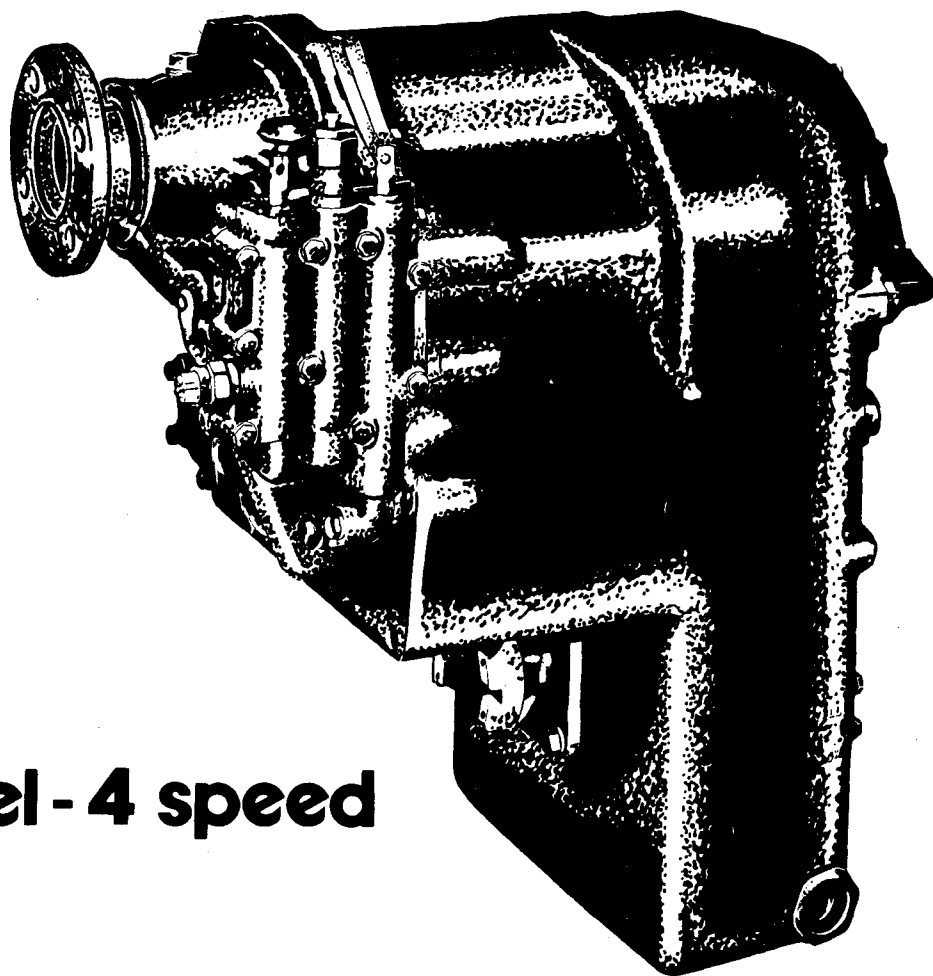


32000 powershift transmission

maintenance & service manual



R model - 4 speed

CLARK COMPONENTS COMPANY

Div. of Clark Equipment Company

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FOREWORD



This manual has been prepared to provide the customer and the maintenance personnel with information and instructions on the maintenance and repair of the **CLARK** Power Shift Transmission.

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

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

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

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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
- Transmission Case and Front Cover Group
- Reverse and 3rd, Forward and 2nd Clutch Group
- Low, 4th and Output Group
- Control Valve Assembly
- Axle Disconnect and Mechanical Parking Brake
- Assembly Instruction
- Clutch and Gear Arrangement
- Shielded Bearing Installation
- Four 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.

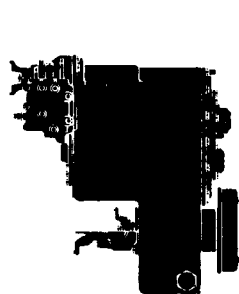
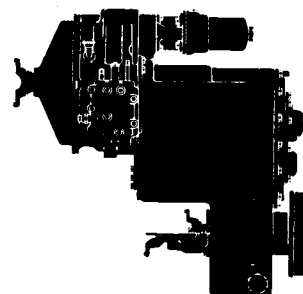
With the engine running and the directional control lever in neutral position, oil pressure from the regulating valve is blocked at the control valve, and the transmission is in neutral. Movement of the forward and reverse spool will direct oil, under pressure to either the forward or reverse direction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

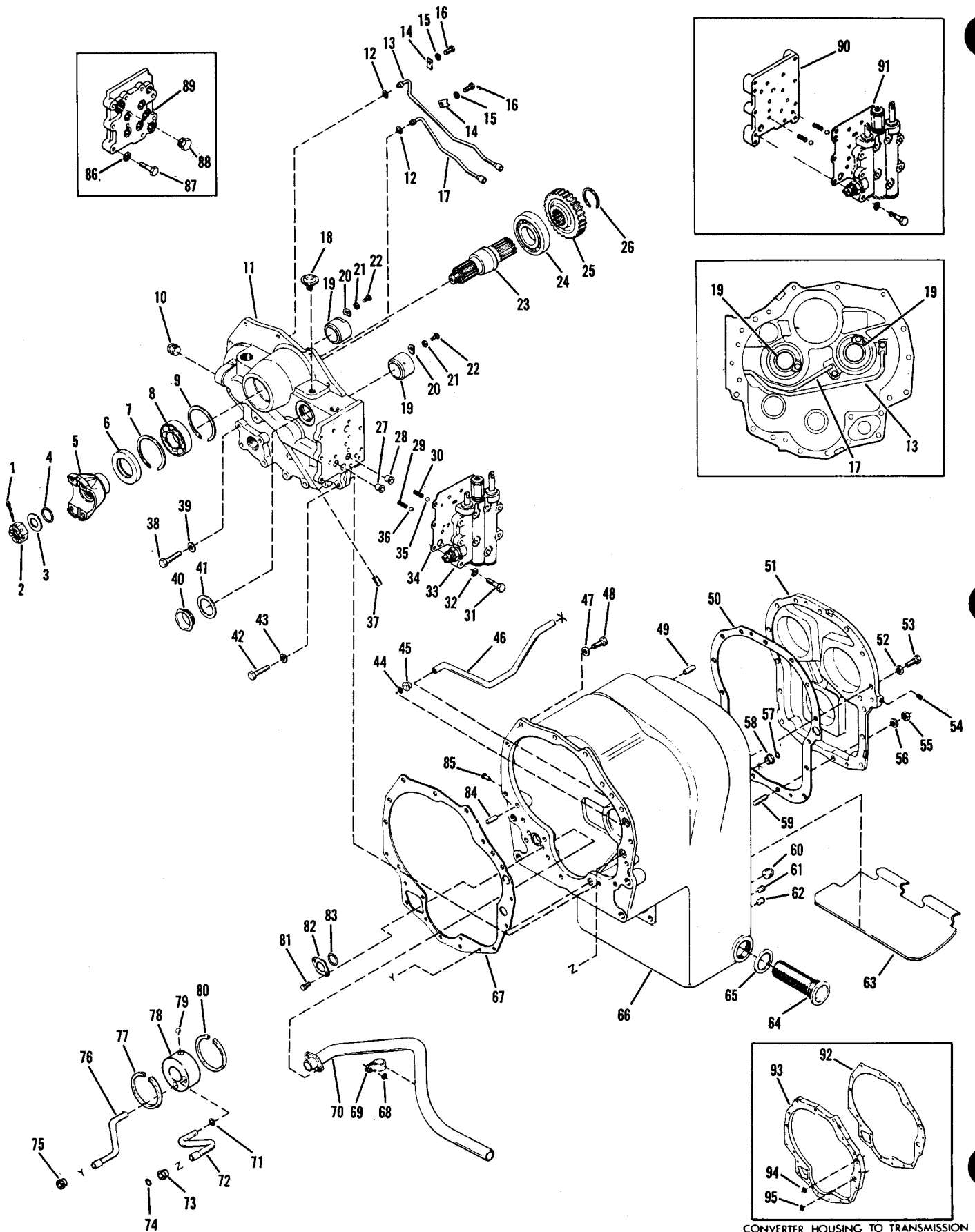
The direction or speed clutch assembly consists of a drum with internal splines and a bore to receive a hydraulically actuated piston. The piston is "oil tight" by the use of sealing rings. A steel disc with external splines is inserted into the drum and rests against the piston. Next, friction disc 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**

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CONVERTER HOUSING TO TRANSMISSION
CASE SPACER USED ONLY WITH 12
PLATE CLUTCH PACK ASSEMBLY

Figure B

R32000 TRANSMISSION CASE AND FRONT COVER GROUP

ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	Flange Nut Cotter	1	48	Cover to Case Screw	10
2	Flange Nut	1	49	Rear Cover Dowel Pin	2
3	Flange Nut Washer	1	50	Rear Cover to Transmission Case Gasket	1
4	Flange "O" Ring	1	51	Rear Cover	1
5	Input Flange	1	52	Rear Cover to Transmission Case Screw Lockwasher ..	13
6	Input Flange Oil Seal	1	53	Rear Cover to Transmission Case Screw	13
7	Input Shaft Front Bearing Retaining Ring	1	54	Rear Cover Pipe Plug	1
8	Input Shaft Front Bearing	1	55	Rear Cover to Case Stud Nut	2
9	Input Shaft Front Bearing Retaining Ring	1	56	Rear Cover to Case Stud Lockwasher	2
10	Pipe Plug	1	57	Clutch Pressure Tube "O" Ring	1
11	Front Cover & Tube Assembly	1	58	Tube Sleeve	1
12	"O" Ring	2	59	Rear Cover to Case Stud	2
13	3rd Speed Tube Assembly	1	60	Magnetic Drain Plug	1
14	Tube Clip	2	61	Oil Level Plug	1
15	Tube Clip Screw Lockwasher	2	62	Oil Level Plug	1
16	Tube Clip Screw	2	63	Oil Baffle	1
17	Reverse Tube Assembly	1	64	Screen Assembly	1
18	Breather	1	65	Screen Assembly Gasket	1
19	Front Cover Sleeve	2	66	Transmission Case & Tube Assembly	1
20	Front Cover Sleeve Lock	2	67	Front Cover Gasket	1
21	Sleeve Lockscrew Lockwasher	2	68	Suction Tube Clip Washer	1
22	Sleeve Lockscrew	2	69	Suction Tube Clip	1
23	Input Shaft	1	70	Suction Tube Assembly	1
24	Input Shaft Rear Bearing	1	71	Pressure Tube "O" Ring	1
25	Input Shaft Gear	1	72	4th Speed Pressure Tube	1
26	Input Shaft Gear Retaining Ring	1	73	Tube Sleeve	1
27	Tube Sleeve	1	74	Pressure Tube "O" Ring	1
28	Tube Sleeve	1	75	Tube Sleeve	1
29	Detent Spring	1	76	4th Speed Clutch Lube Tube	1
30	Detent Spring	1	77	Oil Distributor Retainer Ring	1
31	Valve to Converter Housing Screw	9	78	4th Clutch Front Oil Distributor	1
32	Valve to Converter Housing Screw Lockwasher	9	79	Locking Ball	1
33	Control Valve Assembly	1	80	Oil Distributor Retainer Ring	1
34	Control Valve Gasket	1	81	Suction Line Screw	2
35	Detent Ball	1	82	Suction Line Washer	1
36	Detent Ball	1	83	Suction Line "O" Ring	1
37	Pipe Plug	1	84	Front Cover Dowel Pin	2
38	Cover to Case Screw	4	85	Suction Tube Clip Rivet	1
39	Cover to Case Screw Lockwasher	4	86	Valve Plate to Cover Screw Lockwasher	9
40	Front Cover Plug	1	87	Valve Plate to Cover Screw	9
40	Front Cover Plug	1	88	Valve Plate Plug	1
41	Front Cover Plug Gasket	1	89	Valve Plate Cover	1
42	Cover to Case Screw	4	90	Control Valve Mounting Plate	1
43	Cover to Case Screw Lockwasher	4	91	Control Valve Gasket	1
44	Clutch Pressure Tube "O" Ring	1	92	Front Cover to Transmission Case Spacer Gasket	1
45	Tube Sleeve	1	93	Front Cover to Transmission Case Spacer	1
46	Low Speed Clutch Pressure Tube	1	94	Low Speed Pressure Tube "O" Ring	1
47	Cover to Case Screw Lockwasher	10	95	4th Speed Pressure Tube "O" Ring	1

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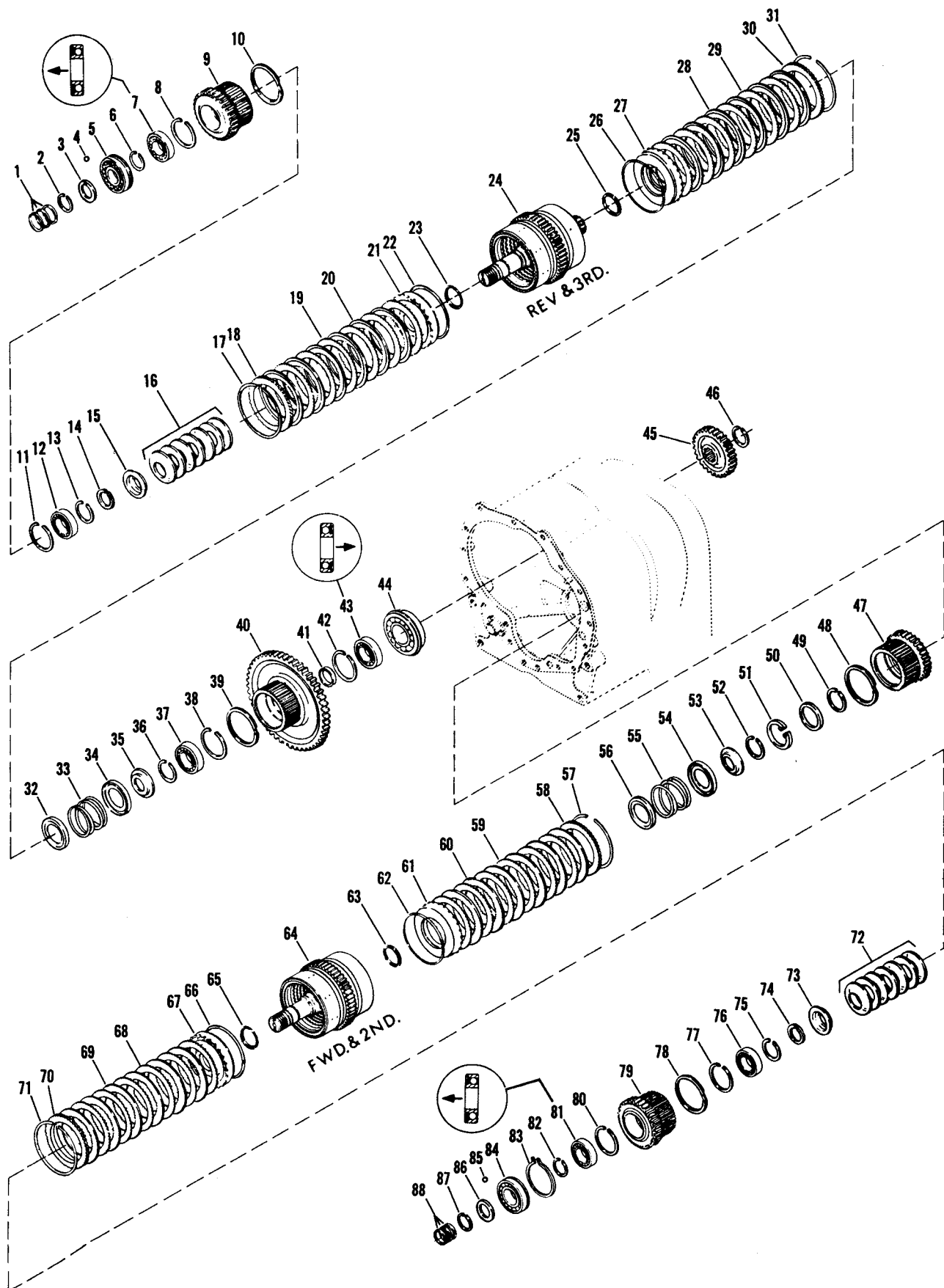


Figure C

R OR HR32000

REVERSE & 3RD & FORWARD & 2ND CLUTCH GROUP

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

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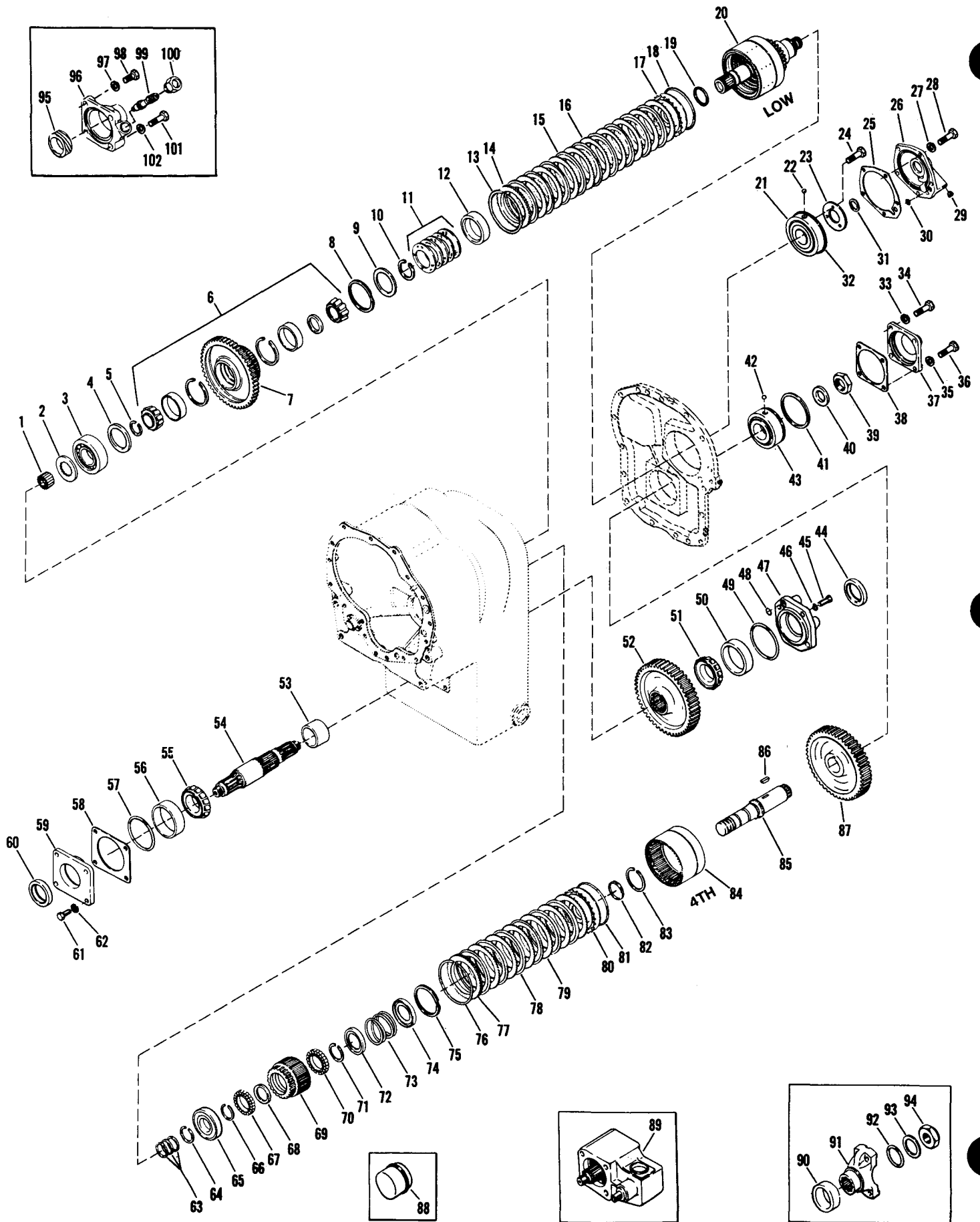


Figure D

R OR HR32000 LOW, 4TH & OUTPUT GROUP

ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	Low Speed Clutch Shaft Pilot Bearing.....	1	52	Output Shaft Gear.....	1
2	2nd Gear Bearing End Plate.....	1	53	Output Shaft Gear Spacer.....	1
3	2nd Gear Bearing.....	1	54	Output Shaft.....	1
4	Bearing Retaining Ring Retainer.....	1	55	Front Bearing Cone.....	1
5	Low Speed Gear Bearing Ring.....	1	56	Front Bearing Cup.....	1
6	Low Speed Gear Bearing Assembly.....	1	57	Front Bearing Cap "O" Ring.....	1
7	Low Speed Gear.....	1	58	Bearing Cap Shim.....	AR
8	Clutch Hub Oil Baffle Ring.....	1	59	Front Bearing Cap.....	1
9	Spring Retainer Ring Retainer.....	1	60	Front Bearing Cap Oil Seal.....	1
10	Spring Retaining Ring.....	1	61	Front Bearing Cap Screw.....	4
11	Belleville Washer.....	5	62	Front Bearing Cap Screw Lockwasher.....	4
12	Piston to Belleville Washer Spacer.....	1	63	4th Gear Piston Ring.....	3
13	End Plate Retaining Ring.....	1	64	4th Gear Front Bearing Snap Ring.....	1
14	End Plate.....	1	65	Idler Shaft Front Bearing.....	1
15	Clutch Inner Disc.....	9	66	4th Gear Bearing Snap Ring.....	1
16	Clutch Outer Disc.....	9	67	4th Gear Bearing.....	1
17	Clutch Piston.....	1	68	4th Gear Spacer.....	1
18	Clutch Piston Outer Seal Ring.....	1	69	4th Gear.....	1
19	Clutch Piston Inner Seal Ring.....	1	70	4th Gear Bearing.....	1
20	Low Speed Clutch Drum.....	1	71	Bearing Snap Ring.....	1
21	Low Speed Shaft Rear Bearing.....	1	72	Spring Retainer.....	1
22	Bearing Lockball.....	1	73	Piston Return Spring.....	1
23	Rear Bearing Retainer Plate.....	1	74	Spring Retainer.....	1
24	Rear Bearing Retainer Plate Screw.....	1	75	Oil Baffle Ring.....	1
25	Rear Bearing Cap Gasket.....	1	76	Backing Plate Snap Ring.....	1
26	Rear Bearing Cap.....	1	77	Clutch Disc Backing Plate.....	1
27	Rear Bearing Cap Screw Lockwasher.....	5	78	Clutch Inner Disc.....	6
28	Rear Bearing Cap Screw.....	5	79	Clutch Outer Disc.....	6
29	Rear Bearing Cap Plug.....	1	80	Clutch Piston.....	1
30	Rear Bearing Cap "O" Ring.....	1	81	Clutch Piston Outer Seal Ring.....	1
31	Clutch Shaft Piston Ring.....	1	82	Clutch Piston Inner Seal Ring.....	1
32	Low Speed Shaft Rear Bearing Locating Ring.....	1	83	4th Clutch Drum Locating Ring.....	1
33	Bearing Cap Screw Lockwasher.....	4	84	4th Clutch Drum.....	1
34	Bearing Cap Screw.....	4	85	Idler Shaft.....	1
35	Bearing Cap Screw Lockwasher.....	4	86	Idler Shaft Gear Key.....	1
36	Bearing Cap Screw.....	4	87	Idler Shaft Gear.....	1
37	Idler Shaft Bearing Cap.....	1	88	Bore Plug.....	1
38	Idler Shaft Bearing Cap Gasket.....	1	89	Disconnect Assembly.....	1
39	Idler Shaft Nut.....	1	90	Oil Seal.....	1
40	Idler Shaft Washer.....	1	91	Output Flange.....	1
41	Rear Bearing Locating Ring.....	1	92	Output Flange "O" Ring.....	1
42	Idler Shaft Rear Bearing Lock Ball.....	1	93	Output Flange Washer.....	1
43	Idler Shaft Rear Bearing.....	1	94	Output Flange Nut.....	1
44	Rear Bearing Cap Oil Seal.....	1	95	Speedo Drive Gear.....	1
45	Rear Bearing Capscrew.....	4	96	Rear Bearing Cap.....	1
46	Rear Bearing Capscrew Lockwasher.....	4	97	Rear Bearing Cap Screw Lockwasher.....	3
47	Rear Bearing Cap.....	1	98	Rear Bearing Cap Screw.....	3
48	Rear Bearing Cap "O" Ring.....	1	99	Speedo Driven Gear.....	1
49	Rear Bearing Cap "O" Ring.....	1	100	Speedo Tube Nut.....	1
50	Rear Bearing Cup.....	1	101	Rear Bearing Cap Screw.....	1
51	Rear Bearing Cone.....	1	102	Rear Bearing Cap Screw Lockwasher.....	1

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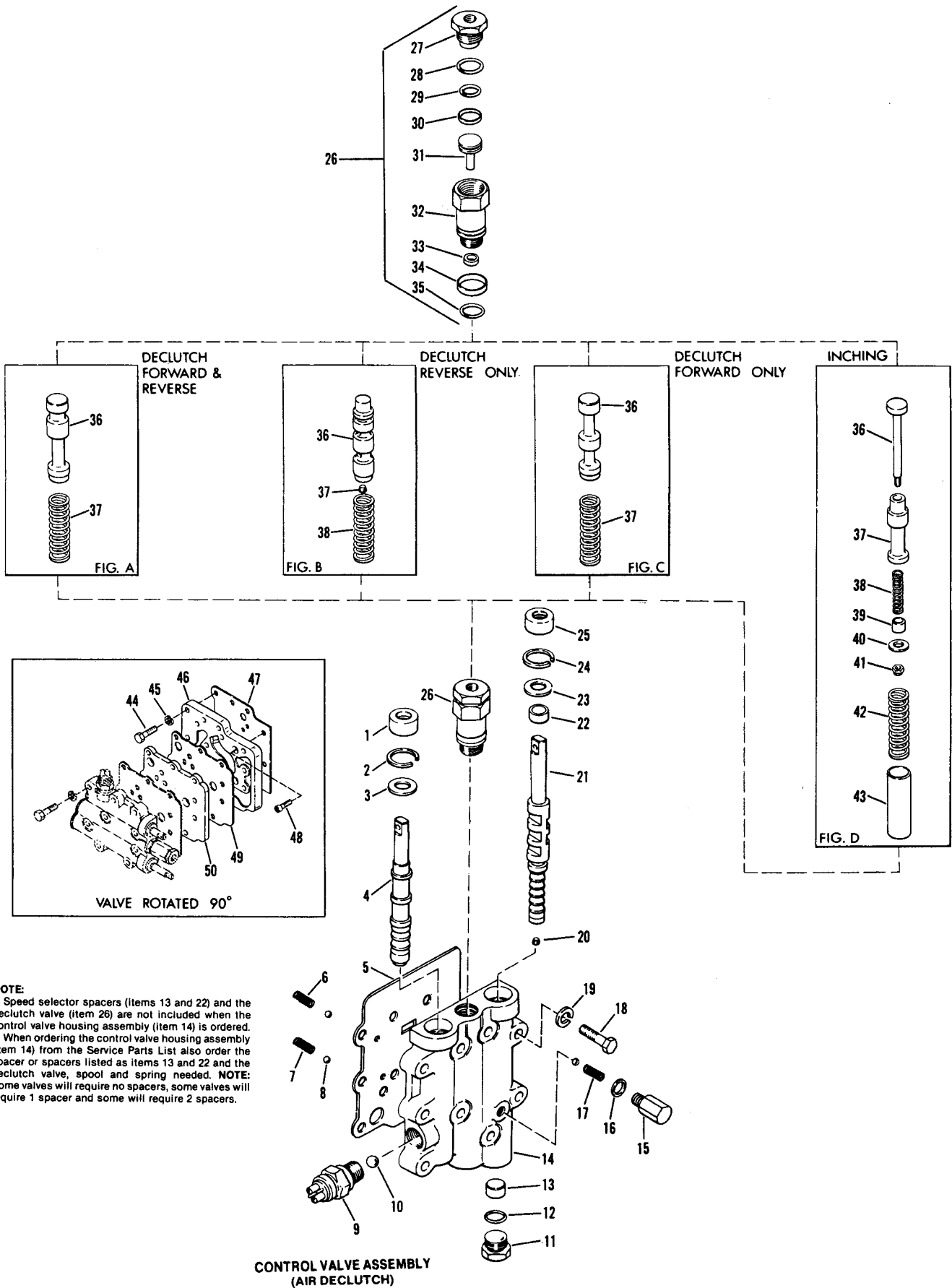


Figure E

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	Figures A-B-C & D are various declutch options.		
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

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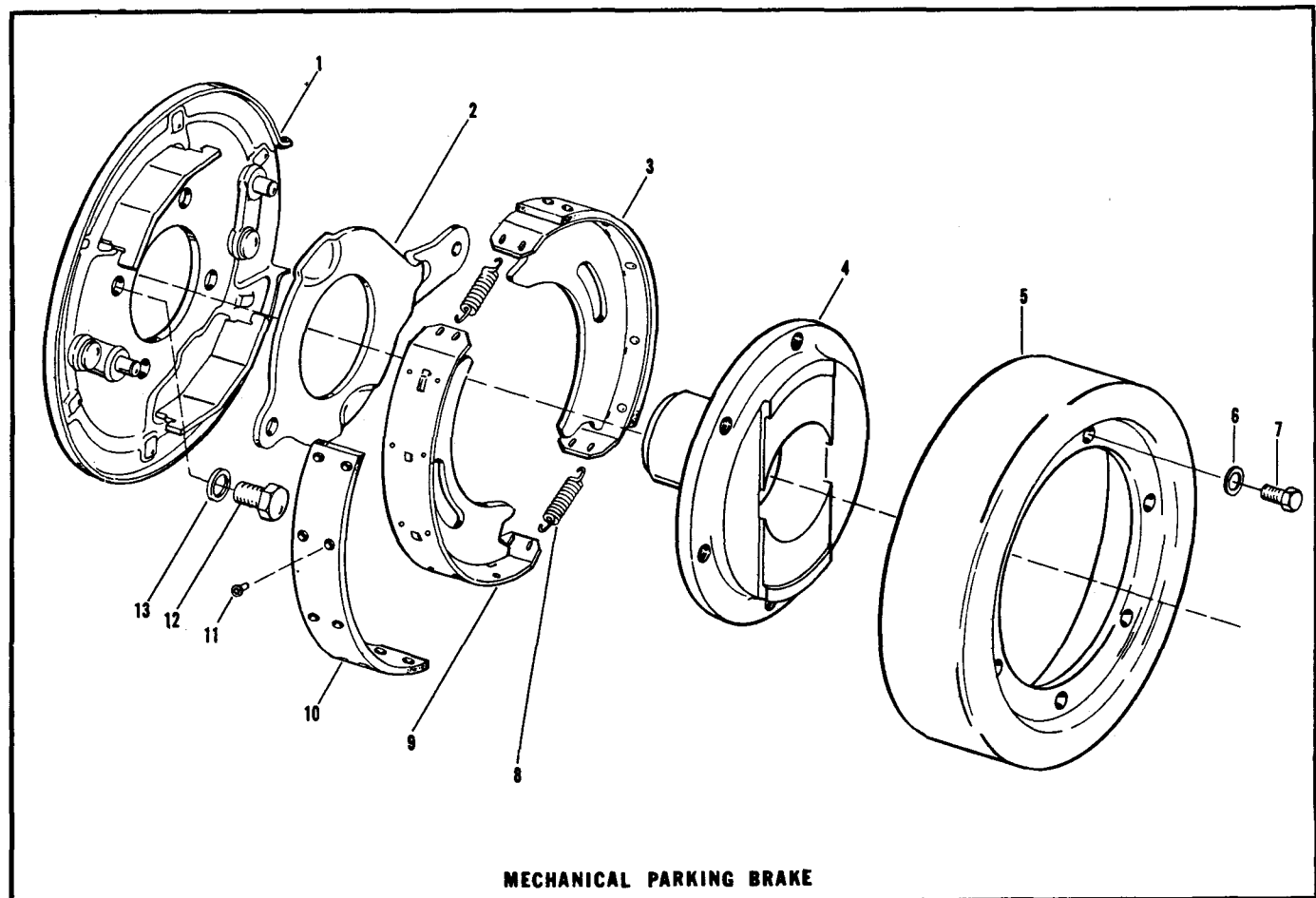
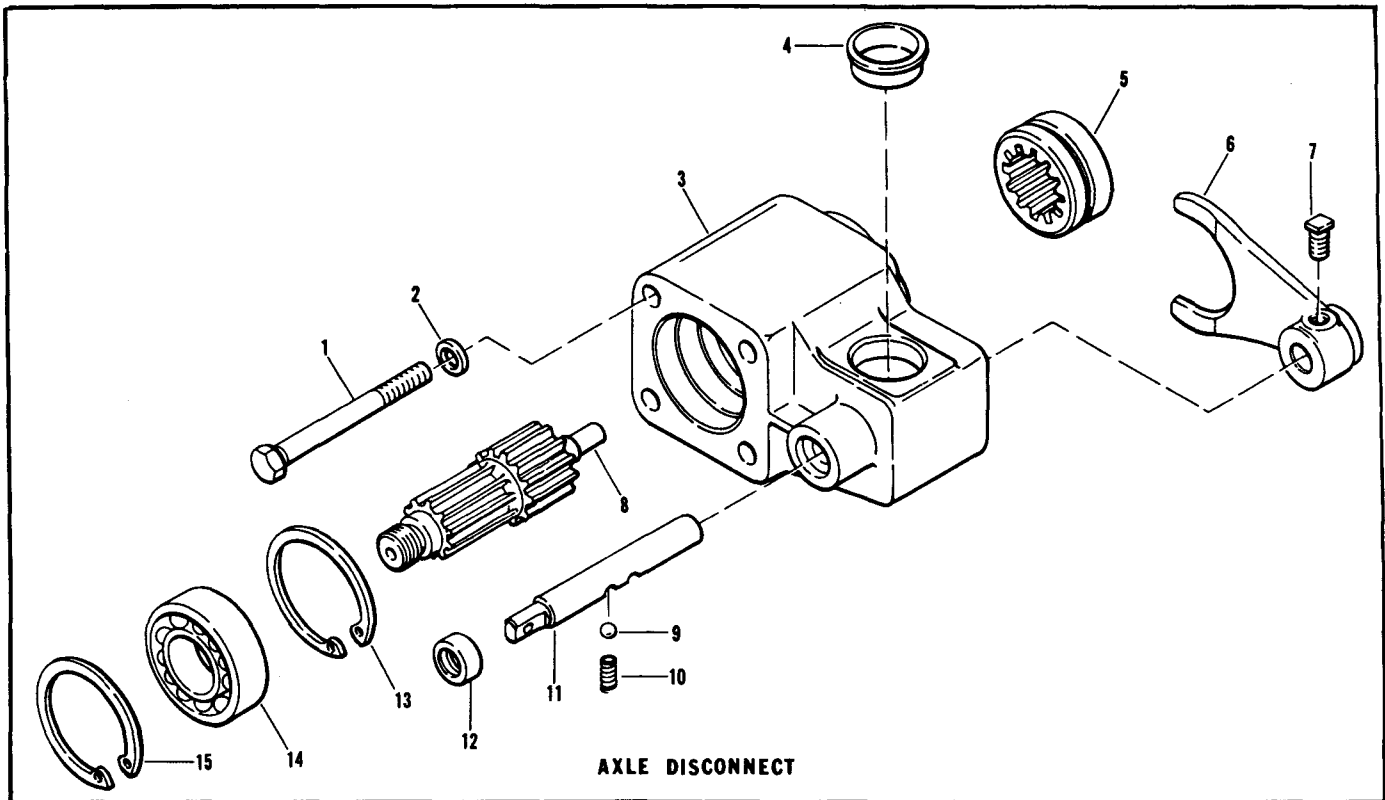


Figure F

AXLE DISCONNECT

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

MECHANICAL PARKING BRAKE

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

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R-32000 ASSEMBLY INSTRUCTION ILLUSTRATION

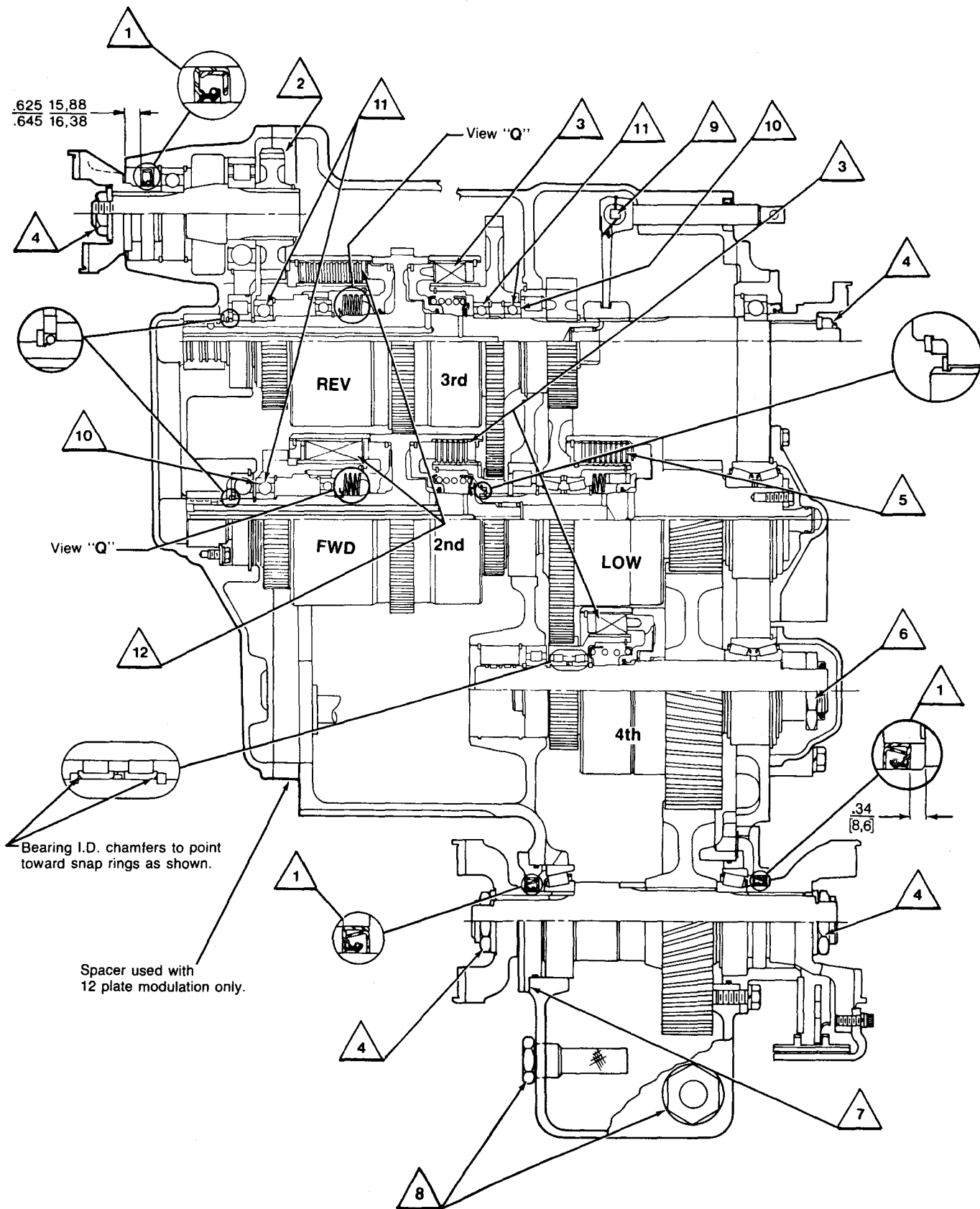


Figure G

- 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 bronze plates. Assemble alternately, starting with outer steel plate.
- 4 Tighten nut 200 to 250 Lbs. Ft. [271,2-338,9 N·m]
- 5 Low clutch, 9-outer steel plates, 9-inner bronze plates. Assemble alternately, starting with outer steel plate.
- 6 Tighten nut 250 to 300 Lbs. Ft. [339,0-406,0 N·m]

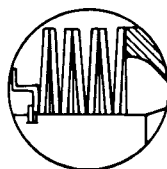
- 7 Shim output shaft bearings to produce 6 to 8 Lbs.-In. [0,68,-0,90 N·m] preload.
- 8 Tighten oil screen ass'y. 10 to 15 Lbs. Ft. [13,6-20,0 N·m]
- 9 Lockwire to prevent loosening
- 10 Bearing shield out
- 11 Must be loose internal fit bearings, No. "3" etched on bearing.
- 12 (12 Plate Modulation) Two clutches, 12-outer steel plates, 12-inner bronze 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: Metric dimensions shown in brackets [].

View "Q"
2 Places



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

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 G

MAINTENANCE AND SERVICE

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

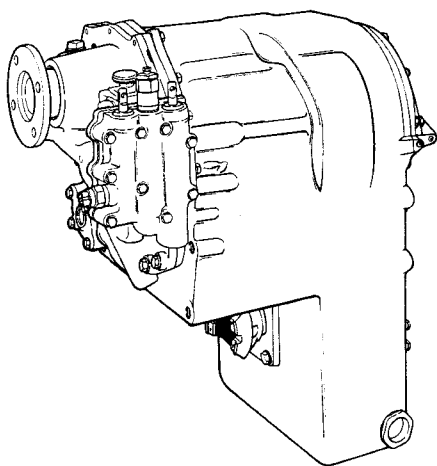


Figure 1
Side view of transmission.

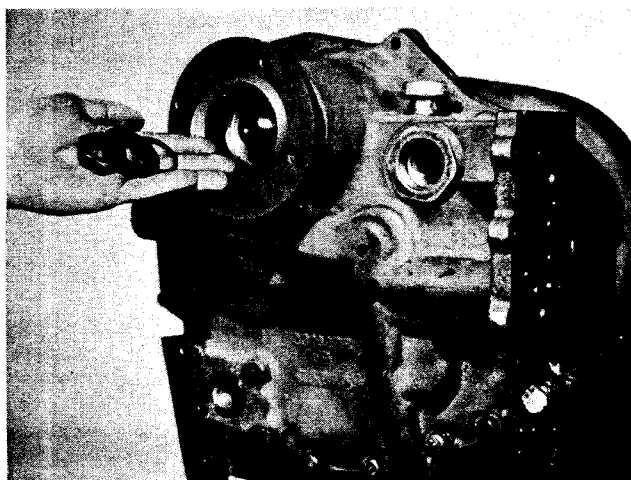


Figure 3
Remove companion flange nut, washer and "O" ring.

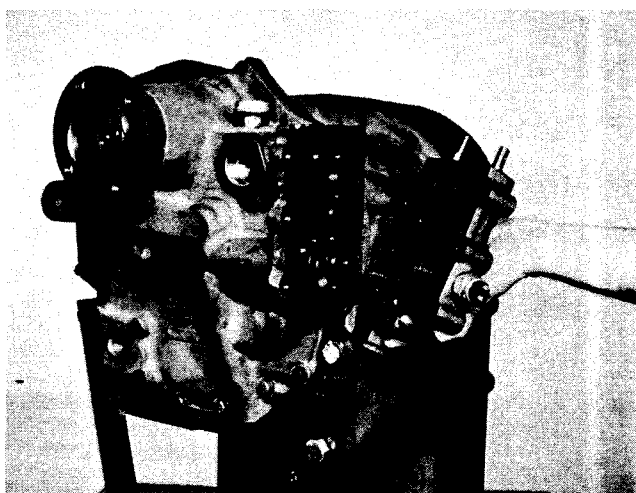


Figure 2
Remove control valve bolts and washers. Remove control valve. Use caution as not to lose detent springs and balls.

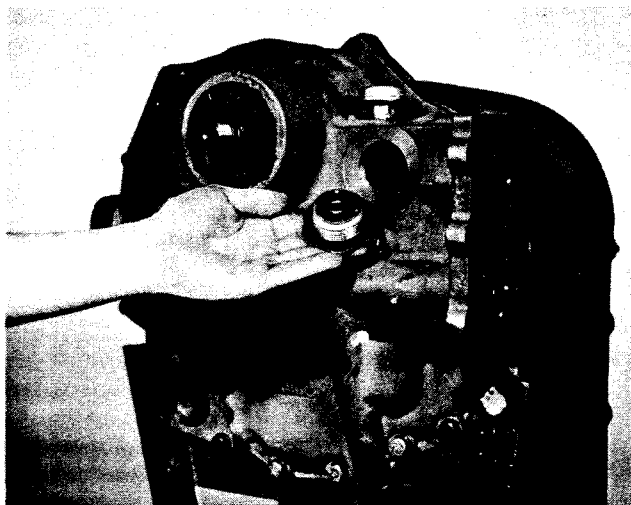


Figure 4
Remove front cover plug.

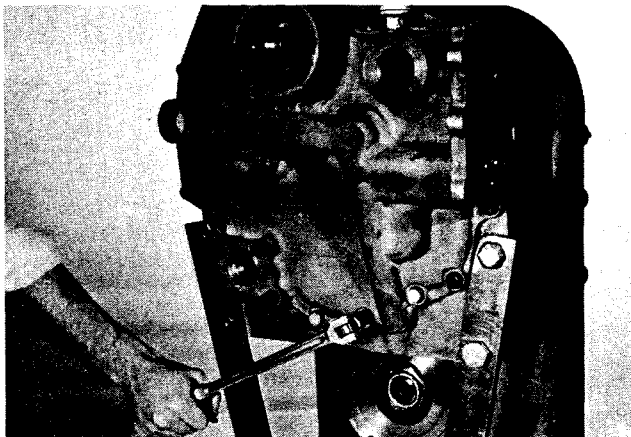


Figure 5

Remove bolts securing front cover to transmission housing.

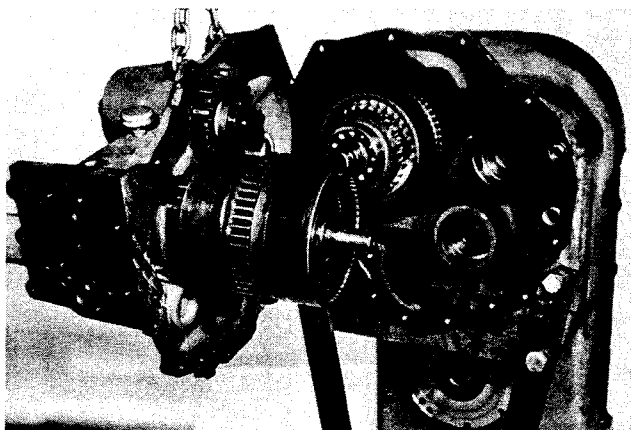


Figure 6

Remove front cover and forward and 2nd clutch.

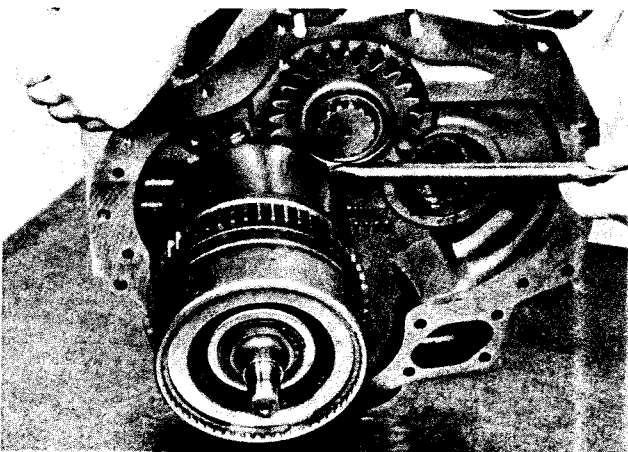


Figure 7

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

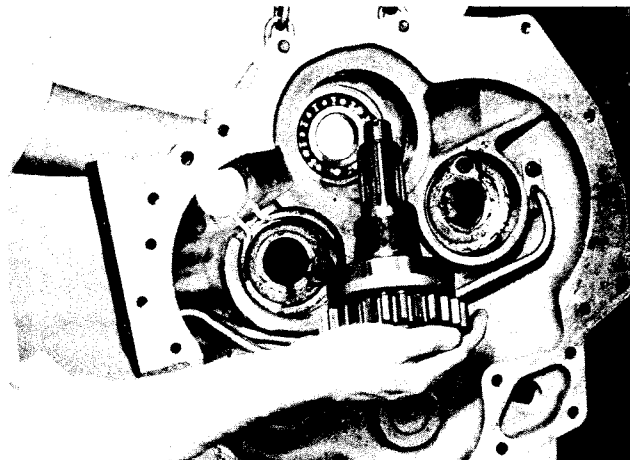


Figure 8

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

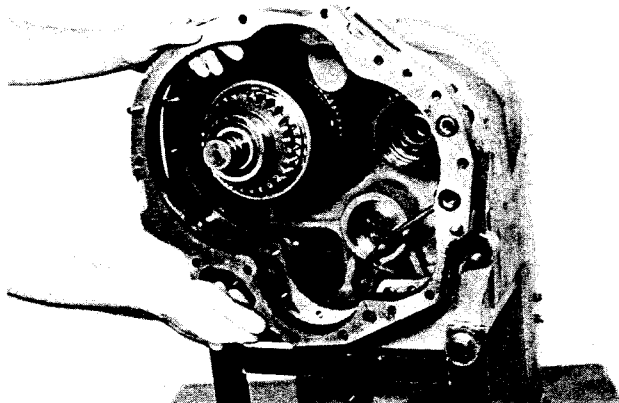


Figure 9

Remove converter to transmission housing spacer. (Used with 12 plate modulated clutches).

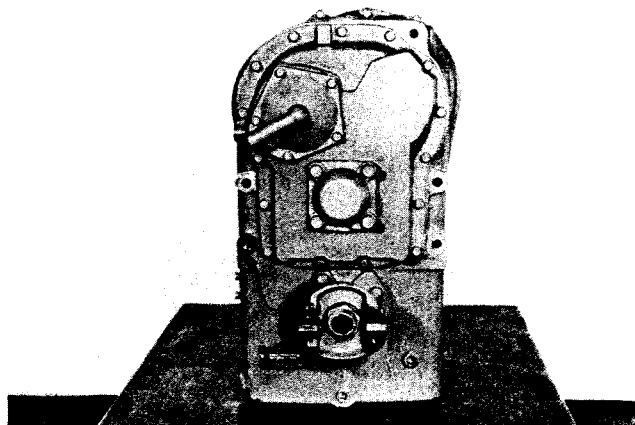


Figure 10

Rear view of transmission.

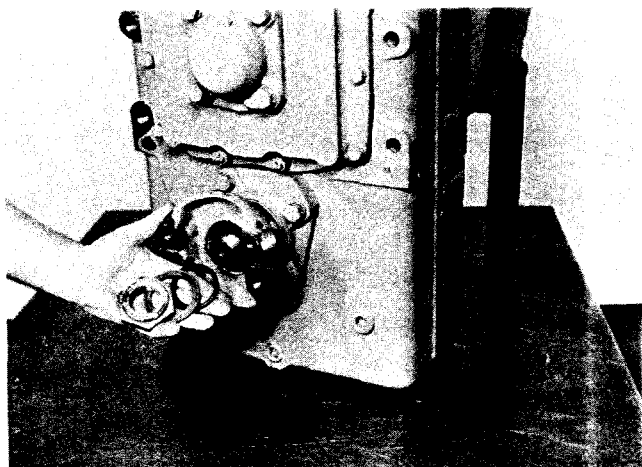


Figure 11

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

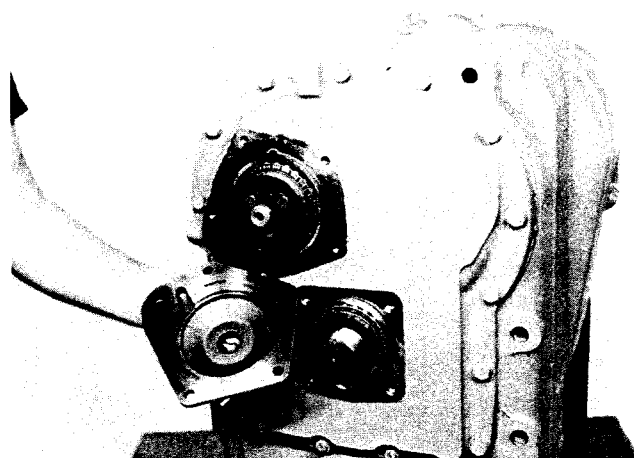


Figure 14

Remove low clutch rear bearing cap.

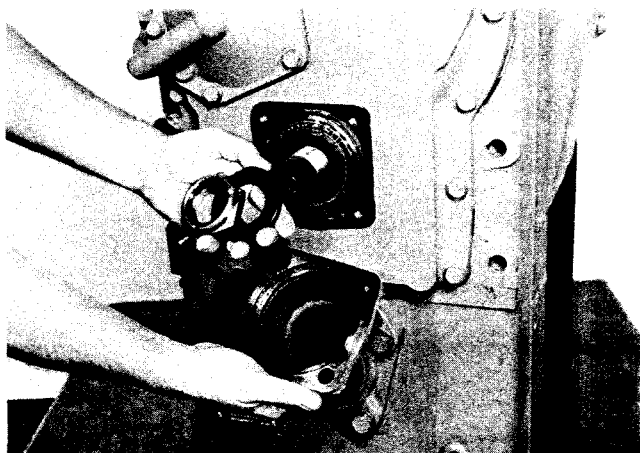


Figure 12

Remove idler shaft bearing cap bolts, bearing cap, idler shaft nut and spacer.

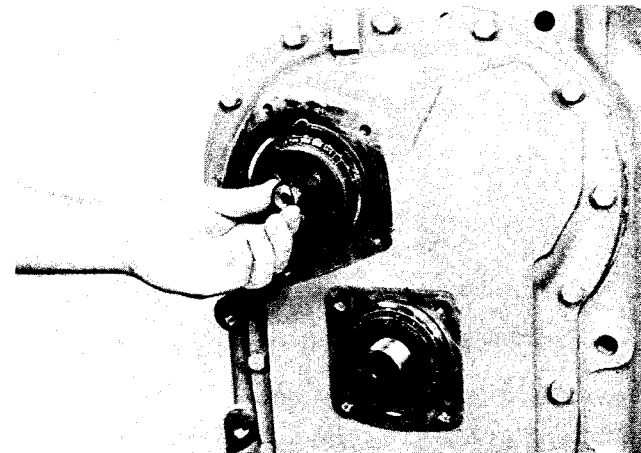


Figure 15

Cut and remove lock wire. Remove low clutch shaft oil sealing ring.

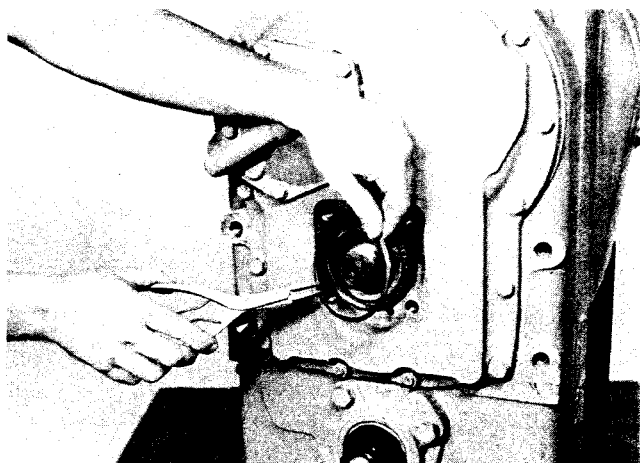


Figure 13

Remove idler shaft rear bearing locating ring.

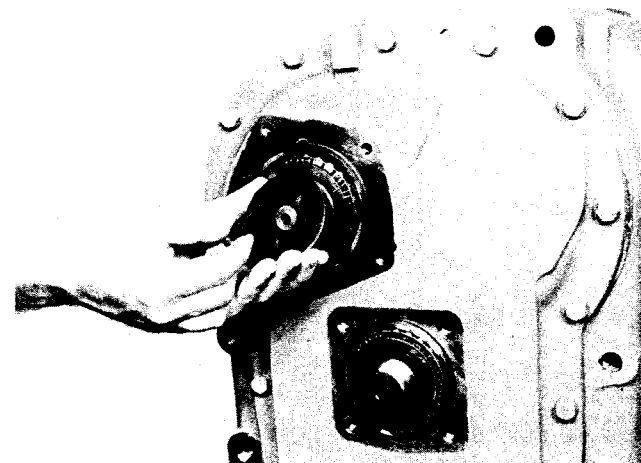


Figure 16

Remove 3 bolts and bearing retainer plate.

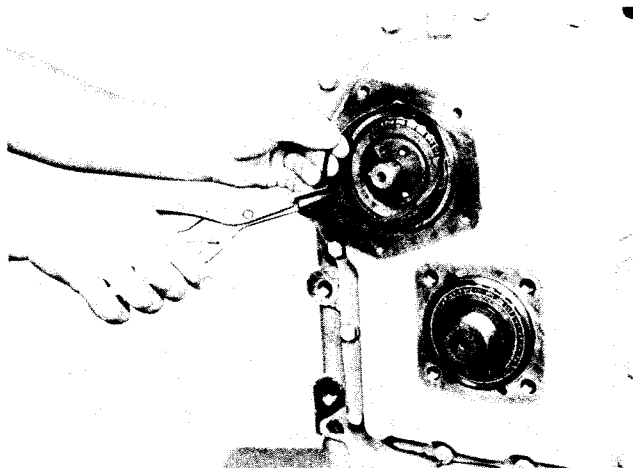


Figure 17

Remove bearing locating ring.

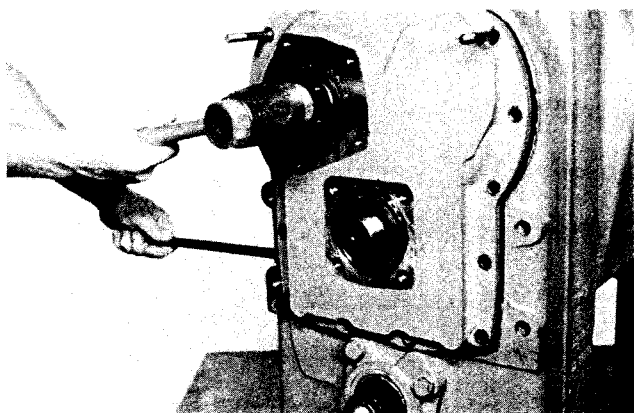


Figure 18

Remove rear cover bolts. Using pry slots provided, pry cover from transmission housing tapping on low clutch and idler shaft to allow cover to be removed without shaft binding. **NOTE:** The use of alignment studs will facilitate cover removal.

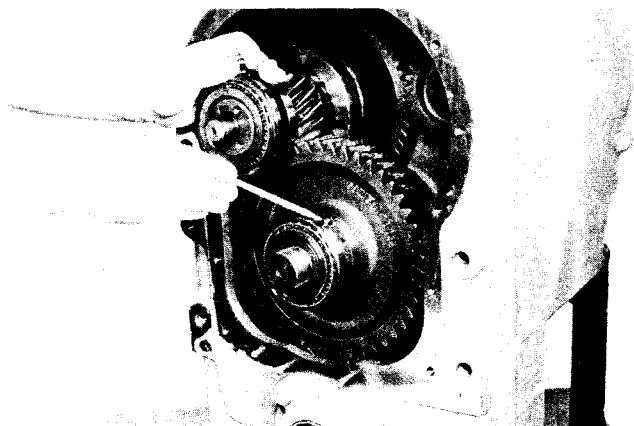


Figure 19

Remove bearing lock-balls.

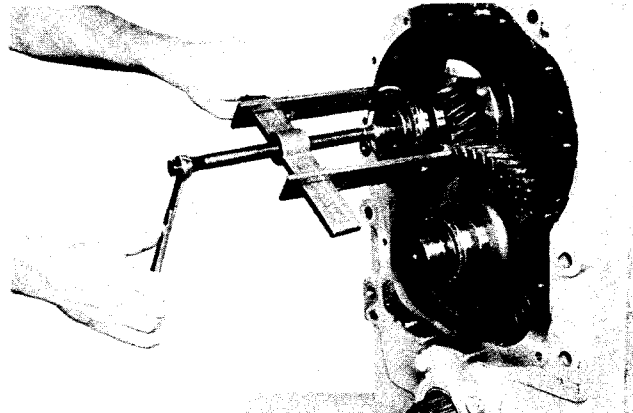


Figure 20

Remove low clutch double bearing cup, outer cone and spacer.

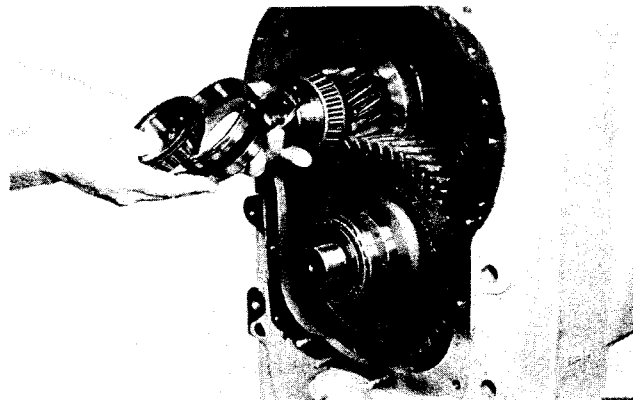


Figure 21

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

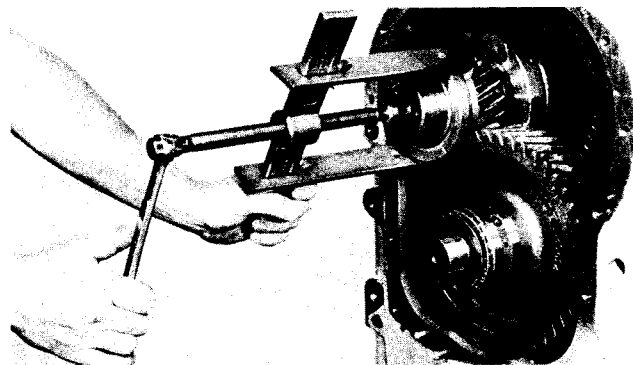


Figure 22

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. 22-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 21.

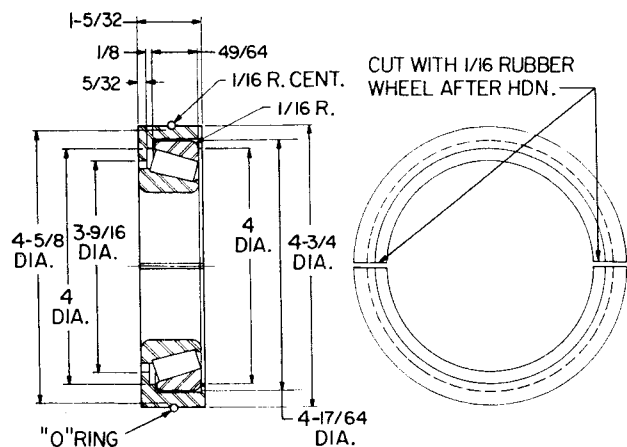


Figure 22-A

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

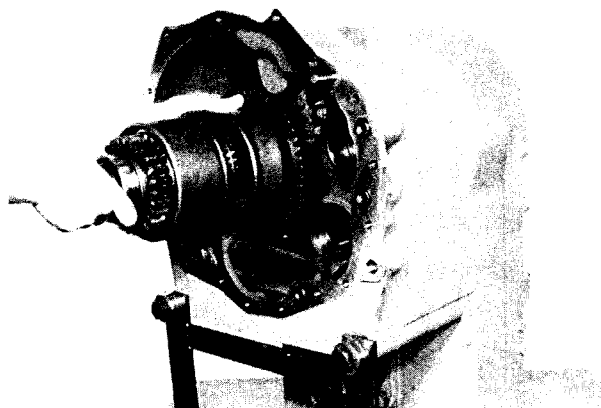


Figure 25

Remove reverse and 3rd clutch assembly.

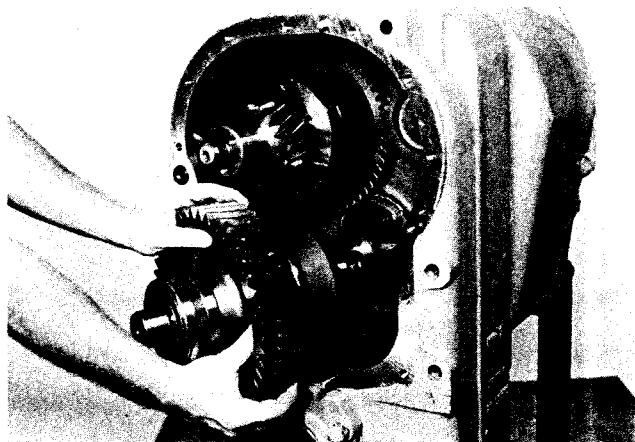


Figure 23

Remove idler shaft and 4th speed clutch from housing.

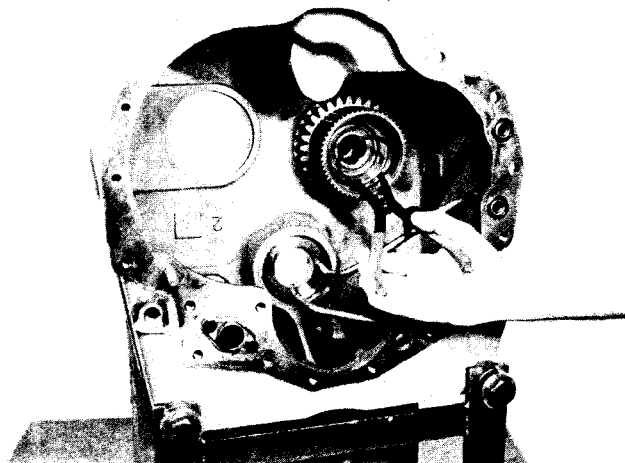


Figure 26

Remove 2nd gear ring retainer snap ring.

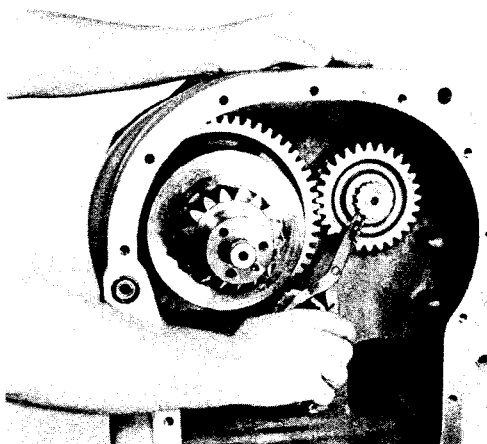


Figure 24

Remove low speed drive gear retainer ring and drive gear.

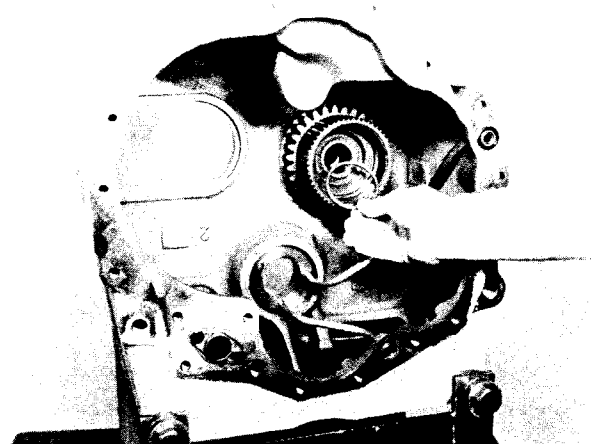


Figure 27

Remove 2nd gear retainer ring retainer.

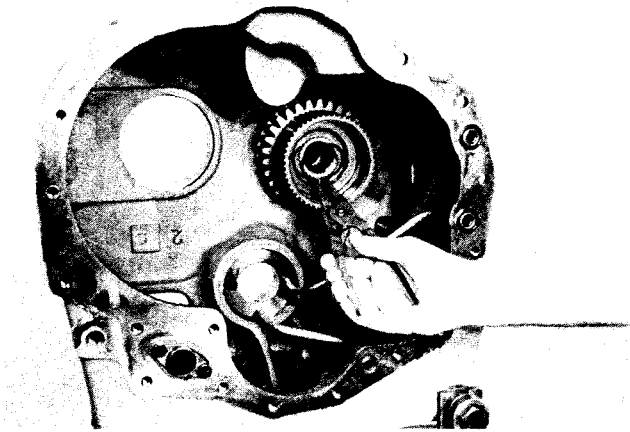


Figure 28

Remove 2nd gear retainer ring.

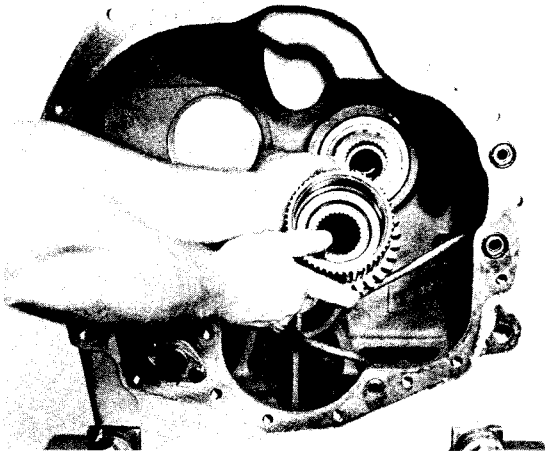


Figure 29

Remove 2nd gear, and 2nd gear bearing end plate.

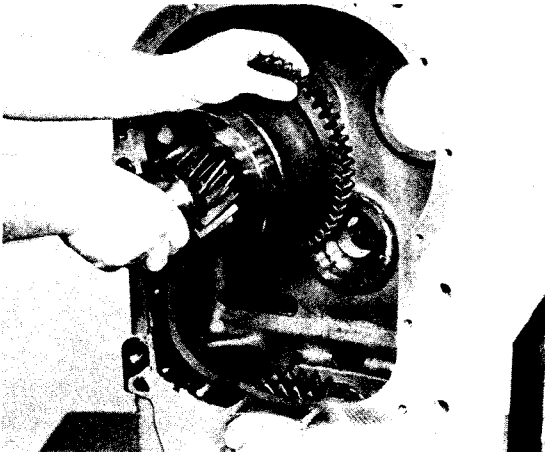


Figure 30

Remove low clutch assembly.

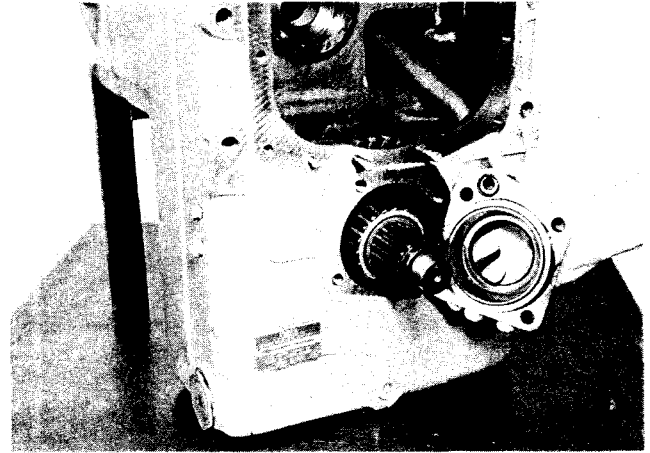


Figure 31

Remove rear output shaft bearing cap bolts and cap.

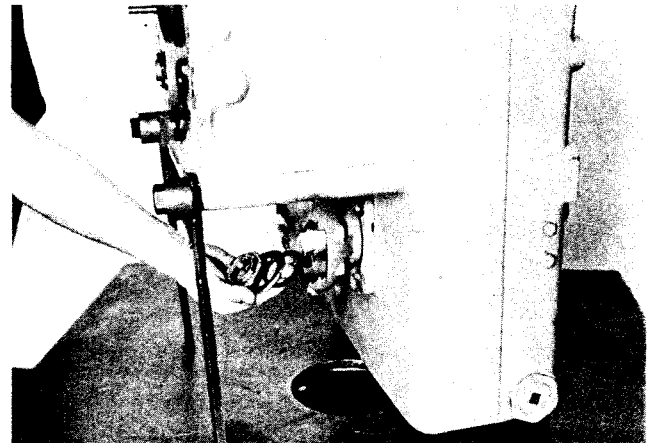


Figure 32

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

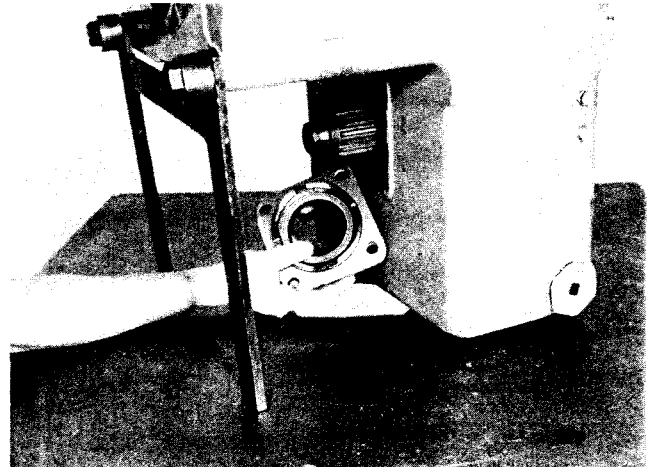


Figure 33

Remove output shaft front bearing cap bolts and cap.

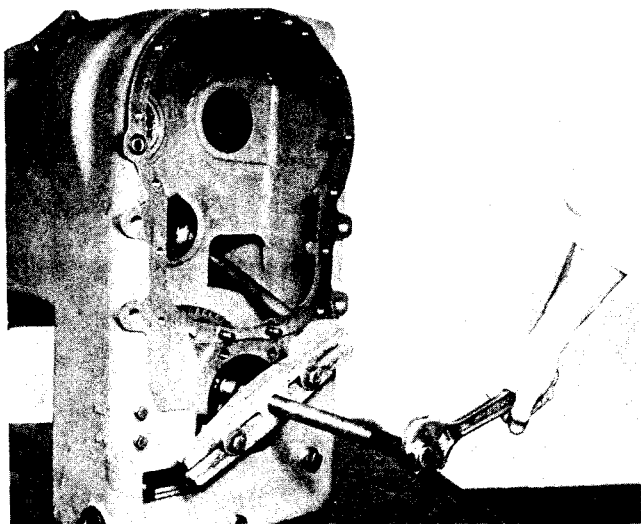


Figure 34

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

CLUTCH DISASSEMBLY

DO NOT MIX BELLEVILLE SPRING WASHERS IN LOW CLUTCH WITH OTHER SPRING WASHERS (SEE NOTE IN FIGURE 43)

NOTE: DO NOT MIX THE FRICTION DISCS IN THE LOW CLUTCH WITH THE FRICTION DISCS OF ANY OF THE OTHER CLUTCHES. (SEE NOTE FOLLOWING FIGURE 88).

LOW CLUTCH DISASSEMBLY

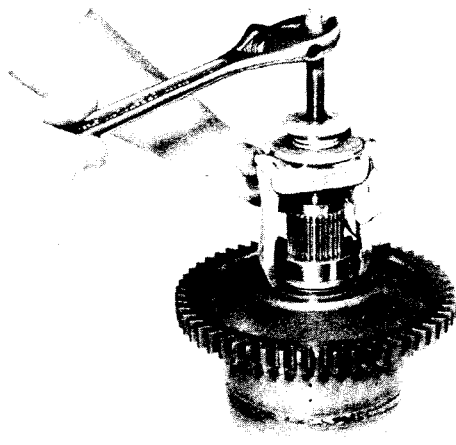


Figure 35

Remove clutch shaft front bearing race.

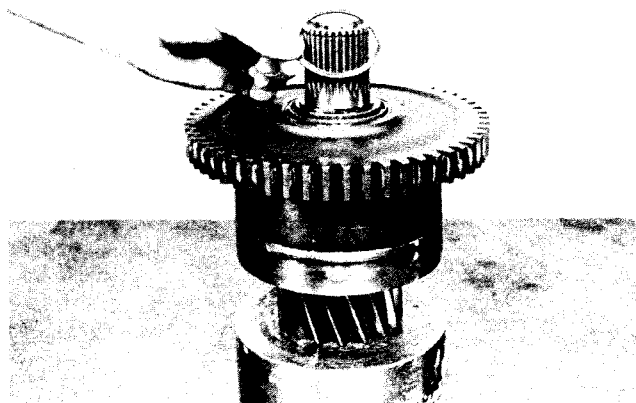


Figure 36

Remove low speed gear taper bearing retainer ring retainer.

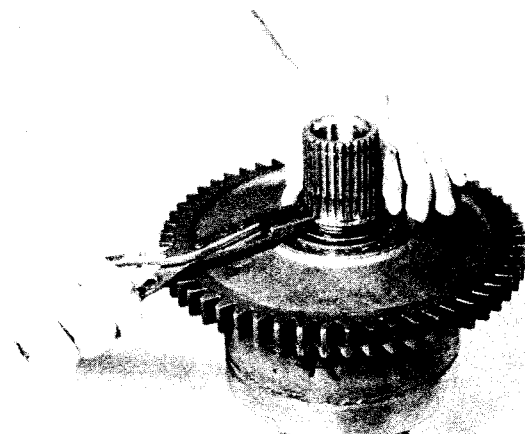


Figure 37

Remove low speed gear taper bearing retainer ring.

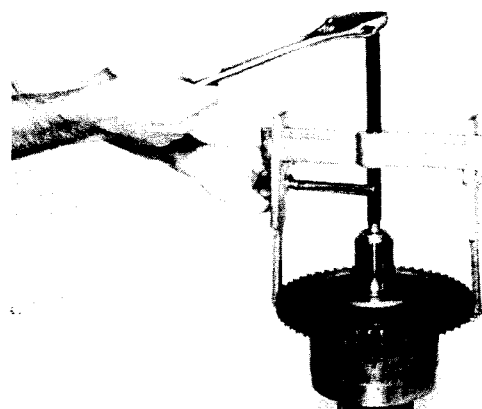


Figure 38

Remove low speed gear and outer taper bearing. Remove low clutch taper bearing spacer.

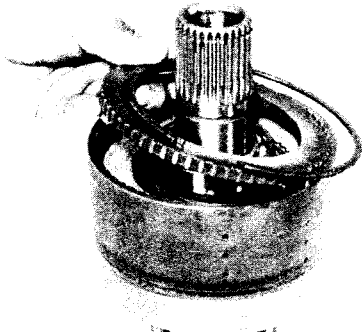


Figure 39

Remove clutch end plate retainer ring. Remove clutch end plate and inner and outer clutch discs.

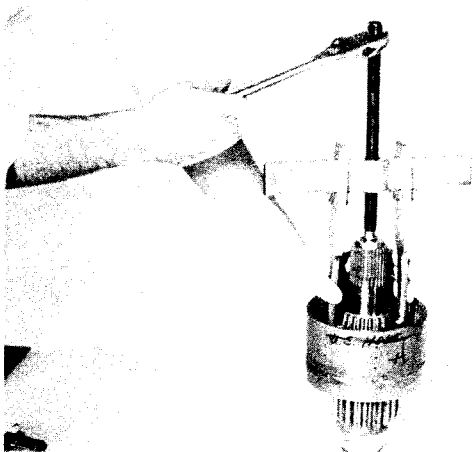


Figure 40

Remove low gear inner taper bearing.

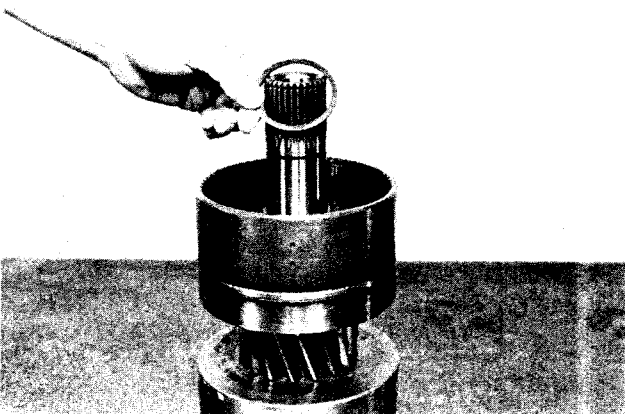


Figure 41

Remove snap ring, ring retainer.

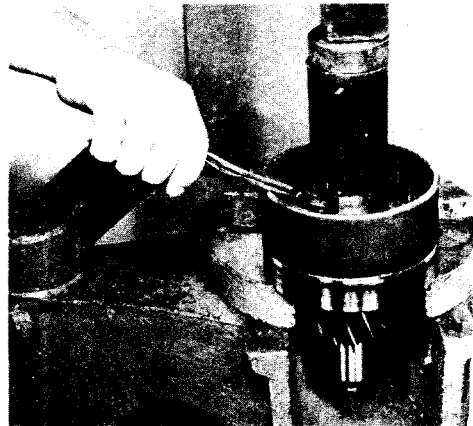


Figure 42

Remove clutch piston return Belleville washer retainer ring. A sleeve with a portion removed is recommended for removing the clutch piston return spring belleville washers and retainer ring. Sleeve shown is a common pipe, with a 1-1/2 x 1 [39,0 x 26,0mm] opening. The pipe is 6 x 3-1/4 x 2-3/4 [155,0 x 85,0 x 78,0mm]. Compress Belleville washer. Through opening remove retainer ring. Release tension on washers. Remove spring retainer ring.

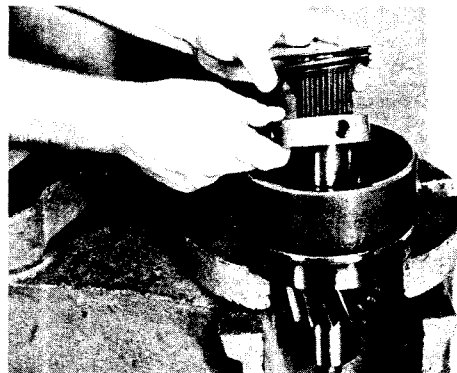


Figure 43

Remove Belleville washers and spacer. Turn clutch over and tap clutch shaft on a block of wood to remove clutch piston. **NOTE: Belleville washers in the low clutch are different than washers in the forward and reverse clutch. Low clutch washers have (4) four holes in them (For identification only). Do not mix low clutch washers with forward and reverse washers.**

FORWARD AND 2ND CLUTCH DISASSEMBLY (Forward being disassembled)

Forward and 2nd clutch and reverse and 3rd clutch disassemble and reassemble the same except forward and reverse clutches use belleville washers for the piston return and the 2nd and 3rd clutches use a spring for the piston return.



Figure 44

Remove clutch shaft piston rings.

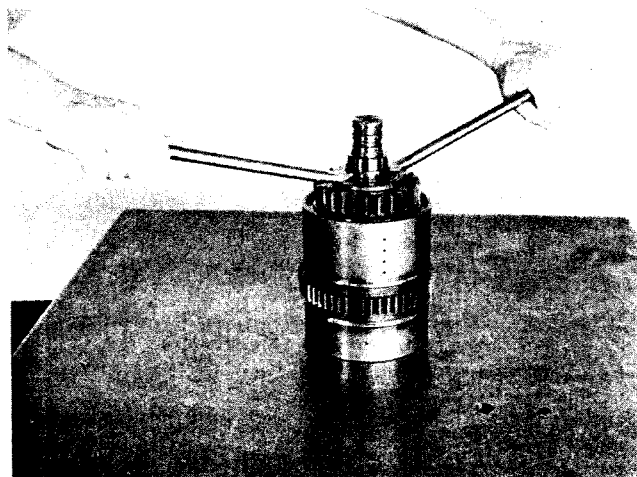


Figure 47

Pry front bearing inner race from shaft. **Caution:** Do not damage bearing roller surface.

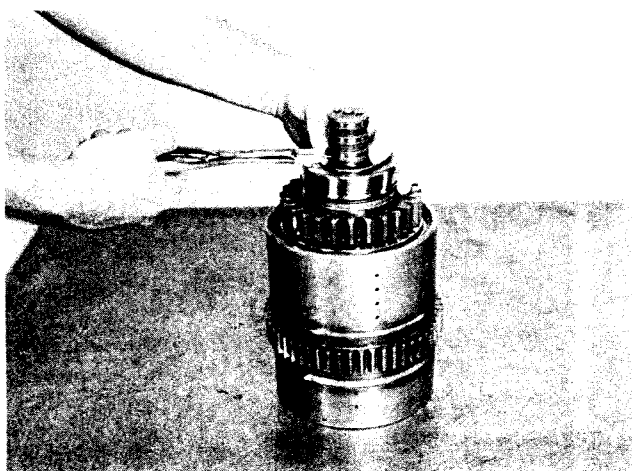


Figure 45

Remove front bearing retainer ring.

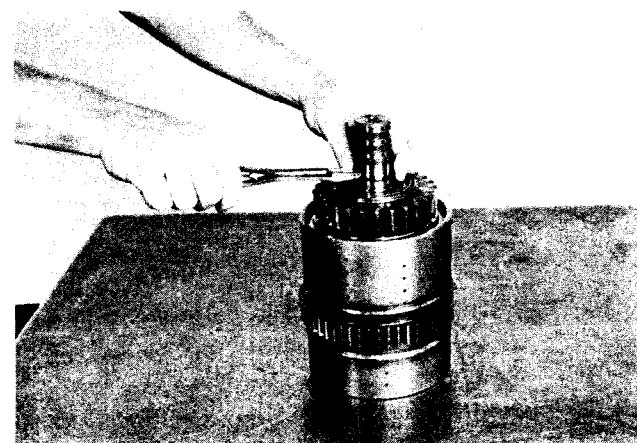


Figure 48

Remove front bearing locating ring.



Figure 46

Remove spacer and bearing. **Caution:** Do not lose lock ball.

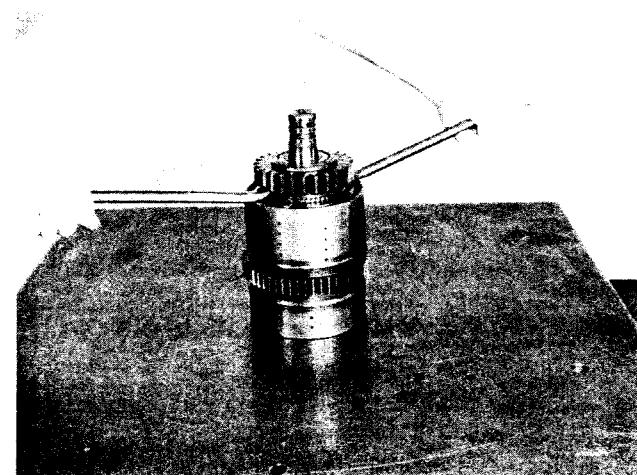


Figure 49

Pry gear up to accommodate gear puller.

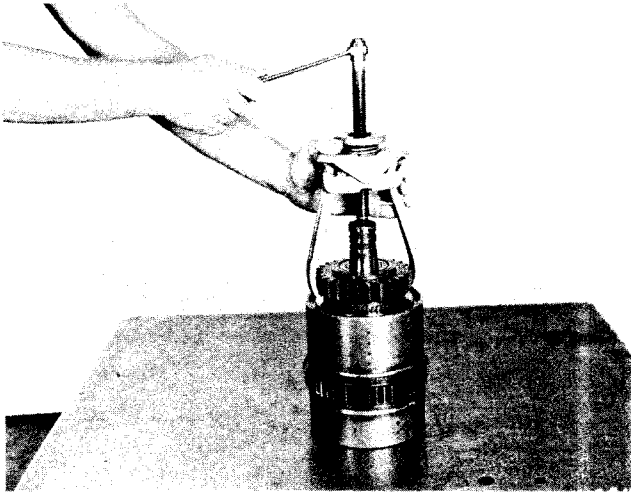


Figure 50

Remove clutch driven gear and outer bearing.

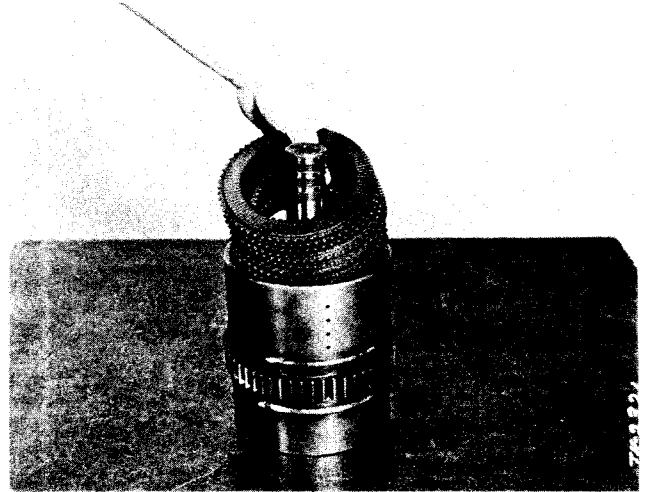


Figure 53

Remove inner and outer clutch discs.

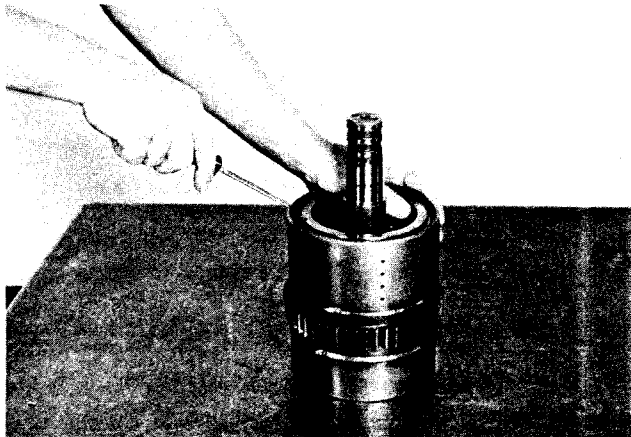


Figure 51

Remove end plate retainer ring.

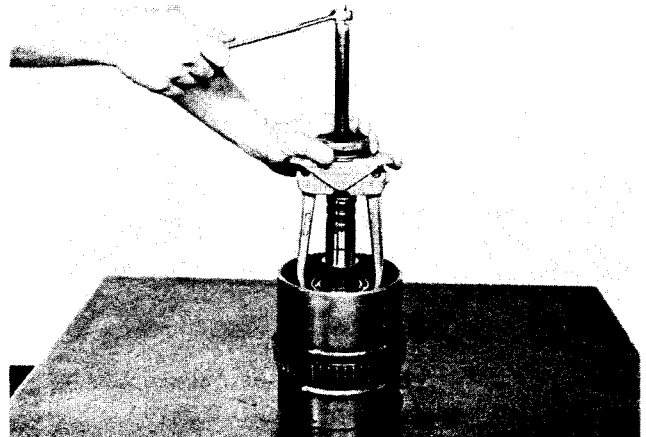


Figure 54

Remove inner bearing.

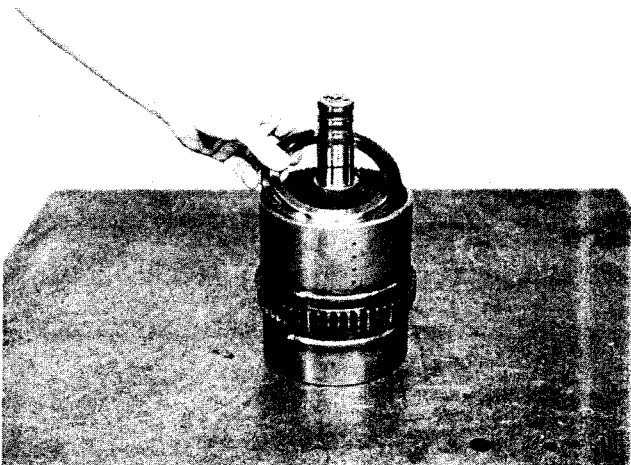


Figure 52

Remove end plate.

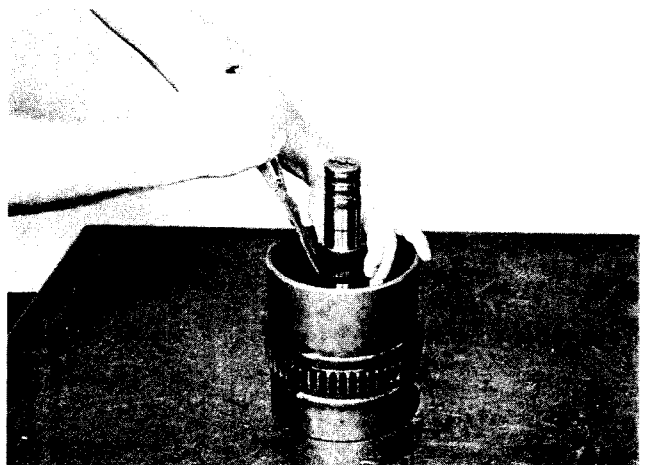


Figure 55

Remove bearing locating ring.



Figure 56

Compress spring retainer washer. Through opening remove spring retainer snap ring. Release tension on spring retainer.



Figure 57

Remove snap ring and snap ring retainer.

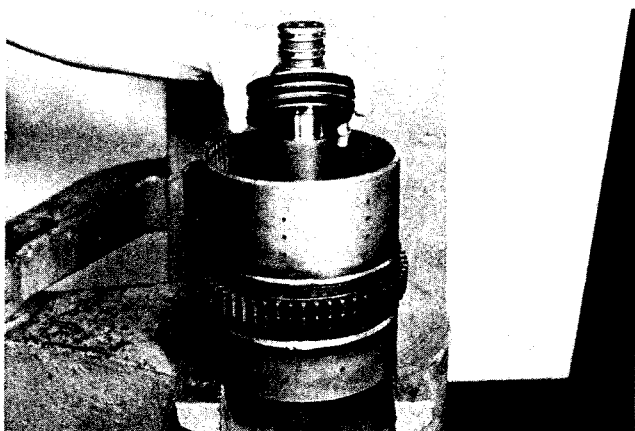


Figure 58

Remove Belleville washers. **NOTE:** Non-modulated clutches will have a piston return spring in forward & reverse.



Figure 59

Remove clutch piston.

4th CLUTCH DISASSEMBLY



Figure 60

Remove clutch shaft piston rings and front bearing retainer ring.

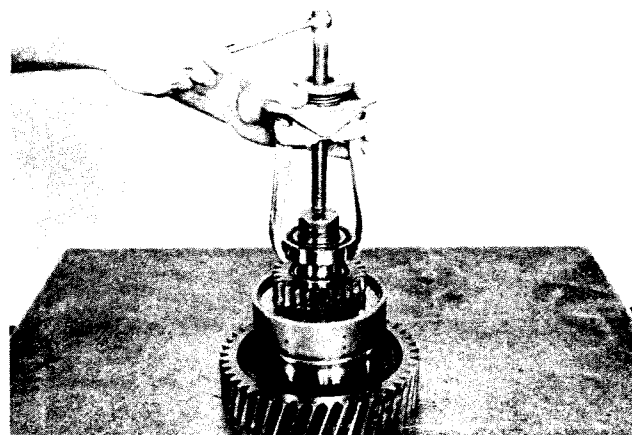


Figure 61

Pry bearing up to accommodate gear puller. Remove front bearing.

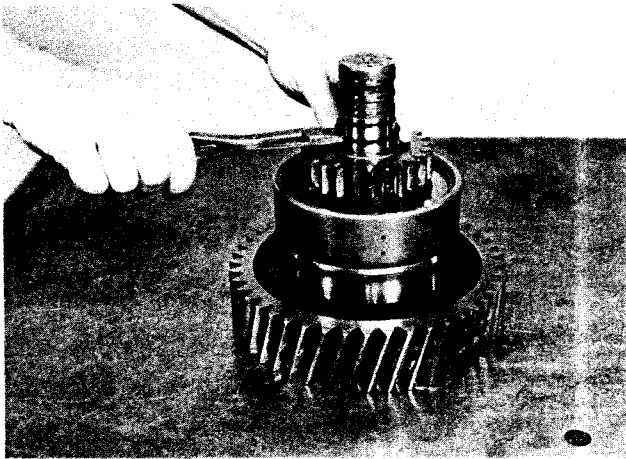


Figure 62

Remove front bearing locating ring.

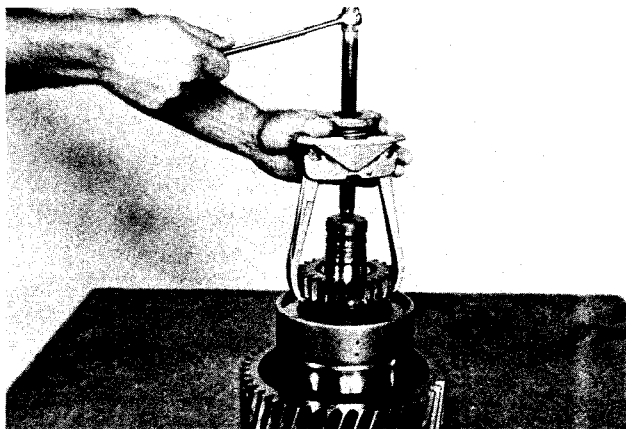


Figure 63

Pry 4th gear up to accommodate puller and remove.

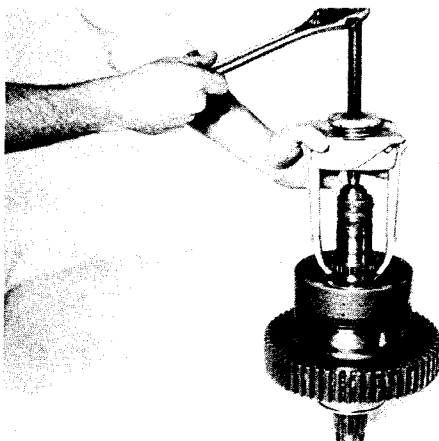


Figure 64

Remove inner bearing spacer and inner bearing. Disassemble clutch discs and piston as explained in previous section.

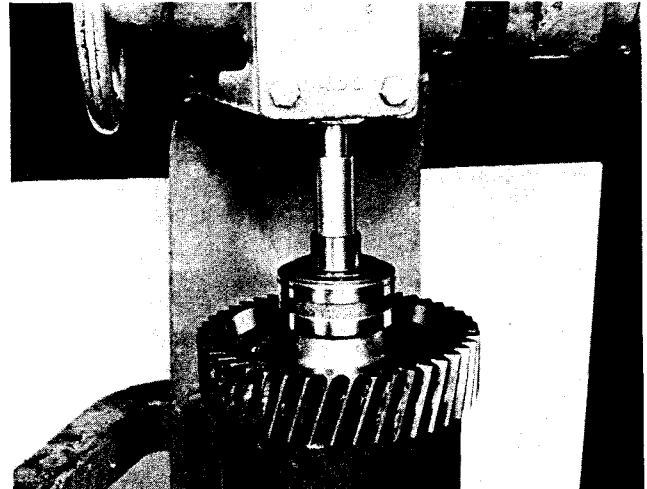


Figure 65

If rear bearing and or gear are to be replaced remove gear and taper bearing from clutch drum.

CLEANING AND INSPECTION

CLEANING

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

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

Bearings

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

Housings

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

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

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

INSPECTION

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

Bearings

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

Oil Seals, Gaskets, Etc.

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

Gears and Shafts

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

Housing, Covers, etc.

Inspect housings, covers and bearing caps to be certain they are thoroughly clean 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.

FORWARD AND 2ND CLUTCH REASSEMBLY (Forward being assembled)



Figure 66

Install new clutch piston inner and outer sealing rings.



Figure 67

Insert clutch piston in clutch drum. **CAUTION:** Do not damage sealing rings. See note in Figure 58.

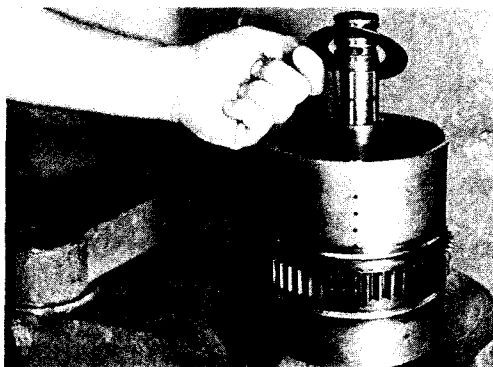


Figure 68

Install 1st Belleville washer, large diameter of bevel down as shown. **NOTE:** Do not mix forward clutch Belleville washers with low clutch washers. See **NOTE:** Figure 43.

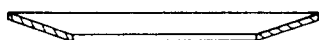
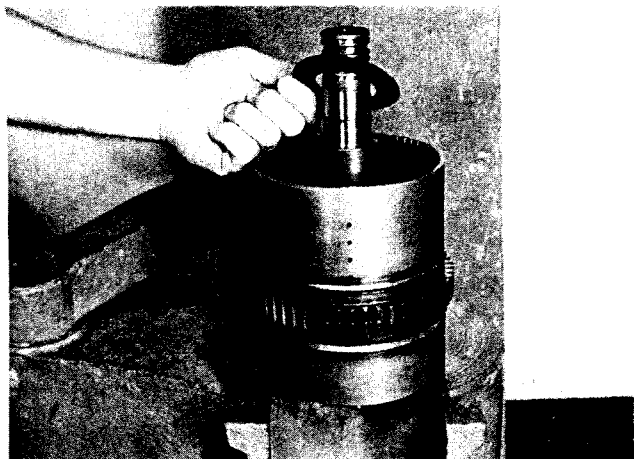


Figure 69

Install 2nd Belleville washer with large diameter of bevel up. Install balance of washers, quantity of (7) seven alternating bevel.



Figure 70

Install Belleville snap ring retainer and snap ring. Compress Belleville washers and snap ring retainer, install snap ring in lower snap ring groove. Install inner bearing locating ring. See page 33, Figure A.

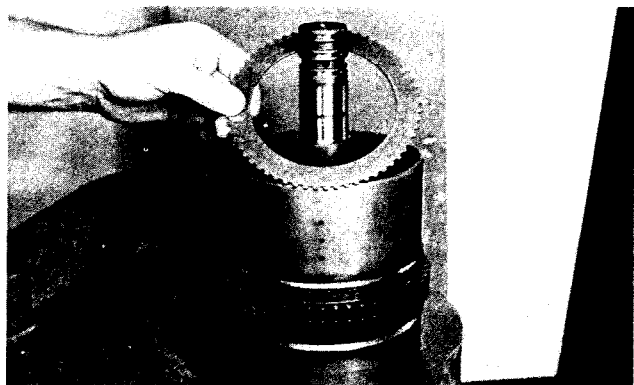


Figure 71

Insert one steel disc.

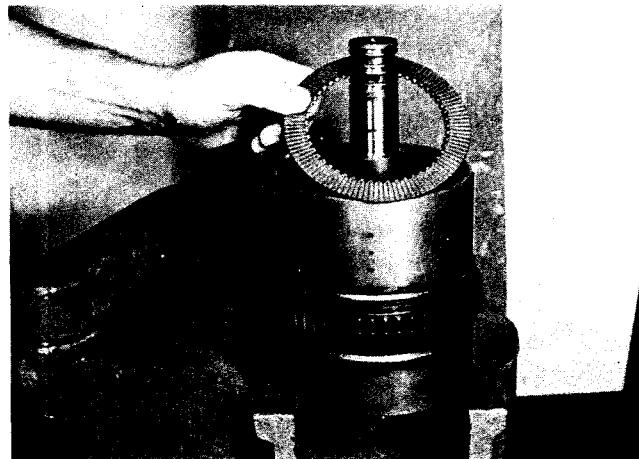


Figure 72

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.

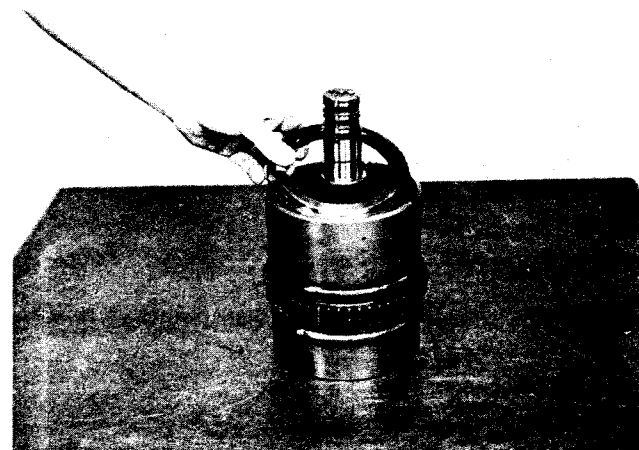


Figure 73

Install end plate.

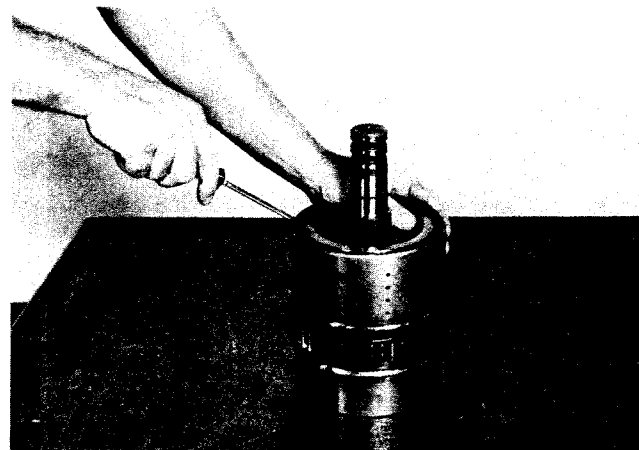


Figure 74

Install end plate retainer ring.

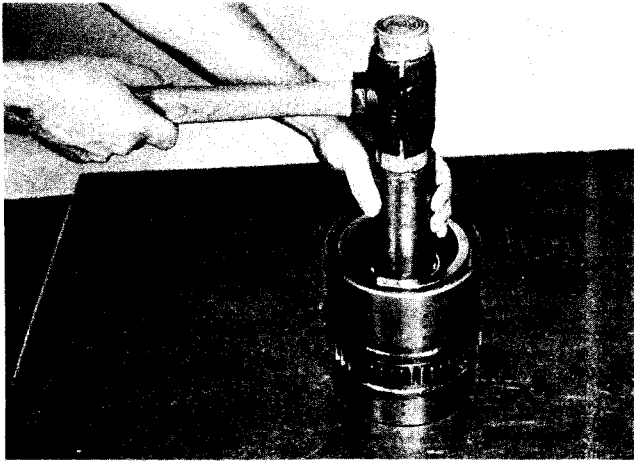


Figure 75

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

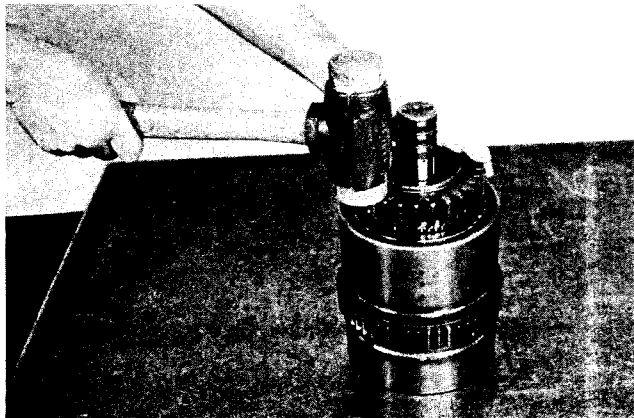


Figure 76

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

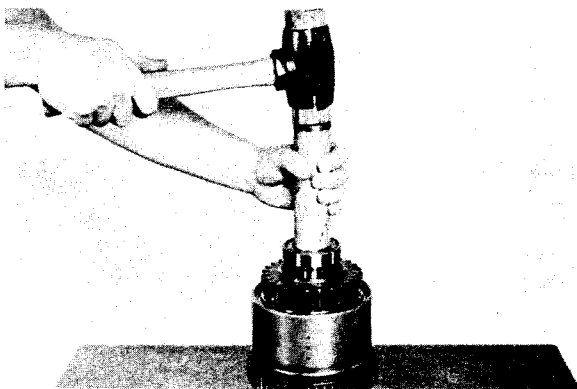


Figure 77

Install driven gear outer bearing. **NOTE:** Bearing shield out. See page 35.

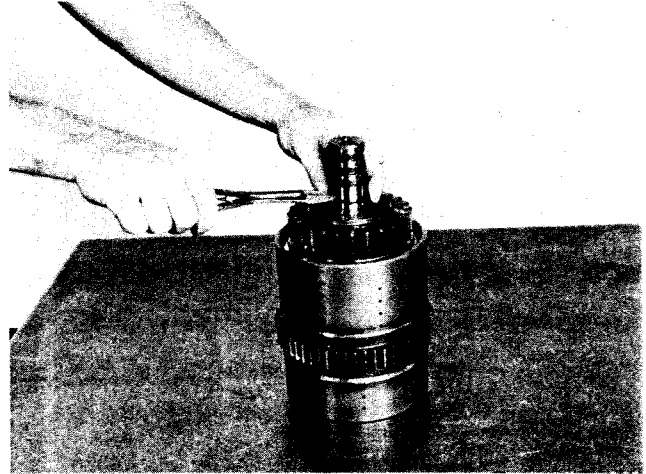


Figure 78

Install front bearing locating ring.

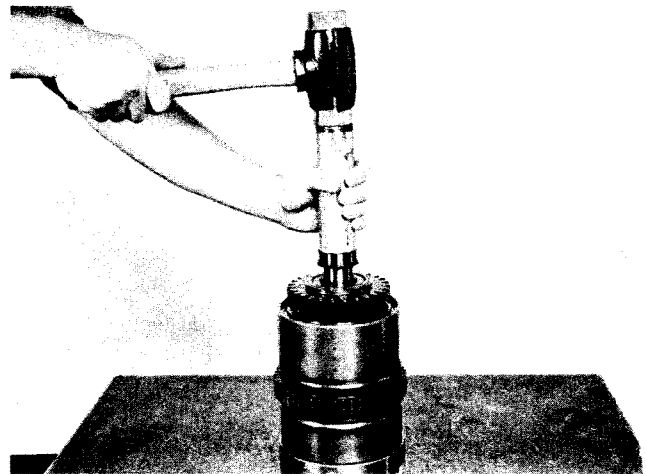


Figure 79

Install front bearing inner race.

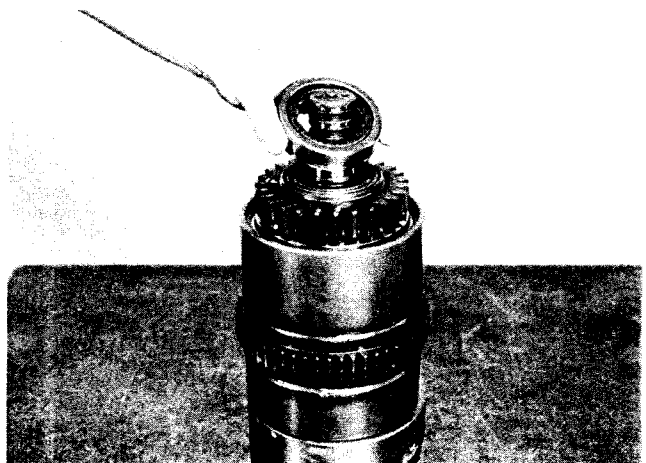


Figure 80

Install front bearing and outer race.

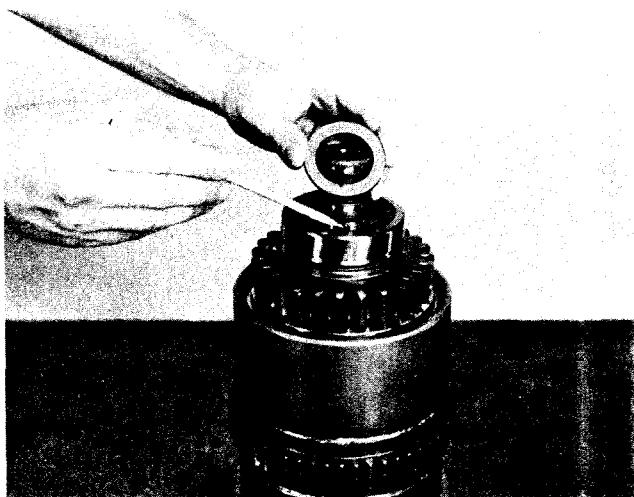


Figure 81

Install lock ball and bearing spacer.

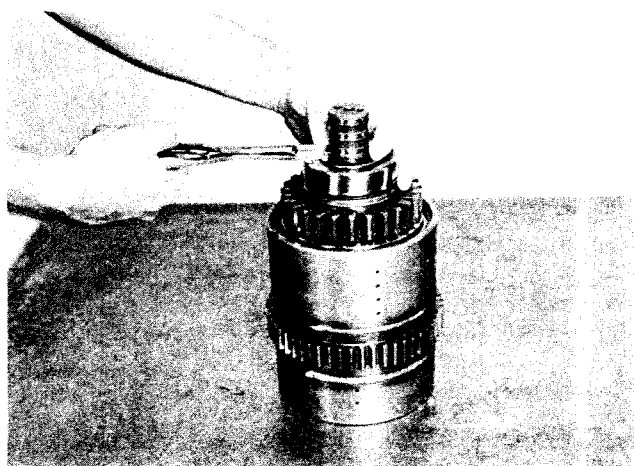


Figure 82

Install bearing retainer ring.



Figure 83

Install piston rings.

FORWARD & REVERSE NON-MODULATED CLUTCHES AND 2ND & 3RD CLUTCH PISTON RETURN SPRING REASSEMBLY

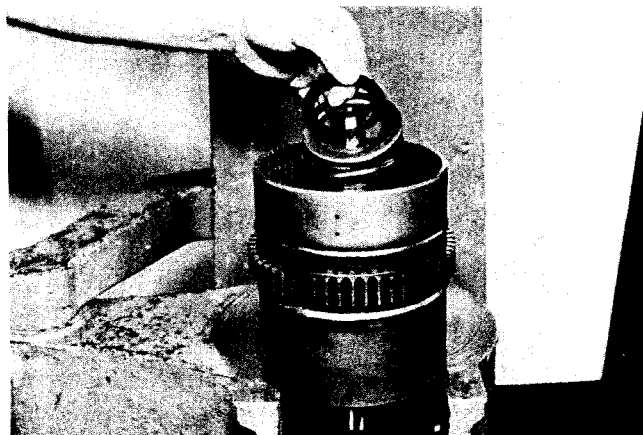


Figure 84

Install new clutch piston inner and outer sealing ring. Insert piston into clutch drum using caution as not to damage seals. Position inner spring retainer, piston return spring, outer spring retainer and retainer snap ring retainer and snap ring. Compress spring and retainer and install snap ring. **See page 33, Figure B.**

Assemble clutch discs and end plate as previously explained.

LOW CLUTCH REASSEMBLY



Figure 85

Install new clutch piston inner and outer sealing ring. Insert piston into clutch drum using caution as not to damage seals. Install piston to Belleville washers spacer. **NOTE: In Figure 43. Install Belleville washers. First washer with large diameter of washer toward spacer. Alternate (5) five washers. See page 33, Figure C.**



Figure 86

Position piston return spring belleville washer snap ring. Compress belleville washers and install snap ring.

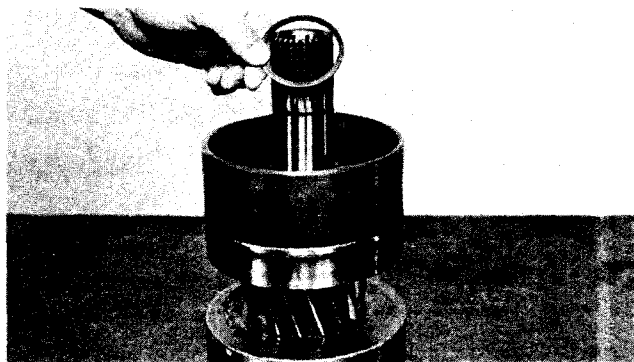


Figure 87

Install snap ring retainer.

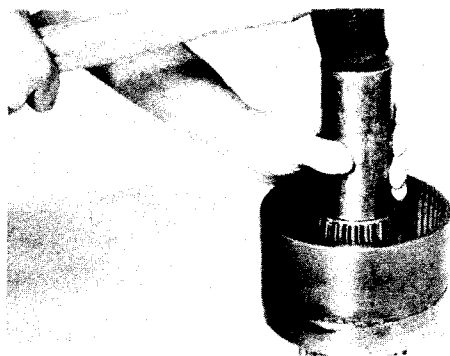


Figure 88

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

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

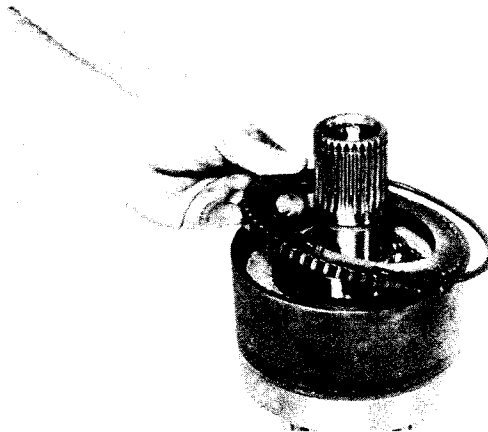


Figure 89

Install end plate and retainer ring.

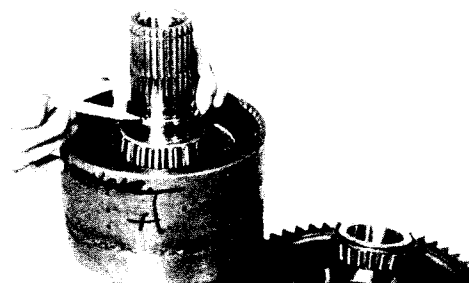


Figure 90

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

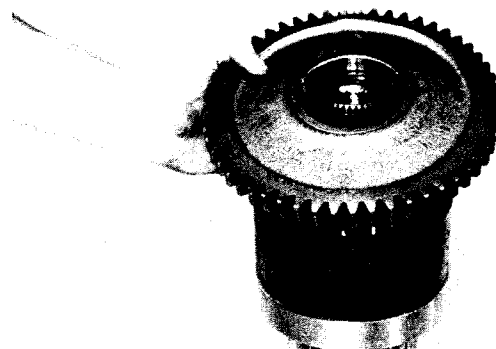


Figure 91

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

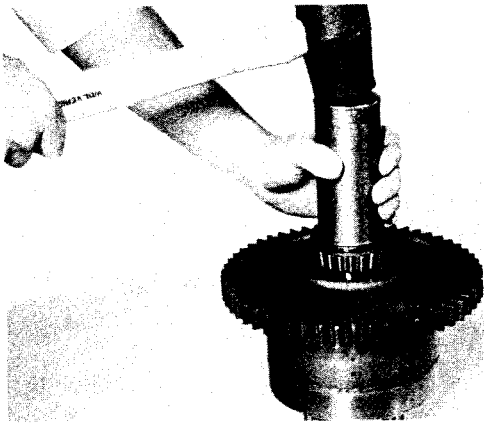


Figure 92

Install low gear outer taper bearing.

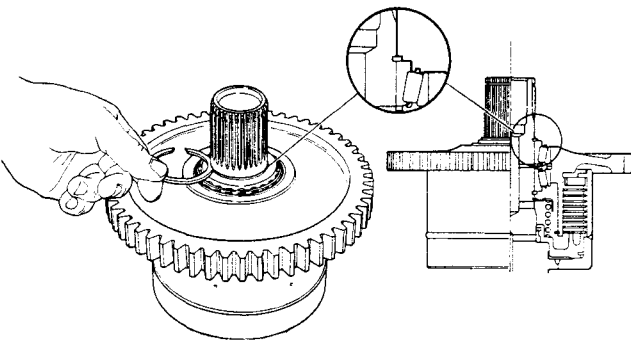


Figure 93

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.

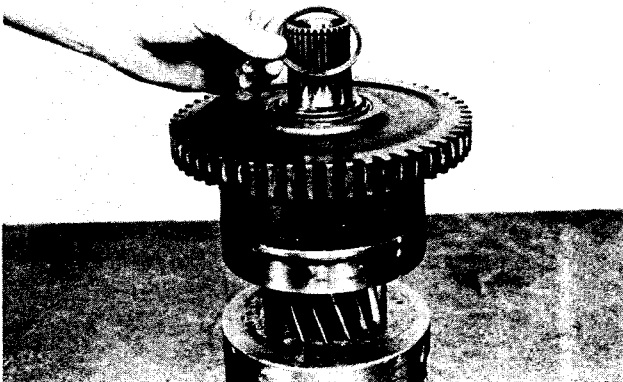


Figure 94

Install low speed gear taper bearing retainer ring retainer.

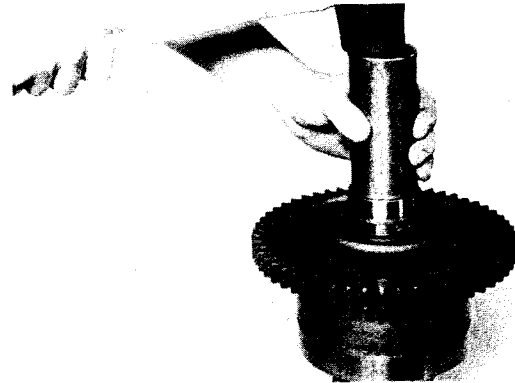


Figure 95

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

4TH SPEED CLUTCH REASSEMBLY

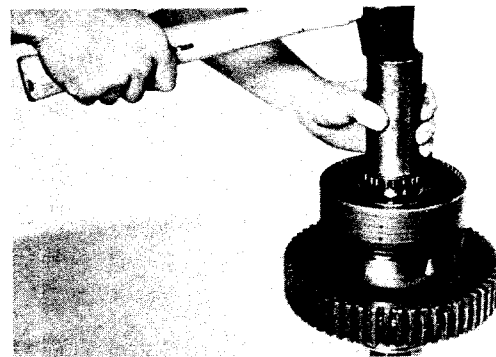


Figure 96

Install piston, and piston return spring. See page 33, Figure D. Install inner and outer discs as explained in Fig. 66 through Fig. 74. Install 4th speed gear inner bearing.

NOTE: Bearing Part Number must go down. See Figure 99.

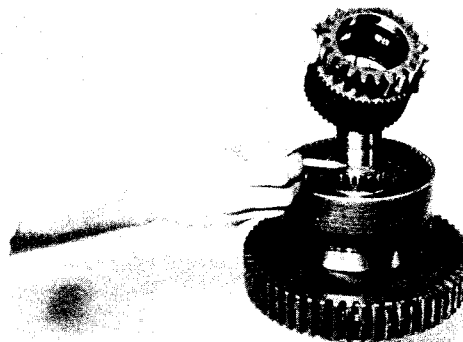


Figure 97

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

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

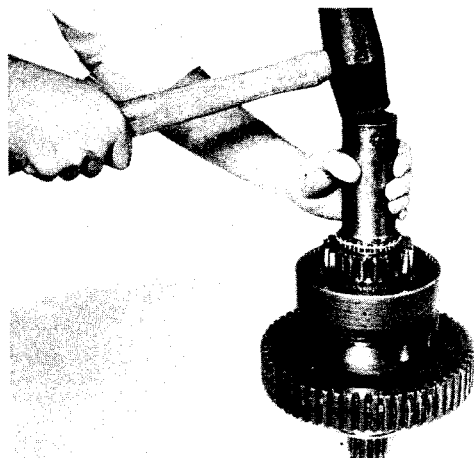


Figure 98

Install 4th speed gear outer bearing. **NOTE:** Bearing Part Number must go up. See Figure 99. It is recommended a rubber band be used to hold outer bearing rollers in position when installing bearing.

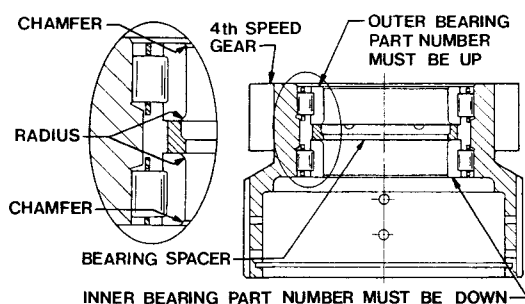


Figure 99

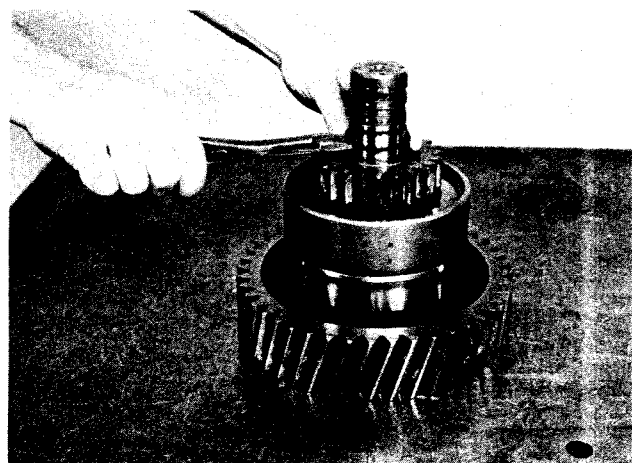


Figure 100

Install outer bearing locating ring.

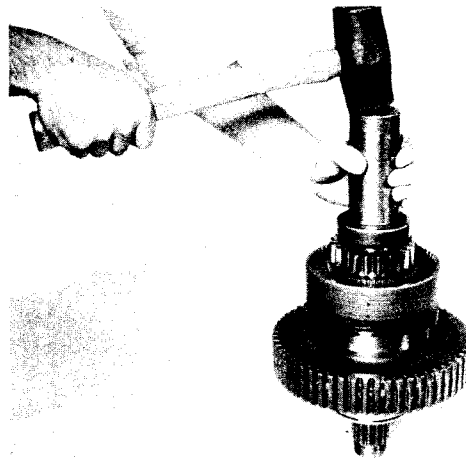


Figure 101

Install front bearing and bearing retainer ring.

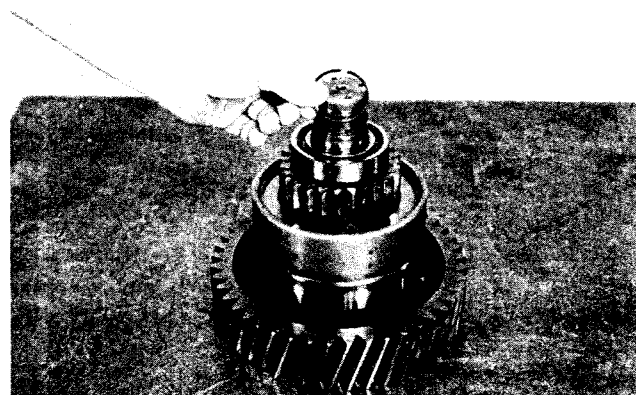


Figure 102

Install clutch shaft piston rings.

TRANSMISSION REASSEMBLY

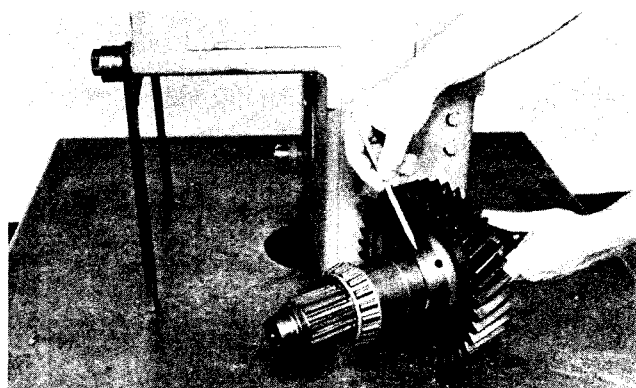


Figure 103

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.

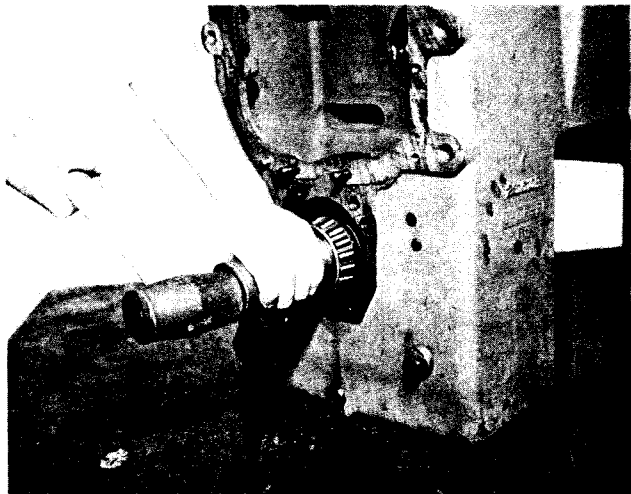


Figure 104

Position output gear in transmission case with protruding hub toward front of case. See Fig. 103. 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.

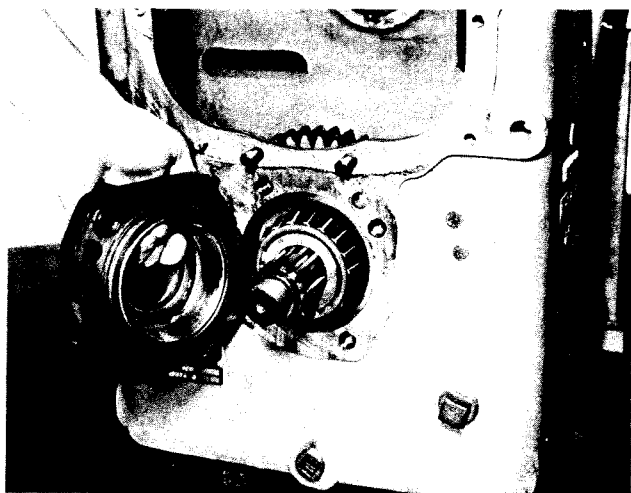


Figure 105

Coat outer diameter of oil seal with permatex No. 2 and press seal in bearing cap with lip of seal in. 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. Tighten bearing cap bolts to specified torque. (See torque chart).

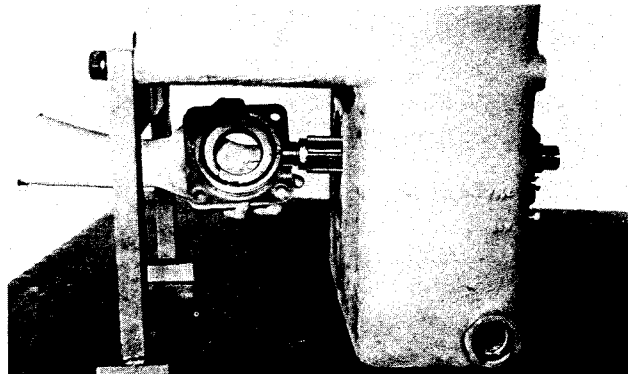


Figure 106

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.

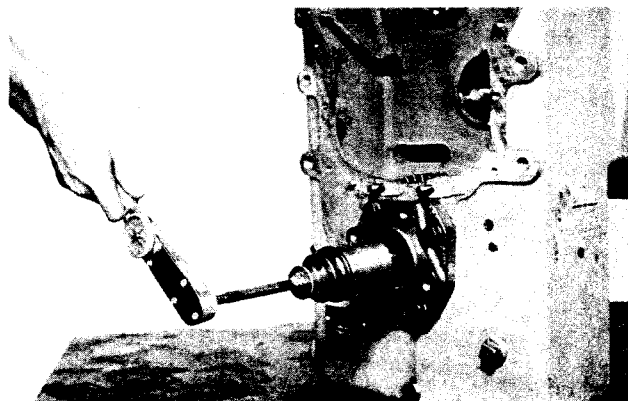


Figure 107

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

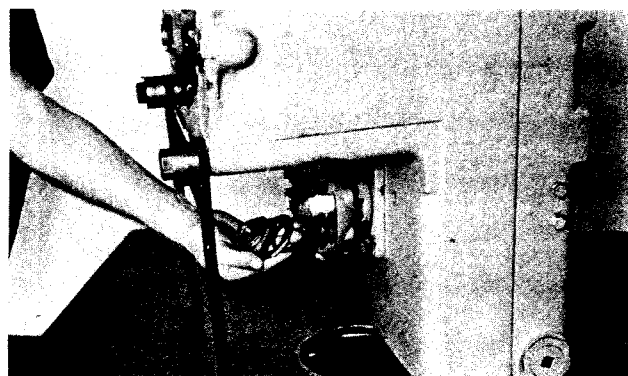


Figure 108

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

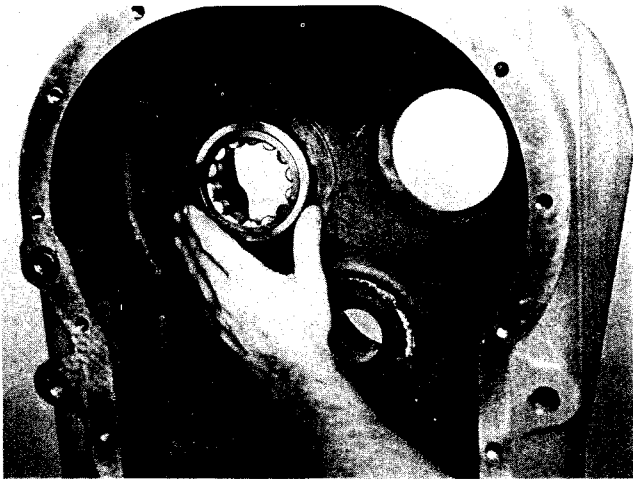


Figure 109

Install low clutch front bearing.

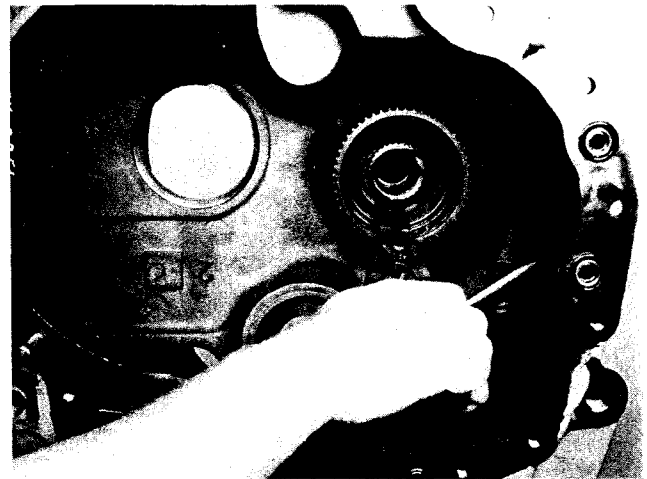


Figure 112

Install 2nd speed gear retainer ring.

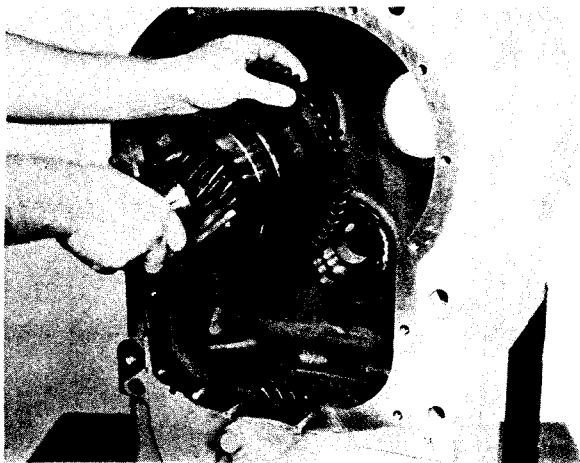


Figure 110

Install low clutch assembly from rear of transmission case.

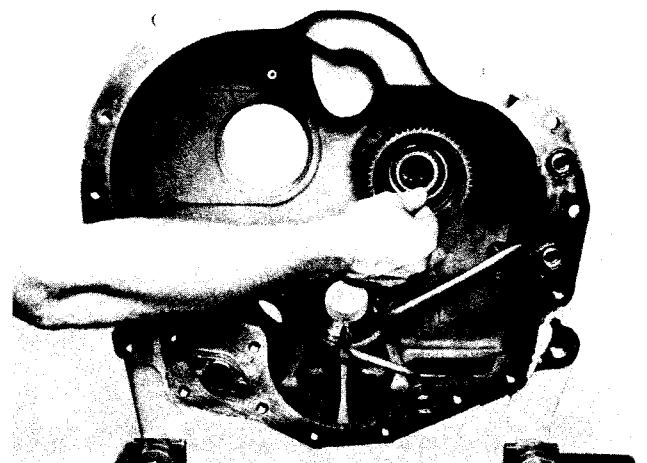


Figure 113

Install 2nd speed gear retainer ring retainer.

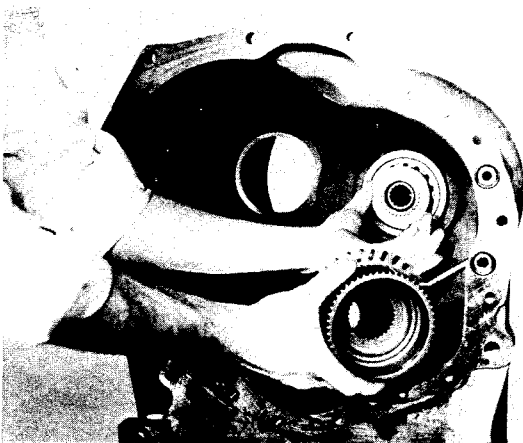


Figure 111

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

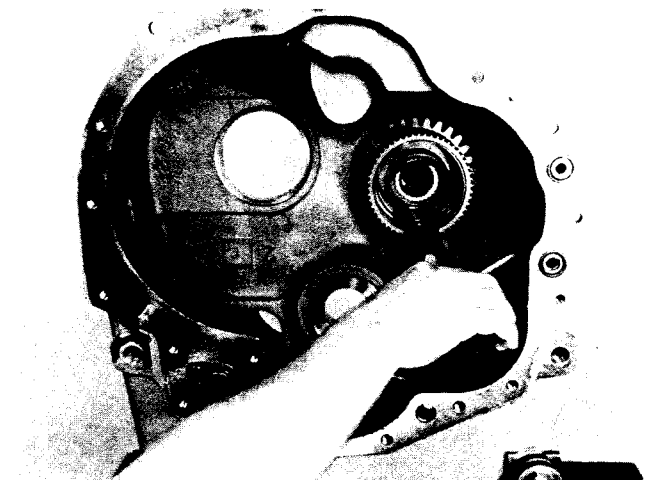


Figure 114

Install 2nd gear ring retainer snap ring.

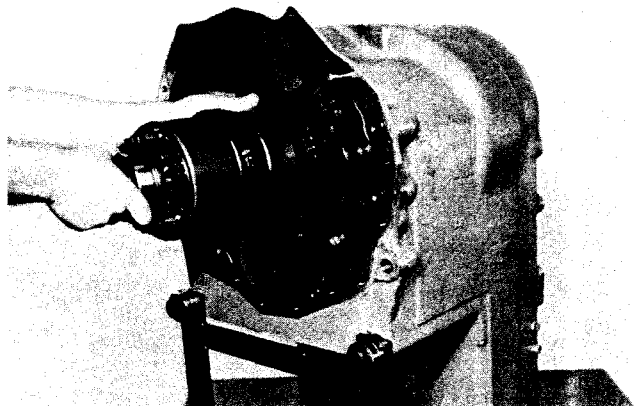


Figure 115

Install reverse and 3rd clutch assembly from the front of the transmission.

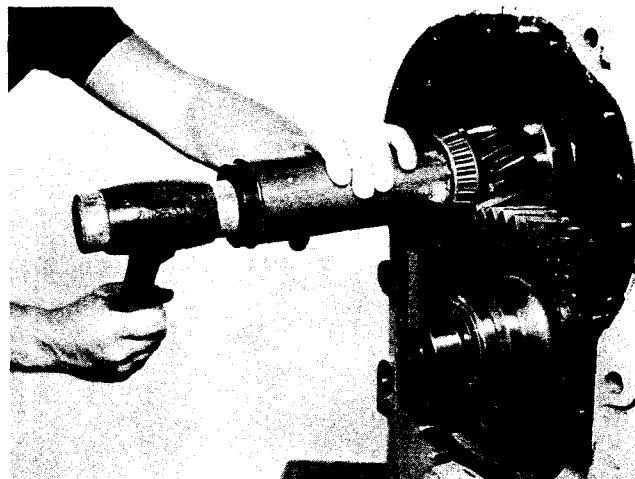


Figure 118

Install low clutch inner taper bearing. **NOTE:** Heat bearing in hot oil bath prior to installation.

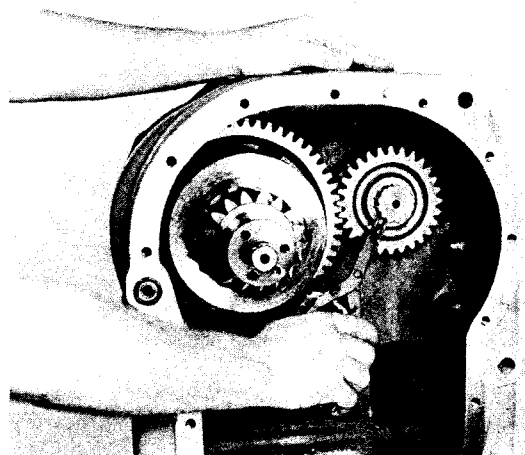


Figure 116

Install low speed drive gear and retainer ring.

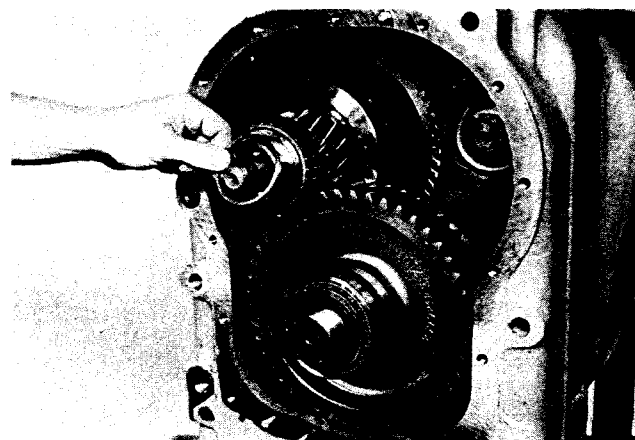


Figure 119

Install bearing spacer.

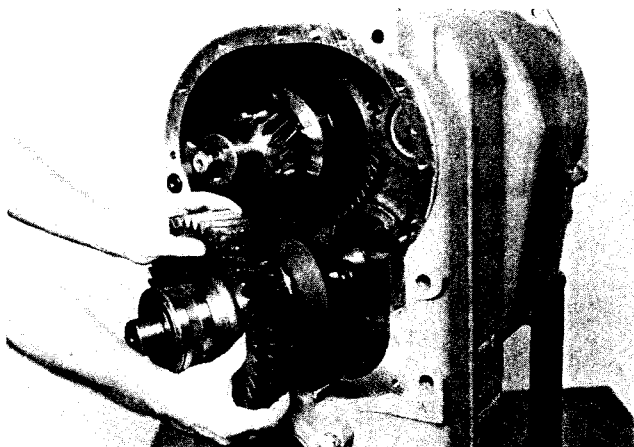


Figure 117

Install idler shaft and 4th speed clutch assembly.

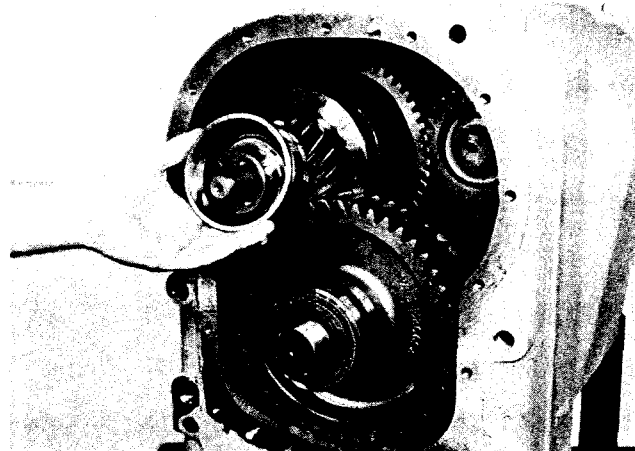


Figure 120

Install bearing cup.

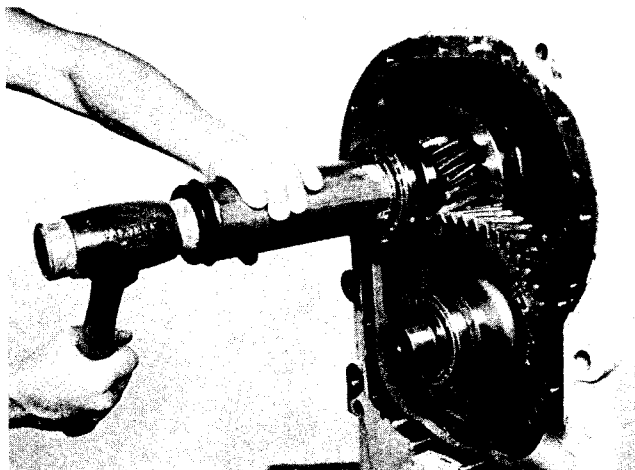


Figure 121

Install outer taper bearing. **NOTE:** Heat bearing in hot oil bath prior to installation.

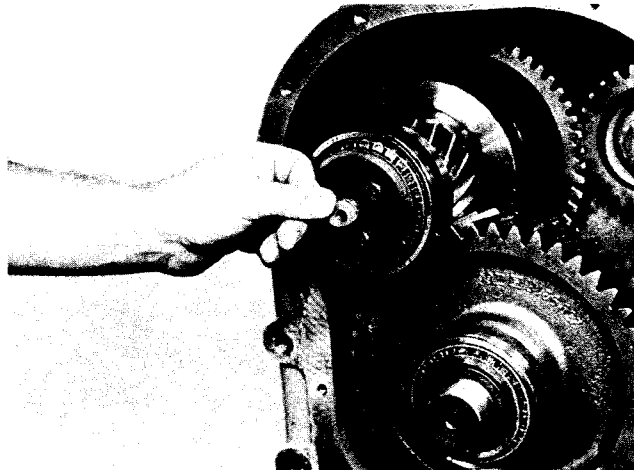


Figure 124

Install low clutch shaft sealing ring.

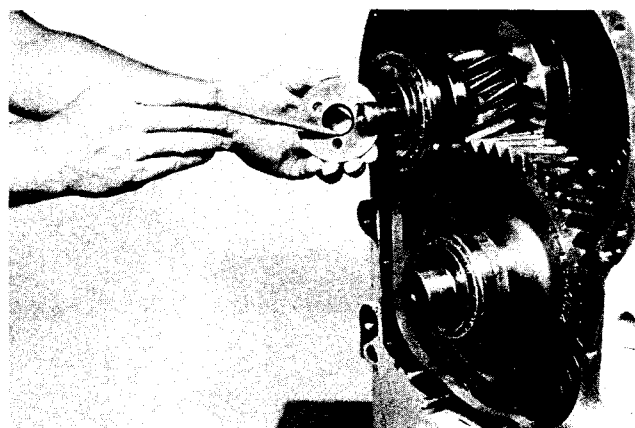


Figure 122

Install retainer plate, inner diameter chamfer toward bearing.

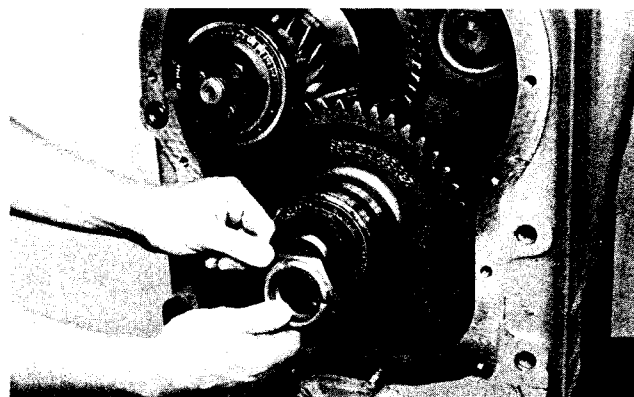


Figure 125

Install idler shaft spacer and nut. Torque nut 250 to 300 ft. lbs. torque [339,0-406,0 N.m]

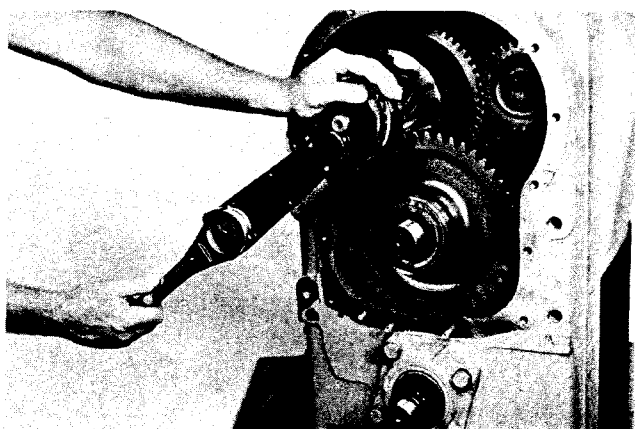


Figure 123

Install bolts and block gears. Torque bolts to specifications and lock wire together.

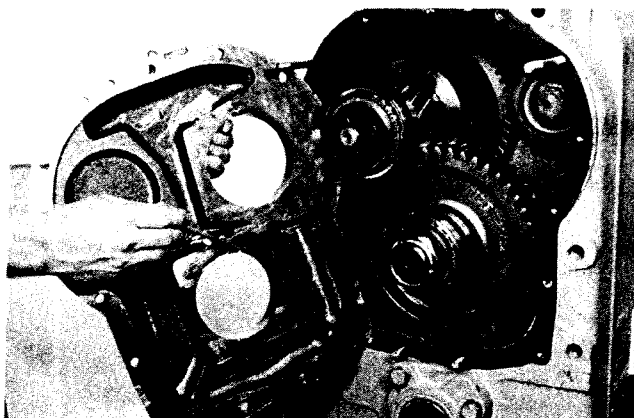


Figure 126

Install alignment studs and new gasket. Place lock balls in low shaft and idler shaft. A light coat of grease will hold lock balls in place. Position shafts so lock balls align with notches in rear cover.

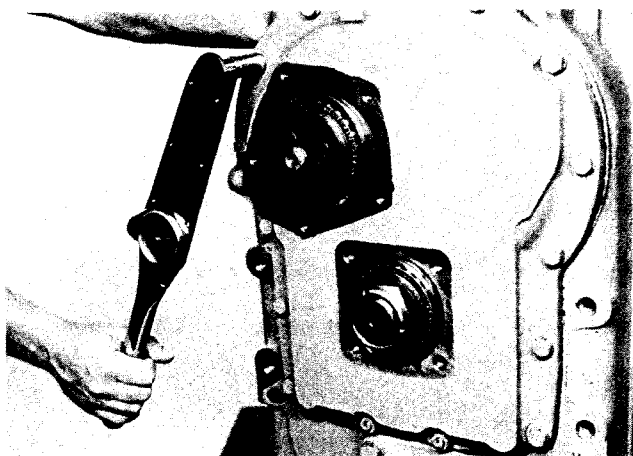


Figure 127

Tap cover in place and secure with bolts and lockwashers torque cover bolts to specifications.

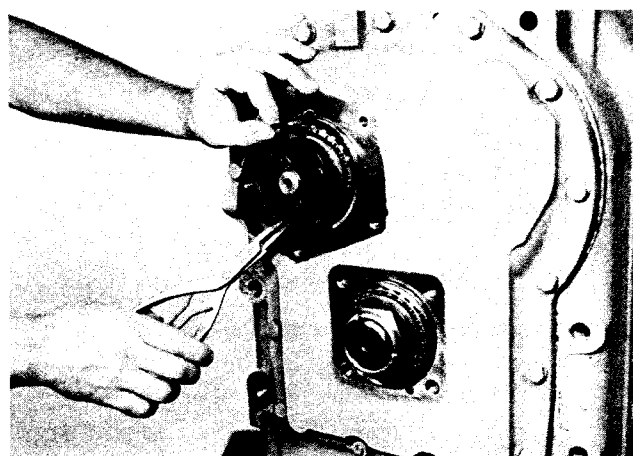


Figure 128

Top low clutch and idler shaft to rear of transmission to allow for rear bearing snap ring clearance. Install snap ring.

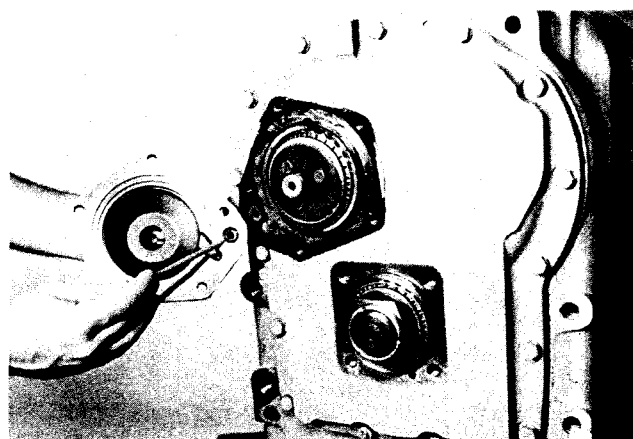


Figure 129

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

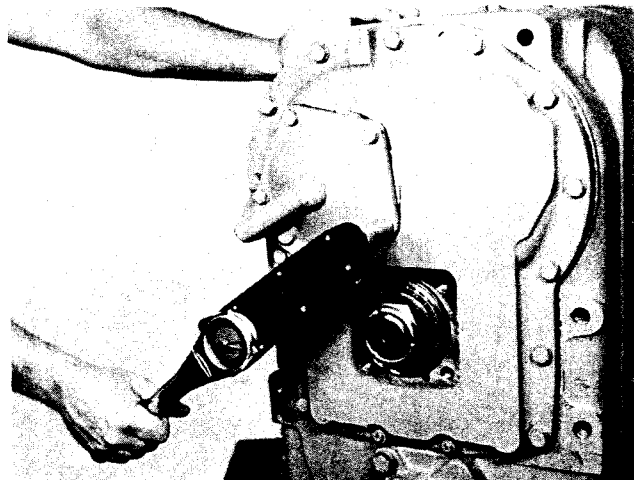


Figure 130

Install bearing cap with bolts and lockwashers. Torque to specifications.

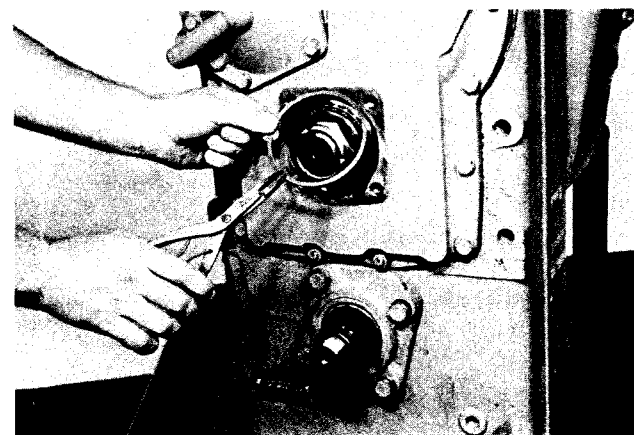


Figure 131

Install idler shaft rear bearing locating ring.

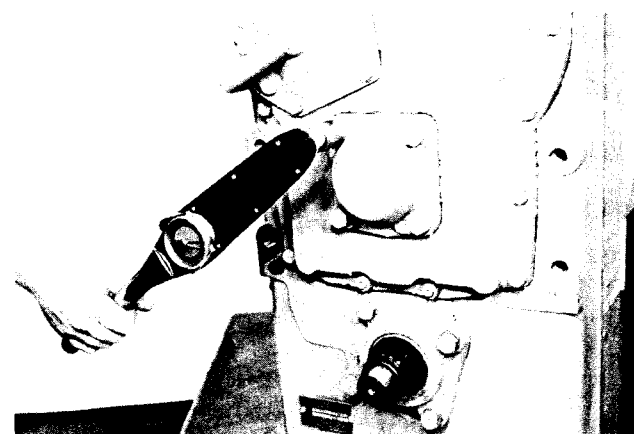


Figure 132

Use new gasket and install idler shaft bearing cap and cap bolts and lockwashers. Torque bolts to specifications.

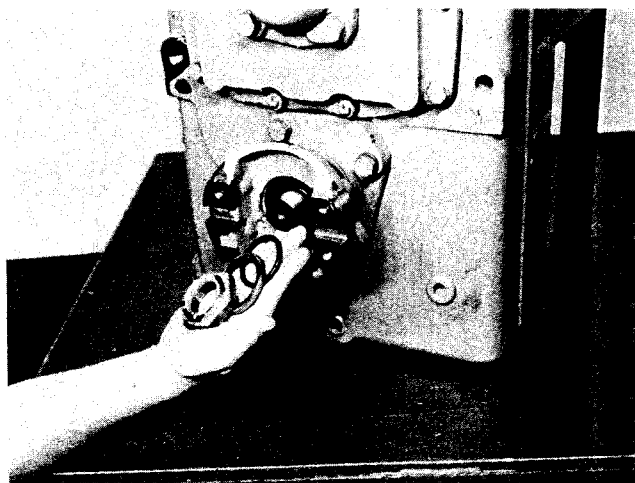


Figure 133

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

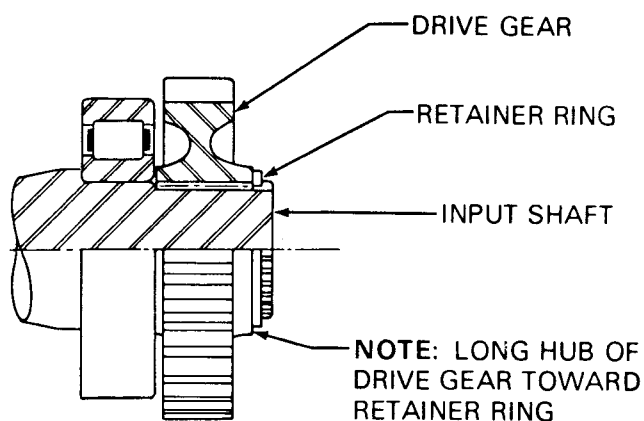


Figure 134

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

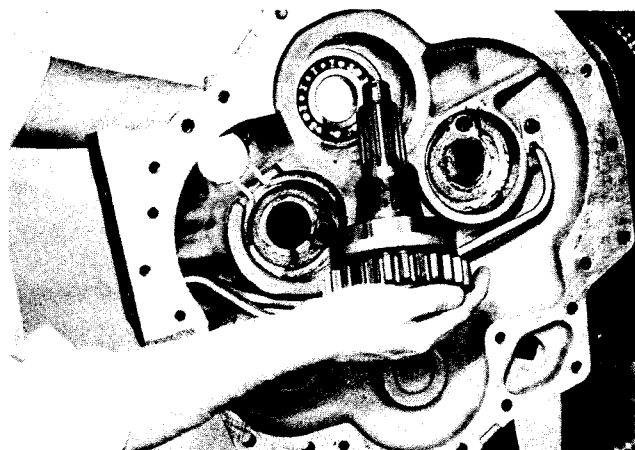


Figure 135

Install input shaft into front bearing.

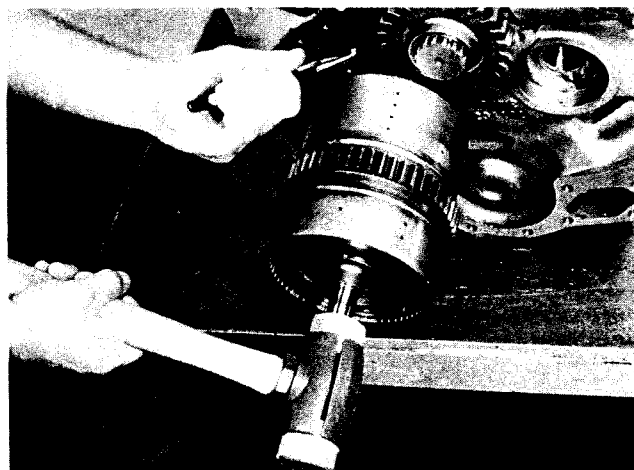


Figure 136

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.

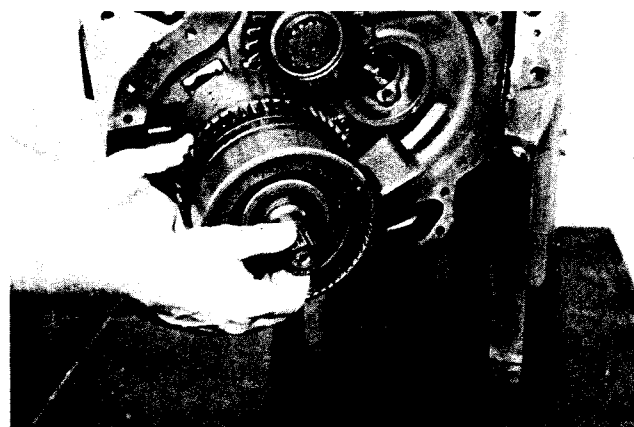


Figure 137

Install 2nd speed clutch pilot bearing.

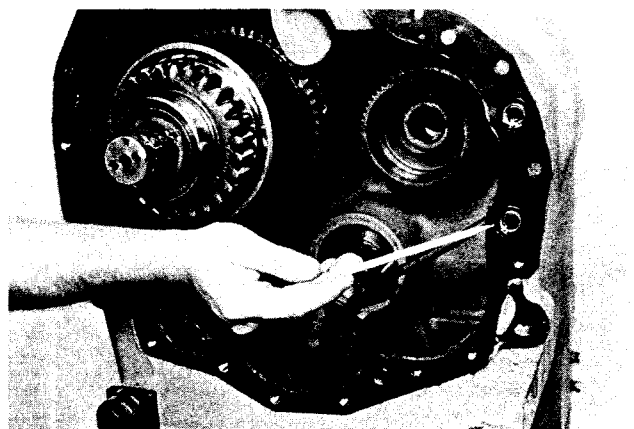


Figure 138

Install transmission case gasket and "O" ring seals.

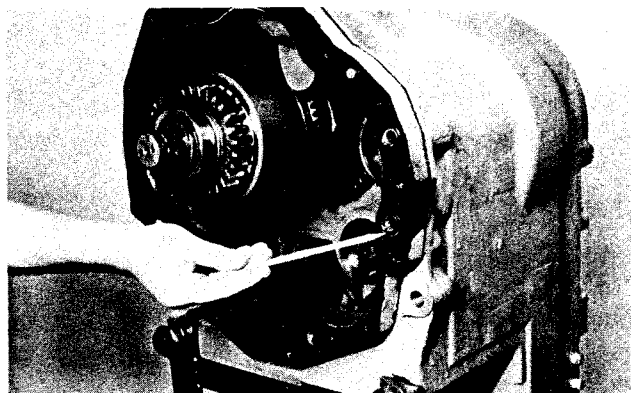


Figure 139

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

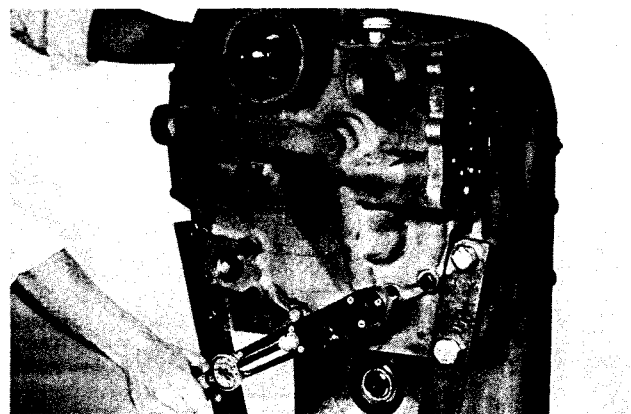


Figure 140

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.

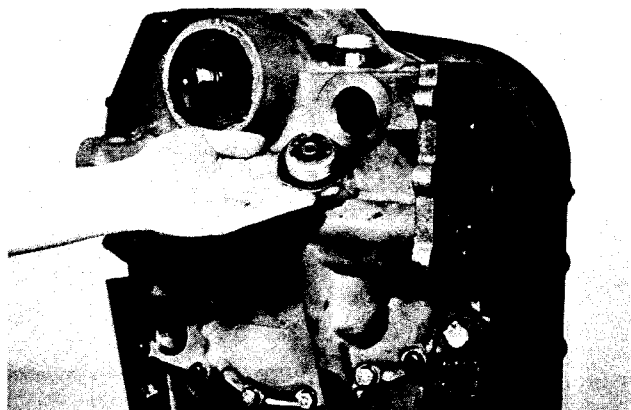


Figure 141

Install front cover plug.

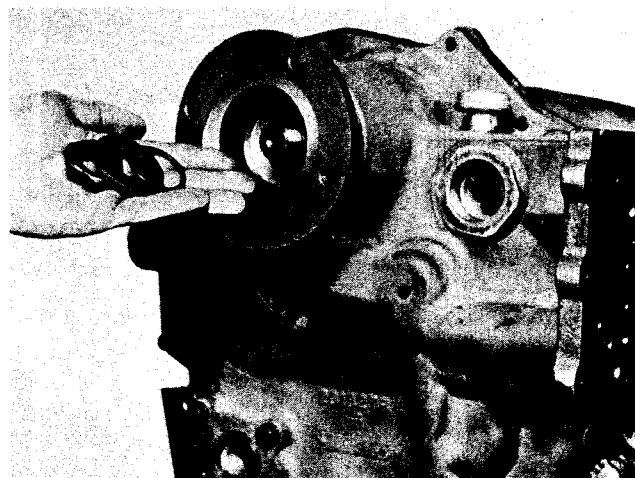


Figure 142

Install companion flange, flange "O" ring, washer and nut. Tighten standard slotted nut or elastic stop nut 200 to 250 ft. lbs. torque [271,2-338,9 N.m].

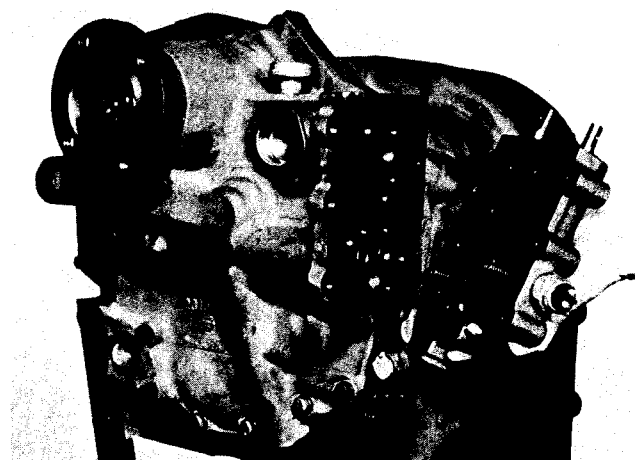


Figure 143

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

NOTE: See pages 40 and 41 for proper control cover gasket identification.

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).

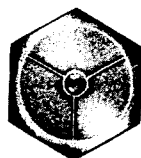
Add quantity necessary to bring fluid level to **LOW** mark on dipstick or runs freely from **LOWER** oil level check plug hole. Install oil level plug or dipstick. Recheck with hot oil (180-200° F.) [82, 2-93, 3° C].

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.

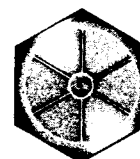
TORQUE IN (LBS.—FT.) BOLTS, CAPSCREWS, STUDS AND NUTS

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

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

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

CLUTCH PRESSURE 240 - 280 psi [16,9-19,6 kg/cm²] — With parking brake set (see note), oil temperature 180 - 200° F. [82,2-93,3° C], engine at idle (400 to 600 RPM), shift thru direction and speed clutches. All clutch pressure must be equal within 5 psi. [0,4 kg/cm²]. If clutch pressure varies in any one clutch more than 5 psi. [0,4 kg/cm²] repair clutch.

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

ALWAYS USE PARKING BRAKE WHEN MAKING CLUTCH PRESSURE CHECKS.

LUBRICATION

TYPE OF OIL See Lube Chart.

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

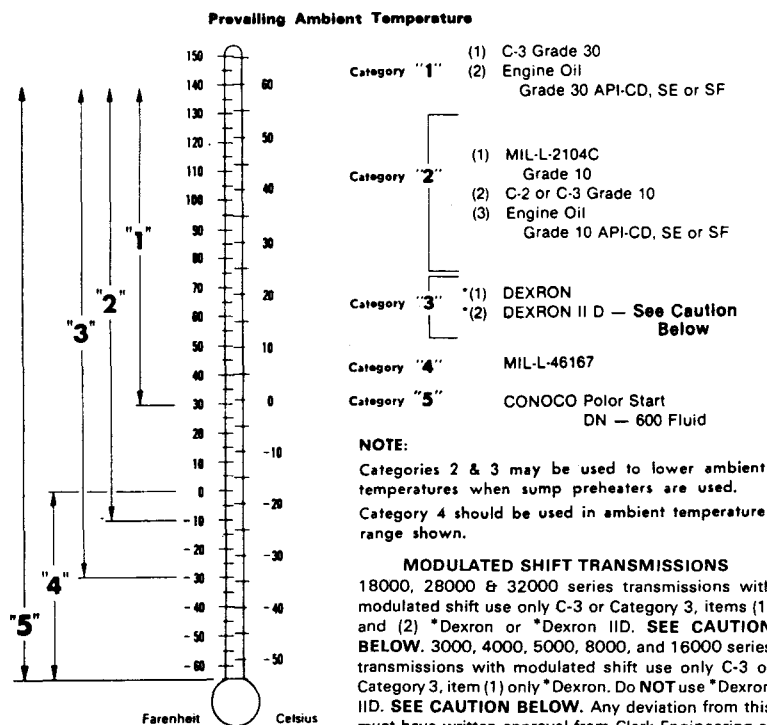
CHECK PERIOD Check oil level DAILY with engine running at 500-600 RPM and oil at 180° to 200° F. [82,2 - 93,3° C]. Maintain oil level to FULL mark.

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

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

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

RECOMMENDED LUBRICANTS FOR CLARK POWER SHIFTED TRANSMISSION AND TORQUE CONVERTERS



*Dexron is a registered trademark of General Motors Corporation.

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

TROUBLE SHOOTING GUIDE

For The R and HR Model, 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.	1. Fill to proper level.
2. Clutch pressure regulating valve spool stuck open.	2. Clean valve spool and housing.
3. Faulty charging pump.	3. Replace pump.
4. Broken or worn clutch shaft or piston sealing rings.	4. Replace sealing rings.
5. Clutch piston bleed valve stuck open.	5. Clean bleed valves thoroughly.

LOW CONVERTER CHARGING PUMP OUTPUT

1. Low oil level.	1. Fill to proper level.
2. Suction screen plugged.	2. Clean suction screen.
3. Air leaks at pump intake hose and connections or collapsed hose. (R-32000 only)	3. Tighten all connections or replace hose if necessary.
4. Defective oil pump.	4. Replace pump.

OVERHEATING

1. Worn oil sealing rings.	1. Remove, disassemble, and rebuild converter assembly.
2. Worn oil pump.	2. Replace.
3. Low oil level.	3. Fill to proper level.
4. Pump suction line taking air. (R-32000 only)	4. Check oil line connections and tighten securely.

NOISY CONVERTER

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

LACK OF POWER

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

THEORY OF OPERATION

TRANSMISSION MODULATOR VALVE OPERATIONAL DESCRIPTION

Both directional clutch assemblies are controlled by individual modulator valves. The pressure rise at side "A" of the regulator spool is the same as that applying the clutch piston. Supply flow to the clutch and modulator is limited by a flow limiting orifice. From this limited flow the regulator spool drains flow to the vent port. The regulator spool restricts flow through the vent port to build clutch pressure at a pre-determined rate. Once the vent flow is shut off, only minimal flow passes through the flow limiting orifice to make up for normal spool and clutch leakages. Pressure on either side of the orifice is virtually identical and full regulated system pressure is applied at the clutch piston.

When forward direction is selected the oil under pressure enters the port on the "A" side of the regulator spool. This passes through the dampening orifice. The pressure force on the spool area shifts the spool to the right exposing the vent port. The time required to shift the regulator spool over to expose the vent port shows up as a pressure spike at the beginning of the pressure versus time chart.

The movement of the regulator spool is opposed by the regulator and accumulator springs. This provides an initial low pressure head of approximately 20 psi [137,9 Kpa] on the "A" side of the spool. This 20 psi [137,9 Kpa] is represented as a horizontal line on the pressure versus time chart immediately following the spike. Oil flows through the regulator spool orifice due to a pressure imbalance. Pressure at side "A" is constantly 10 psi [68,9 Kpa] higher than side "B" as a result of the added force of the side "B" spring.

The 10 psi [68,9 Kpa] supply through the regulator spool orifice gives a controlled flow rate. This controlled flow establishes the time it takes to fill the accumulated cavity.

As the accumulator cavity is filled, the accumulator spool is forced against the accumulator springs. As the springs compress their force increases causing the hydraulic pressure in the accumulator cavity and "B" side of the regulator spool to increase. Pressure on the "A" side of the regulator spool increases with the opposing force on the "B" side.

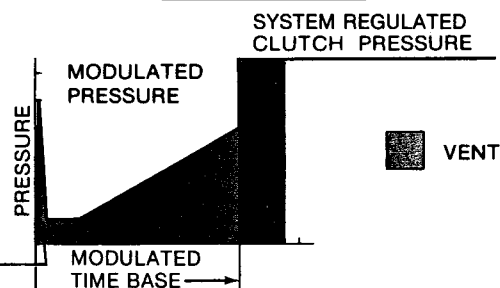
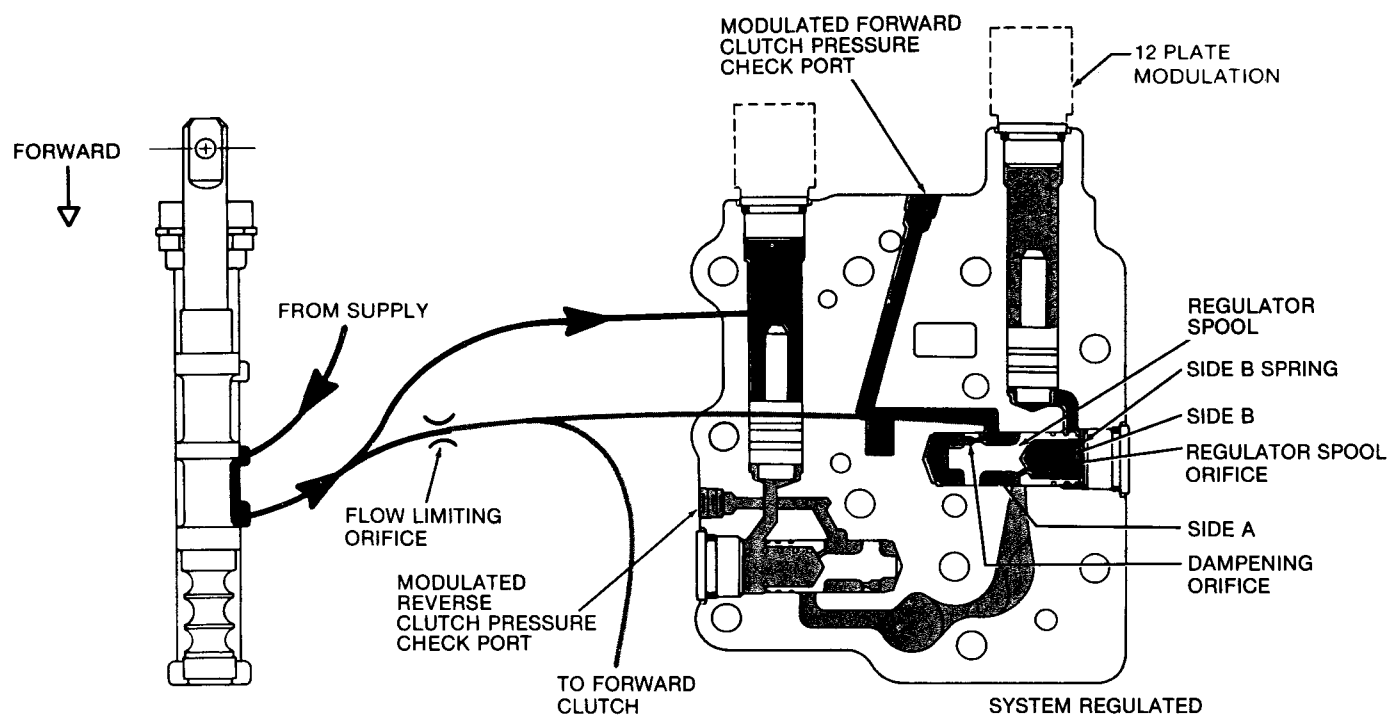
This causes the rising slope in the clutch pressure versus time chart. The rate of this rise is controlled by the accumulator spring force. Once the accumulator spool is stroked to its limit, pressure on "A" and "B" side of the regulator spool is balanced since no flow passes through the regulator spool orifice. The regulator spool spring pushes the regulator spool to the left shutting off the vent flow. The clutch and modulator pressure rapidly rise to the system regulated clutch supply pressure setting. This is the vertical line on the clutch pressure versus time chart.

The entire modulator sequence of events occurs in less than two seconds. The steady rise of clutch pressure increases the clutch driving torque which results in a smooth clutch application.

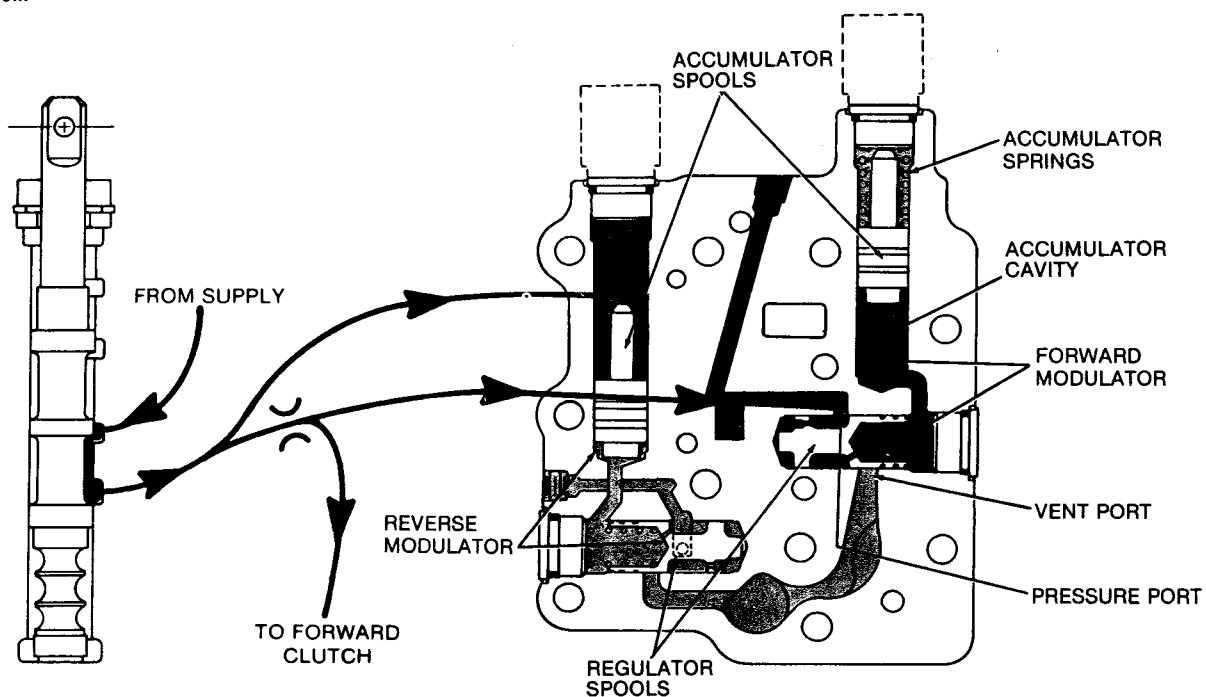
When forward direction is selected the reverse clutch and modulator are vented through the control valve to the transmission sump. The reverse accumulator cavity is vented back through the regulator spool orifice. To hasten the reset time of the accumulator, immediately preparing the transmission for a directional shift, full system regulated clutch supply pressure from the forward control valve is directed to the spring cavity of the reverse accumulator.

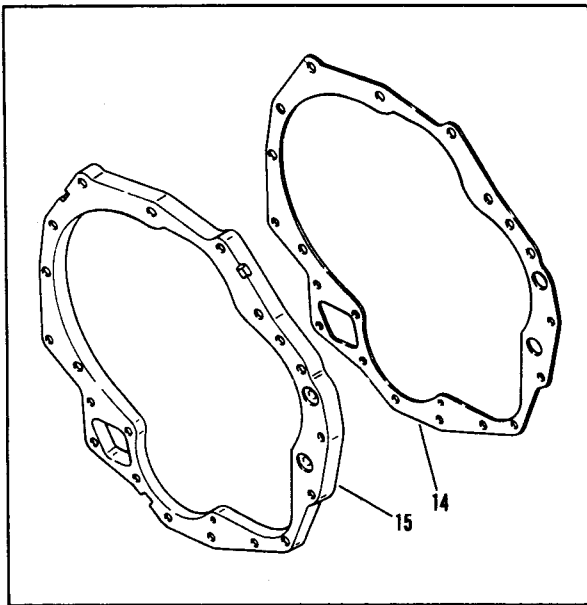
When reverse direction is selected the reverse clutch and modulator function through the same sequence of events as the forward clutch and modulator. This same sequence of events also applies to the lock-up modulators.

32000 SERIES MODULATION

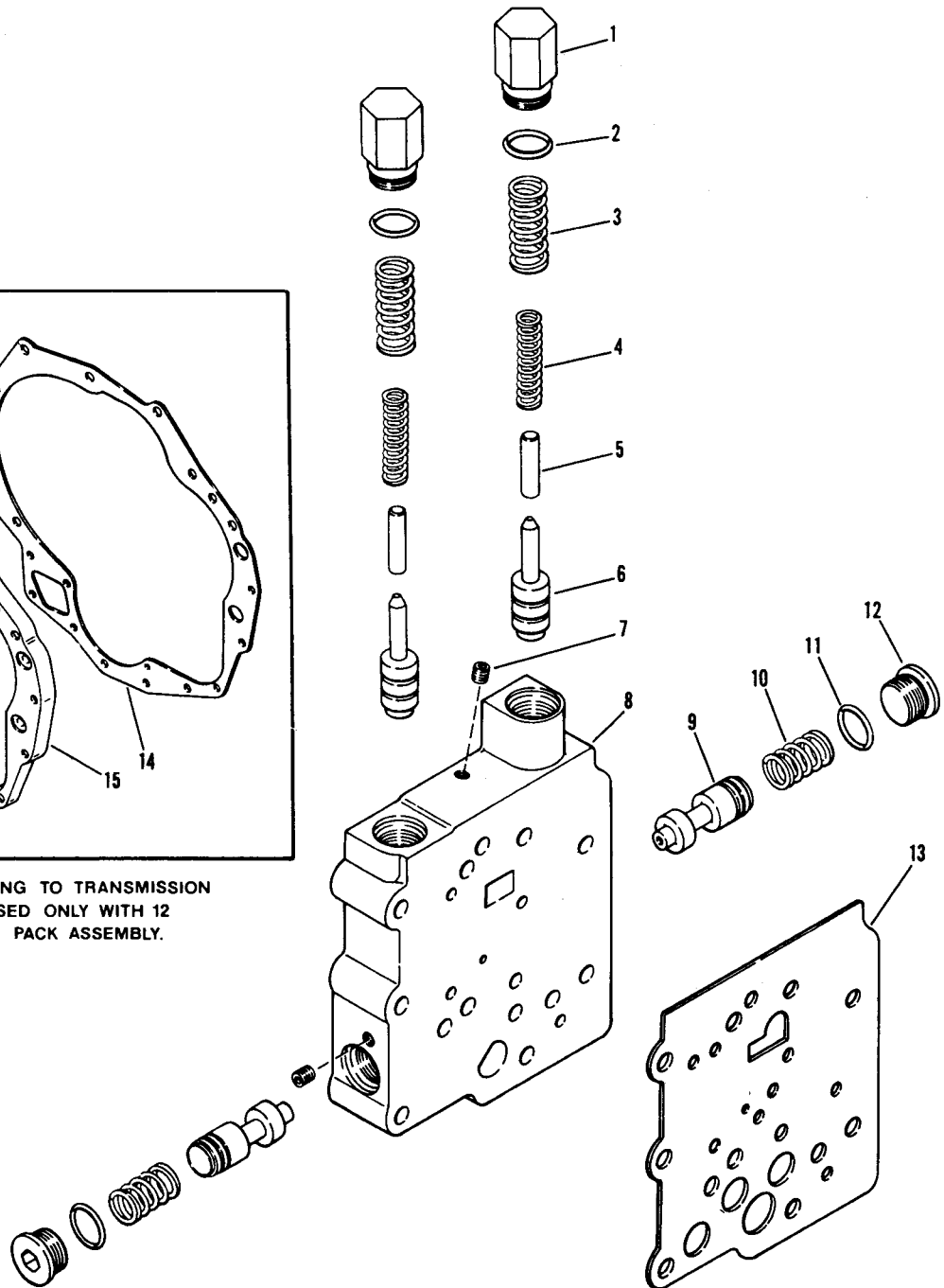


This pressure spike is time required for spools to react. The spike pressure is used to quickly fill the clutch pressure supply passages with oil.





CONVERTER HOUSING TO TRANSMISSION
CASE SPACER USED ONLY WITH 12
PLATE CLUTCH PACK ASSEMBLY.



MODULATED VALVE ASSEMBLY

ITEM	DESCRIPTION	QTY.
1	Accumulator Valve Stop Plug	2
2	Accumulator Valve Stop Plug "O" Ring....	2
3	Accumulator Spring - Outer.....	2
4	Accumulator Spring - Inner.....	2
5	Accumulator Valve Pin.....	2
6	Accumulator Valve	2
7	Plug	2
8	Modulator Valve Housing	1

ITEM	DESCRIPTION	QTY.
9	Regulator Spool	2
10	Regulator Spring.....	2
11	Regulator Spool Stop Plug "O" Ring....	2
12	Regulator Spool Plug.....	2
13	Modulator Valve to Plate Gasket	1
14	Housing Spacer Gasket.....	
15	Housing Spacer	

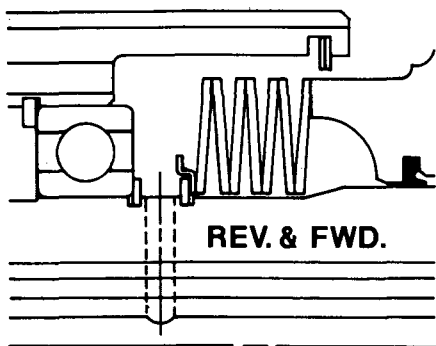
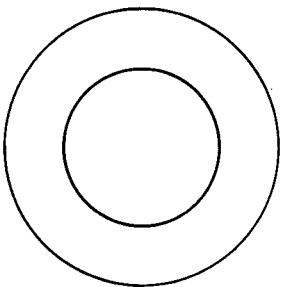


FIG. A



**BELLEVILLE WASHER
REV. & FWD.**

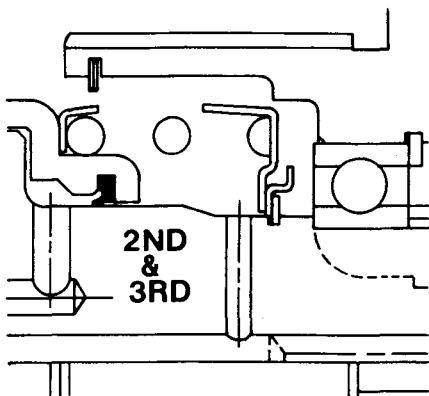


FIG. B

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

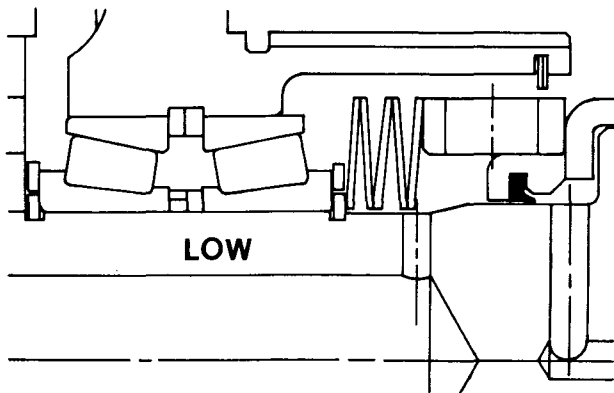
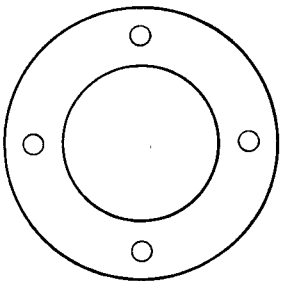


FIG. C



**BELLEVILLE WASHER
LOW ONLY**

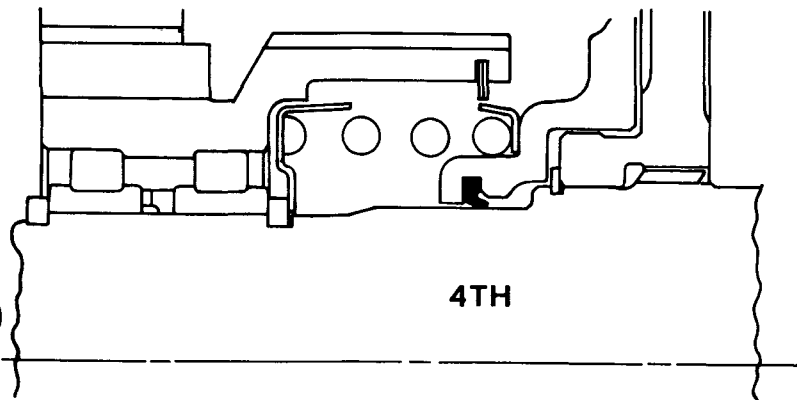
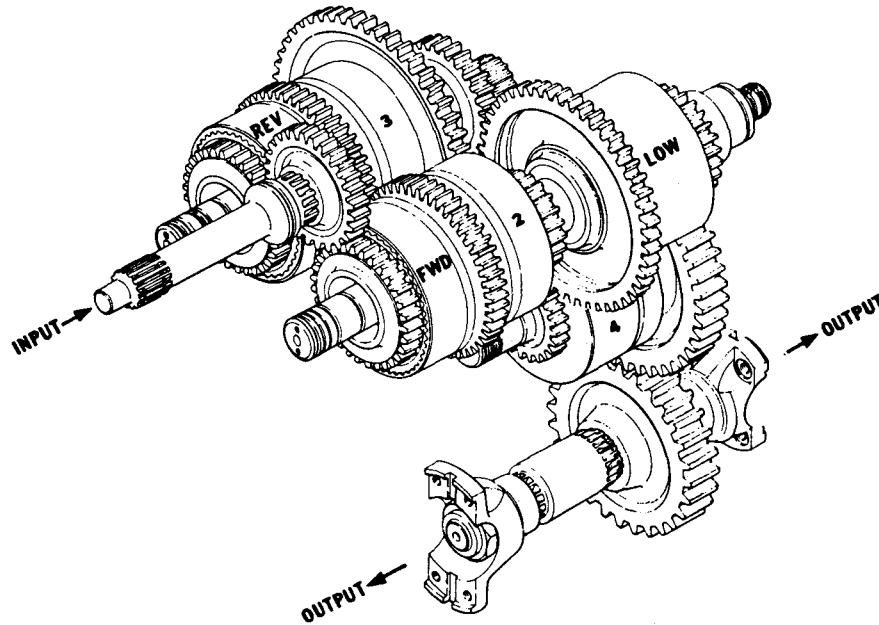


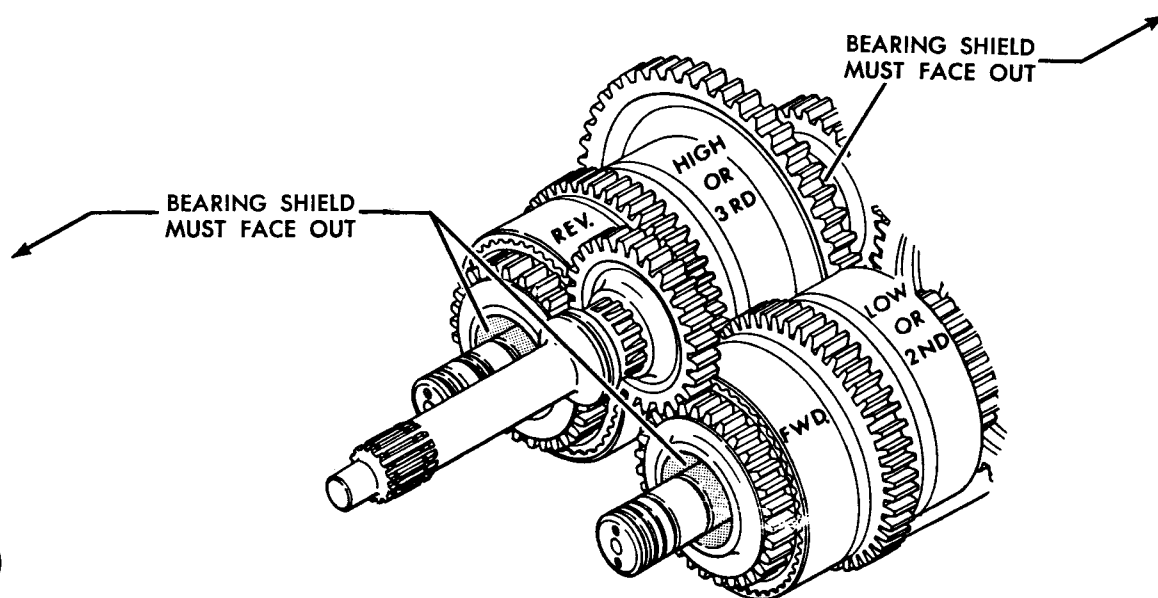
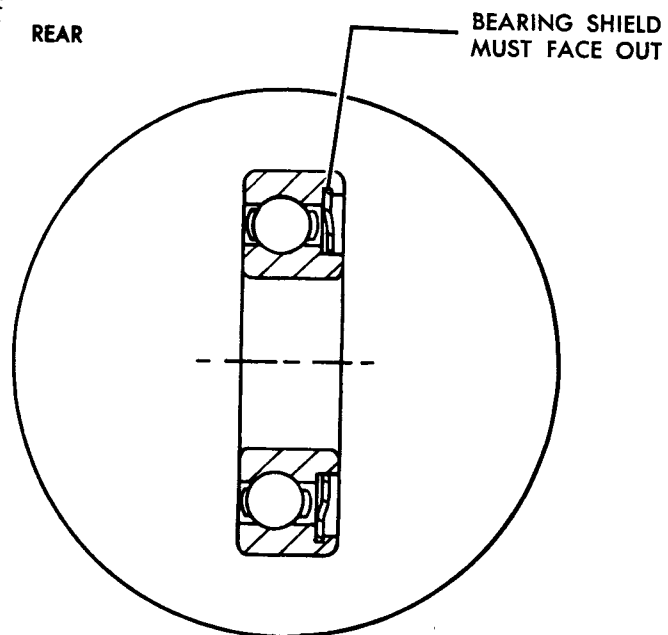
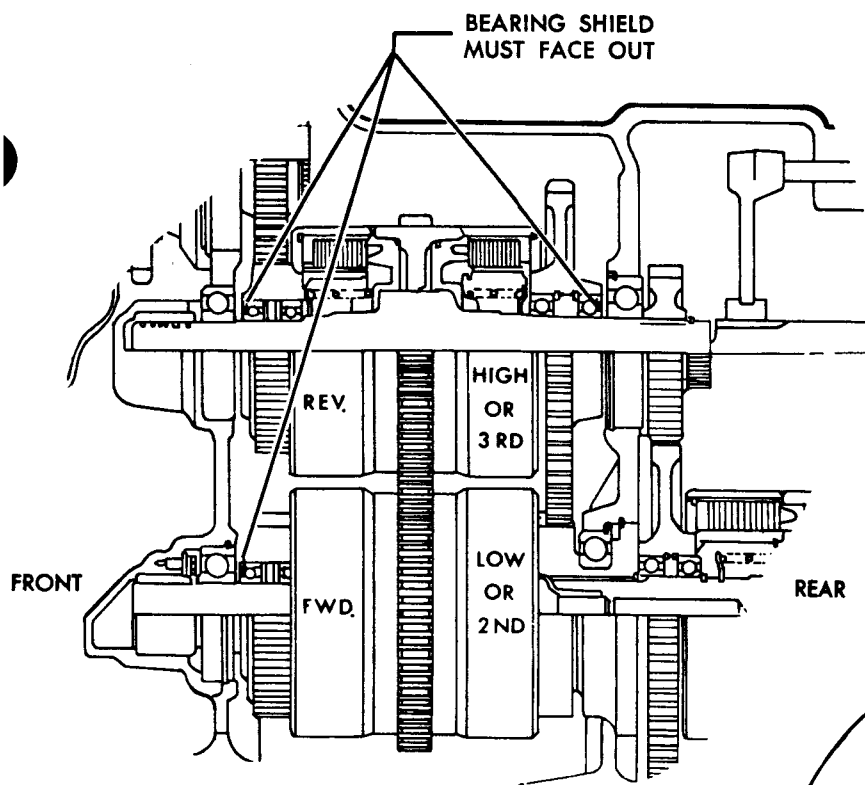
FIG. D



**32000 SERIES-4 SPEED
CLUTCH & GEAR ARRANGEMENT**

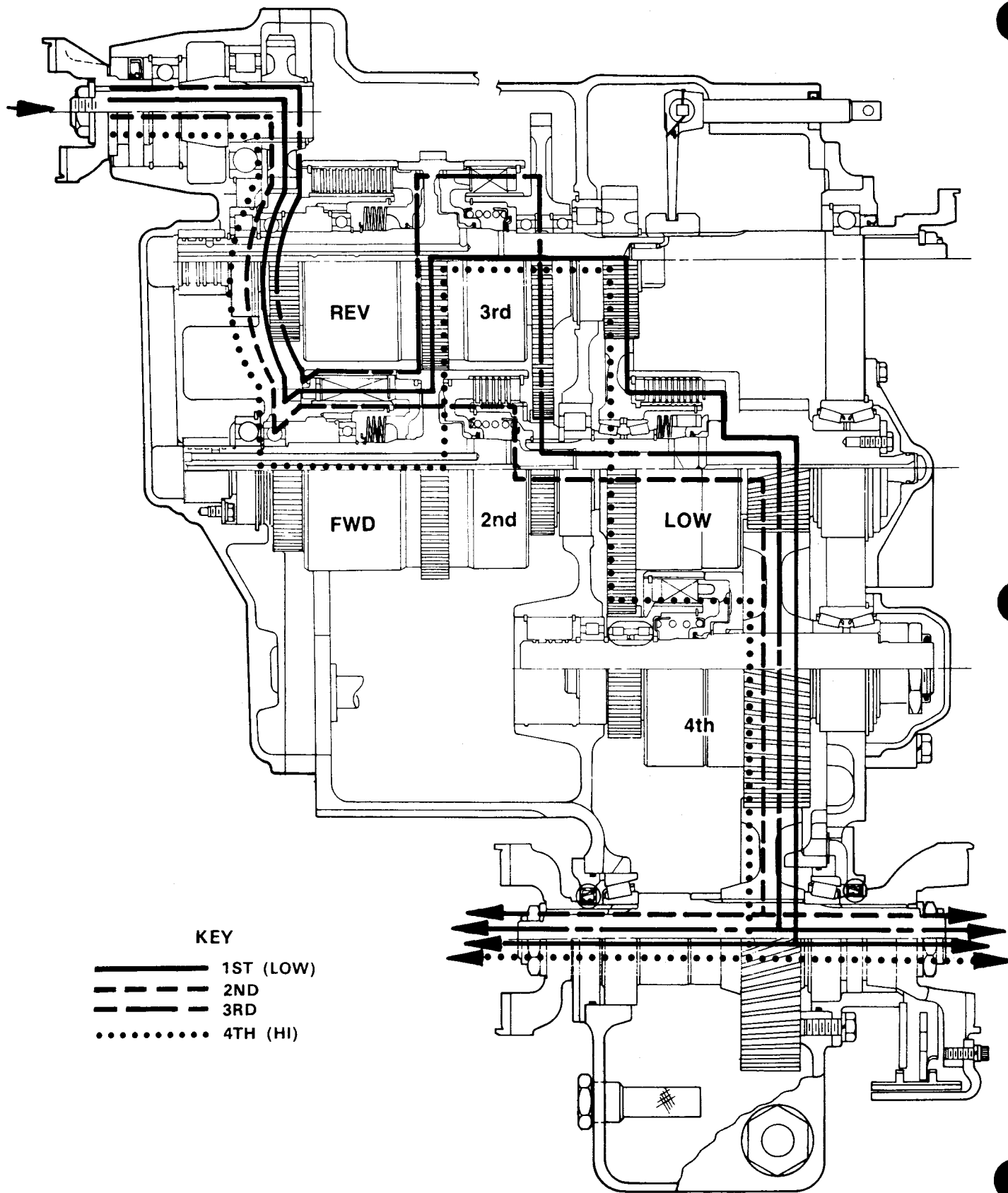
CONVERTER CHARGE PUMP REPLACEMENT AND PRIMING PROCEDURE

1. The cause for pump failure must be found and corrected before a replacement pump is installed. Check all of the hoses, tubes, "O" rings, adaptors and split flanges.
2. Replace any collapsed or damaged hoses, damaged split flange "O" rings, tube "O" rings and adaptors.
3. After all checks have been made and corrections completed install the pump.
4. See filling instructions on page 27.
5. Start the engine. Run the engine at low idle for two minutes, watch the clutch pressure gage and listen for cavitation of the pump.
6. If the pressure does not come up, check the oil level and bleed off air from system as follows.
7. To bleed off the air from the system, loosen the pressure gage line at the pressure regulating valve or loosen the pressure hose at the oil filter or pressure regulating valve. Crank the engine over until the air is displaced with oil. **DO NOT START THE ENGINE.**
8. If bleeding the lines does not correct the problem it may become necessary to prime the pump. Disconnect the suction hose or pressure hose, whichever is higher, and fill the port with transmission oil, reconnect the hose and tighten.
9. Start the engine and check pressure.
10. Recheck oil level with hot oil (180-200°F) with engine at idle. Add oil as necessary to bring oil level to full mark.



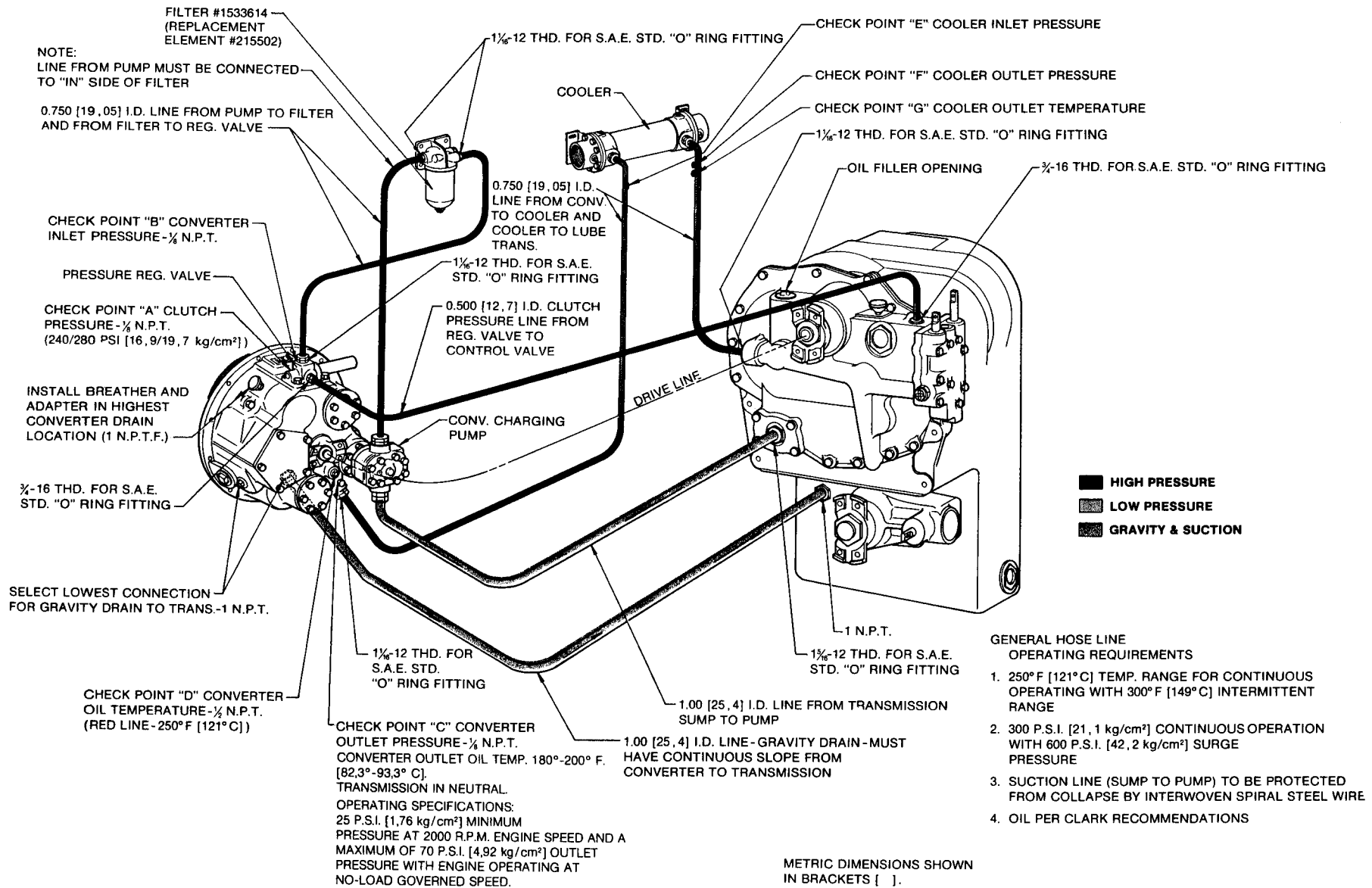
SHIELDED BEARING INSTALLATION

CLARK



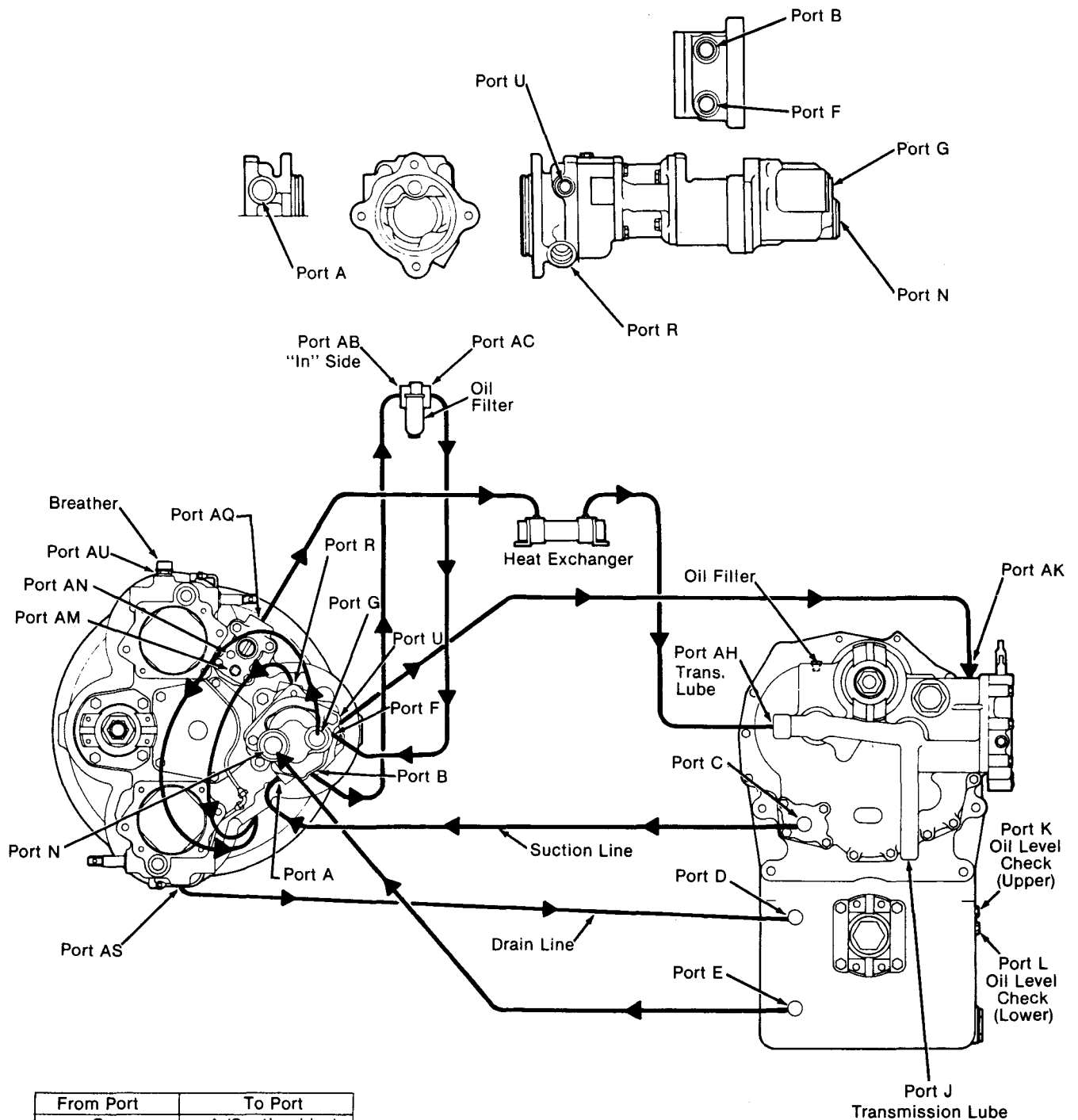
4 SPEED TRANSMISSION

R32000 — C 270/C 320 EXTERNAL PLUMBING DIAGRAM



CLARK

OIL CIRCUIT AND PLUMBING DIAGRAM FOR C-5000 OR C-8000 WITH R-32000 SERIES TRANSMISSION

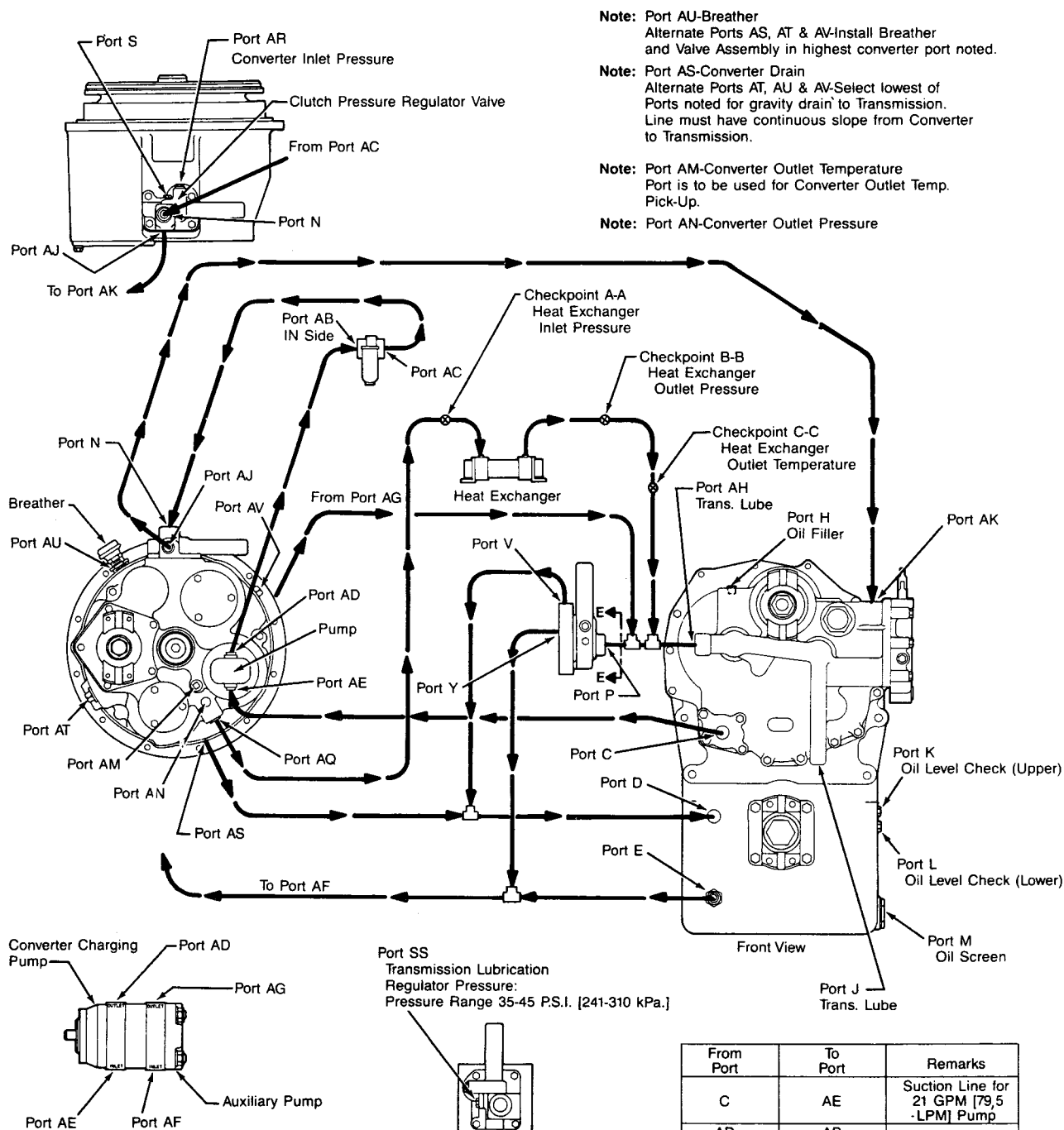


From Port	To Port
C	A (Suction Line)
B	AB
AC	F
AQ	Heat Exchanger
Heat Exchanger	AH
AS	D (Drain Line)
E	N
U	AK

Port U - Clutch Pressure
 Port AM - Converter Outlet Temperature
 Port AN - Converter Outlet Pressure
Note: Port AU - Breather
 Install Breather and Valve Assembly in highest converter Port.

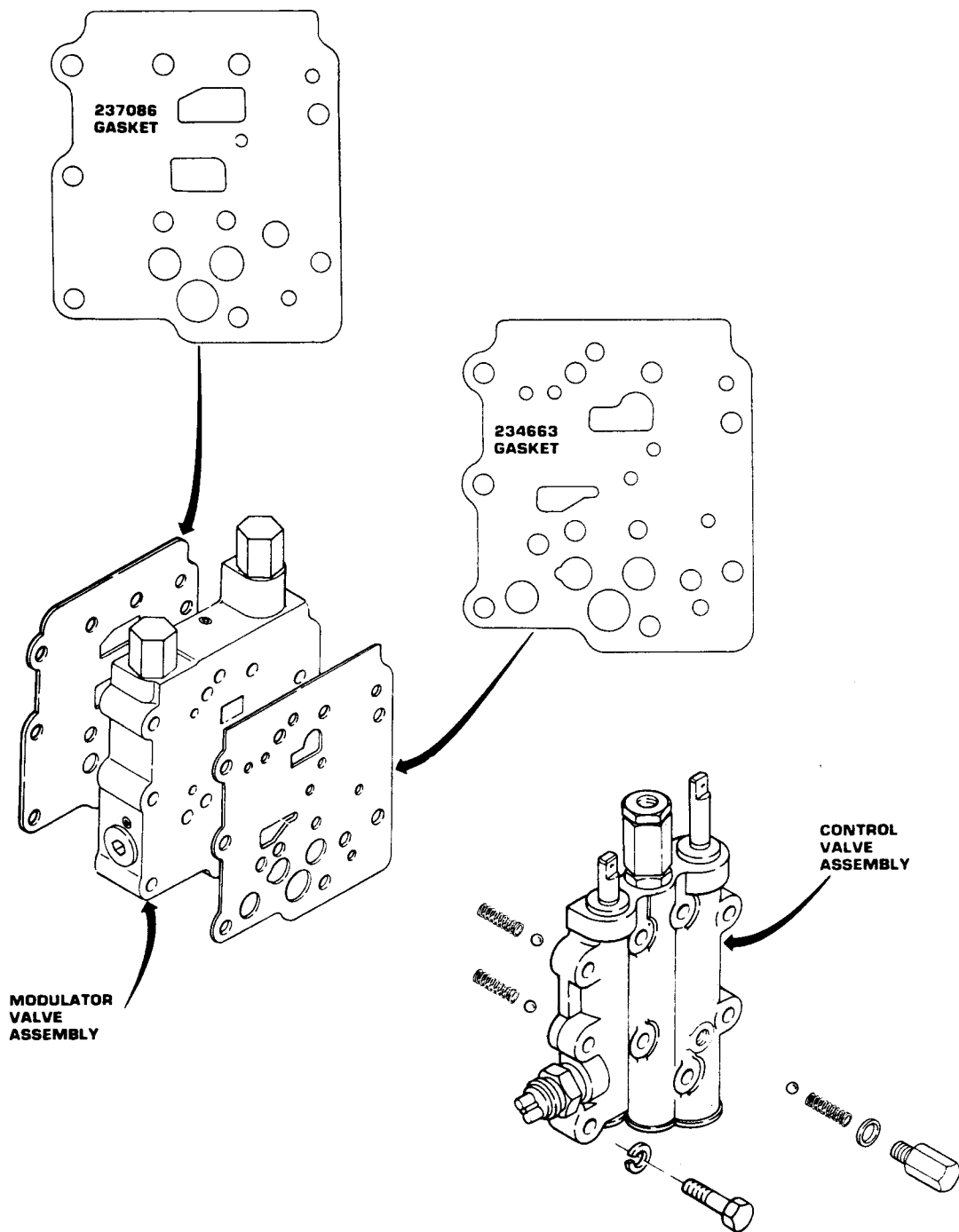
Note: Port AS - Converter Drain
 Gravity Drain to transmission line must have continuous slope from converter to transmission.

OIL CIRCUIT AND PLUMBING DIAGRAM FOR C & CL 270 AND R32000 SERIES TRANSMISSION WITH MODULATION AND AUXILIARY LUBE. PUMP

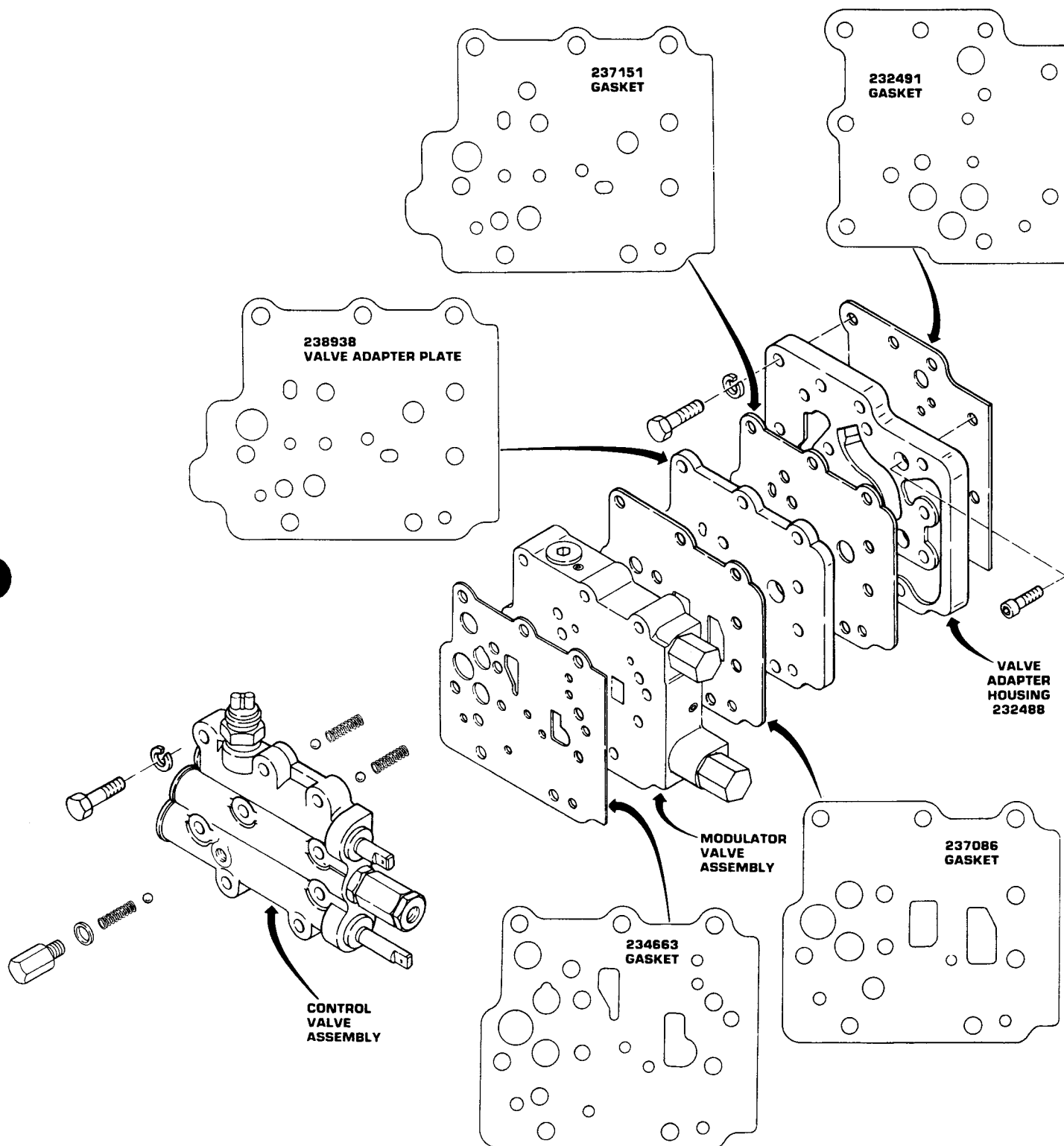


From Port	To Port	Remarks
C	AE	Suction Line for 21 GPM [79,5 LPM] Pump
AD	AB	
AC	N	
AJ	AK	
AQ	Heat Exchanger	
Heat Exchanger	TEE	
AS	D	Drain Line
P	AH	Max Length 36 Inches [914,4]
E	AF	
AG	TEE	
V	TEE	
Y	TEE	

ALWAYS USE PARKING BRAKE WHEN MAKING CLUTCH PRESSURE CHECKS.



Control Valve (Vertical) With Modulation



Control Valve (90° Position) With Modulation