

# Maintenance/Service Manual

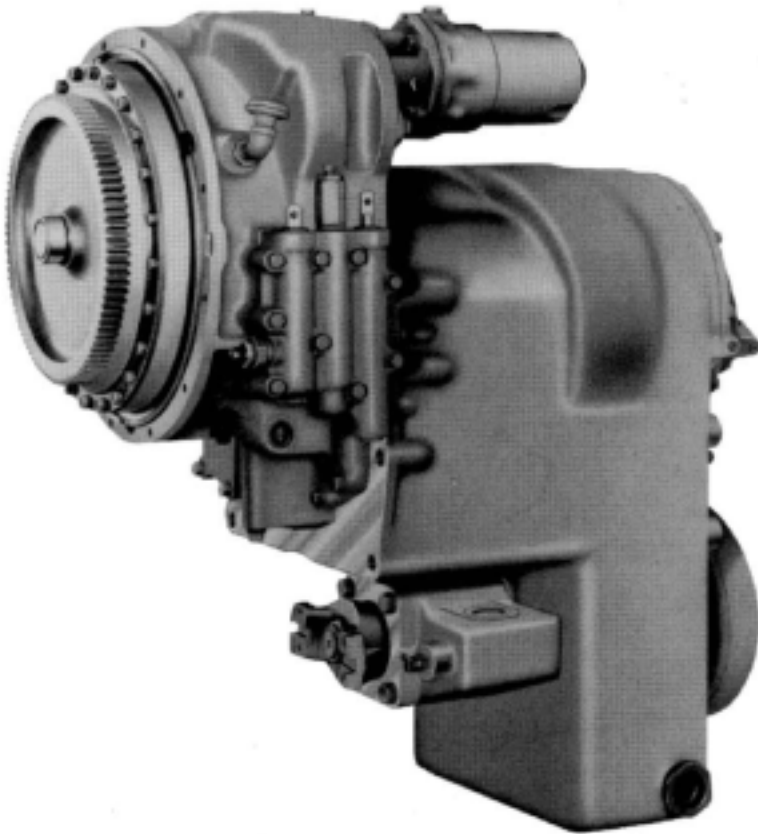
## Model 32000

### Powershift Transmission

R & HR MODEL

3, 6 & 8 SPEED with RANGE SHIFT

LONG DROP



**SPICER OFF-HIGHWAY COMPONENTS**



## TOWING OR PUSH STARTING

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

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

## FORWARD

This manual has been prepared to provide the customer and the maintenance personnel with information and instructions on the maintenance and repair of the **SPICER OFF-HIGHWAY COMPONENTS DIVISION** product.

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

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

Whenever repair or replacement of component parts is required, only **Spicer Off-Highway Components Division**-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. **Spicer Off-Highway Components Division** does not warrant repair or replacement parts, nor failures resulting from the use of parts which are not supplied by or approved by **Spicer Off-Highway Components Division**. **IMPORTANT: Always furnish the Distributor with the serial and model number when ordering parts.**

## TABLE OF CONTENTS

### HOW THE UNITS OPERATE

### SECTIONAL VIEWS AND PARTS IDENTIFICATION

Basic Design Silhouette.....	Fig. A
Converter Group.....	Fig. B
Converter and Transmission Case Group.....	Fig. C
Reverse and 3rd and Forward and 2nd Clutch Group.....	Fig. D
Low (1st Clutch) and Output Group.....	Fig. E
Regulating Valve, Charging Pump and Filter Group.....	Fig. F
Control Valve Assembly.....	Fig. G
Axle Disconnect and Mechanical Parking Brake.....	Fig. H
Assembly Instruction Illustration.....	Fig. I
HR32000 3 Speed Typical Cross Section .....	Fig J
DISASSEMBLY OF TRANSMISSION.....	1
REASSEMBLY OF TRANSMISSION.....	38
SERVICING MACHINE AFTER TRANSMISSION OVERHAUL.....	56
SPECIFICATIONS AND SERVICE DATA.....	57
LUBRICATION.....	57
TROUBLE SHOOTING GUIDE.....	58
16 SCREW RING GEAR INSTALLATION.....	60-61
TYPICAL THREE SPEED POWER FLOW.....	62-63
HR EXTERNAL PLUMBING DIAGRAM.....	65
CLEANING AND INSPECTION.....	66
SPEED SENSOR BUSHING INSTALLATION.....	67
32 SCREW RING GEAR INSTALLATION.....	68-69
R-MODEL SECTION.....	70
6 & 8 SPEED SECTION.....	80
8 SPEED SECTION.....	92
DRIVE PLATE INSTALLATION.....	98
ELECTRIC CONTROLS.....	100

NOTE: Metric Dimensions Shown in Brackets [   ].



## TRANSMISSION ASSEMBLY

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

The transmission and torque converter function together and operate through a common hydraulic system. It is necessary to consider both units in the study of their function and operation.

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

- Basic Design Silhouette
- Converter Group
- Converter and Transmission Case Group
- Reverse and 3rd, Forward and 2nd Clutch Group
- Low (1st) Clutch and Output Group
- Regulating Valve, Charging Pump and Filter Group
- Control Valve Assembly
- Axle Disconnect and Mechanical Parking Brake
- Assembly Instruction
- Ring Gear Installation
- Clutch and Gear Arrangement
- Three Speed Power Flow
- External Plumbing

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

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

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

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

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

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

## HOW THE UNITS OPERATE

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

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

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

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

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

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

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

The shift control valve assembly consists of a valve body with selector valve spools. A detent ball and spring in the selector spool provides one position for each speed range. A detent ball and spring in the direction spool provides three positions, one each for forward, neutral and reverse.

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

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

The direction or speed clutch assembly consists of a drum with internal splines and a bore to receive a hydraulically actuated piston. The piston is "oil tight" by the use of sealing rings. A steel disc with external splines is inserted into the drum and rests against the piston. Next, a friction disc with splines at the inner diameter is inserted. Discs are alternated until the required total is achieved. A heavy back-up plate is then inserted and secured with a snap ring. A Hub with O.D. splines is inserted into the splines of discs with teeth on the inner diameter. The discs and hub are free to increase in speed or rotate in the opposite direction as long as no pressure is present in that specific clutch.

To engage the clutch, as previously stated, the control valve is placed in the desired position. This allows oil under pressure to flow from the control valve, through a tube, to a chosen clutch shaft. This shaft has a drilled passageway for oil under pressure to enter the shaft. Oil pressure sealing rings are located on the clutch shaft. These rings direct oil under pressure to a desired clutch. Pressure of the oil forces the piston and discs against the heavy back-up plate. The discs, with teeth on the outer diameter, clamping against discs with teeth on the inner diameter, enables the hub and clutch shaft to be locked together and allows them to drive as a unit.

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



R-32000

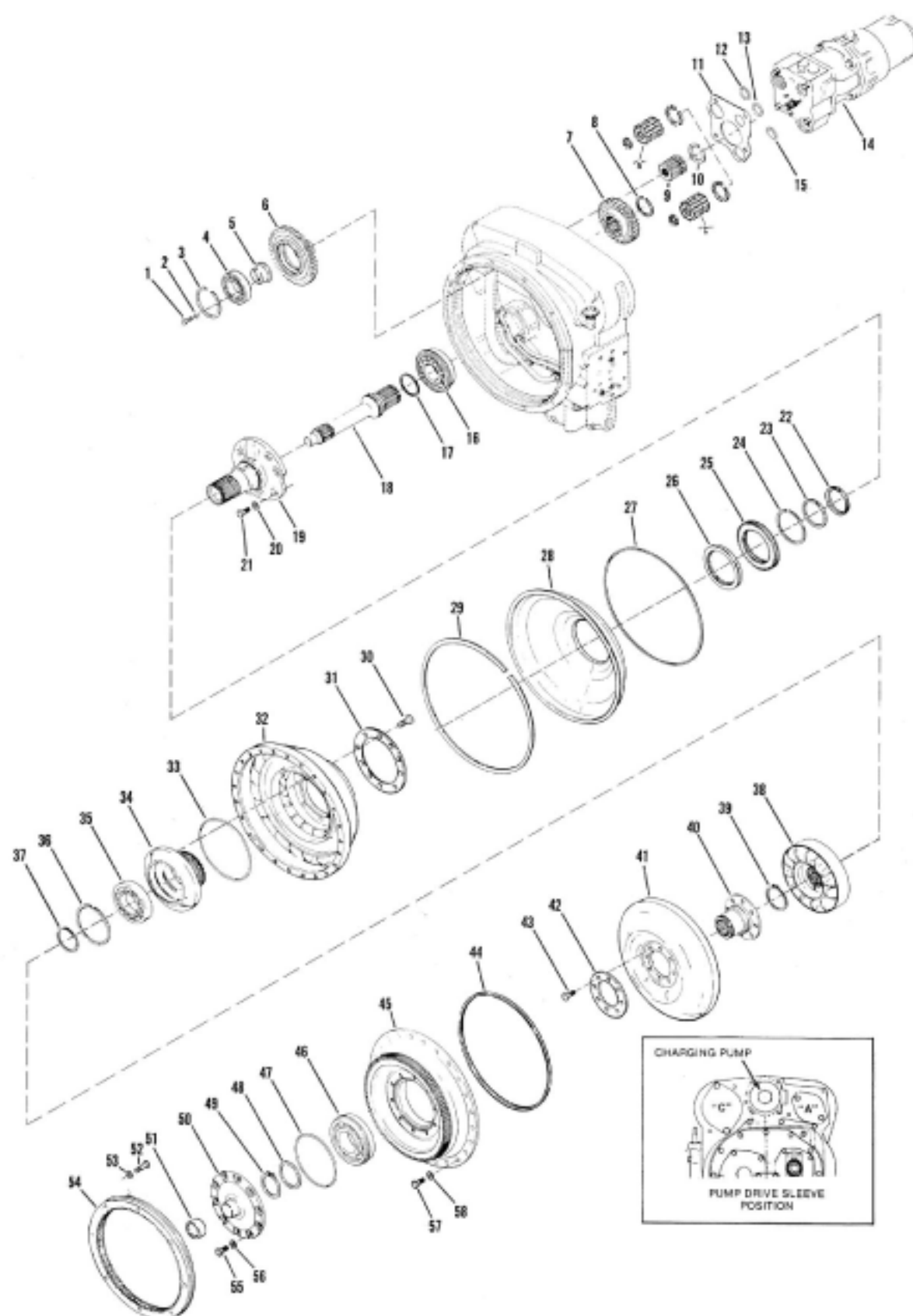


HR-32000



MHR-32000

FIG. A



**Figure B**

## HR32000 CONVERTER GROUP

ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	Bearing Support Screw .....	6	30	Hub to Impeller Screw.....	12
2	Bearing Support Screw Lockwasher...	6	31	Impeller Hub Screw Backing Ring ....	1
3	Drive Gear Snap Ring .....	3	32	Impeller.....	1
4	Pump Drive Gear Bearing .....	3	33	Impeller Hub "O" Ring .....	1
5	Pump Drive Bearing Support.....	3	34	Impeller Hub.....	1
6	Pump Drive Gear .....	3	35	Impeller Hub Bearing.....	1
7	Turbine Shaft Gear.....	1	36	Bearing Snap Ring .....	1
8	Turbine Shaft Gear Snap Ring .....	1	37	Reaction Member Spacer .....	1
9	Charging Pump Drive Sleeve.....	1	38	Reaction Member.....	1
10	Pump Sleeve Snap Ring .....	1	39	Reaction Member Snap Ring .....	1
11	Valve to Housing Gasket.....	1	40	Turbine Hub .....	1
12	Valve Body "O" Ring .....	1	41	Turbine .....	1
13	Valve Body "O" Ring .....	1	42	Turbine Hub Backing Ring .....	1
14	Charging Pump & Oil Filter Assembly ...	1	43	Turbine Hub Screw .....	8
15	Valve Body "O" Ring .....	1	44	Impeller to Cover "O" Ring.....	1
16	Turbine Shaft Bearing .....	1	45	Impeller Cover .....	1
17	Turbine Shaft Piston Ring.....	1	46	Impeller Cover Bearing .....	1
18	Turbine Shaft .....	1	47	Bearing Cap to Impeller Cover "O" Ring	1
19	Stator Support .....	1	48	Bearing Washer .....	1
20	Stator Support Screw Lockwasher ....	6	49	Bearing Snap Ring .....	1
21	Stator Support Screw.....	6	50	Impeller Cover Bearing Cap.....	1
22	Piston Ring .....	1	51	Impeller Cover Sleeve .....	1
23	Piston Ring Expander Spring .....	1	52	Ring Gear Screw .....	16
24	Impeller Hub Gear Snap Ring.....	1	53	Plain Washer.....	16
25	Impeller Hub Gear .....	1	54	Flywheel Ring Gear .....	1
26	Oil Baffle Oil Seal.....	1	55	Bearing Cap to Impeller Cover Screw ...	10
27	Oil Baffle Seal Ring .....	1	56	Bearing Cap to Impeller Cover Screw Lockwasher .....	10
28	Oil Baffle .....	1	57	Impeller to Cover Screw .....	24
29	Oil Baffle Retainer Ring.....	1	58	Impeller to Cover Screw Lockwasher ...	24

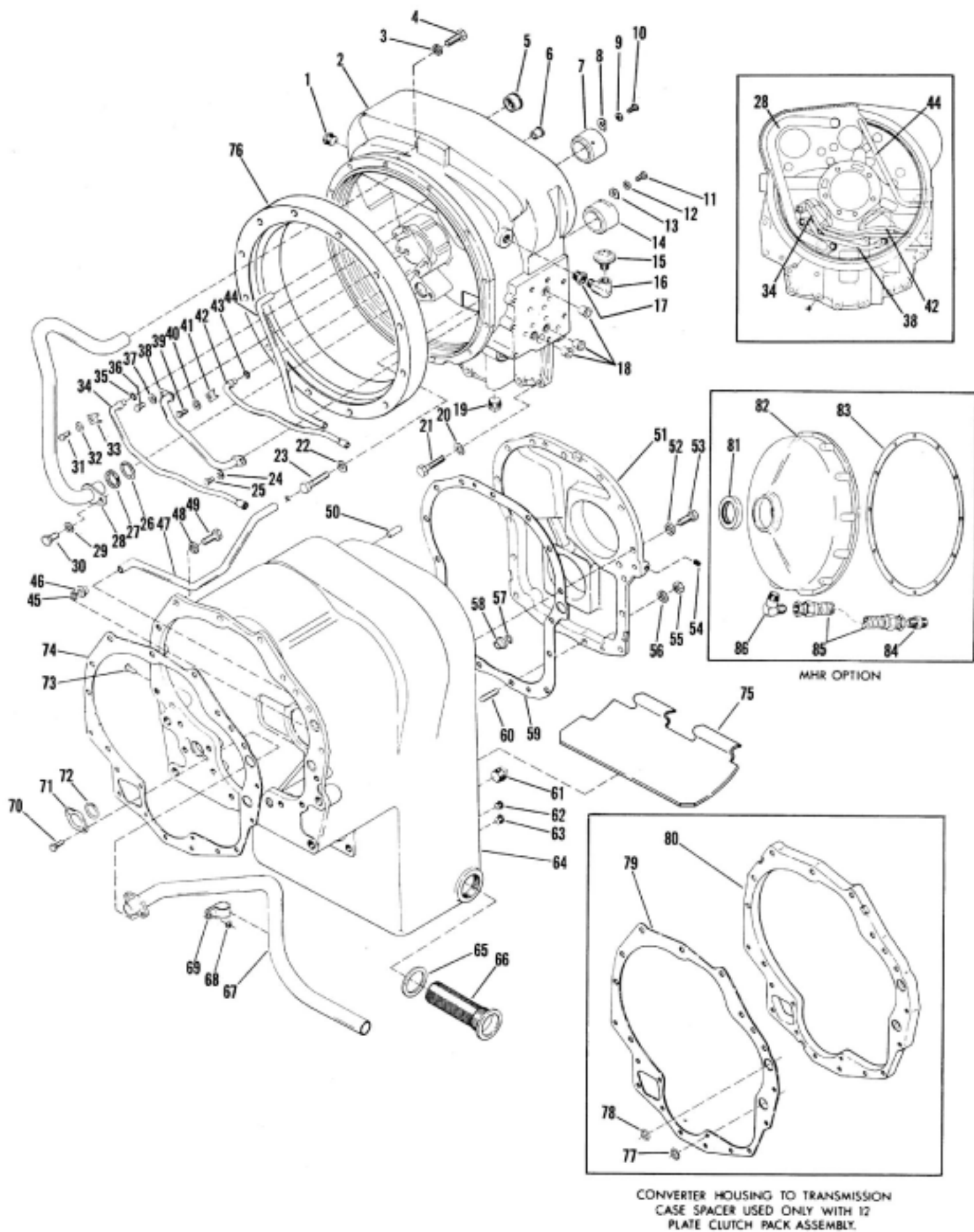


Figure C

# **HR32000 CONVERTER & TRANSMISSION CASE GROUP**

ITEM	DESCRIPTION	QTY	ITEM	DESCRIPTION	QTY
1	Pipe Plug.....	1	45	Clutch Pressure Tube "O" Ring.....	1
2	Converter Housing Assembly.....	1	46	Tube Sleeve.....	1
3	Converter Housing to Front Cover Screw Lockwasher.....	12	47	Low Speed Clutch Pressure Tube.....	1
4	Converter Housing to Front Cover Screw.....	12	48	Transmission Case to Converter Housing Screw Lockwasher.....	10
5	Tube Sleeve.....	1	49	Transmission Case to Converter Housing Screw.....	10
6	Tube Sleeve.....	1	50	Rear Cover Dowel Pin.....	2
7	Converter Housing Sleeve.....	1	51	Rear Cover.....	1
8	Converter Housing Sleeve Lock.....	1	52	Rear Cover to Transmission Case Screw Lockwasher.....	13
9	Converter Housing Sleeve Screw Lockwasher.....	1	53	Rear Cover to Transmission Case Screw.....	13
10	Converter Housing Sleeve Screw.....	1	54	Rear Cover Pipe Plug.....	1
11	Converter Housing Sleeve Screw.....	1	55	Rear Cover to Case Stud Nut.....	2
12	Converter Housing Sleeve Screw Lockwasher.....	1	56	Rear Cover to Case Stud Lockwasher.....	2
13	Converter Housing Sleeve Lock.....	1	57	Clutch Pressure Tube "O" Ring.....	1
14	Converter Housing Sleeve.....	1	58	Tube Sleeve.....	1
15	Breather.....	1	59	Rear Cover to Transmission Case Gasket.....	1
16	Street Ell.....	1	60	Rear Cover to Case Stud.....	2
17	Breather Reducing Bushing.....	1	61	Magnetic Drain Plug.....	1
18	Tube Sleeve.....	3	62	Oil Level Plug.....	1
19	Pipe Plug.....	1	63	Oil Level Plug.....	1
20	Converter Housing to Transmission Housing Screw Lockwasher.....	4	64	Transmission Case Assembly.....	1
21	Converter Housing to Transmission Housing Screw.....	4	65	Screen Assembly Gasket.....	1
22	Converter Housing to Transmission Housing Lockwasher.....	4	66	Screen Assembly.....	1
23	Converter Housing to Transmission Housing Screw.....	4	67	Suction Tube.....	1
24	Lube Tube Retaining Screw Lockwasher.....	1	68	Suction Tube Clip Washer.....	1
25	Lube Tube Retaining Screw.....	1	69	Suction Tube Clip.....	1
26	Suction Tube "O" Ring.....	1	70	Suction Line Screw.....	2
27	Suction Tube Spacer Ring.....	1	71	Suction Line Washer.....	1
28	Suction Tube Assembly.....	1	72	Suction Line "O" Ring.....	1
29	Suction Tube Retainer Screw Lockwasher.....	1	73	Suction Tube Clip Rivet.....	1
30	Suction Tube Retainer Screw.....	1	74	Converter Housing to Transmission Case Gasket.....	1
31	Tube Clip Screw.....	1	75	Oil Baffle.....	1
32	Tube Clip Screw Lockwasher.....	1	76	Converter Housing Adaptor Ring.....	1
33	Tube Clip.....	1	77	4th Speed Pressure Tube "O" Ring.....	1
34	Reverse Tube Assembly.....	1	78	Low Speed Pressure Tube "O" Ring.....	1
35	Reverse Tube "O" Ring.....	1	79	Converter Housing to Transmission Case Gasket.....	1
36	Lube Tube Retainer Screw.....	1	80	Converter Housing to Transmission Case Spacer (12 plate clutch pack only).....	1
37	Lube Tube Retainer Screw Lockwasher.....	1	81	Front Cover Oil Seal.....	1
38	Lube Tube Assembly.....	1	82	Converter Housing Front Cover.....	1
39	Tube Clip Screw.....	1	83	Converter Housing Front Cover Gasket.....	1
40	Tube Clip Screw Lockwasher.....	1	84	Hose Fitting.....	1
41	Tube Clip.....	1	85	Hose Assembly.....	1
42	3rd Speed Tube.....	1	86	Hose Fitting.....	1
43	3rd Speed Tube "O" Ring.....	1			
44	Valve Oil Supply Tube.....	1			

**ITEMS 81 THRU 86 FOR MHR ONLY.**

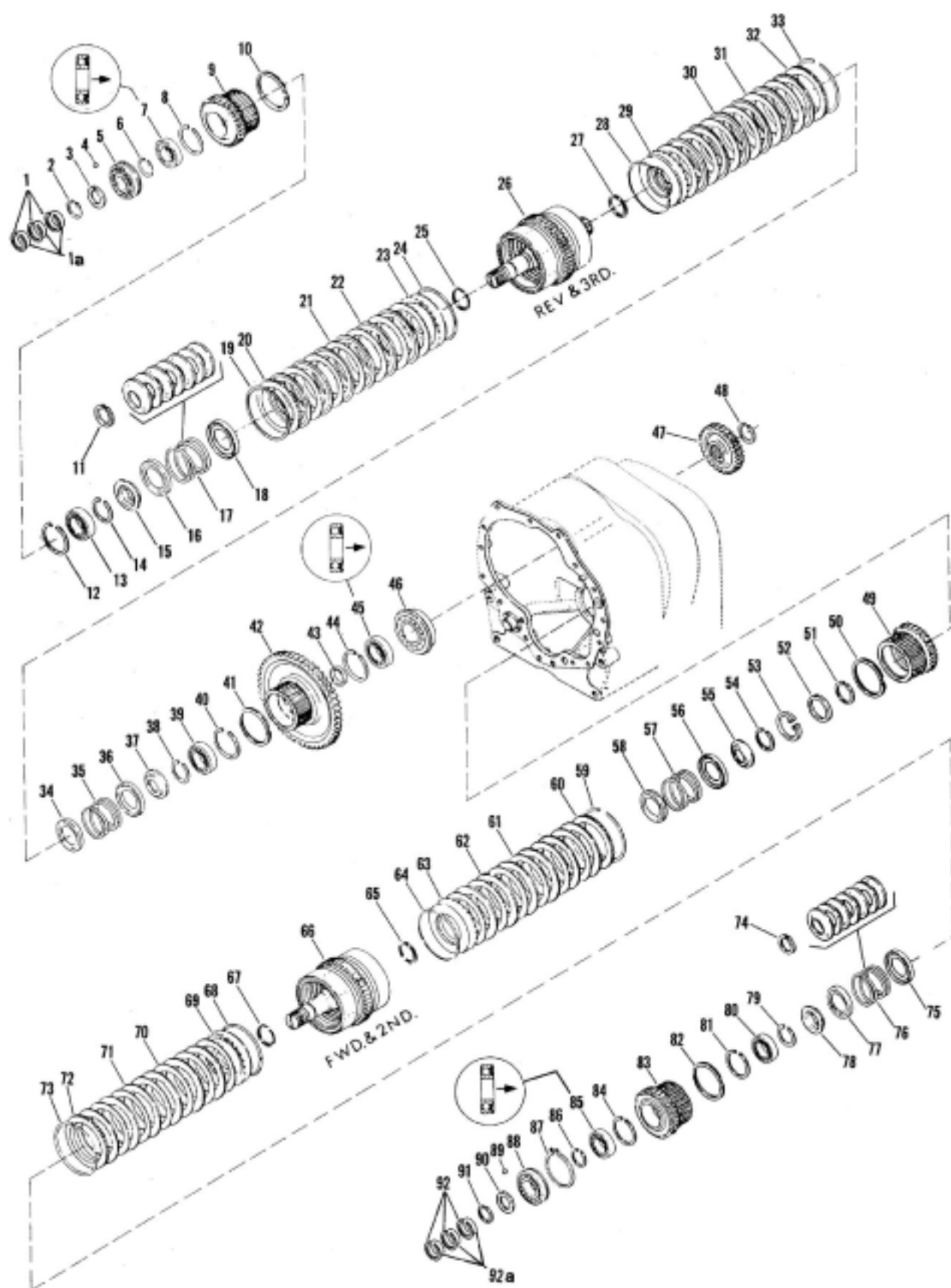


Figure D



**R OR HR32000**  
**REVERSE & 3RD & FORWARD & 2ND CLUTCH GROUP**

ITEM	DESCRIPTION	QTY	ITEM	DESCRIPTION	QTY
1	Reverse & 3rd Clutch Shaft Piston Ring .....	3	47	Low Clutch Drive Gear .....	1
1A	Piston Ring Expander Springs .....	3	48	Gear Retaining Ring .....	1
2	Front Bearing Retainer Ring .....	1	49	2nd Gear .....	1
3	Reverse & 3rd Shaft Front Bearing End Plate .....	1	50	Clutch Hub Oil Baffle Ring .....	1
4	Reverse & 3rd Shaft Bearing End Plate Ball .....	1	51	2nd Gear Retainer Ring .....	1
5	Reverse & 3rd Shaft Front Bearing .....	1	52	2nd Gear Retainer Ring Retainer .....	1
6	Front Bearing Retainer Ring .....	1	53	2nd Gear Retainer Ring Retainer Snap Ring .....	1
7	Clutch Driven Gear Bearing - Shield In .....	1	54	Spring Retainer Snap Ring .....	1
8	Clutch Driven Gear Bearing Snap Ring .....	1	55	Spring Retainer Snap Ring Retainer .....	1
9	Clutch Driven Gear .....	1	56	Spring Retainer .....	1
10	Clutch Hub Oil Baffle Ring .....	1	57	Piston Return Spring .....	1
11	Spring Retainer Snap Ring .....	1	58	Spring Retainer .....	1
12	Clutch Driven Gear Bearing Snap Ring .....	1	59	End Plate Retainer Ring .....	1
13	Clutch Driven Gear Bearing .....	1	60	End Plate - 2nd Clutch .....	1
14	Spring Retainer Snap Ring .....	1	61	Clutch Outer Disc - 2nd Clutch .....	6
15	Spring Retainer Snap Ring Retainer .....	1	62	Clutch Inner Disc - 2nd Clutch .....	6
16	Spring Retainer .....	1	63	Clutch Piston Assembly - 2nd Clutch .....	1
17	Piston Return Spring .....	1	64	Clutch Piston Outer Seal .....	1
18	Spring Retainer .....	1	65	Clutch Piston Inner Seal .....	1
19	End Plate Retainer Ring .....	1	66	Forward & 2nd Clutch Drum .....	1
20	End Plate - Reverse Clutch .....	1	67	Clutch Piston Inner Seal .....	1
21	Clutch Outer Disc - Reverse Clutch .....	6	68	Clutch Piston Outer Seal .....	1
22	Clutch Inner Disc - Reverse Clutch .....	6	69	Clutch Piston Assembly - Forward Clutch .....	1
23	Clutch Piston Assembly - Reverse Clutch .....	1	70	Clutch Outer Disc - Forward Clutch .....	6
24	Clutch Piston Outer Seal .....	1	71	Clutch Inner Disc - Forward Clutch .....	6
25	Clutch Piston Inner Seal .....	1	72	End Plate - Forward Clutch .....	1
26	Reverse & 3rd Clutch Drum .....	1	73	End Plate Retainer Ring .....	1
27	Clutch Piston Inner Seal .....	1	74	Spring Retainer Snap Ring .....	1
28	Clutch Piston Outer Seal .....	1	75	Spring Retainer .....	1
29	Clutch Piston - 3rd Clutch .....	1	76	Piston Return Spring .....	1
30	Clutch Inner Disc - 3rd Clutch .....	6	77	Spring Retainer .....	1
31	Clutch Outer Disc - 3rd Clutch .....	6	78	Spring Retainer Snap Ring Retainer .....	1
32	End Plate - 3rd Clutch .....	1	79	Spring Retainer Snap Ring .....	1
33	End Plate Retainer Ring .....	1	80	Clutch Driven Gear Bearing .....	1
34	Spring Retainer .....	1	81	Clutch Driven Gear Bearing Snap Ring .....	1
35	Piston Return Spring .....	1	82	Clutch Hub Oil Baffle Ring .....	1
36	Spring Retainer .....	1	83	Forward Clutch Driven Gear .....	1
37	Spring Retainer Snap Ring Retainer .....	1	84	Clutch Driven Gear Bearing Snap Ring .....	1
38	Spring Retainer Snap Ring .....	1	85	Clutch Driven Gear Bearing - Shield In .....	1
39	3rd Gear Bearing .....	1	86	Front Bearing Retainer Ring .....	1
40	3rd Gear Bearing Snap Ring .....	1	87	Front Bearing Locating Ring .....	1
41	Clutch Hub Oil Baffle Ring .....	1	88	Forward & 2nd Shaft Front Bearing .....	1
42	3rd Gear .....	1	89	Forward & 2nd Shaft Bearing End Plate Ball .....	1
43	3rd Gear Bearing Spacer .....	1	90	Forward & 2nd Shaft Front Bearing End Plate .....	1
44	3rd Gear Bearing Snap Ring .....	1	91	Front Bearing Retainer Ring .....	1
45	3rd Gear Bearing - Shield Out .....	1	92	Forward & 2nd Shaft Piston Ring .....	3
46	Reverse & 3rd Shaft Rear Bearing .....	1	92A	Piston Ring Expander Springs .....	3

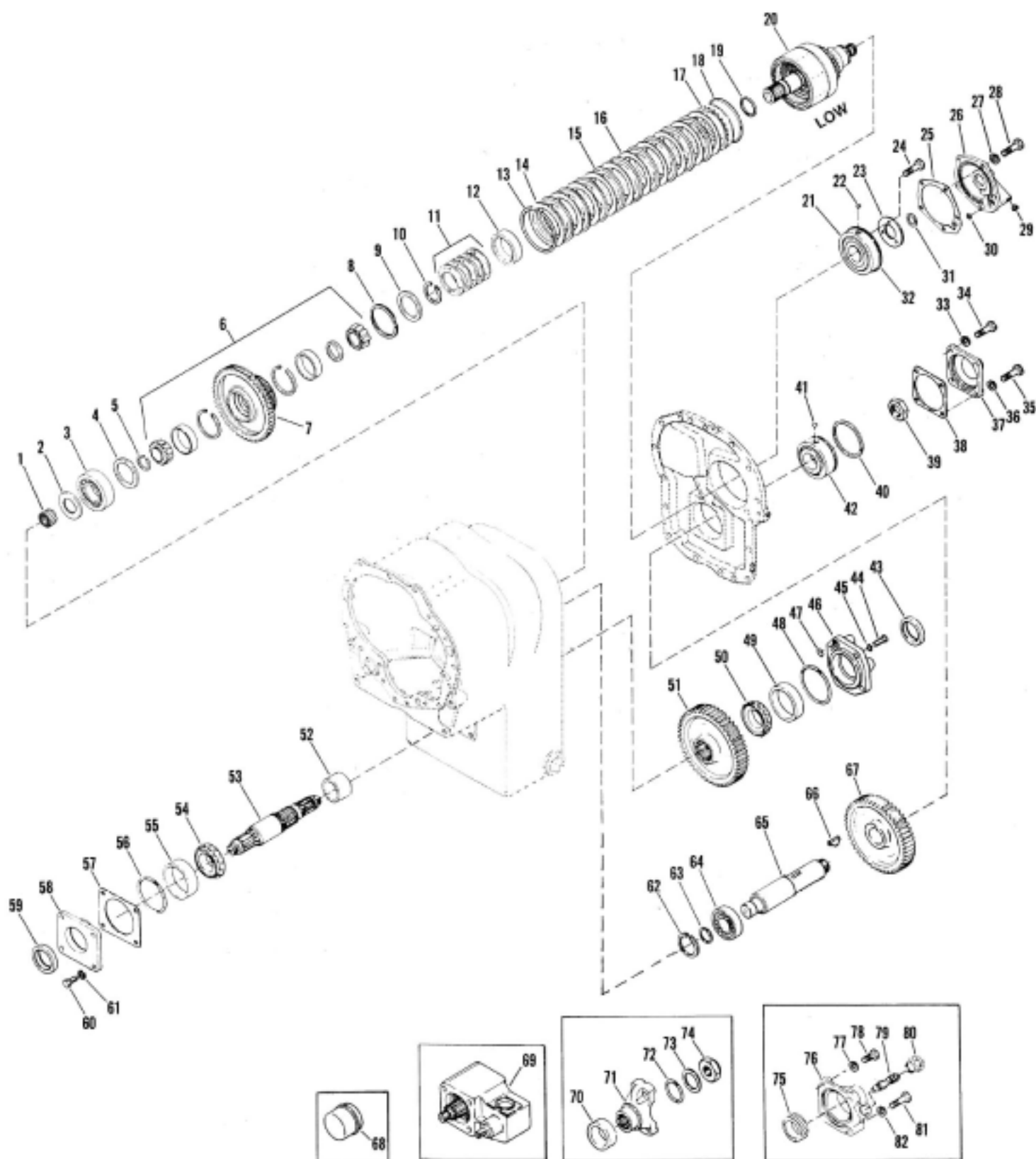


Figure E

## R OR HR32000 LOW (1ST) CLUTCH & OUTPUT GROUP

ITEM	DESCRIPTION	QTY	ITEM	DESCRIPTION	QTY.
1	Low Speed Clutch Shaft Pilot Bearing .....	1	42	Idler Shaft Rear Bearing .....	1
2	2nd Gear Bearing End Plate .....	1	43	Rear Bearing Cap Oil Seal .....	1
3	2nd Gear Bearing .....	1	44	Rear Bearing Cap Screw .....	4
4	Bearing Retaining Ring Retainer .....	1	45	Rear Bearing Cap Screw Lockwasher .....	4
5	Low Speed Gear Bearing Retainer Ring .....	1	46	Rear Bearing Cap .....	1
6	Low Speed Gear Bearing Assembly .....	1	47	Rear Bearing Cap "O" Ring .....	1
7	Low Speed Gear .....	1	48	Rear Bearing Cap "O" Ring .....	1
8	Clutch Hub Oil Baffle Ring .....	1	49	Rear Bearing Cup .....	1
9	Spring Retaining Ring Retainer .....	1	50	Rear Bearing Cone .....	1
10	Spring Retaining Ring .....	1	51	Output Shaft Gear .....	1
11	Piston Return Disc Springs .....	5	52	Output Shaft Gear Spacer .....	1
12	Piston to Piston Return Disc Springs Spacer .....	1	53	Output Shaft .....	1
13	End Plate Retainer Ring .....	1	54	Front Bearing Cone .....	1
14	End Plate .....	1	55	Front Bearing Cup .....	1
15	Clutch Inner Disc .....	9	56	Front Bearing Cap "O" Ring .....	1
16	Clutch Outer Disc .....	9	57	Bearing Cap Shim .....	AR
17	Clutch Piston .....	1	58	Front Bearing Cap .....	1
18	Clutch Piston Outer Seal .....	1	59	Front Bearing Cap Oil Seal .....	1
19	Clutch Piston Inner Seal .....	1	60	Front Bearing Cap Screw .....	4
20	Low Speed Clutch Drum .....	1	61	Front Bearing Cap Screw Lockwasher .....	4
21	Low Speed Shaft Rear Bearing .....	1	62	Bearing Retainer Ring .....	1
22	Bearing Lockball .....	1	63	Bearing Locating Ring .....	1
23	Rear Bearing Retainer Plate .....	1	64	Idler Shaft Front Bearing .....	1
24	Rear Bearing Retainer Plate Screw .....	3	65	Idler Shaft .....	1
25	Rear Bearing Cap Gasket .....	1	66	Idler Shaft Gear Key .....	1
26	Rear Bearing Cap .....	1	67	Idler Shaft Gear .....	1
27	Rear Bearing Cap Screw Lockwasher .....	5	68	Bore Plug (optional) .....	1
28	Rear Bearing Cap Screw .....	5	69	Disconnect Assembly (optional) .....	1
29	Rear Bearing Cap Plug .....	1	70	Oil Seal .....	1
30	Rear Bearing Cap "O" Ring .....	1	71	Output Flange .....	1
31	Clutch Shaft Piston Plug .....	1	72	Output Flange "O" Ring .....	1
32	Low Speed Shaft Rear Bearing Locating Ring .....	1	73	Output Flange Washer .....	1
33	Bearing Cap Screw Lockwasher .....	2	74	Output Flange Nut .....	1
34	Bearing Cap Screw .....	2	75	Speedo Drive Gear .....	1
35	Bearing Cap Screw .....	2	76	Rear Bearing Cap .....	1
36	Bearing Cap Screw Lockwasher .....	2	77	Rear Bearing Cap Screw Lockwasher .....	3
37	Idler Shaft Bearing Cap .....	1	78	Rear Bearing Cap Screw .....	3
38	Idler Shaft Bearing Cap Gasket .....	1	79	Speedo Driven Gear .....	1
39	Idler Shaft Nut .....	1	80	Speedo Tube Nut .....	1
40	Rear Bearing Locating Ring .....	1	81	Rear Bearing Cap Screw .....	1
41	Idler Shaft Rear Bearing Lockball .....	1	82	Rear Bearing Cap Screw Lockwasher .....	1

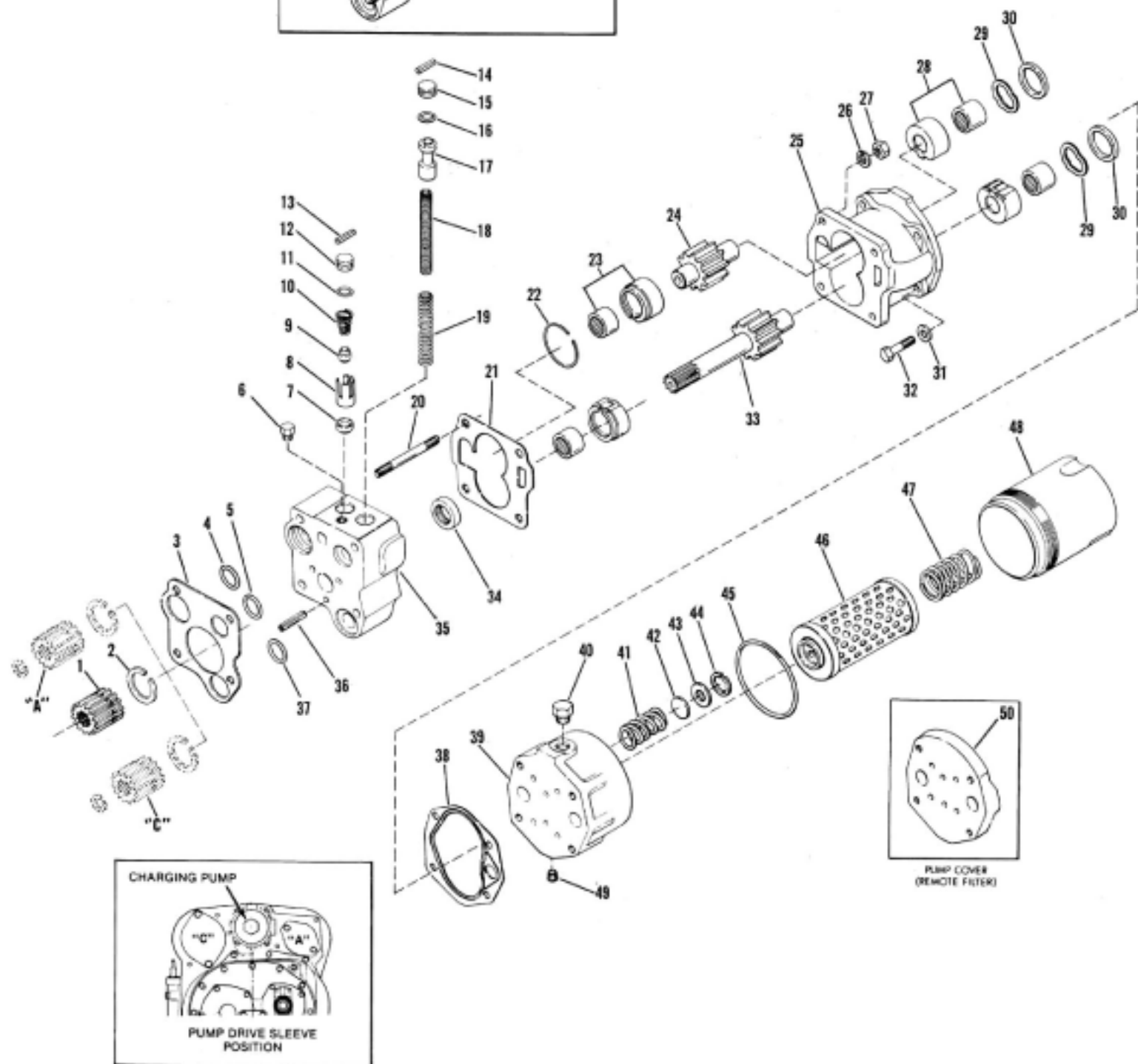
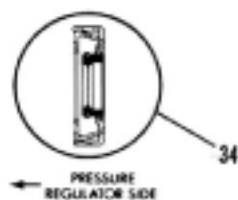
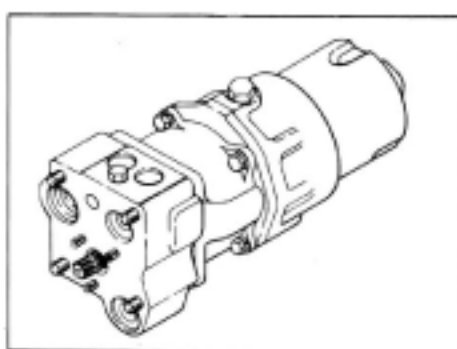


Figure F

## PRESSURE REGULATOR VALVE, CHARGING PUMP & OIL FILTER GROUP

ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	Charging Pump Drive Sleeve.....	1	26	Valve to Housing Stud Lockwasher ...	4
2	Pump Sleeve Snap Ring .....	1	27	Valve to Housing Stud Nut .....	4
3	Valve to Housing Gasket.....	1	28	Thrust Plate & Bearing Assembly .....	2
4	Valve Body "O" Ring .....	1	29	Wave Spring.....	2
5	Valve Body "O" Ring .....	1	30	Pump Shaft Seal.....	2
6	Pipe Plug.....	1	31	Pump to Filter Adaptor Screw Lockwasher .....	4
7	Safety Valve Seat.....	1	32	Pump to Filter Adaptor Screw.....	4
8	Safety Valve Spacer.....	1	33	Pump Drive Shaft Assembly .....	1
9	Safety Valve Plunger .....	1	34	Pump Drive Shaft Oil Seal.....	1
10	Safety Valve Spring .....	1	35	Pressure Regulator Valve.....	1
11	Valve Stop "O" Ring .....	1	36	Valve Body Roll Pin .....	3
12	Valve Stop.....	1	37	Valve Body "O" Ring .....	1
13	Valve Stop Roll Pin .....	1	38	Pump to Filter Gasket .....	1
14	Valve Stop Roll Pin .....	1	39	Filter Adaptor .....	1
15	Valve Stop.....	1	40	Filter Adaptor Plug.....	1
16	Valve Stop "O" Ring .....	1	41	By-Pass Filter Disc Spring.....	1
17	Valve Piston .....	1	42	By-Pass Filter Disc.....	1
18	Valve Spring - Inner.....	1	43	By-Pass Filter Disc Seat .....	1
19	Valve Spring - Outer .....	1	44	Filter Seat Retainer Ring.....	1
20	Valve to Converter Housing Stud.....	4	45	Filter Housing "O" Ring.....	1
21	Valve Body to Pump Gasket .....	1	46	Oil Filter Element Assembly .....	1
22	Pump Body Snap Ring.....	1	47	Oil Filter Element Spring.....	1
23	Thrust Plate & Bearing Assembly .....	2	48	Filter Housing.....	1
24	Pump Driven Shaft Assembly .....	1	49	Pipe Plug.....	1
25	Charging Pump Housing .....	1	50	Optional Adaptor for Remote Filter ...	1

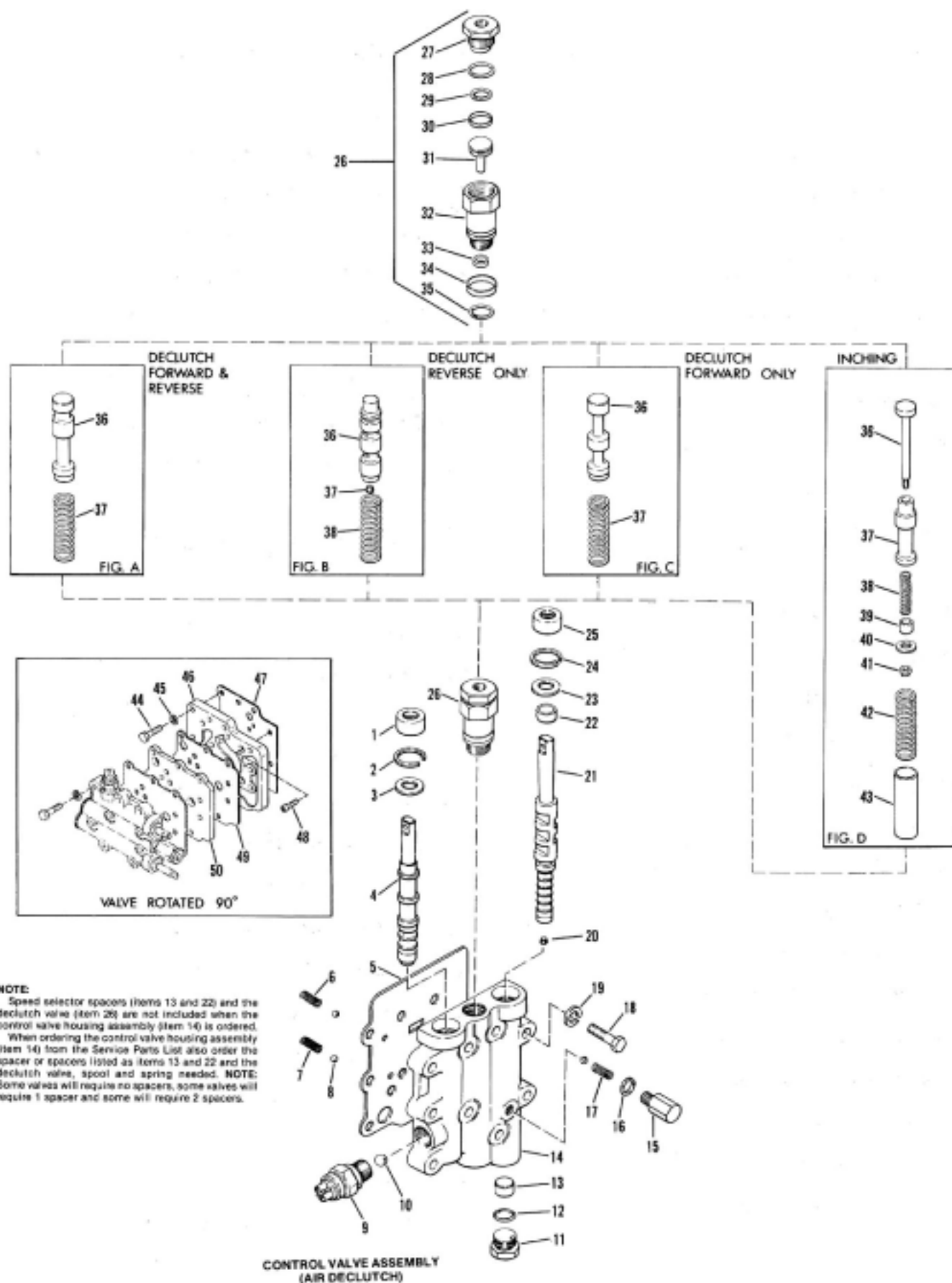


Figure G

## CONTROL VALVE ASSEMBLY

ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	Oil Seal .....	1	22	Overshift Spacer (Not on all models)....	1
2	Oil Seal Retainer Ring .....	1	23	Oil Seal Retainer Washer .....	1
3	Oil Seal Retainer Washer .....	1	24	Oil Seal Retainer Ring .....	1
4	Forward & Reverse Valve Spool .....	1	25	Oil Seal .....	1
5	Control Valve Gasket .....	1	26	Piston Housing Assembly .....	1
6	Detent Spring .....	1	27	Stop Plug .....	1
7	Detent Spring .....	1	28	Plug "O" Ring .....	1
8	Detent Ball .....	3	29	Piston "O" Ring .....	1
9	Neutral Switch .....	1	30	Glyd Ring .....	1
10	Detent Ball .....	1	31	Piston .....	1
11	Valve Housing Plug .....	1	32	Piston Housing .....	1
12	Valve Housing Plug "O" Ring .....	1	33	Oil Seal .....	1
13	Overshift Spacer (Not on all models)....	1	34	Band Seal .....	1
14	Control Valve Housing .....	1	35	"O" Ring .....	1
15	Detent Spring Plug .....	1	<b>Figures A-B-C &amp; D are various declutch options.</b>		
16	Detent Spring Plug Washer .....	1	44	Adaptor Screw .....	4
17	Detent Spring .....	1	45	Adaptor Screw Lockwasher .....	4
18	Valve to Adaptor Housing Screw .....	9	46	Valve Adaptor .....	1
19	Valve to Adaptor Housing Screw Lockwasher .....	9	47	Valve Adaptor Gasket .....	1
20	Speed Selector Spool Plug .....	1	48	Adaptor Screw .....	5
21	Speed Selector Spool .....	1	49	Adaptor to Plate Gasket .....	1
			50	Valve Adaptor Plate .....	1

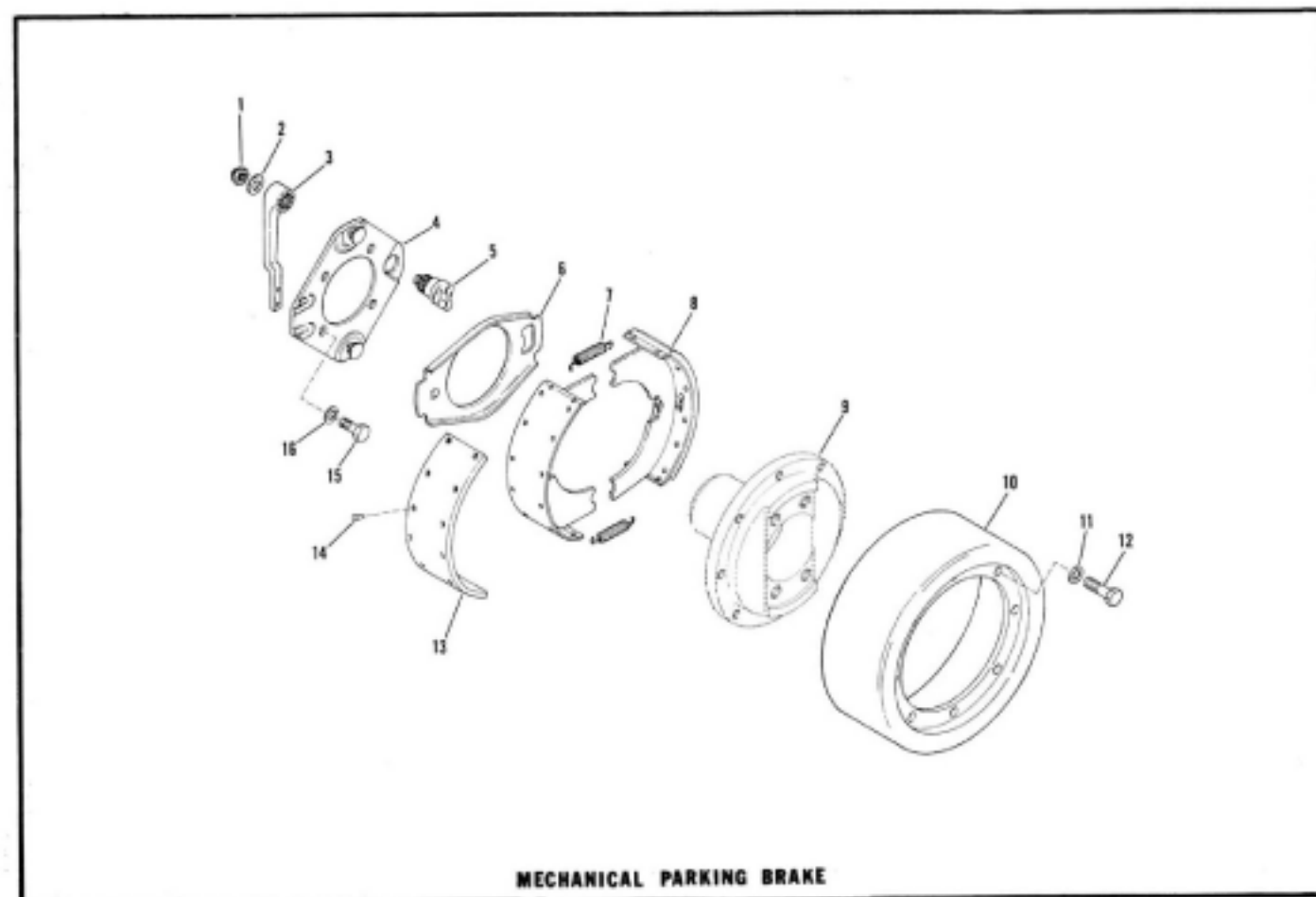
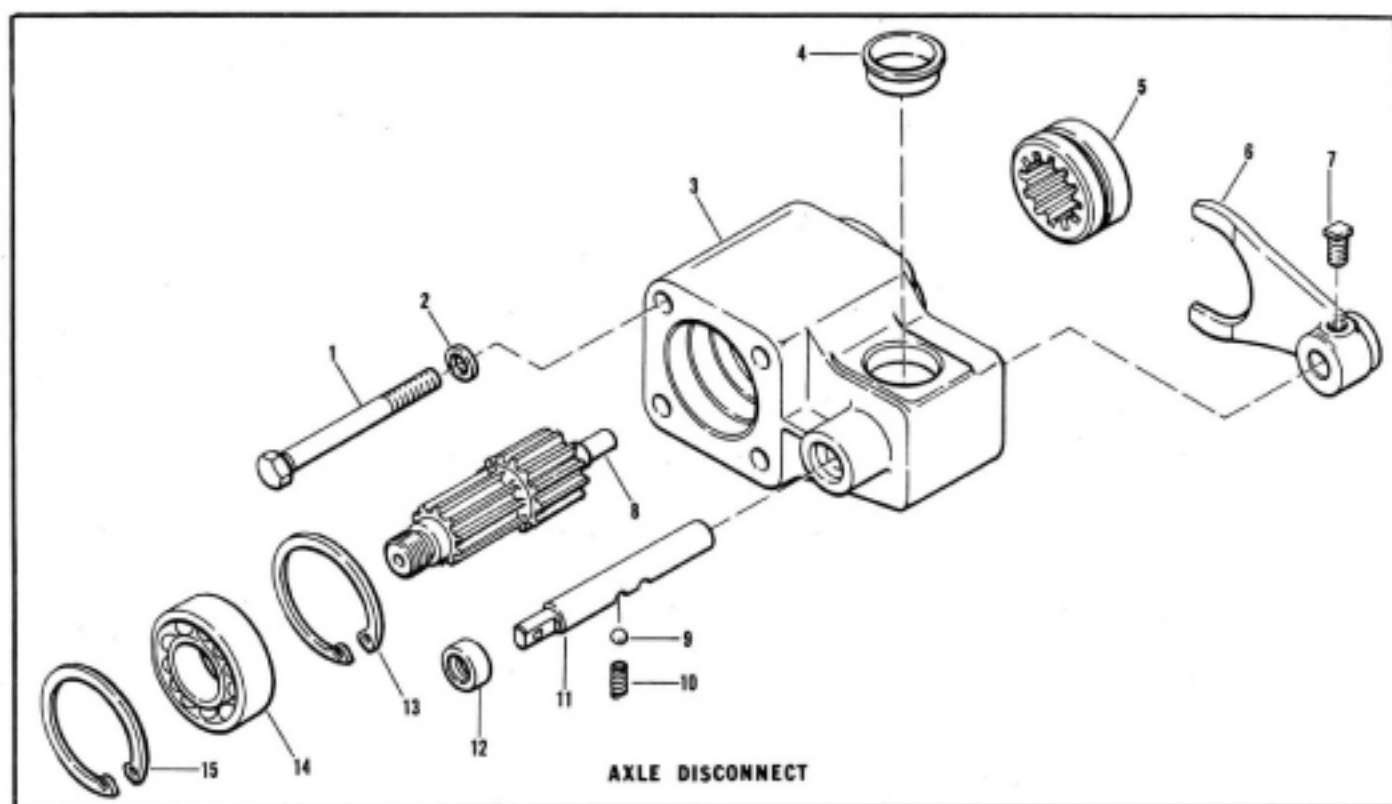


Figure H



### AXLE DISCONNECT

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

### PARKING BRAKE GROUP 10 X 3 BRAKE

ITEM	DESCRIPTION	QTY	ITEM	DESCRIPTION	QTY
1	Lock Nut.....	1	9	Brake Flange.....	1
2	Washer.....	1	10	Brake Drum.....	1
3	Operating Lever.....	1	11	Brake Drum Screw Lockwasher.....	6
4	Backing Plate.....	1	12	Brake Drum Screw.....	6
5	Cam Shaft.....	1	13	Brake Lining.....	1
6	Strut Assembly.....	1	14	Rivet Kit.....	24
7	Return Spring.....	1	15	Backing Plate Screw.....	4
8	Brake Shoe, Lining & Rivet.....	1	16	Backing Plate Screw Lockwasher.....	4

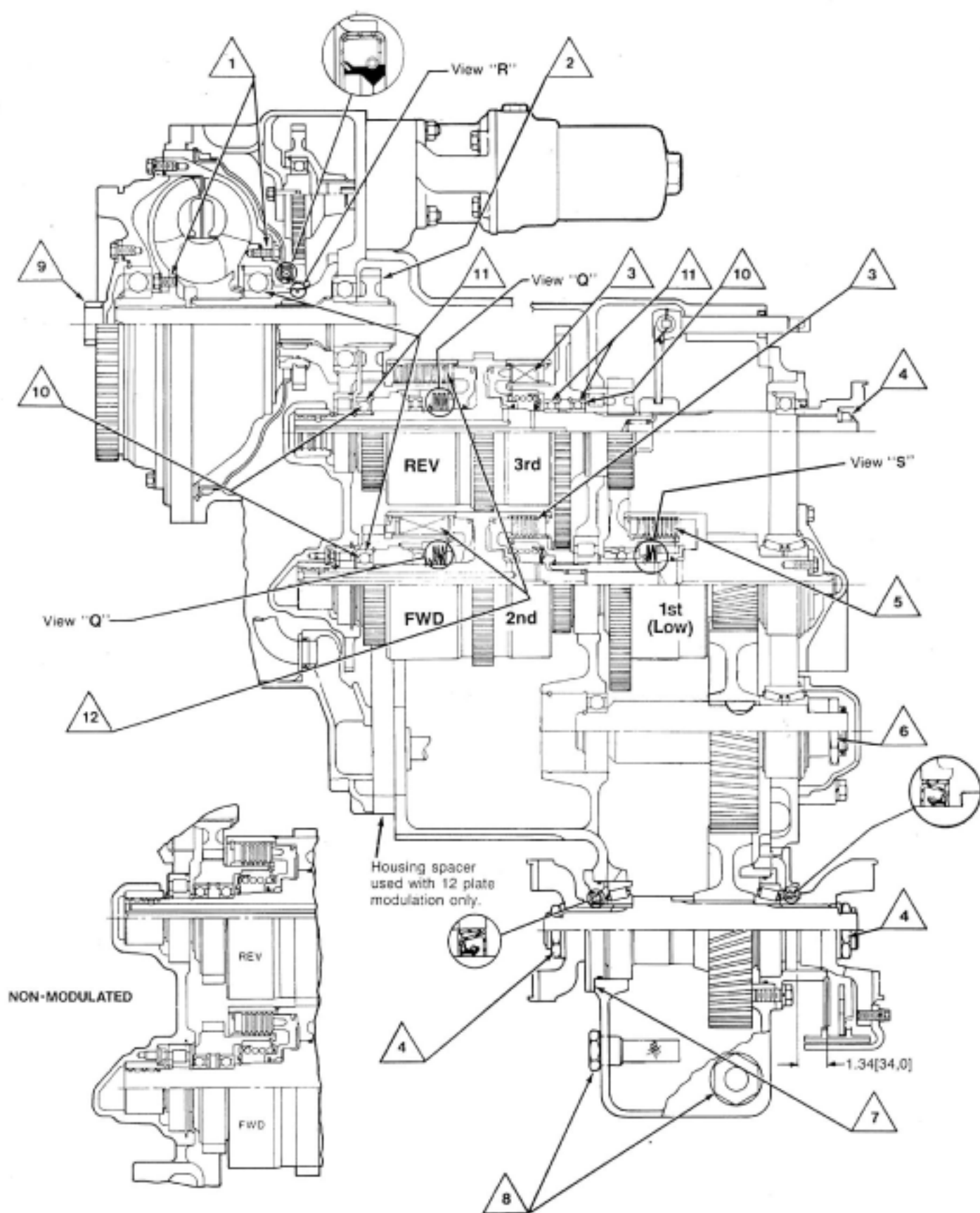


Figure I

1. Impeller Hub and Turbine Hub Assembly with Backing Ring and Special Self Locking Screws.  
1. Clean hub mounting surface and tapped holes with solvent. Dry thoroughly being certain tapped holes are dry & clean.  
2. Install backing ring and special self locking screws.  
Tighten screws 40 to 45 Lbs. Ft. [54,3-61,0 N-m]  
Note: Assembly of hub must be complete within a fifteen minute period from start of screw installation. The special screw is to be used for one installation only. If the screw is removed for any reason it must be replaced. The epoxy left in the hub holes must be removed with the proper tap and cleaned with solvent. Dry hole thoroughly and use a new screw for reinstallation.

2. Gear to be assembled with long hub length to this side.

3. Three clutches, 6-outer steel plates, 6-inner friction plates. Assemble alternately, starting with outer steel plate.

4. See Elastic Stop Nut Torque Chart

5. Low clutch, 9-outer steel plates, 9-inner friction plates. Assemble alternately, starting with outer steel plate.

6. See Elastic Stop Nut Torque Chart

7. Shim output shaft bearings to produce 6 to 8 Lbs.-in. [0,68-0,90 N-m] preload.

8. Tighten oil screen ass'y. 10 to 15 Lbs. Ft. [13,6-20,0 N-m]

9. Heat nose bushing to 200° F° (93°C) before ass'y. of bushing to cover.

10. Bearing shield OUT on 3rd speed clutch. Bearing shield IN on Fwd. & Rev. clutch.

11. Must be loose internal fit bearings, No. "3" etched on bearing.

12. (12 Plate Modulation) Two clutches, 12-outer steel plates, 12-inner friction plates. Assemble alternately, starting with outer steel plate.

#### Notes

- A. - Use Permatex & Crane Sealer only where specified.  
B. - All lead in chamfers for oil seals, piston rings & "O" rings must be smooth & free from burrs. Inspect at ass'y.  
C. - Lubricate all piston ring grooves & "O" rings with oil before ass'y.  
D. - Apply very light coat of Permatex No. 2 to O.D. of all oil seals before ass'y.  
E. - After assembly of parts using Permatex or Crane sealer, there must not be any free or excess material that could enter the oil circuit.  
F. - Apply light coat of Crane Sealer to all pipe plugs.  
G. - Apply a thin coating of grease between seal lips on lip type seals prior to ass'y.  
H. - Apply light coat of Permatex No. 2 to all thru hole stud threads.

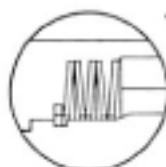
NOTE: The friction discs in the low clutch has a higher co-efficient rating than the friction discs in the other clutches, therefore the discs must not be mixed. The low clutch inner disc can be identified by an "X" stamped on one side of the inner teeth. The low clutch inner disc also has a strip of non-soluble yellow paint sprayed on the outer edge of the disc.

View "Q" 2 Places  
Modulation only



Forward & Reverse Clutch Return Springs.  
Concave side of first spring to be placed against clutch piston. Remaining six springs of each clutch to be stacked alternately reversed as shown. See note on page 77.

Low Clutch Return Springs.  
Concave side of first spring to be placed against clutch piston. Remaining four springs to be stacked alternately reversed as shown.



View "S"

View "R"



Enlarged view of Piston Ring & Expander  
Note: Expander gap to be approx. 180° from ring hook joint to aid ring assembly.

NOTE: Metric dimensions shown in brackets [ ].

#### ELASTIC STOP NUT TORQUE

THREAD SIZE	LB.-FT.	[N-m]
1" - 20	150 - 200	[203,4 - 271,1]
1 1/4" - 18	200 - 250	[271,2 - 338,9]
1 1/2" - 18	300 - 350	[406,8 - 474,5]
1 3/4" - 12	400 - 450	[542,4 - 610,1]

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]
.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]
.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]
.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]
.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]
.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]
.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]

Figure 1

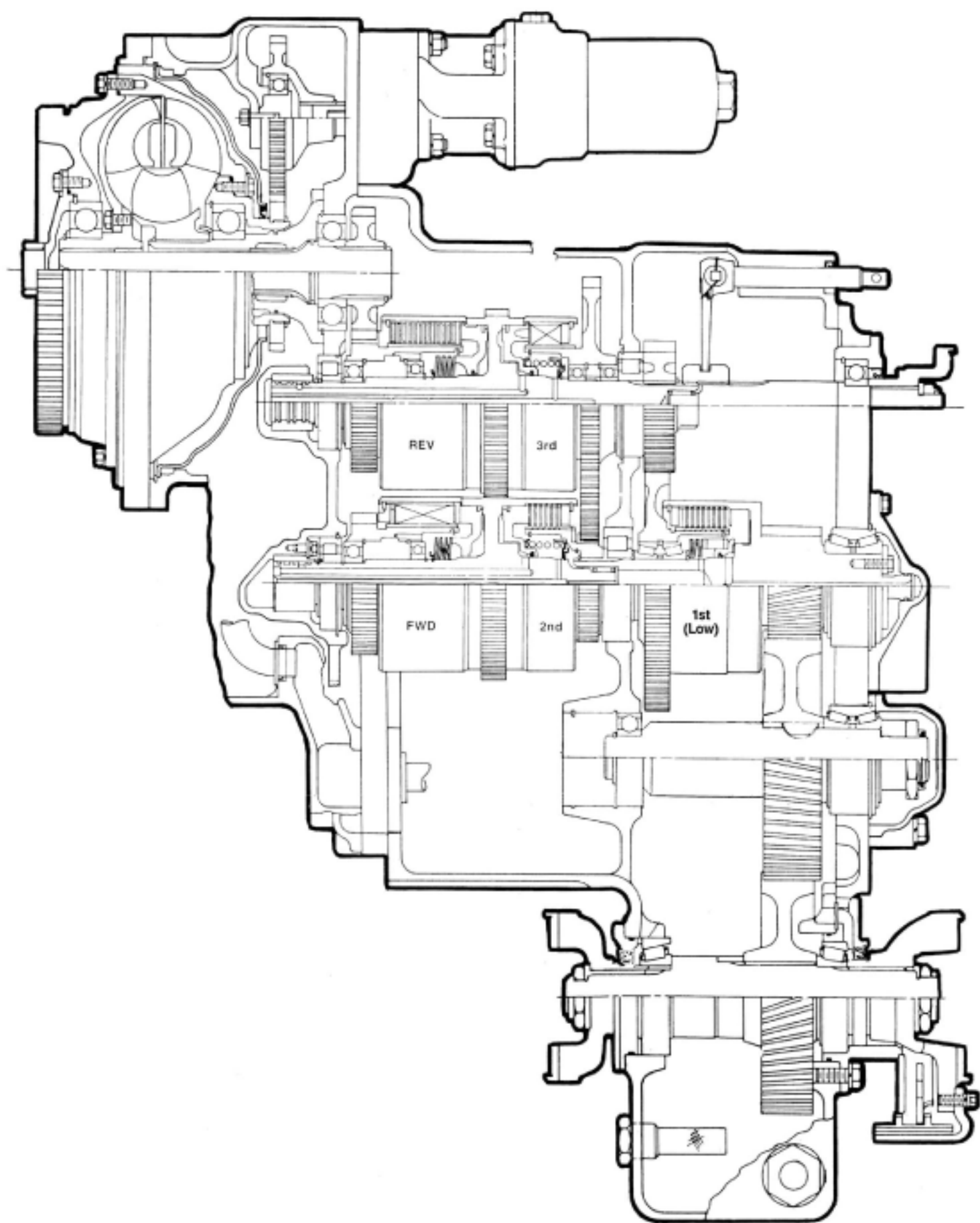


Figure J

## 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 HR32000 3 speed long drop 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. Drain as much oil as possible before disassembly. See page 70 for R-Model (remote mounted) transmission front cover section. See page 85 for 6 & 8 speed maintenance information.

### DISASSEMBLY

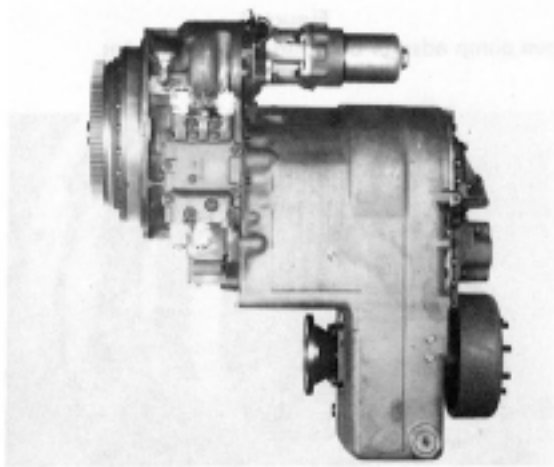


Figure 1

Side view of 3 speed HR32000 long drop transmission.

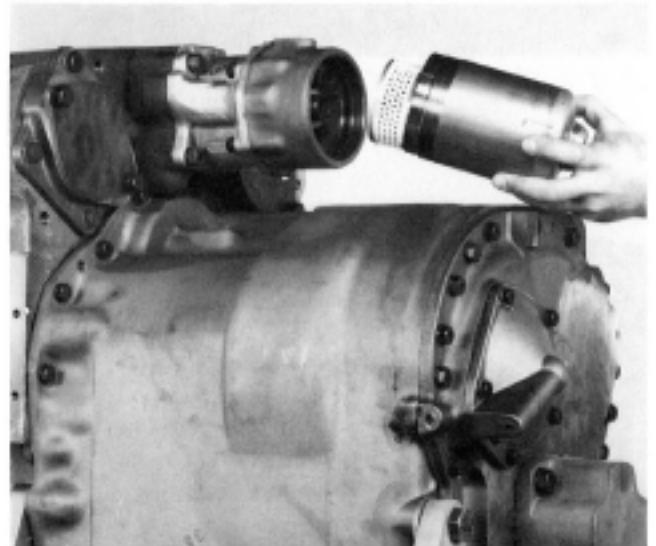


Figure 3

Remove filter element housing and element. **NOTE:** It is recommended a small pan be used to catch remaining oil in element housing.

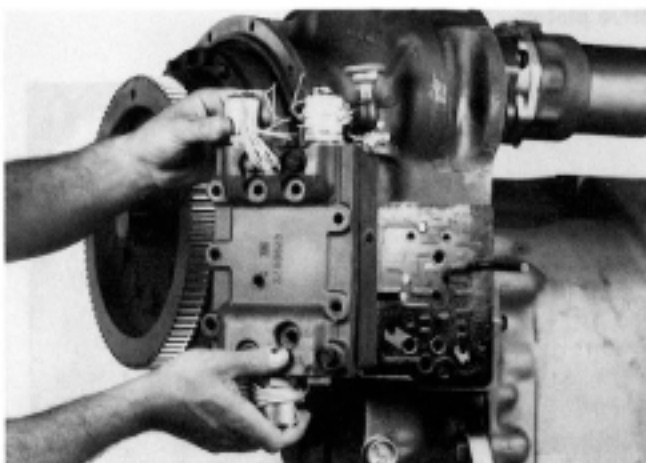


Figure 2

Remove two valve to converter housing capscrews. Install two aligning studs as shown. Remove remaining capscrews. Remove control valve and gasket.

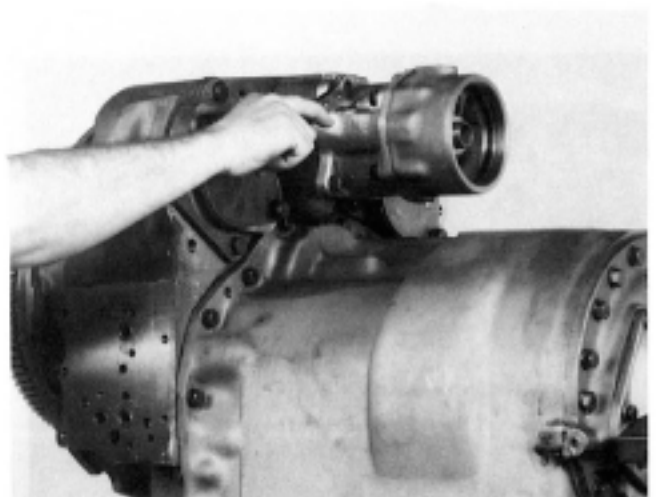
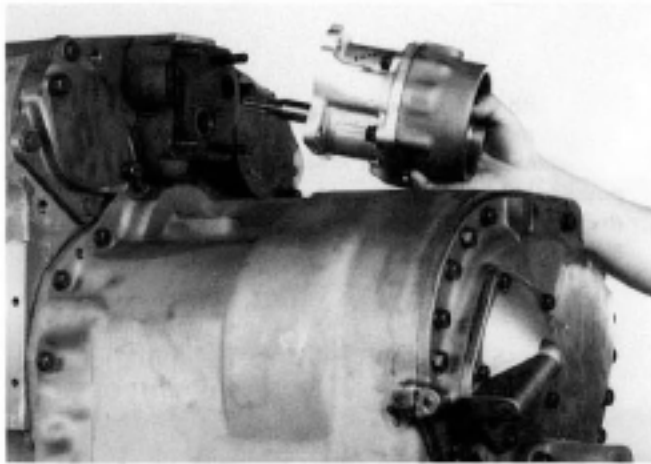
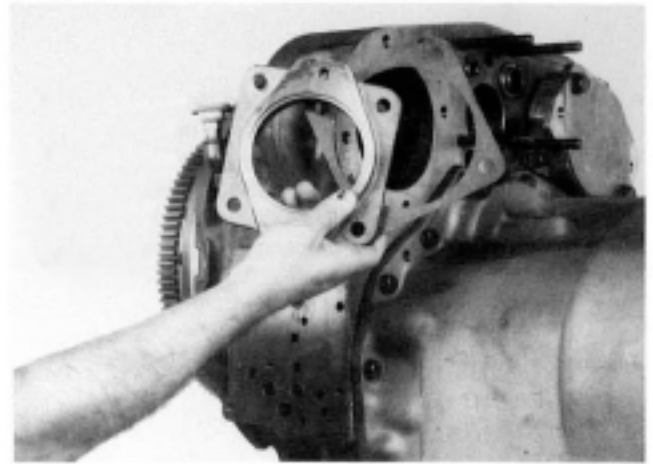


Figure 4

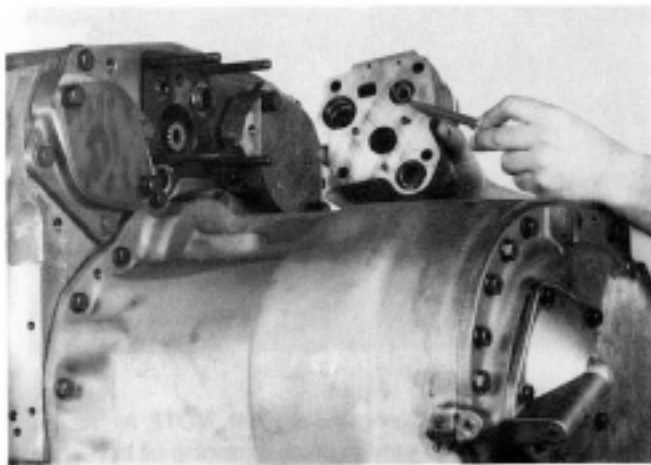
Remove charging pump to pressure regulating valve stud nuts.



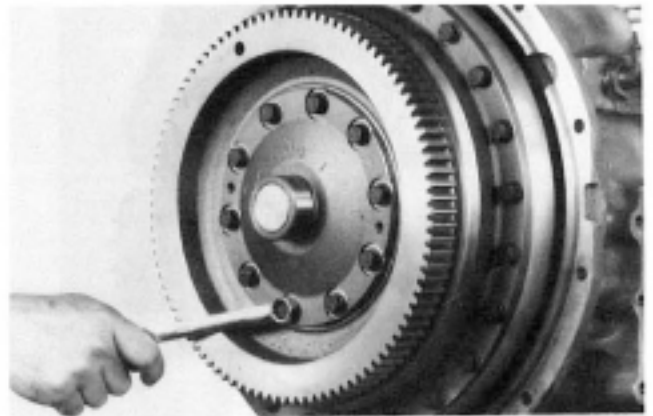
**Figure 5**  
Remove charging pump and filter adaptor assembly.



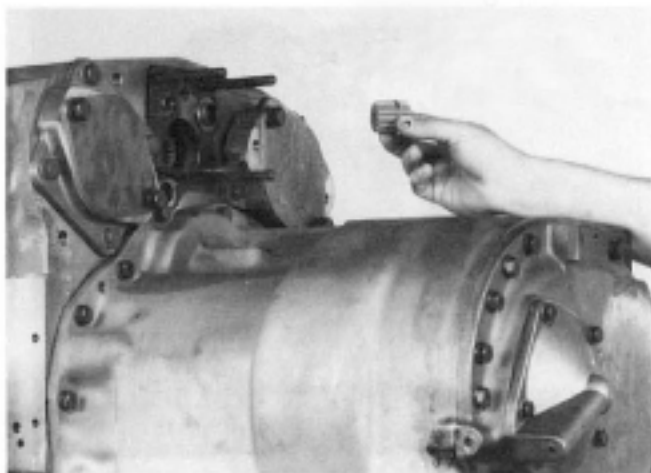
**Figure 8**  
Remove pump adaptor bolts, adaptor and gasket.



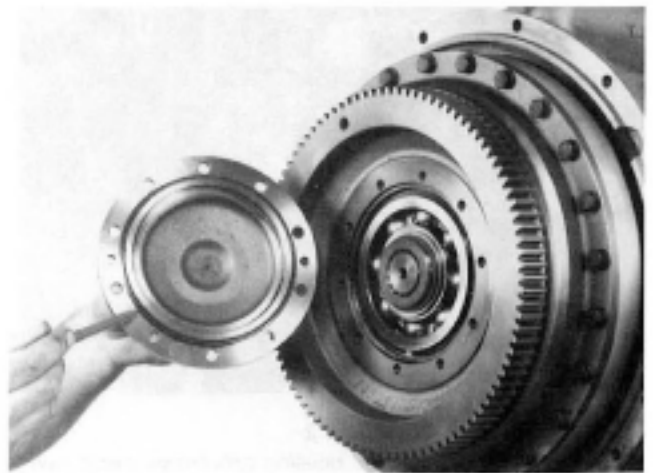
**Figure 6**  
Remove pressure regulating valve assembly and "O" rings.



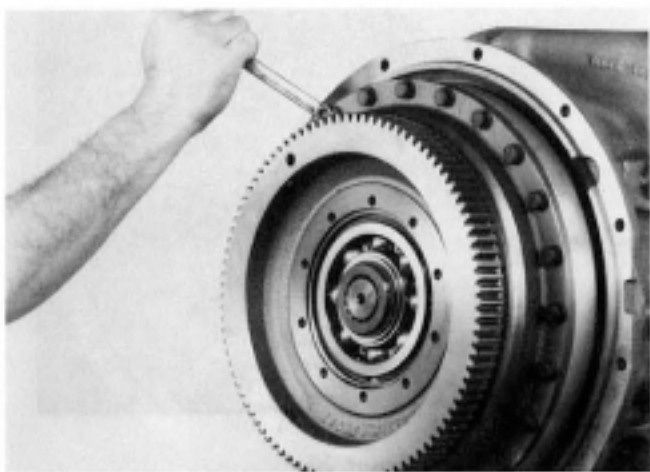
**Figure 9**  
Remove impeller cover bearing cap bolts. **NOTE:** Some units will have drive plates instead of ring gear. Remove drive plates.



**Figure 7**  
Remove pump drive sleeve and gasket.

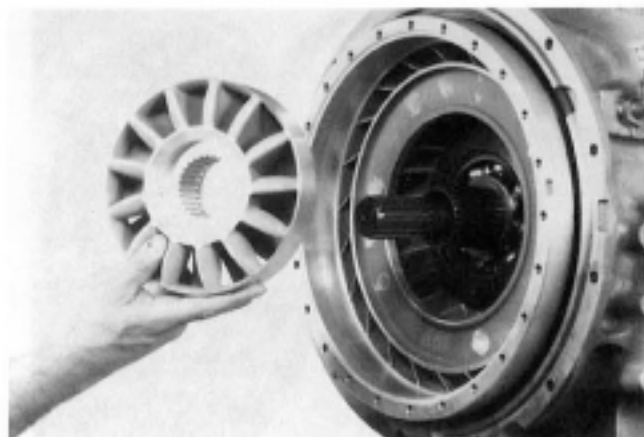


**Figure 10**  
Remove bearing cap and "O" ring.



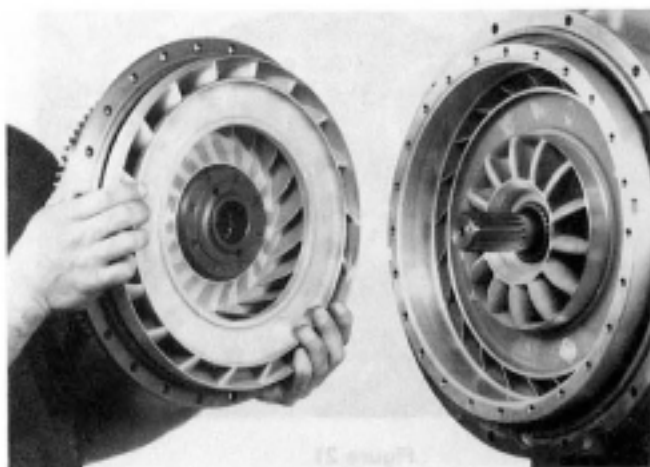
**Figure 11**

Remove impeller cover to impeller bolts.



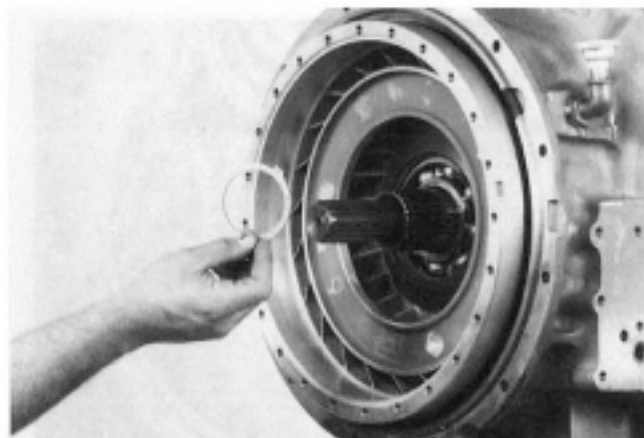
**Figure 14**

Remove reaction member.



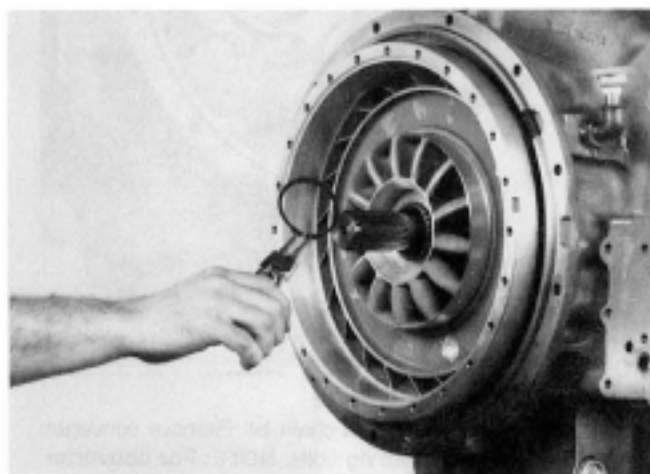
**Figure 12**

Remove impeller cover and turbine as an assembly.



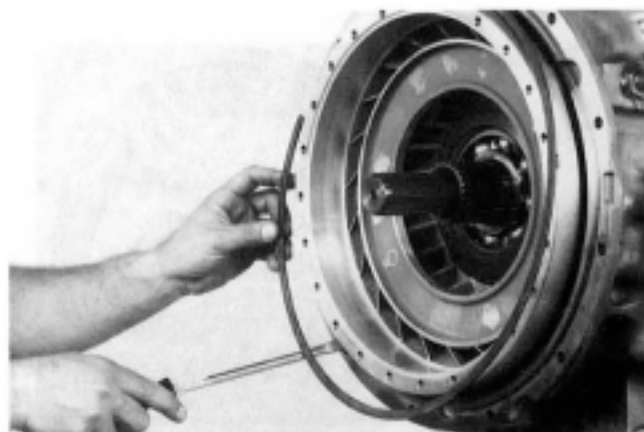
**Figure 15**

Remove reaction member spacer.



**Figure 13**

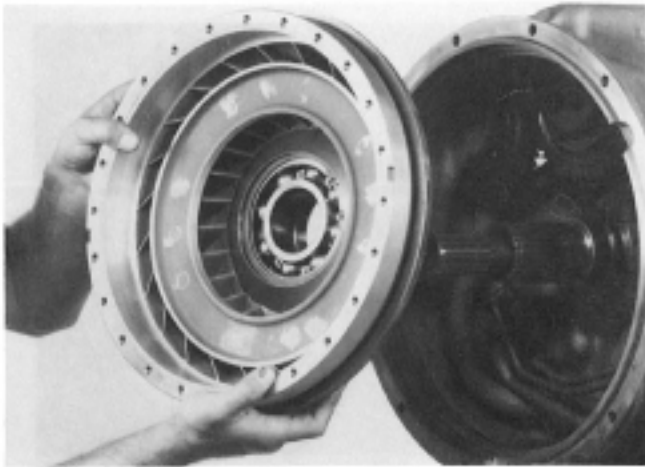
Remove reaction member retainer ring.



**Figure 16**

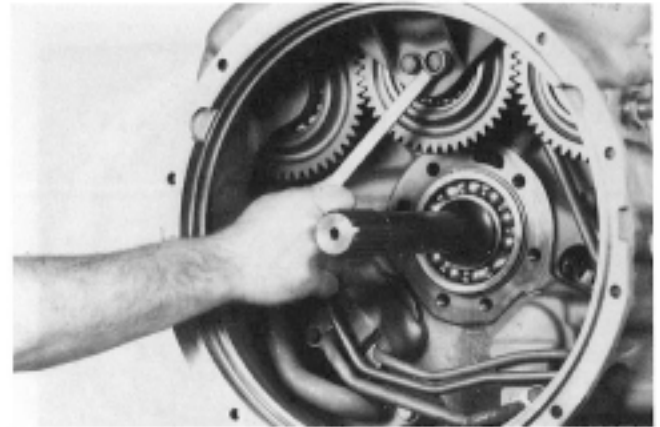
Remove oil baffle retainer ring. Using pry slots in converter housing, pry oil baffle and impeller from housing. **NOTE:** Impeller, oil baffle and impeller hub gear are removed as an assembly.





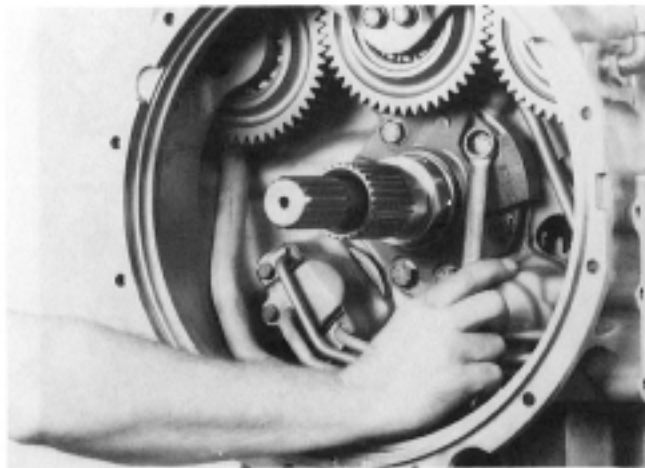
**Figure 17**

Remove impeller assembly.



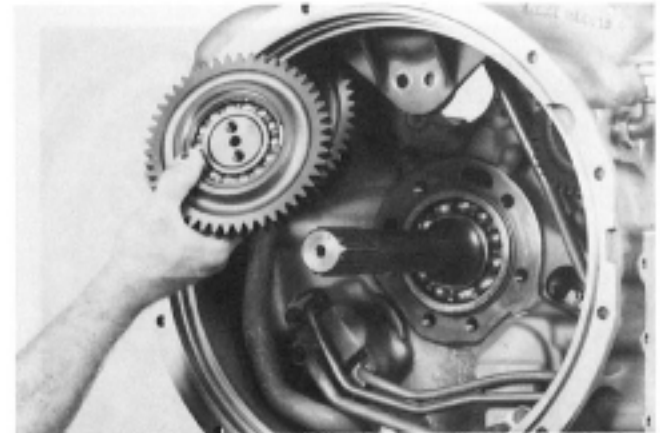
**Figure 20**

Remove pump drive gear support bolts.



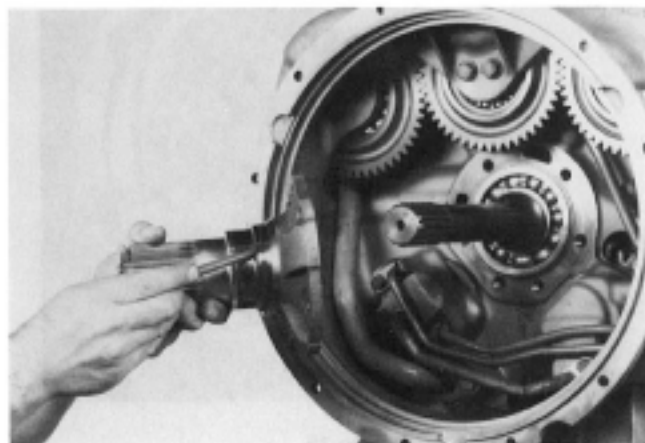
**Figure 18**

Remove stator support to housing bolts.



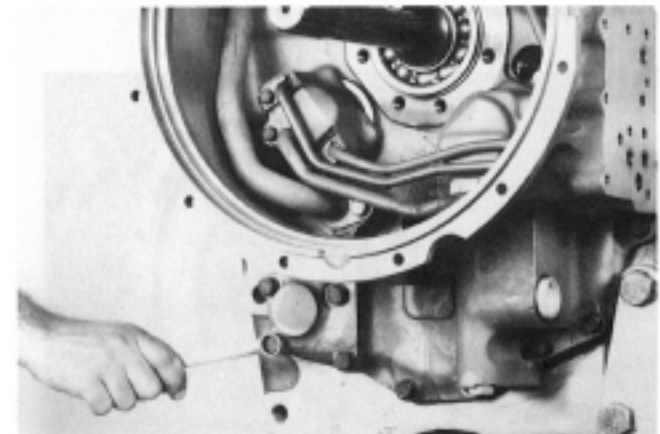
**Figure 21**

Remove pump drive gear and bearing assemblies.



**Figure 19**

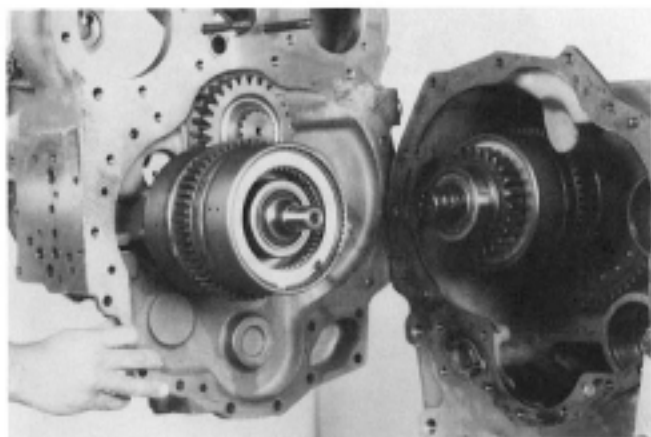
Remove stator support. **NOTE:** Support must be turned to clear pump drive gear.



**Figure 22**

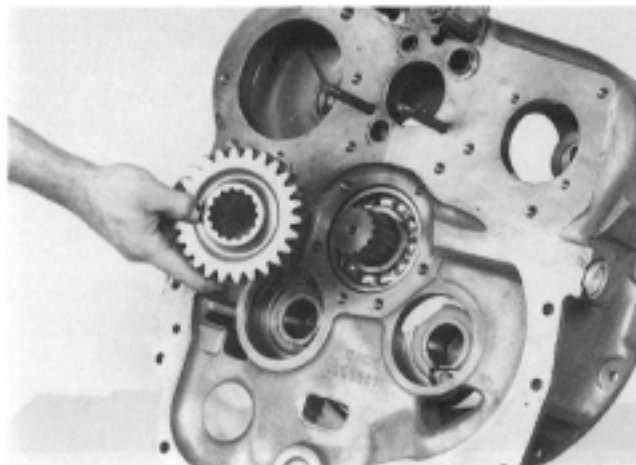
Support converter housing with a chain fall. Remove converter housing to transmission housing bolts. **NOTE:** For converter housing removal on the 8 speed transmission, see Figure 1 in the 8 speed section, page 93.





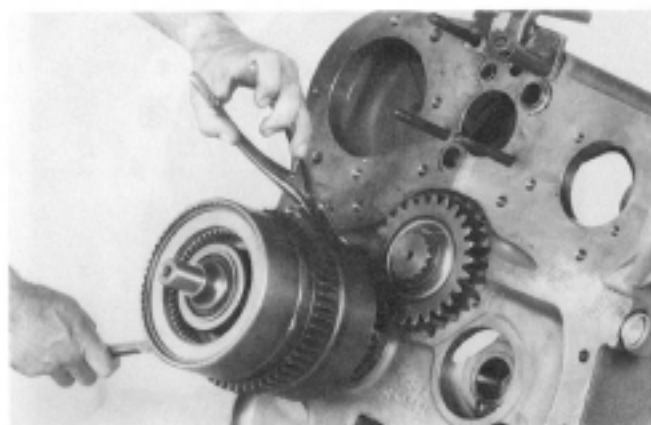
**Figure 23**

Separate the converter housing from the transmission housing. Remove gasket. **NOTE:** Forward and 2nd clutch will remain in converter housing.



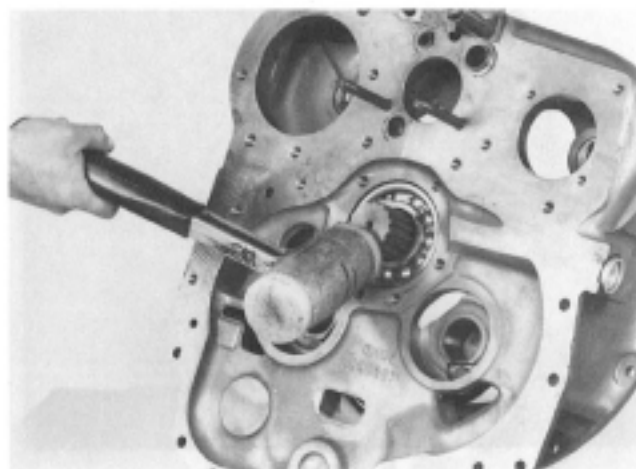
**Figure 26**

Remove turbine shaft gear.



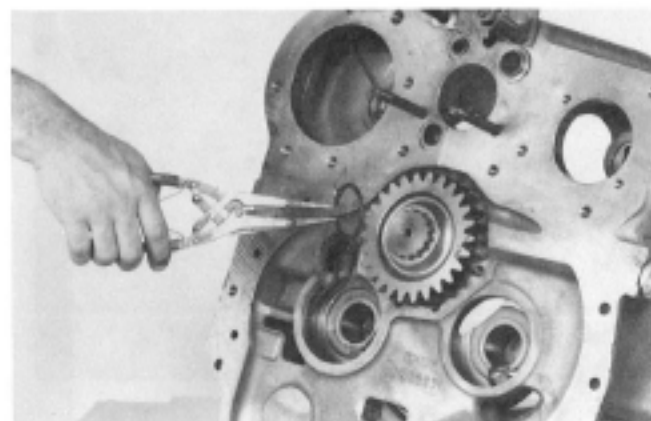
**Figure 24**

Use a spreading type snap ring pliers to spread the ears on forward clutch front bearing retainer ring. Remove forward clutch with pry bar.



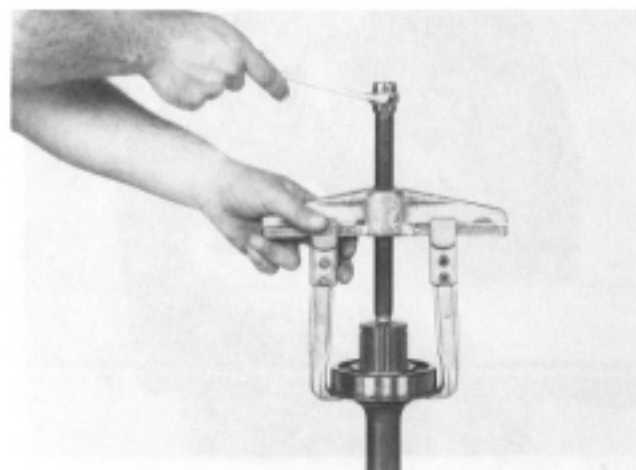
**Figure 27**

Tap turbine shaft and bearing from converter housing.



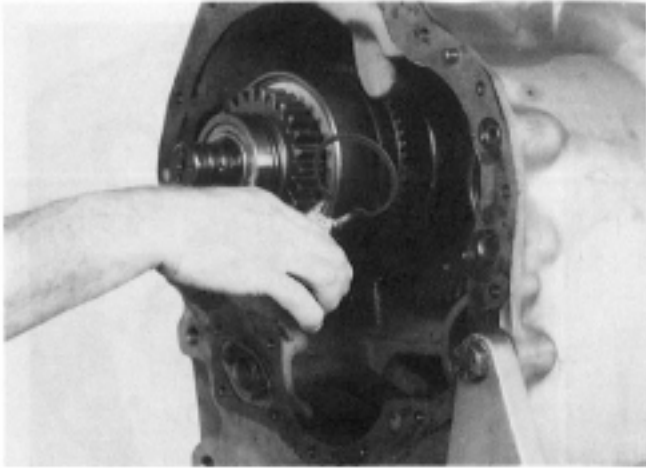
**Figure 25**

Remove turbine shaft gear retainer ring.

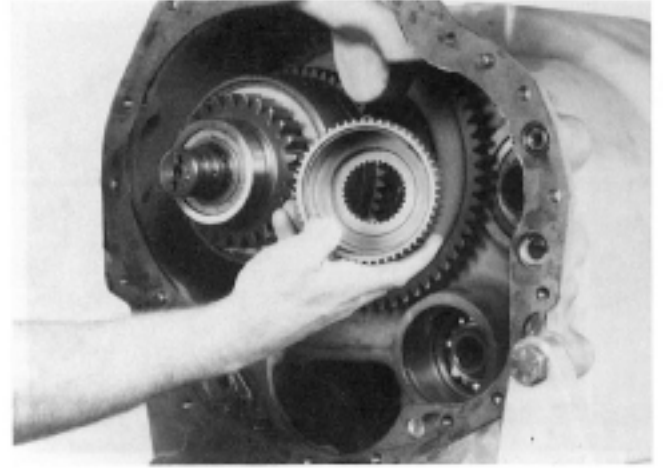


**Figure 28**

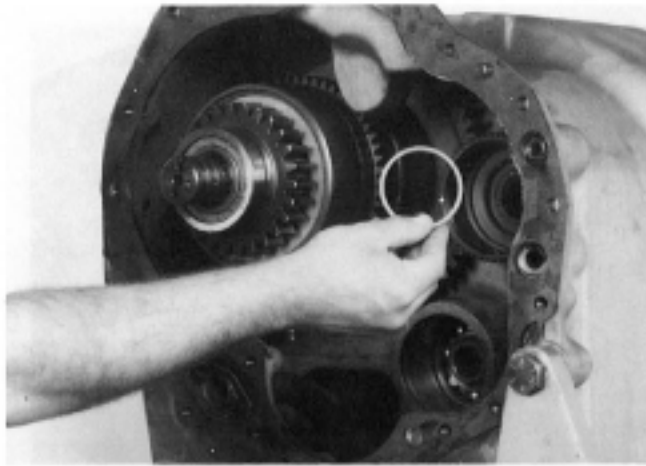
Remove bearing from turbine shaft.



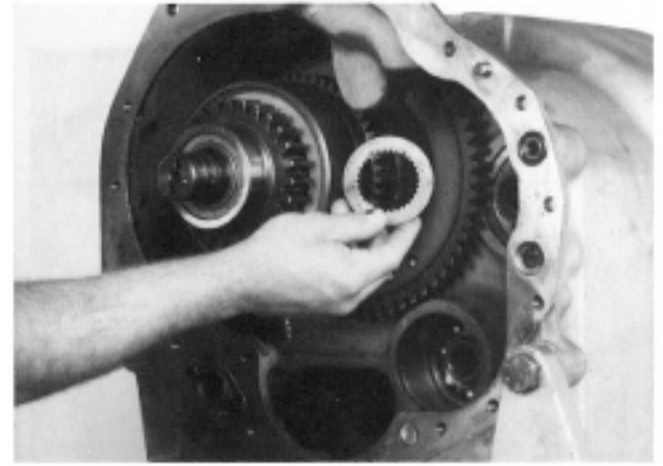
**Figure 29**  
Remove 2nd clutch disc hub retainer ring retainer.



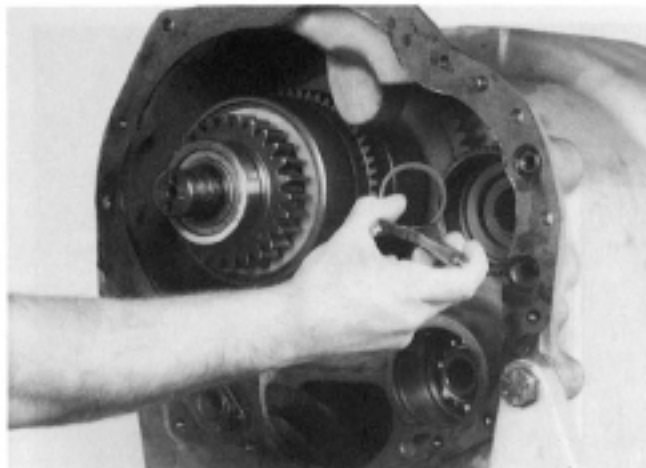
**Figure 32**  
Remove disc hub.



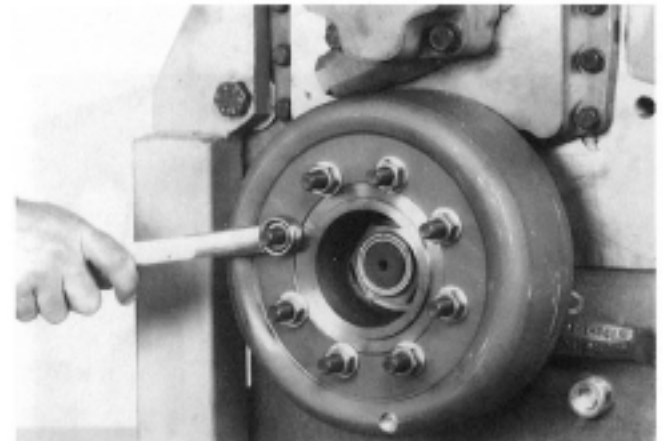
**Figure 30**  
Remove disc hub ring retainer.



**Figure 33**  
Remove bearing end plate.



**Figure 31**  
Remove disc hub retainer ring.



**Figure 34**  
Remove brake drum stud nuts (used only to hold drum in place after drive shaft was removed).

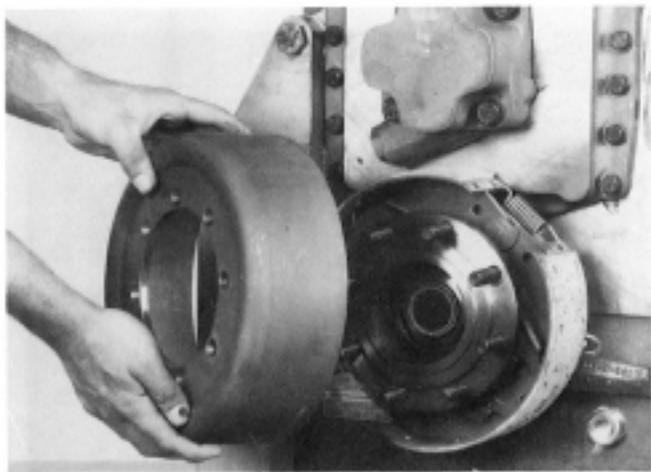


Figure 35

Remove brake drum.

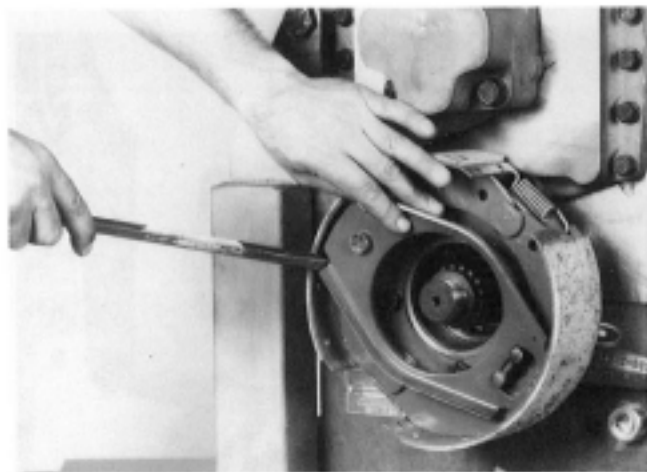


Figure 38

Pry brake strut from brake bands.

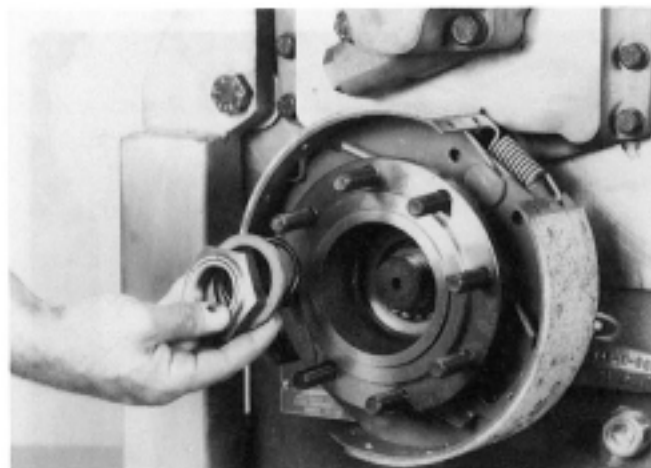


Figure 36

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

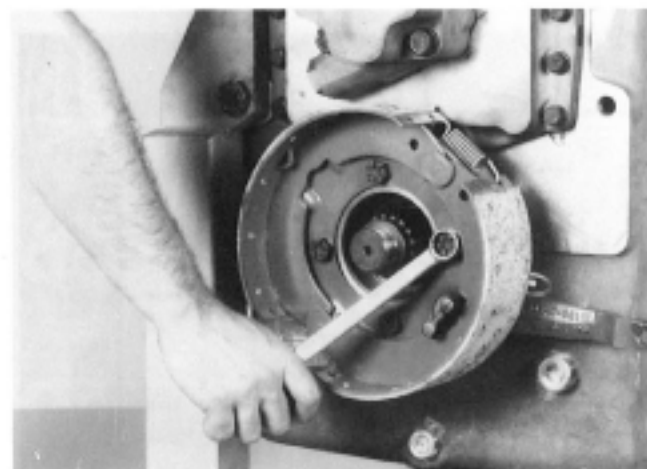


Figure 39

Remove brake backing plate bolts.

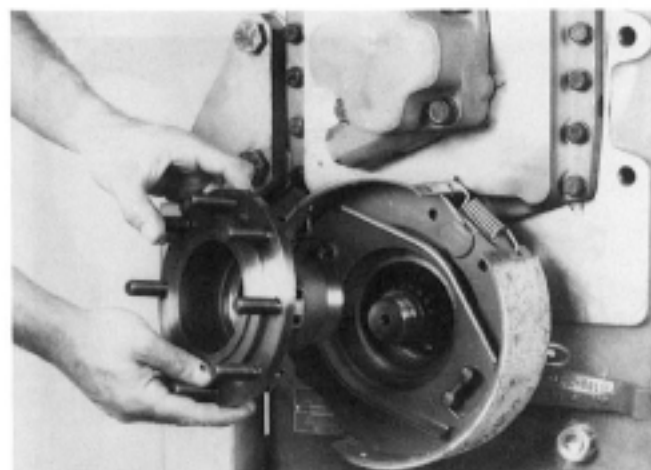


Figure 37

Remove output flange.

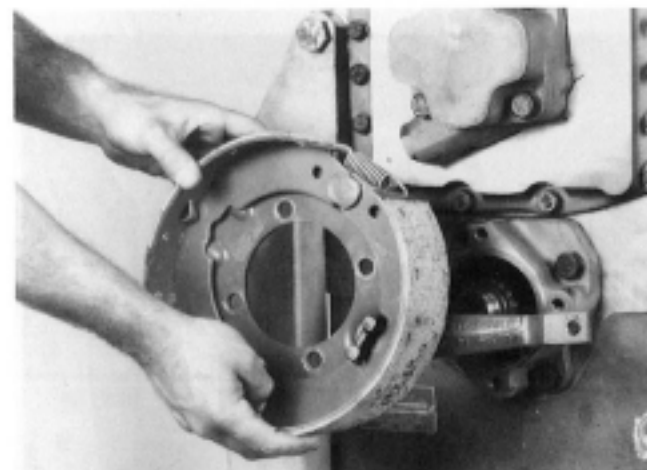
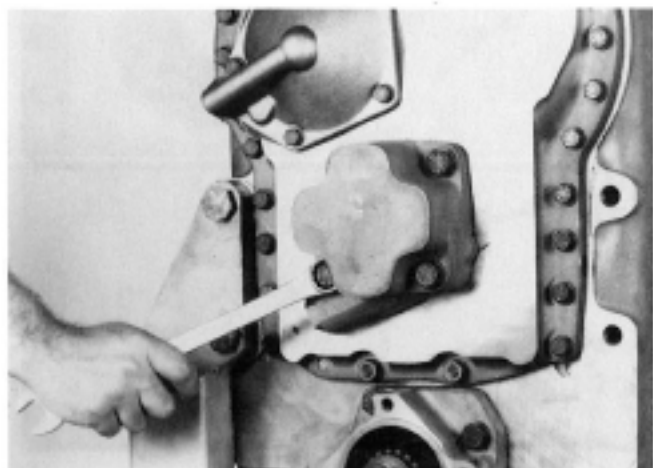
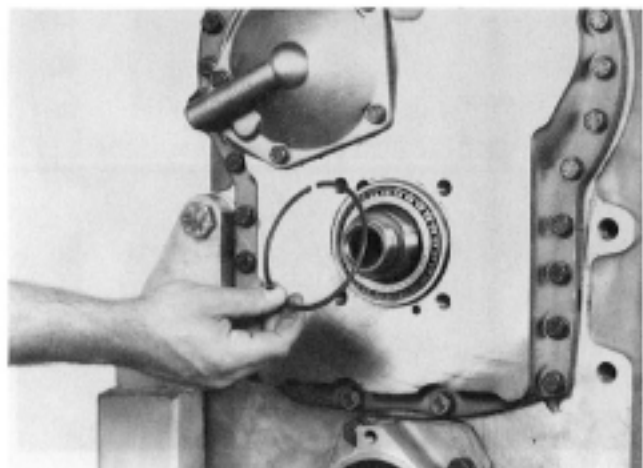


Figure 40

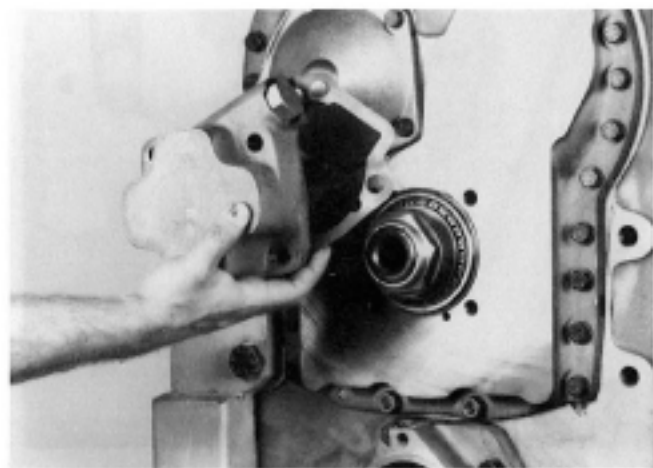
Remove backing plate and brake band assembly.



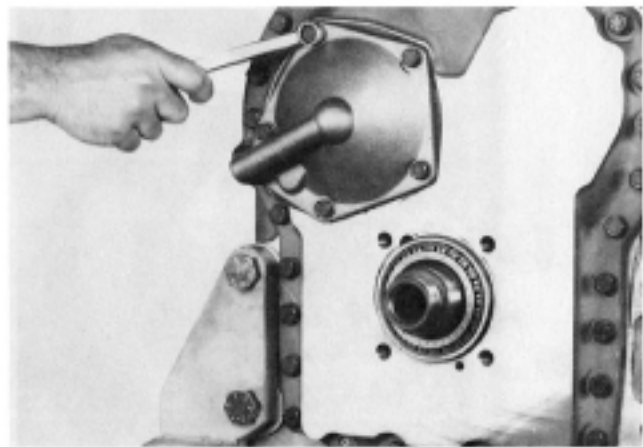
**Figure 41**  
Remove idler shaft rear bearing cap bolts and washers.



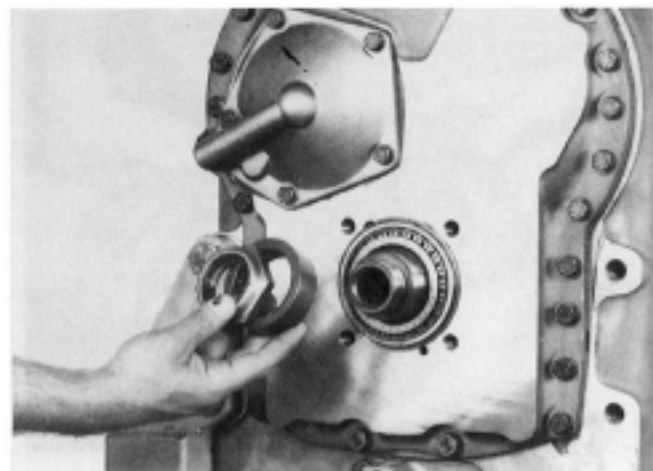
**Figure 44**  
Remove rear bearing locating ring.



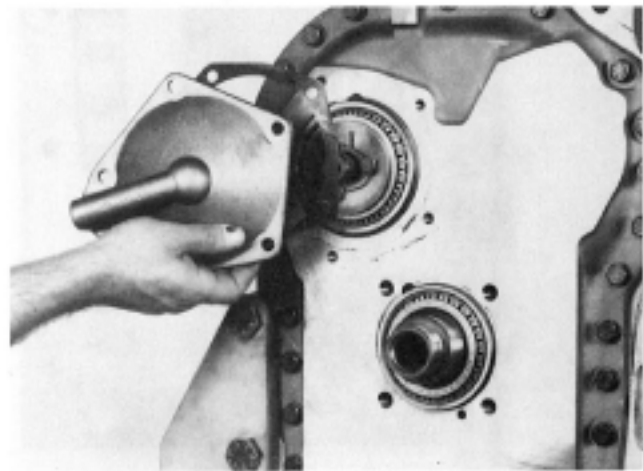
**Figure 42**  
Remove bearing cap and gasket.



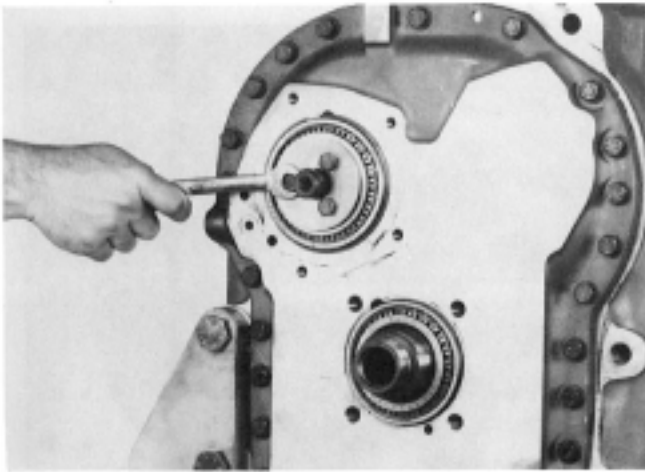
**Figure 45**  
Remove 1st speed clutch (low) rear bearing cap bolts and washers.



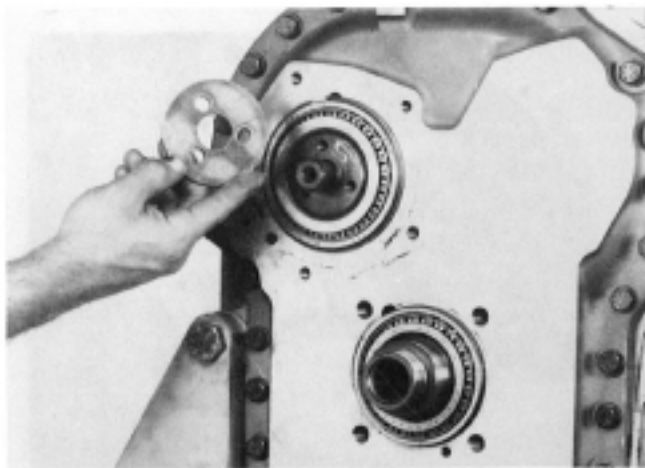
**Figure 43**  
Remove idler shaft rear bearing retainer nut and spacer.



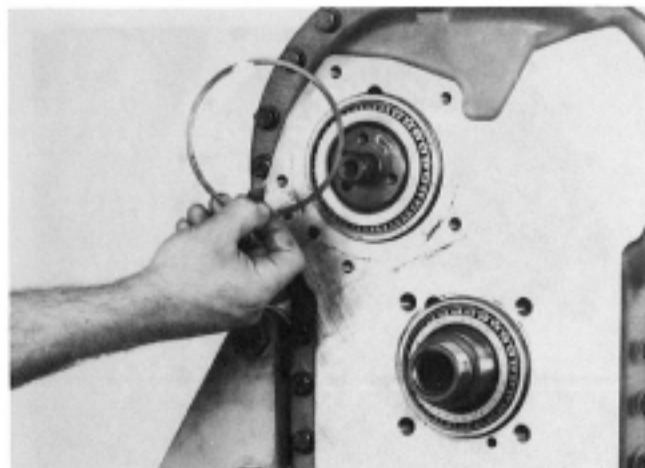
**Figure 46**  
Remove bearing cap and gasket.



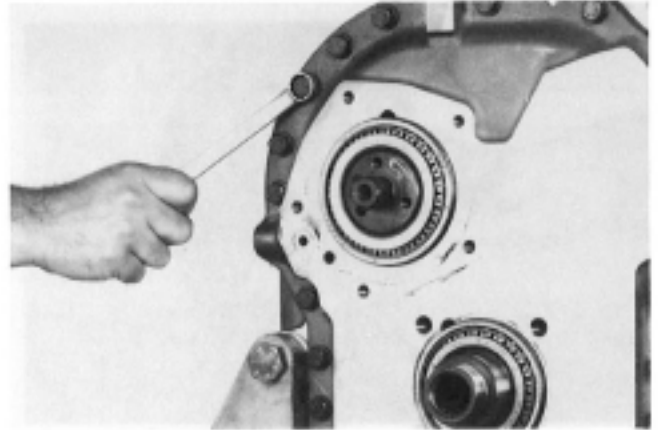
**Figure 47**  
Remove rear bearing retainer plate bolts.



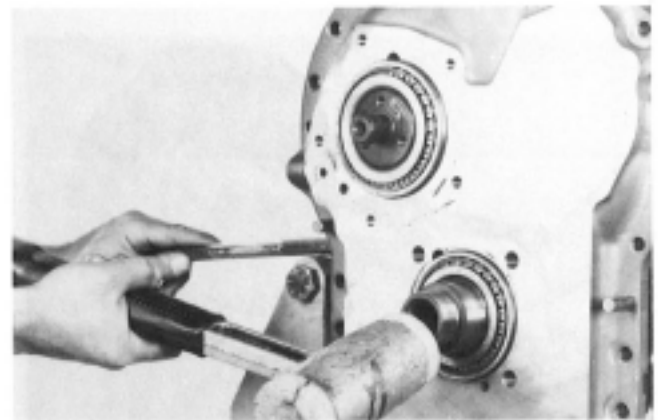
**Figure 48**  
Remove retainer plate.



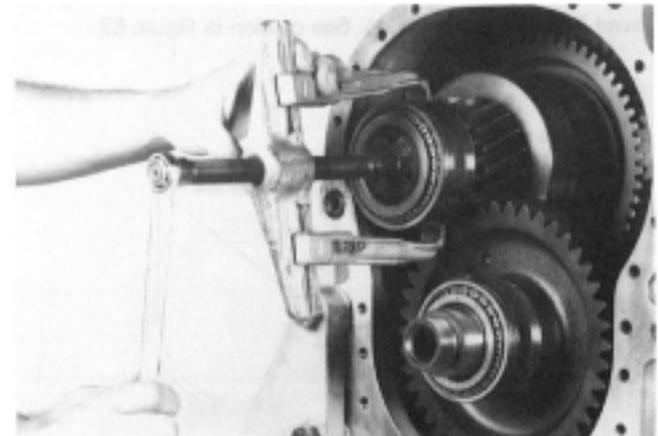
**Figure 49**  
Remove bearing locating ring.



**Figure 50**  
Remove rear cover bolts and washers.



**Figure 51**  
Using pry slots provided, pry cover from transmission housing tapping on 1st speed clutch and idler shaft to allow cover to be removed without shaft binding. **NOTE:** The use of alignment studs will facilitate cover removal.



**Figure 52**  
Remove 1st speed clutch double bearing cup, outer taper bearing and spacer.



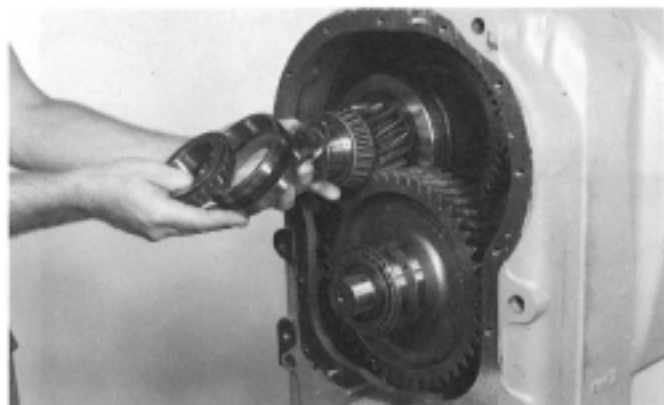


Figure 53

**CAUTION:** Outer cone, double bearing cup, spacer and inner bearing cone are replaced as a set.

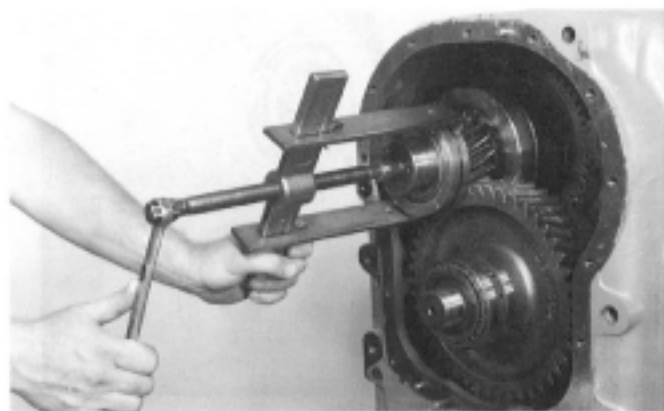


Figure 54

Remove low clutch inner bearing cone. **NOTE:** To remove the inner cone bearing without damage, a special bearing puller must be made (see diagram Fig. 54-A) or the outer cage and rollers may be pulled from the bearing inner race and the inner race can be removed after the low clutch assembly has been removed from the transmission. See caution in Figure 53.

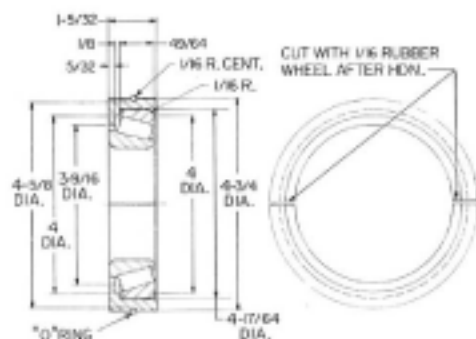


Figure 54-A

A timken bearing cup, No. 29520 must be used with the above bearing puller.

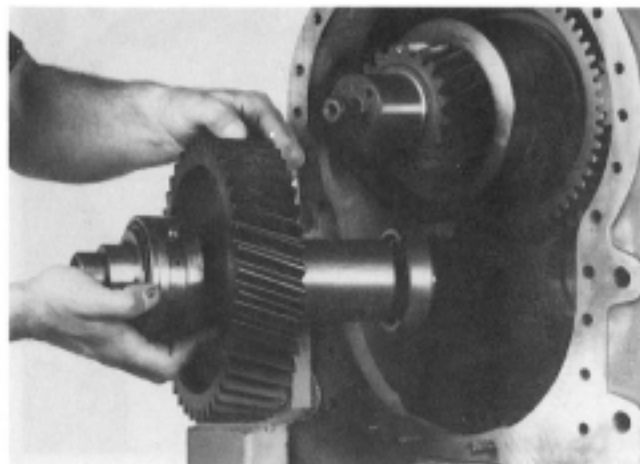


Figure 55

Remove idler shaft assembly. **NOTE:** The 6 & 8 speed transmission will have two gears and a heavier front bearing.

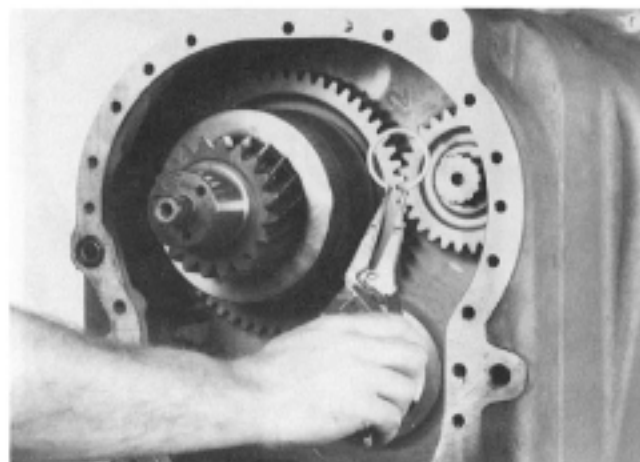


Figure 56

Remove 1st speed clutch drive gear retainer ring.

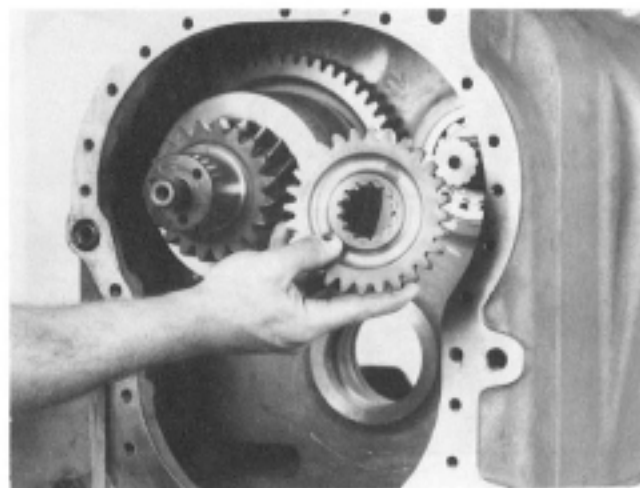
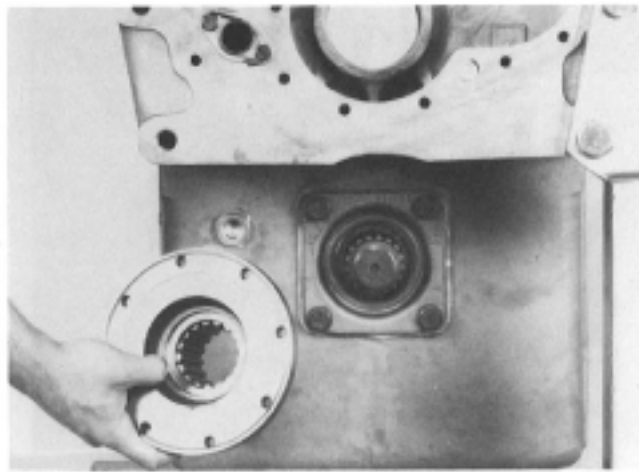


Figure 57

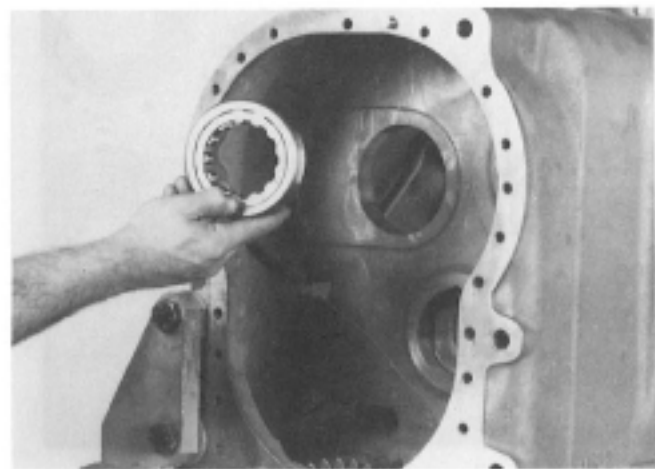
Remove drive gear.



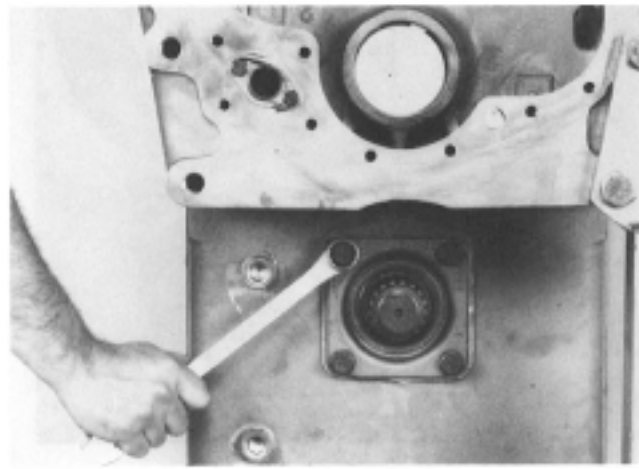
**Figure 58**  
Remove 1st speed clutch assembly.



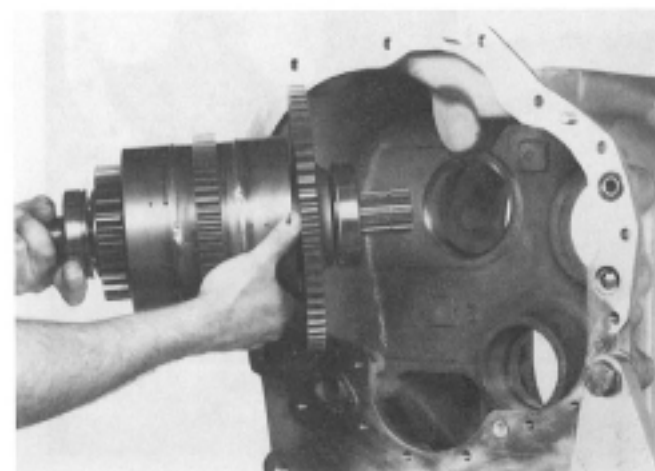
**Figure 61**  
Remove front output flange nut, washer, "O" ring and flange. See 6 & 8 Speed Section for Range Shift Output Shaft Removal.



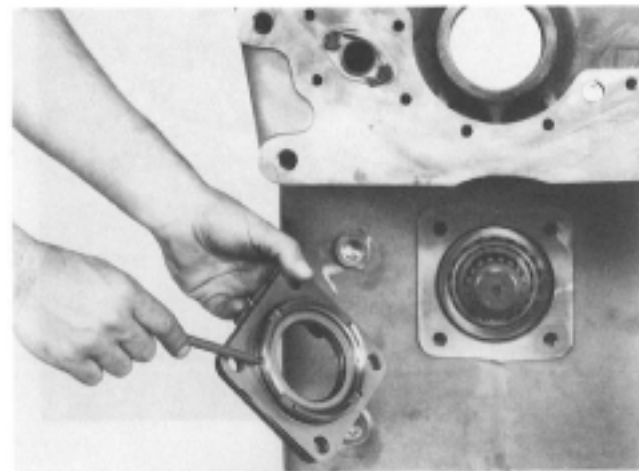
**Figure 59**  
Remove 1st speed front bearing.



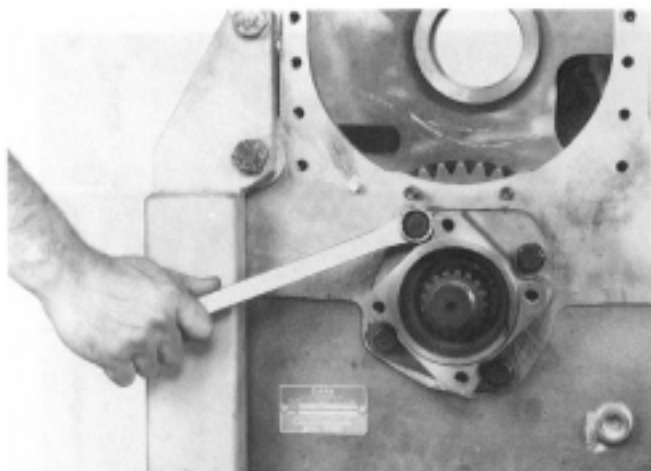
**Figure 62**  
Remove output shaft front bearing cap bolts and washers.



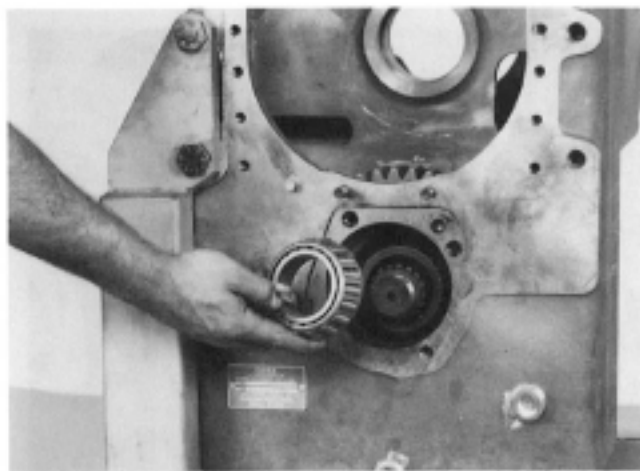
**Figure 60**  
Remove reverse and 3rd clutch assembly.



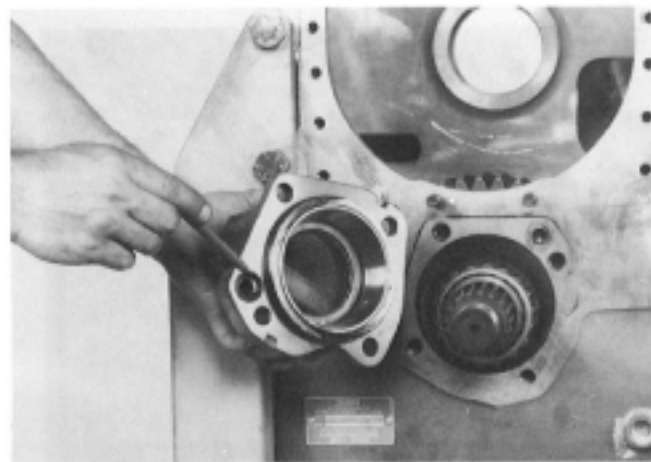
**Figure 63**  
Remove bearing cap, "O" ring and shims.



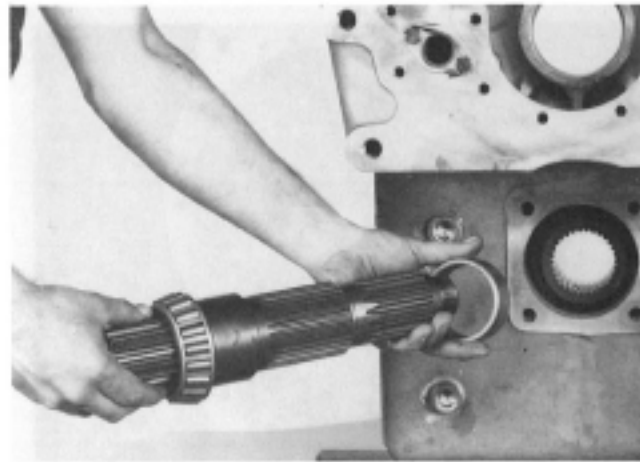
**Figure 64**  
Remove output shaft rear bearing cap bolts and washers.



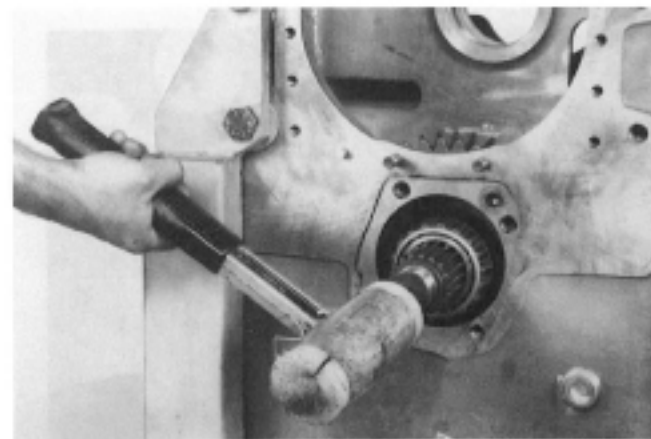
**Figure 67**  
Remove rear taper bearing.



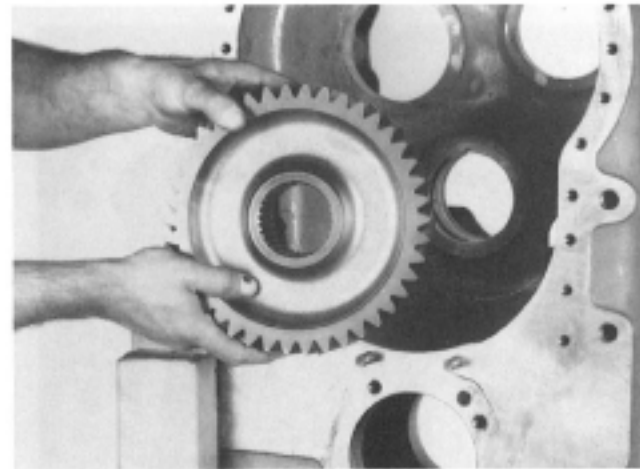
**Figure 65**  
Remove bearing cap and "O" rings.



**Figure 68**  
Remove output shaft, gear spacer and front taper bearing.

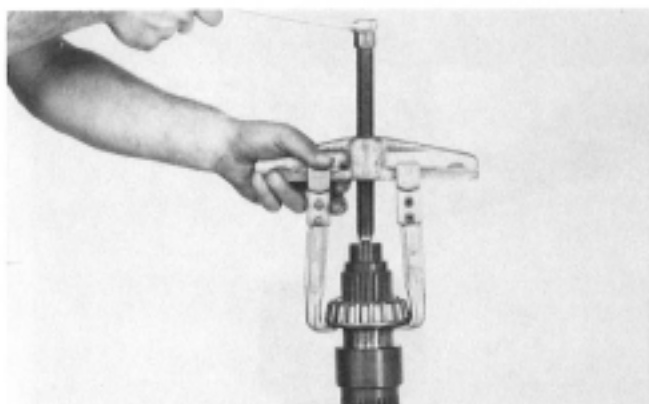


**Figure 66**  
Block output gear. Push or drive output shaft through taper bearing and output gear.



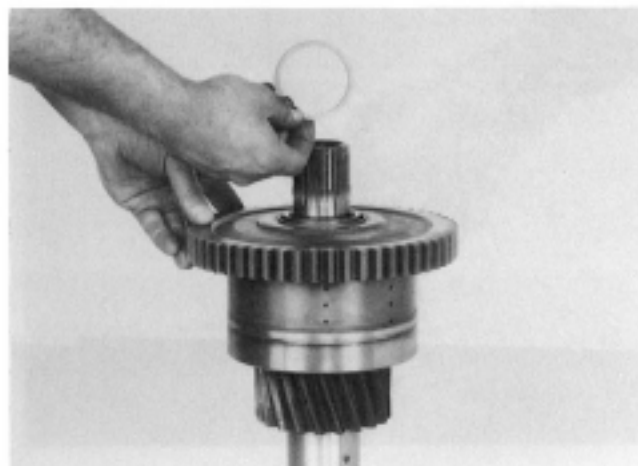
**Figure 69**  
Remove output gear.





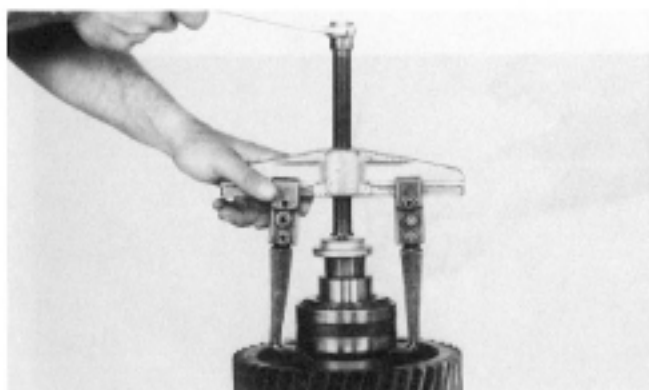
**Figure 70**

Remove front bearing.



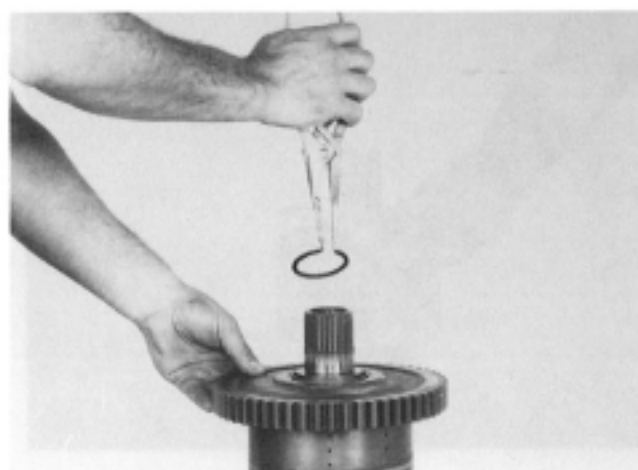
**Figure 73**

Remove taper bearing retainer ring retainer.



**Figure 71**

If idler shaft, idler gear or rear bearing are to be replaced, remove bearing and gear. Turn shaft over and remove the front bearing retainer ring and bearing.

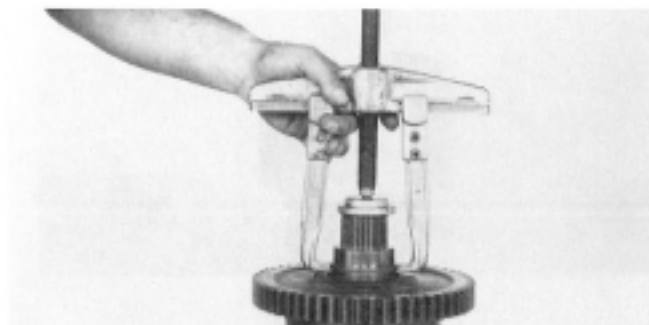


**Figure 74**

Remove bearing retainer ring.

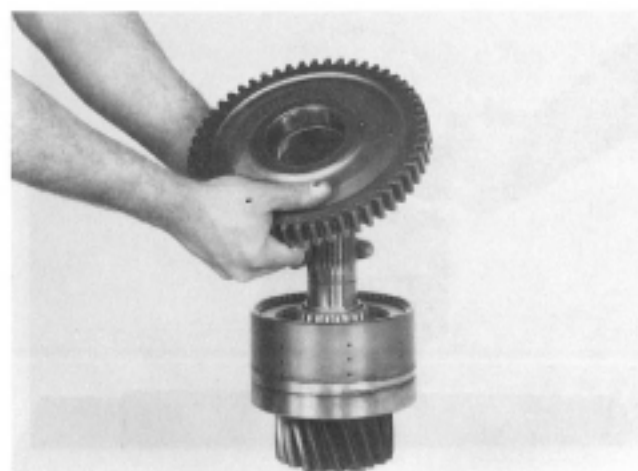
# **1ST SPEED CLUTCH (LOW) DISASSEMBLY AND REASSEMBLY** See 8 Speed Section for 4th Speed Clutch Repair

## **DISASSEMBLY** See Note in Figure 83



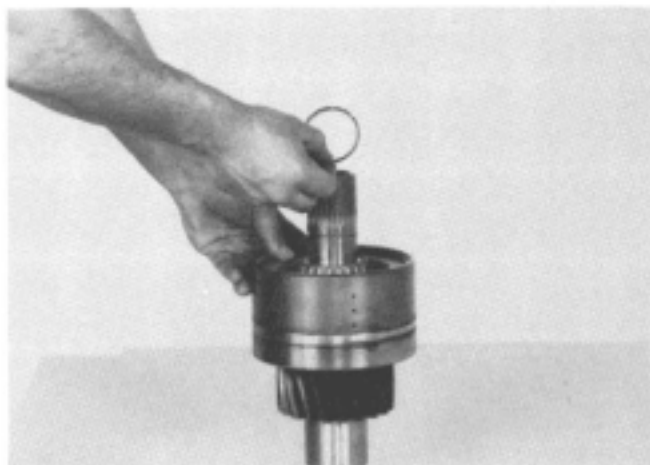
**Figure 72**

Remove clutch assembly front bearing inner race.

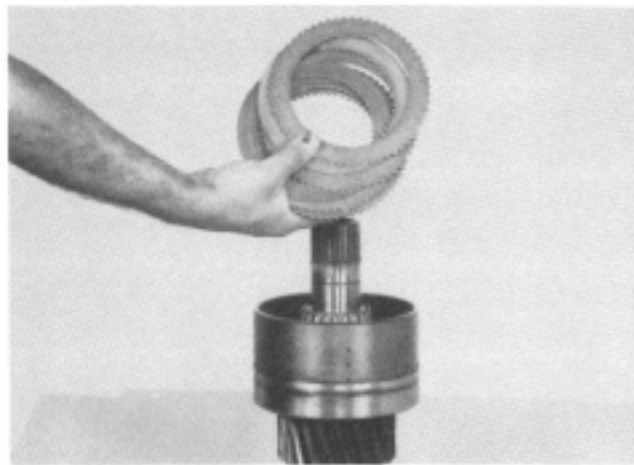


**Figure 75**

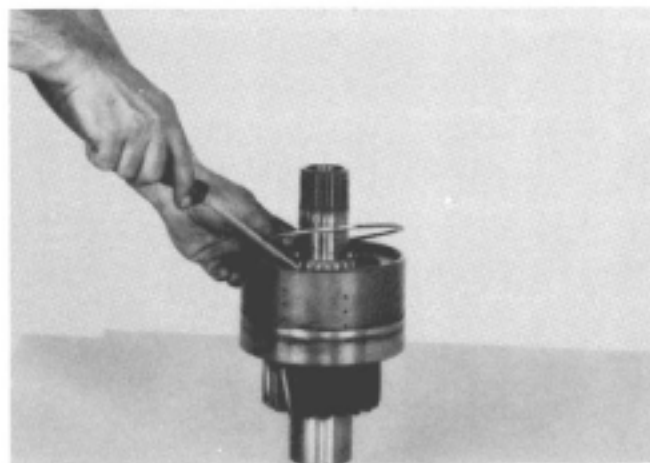
Remove 1st speed gear and outer taper bearing.



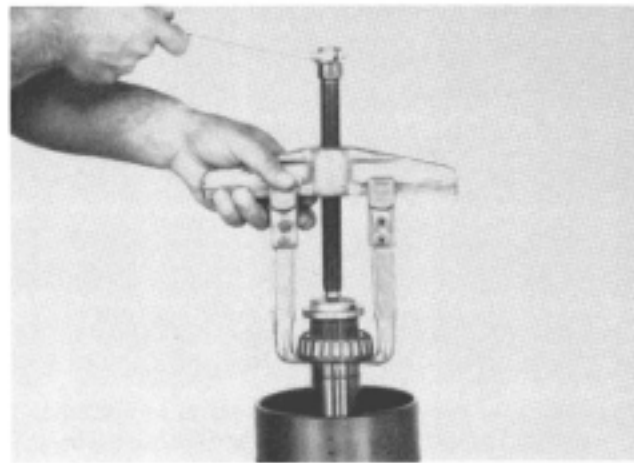
**Figure 76**  
Remove taper bearing spacer.



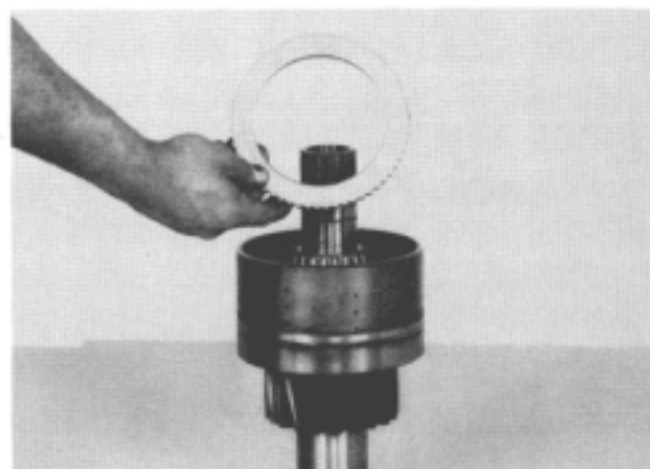
**Figure 79**  
Remove inner and outer clutch discs.



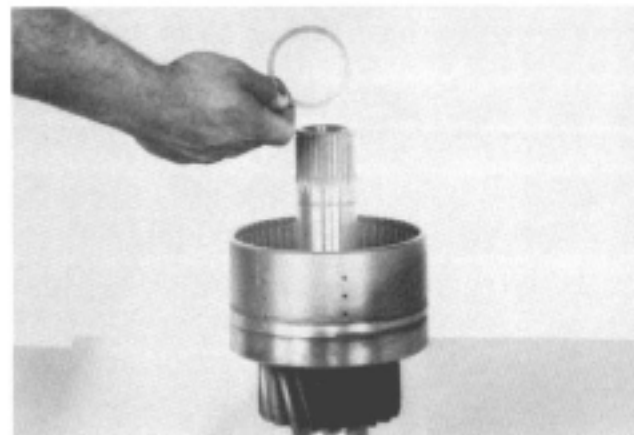
**Figure 77**  
Remove clutch end plate retainer ring.



**Figure 80**  
Remove inner taper bearing.



**Figure 78**  
Remove end plate.

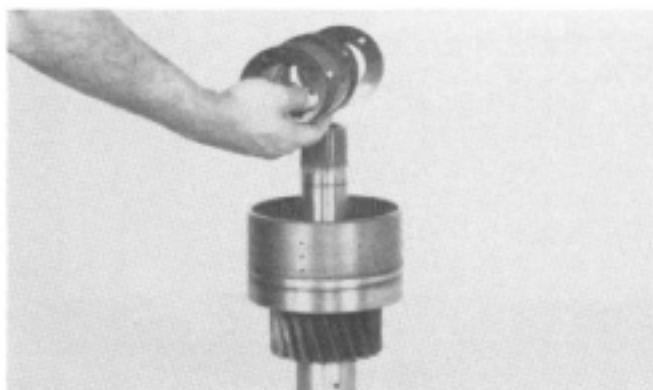


**Figure 81**  
Remove piston return disc spring retainer ring retainer washer.



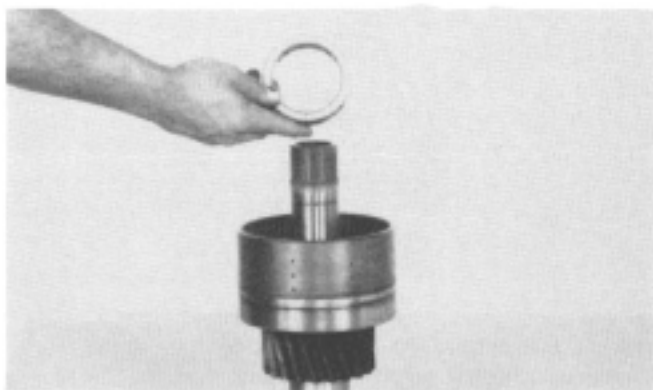
**Figure 82**

Remove return disc spring retainer ring.



**Figure 83**

Remove piston return disc spring. **NOTE:** Disc springs in the low clutch are different than springs in the forward and reverse clutch. Do not mix low clutch springs with forward and reverse springs (see note at top of page). Non modulated units will have return springs in forward & reverse clutches.



**Figure 84**

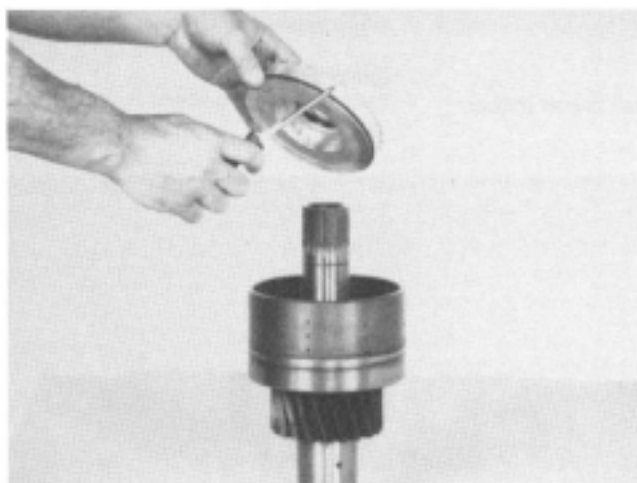
Remove return spring to piston spacer. Turn clutch over and tap clutch shaft on a block of wood to remove clutch piston.

**See cleaning and inspection page.**

**NOTE:** Each disc spring assembly is made up of selected springs to precisely match each part within this assembly. Failure to replace all piston return springs can result in unequal deflection within the spring pack. The result of this imbalance may adversely affect overall life of springs.

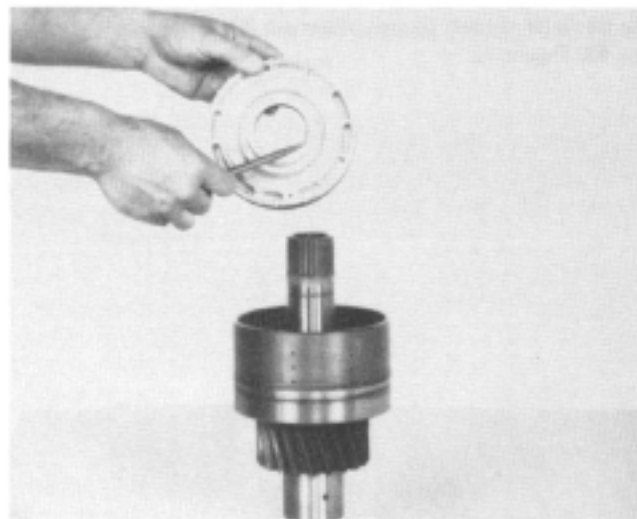
The disc spring packs are to be used as complete assemblies and care should be taken not to intermix the individual disc springs with disc springs in another clutch or disc spring pack.

## 1ST SPEED CLUTCH REASSEMBLY



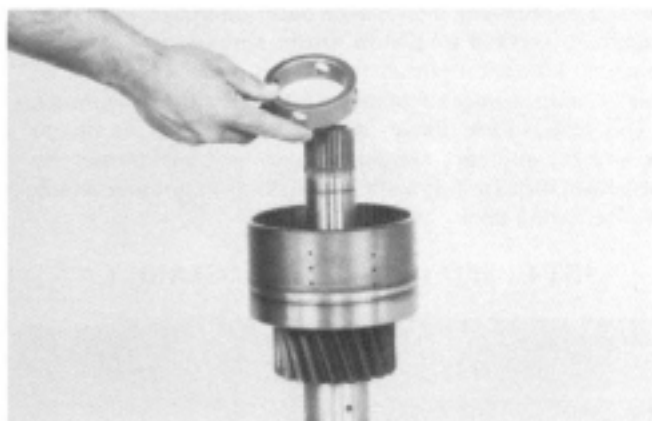
**Figure 85**

Install clutch piston outer seal ring.



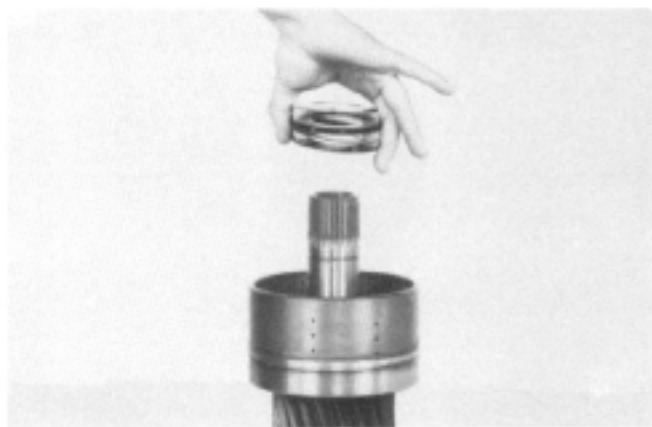
**Figure 86**

Install clutch piston inner seal ring. Install piston into clutch drum. Use caution as not to damage seal rings.



**Figure 87**

Install piston spacer.



**Figure 88**

See NOTE in figure 83. Install disc springs. First spring with large diameter toward spacer. Alternate (5) five washers. See page 59, Figure C.



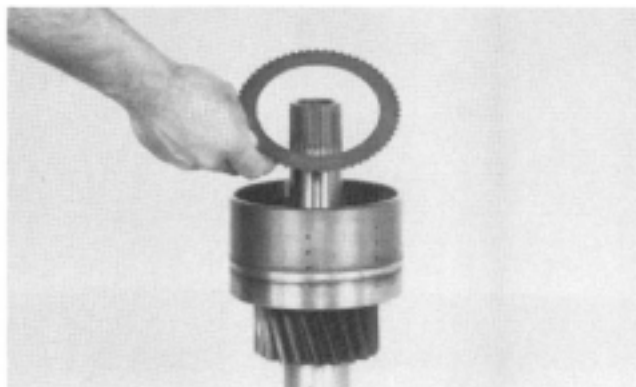
**Figure 89**

Position return spring retainer ring on clutch shaft. Compress disc springs and install retainer ring.



**Figure 90**

Position ring retainer over retainer ring.



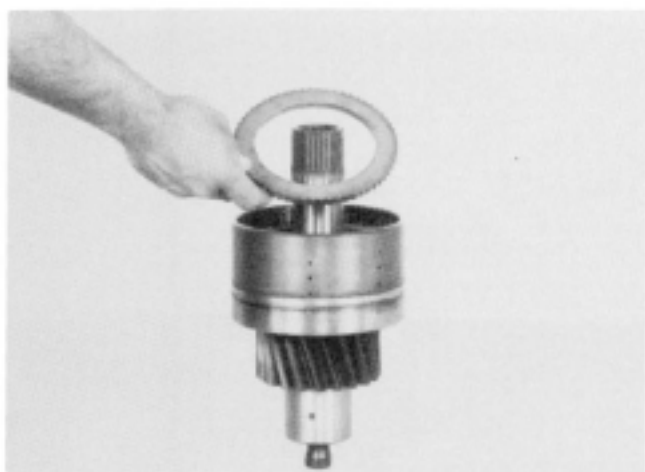
**Figure 91**

Install one steel disc.



**Figure 92**

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



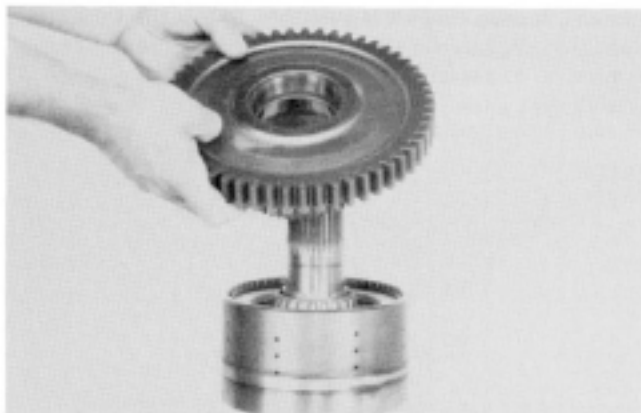
**Figure 93**  
Install clutch disc end plate.



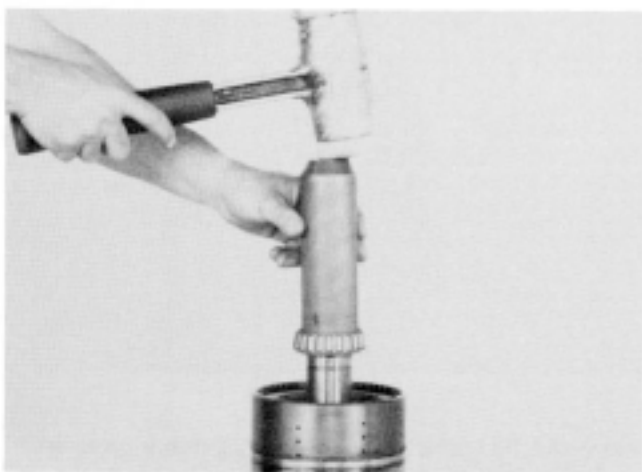
**Figure 96**  
Position taper bearing spacer on shaft.



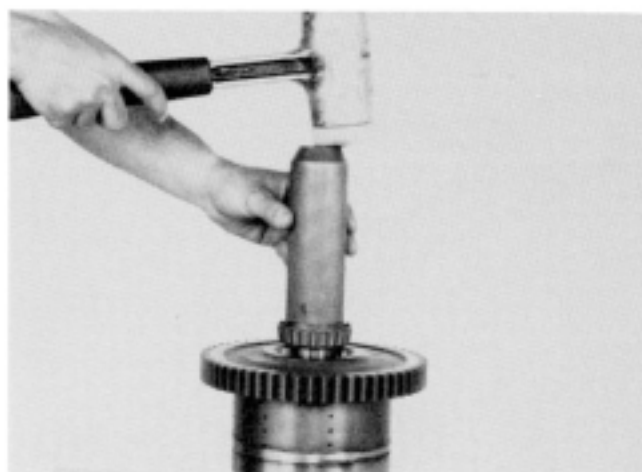
**Figure 94**  
Install end plate retainer ring.



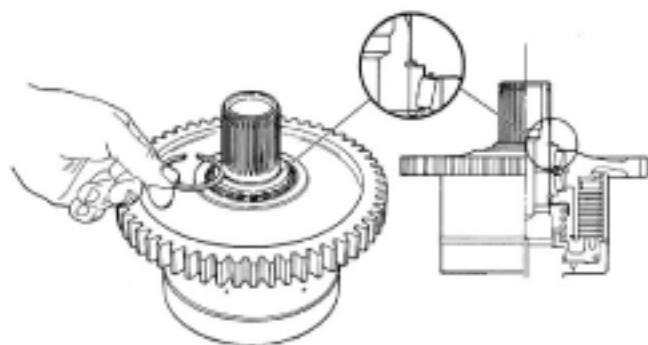
**Figure 97**  
Install 1st gear into clutch drum. Align splines on 1st gear with internal teeth of friction discs. Tap gear into position. Do not force this operation. Gear splines must be in full position with internal teeth of all friction discs.



**Figure 95**  
Install inner clutch gear taper bearing.



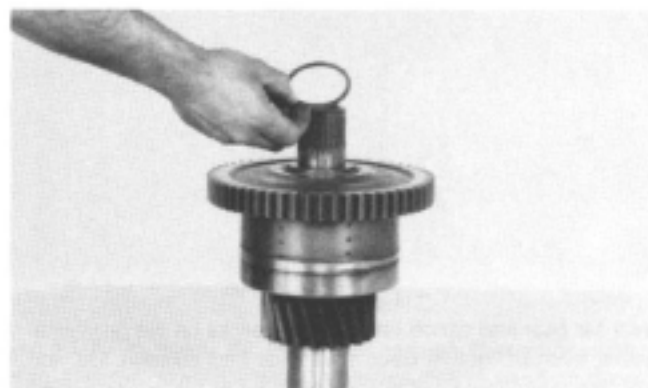
**Figure 98**  
Install outer taper bearing.



**Figure 99**

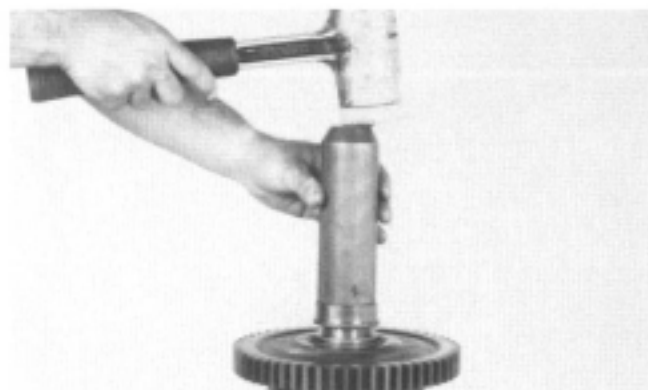
Install low clutch taper bearing retainer ring.

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



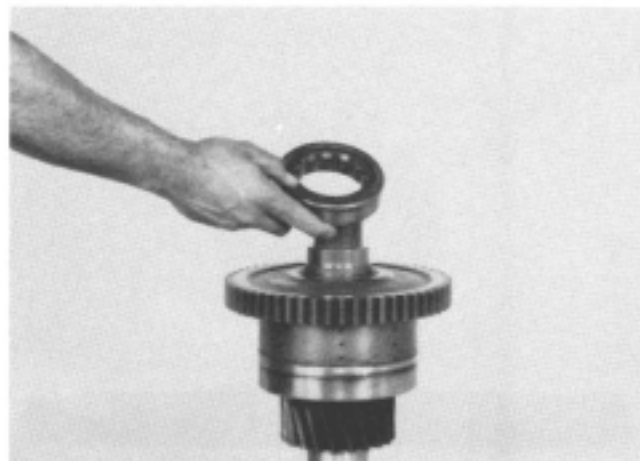
**Figure 100**

Position ring retainer over retainer ring.



**Figure 101**

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

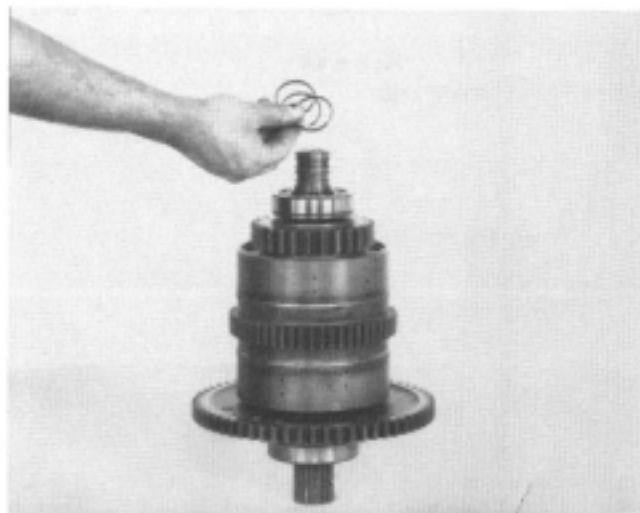


**Figure 102**

Position front bearing on clutch shaft inner race. **NOTE:** Bearing could be installed in transmission case before installing clutch.

## REVERSE AND 3RD CLUTCH DISASSEMBLY AND REASSEMBLY

### DISASSEMBLY (Reverse being disassembled)



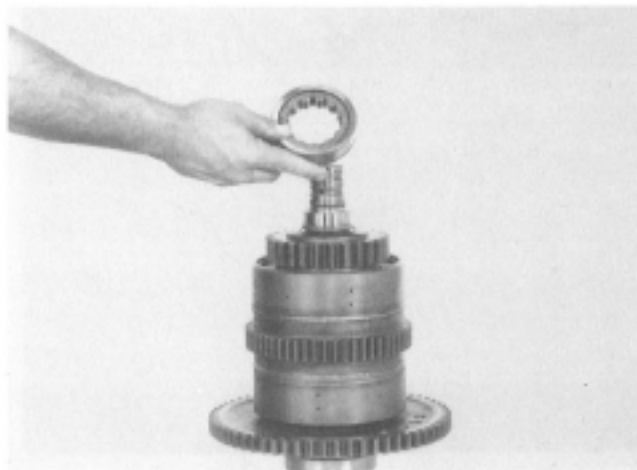
**Figure 103**

Remove clutch shaft piston rings. **NOTE:** Some units will have Teflon piston rings and expander springs. these rings are to be replaced with a new style ring and does **NOT** use an expander spring. See page 79 for proper piston ring installation.

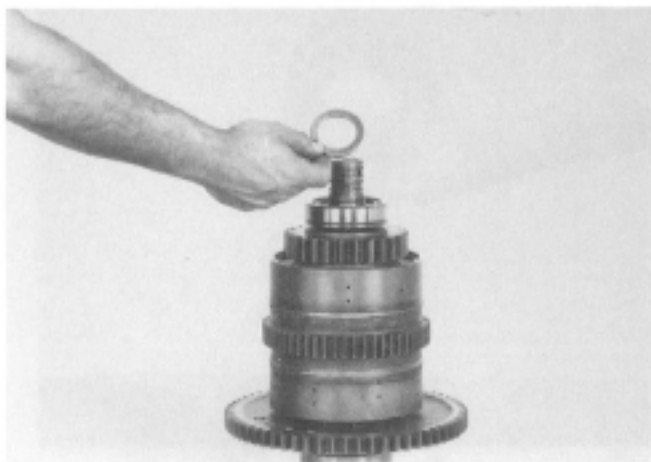




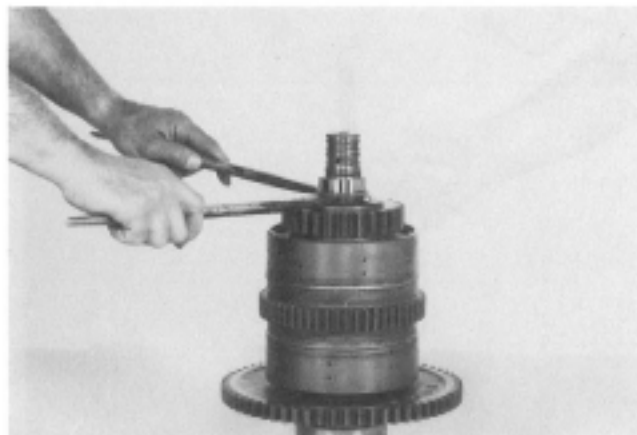
**Figure 104**  
Remove front bearing retainer ring.



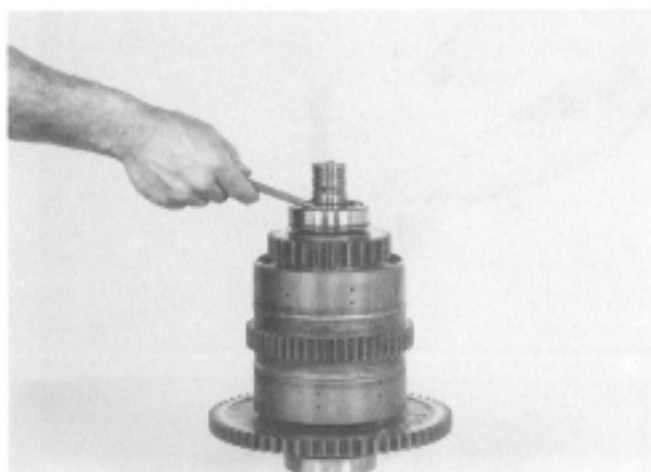
**Figure 107**  
Remove front bearing.



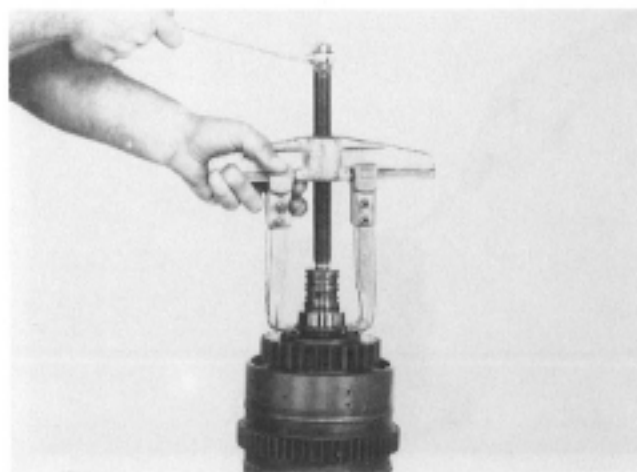
**Figure 105**  
Remove front bearing end plate.



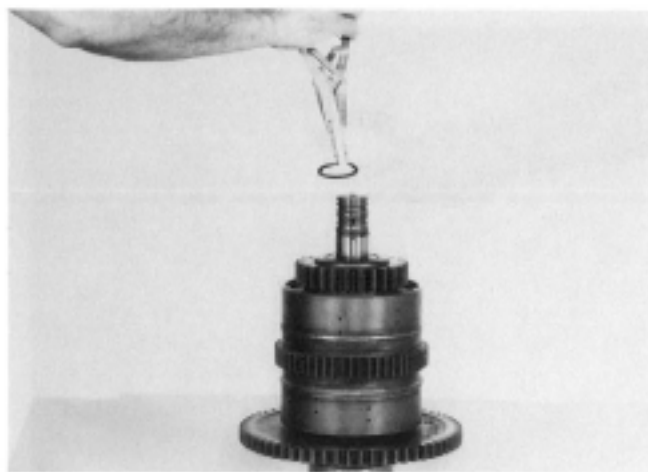
**Figure 108**  
Pry front bearing inner race up far enough to use a bearing puller.



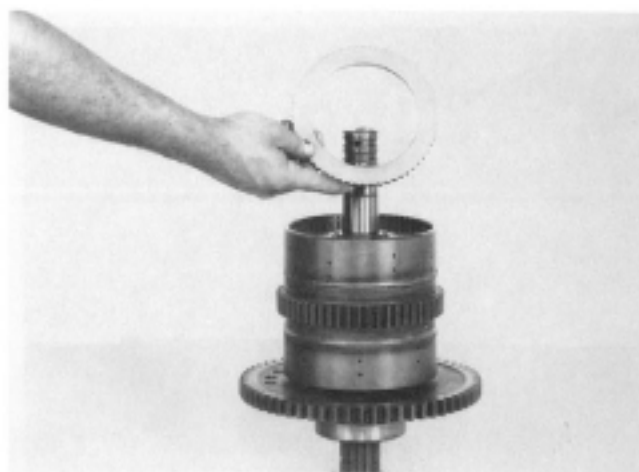
**Figure 106**  
Remove end plate lock ball.



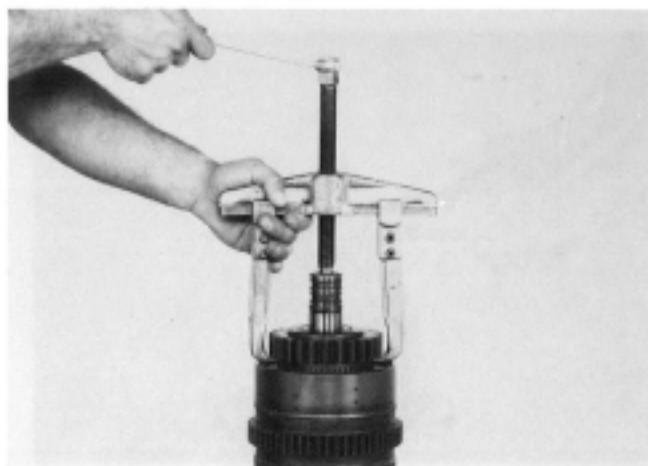
**Figure 109**  
Remove bearing inner race.



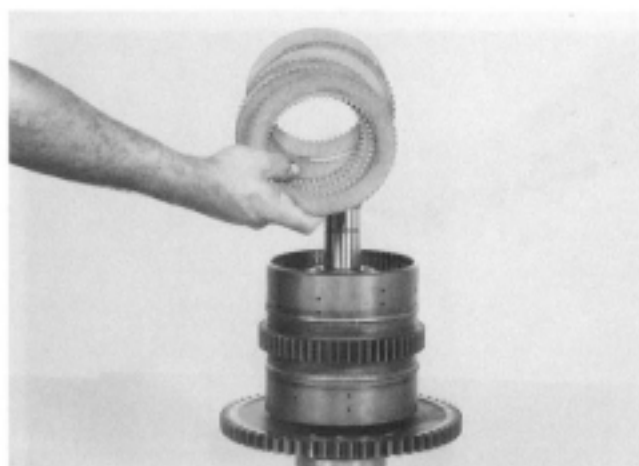
**Figure 110**  
Remove clutch driven gear outer bearing retainer ring.



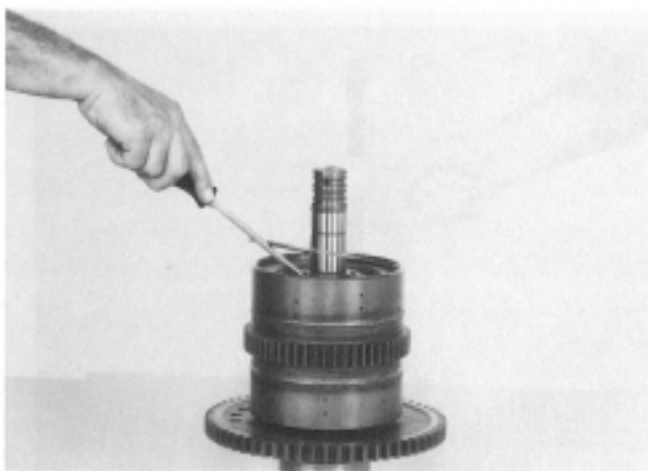
**Figure 113**  
Remove end plate.



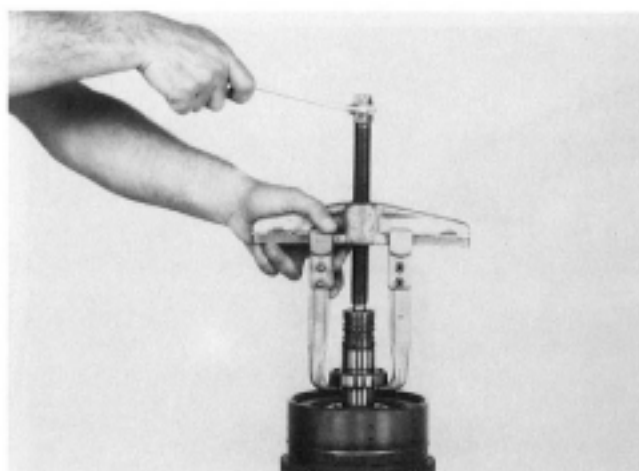
**Figure 111**  
Remove clutch gear and outer bearing.



**Figure 114**  
Remove inner and outer clutch discs.

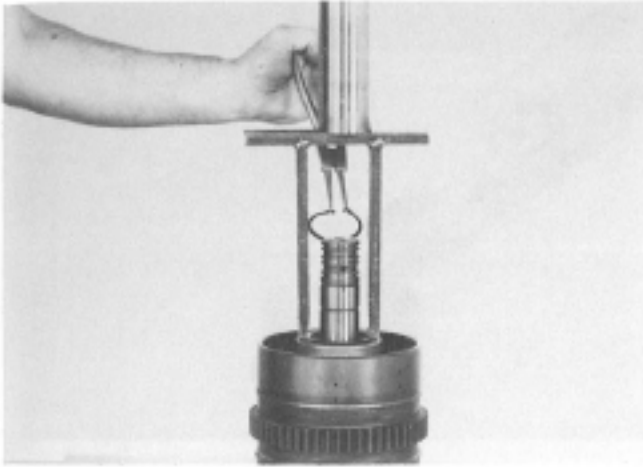


**Figure 112**  
Remove clutch disc end plate retainer ring.



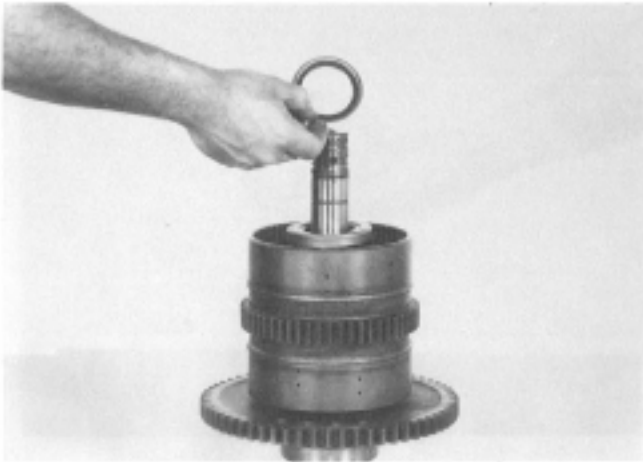
**Figure 115**  
Remove inner bearing.





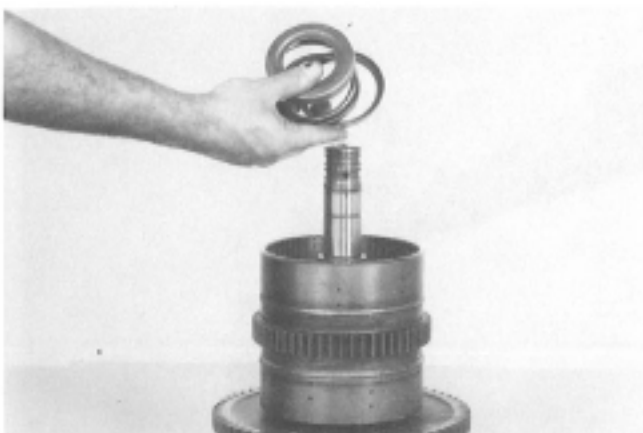
**Figure 116**

Compress piston return spring. Remove spring retainer ring.



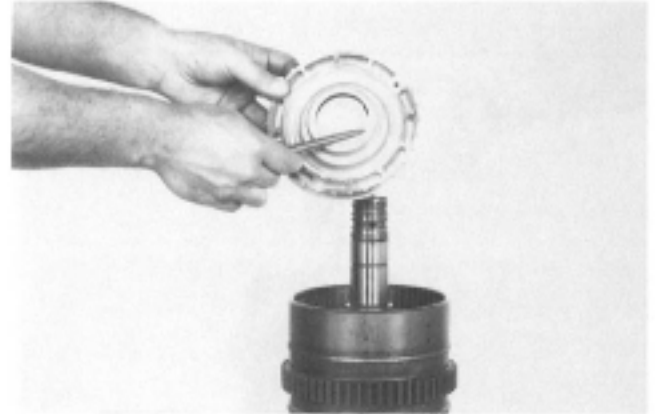
**Figure 117**

Remove retainer ring retaining washer.



**Figure 118**

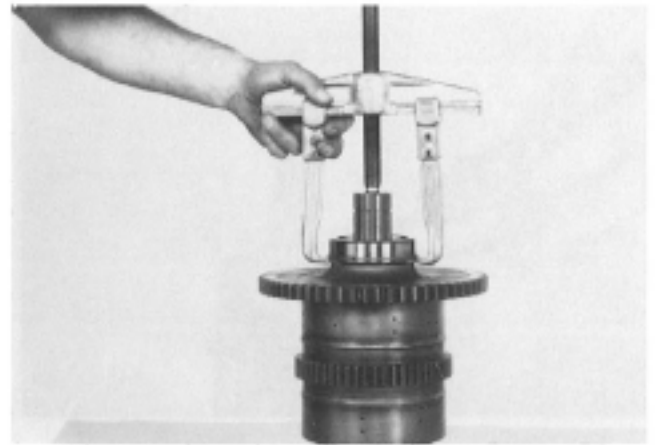
Remove piston return spring and retainers. **NOTE:** Modulated forward and reverse clutches will have piston return disc springs. (See note on page 15, Figure 83.)



**Figure 119**

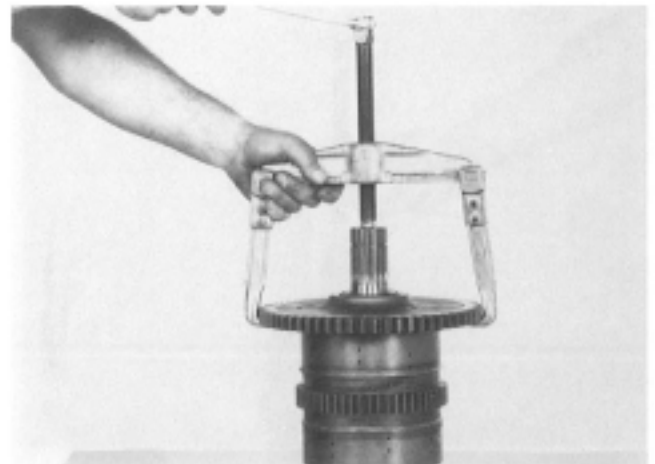
Remove clutch piston.

### 3RD SPEED CLUTCH DISASSEMBLY



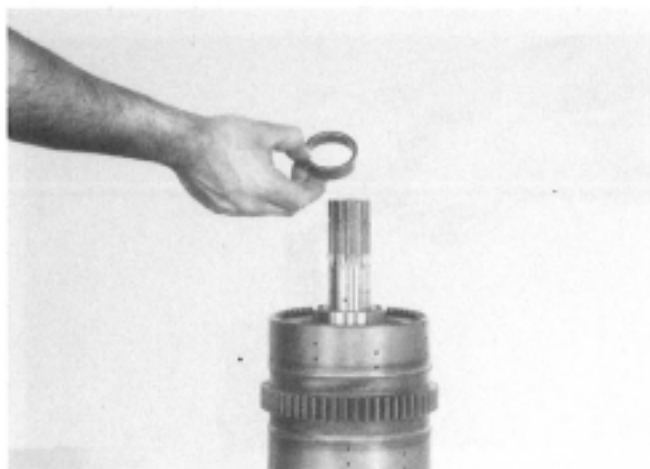
**Figure 120**

Remove 3rd speed clutch shaft bearing.



**Figure 121**

Remove 3rd speed gear and outer bearing.



**Figure 122**  
Remove clutch gear outer and inner bearing spacer.



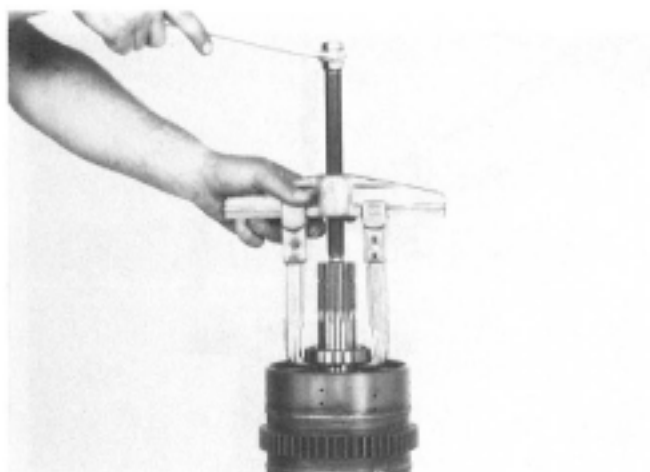
**Figure 125**  
Remove clutch disc end plate retainer ring.



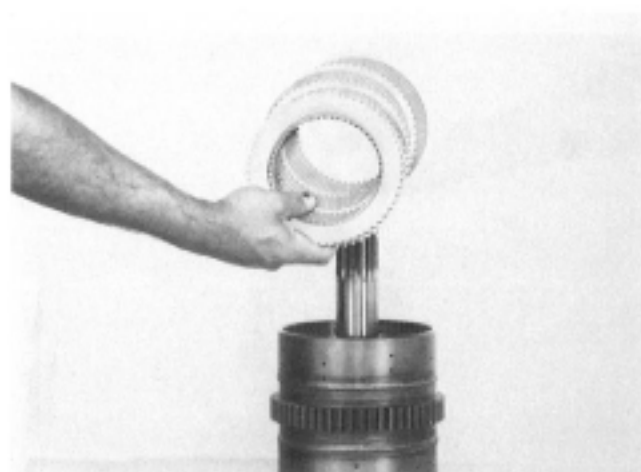
**Figure 123**  
Pry inner bearing up far enough to use a bearing puller.



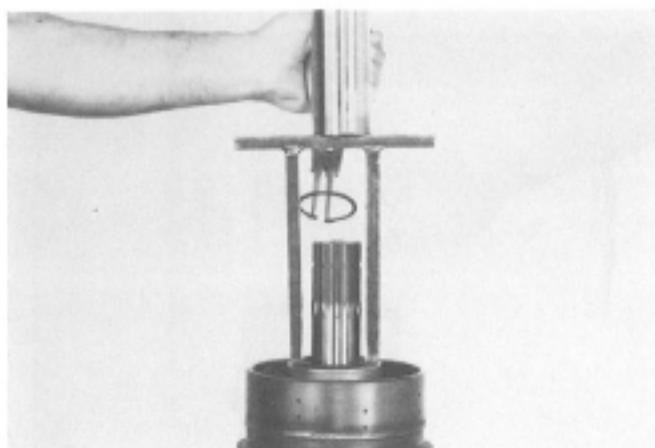
**Figure 126**  
Remove end plate.



**Figure 124**  
Remove inner bearing.



**Figure 127**  
Remove inner and outer clutch discs.



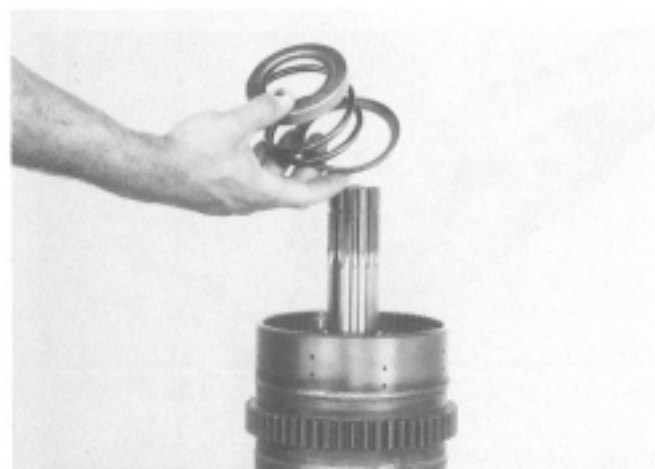
**Figure 128**

Compress piston return spring. Remove return spring retainer ring.



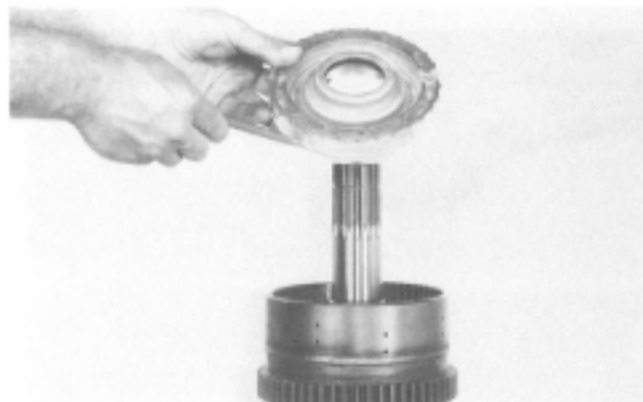
**Figure 129**

Remove retainer ring retaining washer.



**Figure 130**

Remove return spring retainers and spring.



**Figure 131**

Remove clutch piston.

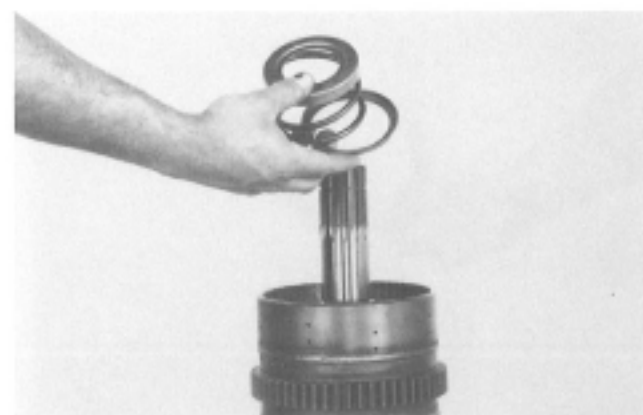
**See cleaning and inspection page.**

### **3RD SPEED CLUTCH REASSEMBLY**



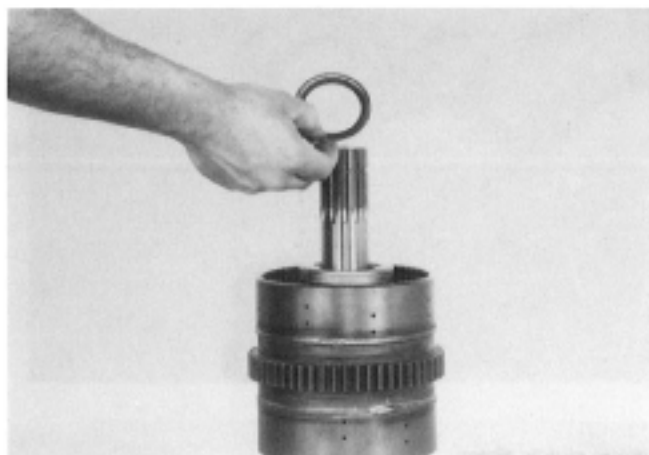
**Figure 132**

Install clutch piston inner and outer seal rings. Install clutch piston in clutch drum, use caution as not to damage seal rings.



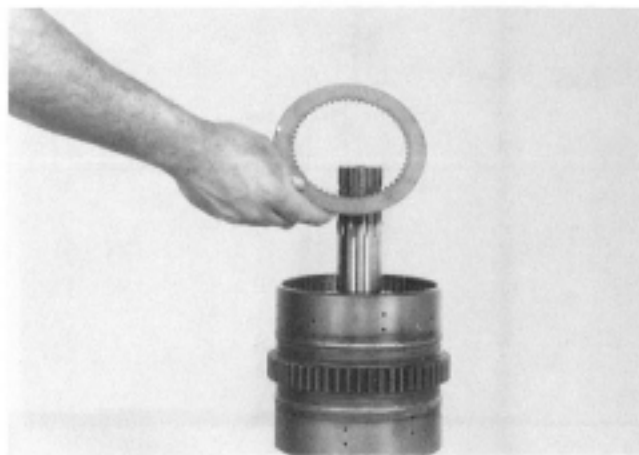
**Figure 133**

Position the inner return spring retainer, the return spring and the outer spring retainer on clutch shaft.



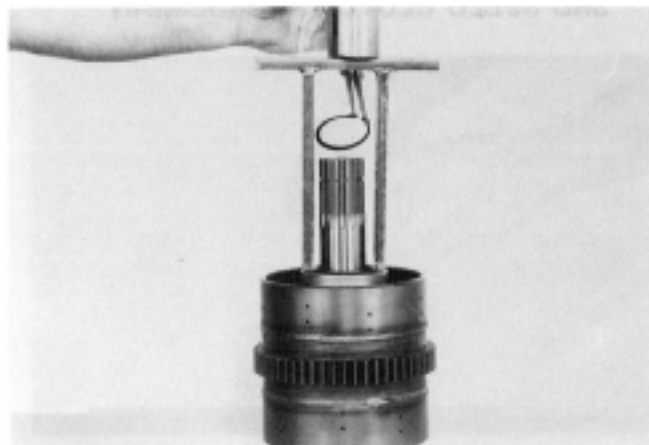
**Figure 134**

Position return spring retainer ring retaining washer on clutch shaft.



**Figure 137**

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



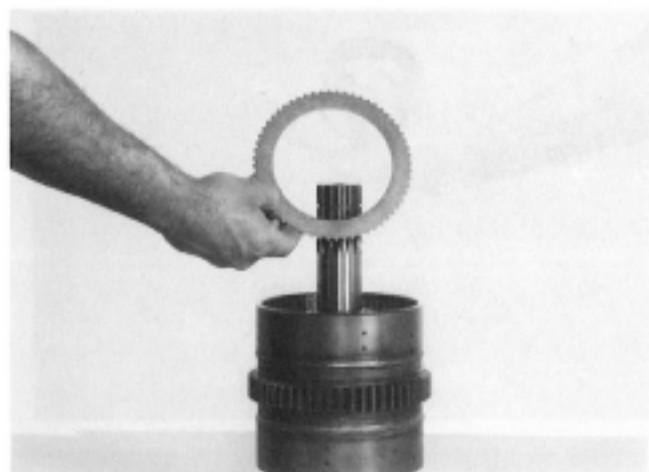
**Figure 135**

Compress return spring and install retainer ring being certain ring is in full position in retaining washer and ring groove.



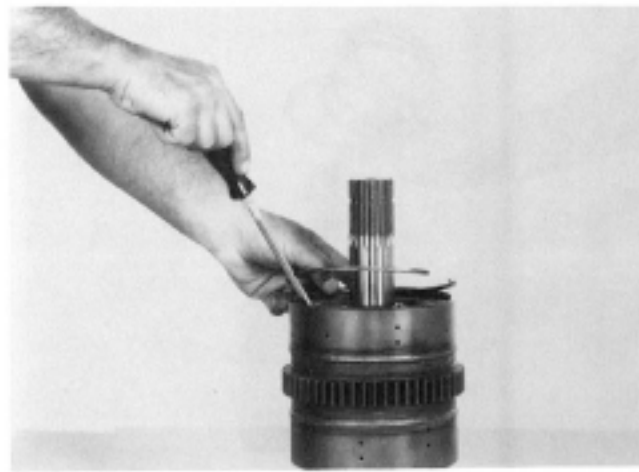
**Figure 138**

Install clutch disc end plate.



**Figure 136**

Install one steel disc.



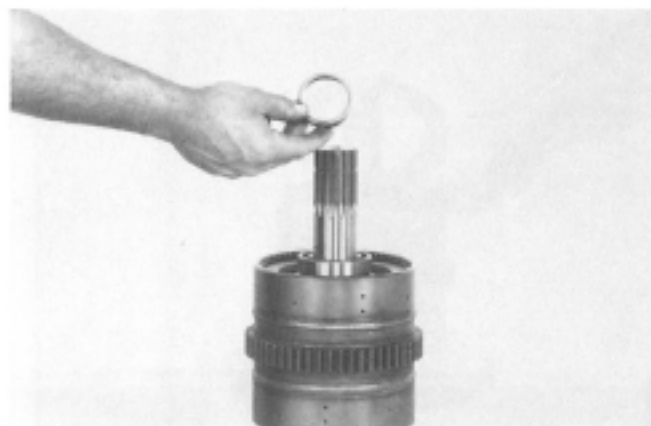
**Figure 139**

Install end plate retainer ring.



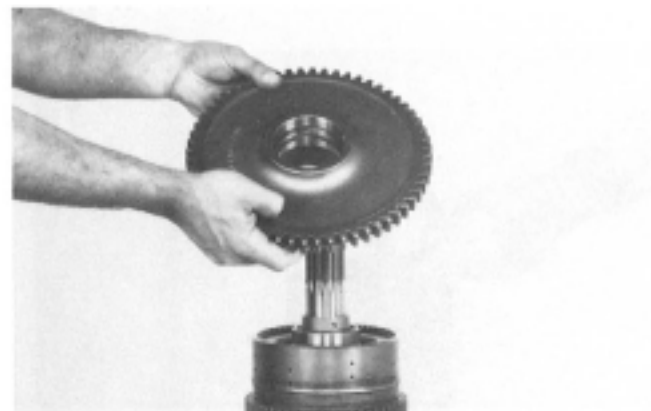
**Figure 140**

Install clutch gear inner bearing. **NOTE:** The inner bearing does not have a bearing shield.



**Figure 141**

Install clutch gear inner and outer bearing spacer.



**Figure 142**

Install clutch 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 143**

Install clutch gear outer bearing. **NOTE:** Outer bearing has a shield in it, this shield must be up.



**Figure 144**

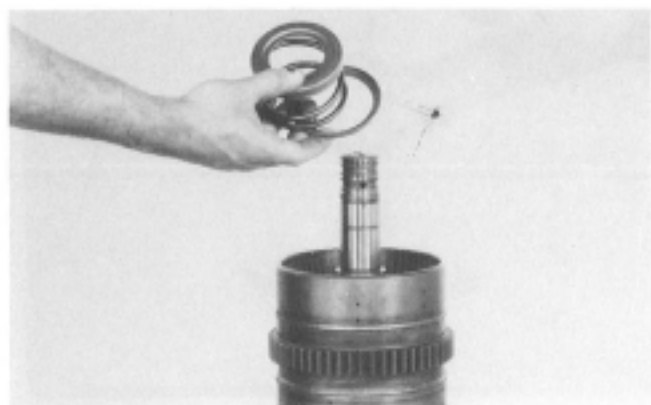
Install 3rd speed clutch shaft rear bearing. **NOTE:** Bearing outer diameter locating ring must be down.

## REVERSE CLUTCH REASSEMBLY



**Figure 145**

Install clutch piston inner and outer oil seal rings. Install clutch piston in clutch drum, use caution as not to damage seal rings.



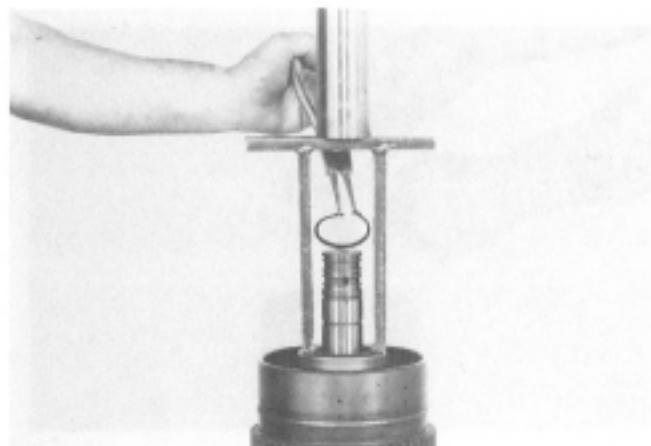
**Figure 146**

Position the inner return spring retainer, the return spring and the outer spring retainer. **NOTE:** If reverse and forward clutches are modulated, assemble disc springs as shown in Figure A on page 59.



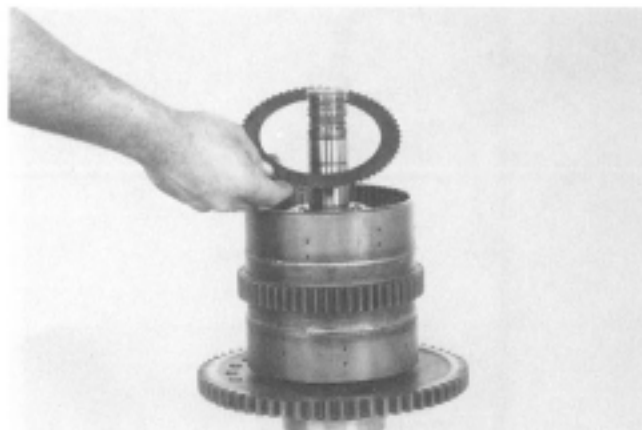
**Figure 147**

Position return spring retainer ring retaining washer on clutch shaft.



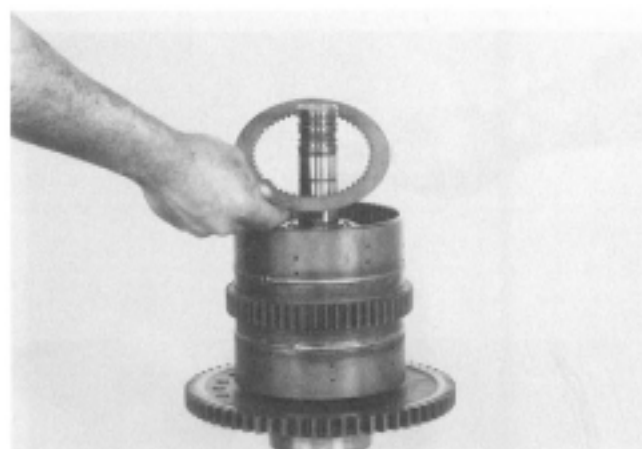
**Figure 148**

Compress return spring and install retainer ring being certain ring is in full position in retaining washer and ring groove.



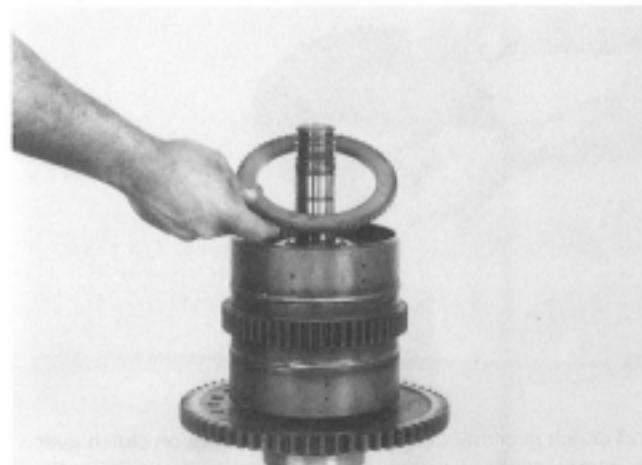
**Figure 149**

Install one steel disc.



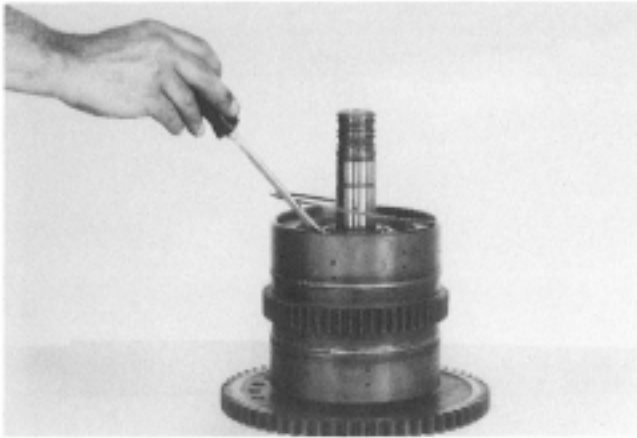
**Figure 150**

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



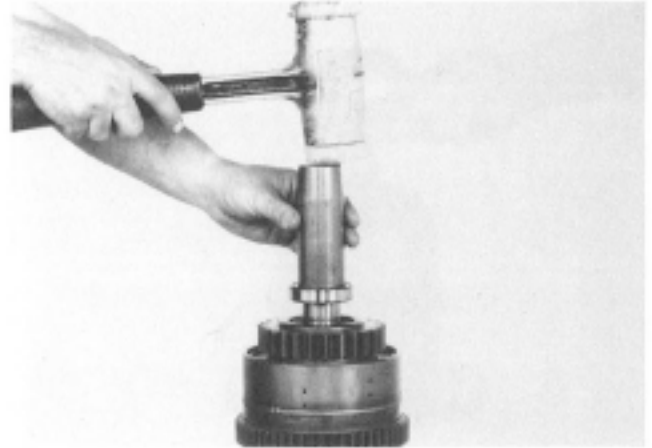
**Figure 151**

Install clutch disc end plate.



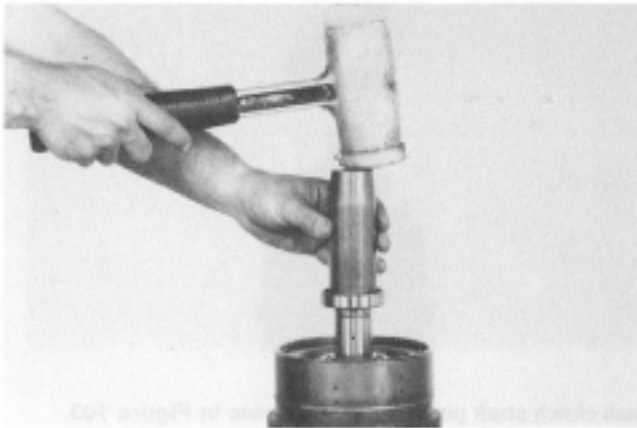
**Figure 152**

Install end plate retainer ring.



**Figure 155**

Install clutch gear outer bearing. **NOTE:** Outer bearing has a shield in it, this shield must be down.



**Figure 153**

Install clutch gear inner bearing. **NOTE:** This bearing does not have a shield in it.



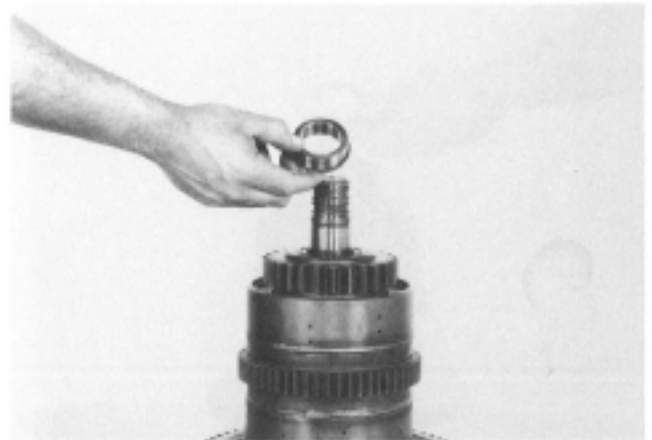
**Figure 156**

Install clutch gear outer bearing retainer ring.



**Figure 154**

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



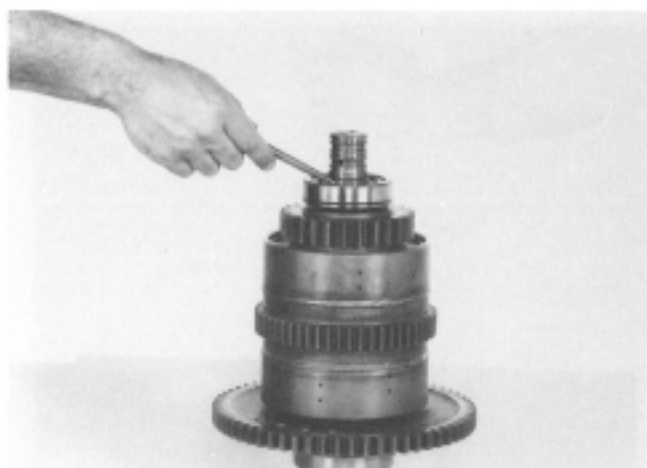
**Figure 157**

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





**Figure 158**  
Position front bearing over bearing race.



**Figure 159**  
Position end plate lock ball in clutch shaft.



**Figure 160**  
Install bearing end plate, aligning notch in plate with lock ball.



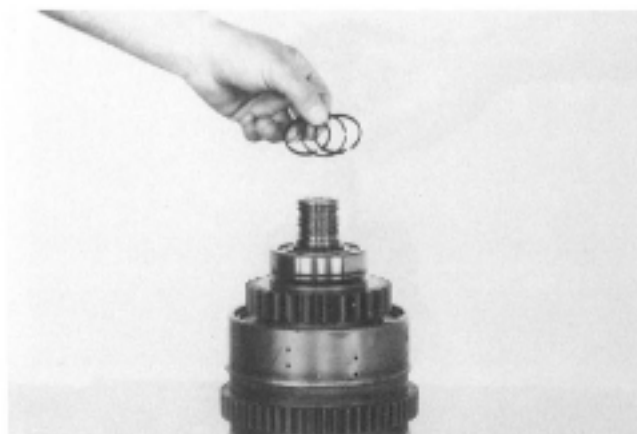
**Figure 161**  
Install bearing retainer ring.



**Figure 162**  
Install clutch shaft piston rings. See note in Figure 103.

## DISASSEMBLY AND REASSEMBLY OF THE FORWARD AND 2ND CLUTCH

(Forward being disassembled)



**Figure 163**  
Remove clutch shaft piston rings. (See note in Figure 103.)



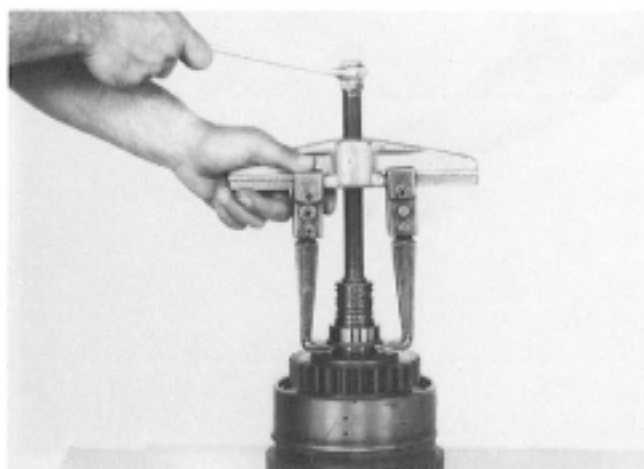
**Figure 164**  
Remove front bearing end plate retainer ring.



**Figure 167**  
Remove bearing end plate lock ball.



**Figure 165**  
Remove end plate.



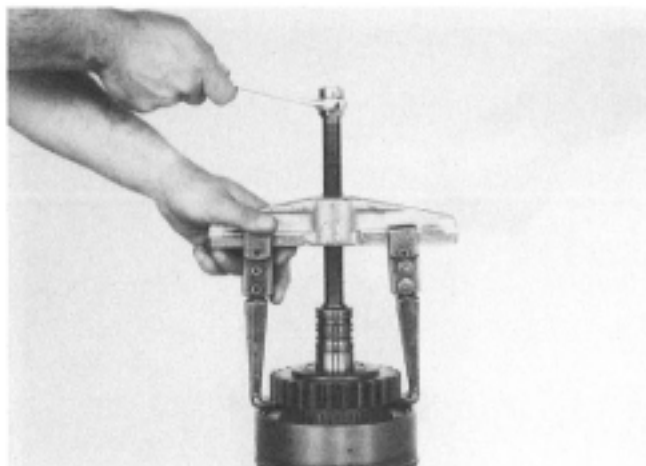
**Figure 168**  
Remove front bearing inner race.



**Figure 166**  
Remove front bearing.



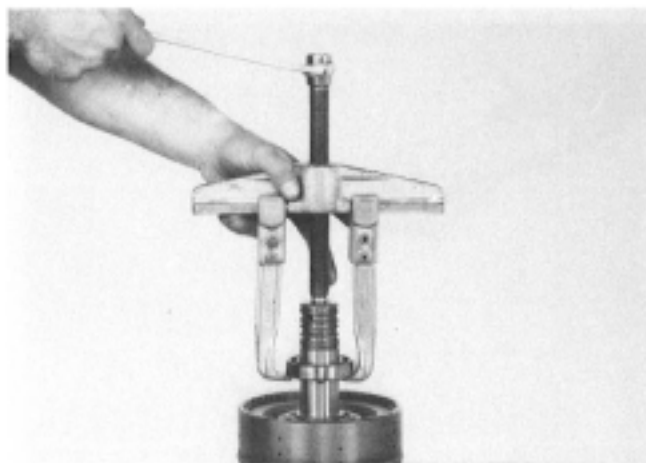
**Figure 169**  
Remove clutch gear outer bearing retainer ring.



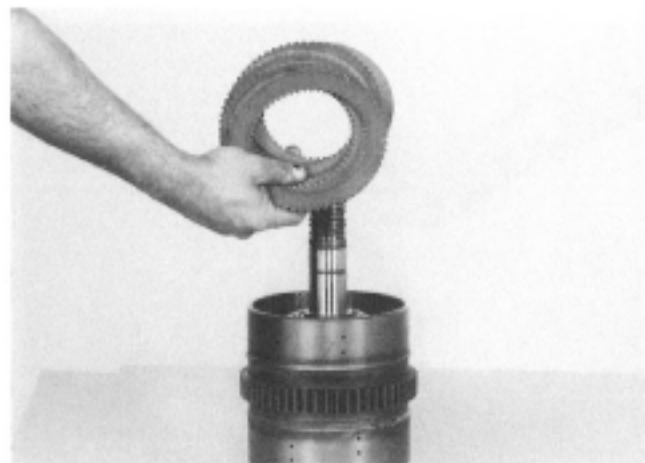
**Figure 170**  
Remove clutch gear and outer bearing.



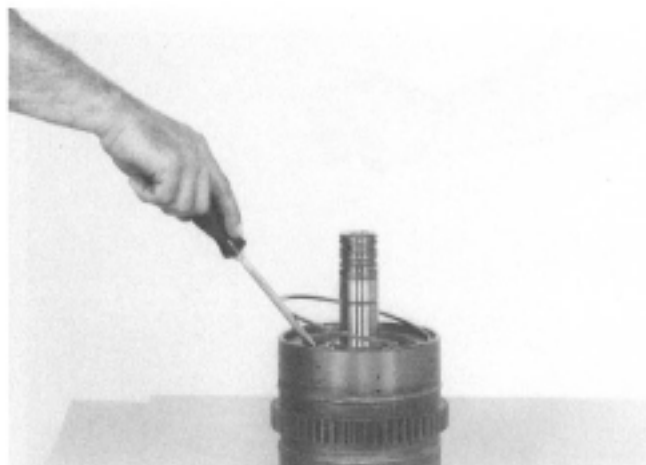
**Figure 173**  
Remove end plate.



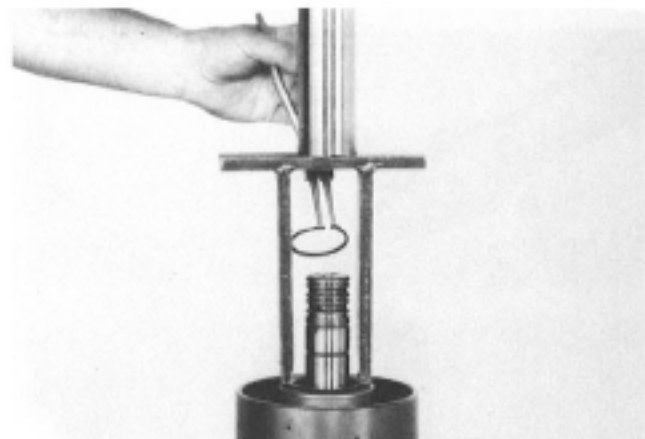
**Figure 171**  
Remove inner bearing.



**Figure 174**  
Remove inner and outer clutch discs.



**Figure 172**  
Remove clutch disc end plate retainer ring.



**Figure 175**  
Compress piston return spring. Remove return spring retainer ring.

## 2ND CLUTCH DISASSEMBLY



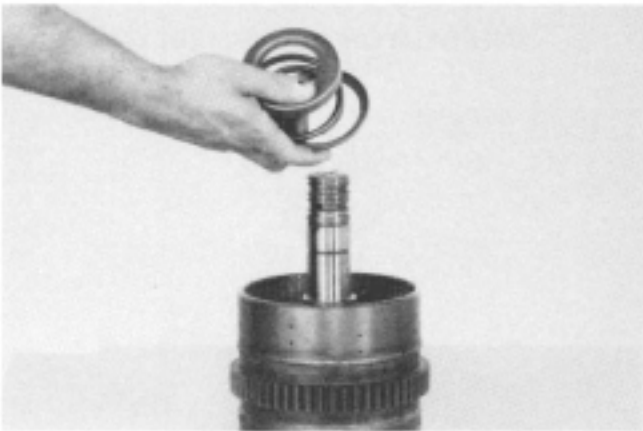
**Figure 176**

Remove retainer ring retaining ring.



**Figure 179**

Remove clutch disc end plate retainer ring.



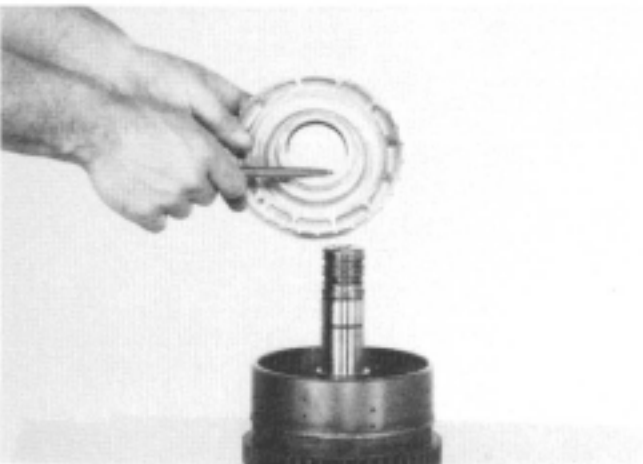
**Figure 177**

Remove piston return spring and retainers. See note in Figure 118.



**Figure 180**

Remove end plate.



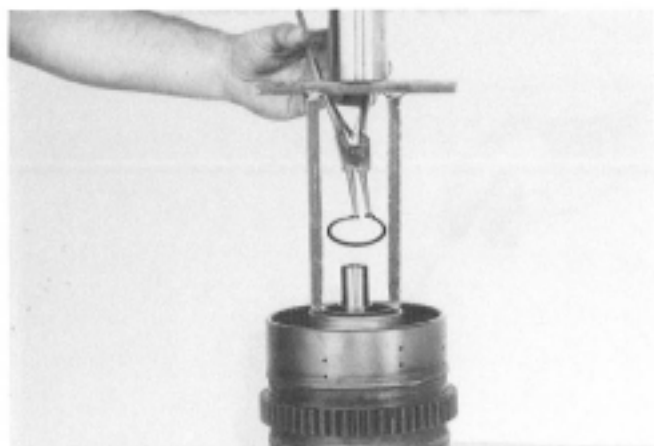
**Figure 178**

Remove clutch piston.



**Figure 181**

Remove inner and outer clutch discs.



**Figure 182**

Compress piston return spring. Remove return spring retainer ring.



**Figure 183**

Remove retainer ring retaining washer.



**Figure 184**

Remove return spring retainers and spring.



**Figure 185**

Remove clutch piston.

**See cleaning and inspection page.**

## **2ND CLUTCH REASSEMBLY**



**Figure 186**

Install clutch piston inner and outer seal rings. Install clutch piston in clutch drum, use caution as not to damage seal rings.



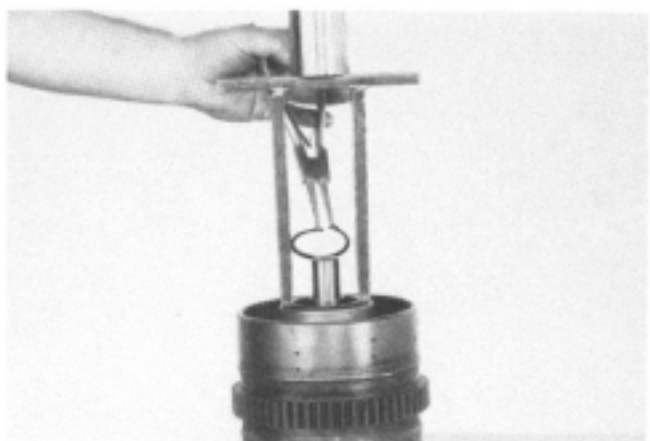
**Figure 187**

Position the inner return spring retainer, the return spring and outer spring retainer on clutch shaft.



**Figure 188**

Position return spring retainer ring retaining washer on clutch shaft.



**Figure 189**

Compress return spring and install retainer ring, being certain ring is in full position in retaining washer and ring groove.



**Figure 190**

Install one steel disc.



**Figure 191**

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



**Figure 192**

Install clutch disc end plate.



**Figure 193**

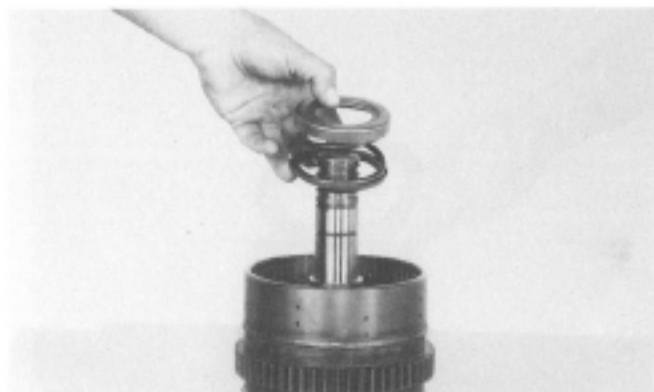
Install end plate retainer ring.

## FORWARD CLUTCH REASSEMBLY



**Figure 194**

Install clutch piston inner and outer seal rings. Install piston in clutch drum, use caution as not to damage seal rings.



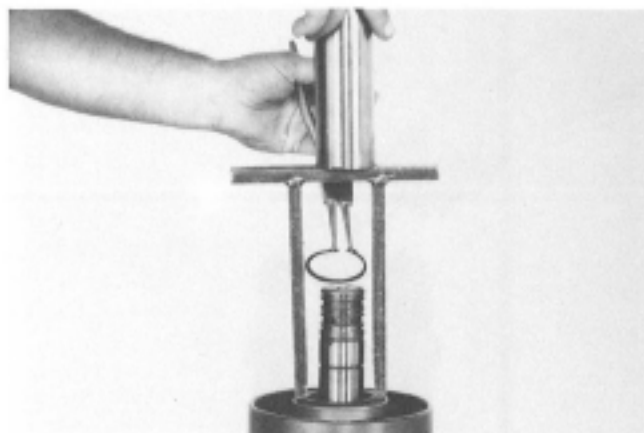
**Figure 195**

Position the inner return spring retainer, the return spring and outer spring retainer. **NOTE:** If forward and reverse clutches are modulated, assemble piston return disc springs as shown in Figure A on page 59.



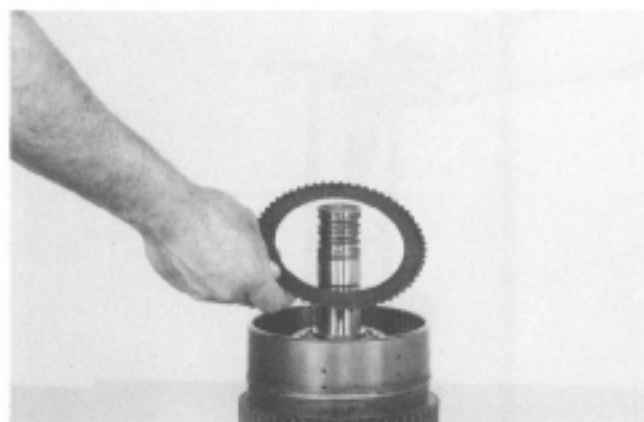
**Figure 196**

Position return spring retainer ring retaining washer on clutch shaft.



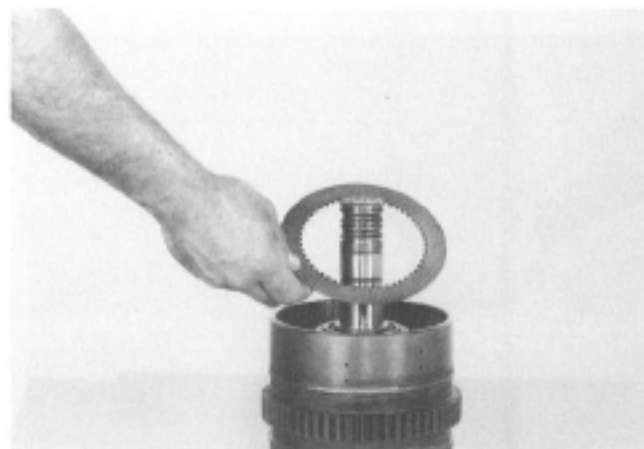
**Figure 197**

Compress return spring and install retainer ring, being certain ring is in full position in retaining washer and ring groove.



**Figure 198**

Install one steel disc.



**Figure 199**

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





**Figure 200**  
Install clutch disc end plate.



**Figure 203**  
Install clutch 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 201**  
Install end plate retainer ring.



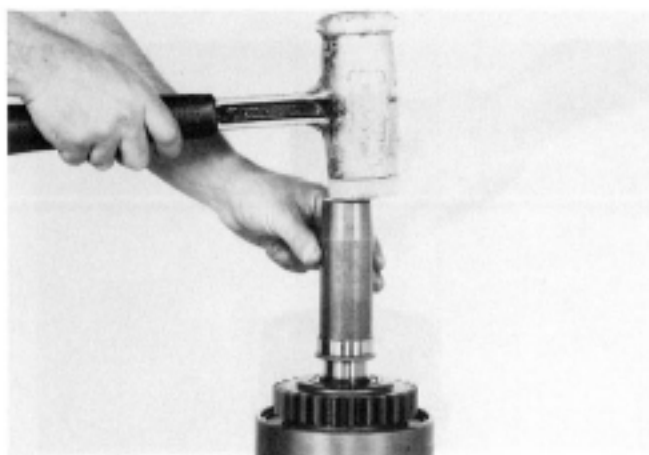
**Figure 204**  
Install clutch gear outer bearing. **NOTE:** Outer bearing has a shield in it, this shield must be down.



**Figure 202**  
Install clutch gear inner bearing. **NOTE:** This bearing does not have a shield in it.



**Figure 205**  
Install bearing retainer ring.



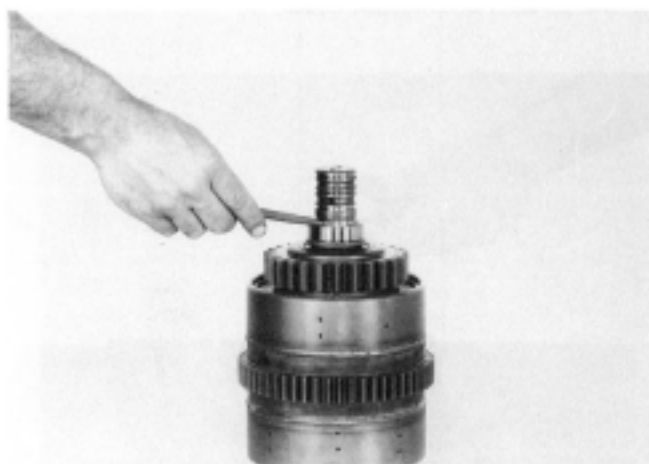
**Figure 206**

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



**Figure 209**

Install bearing end plate, aligning notch in plate with lock ball.



**Figure 207**

Position end plate lock ball in clutch shaft.



**Figure 210**

Install bearing retainer ring.



**Figure 208**

Position front bearing over bearing race.



**Figure 211**

Install clutch shaft piston rings. See note in Figure 103.

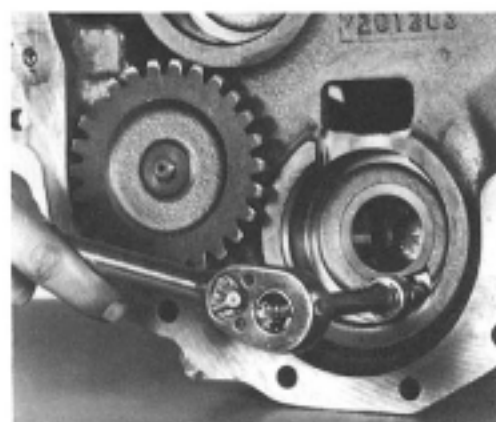
## OIL SEALING RING SLEEVE REMOVAL

**NOTE:** The following photos are not of the HR Converter Housing but the sleeve removal procedure is identical.



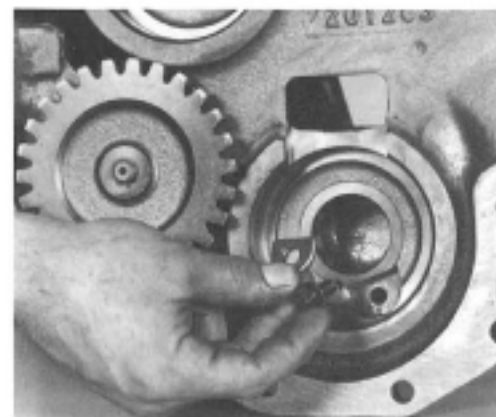
**Figure 212**

Remove clutch front bearing locating ring.



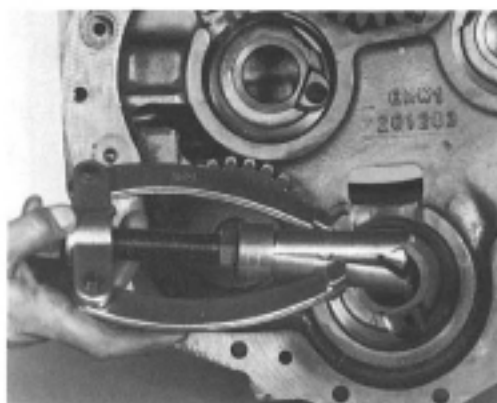
**Figure 213**

Remove oil sealing ring sleeve retainer screw.



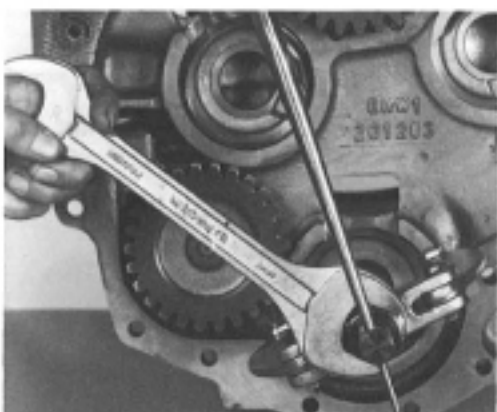
**Figure 214**

Remove screw and sleeve lock.



**Figure 215**

Use a sleeve puller like the one shown.



**Figure 216**

Sleeve being removed.

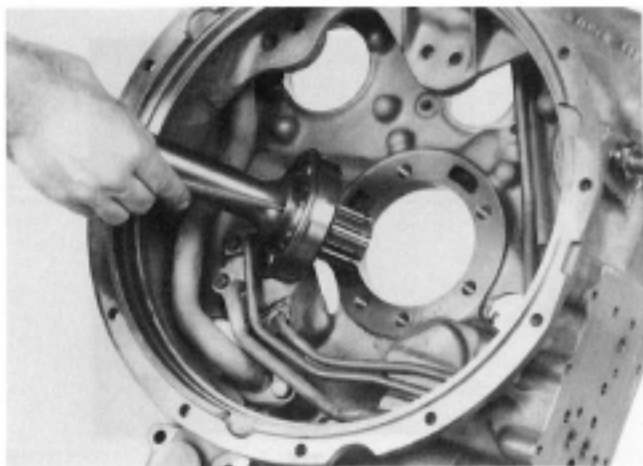
**See cleaning and inspection page.**

**NOTE:** When installing a new sleeve it is recommended a press or a driver be used to prevent damage to the sleeve and be sure the notch in the sleeve is aligned with sleeve lock notch. Install sleeve lock and capscrew. Tighten screw to specified torque. (See torque chart.)



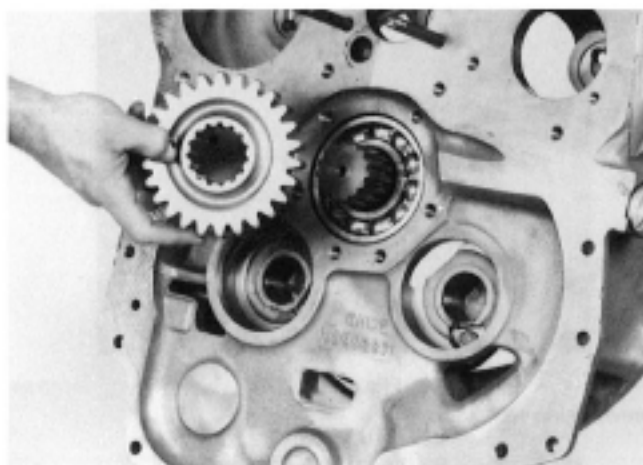
**Figure 217**

Position new oil sealing ring on turbine shaft. Install turbine shaft bearing on shaft with bearing outer locating ring down.



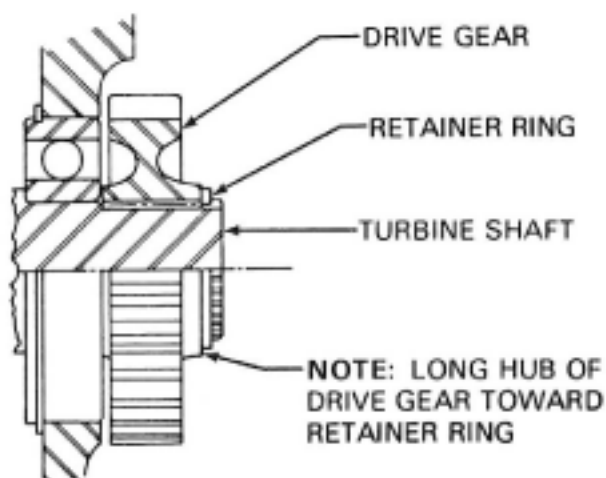
**Figure 218**

Install turbine shaft and bearing in converter housing.

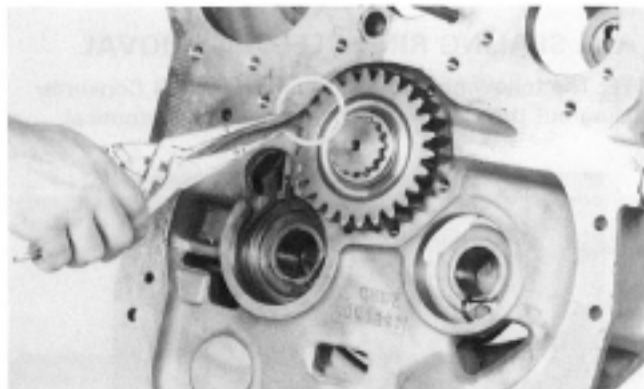


**Figure 219**

Install turbine shaft drive gear as shown in Figure 219-A.



**Figure 219-A**

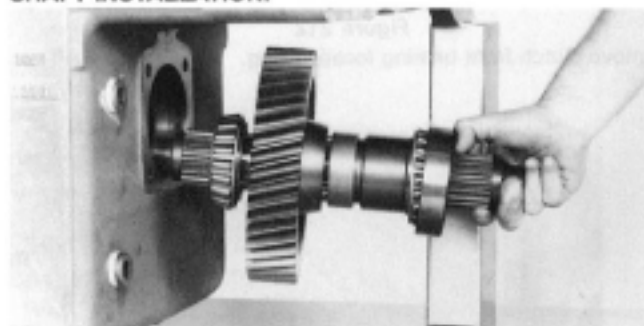


**Figure 220**

Install drive gear retainer ring.

## TRANSMISSION REASSEMBLY

**SEE 6 & 8 SPEED SECTION FOR RANGE SHIFT OUTPUT SHAFT INSTALLATION.**



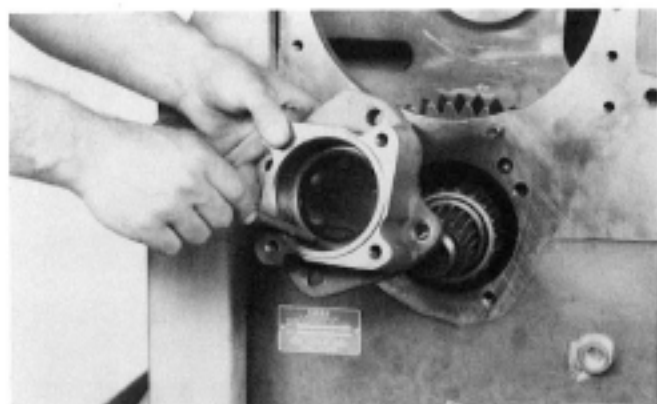
**Figure 221**

View of output shaft as it would be positioned in transmission case. **NOTE:** Front cone bearing shouldered on shaft with large diameter of bearing in, and long hub of gear toward gear spacer.



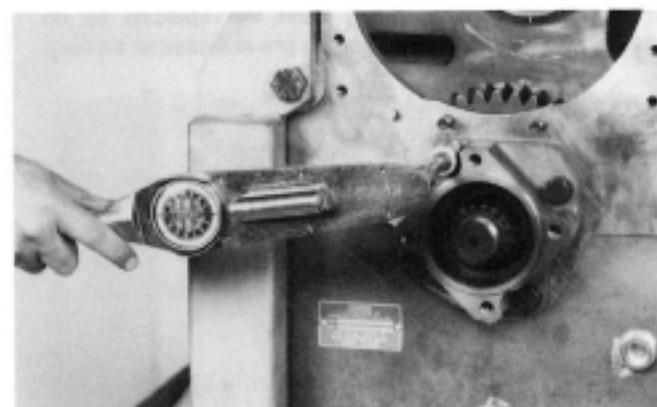
**Figure 222**

Position output gear in transmission case with protruding hub toward front of case. See Figure 221. Insert output shaft, gear spacer and taper bearing from front of case and through output gear. Install front taper bearing cup. Block output shaft and install rear taper bearing with large diameter in.



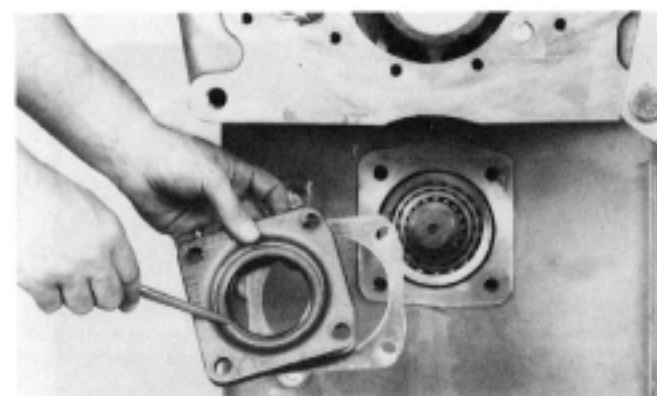
**Figure 223**

Coat outer diameter of oil seal with Permatex No. 2 and press seal in bearing cap with lip of seal in. See assembly instruction sheet for seal depth. Using new "O" rings install rear output bearing cap, oil seal and taper bearing cup on transmission case. Lube opening in bearing cap must be aligned with lube opening in case.



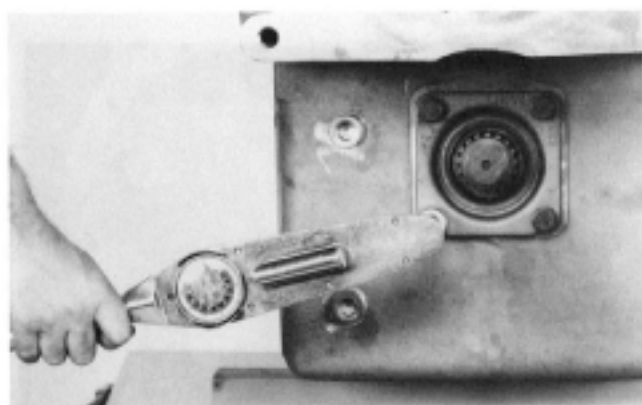
**Figure 224**

Tighten bearing cap bolts to specified torque. (See torque chart.)



**Figure 225**

\* Coat outer diameter of front output oil seal with Permatex No. 2. Install seal in bearing cap with lip of seal in.



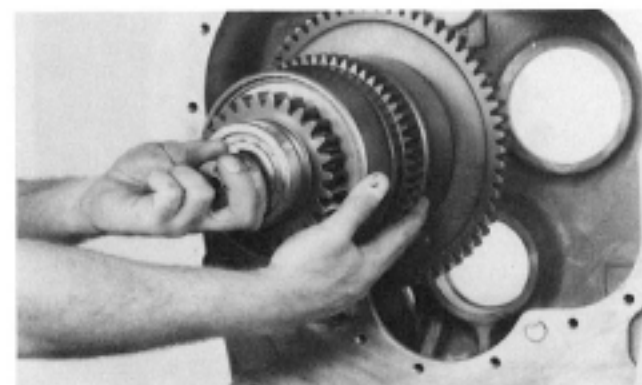
**Figure 226**

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



**Figure 227**

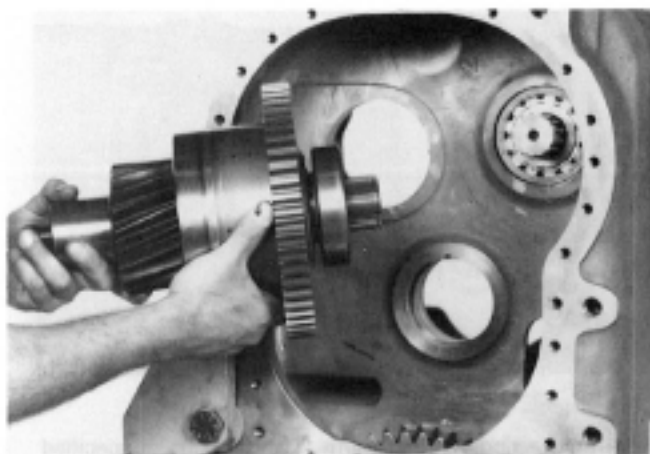
Using a inch lb. torque wrench, determine the rolling torque of the output shaft and record. Tighten front bearing cap bolts to specified torque. Check rolling torque with bolts tight. Torque must be 6 to 8 inch lbs. (0,7-0,09 N.m) more than when bearing cap bolts were loose. Add or omit shims on the front bearing cap to achieve the proper preload.



**Figure 228**

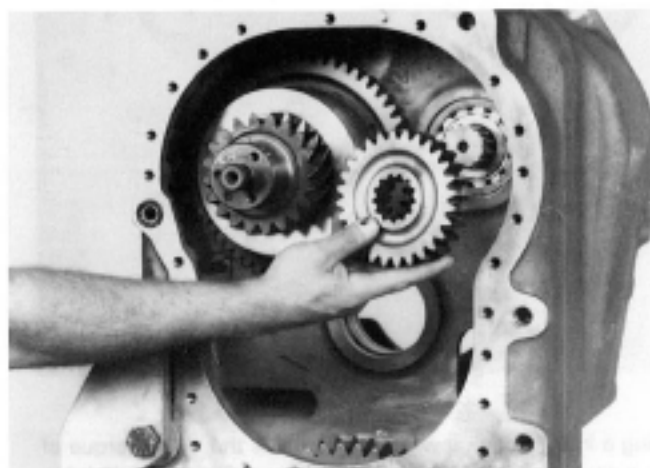
Position reverse and 3rd clutch in transmission housing.





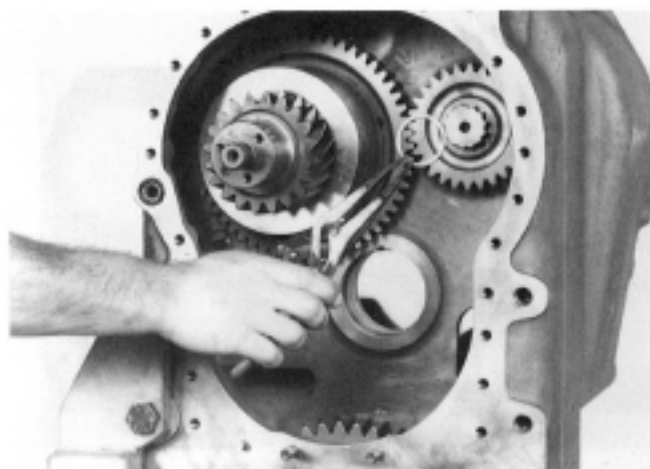
**Figure 229**

From the rear of the transmission case, install the low (1st) clutch.



**Figure 230**

Install low (1st) speed drive gear on clutch shaft.



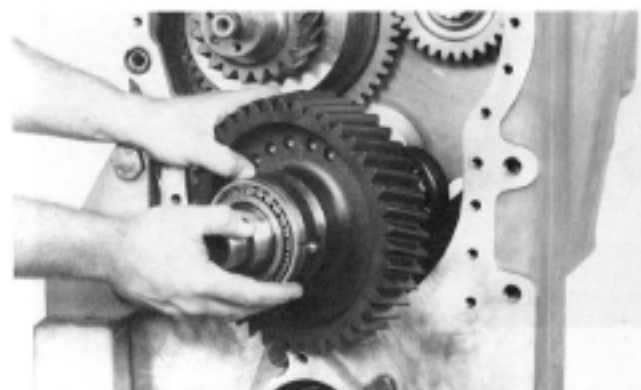
**Figure 231**

Install drive gear retainer ring.



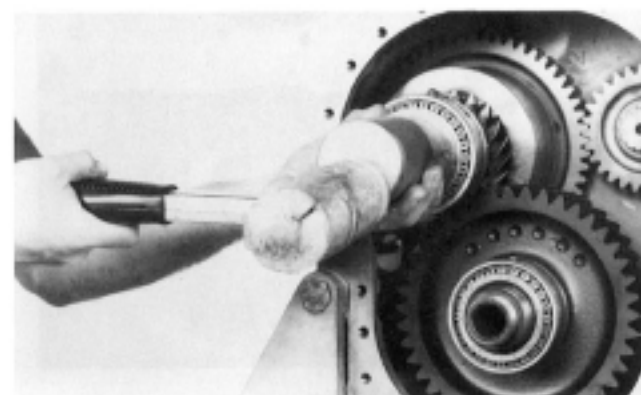
**Figure 232**

If idler shaft was disassembled, install front bearing. Install idler gear on shaft with long hub of gear up. (6 & 8 speed will have two gears on the idler shaft). Install rear inner taper bearing with large diameter of taper down. Install bearing spacer and double bearing cup with outer diameter locating ring groove up. Install outer taper bearing with large diameter of taper up. **NOTE: Double taper bearing must be replaced as an assembly as the bearing spacer is pre-selected at factory.**



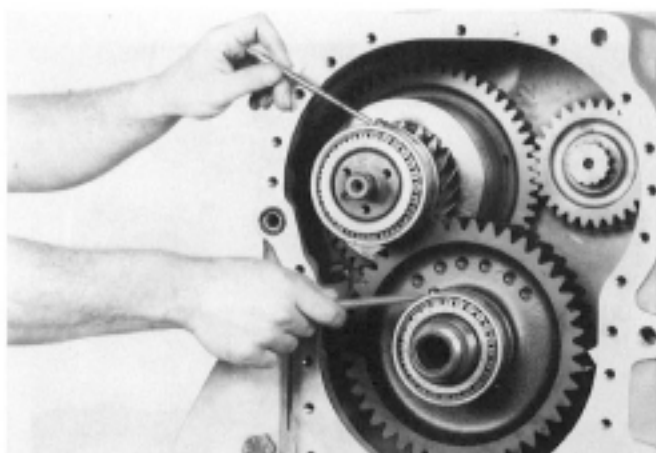
**Figure 233**

Install idler shaft assembly. **NOTE: Lock ball in bearing cup.**



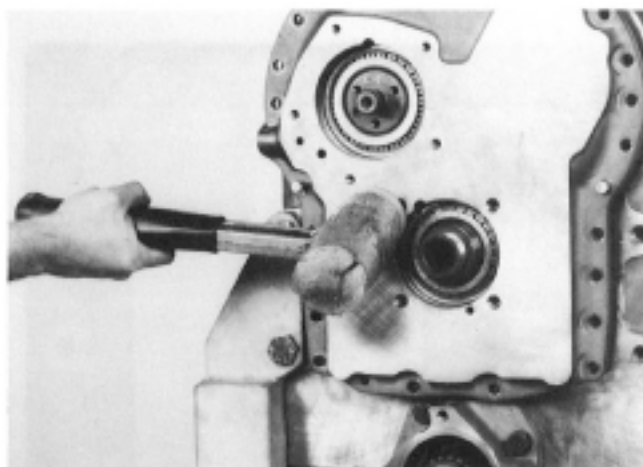
**Figure 234**

Install low (1st) clutch outer double taper bearing. **NOTE: Locating ring groove in bearing cup to be out (to the rear).**



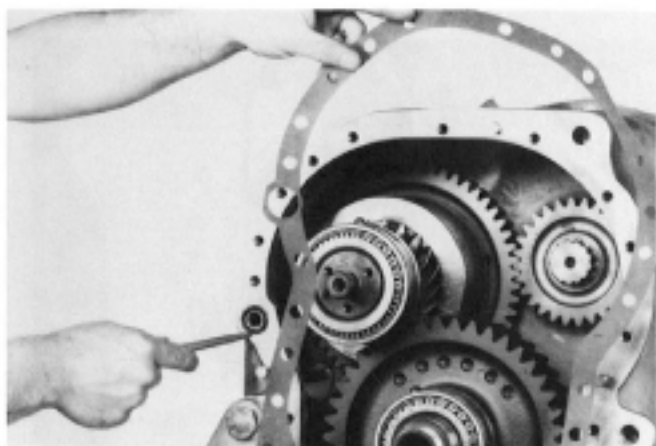
**Figure 235**

Use caution as not to lose low (1st) and idler bearing lock balls. A light coat of grease will hold lock balls in place.



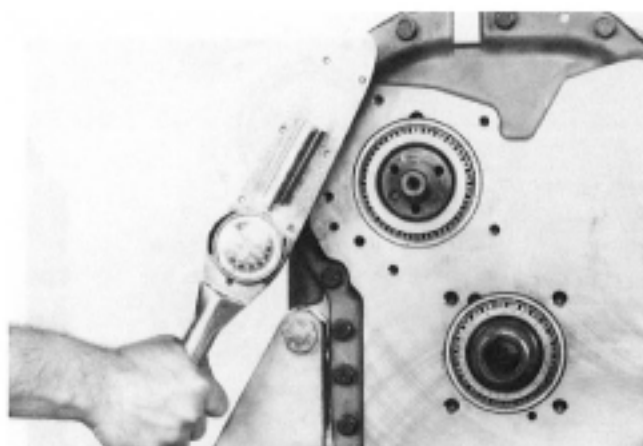
**Figure 238**

Tap cover in place.



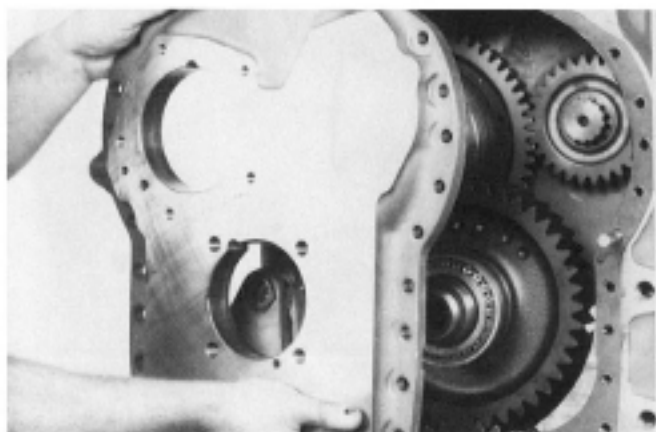
**Figure 236**

The use of aligning studs will facilitate rear cover installation. Position a new gasket and "O" ring on rear of case. A light coat of grease will hold gasket in place.



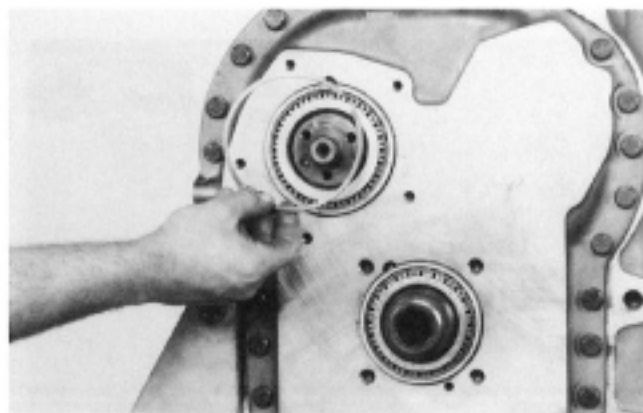
**Figure 239**

Install rear cover bolts and washers, tighten to specified torque. (See torque chart).



**Figure 237**

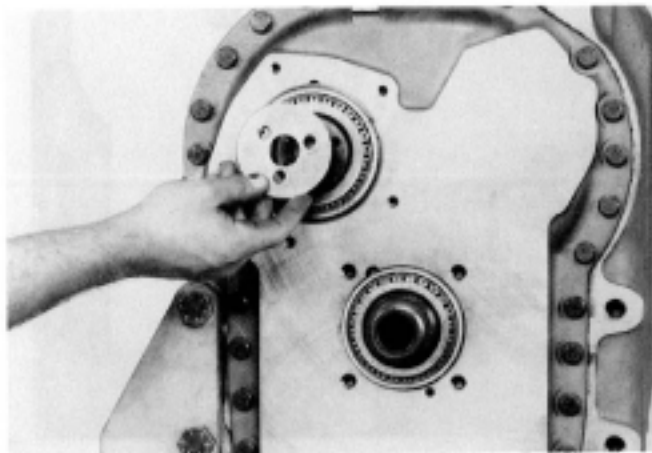
Align lock balls in bearing with notches in rear cover.



**Figure 240**

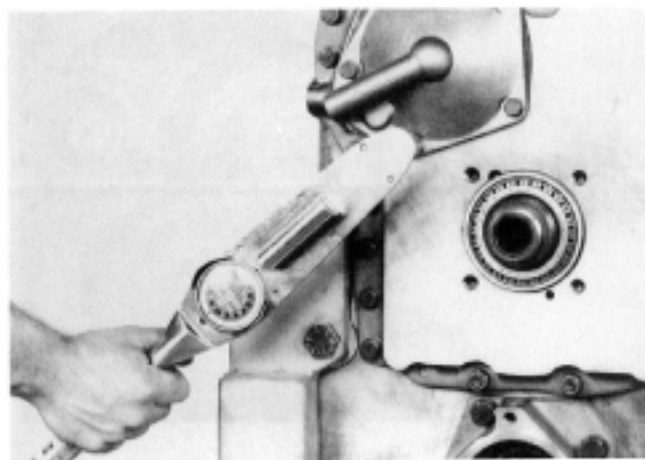
From the front, tap the low (1st) clutch and idler shaft to the rear to expose the rear bearing locating ring groove. Install locating ring.





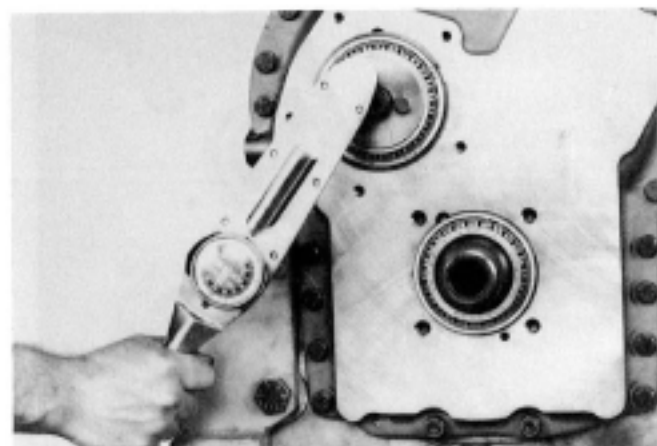
**Figure 241**

Install low (1st) clutch rear bearing retainer plate. **NOTE:** Inner diameter hole chamfer to go toward bearing.



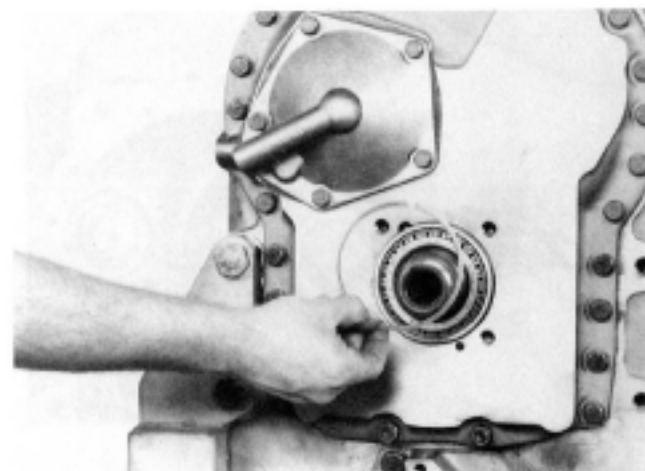
**Figure 244**

Position bearing cap over bearing and install bearing cap bolts. Tighten to specified torque. (See torque chart).



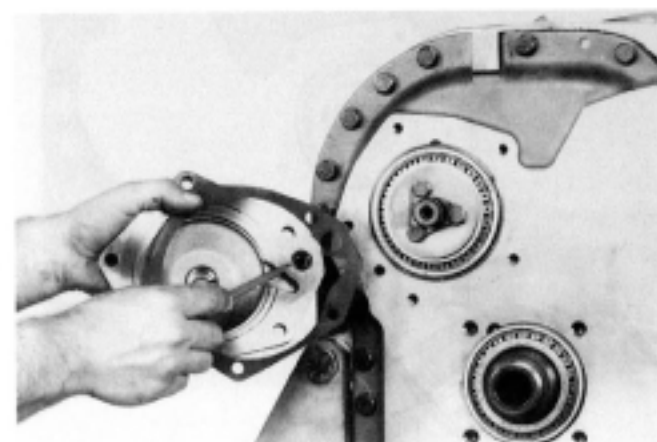
**Figure 242**

Install retainer plate bolts and tighten to specified torque (see torque chart). Lock wire bolts together to prevent loosening.



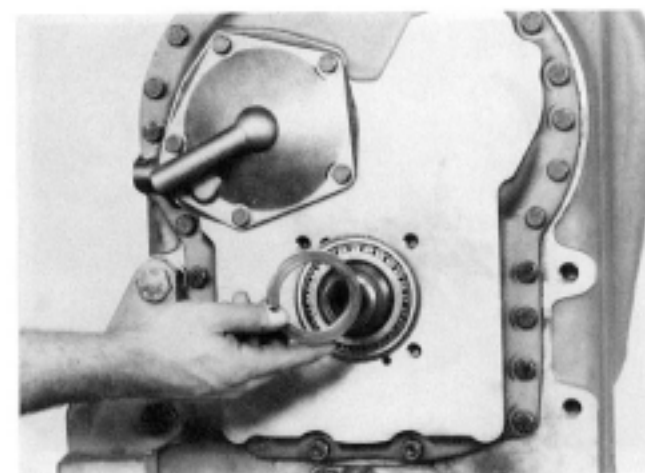
**Figure 245**

Install idler shaft rear bearing locating ring.



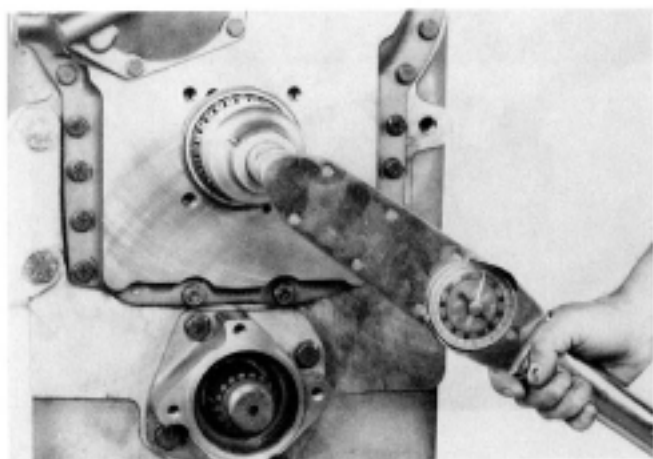
**Figure 243**

Install new "O" ring and gasket on low (1st) clutch shaft rear bearing cap.



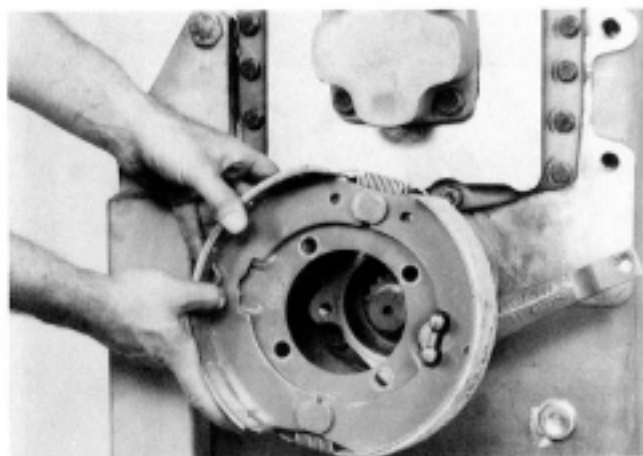
**Figure 246**

Install idler shaft rear bearing spacer.



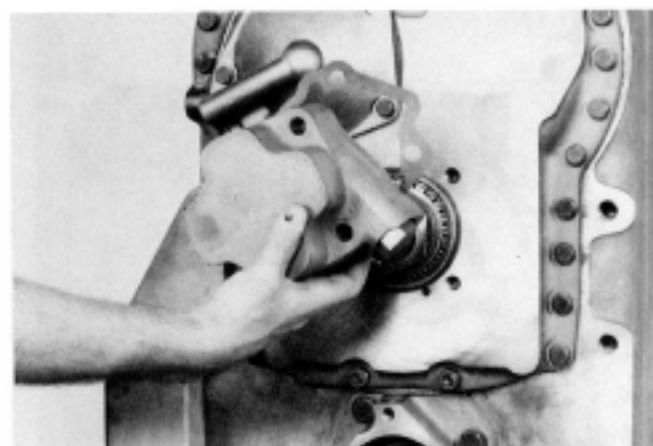
**Figure 247**

Install idler shaft rear bearing retainer nut. Tighten to specified torque. (See elastic stop nut torque chart).



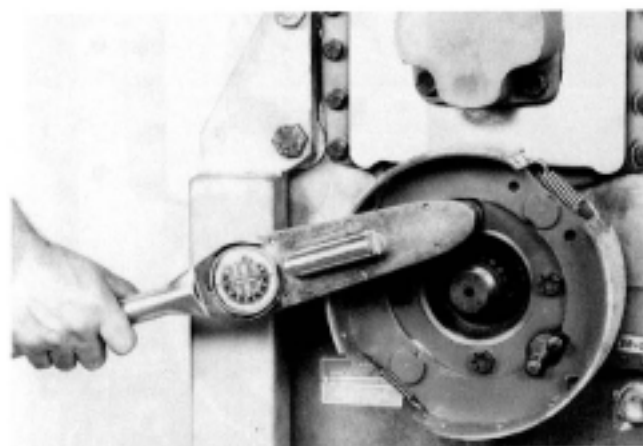
**Figure 250**

Install brake backing plate and brake band assembly on output bearing cap.



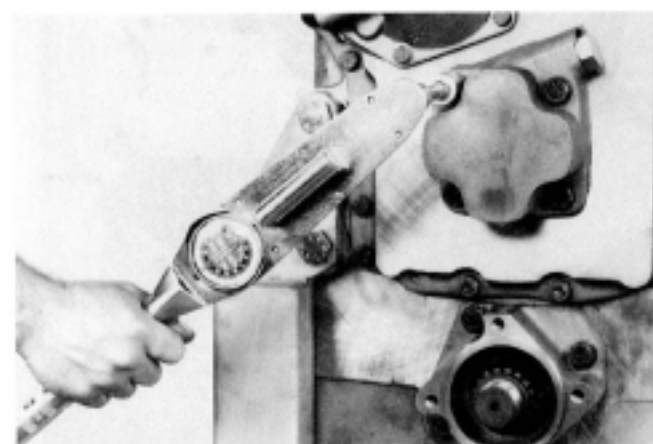
**Figure 248**

Position a new gasket on the idler shaft rear bearing cap, install bearing cap.



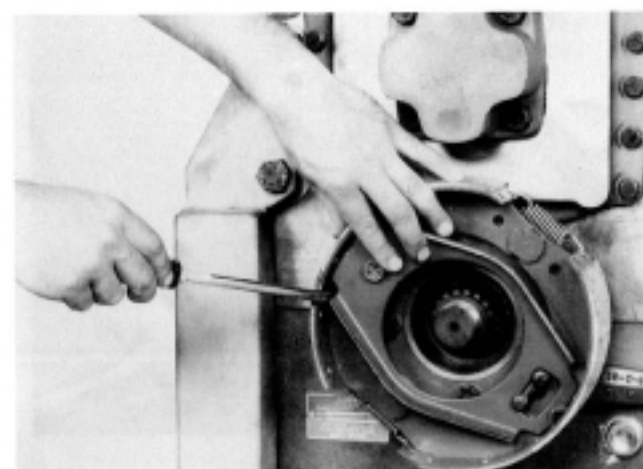
**Figure 251**

Install backing plate cap screws and tighten to specified torque. (See torque chart).



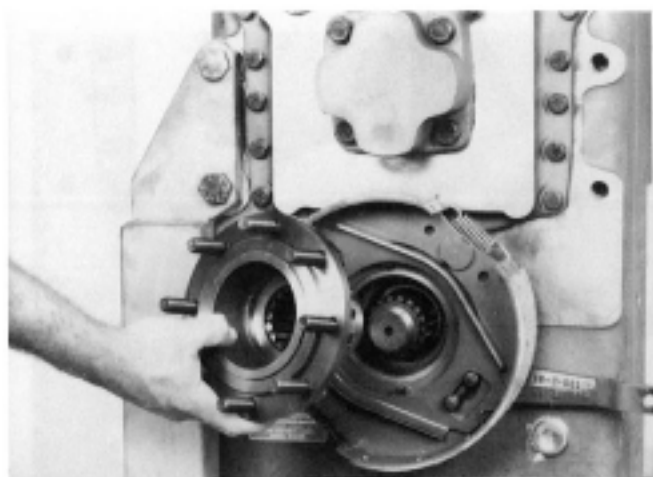
**Figure 249**

Install cap screws and tighten to specified torque. (See torque chart).

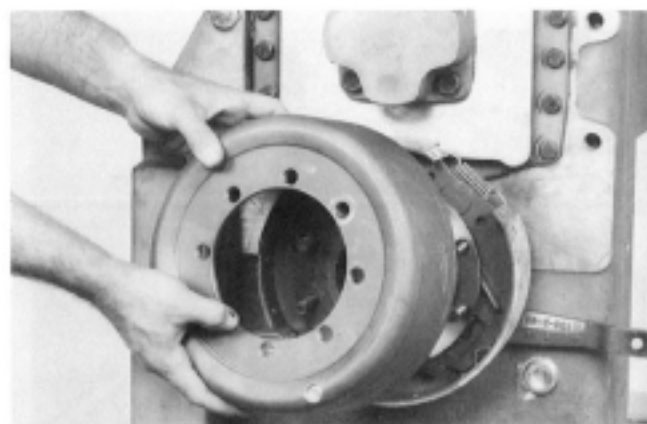


**Figure 252**

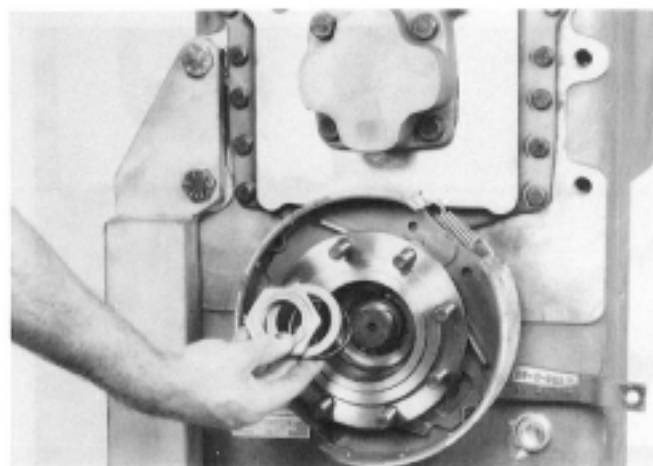
Install brake strut to brake bands.



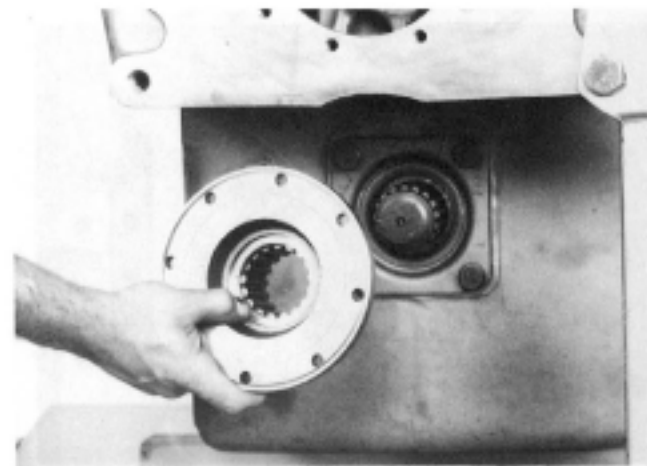
**Figure 253**  
Install rear output flange.



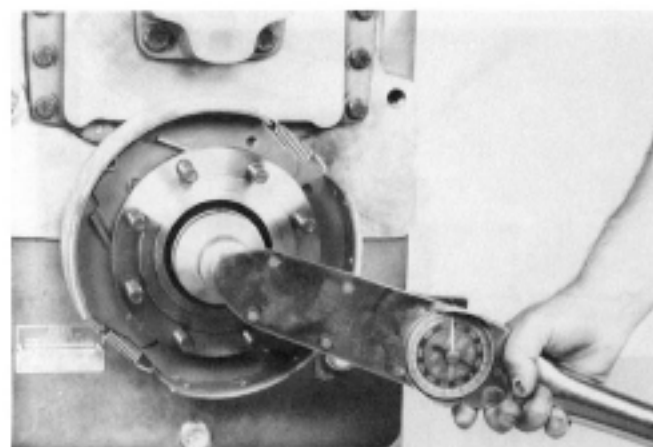
**Figure 256**  
Position brake drum on output flange studs. Install stud nut washers and stud nuts. Tighten stud nuts enough to hold drum in place until drive shaft is installed.



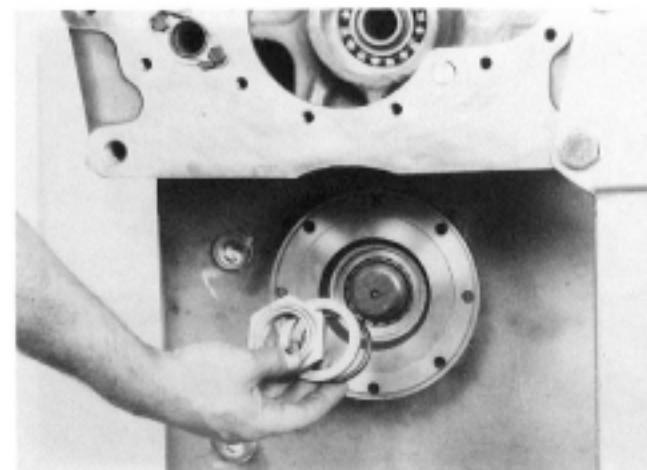
**Figure 254**  
Install flange "O" ring, washer and lock nut.



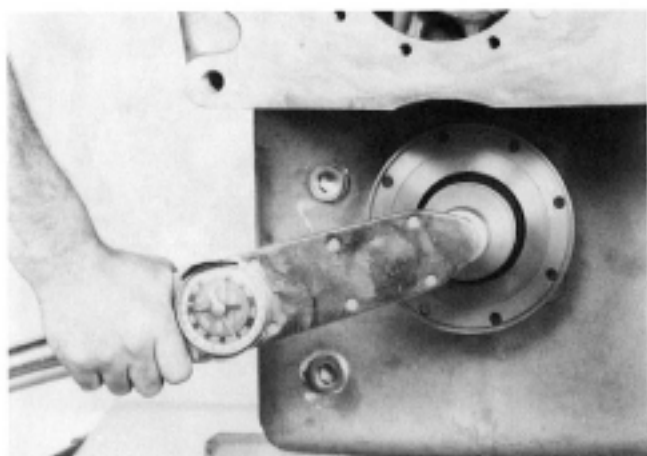
**Figure 257**  
Install front output flange.



**Figure 255**  
Tighten lock nut to specified torque. (See elastic stop nut torque chart).

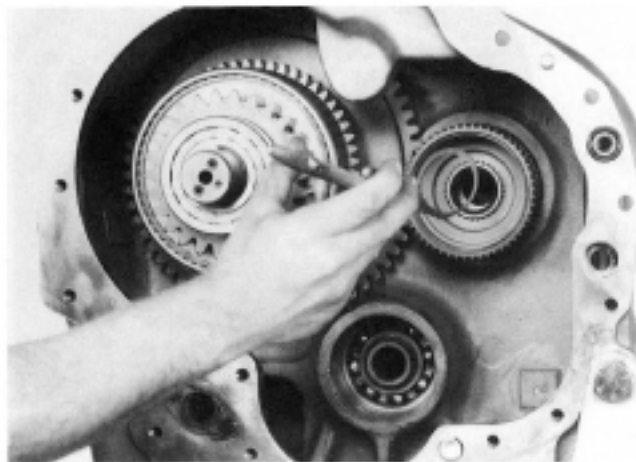


**Figure 258**  
Install new output flange "O" ring, washer and flange nut.



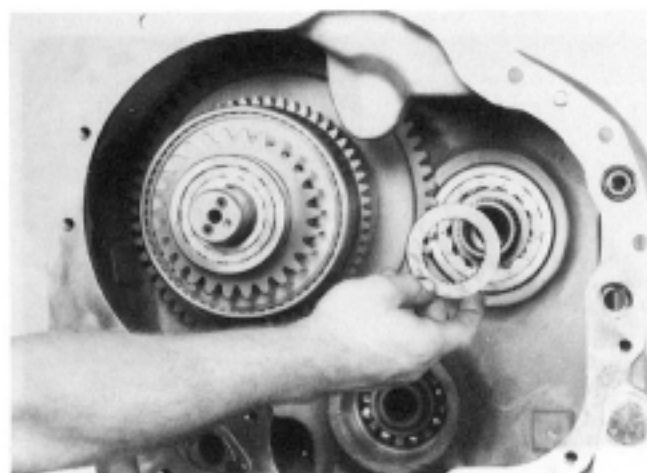
**Figure 259**

Tighten flange nut to proper specifications. (See elastic stop nut torque chart).



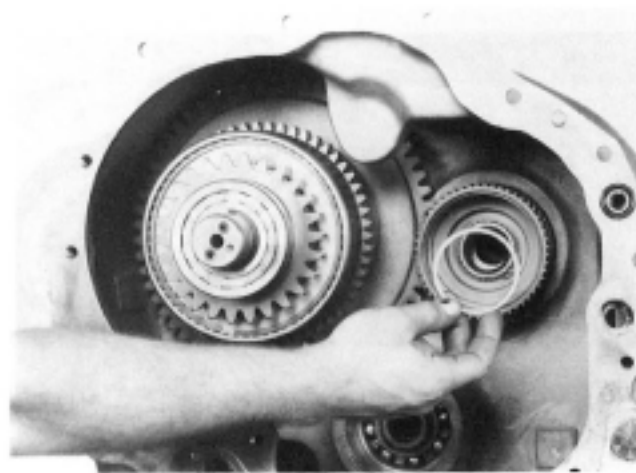
**Figure 262**

Install disc hub retainer ring.



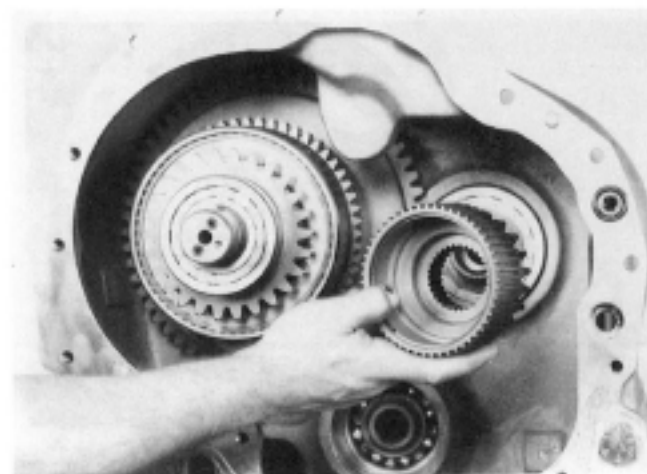
**Figure 260**

Position 2nd clutch bearing end plate on low (1st) clutch shaft.



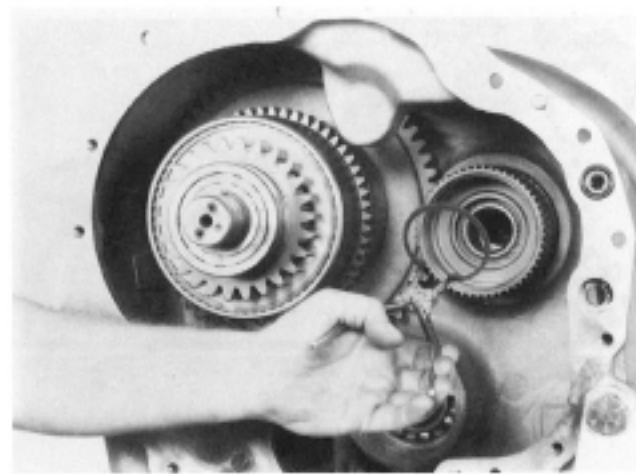
**Figure 263**

Install disc hub retainer ring retainer.



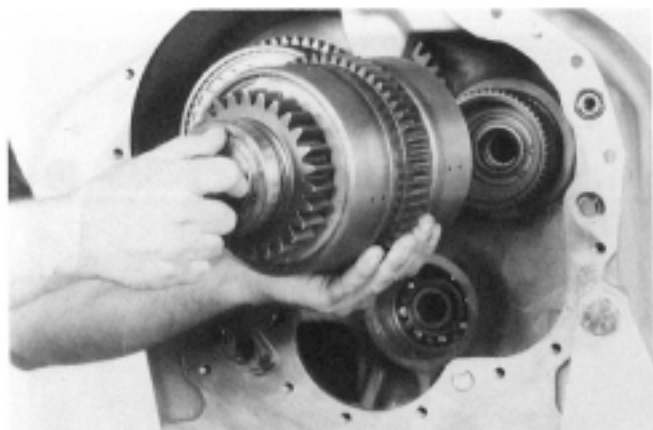
**Figure 261**

Position 2nd clutch disc hub on clutch shaft.



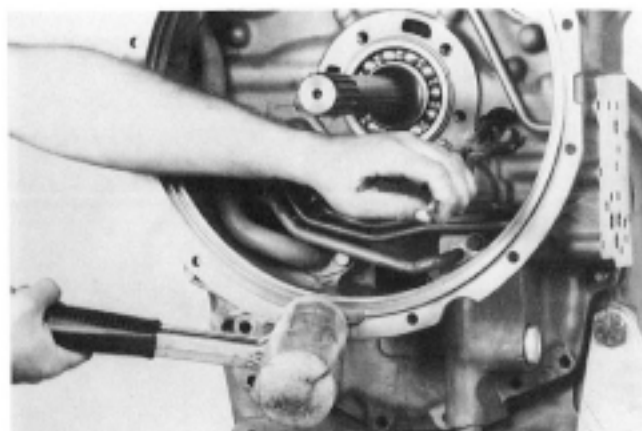
**Figure 264**

Install disc hub ring retainer retaining ring.



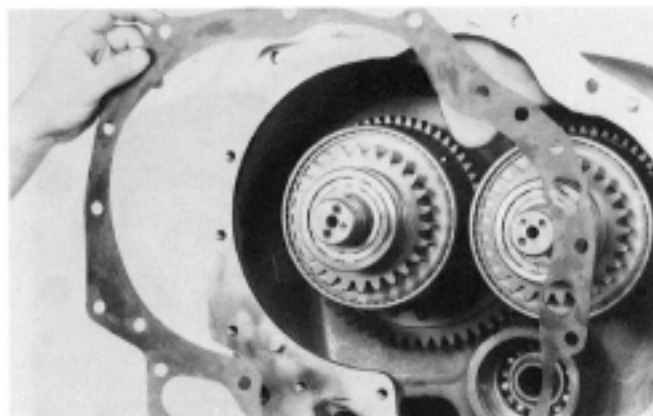
**Figure 265**

Position 2nd speed clutch shaft pilot bearing on clutch shaft. A light coat of grease will hold bearing in place. Install forward and 2nd clutch in clutch disc hub being certain clutch disc hub is in full position in clutch discs. **See 8 speed section for 4th speed clutch installation.**



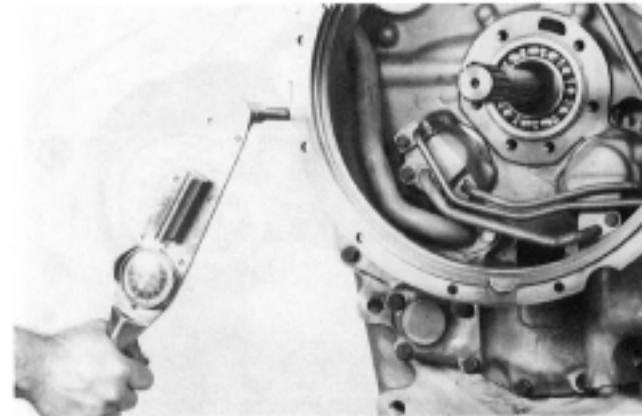
**Figure 268**

Spread forward clutch front bearing locating ring. Position converter housing to transmission housing. Tap housing into place using caution as not to damage clutch shaft oil sealing rings. **Do not force this operation.**



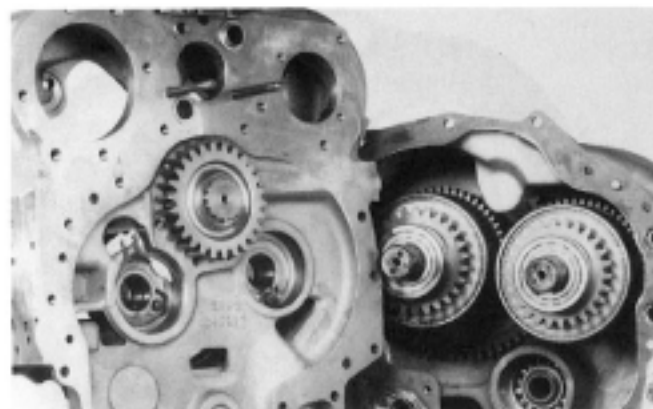
**Figure 266**

Position new gasket and "O" rings on housing. A light coat of grease will hold gasket and "O" rings in place.



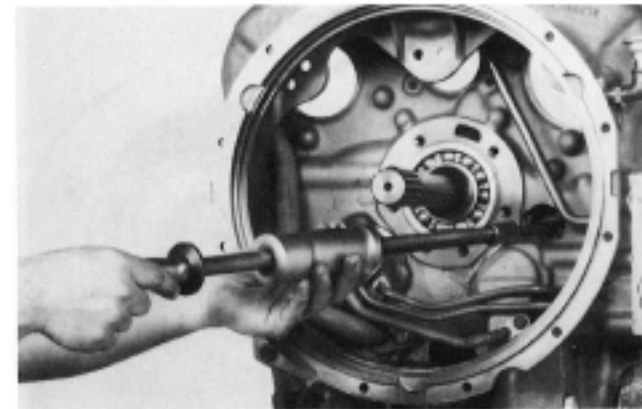
**Figure 269**

Install bolts and washers, tighten to specified torque (see torque chart).



**Figure 267**

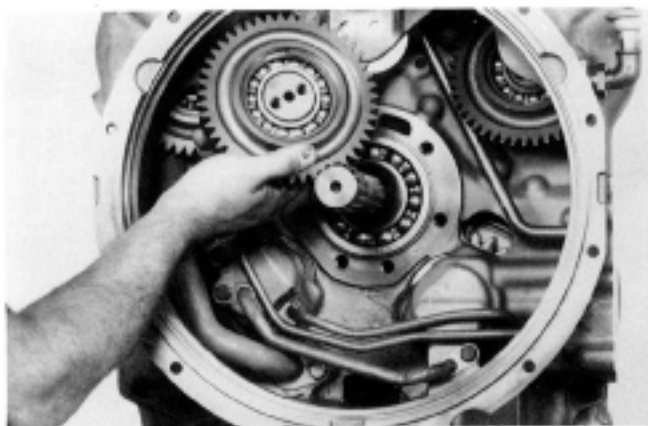
Install alignment studs in transmission housing to facilitate converter housing to transmission housing assembly.



**Figure 270**

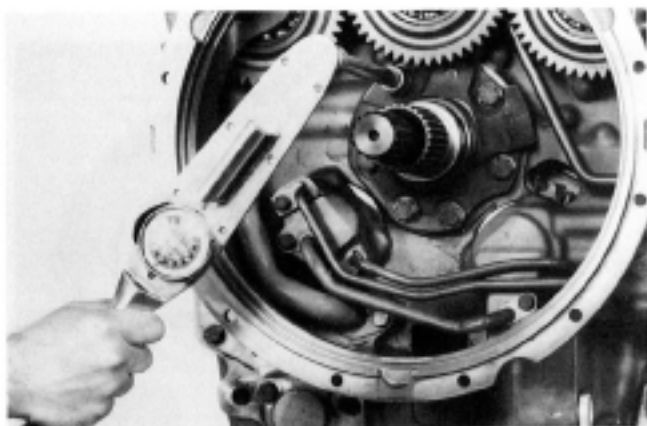
Using a hammer puller as shown, pull forward clutch until front bearing locating ring is in full position in ring groove.





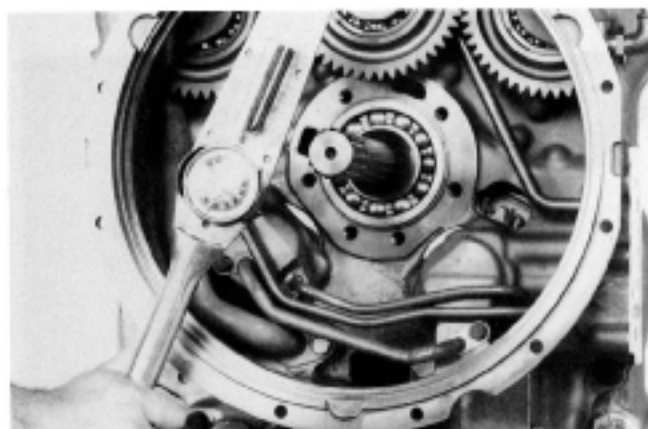
**Figure 271**

Install pump drive gears.



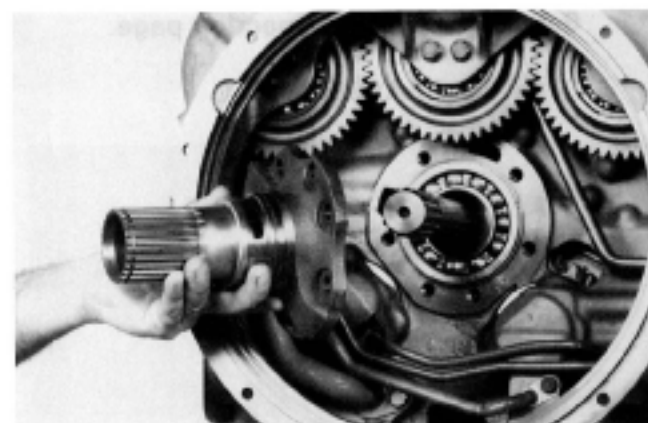
**Figure 274**

Install support bolts and tighten to specified torque. (See torque chart).



**Figure 272**

Tighten pump drive gear support bolts to specified torque. (See torque chart).



**Figure 273**

Install new sealing ring expander spring and oil sealing ring on support. **NOTE:** Expander spring gap to be 180° from sealing ring hook joint. Position support on turbine shaft, turn support to clear pump drive gear. Align support holes with converter housing.

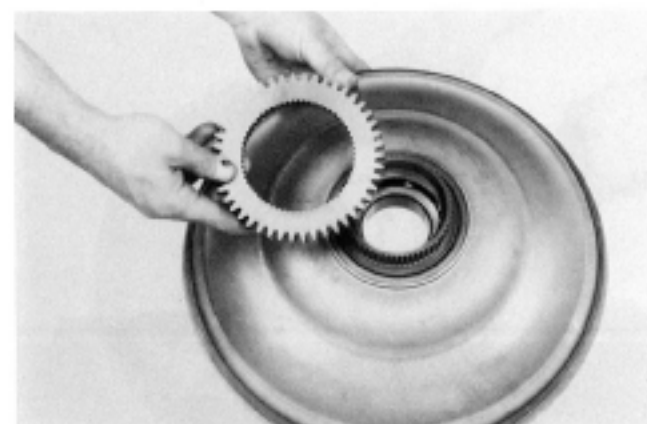
## DISASSEMBLY AND REASSEMBLY OF IMPELLER AND BAFFLE

### DISASSEMBLY



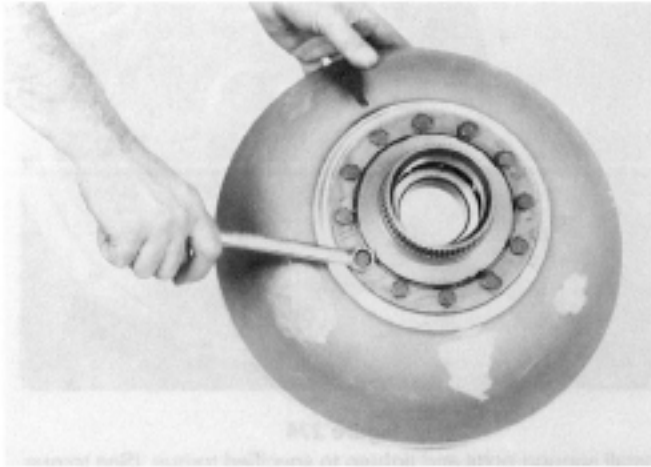
**Figure 275**

Remove pump drive gear retainer ring.



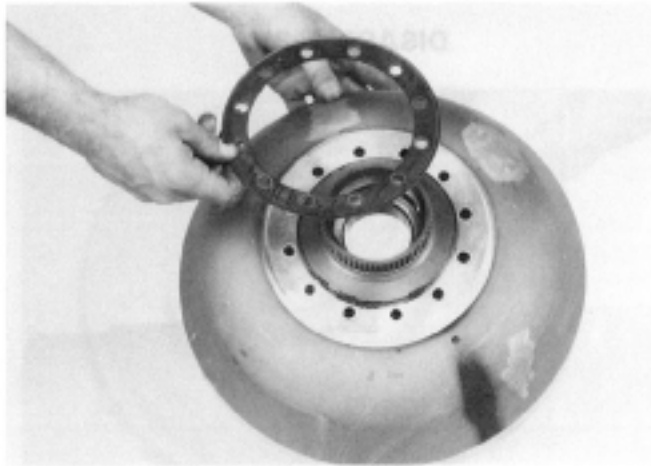
**Figure 276**

Remove pump drive gear.



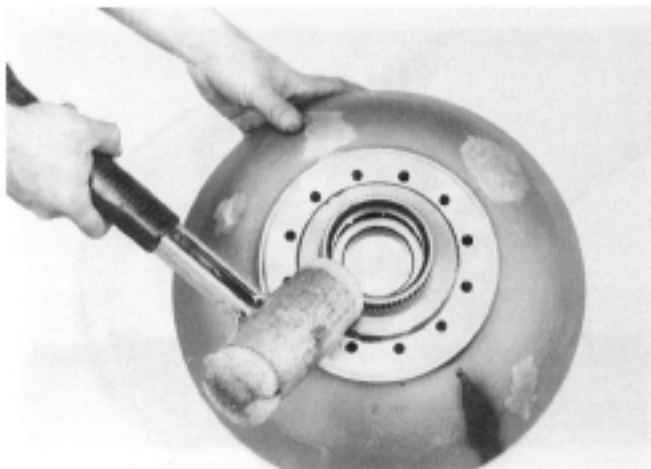
**Figure 277**

Remove impeller hub bolts.



**Figure 278**

Remove backing ring.



**Figure 279**

Tap impeller hub from impeller.



**Figure 280**

Remove hub bearing retainer ring.

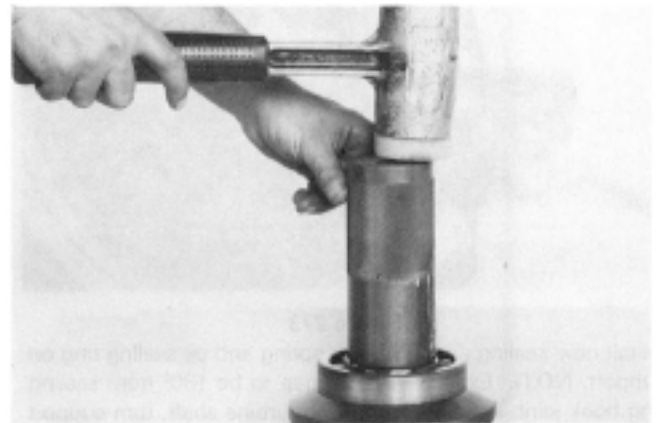


**Figure 281**

Remove hub bearing.

**See cleaning and inspection page.**

## REASSEMBLY



**Figure 282**

Install impeller hub bearing in hub.





**Figure 283**

Install bearing retainer ring.



**Figure 284**

Position new "O" ring on impeller hub.



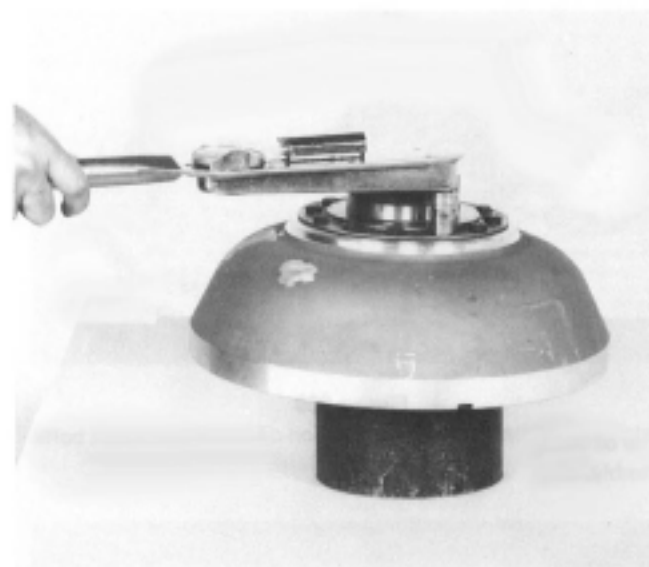
**Figure 285**

Align holes in impeller with holes in impeller hub.



**Figure 286**

Position backing ring on impeller.



**Figure 287**

Install (12) impeller hub special screws to approximately .06 inch [1,5] of seated position. With a calibrated torque wrench, tighten screws to 40-45 lbs. ft. [54,3-61,0 N.m.] torque. **NOTE:** Assembly of impeller to impeller hub must be completed within a fifteen minute period from start of screw installation. The screws are prepared with a coating which begins to harden after installation in the impeller hub holes. If not tightened to proper torque within the fifteen minute period, insufficient screw clamping tension will result. The special screw is to be used for one installation only. If the screw is removed for any reason it must be replaced.

The compound left in the hub holes must be removed with the proper tap and cleaned with solvent. Dry hole thoroughly and use a new screw for reinstallation.



**Figure 288**

Apply a light coat of Permatex No. 2 on the outer diameter of the oil baffle seal. Press seal in oil baffle with lip of seal down.



**Figure 289**

Install new oil baffle seal ring. Position oil baffle on impeller and hub assembly.



**Figure 290**

Install pump drive gear on impeller hub.

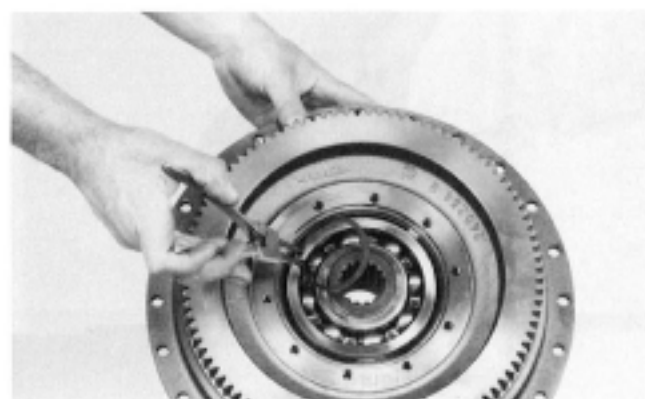


**Figure 291**

Install pump drive gear retainer ring.

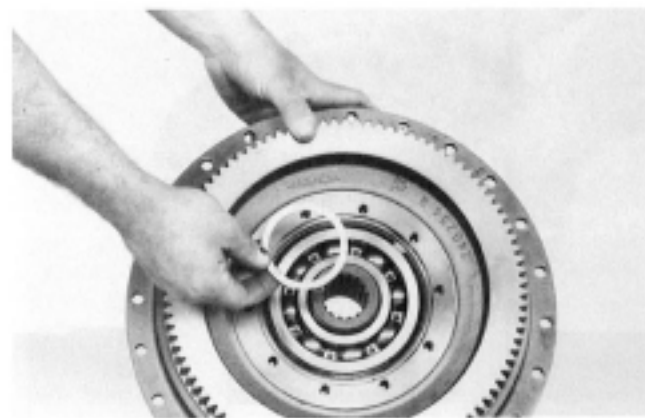
## DISASSEMBLY AND REASSEMBLY OF TURBINE AND IMPELLER COVER

### DISASSEMBLY



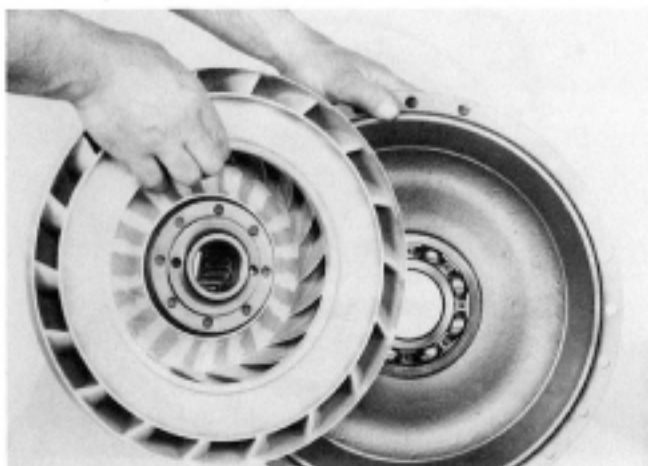
**Figure 292**

Remove turbine hub to impeller cover bearing retainer ring.



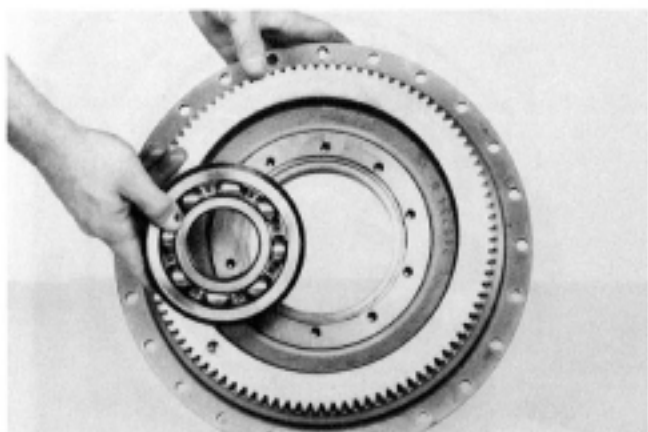
**Figure 293**

Remove retainer ring to bearing washer.



**Figure 294**

Separate turbine from impeller cover.



**Figure 295**

Remove impeller cover bearing.

**See cleaning and inspection page.**

### **REASSEMBLY**



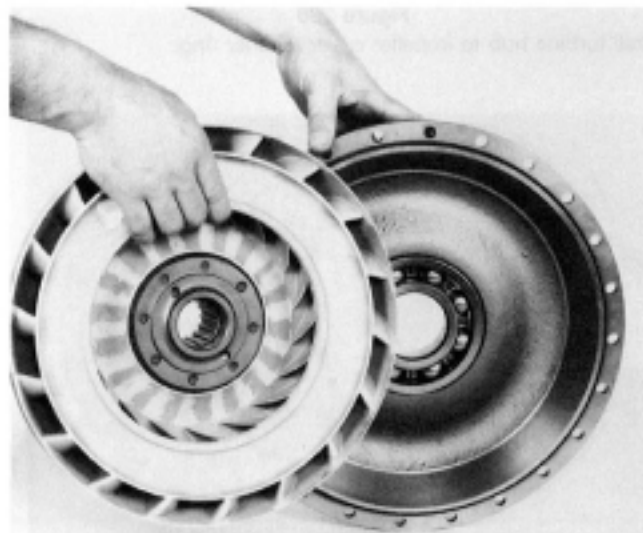
**Figure 296**

Install impeller cover bearing.

If turbine and hub was disassembled, use the following instructions for reassembly.

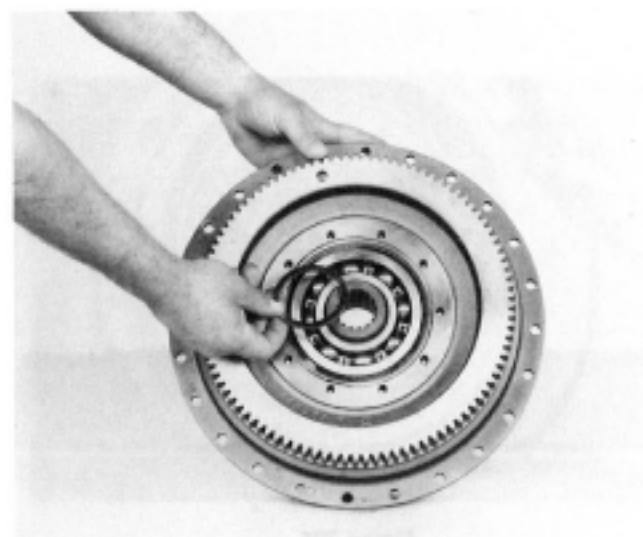
1. Clean hub mounting surface and tapped holes with solvent. Dry thoroughly being certain tapped holes are dry and clean.
2. Install backing ring and special self locking screws.

Tighten screws 40 to 45 lbs. ft. [54,3-61,0 N.m.]. **NOTE:** Assembly of hub must be complete within a fifteen minute period from start of screw installation. The special screw is to be used for one installation only. If the screw is removed for any reason it must be replaced. The epoxy left in the hub holes must be removed with the proper tap and cleaned with solvent. Dry hole thoroughly and use a new screw for reinstallation.



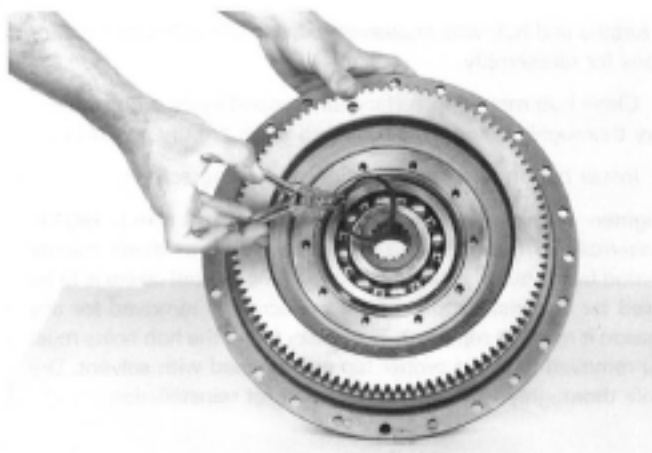
**Figure 297**

Position turbine and hub assembly in impeller cover assembly.

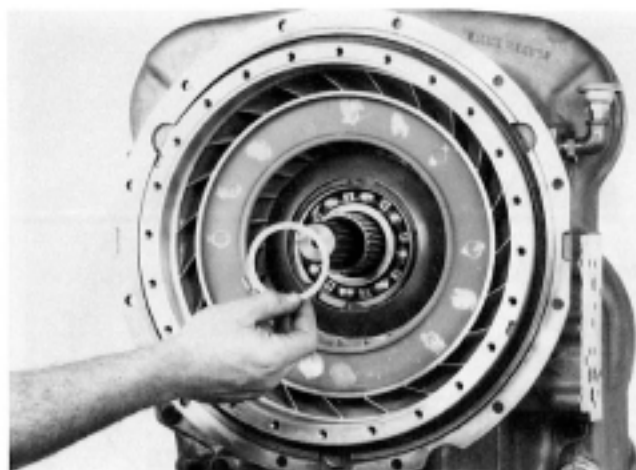


**Figure 298**

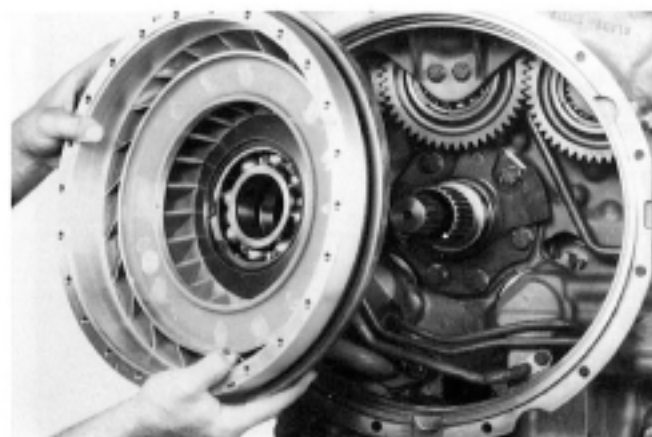
Position bearing washer over turbine hub.



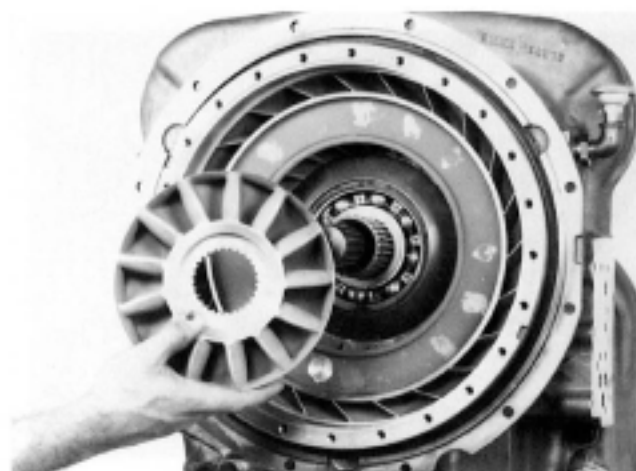
**Figure 299**  
Install turbine hub to impeller cover retainer ring.



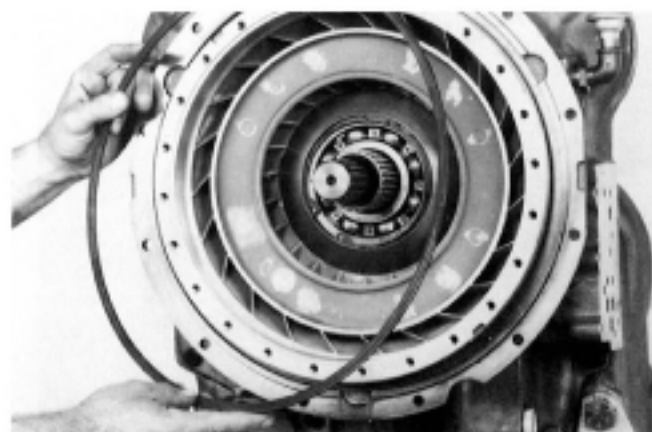
**Figure 302**  
Install reaction member spacer with tang facing out.



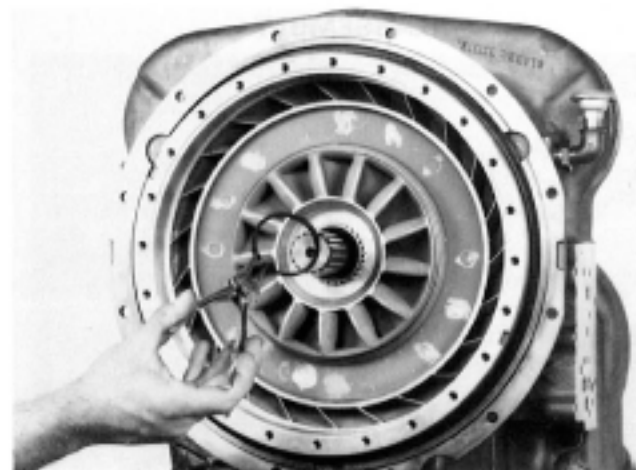
**Figure 300**  
Grease stator support piston ring, oil baffle oil seal and seal ring to facilitate reassembly. Install impeller and oil baffle assembly in converter housing.



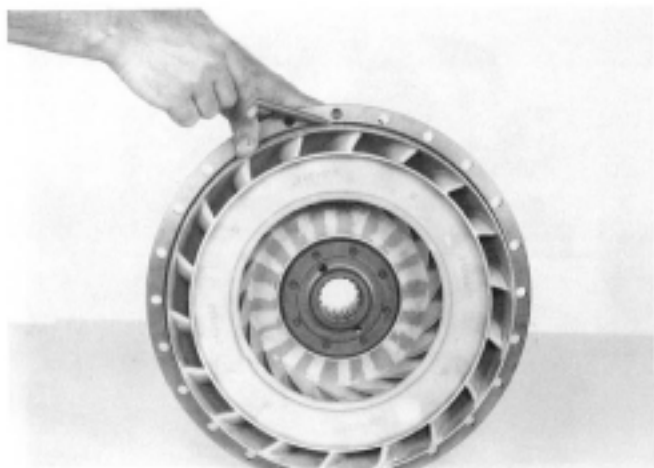
**Figure 303**  
Install reaction member with thick part of blades out.



**Figure 301**  
Position oil baffle in housing. Secure with oil baffle retainer ring, being sure ring is in full position in ring groove.

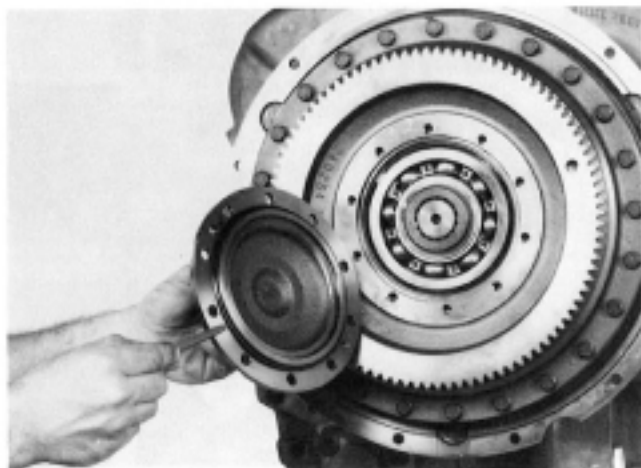


**Figure 304**  
Install reaction member retainer ring.



**Figure 305**

Position a new "O" ring on impeller cover.



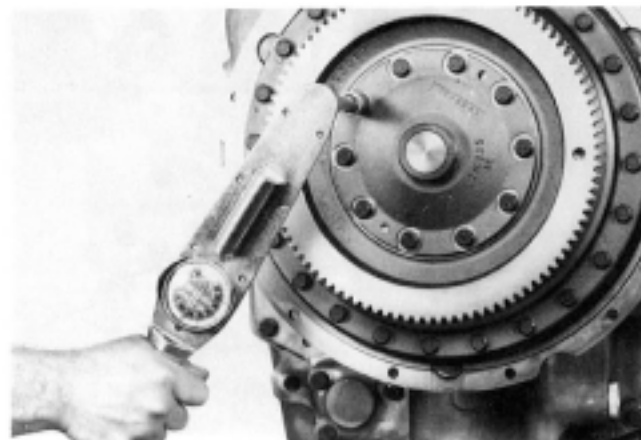
**Figure 308**

Position new "O" ring on impeller cover bearing cap.



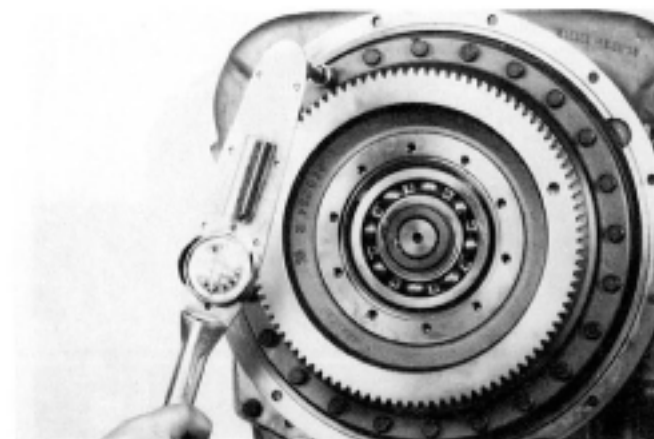
**Figure 306**

Position turbine and impeller cover on turbine shaft. **NOTE:** Some units will have drive plates instead of impeller cover & ring gear. See drive plate installation section.



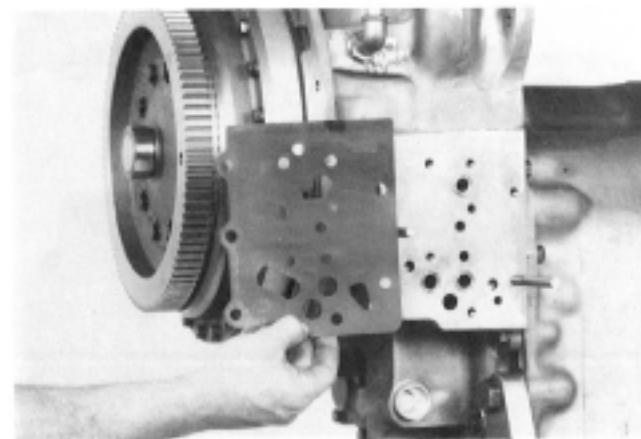
**Figure 309**

Install bearing cap, bolts and washers, tighten to specified torque. (See torque chart).



**Figure 307**

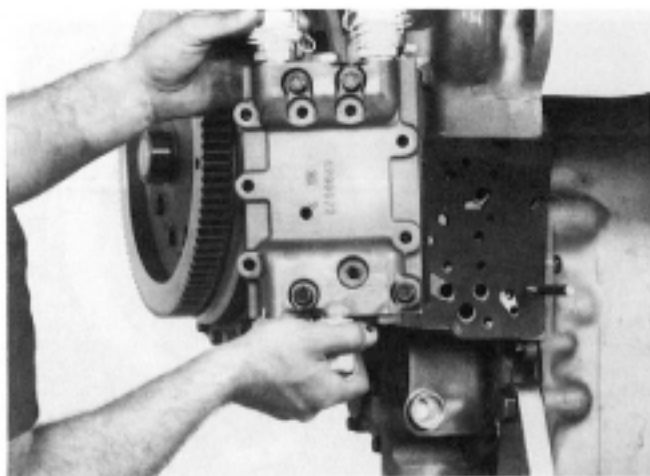
Install impeller cover to impeller bolts and washers. Tighten to specified torque (see torque chart).



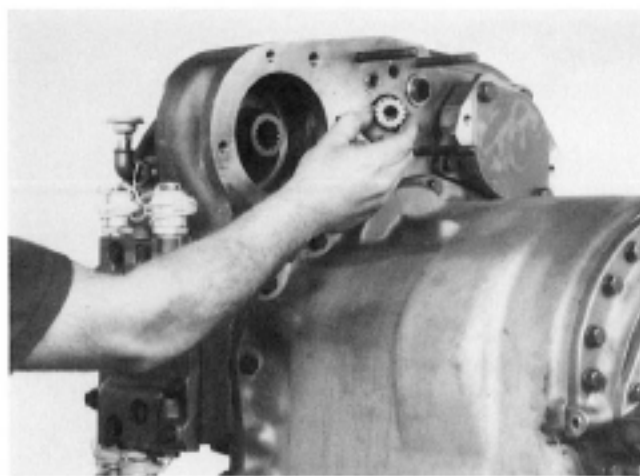
**Figure 310**

Install aligning studs to facilitate control valve assembly. Install new control valve gasket.

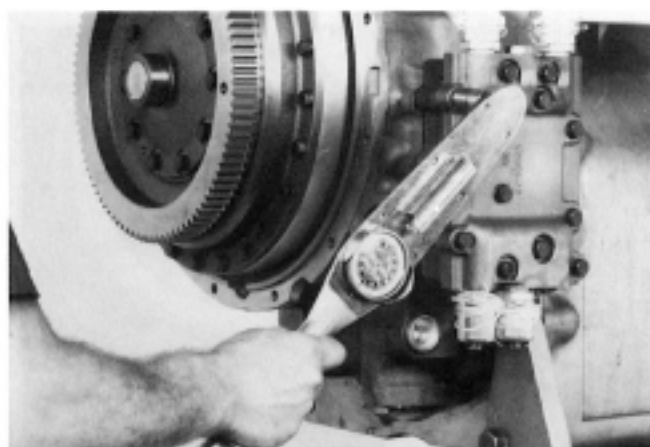




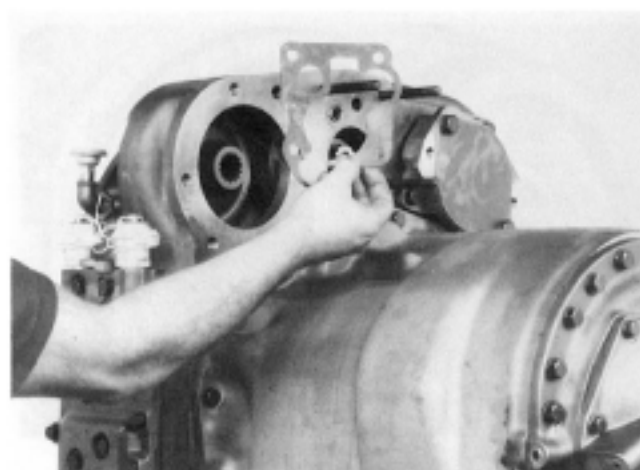
**Figure 311**  
Position control valve assembly on aligning studs.



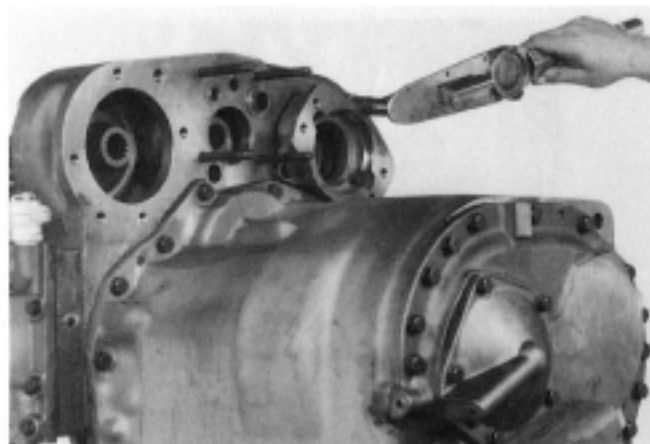
**Figure 314**  
Install charging pump drive sleeve.



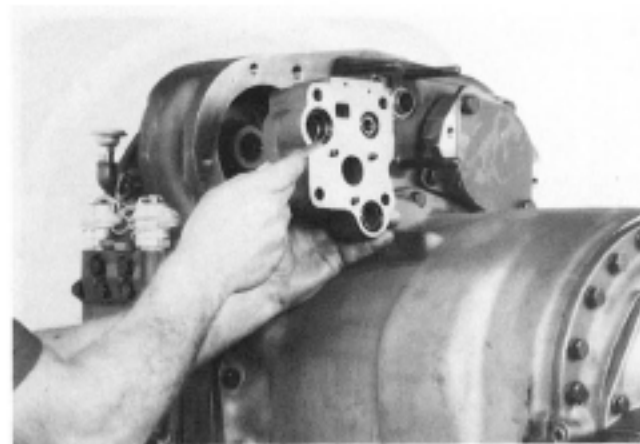
**Figure 312**  
Install control valve bolts and washers and tighten to specified torque. (See torque chart).



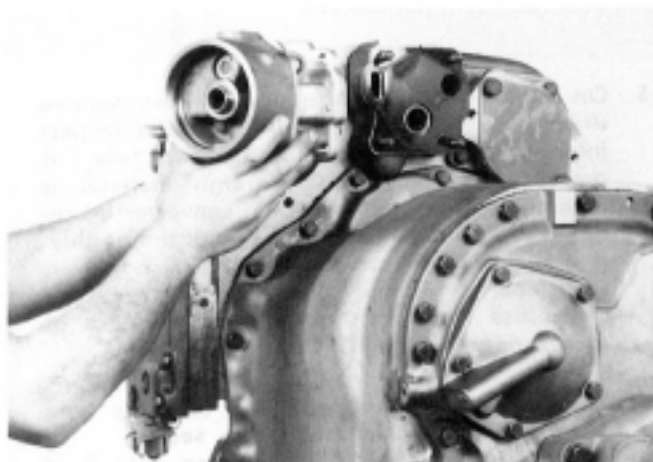
**Figure 315**  
Install new pressure regulating valve gasket.



**Figure 313**  
Install pump adaptor, bolts and washers. Tighten to specified torque. (See torque chart).

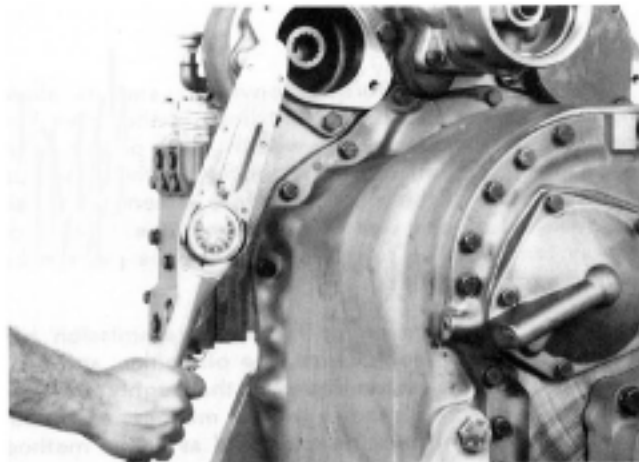


**Figure 316**  
Install new "O" rings on pressure regulating valve. Position valve on studs.



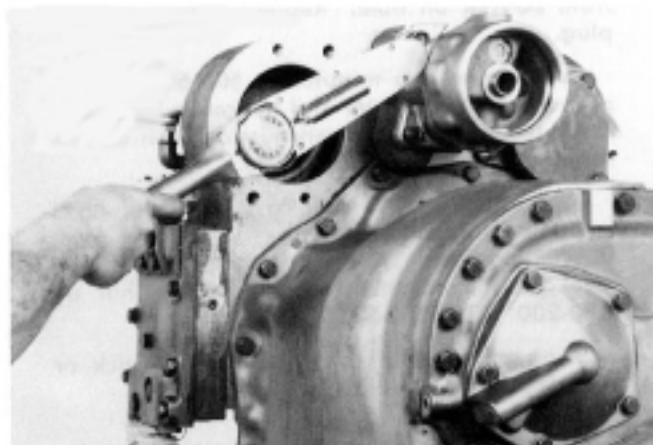
**Figure 317**

Position new valve to pump gasket on studs. Install charging pump and filter adaptor on studs.



**Figure 320**

Install bolts and washers. Tighten to specified torque. (See torque chart).



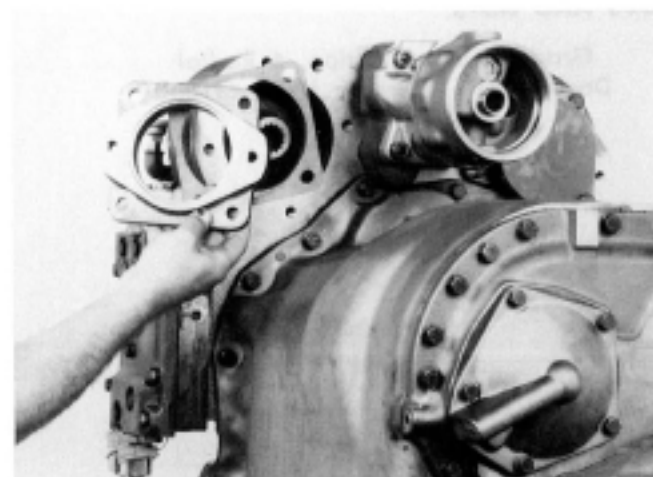
**Figure 318**

Install washers and nuts, tighten to specified torque. (See torque chart).



**Figure 321**

Install new filter element and filter housing.



**Figure 319**

Install new auxiliary pump adaptor gasket and adaptor.



## SERVICING MACHINE AFTER TRANSMISSION OVERHAUL

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

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

The following are considered the minimum steps to be taken:

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

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

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

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

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

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

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

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

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

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



Grade 5

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



Grade 8

LUBRICATED OR PLATED

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

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

<b>CONVERTER OUT PRESSURE</b>	Converter outlet oil temp. 180° - 200° F. [82.2° - 93.3° C]. Transmission in <b>NEUTRAL</b> . Operating specifications: 25 P.S.I. [172.4 kPa] minimum pressure at 2000 R.P.M. engine speed <b>AND</b> a maximum of 70 P.S.I. [482.6 kPa] outlet pressure with engine operating at no-load governed speed.	<b>OIL FILTRATION</b>	Full flow oil filter safety by-pass, also strainer screen in sump at bottom of transmission case.
<b>CONTROLS</b>	Forward and Reverse - Manual Speed Selection - Manual	<b>CLUTCH PRESSURE</b>	240 - 300 psi [1654.8 - 2068, 4 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. <b>NOTE: Never use service brakes while making clutch pressure checks. Units having brake actuated declutching in forward and/or reverse will not give a true reading.</b> <b>ALWAYS USE PARKING BRAKE WHEN MAKING CLUTCH PRESSURE CHECKS.</b>
<b>CLUTCH TYPE</b>	Multiple discs, hydraulically actuated, spring released, automatic wear compensation and no adjustment. All clutches oil cooled and lubricated.		
<b>CLUTCH INNER DISC</b>	Friction.		
<b>CLUTCH OUTER DISC</b>	Steel.		

### LUBRICATION

#### RECOMMENDED LUBRICANTS FOR TORQUE CONVERTERS AND POWERSHIFT TRANSMISSIONS

<b>TYPE OF OIL</b>	See Lube Chart.	(a)	Drain transmission and remove sump screen. Clean screen thoroughly and replace, using new gaskets.
<b>CAPACITY</b>	Consult Operators Manual on applicable machine model for system capacity. Torque Converter, Transmission and allied hydraulic system must be considered as a whole to determine capacity.	(b)	Drain oil filters, remove and discard filter elements. Clean filter shells and install new elements.
<b>CHECK PERIOD</b>	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.	(c)	Refill transmission to LOW mark.
<b>NORMAL DRAIN PERIOD</b>	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]. <b>NOTE: It is recommended that filter elements be changed after 50 and 100 hours of operation on new and rebuilt or repaired units.</b>	(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.

Torque converter/transmission lubricant must be qualified by one of the following specifications.

#### ORDER OF PREFERENCE:

- |                           |   |
|---------------------------|---|
| 1. Caterpillar TO - 4     | 4. Allison C-4                            |
| 2. John Deere J20 C, D    | 5. Dexron II Equivalent - See note below. |
| 3. Military MIL-PRF-2104G |   |

**IMPORTANT:** Dexron® II equivalent is acceptable; however it is not compatible with torque converters or transmissions equipped with graphitic friction material clutch plates.

**LUBRICANTS NOT RECOMMENDED: DEXRON III, ENGINE OIL, ANY GL-5 OILS.**

**OIL VISCOSITY** - It is recommended that the highest viscosity monograde lubricant available be used for the anticipated ambient temperature. Typically this will be a CAT TO-4 qualified lubricant. When large swings in ambient temperature are probable, J20 C, D multigrades are recommended. Multigrade lubricants should be applied at the lower viscosity rating for the prevailing ambient temperature, i.e. a 10W20 should be used where a 10W monograde is used. If a C-4 multigrade is used in place of J20 lubricant it is recommended that the viscosity span no more than 10 points, i.e. 10W20.

**SYNTHETIC LUBRICANTS ARE APPROVED IF QUALIFIED BY ONE OF THE ABOVE SPECIFICATIONS. OIL VISCOSITY GUIDELINES APPLY, BUT SYNTHETIC MULTIGRADES MAY SPAN MORE THAN 10 POINTS.**

**FOR FIRE RESISTANT FLUID RECOMMENDATIONS PLEASE CONTACT SPICER OFF-HIGHWAY PRODUCTS.**

**SUMP PREHEATERS** - preheat the transmission fluid to the minimum temperature for the oil viscosity used before engine start up.

**NORMAL OIL CHANGE INTERVAL** - drain and refill system every 1000 hours for average environmental and duty cycle conditions. Severe or sustained high operating temperature or very dusty atmospheric conditions will result in accelerated deterioration or contamination. Judgement must be used to determine the required change intervals for extreme conditions.

**EXTENDED OIL CHANGE INTERVAL** - Extended oil service life may result when using synthetic fluids. Appropriate change intervals should be determined for each transmission by measuring oil oxidation and wear metals, over time, to determine a baseline. Wear metal analysis can provide useful information, but a transmission should not be removed from service based solely on this analysis.

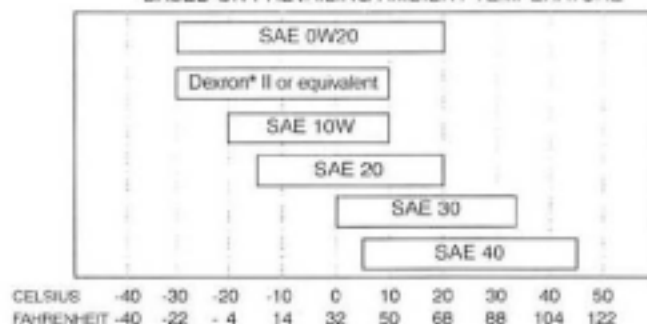
**FILTERS** - Service oil filter element every 500 hours under normal environmental and duty cycle conditions. Service the high performance extended life filter element every 1000 hours or upon warning indication from the filter back pressure sensor.

This recommended lubricant section does not apply to transmissions with electronic modulation where separate approved oils are identified.

Any deviation from this recommendation must have written approval from the application engineering department of Spicer Off-Highway Products.

\*Dexron is a registered trademark of General Motors Corp.

#### RECOMMENDED SAE J300 VISCOSITY GRADE BASED ON PREVAILING AMBIENT TEMPERATURE



#### POWER SHIFT TRANSMISSION AND TORQUE CONVERTER HYDRAULIC FLUID ANALYSIS

Spicer Off-Highway Components Division recommends that when chemical sampling of a power shift transmission lubrication circuit fluid is being taken that several samples be analyzed over a period of time to establish its normal base. Large changes in particle quantity from the normal level may indicate an abnormal condition within the transmission or its lubrication fluid. Any conclusion made of the transmission actual condition, or action taken by the transmission user when interpreting the sample results, is the full responsibility of the user.

The following part per million (PPM) values represent general guidelines which may be used for references as a normal limit:

Iron	Fe	125 PPM
Copper	Cu	350 PPM
Silicon	Si	20 PPM
Aluminum	Al	15 PPM
Lead	Pb	50 PPM
Chromium	Cr	5 PPM

# TROUBLE SHOOTING GUIDE

For The  
R and HR Model, 32000 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.
2. Clutch pressure regulating valve spool stuck open.
3. Faulty charging pump.
4. Broken or worn clutch shaft or piston sealing rings.
5. Clutch piston bleed valve stuck open.

1. Fill to proper level.
2. Clean valve spool and housing.
3. Replace pump.
4. Replace sealing rings.
5. Clean bleed valves thoroughly.

## LOW CONVERTER CHARGING PUMP OUTPUT

1. Low oil level.
2. Suction screen plugged.
3. Air leaks at pump intake hose and connections or collapsed hose. (R-32000 only)
4. Defective oil pump.

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

## OVERHEATING

1. Worn oil sealing rings.
2. Worn oil pump.
3. Low oil level.
4. Pump suction line taking air. (R-32000 only)

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

## NOISY CONVERTER

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

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

## LACK OF POWER

1. Low engine RPM at converter stall.
2. See "Overheating" and make same checks.

1. Tune engine check governor.
2. Make corrections as explained in "Overheating."

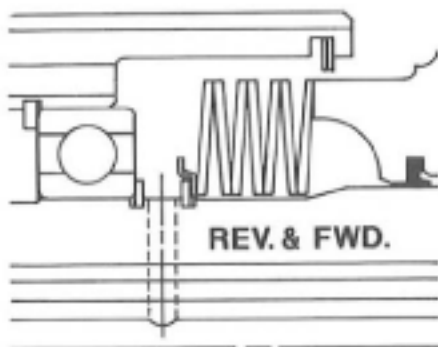


FIG. A



MODULATED FWD.  
& REV. CLUTCHES

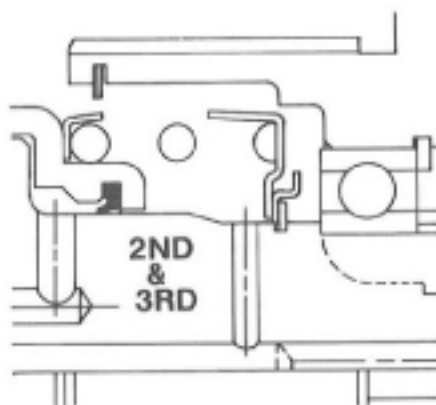


FIG. B

{ 2nd & 3rd & NON-  
MODULATED FORWARD &  
REVERSE CLUTCHES

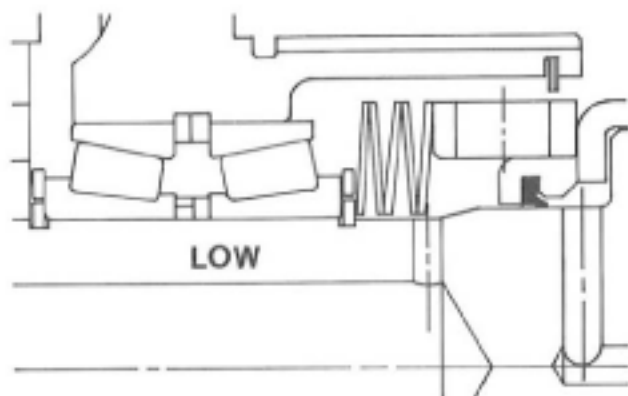


FIG. C



LOW (1st)  
CLUTCH

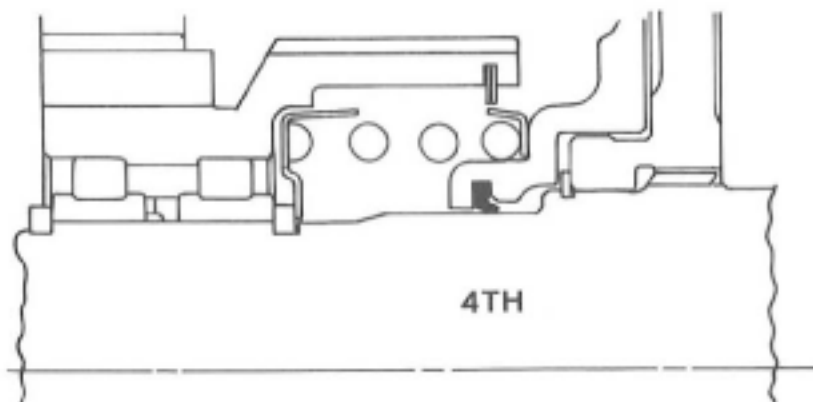
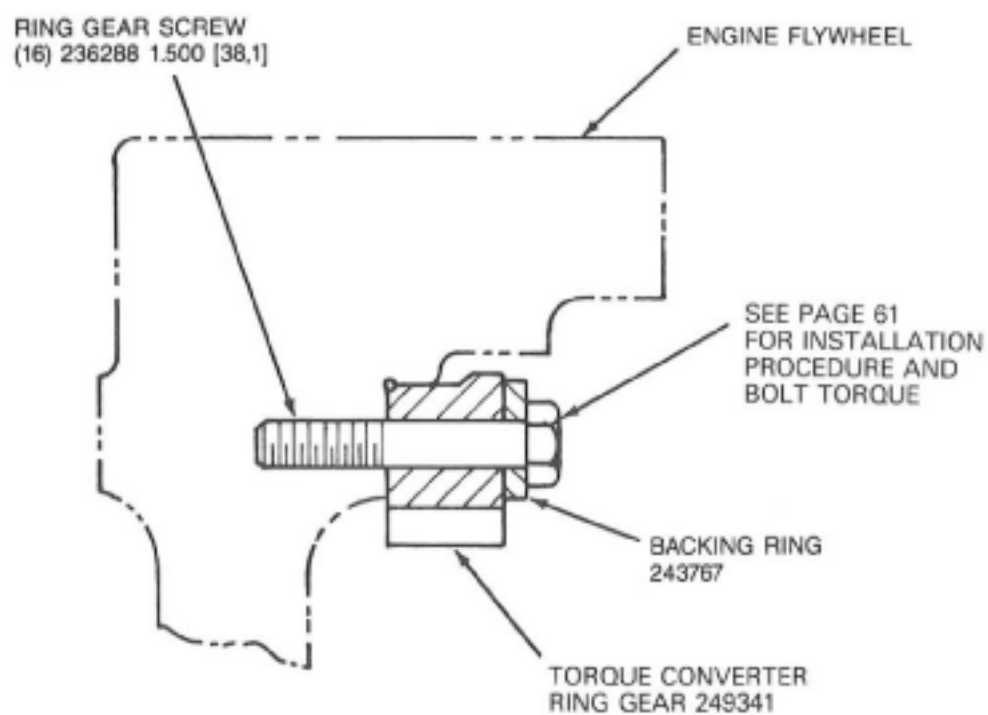
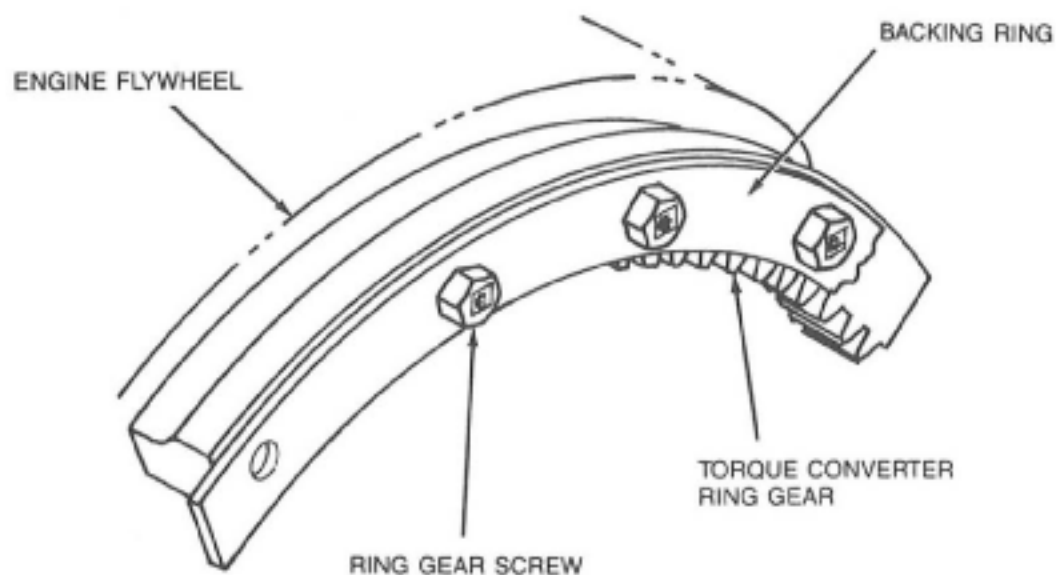


FIG. D  
(4 SPEED ONLY)



## 16 SCREW RING GEAR INSTALLATION PROCEDURE (Non-Asbestos Ring Gear)

1. Remove all burrs from flywheel mounting face and pilot bores. Clean the torque converter ring gear flywheel mounting surface and the ring gear screw tapped holes with solvent. Dry thoroughly, being certain ring gear screw holes are dry and clean.
2. Check engine flywheel and housing or housing adaptor for conformance to standard S.A.E. No. 3 — SAE J927 and J1033 tolerance specifications for pilot bores size, pilot bores eccentricities and mounting face deviations. Measure and record engine crankshaft end play.
3. Install torque converter ring gear as shown.

**NOTE:** Assembly of the ring gear must be completed within a fifteen minute period from start of screw installation. The screws are prepared with an epoxy coating which begins to harden after installation in the flywheel mounting holes. If not tightened to proper torque within the fifteen minute period insufficient screw clamping tension will result.

4. Install backing ring and sixteen (16) special screws to approximately .06 inch [1,5 mm] of seated position. It is permissible to use a power wrench for this installation phase. With a calibrated torque wrench tighten screws 30 to 33 pounds feet of torque [40,7 - 44,7 N.m].

To obtain maximum effectiveness of the special screw's locking feature, a minimum time period after screw installation of twelve (12) hours is suggested before engine start-up.

The special screw is to be used for **ONE** installation only. If the screw is removed for any reason it **MUST BE REPLACED**. It is recommended that the epoxy left in the flywheel hole be removed with the proper tap and cleaned with solvent. Dry hole thoroughly and use a **NEW** screw for re-installation.

5. Assemble torque converter to engine flywheel by sliding converter into position by hand before fastening housing attachment screws. This may require more than one trial to match the drive gear teeth. Pulling the converter into position with housing attachment bolts is not recommended.
6. Measure engine crankshaft end play after assembly of torque converter. This value must be within one thousandth (.001) of an inch [0,0254mm] of end play recorded (in Paragraph #2) before assembly of torque converter.

### 802553 — 1.5 INCH [38,1] 16 SCREW RING GEAR KIT

1	249341	Torque Converter Ring Gear
16	236288	Ring Gear Screw 1.5 Inch [38,1]
1	802555	Installation Instruction Sheet

### 802554 — 1.5 INCH [38,1] 16 SCREW RING GEAR KIT

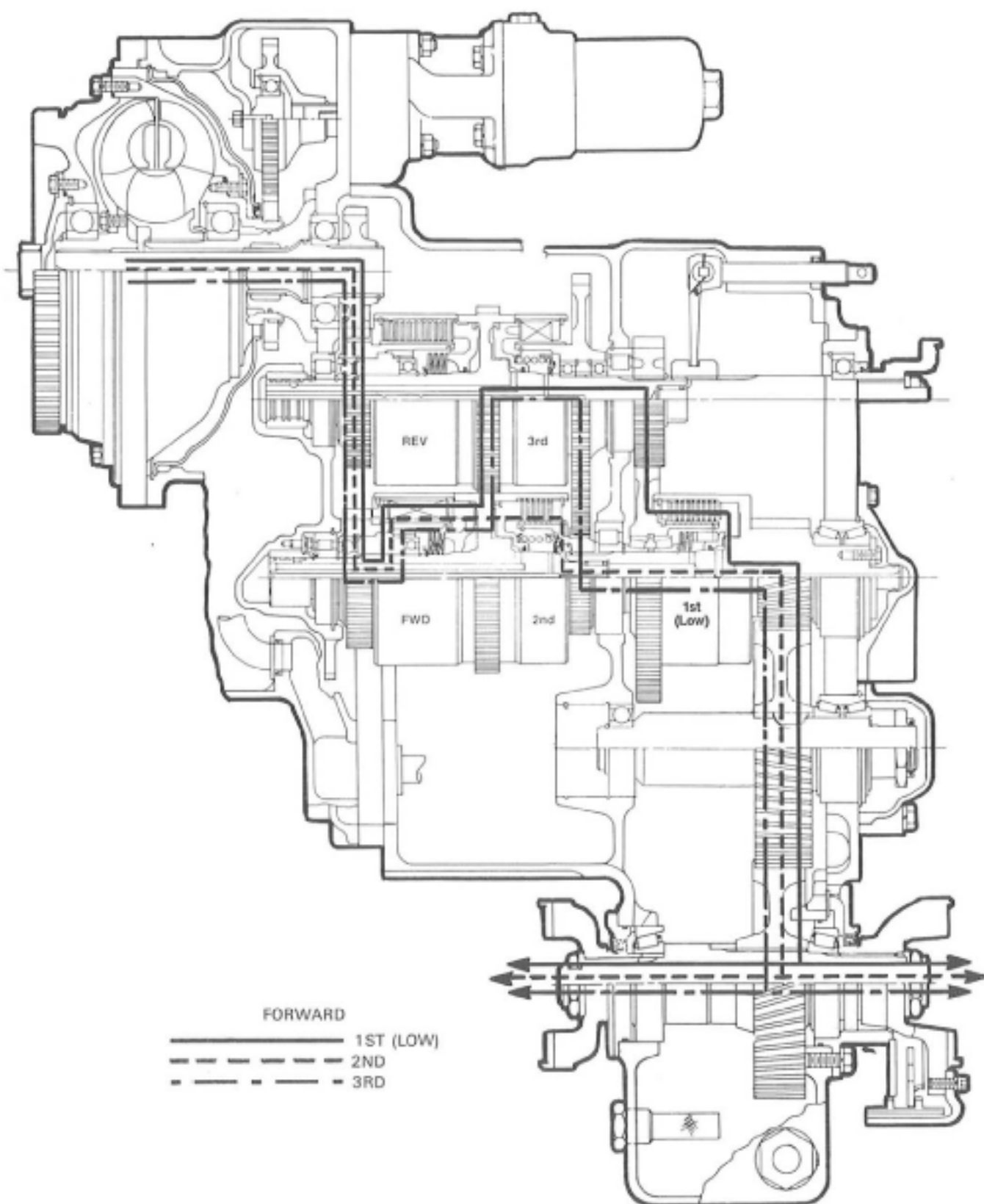
1	249341	Torque Converter Ring Gear
16	236288	Ring Gear Screw 1.5 Inch [38,1]
1	243767	Backing Ring
1	802555	Installation Instruction Sheet

243767 Backing Ring not included in 802553 Ring Gear Kit. Must be Ordered Separately.

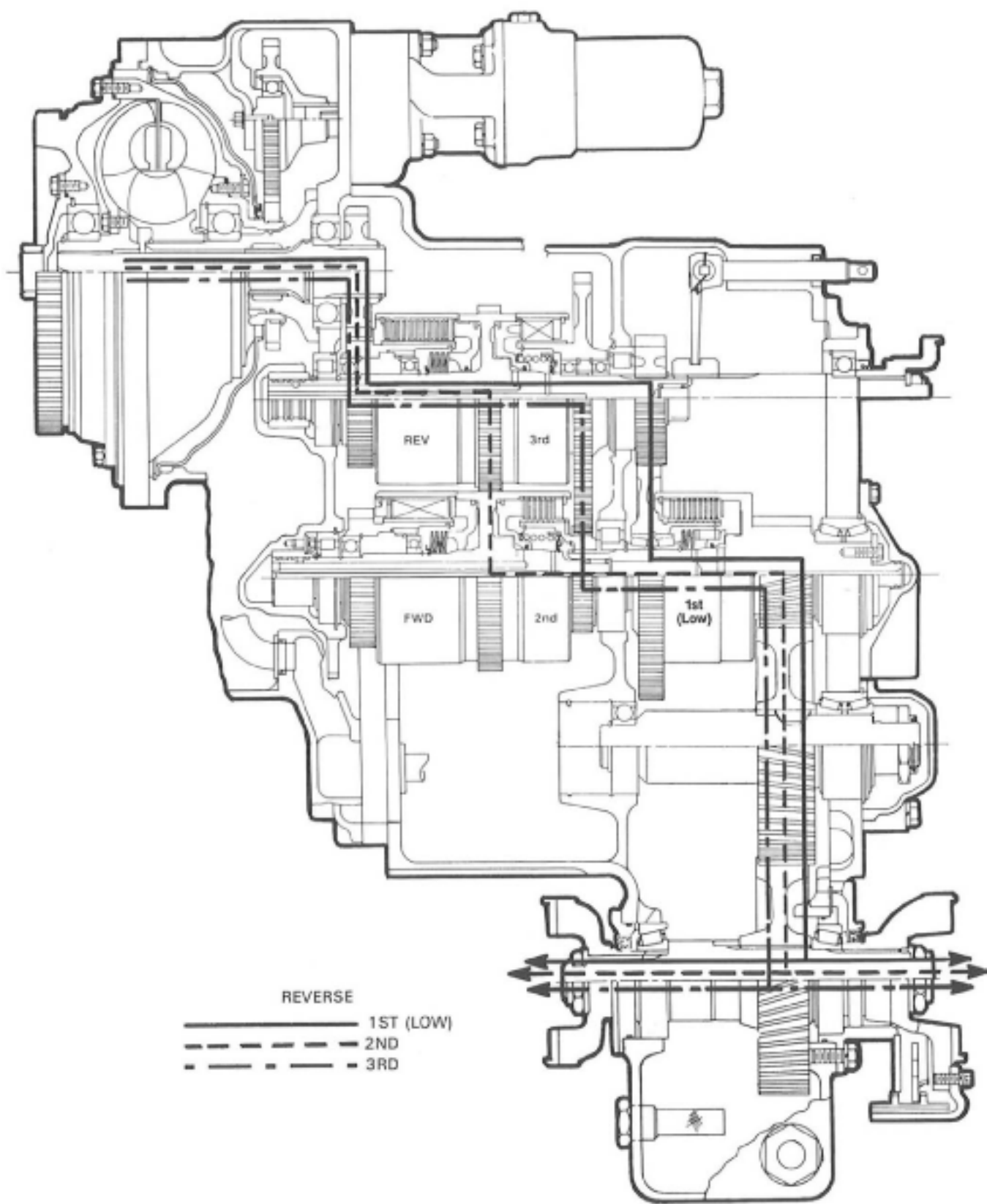
Dimensions are in inches — Dimensions in [ ] are mm.

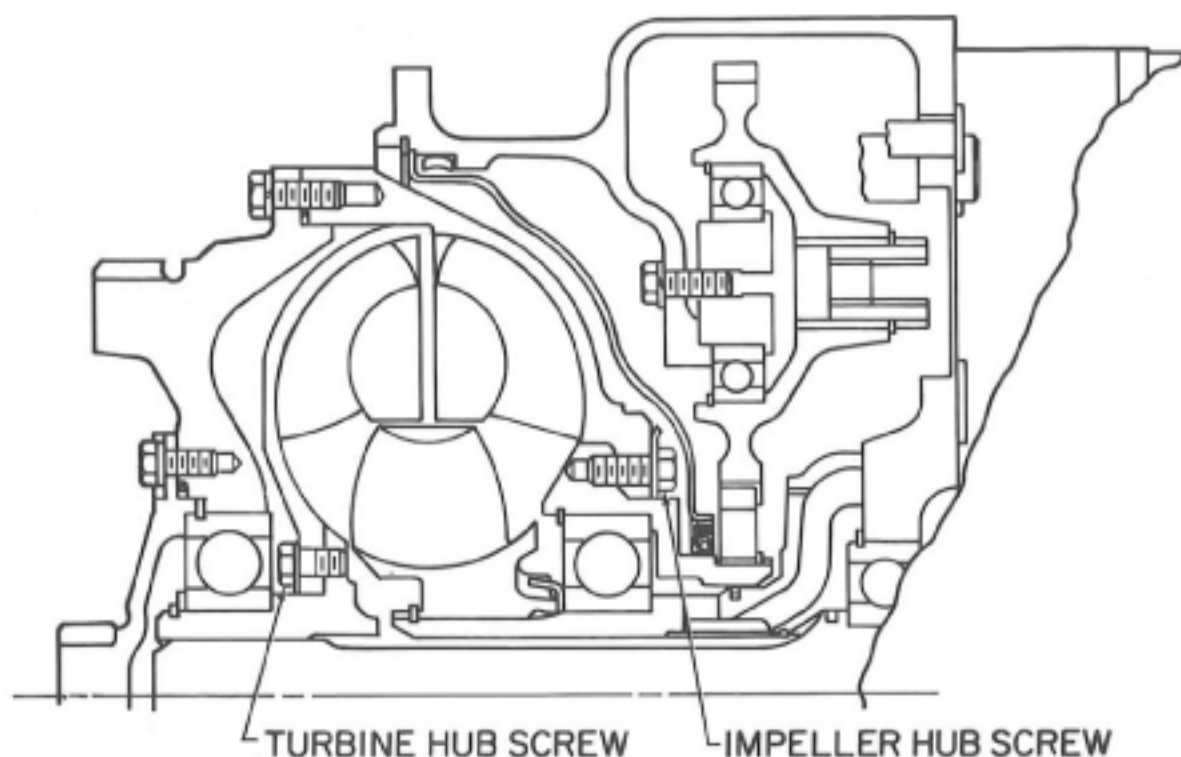
**SEE PAGE 60 FOR INSTALLATION ILLUSTRATIONS**

**SEE PAGE 69 FOR 32 BOLT INSTALLATION**



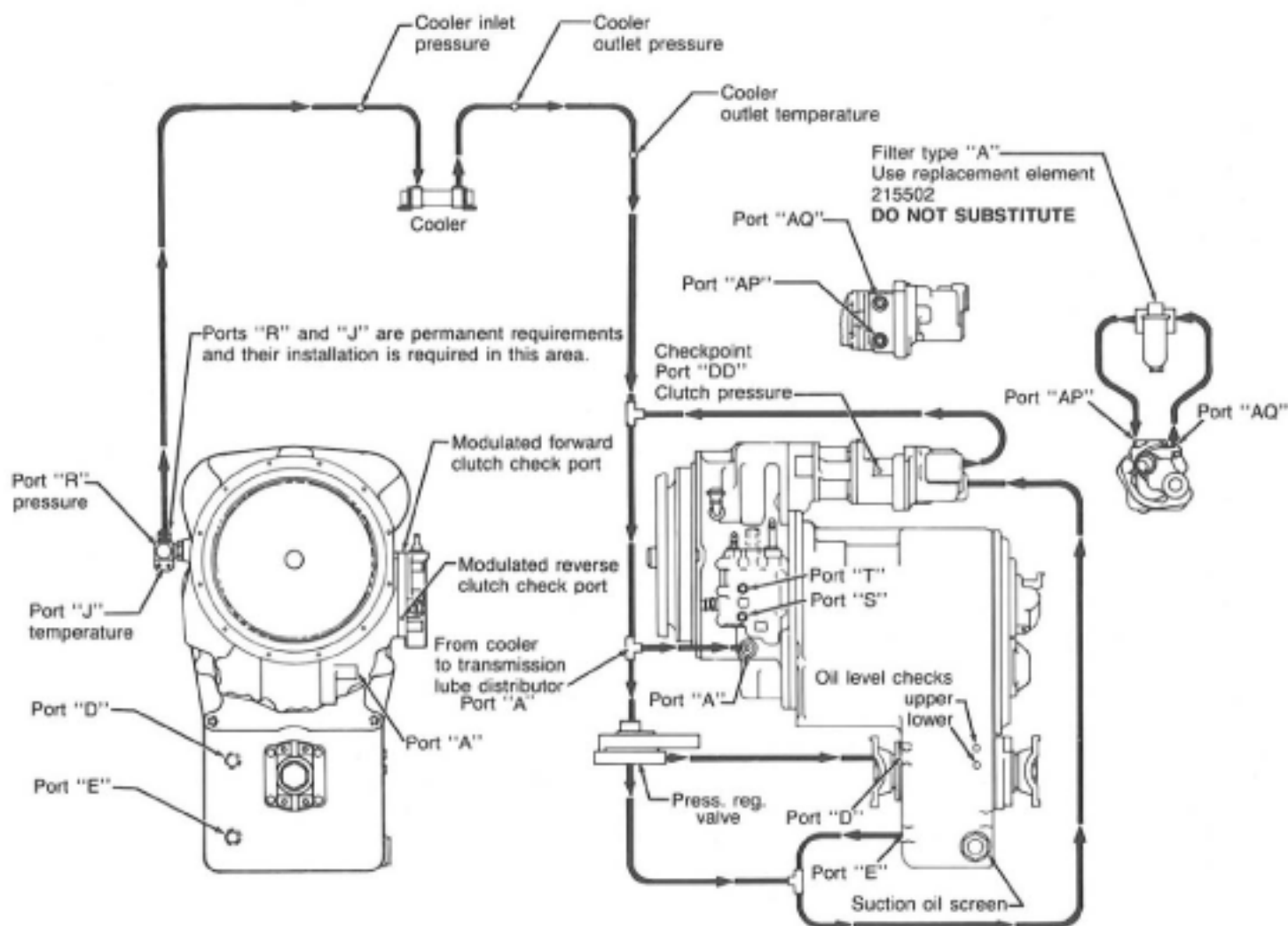






**IMPELLER HUB & TURBINE HUB ASSEMBLY WITH BACKING RING AND SPECIAL SELF LOCKING SCREWS.**

1. CLEAN HUB MOUNTING SURFACE AND TAPPED HOLES WITH SOLVENT. DRY THOROUGHLY BEING CERTAIN TAPPED HOLES ARE DRY AND CLEAN.
2. INSTALL BACKING RING AND SPECIAL SCREWS TO APPROXIMATELY .06 INCH [1,5] OF SEATED POSITION. WITH A CALIBRATED TORQUE WRENCH, TIGHTEN SCREWS 40 TO 45 LBS. FT. TORQUE [54,3-61,0 N.m]. NOTE: ASSEMBLY OF IMPELLER OR TURBINE HUB MUST BE COMPLETED WITHIN A FIFTEEN MINUTE PERIOD FROM START OF SCREW INSTALLATION. THE SCREWS ARE PREPARED WITH A COATING WHICH BEGINS TO HARDEN AFTER INSTALLATION IN THE HUB HOLES. IF NOT TIGHTENED TO PROPER TORQUE WITHIN THE FIFTEEN MINUTE PERIOD, INSUFFICIENT SCREW CLAMPING TENSION WILL RESULT. THE SPECIAL SCREW IS TO BE USED FOR ONE INSTALLATION ONLY. IF THE SCREW IS REMOVED FOR ANY REASON IT MUST BE REPLACED. THE COMPOUND LEFT IN THE HUB HOLES MUST BE REMOVED WITH THE PROPER TAP AND CLEANED WITH SOLVENT. DRY HOLE THOROUGHLY AND USE A NEW SCREW FOR REINSTALLATION.



Port "J" Converter outlet temperature  
 Port "R" Converter outlet pressure  
 Port "T" Checkpoint transmission forward clutch pressure  
 Port "S" Checkpoint transmission reverse clutch pressure  
 Ports "J", "R", and "DD" Used for field trouble shooting

### PLUMBING DIAGRAM FOR HR 32000 W/12 PLATE MODULATION AND AUXILIARY LUBE

## 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.

#### Housings

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

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

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

### INSPECTION

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

#### Bearings

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

#### Oil Seals, Gaskets and Retaining Rings

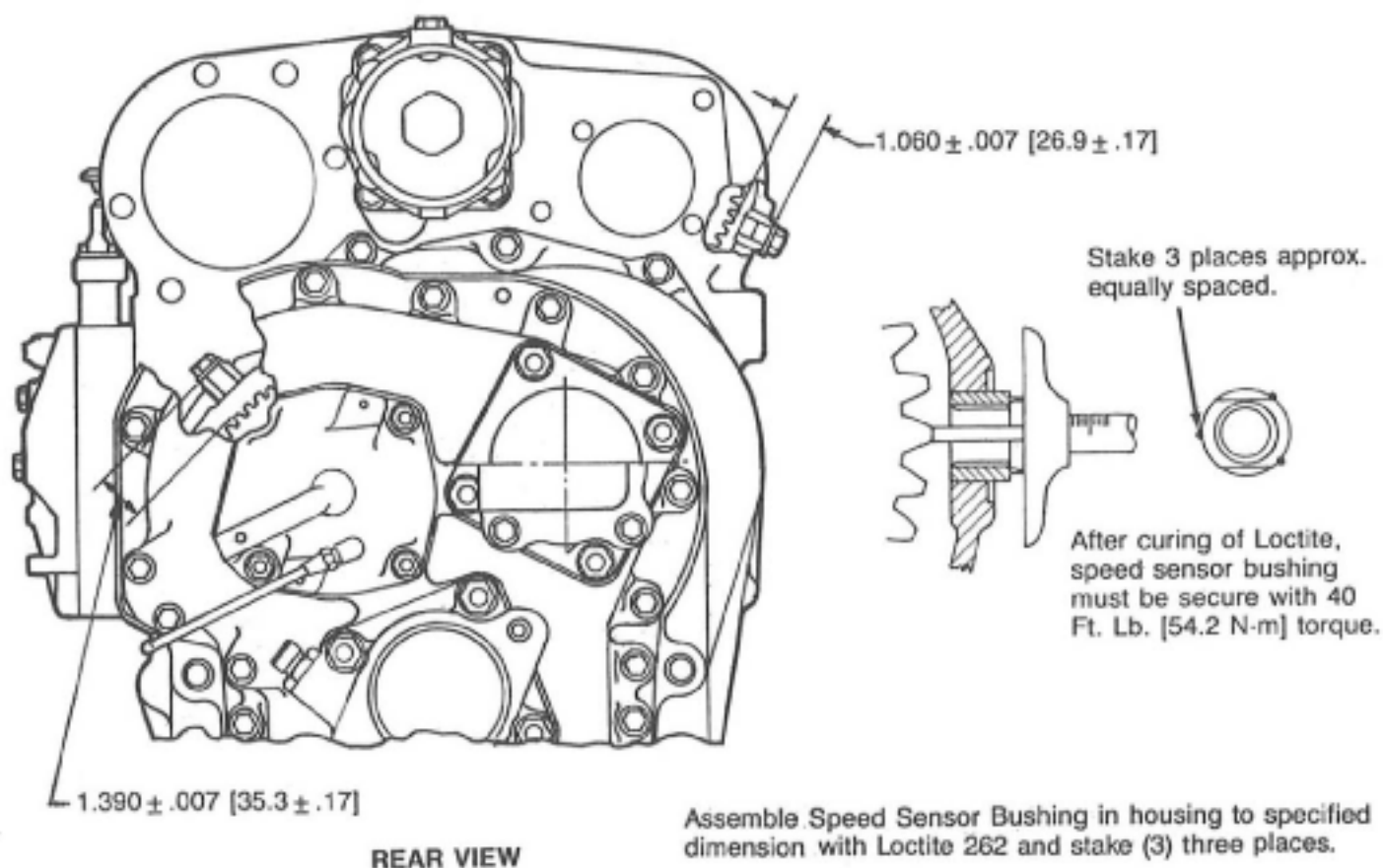
Replacement of spring load oil seals, "O" rings, metal sealing rings, gaskets and snap rings is more economical when unit is disassembled than premature overhaul to replace these parts at a future time. Further loss of lubricant through a worn seal may result in failure of other more expensive parts 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 coat of chassis grease to stabilize rings in their grooves for ease of assembly of mating members. Lubricate all "O" rings and seals with recommended type Automatic Transmission Fluid before assembly.

#### Gears and Shafts

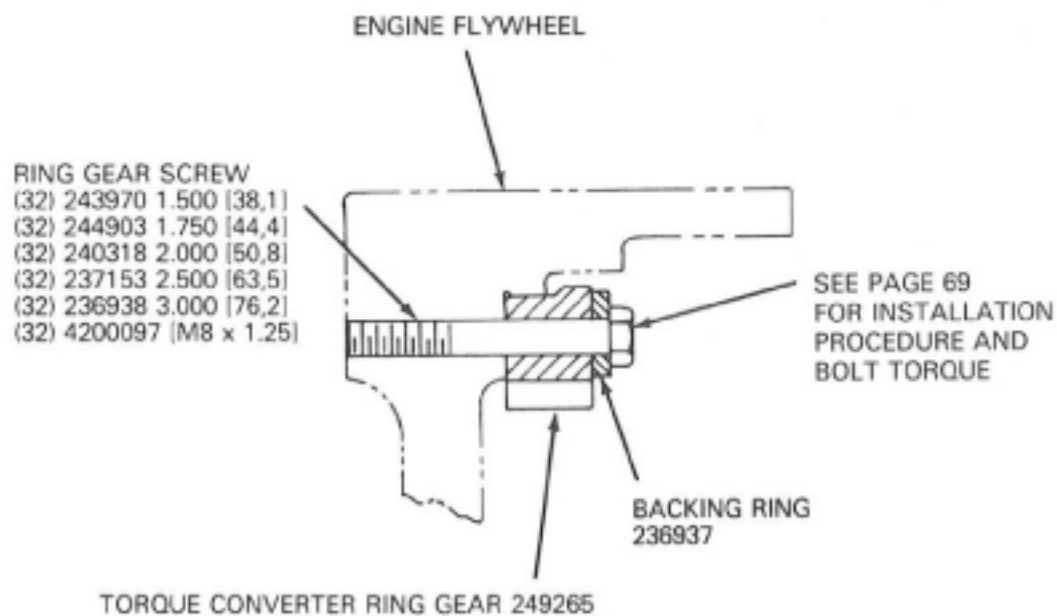
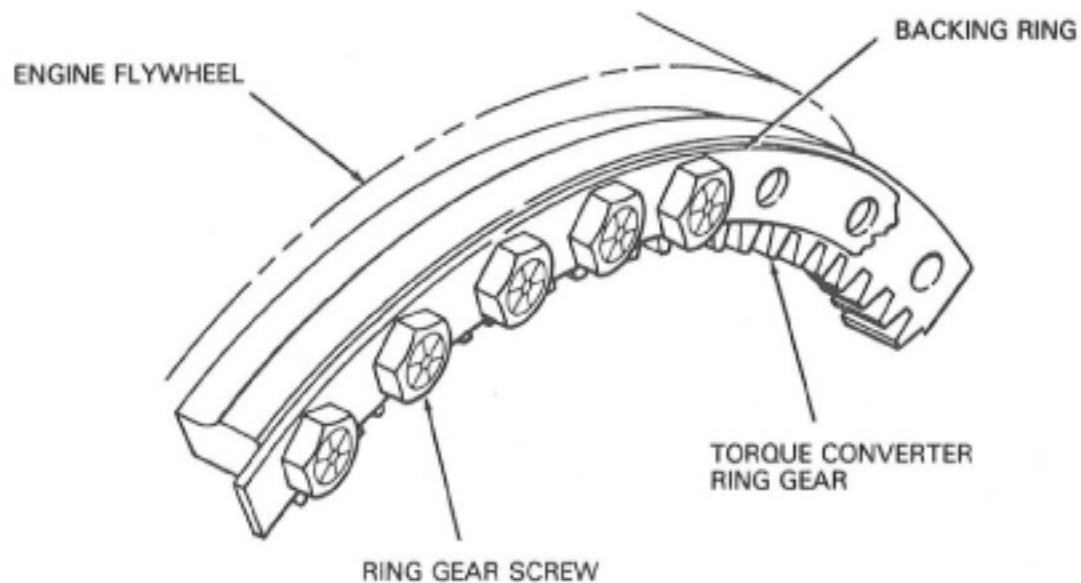
If magna-flux process is available, use process to check parts. Examine teeth on all gears carefully for wear, pitting, chipping, nicks, cracks or scores. If gear teeth show spots where case hardening is worn through or cracked, replace with new gear. Small nicks may be removed with suitable hone. Inspect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

#### Housing, Covers, etc.

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



## SPEED SENSOR BUSHING INSTALLATION



## 32 SCREW RING GEAR INSTALLATION PROCEDURE (Non-Asbestos Ring Gear)

1. Remove all burrs from flywheel mounting face and pilot bores. Clean the torque converter ring gear flywheel mounting surface and the ring gear screw tapped holes with solvent. Dry thoroughly, being certain ring gear screw holes are dry and clean.
2. Check engine flywheel and housing or housing adaptor for conformance to standard S.A.E. No. 3 — SAE J927 and J1033 tolerance specifications for pilot bores size, pilot bores eccentricities and mounting face deviations. Measure and record engine crankshaft end play.
3. Install torque converter ring gear as shown.

**NOTE: Assembly of the ring gear must be completed within a fifteen minute period from start of screw installation.** The screws are prepared with an epoxy coating which begins to harden after installation in the flywheel mounting holes. If not tightened to proper torque within the fifteen minute period insufficient screw clamping tension will result.

4. Install backing ring and thirty-two (32) special screws to approximately .06 inch [1,5 mm] of seated position. It is permissible to use a power wrench for this installation phase. With a calibrated torque wrench tighten screws 23 to 25 pounds feet of torque [31,2 - 33,8 N.m].

To obtain maximum effectiveness of the special screw's locking feature, a minimum time period after screw installation of twelve (12) hours is suggested before engine start-up.

The special screw is to be used for **ONE** installation only. If the screw is removed for any reason it **MUST BE REPLACED**. It is recommended that the epoxy left in the flywheel hole be removed with the proper tap and cleaned with solvent. Dry hole thoroughly and use a **NEW** screw for re-installation.

5. Assemble torque converter to engine flywheel by sliding converter into position by hand before fastening housing attachment screws. This may require more than one trial to match the drive gear teeth. Pulling the converter into position with housing attachment bolts is not recommended.
6. Measure engine crankshaft end play after assembly of torque converter. This value must be within one thousandth (.001) of an inch [0,0254mm] of end play recorded (in Paragraph #2) before assembly of torque converter.

### 802544 — 1.5 INCH [38,1] 32 SCREW RING GEAR KIT

1	249265	Torque Converter Ring Gear
32	243970	Ring Gear Screw 1.5 Inch [38,1]
1	802550	Installation Instruction Sheet

### 802547 — 2.5 INCH [63,5] 32 SCREW RING GEAR KIT

1	249265	Torque Converter Ring Gear
32	237153	Ring Gear Screw 2.5 Inch [63,5]
1	802550	Installation Instruction Sheet

### 802545 — 1.75 INCH [44,4] 32 SCREW RING GEAR KIT

1	249265	Torque Converter Ring Gear
32	244903	Ring Gear Screw 1.75 Inch [44,4]
1	802550	Installation Instruction Sheet

### 802548 — 3.0 INCH [76,2] 32 SCREW RING GEAR KIT

1	249265	Torque Converter Ring Gear
32	236938	Ring Gear Screw 3.0 Inch [76,2]
1	802550	Installation Instruction Sheet

### 802546 — 2.0 INCH [50,8] 32 SCREW RING GEAR KIT

1	249265	Torque Converter Ring Gear
32	240318	Ring Gear Screw 2.0 Inch [50,8]
1	802550	Installation Instruction Sheet

### 802549 — M8-32 SCREW RING GEAR KIT

1	249265	Torque Converter Ring Gear
32	4200097	Ring Gear Screw [M8 x 1,25]
1	802550	Installation Instruction Sheet

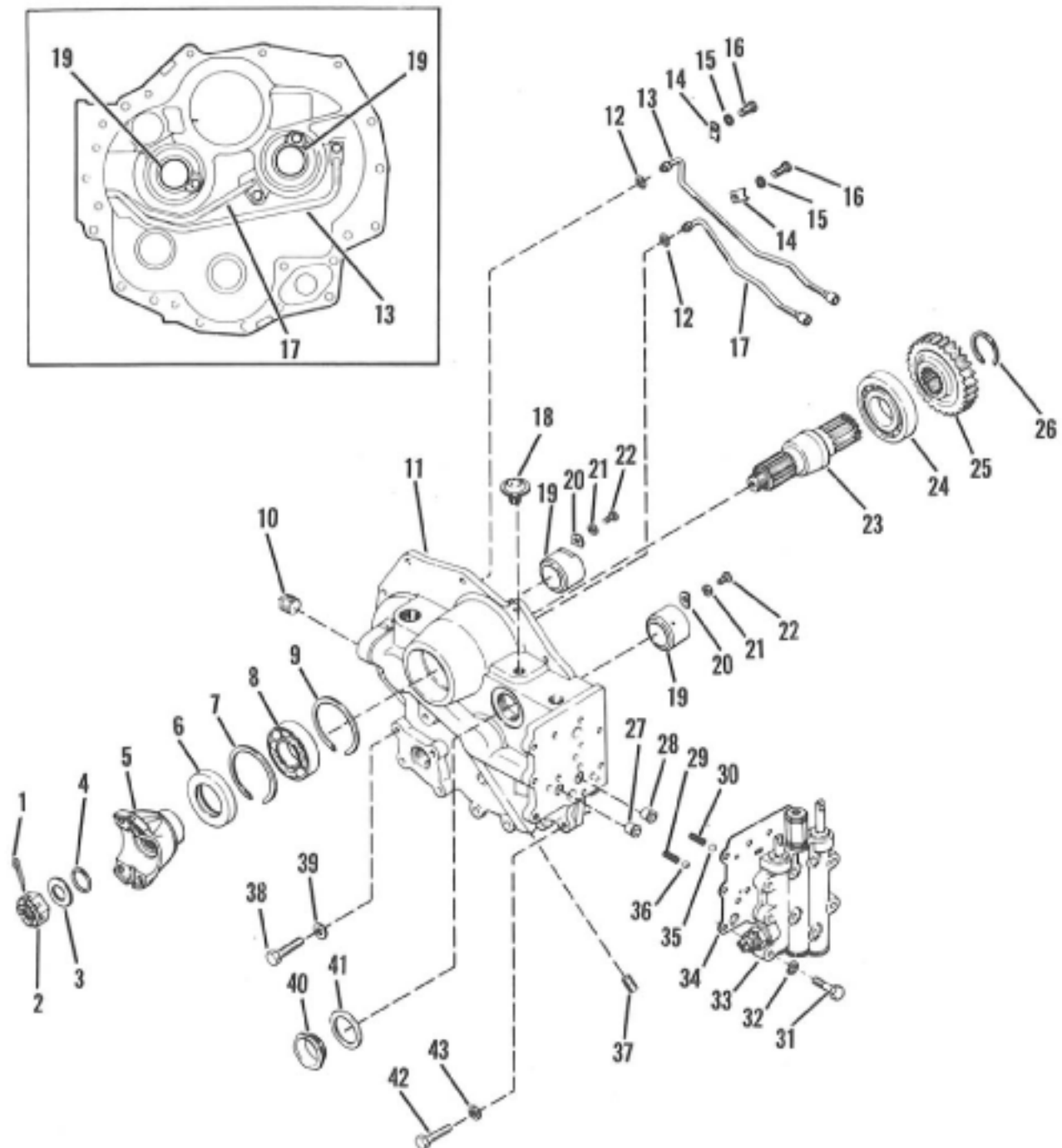
236937 Backing Ring Not Included in Ring Gear Kit. Must be Ordered Separately.

**NOTE:** The initial installation drive gear mounting kit includes a converter air breather. This breather is used on C & CL 270/C & CL 320 converters only and is not required for the HR & LHR 28000/HR & LHR 32000 applications.

**SEE PAGE 68 FOR INSTALLATION ILLUSTRATIONS**



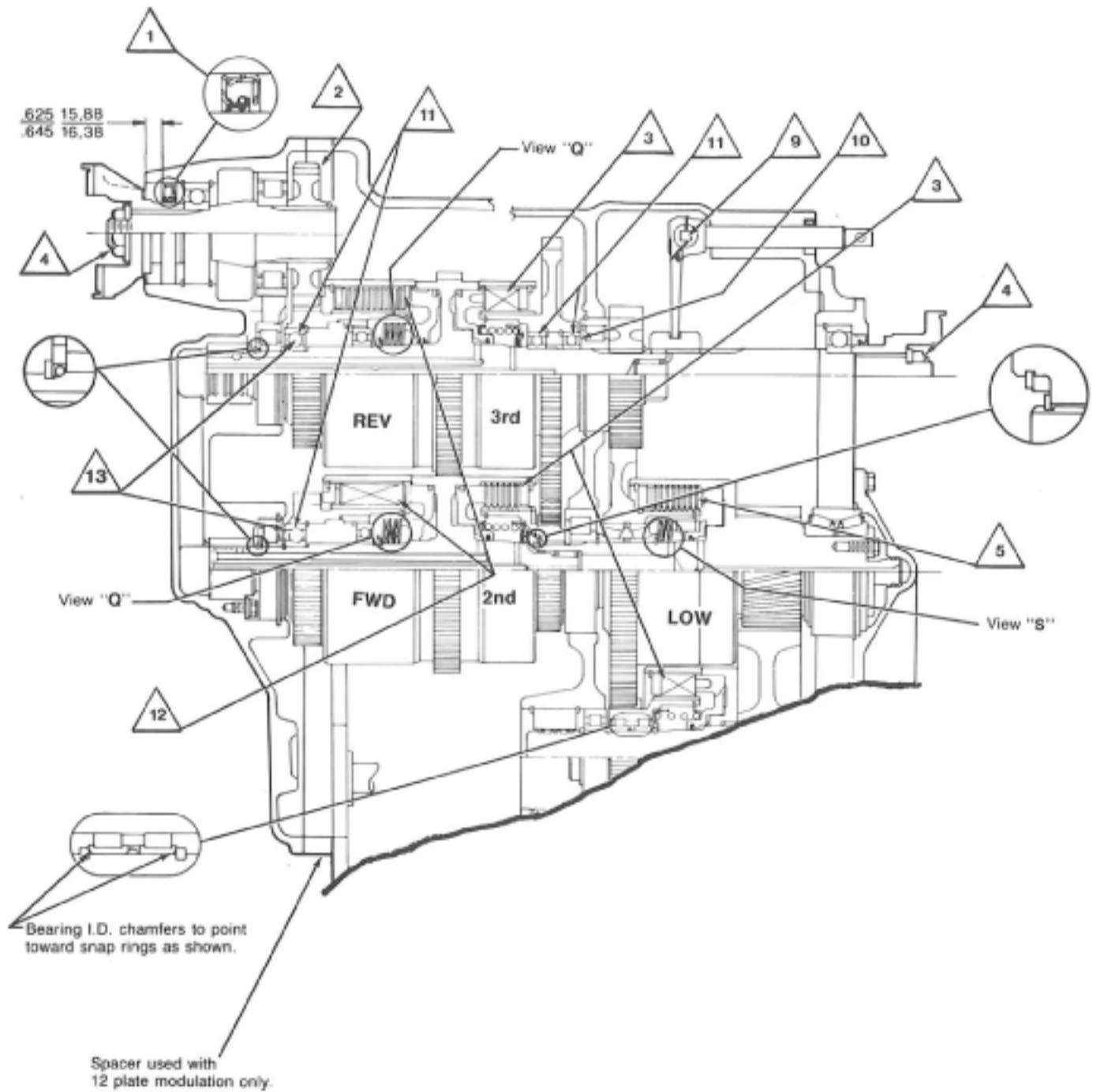
## R-MODEL SECTION



## R32000 FRONT COVER GROUP

ITEM	DESCRIPTION	QTY	ITEM	DESCRIPTION	QTY
1	Flange Nut Cotter .....	1	23	Input Shaft .....	1
2	Flange Nut .....	1	24	Input Shaft Rear Bearing .....	1
3	Flange Nut Washer .....	1	25	Input Shaft Gear .....	1
4	Flange "O" Ring .....	1	26	Input Shaft Gear Retaining Ring .....	1
5	Input Flange .....	1	27	Tube Sleeve .....	1
6	Input Flange Oil Seal .....	1	28	Tube Sleeve .....	1
7	Input Shaft Front Bearing Retaining Ring .....	1	29	Detent Spring .....	1
8	Input Shaft Front Bearing .....	1	30	Detent Spring .....	1
9	Input Shaft Front Bearing Retaining Ring .....	1	31	Valve to Converter Housing Screw .....	9
10	Pipe Plug .....	1	32	Valve to Converter Housing Screw Lockwasher .....	9
11	Front Cover & Tube Assembly .....	1	33	Control Valve Assembly .....	1
12	"O" Ring .....	2	34	Control Valve Gasket .....	1
13	3rd Speed Tube Assembly .....	1	35	Detent Ball .....	1
14	Tube Clip .....	2	36	Detent Ball .....	1
15	Tube Clip Screw Lockwasher .....	2	37	Pipe Plug .....	1
16	Tube Clip Screw .....	2	38	Cover to Case Screw .....	4
17	Reverse Tube Assembly .....	1	39	Cover to Case Screw Lockwasher .....	4
18	Breather .....	1	40	Front Cover Plug .....	1
19	Front Cover Sleeve .....	2	41	Front Cover Plug Gasket .....	1
20	Front Cover Sleeve Lock .....	2	42	Cover to Case Screw .....	4
21	Sleeve Lockscrew Lockwasher .....	2	43	Cover to Case Screw Lockwasher .....	4
22	Sleeve Lockscrew .....	2			

R-32000  
ASSEMBLY INSTRUCTION ILLUSTRATION



- 1 Apply very light coat of Permatex No. 2 to O.D. of all oil seals before ass'y.
- 2 Gear to be assembled with long hub length to this side.
- 3 Three clutches, 6-outer steel plates, 6-inner friction plates. Assemble alternately, starting with outer steel plate.
- 4 See Elastic Stop Nut Torque Chart
- 5 Low clutch, 9-outer steel plates, 9-inner friction plates. Assemble alternately, starting with outer steel plate.

- 9 Lockwire to prevent loosening
- 10 Bearing shield out
- 11 Must be loose internal fit bearings, No. "3" etched on bearing.
- 12 (12 Plate Modulation) Two clutches, 12-outer steel plates, 12-inner friction plates. Assemble alternately, starting with outer steel plate.
- 13 Bearing shield in.

- A. - Use Permatex & Crane Sealer only where specified.
- B. - All lead in chamfers for oil seals, piston rings & "O" rings must be smooth & free from burrs. Inspect at ass'y.
- C. - Lubricate all piston ring grooves & "O" rings with oil before ass'y.
- D. - Apply very light coat of Permatex No. 2 to O.D. of all oil seals before ass'y.

#### Notes

- E. - After assembly of parts using Permatex or Crane sealer, there must not be any free or excess material that could enter the oil circuit.
- F. - Apply light coat of Crane Sealer to all pipe plugs.
- G. - Apply a thin coating of grease between seal lips on lip type seals prior to ass'y.
- H. - Apply light coat of Permatex No. 2 to all thru hole stud threads.

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

Low Clutch Return Springs.  
Concave side of first spring to be placed against clutch piston. Remaining four washers to be stacked alternately reversed as shown.



View "S"

View "Q"  
2 Places



Forward & Reverse Clutch Return Springs.  
Concave side of first spring to be placed against clutch piston. Remaining six washers of each clutch to be stacked alternately reversed as shown.

ELASTIC STOP NUT TORQUE

THREAD SIZE	LB.-FT.	[N·m]
1" - 20	150 - 200	[203.4 - 271.1]
1 1/4" - 18	200 - 250	[271.2 - 338.9]
1 1/2" - 18	300 - 350	[406.8 - 474.5]
1 3/4" - 12	400 - 450	[542.4 - 610.1]

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]
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]
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]
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]
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]
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]
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]

## 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 32000 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

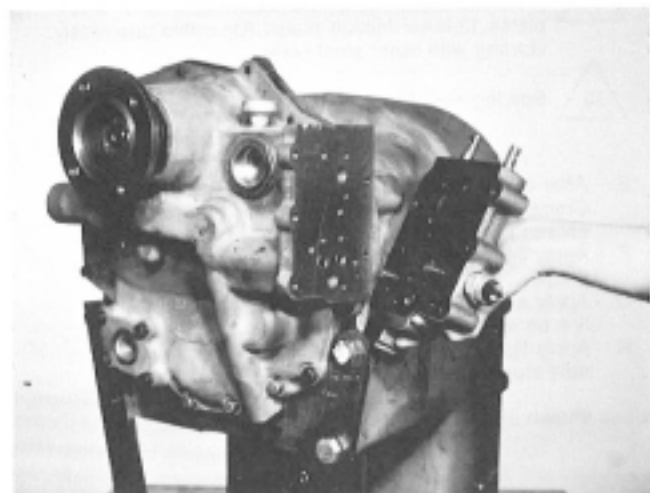


Figure 1

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

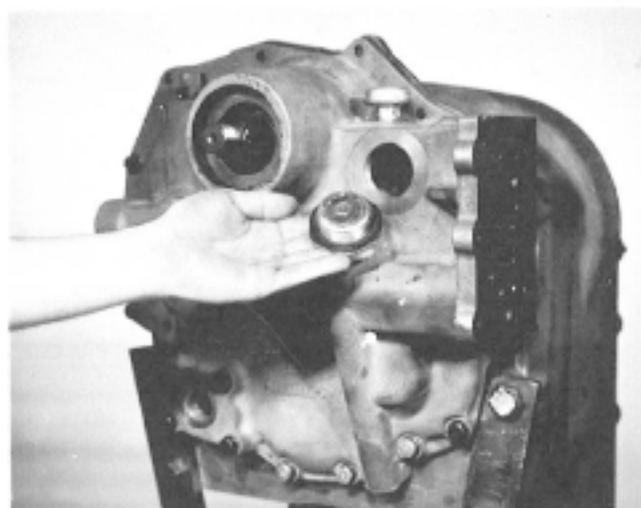


Figure 3

Remove front cover plug.

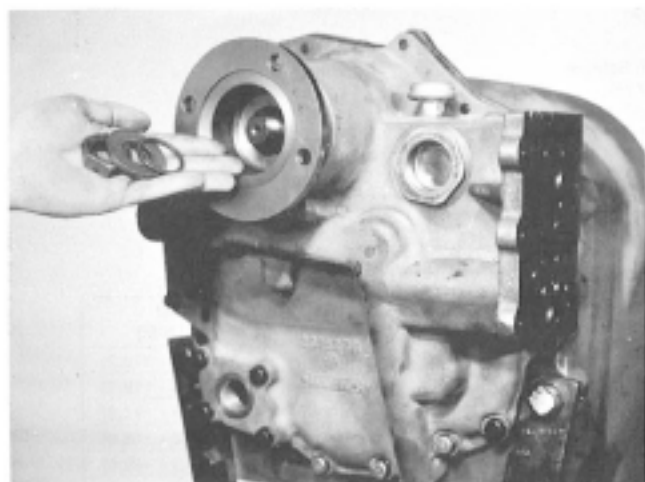


Figure 2

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

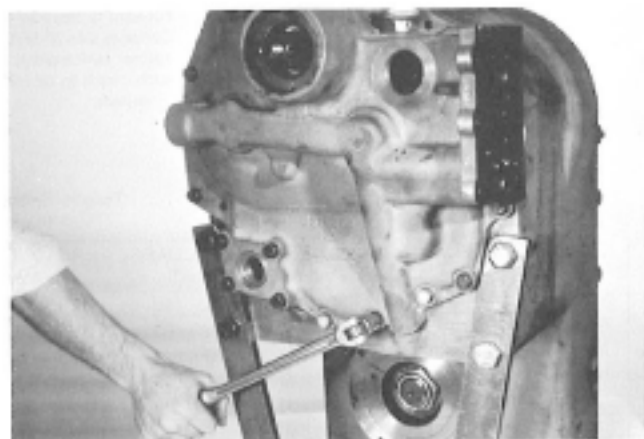
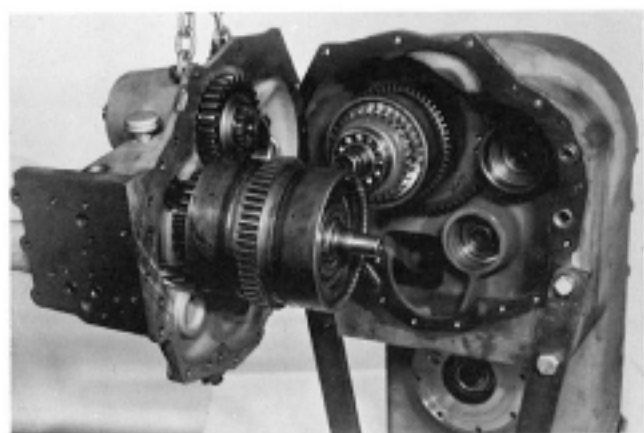


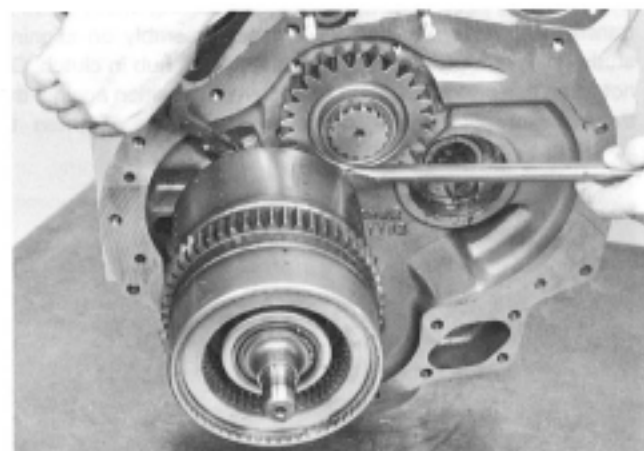
Figure 4

Remove bolts securing front cover to transmission housing.



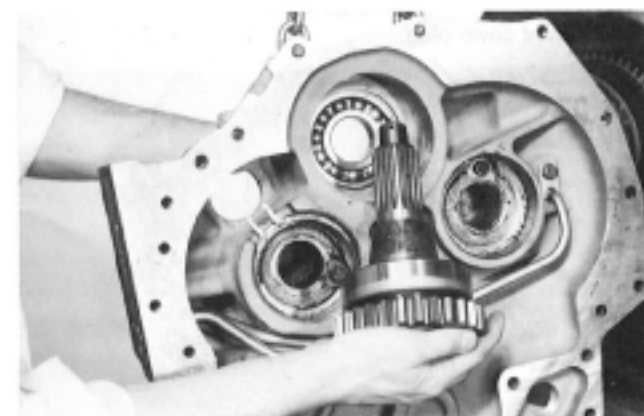
**Figure 5**

Remove front cover and forward and 2nd clutch.



**Figure 6**

Use a spreading type snap ring pliers to spread the ears on forward clutch front bearing retainer ring. Remove forward clutch with pry bar.

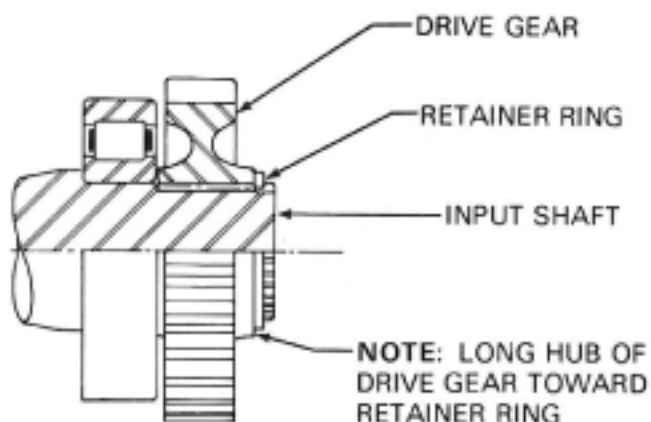


**Figure 7**

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

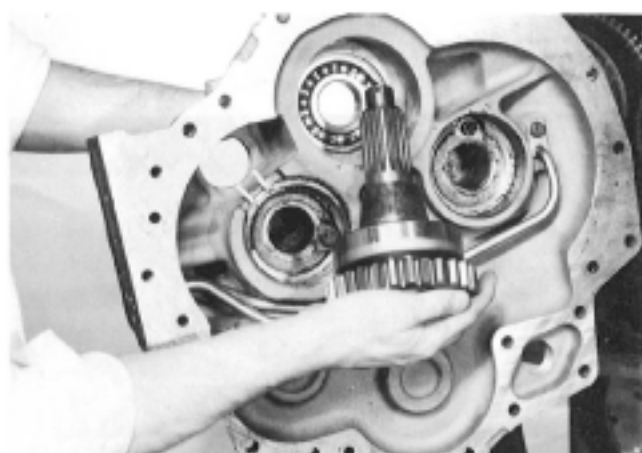
See cleaning and inspection page.

INSTALL INPUT SHAFT OIL SEAL IN FRONT COVER AS SHOWN ON PAGE 72.



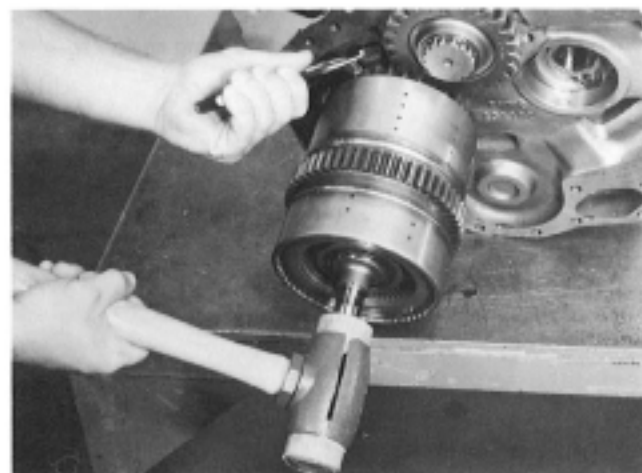
**Figure 8**

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



**Figure 9**

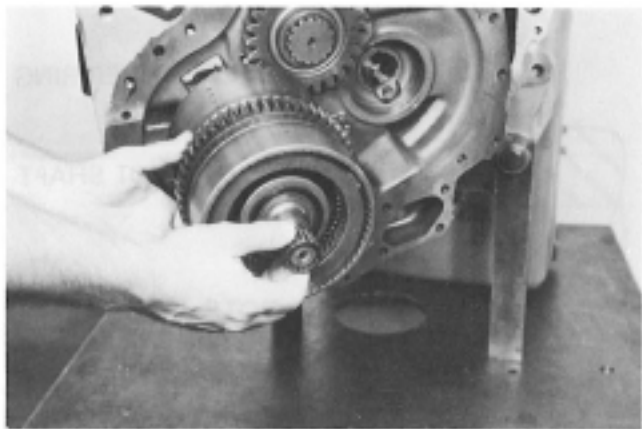
Install input shaft into front bearing.



**Figure 10**

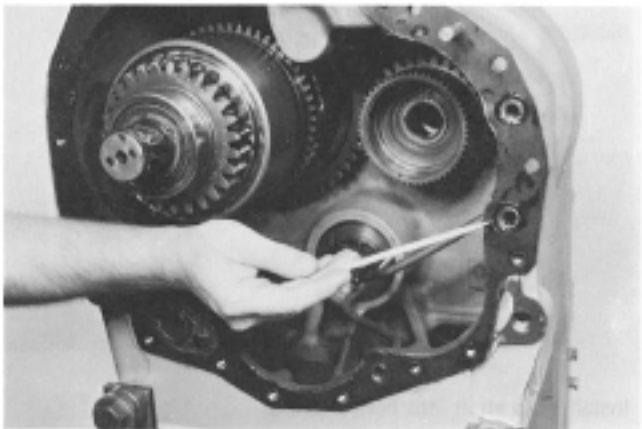
Support converter housing with chain fall. Spread forward clutch front bearing retainer ring and tap forward and 2nd clutch assembly into transmission case assembly. Be certain snap ring is in full position in ring groove.





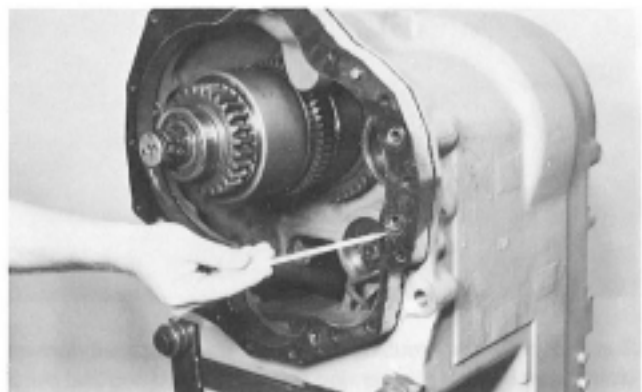
**Figure 11**

Install 2nd speed clutch pilot bearing.



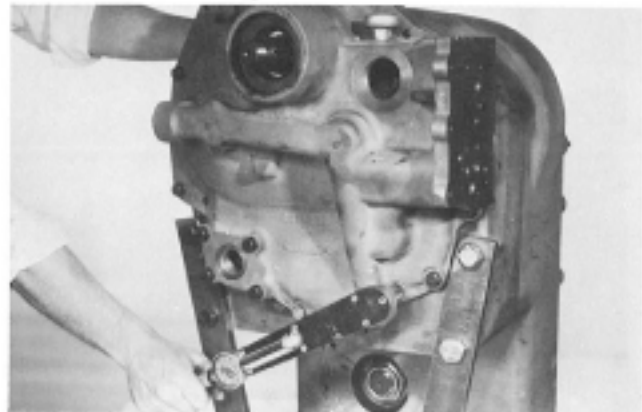
**Figure 12**

Install transmission case gasket and "O" ring seals.



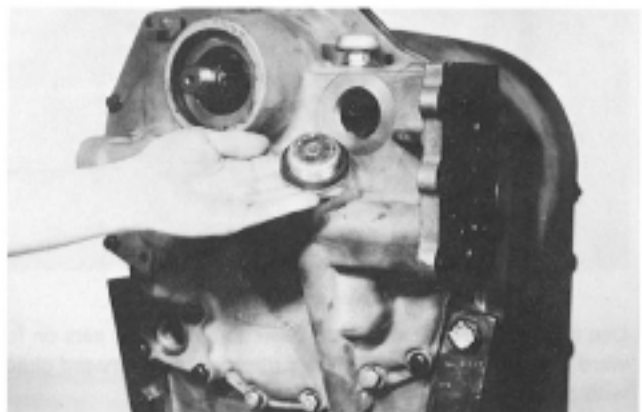
**Figure 13**

Install housing spacer, gasket and "O" ring seals. **NOTE:** Housing spacer is used with 12 plate clutch modulation only.



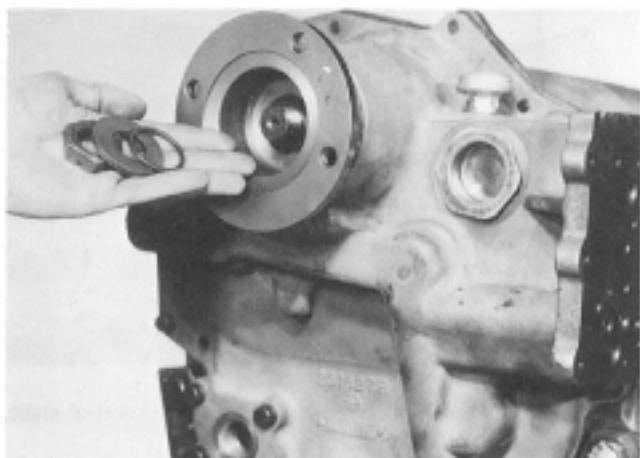
**Figure 14**

Support front cover with a chain fall. Install alignment studs in transmission case. Position front cover assembly on aligning studs. Turn output flange to align clutch disc hub in clutch. Do not force this operation. With front cover in position against the transmission case install cover to case bolts. Tighten to specified torque.



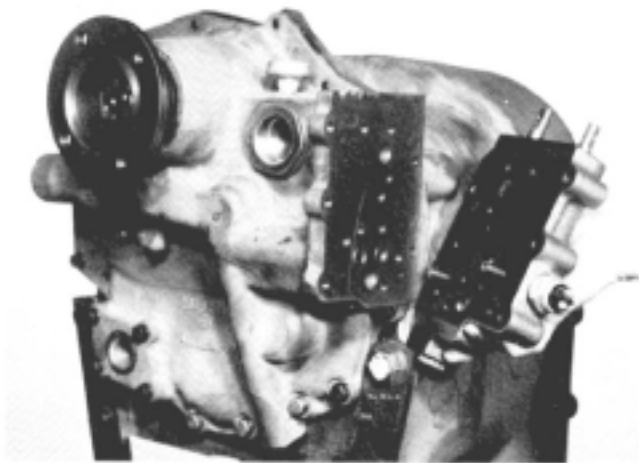
**Figure 15**

Install front cover plug.



**Figure 16**

Install companion flange, flange "O" ring, washer and nut. Torque nut to specified torque. (See elastic stop nut torque chart).



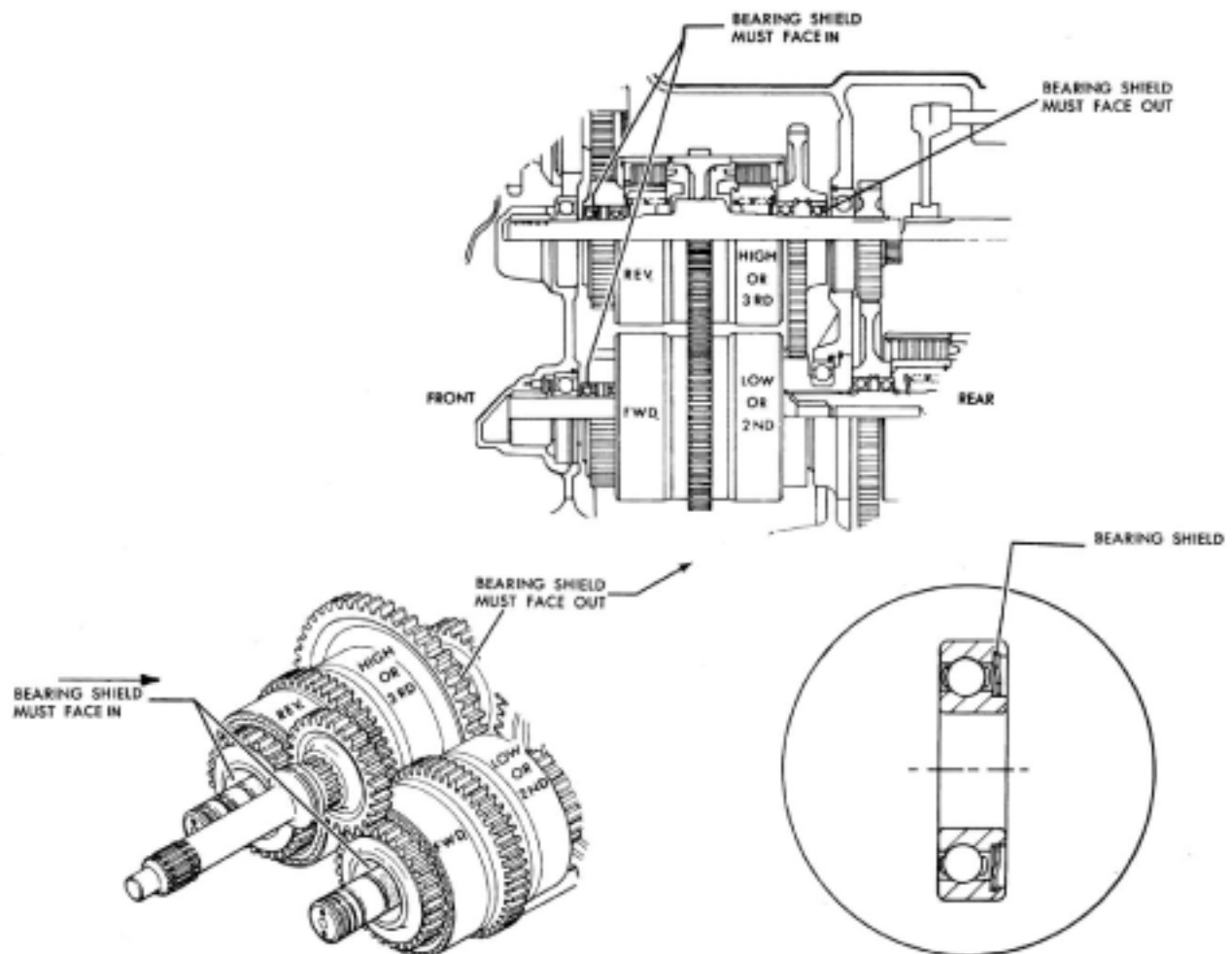
**Figure 17**

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

**NOTE:** The disc spring packs are to be used as complete assemblies and care should be taken not to intermix the individual disc springs with disc springs in another clutch or disc spring pack.

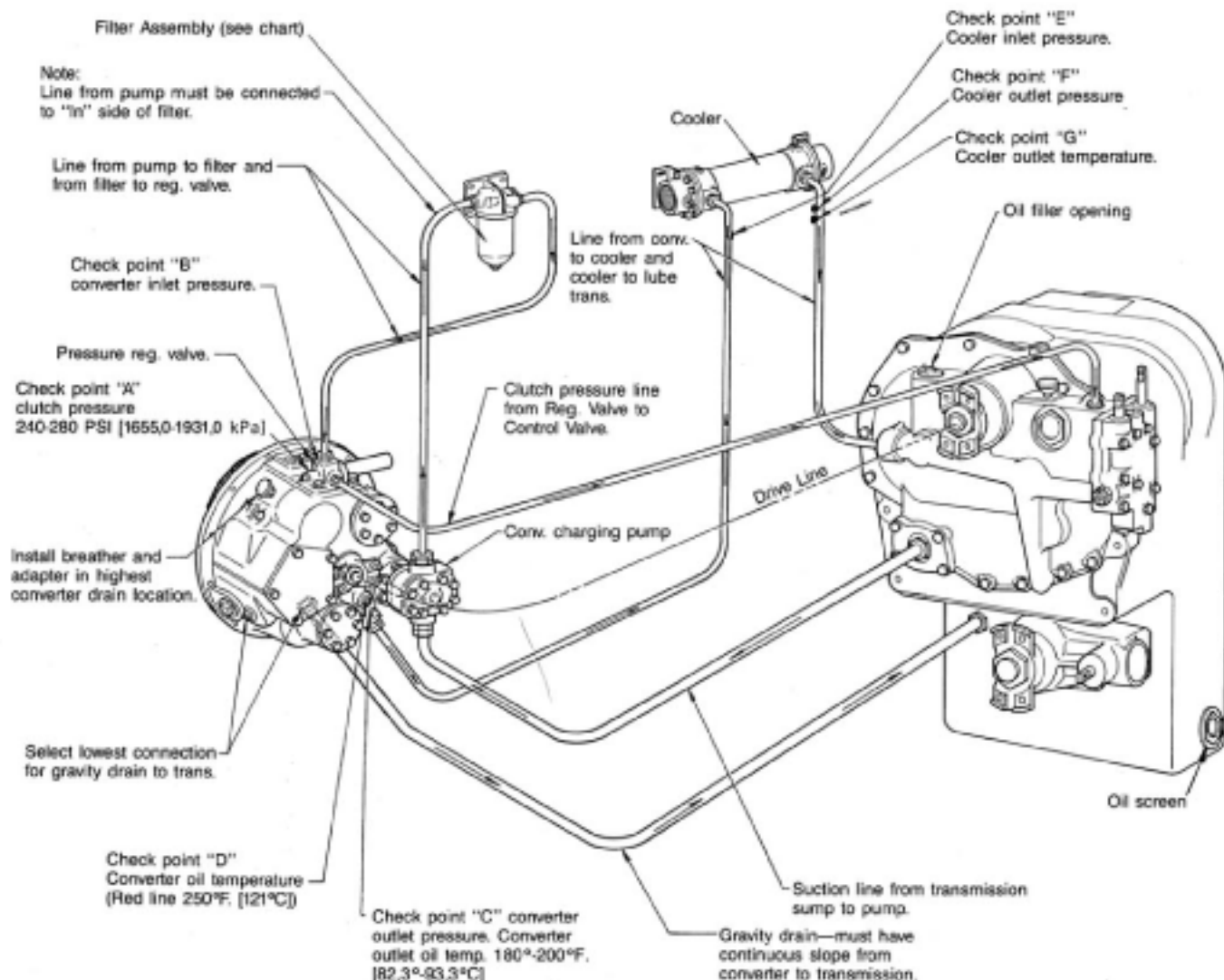
Each disc spring assembly is made up of selected springs to precisely match each part within this assembly. Failure to replace all piston return springs can result in unequal deflection within the spring pack. The result of this imbalance may adversely affect overall life of springs.

Service replacement assemblies are banded together and must be replaced as assembly.



**SHIELDED BEARING INSTALLATION**

## R32000 - C270/C320 EXTERNAL PLUMBING DIAGRAM



Metric dimensions shown in brackets [ ].

Note: Do not deviate any line size.

### FILTER ASSEMBLY CHART

Filter Type	Assembly No.	Cartridge No.	Spin-on Type	
			Assembly No.	Element
A	1533614 Single Can	215502	247055 Single Element	247052
B	234777 Dual Can	215502	246787 Dual Element	243622

#### Notes:

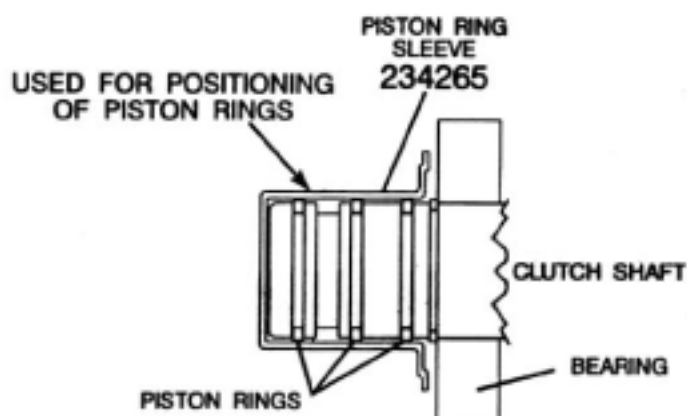
Hose line operating requirements.

- Pressure Lines**—Suitable for operation from ambient to 250°F. [121.1°C] continuous operating temperature. Must withstand 300 PSI [2068 kPa] continuous pressure with 600 PSI [4137 kPa] intermittent surges. Ref. S.A.E. Spec. No. J517,100R1 Hydraulic Hose Specification.
- Suction Line**—To be protected from collapse by interwoven steel wire. Ref. S.A.E. Spec. No. J517,100R4 Hydraulic Hose Specification. Suitable for operation from ambient to 250°F. [121.1°C]. Continuous operating temperature.
- Gravity Drain Line**—Suitable for operation from ambient to 250°F. [121.1°C] continuous operating temperature. Ref. S.A.E. Spec. No. J517,100R1 Hydraulic Hose Specification.
- All Hose Lines** used must conform to S.A.E. Spec. No. J1019 Test Procedure for High Temp. Transmission Oil Hose.
- See Lubrication Specifications.

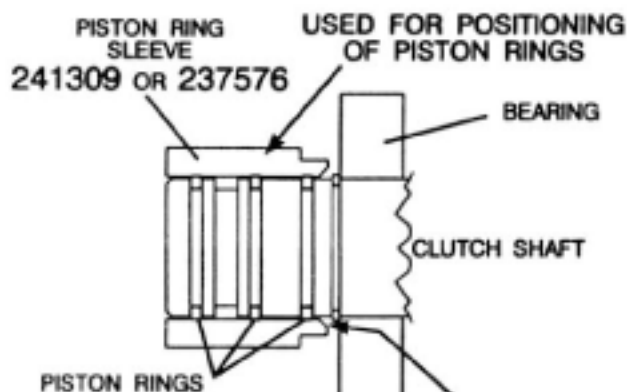
## INSTALLATION INSTRUCTIONS OF NEW NON-METALLIC SEALING RINGS

Proper oil sealing ring (piston ring) installation procedures. Refer to the appropriate transmission maintenance and service manual for disassembly, cleaning, inspection and reassembly.

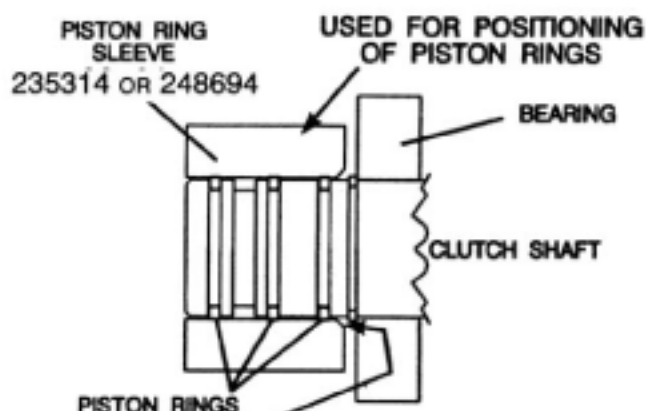
1. Fill the oil sealing ring grooves with a good grade of grease, this will help stabilize the sealing ring in the ring groove for installation.
2. Carefully position the piston ring on the shaft in the inner most ring groove. Hook the piston ring joint.
3. Repeat steps 1, and 2 for the remaining ring or rings making certain all hook joints are fastened securely.
4. Apply a heavy coat of grease to the outer diameter of the rings and shaft. Center the piston rings in the ring groove.
5. When installing the clutch assembly in the transmission case it is recommended a piston ring sleeve P/N's 241309, 237576, 234265, 235314 or 248694 be used to center all of the piston rings in their respective ring grooves. Use extreme caution to not damage piston ring when installing the clutch shaft in the transmission case, or when installing the converter housing or front cover on the clutch shafts.



### 18000 SERIES

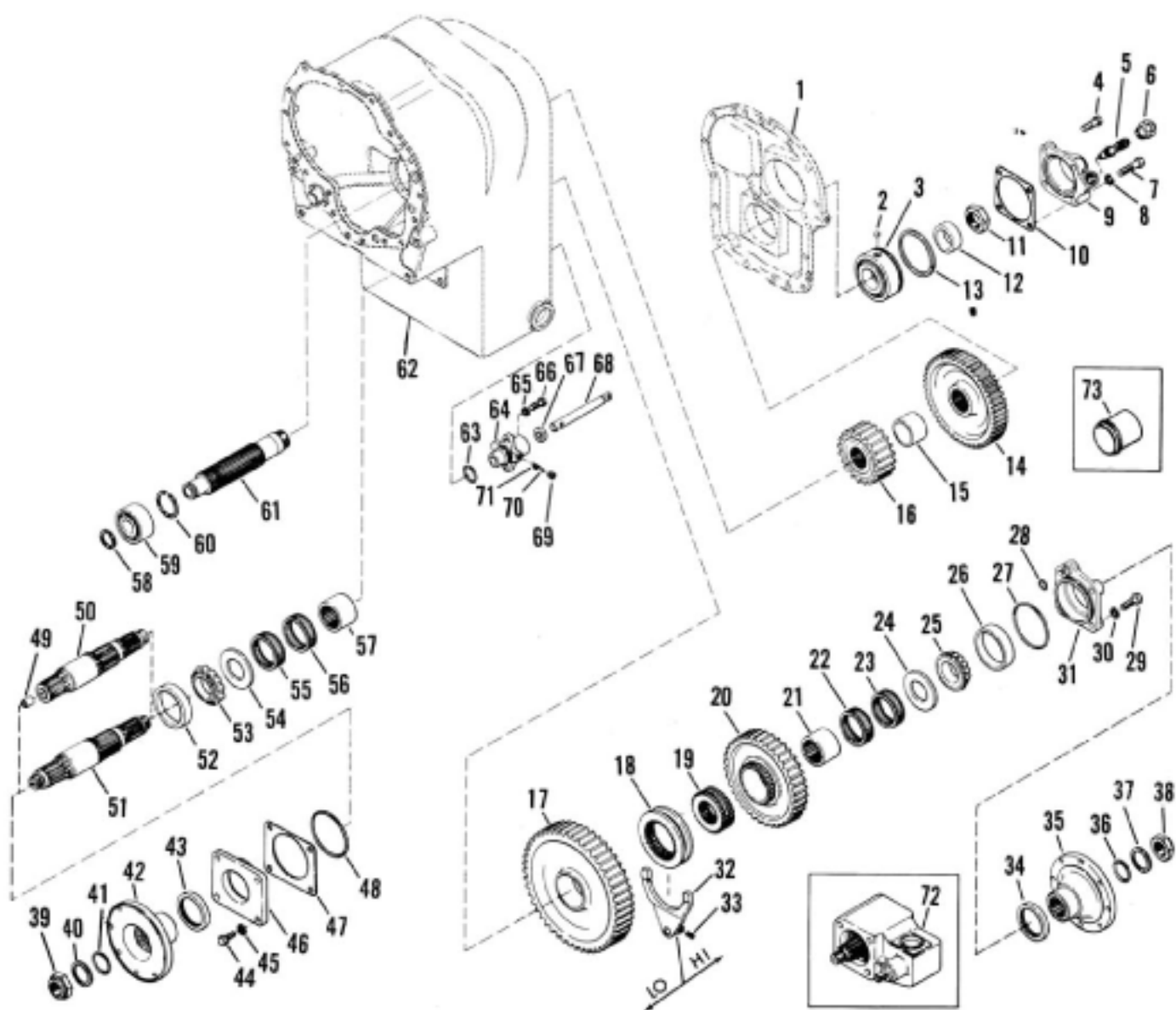


### 2420, 24000, 28000, 32000, 33000 34000, 36000 SERIES



### 28000, 32000 SERIES 4TH CLUTCH SHAFT

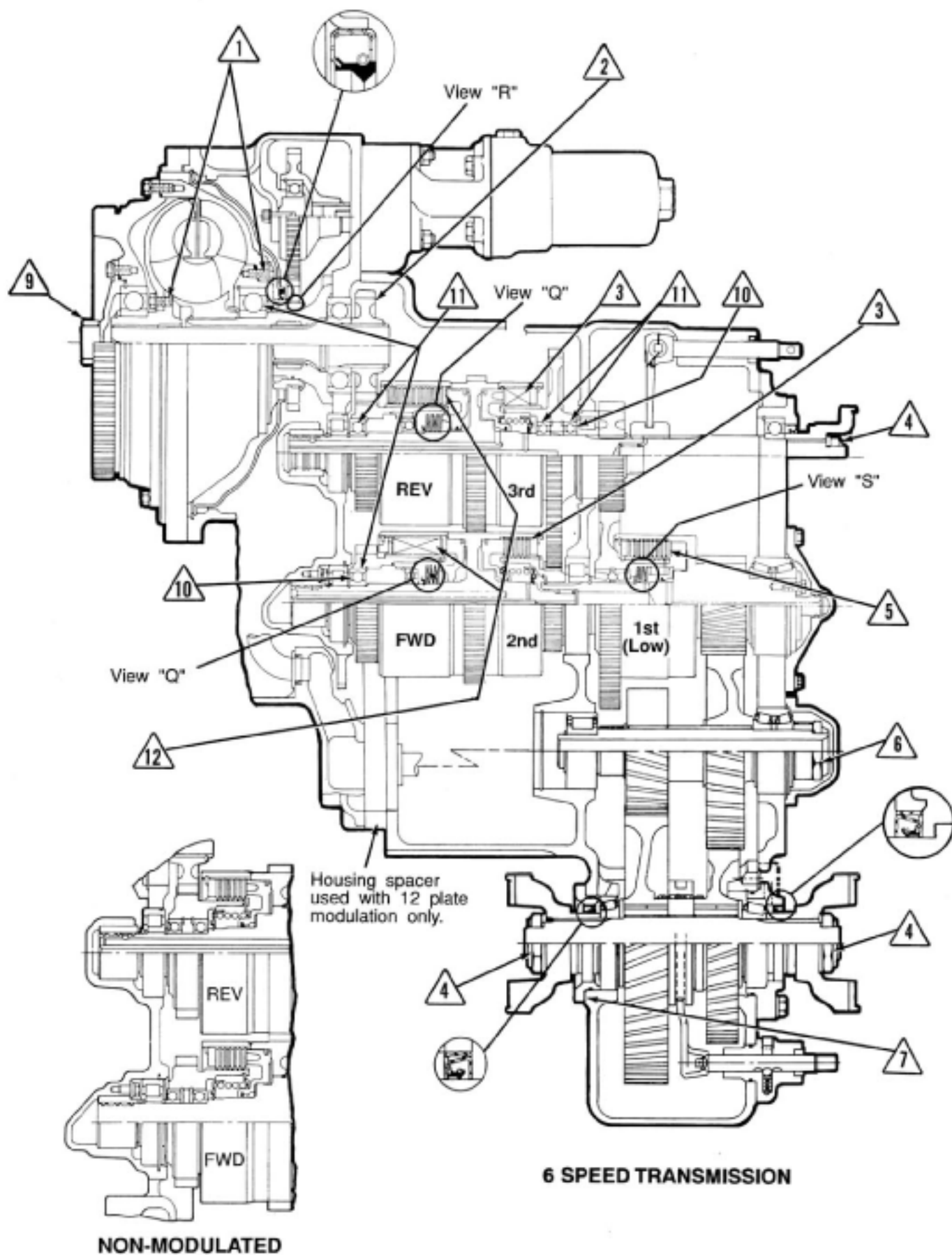
Be sure that lead in chamfer and intersection of lead in chamfer to piston ring bore is free of burrs and nicks.



### 32000 6 & 8 SPEED OUTPUT GROUP WITH RANGE SHIFT

ITEM	DESCRIPTION	QTY	ITEM	DESCRIPTION	QTY
1	Rear Cover .....	1	38	Output Flange Nut .....	1
2	Idler Shaft Rear Bearing Lock Ball .....	1	39	Output Flange Nut .....	1
3	Idler Shaft Rear Bearing .....	1	40	Output Flange Washer .....	1
4	Idler Shaft Bearing Cap Screw .....	3	41	Output Flange "O" Ring .....	1
5	Speedometer Driven Gear .....	1	42	Output Flange .....	1
6	Speedometer Tube Nut .....	1	43	Output Shaft Front Bearing Cap Oil Seal ...	1
7	Idler Shaft Bearing Capscrew .....	1	44	Output Shaft Front Bearing Cap Screw ....	4
8	Idler Shaft Bearing Capscrew Lockwasher ..	4	45	Output Shaft Front Bearing Cap Lockwasher	4
9	Idler Shaft Bearing Cap .....	1	46	Output Shaft Front Bearing Cap .....	1
10	Idler Shaft Bearing Cap Gasket .....	1	47	Front Bearing Cap Shim .....	AR
11	Idler Shaft Nut .....	1	48	Front Bearing Cap "O" Ring .....	1
12	Speedometer Drive Gear or Bearing Spacer .	1	49	Bushing (Used with Disconnect Only) ....	1
13	Idler Shaft Rear Bearing Locating Ring ....	1	50	Output Shaft (Used with Disconnect Only) .	1
14	Idler Shaft Gear .....	1	51	Output Shaft .....	1
15	Idler Shaft Gear Spacer .....	1	52	Output Shaft Front Bearing Cup .....	1
16	Idler Shaft Low Range Gear .....	1	53	Output Shaft Front Bearing Cone .....	1
17	Low Range Gear .....	1	54	Output Gear Thrust Washer .....	1
18	High Low Shift Hub .....	1	55	Output Gear Bearing .....	1
19	Shift Hub Sleeve .....	1	56	Output Gear Bearing .....	1
20	High Range Gear .....	1	57	Output Gear Bearing Inner Race .....	1
21	Output Gear Inner Race .....	1	58	Idler Shaft Front Bearing Retainer Ring ....	1
22	Output Gear Bearing .....	1	59	Idler Shaft Front Bearing .....	1
23	Output Gear Bearing .....	1	60	Idler Shaft Gear Locating Ring .....	1
24	Output Gear Thrust Washer .....	1	61	Idler Shaft .....	1
25	Output Shaft Rear Bearing Cone .....	1	62	Transmission Case Assembly .....	1
26	Output Shaft Rear Bearing Cup .....	1	63	Range Shift Rail Support "O" Ring .....	1
27	Output Shaft Rear Bearing Cap "O" Ring ..	1	64	Range Shift Rail Support .....	1
28	Output Shaft Rear Bearing Cap "O" Ring ..	1	65	Range Shift Rail Support Screw	
29	Output Shaft Rear Bearing Cap Screw ....	4		Lockwasher .....	2
30	Output Shaft Rear Bearing Cap Screw		66	Range Shift Rail Support Screw .....	2
	Lockwasher .....	4	67	Range Shift Rail Oil Seal .....	1
31	Output Shaft Rear Bearing Cap .....	1	68	Range Shift Rail .....	1
32	High and Low Range Shift Fork .....	1	69	Range Shift Rail Detent Plug .....	1
33	Shift Fork Lock Screw .....	1	70	Range Shift Rail Detent Ball .....	1
34	Rear Bearing Cap Oil Seal .....	1	71	Range Shift Rail Detent Spring .....	1
35	Rear Output Flange .....	1	72	Disconnect (Optional) .....	1
36	Output Flange "O" Ring .....	1	73	Bearing Cap Bore Plug (Optional) .....	1
37	Output Flange Washer .....	1			





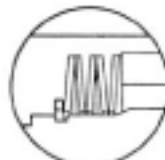
- ⚠ Impeller Hub and Turbine Hub Assembly with Backing Ring and Special Self Locking Screws.  
1. Clean hub mounting surface and tapped holes with solvent. Dry thoroughly being certain tapped holes are dry & clean.  
2. Install backing ring and special self locking screws.  
Tighten screws 40 to 45 Lbs. Ft. [54,3-61,0 N-m]  
Note: Assembly of hub must be complete within a fifteen minute period from start of screw installation. The special screw is to be used for one installation only. If the screw is removed for any reason it must be replaced. The epoxy left in the hub holes must be removed with the proper tap and cleaned with solvent. Dry hole thoroughly and use a new screw for reinstallation.
- ⚠ Gear to be assembled with long hub length to this side.
- ⚠ Three clutches, 6-outer steel plates, 6-inner friction plates. Assemble alternately, starting with outer steel plate.
- ⚠ See Elastic Stop Nut Torque Chart
- ⚠ Low clutch, 9-outer steel plates, 9-inner friction plates. Assemble alternately, starting with outer steel plate.
- ⚠ See Elastic Stop Nut Torque Chart
- ⚠ Shim output shaft bearings to produce 6 to 8 Lbs.-in. [0,68-0,90 N-m] preload.
- ⚠ Tighten oil screen ass'y. 10 to 15 Lbs. Ft. [13,6-20,0 N-m] (Not shown)

View "Q" 2 Places  
Modulation only



Low Clutch Return Springs.  
Concave side of first spring to be placed against clutch piston. Remaining four springs to be stacked alternately reversed as shown.

View "S"



Forward & Reverse Clutch Return Springs.  
Concave side of first spring to be placed against clutch piston. Remaining six springs of each clutch to be stacked alternately reversed as shown. See note on page 77.

NOTE: Metric dimensions shown in brackets [ ].

- ⚠ Heat nose bushing to 200° F° (93°C) before ass'y. of bushing to cover.
- ⚠ Bearing shield OUT on 3rd speed clutch. Bearing shield IN on Fwd. & Rev. clutch.
- ⚠ Must be loose internal fit bearings. No. "3" etched on bearing.
- ⚠ (12 Plate Modulation) Two clutches, 12-outer steel plates, 12-inner friction plates. Assemble alternately, starting with outer steel plate.

#### Notes

- A - Use Permatex & Crane Sealer only where specified.  
B - All lead in chamfers for oil seals, piston rings & "O" rings must be smooth & free from burrs. Inspect at ass'y.  
C - Lubricate all piston ring grooves & "O" rings with oil before ass'y.  
D - Apply very light coat of Permatex No. 2 to O.D. of all oil seals before ass'y.  
E - After assembly of parts using Permatex or Crane sealer, there must not be any free or excess material that could enter the oil circuit.  
F - Apply light coat of Crane Sealer to all pipe plugs.  
G - Apply a thin coating of grease between seal lips on lip type seals prior to ass'y.  
H - Apply light coat of Permatex No. 2 to all thru hole stud threads.

NOTE: The friction discs in the low clutch has a higher co-efficient rating than the friction discs in the other clutches, therefore the discs must not be mixed. The low clutch inner disc can be identified by an "X" stamped on one side of the inner teeth. The low clutch inner disc also has a strip of non-soluble yellow paint sprayed on the outer edge of the disc.

View "R"



Enlarged view of Piston Ring & Expander  
Note: Expander gap to be approx. 180° from ring hook joint to aid ring assembly.

#### ELASTIC STOP NUT TORQUE

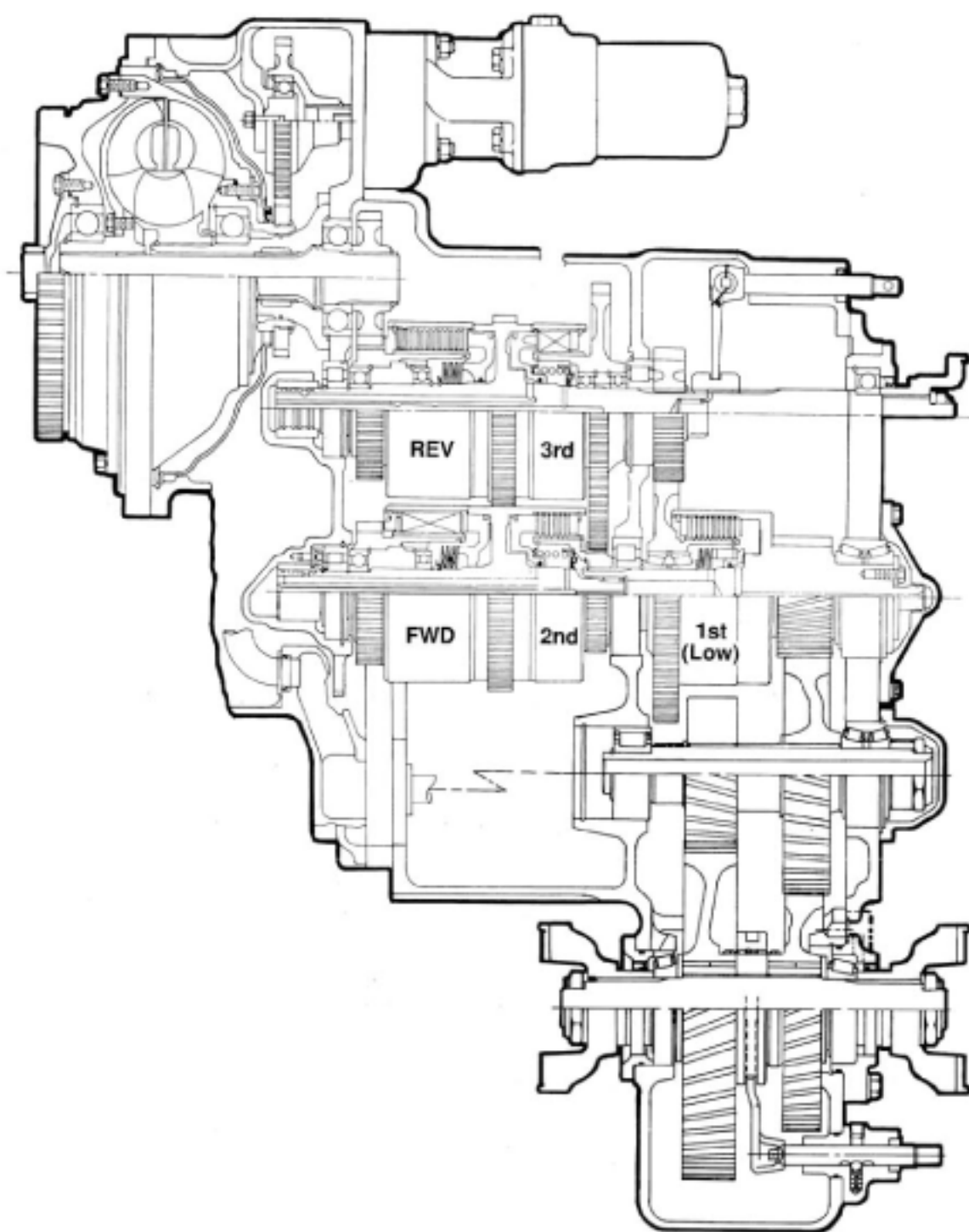
THREAD SIZE	LB.-FT.	[N-m]
1" - 20	150 - 200	[203,4 - 271,1]
1 1/4" - 18	200 - 250	[271,2 - 338,9]
1 1/2" - 18	300 - 350	[408,8 - 474,5]
1 3/4" - 12	400 - 450	[542,4 - 610,1]

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]
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]
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]
4375	41 - 45	[55,6 - 61,6]	37 - 41	[50,2 - 55,5]	58 - 64	[78,7 - 86,7]	52 - 57	[70,6 - 77,2]
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]
3125	16 - 20	[21,7 - 27,1]	12 - 16	[16,3 - 21,6]	28 - 32	[38,0 - 43,3]	25 - 30	[35,3 - 40,6]
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]



## R & HR MODEL 6 & 8 SPEED

The R & HR 32000 6 speed transmission is the same as the 3 speed R & HR 32000 except the difference being in the idler and output shafts. The 6-speed unit has a gear added to the idler shaft and the output shaft has a high and low range shift.

The 32000 8 speed transmission is the same as the 6 speed except the 8 speed has a 4th speed clutch.

The 6-speed transmission has 3 working range shifts and 3 travel range shifts.

Gear ratio determines working and travel ranges. They are as follows:

1st - 2nd and 4th working range. 3rd - 5th and 6th travel range.

**NOTE: Range shift from low to high must be made with machine stopped.**

### DISASSEMBLY

Figure 55 shows the idler shaft with one gear. The 6-speed unit will have two gears and a heavier front bearing. See Figure 55A below:

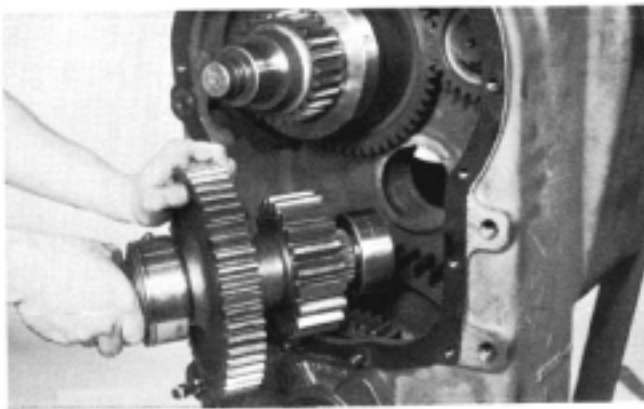


Figure 55A

6 & 8 speed idler shaft, gear and bearing assembly. **NOTE: Do not lose rear bearing lock ball.**

### 6 & 8 SPEED OUTPUT DISASSEMBLY

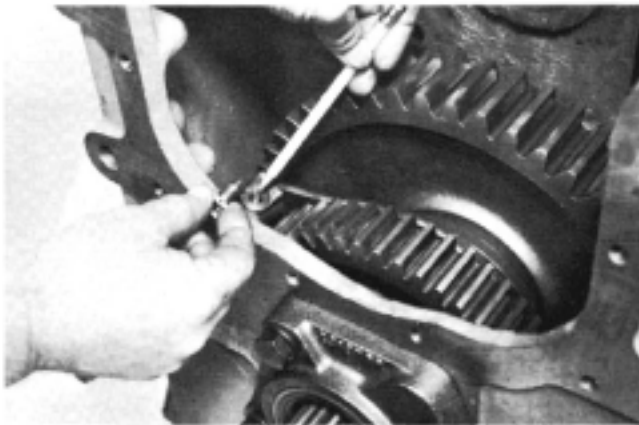


Figure 1

With all clutches and shafts removed, cut lockwire on range shift fork lock screw. Remove fork lock screw.

The 8-speed transmission has 8 forward speeds and 8 reverse speeds.

The 8-speed transmission has 4 working range shifts and 4 travel range shifts.

Gear ratio determines working and travel ranges. They are as follows:

1st - 2nd - 3rd and 5th working ranges 4th - 6th - 7th and 8th travel range.

**NOTE: Range shift from low to high must be made with machine stopped.**

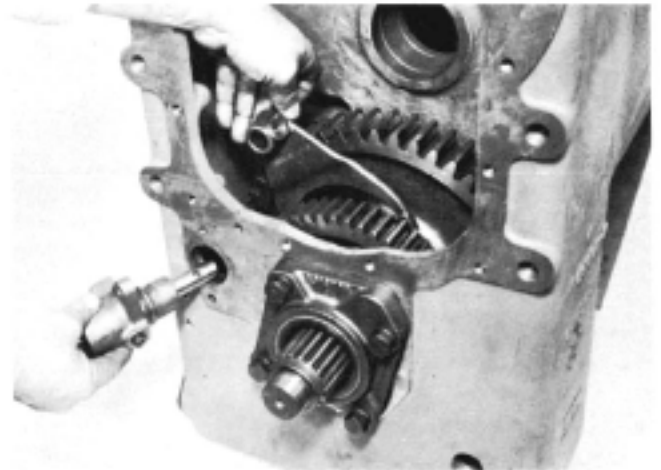


Figure 2

Remove range shift rail support bolts. Remove rail support, rail and range shift fork.

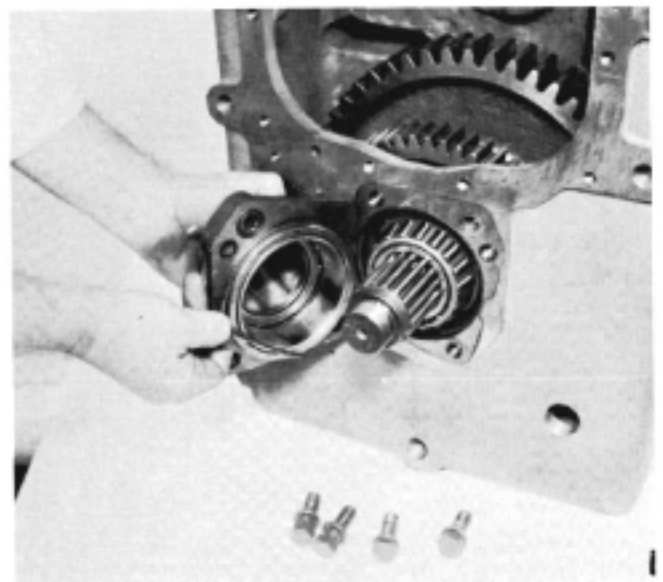
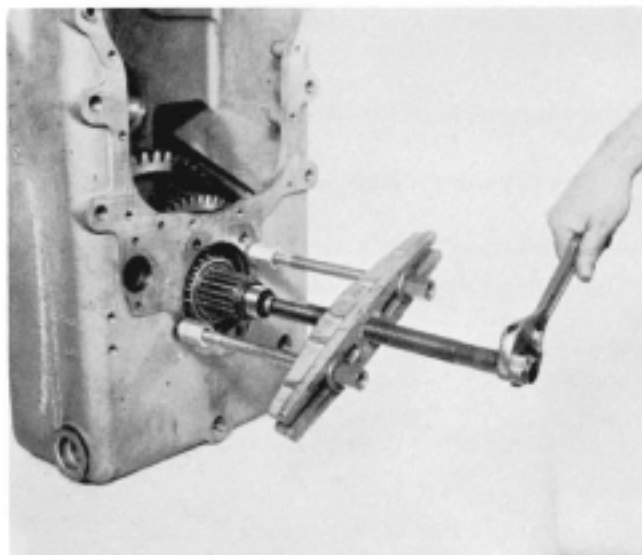


Figure 3

Remove output shaft rear bearing cap bolts and bearing cap.



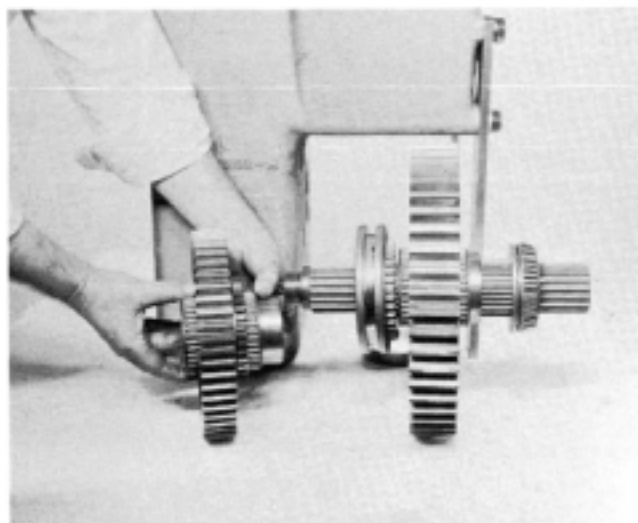
**Figure 4**

Remove front output flange nut, washer, "O" ring, flange and bearing cap from housing. Block output gears. Push output shaft from rear through gears and taper bearing.

Proceed with Figure 72 through 216 in the R & HR 32000 Series 3-Speed Maintenance Section then refer to Figure 5 below.

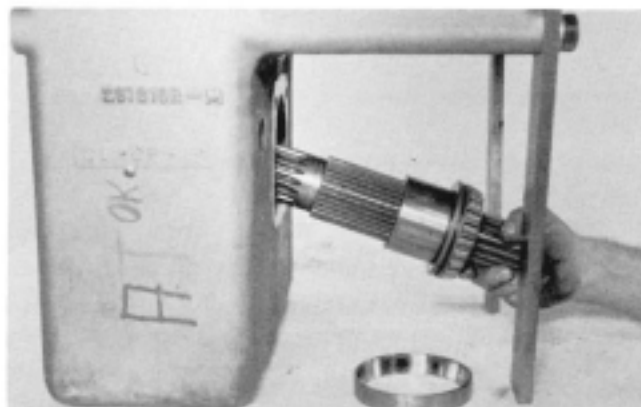
## REASSEMBLY

(See cleaning and inspection page.)



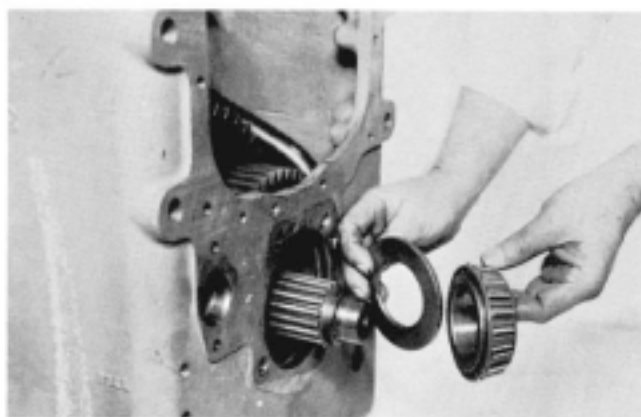
**Figure 5**

View of output shaft as it would be positioned in transmission case. **NOTE:** Front bearing cone and output gear thrust washer shouldered on shaft with large diameter of bearing in.



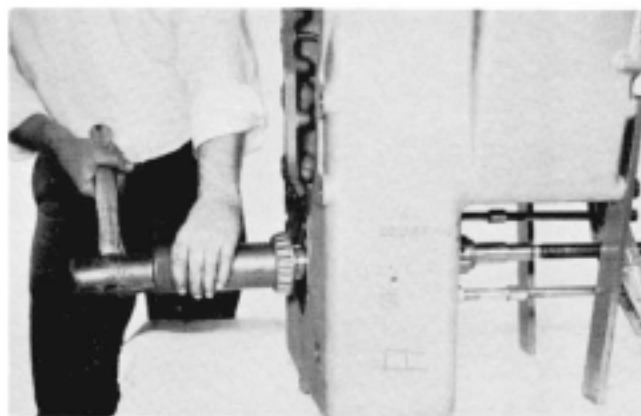
**Figure 6**

Position high and low range gears, shift hub, hub sleeve and needle bearings in transmission case as shown in Figure 5. Insert output shaft, front bearing and thrust washer through output gears. Use caution as not to damage high and low range gear needle bearings.



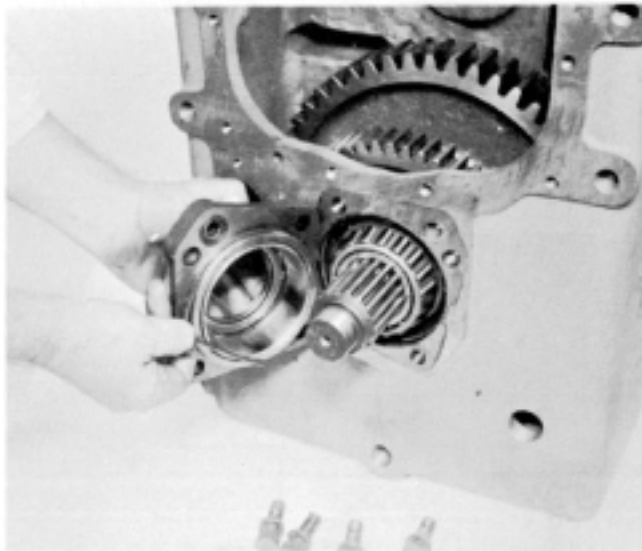
**Figure 7**

Position output gear thrust washer and rear taper bearing on output shaft.



**Figure 8**

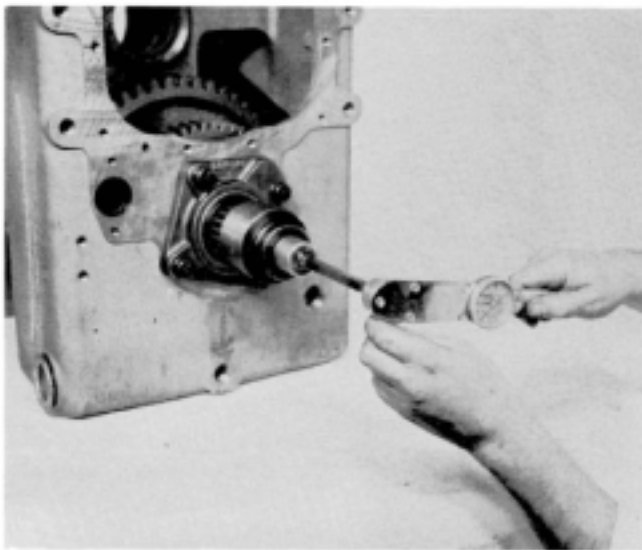
Block output shaft from the front and install rear taper bearing.



**Figure 9**

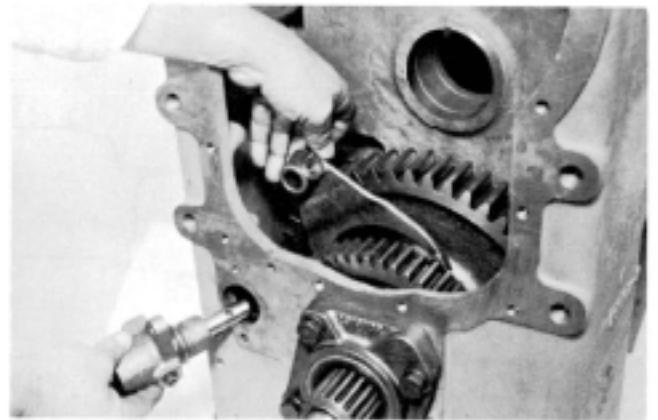
Using new "O" rings install rear output bearing cap and taper bearing cup on transmission case. Lube opening in bearing cap must be aligned with lube opening in case. Tighten bearing cap bolts to specified torque. (See torque chart.)

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



**Figure 10**

Using a inch lb. torque wrench, determine the rolling torque of the output shaft and record. Tighten front bearing cap bolts to specified torque. Check rolling torque with bolts tight. Torque must be 6 to 8 inch lbs. [0.68 - 0.90 N·m] more than when bearing cap bolts were loose. Add or omit shims on the front bearing cap to achieve the proper preload.



**Figure 11**

Locate high-low range shift fork in shift hub with offset of fork toward gear. Insert rail support and rail into bore in transmission housing and into shift fork.



**Figure 12**

Tighten support bolts to specified torque. (See torque chart.)

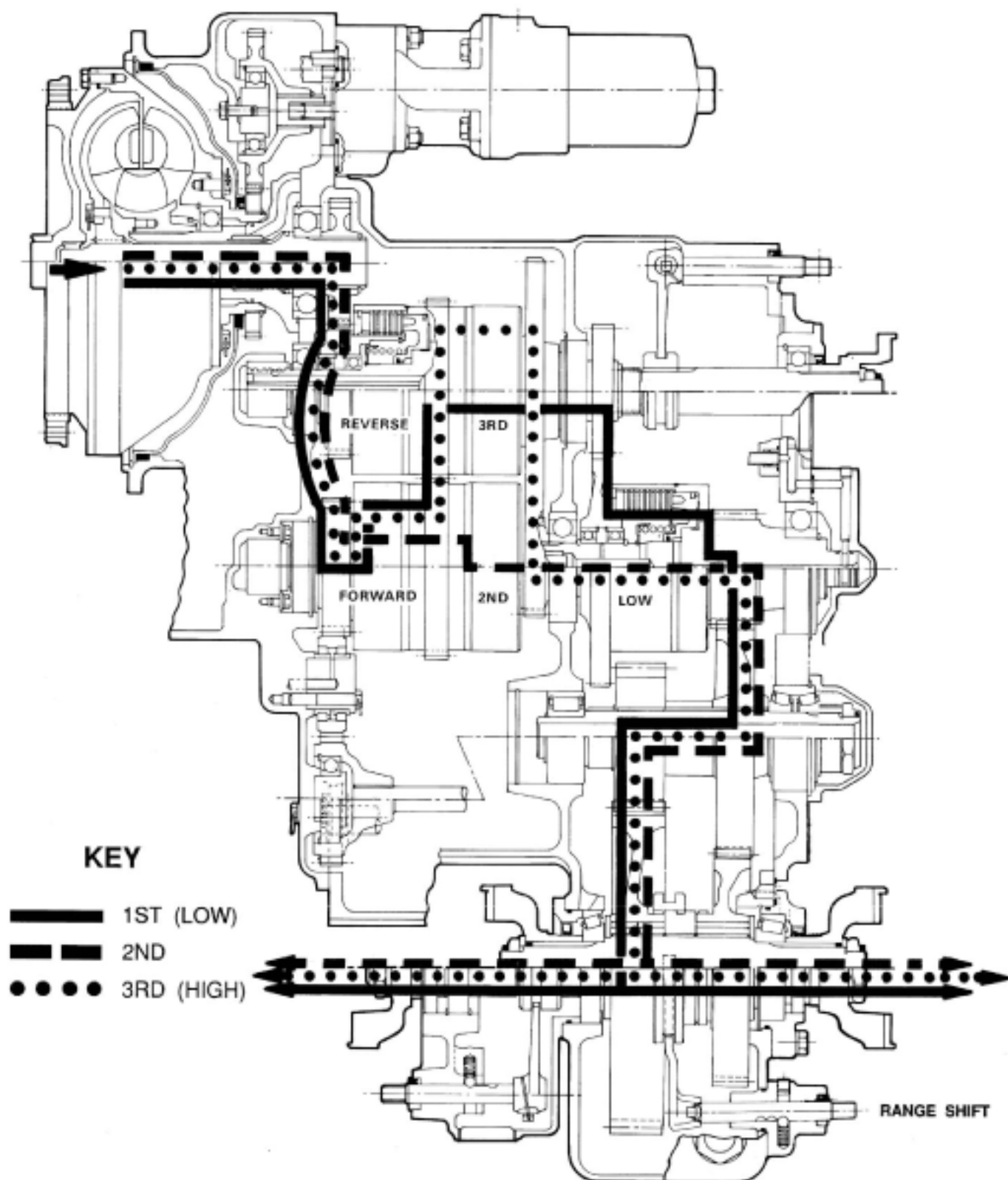


**Figure 13**

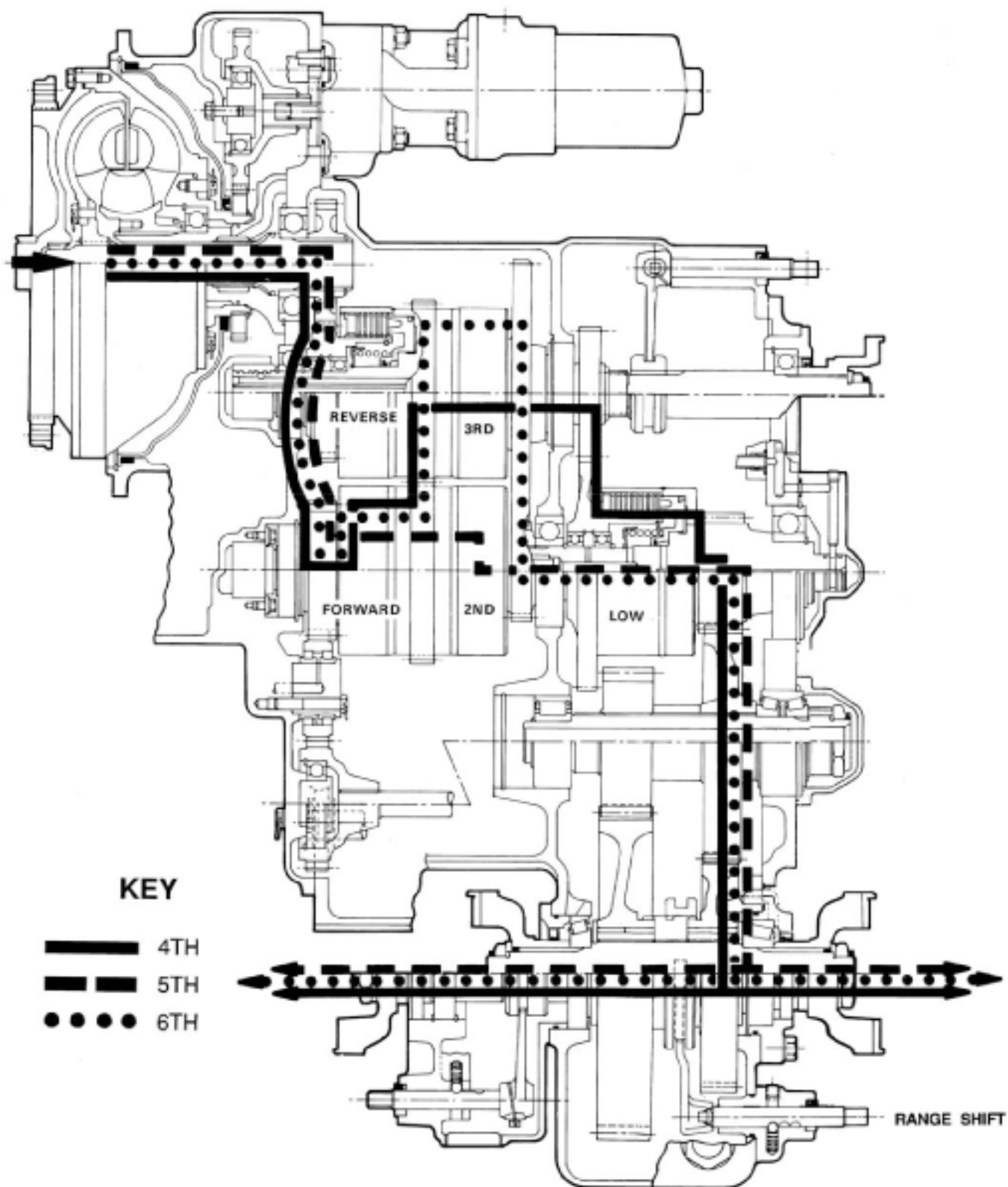
Locate lockwire hole in shift rail with hole in shift fork. Install lockwire, tighten securely and lockwire to prevent loosening.

Proceed with Figure 228 in the R & HR 32000 3-Speed Section.

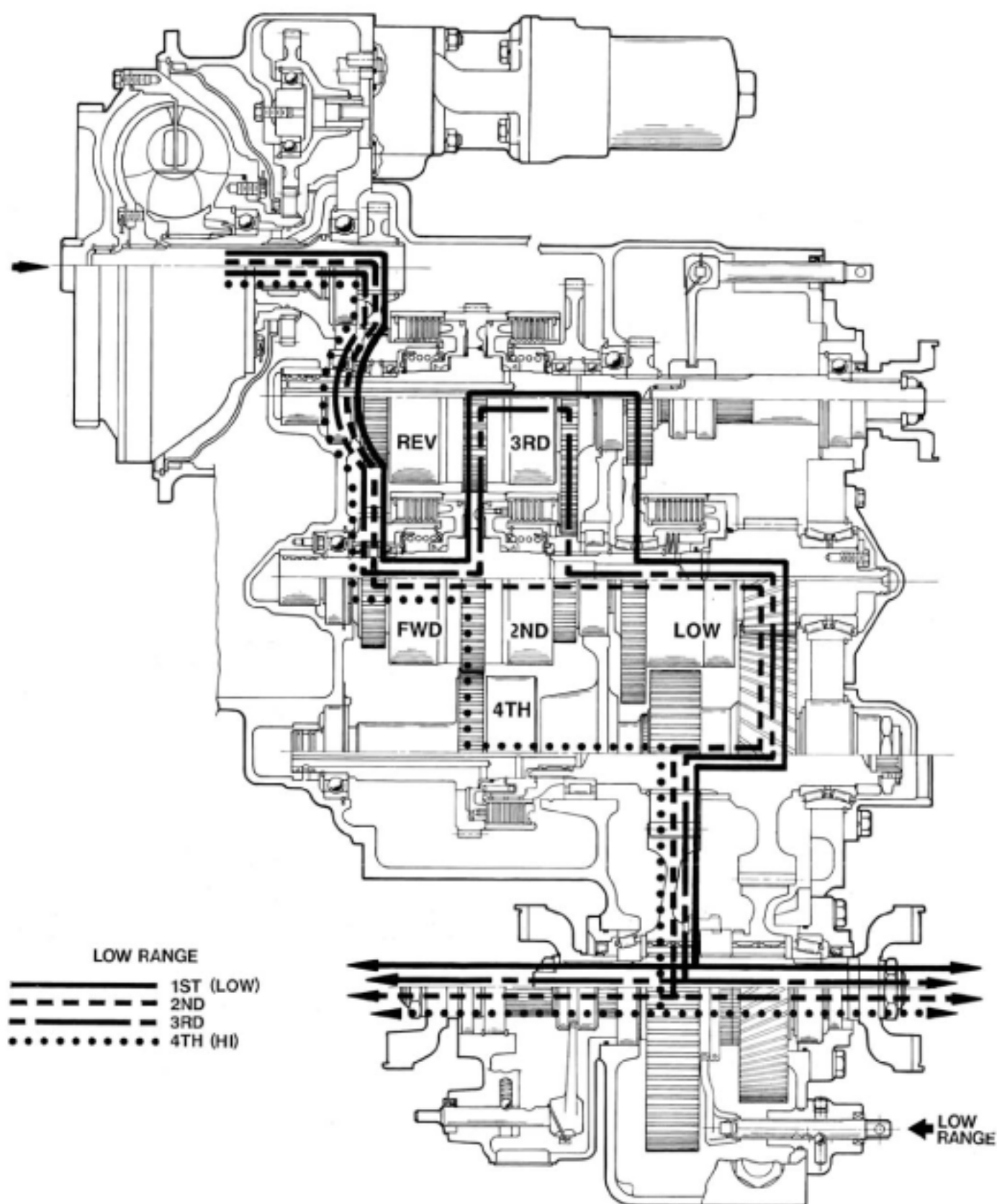




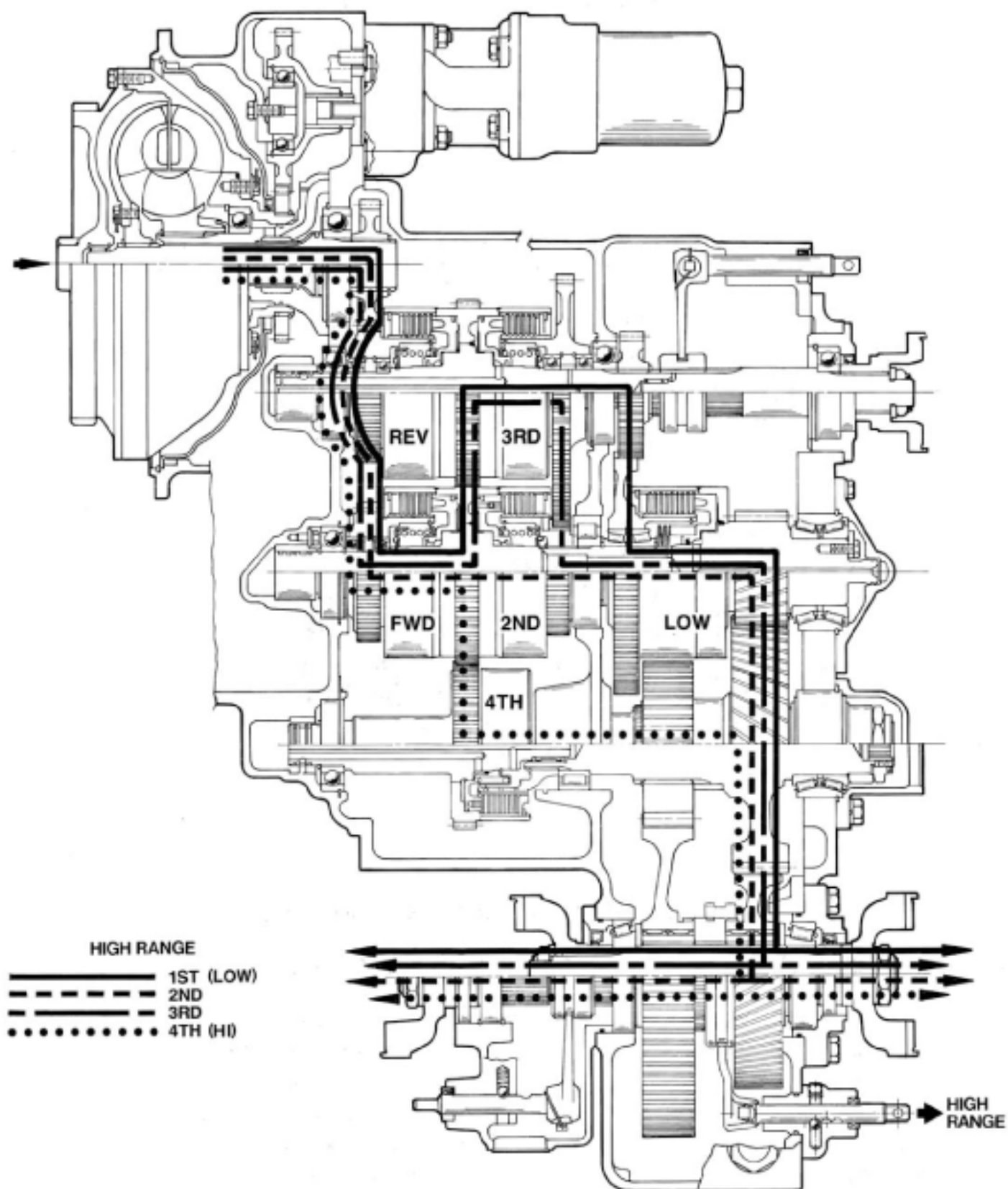
**6 SPEED TRANSMISSION LOW RANGE**



6 SPEED TRANSMISSION HI RANGE

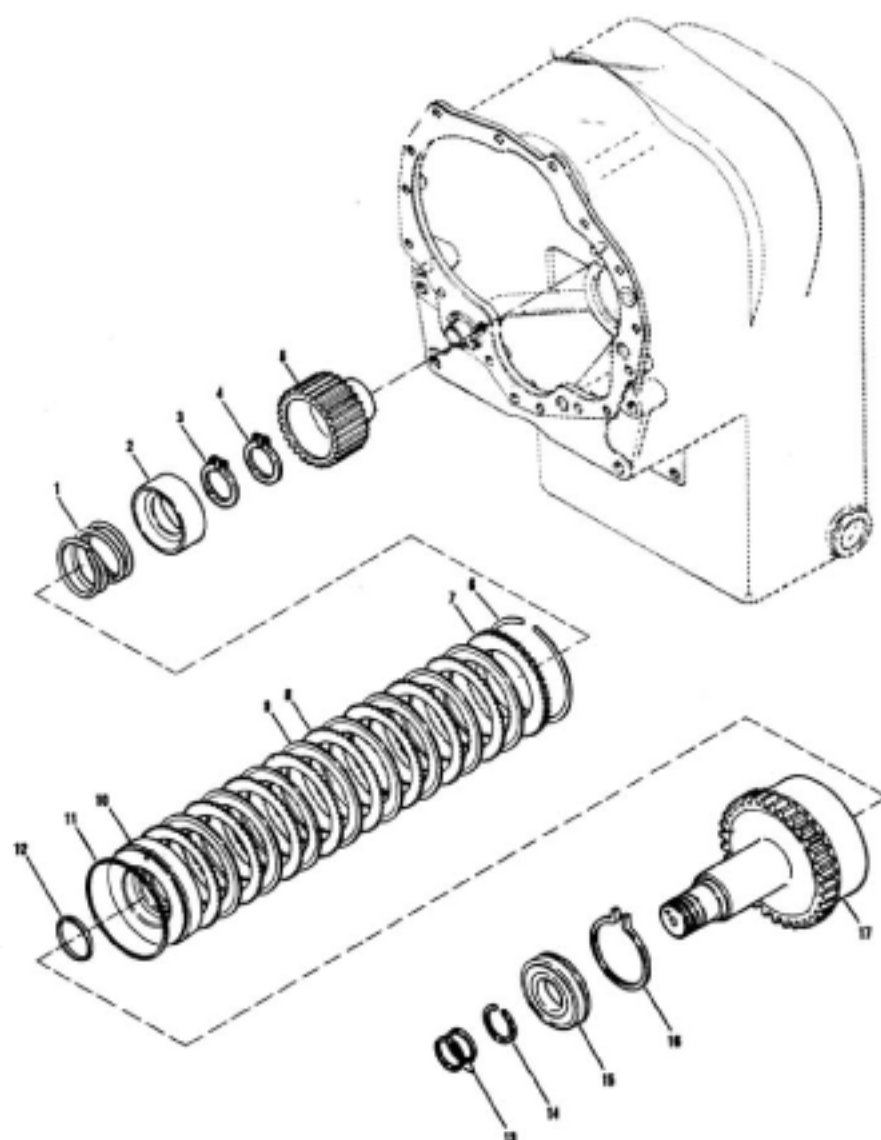


8 SPEED TRANSMISSION LOW RANGE



**8 SPEED TRANSMISSION HIGH RANGE**

## 8 SPEED CLUTCH SECTION



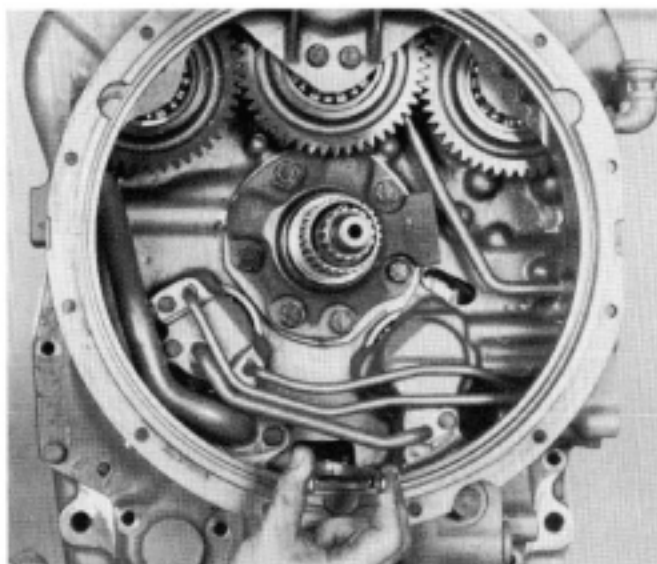
### 4TH SPEED CLUTCH GROUP 8 SPEED TRANSMISSION

ITEM	DESCRIPTION	QTY	ITEM	DESCRIPTION	QTY
1	Piston Return Spring.....	1	10	Clutch Piston Assembly.....	1
2	Spring Retainer.....	1	11	Clutch Piston Seal - Outer.....	1
3	Spring Retainer Snap Ring.....	1	12	Clutch Piston Seal - Inner.....	1
4	Clutch Hub Snap Ring.....	1	13	4th Sped Shaft Piston Ring.....	2
5	4th Speed Clutch Hub.....	1	14	Front Bearing Retainer Ring.....	1
6	Backing Plate Snap Ring.....	1	15	4th Speed Shaft Front Bearing.....	1
7	Clutch Disc Backing Plate.....	1	16	Front Bearing Snap Ring.....	1
8	Clutch Outer Disc.....	7	17	4th Speed Shaft & Plug Assembly.....	1
9	Clutch Inner Disc.....	8			

## 8 SPEED SECTION

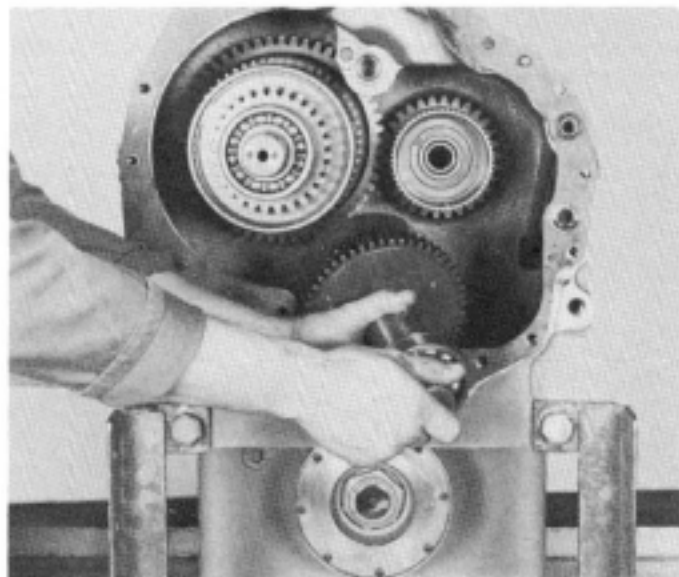
The difference between the 6 speed transmission and the 8 speed is that the 8 speed has an added 4th speed clutch. This section will describe the converter housing removal and the 4th speed clutch repair.

### DISASSEMBLY



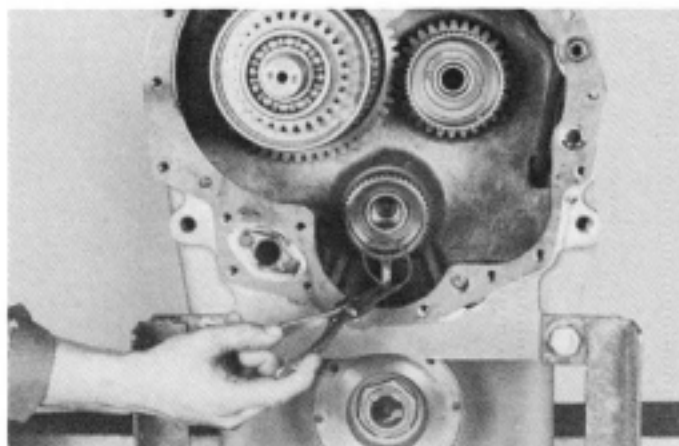
**Figure 1**

Remove bolts securing converter housing to transmission housing. Support converter housing with a chain fall. Using spreading type snap ring pliers, spread ears on the fourth speed clutch front bearing retaining ring. Holding snap ring open, tap converter housing from transmission housing. The fourth clutch will remain in the transmission housing.



**Figure 2**

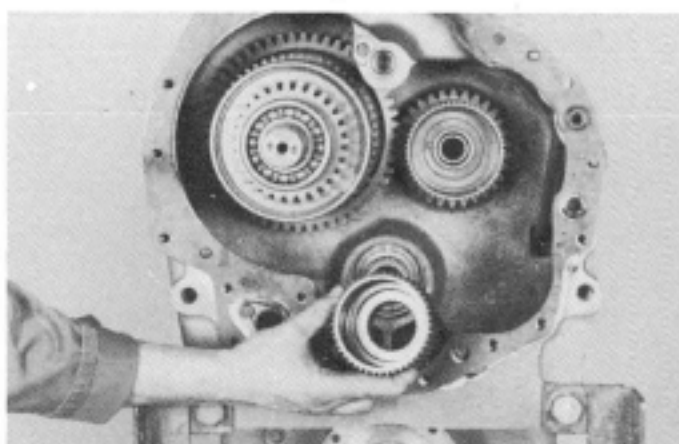
Remove fourth speed clutch assembly from transmission housing



**Figure 3**

Remove fourth speed clutch disc hub retainer ring.

**Figure**

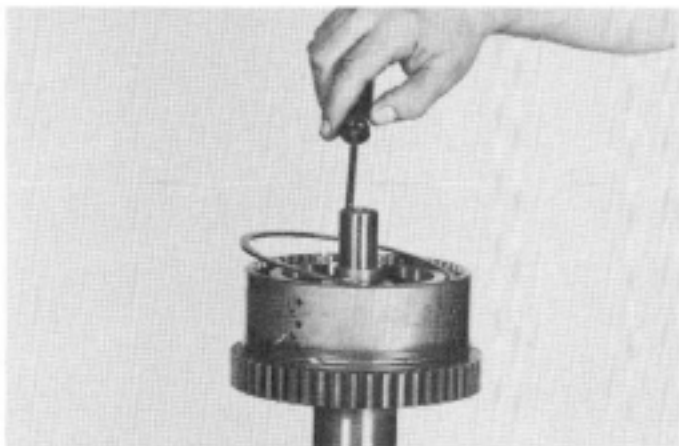


**Figure 4**

Remove fourth speed clutch disc hub.

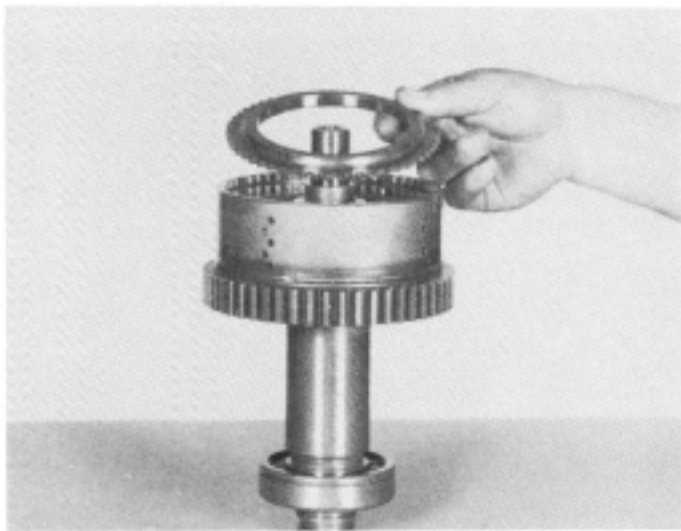
### 4TH SPEED CLUTCH DISASSEMBLY

(8 speed transmission only)



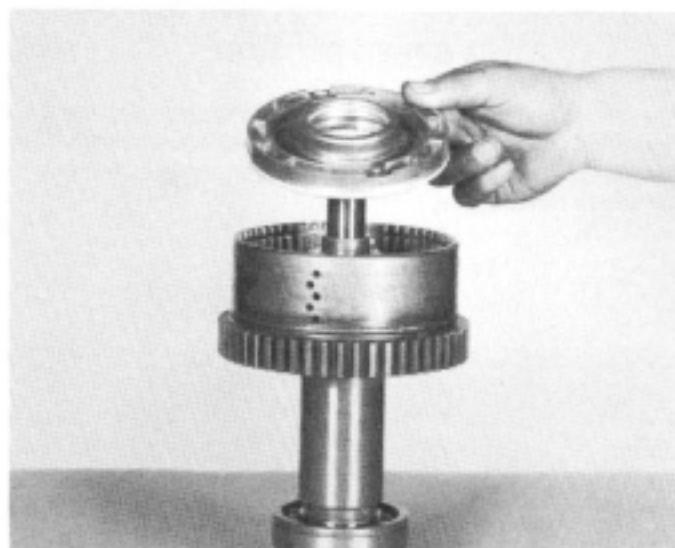
**Figure 5**

Remove end plate retainer.



**Figure 6**

Remove end plate.



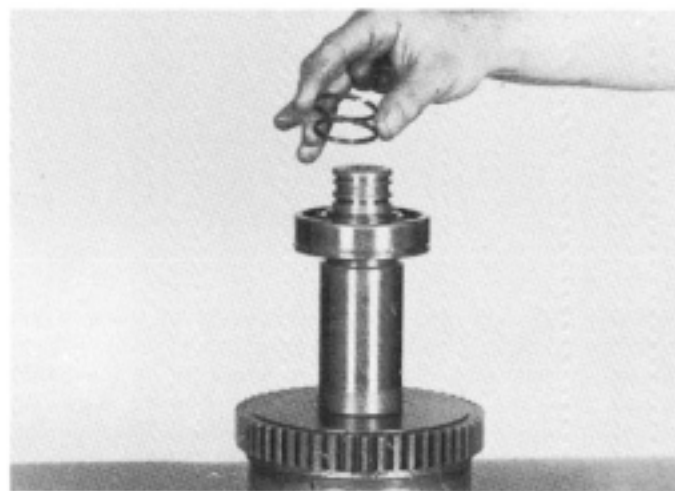
**Figure 9**

Remove clutch piston.



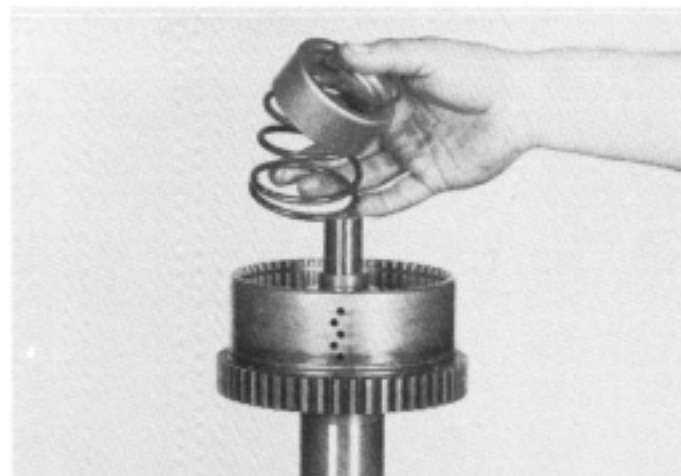
**Figure 7**

Remove inner and outer clutch discs.



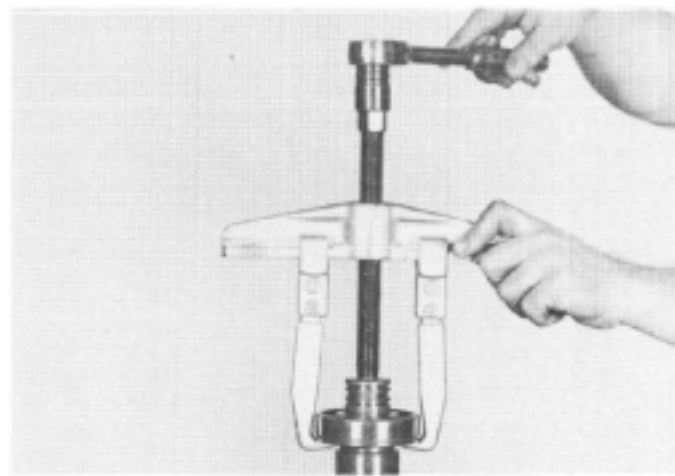
**Figure 10**

Remove clutch shaft piston rings and expander springs. See note in Figure 103.



**Figure 8**

Compress spring retainer washer. Remove spring retainer snap ring. Release tension on spring retainer. Remove snap ring, spring retainer and return spring.



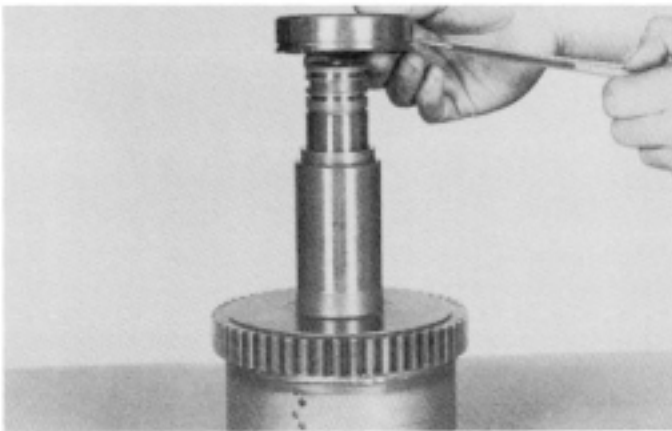
**Figure 11**

Remove clutch shaft bearing retainer ring. Remove shaft bearing.

**See cleaning and inspection page.**

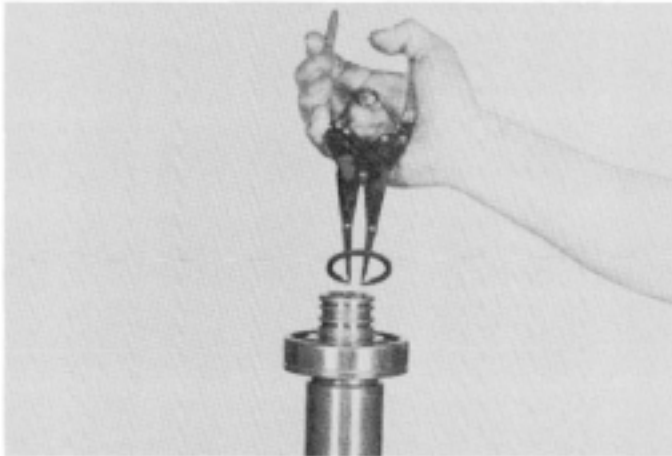


**4TH SPEED CLUTCH  
REASSEMBLY  
(8 speed transmission only)**



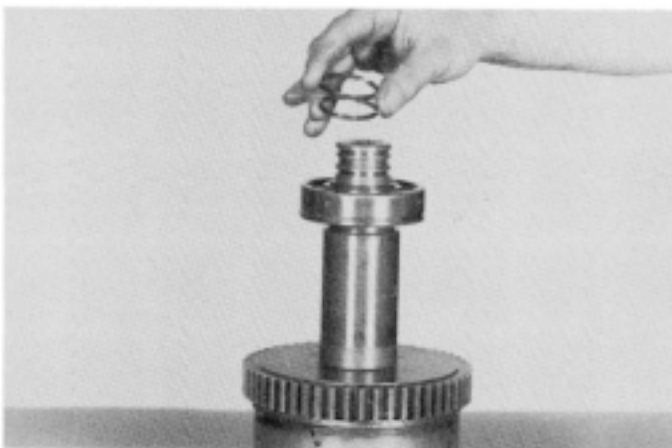
**Figure 12**

Install clutch shaft bearing. **NOTE:** Bearing snap ring groove must be down.



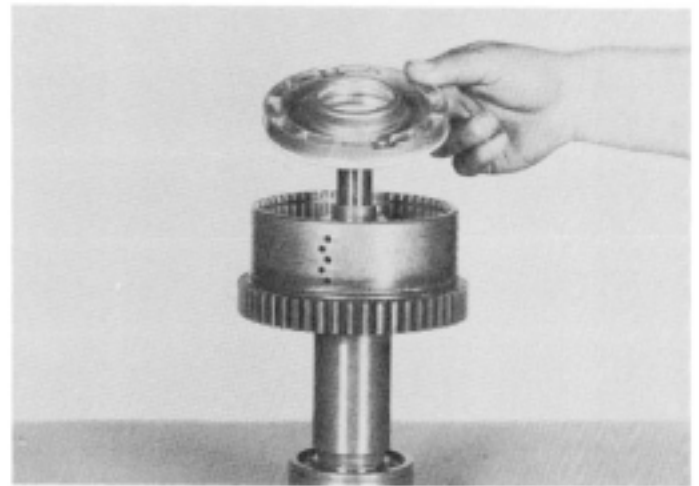
**Figure 13**

Install bearing retainer ring.



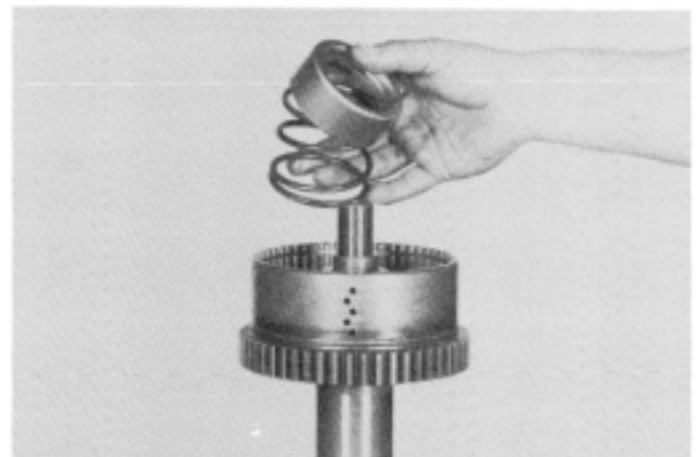
**Figure 14**

Install piston rings as explained on page 79.



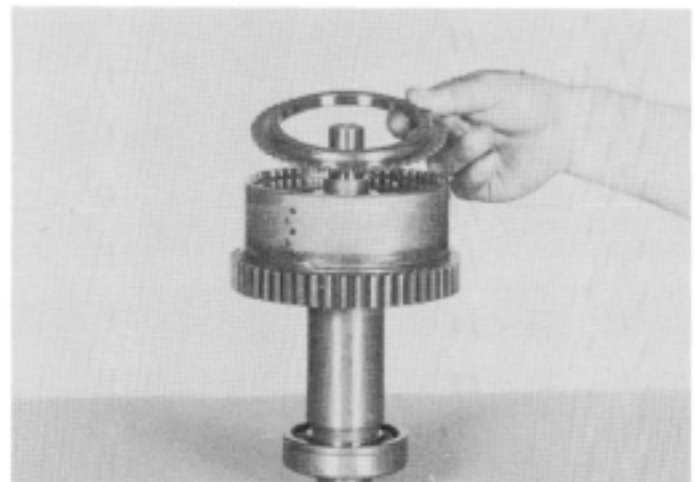
**Figure 15**

Install new clutch piston inner and outer sealing rings. Insert clutch piston in clutch drum. Use caution as not to damage sealing rings.



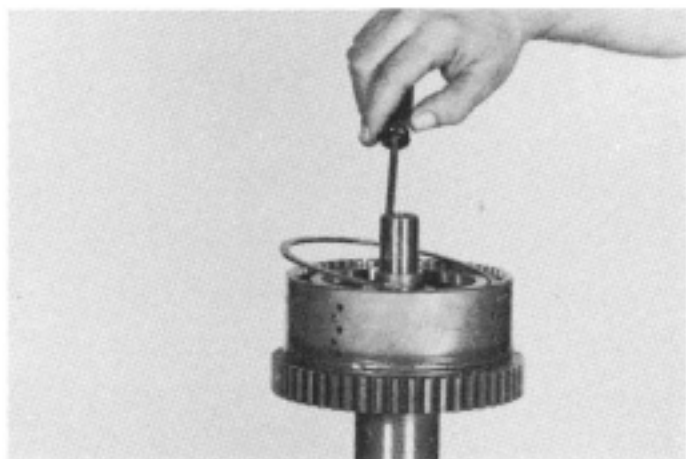
**Figure 16**

Install clutch piston return spring, spring retainer and retainer snap ring. Install one friction disc. Alternate steel and friction discs until the proper amount of discs are installed. First disc next to piston is friction, last disc installed is friction. (8 friction - 7 steel).



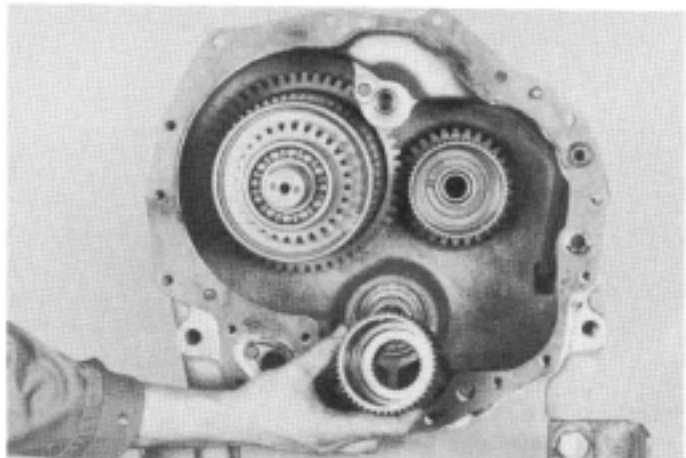
**Figure 17**

Install end plate.

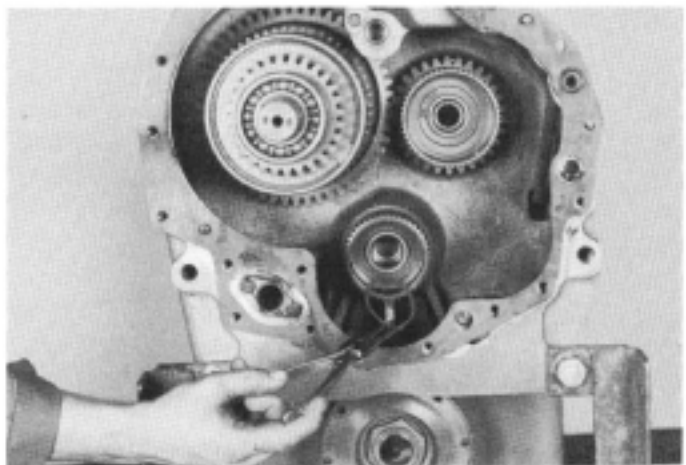


**Figure 18**  
Install end plate retainer ring. See transmission reassembly on page 38.

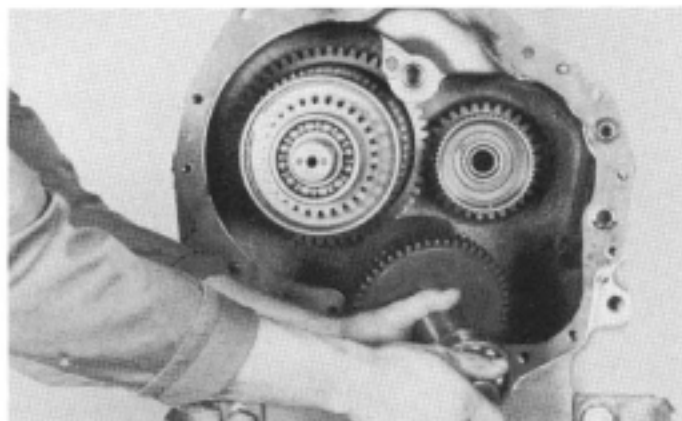
#### 4TH SPEED CLUTCH INSTALLATION (8 speed only)



**Figure 19**  
Position 4th speed clutch disc hub on idler shaft.

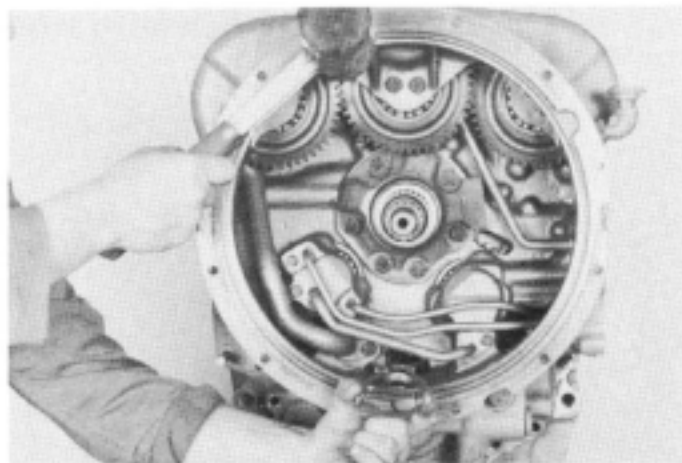


**Figure 20**  
Install disc hub retainer ring.

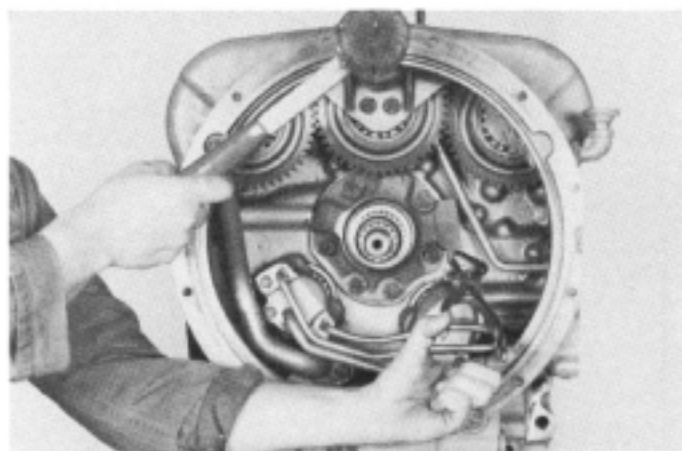


**Figure 21**  
Position pilot bearing on fourth speed clutch shaft. Install fourth clutch on disc hub. Use caution as not to damage the pilot bearing.

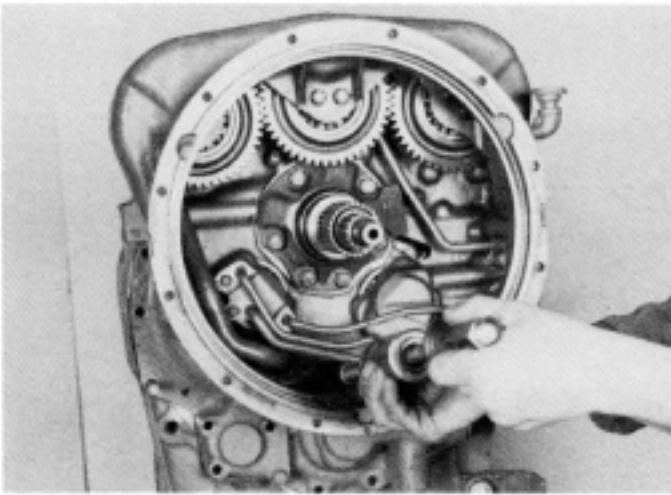
#### CONVERTER HOUSING INSTALLATION



**Figure 22**  
Support converter housing with a chain fall. Spread fourth clutch front bearing retainer ring. Position converter housing to transmission case assembly. Tap housing into place using caution as not to damage any of the clutch shaft piston rings.

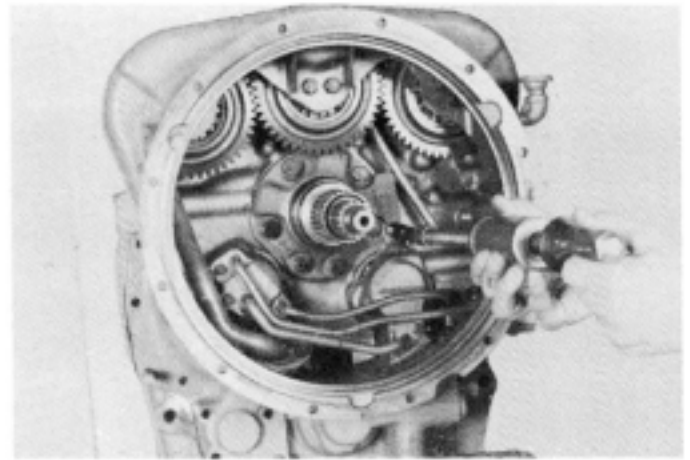


**Figure 23**  
Spread forward clutch front bearing retainer ring to allow the converter housing to position properly.



**Figure 24**

A hammer puller was used to pull the fourth clutch bearing forward to engage the front bearing snap ring in the bearing groove.



**Figure 25**

Use the same procedure for the forward clutch as explained in Figure 24. Be certain both snap rings are fully seated in the bearing snap ring grooves. Install converter housing to transmission housing cap screws, tighten to specified torque.

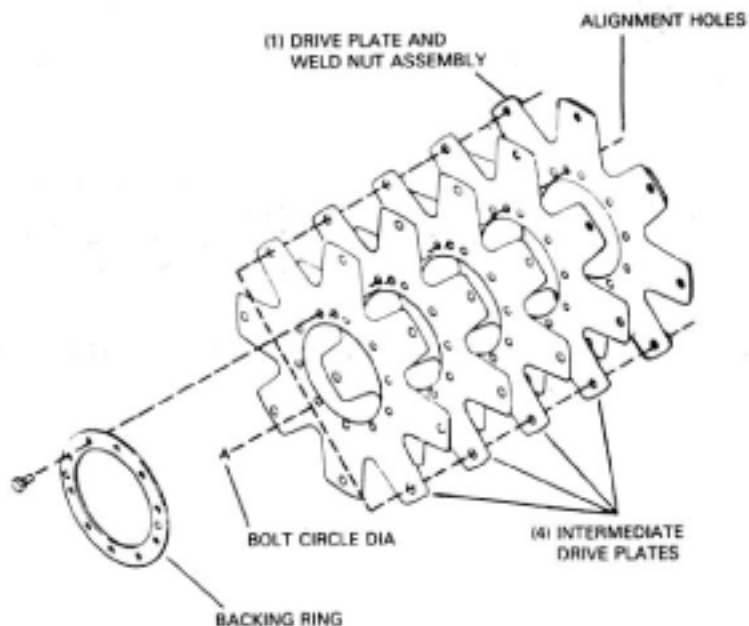
**REFER TO PAGE 46 FOR COMPLETE TRANSMISSION REASSEMBLY.**

## DRIVE PLATE INSTALLATION

**SUBJECT:** 28000/32000 Series Transmission and C-270/C-320 Series Converter Drive Plate Kits.

**REASON FOR BULLETIN:** Proper Identification by Bolt Circle Diameter.

Measure the "A" dimension (Bolt Circle diameter) and order Drive Plate Kit listed below.



### "A" Dimension (Bolt Circle Diameter)

13.125" [333,375 mm] Diameter

Kit No. 802335

13.50" [342,900 mm] Diameter

Kit No. 802333

17.00" [431,800 mm] Diameter

Kit No. 802454

Each kit will include the following parts:

- 4 Intermediate Drive Plates
- 1 Drive Plate and Weld Nut Assembly.
- 1 Backing Ring.
- 10 Screw and Lockwasher Assembly.
- 1 Instruction Sheet.

TO FACILITATE ASSEMBLY, ALIGN SMALL HOLES IN DRIVE PLATES — SEE ILLUSTRATION ABOVE.

Position drive plate and weld nut assembly on impeller cover with weld nuts toward cover. Align intermediate drive plate and backing ring with holes in impeller cover. **NOTE:** Two dimples 180° apart in backing ring must be out (toward engine flywheel). Install capscrews and washers. Tighten 23 to 25 ft. lbs. torque [31,2 - 33,8 N.m].

**SEE PAGE 99 FOR TRANSMISSION TO ENGINE  
INSTALLATION PROCEDURE**

Instruction Sheet 902304  
TSB-79 Rev. 11-93

## TRANSMISSION TO ENGINE INSTALLATION PROCEDURE

1. Remove all burrs from flywheel mounting face and nose pilot bore. Clean drive plate surface with solvent.
2. Check engine flywheel and housing for conformance to standard S.A.E. #3 - S.A.E. J-927 tolerance specifications for pilot bore size, pilot bore runout and mounting face flatness. Measure and record engine crankshaft end play.
3. Install two 3.50 [88,90 mm] long transmission to flywheel housing guide studs in the engine flywheel housing as shown. Rotate the engine flywheel to align a drive plate mounting screw hole with the flywheel housing access hole.
4. Install a 4.00 [101,60 mm] long drive plate locating stud .3750-24 fine thread in a drive plate nut. Align the locating stud in the drive plate with the flywheel drive plate mounting screw hole positioned in step No. 3.
5. Locate transmission on flywheel housing aligning drive plate to flywheel and transmission to flywheel housing.

Install transmission to flywheel housing screws. Tighten screws to specified torque. Remove transmission to engine guide studs. Install remaining screws and tighten to specified torque.

6. Remove drive plate locating stud.
7. Install drive plate attaching screw and washer. Snug screw but **do not tighten**. Some engine flywheel housings have a hole located on the flywheel housing circumference in line with the drive plate screw access hole. A screwdriver or pry bar used to hold the drive plate against the flywheel will facilitate installation of the drive plate screws. Rotate the engine flywheel and install the remaining seven (7) flywheel to drive plate attaching screws. Snug screws but do not tighten. After all eight (8) screws are installed torque each one 25 to 30 ft. lbs. torque [33,9 - 40,6 N.m.]. This will require torquing each screw and rotating the engine flywheel until the full amount of eight (8) screws have been tightened.
8. Measure engine crankshaft end play after transmission has been completely installed on engine flywheel. This value must be within .001 [0,025 mm] of the end play recorded in step No. 2.

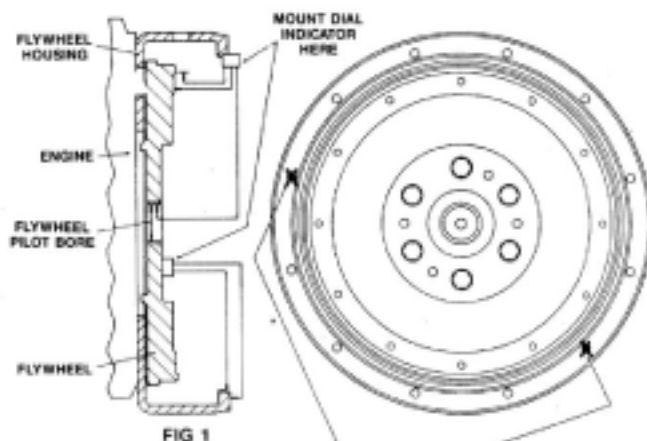


FIG 1

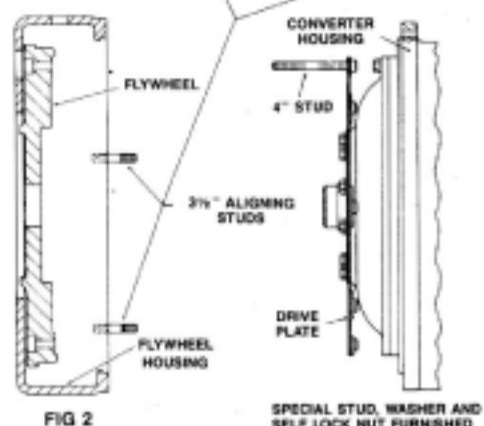


FIG 2

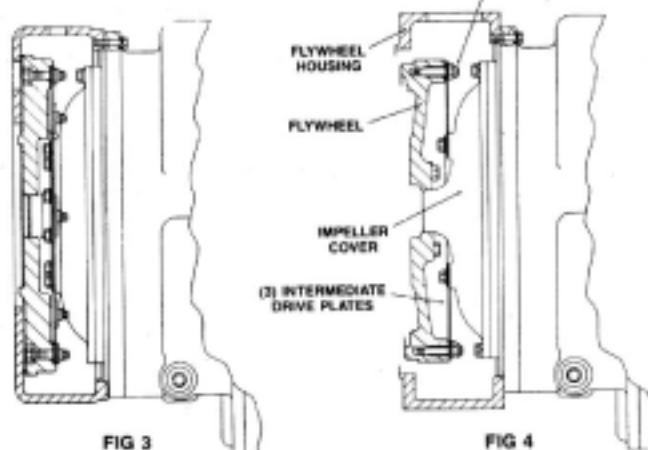
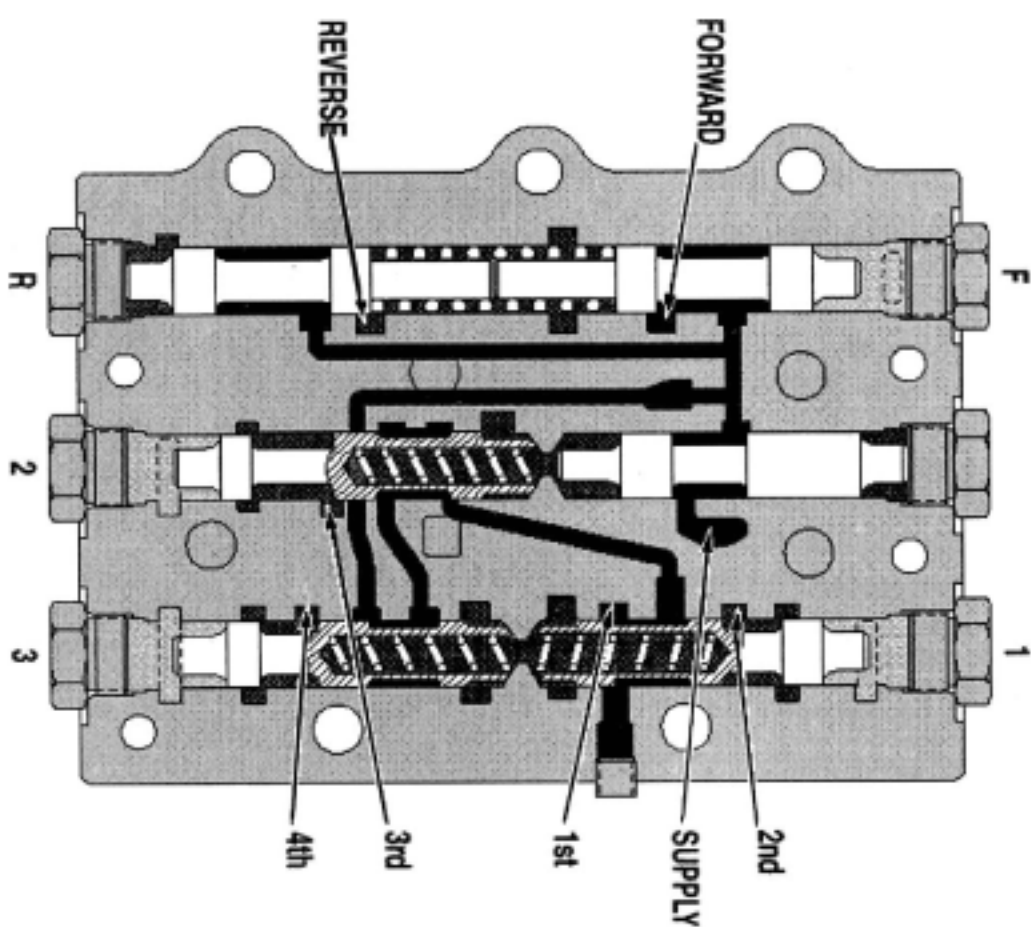
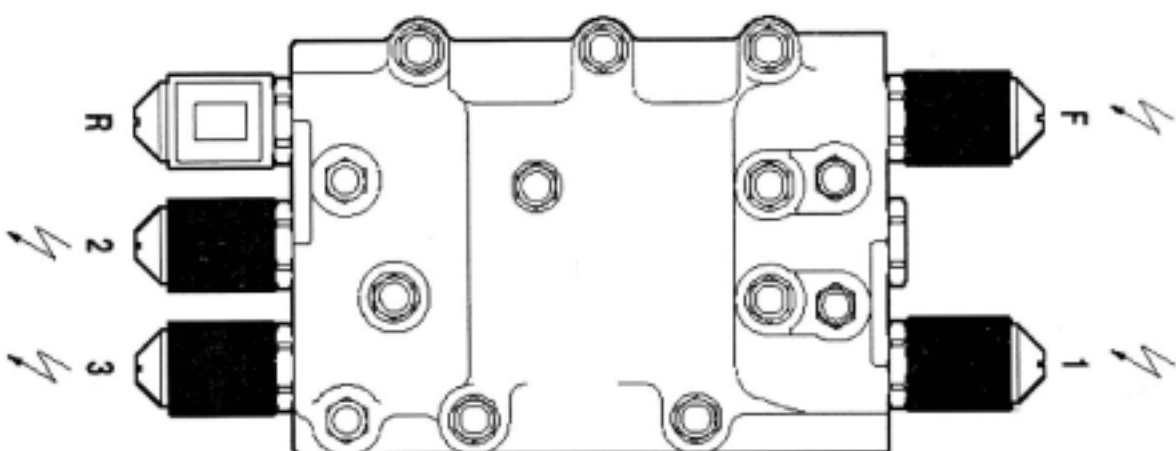


FIG 3

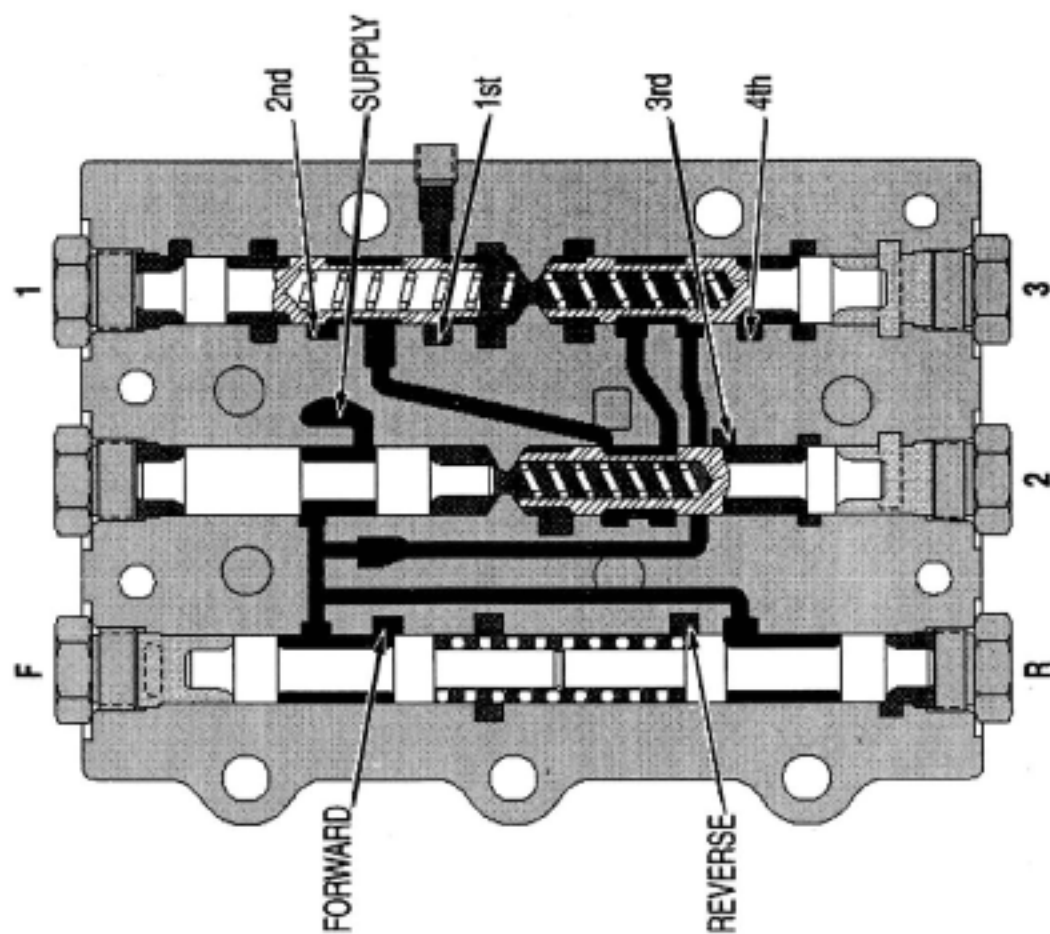
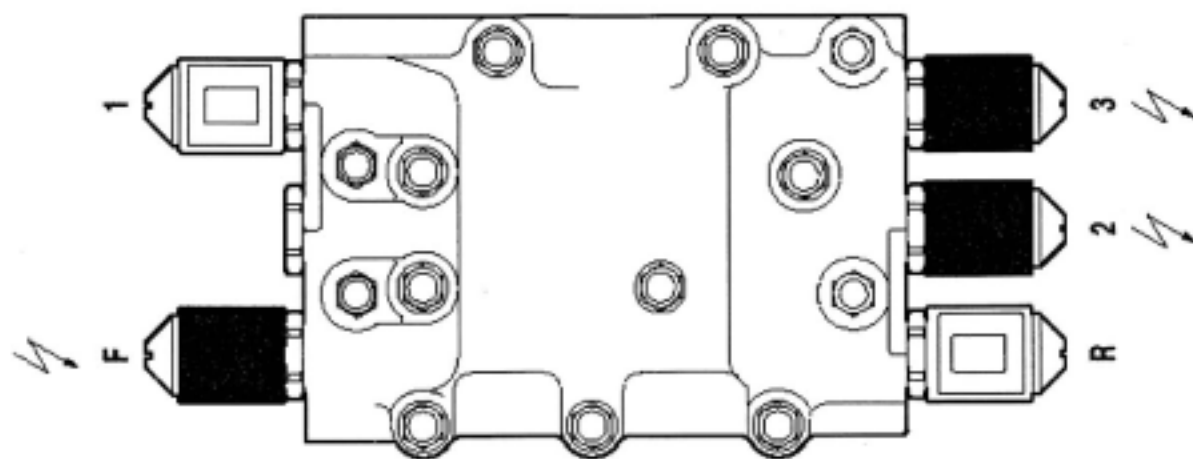
FIG 4

# Control valve function of 28000 / 32000 - 4 speed : forward 1st



OFF-HIGHWAY COMPONENTS

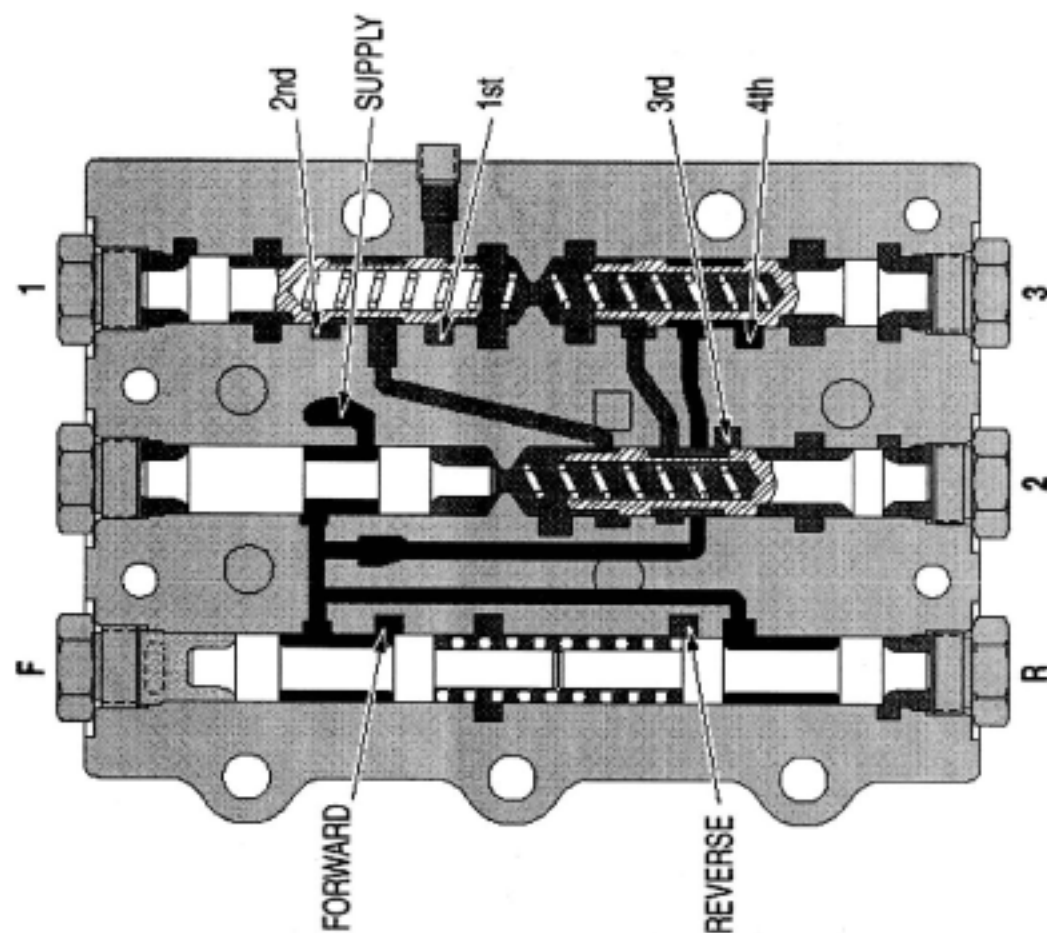
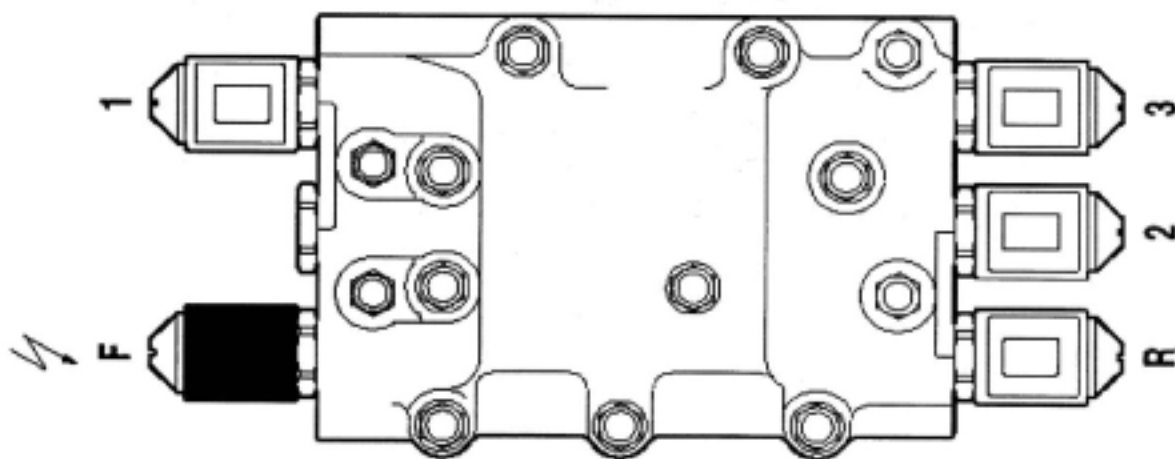
# Control valve function of 28000 / 32000 - 4 speed : forward 2nd



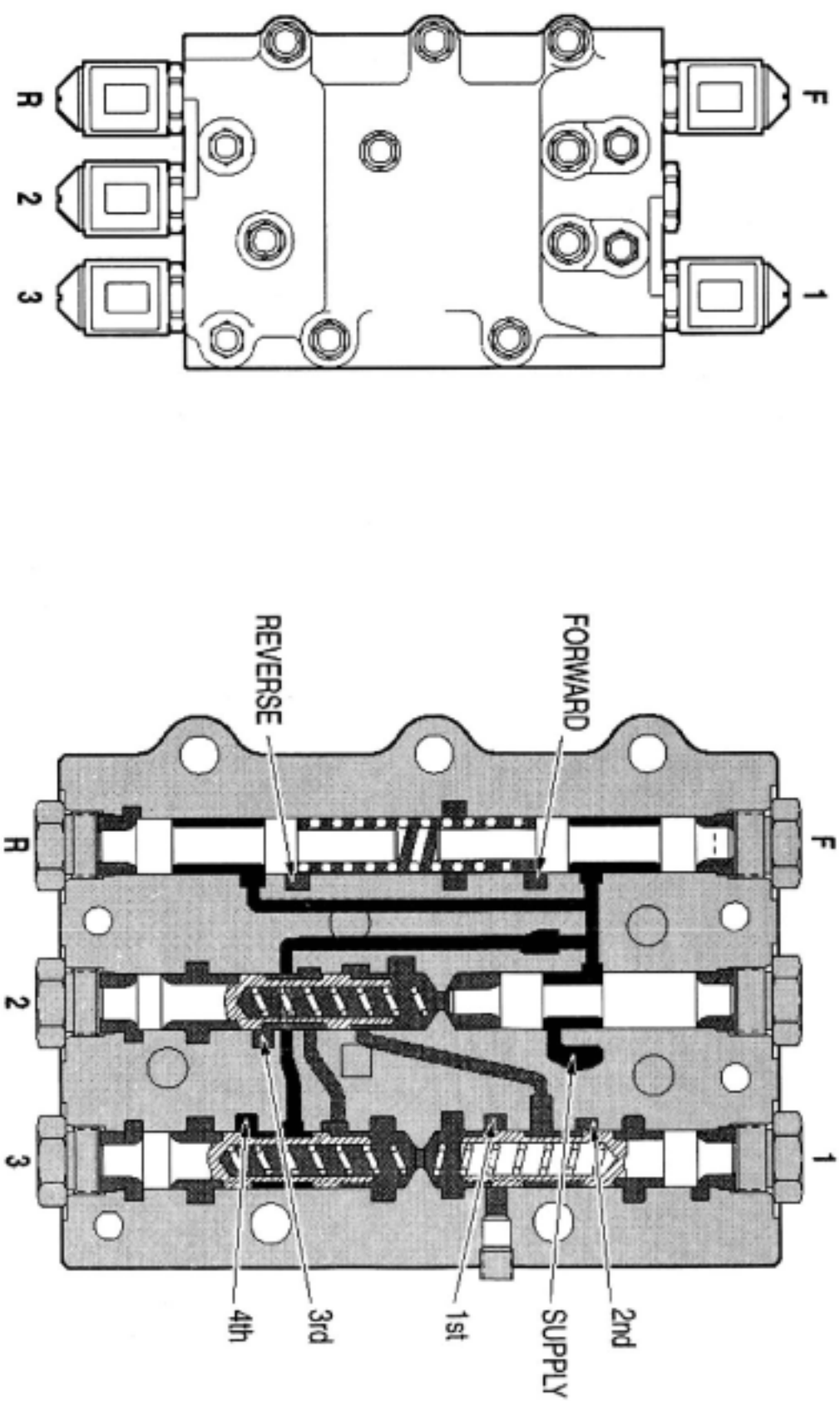




# Control valve function of 28000 / 32000 - 4 speed : forward 4th

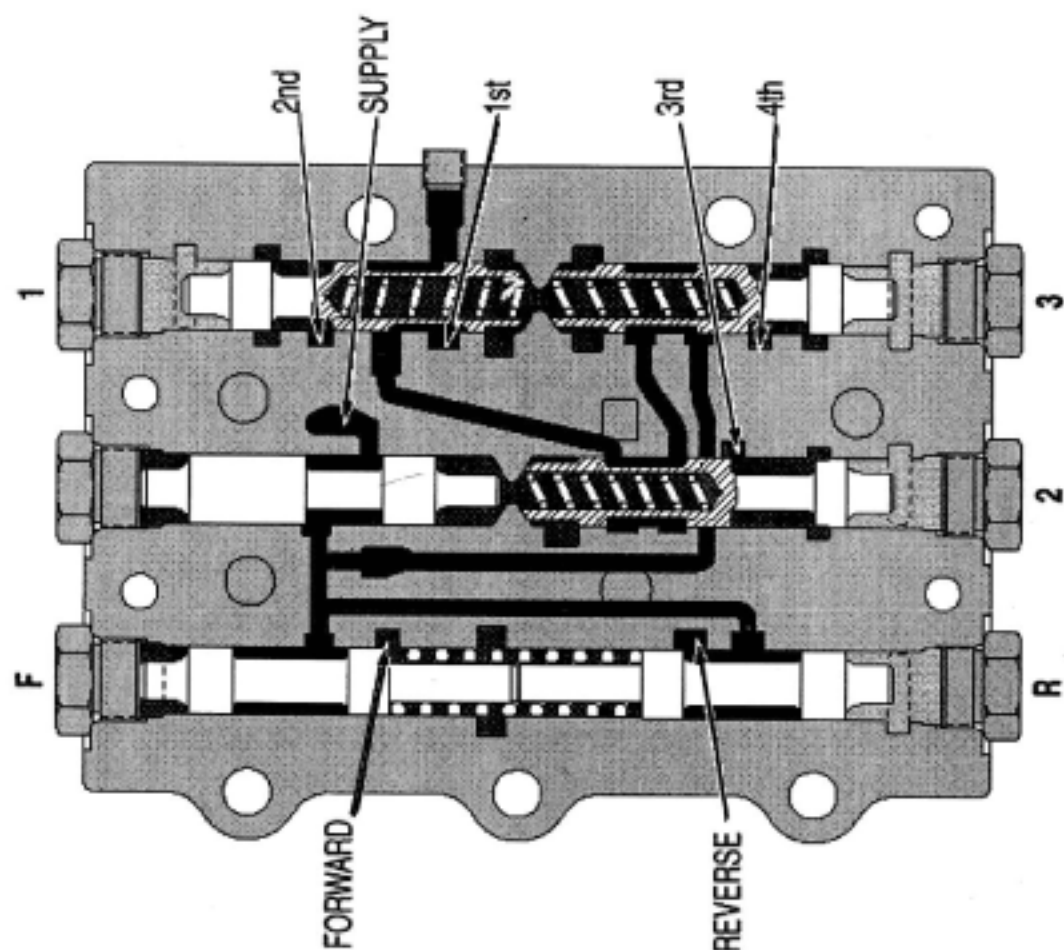
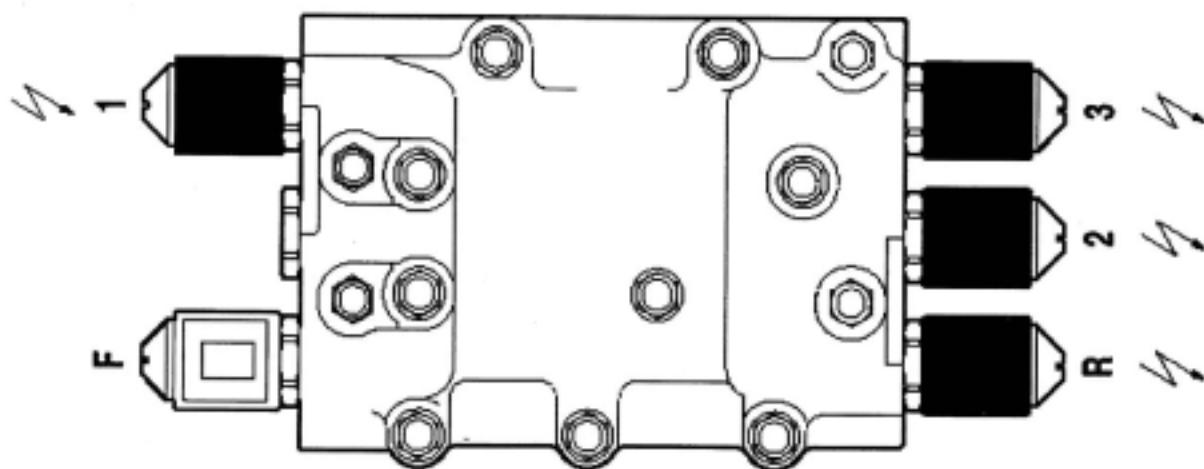


# Control valve function of 28000 / 32000 - 4 speed : neutral 4th



OFF-HIGHWAY COMPONENTS

# Control valve function of 28000 / 32000 - 4 speed : reverse 1st



## NOTES

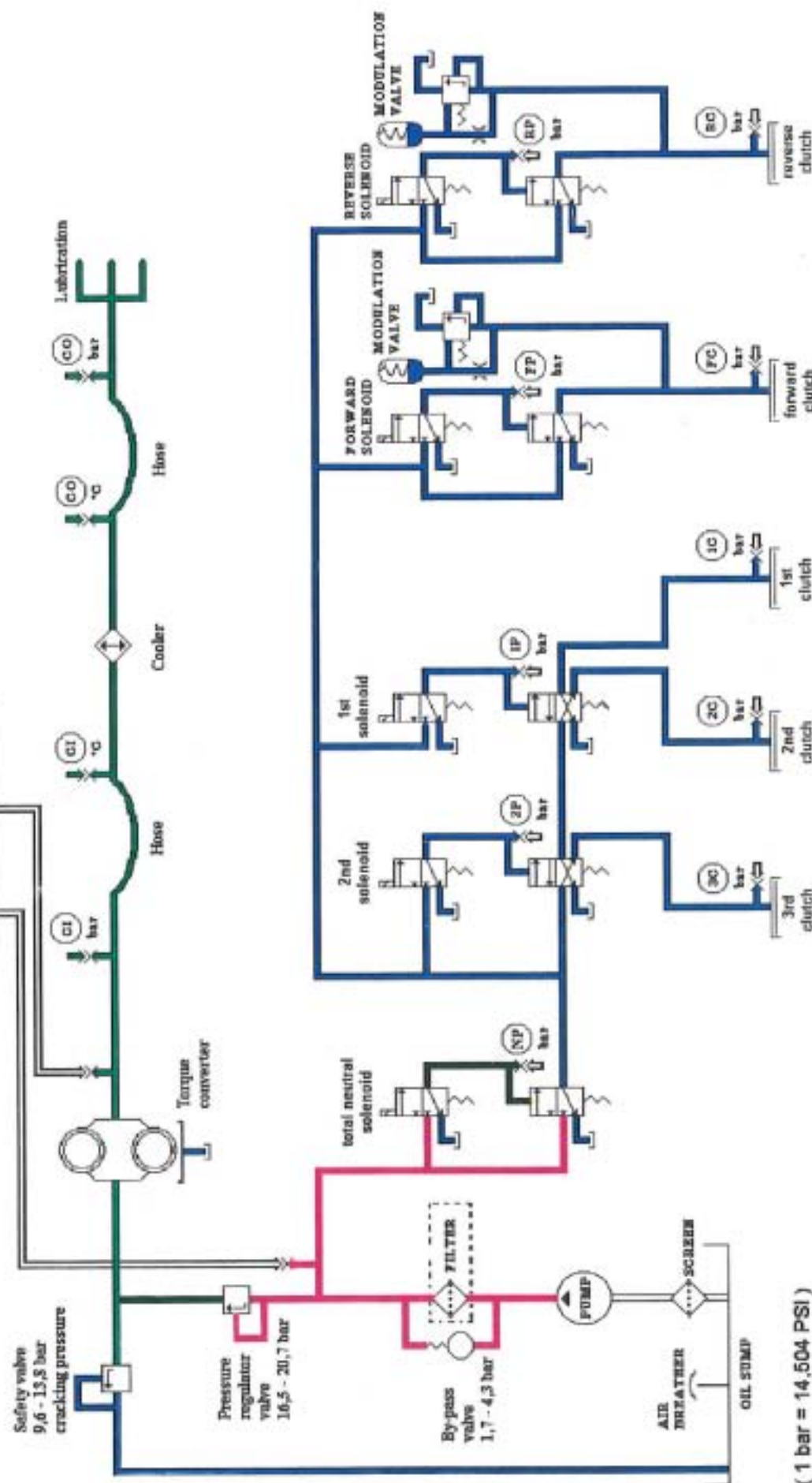
[illegible]

**28000 / 32000 transmission - hydraulic diagram  
3 speed - with total neutral**

**OPERATOR COMPARTMENT**  
PRESSURE GAUGE  
TEMPERATURE GAUGE

**Total neutral**

(X) PRESSURE CHECK-PORT  
bar  
(E) TEMPERATURE CHECK-PORT  
°C



( 1 bar = 14,504 PSI )



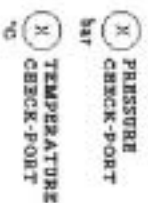
**OFF-HIGHWAY COMPONENTS**



## 3 speed - with total neutral

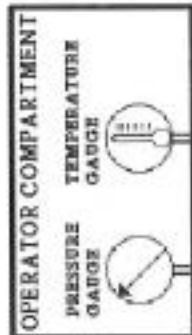
PRESSURE TEMPERATURE  
GAUGE GAUGE

**Forward and 1st clutch engaged**

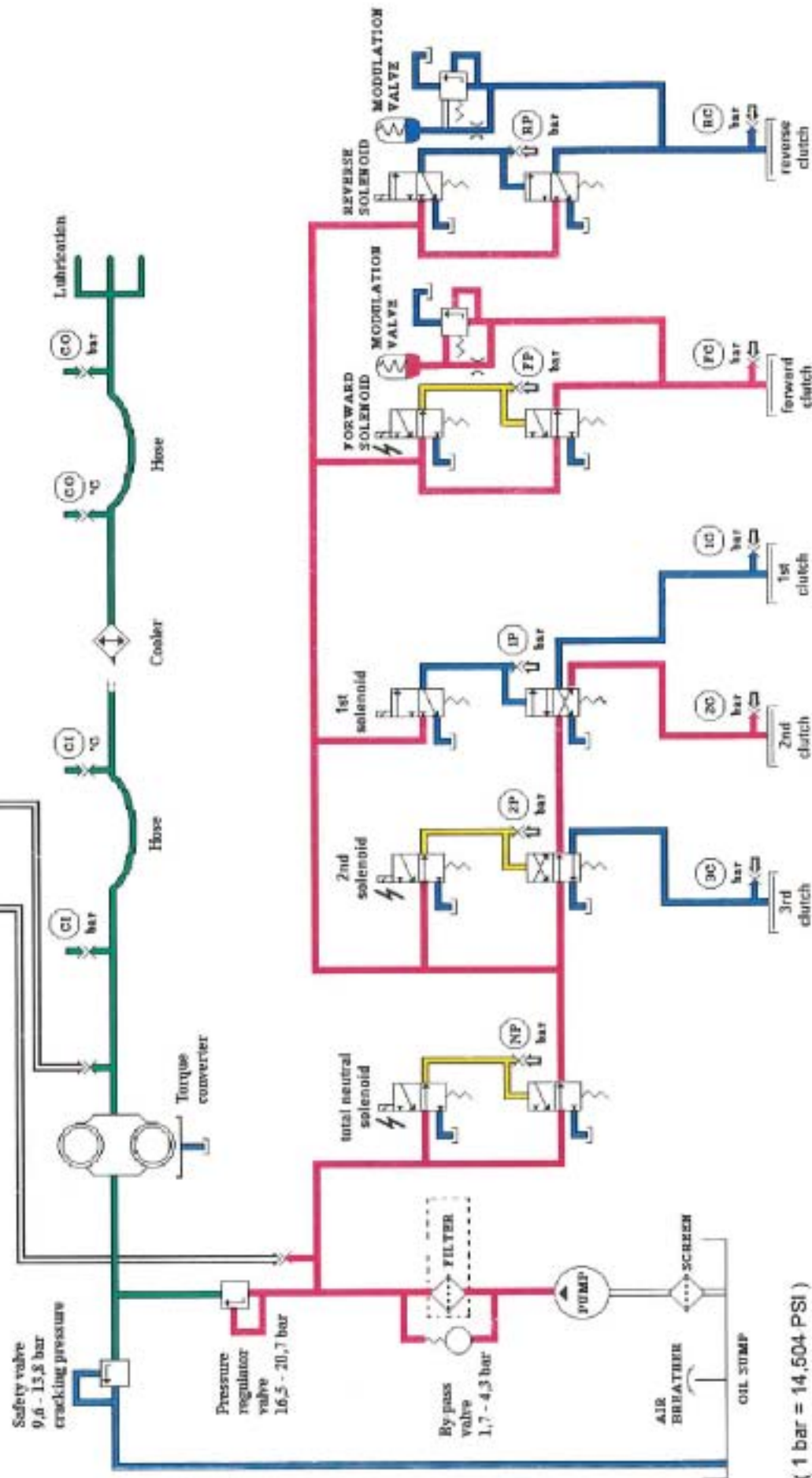
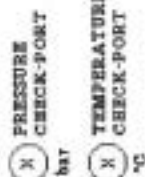




**28000 / 32000 transmission - hydraulic diagram  
3 speed - with total neutral**

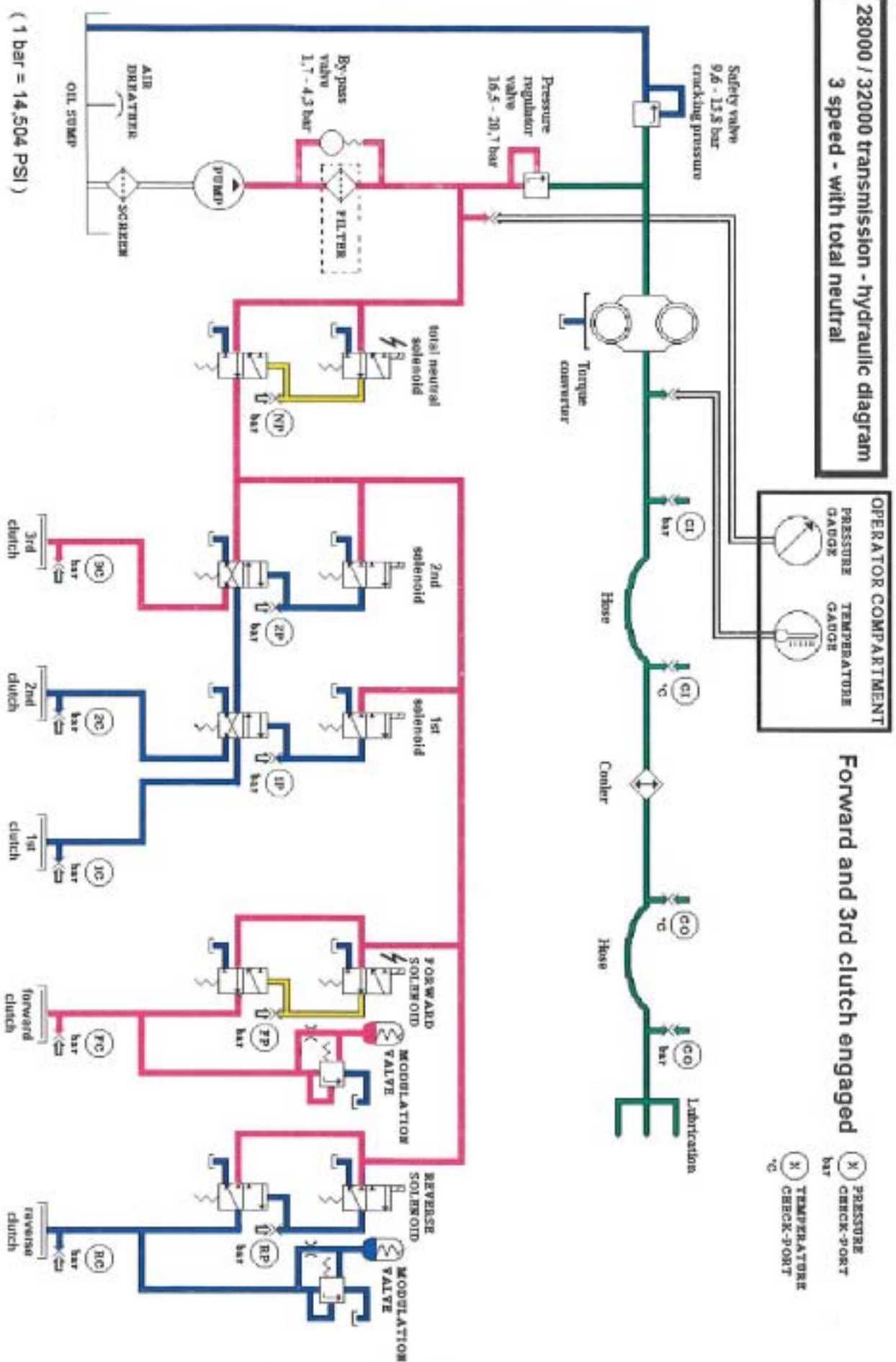


**Forward and 2nd clutch engaged**



( 1 bar = 14,504 PSI )

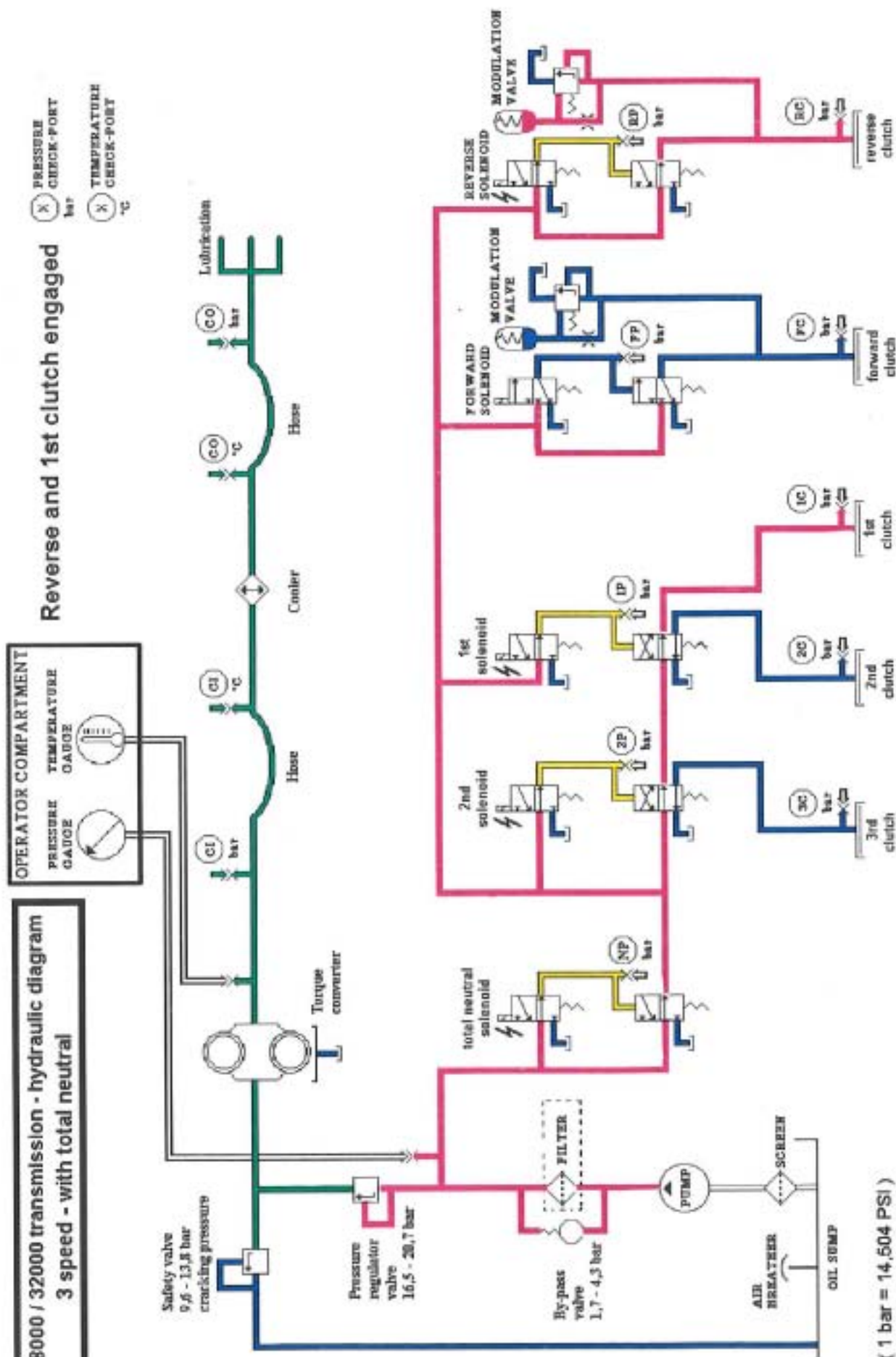
**28000 / 32000 transmission - hydraulic diagram**  
**3 speed - with total neutral**



**OFF-HIGHWAY COMPONENTS**

**28000 / 32000 transmission - hydraulic diagram  
3 speed - with total neutral**

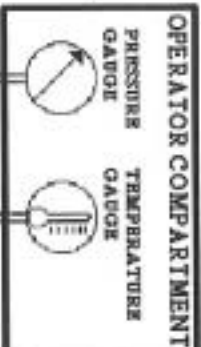
**Reverse and 1st clutch engaged**



( 1 bar = 14,504 PSI )

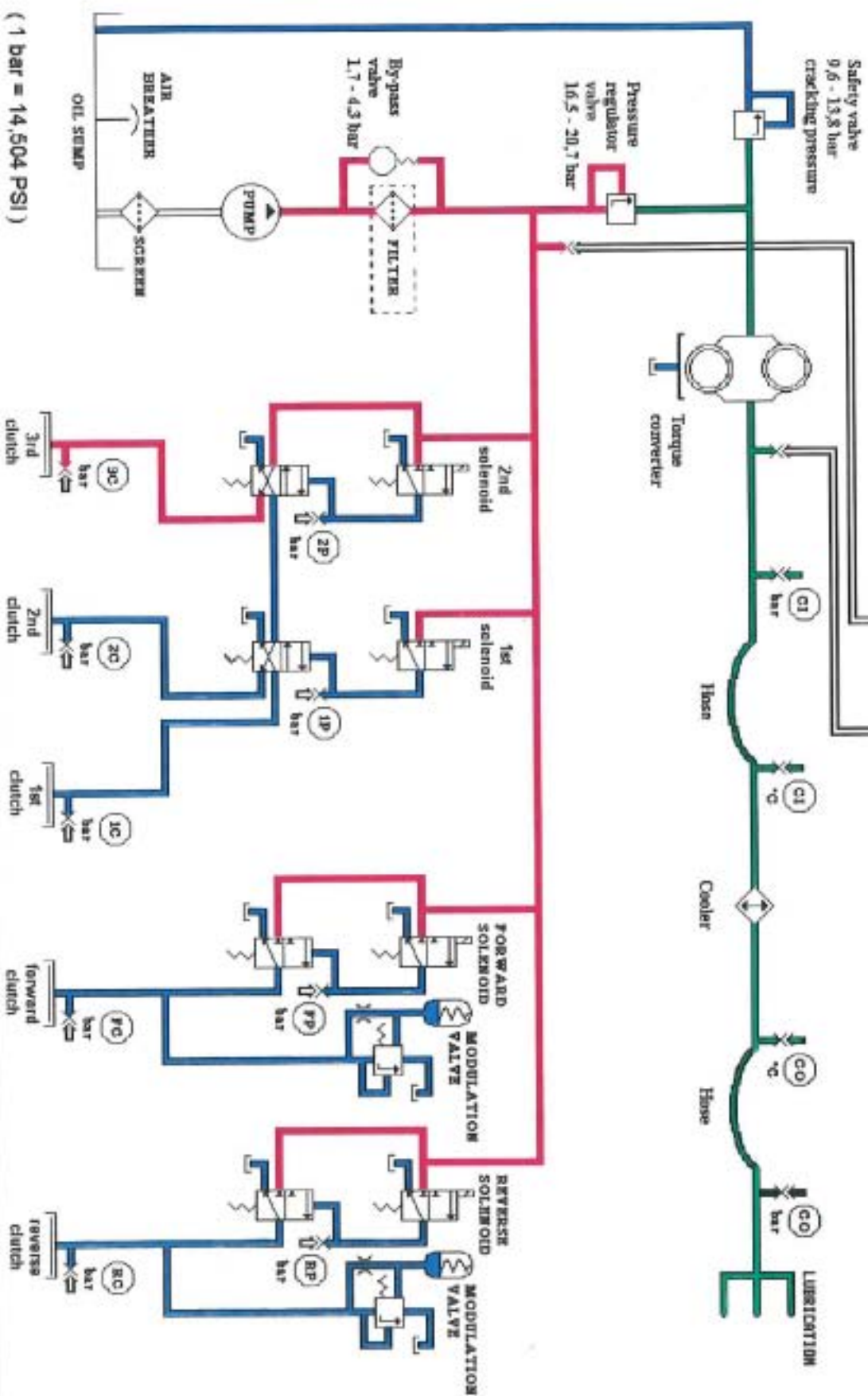


**28000 / 32000 transmission - hydraulic diagram**  
**3 speed - without total neutral**



**Neutral and 3rd clutch engaged**

⊗ PRESSURE CHECK-PORT  
 bar  
 ⊗ TEMPERATURE CHECK-PORT  
 °C



(1 bar = 14,504 PSI)



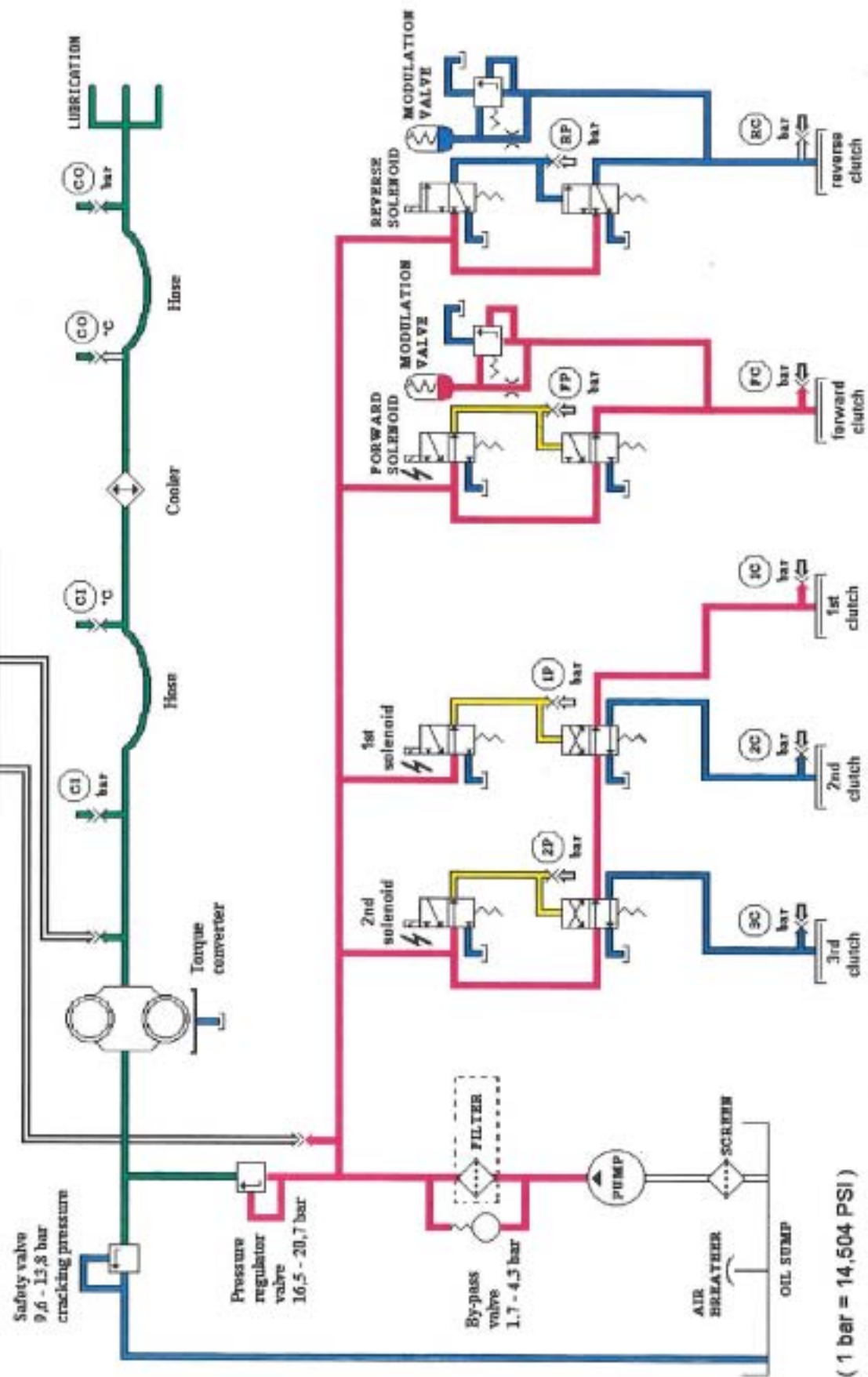
**OFF-HIGHWAY COMPONENTS**

**28000 / 32000 transmission - hydraulic diagram  
3 speed - without total neutral**

**Forward and 1st clutch engaged**

⊗ PRESSURE  
bar

⊗ TEMPERATURE  
°C



( 1 bar = 14,504 PSI )



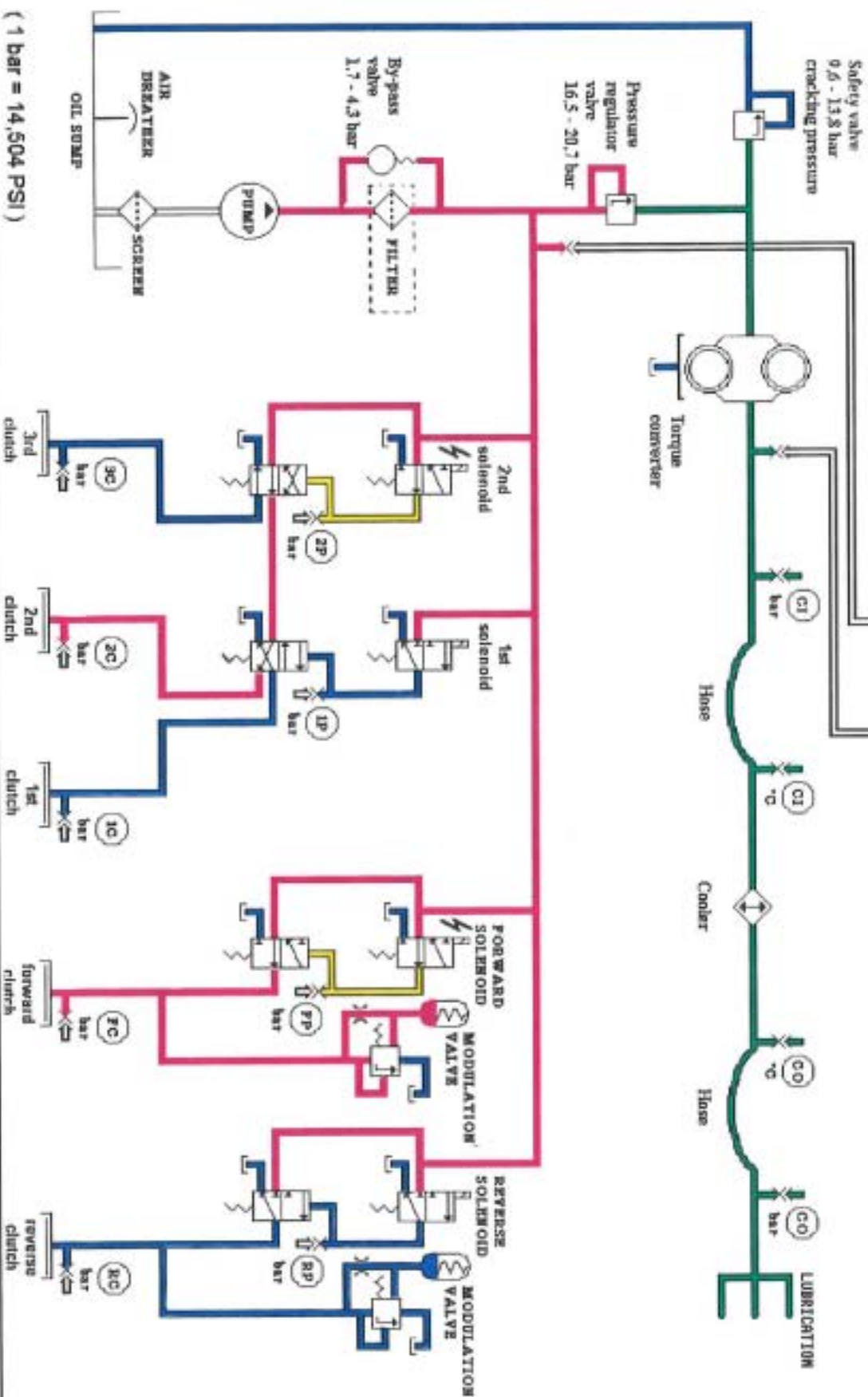
**28000 / 32000 transmission - hydraulic diagram**  
**3 speed - without total neutral**

**OPERATOR COMPARTMENT**

PRESSURE GUAGE  
TEMPERATURE GUAGE

⊗ PRESSURE CHECK-PORT  
 °C TEMPERATURE CHECK-PORT

**Forward and 2nd clutch engaged**



( 1 bar = 14,504 PSI )



**OFF-HIGHWAY COMPONENTS**

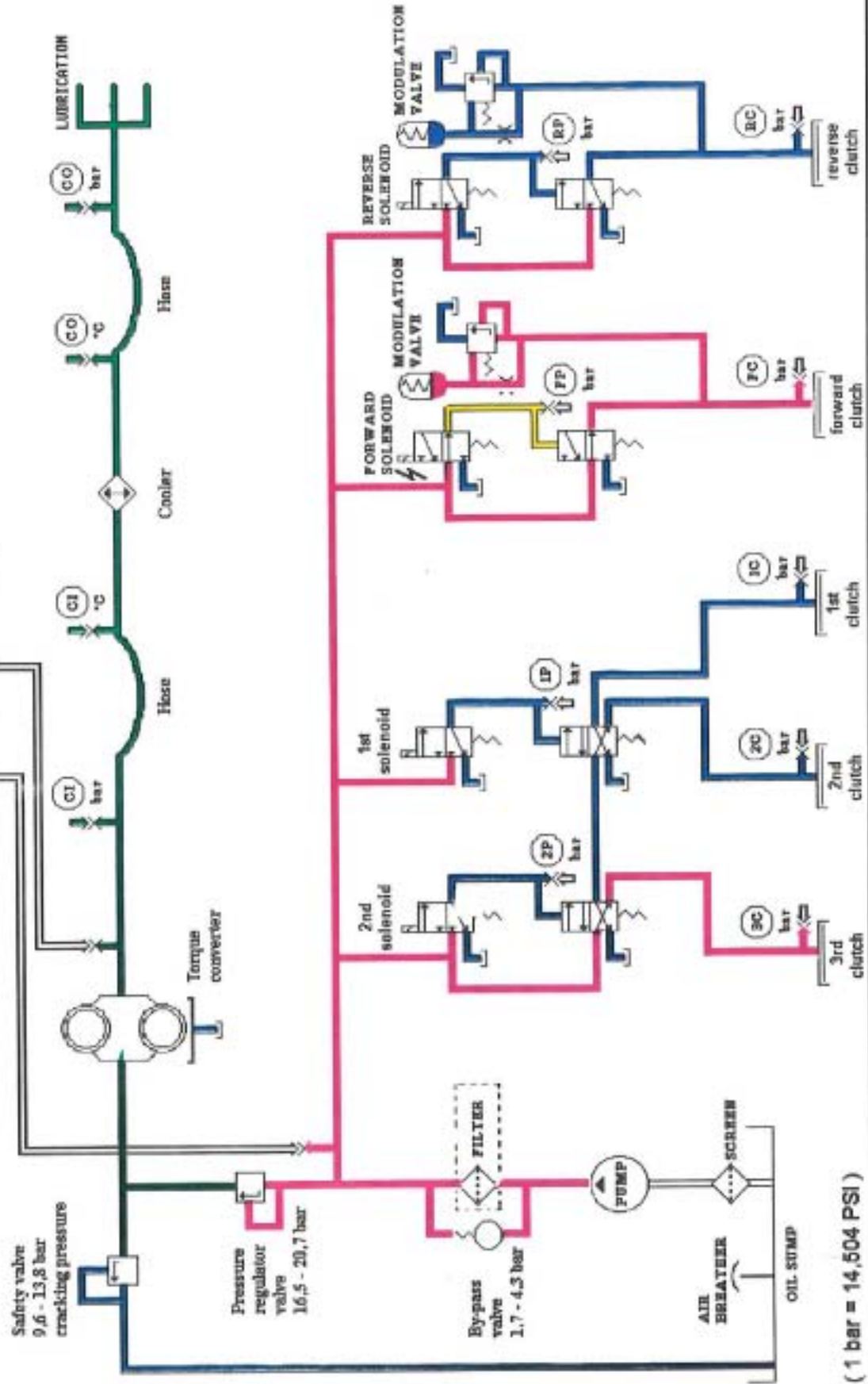


**28000 / 32000 transmission - hydraulic diagram  
3 speed - without total neutral**

**Forward and 3rd clutch engaged**

(X) PRESSURE  
CHECK-PORT  
bar

(X) TEMPERATURE  
CHECK-PORT  
°C





**28000 / 32000 transmission - hydraulic diagram**  
**3 speed - without total neutral**

**OPERATOR COMPARTMENT**

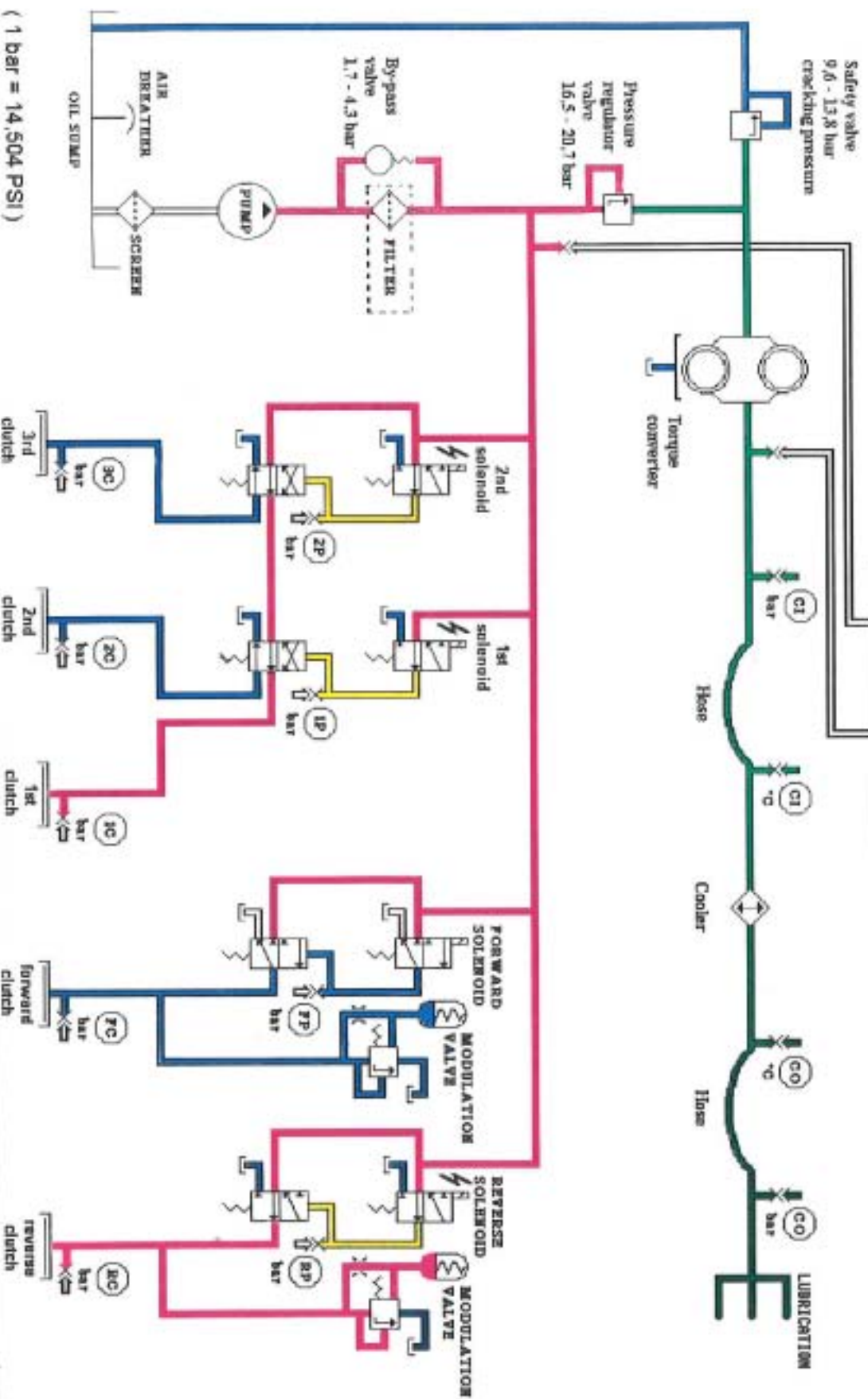
PRSSURE  
GAUGE

TEMPERATURE  
GAUGE

**Reverse and 1st clutch engaged**

(X) PRESSURE  
CHECK-PORT  
bar

(°C) TEMPERATURE  
CHECK-PORT  
°C



( 1 bar = 14,504 PSI )



**OFF-HIGHWAY COMPONENTS**

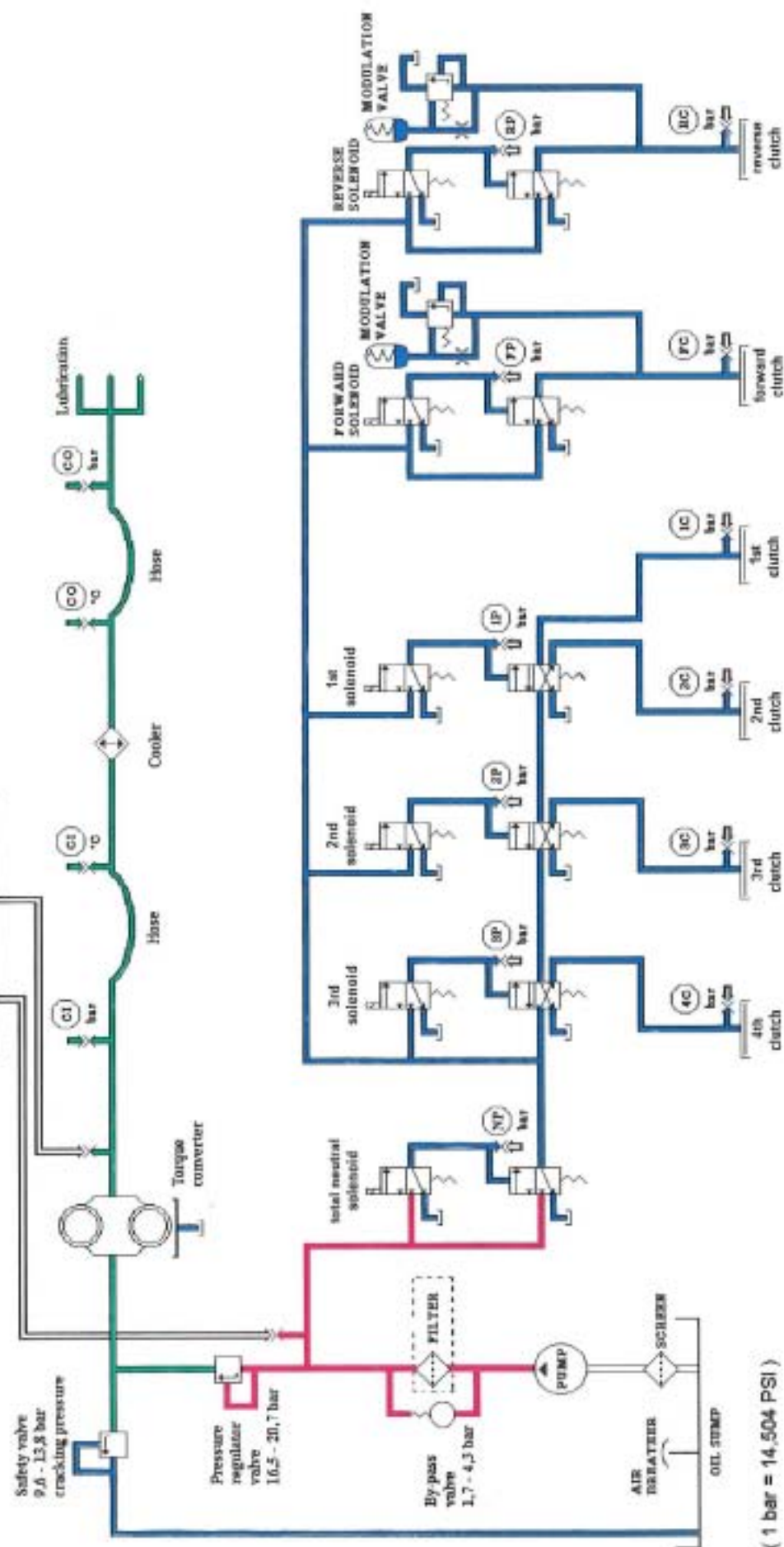
28000 / 32000 transmission - hydraulic diagram  
4 speed - with total neutral

OPERATOR COMPARTMENT

(X) PRESSURE  
 CHECK-PORT  
 bar

(X) TEMPERATURE  
 CHECK-PORT  
 °C

Total neutral



( 1 bar = 14.504 PSI )

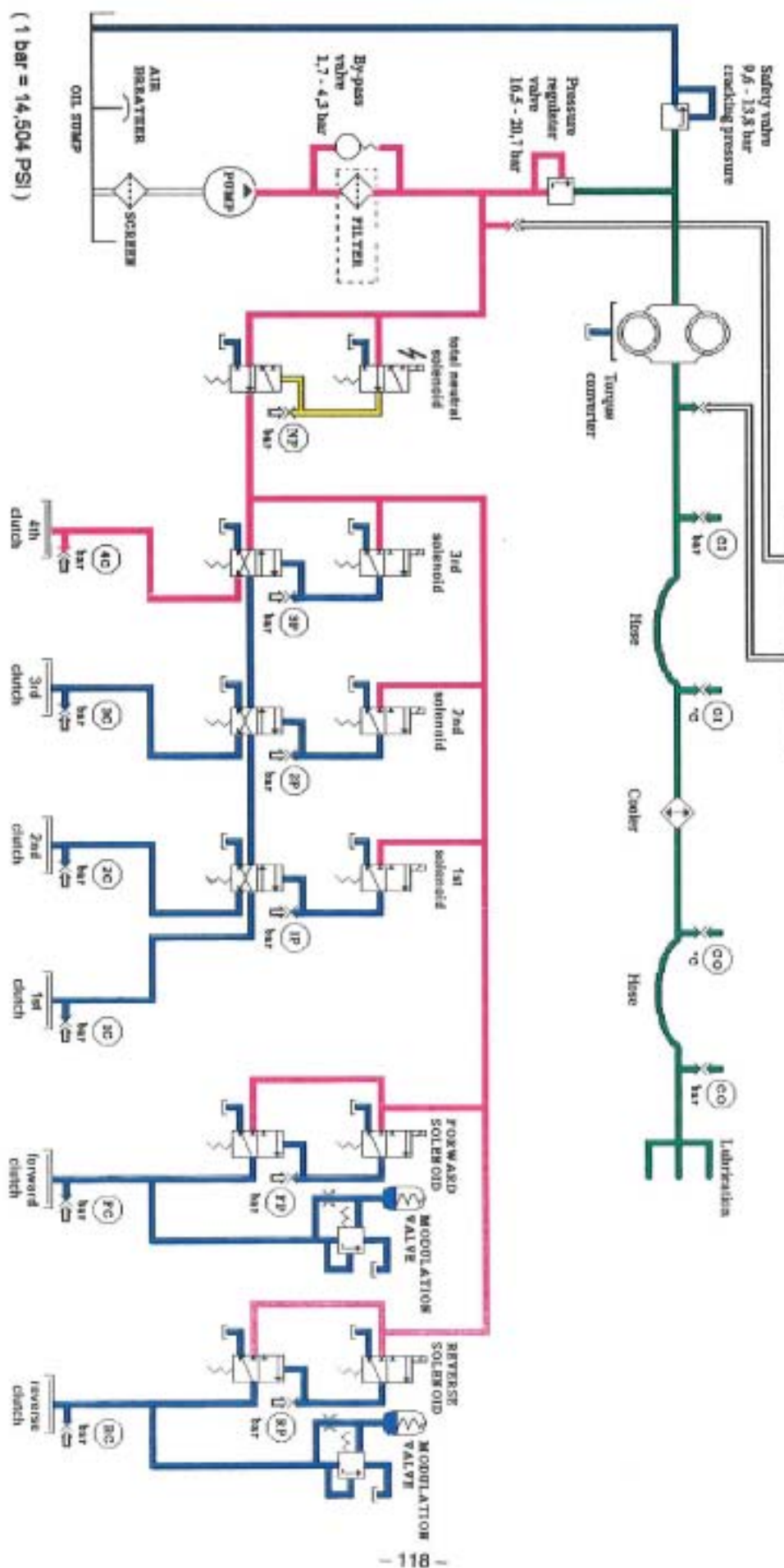
**28000 / 32000 transmission - hydraulic diagram**  
**4 speed - with total neutral**

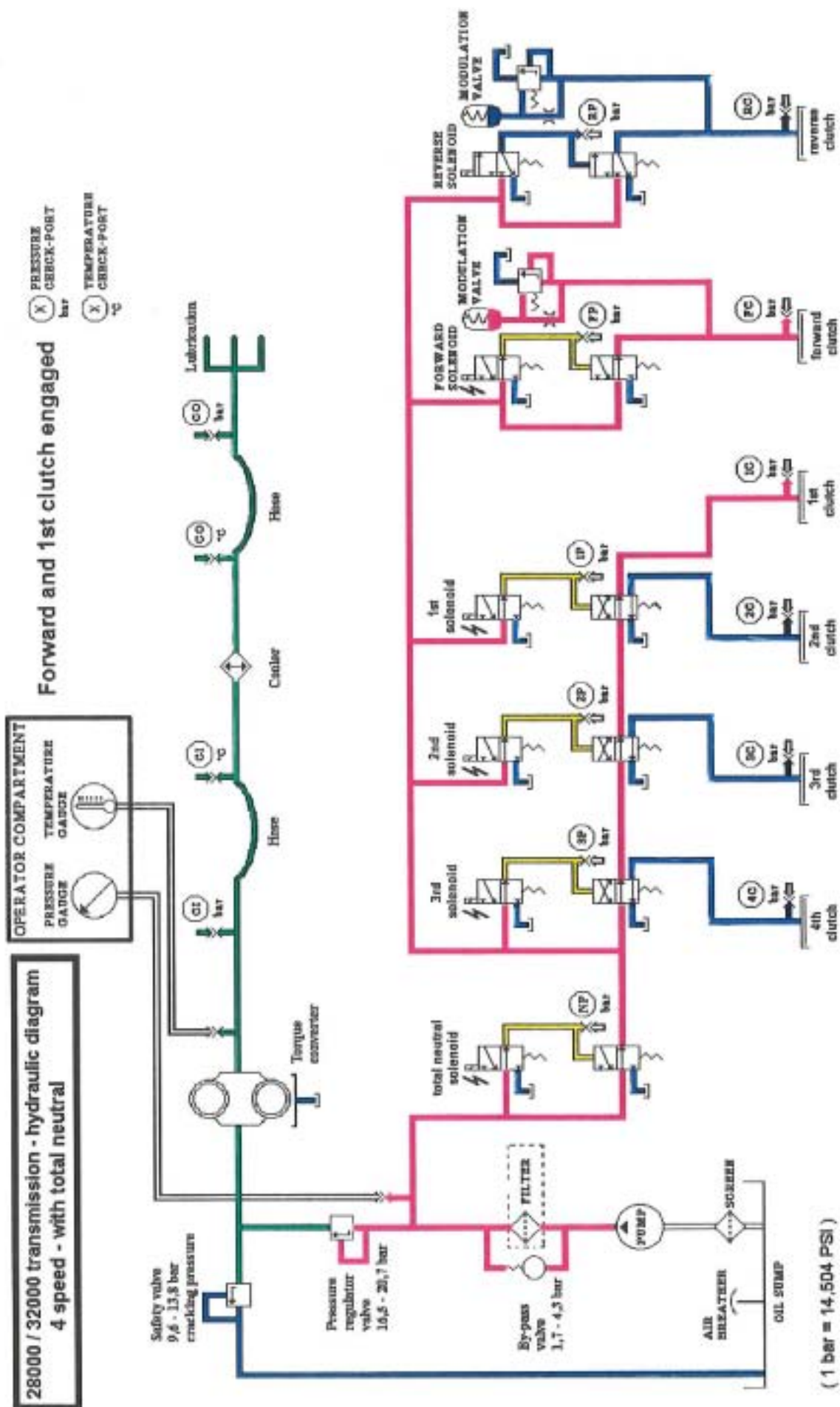
**OPERATOR COMPARTMENT**

PRESSURE GAUGE  
 TEMPERATURE GAUGE

**Neutral and 4th clutch engaged**

- (X) PRESSURE CHECK-POINT
- (T) TEMPERATURE CHECK-POINT







**28000 / 32000 transmission - hydraulic diagram**  
**4 speed - with total neutral**

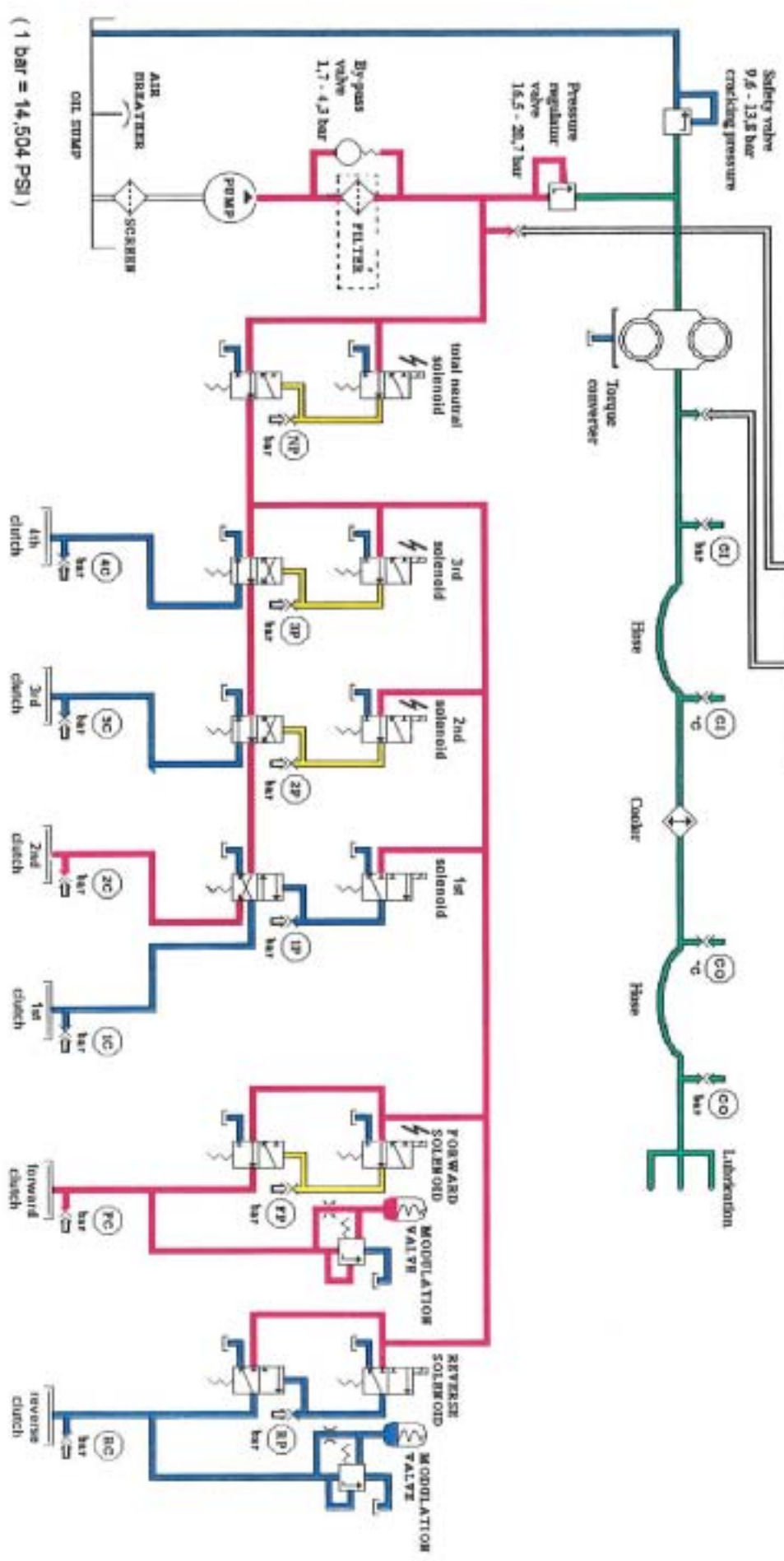
**OPERATOR COMPARTMENT**

PRESSURE GAUGE

TEMPERATURE GAUGE

**Forward and 2nd clutch engaged**

- ⊗ PRESSURE CHECK-POINT
- ⊗ TEMPERATURE CHECK-POINT



( 1 bar = 14,504 PSI )



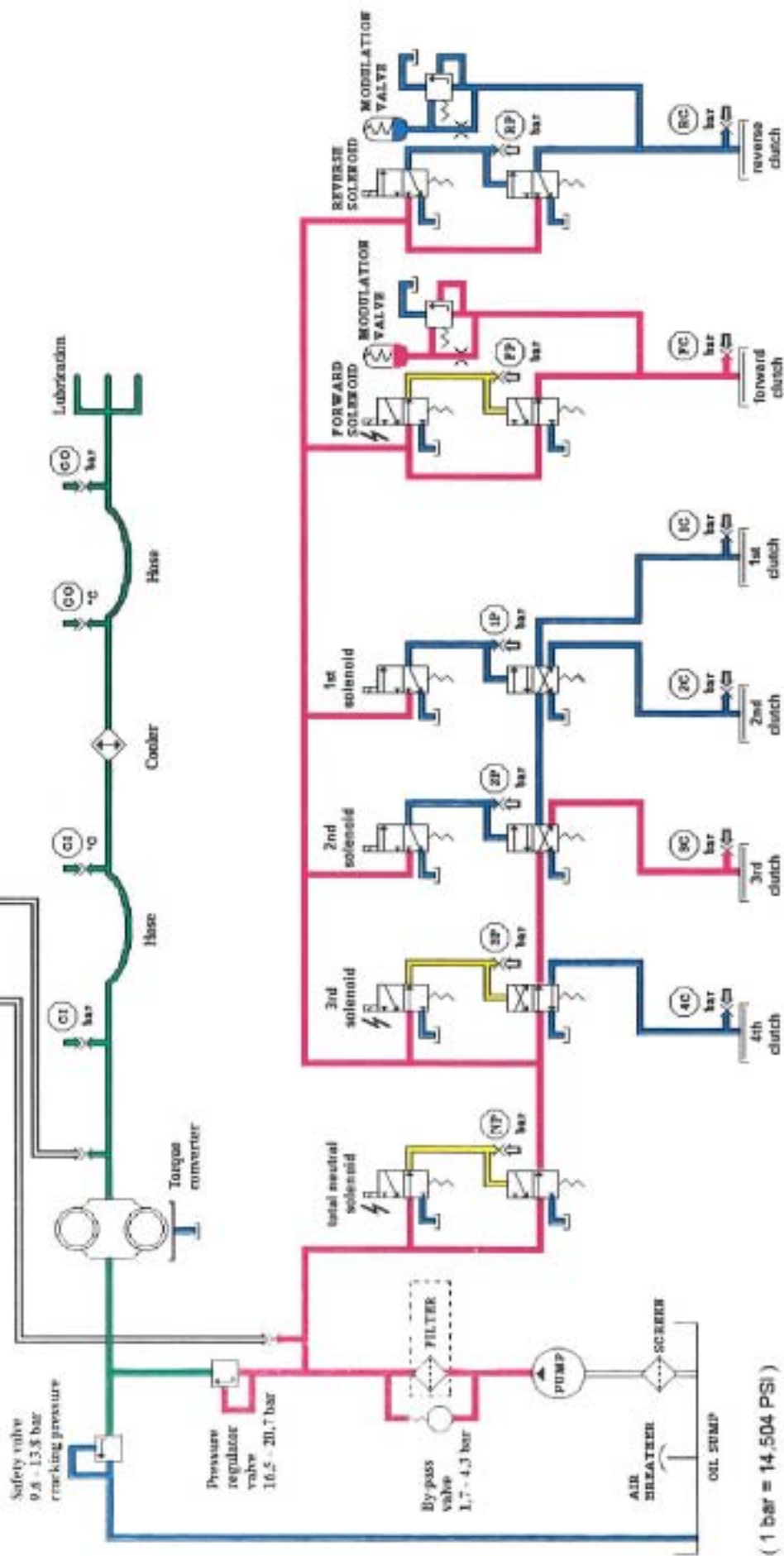
**OFF-HIGHWAY COMPONENTS**

**OPERATOR COMPARTMENT**

**PRESSURE GAUGE**

**TEMPERATURE GAUGE**

Forward and 3rd clutch engaged



( 1 bar = 14,504 PSI )

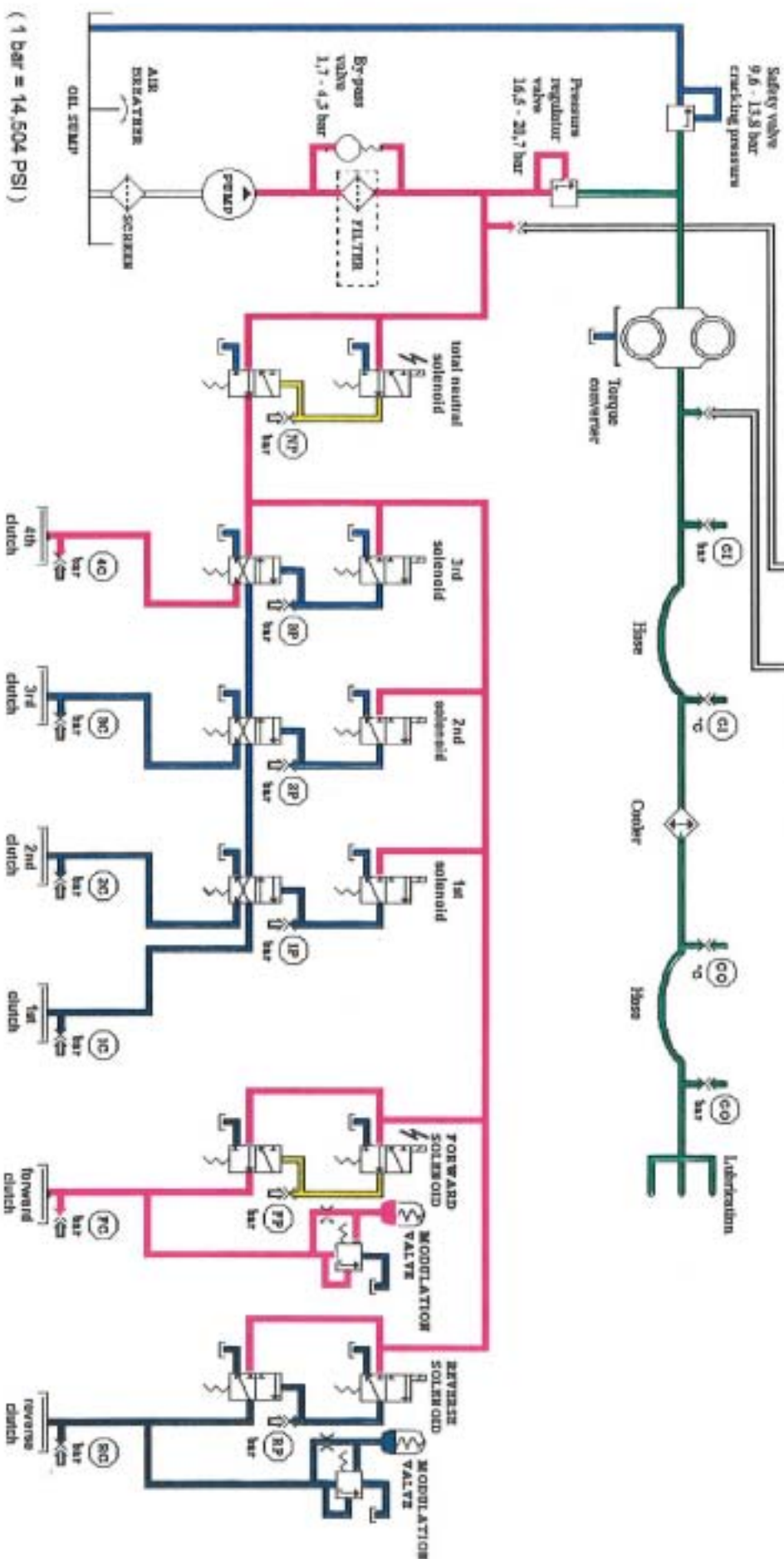


**28000 / 32000 transmission - hydraulic diagram**  
**4 speed - with total neutral**

**OPERATOR COMPARTMENT**  
 PRESSURE GAUGE  
 TEMPERATURE GAUGE

**Forward and 4th clutch engaged**

(X) PRESSURE CHECK-PORT  
 bar  
 (X) TEMPERATURE CHECK-PORT  
 °C



( 1 bar = 14,504 PSI )



**OFF-HIGHWAY COMPONENTS**

**28000 / 32000 transmission - hydraulic diagram  
4 speed - with total neutral**

**OPERATOR COMPARTMENT**

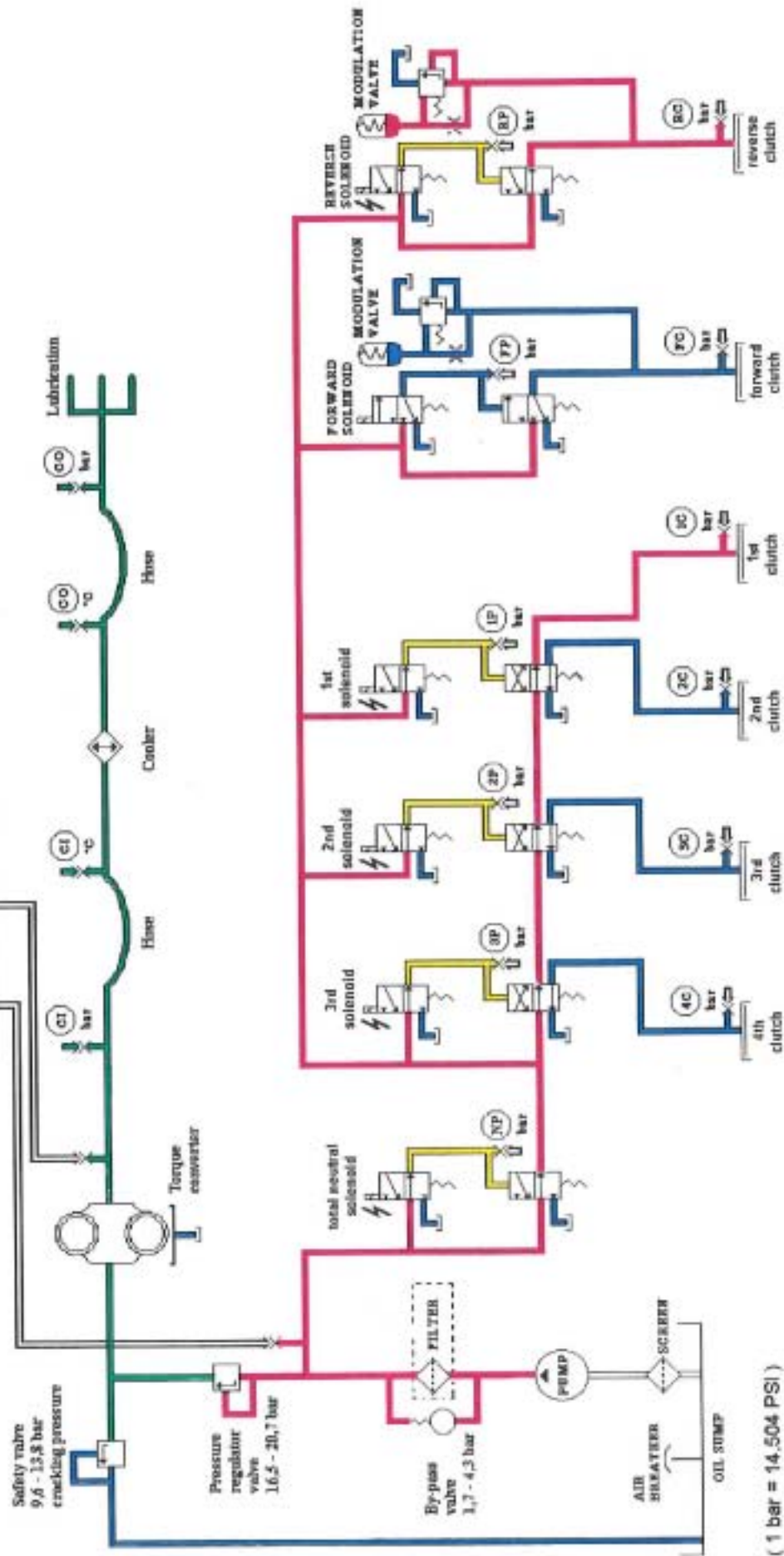
PRESSURE  
GAUGE

TEMPERATURE  
GAUGE

Reverse and 1st clutch engaged

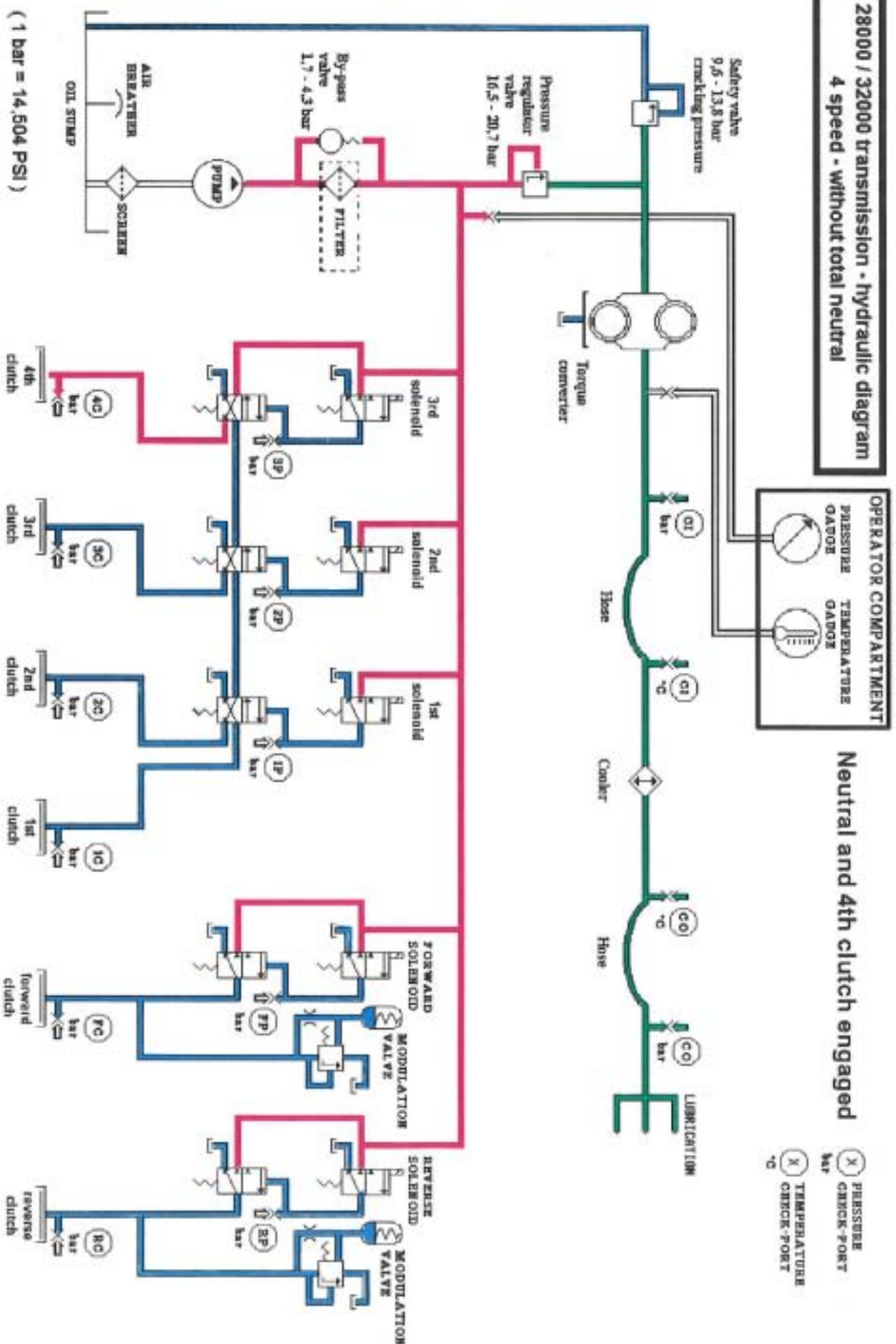
(X) PRESSURE  
CHECK-POINT  
bar

(X) TEMPERATURE  
CHECK-POINT  
°C



( 1 bar = 14.504 PSI )

**28000 / 32000 transmission - hydraulic diagram**  
**4 speed - without total neutral**





**4 speed - without total neutral**

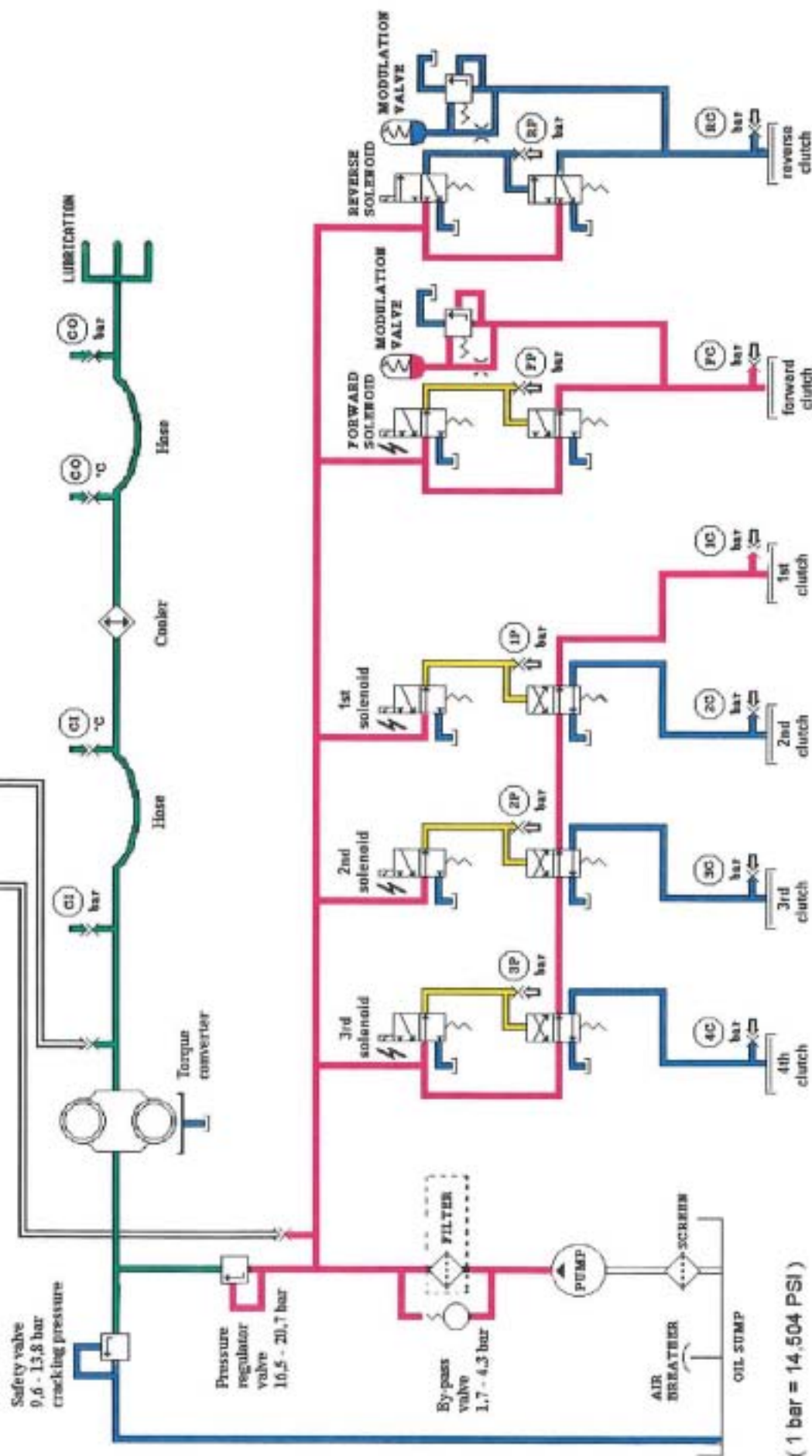
## Neutral and 4th clutch engaged



**28000 / 32000 transmission - hydraulic diagram  
4 speed - without total neutral**

**Forward and 1st clutch engaged**

(X) PRESSURE CHECK-PORT  
 bar  
 (X) TEMPERATURE CHECK-PORT  
 °C



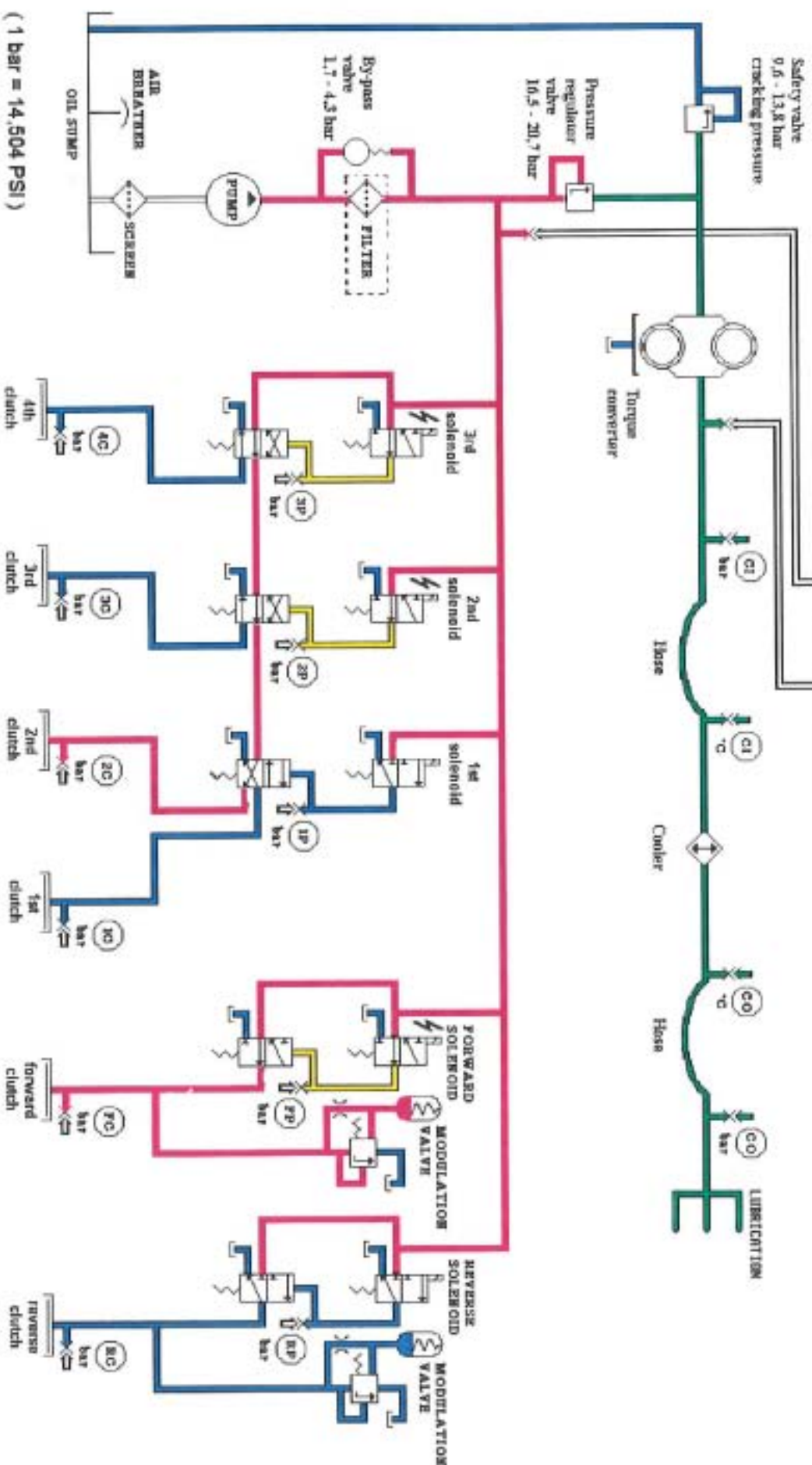
**OFF-HIGHWAY COMPONENTS**

**28000 / 32000 transmission - hydraulic diagram**  
**4 speed - without total neutral**

**OPERATOR COMPARTMENT**  
 PRESSURE GAUGE  
 TEMPERATURE GAUGE

**Forward and 2nd clutch engaged**

⊗ PRESSURE CHECK-PORT  
 °C TEMPERATURE CHECK-PORT

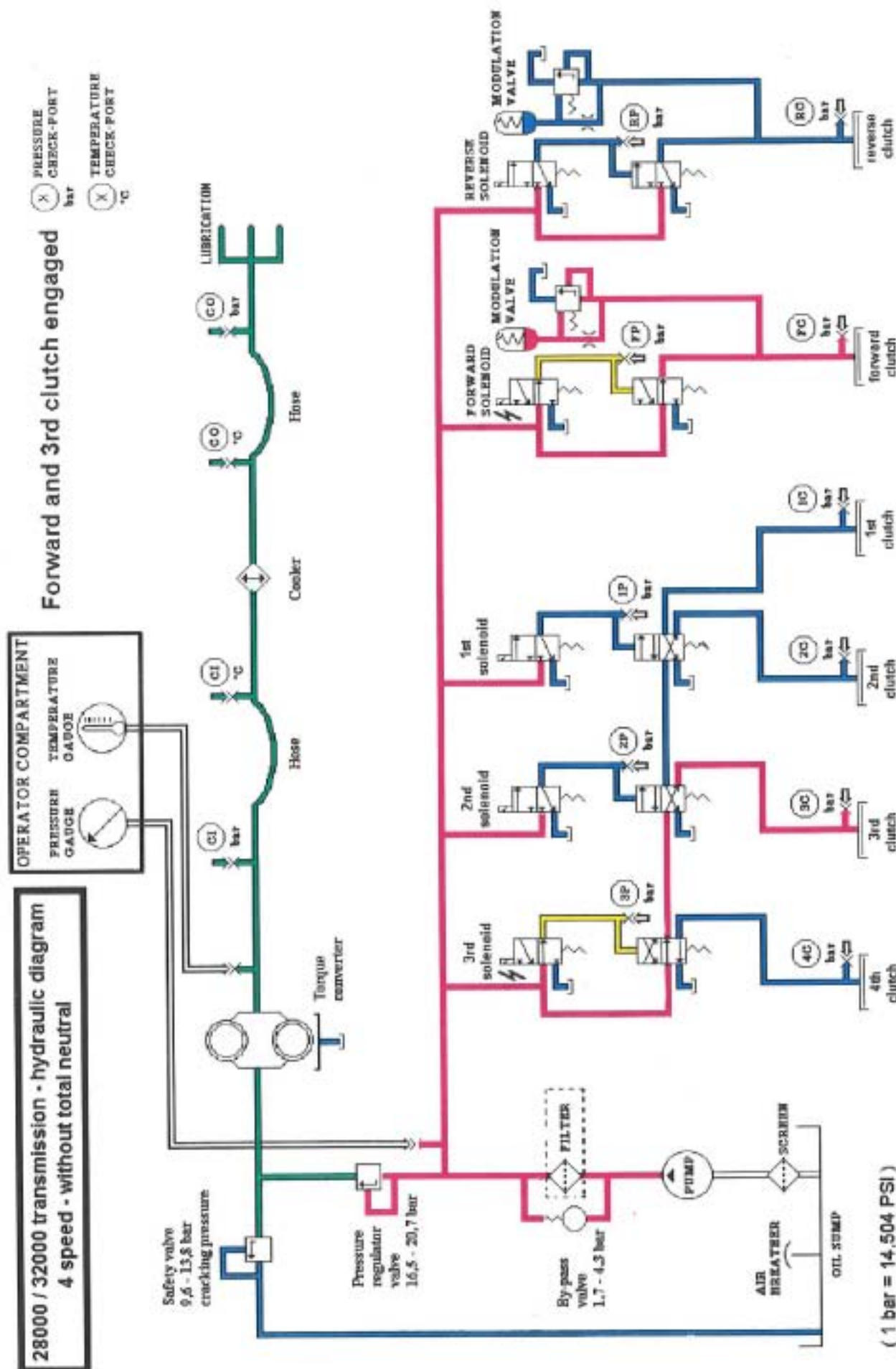


(1 bar = 14,504 PSI)



**OFF-HIGHWAY COMPONENTS**

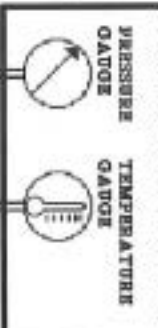




( 1 bar = 14,504 PSI )

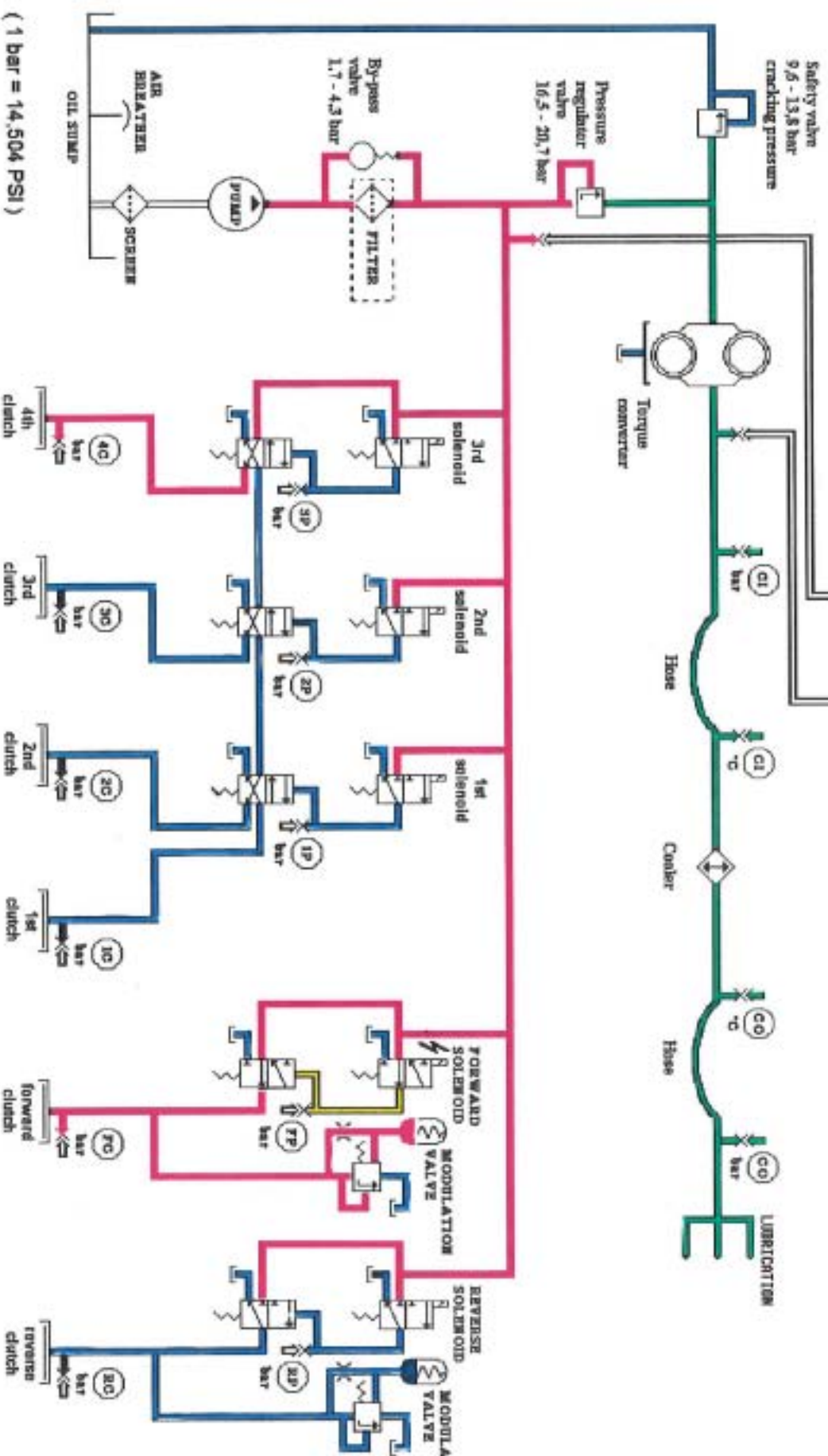
**28000 / 32000 transmission - hydraulic diagram**  
**4 speed - without total neutral**

**OPERATOR COMPARTMENT**



**Forward and 4th clutch engaged**

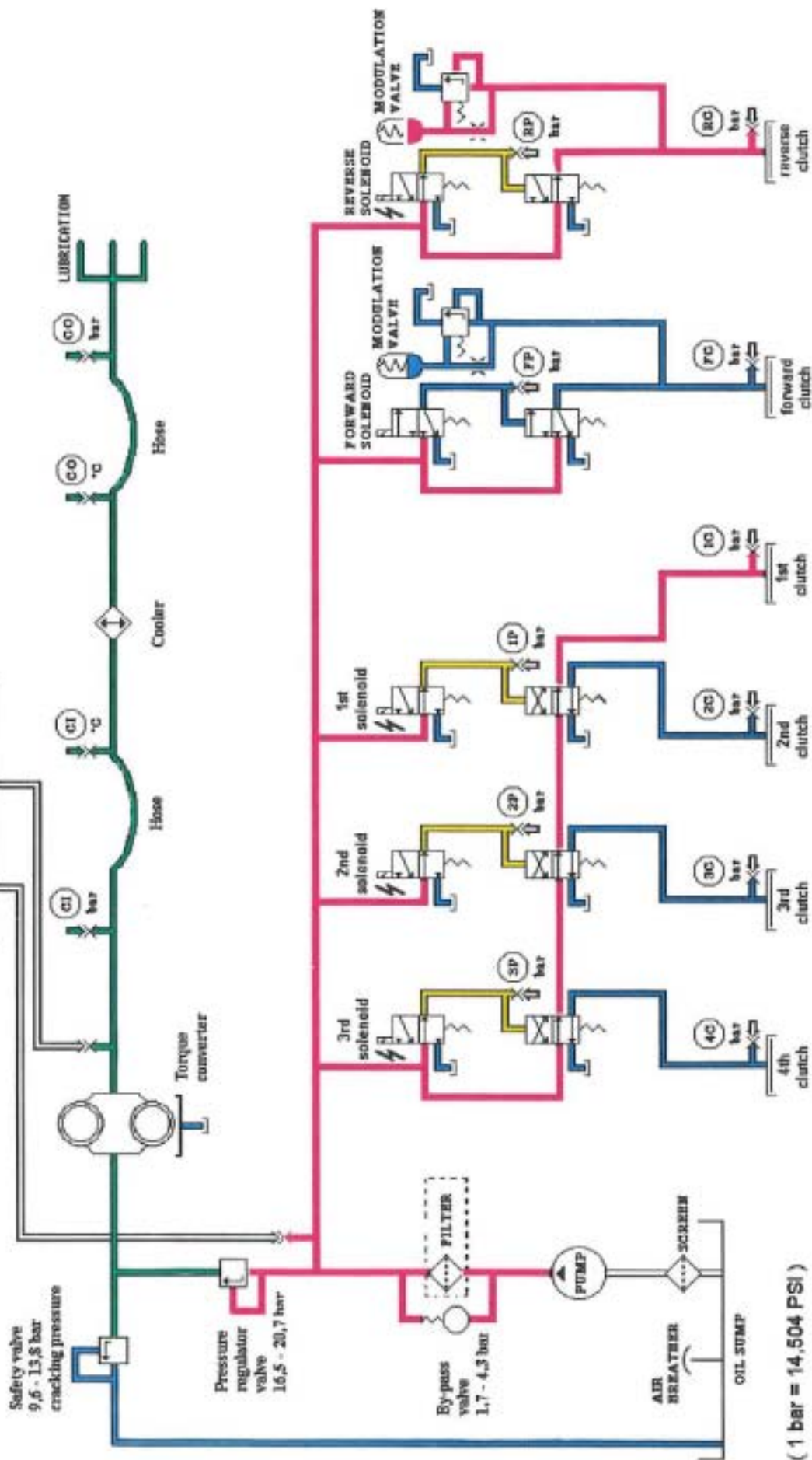
- (X) PRESSURE CHECK-PORT
- bar
- (X) TEMPERATURE CHECK-PORT
- °C



**28000 / 32000 transmission - hydraulic diagram**  
**4 speed - without total neutral**

**Reverse and 1st clutch engaged**

(X) PRESSURE CHECK-PORT  
 bar  
 (X) TEMPERATURE CHECK-PORT  
 °C



( 1 bar = 14,504 PSI )





---

***OFF-HIGHWAY COMPONENTS***

**APPLICATION POLICY**

Capability ratings, features and specifications vary depending upon the model type of service. Application approvals must be obtained from Spicer Off-Highway Products Division. We reserve the right to change or modify our product specifications, configurations, or dimensions at any time without notice.



**SPICER OFF-HIGHWAY PRODUCTS DIVISION**

1293 Glenway Drive  
Statesville, NC 28625

Tel: 704-873-2811 Fax: 704-878-5616