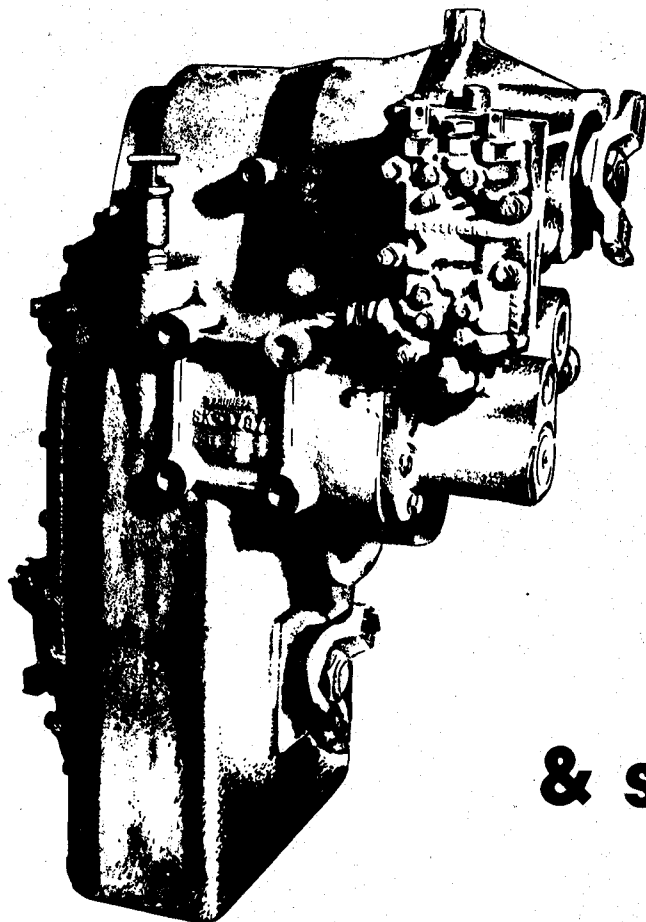


18000 powershift transmission

R model 3 speed
long drop output

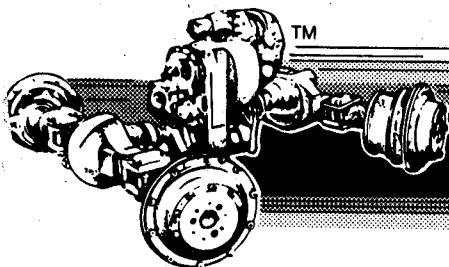


**maintenance
& service manual**

CLARK COMPONENTS
INTERNATIONAL INC.

Power Transfer Systems

A Business Unit of Clark Equipment Co.



NOTES

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

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NOTE: Metric Dimensions Shown in Brackets [].

HOW THE UNITS OPERATE

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	Fig. A
Front Cover and Transmission Case Group	Fig. B
Three Speed Gear and Clutch Group	Fig. C
Clutch Group	Fig. D
Control Valve Assembly	Fig. E
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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 shift control valve assembly may be mounted directly on the 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.

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 oil filter and the pressure regulating valve.

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 passageway, 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 or bleed orifices, depending upon the model, in the clutch piston which allow quick escape for oil when the pressure to the piston is released.

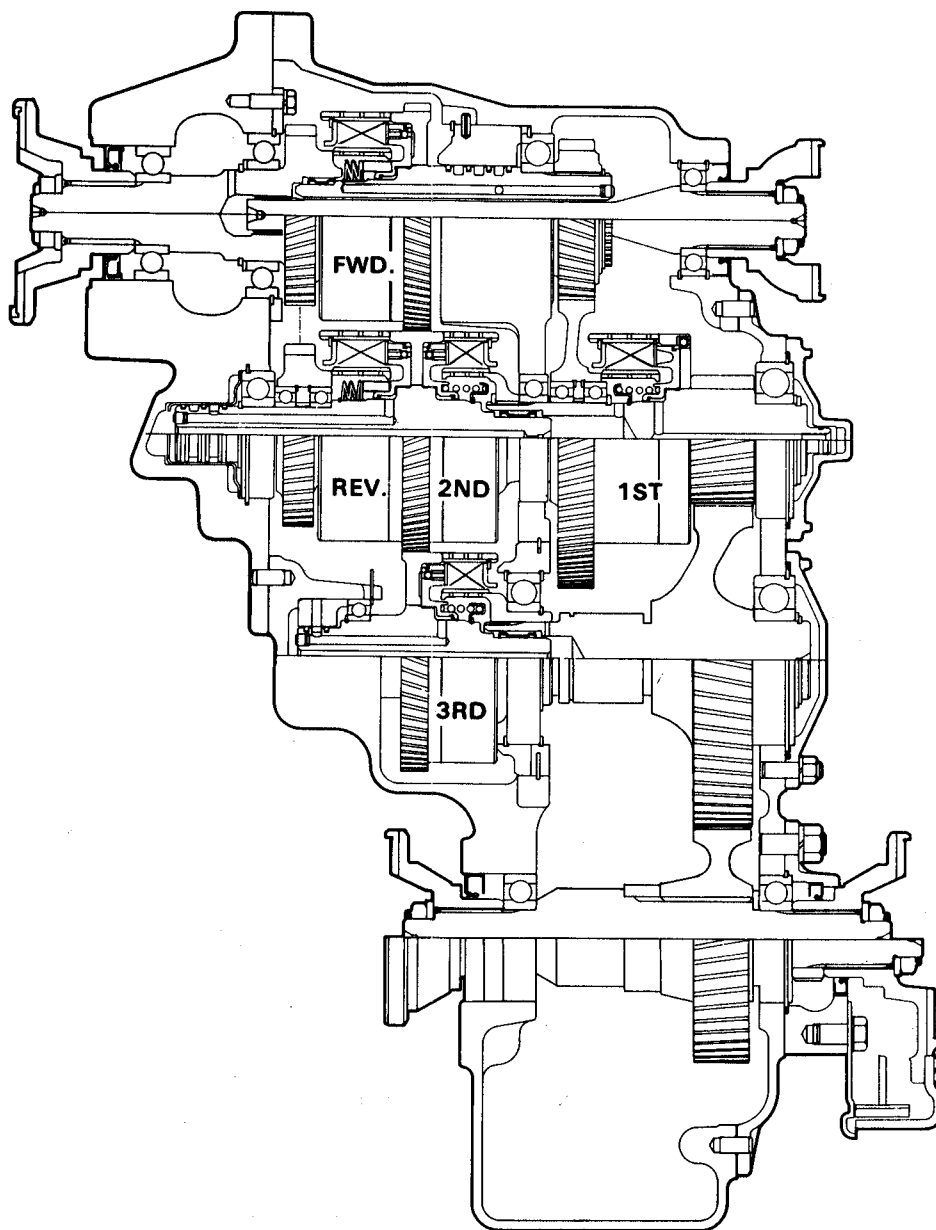


Figure A

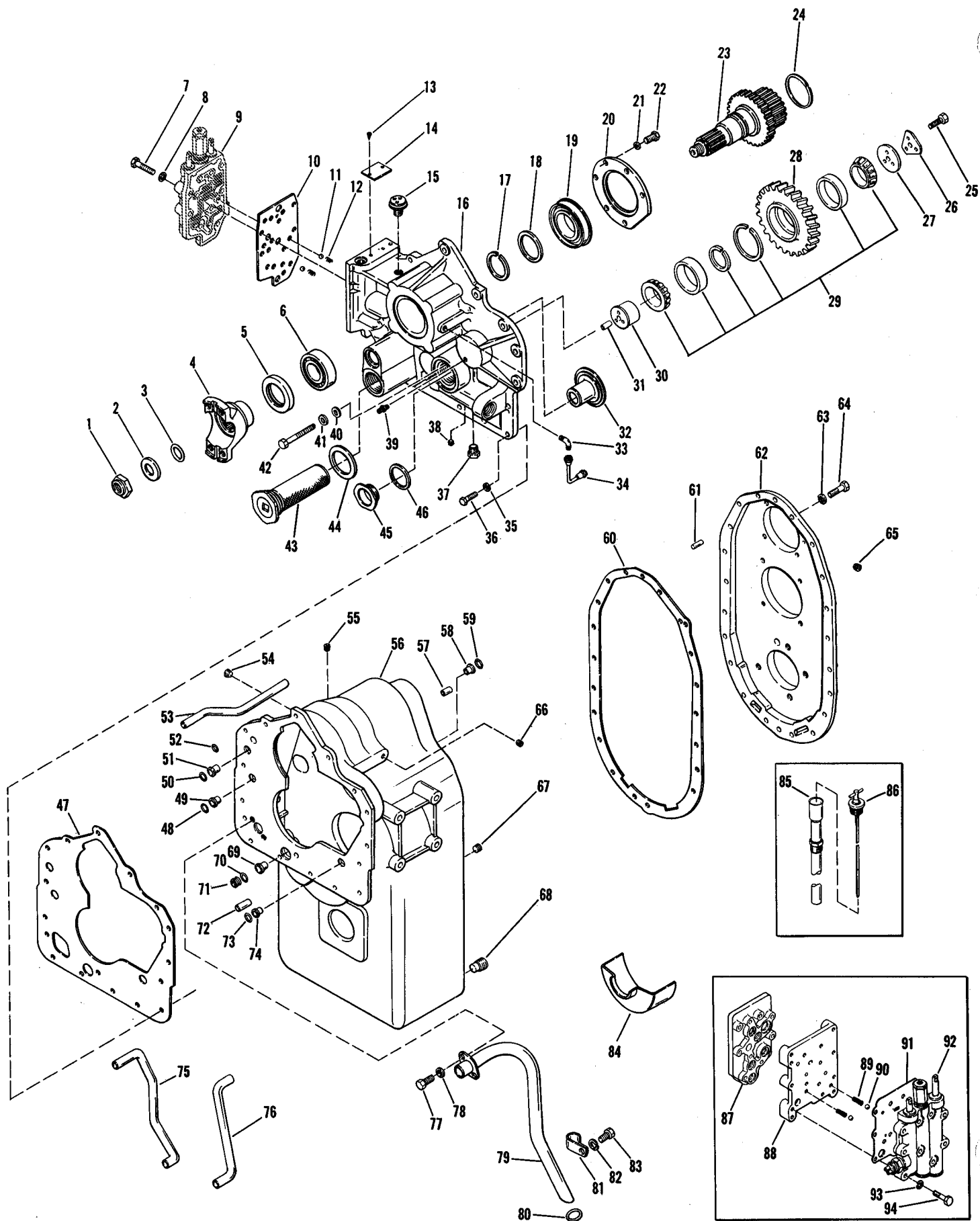


Figure B

R-18000 CASE AND FRONT COVER GROUP

ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	Input Flange Nut	1	45	Front Cover Plug	1
2	Input Flange Washer	1	46	Front Cover Plug Gasket	1
3	Input Flange "O" Ring	1	47	Front Cover Gasket	1
4	Input Flange	1	48	Clutch Pressure Tube "O" Ring	1
5	Input Flange Oil Seal	1	49	Tube Sleeve	1
6	Input Shaft Front Bearing	1	50	Clutch Pressure Tube "O" Ring	1
7	Valve to Converter Housing Screw	9	51	Tube Sleeve	1
8	Valve to Converter Housing Screw Lockwasher	9	52	Clutch Pressure Tube "O" Ring	1
9	Control Valve Assembly	1	53	Low Speed Clutch Pressure Tube	1
10	Control Valve Gasket	1	54	Pipe Plug	1
11	Detent Ball	2	55	Pipe Plug (Not used with Dipstick)	1
12	Detent Spring	2	56	Transmission Case Assembly	1
13	Name Plate Screw	2	57	Case to Rear Cover Dowel Pin	1
14	Name Plate	1	58	Tube Sleeve	1
15	Breather	1	59	Clutch Pressure Tube "O" Ring	1
16	Front Cover	1	60	Rear Cover to Case Gasket	1
17	Rear Bearing Snap Ring	1	61	Case to Rear Cover Dowel Pin	1
18	Rear Bearing Washer	1	62	Rear Cover Assembly	1
19	Input Shaft Rear Bearing	1	63	Rear Cover to Case Screw Lockwasher	20
20	Rear Bearing Retaining Plate	1	64	Rear Cover to Case Screw	20
21	Retaining Plate Screw Lockwasher	6	65	Pipe Plug	1
22	Retaining Plate Screw	6	66	Pipe Plug	1
23	Input Shaft and Hub Assembly	1	67	Pipe Plug	1
24	Baffle Ring	1	68	Magnetic Drain Plug	2
25	Bearing Retainer Plate Screw	3	69	Tube Sleeve	1
26	Bearing Lock Plate	1	70	3rd Speed Pressure Plug "O" Ring	1
27	Reverse Idler Gear Bearing Retaining Plate	1	71	3rd Speed Pressure Plug	1
28	Reverse Idler Gear	1	72	Front Cover to Case Dowel Pin	2
29	Reverse Idler Gear Bearing Assembly	1	73	Clutch Pressure Tube "O" Ring	1
30	Reverse Idler Shaft	1	74	Tube Sleeve	1
31	Reverse Idler Shaft Pin	1	75	3rd Speed Tube	1
32	Front Cover Sleeve	1	76	Clutch Lube Tube	1
33	Lube Tube Fitting	1	77	Suction Line Retainer Screw	2
34	Lube Tube Assembly	1	78	Suction Line Retainer Screw Lockwasher	2
35	Front Cover to Case Screw Lockwasher	16	79	Suction Tube Assembly	1
36	Front Cover to Case Screw	16	80	Suction Tube "O" Ring	1
37	Lube Plug	1	81	Suction Tube Clip	1
38	Lube Plug	1	82	Clip Lockwasher	1
39	Tube Connector	1	83	Clip Retainer Screw	1
40	Reverse Idler Shaft Screw Seal Washer	3	84	Oil Baffle	1
41	Reverse Idler Shaft Screw Washer	3	85	Dipstick Tube Assembly	1
42	Reverse Idler Shaft Screw	3	86	Dipstick	1
43	Suction Screen Assembly	1	87 thru 94 Optional Remote Mounted Control Valve Parts		
44	Screen Assembly Gasket	1			

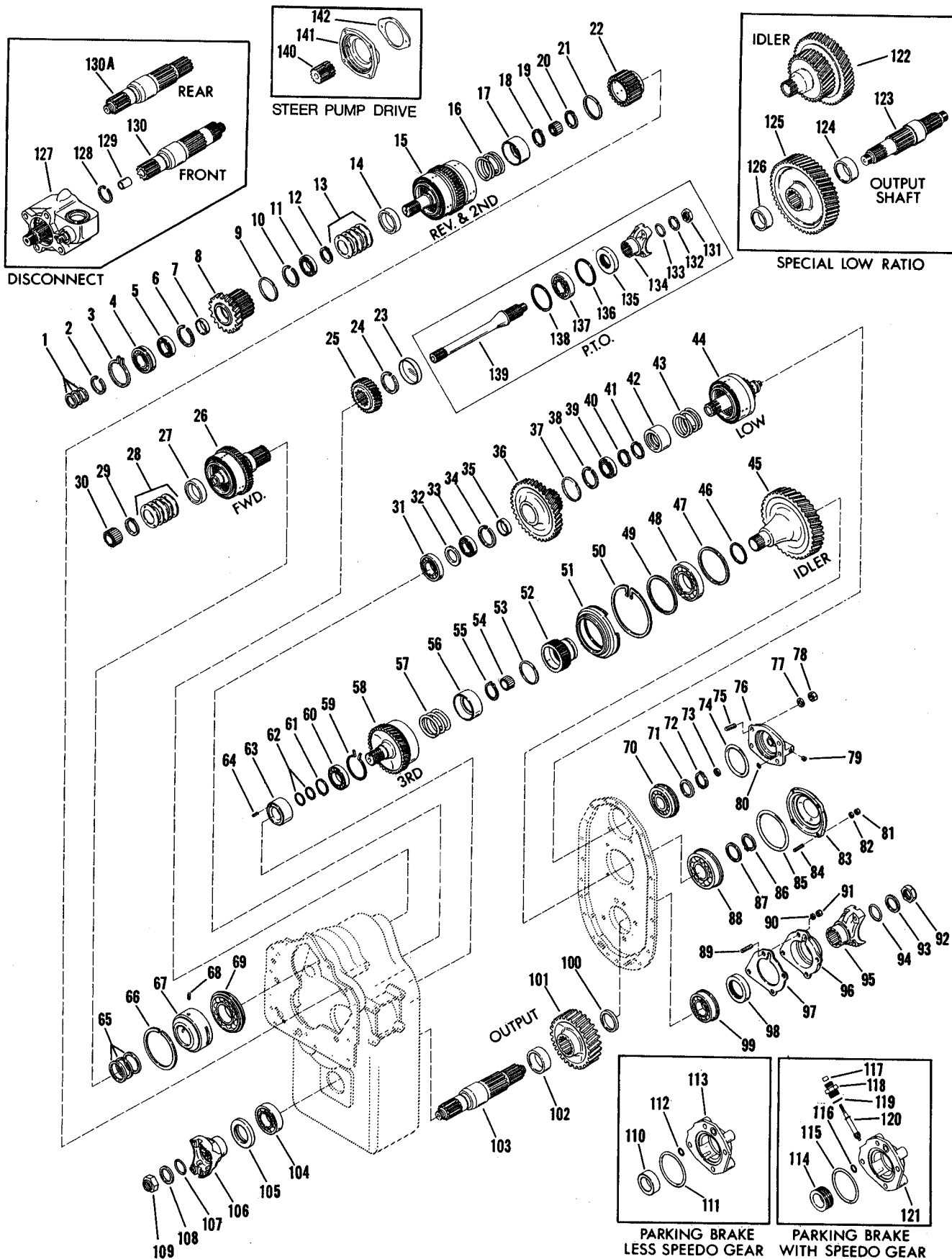
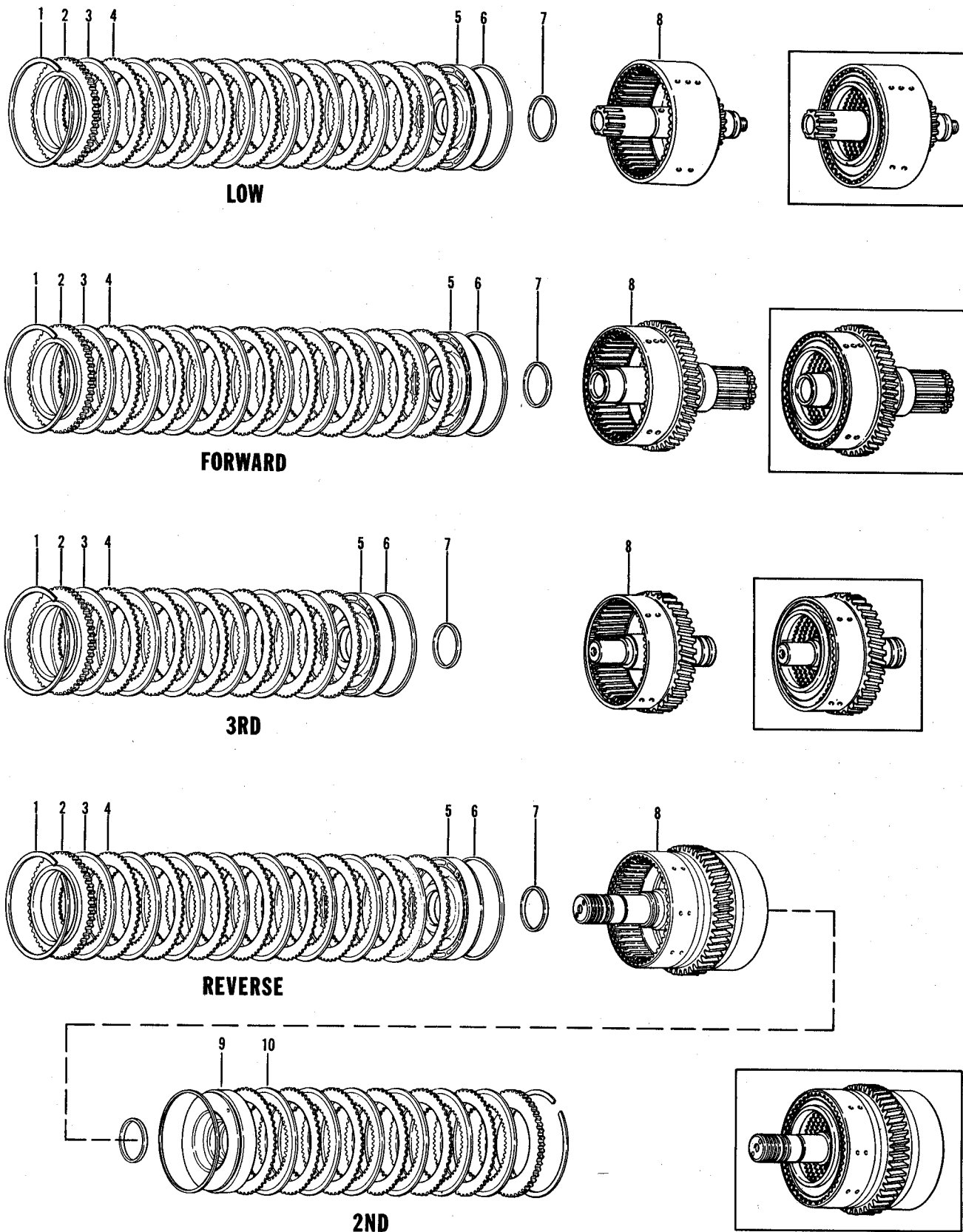


Figure C

18000 THREE SPEED LONG DROP GEAR AND CLUTCH GROUP

ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	Reverse and 2nd Shaft Piston Ring	3	57	Piston Return Spring.....	1
2	Front Bearing Retaining Ring.....	1	58	3rd Speed Clutch	1
3	Front Bearing Snap Ring	1	59	3rd Speed Clutch Shaft Front Bearing Locating Ring	1
4	Reverse and 2nd Shaft Front Bearing	1	60	3rd Speed Clutch Shaft Front Bearing	1
5	Clutch Driven Gear Bearing	1	61	3rd Speed Clutch Shaft Front Bearing Retaining Ring.....	1
6	Bearing Retaining Ring.....	1	62	3rd Speed Clutch Shaft Piston Ring.....	2
7	Clutch Driven Gear Bearing Spacer.....	1	63	Piston Ring Outer Race	1
8	Reverse Clutch Gear and Hub Assembly	1	64	Outer Race Roll Pin	1
9	Baffle Ring.....	1	65	Forward Shaft Piston Ring	3
10	Bearing Retaining Ring.....	1	66	Piston Ring Sleeve Retainer Ring.....	1
11	Clutch Driven Gear Bearing	1	67	Piston Ring Sleeve	1
12	Spring Retainer Snap Ring.....	1	68	Sleeve Roll Pin	1
13	Piston Return Belleville Springs	5	69	Forward Clutch Shaft Rear Bearing.....	1
14	Piston Return Spring Spacer	1	70	Low Speed Clutch Shaft Rear Bearing	1
15	Reverse and 2nd Clutch.....	1	71	Rear Bearing Support Washer	1
16	Piston Return Spring.....	1	72	Rear Bearing Retaining Ring	1
17	Spring Retainer.....	1	73	Low Speed Clutch Shaft Piston Ring	1
18	Spring Retainer Snap Ring.....	1	74	Rear Bearing Cap "O" Ring	1
19	Reverse and 2nd Clutch Shaft Rear Bearing	1	75	Bearing Cap Stud	4
20	2nd Clutch Disc Hub Snap Ring	1	76	Low Speed Clutch Shaft Rear Bearing Cap	1
21	Baffle Ring.....	1	77	Bearing Cap Stud Lockwasher.....	4
22	2nd Clutch Disc Hub.....	1	78	Bearing Cap Stud Nut.....	4
23	Bore Plug	1	79	Bearing Cap Plug.....	1
24	Gear Retainer Snap Ring	1	80	Bearing Cap "O" Ring.....	1
25	Forward Shaft Gear.....	1	81	Rear Bearing Cap Stud Nut	4
26	Forward Clutch	1	82	Rear Bearing Cap Stud Lockwasher	4
27	Piston Return Spring Spacer	1	83	Idle Shaft Rear Bearing Cap	1
28	Piston Return Belleville Springs	5	84	Rear Bearing Cap Stud.....	4
29	Spring Retainer Snap Ring.....	1	85	Rear Bearing Cap "O" Ring	1
30	Forward Clutch Shaft Pilot Bearing.....	1	86	Idle Shaft Rear Bearing Retainer Ring.....	1
31	Low Speed Clutch Shaft Front Bearing.....	1	87	Rear Bearing Support Washer	1
32	Front Bearing Spacer	1	88	Idle Shaft Rear Bearing	1
33	Low Speed Gear Bearing	1	89	Bearing Cap Stud	4
34	Low Speed Gear Bearing Locating Ring.....	1	90	Bearing Cap Stud Lockwasher.....	4
35	Low Speed Gear Spacer.....	1	91	Bearing Cap Stud Nut.....	4
36	Low Speed Gear and Hub Assembly.....	1	92	Flange Nut.....	1
37	Baffle Ring.....	1	93	Flange Washer.....	1
38	Low Speed Gear Bearing Locating Ring.....	1	94	Flange "O" Ring	1
39	Low Speed Gear Bearing	1	95	Output Flange	1
40	Low Speed Gear Bearing Retaining Ring	1	96	Output Shaft Rear Bearing Cap	1
41	Spring Retainer Snap Ring.....	1	97	Bearing Cap Gasket	1
42	Spring Retainer	1	98	Rear Bearing Cap Oil Seal	1
43	Piston Return Spring.....	1	99	Output Shaft Rear Bearing	1
44	Low Speed Clutch.....	1	100	Output Shaft Rear Bearing Spacer.....	1
45	Idle Shaft and Gear	1	101	Output Gear	1
46	Bearing Retaining Ring.....	1	102	Output Gear Spacer	1
47	Bearing Locating Ring	1	103	Output Shaft	1
48	3rd Clutch Disc Hub Bearing	1	104	Output Shaft Front Bearing	1
49	Bearing Locating Ring	1	105	Front Oil Seal	1
50	Bearing Carrier Locating Ring	1	106	Output Flange	1
51	Bearing Carrier.....	1	107	Flange "O" Ring	1
52	3rd Speed Clutch Disc Hub.....	1	108	Flange Washer.....	1
53	Baffle Ring.....	1	109	Flange Nut.....	1
54	3rd Speed Clutch Shaft Pilot Bearing.....	1	110 thru 139	Various Options	
55	Spring Retainer Snap Ring.....	1			
56	Spring Retainer	1			



18000 SERIES 3 SPEED LONG DROP CLUTCH ASSEMBLY

Figure D

LOW CLUTCH GROUP

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

FORWARD CLUTCH GROUP

ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	Backing Plate Snap Ring	1	5	Clutch Piston	1
2	Clutch Disc Backing Plate	1	6	Outer Clutch Piston Ring	1
3	Clutch Inner Disc	8	7	Inner Clutch Piston Seal	1
4	Clutch Outer Disc	8	8	Forward Clutch Shaft and Drum Assembly.....	1

3RD CLUTCH GROUP

ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	Backing Plate Snap Ring	1	5	Clutch Piston Assembly	1
2	Clutch Disc Backing Plate	1	6	Outer Clutch Piston Seal	1
3	Clutch Inner Disc	6	7	Inner Clutch Piston Seal	1
4	Clutch Outer Disc	6	8	3rd Speed Clutch Shaft and Drum Assembly..	1

REVERSE AND 2ND CLUTCH GROUP

ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	Backing Plate Snap Ring	2	6	Outer Clutch Piston Seal	2
2	Clutch Disc Backing Plate	2	7	Inner Clutch Piston Seal	2
3	Clutch Inner Disc	8	8	Reverse and 2nd Speed Clutch Shaft and Drum Assembly	1
4	Clutch Outer Disc	14	9	Clutch Piston	1
5	Clutch Piston	1	10	Clutch Inner Disc	6

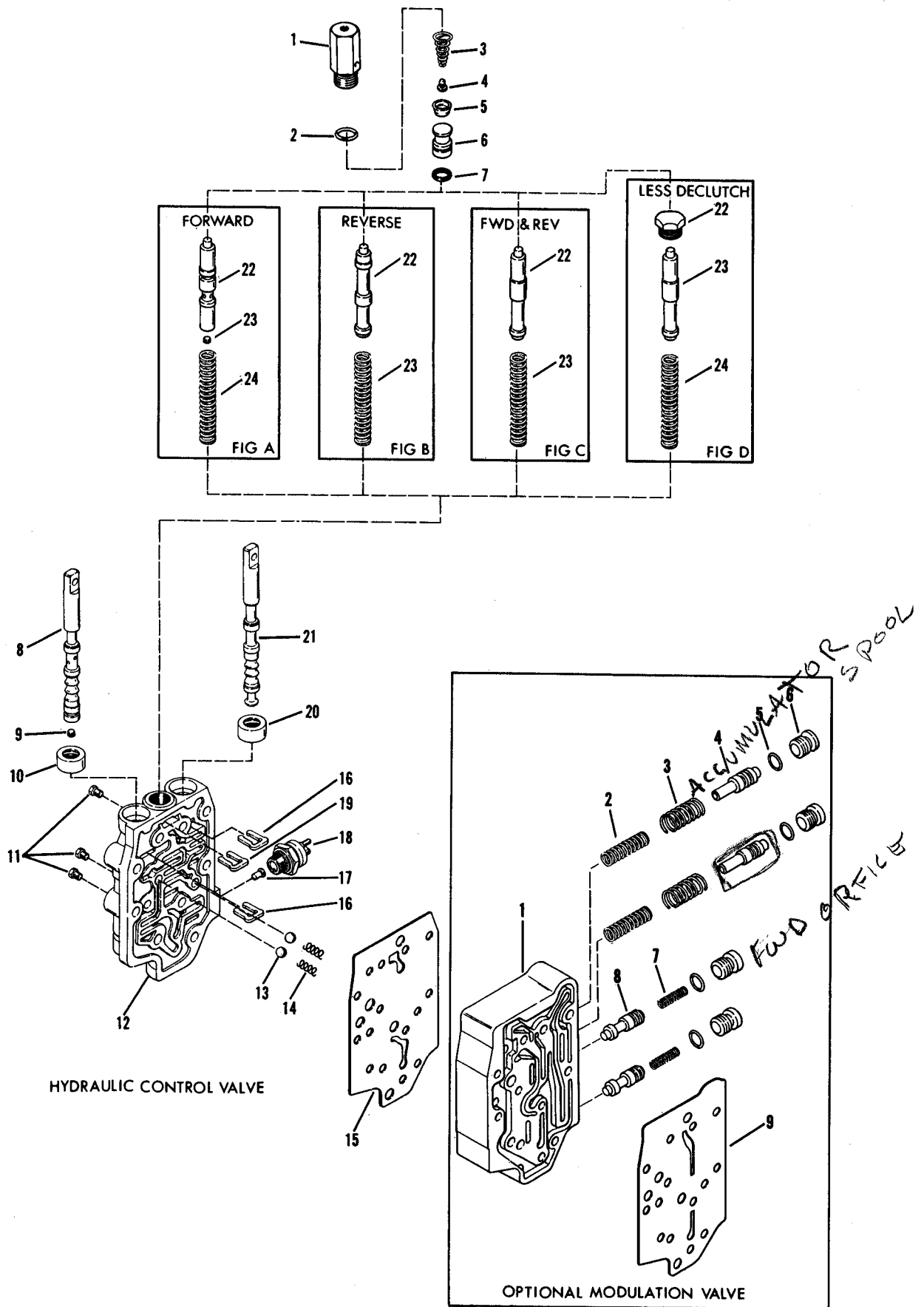


Figure E

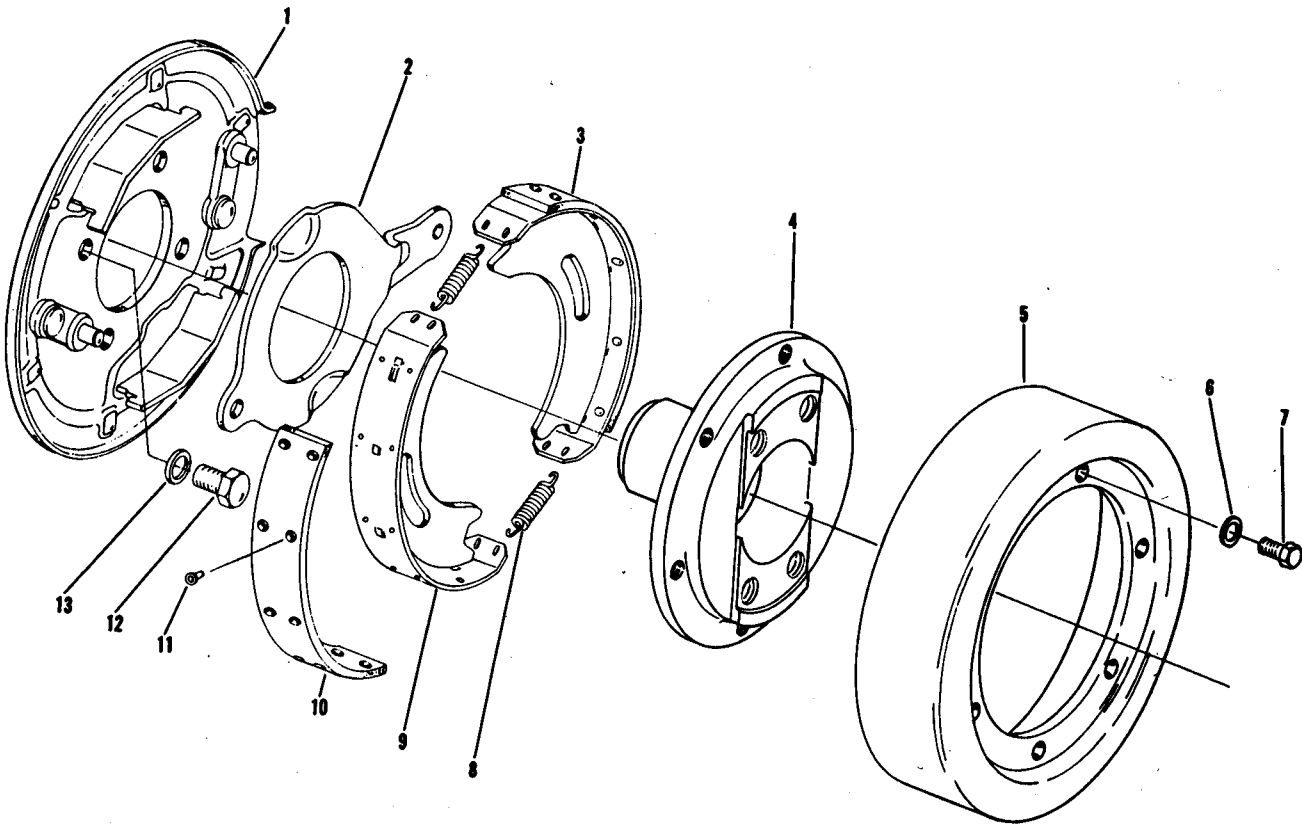
CONTROL VALVE ASSEMBLY

ITEM	DESCRIPTION	QTY.
1	Hydraulic Actuator Assembly	1
2	Piston Housing "O" Ring	1
3	Piston Balance Spring	1
4	Spring Retainer Pin	1
5	Piston Seal	1
6	Piston	1
7	Glyd Ring	1
8	Speed Selector Spool	1
9	Spool Plug	1
10	Oil Seal	1
11	Pipe Plug	3
12	Control Valve Housing	1
13	Detent Ball	2
14	Detent Spring	2
15	Control Valve Gasket	1
16	Valve Spool Stop	2
17	Neutral Switch Actuating Pin	1
18	Neutral Switch	1
19	Declutch Spool Stop	1
20	Oil Seal	1
21	Forward and Reverse Valve Spool	1

NOTE: Items 22 thru 24 are various declutch options.

MODULATOR VALVE ASSEMBLY
(Optional)

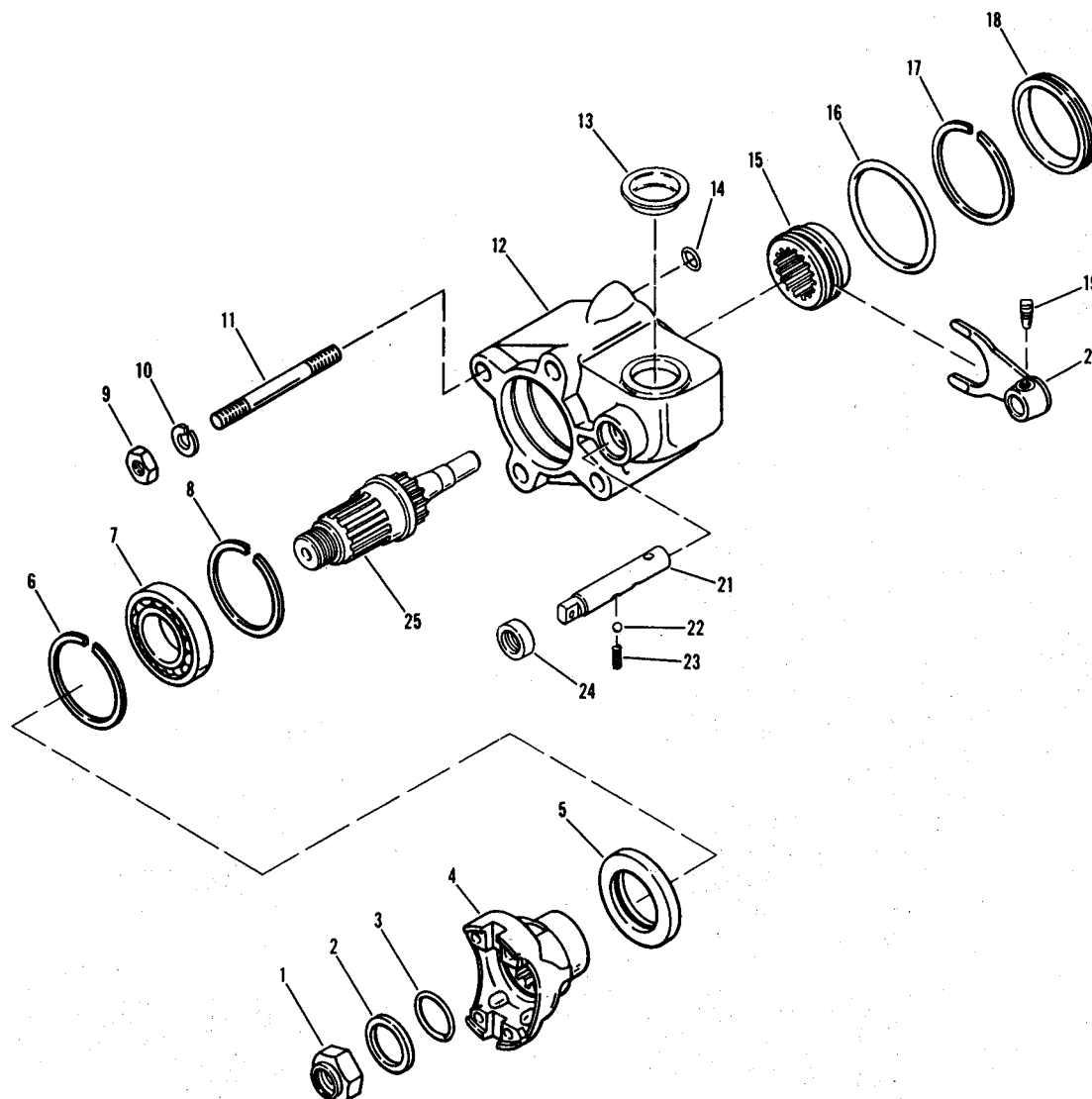
ITEM	DESCRIPTION	QTY.
1	Modulator Valve Housing	1
2	Accumulator Spring (Inner) Not Used on All Models	2
3	Accumulator Spring (Outer)	2
4	Accumulator Valve	2
5	Spool Stop Plug "O" Ring	4
6	Spool Stop Plug	4
7	Regulator Spring	2
8	Regulator Spool	2
9	Modulator Valve to Converter Housing Gasket	1



PARKING BRAKE GROUP

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	Brake Lining 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			

Figure F

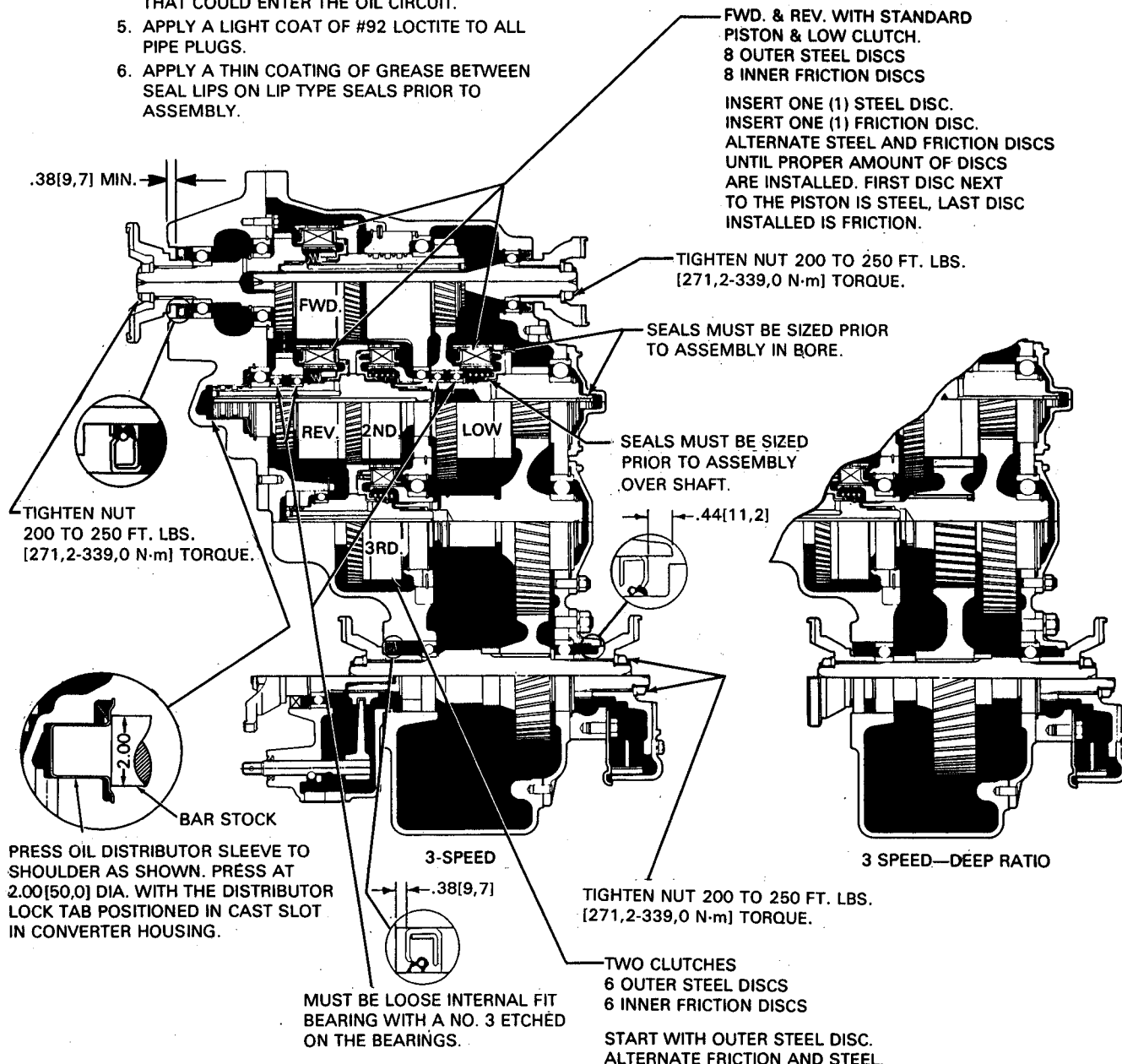


AXLE DISCONNECT ASSEMBLY

ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	Output Flange Nut	1	14	Housing "O" Ring	1
2	Flange Nut Washer	1	15	Shift Hub	1
3	Flange Nut "O" Ring	1	16	Housing "O" Ring	1
4	Output Flange	1	17	Housing Pilot Ring Retainer Ring	1
5	Output Flange Oil Seal	1	18	Housing Pilot Ring	1
6	Bearing Retainer Ring	1	19	Shift Fork Lockscrew	1
7	Bearing	1	20	Shift Fork	1
8	Bearing Retainer Ring	1	21	Shift Rail	1
9	Stud Nut	4	22	Detent Ball	1
10	Stud Lockwasher	4	23	Detent Spring	1
11	Disconnect Stud	4	24	Shift Rail Oil Seal	1
12	Disconnect Housing	1	25	Disconnect Shaft	1
13	Housing Plug	1			

Figure G

1. ALL LEAD IN CHAMFERS FOR OIL SEALS, PISTON RINGS, & "O" RINGS MUST BE SMOOTH AND FREE FROM BURRS. INSPECT AT ASSEMBLY.
2. LUBRICATE ALL PISTON RING GROOVES & "O" RINGS WITH OIL BEFORE ASSEMBLY.
3. APPLY VERY LIGHT COAT OF PERMATEX NO. 2 TO O.D. OF ALL OIL SEALS BEFORE ASSEMBLY.
4. AFTER ASSEMBLY OF PARTS USING LOCTITE OR PERMATEX THERE MUST NOT BE ANY FREE OR EXCESS MATERIAL THAT COULD ENTER THE OIL CIRCUIT.
5. APPLY A LIGHT COAT OF #92 LOCTITE TO ALL PIPE PLUGS.
6. APPLY A THIN COATING OF GREASE BETWEEN SEAL LIPS ON LIP TYPE SEALS PRIOR TO ASSEMBLY.



Grade 5 Torque Specification for Lubricated or Plated Screw Threads Grade 8

NOM. SIZE	FINE THREAD		COARSE THREAD		FINE THREAD		COARSE THREAD	
	LB-FT	[N·m]	LB-FT	[N·m]	LB-FT	[N·m]	LB-FT	[N·m]
.2500	9 - 11	[12,3 - 14,9]	8 - 10	[10,9 - 13,5]	11 - 13	[15,0 - 17,6]	9 - 11	[12,3 - 14,9]
.3125	16 - 20	[21,7 - 27,1]	12 - 16	[16,3 - 21,6]	28 - 32	[38,0 - 43,3]	26 - 30	[35,3 - 40,6]
.3750	26 - 29	[35,3 - 39,3]	23 - 25	[31,2 - 33,8]	37 - 41	[50,2 - 55,5]	33 - 36	[44,8 - 48,8]
.4375	41 - 45	[55,6 - 61,0]	37 - 41	[50,2 - 55,5]	58 - 64	[78,7 - 86,7]	52 - 57	[70,6 - 77,2]
.5000	64 - 70	[86,8 - 94,9]	57 - 63	[77,3 - 85,4]	90 - 99	[122,1 - 134,2]	80 - 88	[108,5 - 119,3]
.5625	91 - 100	[123,4 - 135,5]	82 - 90	[111,2 - 122,0]	128 - 141	[173,6 - 191,1]	115 - 127	[156,0 - 172,2]
.6250	128 - 141	[173,5 - 191,2]	113 - 124	[153,2 - 168,1]	180 - 198	[224,0 - 268,5]	159 - 175	[215,6 - 237,3]
.7500	223 - 245	[302,3 - 332,2]	200 - 220	[271,2 - 298,3]	315 - 347	[427,1 - 470,5]	282 - 310	[382,3 - 420,3]

Figure H

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 18000 series transmission with many options. Companion flanges and output shafts with and without disconnect assemblies may vary on

specific 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

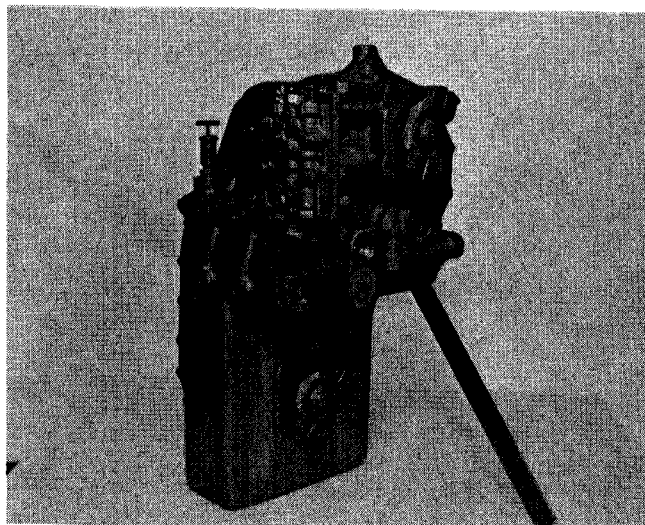


Figure 1
Side view of R-18000 transmission

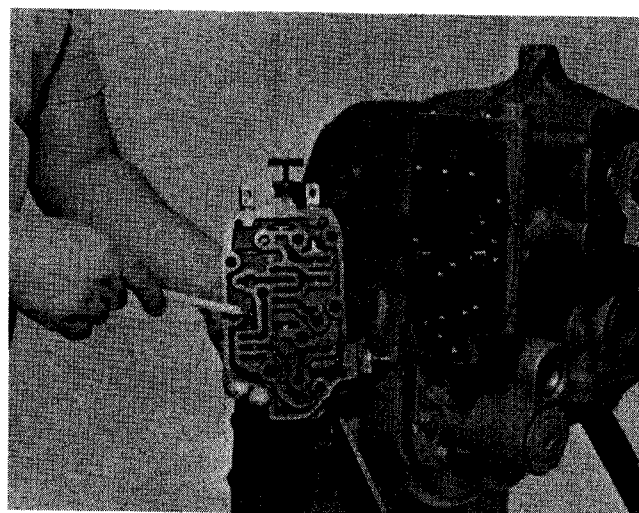


Figure 3
Remove control valve assembly. Use caution as not to lose detent springs and balls.

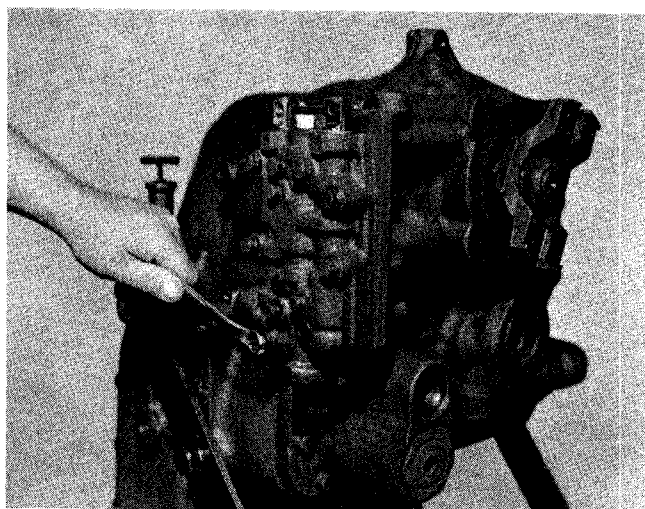


Figure 2
Remove control valve bolts and washers.

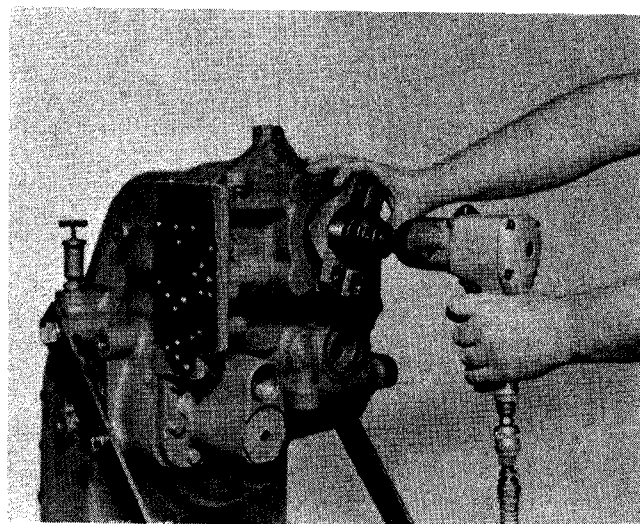


Figure 4
Remove input flange nut, washer, "O" ring and flange.

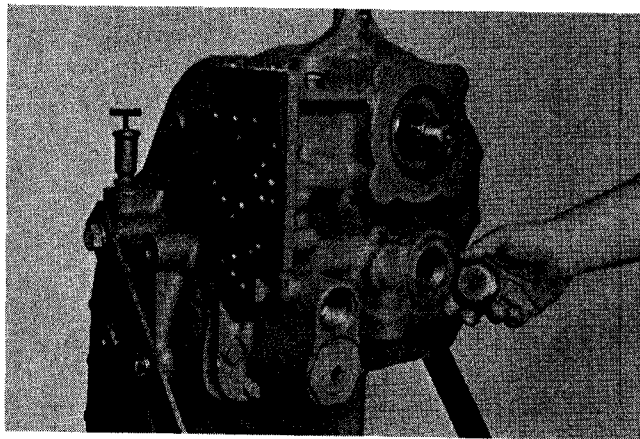


Figure 5
Remove front cover plug.

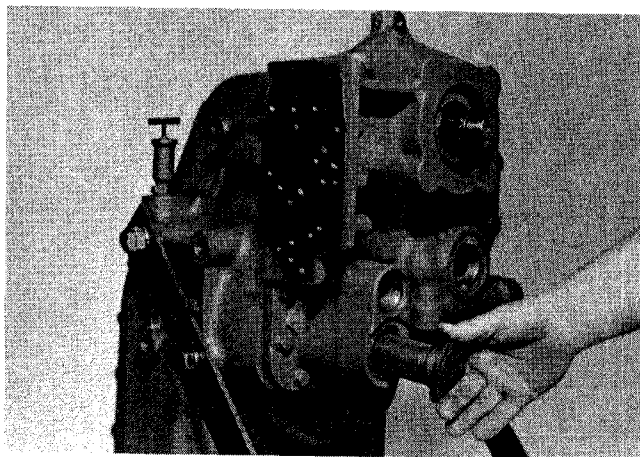


Figure 6
Remove suction screen assembly.

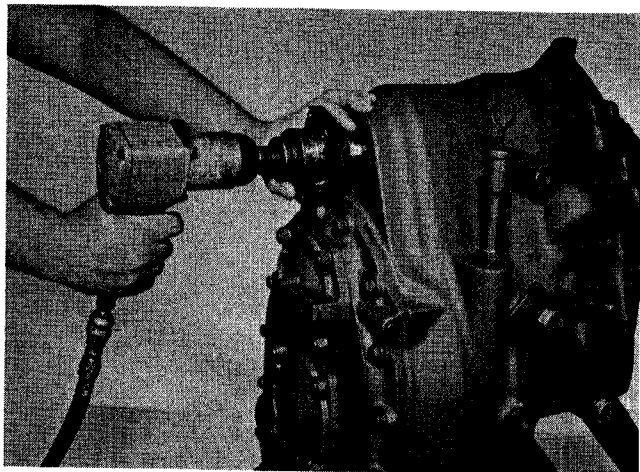


Figure 7
Loosen P.T.O. flange nut.

NOTE: P.T.O. is optional. If not used proceed to Fig. 12.

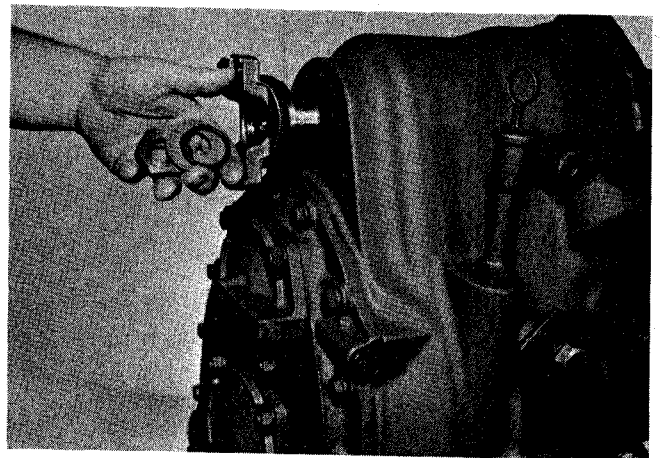


Figure 8
Remove flange nut, washer, "O" ring and flange.

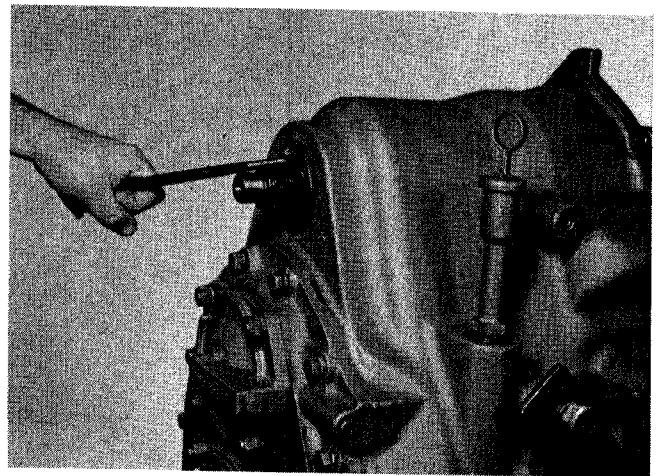


Figure 9
Using a pointed bar or screwdriver, pry oil seal from housing . Use caution as not to damage housing bore.

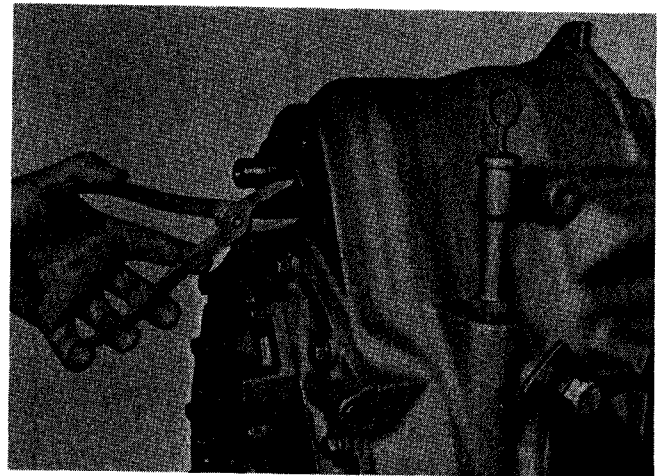


Figure 10
Remove P.T.O. bearing outer retainer ring.

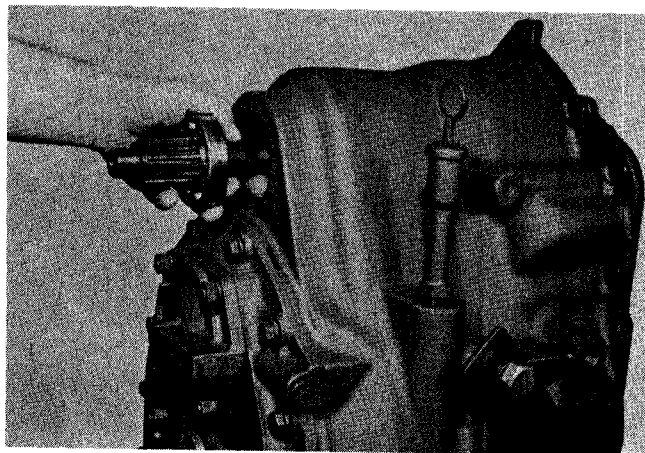


Figure 11
Remove P.T.O. shaft and bearing from housing.

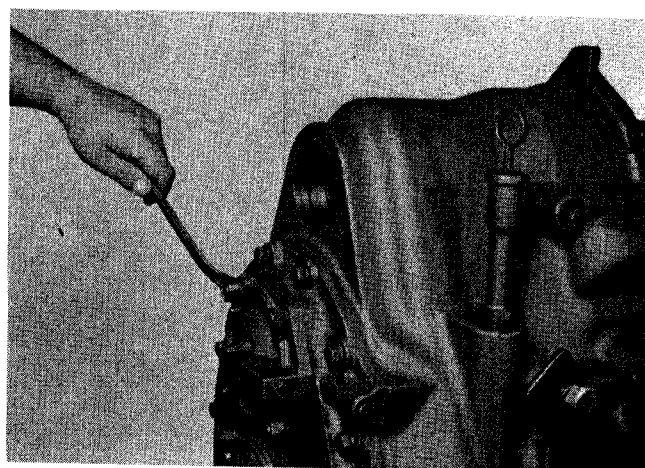


Figure 14
Remove low clutch rear bearing cap stud nuts and washers. Remove cap.

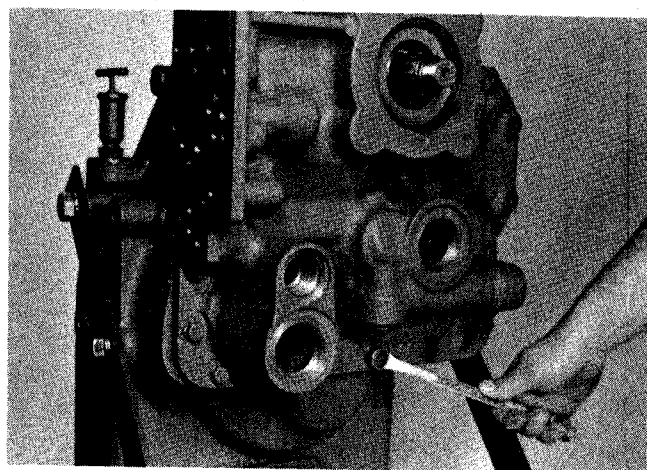


Figure 12
Remove front cover bolts and washers.

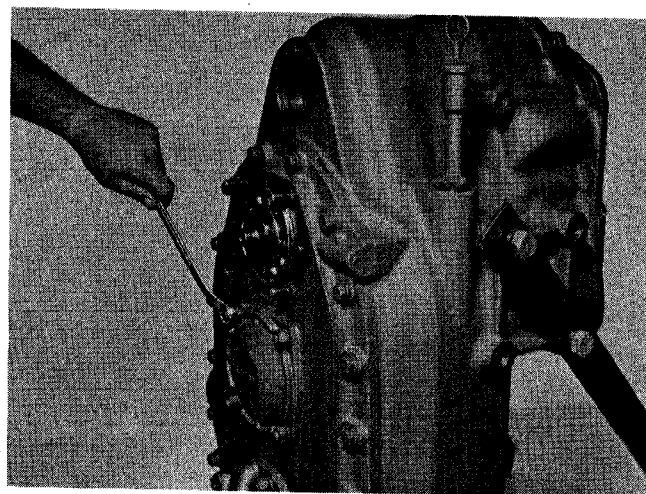


Figure 15
Remove idler shaft bearing cap stud nuts and washers.

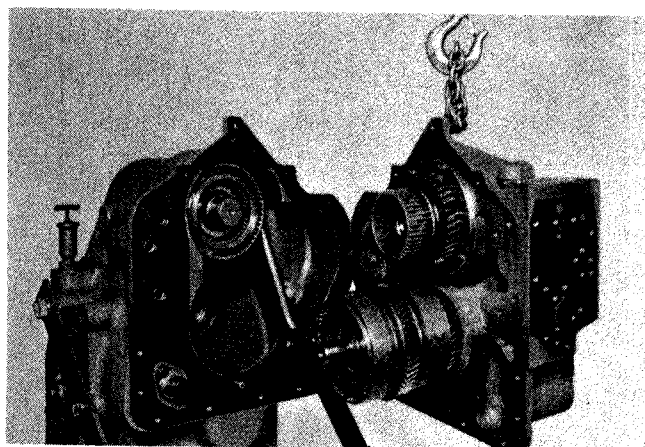


Figure 13
Support front cover with a chain fall. Pry front cover and reverse and 2nd clutch assembly from transmission housing.

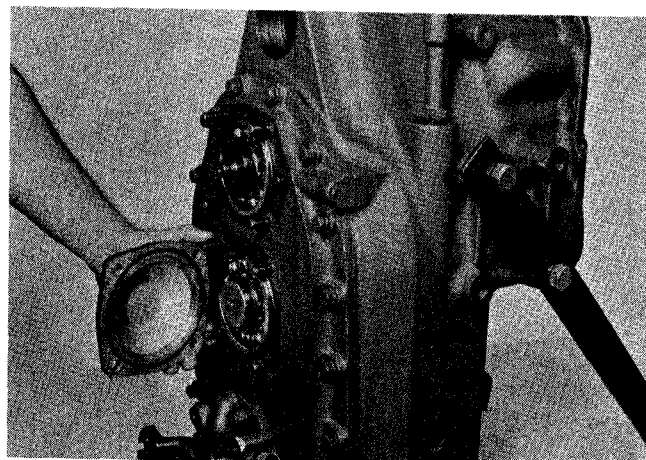


Figure 16
Remove bearing cap.

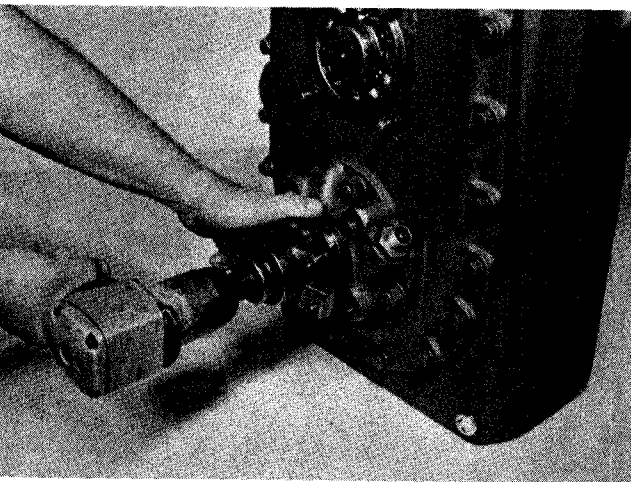


Figure 17
Loosen output flange nut.

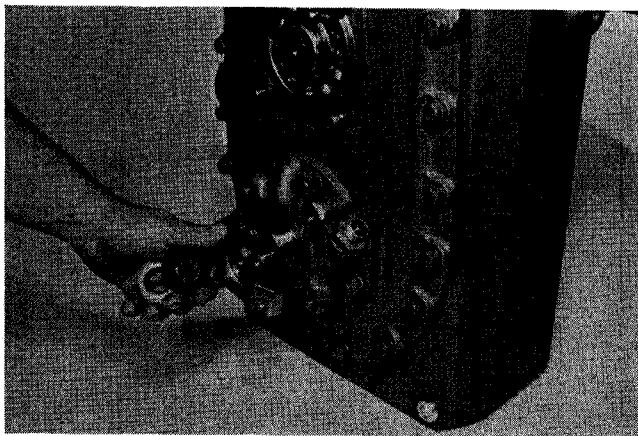


Figure 18
Remove flange nut, washer, "O" ring and flange. If a parking brake is used remove brake drum. Remove brake backing plate bolts and washers. Remove backing plate assembly.

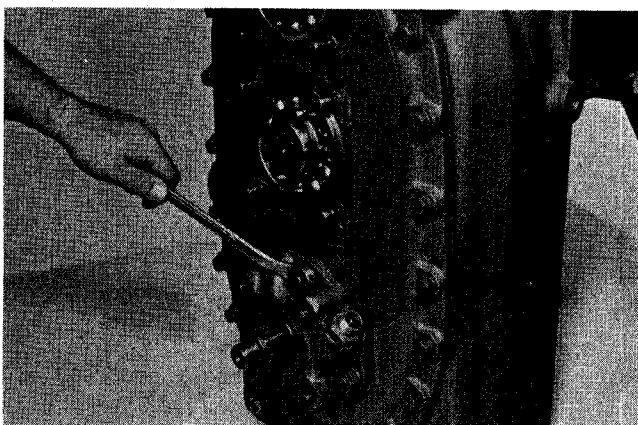


Figure 19
Remove output shaft bearing cap stud nuts and washers.

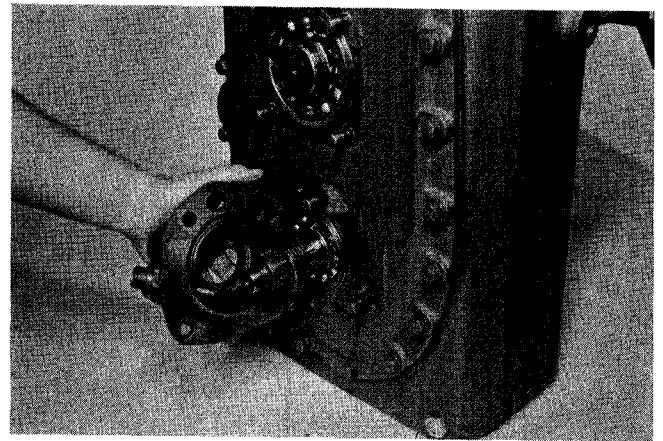


Figure 20
Remove output shaft bearing cap. Cap shown has optional speedometer gear. Remove speedometer drive gear from output shaft.

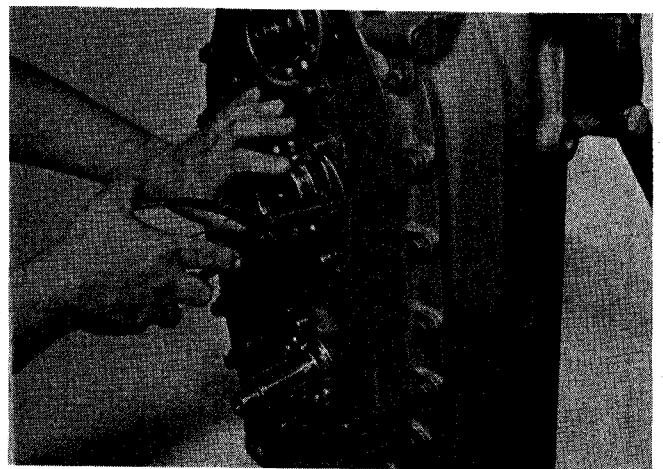


Figure 21
Remove low clutch, idler shaft and output shaft rear bearing locating rings.

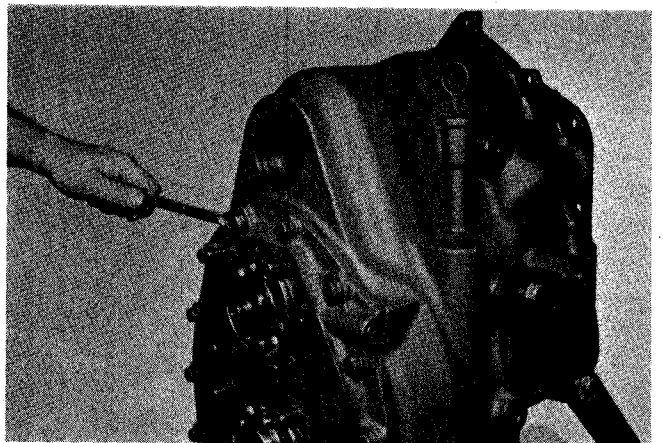


Figure 22
Remove rear cover bolts and washers.

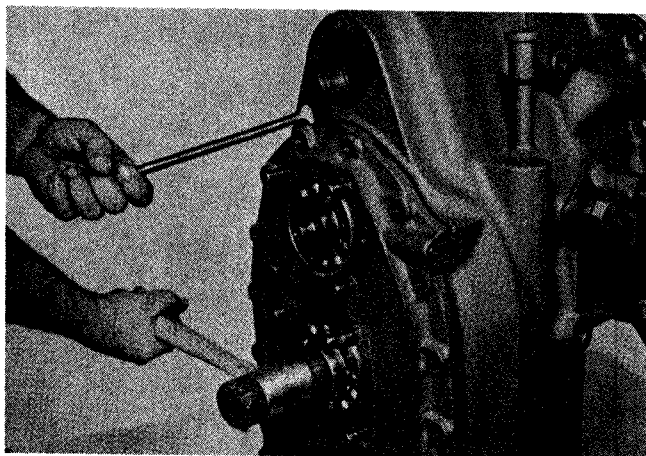


Figure 23

Using pry slots provided, pry cover from transmission housing. Using a soft hammer tap on low clutch, idler and output shafts to prevent cover from binding.

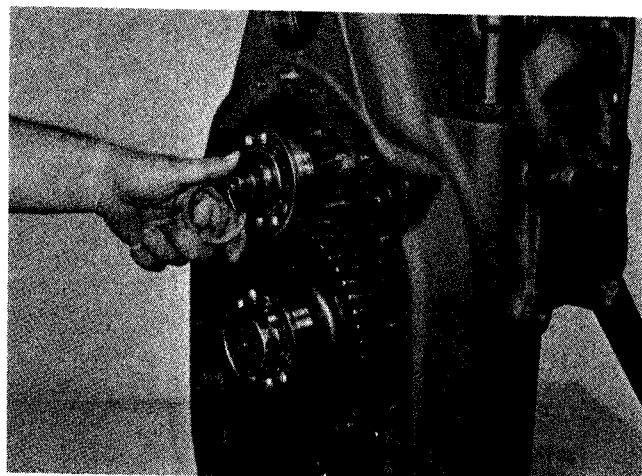


Figure 26

Low clutch rear bearing spacer and retainer ring.

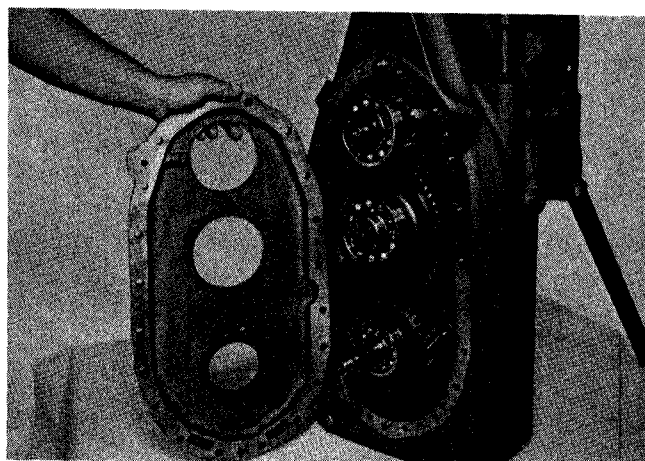


Figure 24

Rear cover removed

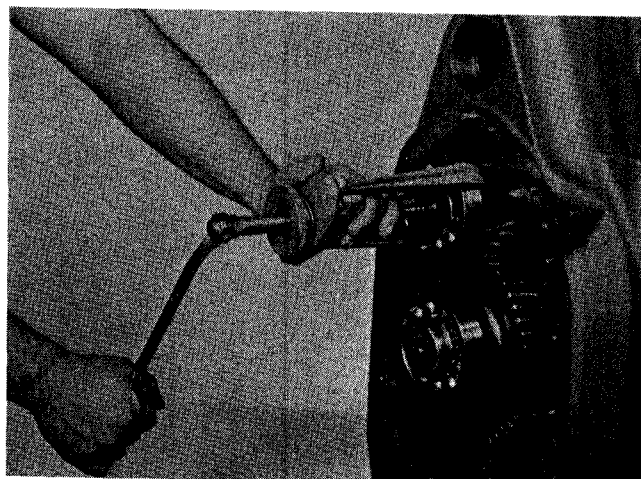


Figure 27

Remove low clutch rear bearing

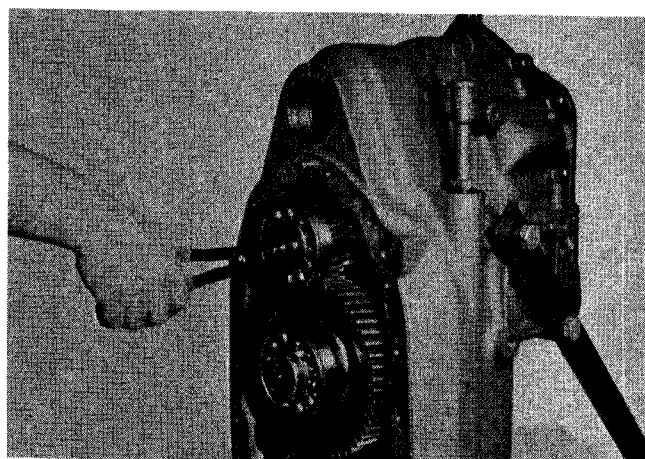


Figure 25

Remove low clutch rear bearing retainer ring.

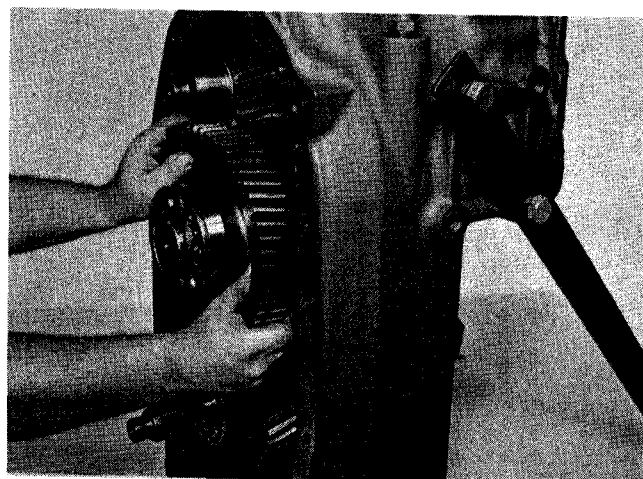


Figure 28

Remove idler gear and rear bearing as an assembly.

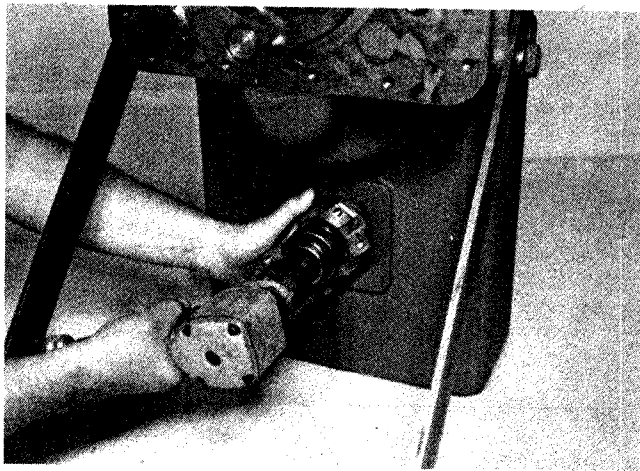


Figure 29

Remove output shaft front flange nut, washer, "O" ring and flange.

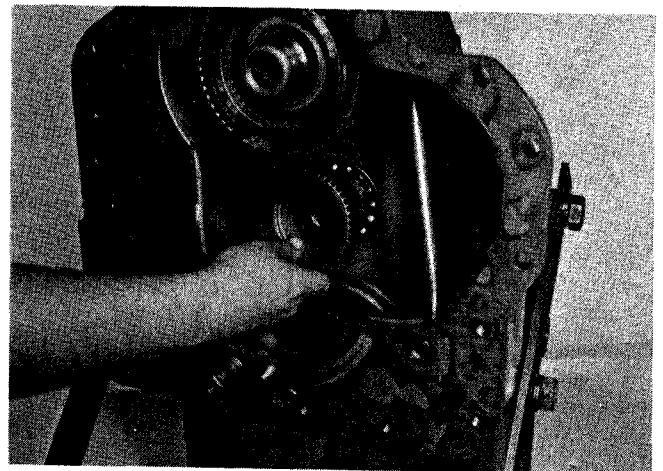


Figure 32

Remove disc hub.

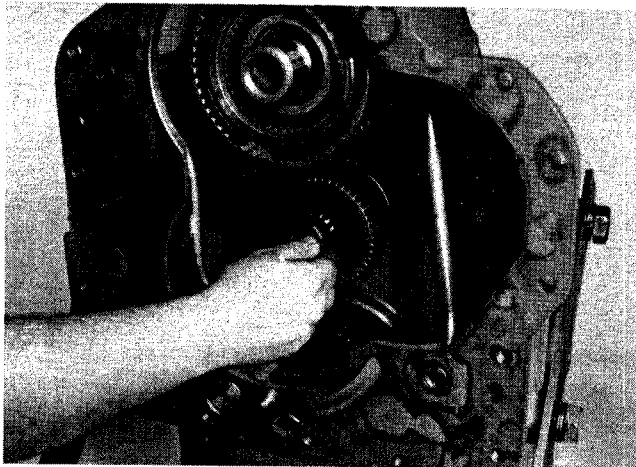


Figure 30

Remove reverse and 2nd clutch pilot bearing.

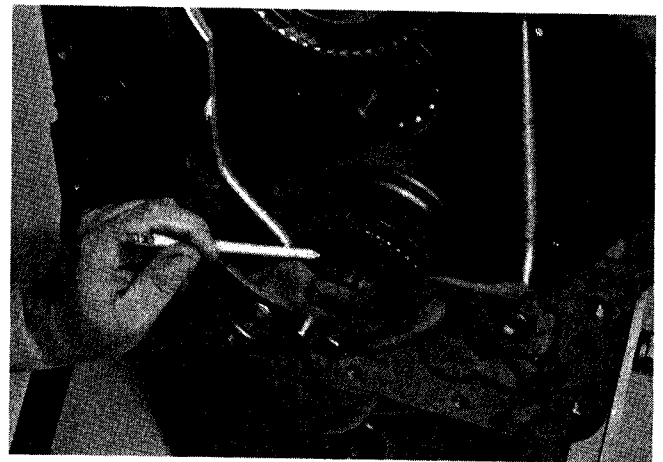


Figure 33

Compress ears on 3rd clutch front bearing locating ring. Remove ring from ring groove. It is not necessary to remove ring from clutch, it will come out when clutch is removed.

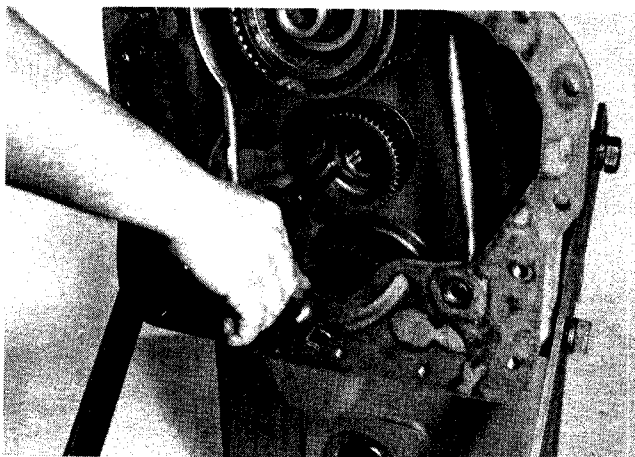


Figure 31

Remove 2nd clutch disc hub retainer ring.

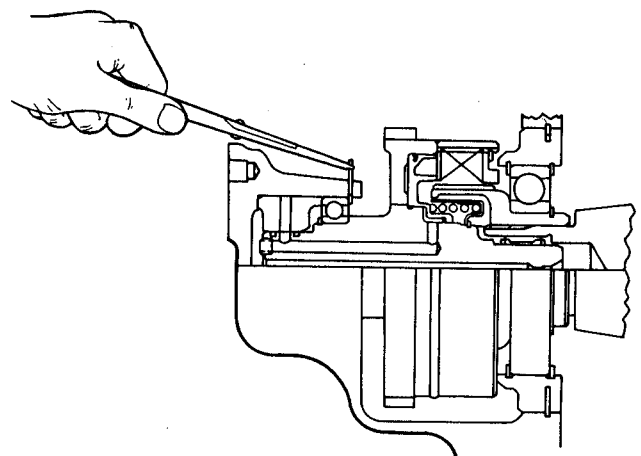


Figure 33A



Figure 34

Tap low clutch assembly from housing. If possible it is recommended someone help in this operation to prevent the low clutch from dropping out of the case.

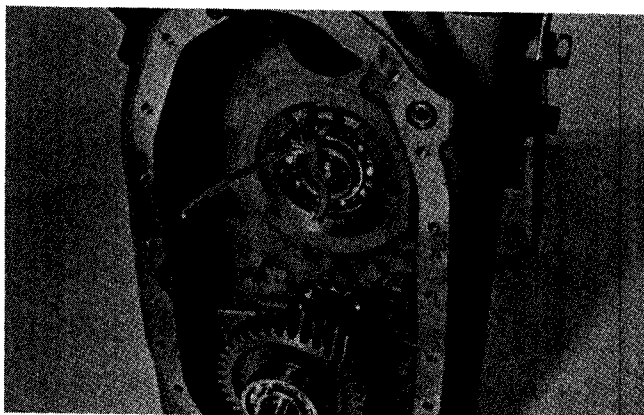


Figure 35

Using contracting type snap ring pliers as shown, contract 3rd clutch bearing carrier locating ring. Lock pliers to hold ring contracted.

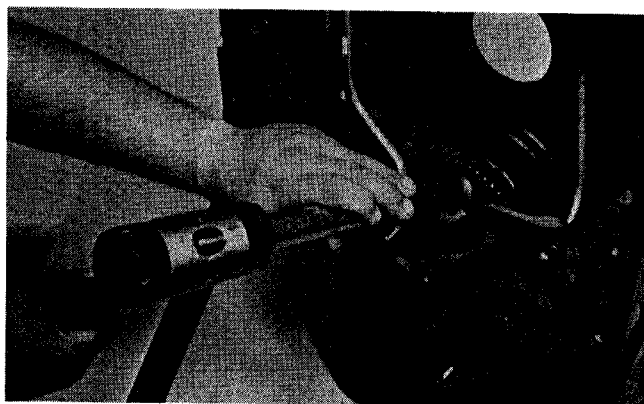


Figure 36

From front of transmission and using a soft bar tap 3rd speed clutch assembly from housing. If clutch seems difficult to remove recheck front and rear snap rings being sure they are clear of the ring groove.

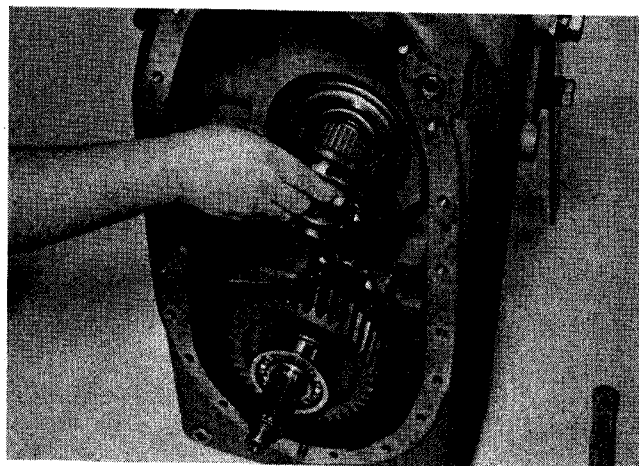


Figure 37

Remove bearing carrier, bearing and 3rd speed clutch disc hub.

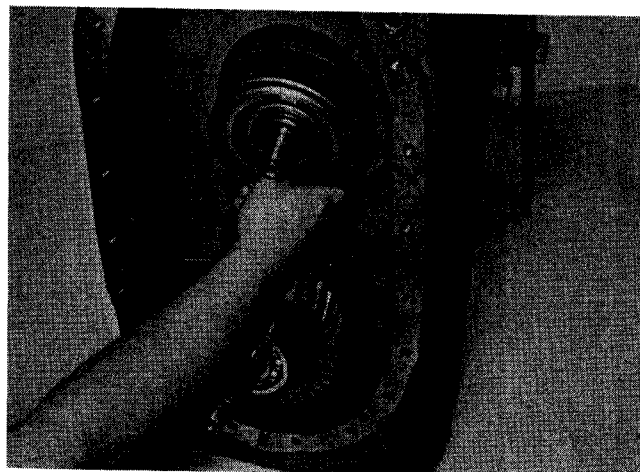


Figure 38

Remove 3rd speed clutch assembly.

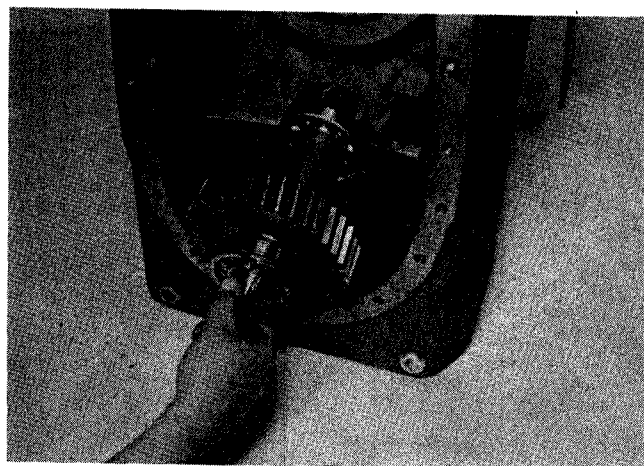


Figure 39

Remove output shaft and bearings as an assembly.

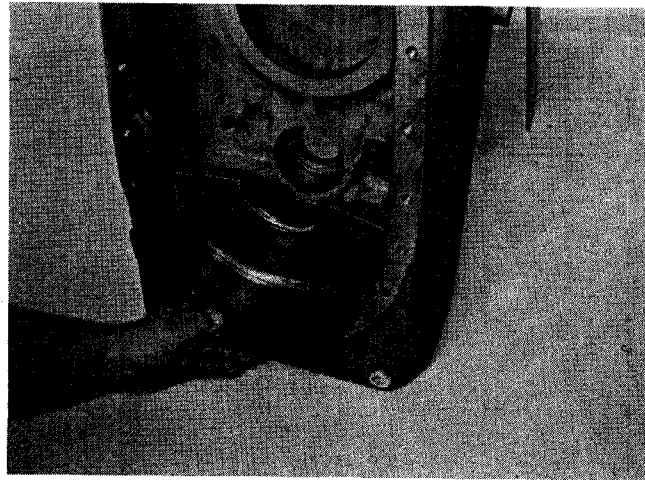


Figure 40
Remove oil sump oil baffle.

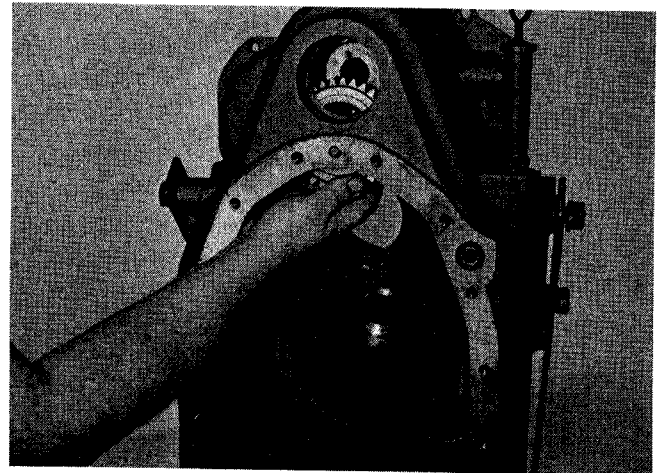


Figure 42
Remove forward clutch shaft drive gear.

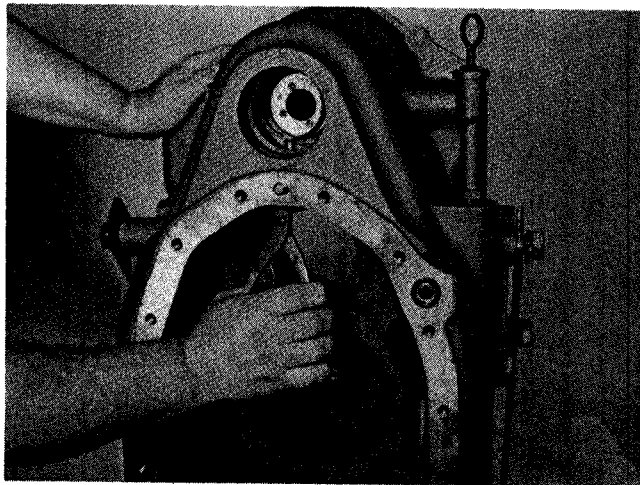


Figure 41
Remove forward clutch shaft drive gear retainer ring.
See Figure 41A.

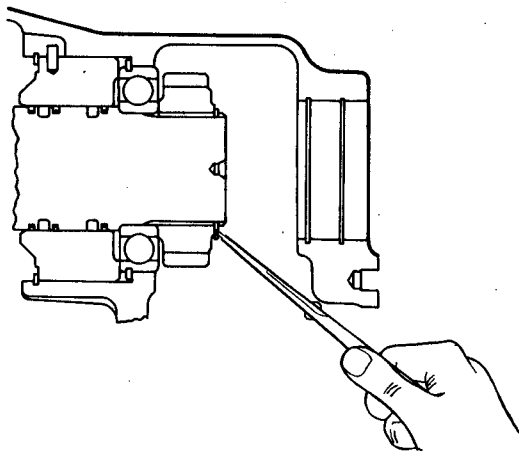


Figure 41A

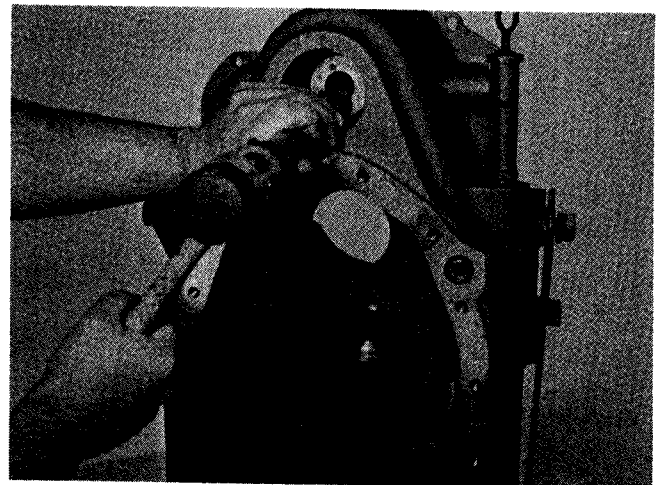


Figure 43
Tap forward clutch from rear bearing.

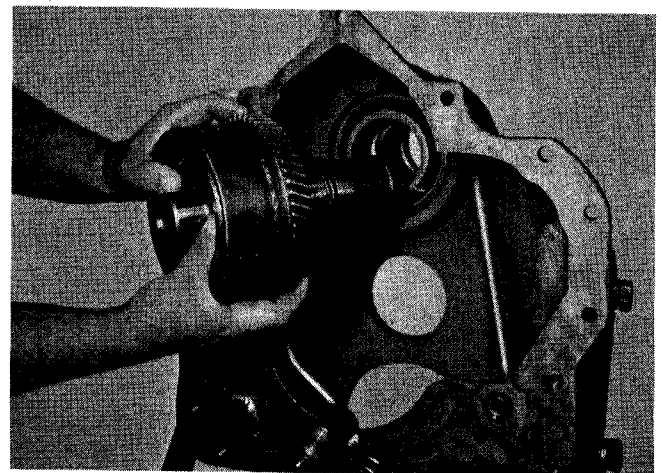


Figure 44
Remove forward clutch assembly.

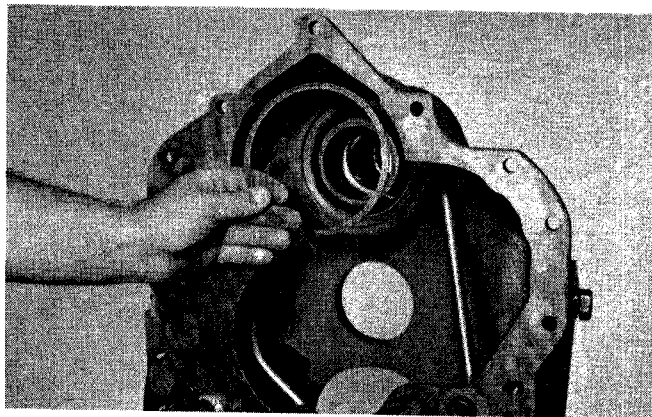


Figure 45

Remove forward clutch piston ring sleeve retainer ring.

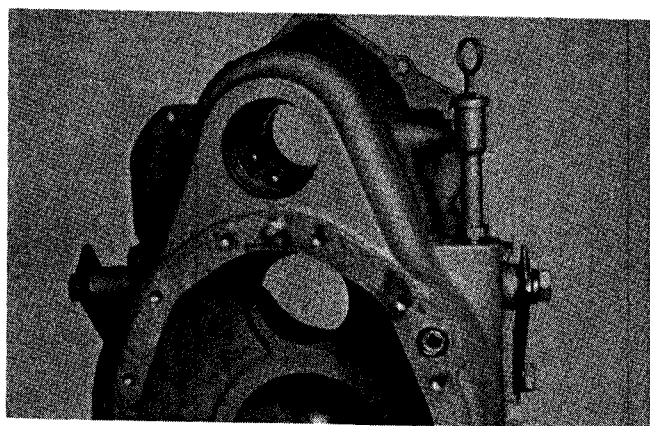


Figure 46

If piston ring sleeve or forward clutch rear bearing is to be replaced, tap bearing from rear of housing.

CLUTCH DISASSEMBLY

Low Clutch

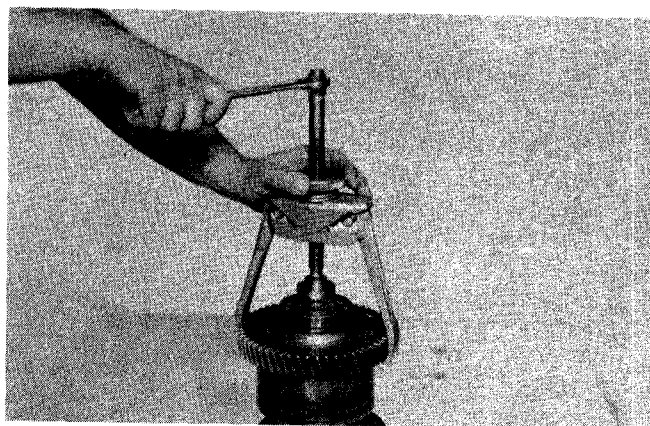


Figure 47

Remove low gear and hub, bearing spacer and low clutch front bearing.

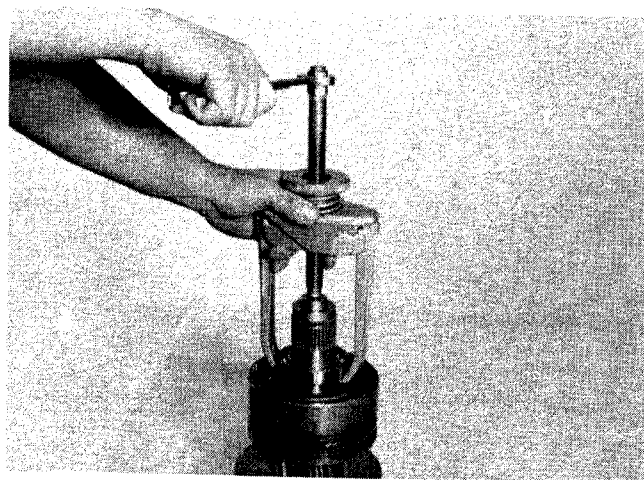


Figure 48

Remove low speed gear bearing.

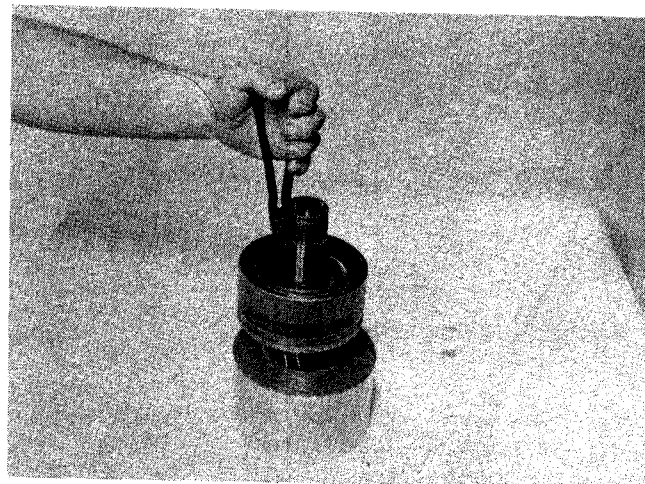


Figure 49

Remove low gear bearing locating ring.

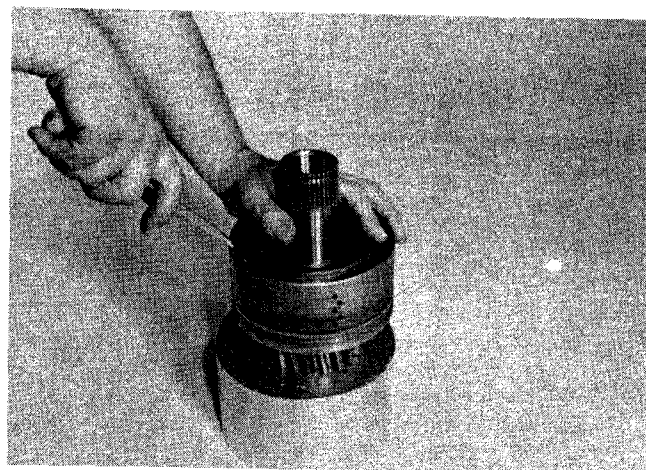


Figure 50

Remove end plate retainer ring.

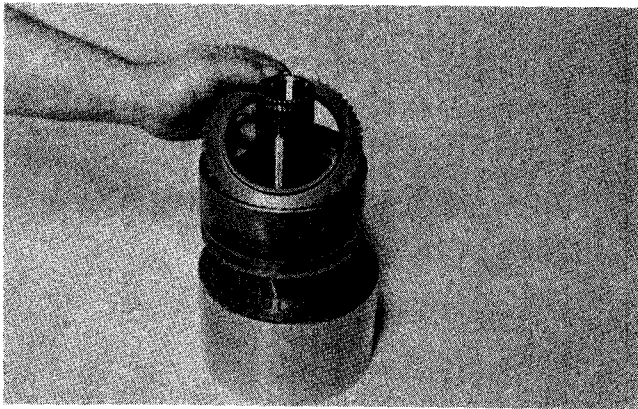


Figure 51
Remove end plate.

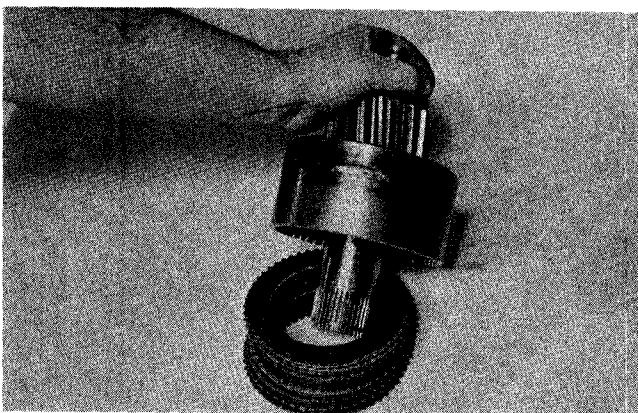


Figure 52
Turn clutch over. Remove inner and outer clutch discs. Do not mix low clutch friction discs with friction discs in other clutches.

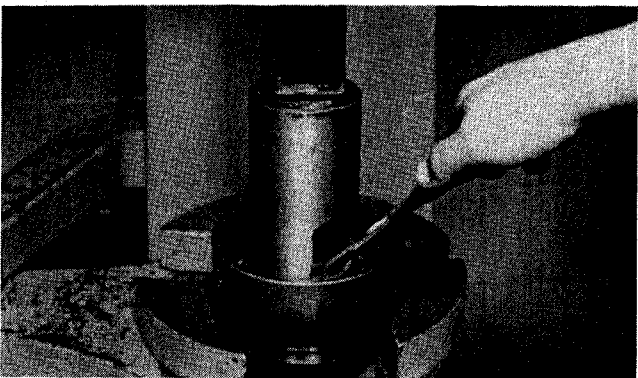


Figure 53
Remove clutch piston return spring. A sleeve with a portion removed is recommended for removing the clutch piston return spring, washer, and retainer ring. Sleeve shown is a common pipe, with a 1-1/2 x 1 [39,0x26,0mm] opening. The pipe is 6 x 3-1/4 x 2-3/4 [155,0x85,0x78,0mm]. Compress spring retainer washer. Through opening remove spring retainer snap ring. Release tension on spring retainer.

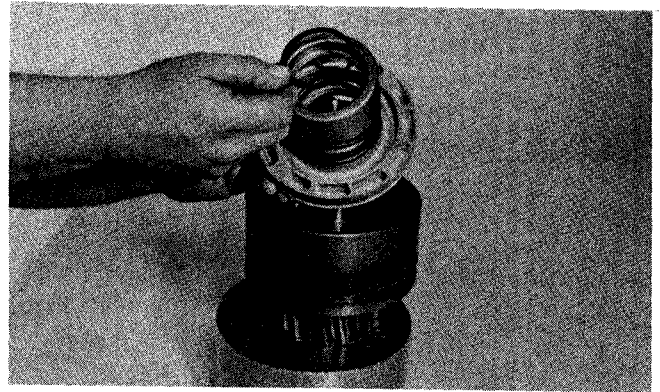


Figure 54
Remove spring retainer and spring. Turn clutch over and tap clutch shaft on a block of wood to remove clutch piston.

LOW CLUTCH REASSEMBLY

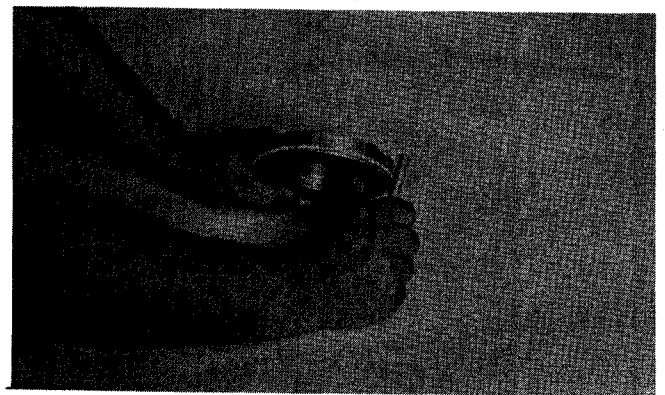


Figure 55
Install clutch piston outer seal ring. **NOTE:** Ring must be sized before installing in clutch drum. Sizing is best accomplished by rotating piston while holding a round object against the new seal ring as shown. Rotate piston until seal ring is flush with outer diameter of piston.

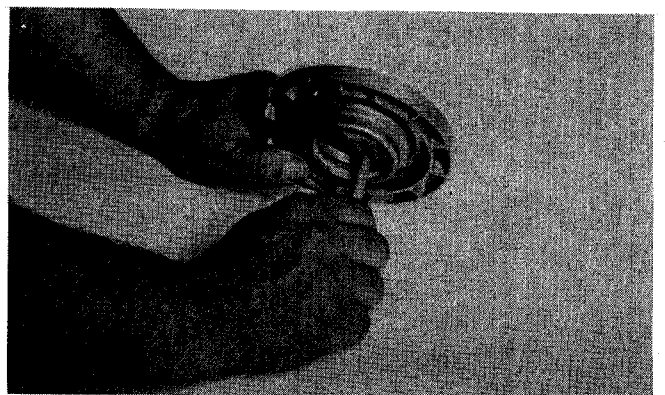


Figure 56
Install clutch piston inner seal ring and size as described in Figure 55.

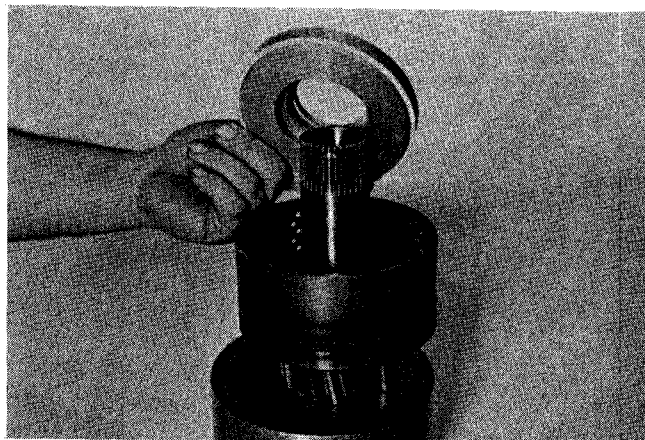


Figure 57

Position piston in low clutch drum as shown. Use caution as not to damage inner and outer piston sealing rings.

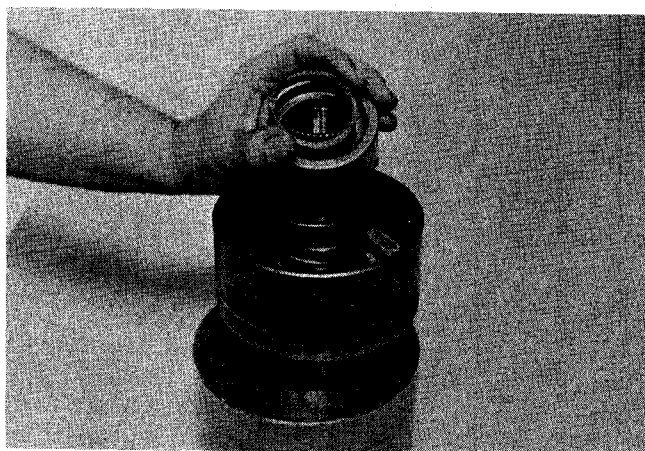


Figure 58

Position piston return spring, spring retainer, and snap ring in clutch drum.

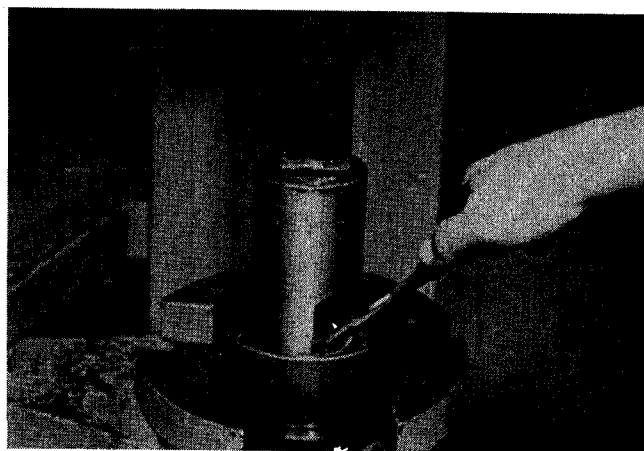


Figure 59

Compress spring and retainer. Install retainer snap ring.



Figure 60

Install clutch inner bearing locating ring.

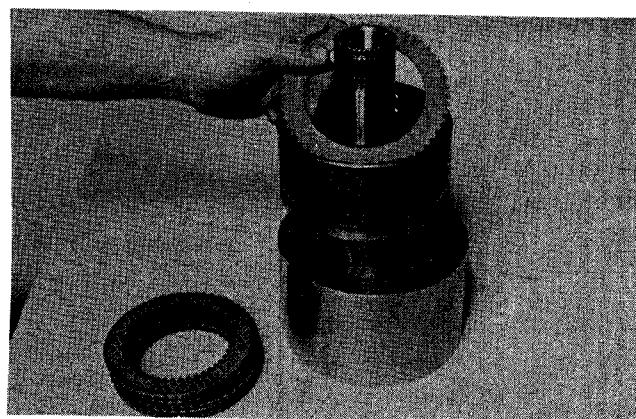


Figure 61

Install one steel disc.

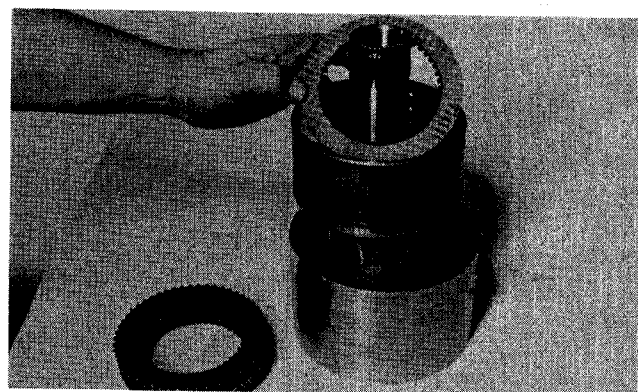


Figure 62

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 friction disc has a yellow mark of nonsoluble paint on the outer diameter for permanent identification. 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. Install end plate and snap ring.

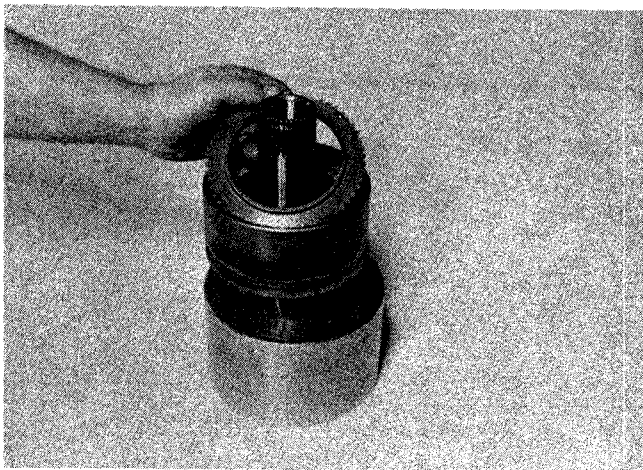


Figure 63
Install clutch disc end plate.

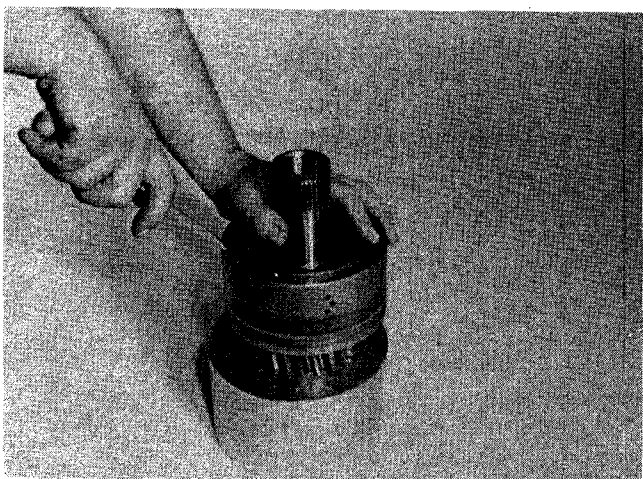


Figure 64
Install end plate retainer ring.

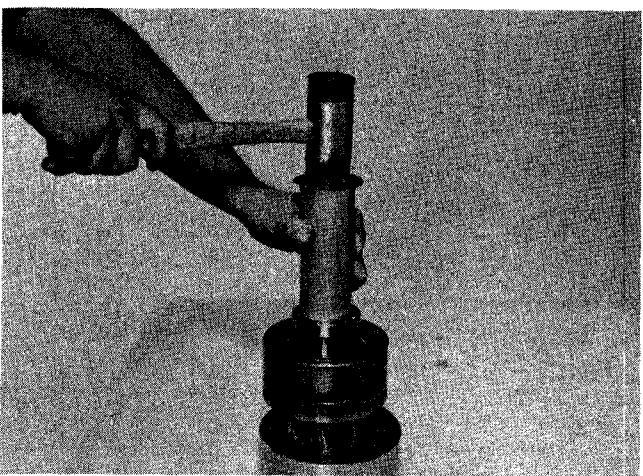


Figure 65
Install low speed gear inner bearing.

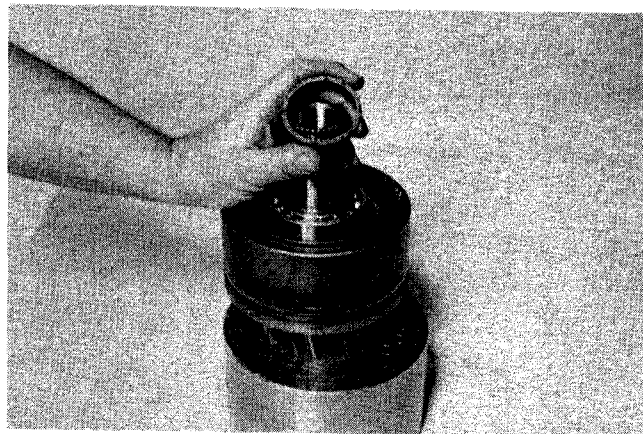


Figure 66
Install low speed gear bearing spacer.

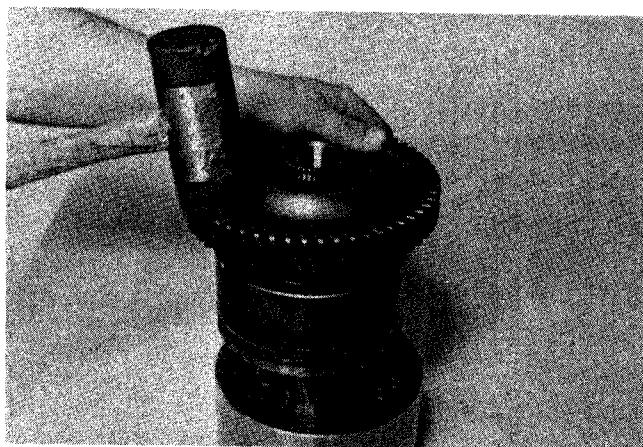


Figure 67
Install low clutch driven gear and hub into clutch drum. Align splines on clutch hub with internal teeth of friction discs. Tap gear into position. Do not force this operation. Gear splines must be in full position with internal teeth of all friction discs.

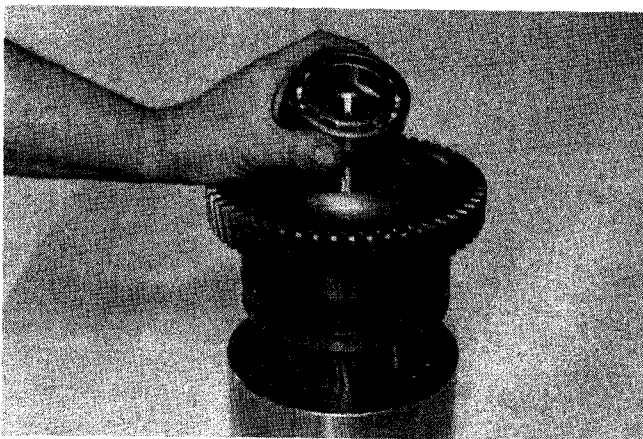


Figure 68
Install low speed gear outer bearing.

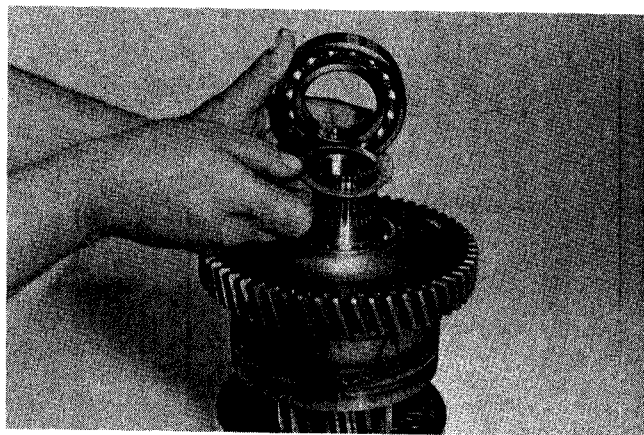


Figure 69

Position low gear front bearing spacer and bearing on clutch shaft.

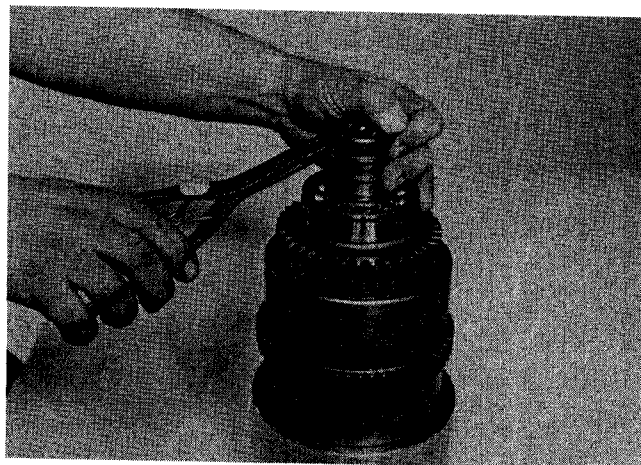


Figure 72

Remove front bearing retainer ring.

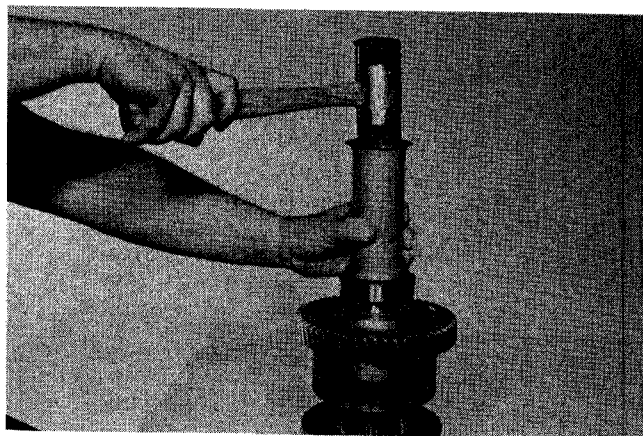


Figure 70

Tap bearing into position.

See Figure 98 for Reverse and 2nd Clutch removal.

REVERSE AND 2nd CLUTCH DISASSEMBLY (Reverse being disassembled)

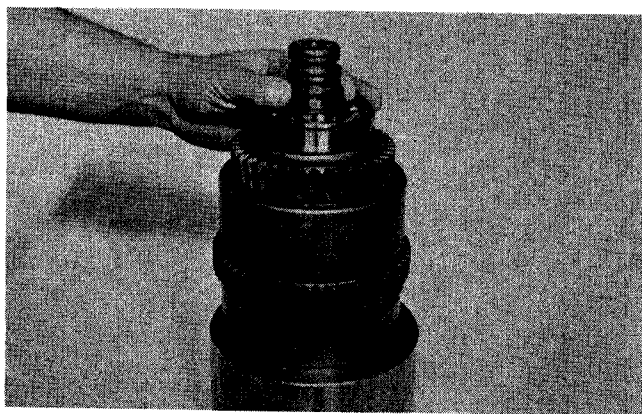


Figure 71

Remove clutch shaft piston rings.

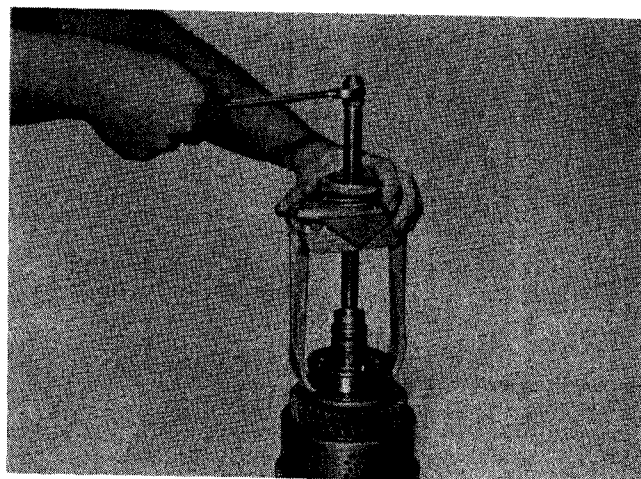


Figure 73

Remove front bearing.

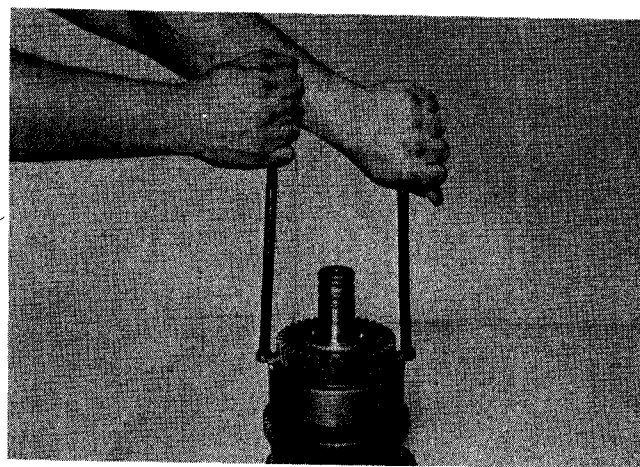


Figure 74

Pry reverse gear from clutch assembly far enough to use a gear puller.

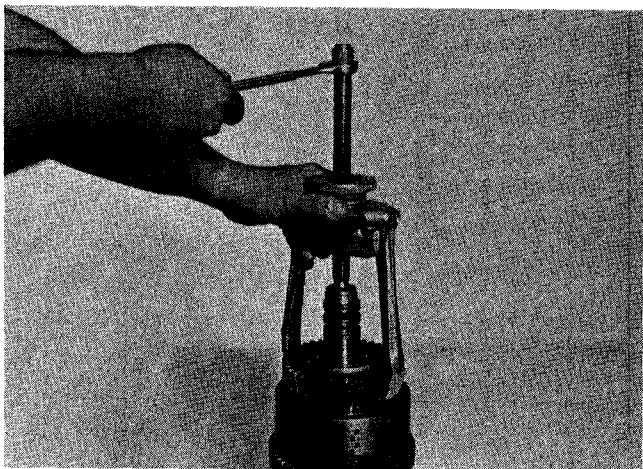


Figure 75
Remove gear as shown.

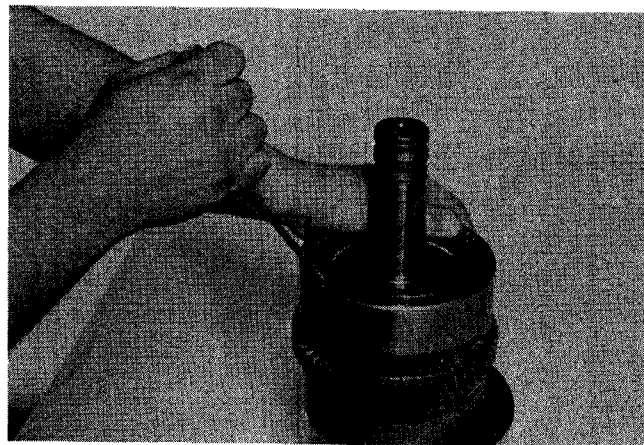


Figure 78
Remove end plate retainer ring.

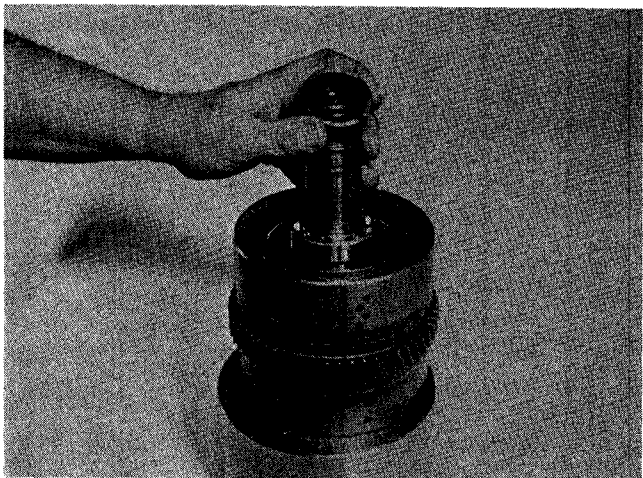


Figure 76
Remove bearing spacer.

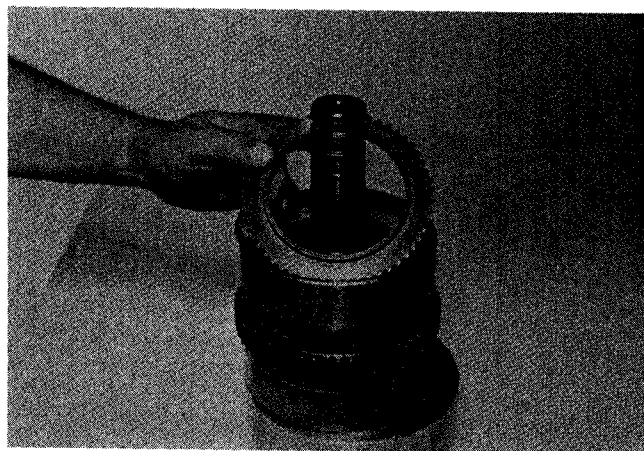


Figure 79
Remove end plate.

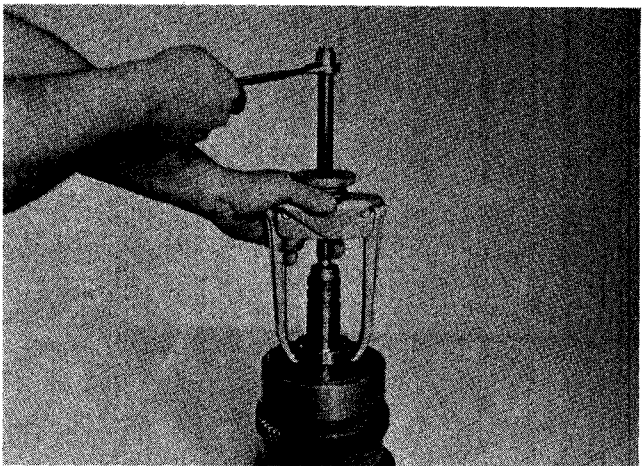


Figure 77
Remove inner bearing.

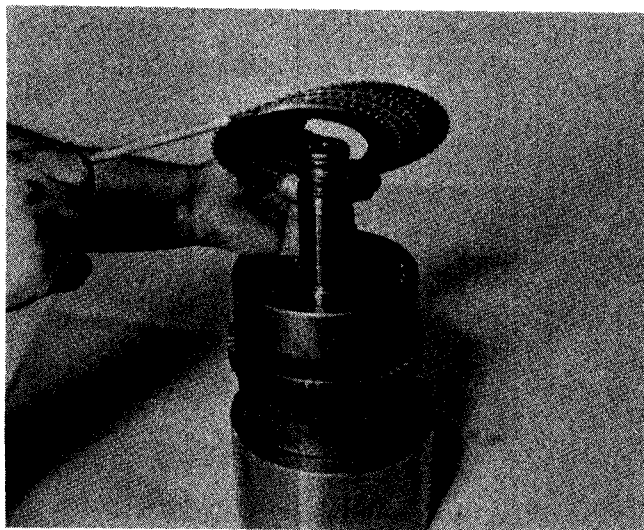


Figure 80
Remove clutch discs.



Figure 81

Refer to procedure shown in Figure 53 for removing return spring retainer ring. Remove ring, piston return Belleville spring washers and spacer. Turn clutch over and tap shaft on a block of wood to remove clutch piston. Repeat procedure for 2nd clutch disassembly. **NOTE:** 2nd clutch will not have Belleville washers for piston return.

REVERSE AND 2nd CLUTCH REASSEMBLY (Reverse being assembled)



Figure 82

Install inner and outer clutch piston seal rings. Size rings as explained in Figure 55. Position piston in clutch drum.



Figure 83

Install piston return spring spacer, Belleville spring washers and retainer ring.

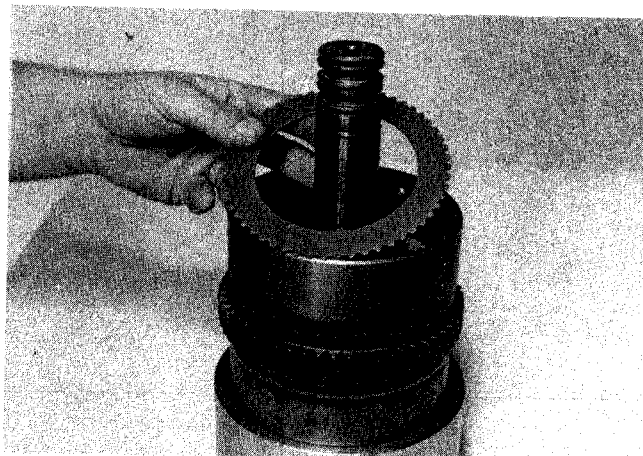


Figure 84
Install 1st steel disc.

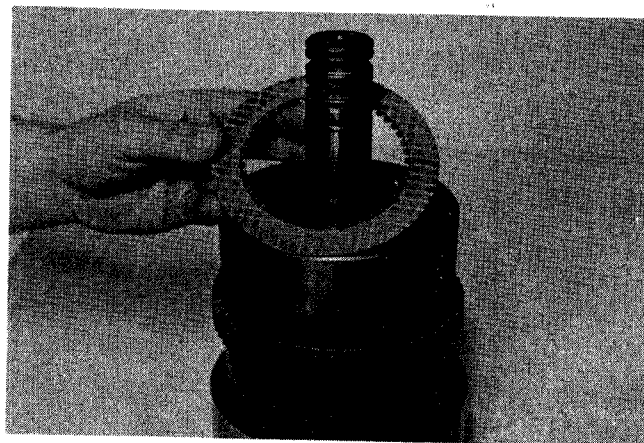


Figure 85
Install one friction disc.

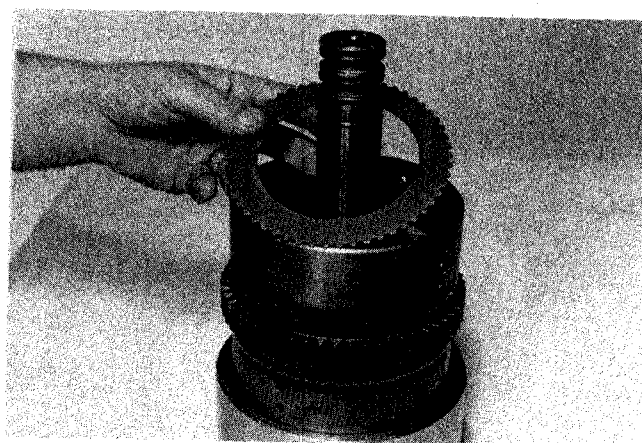


Figure 86
Install next steel disc. Alternate friction and steel discs until the proper amount of discs are installed. First disc next to the piston is steel, last disc installed is friction.

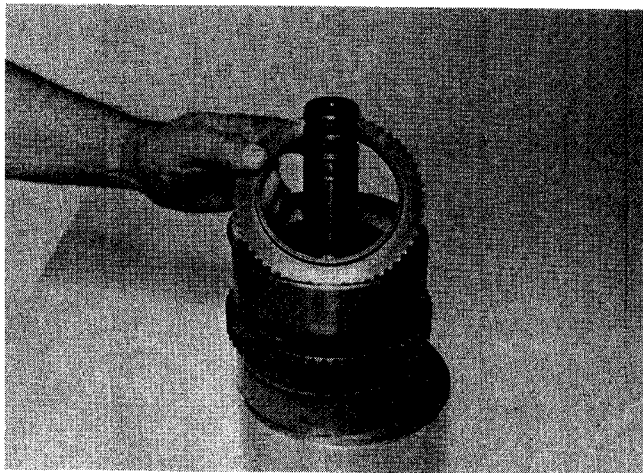


Figure 87
Install end plate.

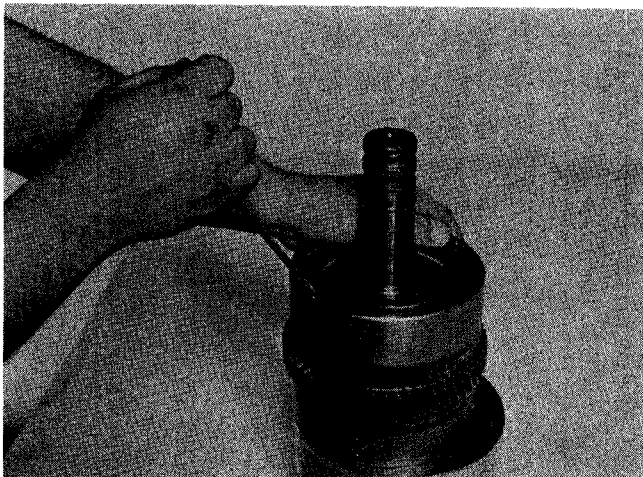


Figure 88
Install end plate retainer ring.

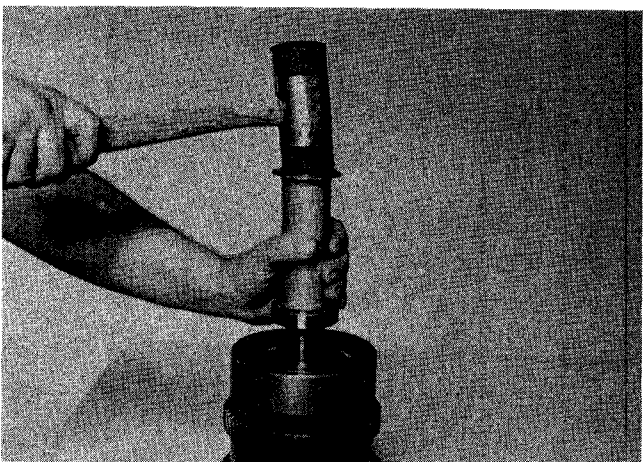


Figure 89
Install inner clutch driven gear bearing.

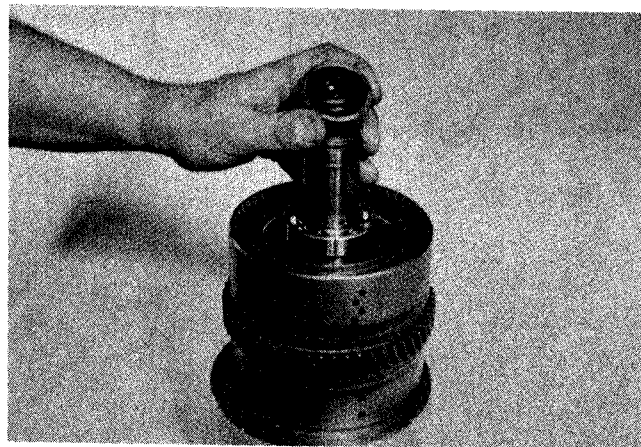


Figure 90
Install bearing spacer.

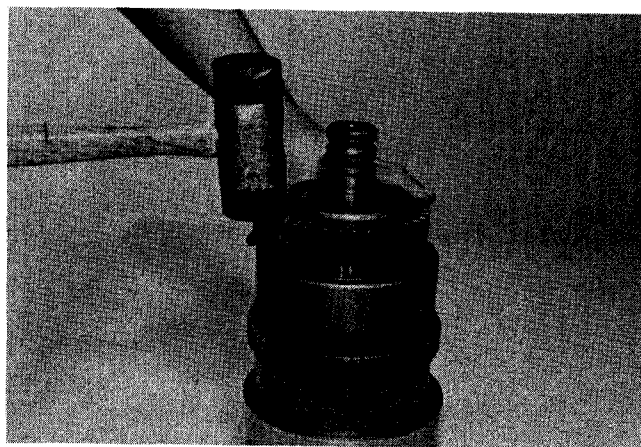


Figure 91
Install clutch driven gear into clutch drum. Align splines on clutch gear with internal teeth of friction discs. Tap gear into position. Do not force this operation. Gear splines must be in full position with internal teeth of all friction discs.

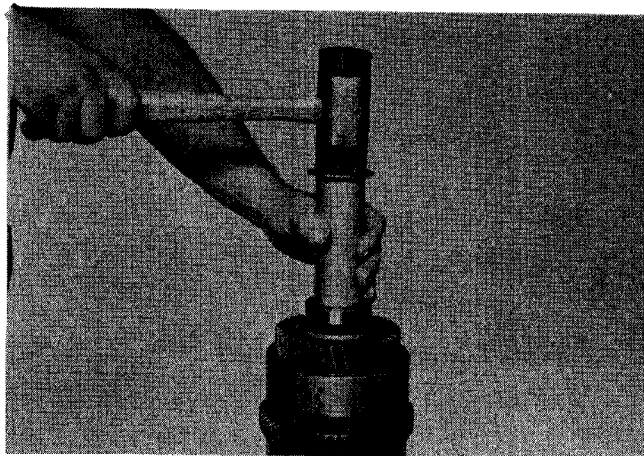


Figure 92
Install outer bearing.

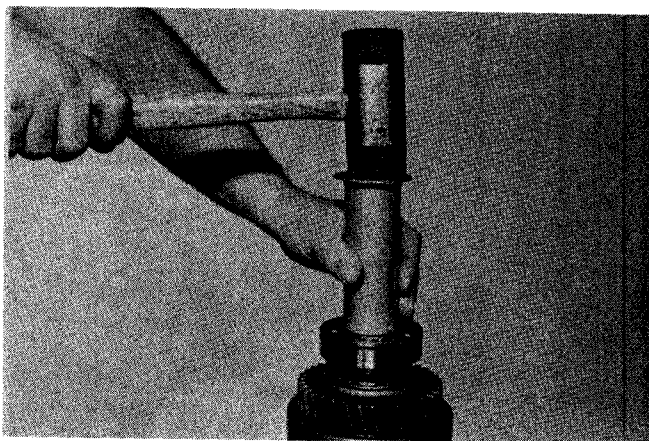


Figure 93

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

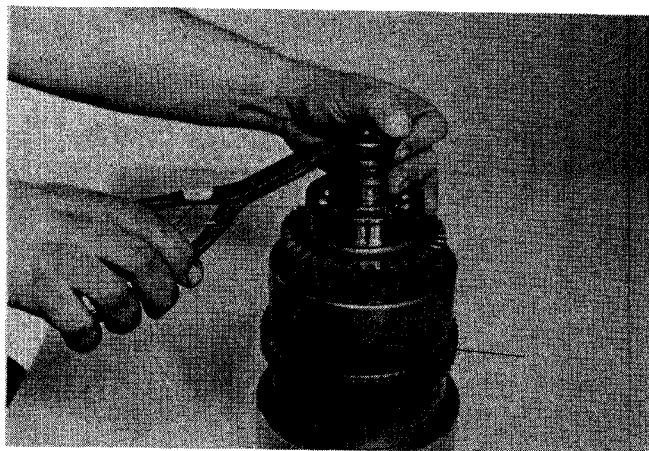


Figure 94

Install front bearing retainer ring.

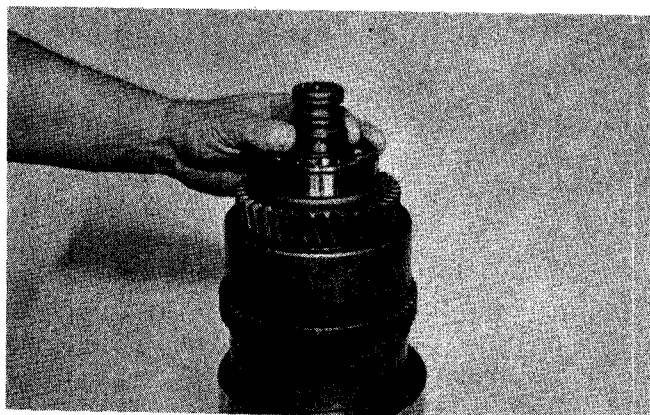


Figure 95

Install new clutch shaft piston rings. Grease rings to center on shaft to facilitate reassembly into transmission housing. **NOTE:** 2nd clutch uses a return spring and not Belleville washers for piston return.

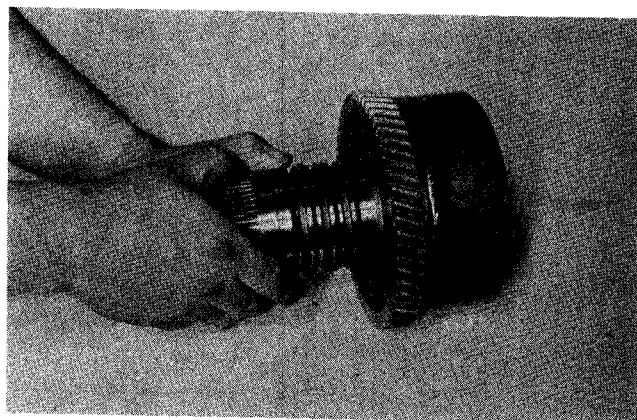


Figure 96

Forward clutch will disassemble and reassemble the same as the reverse clutch. Install new clutch shaft piston rings. Grease rings to facilitate reassembly.

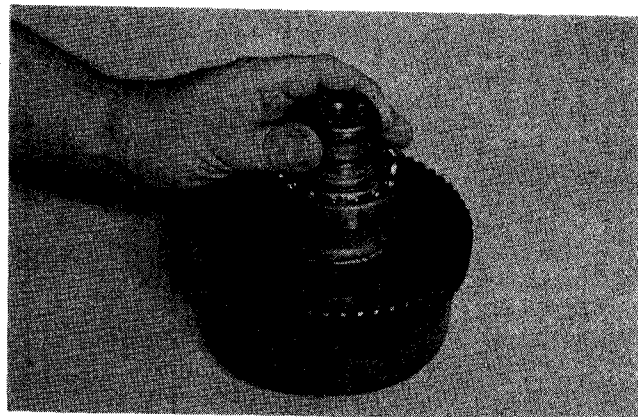


Figure 97

The 3rd speed clutch will disassemble and reassemble the same as the low clutch except for the friction plates (See note in Figure 62). Install new clutch shaft piston rings.

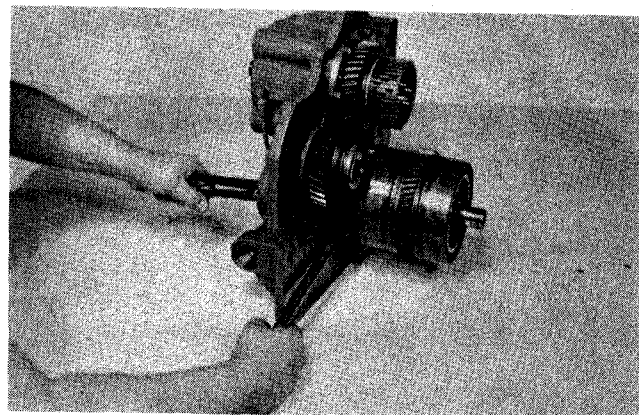


Figure 98

Through front access hole use spreading type snap ring pliers. Spread ears on the reverse clutch front bearing retaining ring. Holding snap ring open pry reverse and 2nd clutch assembly from front cover.

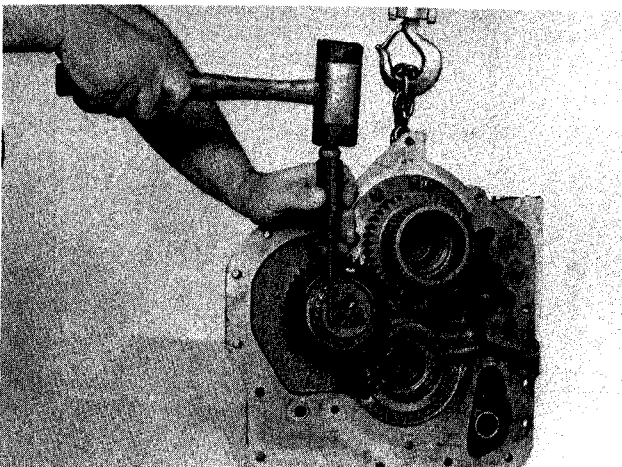


Figure 99

Straighten lockplate tabs from idler gear capscrews. **NOTE:** Some units will have a lock nut type idler gear retention. Disassembly and reassembly of this type is explained in detail starting on page 36, Figure 163.

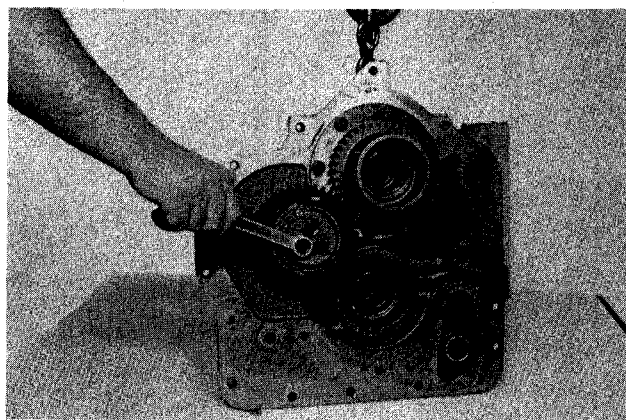


Figure 100

Remove idler gear capscrews.

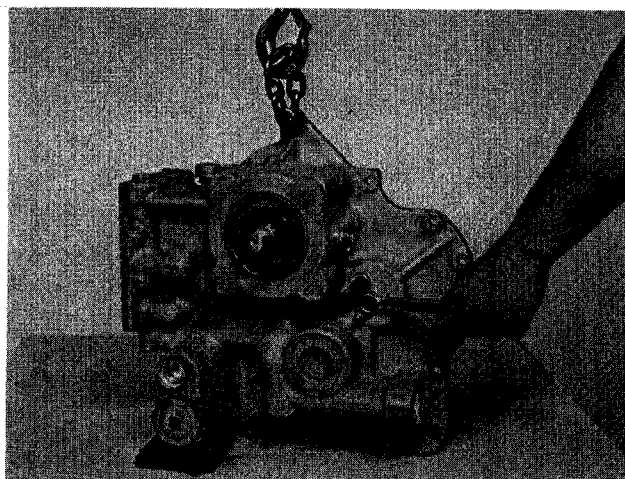


Figure 101

Remove reverse idler shaft front capscrew.

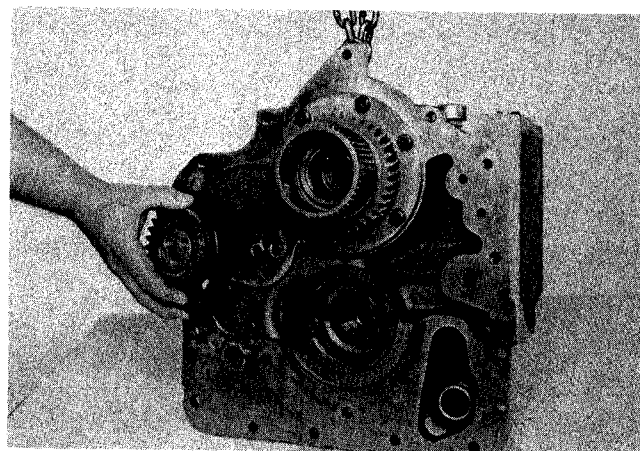


Figure 102

Remove idler gear, outer taper bearing, bearing spacer and inner taper bearing. **NOTE:** Keep bearing spacer with inner and outer bearings as this is a pre-selected spacer for proper bearing pre-load.

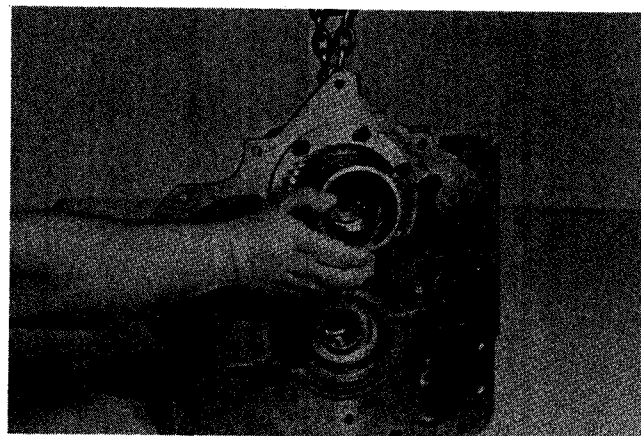


Figure 103

Remove forward clutch shaft pilot bearing.

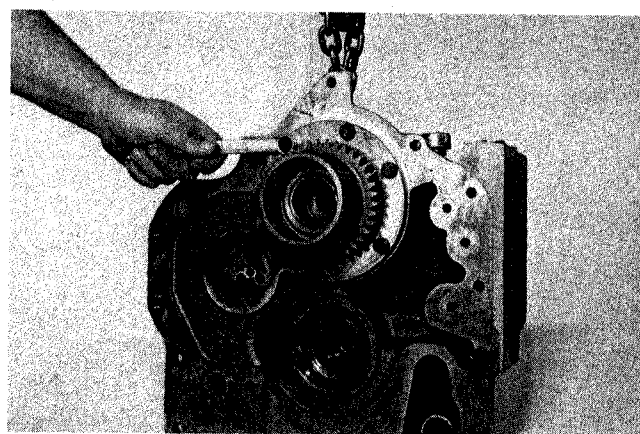


Figure 104

Remove input shaft retainer plate capscrews.

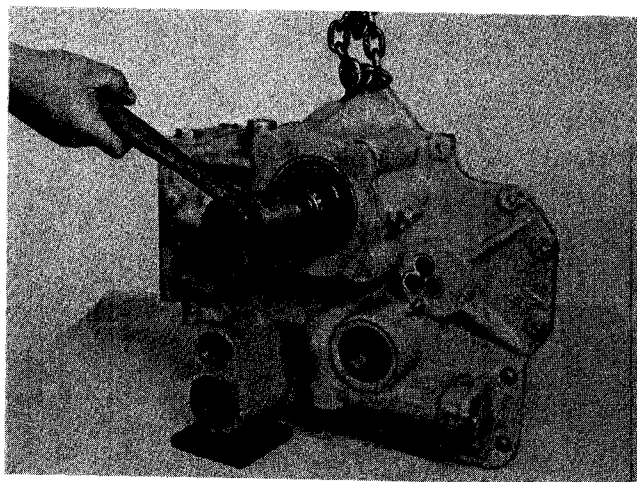


Figure 105

Tap input shaft and bearing assembly from housing.

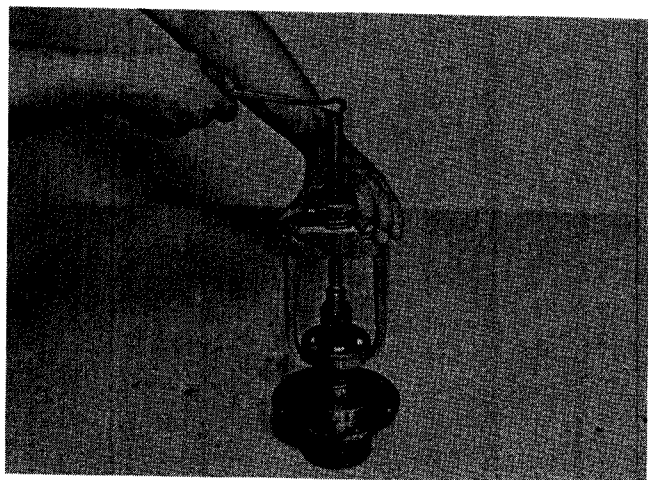


Figure 106

Remove input shaft front bearing.

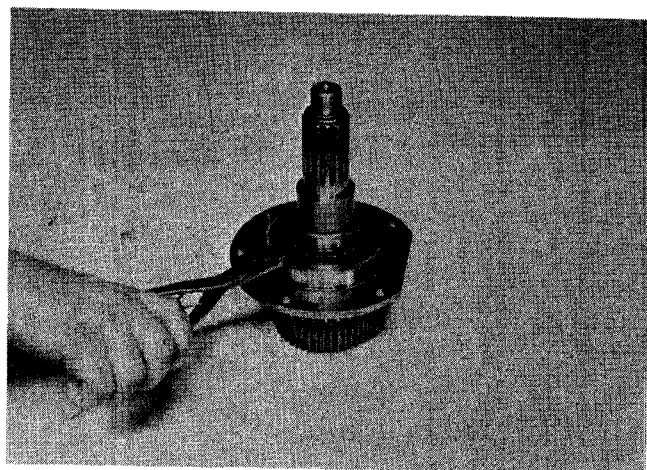


Figure 107

Remove input shaft inner bearing retainer ring.

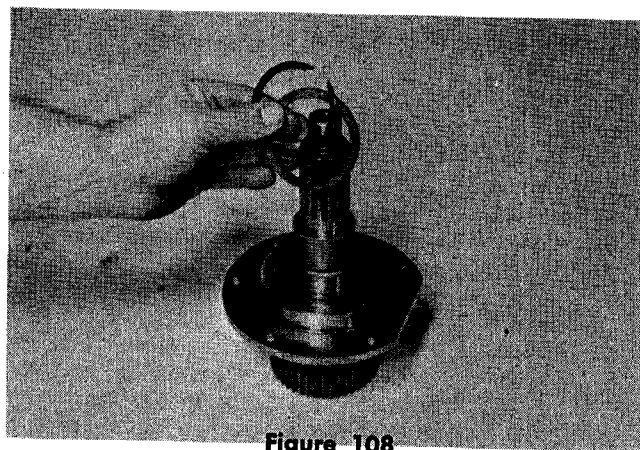


Figure 108

Remove bearing retainer ring and spacer. Press bearing and retainer plate from input shaft. Remove input shaft oil seal.

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 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.

Thoroughly dry all parts cleaned 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 clean light oil and wrap in clean lintless cloth or paper to protect them until installed.

Oil Seals, Gaskets and Retaining Rings

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 type 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

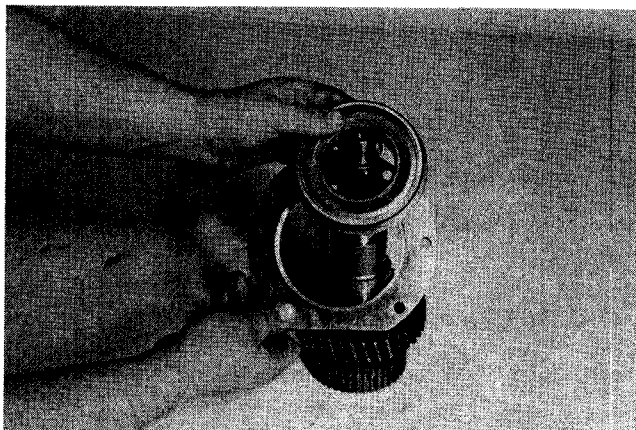


Figure 109

Position input shaft bearing retainer plate and bearing on shaft. **NOTE:** Snap ring groove in retainer plate must be up and bearing shield must also be up. Press bearing into position. Install bearing spacer and retainer ring.

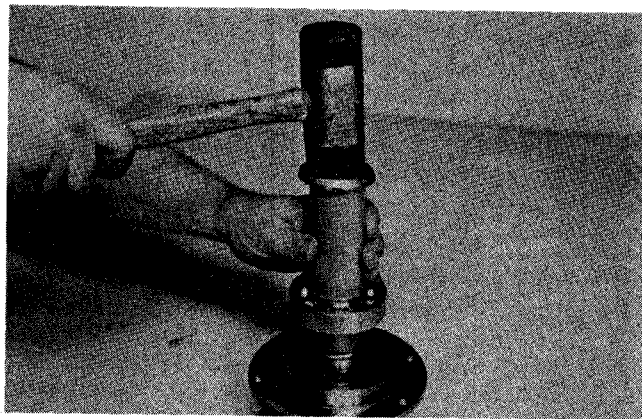


Figure 110

Install input shaft outer bearing

Coat outer diameter of input shaft oil seal with a light coat of Permatex #2. Press seal into front cover with lip of seal in and to a dimension of .360 [9,2 mm] to .390 [9,9 mm] from the outer surface of the cover. (See assembly instruction drawing).

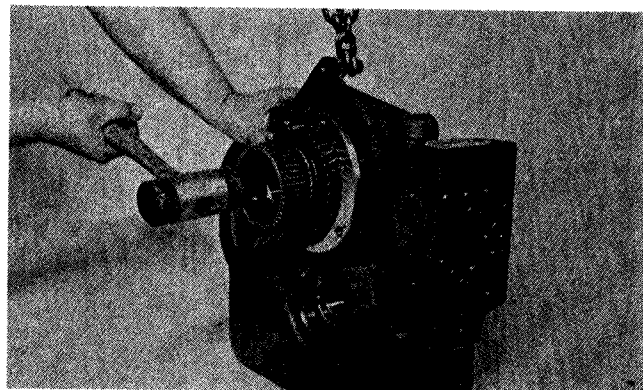


Figure 111

Tap input shaft assembly in front cover aligning holes in retainer plate with holes in cover. Install capscrews and washers. Tighten capscrews 23 to 25 ft. lbs. torque [31,2 - 33,8 N.m].

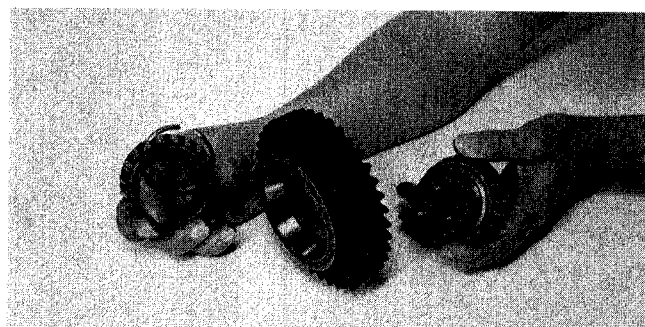


Figure 112

Press idler gear bearing on shaft. Install shaft and bearing in idler gear. Position spacer on shaft, press bearing on shaft into gear. **NOTE:** See Figure 170 for locknut type idler shaft retention.

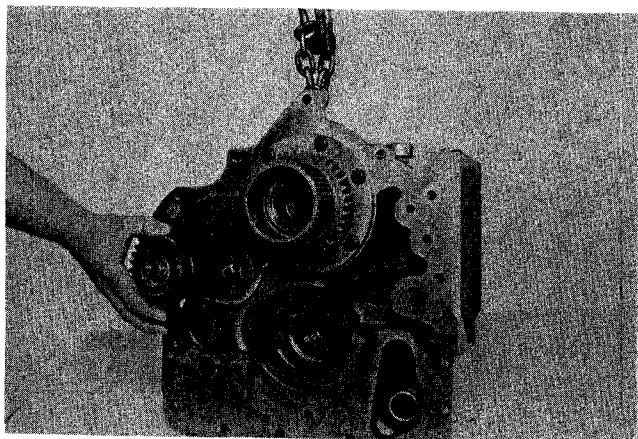


Figure 113

Position reverse idler and bearing assembly into front cover. **NOTE:** Long hub of gear out.

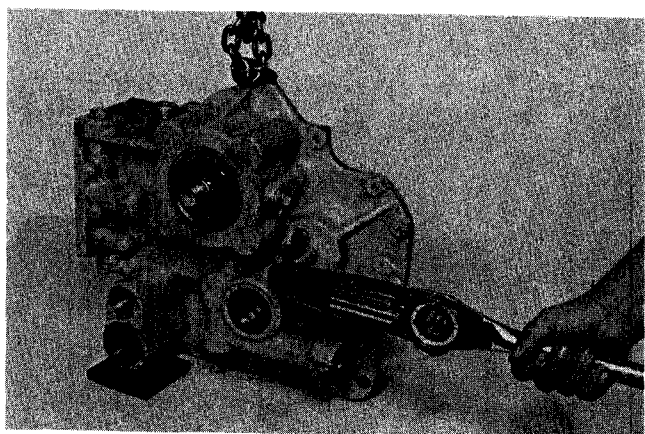


Figure 114

Install reverse idler shaft cap screws and lockwashers. Tighten 58 to 64 ft. lbs. torque [78,7 - 86,7 N.m].

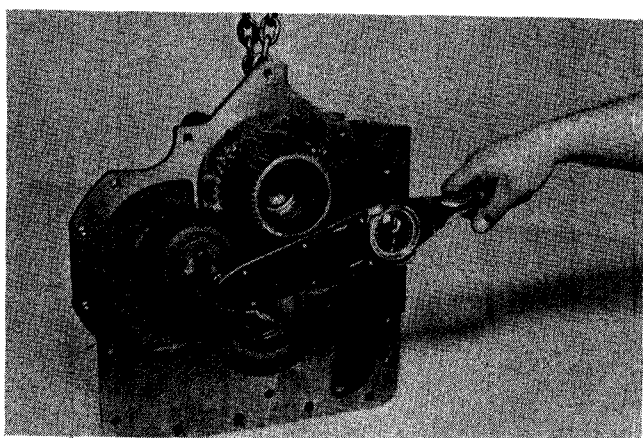


Figure 115

Install bearing retainer plate, lock plate and idler gear cap screws. Tighten cap screws 58 to 64 ft. lbs. torque [78,7 - 86,7 N.m]. Bend lockplate tabs over cap screw heads to prevent loosening.

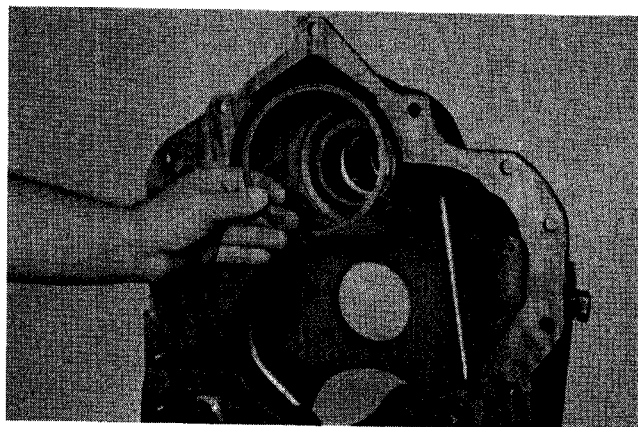


Figure 116

Tap forward clutch shaft rear bearing into bearing bore with bearing snap ring toward front of housing. Align roll pin in forward clutch shaft piston ring sleeve with groove in housing. Tap sleeve into position and secure with sleeve retainer ring.

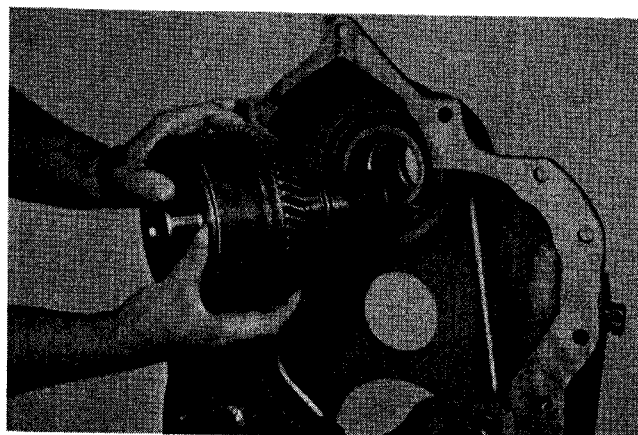


Figure 117

Position forward clutch assembly into transmission housing. Use caution as not to damage forward shaft piston rings.

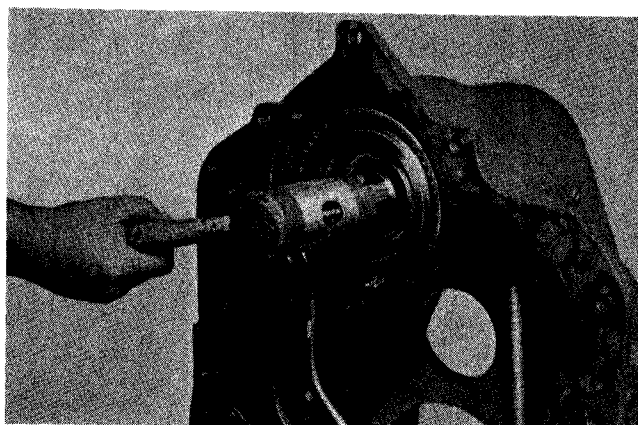


Figure 118

Tap clutch assembly into position

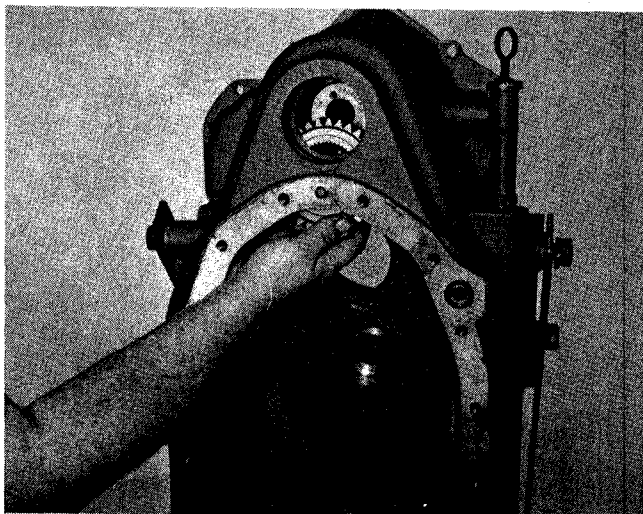


Figure 119

Position forward shaft gear on shaft

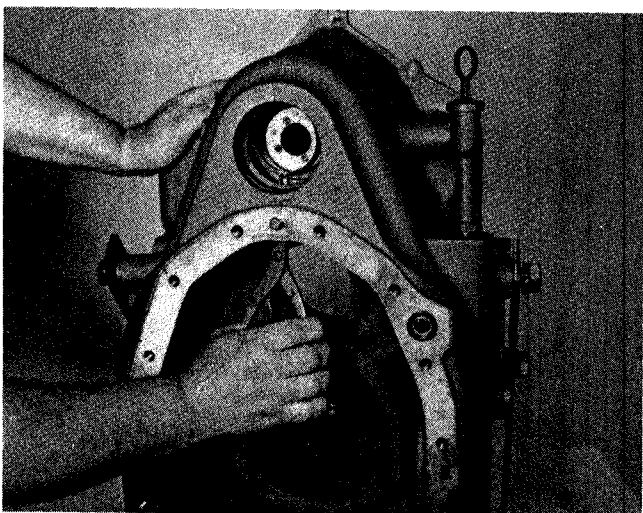


Figure 120

Install gear retainer ring. See Figure 120A.

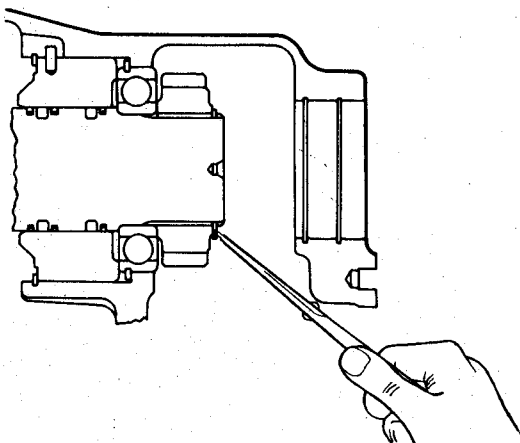


Figure 120A

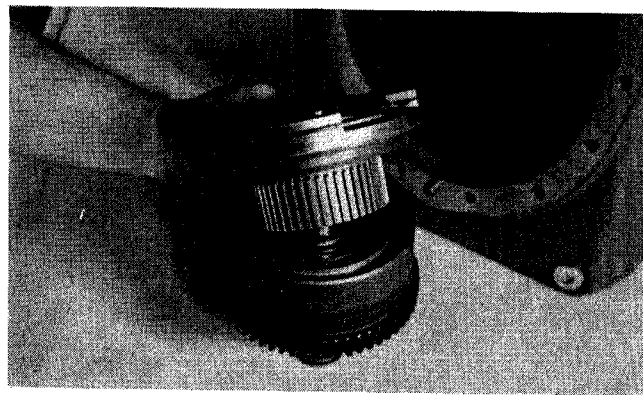


Figure 121

If 3rd speed clutch rear bearing carrier was disassembled press bearing into carrier against locating ring. Secure bearing with retainer ring. Press 3rd speed clutch disc hub into bearing and secure with retainer ring. Position disc hub and bearing carrier on 3rd speed clutch.

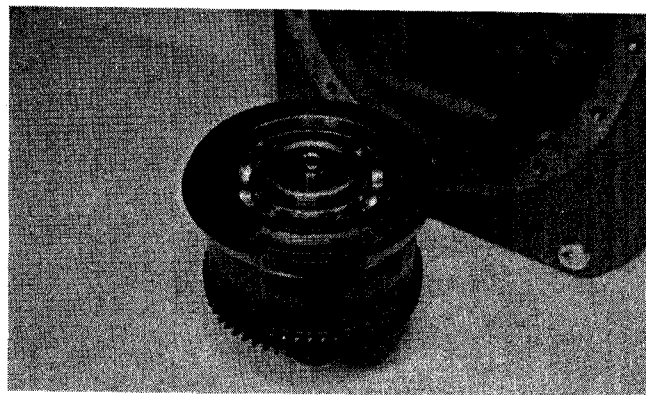


Figure 122

Align splines on disc hub with internal teeth of friction discs in clutch. Do not force this operation. Disc hub splines must be in full position with internal teeth of all friction discs.

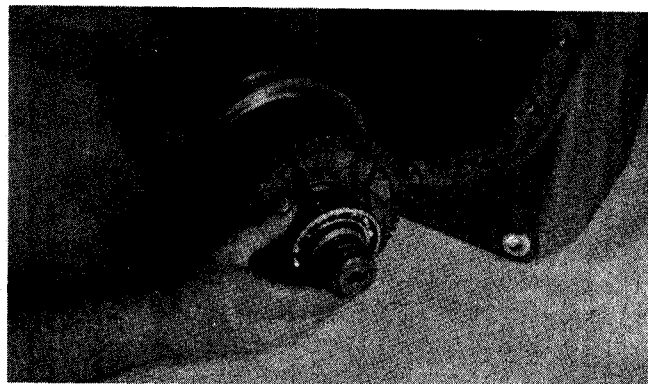


Figure 123

Position the 3rd clutch front bearing locating ring on clutch assembly. Ring will be installed in housing ring groove later in the text.



Figure 124

Using contracting type snap ring pliers as shown, lock pliers to hold ring contracted. Tap 3rd speed clutch assembly and bearing carrier into housing until snap ring groove in housing is aligned with snap ring. Remove pliers being sure snap ring is in full position in snap ring groove.

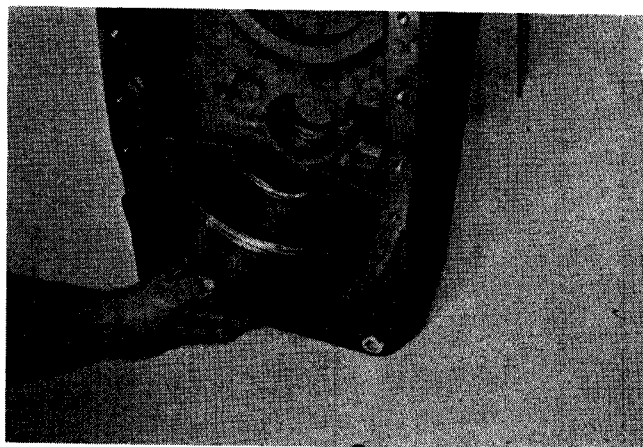


Figure 125

Position sump oil baffle in housing.

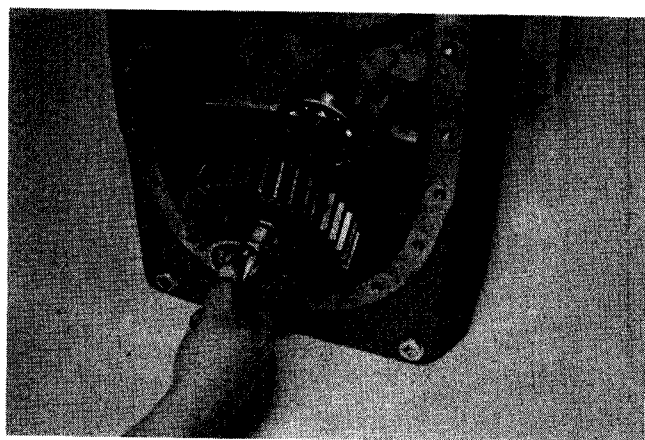


Figure 126

Install output shaft and bearing assembly in housing.

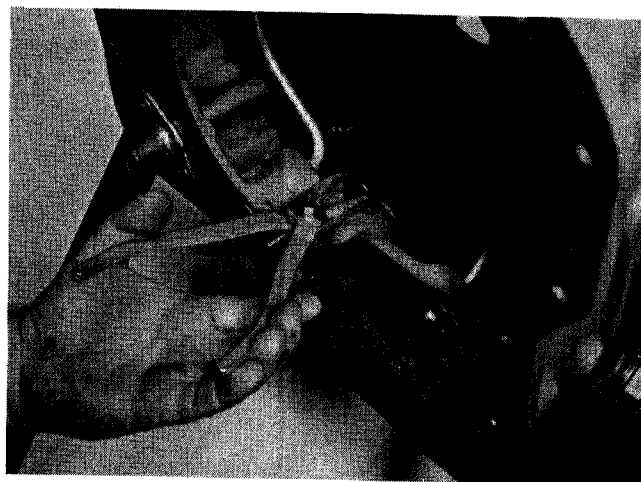


Figure 127

From front of housing install 3rd speed clutch front bearing retainer ring. **NOTE:** Be certain ring is in full position in ring groove.

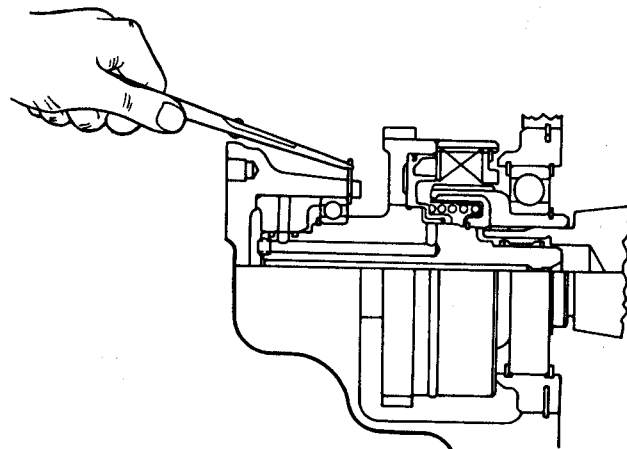


Figure 127A

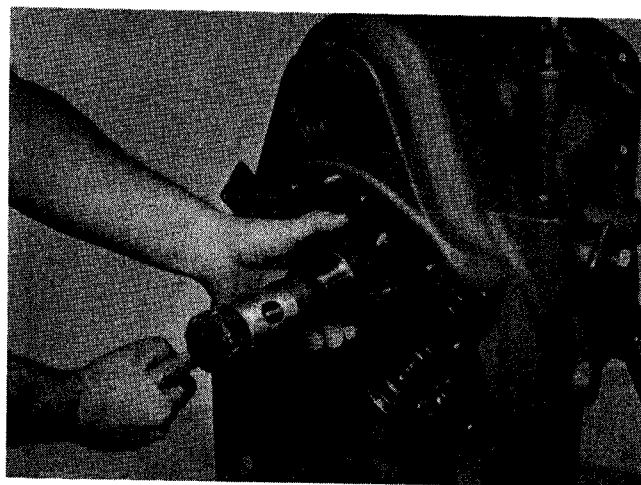


Figure 128

From rear of housing position low speed clutch in bearing bore. Tap clutch in place.

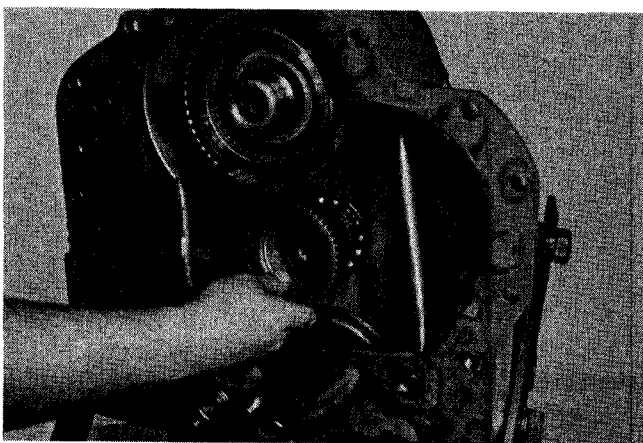


Figure 129

From front of housing install 2nd speed clutch disc hub on low clutch shaft.

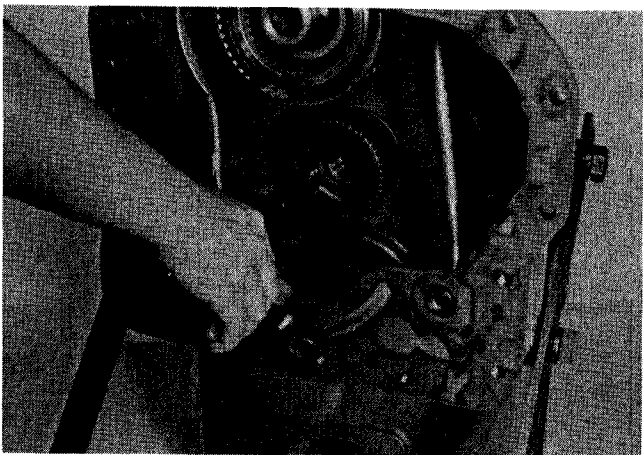


Figure 130

Install disc hub retainer ring.

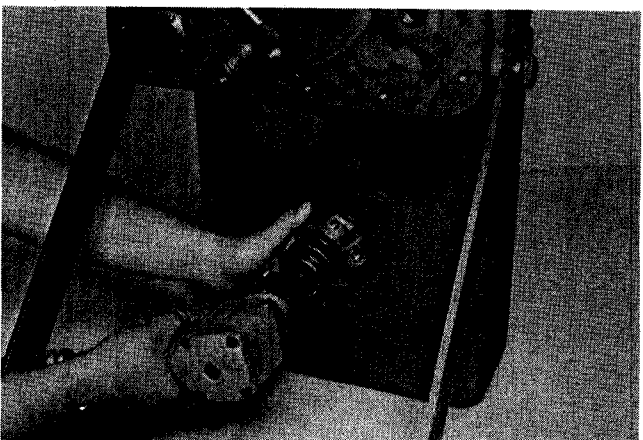


Figure 131

Install front output flange, new "O" ring, washer and nut. Tighten 200 to 250 ft. lbs. torque [271,2 - 338,9 N.m].

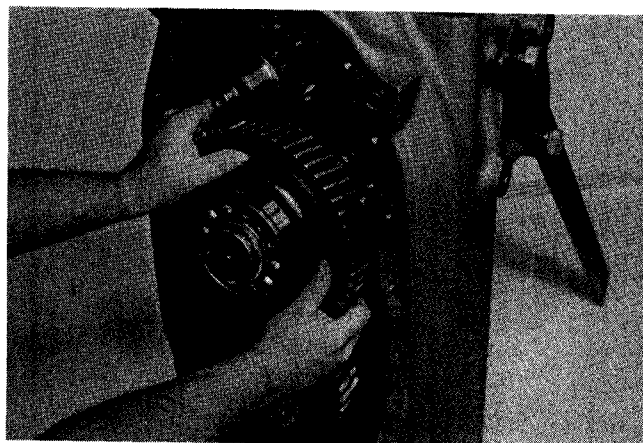


Figure 132

Position idler shaft and bearing assembly in end of 3rd speed clutch. **NOTE:** If special low ratio is incorporated, the idler shaft will have two gears on it. (Unit shown is a standard ratio).

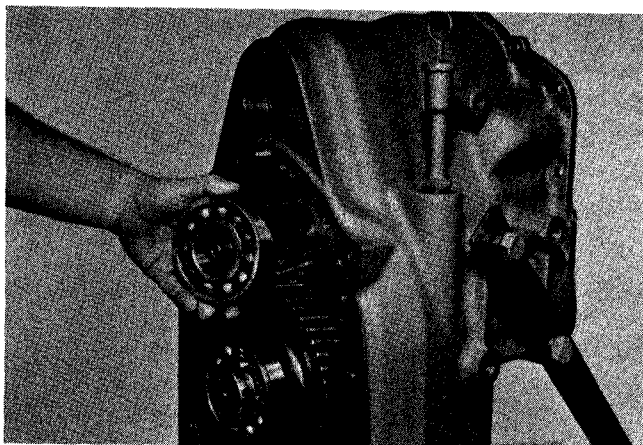


Figure 133

Position low clutch rear bearing on shaft, with snap ring groove out.

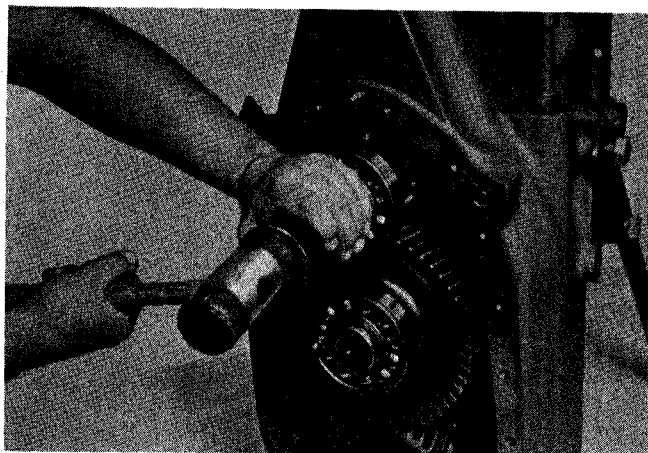


Figure 134

Tap bearing into position.

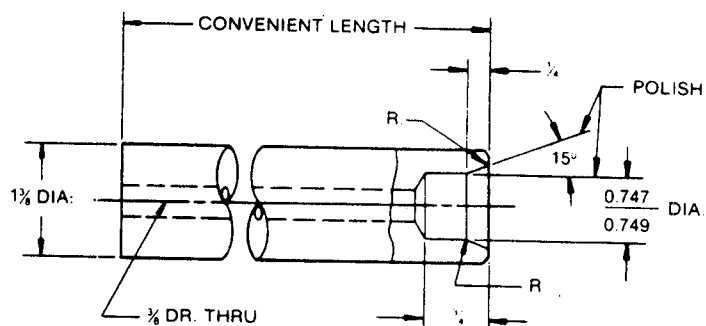


Figure 134-A
Low shaft oil sealing ring sizing tool.

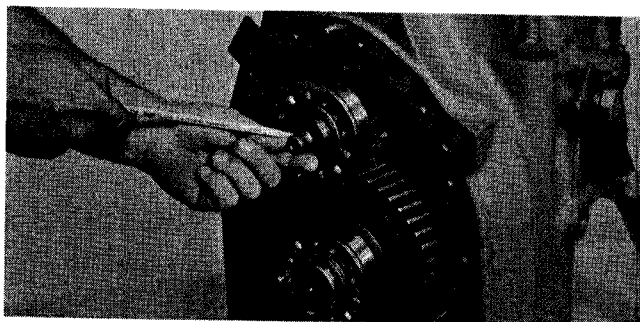


Figure 135
Install new oil sealing ring on low clutch shaft.
NOTE: New ring must be sized before installing low shaft bearing cap.

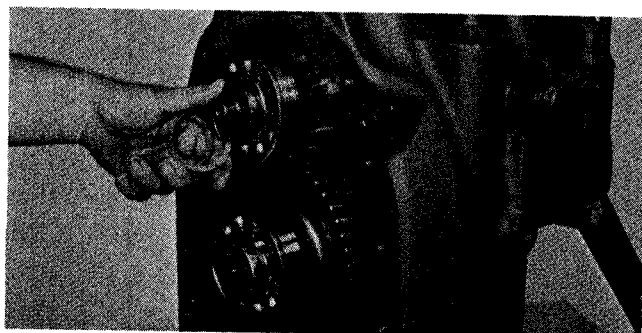


Figure 136
Install low shaft rear bearing spacer.



Figure 137
Install bearing retainer ring.

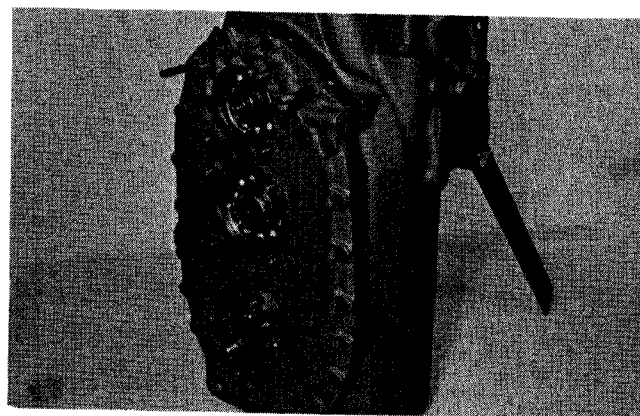


Figure 138
Position new gasket and "O" ring on rear of transmission housing. A thin coat of chassis grease will hold the gasket and "O" ring in place. Install rear cover. Note two aligning studs to facilitate cover to housing assembly. Tap cover in place aligning shaft bearings with bearing bores. Remove studs and install cover bolts and washers.



Figure 139
Tighten rear cover bolts 37 to 41 ft. lbs. torque [50,2 - 55,5 N.m].

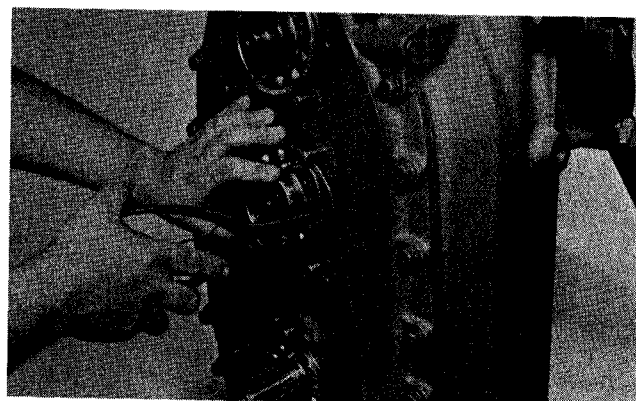


Figure 140
Install low, idler and output shaft rear bearing locating rings.

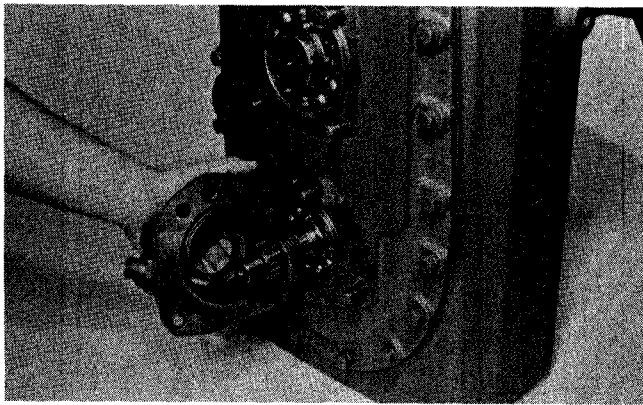


Figure 141

Apply a light coat of Permatex # 2 to the outer diameter of the output oil seal. Press seal in bearing cap with lip of seal toward bearing side of bearing cap. Position new "O" rings on bearing cap. **NOTE:** Some units will have a gasket only between the cap and cover.

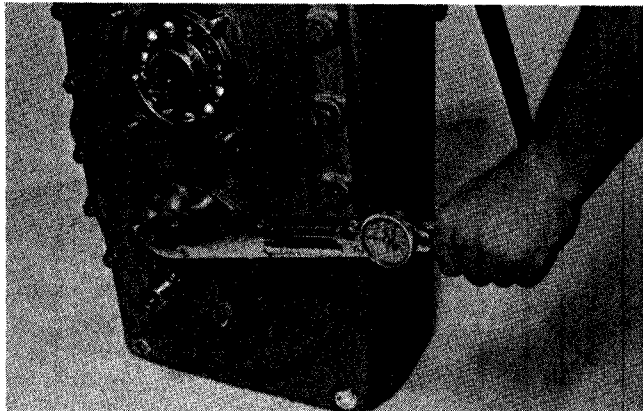


Figure 142

Install lockwashers and stud nuts. Tighten 91 to 100 ft. lbs. torque [123,4 - 135,5 N.m] with aluminum bearing cap torque nuts 75 to 85 ft. lbs. torque [101,7 - 115,2 N.m].

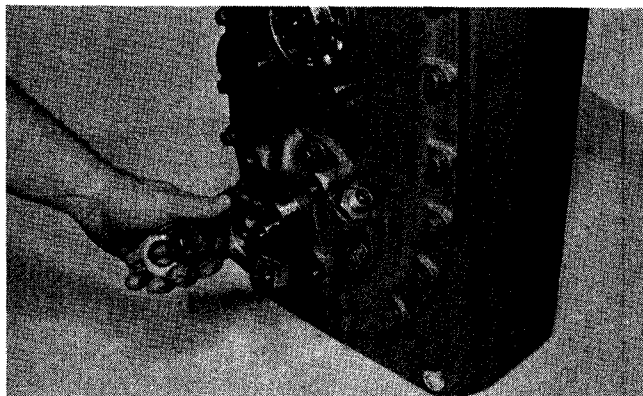


Figure 143

Install output flange, "O" ring, washer and flange nut. Block flange to prevent turning. Tighten flange nut 200 to 250 ft. lbs. torque [271,2 - 339,0 N.m].

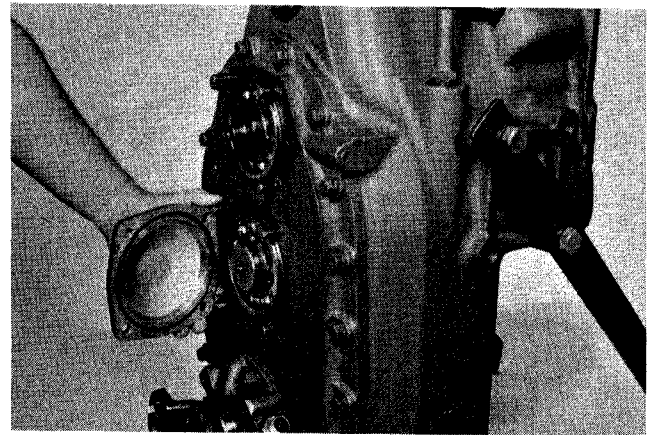


Figure 144

Position new "O" ring on idler shaft bearing cap. Install cap on studs and secure with lockwashers and nuts.

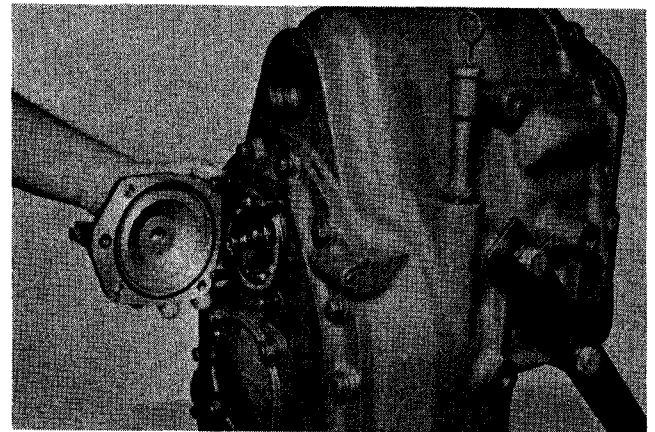


Figure 145

Install new bearing cap and low clutch pressure port "O" rings on low shaft bearing cap. Position bearing cap on low shaft. Install washers and stud nuts.

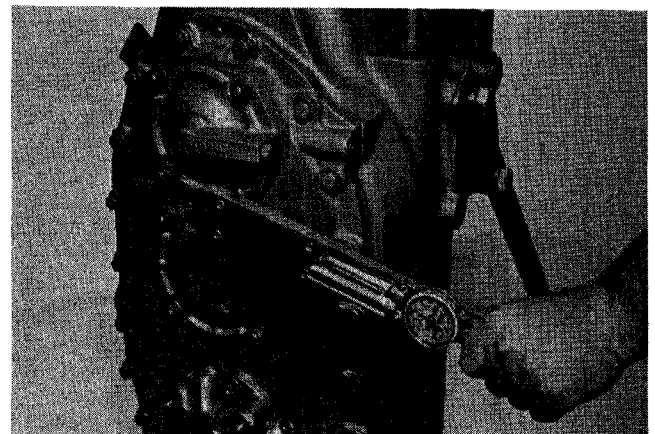


Figure 146

Tighten low shaft and idler shaft stud nuts 41 to 45 ft. lbs. torque [55,6 - 61,0 N.m].

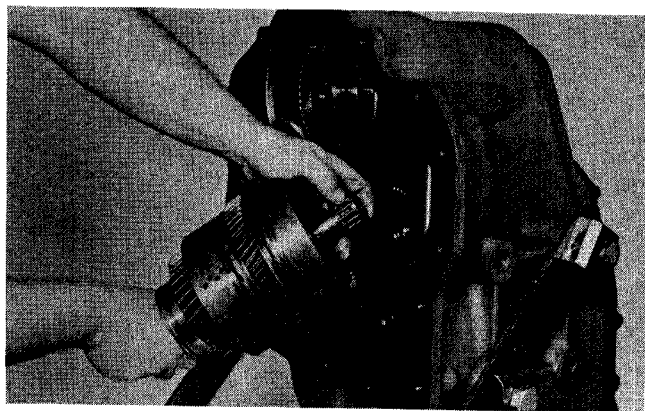


Figure 147

Install 2nd speed clutch shaft rear pilot bearing on shaft. Position reverse and 2nd speed clutch on disc hub aligning splines of disc hub with internal teeth of 2nd speed clutch friction discs. Disc hub must be in full position with friction discs. Do not force this operation.

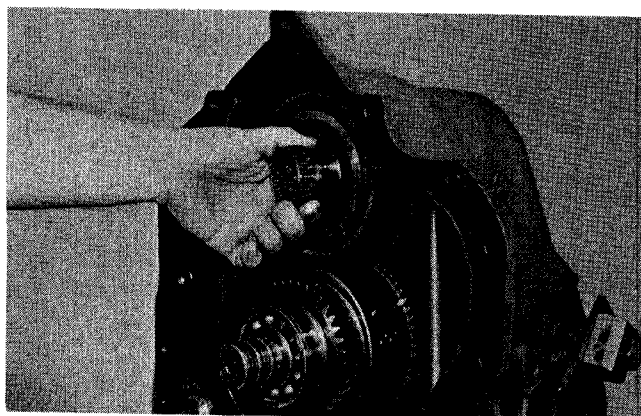


Figure 148

Install forward clutch pilot bearing.

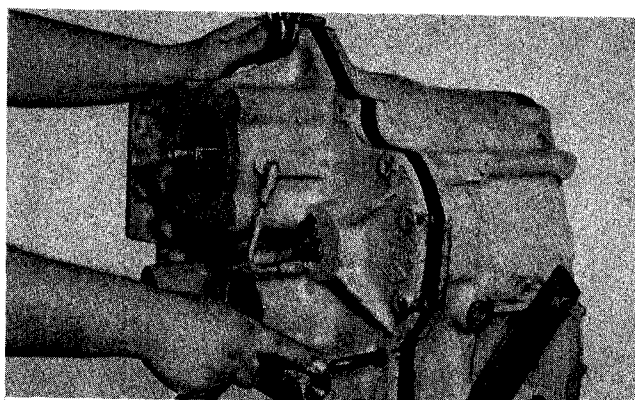


Figure 149

Position new gasket on front of transmission housing. A light coat of chassis grease will hold gasket in place. Locate front cover on transmission housing. Note aligning stud to facilitate assembly.

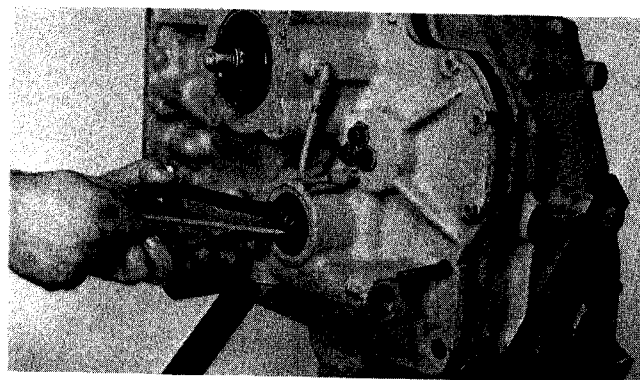


Figure 150

Spread ears on the reverse clutch front bearing. Lock pliers open to hold snap ring open.

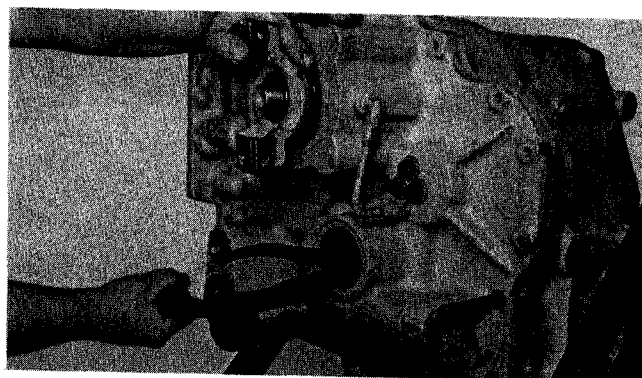


Figure 151

Install input flange on input shaft. Tap front cover while rotating input shaft. This will help in aligning gear teeth and clutch disc hub with clutch plates. Do not force this operation.

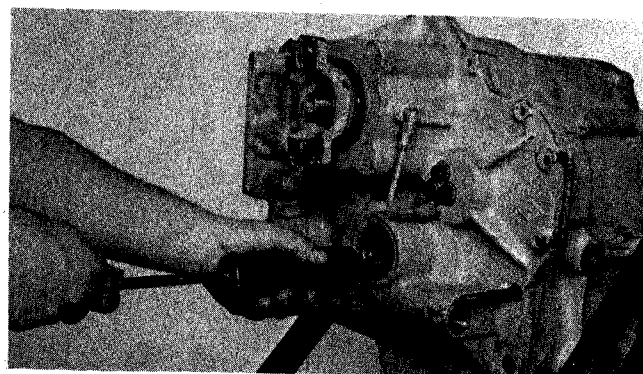


Figure 152

Install a cap screw in the front and one in the rear of the front cover and snug up but do not tighten. This will hold the cover to the transmission housing. Using a hook type hammer puller as shown, pull the reverse clutch gear toward the front of the housing. This will move the reverse and 2nd clutch assembly forward to align the snap ring groove in the bearing with the snap ring in the housing. Make sure snap ring is in full position in bearing ring groove.

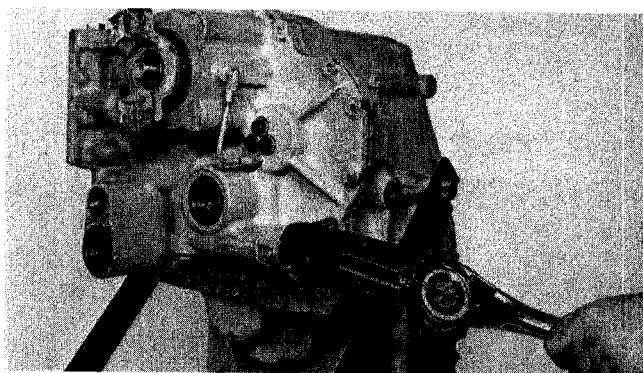


Figure 153

Remove aligning studs. Install front cover to transmission housing capscrews and washers. Tighten capscrews 37 to 41 ft. lbs. torque [50,2 - 55,5 N.m].

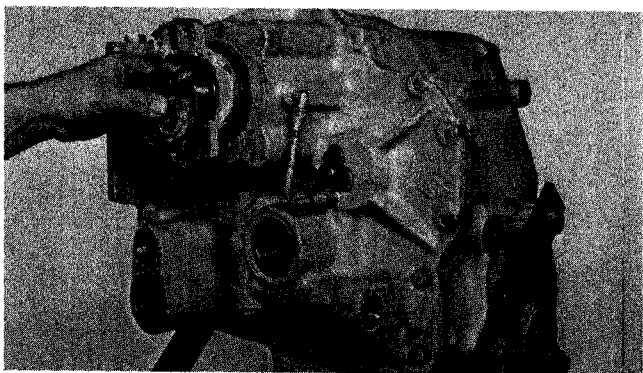


Figure 154

Install input shaft flange nut "O" ring, washer and nut. Tighten nut 200 to 250 ft. lbs. torque [271,2 - 339,0 N.m]. Install front cover plug and sump screen assembly.

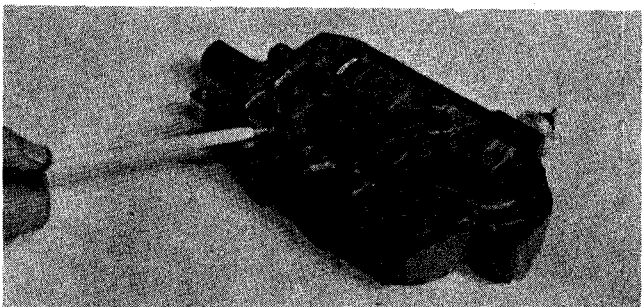


Figure 155

If the control cover valve spools are to be inspected or the spool oil seals changed, remove the valve spool stops as shown and pull spools out of oil seals. Always replace oil seals if valve spools are removed for inspection. Sharp edges on valve spool will cut lip of oil seal. When replacing oil seal, pick old seal out of housing using caution as not to damage oil seal bore. Install new seal in control valve. **NOTE:** When installing speed and direction selector spools through oil seal use extreme caution as not to cut lip of oil seal.

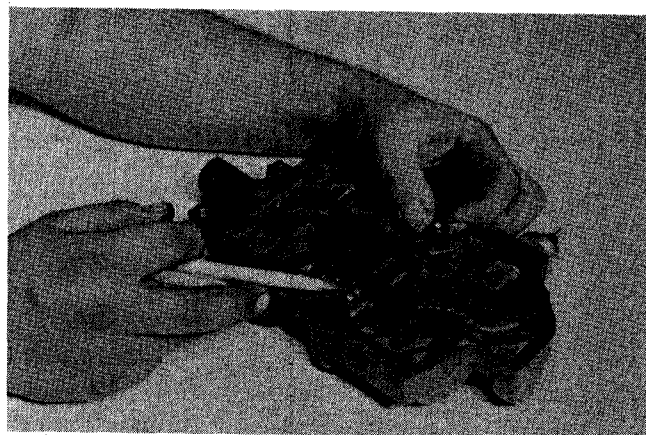


Figure 156

Position detent balls in housing.

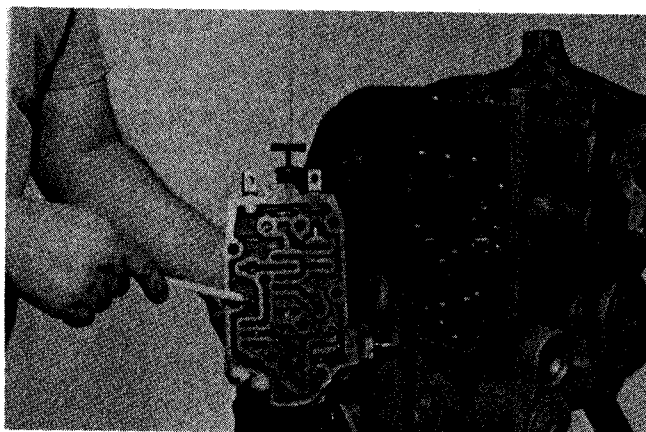


Figure 157

Position new gasket and detent springs on front cover. Note detent balls in position.

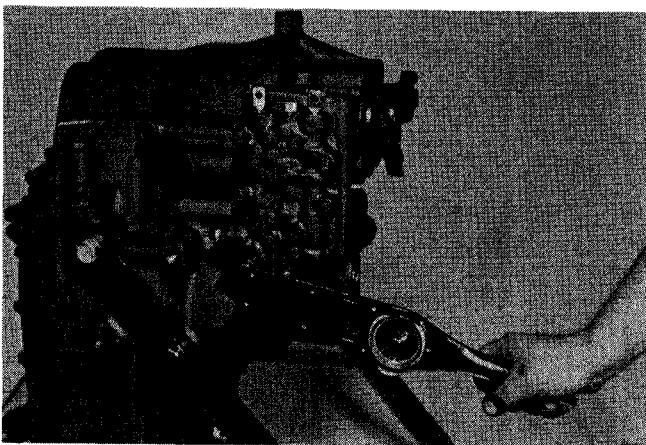


Figure 158

Install control valve capscrews and washers. Tighten capscrews 23 to 25 ft. lbs. torque [31,2 - 33,8 N.m]. **NOTE:** P.T.O. is optional. If P.T.O. is not used, coat outer diameter of bore plug with Permatex # 2. Tap bore plug in housing.

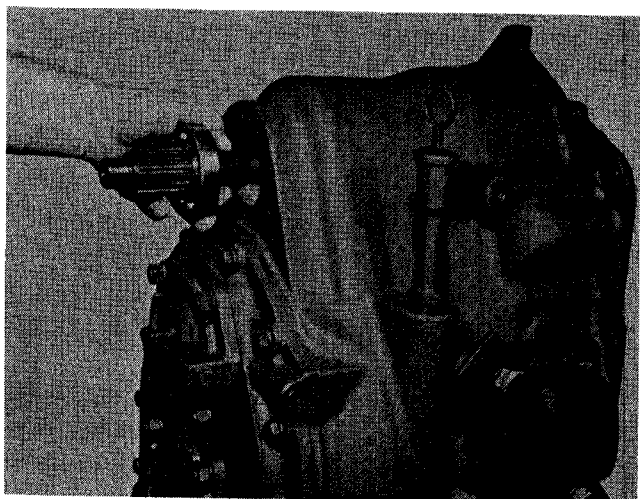


Figure 159

Position P.T.O. shaft and bearing in housing. Tap in place.

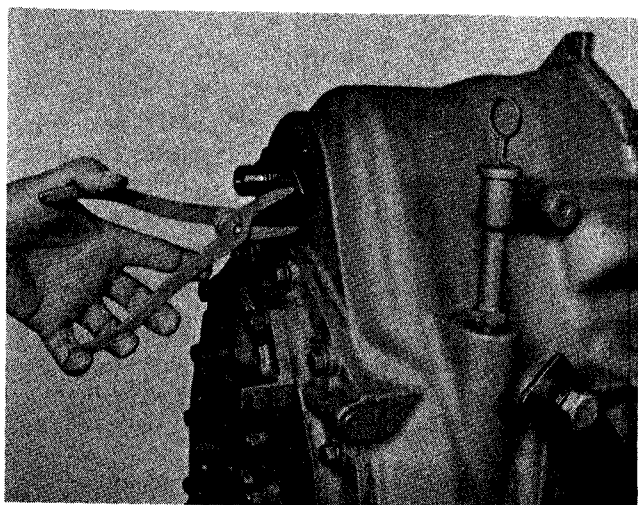


Figure 160

Install P.T.O. bearing retainer ring.

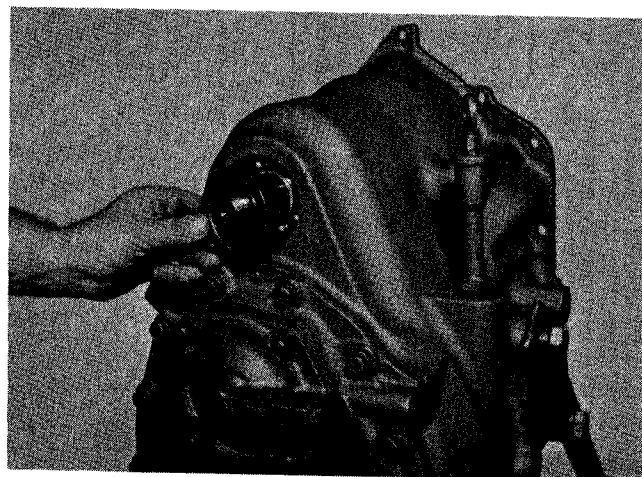


Figure 161

Coat outer diameter of P.T.O. seal with Permatex # 2. Install seal in housing with lip of seal toward the inside.

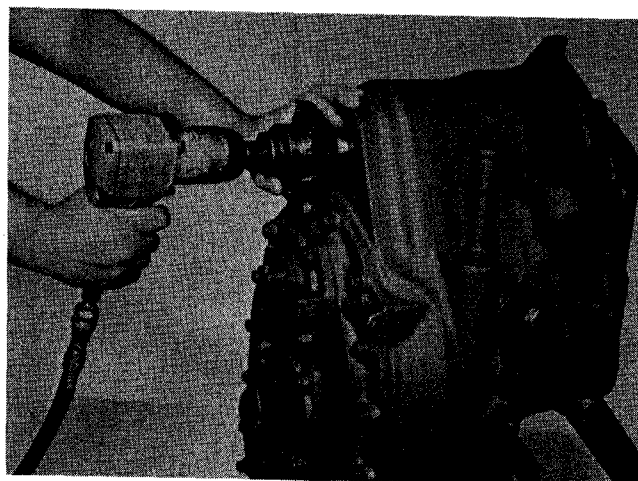


Figure 162

Install P.T.O. flange, new "O" ring, washer and nut. Tighten 200 to 250 ft. lbs. torque [271,2 - 339,0 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 engine 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.

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. Recheck with hot oil (180-200° F.) [82, 2-93, 3° C].

Bring oil level to **FULL** mark on dipstick.

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

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 drive-lines. Because of the design of the hydraulic system, the engine **cannot** be started by pushing or towing.

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 NEUTRAL . Operating specifications: 25 P.S.I. [172,4 kPa] minimum pressure at 2000 R.P.M. engine speed AND a maximum of 70 P.S.I. [482,6 kPa] 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 lubricated.
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

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.

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.

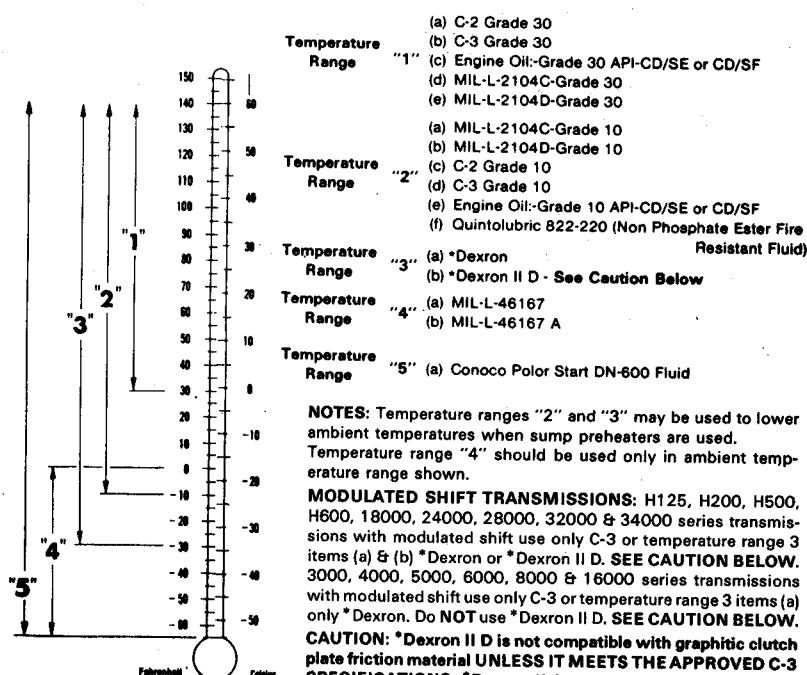
ALWAYS USE PARKING BRAKE WHEN MAKING CLUTCH PRESSURE CHECKS.

LUBRICATION

RECOMMENDED LUBRICANTS FOR CLARK POWER SHIFTED TRANSMISSION AND TORQUE CONVERTERS

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.

Prevailing Ambient Temperature



NOTES: Temperature ranges "2" and "3" may be used to lower ambient temperatures when sump preheaters are used. Temperature range "4" should be used only in ambient temperature range shown.

MODULATED SHIFT TRANSMISSIONS: H125, H200, H500, H600, 18000, 24000, 28000, 32000 & 34000 series transmissions with modulated shift use only C-3 or temperature range 3 items (a) & (b) *Dexron or *Dexron II D. **SEE CAUTION BELOW.** 3000, 4000, 5000, 6000, 8000 & 16000 series transmissions with modulated shift use only C-3 or temperature range 3 items (a) only *Dexron. Do NOT use *Dexron II D. **SEE CAUTION BELOW.**

CAUTION: *Dexron II D is not compatible with graphitic clutch plate friction material **UNLESS IT MEETS THE APPROVED C-3 SPECIFICATIONS.** *Dexron II D cannot be used in the 3000, 4000, 5000, 6000, 8000 or 16000 series power shift transmissions, or the HR28000, HR32000 & HR34000 series having converter lock-up, or the C270 series converter having lock-up **UNLESS IT MEETS THE APPROVED C-3 SPECIFICATIONS.**

Any deviation from this chart must have written approval from the application department of the Clark Components International Engineering and Marketing Department.

*** 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.**

TROUBLE SHOOTING GUIDE **For The** **R Model, 18000 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-18000 only)	3. Tighten all connections or replace hose if necessary.
4. Defective oil pump.	4. Replace pump.

OVERHEATING

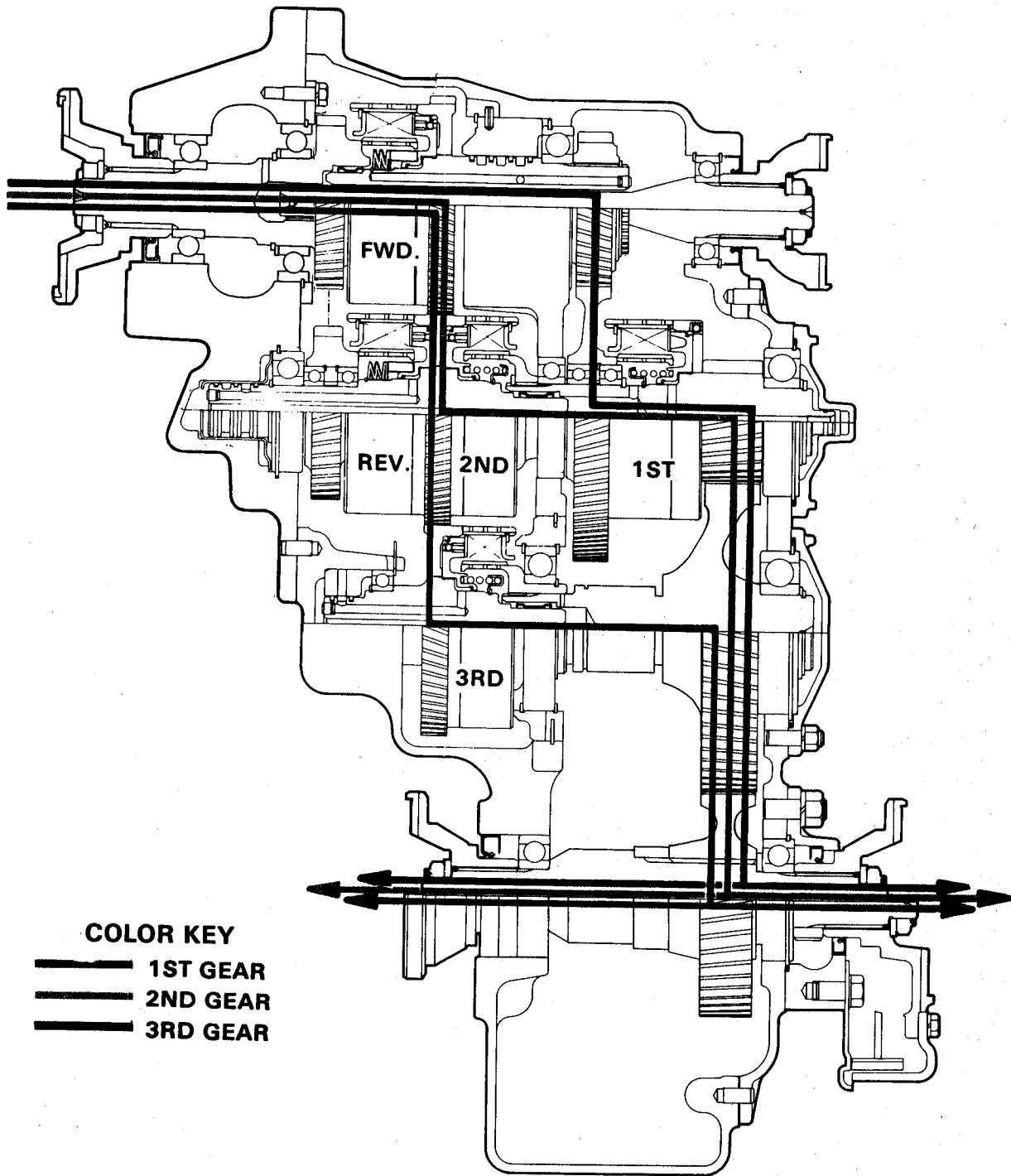
1. Worn oil sealing rings.	1. Remove, disassemble, and rebuild converter assembly.
2. Worn oil pump.	2. Replace.
3. Low oil level.	3. Fill to proper level.
4. Pump suction line taking air. (R-18000 only)	4. Check oil line connections and tighten securely.

NOISY CONVERTER

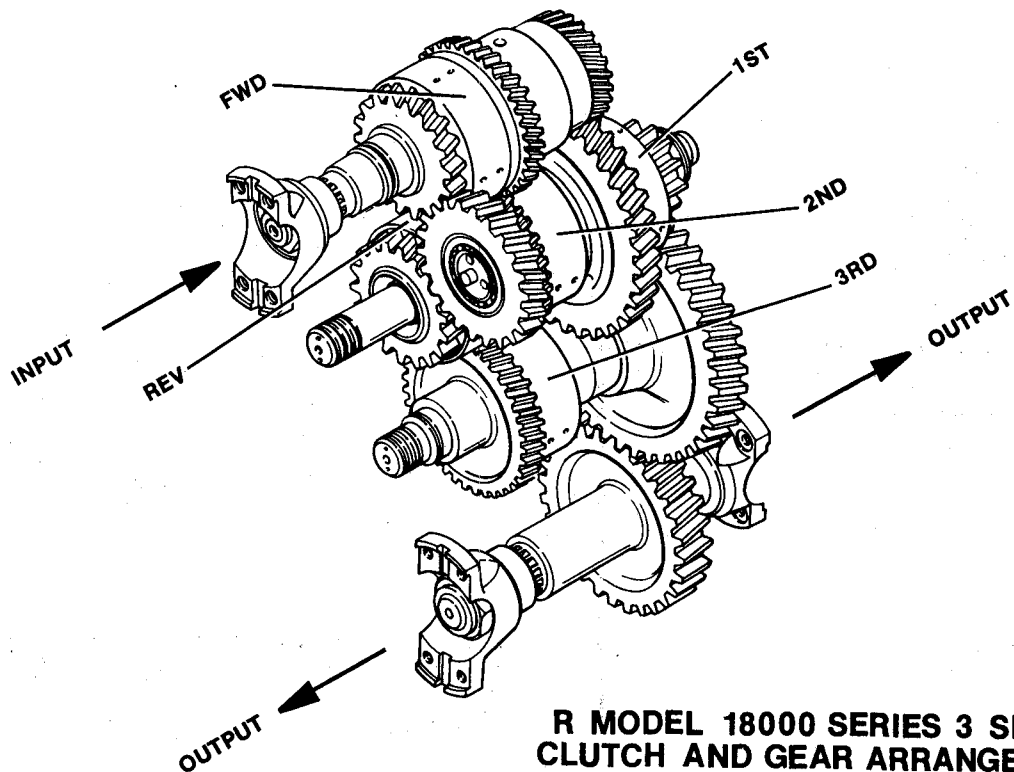
1. Worn oil pump.	1. Replace.
2. Worn or damaged bearings.	2. A complete disassembly will be necessary to determine what bearing is faulty.

LACK OF POWER

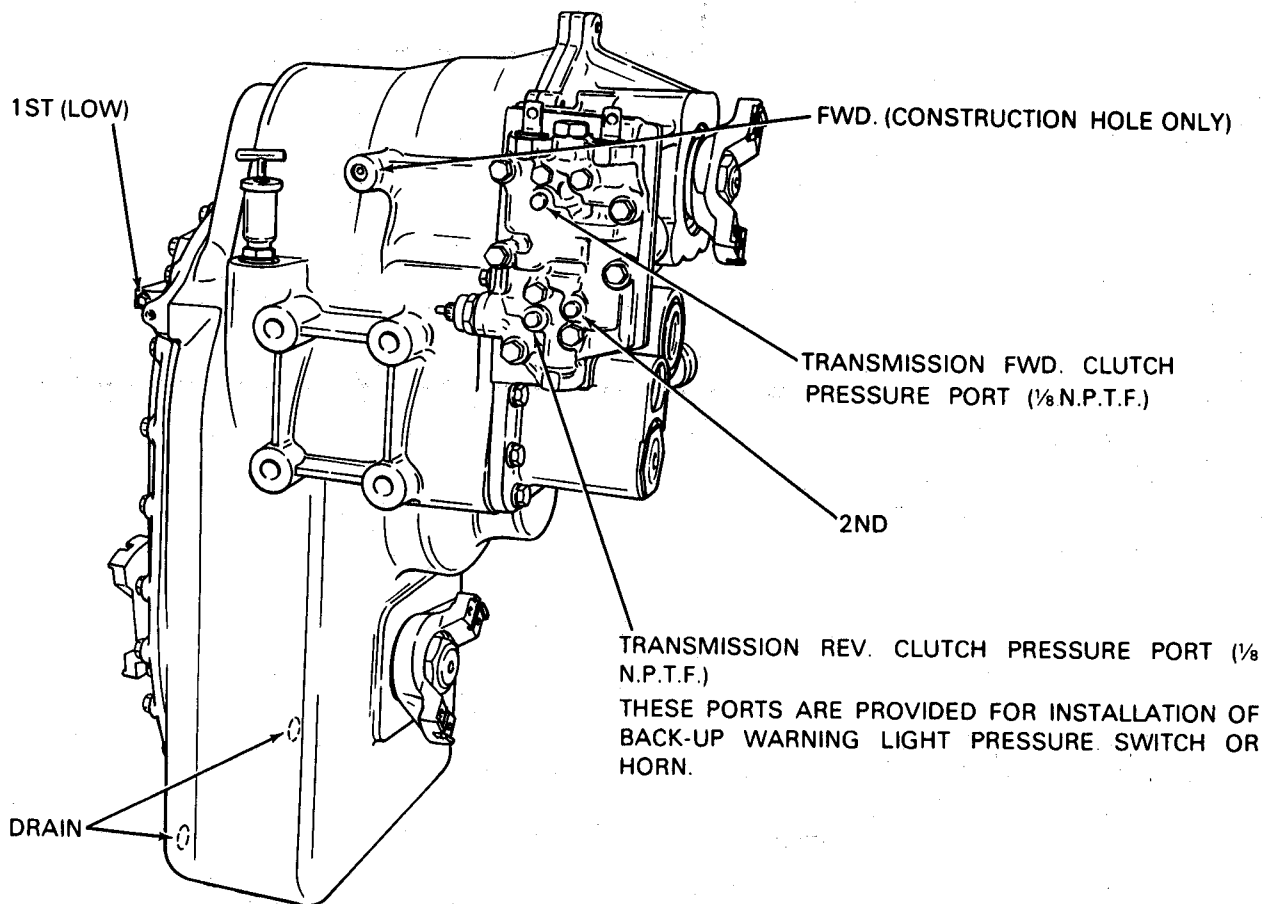
1. Low engine RPM at converter stall.	1. Tune engine check governor.
2. See "Overheating" and make same checks.	2. Make corrections as explained in "Overheating."



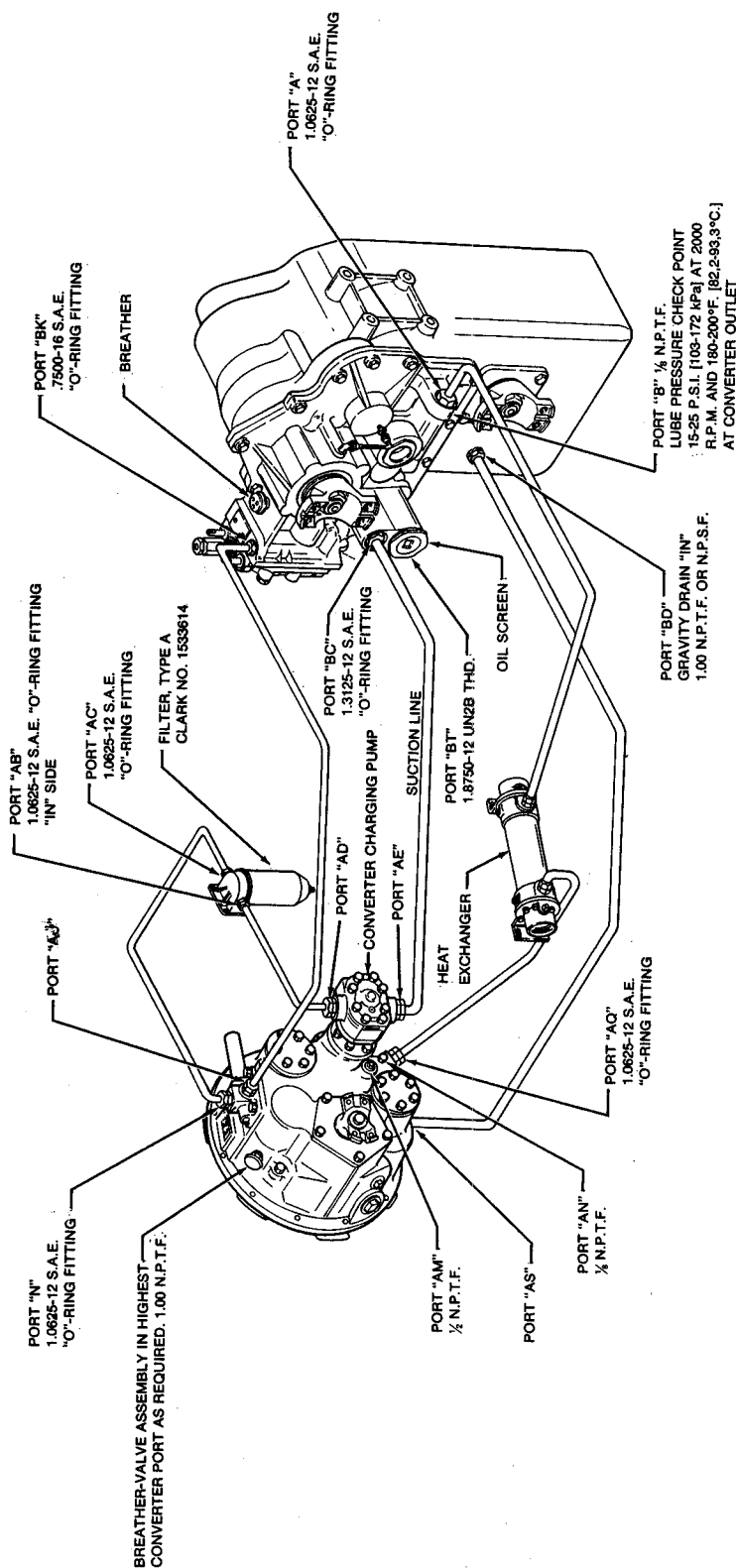
**3 SPEED LONG DROP TRANSMISSION
R MODEL POWER FLOW**



**R MODEL 18000 SERIES 3 SPEED
CLUTCH AND GEAR ARRANGEMENT**



PRESSURE CHECK POINTS



HOSE LINE OPERATING REQUIREMENTS

1. PRESSURE LINES SUITABLE FOR OPERATION FROM AMBIENT TO 250°F. [121,1°C.] CONTINUOUS OPERATING TEMPERATURE. MUST WITHSTAND 300 P.S.I. [2068 kPa] CONTINUOUS PRESSURE WITH 600 P.S.I. [4136 kPa] INTERMITTENT SURGES. REF. S.A.E. SPEC NO. J517,100R1 HYDRAULIC HOSE SPECIFICATION.

- PORT "AS" — CONVERTER DRAIN :

SELECT LOWEST OF PORTS NOTED FOR GRAVITY DRAIN TO TRANSMISSION. LINE MUST HAVE CONTINUOUS SLOPE FROM CONVERTER TO TRANSMISSION. IF VEHICLE CONFIGURATION WILL NOT ALLOW SLOPE OF DRAIN LINE UNDER ALL OPERATING CONDITIONS, A SCAVENGER PUMP MUST BE PROVIDED.

PORT "AM" — CONVERTED OUTLET TEMPERATURE

PORT IS TO BE USED FOR CONVERTER OUTLET TEMP. PICK-UP. GAUGE IS TO BE LOCATED IN THE OPERATOR COMPARTMENT. SEE OIL TEMP. GAUGE SPECIFICATIONS.

CONVERTER OUTLET PRESSURE EQUALS THE TOTAL PRESSURE DROP OF THE HEAT EXCHANGER, HEAT EXCHANGER LINES AND BACK PRESSURE OF THE TRANSMISSION LUBRICATION SYSTEM. CONVERTER OUTLET OIL TEMP. 180°F. 220°F. (82.2°-93.3°C.). TRANSMISSION IN NEUTRAL

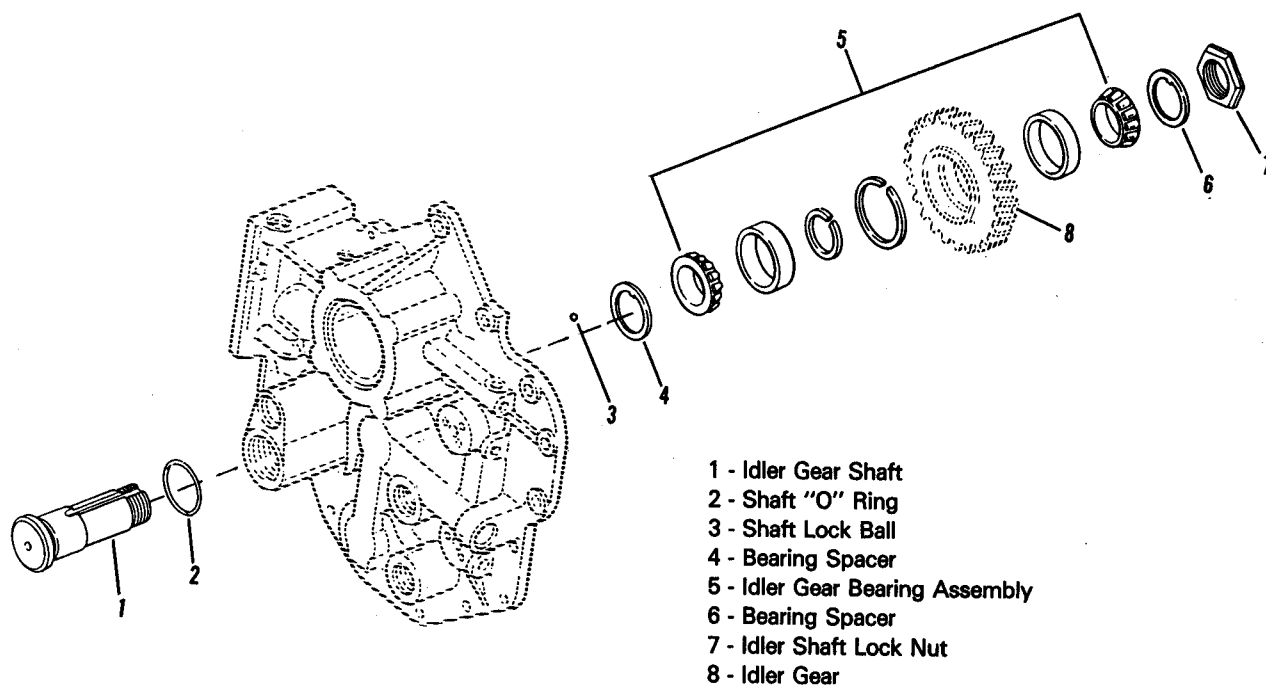
25 P.S.I. [172 kPa] MINIMUM PRESSURE AT 2000 R.P.M. ENGINE AND A MAXIMUM OF 70 P.S.I. [482 kPa] OUTLET PRESSURE WITH ENGINE AT NO-LOAD GOVERNED SPEED.

180-220 P.S.I. [1241-1516 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 WITH 5 P.S.I. [34 kPa]. IF CLUTCH PRESSURE VARIES IN ANY ONE CLUTCH MORE THAN 5 P.S.I. [34 kPa] REPAIR CLUTCH.

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.

ALWAYS USE PARKING BRAKE WHEN MAKING CLUTCH PRESSURE CHECKS

HOSE LINE SIZE				
FROM PORT	TO PORT	LINE I.D.	REMARKS	
BC	AE	1.00 [25.4]	SUCTION LINE	
AD	AB	.75 [19.0]		
AC	N	.75 [19.0]		
AJ	BK	.50 [12.7]		
AQ	HEAT EXCHANGER	.75 [19.0]		
HEAT EXCHANGER	A	.75 [19.0]		
AS	BD	1.00 [25.4]	DRAIN LINE	
HEAT EXCHANGER	D	.75 [19.0]		
BR	A	.75 [19.0]		



DISASSEMBLY AND REASSEMBLY OF LOCK NUT TYPE IDLER SHAFT

DISASSEMBLY

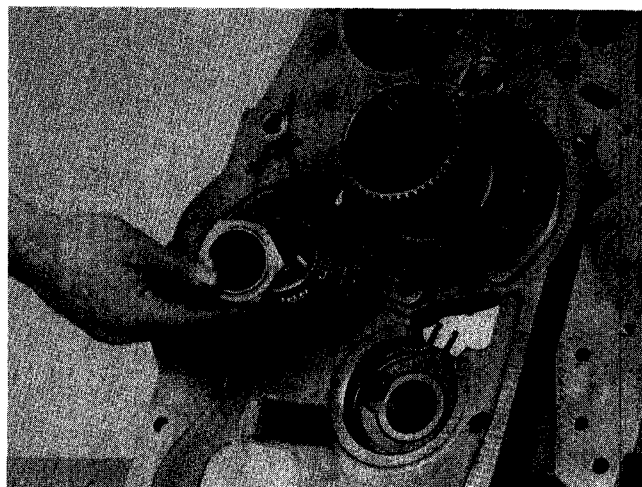


Figure 163

Unclinch lock nut by straightening upset metal in notch in idler shaft. Remove idler shaft nut.

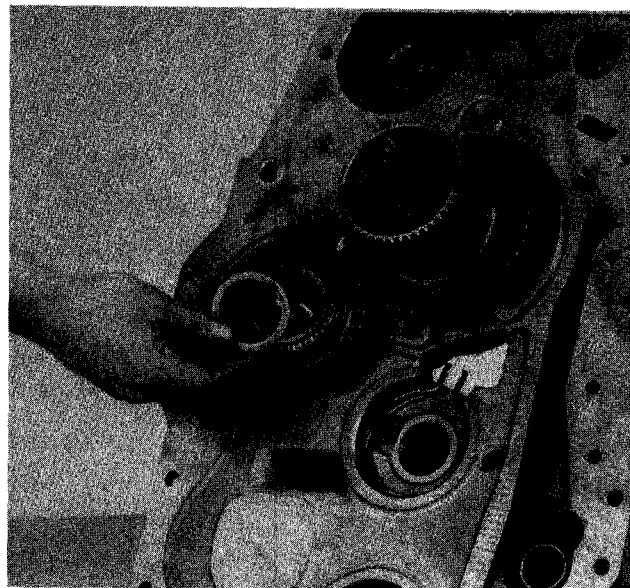


Figure 164

Remove nut spacer.

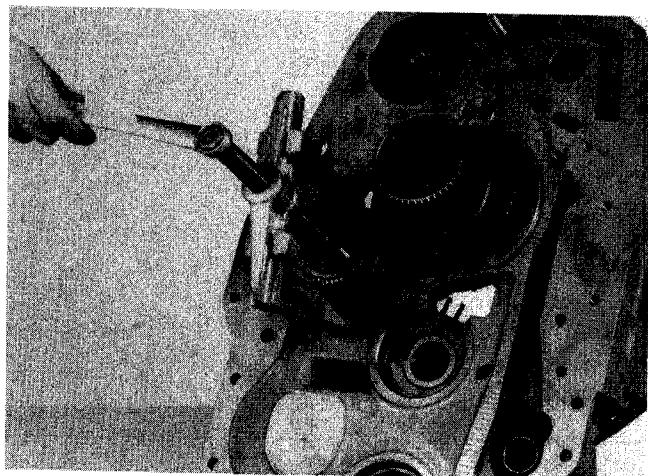


Figure 165
Remove idler gear and outer taper bearing from idler shaft.

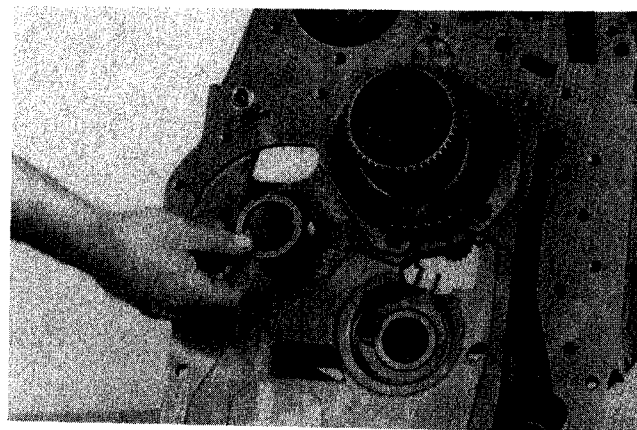


Figure 168
Remove bearing spacer.

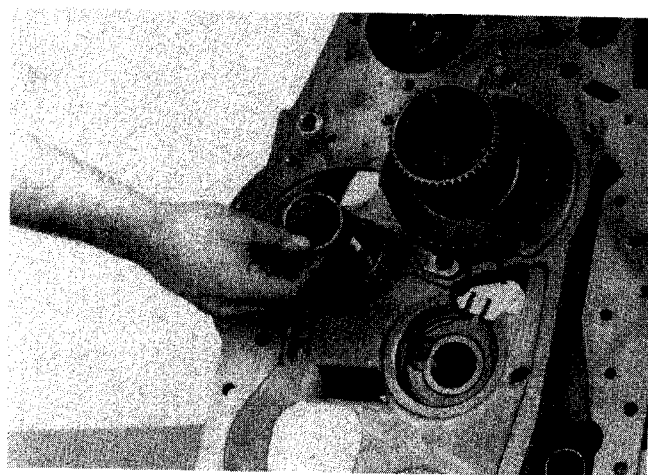


Figure 166
Remove bearing spacer.

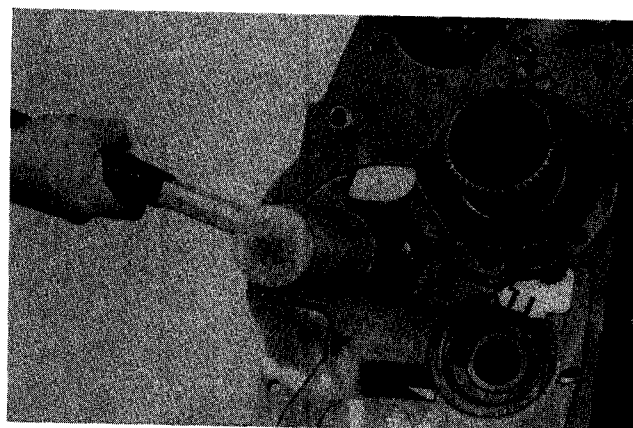


Figure 169
Remove idler shaft, use caution as not to lose shaft lock ball
Refer to page 18 for further disassembly.

REASSEMBLY OF LOCKNUT TYPE IDLER SHAFT

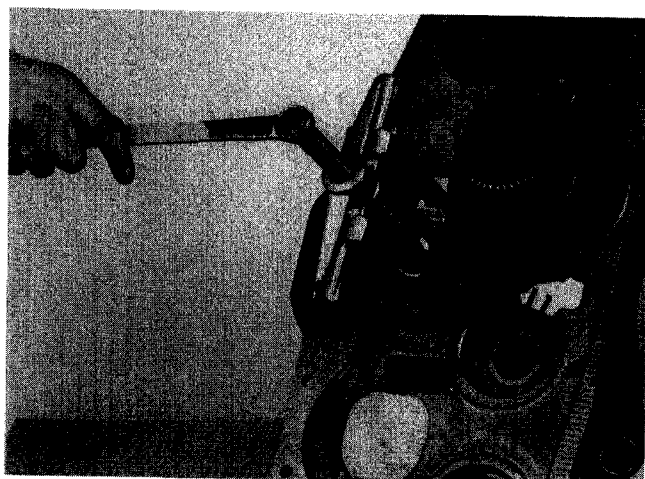


Figure 167
Remove inner taper bearing.



Figure 170
With new "O" ring on shaft, position idler shaft and lock ball in
converter housing. Tap shaft into position. Note lock ball.

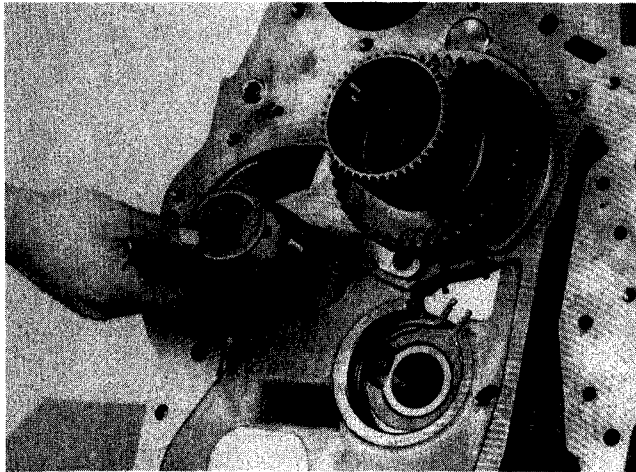


Figure 171
Install reverse idler shaft spacer.

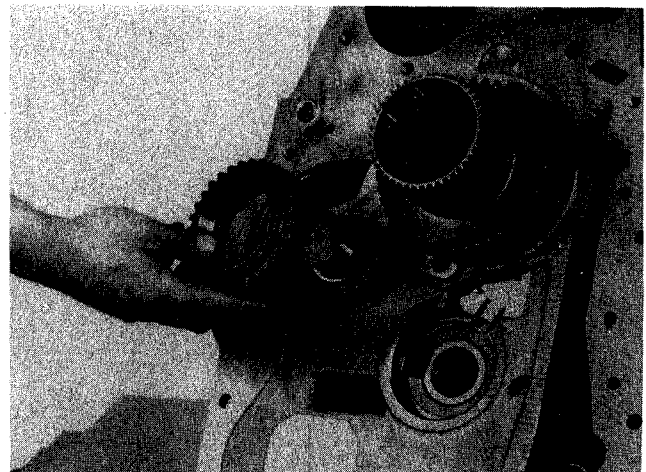


Figure 174
Position idler gear on bearing with hub of gear up.

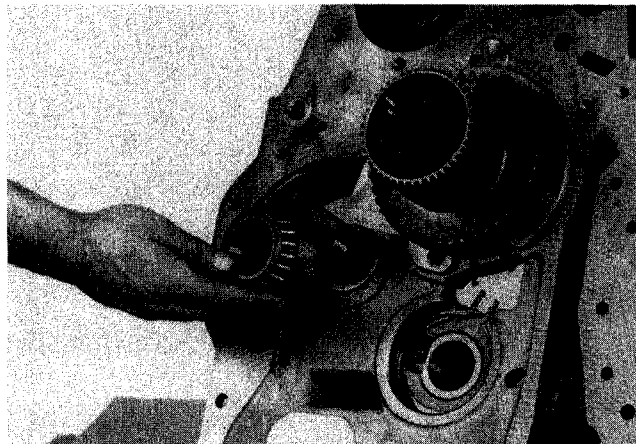


Figure 172
Install inner taper bearing on shaft with large diameter of taper down.

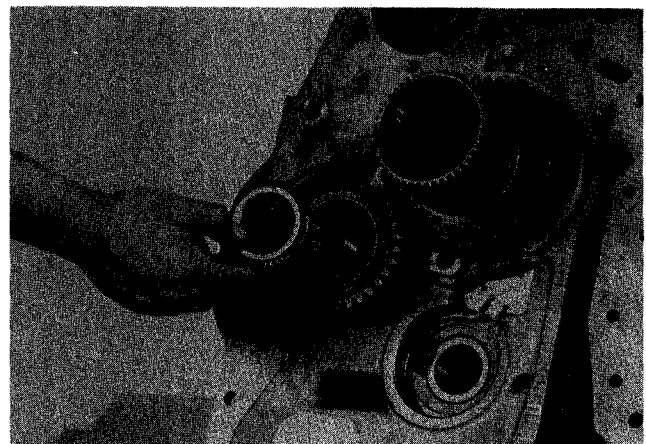


Figure 175
Install idler gear outer taper bearing with large diameter of taper up.

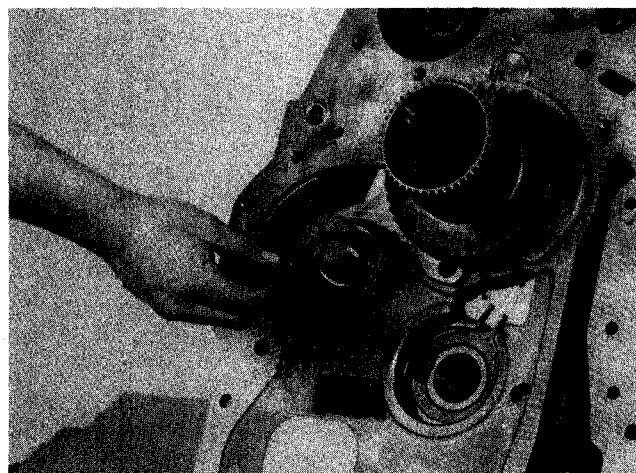


Figure 173
Position bearing spacer on shaft.



Figure 176
Position outer spacer on shaft.

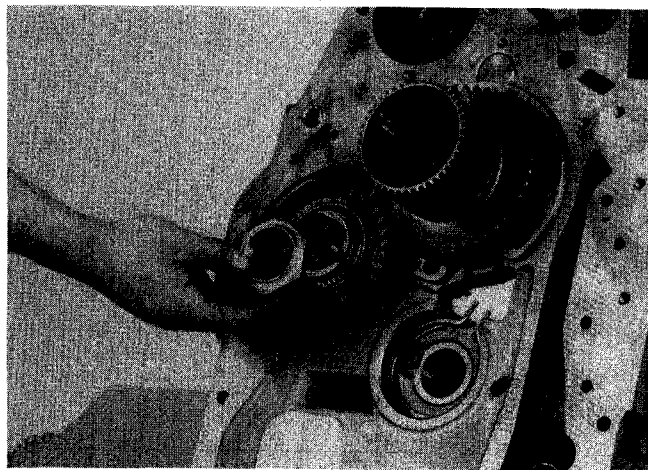


Figure 177
Install retainer nut.

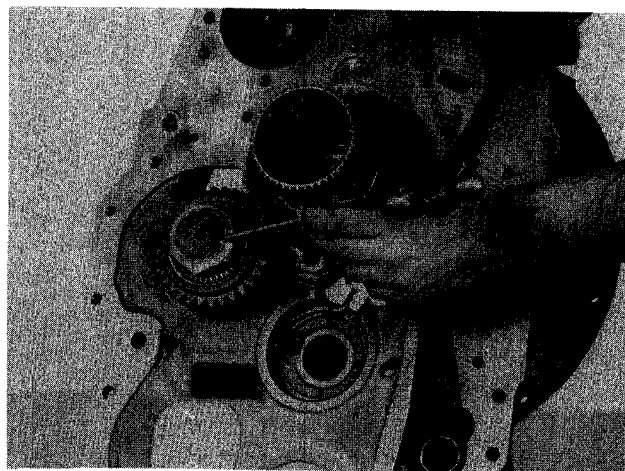


Figure 179
Stake nut securely in shaft notch.

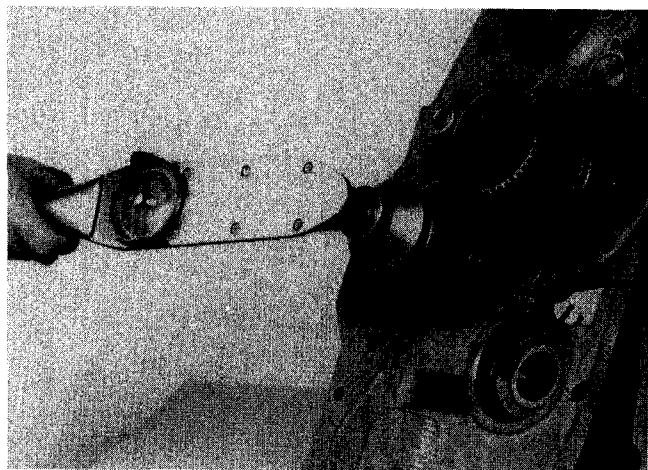


Figure 178
Tighten nut 200 - 250 ft. lbs. torque [271,2 - 338,8 N.m].