flange	1
96	Bearing Cap Oil Seal	1
97	Bearing Cap Screw	4
98	Lockwasher	4
99	Bearing Cap	1
100	Bearing Cap Shim	AR
101	Bearing Cap "O" Ring	1
102	Rear Bearing Cap Bore Plug	1
103	Bearing Cap Screw	4
104	Bearing Cap Screw Lockwasher	4
105	Output Shaft Rear Bearing Cap	1
106	Bearing Cap "O" Ring	1
107	Rear Bearing Cup	1
108	Rear Bearing Cone	1
109	Output Shaft Gear	1
110	4th Gear Piston Ring	3
111	4th Gear Bearing Snap Ring	1
112	4th Gear Shaft Front Bearing	1
113	4th Gear Front Bearing Locating Ring	1
114	4th Gear Bearing	1
115	4th Gear Spacer	1
116	4th Gear	1
117	4th Gear Bearing	1
118	Bearing Snap Ring	1
119	Spring Retainer	1
120	Piston Return Spring	1
121	Spring Retainer	1
122	Oil Baffle Ring	1
123	Backing Plate Snap Ring	1
124	Clutch Disc Backing Plate	1
125	Clutch Inner Disc	6
126	Clutch Outer Disc	6
127	Clutch Piston Assembly	1
128	Clutch Piston Outer Ring	1
129	Clutch Piston Inner Seal	1
130	4th Clutch Drum Locating Ring	1
131	4th Clutch Drum & Hub Assembly	1
132	Idle Shaft & Plug Assembly	1
133	Idle Shaft Gear	1
134	Oil Seal	1
135	Companion Flange	1
136	Flange "O" Ring	1
137	Flange Washer	1
138	Flange Nut	1
139	Output Shaft (used with Disconnect only)	1
140	Bushing (used with Disconnect only)	1
141	Disconnect (optional)	1



LOW CLUTCH GROUP



REVERSE & 3RD CLUTCH GROUP



FORWARD & 2ND CLUTCH GROUP

Figure D

LOW CLUTCH GROUP

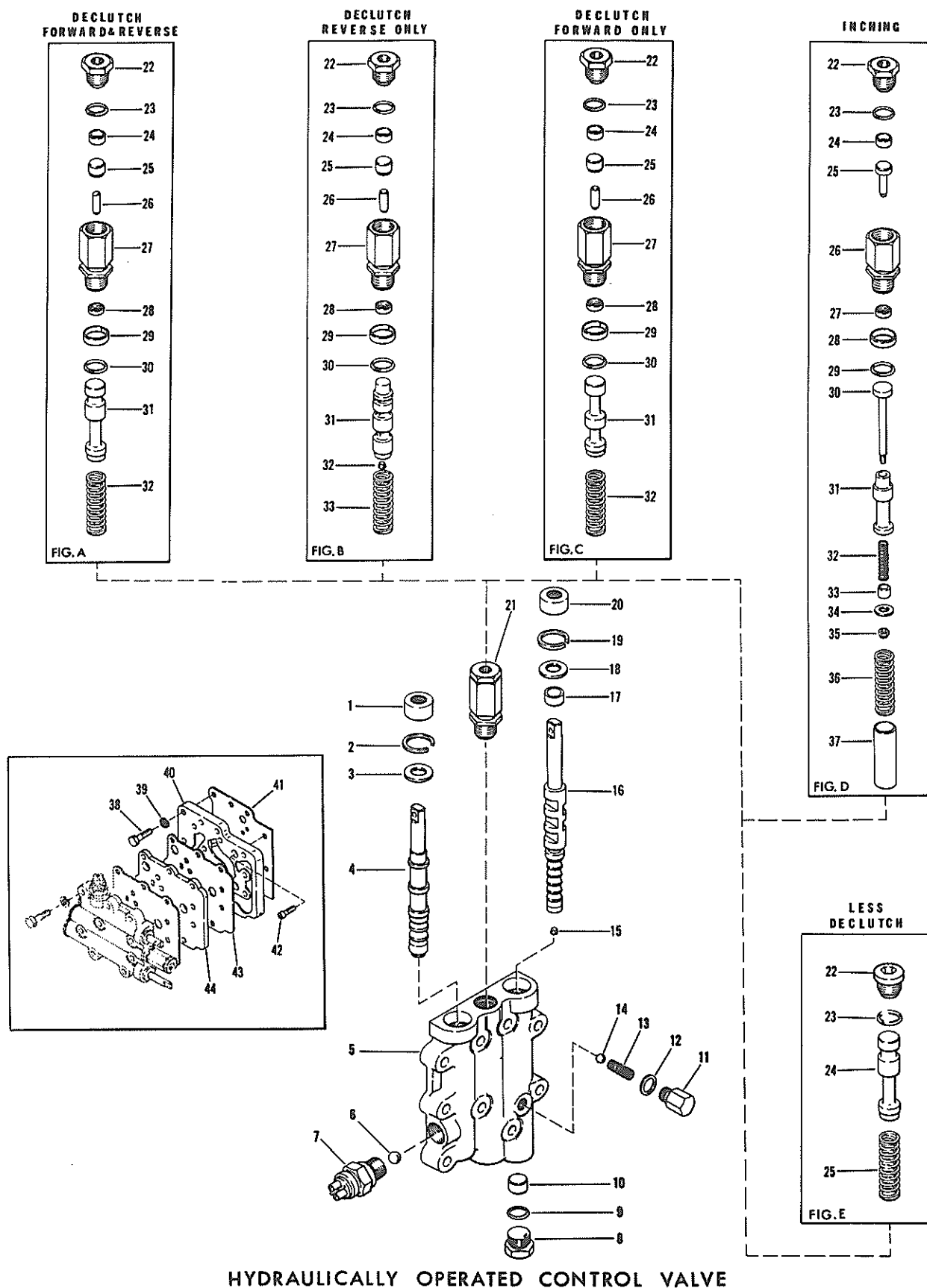
ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	End Plate Retainer Ring	1	5	Clutch Piston	1
2	End Plate	1	6	Clutch Piston Outer Seal Ring	1
3	Clutch Inner Disc	9	7	Clutch Piston Inner Seal Ring.....	1
4	Clutch Outer Disc	9	8	Low Speed Clutch Drum and Shaft.....	1

REVERSE AND 3rd CLUTCH GROUP

ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	End Plate Retainer Ring	2	5	Clutch Piston	2
2	End Plate	2	6	Clutch Piston Outer Seal Ring.....	2
3	Clutch Inner Disc	12	7	Clutch Piston Inner Seal Ring.....	2
4	Clutch Outer Disc	12	8	Reverse and 3rd Clutch Drum and Shaft	1

FORWARD AND 2nd CLUTCH GROUP

ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	End Plate Retainer Ring	2	5	Clutch Piston	2
2	End Plate	2	6	Clutch Piston Outer Seal Ring.....	2
3	Clutch Inner Disc	12	7	Clutch Piston Inner Seal Ring.....	2
4	Clutch Outer Disc	12	8	Forward and 2nd Clutch Drum and Shaft	1



CONTROL VALVE ASSEMBLY

ITEM	DESCRIPTION	QTY
1	Valve Spool Oil Seal	1
2	Valve Spool Oil Seal Retainer Ring	1
3	Valve Spool Oil Seal Washer	1
4	Forward and Reverse Valve Spool	1
5	Control Valve Assembly — Incl. items 1 thru 9, 15, 16 and 18 thru 20	1
6	Neutral Switch Detent Ball	1
7	Neutral Switch	1
8	Valve Housing Plug	1
9	Valve Housing Plug "O" Ring	1
10	Overshift Spacer	1
11	Detent Spring Plug (Optional)	1
12	Detent Spring Plug Washer (Optional)	1
13	Detent Spring (Optional)	1
14	Detent Ball (Optional)	1
15	Speed Selector Spool Pipe Plug	1
16	Speed Selector	1
17	Overshift Spacer	1
18	Valve Spool Oil Seal Washer	1
19	Valve Spool Oil Seal Retainer Ring	1
20	Valve Spool Oil Seal	1
21	Hydraulic Piston Housing Assembly	1

NOTE: Items 22 thru 25, 32, 33 and 37 are various declutch options.

38	Adaptor to Converter Housing Screw	4
39	Adaptor to Converter Housing Screw Lockwasher	4
40	Valve Adaptor Housing	1
41	Converter Housing to Valve Adaptor Housing Gasket	1
42	Adaptor Housing to Converter Housing Screw	5
43	Adaptor Housing to Adaptor Plate Gasket	1
44	Valve Adaptor Plate	1

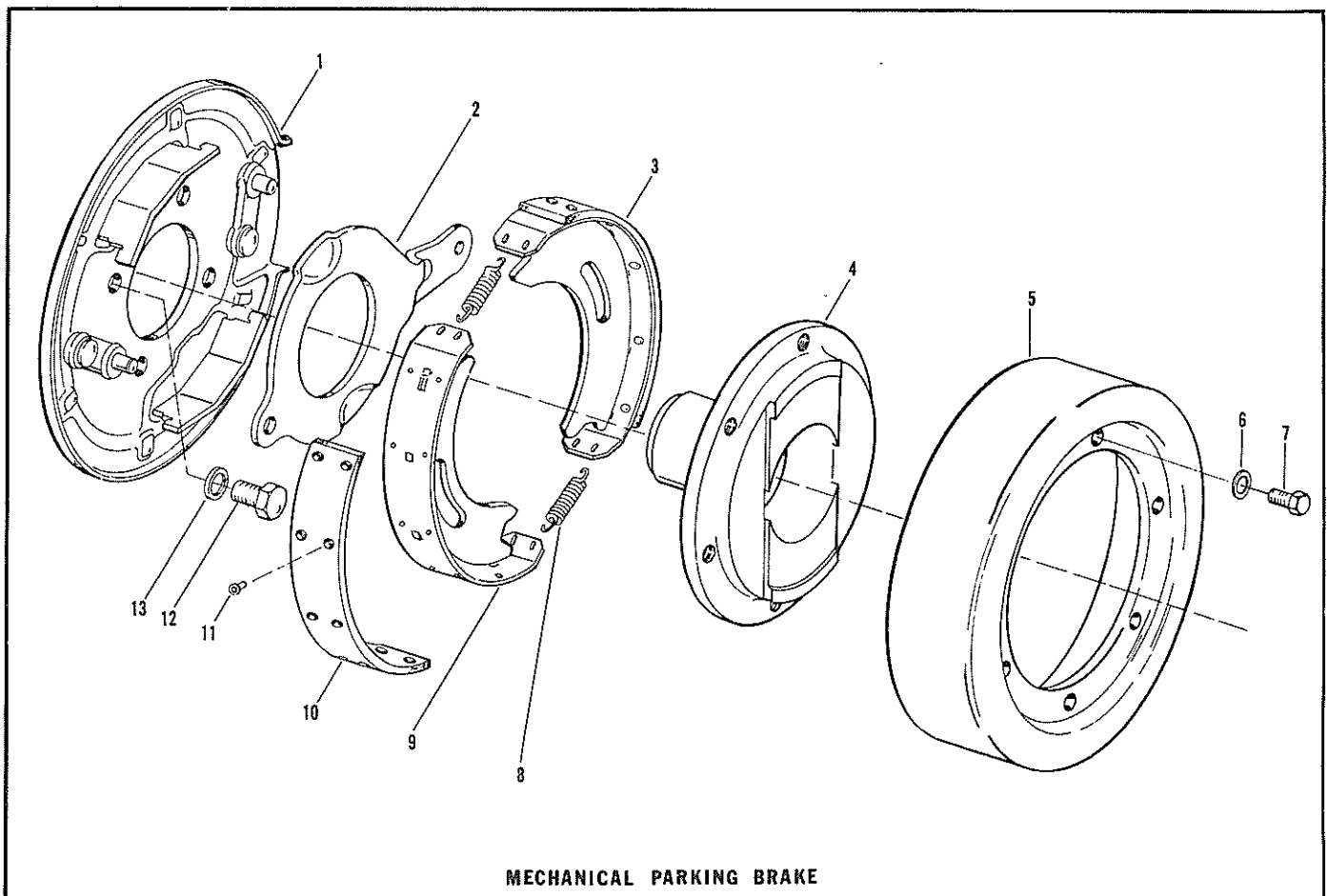
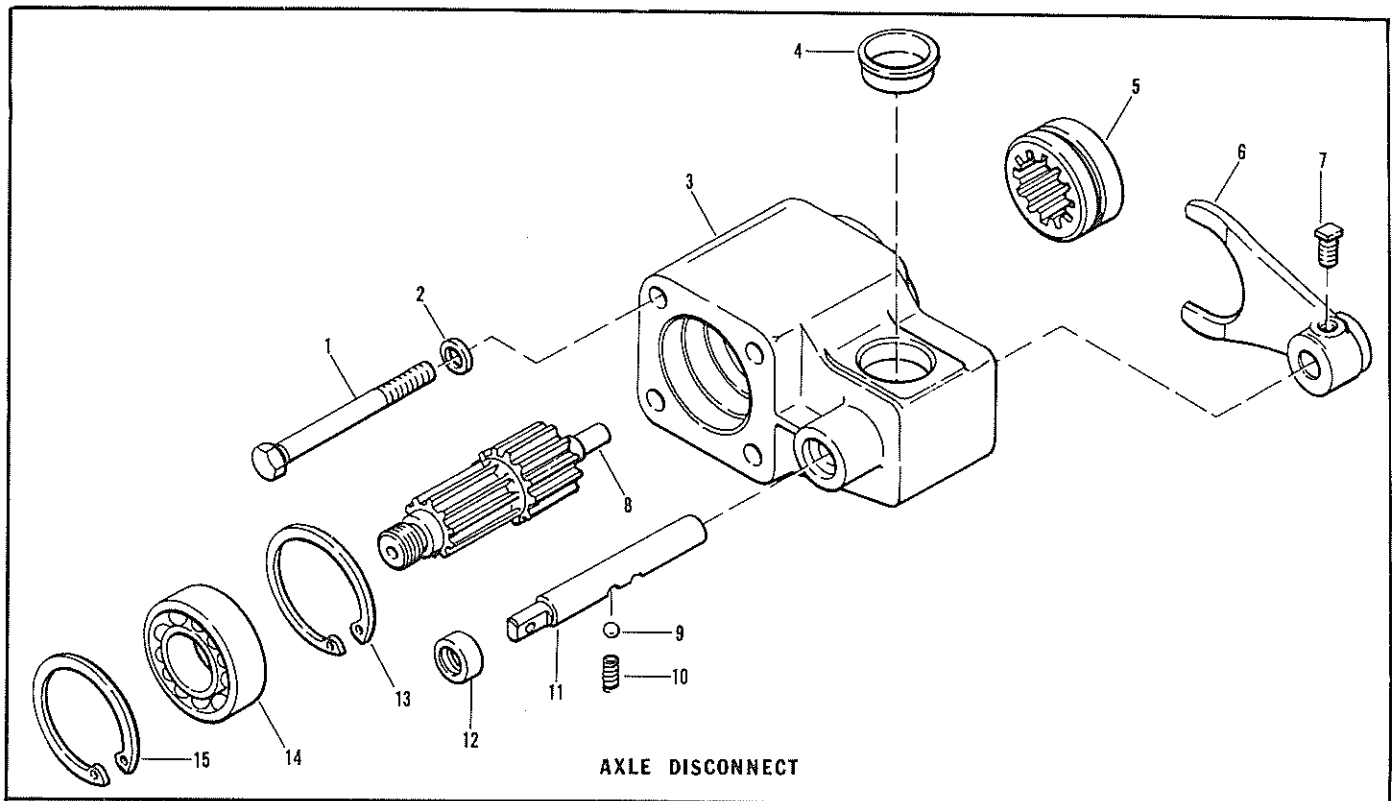


Figure F

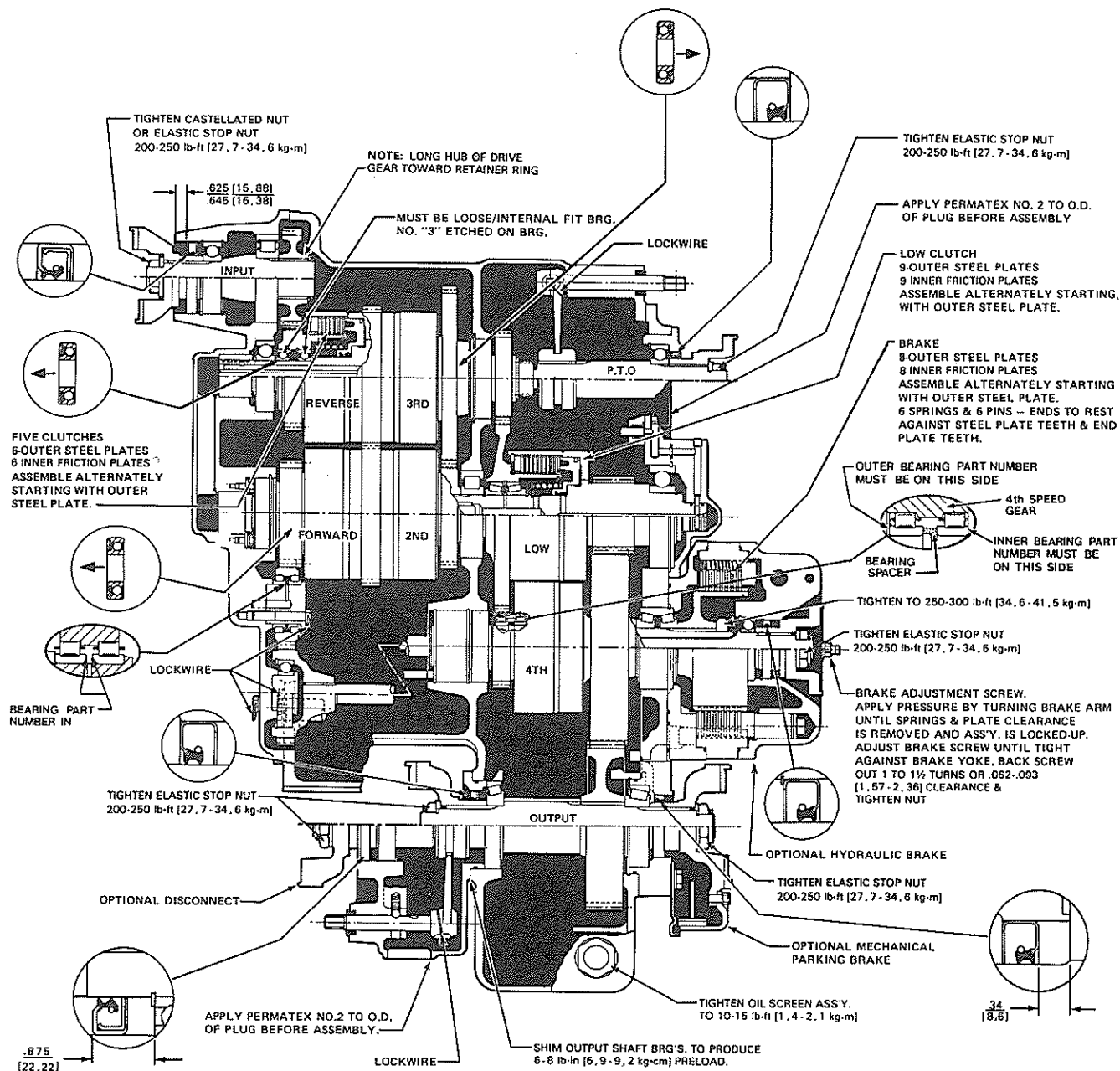
AXLE DISCONNECT

ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	Disconnect Housing Capscrew	4	8	Disconnect Shaft	1
2	Disconnect Housing Capscrew		9	Detent Ball	1
	Lockwasher	4	10	Detent Spring	1
3	Disconnect Housing	1	11	Shift Rail	1
4	Disconnect Housing Plug	1	12	Shift Rail Oil Seal	1
5	Shift Hub	1	13	Bearing Retainer Ring	1
6	Shift Fork	1	14	Bearing	1
7	Shift Fork Lockscrew	1	15	Bearing Retainer Ring	1

MECHANICAL PARKING BRAKE

ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	Backing Plate Assembly.....	1	8	Return Spring	2
2	Actuating Lever	1	9	Brake Shoe (see item 3).....	
3	Brake Shoe and Lining	2	10	Brake Lining	2
4	Brake Flange	1	11	Rivet	20
5	Brake Drum	1	12	Backing Plate Screw	4
6	Brake Drum to Flange Screw Lockwasher	6	13	Backing Plate Screw Lockwasher	4
7	Brake Drum to Flange Screw	6			

1. USE PERMATEX & CRANE SEALER ONLY WHERE SPECIFIED.
2. ALL LEAD IN CHAMFERS FOR OIL SEALS, PISTON RINGS & "O" RINGS MUST BE SMOOTH & FREE FROM BURRS. INSPECT AT ASSEMBLY.
3. LUBRICATE ALL PISTON RING GROOVES & "O" RINGS WITH OIL BEFORE ASSEMBLY.
4. APPLY VERY LIGHT COAT OF PERMATEX NO.2 TO O.D. OF ALL OIL SEALS BEFORE ASSEMBLY.
5. AFTER ASSEMBLY OF PARTS USING PERMATEX OR CRANE SEALER, THERE MUST NOT BE ANY FREE OR EXCESS MATERIAL THAT COULD ENTER THE OIL CIRCUIT.
6. APPLY LIGHT COAT OF CRANE SEALER TO ALL PIPE PLUGS.
7. APPLY A THIN COATING OF GREASE BETWEEN SEAL LIPS ON LIP TYPE SEALS PRIOR TO ASSEMBLY.



R-28420 SERIES POWER SHIFT TRANSMISSION WITH VARIOUS OPTIONS

NOTE: METRIC DIMENSIONS SHOWN IN BRACKETS []

Figure G

MAINTENANCE AND SERVICE

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. It must also be understood that this is a basic 28000 transmission with many options. Companion flanges and output shafts with and without disconnect assemblies may vary on spe-

cific models. The units are very similar to trouble shoot, disassemble, repair, and reassemble.

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.

DISASSEMBLY

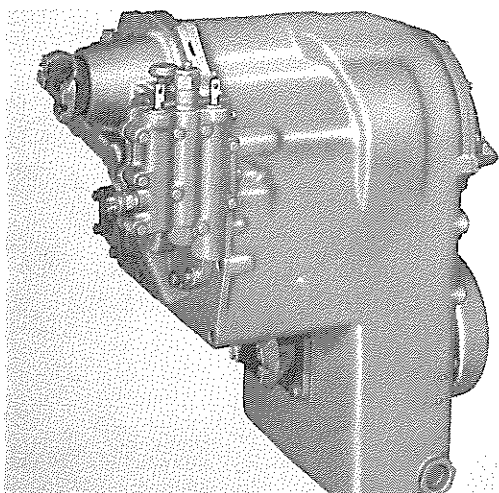


Figure 1
Side view of R 28000.

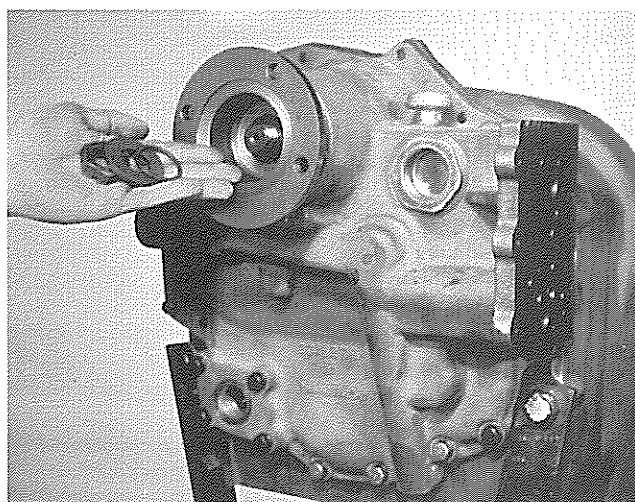


Figure 3
Remove companion flange nut, washer and "O" Ring.

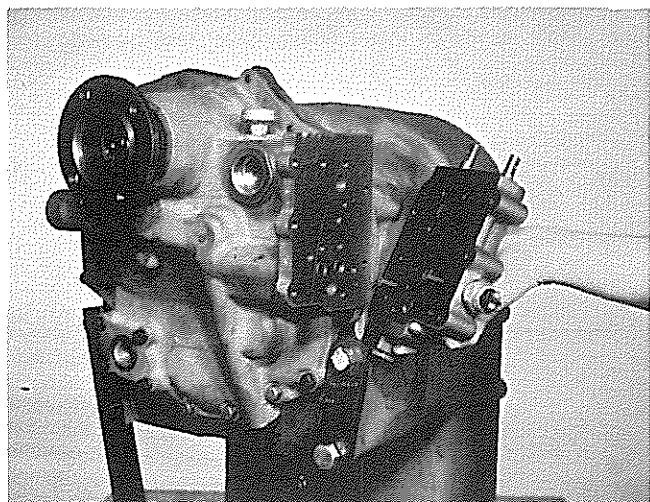


Figure 2
Remove control valve bolts and washers. Remove control valve. Use caution as not to lose detent springs and balls.

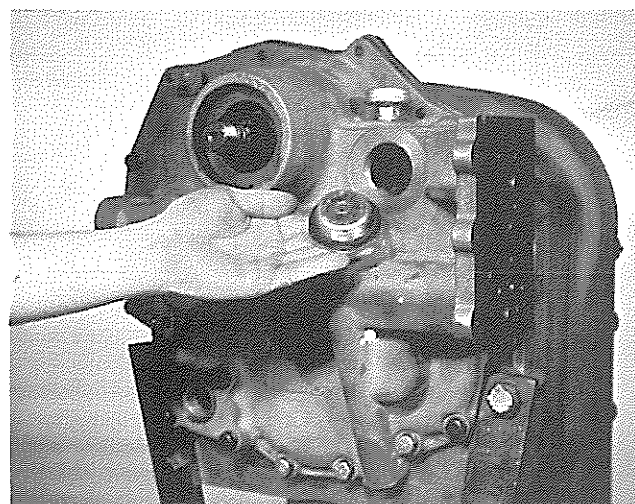
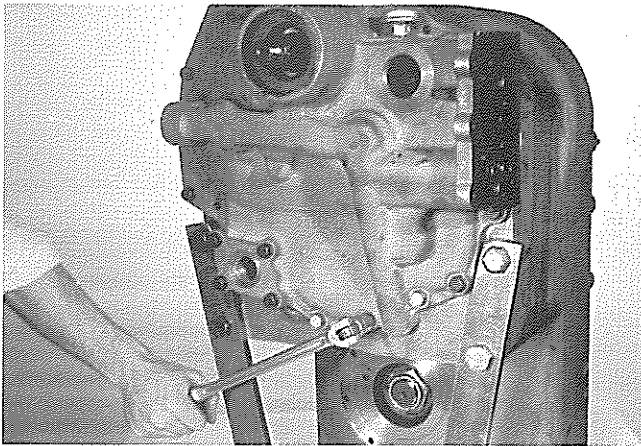
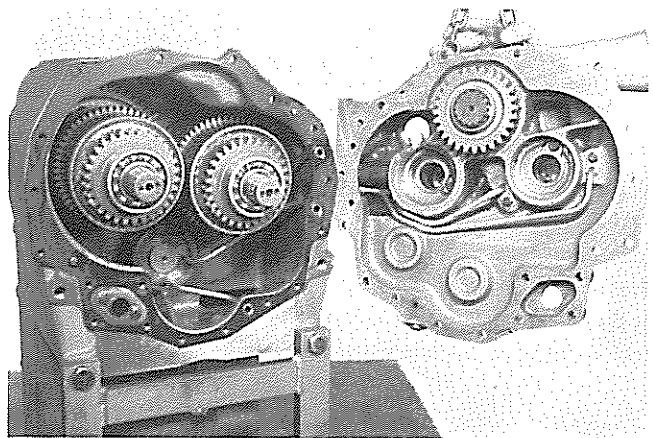


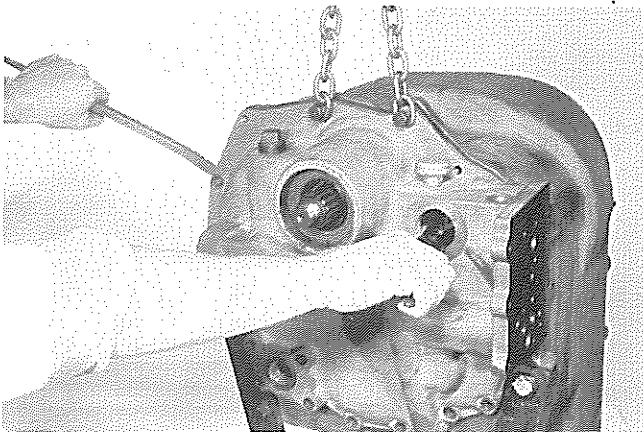
Figure 4
Remove front cover plug.

**Figure 5**

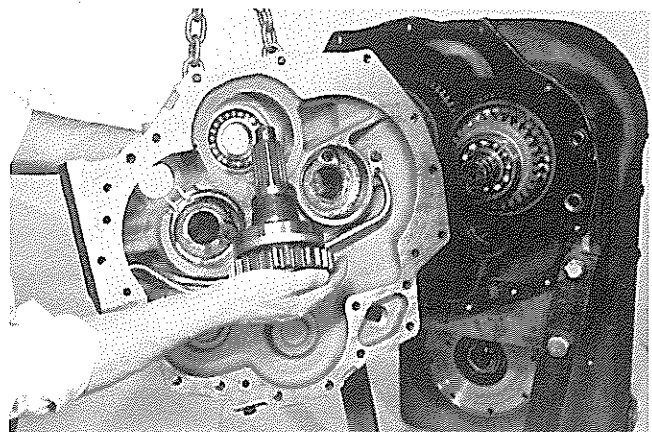
Remove bolts securing front cover to transmission housing.

**Figure 8**

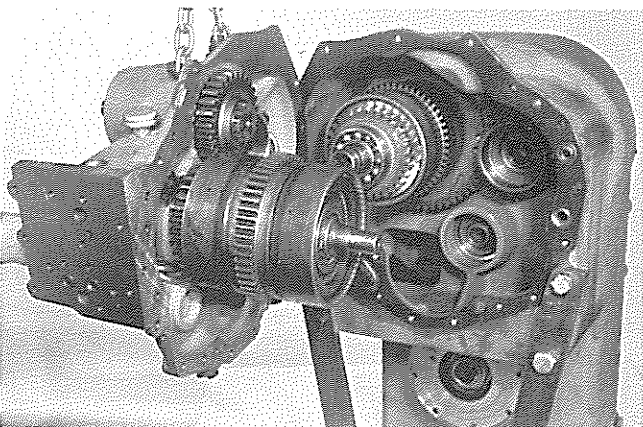
Front cover removed with forward and 2nd and reverse and 3rd clutch in transmission case.

**Figure 6**

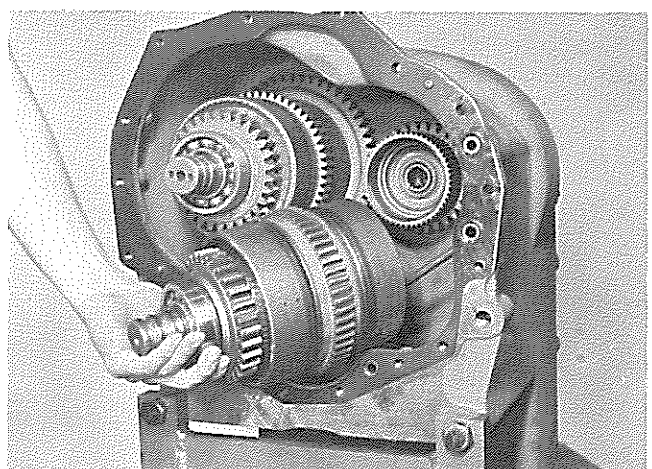
Support front cover with a chain fall. Using spreading type snap ring pliers, spread ears on forward clutch front bearing retaining ring. Holding snap ring open pry front cover from transmission housing.

**Figure 9**

If input shaft is to be removed, tap on threaded end of shaft, remove input shaft, gear and bearing.

**Figure 7**

If forward and 2nd clutch comes out with front cover, spread ears on front bearing snap ring and separate clutch from front cover.

**Figure 10**

Remove forward and 2nd clutch assembly.

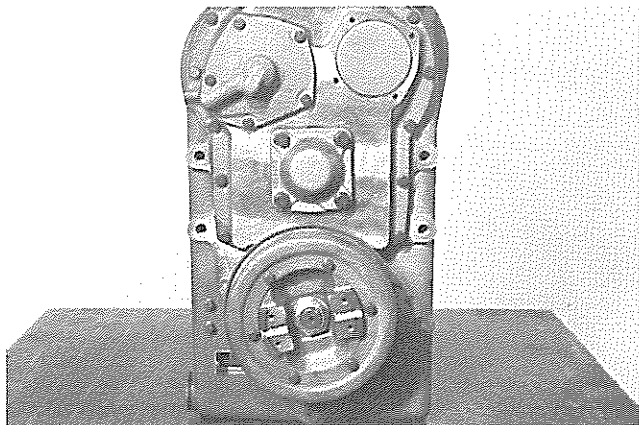


Figure 11

Rear view of transmission utilizing a mechanical parking brake option.

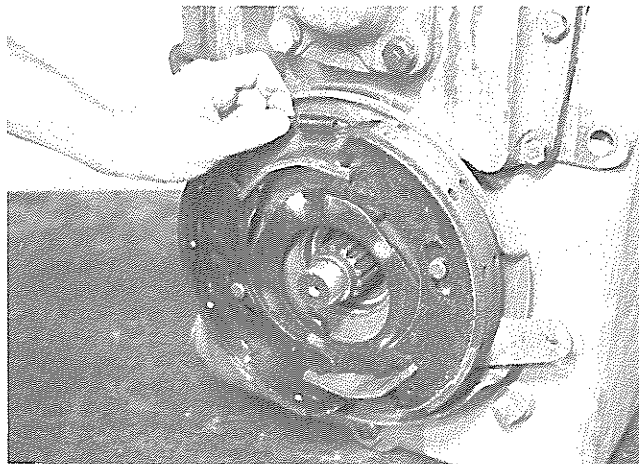


Figure 14

Remove upper and lower brake shoe return springs.

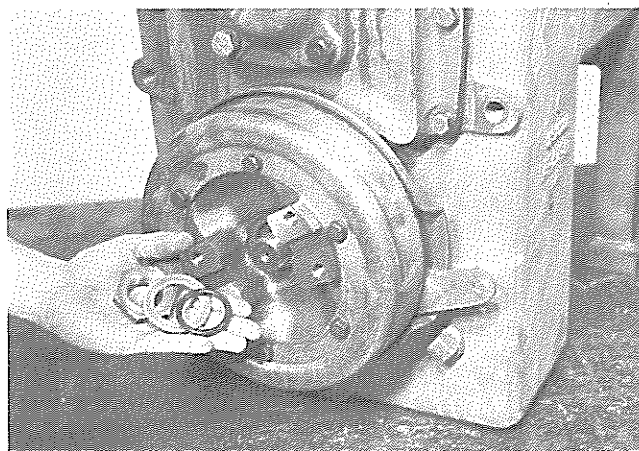


Figure 12

Remove output flange nut, washer and "O" ring. If parking brake is not used, remove companion flange and proceed to Figure 18.

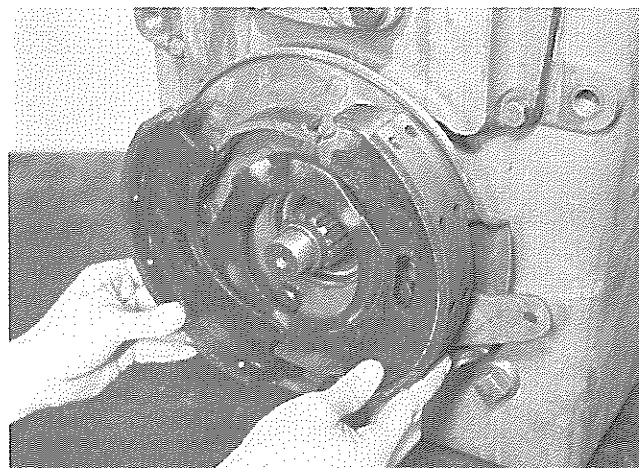


Figure 15

Remove brake shoes.

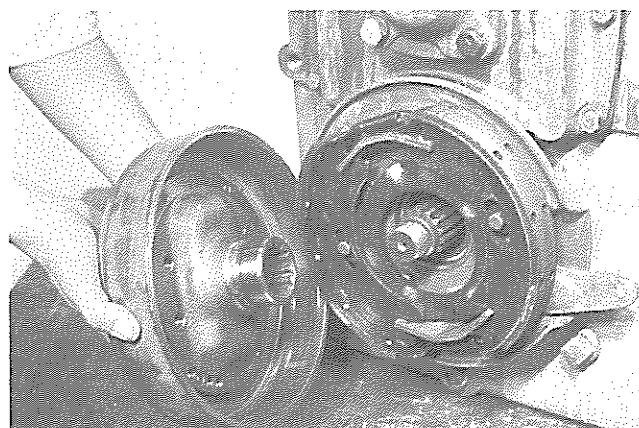


Figure 13

Remove parking brake drum and flange.

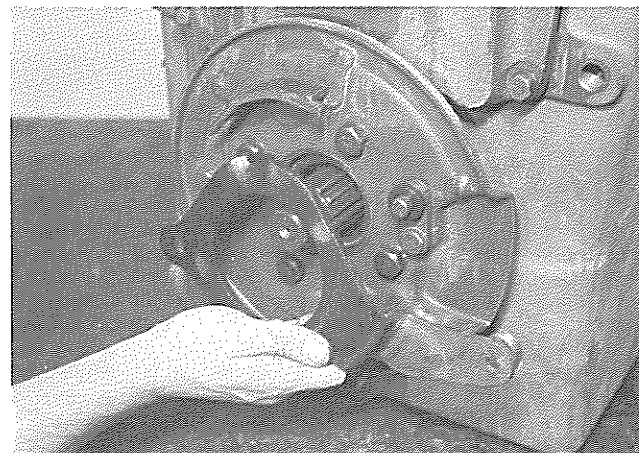


Figure 16

Remove brake actuator arm.

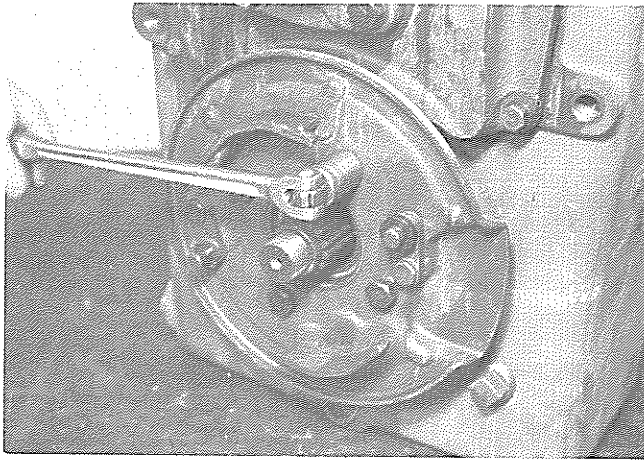


Figure 17
Remove brake backing plate bolts.

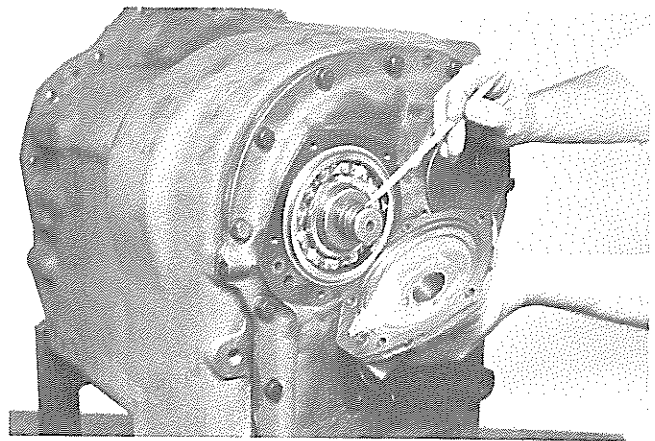


Figure 20
Remove low clutch rear bearing cap.

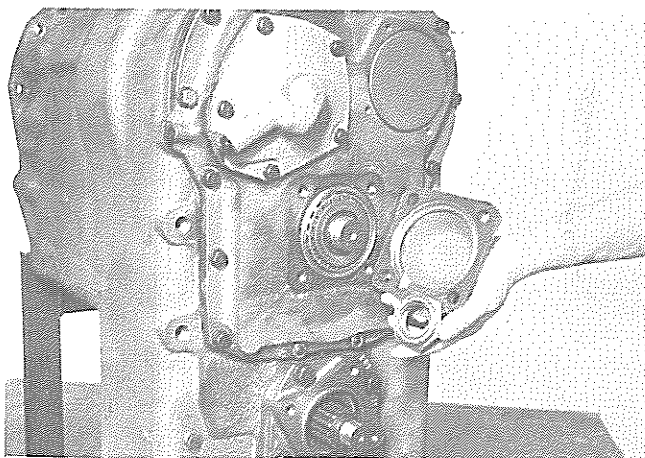


Figure 18
Remove idler shaft bearing cap bolts, bearing cap and idler shaft nut.

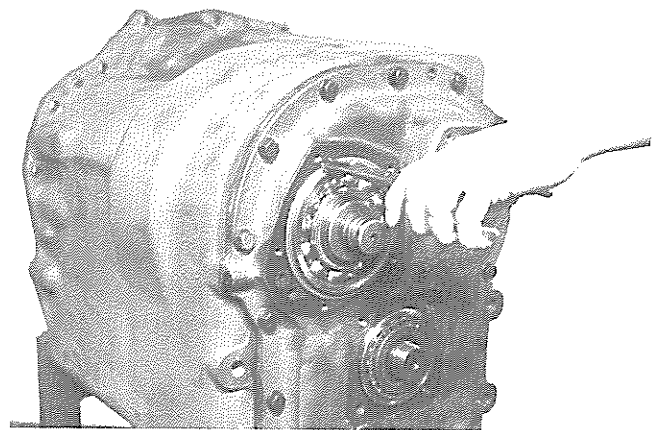


Figure 21
Remove low clutch rear bearing locating ring.

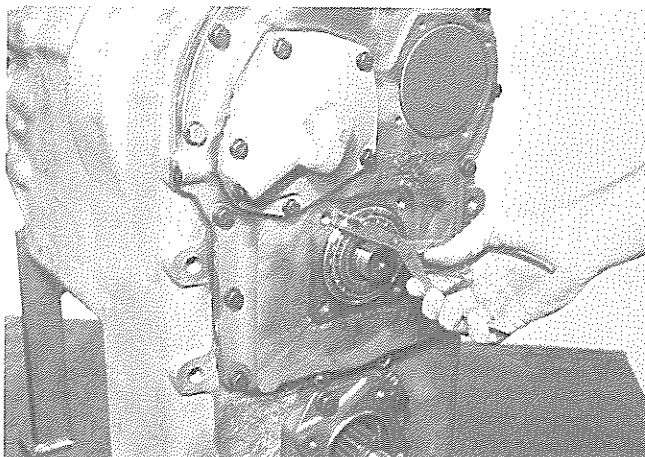


Figure 19
Remove idler shaft rear bearing locating ring.

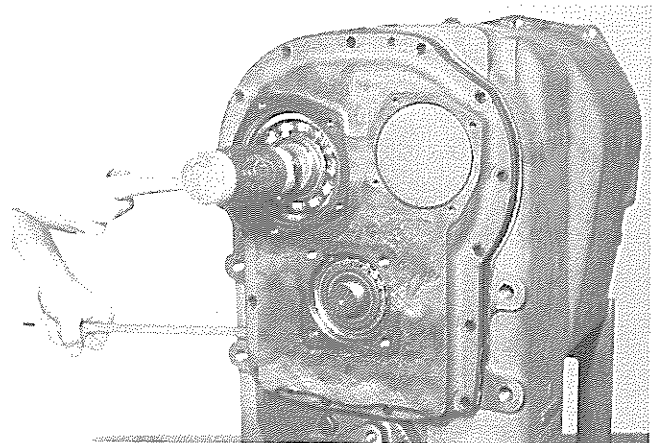


Figure 22
Remove rear cover bolts. Using pry slots provided, pry cover from transmission housing tapping on low clutch and idler shaft to allow cover to be removed without shaft binding.

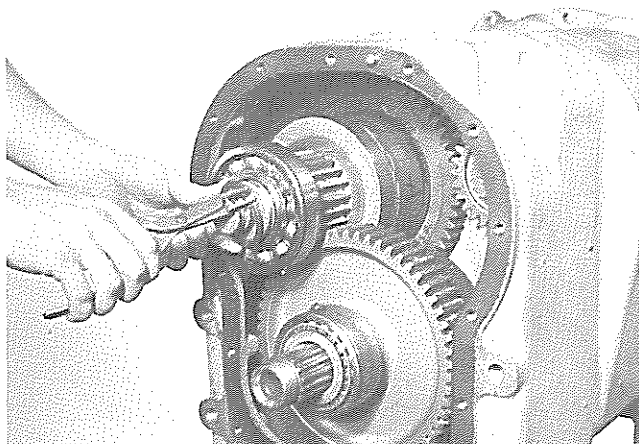


Figure 23

Remove low clutch rear bearing retaining ring.

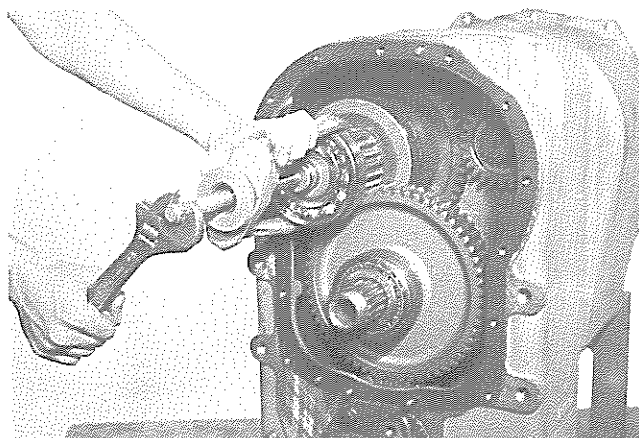


Figure 24

Remove low clutch rear bearing.

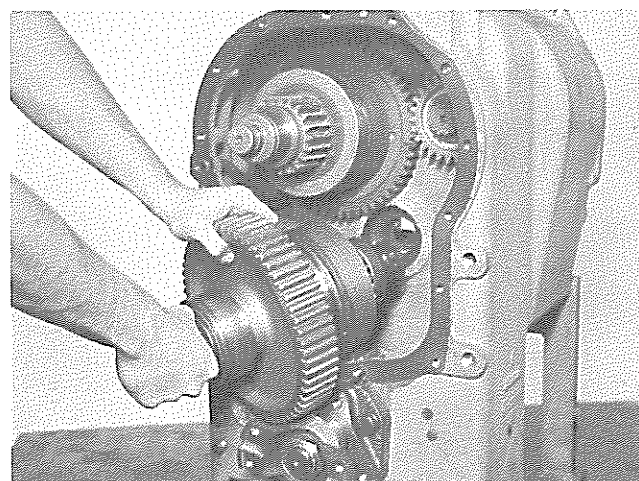


Figure 25

Remove idler shaft and 4th speed clutch from housing.

NOTE: Do not lose rear bearing lock ball.

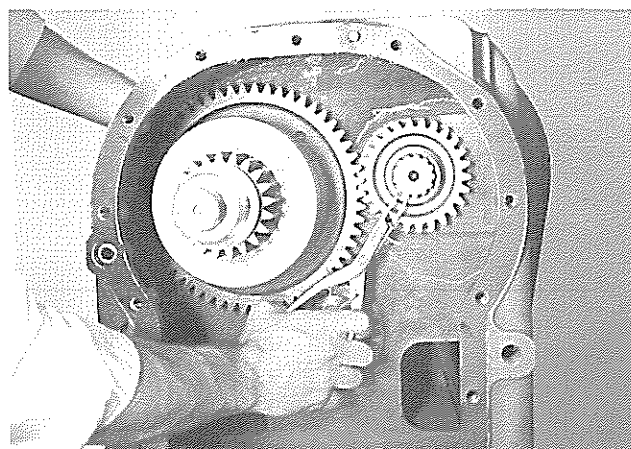


Figure 26

Remove low speed drive gear retainer ring and drive gear.

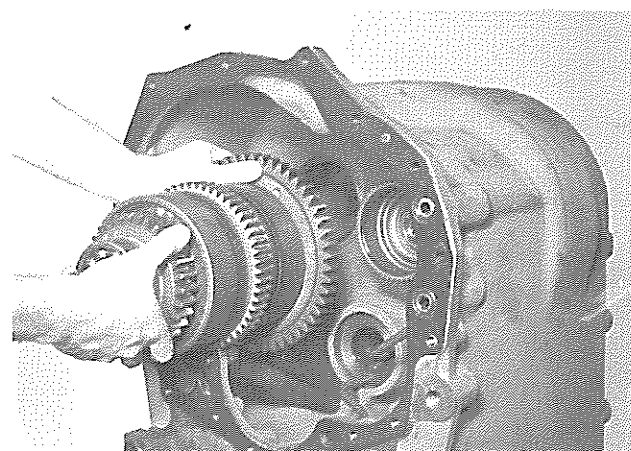


Figure 27

Remove reverse and 3rd clutch assembly.

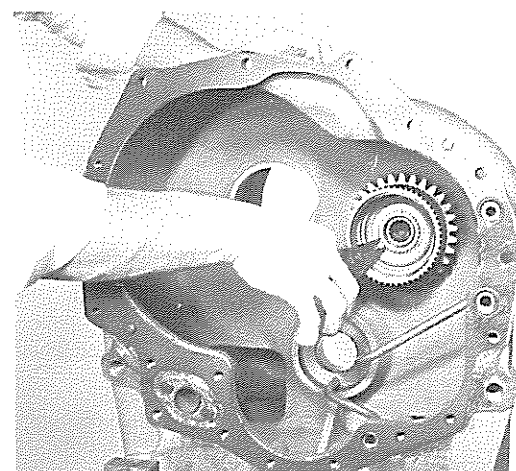


Figure 28

Remove 2nd gear retaining ring.

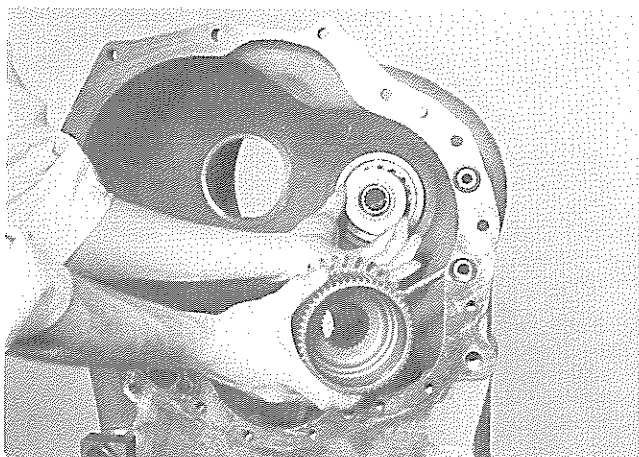


Figure 29
Remove 2nd gear and 2nd gear bearing end plate.

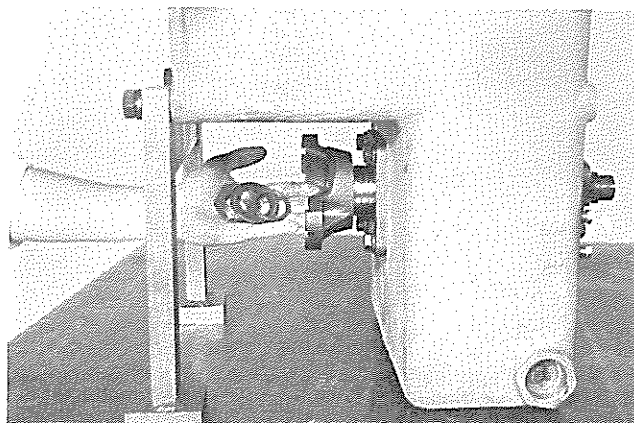


Figure 32
Remove front output flange nut, washer, "O" ring and companion flange.

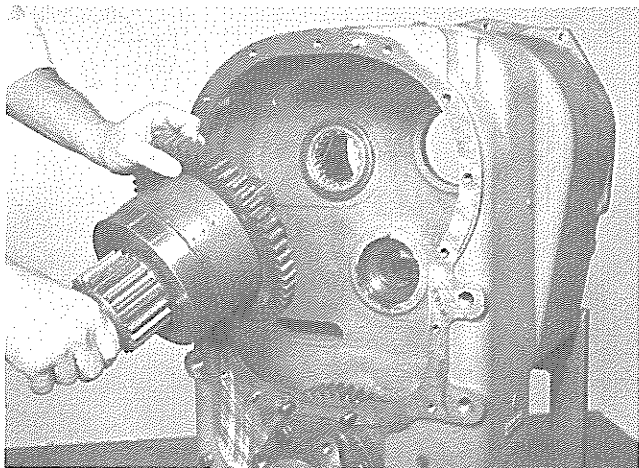


Figure 30
Remove low clutch assembly.

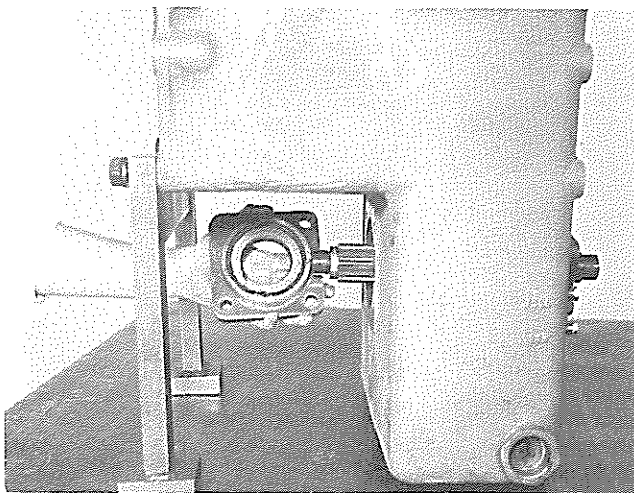


Figure 33
Remove output shaft front bearing cap bolts and cap.

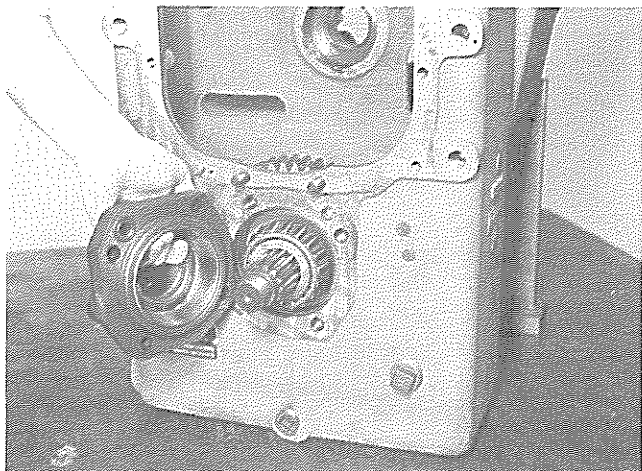


Figure 31
Remove rear output shaft bearing cap bolts and cap.

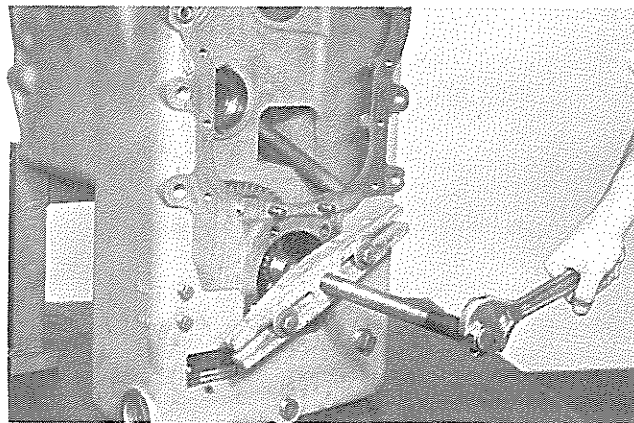


Figure 34
Block output gear. Push output shaft from rear through bearing and gear.

CLUTCH DISASSEMBLY

NOTE: DO NOT MIX THE FRICTION DISCS IN THE LOW CLUTCH WITH THE FRICTION DISCS OF ANY OF THE OTHER CLUTCHES. (SEE NOTE FOLLOWING FIGURE 71).

LOW CLUTCH DISASSEMBLY

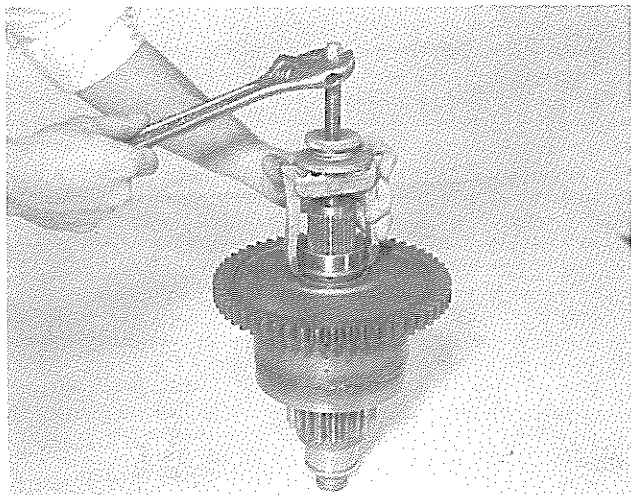


Figure 35

Remove low clutch shaft front bearing inner race.

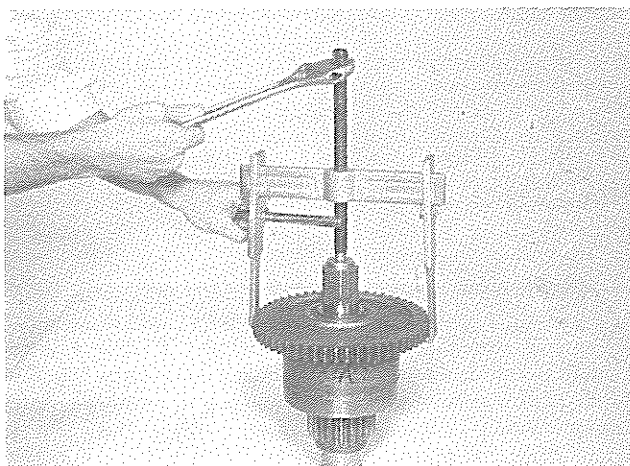


Figure 37

Remove low speed gear and outer taper bearing.

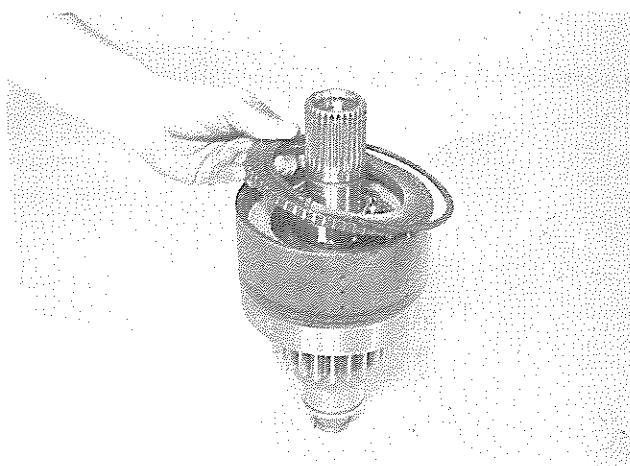


Figure 38

Remove clutch end plate retainer ring.

Remove clutch end plate and inner and outer clutch discs.

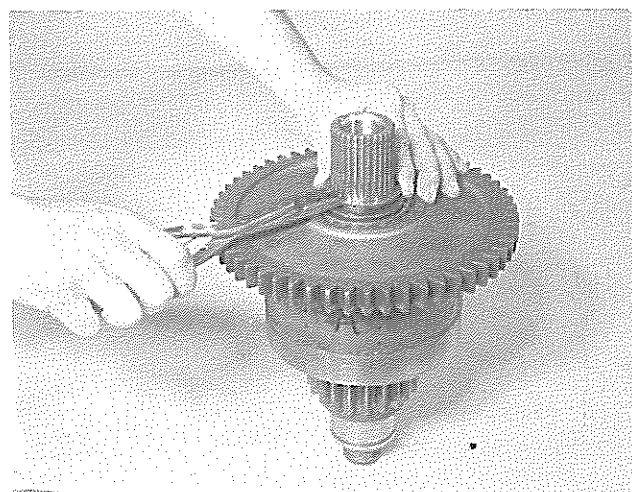


Figure 36

Remove low speed gear taper bearing retainer ring.

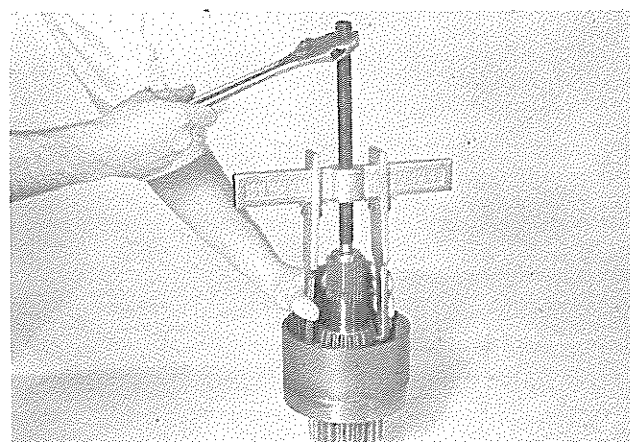
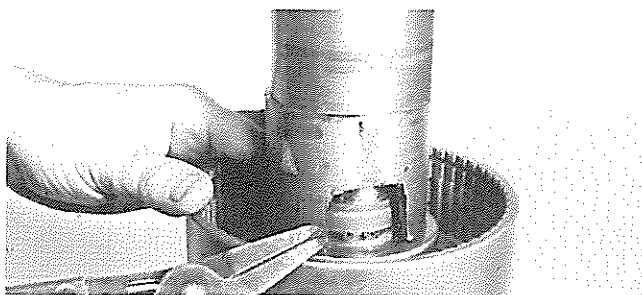


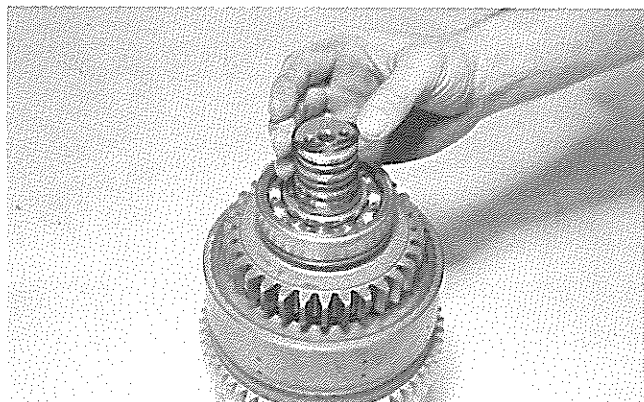
Figure 39

Remove low gear inner taper bearing.

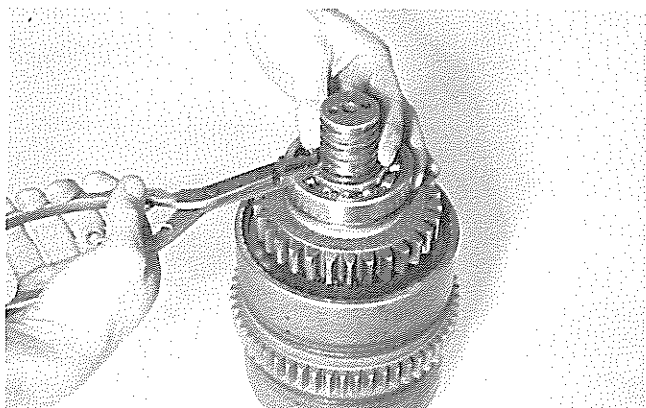
**Figure 40**

Remove clutch piston return spring. A sleeve with a portion removed is recommended for removing the clutch piston return spring, washer, and retainer ring. Sleeve shown is a common pipe, with a 1-1/2 x 1 [39,0x26,0mm] opening. The pipe is 6 x 3-1/4 x 2-3/4 [155,0x85,0x70,0mm]. Compress spring retainer snap ring. Through opening remove spring retainer snap ring. Release tension on spring retainer. Remove spring retainer and spring. Turn clutch over and tap clutch shaft on a block of wood to remove clutch piston.

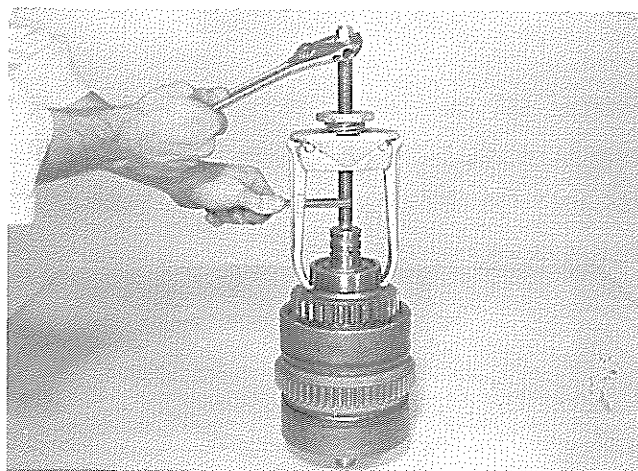
Forward and 2nd Clutch Disassembly

**Figure 41**

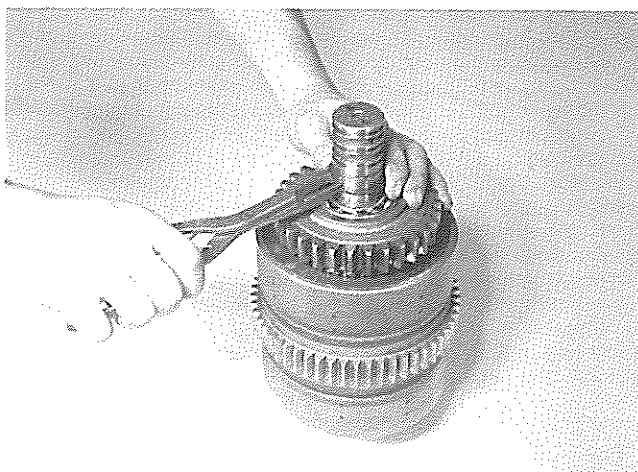
Remove clutch shaft piston rings.

**Figure 42**

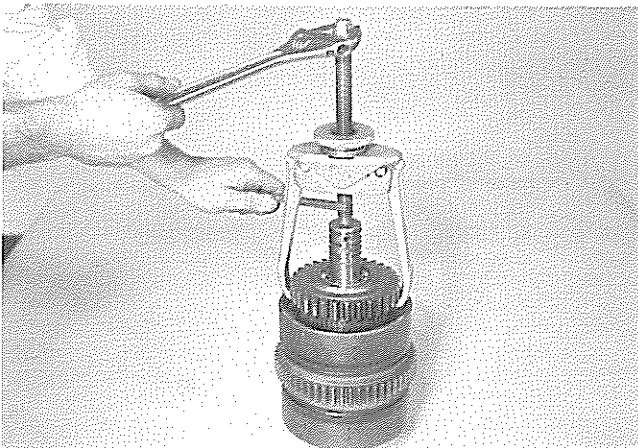
Remove front bearing retainer ring

**Figure 43**

Remove front bearing.

**Figure 44**

Remove front bearing locating ring.

**Figure 45**

Remove clutch driven gear and outer bearing.



Figure 46
Remove inner bearing.

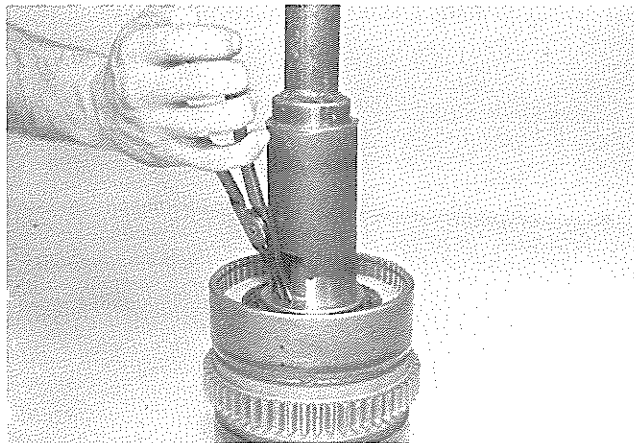


Figure 49
Compress return spring retainer. Remove retainer ring from groove.

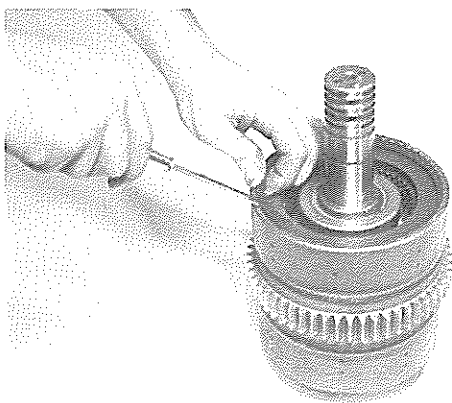


Figure 47
Remove end plate retainer ring.

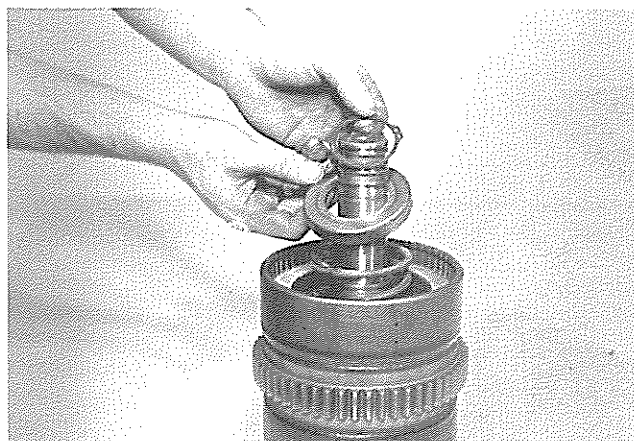


Figure 50
Relieve spring compression. Remove retainer ring, retainer and spring.

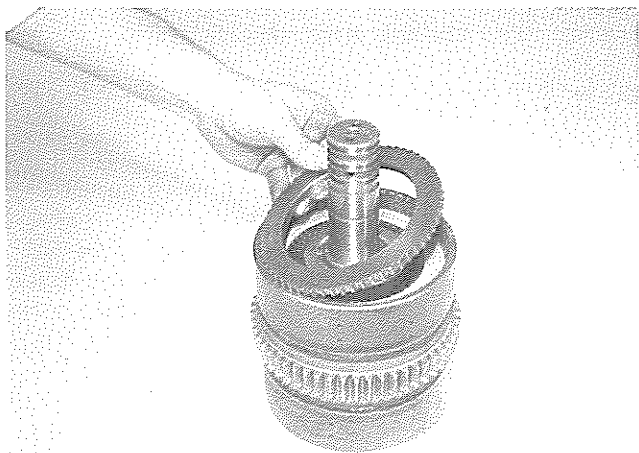


Figure 48
Remove end plate.

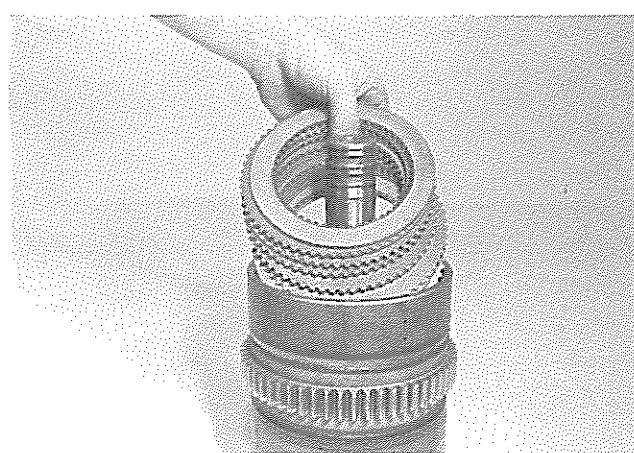


Figure 51
Remove inner and outer clutch discs. Turn clutch over and tap clutch shaft on a block of wood to remove clutch piston.

4th Clutch Disassembly

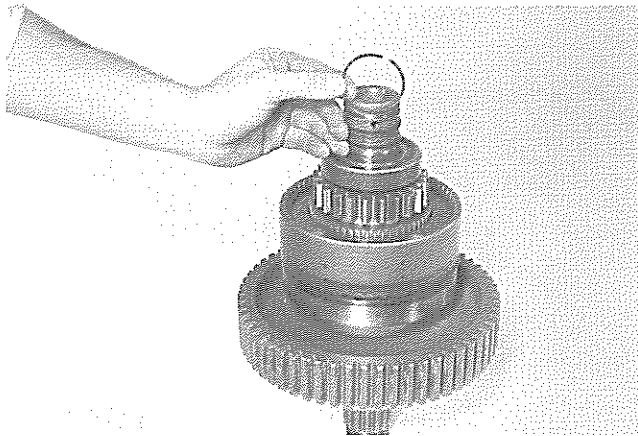


Figure 52
Remove clutch shaft piston rings.

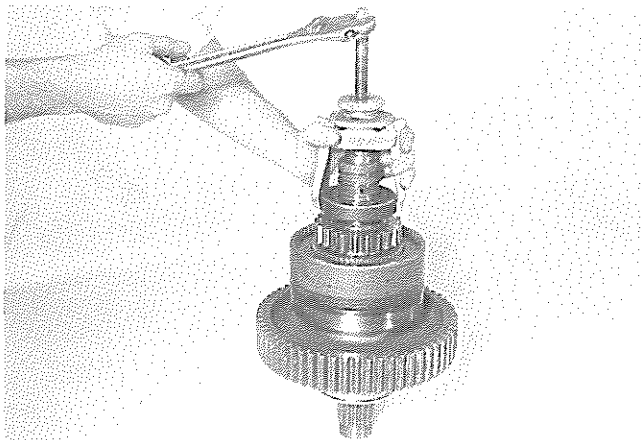


Figure 53
Remove front bearing retainer ring and front bearing.

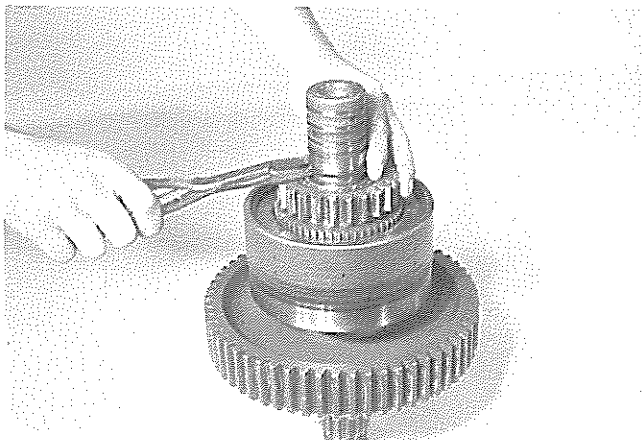


Figure 54
Remove front bearing locating ring.

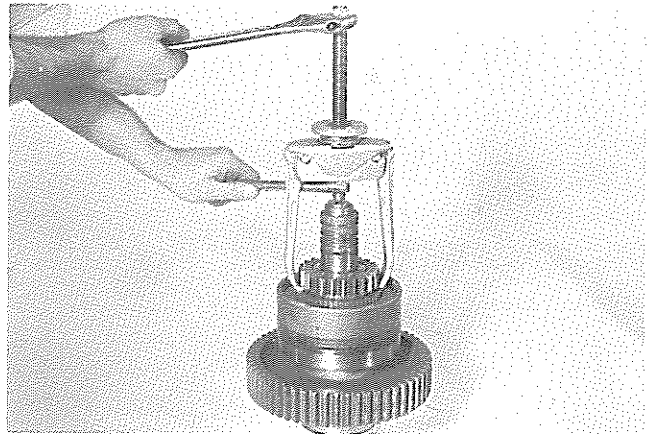


Figure 55
Remove 4th gear from clutch drum.

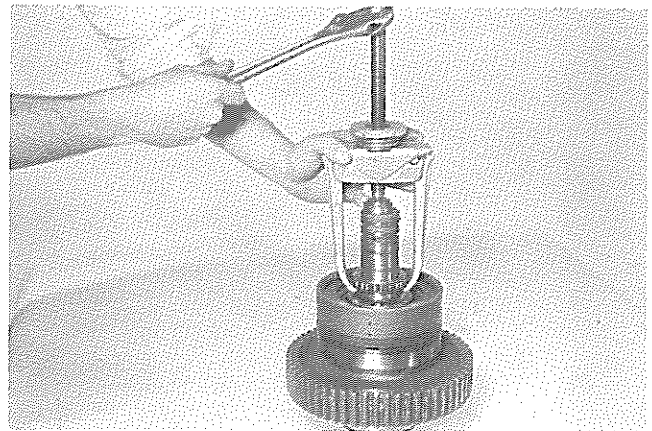


Figure 56
Remove inner bearing spacer and inner bearing. Disassemble clutch discs and piston as explained in Figure 47 through Figure 51.

CLEANING AND INSPECTION

CLEANING

Clean all parts thoroughly using solvent type cleaning fluid. It is recommended that parts be immersed in cleaning fluid and moved 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 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 recommended type 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

Forward and 2nd Clutch Reassembly

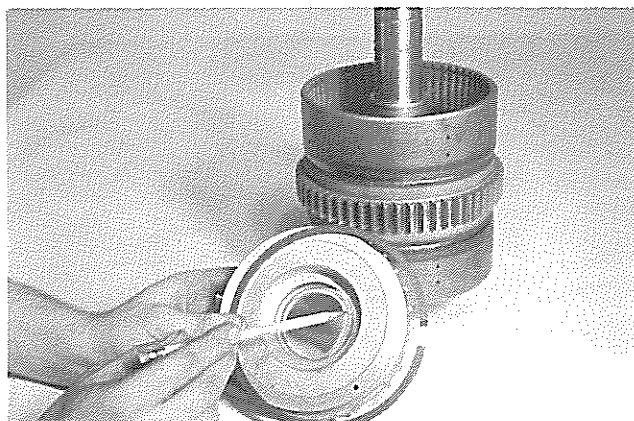


Figure 57

Install new clutch piston inner and outer sealing rings.

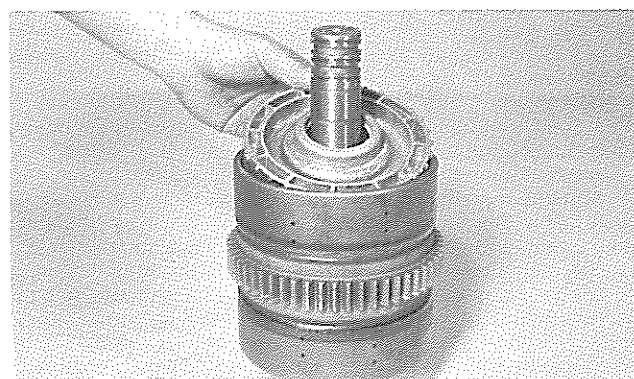
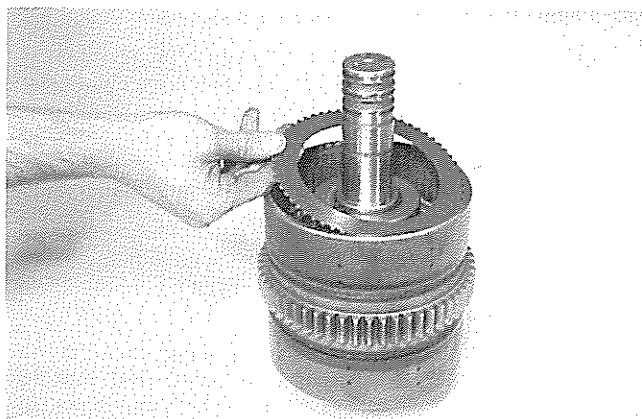
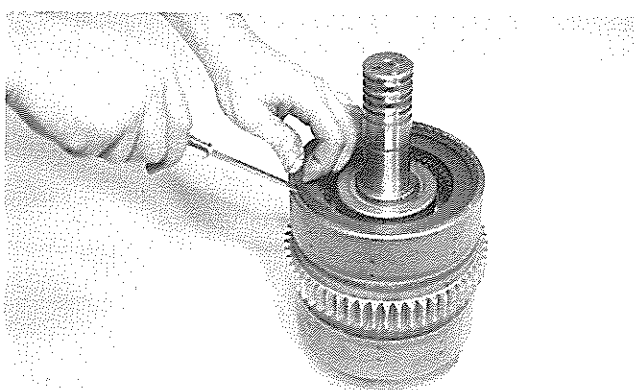


Figure 58

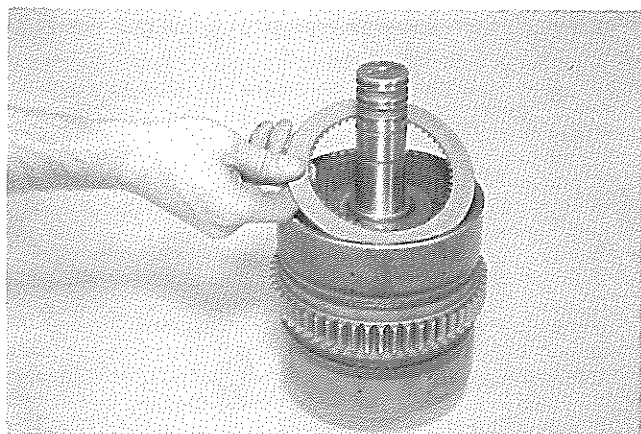
Insert clutch piston in clutch drum. Use caution as not to damage sealing rings.

**Figure 59**

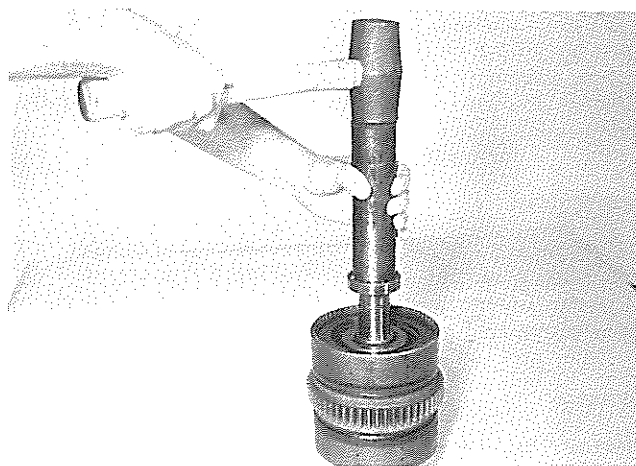
Install clutch piston return spring, spring retainer and retainer snap ring. Insert one steel disc.

**Figure 62**

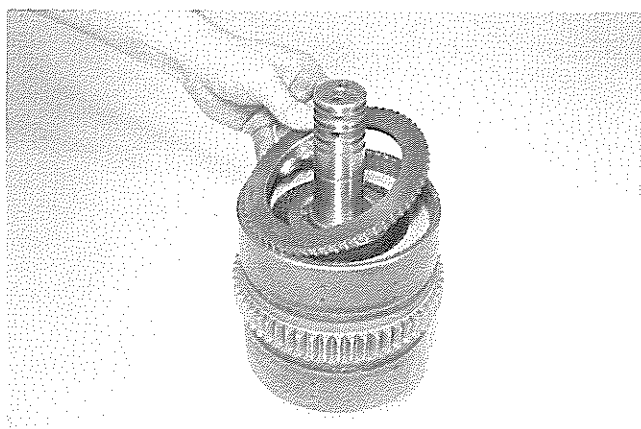
Install end plate retainer ring.

**Figure 60**

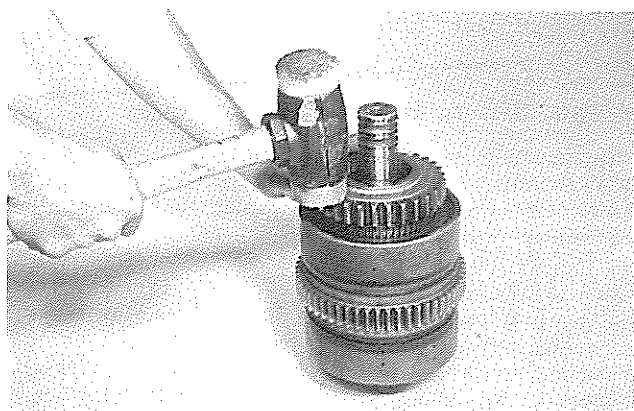
Install one friction disc. Alternate steel and friction discs until the proper amount of discs are installed. First disc next to the piston is steel, last disc installed is friction.

**Figure 63**

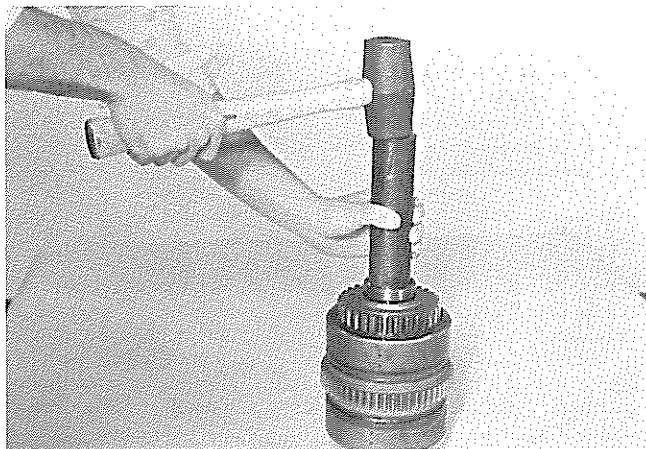
Install clutch driven gear inner bearing.

**Figure 61**

Install end plate.

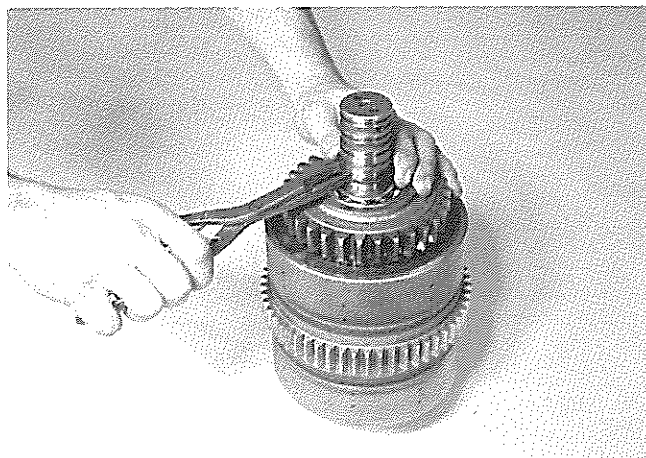
**Figure 64**

Install clutch driven gear into clutch drum. Align splines on clutch gear with internal teeth of friction discs. Tap gear into position. Do not force this operation. Gear splines must be in full position with internal teeth of all friction discs.

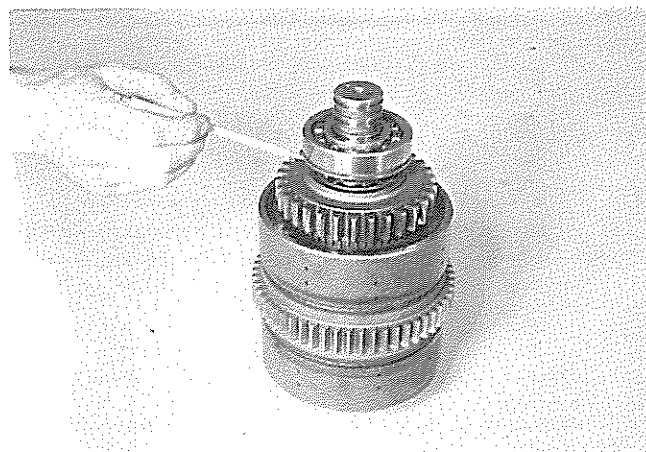
**Fig. 65**

Install driven gear outer bearing

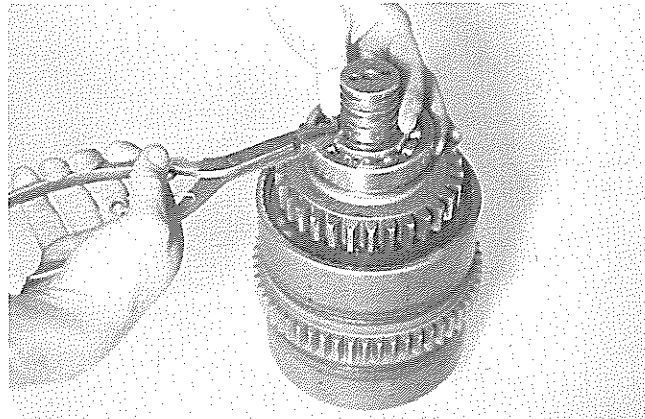
See Fig. K for proper Shielded bearing installation

**Figure 66**

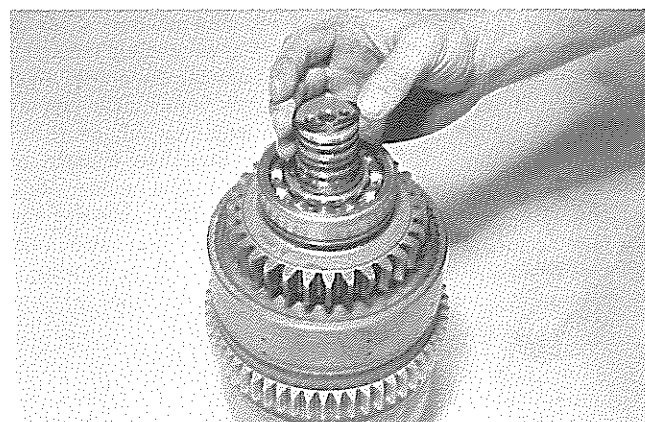
Install front bearing locating ring.

**Figure 67**

Install front bearing. **NOTE:** Snap ring groove in front bearing must be down.

**Figure 68**

Install front bearing retaining ring.

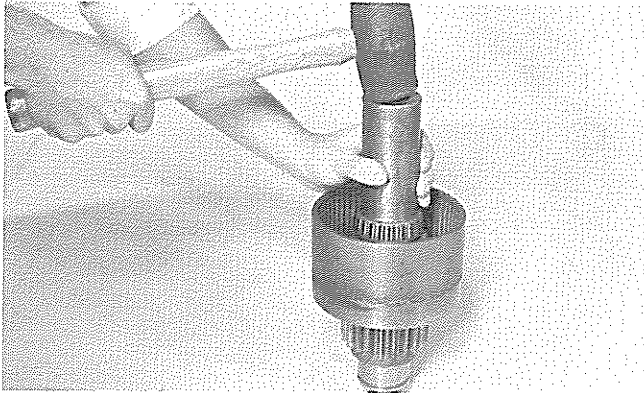
**Figure 69**

Install clutch shaft oil sealing rings. Grease rings to facilitate reassembly into front housings.

Low Clutch Reassembly

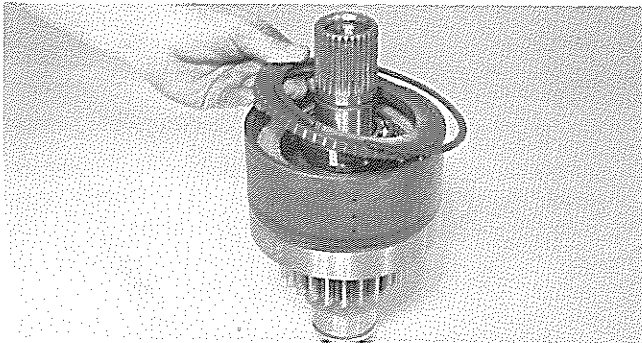
**Figure 70**

Install new clutch piston inner and outer sealing ring. Insert piston into clutch drum using caution as not to damage seals. Position piston return spring, spring retainer and retainer snap ring. Compress spring and retainer and install snap ring.

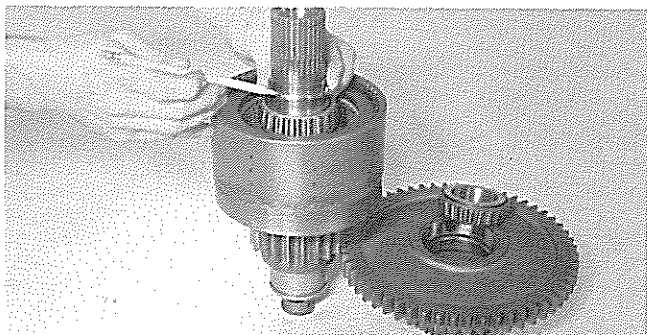
**Figure 71**

Install low gear inner taper bearing.
Install one steel disc.

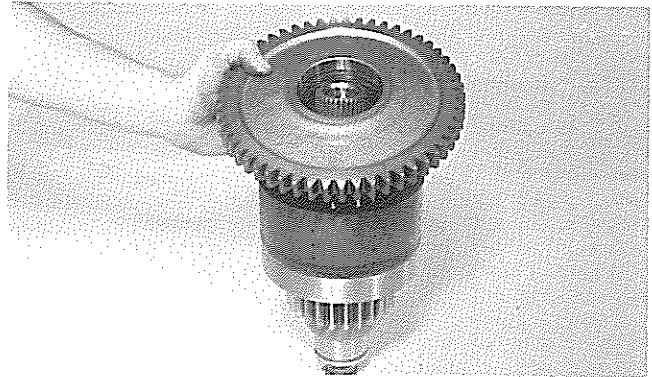
Install one friction disc. **NOTE:** The friction discs in the low clutch has a higher co-efficient rating than the friction discs in the other clutches, therefore the discs must not be mixed. The low clutch inner disc can be identified by an "X" stamped on one side of the inner teeth. The low clutch inner disc also has a strip of non-soluble yellow paint sprayed on the outer edge of the disc. Alternate steel and friction discs until the proper amount of discs are installed. First disc next to the piston is steel, last disc installed is friction.

**Figure 72**

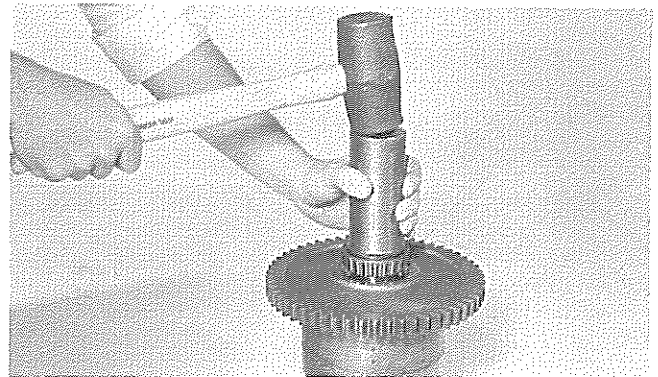
Install end plate and retainer ring.

**Figure 73**

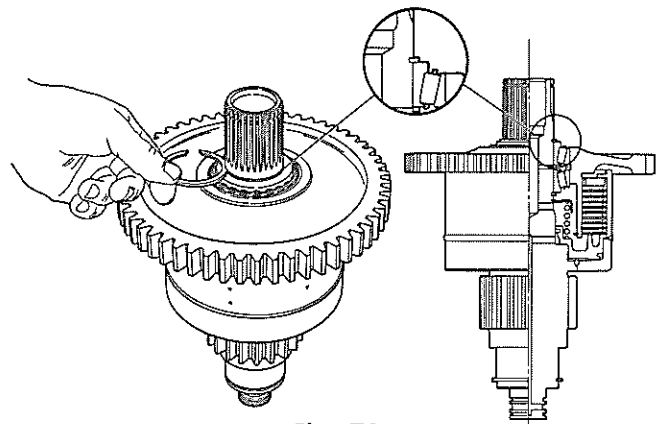
Install low clutch taper bearing spacer. **NOTE:** When installing the 3rd gear in the 3rd speed clutch a bearing spacer is used between the inner and outer 3rd gear bearing also.

**Figure 74**

Install low gear into clutch drum. Align splines on low gear with internal teeth of friction discs. Tap gear into position. Do not force this operation. Gear splines must be in full position with internal teeth of all friction discs.

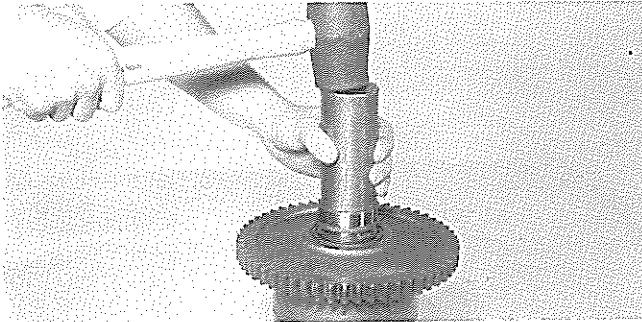
**Figure 75**

Install low gear outer taper bearing.

**Fig. 76**

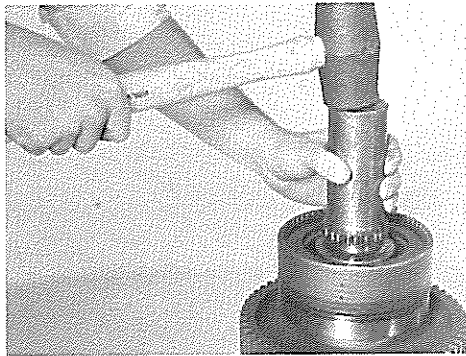
Install low clutch taper bearing retainer ring.

NOTE: Retainer ring is selected at assembly for proper thickness. A snap ring kit is available. Select the thickest of the three rings in the kit that can be fitted into the snap ring groove to assure a proper taper bearing tightness. Check ring as shown for tight ring to bearing fit.

**Figure 77**

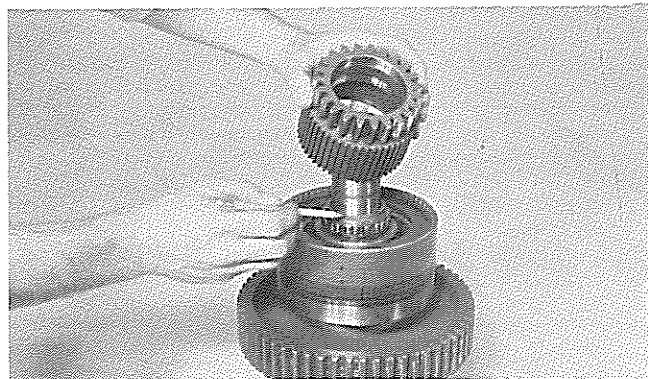
Install low clutch shaft front bearing inner race with large diameter of race down.

4th Speed Clutch Reassembly

**Figure 78**

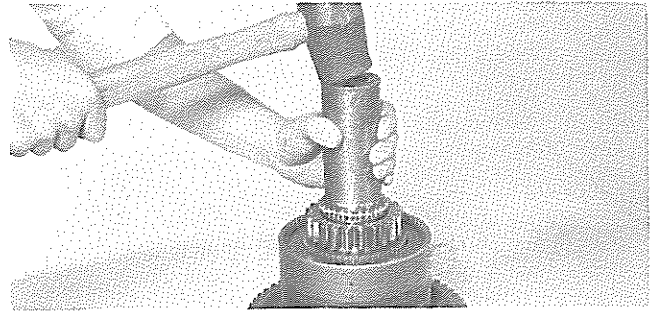
Install piston, piston return spring and inner and outer discs as explained in Fig. 57 through Fig. 62

Install 4th speed gear inner bearing. **NOTE:** Bearing part number must go down. See Fig. 80A.

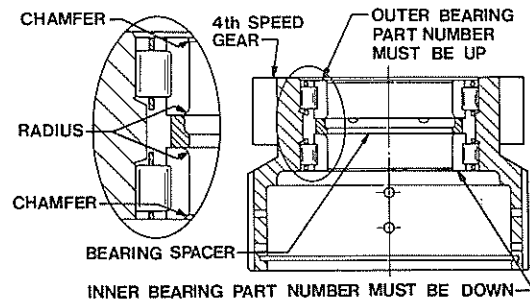
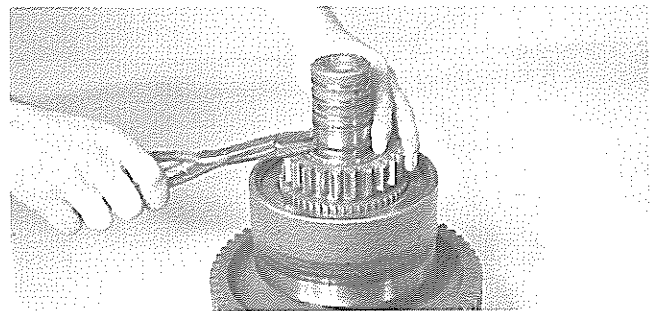
**Figure 79**

Install bearing spacer between inner and outer 4th speed gear bearings.

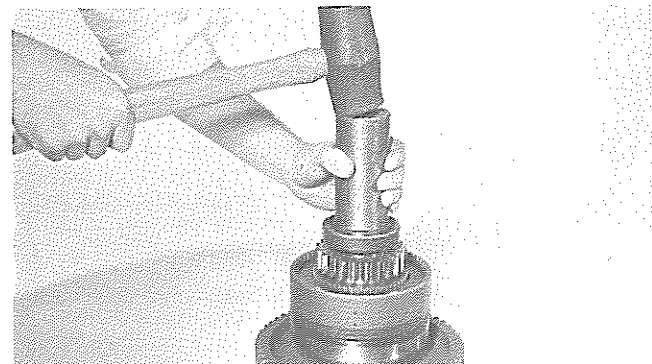
Install 4th speed gear into clutch drum. Align splines on clutch gear with internal teeth of friction discs. Tap gear into position. Do not force this operation. Gear splines must be in full position with internal teeth of all friction discs.

**Figure 80**

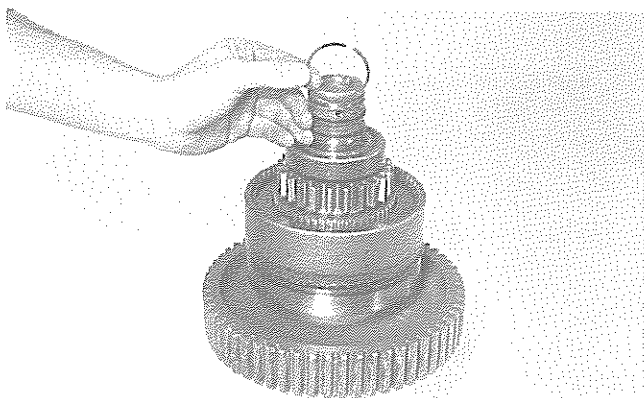
Install 4th speed gear outer bearing. **NOTE:** Bearing Part Number must go up. See Figure 80A. It is recommended a rubber band be used to hold outer bearing rollers in position when installing bearing.

**Figure 80A****Figure 81**

Install front bearing locating ring.

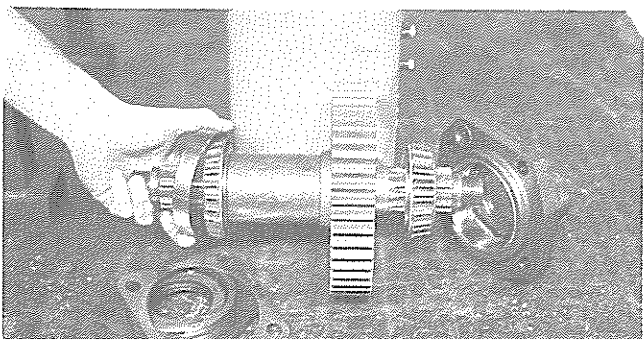
**Figure 82**

Install front bearing and bearing retainer ring.

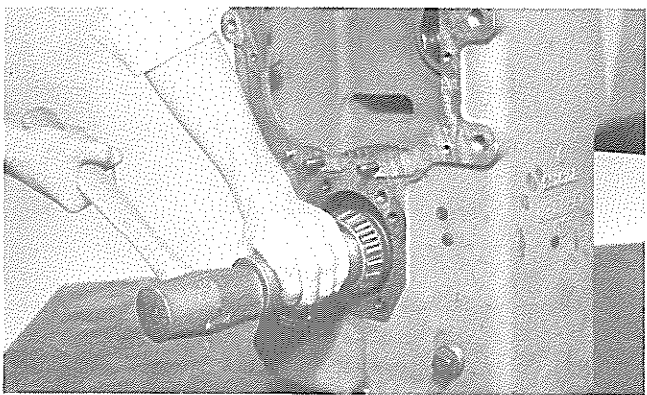
**Figure 83**

Install clutch shaft piston rings.

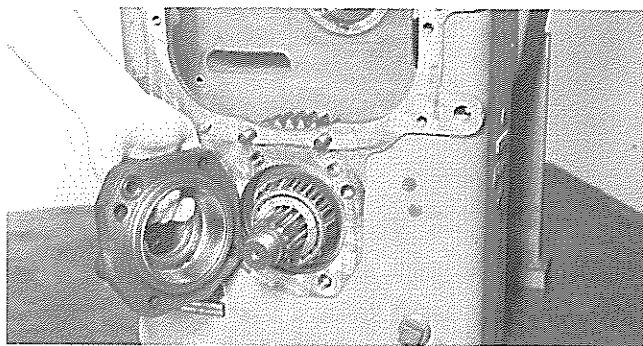
REASSEMBLY OF THE OUTPUT SHAFT

**Figure 84**

View of output shaft as it would be positioned in transmission case. Note front cone bearing shouldered on shaft with large diameter of bearing in.

**Figure 85**

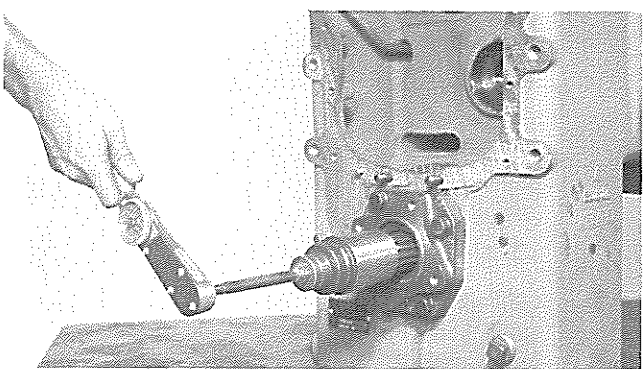
Position output gear in transmission case with protruding hub toward front of case. See Fig. 84. Insert output shaft, gear spacer and taper bearing from front of case and through output gear. Install front taper bearing cup. Block output shaft and install rear taper bearing with large diameter in.

**Figure 86**

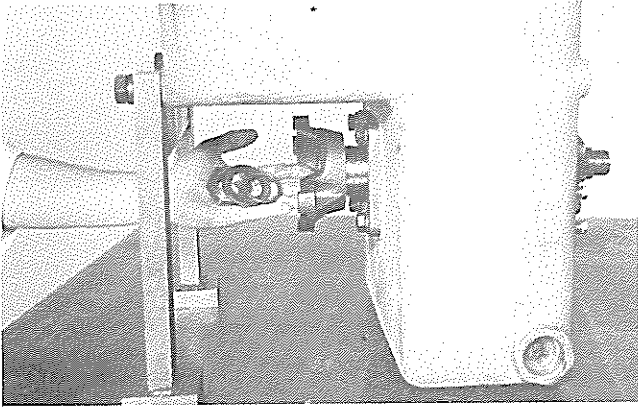
Using new "O" rings install rear output bearing cap and taper bearing cup on transmission case. Lube opening in bearing cap must be aligned with lube opening in case. Tighten bearing cap bolts to specified torque. (See torque chart.)

**Figure 87**

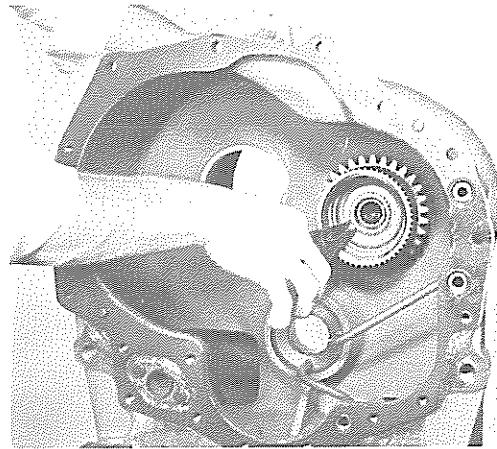
Install front bearing cap and shims. Tighten bolts to specified torque. Tap output shaft front and rear to seat taper bearings. Loosen front bearing cap bolts.

**Figure 88**

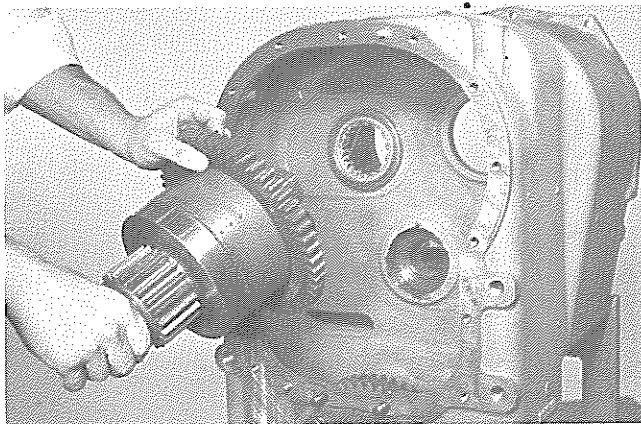
Using an inch lb. torque wrench, determine the rolling torque of the output shaft and record. Tighten front bearing cap bolts to specified torque. Check rolling torque with bolts tight. Torque must be 6 to 8 inch lbs. [0,07-0,09 m.kg] more than when bearing cap bolts were loose. Add or omit shims on the front bearing cap to achieve the proper preload.

**Figure 89**

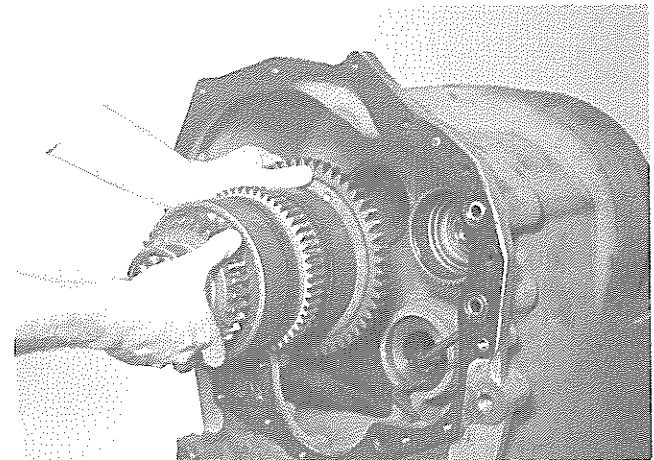
Install output shaft front companion flange, flange "O" ring, washer and flange nut. Block output gear. Tighten nut 200 to 250 ft. lbs. torque [27,6-34,5 m.kg].

**Figure 92**

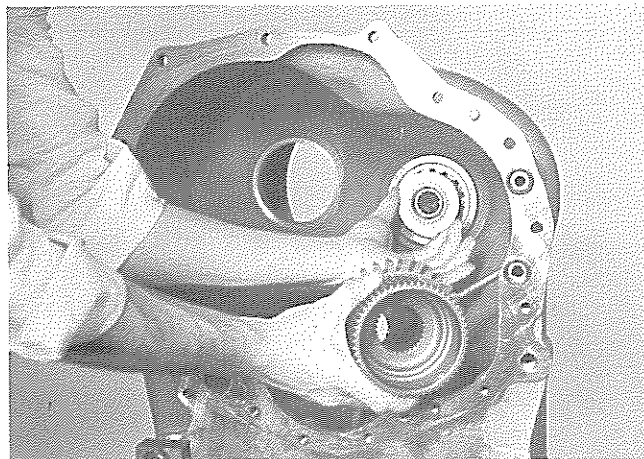
Install 2nd speed gear retainer ring.

**Figure 90**

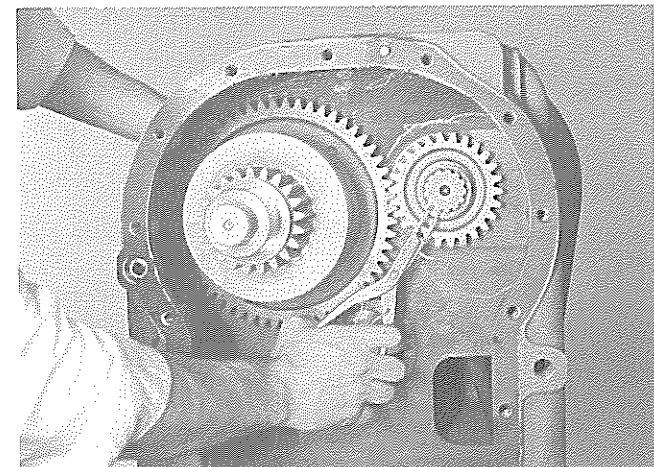
From the rear of the transmission case install the low clutch assembly.

**Figure 93**

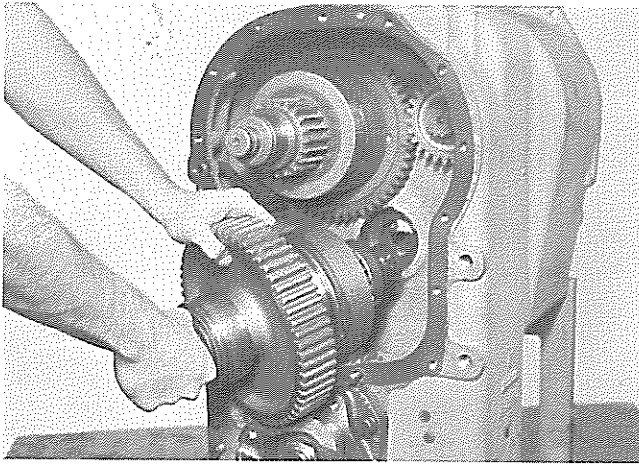
From the front of the transmission case install the reverse and 3rd clutch assembly.

**Figure 91**

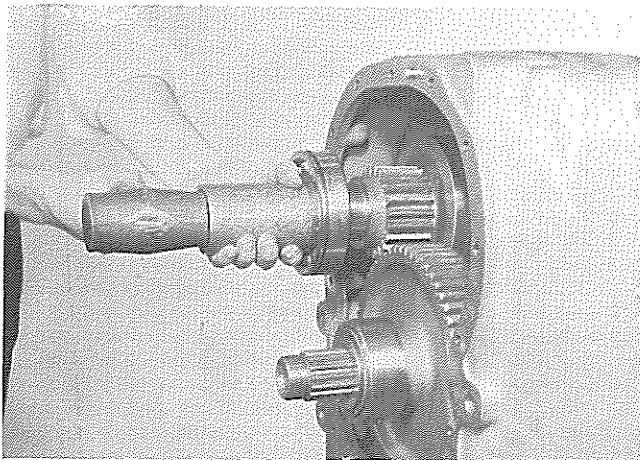
Install 2nd speed bearing end plate and 2nd speed gear on low clutch shaft.

**Figure 94**

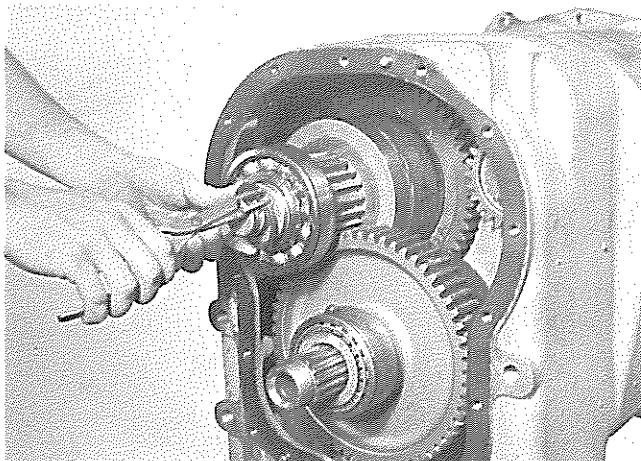
Install low speed drive gear and retainer ring.

**Figure 95**

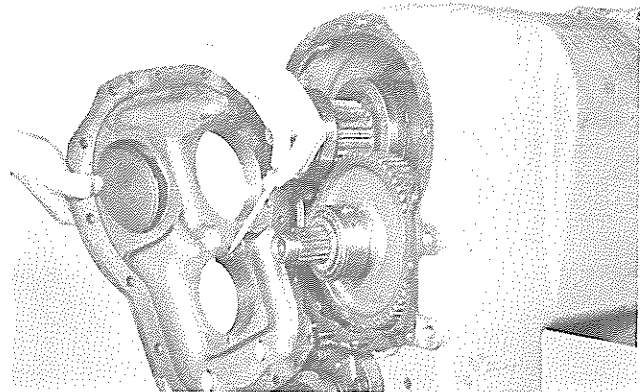
Install idler shaft and 4th speed clutch assembly.

**Figure 96**

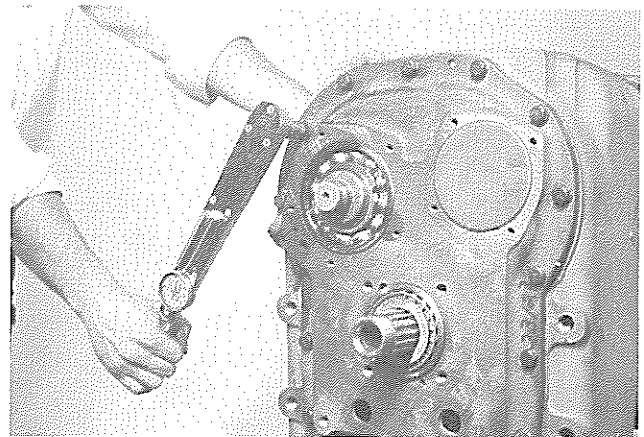
Install low clutch rear bearing with bearing ring groove to the rear.

**Figure 97**

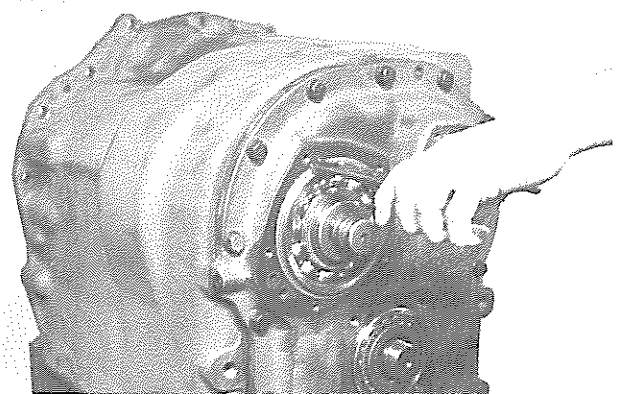
Install low clutch rear bearing retainer ring.

**Figure 98**

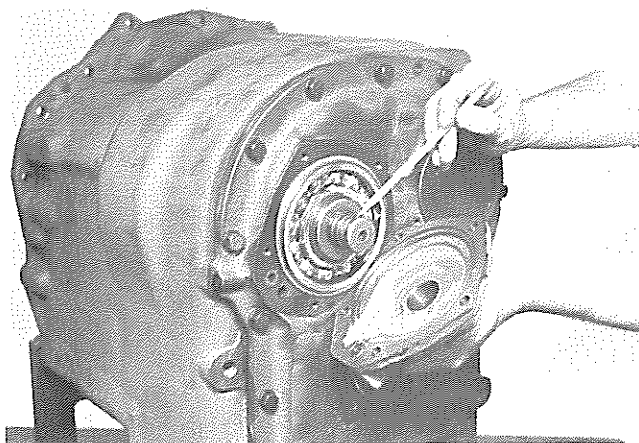
Position a new gasket on rear transmission case. Align lock ball in idler shaft rear bearing with notch in rear transmission cover. Tap cover in place and secure with bolts and lockwashers.

**Figure 99**

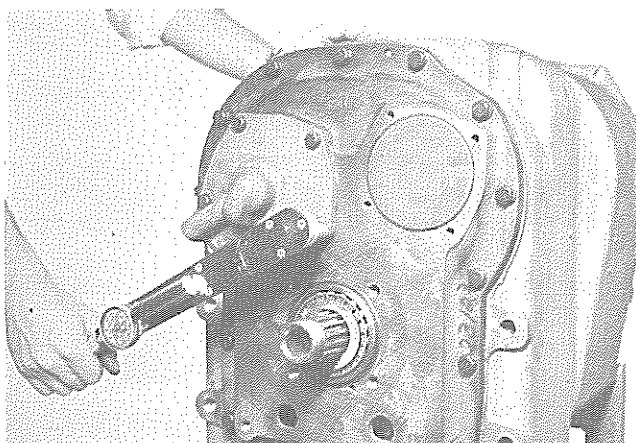
Torque rear cover bolts to specified torque.

**Figure 100**

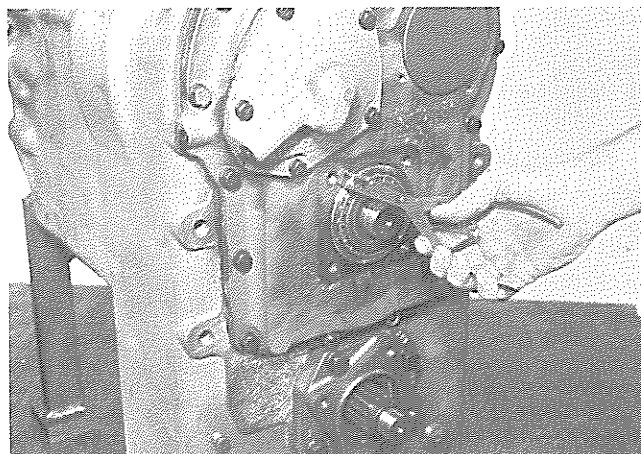
From front of transmission case tap low clutch and idler shaft to rear. This will allow clearance to install rear bearing snap ring.

**Figure 101**

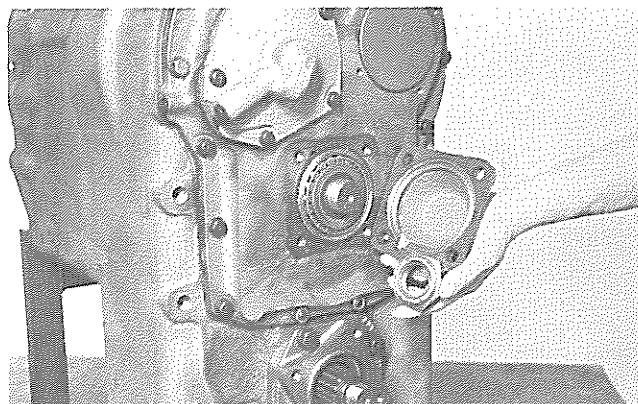
Install low clutch shaft piston rings. Install new gasket and "O" ring on low shaft bearing cap.

**Figure 102**

Install bearing cap and secure with lockwashers and bolts. Tighten to specified torque.

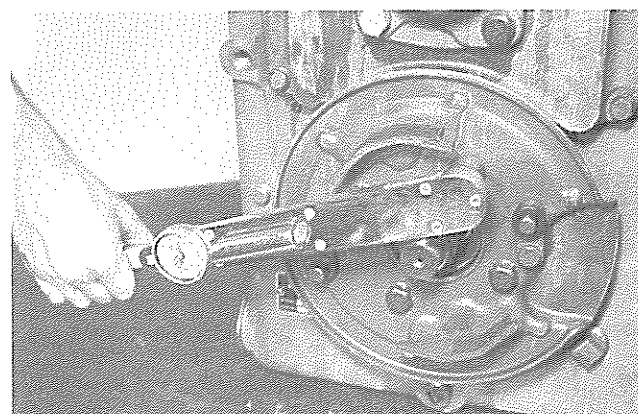
**Figure 103**

Install idler shaft rear bearing locating ring.

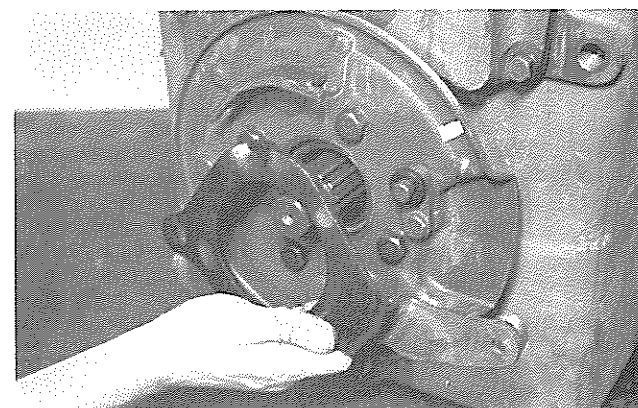
**Figure 104**

Install idler shaft nut. Block idler gear, tighten nut 250 to 300 ft. lbs. torque [34,6-41,4 m.kg]. With a new gasket in position install idler shaft bearing cap. Tighten bolts to specified torque.

If a mechanical parking brake is not used proceed to Figure 110.

**Figure 105**

Install brake backing plate assembly. Tighten bolts to specified torque.

**Figure 106**

Position brake actuating arm.

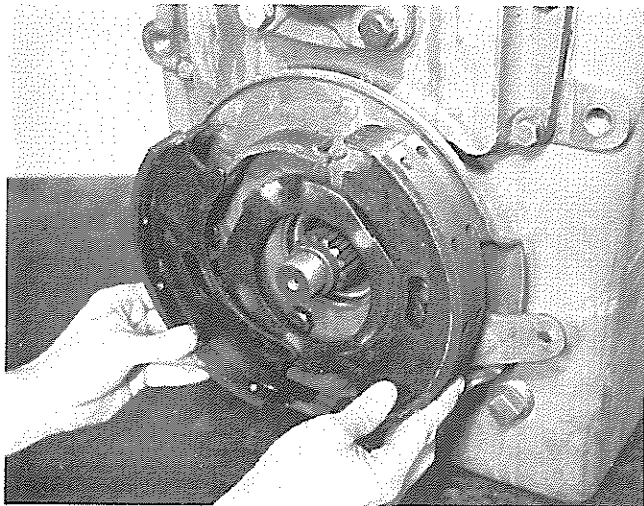


Figure 107
Locate brake shoes.

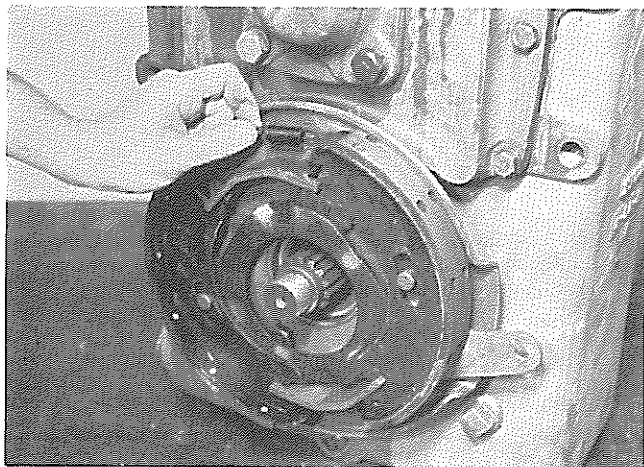


Figure 108
Install upper and lower brake shoe return springs.

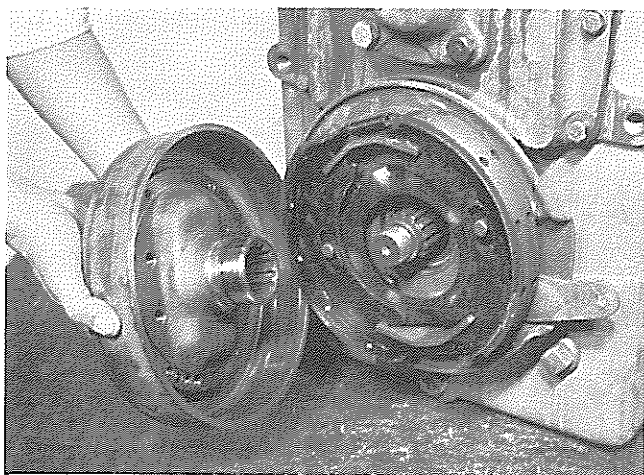


Figure 109
Install brake drum and flange assembly.

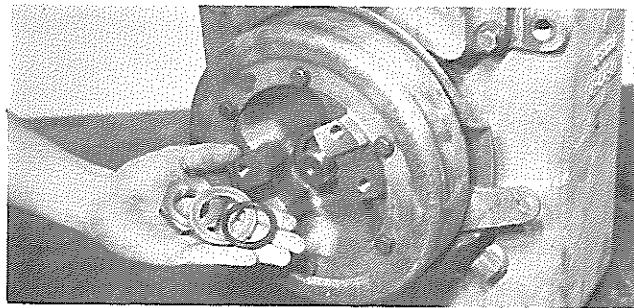


Figure 110
Secure flange with a new "O" ring, washer and flange nut. Block output shaft and tighten nut 200 to 250 ft. lbs. torque [27,7-34,5 m.kg].

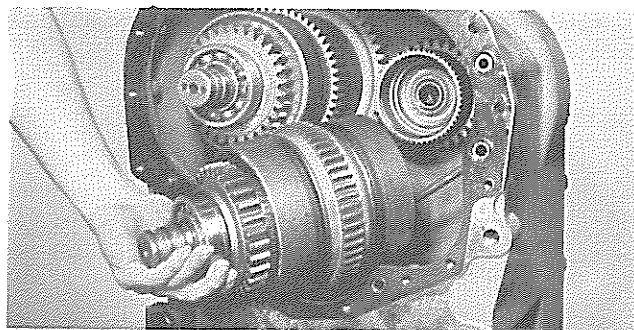


Figure 111
From the front of the transmission case install the forward and 2nd clutch assembly.

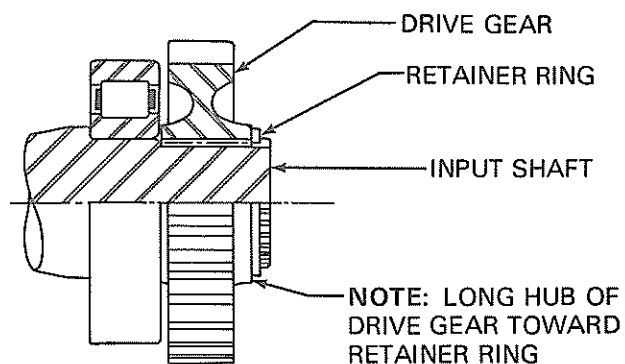


Figure 112
Input shaft, rear bearing, drive gear and snap ring.

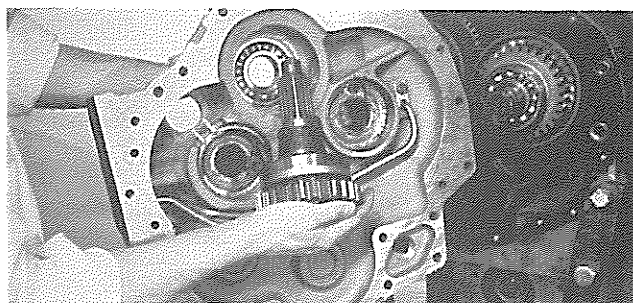
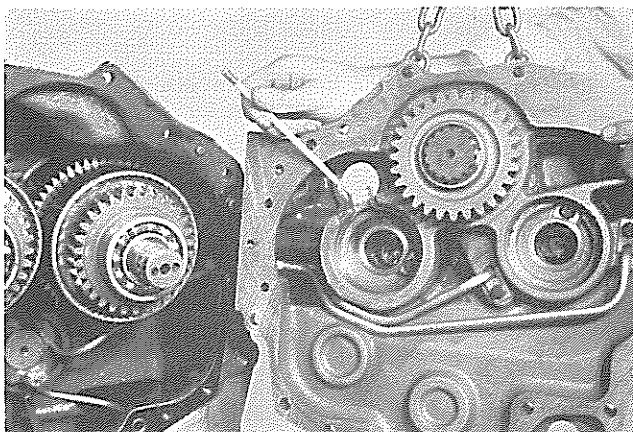
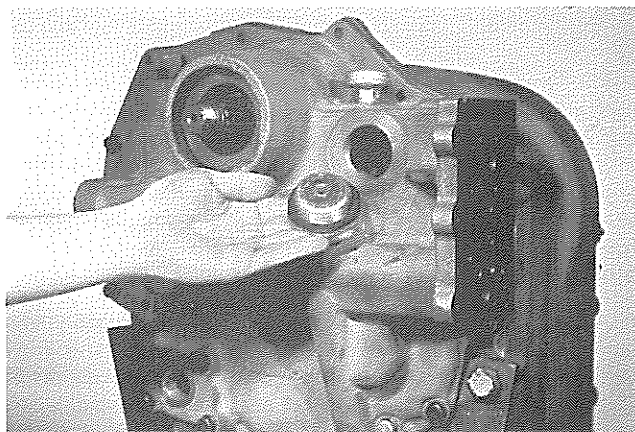


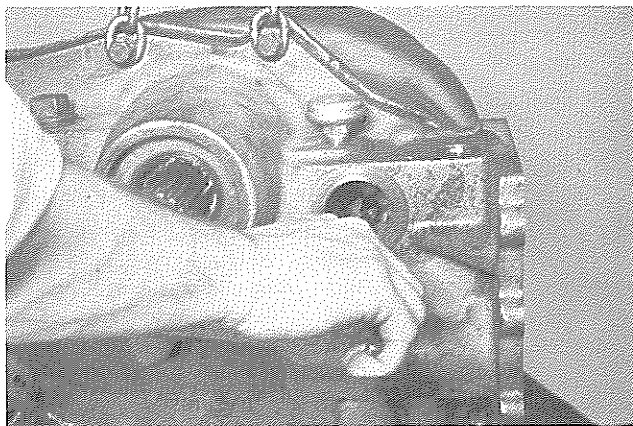
Figure 113
Install input shaft into front bearing.

**Figure 114**

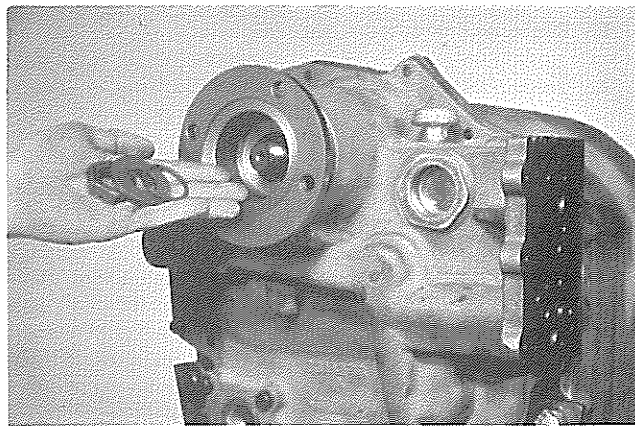
Forward clutch front bearing locating ring.

**Figure 117**

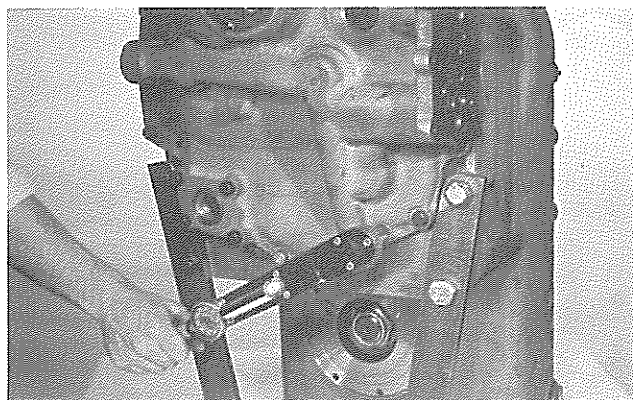
Install front cover plug.

**Figure 115**

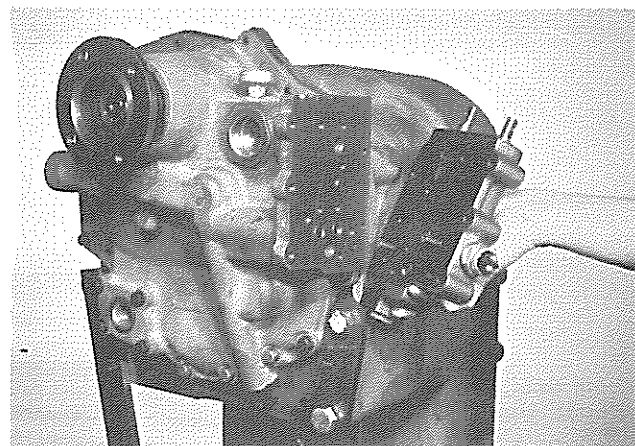
Support front cover with a chain fall. Spread forward clutch front bearing retainer ring. Position front cover to transmission case. Tap cover into place using caution as not to damage any of the clutch shaft piston rings.

**Figure 118**

Install companion flange, flange "O" ring, washer and nut. Tighten standard slotted nut or elastic stop nut 200 to 250 ft. lbs. torque [27,7-34,5 m.kg].

**Figure 116**

Install cover to case bolts. Tighten to specified torque.

**Figure 119**

Locate detent balls and springs in control valve. Position new gasket. Secure valve with bolts and washers. Tighten to specified torque.

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.

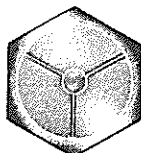
Run engine two minutes at 500-600 RPM to prime torque converter and hydraulic lines. Recheck level of fluid in transmission with engine running at idle (500-600 RPM).

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.

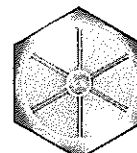
TORQUE IN (LBS.—FT.)
BOLTS, CAPSCREWS, STUDS AND NUTS

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



Grade 5

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



Grade 8

LUBRICATED OR PLATED

Nominal Thread Size	FINE THREADS	COARSE THREADS	FINE THREADS	COARSE THREADS
3/8	26-29 [3,6-4,0m.kg]	23-25 [3,2-3,4m.kg]	37-41 [5,1-5,6m.kg]	33-36 [4,6-4,9m.kg]
7/16	41-45 [5,7-6,2m.kg]	37-41 [5,1-5,6m.kg]	58-64 [8,0-8,8m.kg]	52-57 [7,2-7,8m.kg]
1/2	64-70 [8,8-9,6m.kg]	57-63 [7,9-8,7m.kg]	90-99 [12,4-13,6m.kg]	80-88 [11,-12,1m.kg]
9/16	91-100 [12,6-13,8m.kg]	82-90 [11,3-12,4m.kg]	128-141 [17,7-19,4m.kg]	115-127 [15,9-17,5m.kg]

SPECIFICATIONS AND SERVICE DATA—POWER SHIFT TRANSMISSION AND TORQUE CONVERTER

CONVERTER OUT PRESSURE	Converter outlet oil temp. 180°-200° F. [82, 2 - 93, 3° C]. Transmission in NEUTRAL . Operating specifications: 25 P.S.I. [1,76 Kg/cm ²] minimum pressure at 2000 R.P.M. engine speed AND a maximum of 70 P.S.I. [4,92 Kg/cm ²] outlet pressure with engine operating at no-load governed speed.
CONTROLS	Forward and Reverse — Manual Speed Selection — Manual
CLUTCH TYPE	Multiple discs, hydraulically actuated, spring released, automatic wear compensation and no adjustment. All clutches oil cooled and lubri- cated.
CLUTCH INNER DISC	Friction.
CLUTCH OUTER DISC	Steel

OIL FILTRATION Full flow oil filter safety by-pass, also strainer
screen in sump at bottom of transmission case.

CLUTCH PRESSURE 240 - 280 psi [16,9-19,6 kg/cm²] — 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. [0,4 kg/cm²].**
If clutch pressure varies in any one clutch more
than 5 psi. [0,4 kg/cm²] repair clutch.

NOTE: Never use service brakes while making
clutch pressure checks. Units having brake ac-
tuated declutching in forward and/or reverse will
not give a true reading.

**ALWAYS USE PARKING BRAKE WHEN MAKING
CLUTCH PRESSURE CHECKS.**

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 op-
eration on new and rebuilt or repaired units.

(a) Drain transmission and remove sump
screen. Clean screen thoroughly and
replace, using new gaskets.

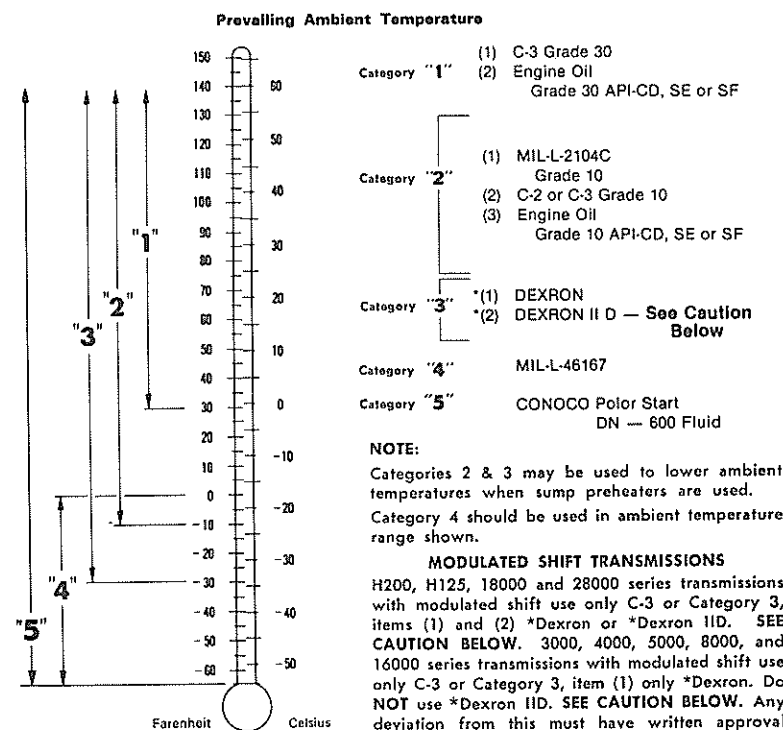
(b) Drain oil filters, remove and discard
filter elements. Clean filter shells and
install new elements.

(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 tempera-
ture 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 POWER SHIFTED TRANSMISSION AND TORQUE CONVERTERS



NOTE:
Categories 2 & 3 may be used to lower ambient
temperatures when sump preheaters are used.
Category 4 should be used in ambient temperature
range shown.

MODULATED SHIFT TRANSMISSIONS
H200, H125, 18000 and 28000 series transmissions
with modulated shift use only C-3 or Category 3,
items (1) and (2) *Dexron or *Dexron IID. **SEE
CAUTION BELOW.** 3000, 4000, 5000, 8000, and
16000 series transmissions with modulated shift use
only C-3 or Category 3, item (1) only *Dexron. Do
NOT use *Dexron IID. **SEE CAUTION BELOW.** Any
deviation from this must have written approval
from Clark Engineering at Jackson, Michigan.

CAUTION: *Dexron II D is not compatible with
graphitic clutch plate friction material. *Dexron II
D cannot be used in the 3000, 4000, 5000, 8000
or 16000 series power shift transmissions, or the
HR28000 series having converter lock-up, or the
C270 series converter having lock-up.

*Dexron is a registered trademark of
General Motors Corporation.

*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 acceler-
ated deterioration and contamination. For extreme conditions judgment must be used to determine the
required change intervals.

TROUBLE SHOOTING GUIDE

For The R and HR Model, 28000 Transmission

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 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 operations 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 control valve, 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 system for pressures and rate of oil flow, it is essential that the following preliminary checks be made:

Check oil level in transmission. This should be done with oil temperatures of 180 to 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.**

LOW CLUTCH PRESSURE

Cause	Remedy
1. Low oil level.	1. Fill to proper level.
2. Clutch pressure regulating valve spool stuck open.	2. Clean valve spool and housing.
3. Faulty charging pump.	3. Replace pump.
4. Broken or worn clutch shaft or piston sealing rings.	4. Replace sealing rings.
5. Clutch piston bleed valve stuck open.	5. Clean bleed valves thoroughly.

LOW CONVERTER CHARGING PUMP OUTPUT

1. Low oil level.	1. Fill to proper level.
2. Suction screen plugged.	2. Clean suction screen.
3. Air leaks at pump intake hose and connections or collapsed hose. (R-28000 only)	3. Tighten all connections or replace hose if necessary.
4. Defective oil pump.	4. Replace pump.

OVERHEATING

1. Worn oil sealing rings.	1. Remove, disassemble, and rebuild converter assembly.
2. Worn oil pump.	2. Replace.
3. Low oil level.	3. Fill to proper level.
4. Pump suction line taking air. (R-28000 only)	4. Check oil line connections and tighten securely.

NOISY CONVERTER

1. Worn coupling gears.	1. Replace.
2. Worn oil pump.	2. Replace.
3. Worn or damaged bearings.	3. A complete disassembly will be necessary to determine what bearing is faulty.

LACK OF POWER

1. Low engine RPM at converter stall.	1. Tune engine check governor.
2. See "Overheating" and make same checks.	2. Make corrections as explained in "Overheating."

R 28000 — C 270 EXTERNAL PLUMBING DIAGRAM

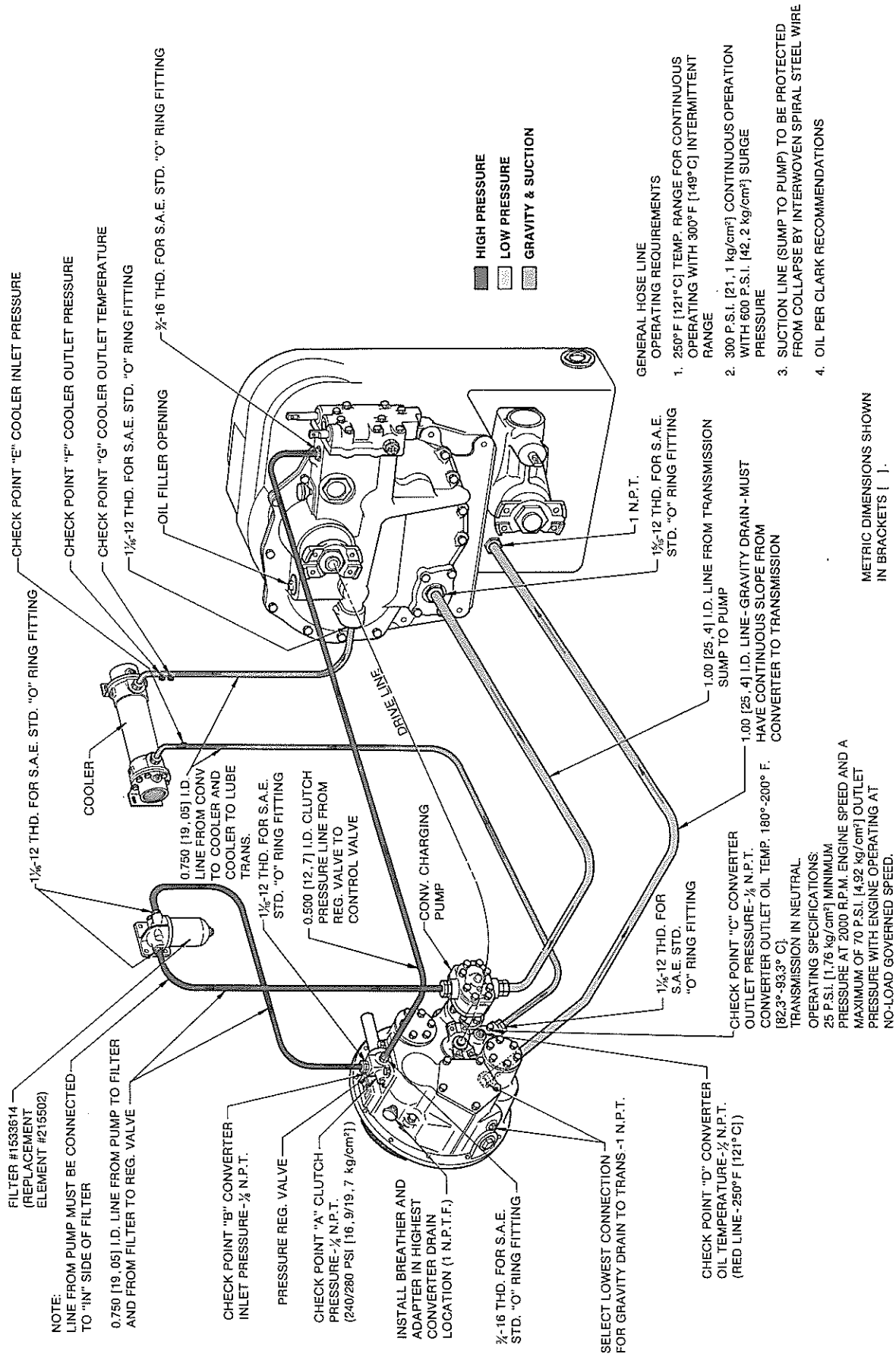


Figure H

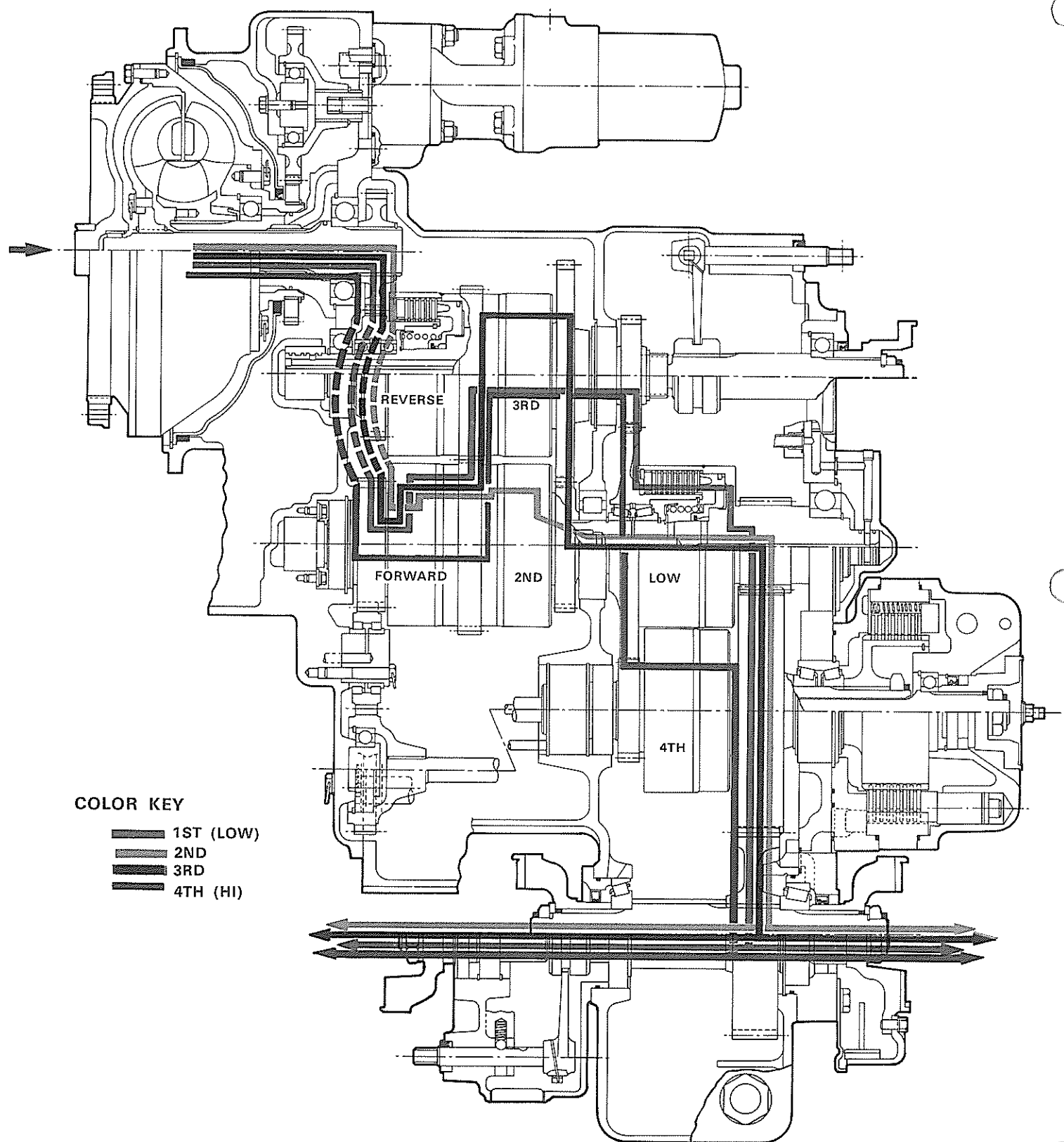
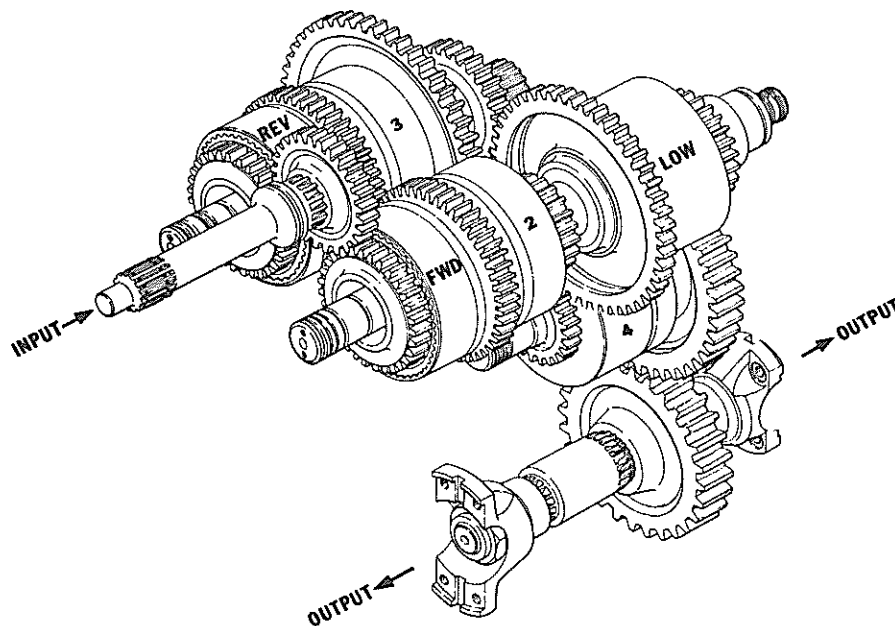
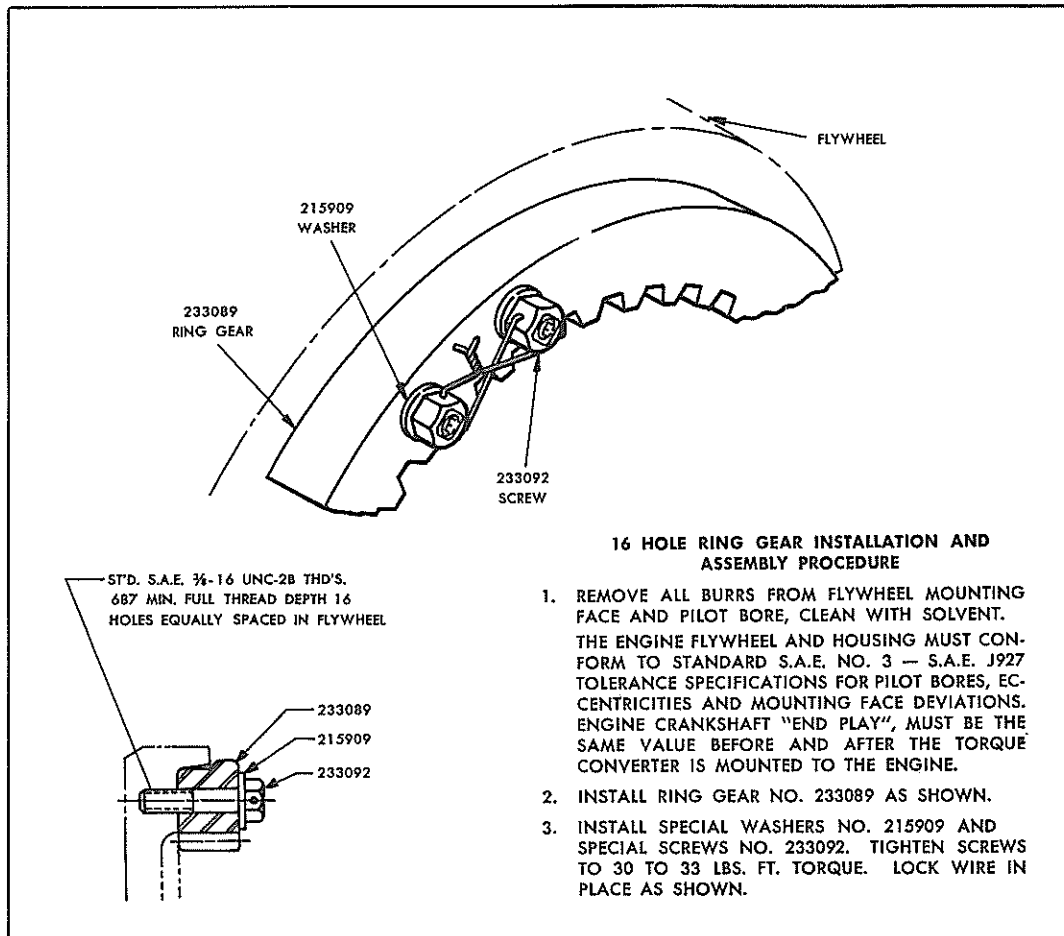


FIG. 1

4 SPEED TRANSMISSION



**28000 SERIES - 4 SPEED
CLUTCH & GEAR ARRANGEMENT**

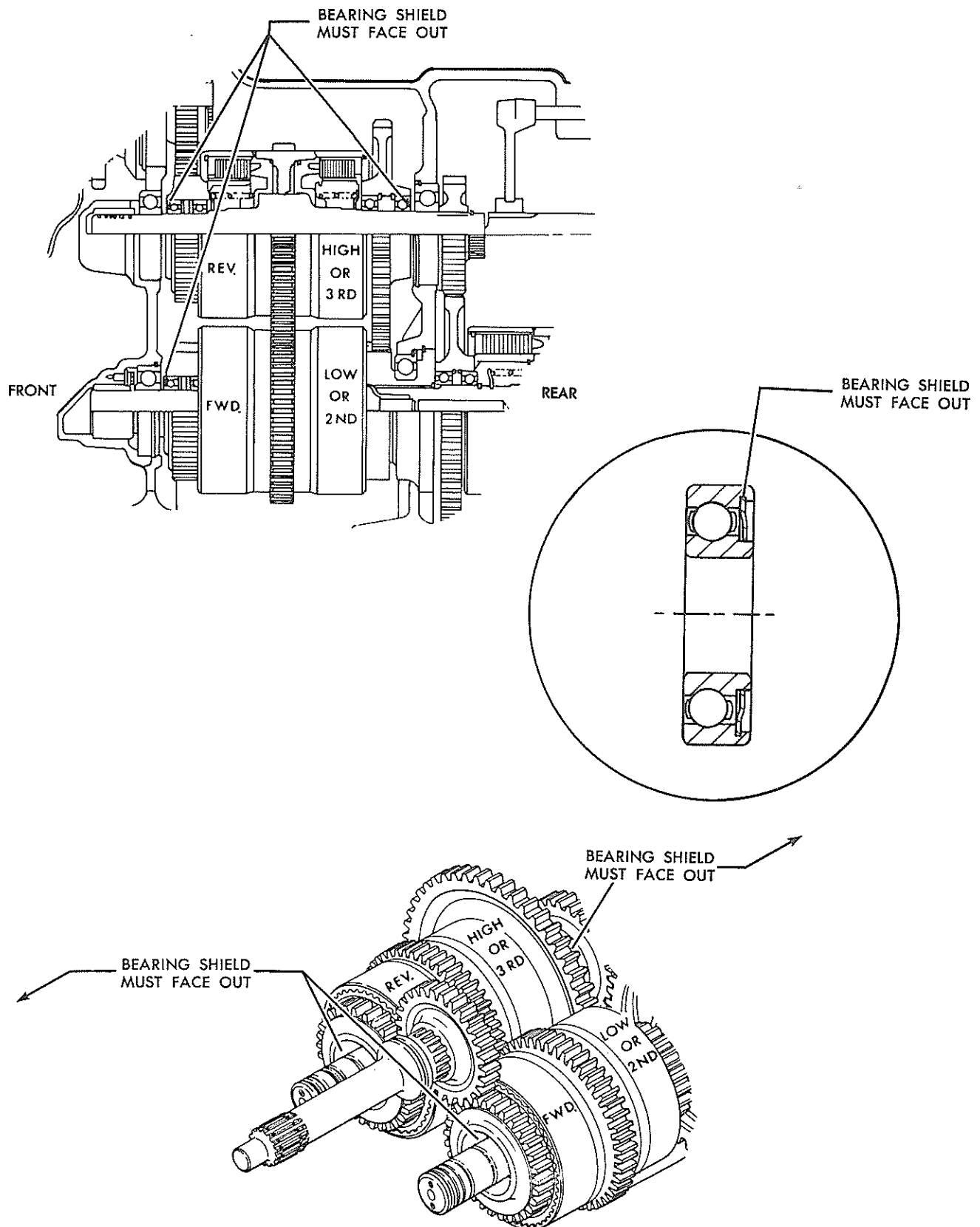


FIG. K

SHIELDED BEARING INSTALLATION