



**SPICER®**

*Off-Highway Products*

## Service Manual

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Powershift Transmission  
32000 R & HR 4-Speed  
Long Drop

TSM-0011  
December 1994

## TOWING OR PUSH STARTING

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

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

## FOREWORD

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

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

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

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

## TRANSMISSION ASSEMBLY

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

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

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

- Basic Design Silhouette
- Converter Group
- Converter and Transmission Case Group
- Reverse and 3rd, Forward and 2nd Clutch Group
- Low, 4th and Output Group
- Regulating Valve, Charging Pump and Filter Group
- Control Valve Assembly
- Axle Disconnect and Mechanical Parking Brake
- Assembly Instruction
- Ring Gear Installation
- Clutch and Gear Arrangement
- 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, a friction disc with splines at the inner diameter is inserted. Discs are alternated until the required total is achieved. A heavy back-up plate is then inserted and secured with a snap ring. A Hub with O.D. splines is inserted into the splines of discs with teeth on the inner diameter. The discs and hub are free to increase in speed or rotate in the opposite direction as long as no pressure is present in that specific clutch.

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

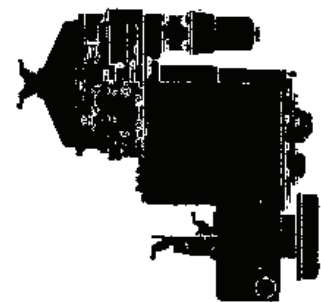
There are bleed balls in the clutch piston which allow quick escape for oil when the pressure to the piston is released.



R-32000

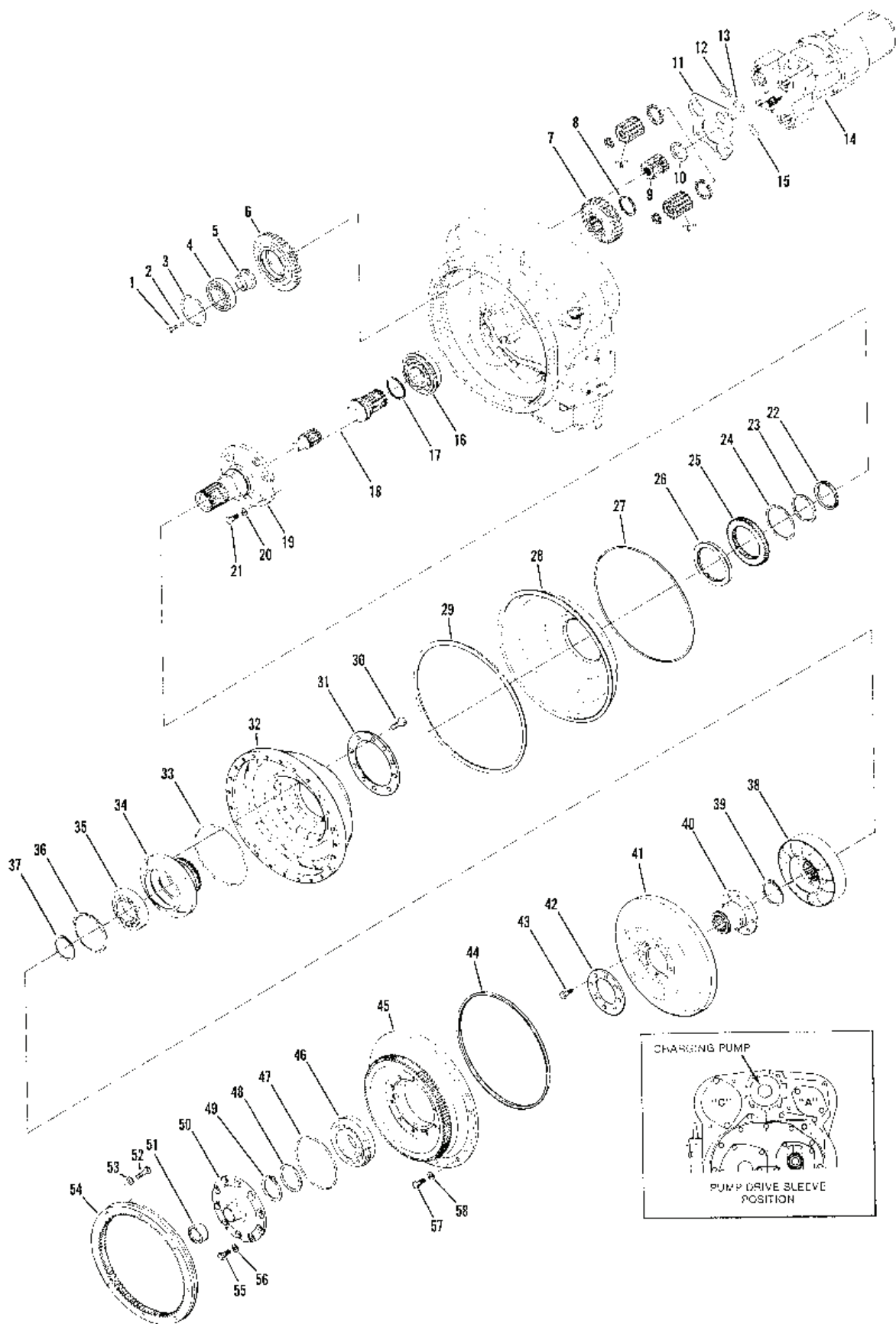


HR-32000



MHR-32000

FIG. A



**Figure B**



## HR32000 CONVERTER GROUP

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

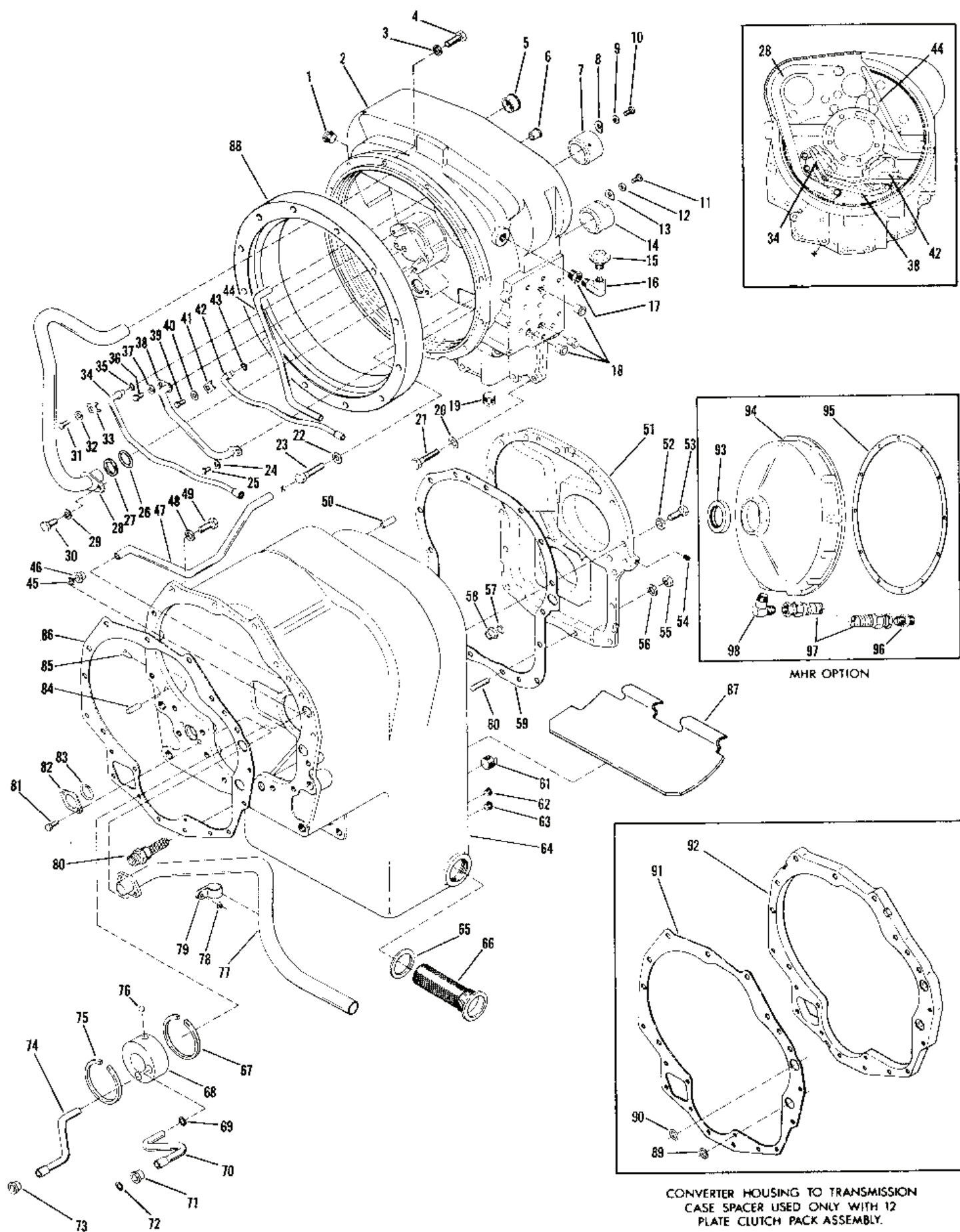


Figure C

## HR32000 CONVERTER & TRANSMISSION CASE GROUP

ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	Pipe Plug.....	1	50	Rear Cover Dowel Pin.....	2
2	Converter Housing Assembly.....	1	51	Rear Cover.....	1
3	Converter Housing to Front Cover Screw Lockwasher.....	12	52	Rear Cover to Transmission Case Screw Lockwasher.....	13
4	Converter Housing to Front Cover Screw.....	12	53	Rear Cover to Transmission Case Screw.....	13
5	Tube Sleeve.....	1	54	Rear Cover Pipe Plug.....	1
6	Tube Sleeve.....	1	55	Rear Cover to Case Stud Nut.....	2
7	Converter Housing Sleeve.....	1	56	Rear Cover to Case Stud Lockwasher.....	2
8	Converter Housing Sleeve Lock.....	1	57	Clutch Pressure Tube "O" Ring.....	1
9	Converter Housing Sleeve Screw Lockwasher.....	1	58	Tube Sleeve.....	1
10	Converter Housing Sleeve Screw.....	1	59	Rear Cover to Transmission Case Gasket.....	1
11	Converter Housing Sleeve Screw.....	1	60	Rear Cover to Case Stud.....	2
12	Converter Housing Sleeve Screw Lockwasher.....	1	61	Magnetic Drain Plug.....	1
13	Converter Housing Sleeve Lock.....	1	62	Oil Level Plug.....	1
14	Converter Housing Sleeve.....	1	63	Oil Level Plug.....	1
15	Breather.....	1	64	Transmission Case Assembly.....	1
16	Street Ell.....	1	65	Screen Assembly Gasket.....	1
17	Breather Reducing Bushing.....	1	66	Screen Assembly.....	1
18	Tube Sleeve.....	3	67	Oil Distributor Retainer Ring.....	1
19	Pipe Plug.....	1	68	4th Clutch Front Oil Distributor.....	1
20	Converter Housing to Transmission Housing Screw Lockwasher.....	4	69	Pressure Tube "O" Ring.....	1
21	Converter Housing to Transmission Housing Screw.....	4	70	4th Speed Pressure Tube.....	1
22	Converter Housing to Transmission Housing Lockwasher.....	4	71	Tube Sleeve.....	1
23	Converter Housing to Transmission Housing Screw.....	4	72	Pressure Tube "O" Ring.....	1
24	Lube Tube Retaining Screw Lockwasher.....	1	73	Tube Sleeve.....	1
25	Lube Tube Retaining Screw.....	1	74	4th Speed Clutch Lube Tube.....	1
26	Suction Tube "O" Ring.....	1	75	Oil Distributor Retainer Ring.....	1
27	Suction Tube Spacer Ring.....	1	76	Locking Ball.....	1
28	Suction Tube Assembly.....	1	77	Suction Tube.....	1
29	Suction Tube Retainer Screw Lockwasher.....	1	78	Suction Tube Clip Washer.....	1
30	Suction Tube Retainer Screw.....	1	79	Suction Tube Clip.....	1
31	Tube Clip Screw.....	1	80	Suction Screen.....	1
32	Tube Clip Screw Lockwasher.....	1	81	Suction Line Screw.....	2
33	Tube Clip.....	1	82	Suction Line Washer.....	1
34	Reverse Tube Assembly.....	1	83	Suction Line "O" Ring.....	1
35	Reverse Tube "O" Ring.....	1	84	Converter Housing to Transmission Case Dowel Pin.....	2
36	Lube Tube Retainer Screw.....	1	85	Suction Tube Clip Rivet.....	1
37	Lube Tube Retainer Screw Lockwasher.....	1	86	Converter Housing to Transmission Case Gasket.....	1
38	Lube Tube Assembly.....	1	87	Oil Baffle.....	1
39	Tube Clip Screw.....	1	88	Converter Housing Adaptor Ring.....	1
40	Tube Clip Screw Lockwasher.....	1	89	4th Speed Pressure Tube "O" Ring.....	1
41	Tube Clip.....	1	90	Low Speed Pressure Tube "O" Ring.....	1
42	3rd Speed Tube.....	1	91	Converter Housing to Transmission Case Gasket.....	1
43	3rd Speed Tube "O" Ring.....	1	92	Converter Housing to Transmission Case Spacer.....	1
44	Valve Oil Supply Tube.....	1	93	Front Cover Oil Seal.....	1
45	Clutch Pressure Tube "O" Ring.....	1	94	Converter Housing Front Cover.....	1
46	Tube Sleeve.....	1	95	Converter Housing Front Cover Gasket.....	1
47	Low Speed Clutch Pressure Tube.....	1	96	Hose Fitting.....	1
48	Transmission Case to Converter Housing Screw Lockwasher.....	10	97	Hose Assembly.....	1
49	Transmission Case to Converter Housing Screw.....	10	98	Hose Fitting.....	1

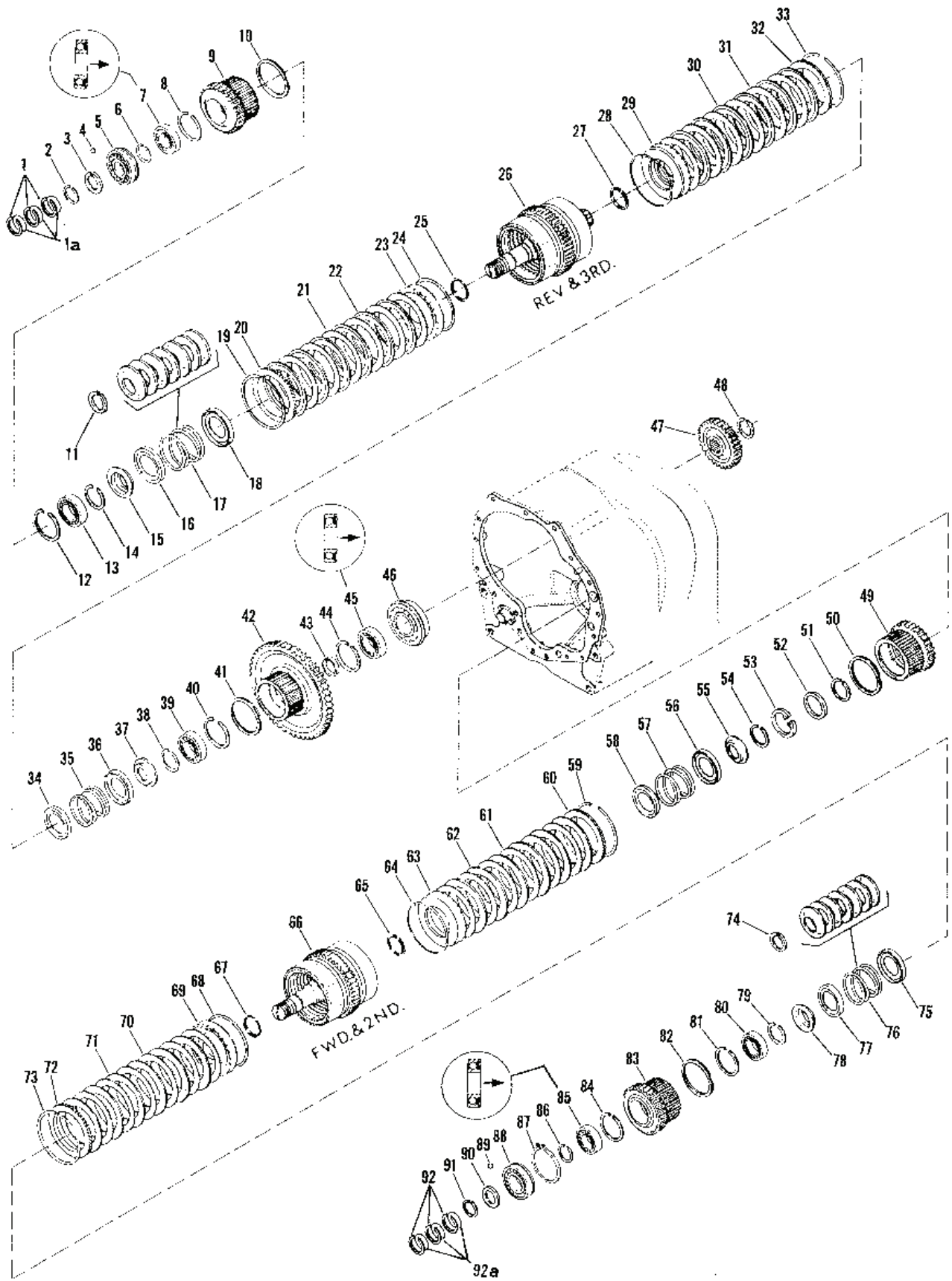


Figure D

# R OR HR32000

## REVERSE & 3RD & FORWARD & 2ND CLUTCH GROUP

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



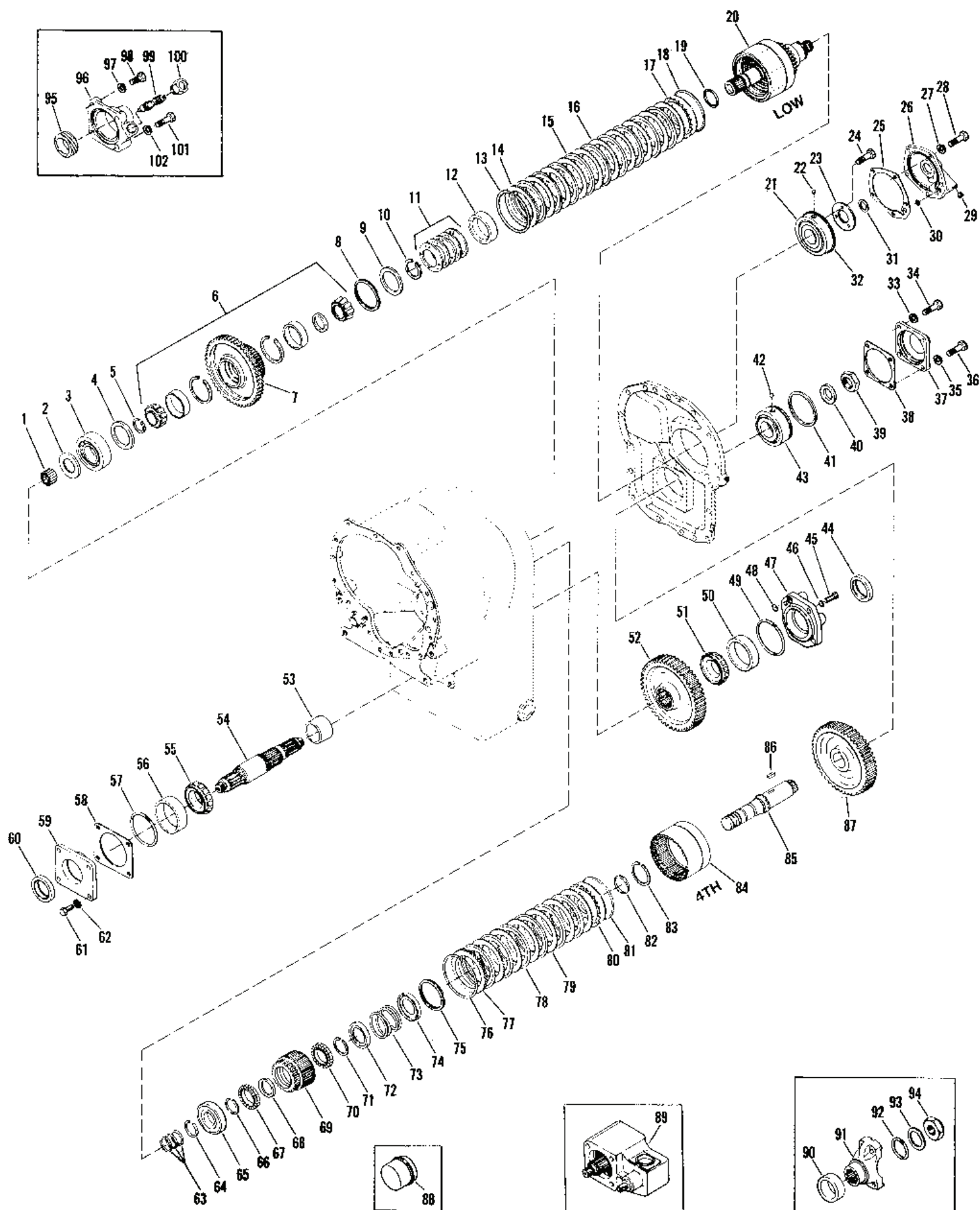


Figure E

## R OR HR32000 LOW, 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	Piston Return Disc Springs	5	62	Front Bearing Cap Screw Lockwasher	4
12	Piston to Disc Spring 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	Idle 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	2	84	4th Clutch Drum	1
34	Bearing Cap Screw	2	85	Idle Shaft	1
35	Bearing Cap Screw Lockwasher	2	86	Idle Shaft Gear Key	1
36	Bearing Cap Screw	2	87	Idle Shaft Gear	1
37	Idle Shaft Bearing Cap	1	88	Bore Plug	1
38	Idle Shaft Bearing Cap Gasket	1	89	Disconnect Assembly	1
39	Idle Shaft Nut	1	90	Oil Seal	1
40	Idle Shaft Washer	1	91	Output Flange	1
41	Rear Bearing Locating Ring	1	92	Output Flange "O" Ring	1
42	Idle Shaft Rear Bearing Lock Ball	1	93	Output Flange Washer	1
43	Idle 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 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	5

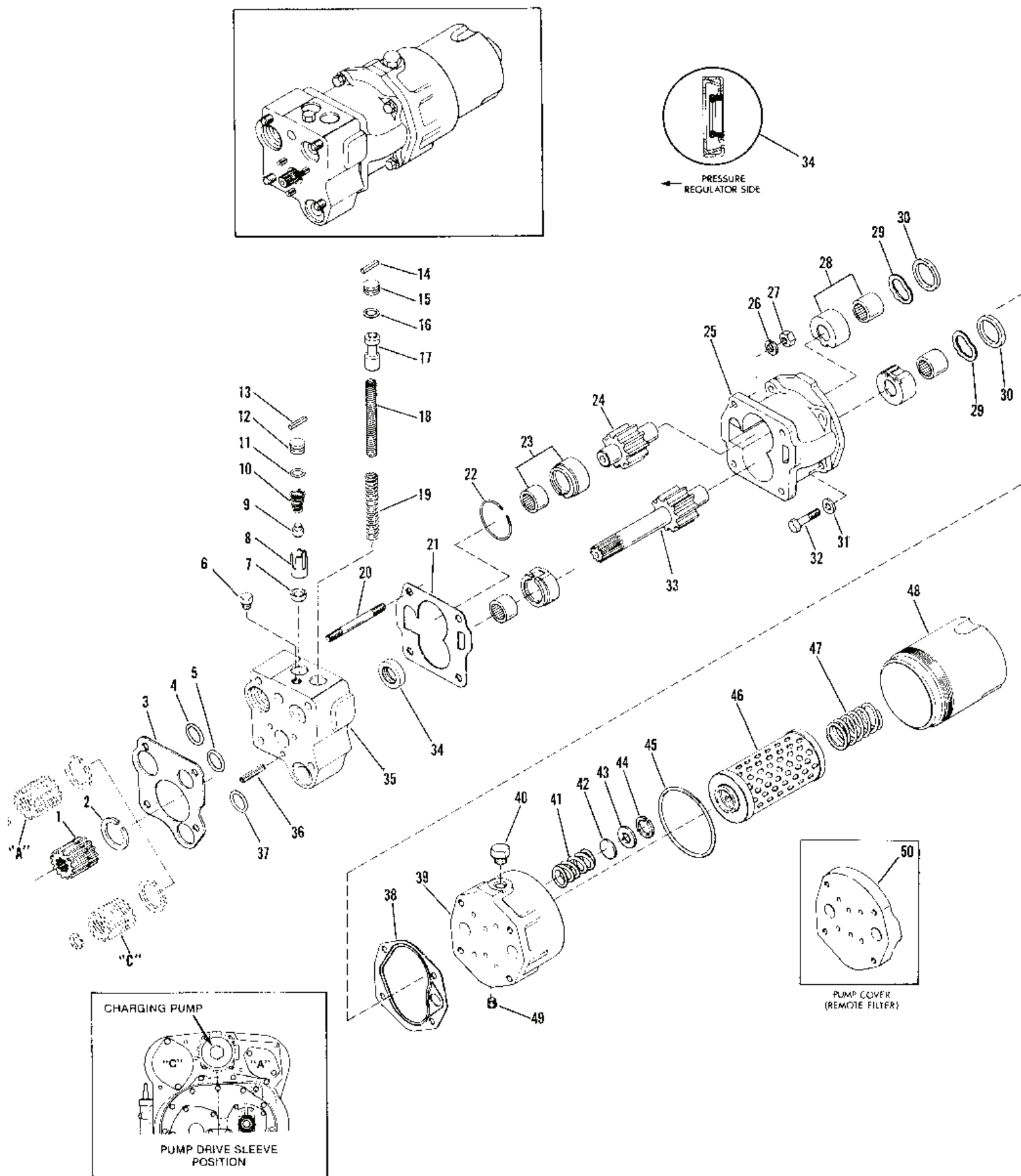


Figure F



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

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

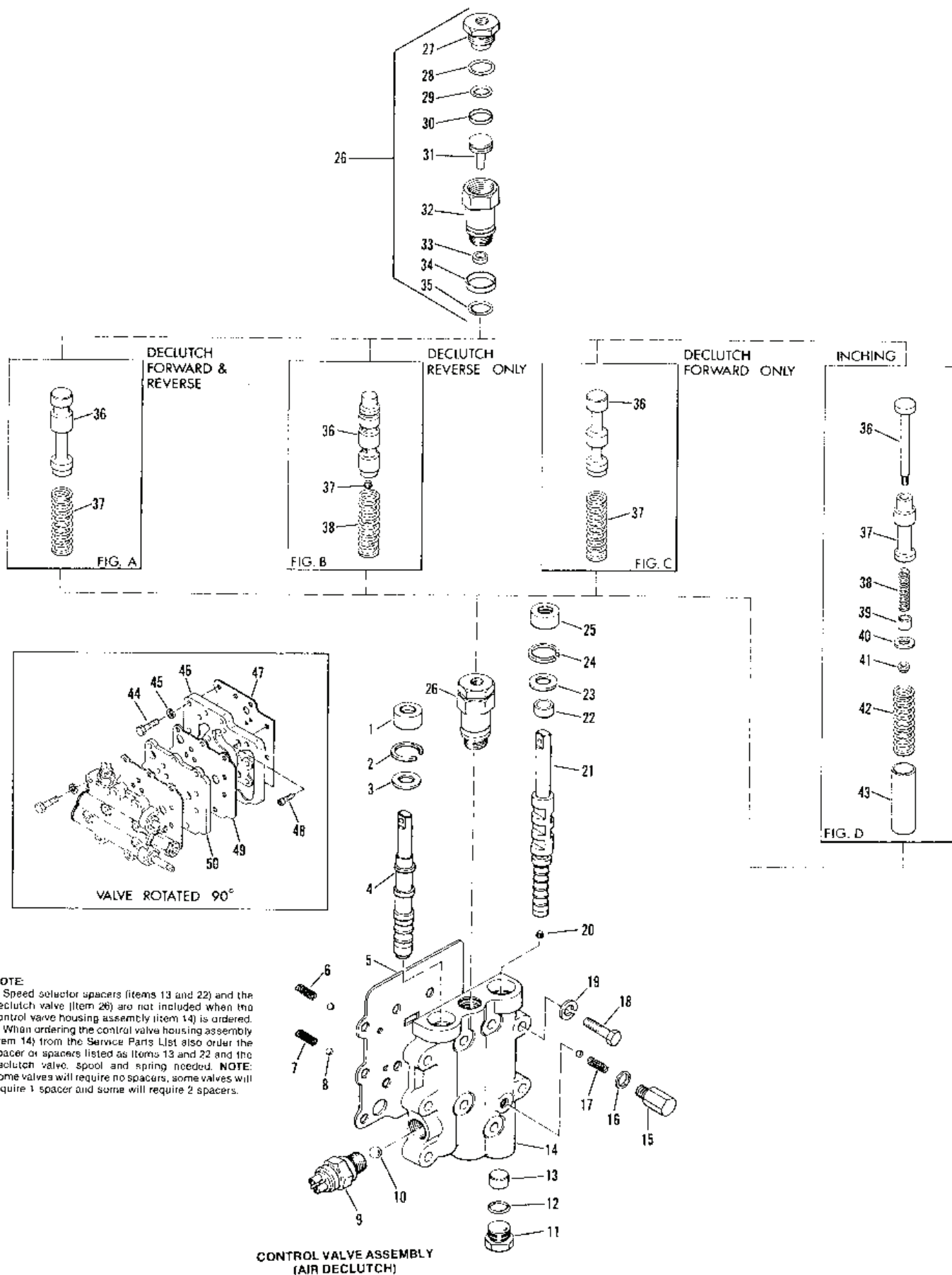


Figure G

## CONTROL VALVE ASSEMBLY

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

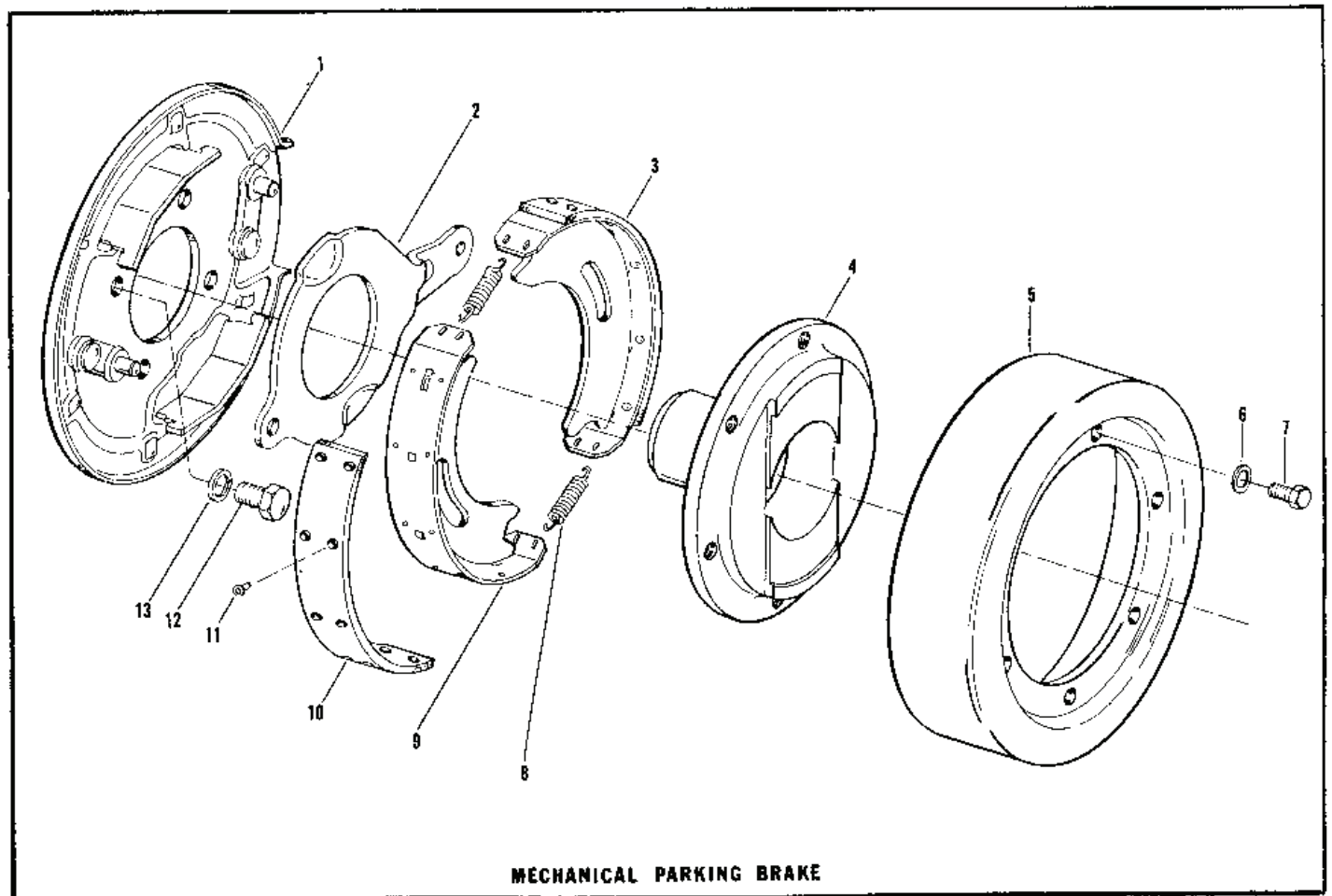
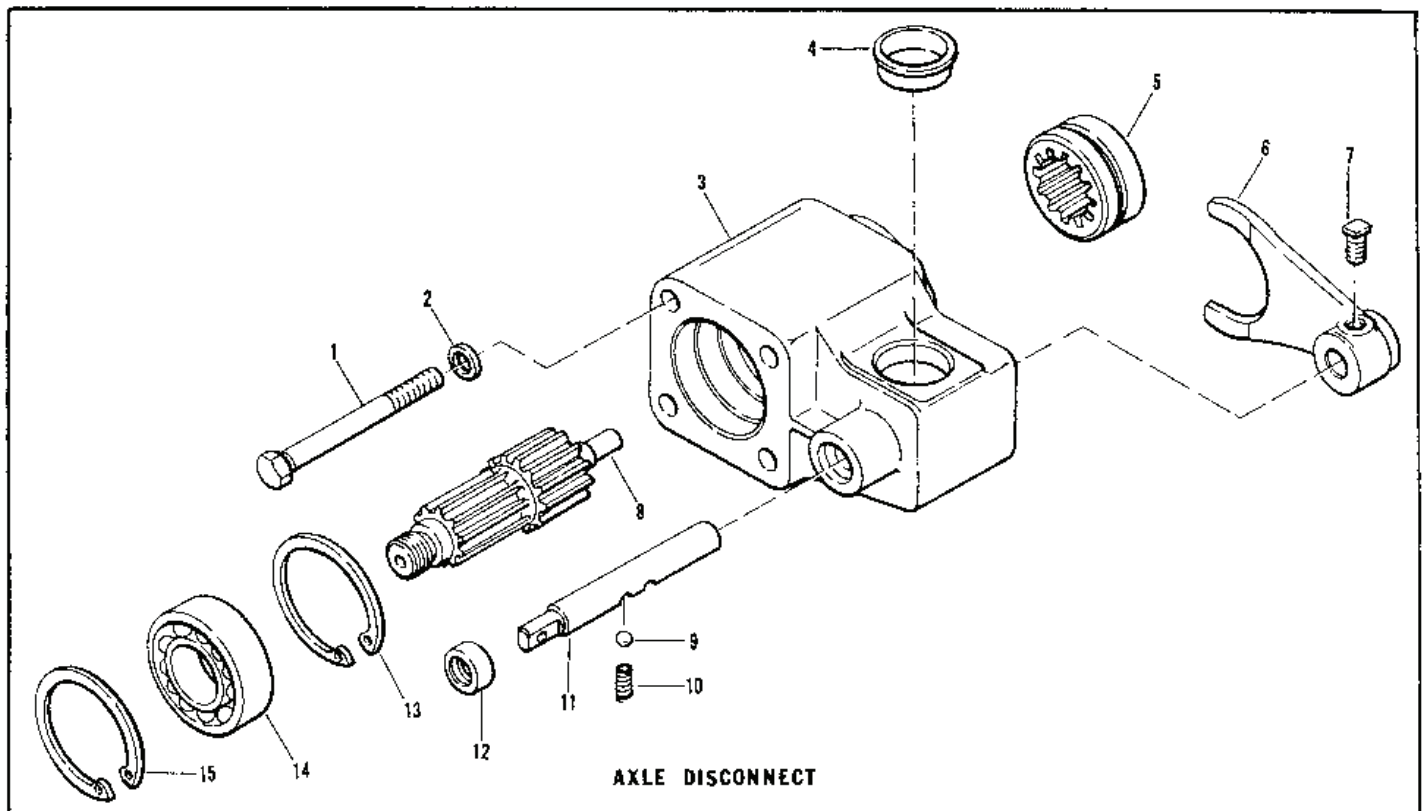


Figure H

### AXLE DISCONNECT

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

### MECHANICAL PARKING BRAKE

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

# ASSEMBLY INSTRUCTION ILLUSTRATION

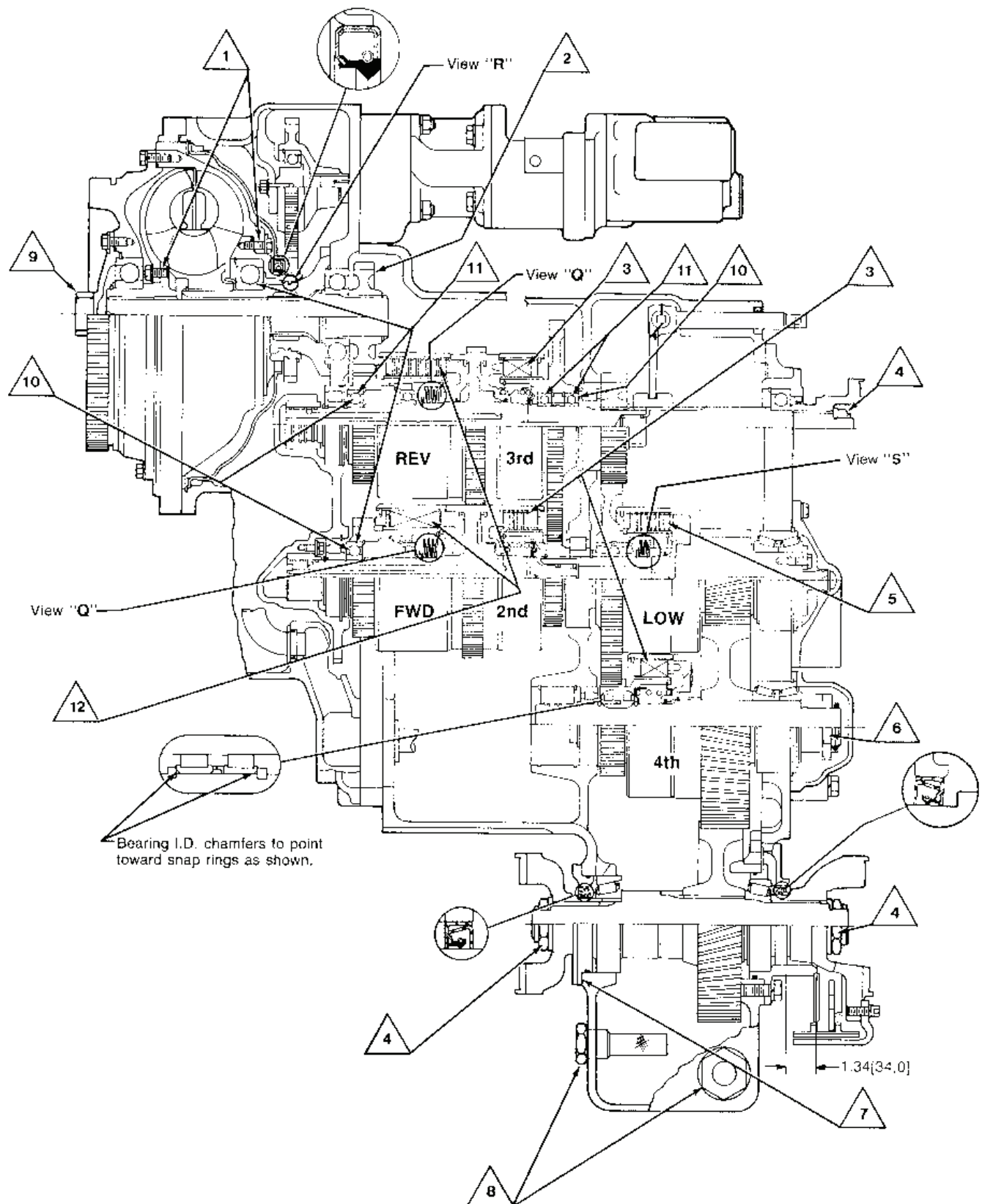


Figure I

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

2. Gear to be assembled with long hub length to this side.
3. Three clutches, 6-outer steel plates, 6-inner friction plates. Assemble alternately, starting with outer steel plate.
4. See Elastic Stop Nut Torque Chart
5. Low clutch, 9-outer steel plates, 9-inner friction plates. Assemble alternately, starting with outer steel plate.
6. See Elastic Stop Nut Torque Chart
7. Shim output shaft bearings to produce 8 to 8 Lbs.-In. [0,68,-0,90 N-m] preload.
8. Tighten oil screen ass'y. 10 to 15 Lbs. Ft. [13,6-20,0 N-m]

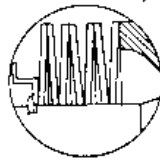
9. Heat nose bushing to 200° F° (93°C) before ass'y. of bushing to cover.
10. Bearing shield **OUT** on 3rd speed clutch. Bearing shield **IN** on Fwd. & Rev. clutch.
11. Must be loose internal fit bearings, No. "3" etched on bearing.
12. (12 Plate Modulation) Two clutches, 12-outer steel plates, 12-inner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

#### Notes

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

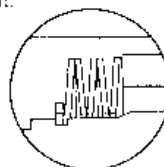
NOTE: The friction discs in the low clutch has a higher co-efficient rating than the friction discs in the other clutches, therefore the discs must not be mixed. The low clutch inner disc can be identified by an "X" stamped on one side of the inner teeth. The low clutch inner disc also has a strip of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

View "Q" 2 Places  
Modulation only



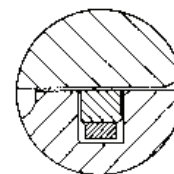
Low Clutch Return Springs.  
 Concave side of first Belleville washer to be placed against clutch piston. Remaining four washers to be stacked alternately reversed as shown.

View "S"



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.

View "R"

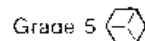


Enlarged view of Piston Ring & Expander  
 Note: Expander gap to be approx. 180° from ring hook joint to aid ring assembly.

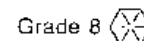
#### ELASTIC STOP NUT TORQUE

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

NOTE: Metric dimensions shown in brackets [ ].



Torque Specification for Lubricated or Plated Screw Threads



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]
5/16"	9 - 100	[123,4 - 135,5]	82 - 90	[111,2 - 122,0]	28 - 141	[173,6 - 191,1]	115 - 127	[156,0 - 172,2]
3/8"	64 - 70	[86,8 - 94,9]	57 - 63	[77,3 - 85,4]	90 - 99	[122,1 - 134,2]	80 - 88	[108,5 - 119,3]
1/2"	41 - 45	[55,6 - 61,0]	37 - 41	[50,2 - 55,5]	58 - 64	[78,7 - 86,7]	52 - 57	[70,6 - 77,2]
3/4"	26 - 29	[35,3 - 39,3]	23 - 25	[31,2 - 33,8]	37 - 41	[50,2 - 55,5]	33 - 36	[44,8 - 48,8]
1"	16 - 20	[21,7 - 27,1]	12 - 16	[16,3 - 21,6]	28 - 32	[38,0 - 43,3]	26 - 30	[35,3 - 40,6]
1 1/4"	9 - 11	[12,3 - 14,9]	8 - 10	[10,9 - 13,5]	11 - 13	[15,0 - 17,6]	9 - 11	[12,3 - 14,9]

Figure 1

## NOTES



## 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.

See page 52 for R-Model (remote mounted) transmission front cover section.

## DISASSEMBLY

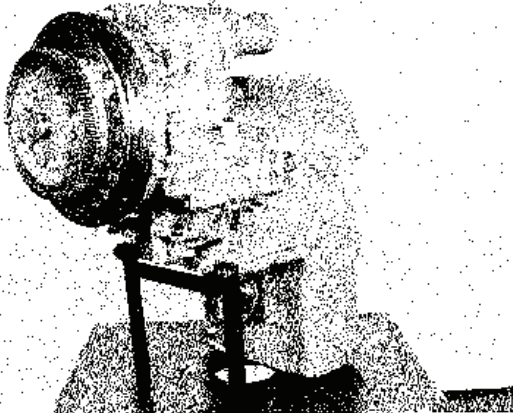


Figure 1

Sideview of transmission.

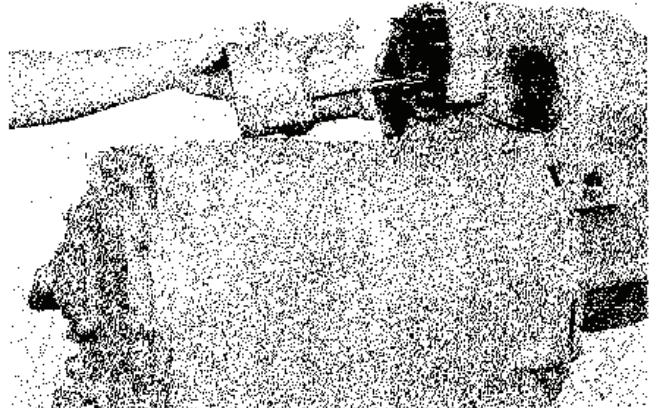


Figure 3

Remove charging pump to regulating valve stud nuts. Remove pump and filter adapter, or double pump assembly.

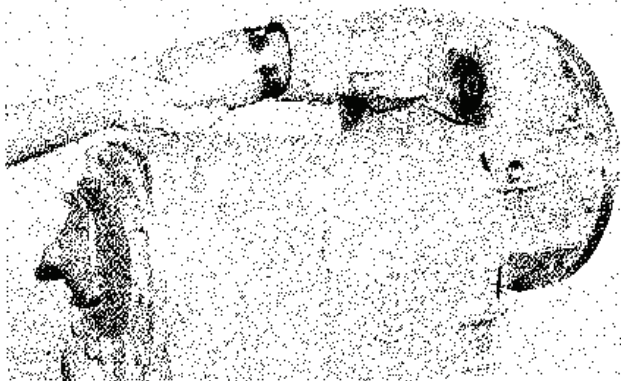


Figure 2

Remove filter housing and filter element. **NOTE:** Some units will have a double pump—proceed to figure 3.

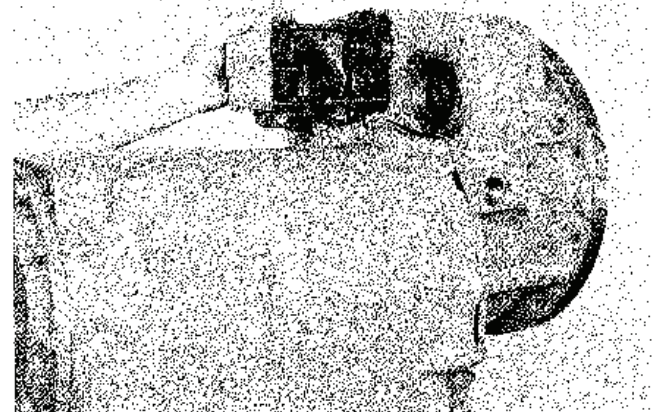
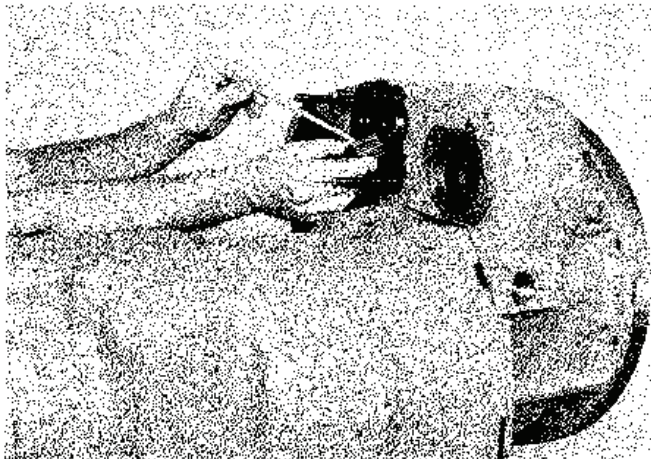


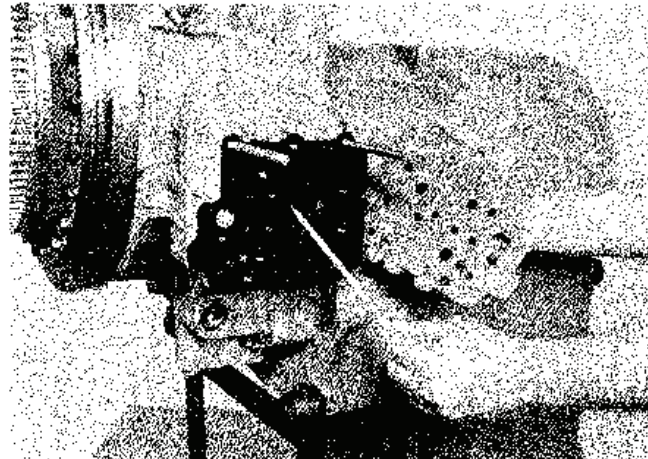
Figure 4

Remove pressure regulating valve assembly.



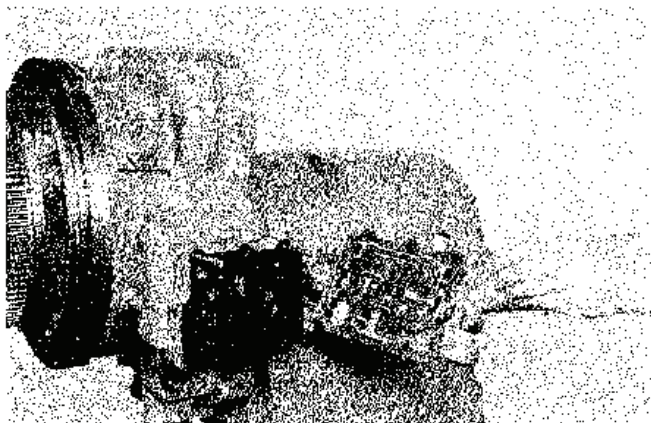
**Figure 5**

Remove pump drive sleeves.



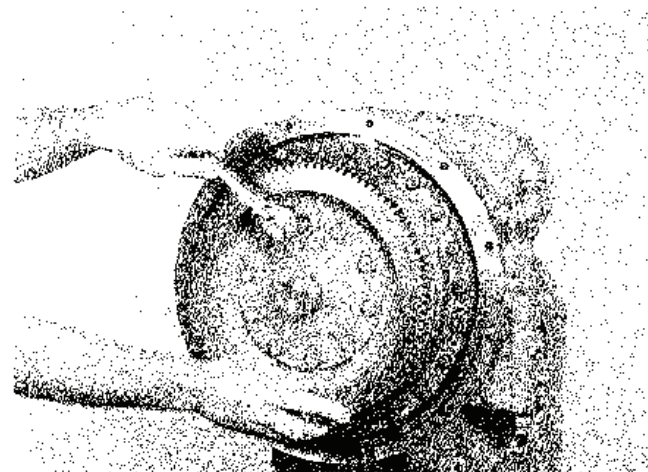
**Figure 8**

Remove modulator valve adapter plate and alignment studs.



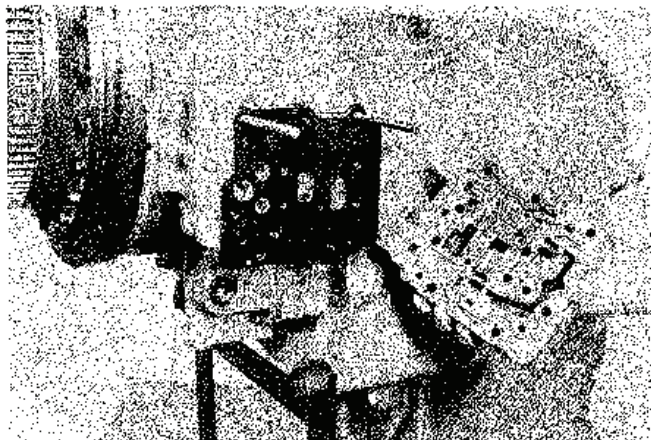
**Figure 6**

Remove two valve to converter housing cap screws. Install two aligning studs as shown. Remove remaining cap screws. Remove control valve. Use caution as not to lose detent springs and balls.



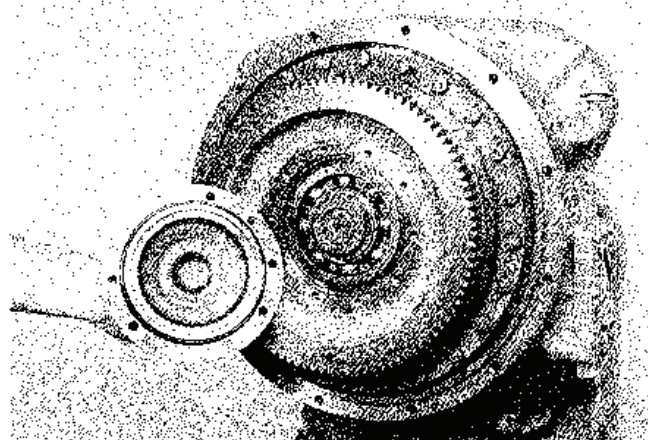
**Figure 9**

Remove impeller cover bearing cap bolts.



**Figure 7**

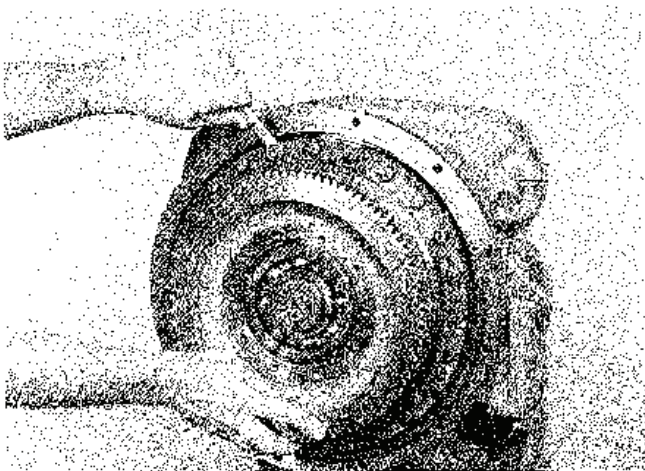
Remove modulator valve.



**Figure 10**

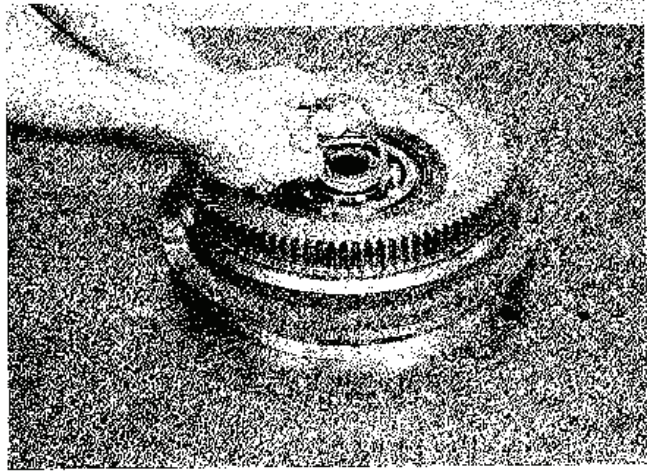
Remove impeller cover bearing cap.





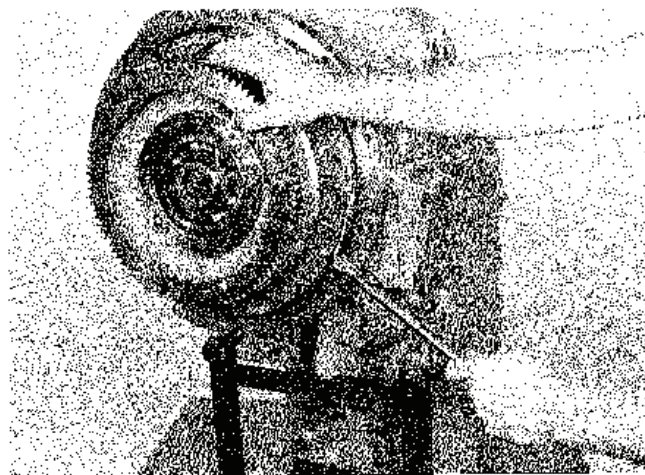
**Figure 11**

Remove impeller cover bolts.



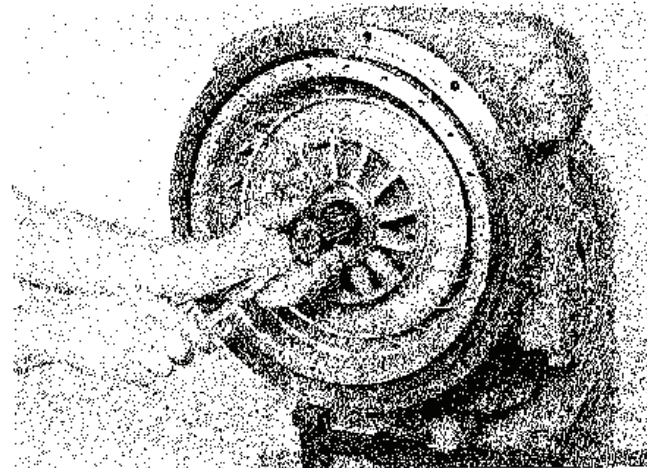
**Figure 14**

Remove impeller cover bearing snap ring and spacer. Separate impeller cover and turbine.



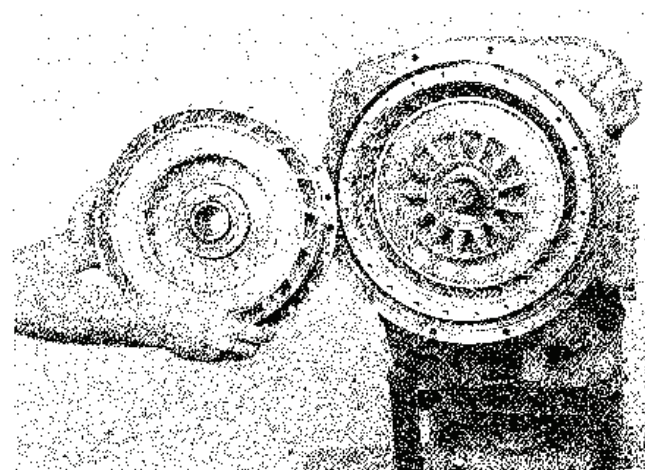
**Figure 12**

Install aligning stud. Use pry slots to remove cover.



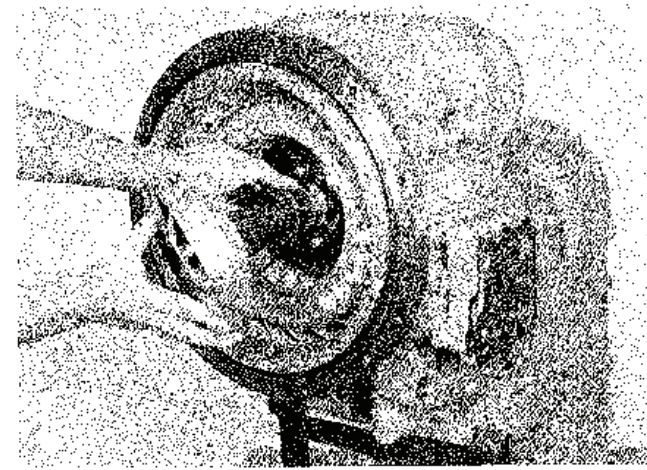
**Figure 15**

Remove reaction member retainer ring.



**Figure 13**

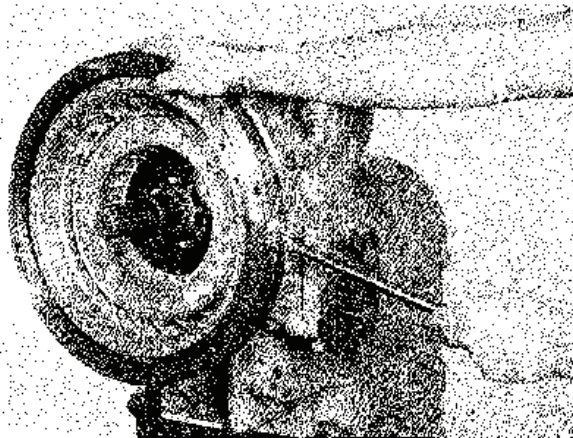
Remove impeller cover and turbine as an assembly.



**Figure 16**

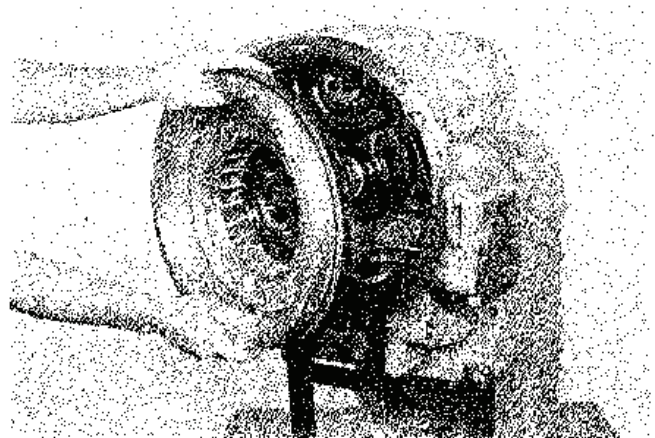
Remove reaction member and spacer.





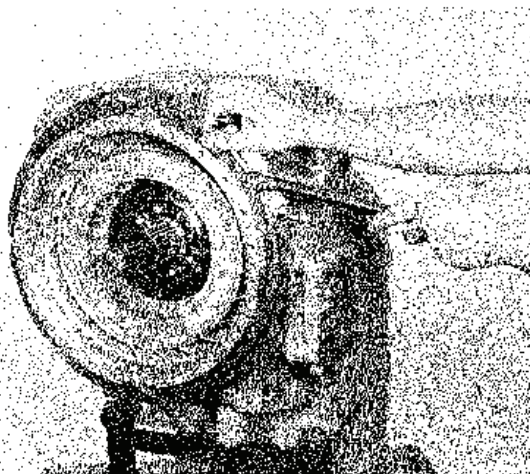
**Figure 17**

Remove converter housing to engine housing spacer ring.



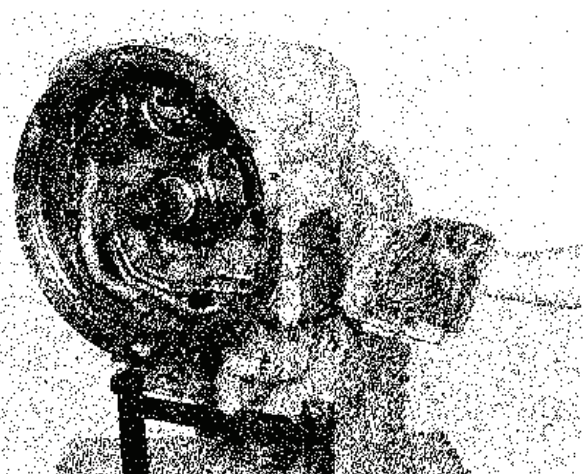
**Figure 20**

Remove impeller assembly.



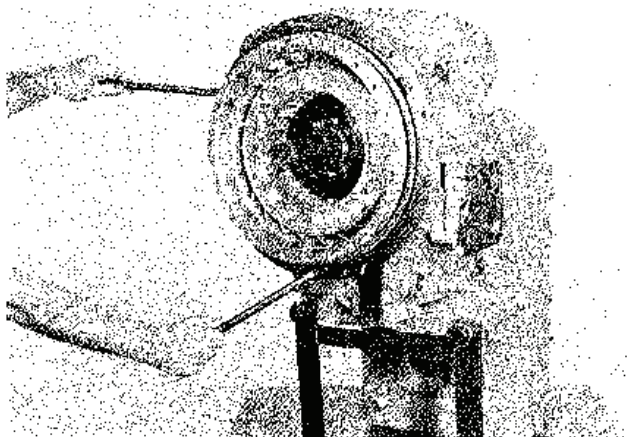
**Figure 18**

Remove oil baffle retainer ring.



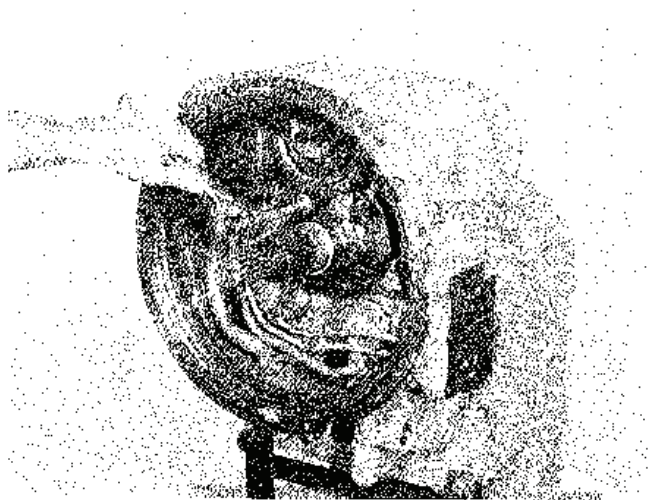
**Figure 21**

Remove control valve adaptor screws, remove adaptor.



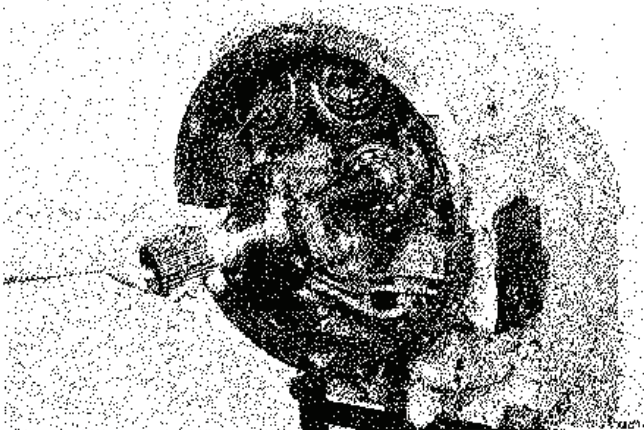
**Figure 19**

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



**Figure 22**

Remove stator support to housing bolts.



**Figure 23**

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



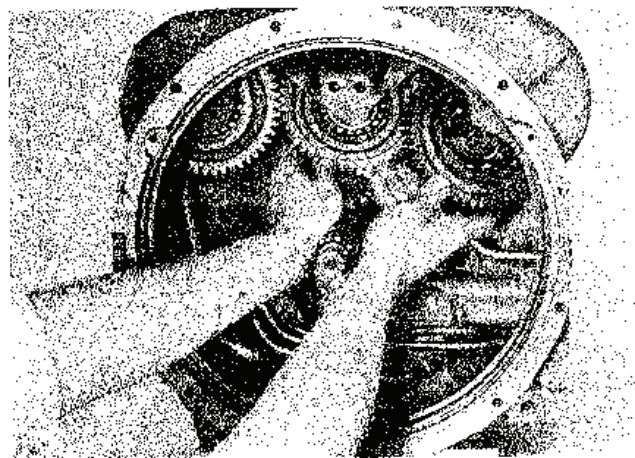
**Figure 26**

Remove pump drive gear bearing support bolts.



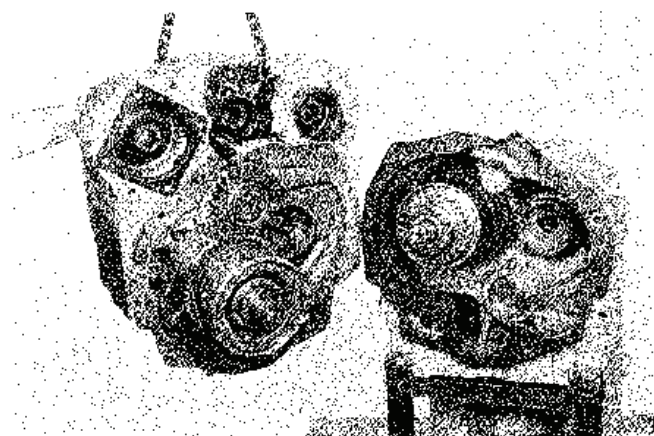
**Figure 24**

Remove converter housing to transmission housing bolts.



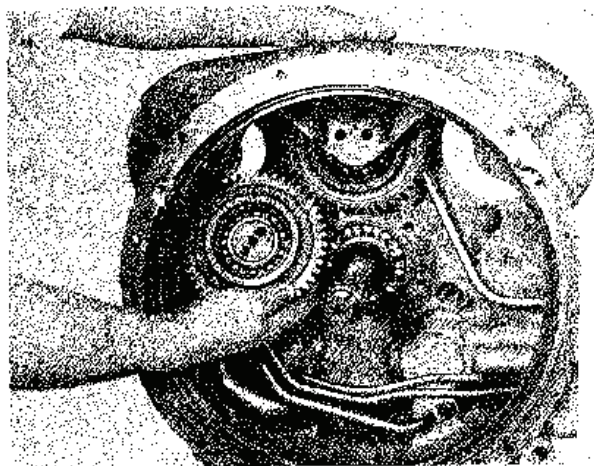
**Figure 27**

Move center gear toward the rear of converter housing. Remove pump drive gear on the right.



**Figure 25**

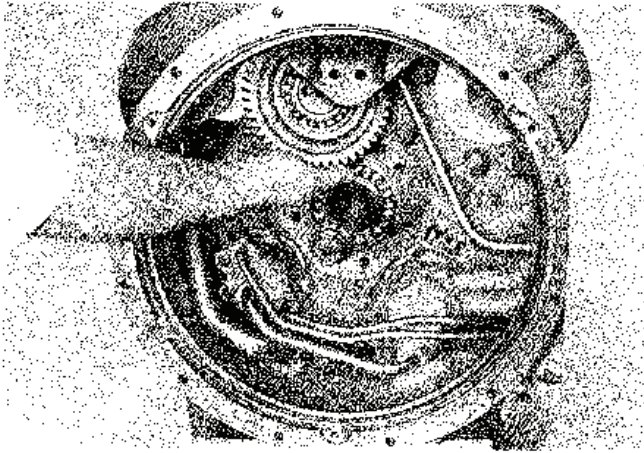
Support converter housing with chain fall and separate from transmission housing.



**Figure 28**

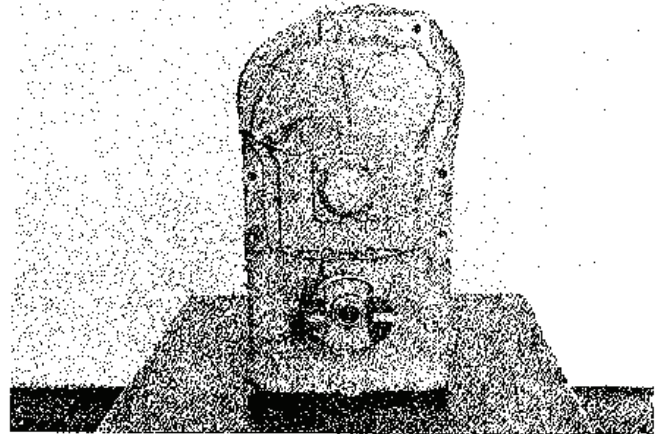
Remove pump drive gear on the left.





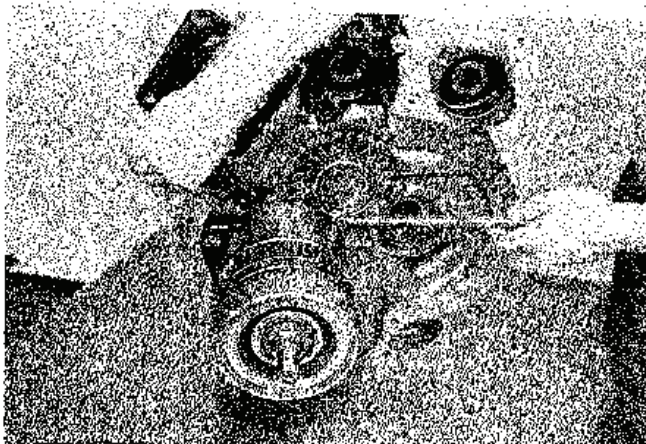
**Figure 29**

Remove center pump drive gear.



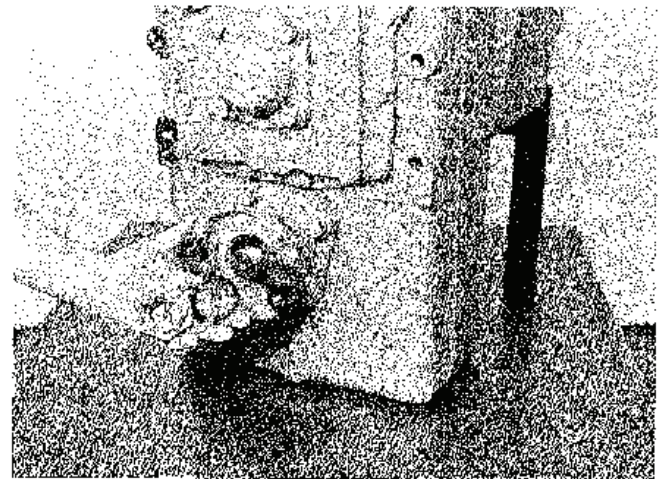
**Figure 32**

Rear view of transmission.



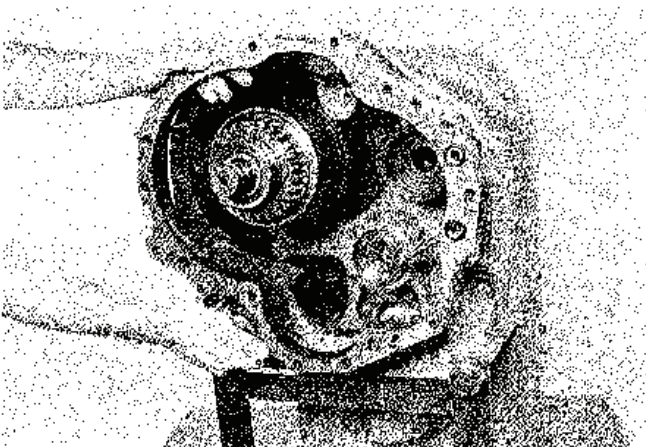
**Figure 30**

Use a spreading type snap ring pliers to spread the ears on forward clutch front bearing retainer ring. Remove forward clutch with pry bar. **NOTE:** If clutch shaft front piston ring sleeves are to be replaced see page 63.



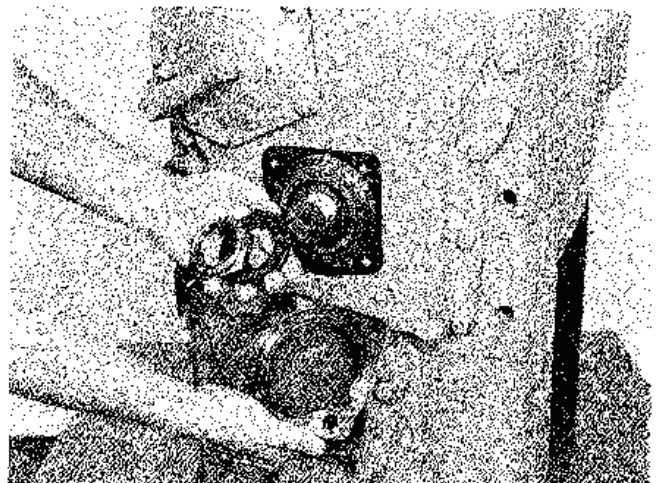
**Figure 33**

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



**Figure 31**

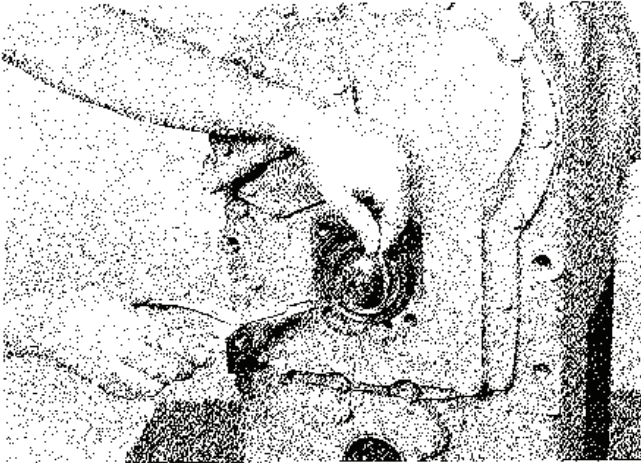
Remove converter to transmission housing spacer. (Used with 12 plate modulated clutches).



**Figure 34**

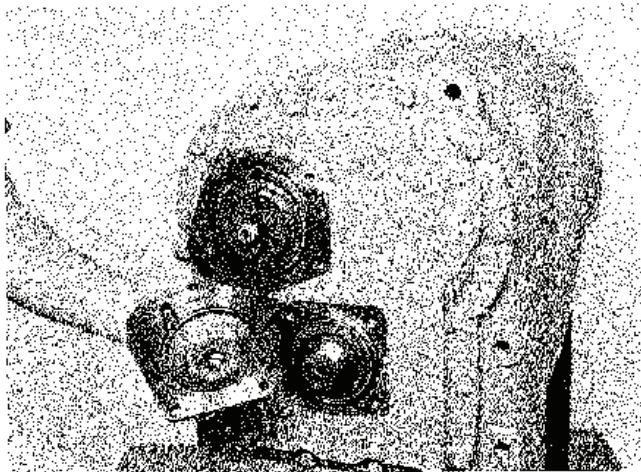
Remove idler shaft bearing cap bolts, bearing cap, idler shaft nut and spacer.





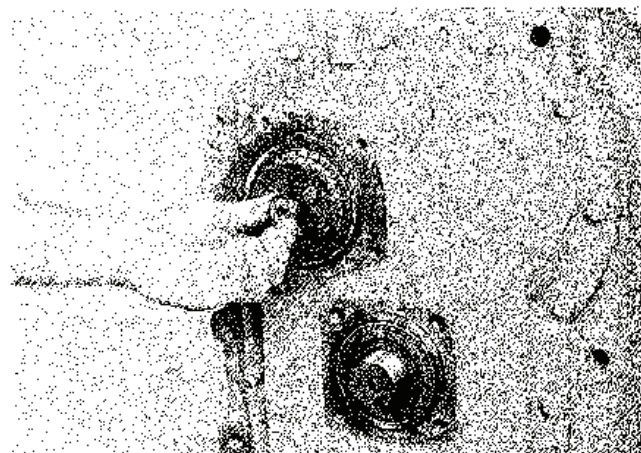
**Figure 35**

Remove idler shaft rear bearing locating ring.



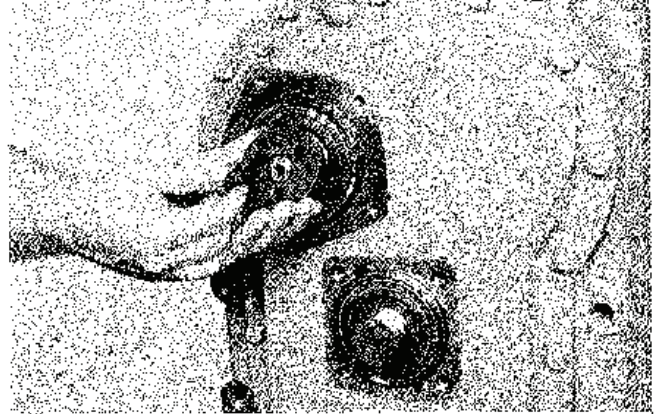
**Figure 36**

Remove low clutch rear bearing cap.



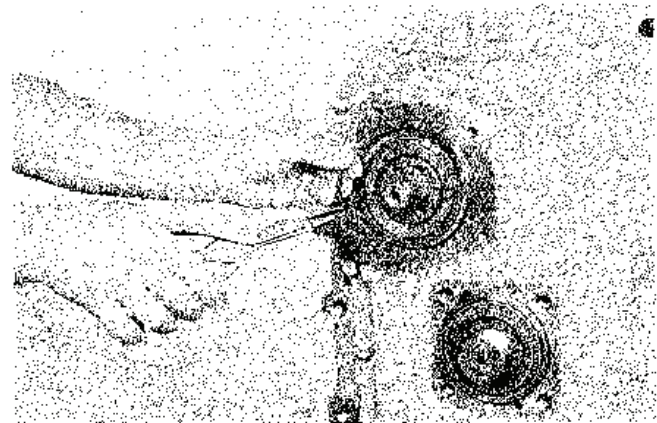
**Figure 37**

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



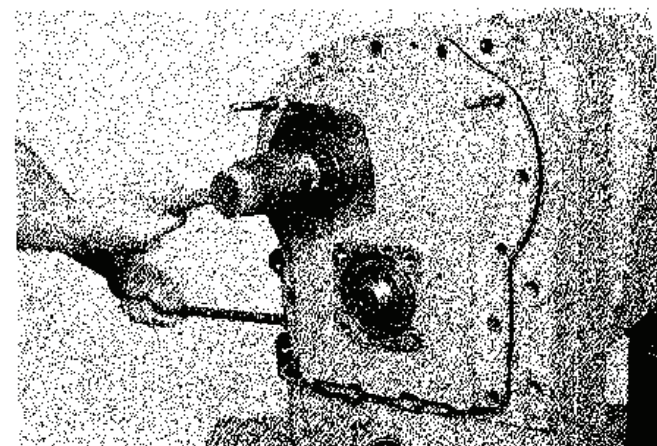
**Figure 38**

Remove 3 bolts and bearing retainer plate.



**Figure 39**

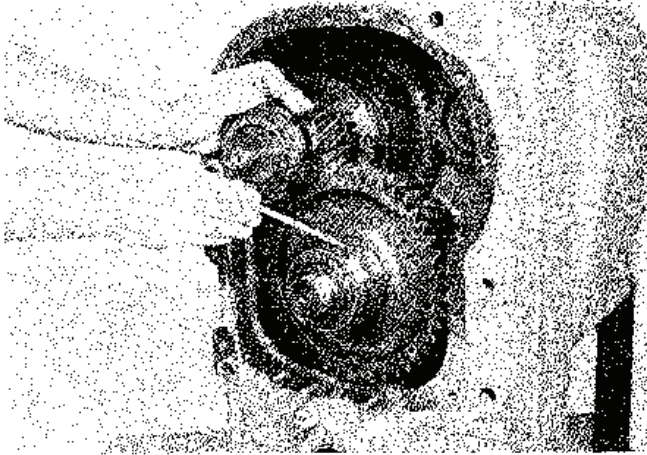
Remove bearing locating ring.



**Figure 40**

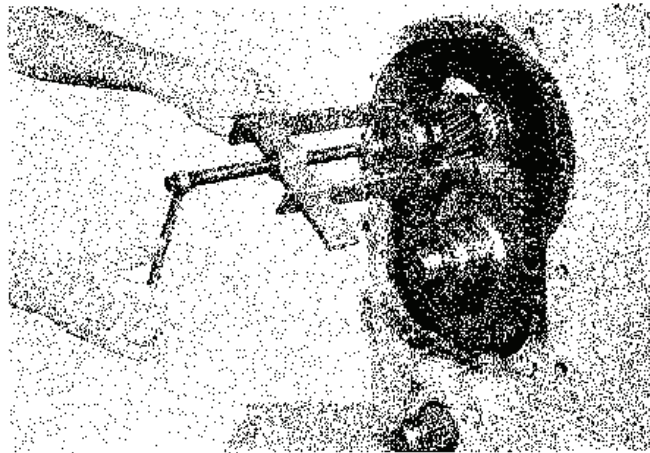
Remove rear cover bolts. Using pry slots provided, pry cover from transmission housing tapping on low clutch and idler shaft to allow cover to be removed without shaft binding. **NOTE:** The use of alignment studs will facilitate cover removal.





**Figure 41**

Remove bearing lock-balls.



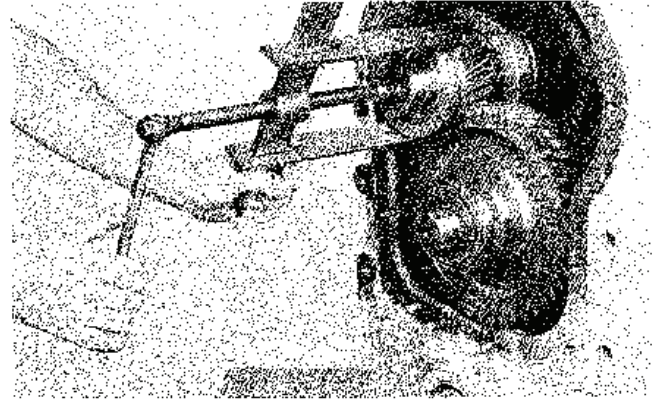
**Figure 42**

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



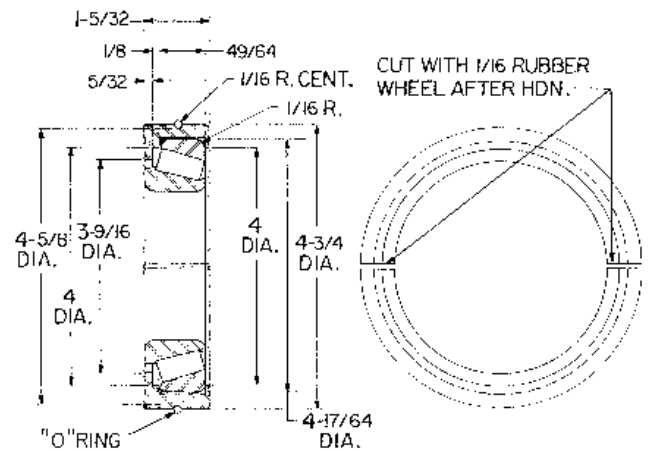
**Figure 43**

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



**Figure 44**

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. 44-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 43.



**Figure 44-A**

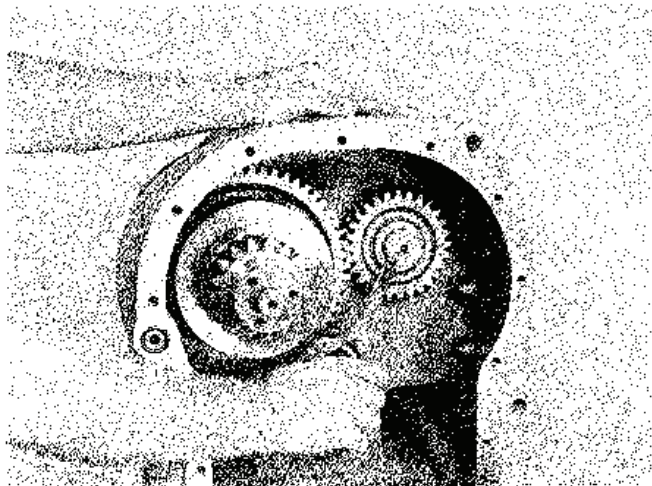
A timken bearing cup, No. 29520 must be used with the above bearing puller.



**Figure 45**

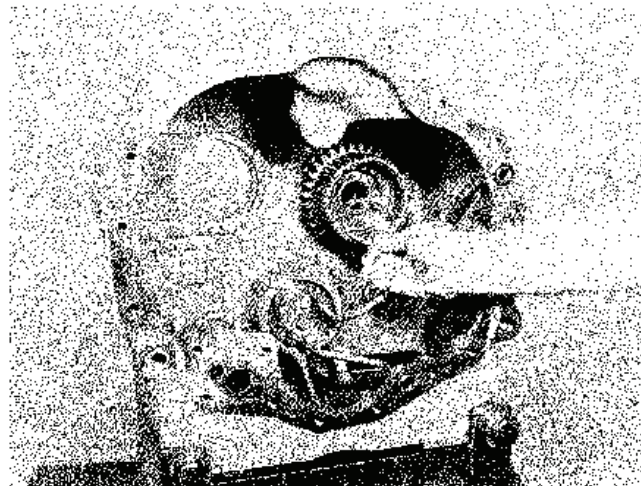
Remove idler shaft and 4th speed clutch from housing.





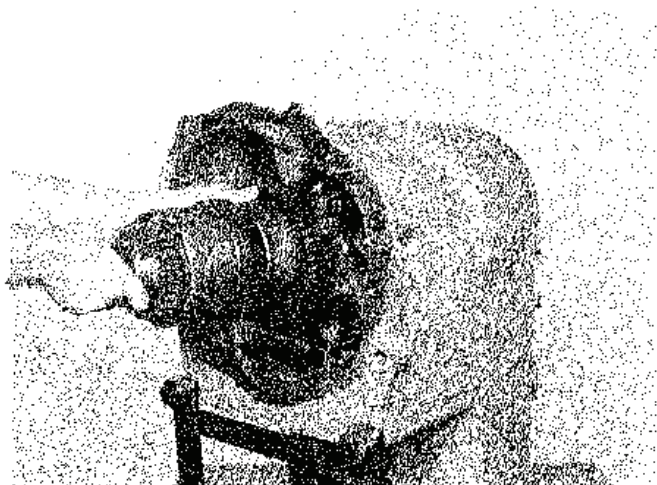
**Figure 46**

Remove low speed drive gear retainer ring and drive gear.



**Figure 49**

Remove 2nd gear retainer ring.



**Figure 47**

Remove reverse and 3rd clutch assembly.



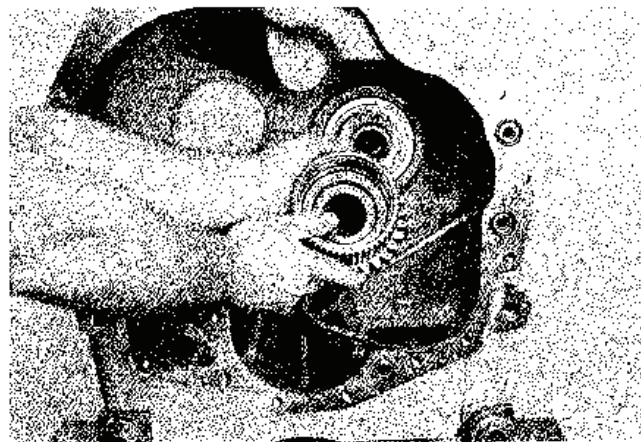
**Figure 50**

Remove 2nd gear retainer ring.



**Figure 48**

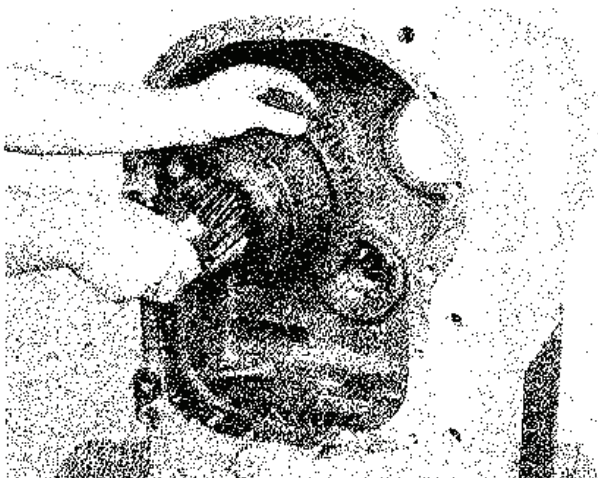
Remove 2nd gear ring retainer snap ring.



**Figure 51**

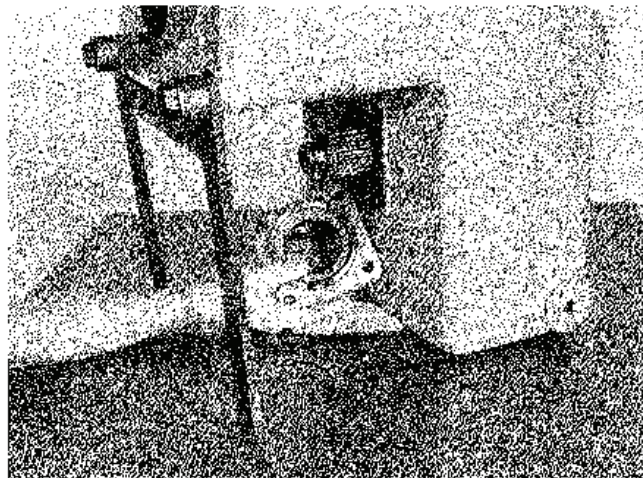
Remove 2nd gear, and 2nd gear bearing end plate.





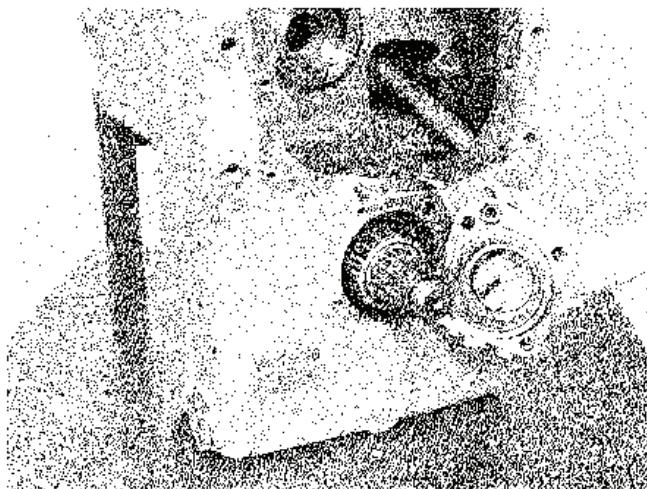
**Figure 52**

Remove low clutch assembly.



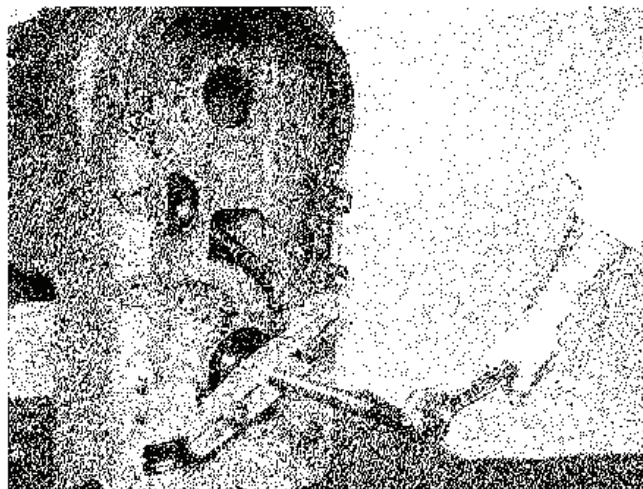
**Figure 55**

Remove output shaft front bearing cap bolts and cap.



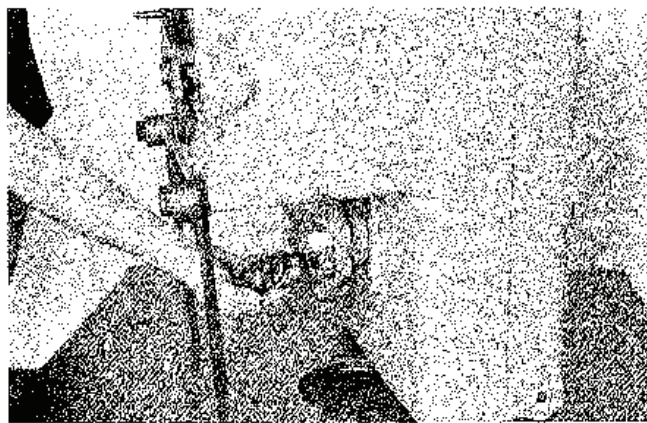
**Figure 53**

Remove rear output shaft bearing cap bolts and cap.



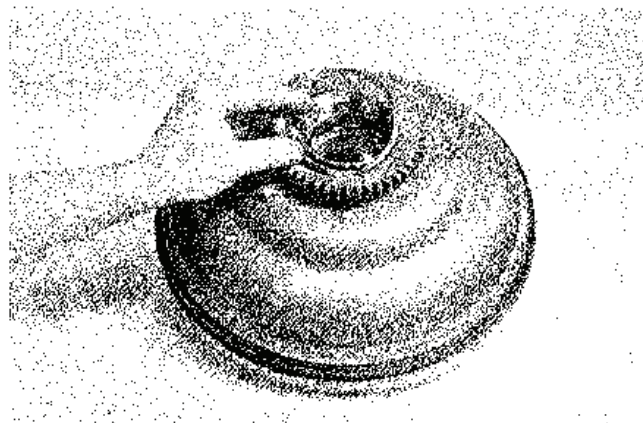
**Figure 56**

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



**Figure 54**

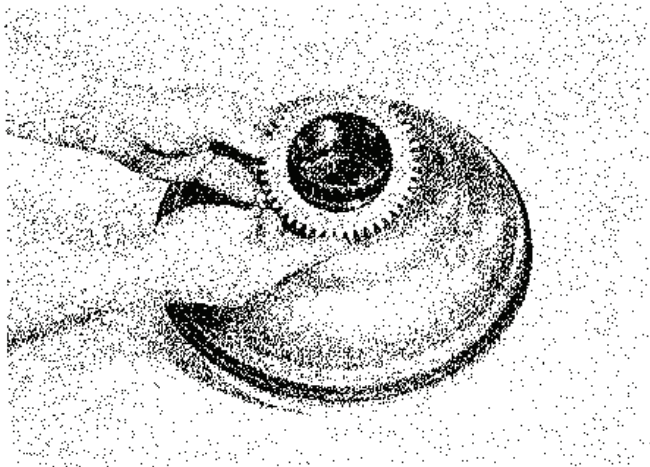
Remove front output flange nut, washer, "O" ring and companion flange.



**Figure 57**

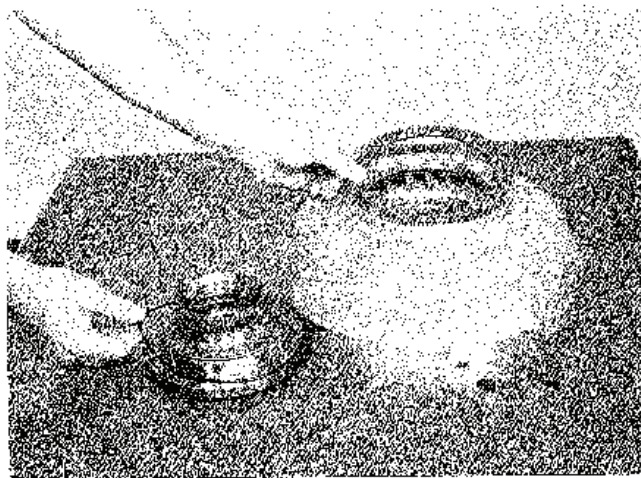
Remove impeller hub gear retainer ring.





**Figure 58**

Remove impeller hub gear.



**Figure 61**

Remove impeller hub, "O" ring and impeller hub screw backing ring.

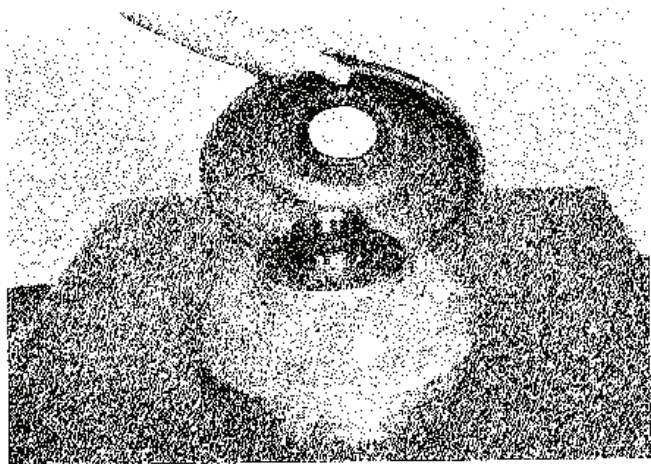
### CLUTCH DISASSEMBLY

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

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

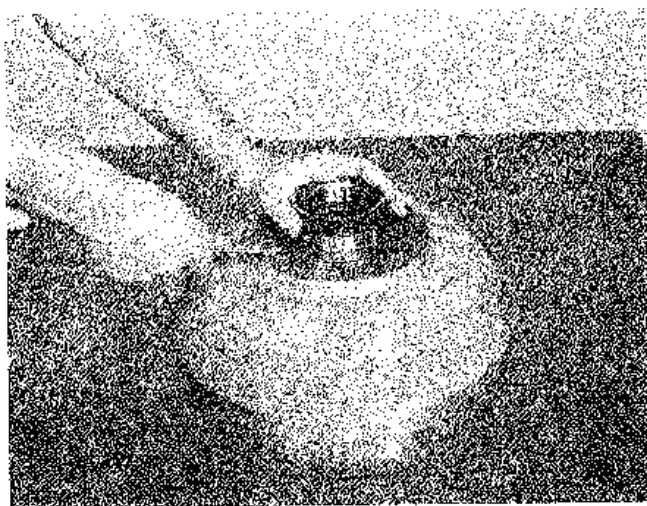
**NOTE:** DO NOT MIX THE FRICTION DISC IN THE LOW CLUTCH WITH THE FRICTION DISCS OF ANY OF THE OTHER CLUTCHES. (SEE NOTE FOLLOWING FIGURE 115).

### LOW CLUTCH DISASSEMBLY



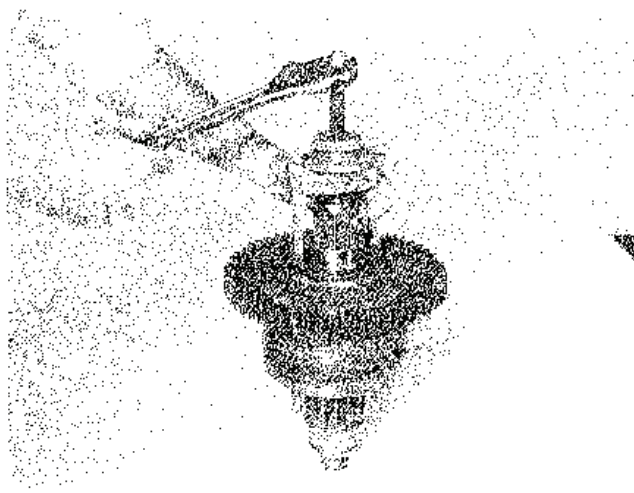
**Figure 59**

Lift oil baffle and oil seal assembly from impeller.



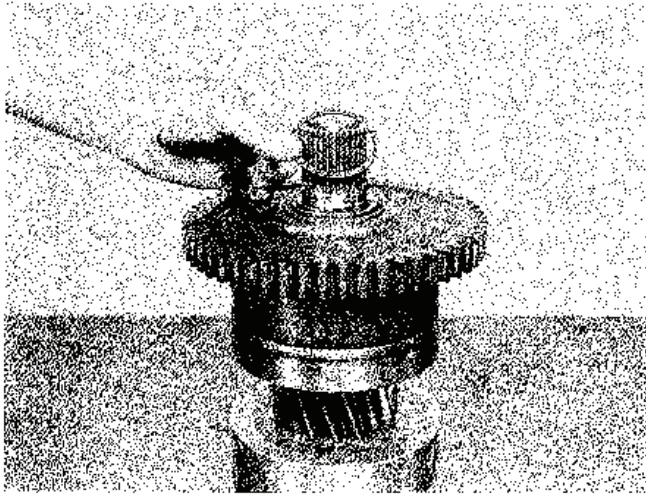
**Figure 60**

Remove impeller to hub bolts.



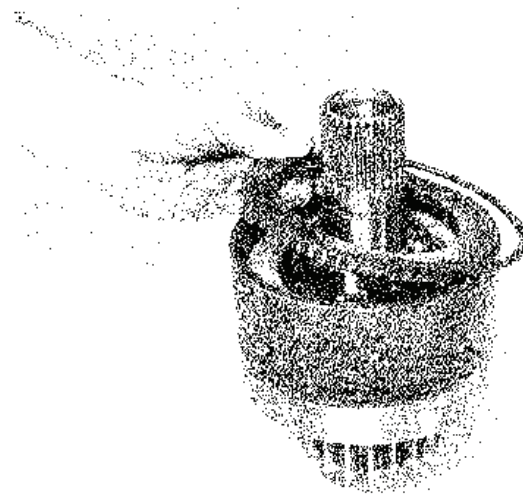
**Figure 62**

Remove low clutch shaft front bearing race.



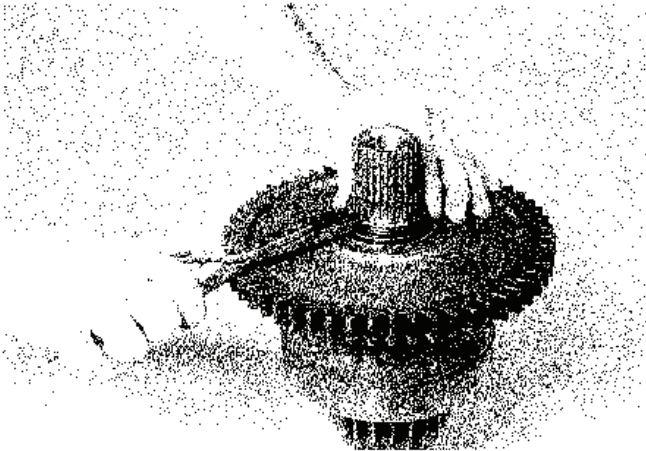
**Figure 63**

Remove low speed gear taper bearing retainer ring retainer.



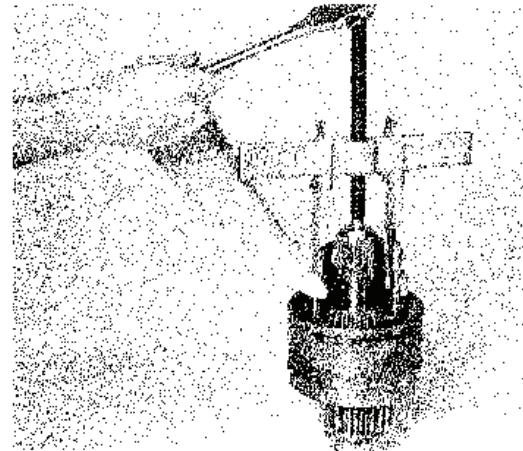
**Figure 66**

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



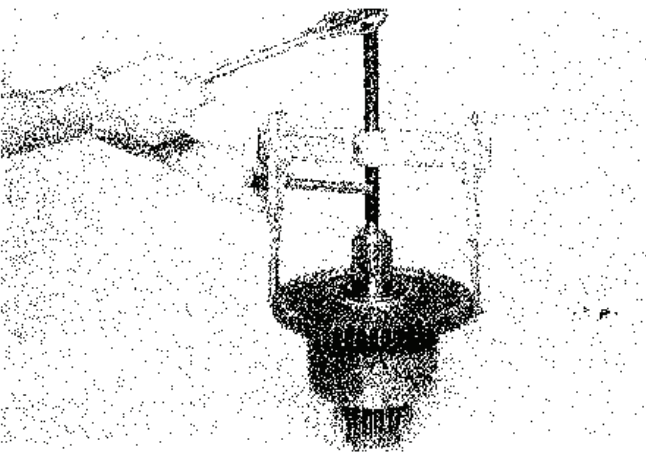
**Figure 64**

Remove low speed gear taper bearing retainer ring.



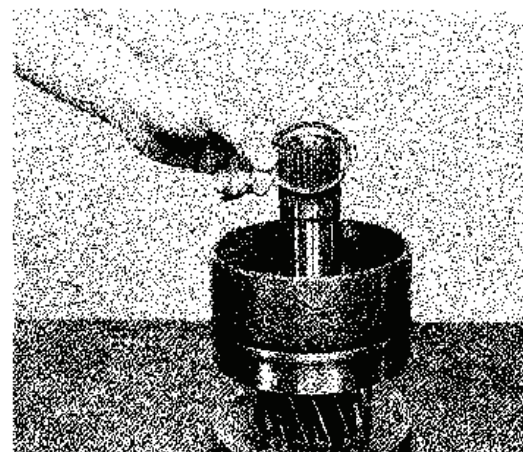
**Figure 67**

Remove low gear inner taper bearing.



**Figure 65**

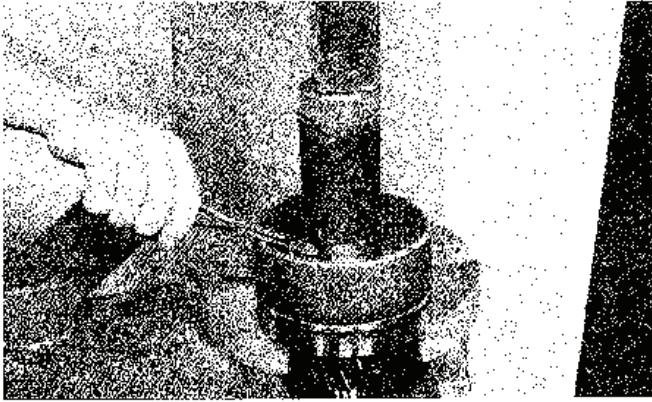
Remove low speed gear and outer taper bearing. Remove low clutch taper bearing spacer.



**Figure 68**

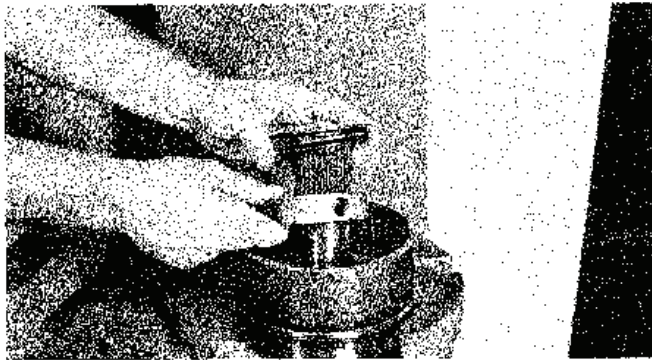
Remove snap ring, ring retainer.





**Figure 69**

Remove clutch piston return disc spring retainer ring. A sleeve with a portion removed is recommended for removing the clutch piston return spring 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 disc spring washer. Through opening remove retainer ring. Release tension on washers. Remove spring retainer ring.

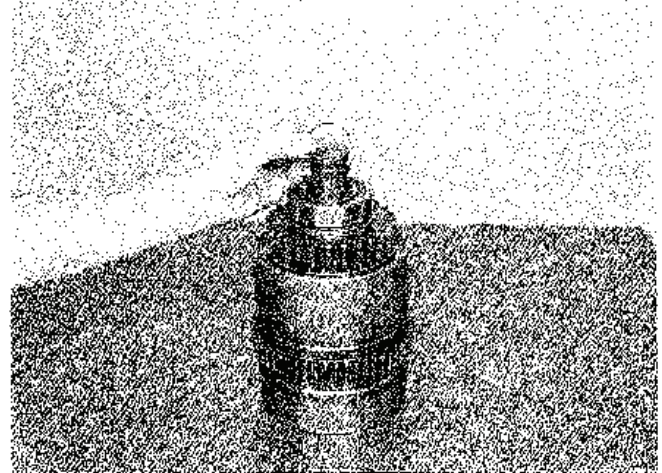


**Figure 70**

Remove disc spring washers and spacer. Turn clutch over and tap clutch shaft on a block of wood to remove clutch piston. **NOTE:** Disc springs in the low clutch are different than springs in the forward and reverse clutch. Do not mix low clutch springs with forward and reverse springs (see note after Figure 61). Non modulated units will have return springs in forward and reverse clutches.

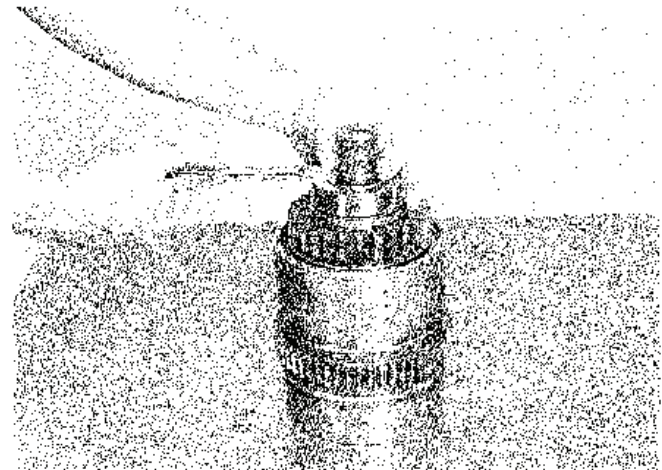
## **FORWARD AND 2ND CLUTCH DISASSEMBLY (Forward being disassembled)**

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



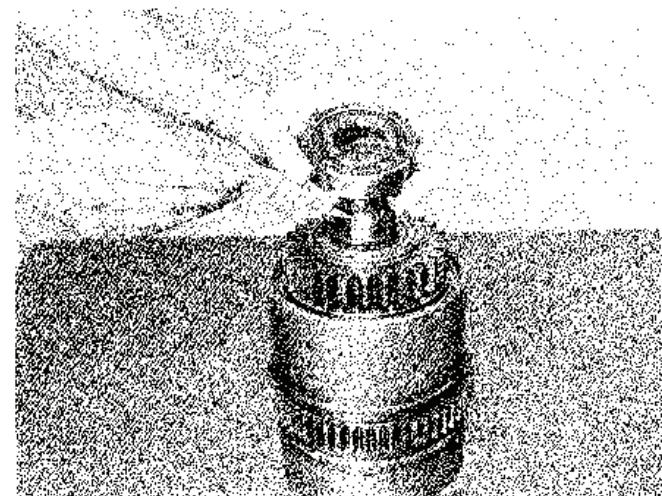
**Figure 71**

Remove clutch shaft piston rings and expander springs. See page 61 for proper piston ring and expander ring installation.



**Figure 72**

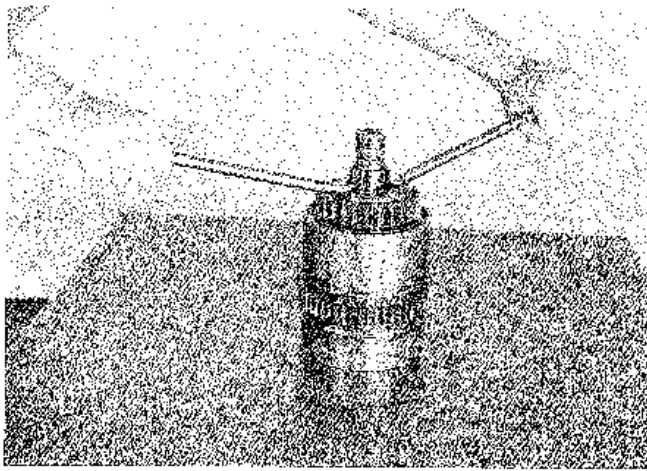
Remove front bearing retainer ring.



**Figure 73**

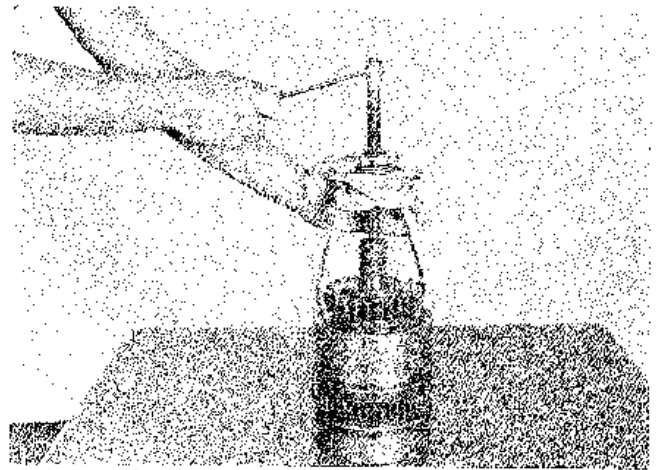
Remove spacer and bearing. **Caution:** Do not lose lock ball.





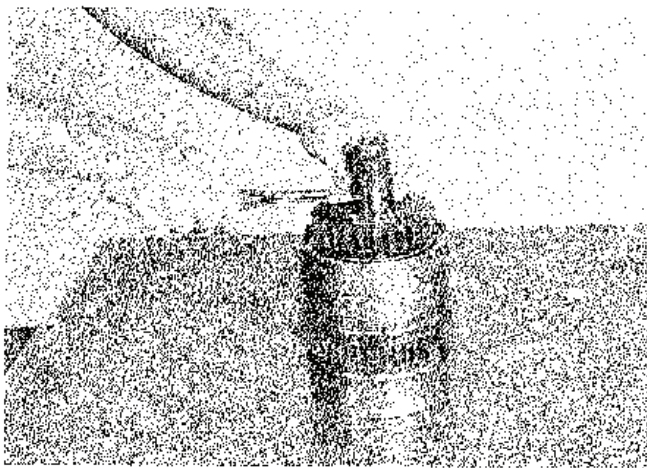
**Figure 74**

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



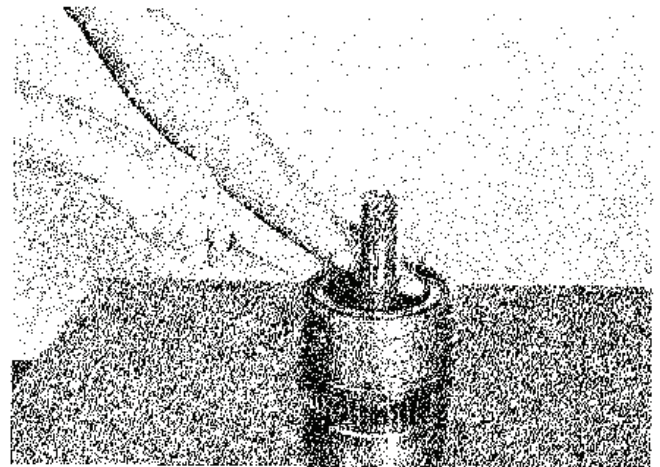
**Figure 77**

Remove clutch driven gear and outer bearing.



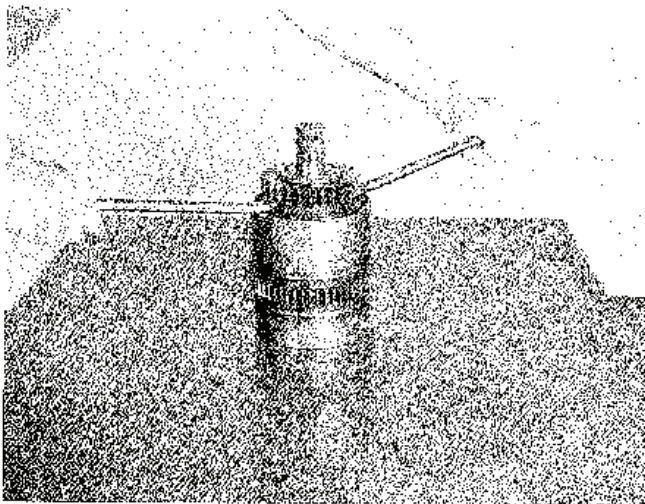
**Figure 75**

Remove front bearing locating ring.



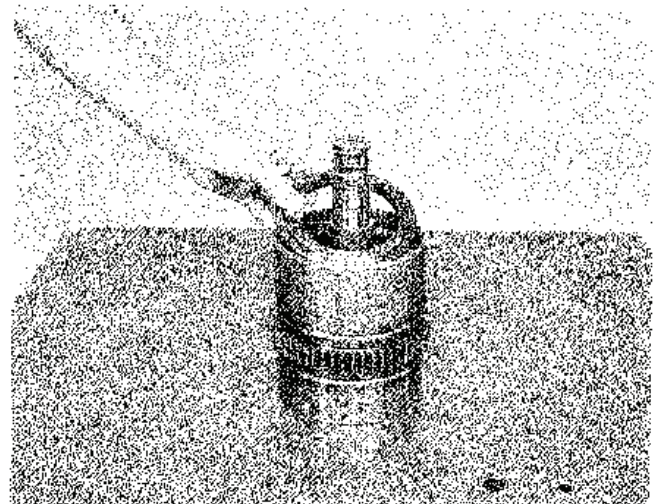
**Figure 78**

Remove end plate retainer ring.



**Figure 76**

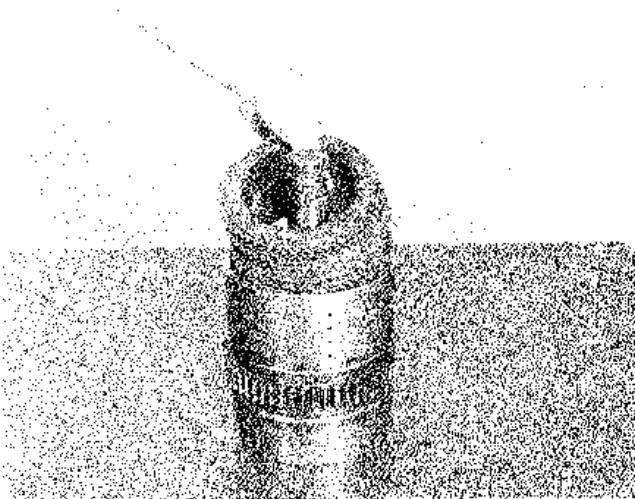
Pry gear up to accommodate gear puller.



**Figure 79**

Remove end plate.





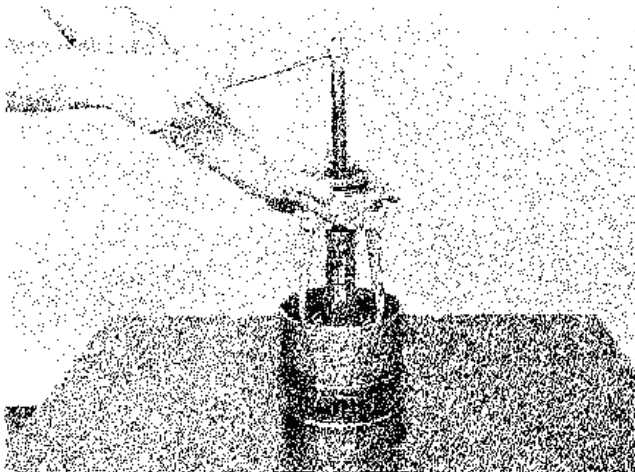
**Figure 80**

Remove inner and outer clutch discs.



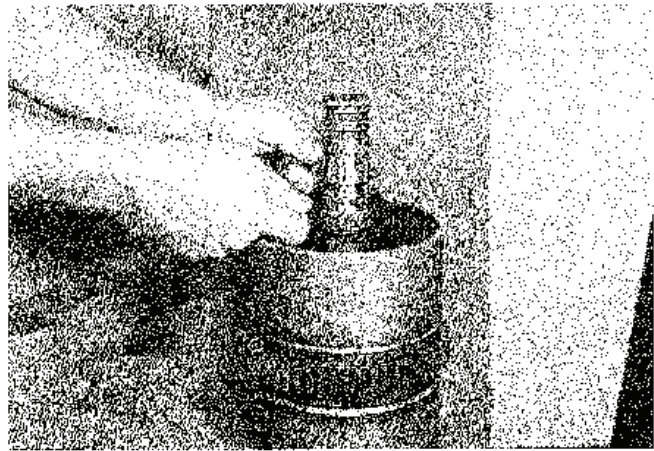
**Figure 83**

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



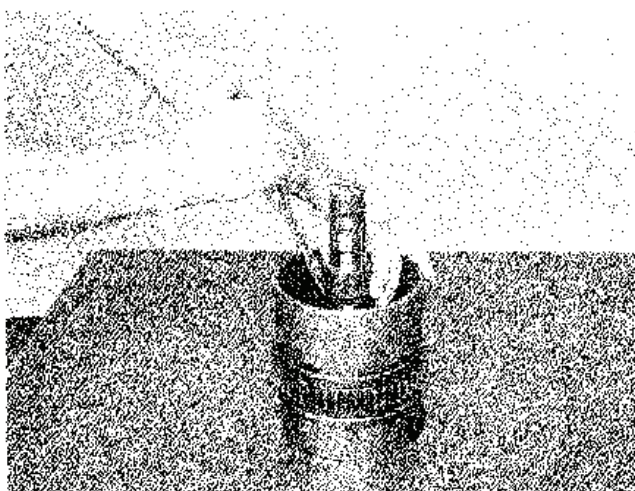
**Figure 81**

Remove inner bearing.



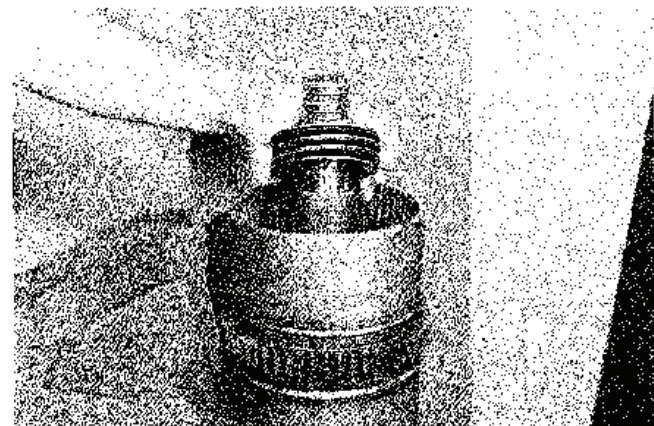
**Figure 84**

Remove snap ring and snap ring retainer.



**Figure 82**

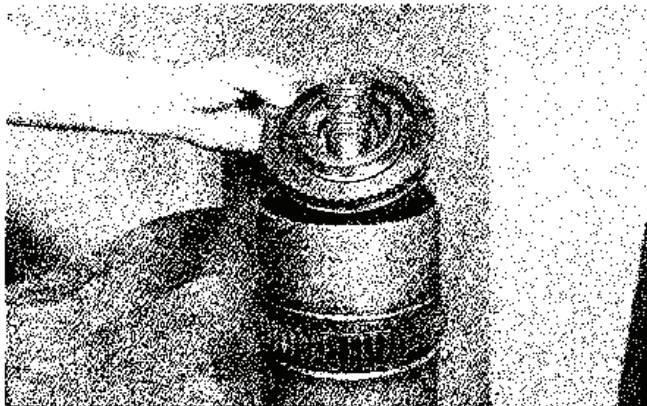
Remove bearing locating ring.



**Figure 85**

Remove disc spring washers. **NOTE:** Non modulated clutches will have a piston return spring in forward and reverse. (See note after Figure 61).

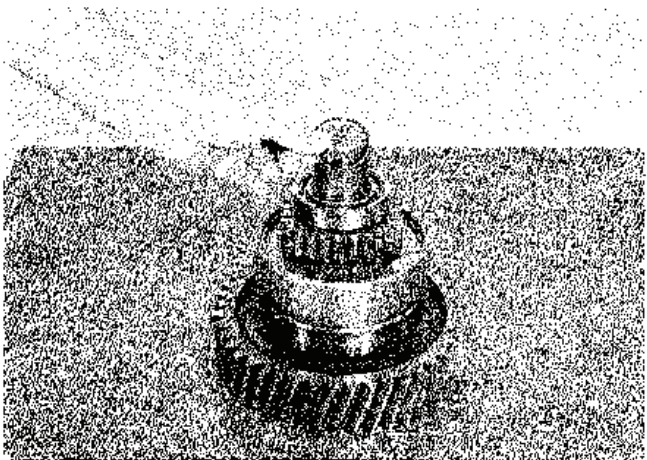




**Figure 86**

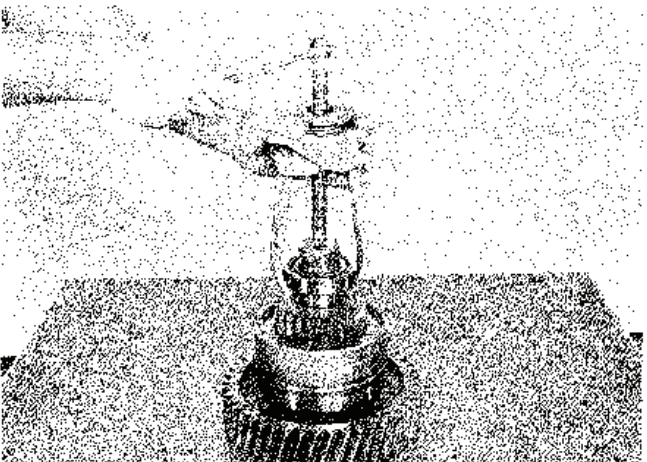
Remove clutch piston.

#### 4th CLUTCH DISASSEMBLY



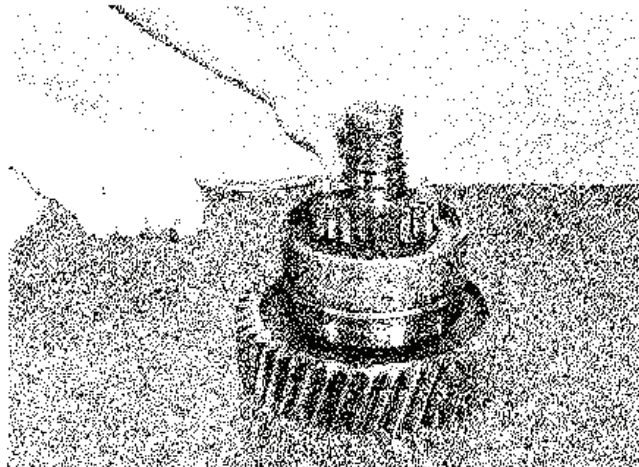
**Figure 87**

Remove clutch shaft piston rings and front bearing retainer ring.



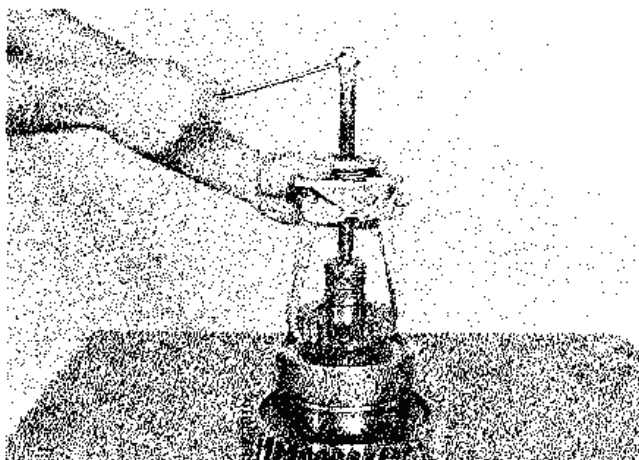
**Figure 88**

Pry bearing up to accommodate gear puller. Remove front bearing retainer ring and front bearing.



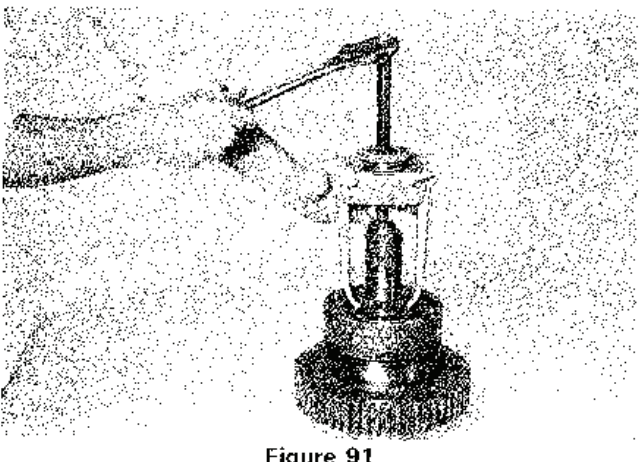
**Figure 89**

Remove front bearing locating ring.



**Figure 90**

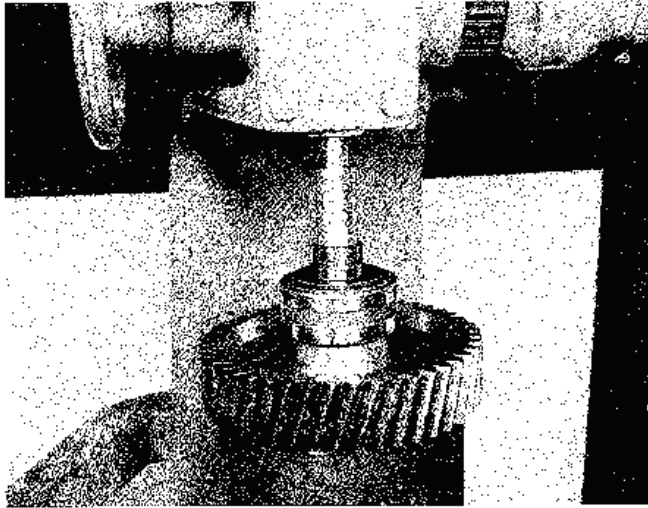
Pry 4th gear up to accommodate puller and remove.



**Figure 91**

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





**Figure 92**

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)

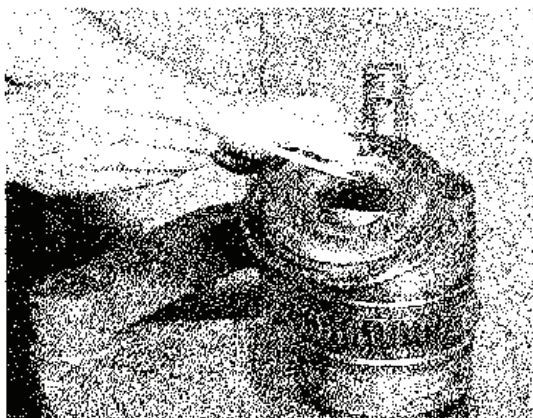


Figure 93

Install new clutch piston inner and outer sealing rings.

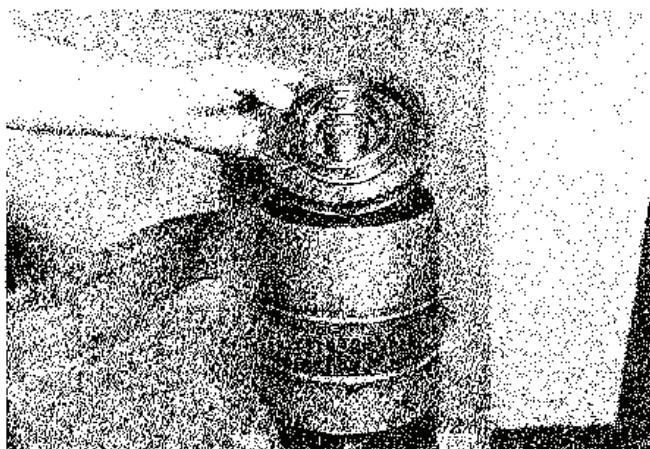


Figure 94

Insert clutch piston in clutch drum. **CAUTION:** Do not damage sealing rings. See note in Figure 85.

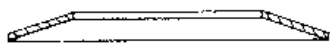


Figure 95

Install 1st disc spring washer, large diameter of bevel down as shown. **NOTE:** Do not mix forward clutch disc spring washers with other washers. (See note after Figure 61).

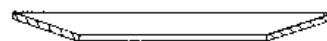


Figure 96

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



Figure 97

Install disc spring snap ring retainer and snap ring. Compress washers and snap ring retainer, install snap ring in lower snap ring groove. Install inner bearing locating ring. (See page 43, Figure A).

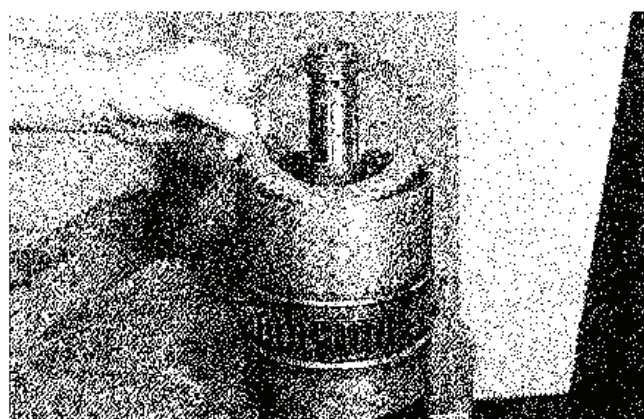
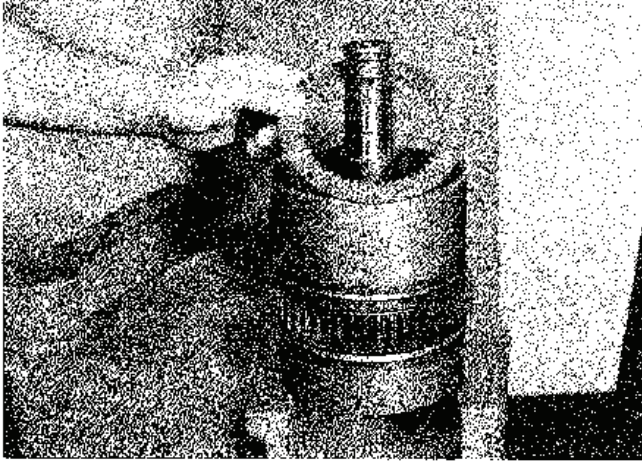


Figure 98

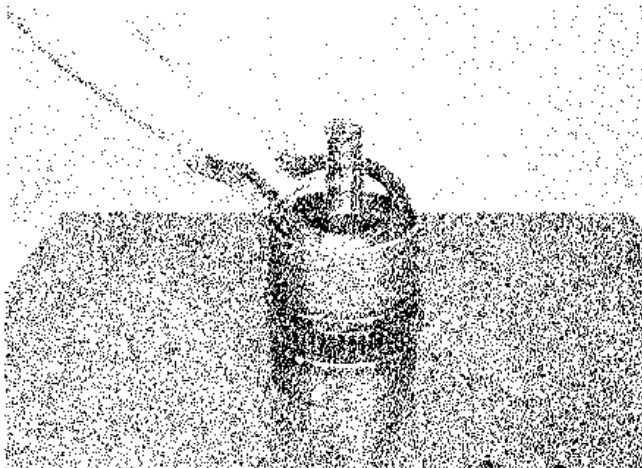
Insert one steel disc.





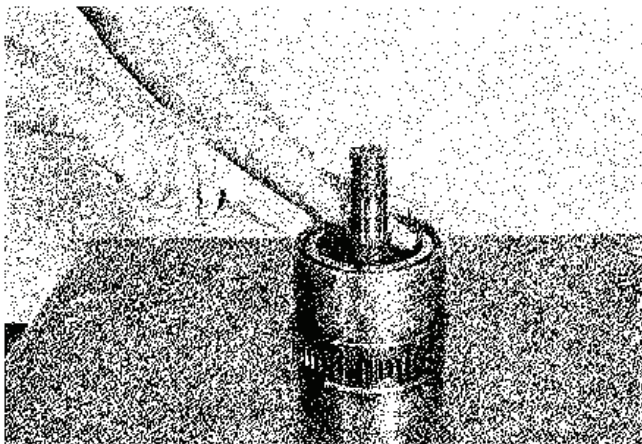
**Figure 99**

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.



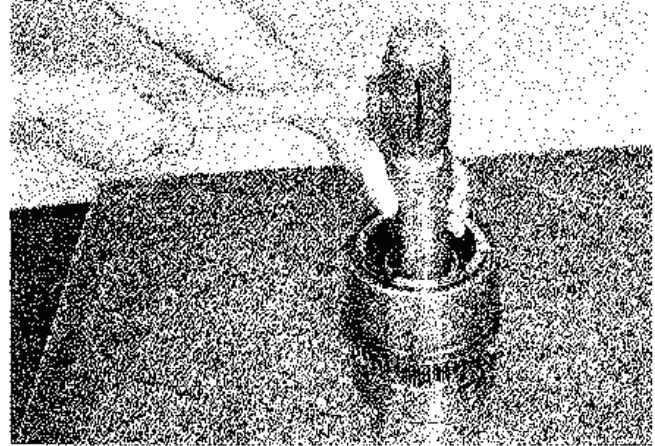
**Figure 100**

Install end plate.



**Figure 101**

Install end plate retainer ring.



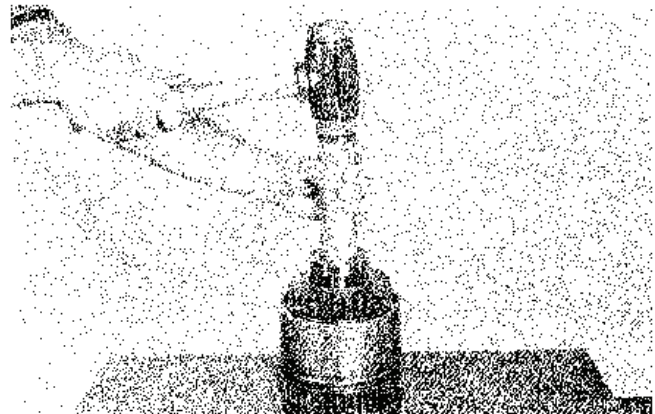
**Figure 102**

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



**Figure 103**

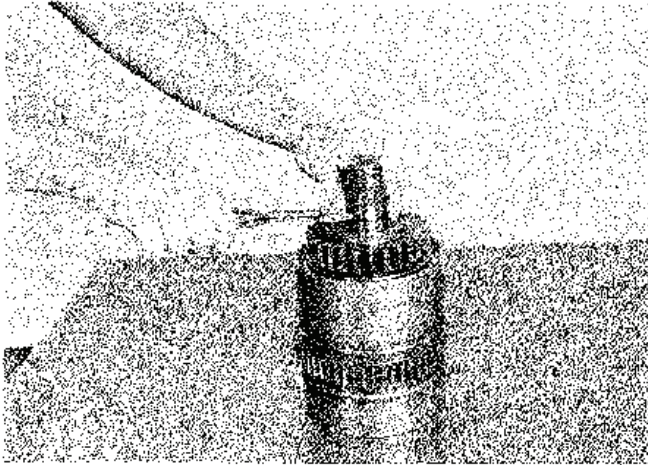
Install clutch driven gear into clutch drum. Align splines on clutch gear with internal teeth of friction discs. Tap gear into position. Do not force this operation. Gear splines must be in full position with internal teeth of all friction discs.



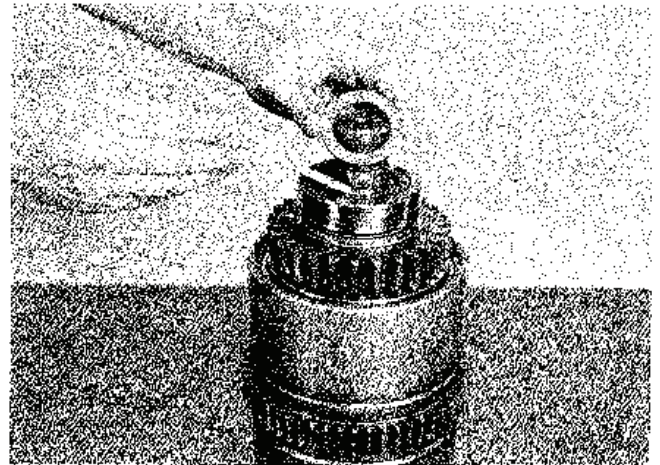
**Figure 104**

Install driven gear outer bearing. **NOTE:** Bearing shield in. (See page 59).

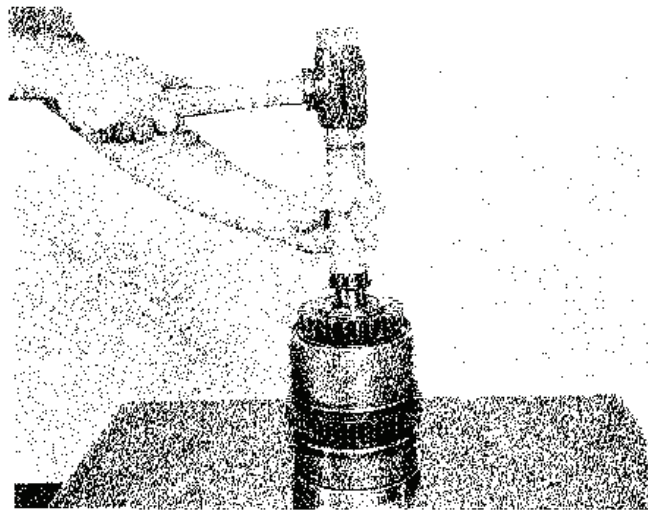




**Figure 105**  
Install front bearing locating ring.



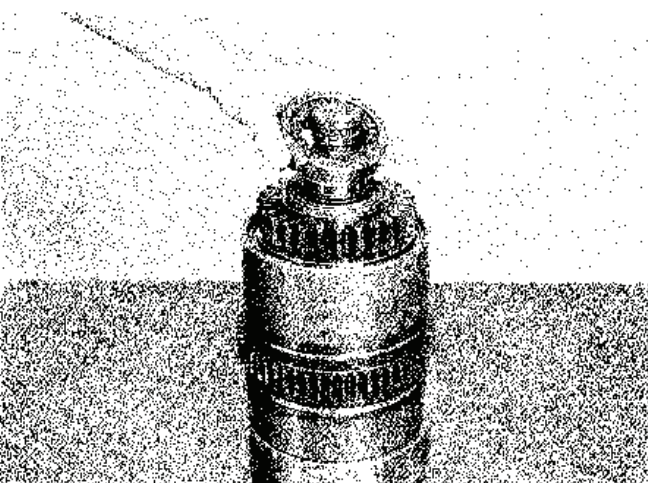
**Figure 108**  
Install lock ball and bearing spacer.



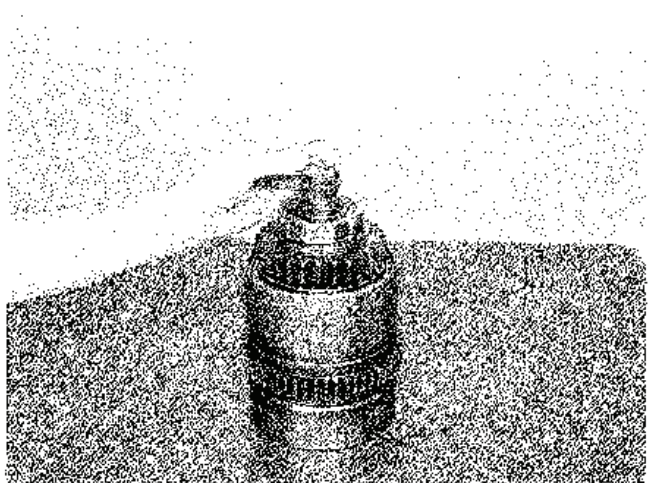
**Figure 106**  
Install front bearing inner race.



**Figure 109**  
Install bearing retainer ring.



**Figure 107**  
Install front bearing and outer race.



**Figure 110**  
Install piston rings and expander springs as explained on page 61.



## FORWARD & REVERSE NON-MODULATED CLUTCHES AND 2nd & 3rd CLUTCH PISTON RETURN SPRING REASSEMBLY



**Figure 111**

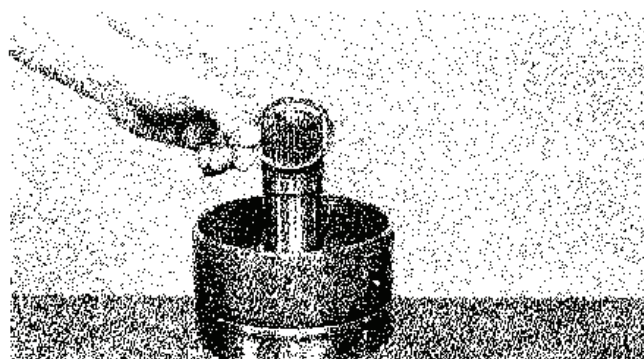
Install new clutch piston inner and outer sealing ring. Insert piston into clutch drum using caution as not to damage seals. Position inner spring retainer, piston return spring, outer spring retainer and retainer snap ring retainer and snap ring. Compress spring and retainer and install snap ring. **See page 43, Figure B.**

Assemble clutch discs and end plate as previously explained.



**Figure 113**

Position piston return disc spring snap ring. Compress disc spring and install snap ring.



**Figure 114**

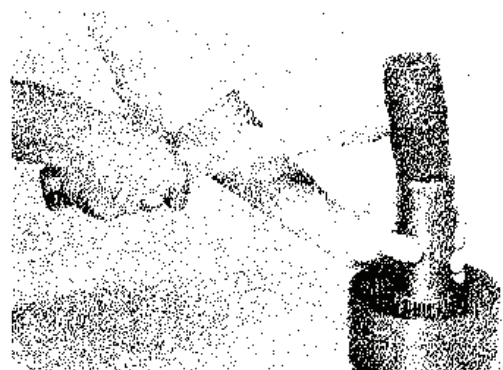
Install snap ring retainer.

## LOW CLUTCH REASSEMBLY



**Figure 112**

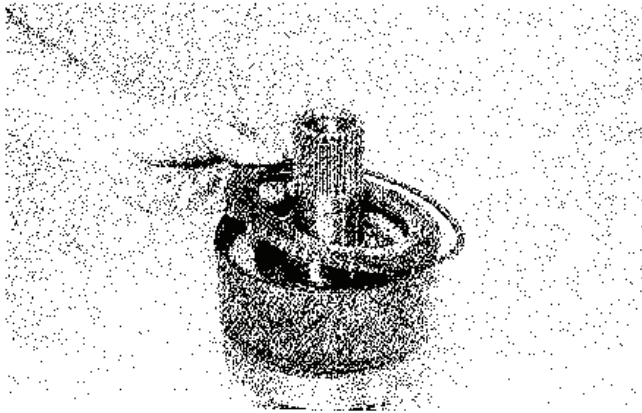
Install new clutch piston inner and outer sealing ring. Insert piston into clutch drum using caution as not to damage seals. Install piston to disc spring washer spacer. **See NOTE: After Figure 61.** Install disc spring washers. First washer with large diameter of washer toward spacer. Alternate (5) five washers. **See page 43, Figure C.**



**Figure 115**

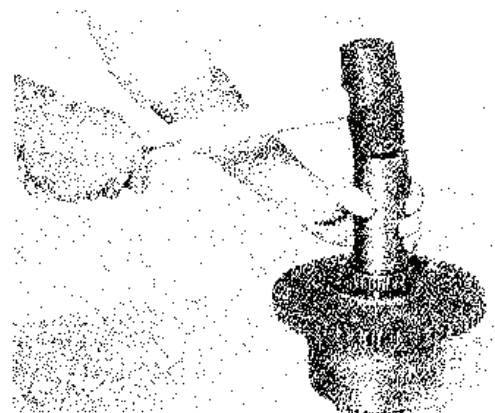
Install low gear inner taper bearing. Install one steel disc.

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.



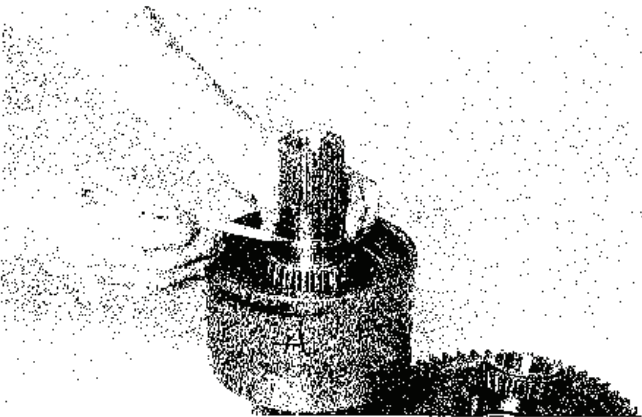
**Figure 116**

Install end plate and retainer ring.



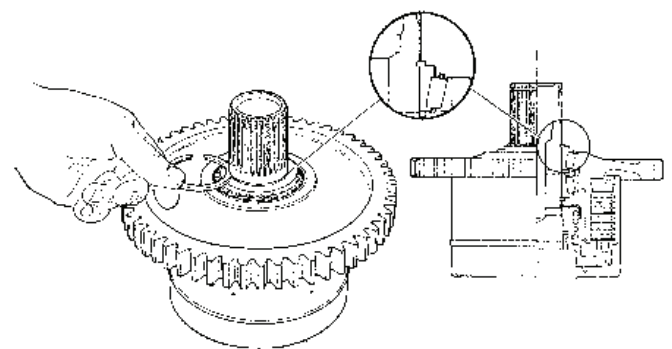
**Figure 119**

Install low gear outer taper bearing.



**Figure 117**

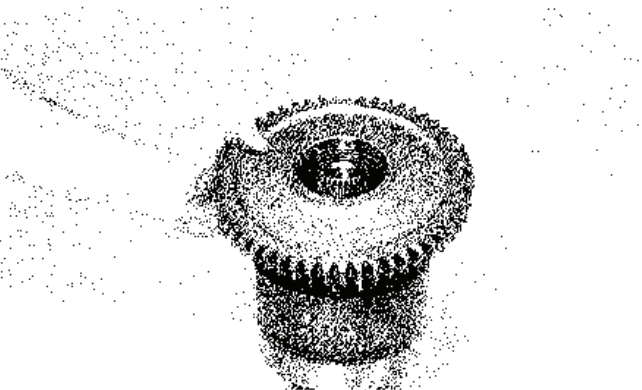
Install low clutch taper bearing spacer. **NOTE:** When installing the 3rd gear in the 3rd speed clutch a bearing spacer is used between the inner and outer 3rd gear bearing also.



**Figure 120**

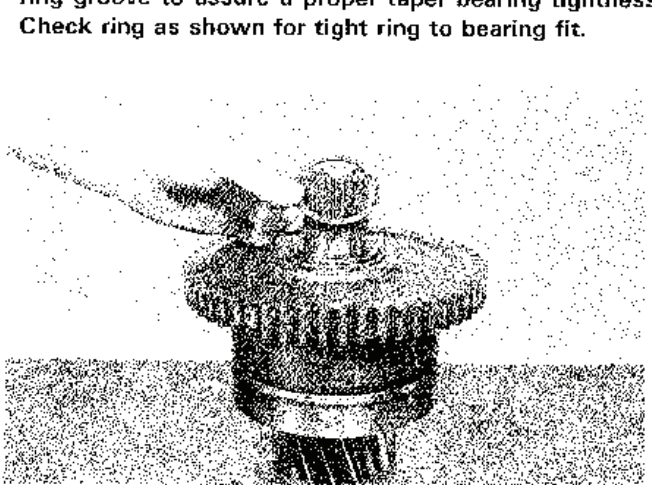
Install low clutch taper bearing retainer ring.

**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 118**

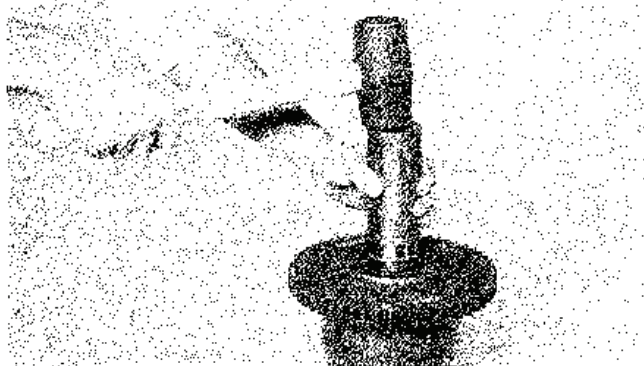
Install low gear into clutch drum. Align splines on low gear with internal teeth of friction discs. Tap gear into position. Do not force this operation. Gear splines must be in full position with internal teeth of all friction discs.



**Figure 121**

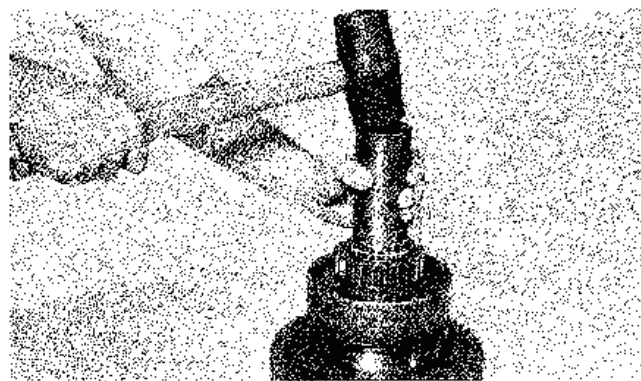
Install low speed gear taper bearing retainer ring retainer.





**Figure 122**

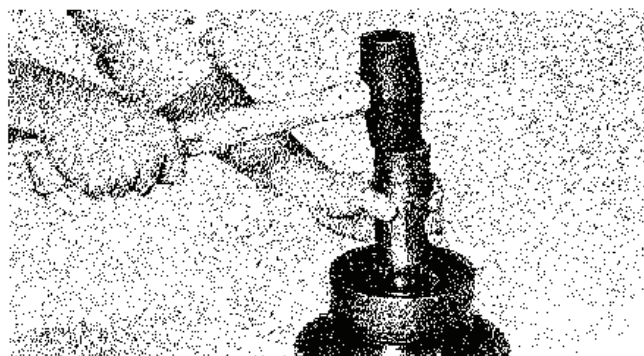
Install low clutch shaft front bearing inner race with large diameter of race down.



**Figure 125**

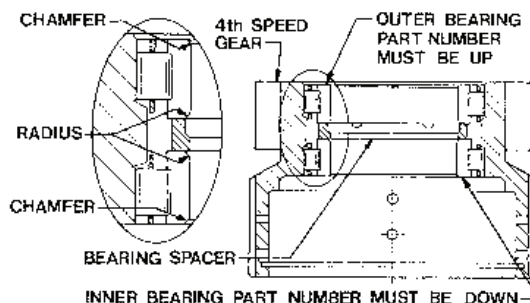
Install 4th speed gear outer bearing. **NOTE:** Bearing Part Number must go up. See Figure 126. It is recommended a rubber band be used to hold outer bearing rollers in position when installing bearing.

### 4th SPEED CLUTCH REASSEMBLY



**Figure 123**

Install piston, and piston return spring. See Page 43, Figure D. Install inner and outer discs as explained in Fig. 93 through Fig. 101. Install 4th speed gear inner bearing. **NOTE:** Bearing Part Number must go down. See Figure 126.



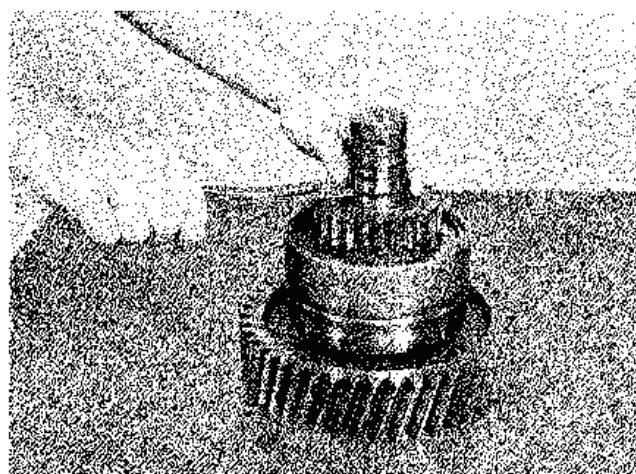
**Figure 126**



**Figure 124**

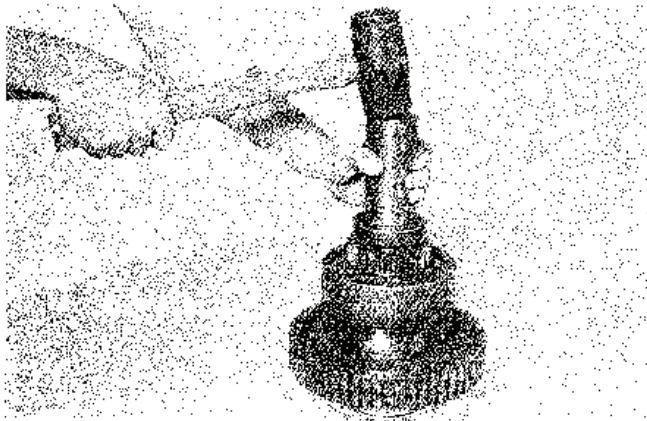
Install bearing spacer between inner and outer 4th speed gear bearings.

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.



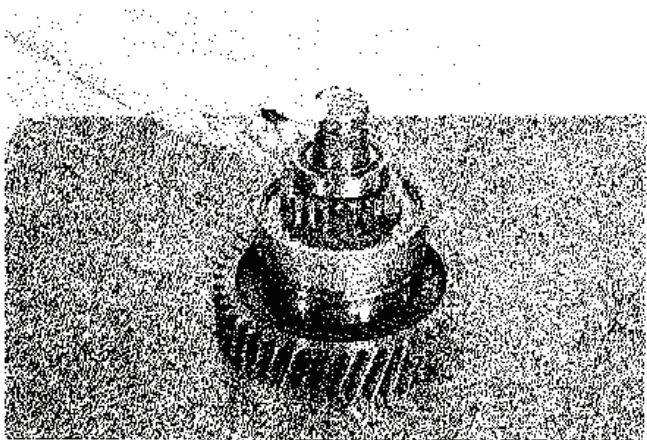
**Figure 127**

Install outer bearing locating ring.



**Figure 128**

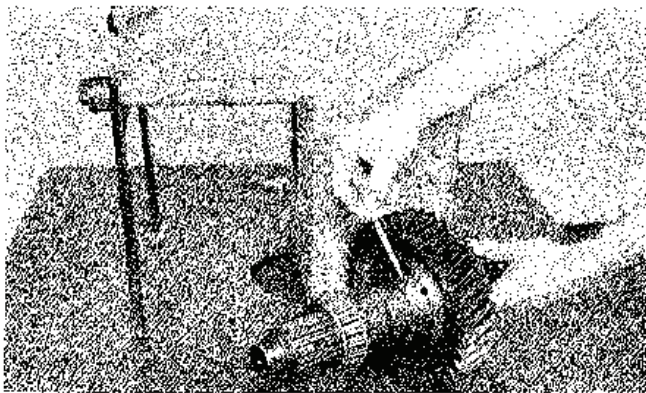
Install front bearing and bearing retainer ring.



**Figure 129**

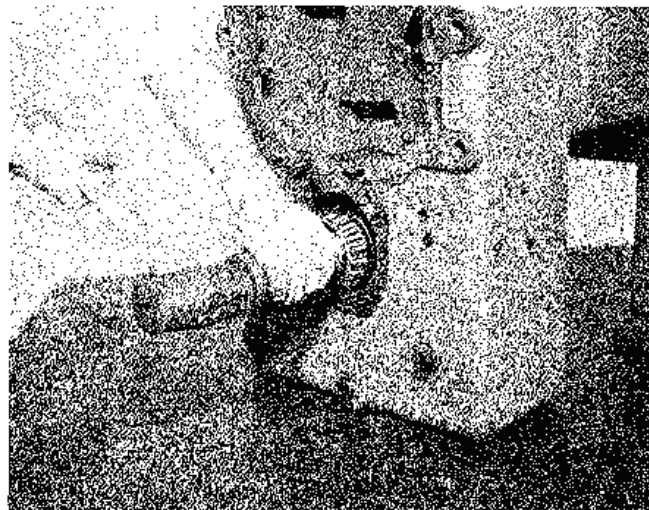
Install clutch shaft piston rings.

## TRANSMISSION REASSEMBLY



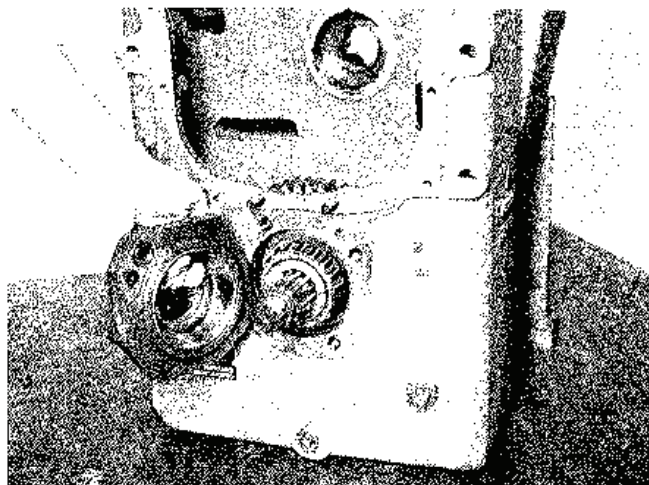
**Figure 130**

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 131**

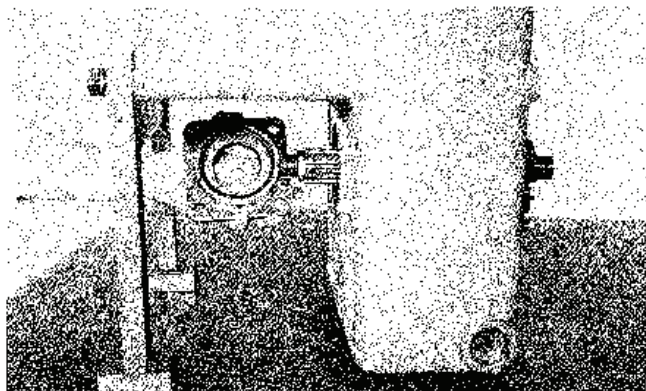
Position output gear in transmission case with protruding hub toward front of case. See Fig. 130. Insert output shaft, gear spacer and taper bearing from front of case and through output gear. Install front taper bearing cup. Block output shaft and install rear taper bearing with large diameter in.



**Figure 132**

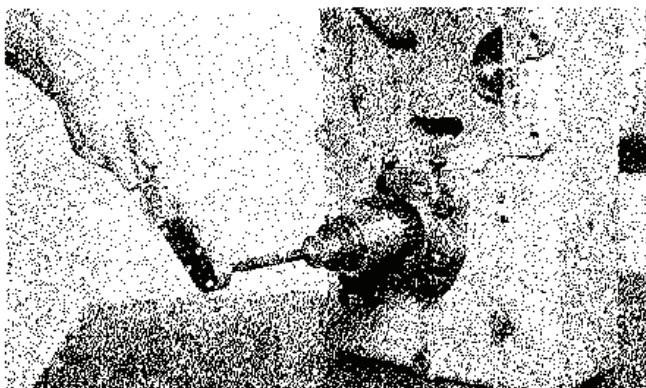
Coat outer diameter of oil seal with Permatex No.2 and press seal in bearing cap with lip of seal in. Using new "O" rings install rear output bearing cap, oil seal and taper bearing cup on transmission case. Lube opening in bearing cap must be aligned with lube opening in case. Tighten bearing cap bolts to specified torque. **(See torque chart.)**





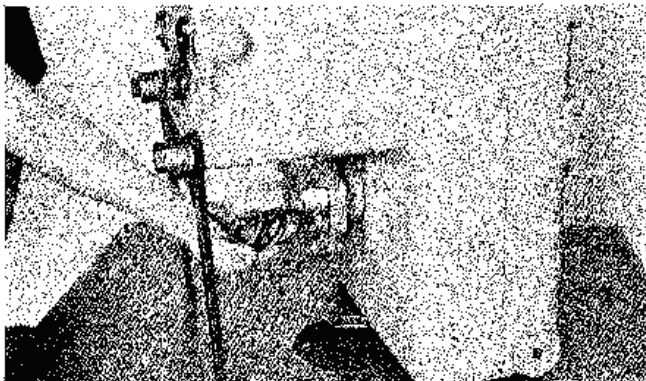
**Figure 133**

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 134**

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. [0,68 - 0,90 N.m] more than when bearing cap bolts were loose. Add or omit shims on the front bearing cap to achieve the proper preload.



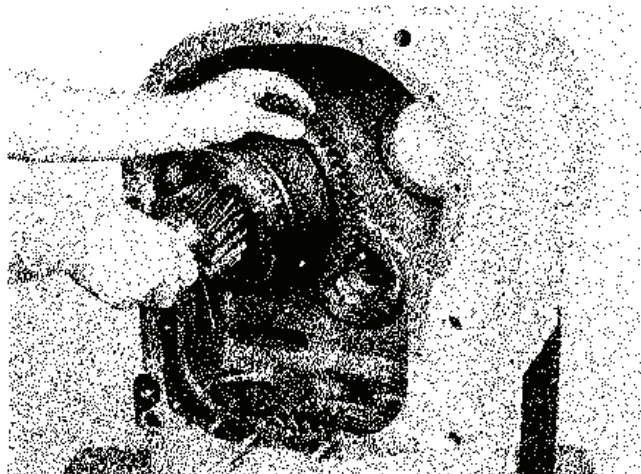
**Figure 135**

Install output shaft front companion flange, flange "O" ring, washer and flange nut. Block output gear. See elastic stop nut torque chart.



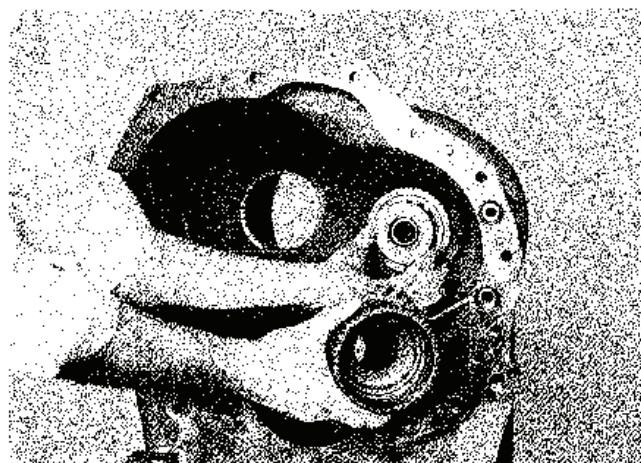
**Figure 136**

Install low clutch front bearing.



**Figure 137**

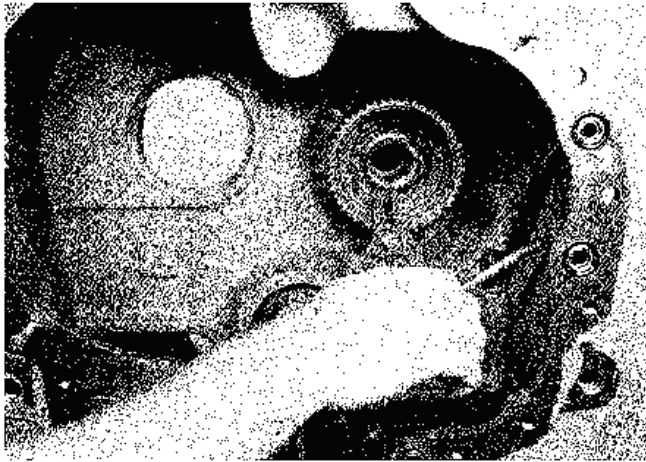
Install low clutch assembly from rear of transmission case.



**Figure 138**

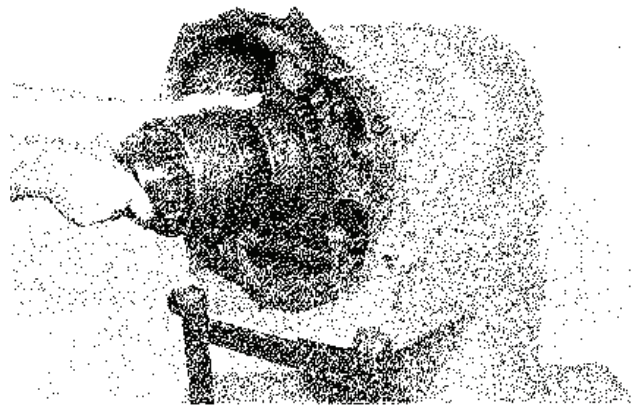
Install 2nd speed bearing end plate and 2nd speed gear on low clutch shaft.





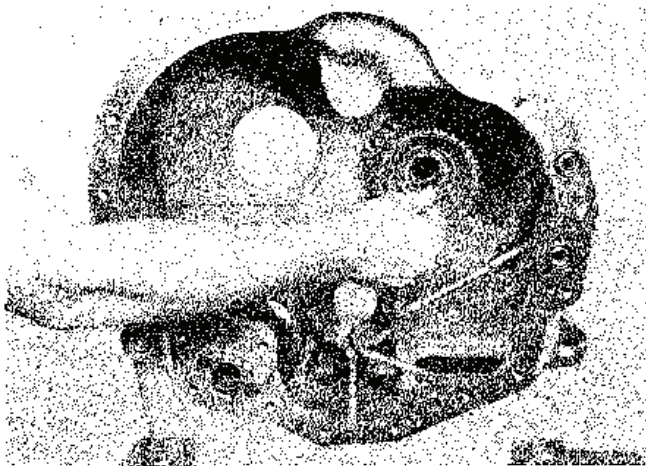
**Figure 139**

Install 2nd speed gear retainer ring.



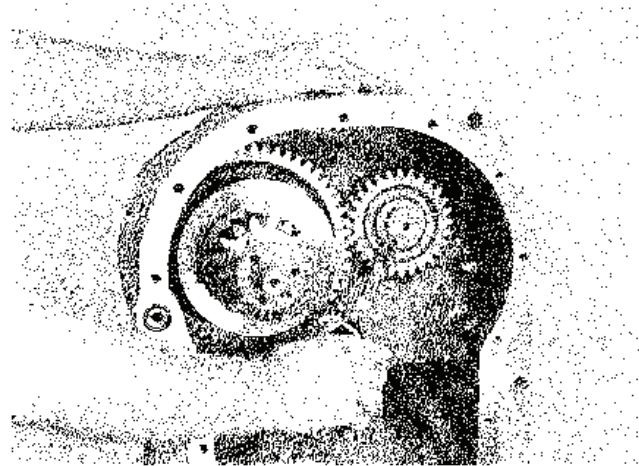
**Figure 142**

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



**Figure 140**

Install 2nd speed gear retainer ring retainer.



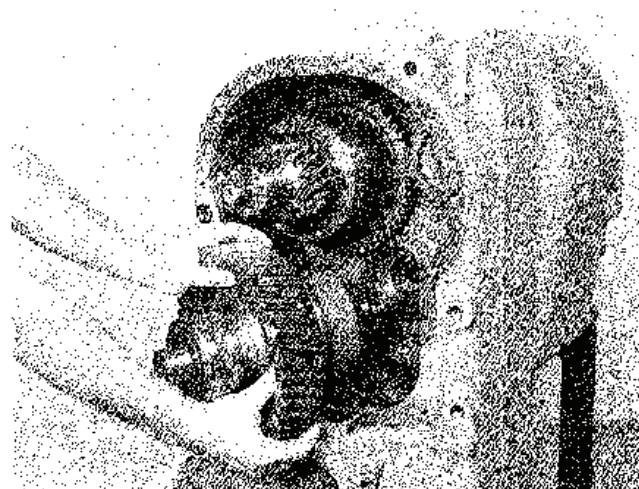
**Figure 143**

Install low speed drive gear and retainer ring.



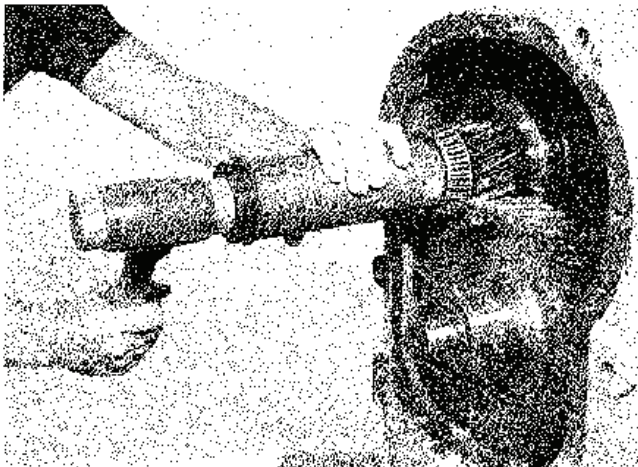
**Figure 141**

Install 2nd gear ring retainer snap ring.



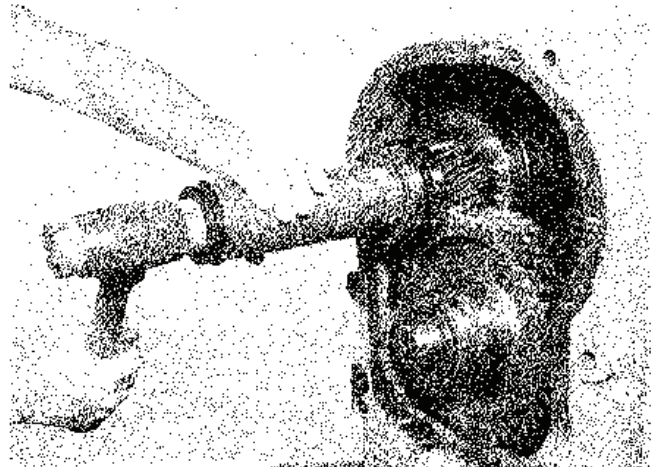
**Figure 144**

Install idler shaft and 4th speed clutch assembly.



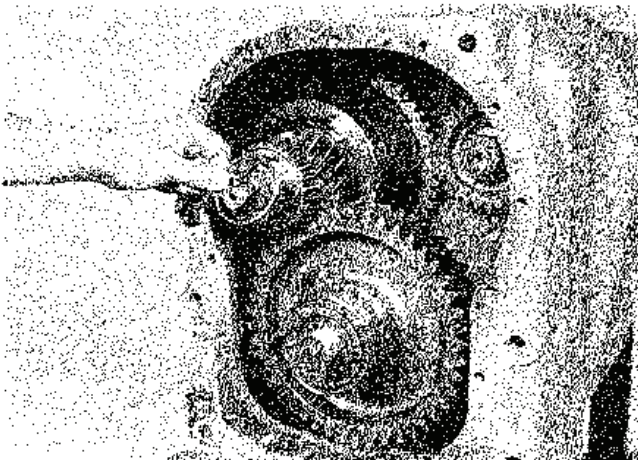
**Figure 145**

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



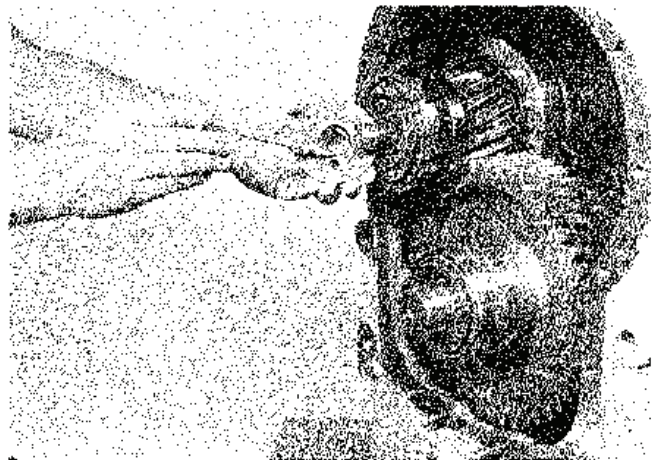
**Figure 148**

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



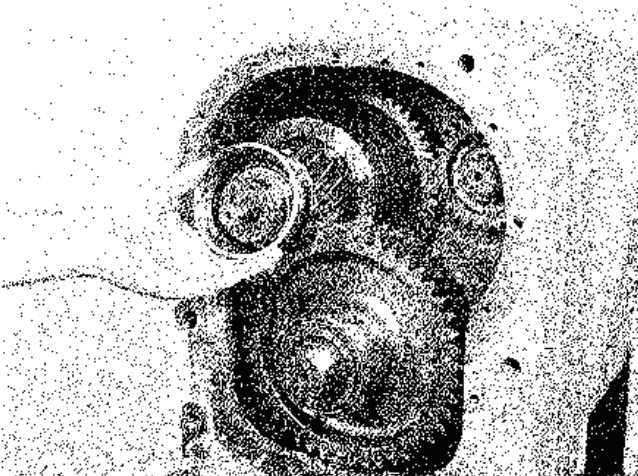
**Figure 146**

Install bearing spacer.



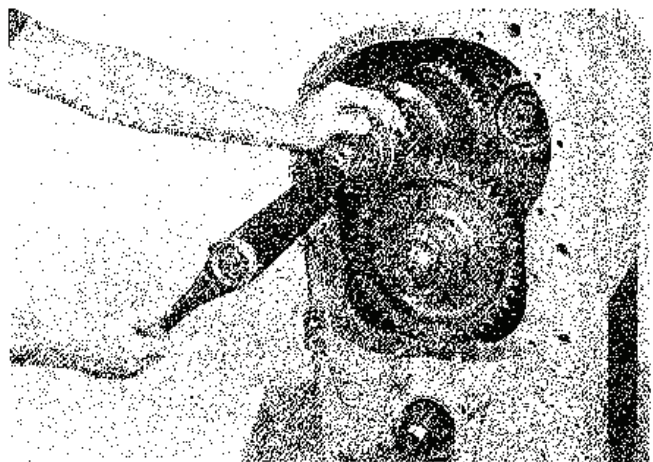
**Figure 149**

Install retainer plate, inner diameter chamfer toward bearing.



**Figure 147**

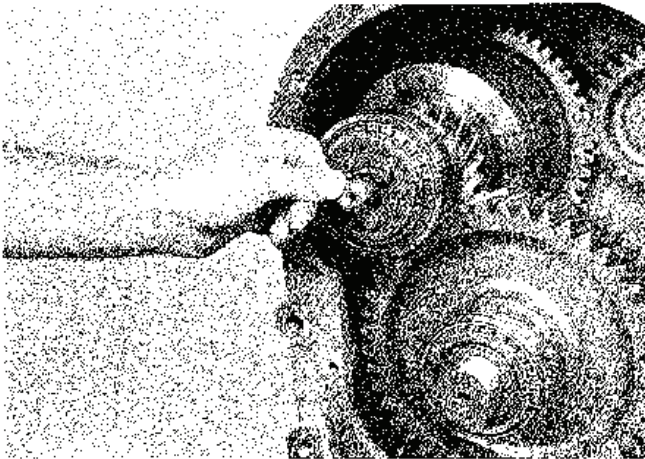
Install bearing cup.



**Figure 150**

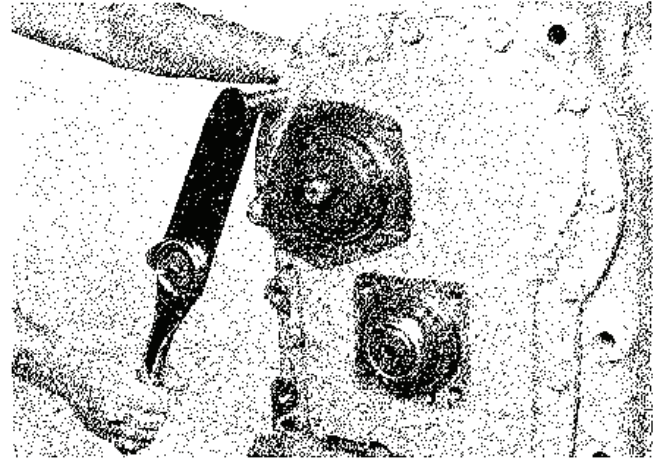
Install bolts and block gears. Torque bolts to specifications and lock wire together.





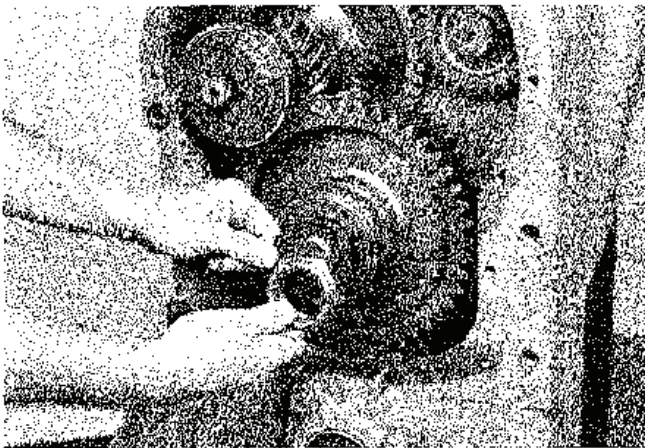
**Figure 151**

Install low clutch shaft sealing ring.



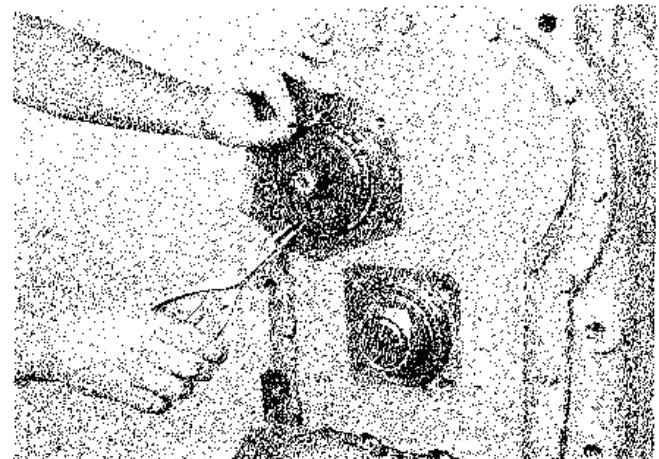
**Figure 154**

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



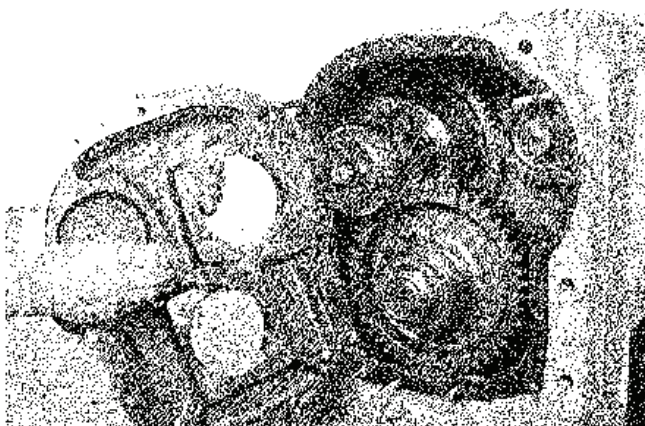
**Figure 152**

Install idler shaft spacer and nut. See elastic stop nut torque chart.



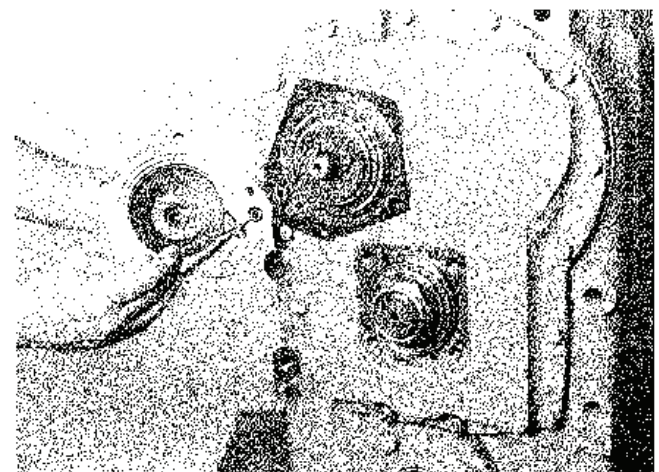
**Figure 155**

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



**Figure 153**

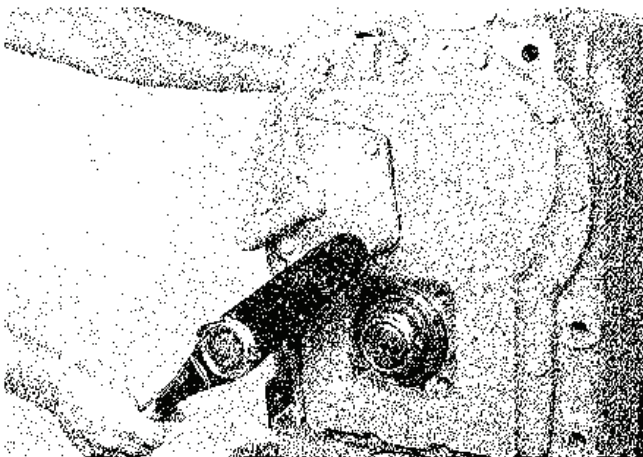
Install alignment studs and new gasket. Place lock balls in low shaft and idler shaft. A light coat of grease will hold lock balls in place. Position shafts so lock balls align with notches in rear cover.



**Figure 156**

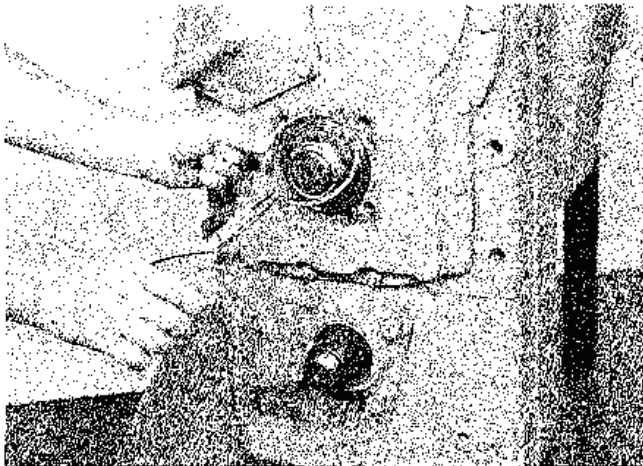
Install new "O" ring and gasket on low shaft bearing cap.





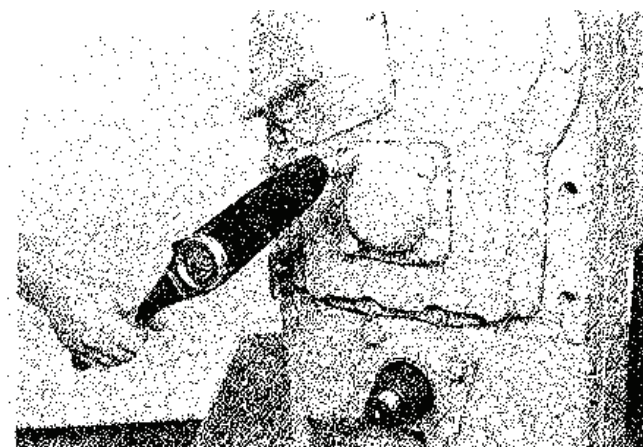
**Figure 157**

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



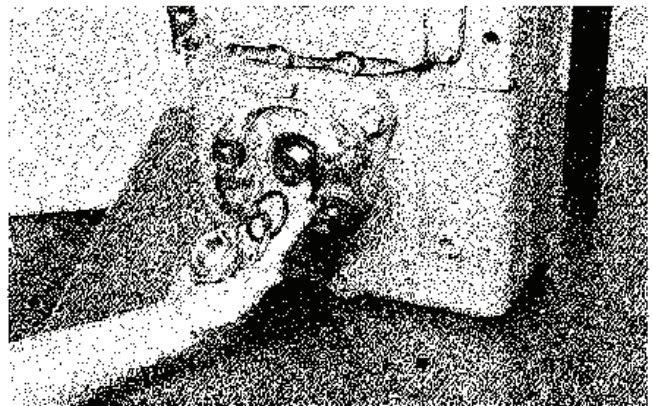
**Figure 158**

Install idler shaft rear bearing locating ring.



**Figure 159**

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



**Figure 160**

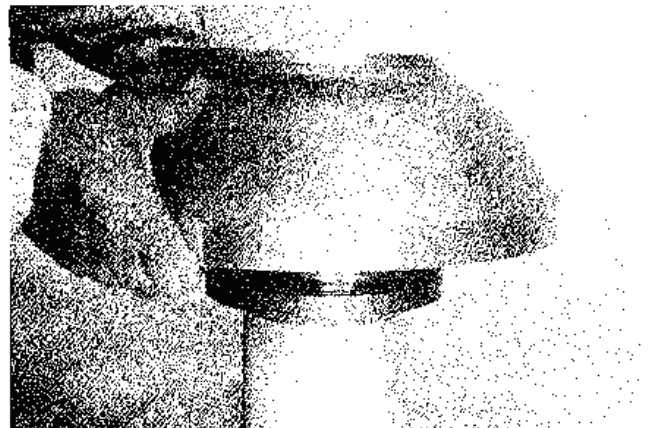
Install new "O" ring. Install washer and flange nut. Block output shaft. See elastic stop nut torque chart.

## IMPELLER REASSEMBLY



**Figure 161**

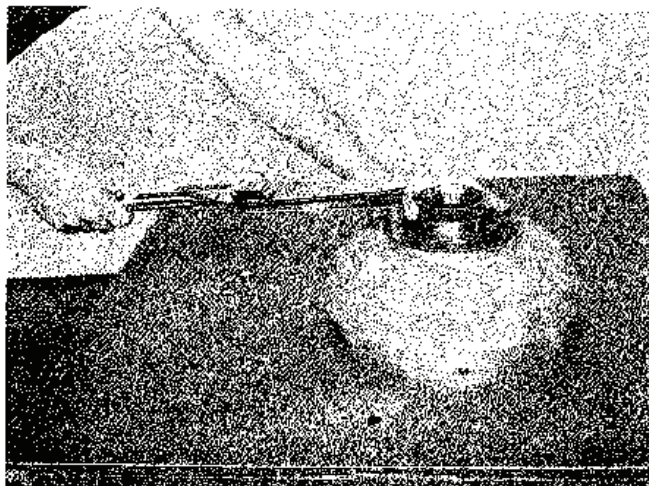
Clean impeller hub mounting surface and tapped holes with solvent. Dry thoroughly being certain tapped holes are dry and clean. Install new "O" ring on impeller hub. Position impeller hub screw backing ring.



**Figure 162**

Align holes in impeller hub with holes in impeller and backing ring.

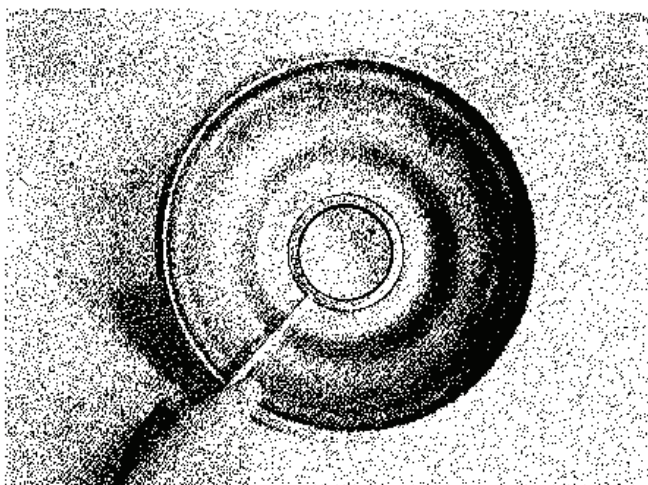




**Figure 163**

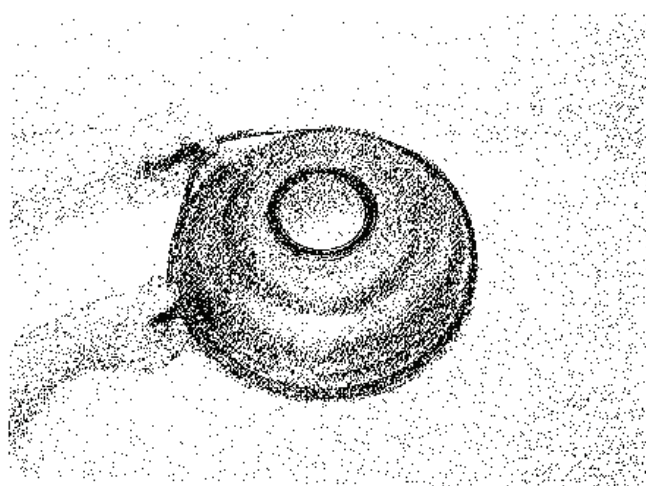
Install (12) impeller hub special screws to approximately .06 inch [1,5] of seated position. With a calibrated torque wrench, tighten screws to 40-45 Lbs. Ft. [54,3-61,0 N.m.] torque. **NOTE:** Assembly of impeller to impeller hub must be completed within a fifteen minute period from start of screw installation.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

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



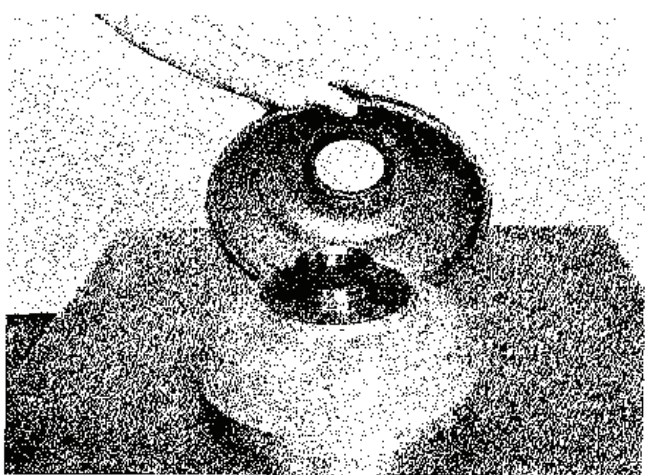
**Figure 164**

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



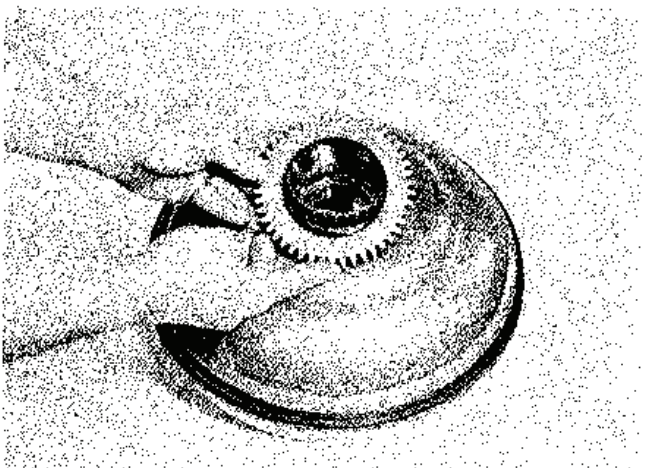
**Figure 165**

Install a new oil baffle seal ring.



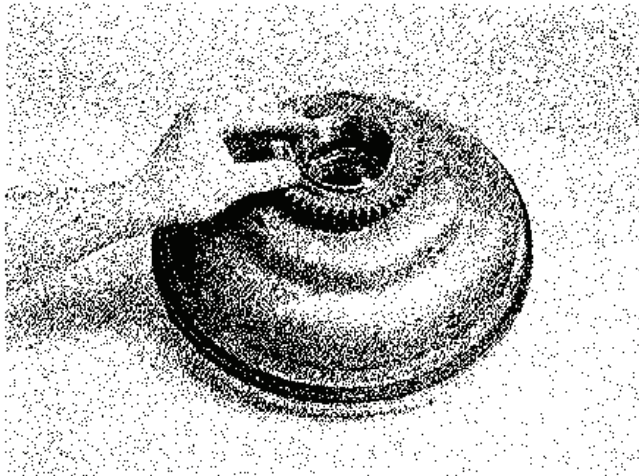
**Figure 166**

Install oil baffle on impeller assembly.



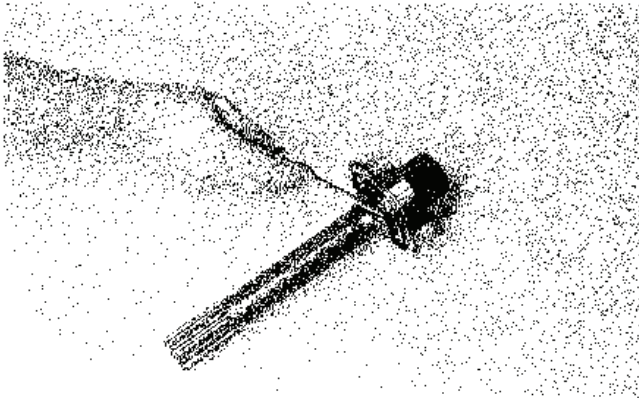
**Figure 167**

Install impeller hub gear.



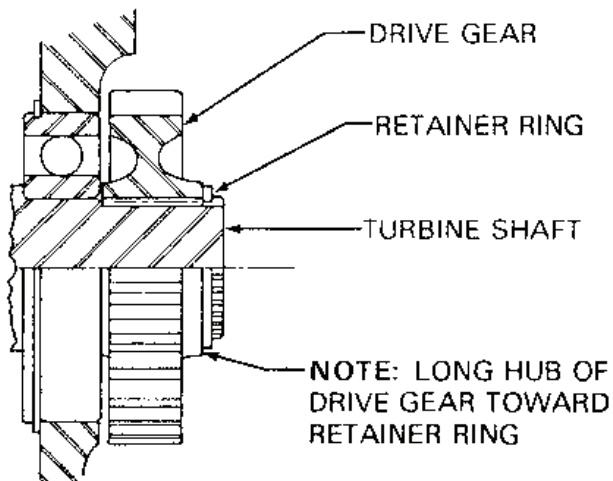
**Figure 168**

Secure impeller hub gear with retainer ring.



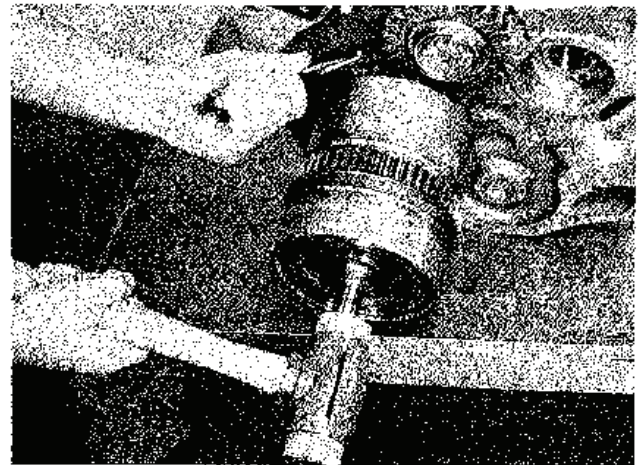
**Figure 169**

Install new turbine shaft piston ring.



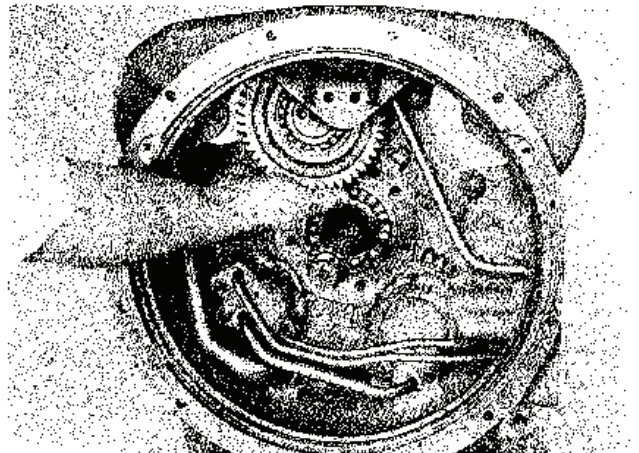
**Figure 170**

Tap turbine shaft and bearing assembly into converter housing from front. At the rear of the converter housing install turbine shaft gear and retainer ring as shown.



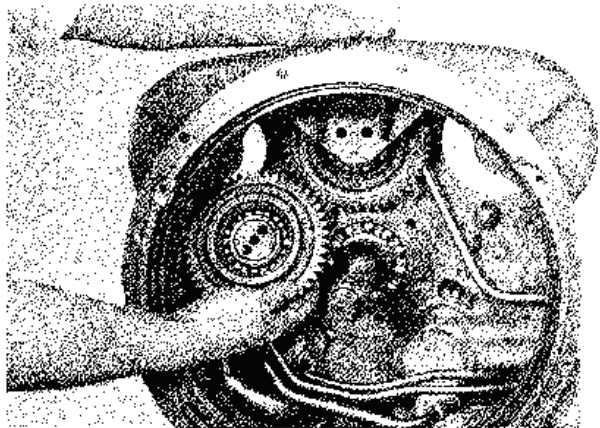
**Figure 171**

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 172**

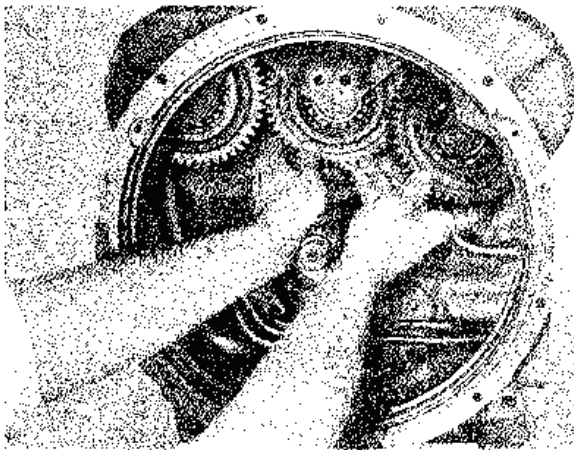
Position center pump drive gear.



**Figure 173**

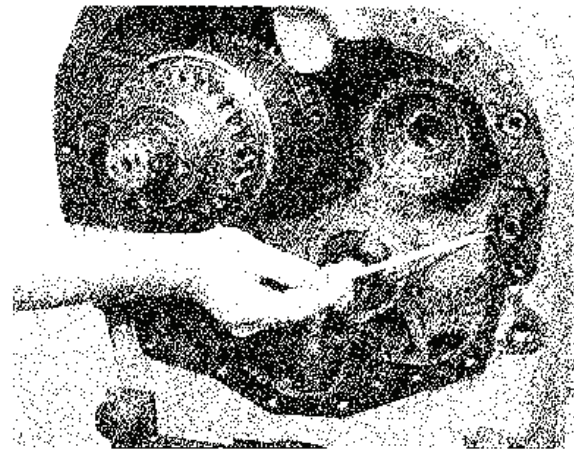
Install left pump drive gear.





**Figure 174**

Install right pump drive gear.



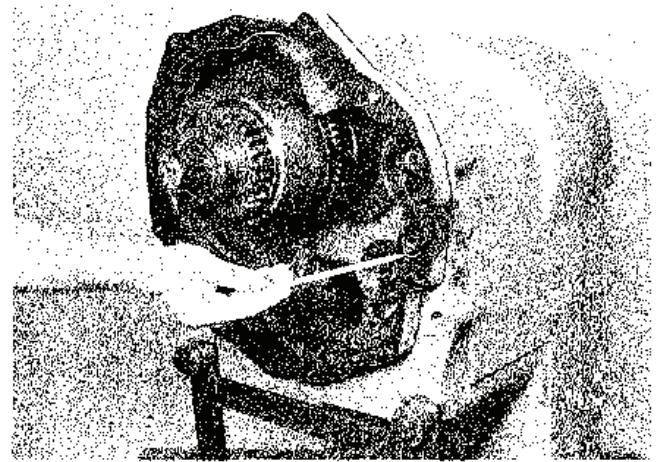
**Figure 177**

Install transmission case gasket and "O" ring seals.



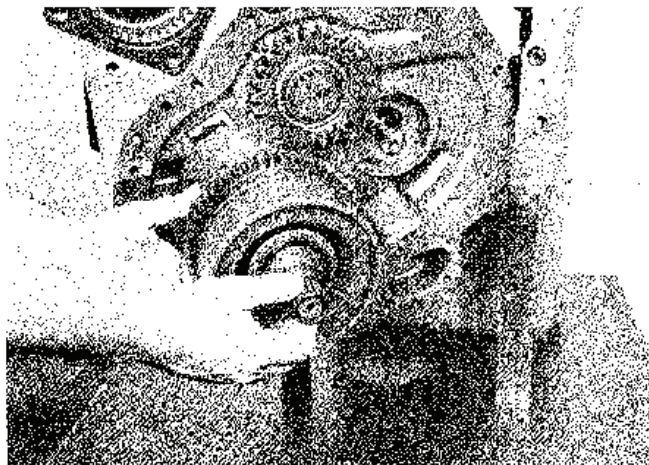
**Figure 175**

Align holes in pump drive gear bearing supports with holes in converter housing. Install bolts and washers and tighten to specified torque.



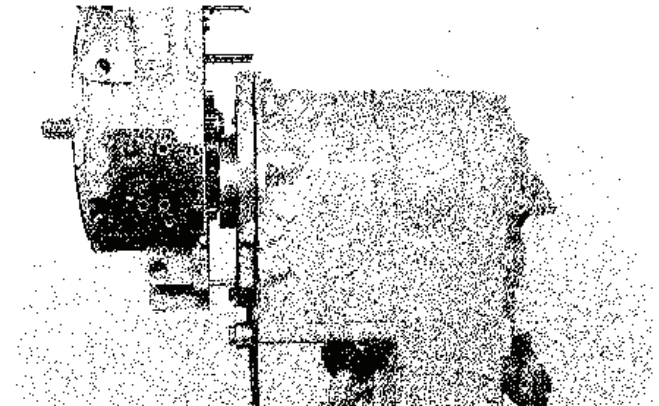
**Figure 178**

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



**Figure 176**

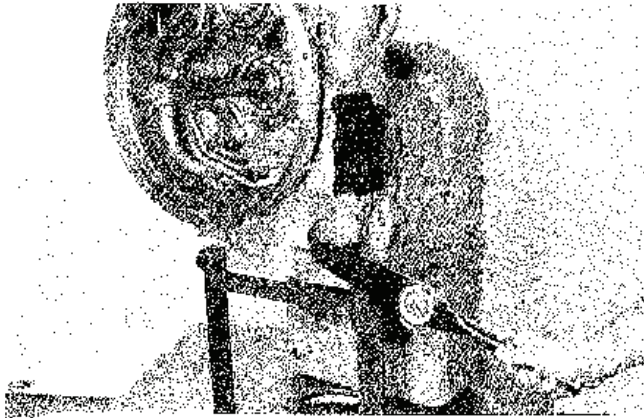
Install 2nd speed clutch pilot bearing.



**Figure 179**

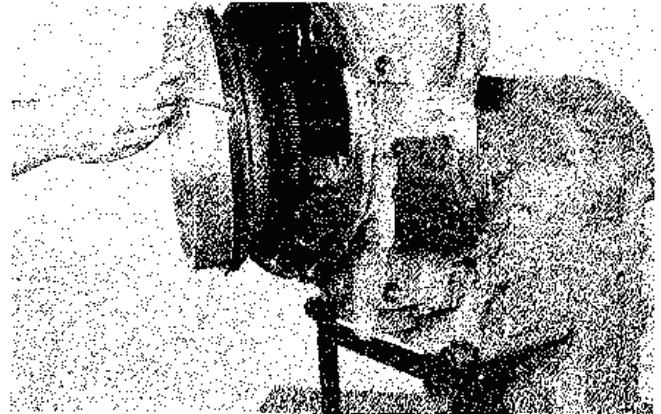
Install alignment studs and position converter housing on studs. **NOTE:** Turn output shaft to align clutch disc hub in clutch and final assembly.





**Figure 180**

Install converter housing to transmission housing bolts and tighten to specified torque. **NOTE:** Bolts are not to be used to pull converter housing to transmission housing.



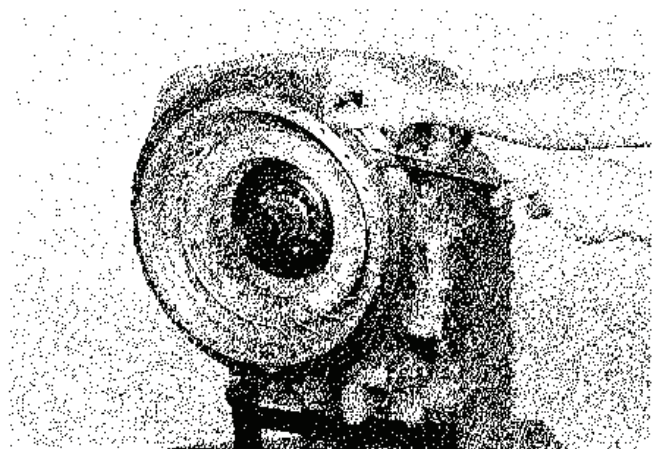
**Figure 183**

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



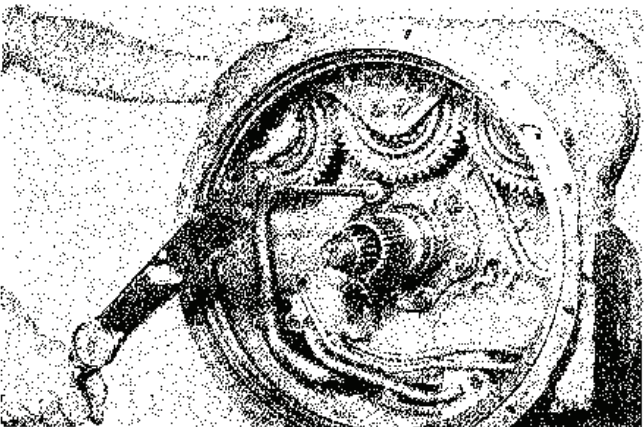
**Figure 181**

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



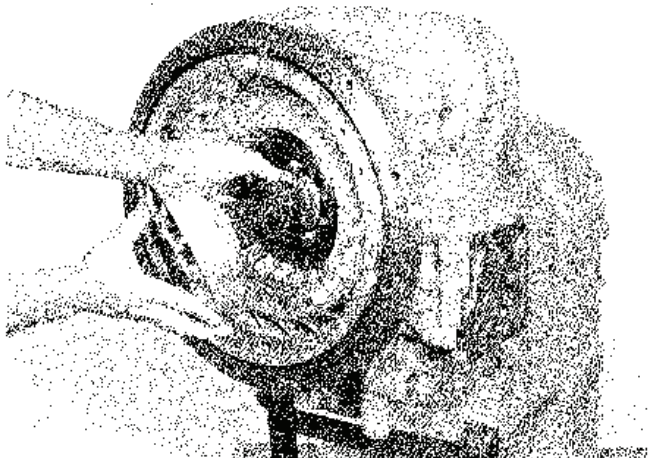
**Figure 184**

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



**Figure 182**

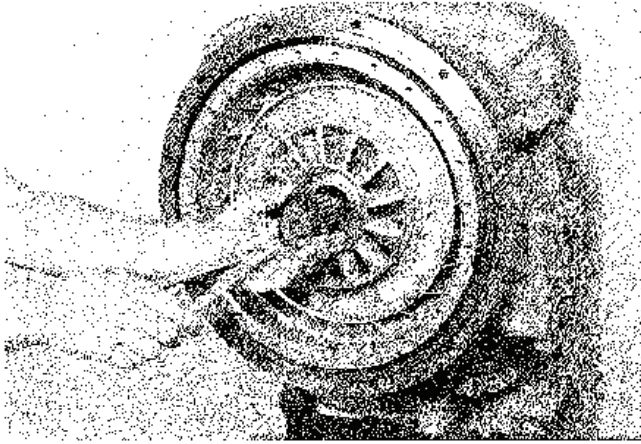
Install stator support bolts and tighten to specified torque.



**Figure 185**

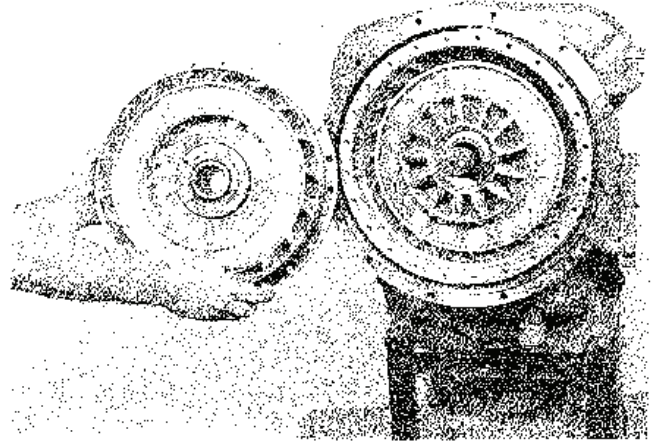
Install reaction member spacer with tang facing out. Install reaction member.





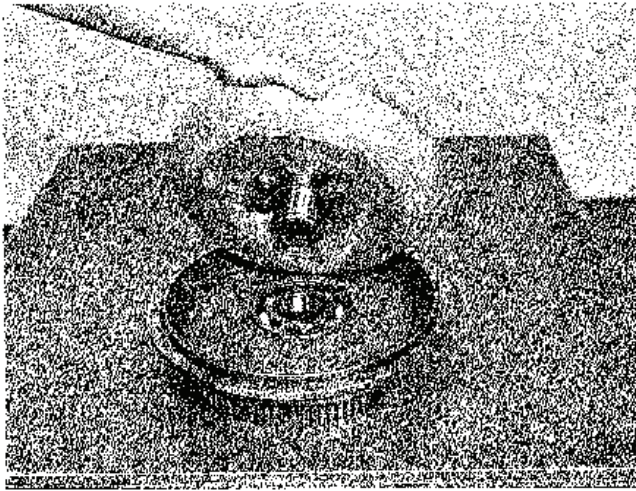
**Figure 186**

Install reaction member retainer ring.



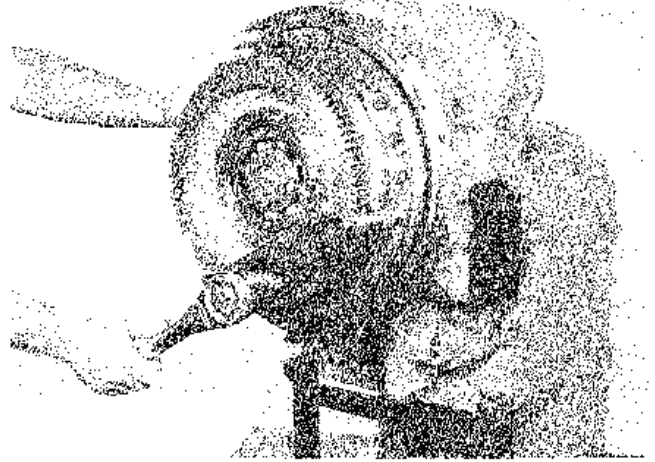
**Figure 189**

Position new impeller to impeller cover "O" ring on impeller. Install turbine and impeller cover.



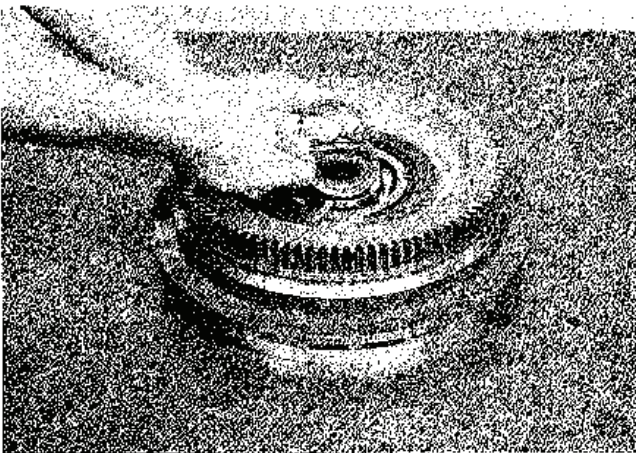
**Figure 187**

Position turbine in impeller cover.



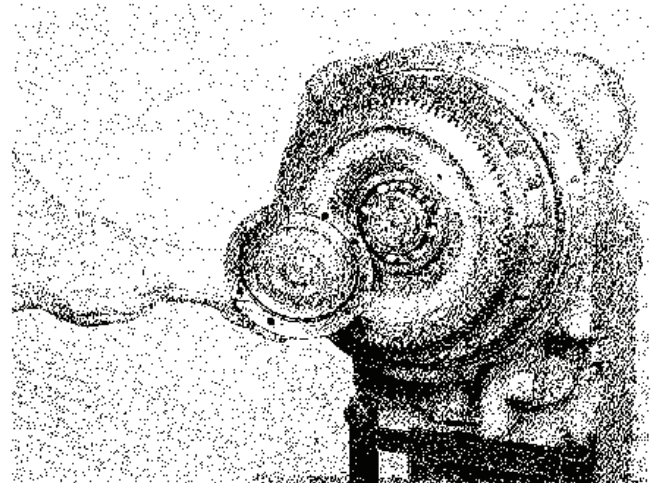
**Figure 190**

Install impeller cover bolts and torque to specifications.



**Figure 188**

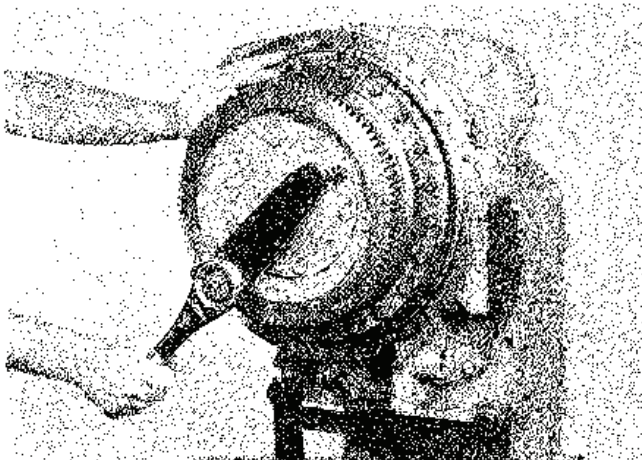
Install spacer and turbine to impeller cover bearing snap ring.



**Figure 191**

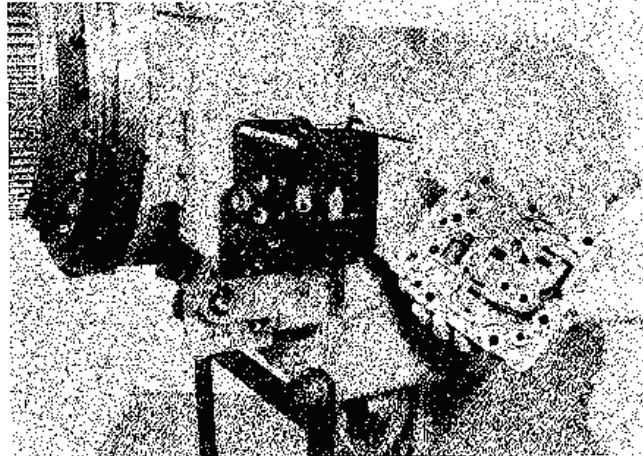
Install new "O" ring seal in impeller cover bearing cap.





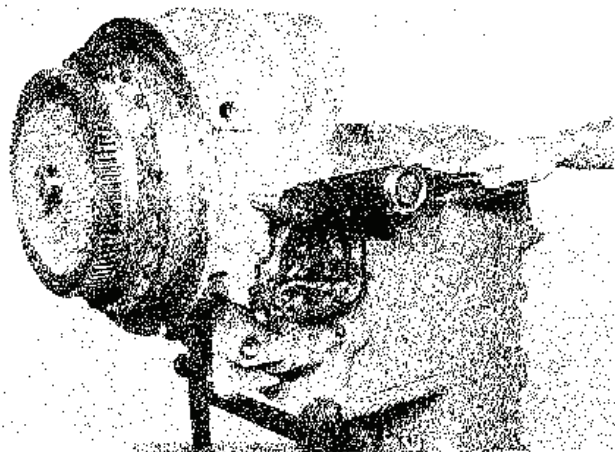
**Figure 192**

Install bearing cap and bolts, torque to specifications.



**Figure 195**

Install gasket and modulator valve.



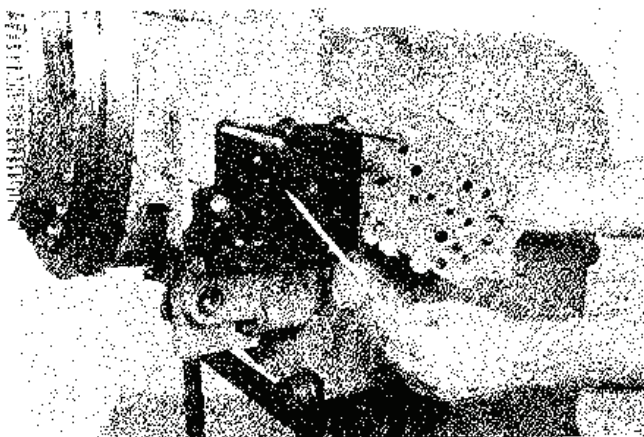
**Figure 193**

Install gasket and 90° adapter. Install and tighten internal screws. Install bolts and torque to specifications.



**Figure 196**

Position new gasket. Position detent spring and balls. Install control valve.



**Figure 194**

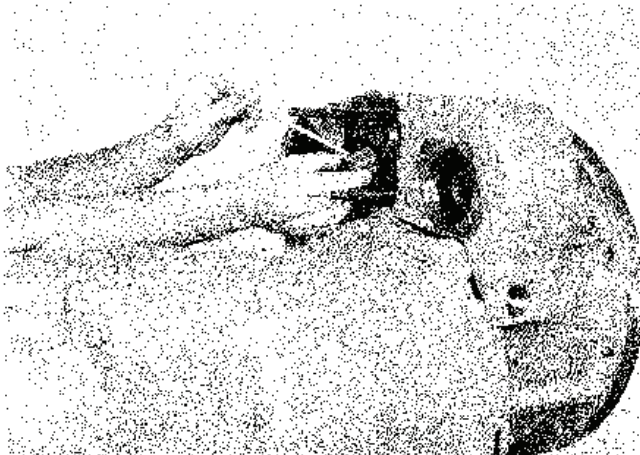
Install alignment studs and new modulator valve adapter plate gasket. Install modulator valve adapter plate.



**Figure 197**

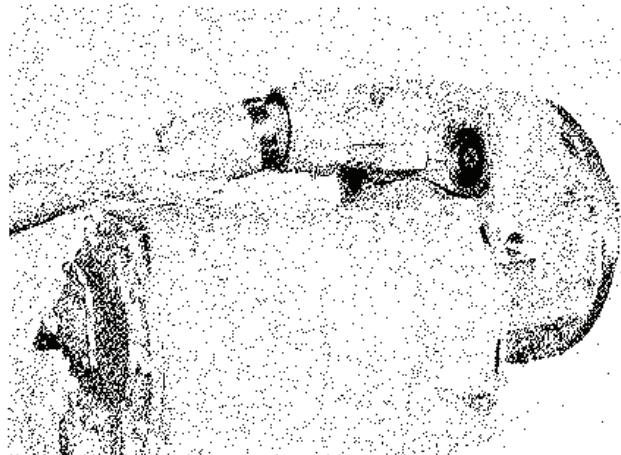
Install control valve bolts and lockwashers, remove aligning studs, tighten bolts to specified torque.





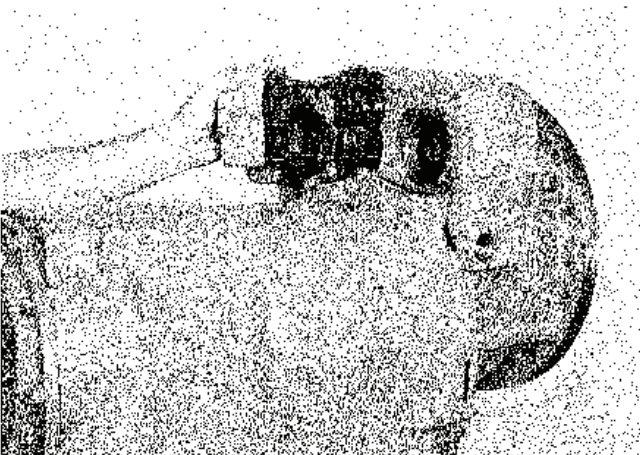
**Figure 198**

Install pump drive sleeves.



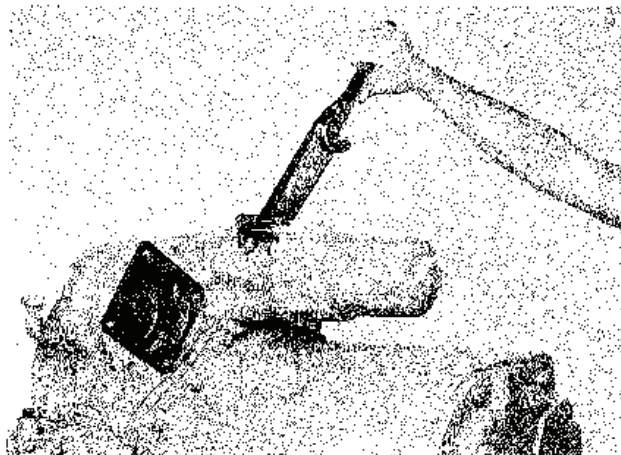
**Figure 201**

Install new oil filter element. Install filter housing.



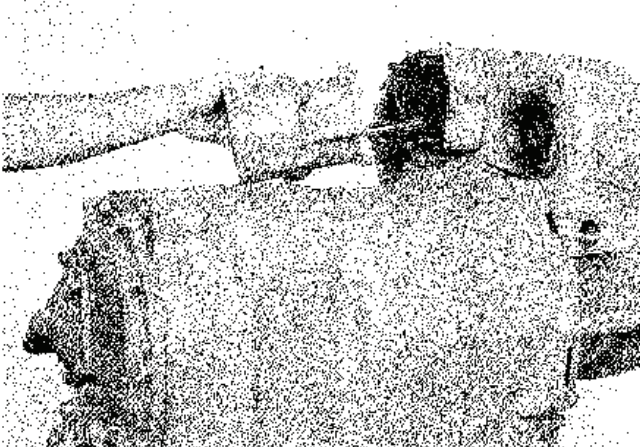
**Figure 199**

Install pressure regulating valve assembly.



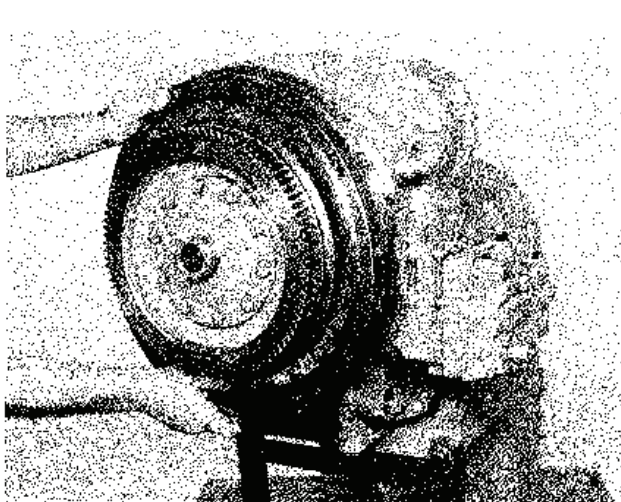
**Figure 202**

Torque pump to regulating valve stud nuts to specifications.  
Torque filter housing 20 to 25 ft. lbs. [27,2-33,0 N.m]



**Figure 200**

Install pump and filter adapter. Install pump to regulating valve stud nuts. **NOTE:** Some units will have a double pump and not a filter adaptor.



**Figure 203**

Install converter housing to engine housing spacer ring.



## 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.

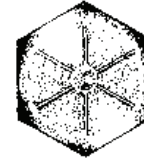
### TORQUE IN (LBS.—FT.) BOLTS, CAPSCREWS, STUDS AND NUTS

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 <b>NEUTRAL</b> . Operating specifications: 25 P.S.I. [172,4 kPa] minimum pressure at 2000 R.P.M. engine speed <b>AND</b> a maximum of 70 P.S.I. [482,6 kPa] outlet pressure with engine operating at no-load governed speed.	OIL FILTRATION	Full flow oil filter safety by-pass, also strainer screen in sump at bottom of transmission case.
CONTROLS	Forward and Reverse — Manual Speed Selection — Manual	CLUTCH PRESSURE	240 - 300 psi [1654,8 - 2068,4 kPa] - With parking brake set [see note], oil temperature 180° - 200°F. [82,2° - 93,3°C], engine at idle (400 to 600 RPM), shift thru direction and speed clutches. All clutch pressure must be equal within 5 psi. [34,5 kPa]. If clutch pressure varies in any one clutch more than 5 psi [34,5 kPa] repair clutch.
CLUTCH TYPE	Multiple discs, hydraulically actuated, spring released, automatic wear compensation and no adjustment. All clutches oil cooled and lubricated.		<b>NOTE:</b> 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.
CLUTCH INNER DISC	Friction.		<b>ALWAYS USE PARKING BRAKE WHEN MAKING CLUTCH PRESSURE CHECKS.</b>
CLUTCH OUTER DISC	Steel.		

## LUBRICATION

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

Prevailing Ambient Temperature

TYPE OF OIL See Lube Chart.

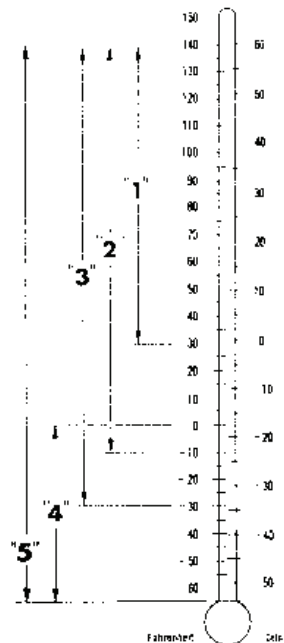
CAPACITY Consult Operator's Manual on applicable machine model for system capacity. Torque Converter, Transmission and allied hydraulic system must be considered as a whole to determine capacity.

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 180° to 200° F. [85,6 - 93,3° C].

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

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



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

Temperature Range	1	(a) C-2 Grade 30 (b) C-3 Grade 30 (c) Engine Oil-Grade 30 API-CD/SE or CD/SF (d) MIL-L-2104C-Grade 30 (e) MIL-L-2104D-Grade 30
Temperature Range	2	(a) MIL-L-2104C-Grade 10 (b) MIL-L-2104D-Grade 10 (c) C-2 Grade 10 (d) C-3 Grade 10
Temperature Range	3	(a) Engine Oil-Grade 10 API-CD/SF or CD/SF (b) Castroltine R22-220 (Non Phosphate Ester Fire Resistant Fluid)
Temperature Range	4	(a) Dexron (b) Dexron II D - See Caution Below
Temperature Range	5	(a) MIL-L-46167 (b) MIL-L-46167 A
Temperature Range	6	(a) Conoco High-Performance Synthetic Motor Oil — Spec. No. G715

**PREFERRED OIL VISCOSITY:** Select highest oil viscosity compatible with prevailing ambient temperatures and oil applied on chart. Temperature ranges "2" and "3" may be used to lower ambient temperatures when sump preheaters are used. Temperature range "4" should be used only in ambient temperature range shown.

**MODULATED SHIFT TRANSMISSIONS:** T17000, 18000, 24000, 28000 & 32000 series transmissions with modulated shift use only C-3 or temperature range 3 items (a) & (b) Dexron or Dexron II D. **SEE CAUTION BELOW.** 3000, 4000, 5000, 6000, 8000, 16000 & 34000 series transmissions with modulated shift use only C-3 or temperature range 3 item (a) only Dexron. Do NOT use Dexron II D. **SEE CAUTION BELOW.**

**CAUTION:** Dexron II D is not compatible with graphitic clutch plate friction material **UNLESS IT MEETS THE APPROVED C-3 SPECIFICATIONS.** Dexron II D cannot be used in the 3000, 4000, 5000, 6000, 8000, 16000 or 34000 series power shift transmissions, or the HR28000 & HR32000 series having converter lock-up, or the C270 series converter having lock-up **UNLESS IT MEETS THE APPROVED C-3 SPECIFICATIONS.**

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

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

# TROUBLE SHOOTING GUIDE

For The  
**R 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.

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

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

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

1. Low oil level.
2. Clutch pressure regulating valve spool stuck open.
3. Faulty charging pump.
4. Broken or worn clutch shaft or piston sealing rings.
5. Clutch piston bleed valve stuck open.

### Remedy

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

## LOW CONVERTER CHARGING PUMP OUTPUT

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

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

## OVERHEATING

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

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

## NOISY CONVERTER

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

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

## LACK OF POWER

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

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



## 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.

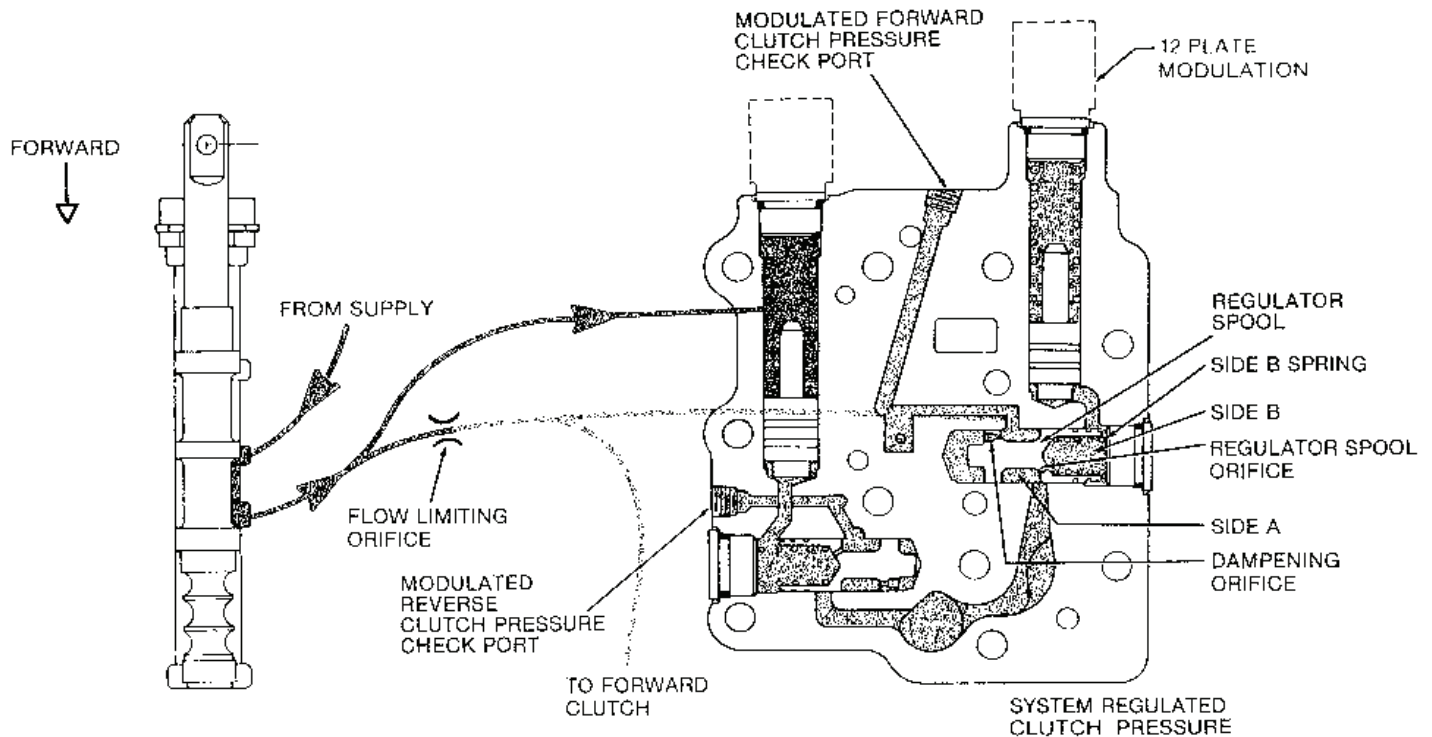
This causes the rising slope in the clutch pressure versus time chart. The rate of this rise is controlled by the accumulator spring force. Once the accumulator spool is stroked to its limit, pressure on "A" and "B" side of the regulator spool is balanced since no flow passes through the regulator spool 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.

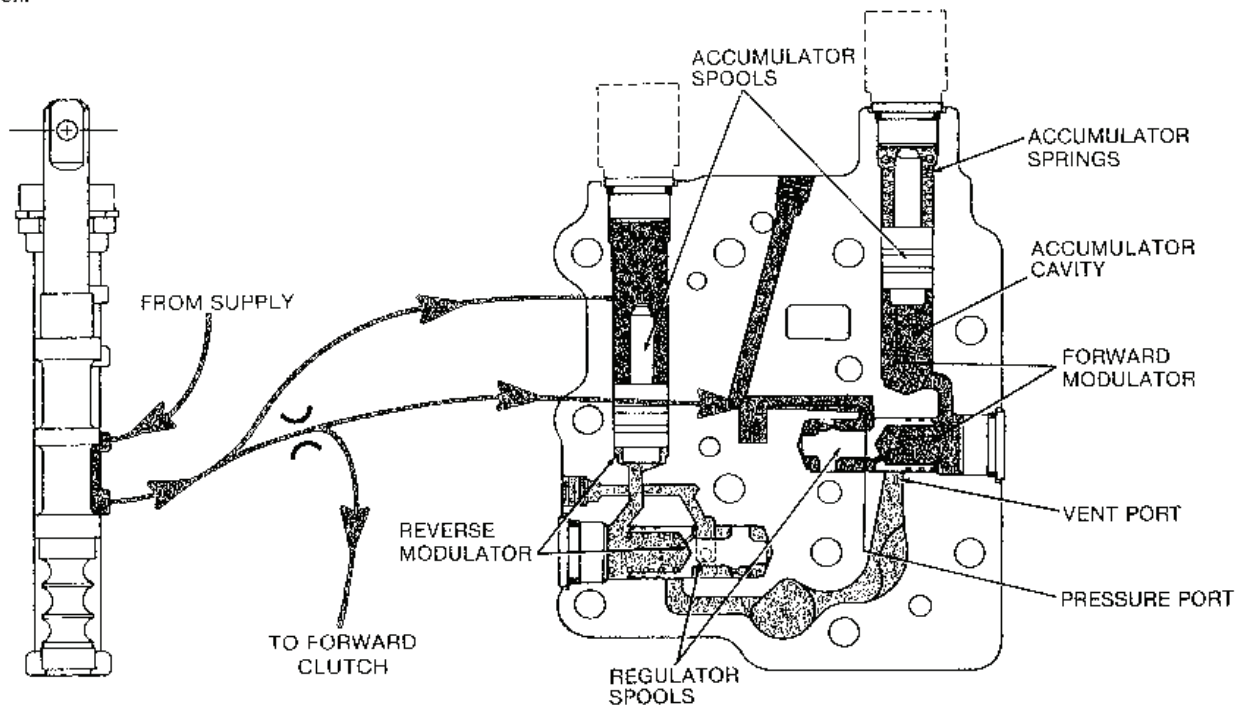
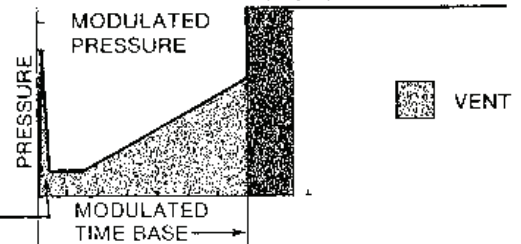
When forward direction is selected the reverse clutch and modulator are vented through the control valve to the transmission sump. The reverse accumulator cavity is vented back through the regulator spool orifice. To hasten the reset time of the accumulator, immediately preparing the transmission for 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.

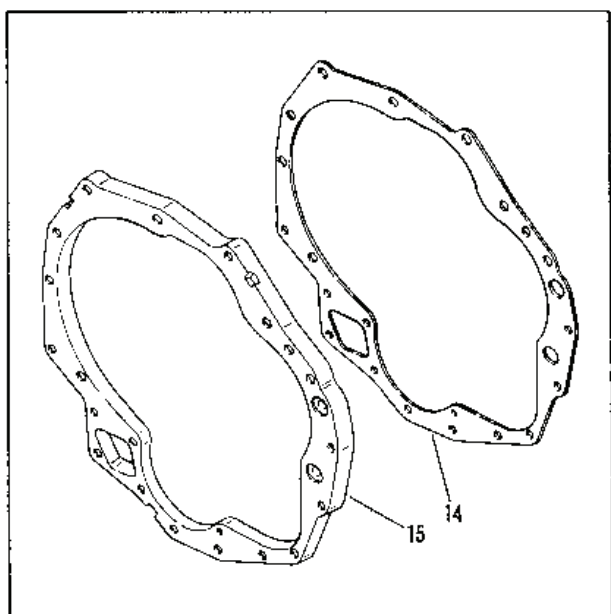
## 32000 SERIES MODULATION



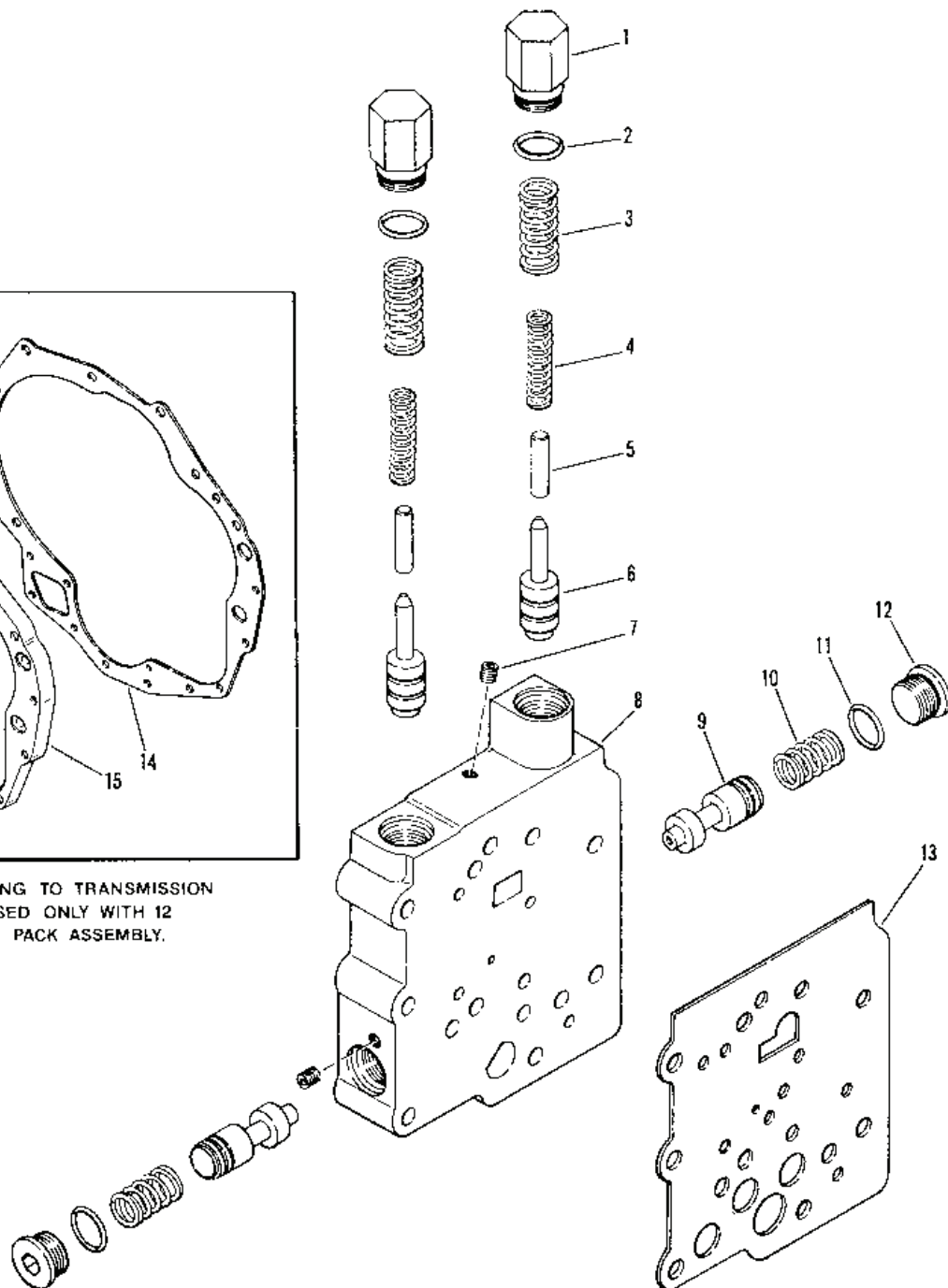
This pressure spike is time required for spools to react. The spike pressure is used to quickly fill the clutch pressure supply passages with oil.







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 .....	

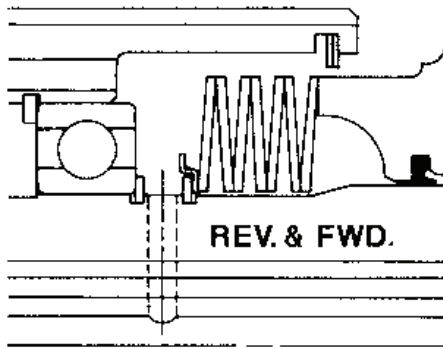
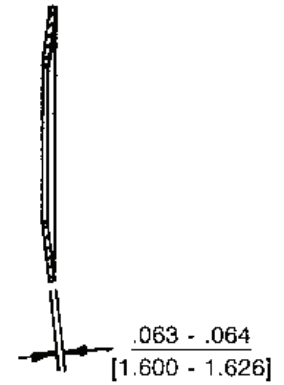


FIG. A



MODULATED FWD.  
& REV. CLUTCHES

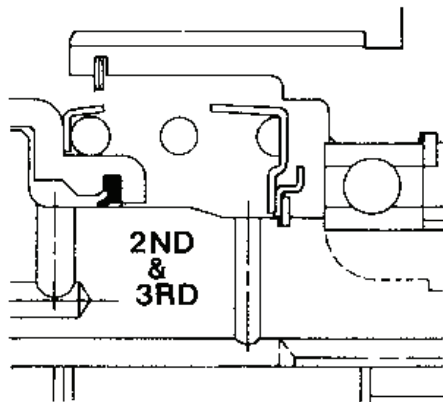


FIG. B

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

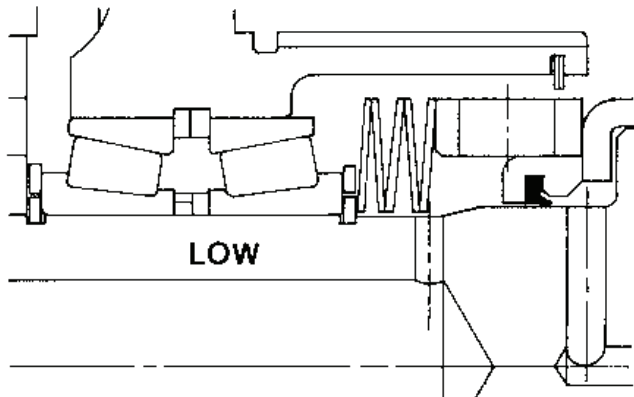
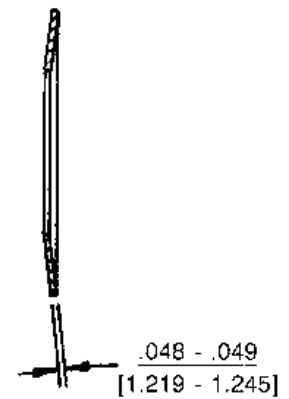


FIG. C



LOW (1st)  
CLUTCH

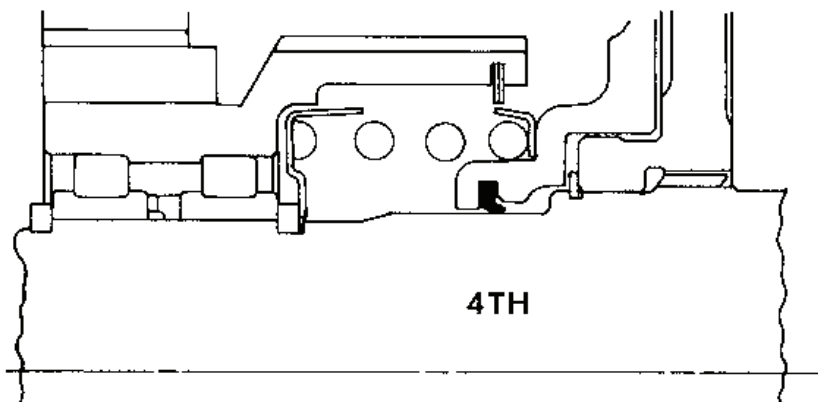


FIG. D  
(4 SPEED ONLY)



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

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

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

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

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

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

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

### 802553 - 1.5 INCH (38,1) 16 SCREW RING GEAR KIT

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

### 802554 - 1.5 INCH (38,1) 16 SCREW RING GEAR KIT

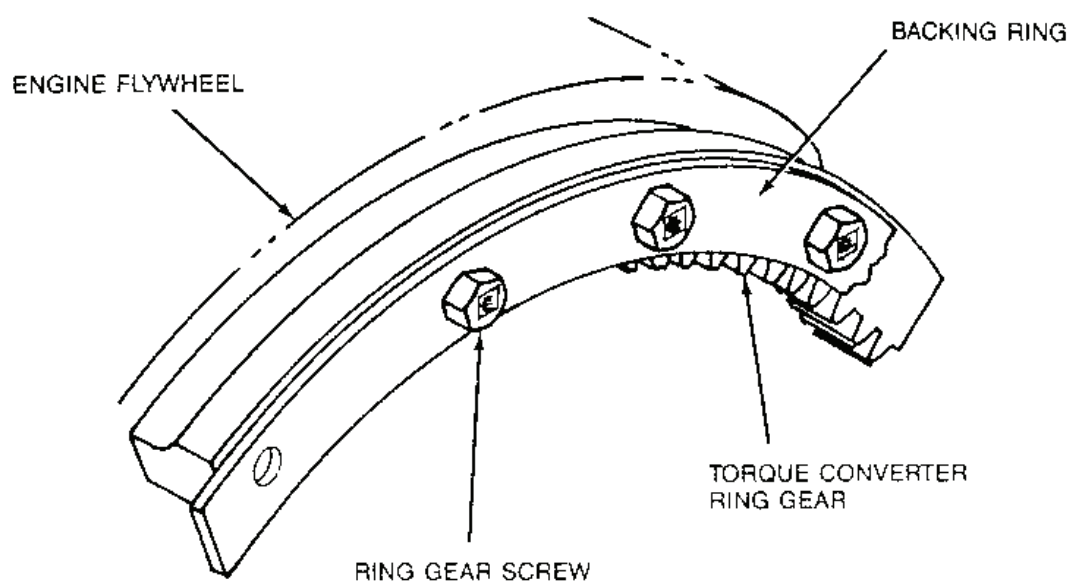
1	249341	Torque Converter Ring Gear
16	236288	Ring Gear Screw 1.5 Inch (38,1)
1	243767	Backing Ring
1	802555	Installation Instruction Sheet

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

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

**SEE PAGE 45 FOR INSTALLATION ILLUSTRATIONS**

**SEE PAGE 50 FOR 32 BOLT INSTALLATION**



RING GEAR SCREW  
(16) 236288 1.500 [38,1]

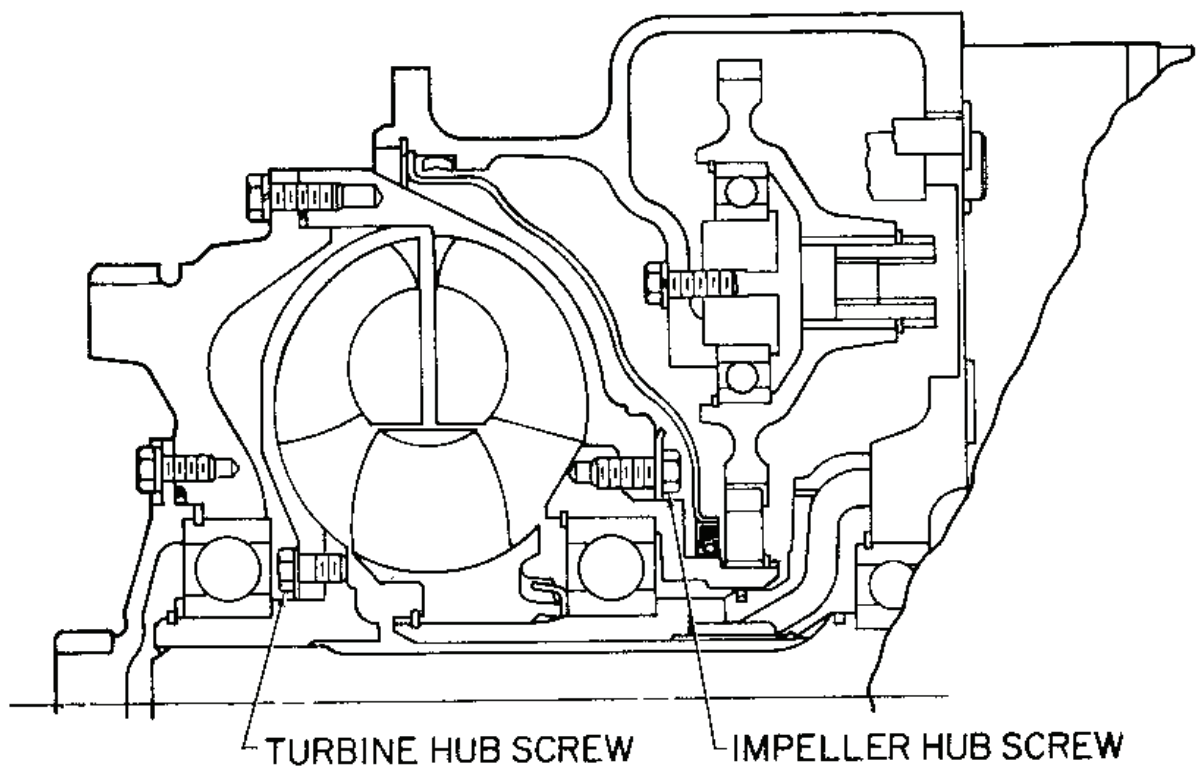
ENGINE FLYWHEEL

SEE PAGE 44  
FOR INSTALLATION  
PROCEDURE AND  
BOLT TORQUE

BACKING RING  
243767

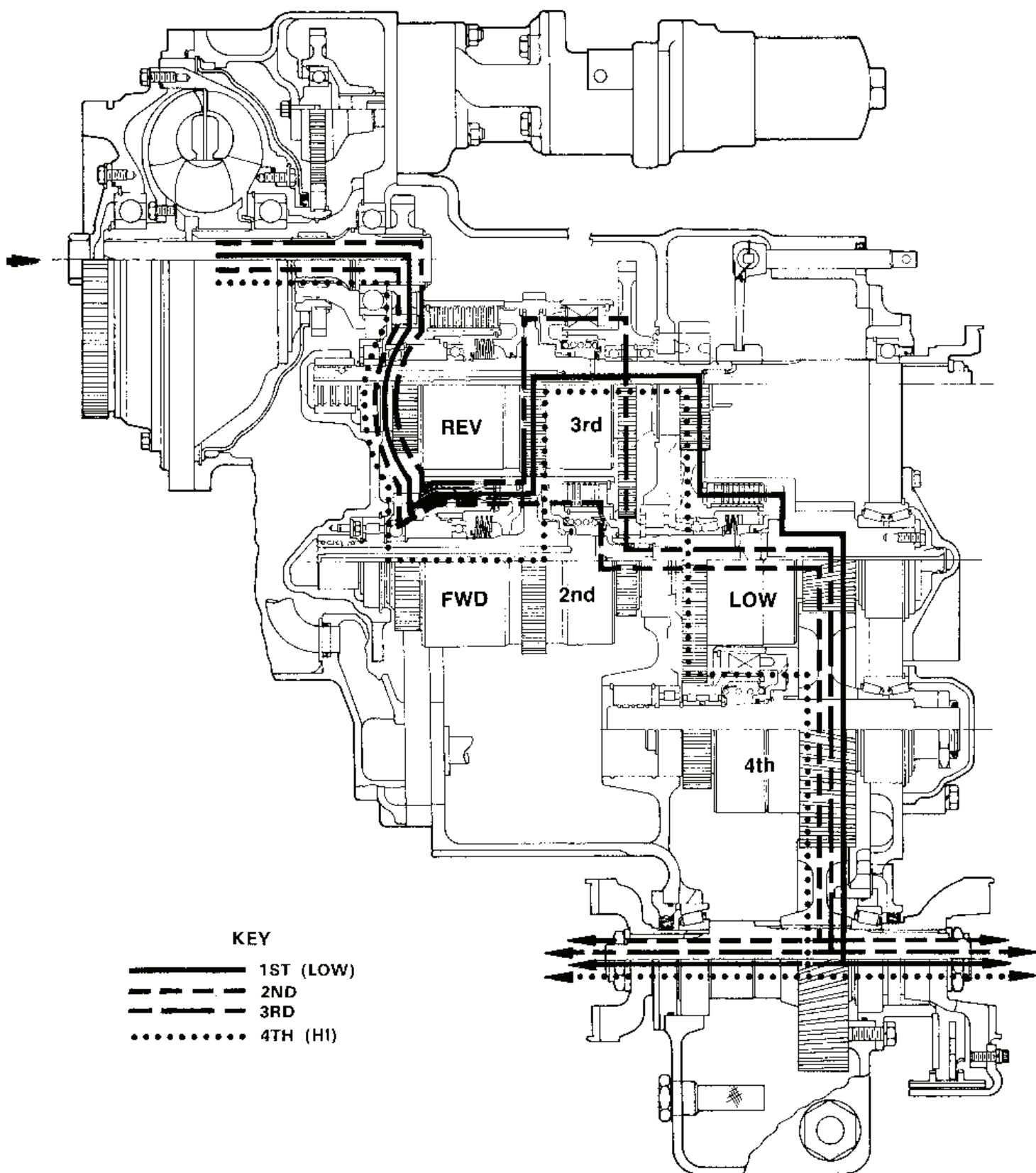
TORQUE CONVERTER  
RING GEAR 249341



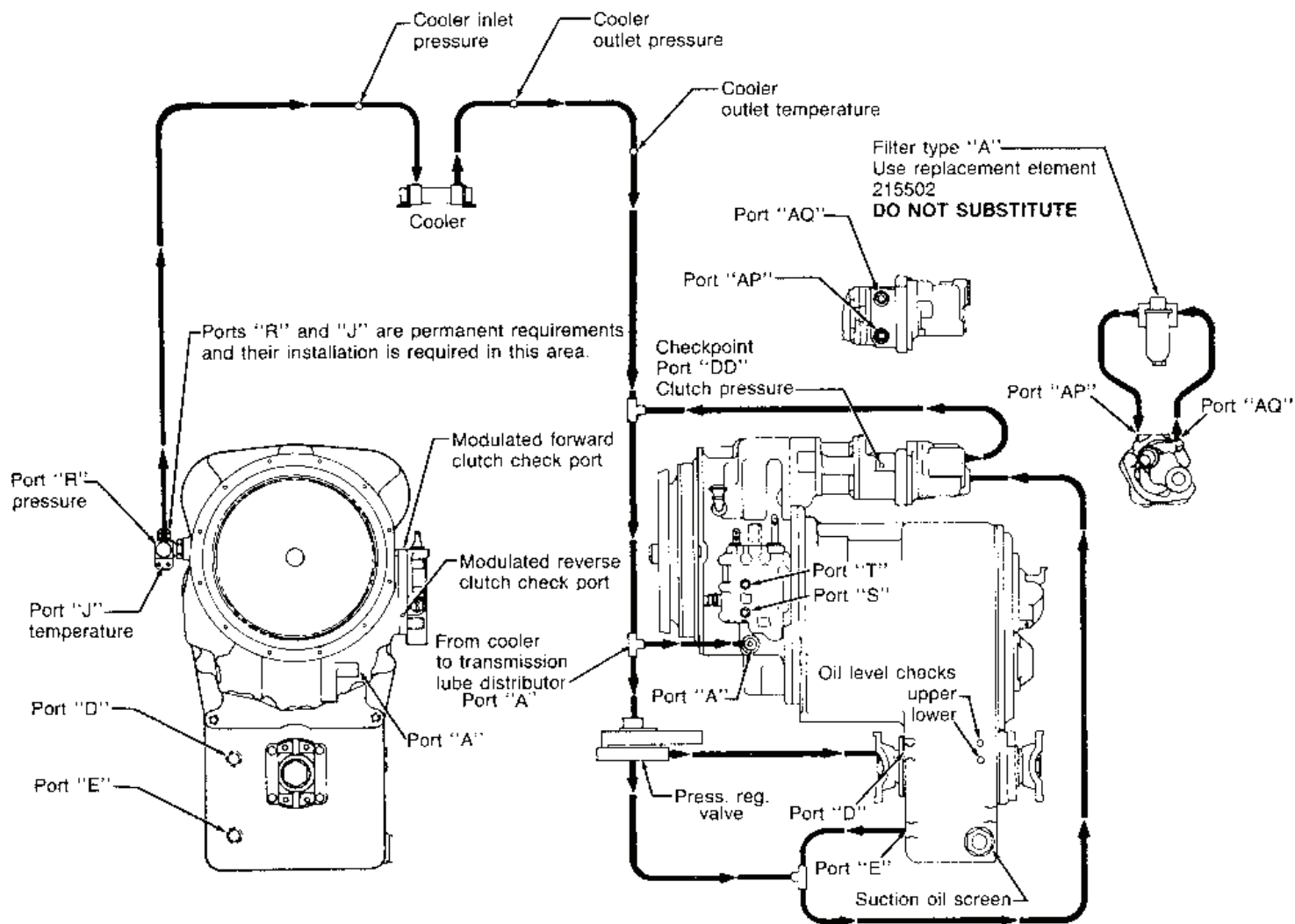


**IMPELLER HUB & TURBINE HUB ASSEMBLY WITH BACKING  
RING AND SPECIAL SELF LOCKING SCREWS.**

1. CLEAN HUB MOUNTING SURFACE AND TAPPED HOLES WITH SOLVENT. DRY THOROUGHLY BEING CERTAIN TAPPED HOLES ARE DRY AND CLEAN.
2. INSTALL BACKING RING AND SPECIAL SCREWS TO APPROXIMATELY .06 INCH [1.5] OF SEATED POSITION. WITH A CALIBRATED TORQUE WRENCH, TIGHTEN SCREWS 40 TO 45 LBS. FT. TORQUE [54.3-61.0 N.m]. NOTE: ASSEMBLY OF IMPELLER OR TURBINE HUB MUST BE COMPLETED WITHIN A FIFTEEN MINUTE PERIOD FROM START OF SCREW INSTALLATION. THE SCREWS ARE PREPARED WITH A COATING WHICH BEGINS TO HARDEN AFTER INSTALLATION IN THE HUB HOLES. IF NOT TIGHTENED TO PROPER TORQUE WITHIN THE FIFTEEN MINUTE PERIOD, INSUFFICIENT SCREW CLAMPING TENSION WILL RESULT. THE SPECIAL SCREW IS TO BE USED FOR ONE INSTALLATION ONLY. IF THE SCREW IS REMOVED FOR ANY REASON IT MUST BE REPLACED. THE COMPOUND LEFT IN THE HUB HOLES MUST BE REMOVED WITH THE PROPER TAP AND CLEANED WITH SOLVENT. DRY HOLE THOROUGHLY AND USE A NEW SCREW FOR REINSTALLATION.



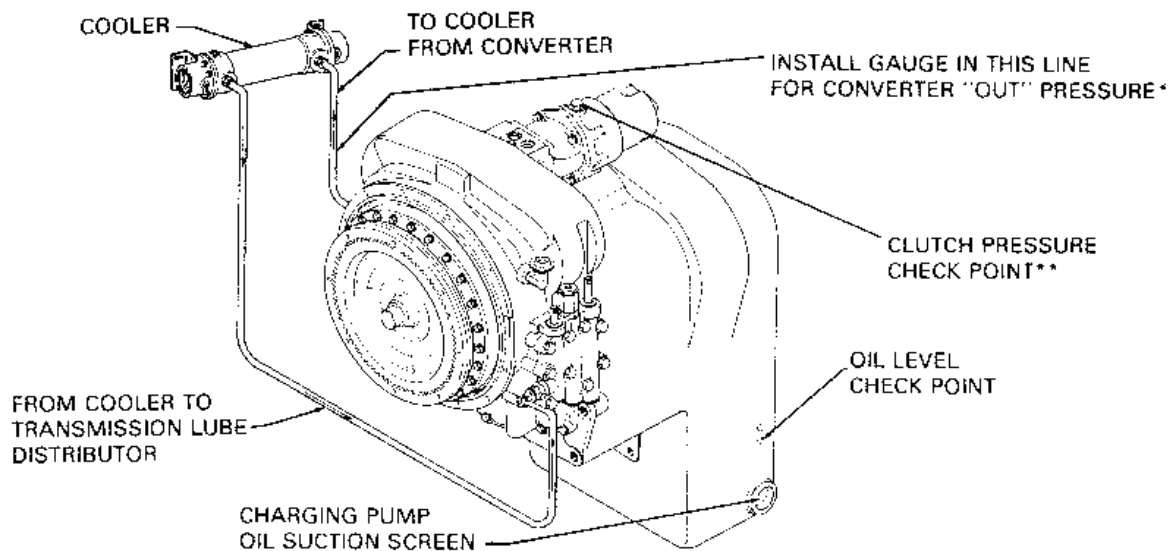
## 4 SPEED TRANSMISSION



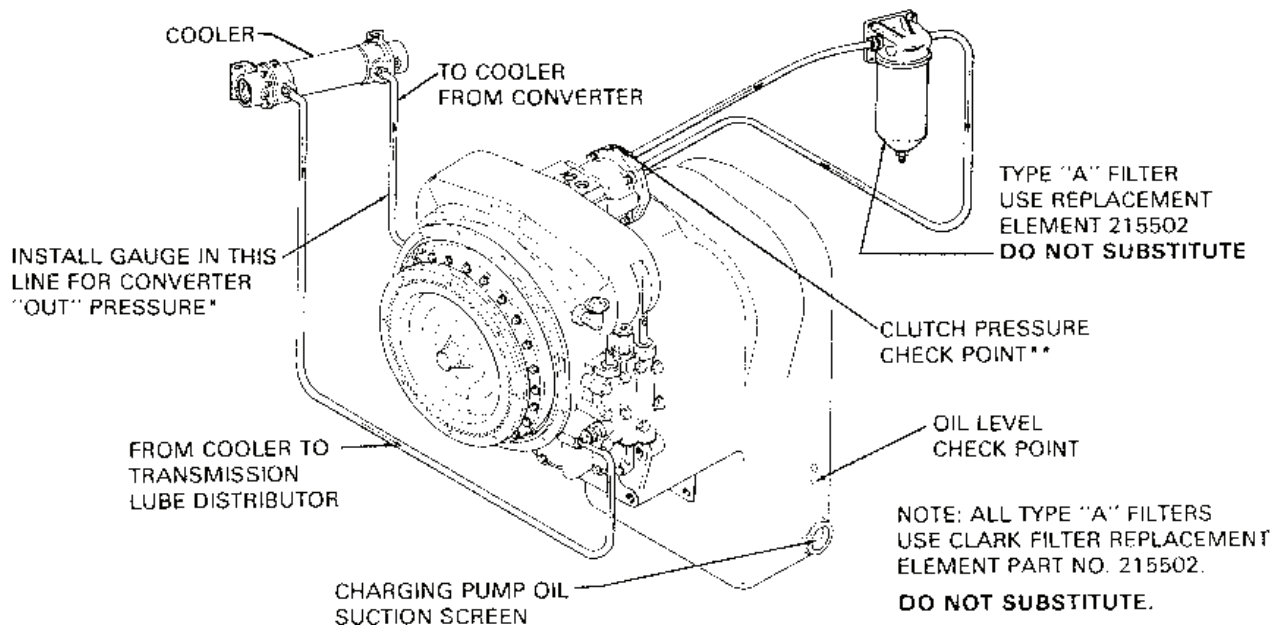
Port "J" Converter outlet temperature  
 Port "R" Converter outlet pressure  
 Port "T" Checkpoint transmission forward clutch pressure  
 Port "S" Checkpoint transmission reverse clutch pressure  
 Ports "J", "R", and "DD" Used for field trouble shooting

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





**32000 SERIES PLUMBING DIAGRAM**



**32000 SERIES PLUMBING DIAGRAM  
(WITH REMOTE FILTER)**

\*CONVERTER OUT PRESSURE 25 MIN.-70 MAX. PSI. [172-482 kPa] TRANSMISSION IN NEUTRAL. OIL TEMPERATURE 180-200° F. [82,2-93,3° C.], ENGINE AT 2000 RPM.

\*\*CLUTCH PRESSURE 240-280 PSI. [1654-1930kPa] — WITH PARKING BRAKE SET (SEE NOTE). OIL TEMPERATURE 180-200° F. [82,2-93,3° C.], ENGINE AT IDLE (400 to 600 RPM), SHIFT THRU DIRECTION AND SPEED CLUTCHES. ALL CLUTCH PRESSURE MUST BE EQUAL WITHIN 5 PSI. [34 kPa]. IF CLUTCH PRESSURE VARIES IN ANY ONE CLUTCH MORE THAN 5 PSI. [34 kPa] REPAIR CLUTCH.

NOTE: NEVER USE SERVICE BRAKES WHILE MAKING CLUTCH PRESSURE CHECKS. UNITS HAVING BRAKE ACTUATED DECLUTCHING IN FORWARD AND/OR REVERSE WILL NOT GIVE A TRUE READING.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

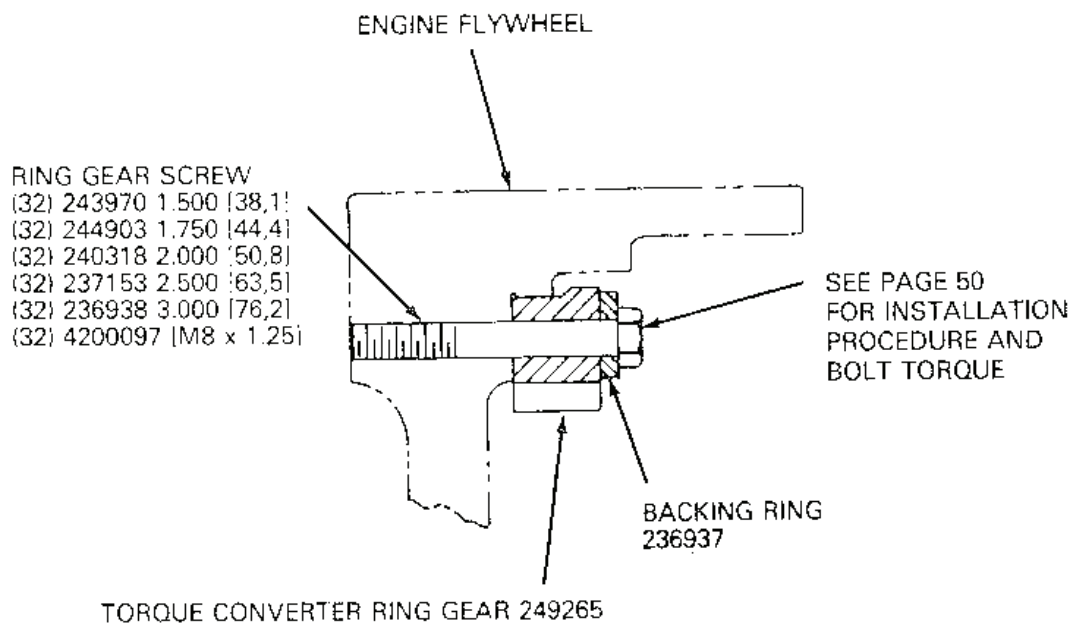
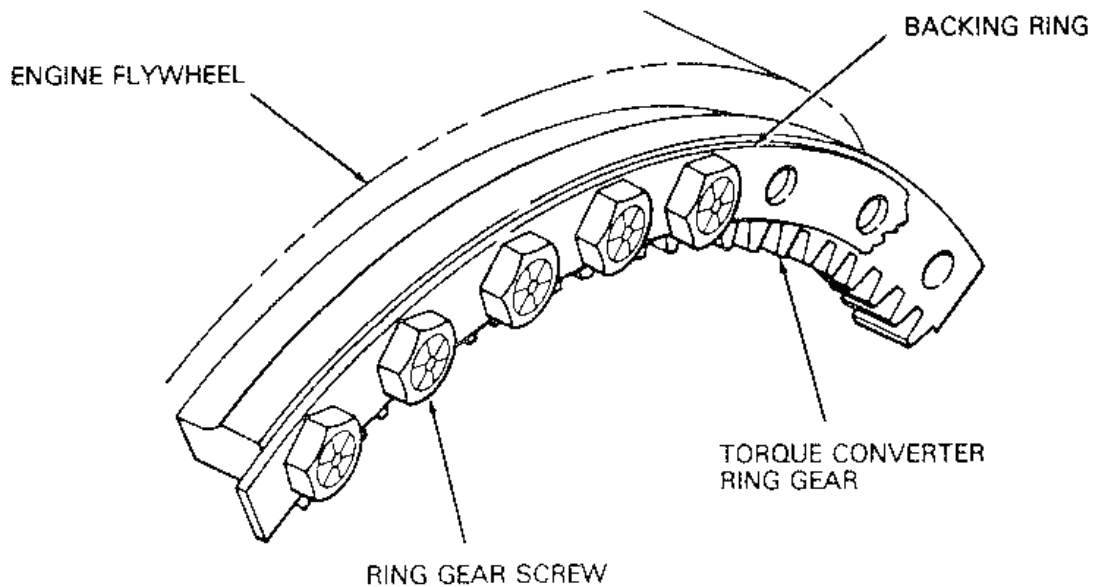
### 802549 — M8-32 SCREW RING GEAR KIT

1	249265	Torque Converter Ring Gear
32	4200097	Ring Gear Screw -M8 x 1.25
1	802550	Installation Instruction Sheet

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

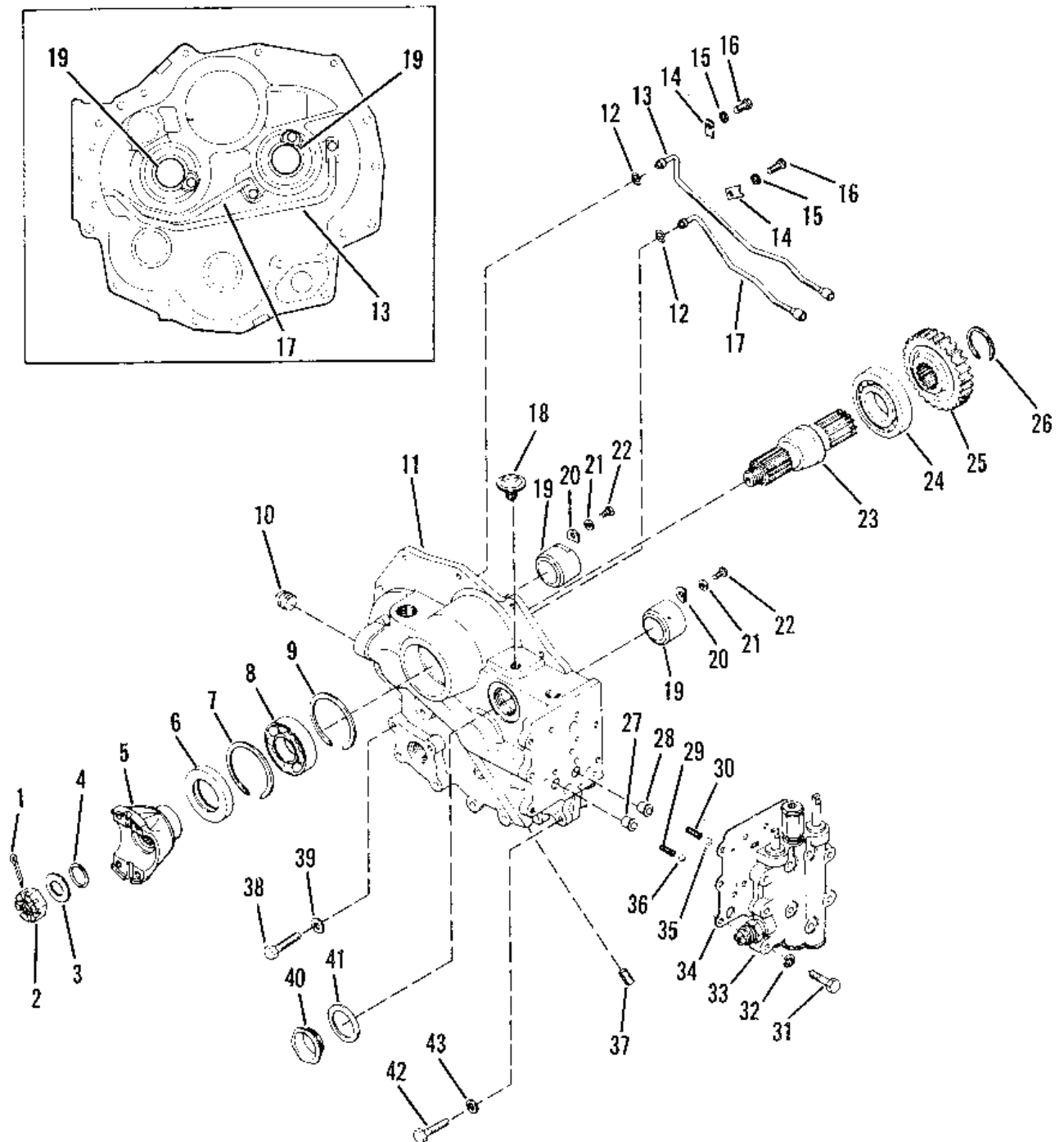
**NOTE:** The initial installation drive gear mounting kit includes a converter air breather. This breather is used on C & CL 270/C & CL 320 converters only and is not required for the HR & LHR 28000/HR & LHR 32000 applications.

**SEE PAGE 51 FOR INSTALLATION ILLUSTRATIONS**





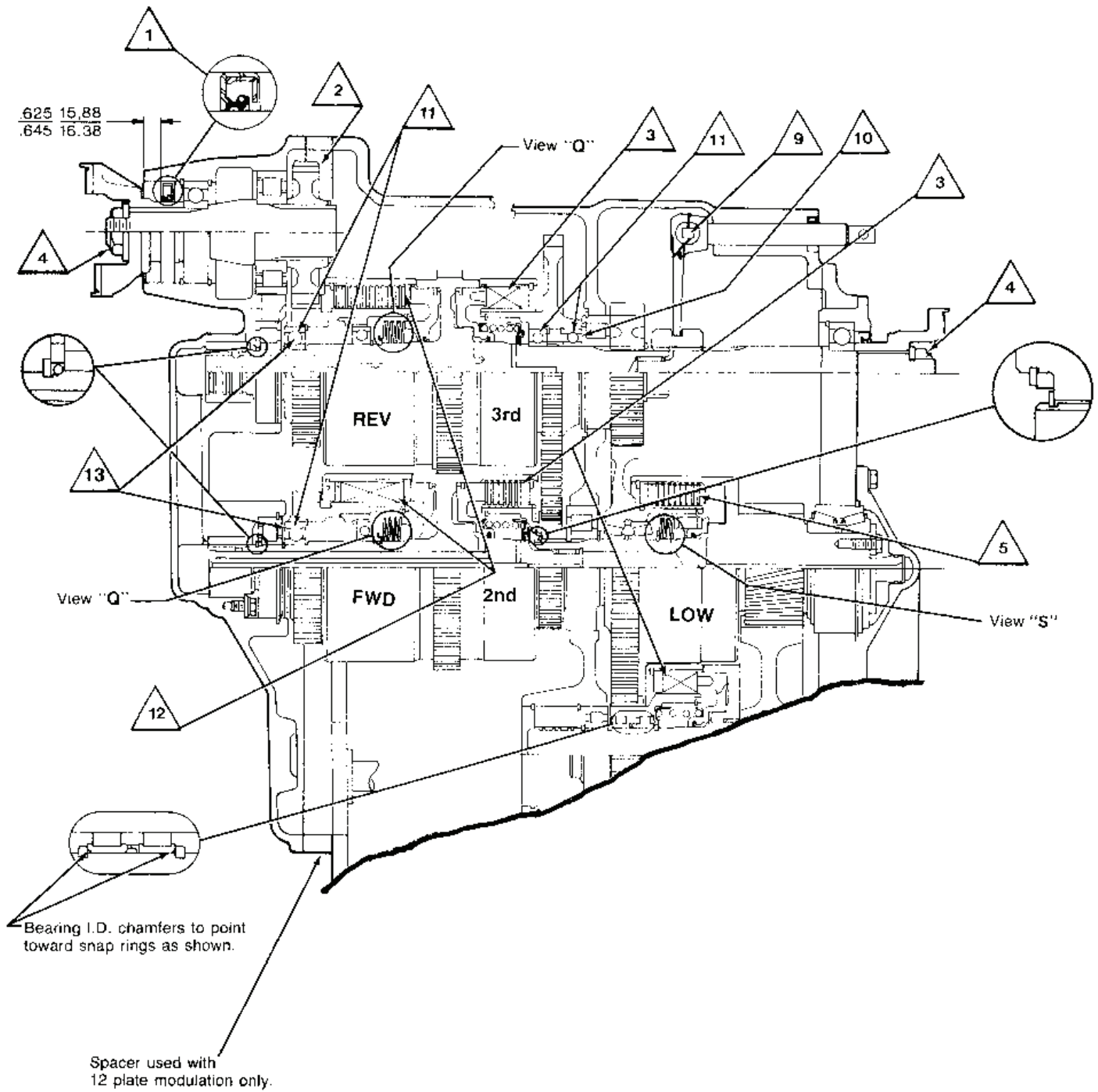
# R-MODEL SECTION



## R32000 FRONT COVER GROUP

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

R-32000  
ASSEMBLY INSTRUCTION ILLUSTRATION







1 Apply very light coat of Permatex No. 2 to O.D. of all oil seals before ass'y.



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



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



4 See Elastic Stop Nut Torque Chart



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



9 Lockwire to prevent loosening



10 Bearing shield out



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



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



13 Bearing shield in.

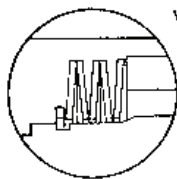
#### Notes

- 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 [ ].

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



View "S"

View "Q"  
2 Places



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

#### ELASTIC STOP NUT TORQUE

THREAD SIZE	LB.-FT.	[N-m]
1" - 20	150 - 200	[203.4 - 271.1]
1 1/4" - 18	200 - 250	[271.2 - 338.9]
1 1/2" - 18	300 - 350	[408.6 - 474.5]
1 3/4" - 12	400 - 450	[542.4 - 610.1]

Grade 5

Torque Specification for Lubricated  
or Plated Screw Threads

Grade 8

NOM SIZE	FINE THREAD		COARSE THREAD		FINE THREAD		COARSE THREAD	
	LB-FT	[N-M]	LB-FT	[N-M]	LB-FT	[N-M]	LB-FT	[N-M]
.5625	91 - 100	[123.4 - 135.5]	82 - 90	[111.2 - 122.0]	128 - 141	[173.6 - 191.1]	115 - 127	[156.0 - 172.2]
.5000	64 - 70	[86.8 - 94.9]	57 - 63	[77.3 - 85.4]	90 - 99	[122.1 - 134.2]	80 - 88	[108.5 - 119.3]
.4375	41 - 45	[55.6 - 61.0]	37 - 41	[50.2 - 55.5]	58 - 64	[78.7 - 86.7]	52 - 57	[70.6 - 77.2]
.3750	26 - 29	[35.3 - 39.3]	23 - 25	[31.2 - 33.8]	37 - 41	[50.2 - 55.5]	33 - 36	[44.8 - 48.8]
.3125	16 - 20	[21.7 - 27.1]	12 - 16	[16.3 - 21.6]	28 - 32	[38.0 - 43.3]	26 - 30	[35.3 - 40.6]
.2500	9 - 11	[12.3 - 14.9]	8 - 10	[10.9 - 13.5]	11 - 13	[15.0 - 17.6]	9 - 11	[12.3 - 14.9]

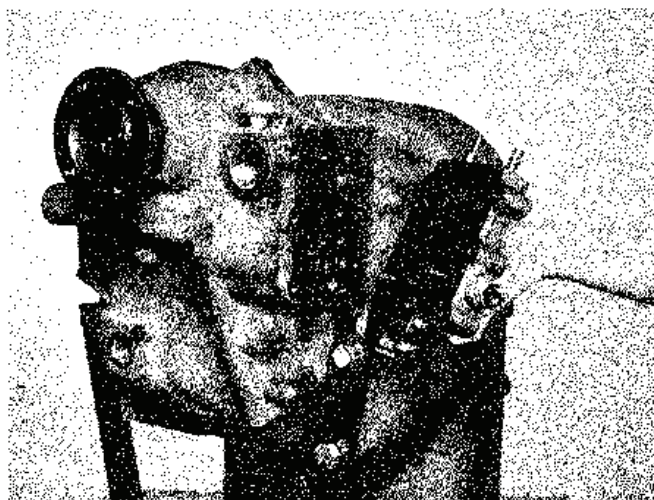
## MAINTENANCE AND SERVICE

The instructions contained herein cover the disassembly and reassembly of the transmission in a sequence that would normally be followed after the unit has been removed from the machine and is to be completely overhauled. It must also be understood that this is a basic 32000 transmission with many options. Companion flanges and output shafts with and without disconnect

assemblies may vary on specific models. The units are very similar to trouble shoot, disassemble, repair and re-assemble.

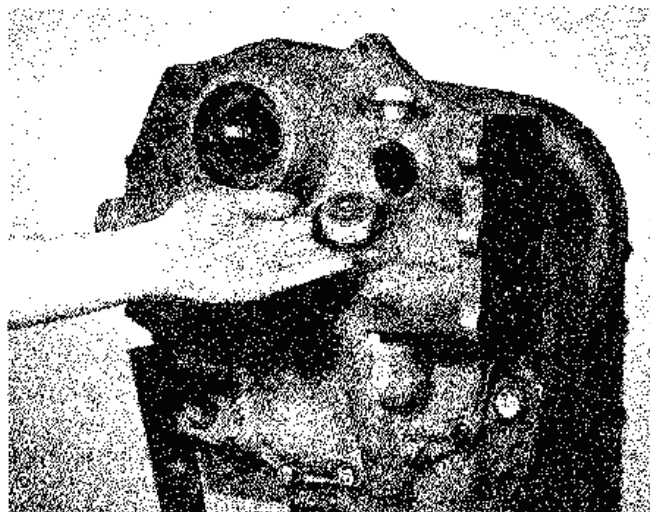
**CAUTION:** Cleanliness is of extreme importance and an absolute must in the repair and overhaul of this unit. Before attempting any repairs, the exterior of the unit must be thoroughly cleaned to prevent the possibility of dirt and foreign matter entering the mechanism.

## DISASSEMBLY



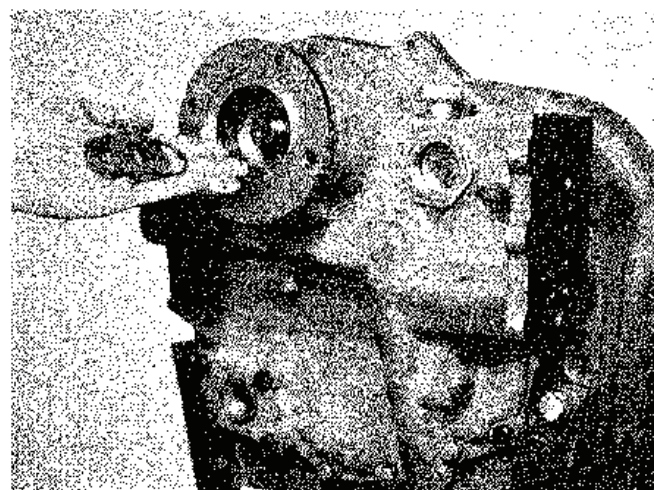
**Figure 1**

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



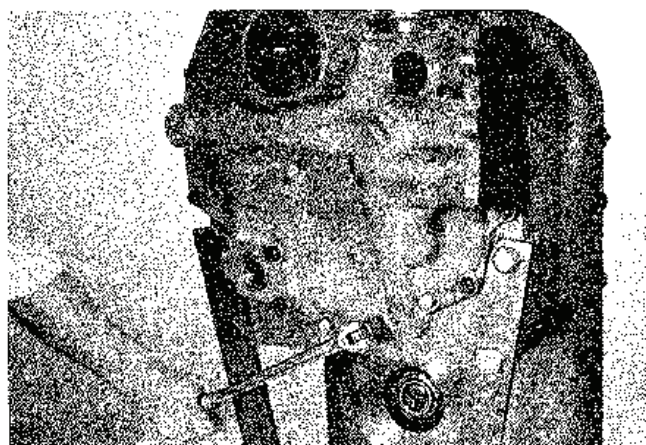
**Figure 3**

Remove front cover plug.



**Figure 2**

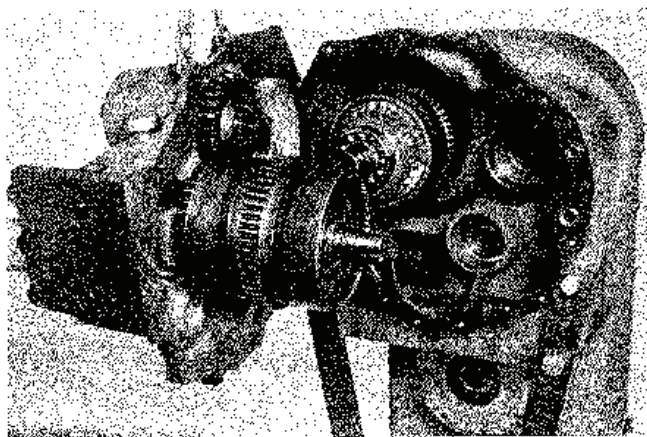
Remove companion flange nut, washer and "O" ring.



**Figure 4**

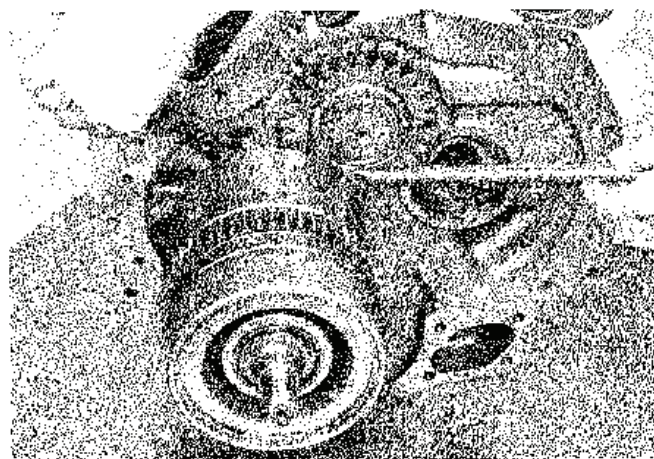
Remove bolts securing front cover to transmission housing.





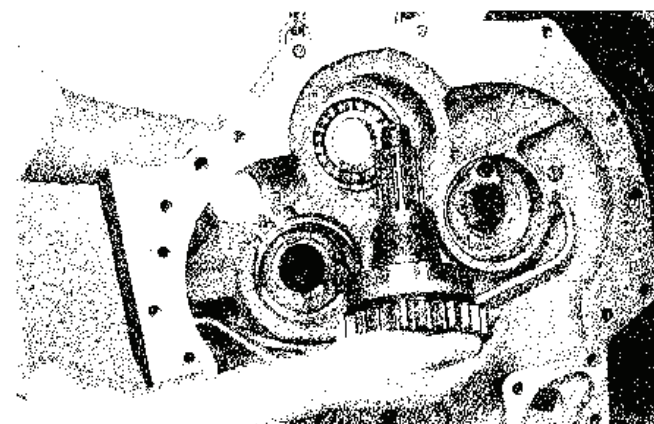
**Figure 5**

Remove front cover and forward and 2nd clutch.



**Figure 6**

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

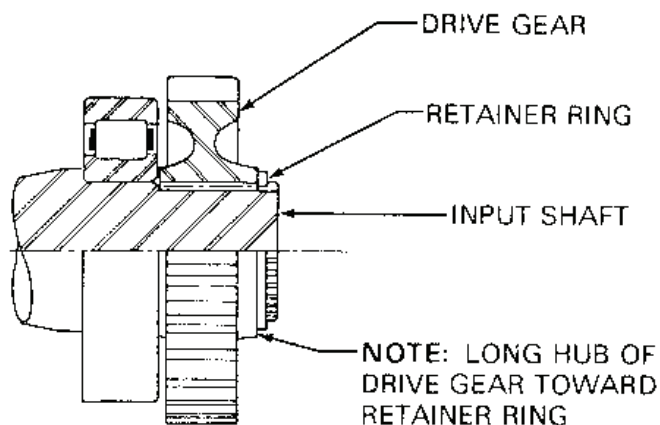


**Figure 7**

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

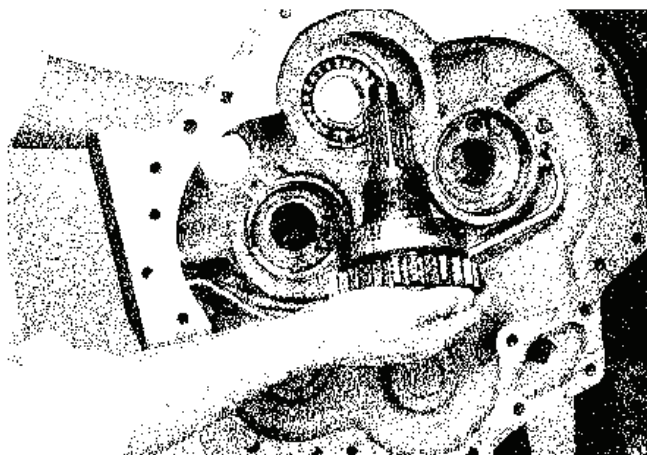
See cleaning and inspection page.

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



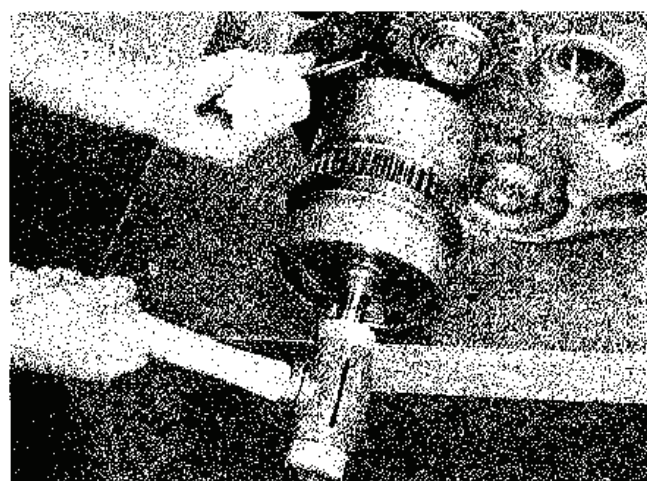
**Figure 8**

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



**Figure 9**

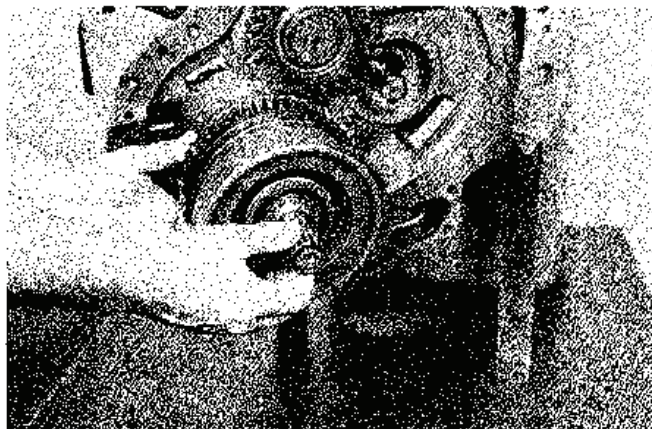
Install input shaft into front bearing.



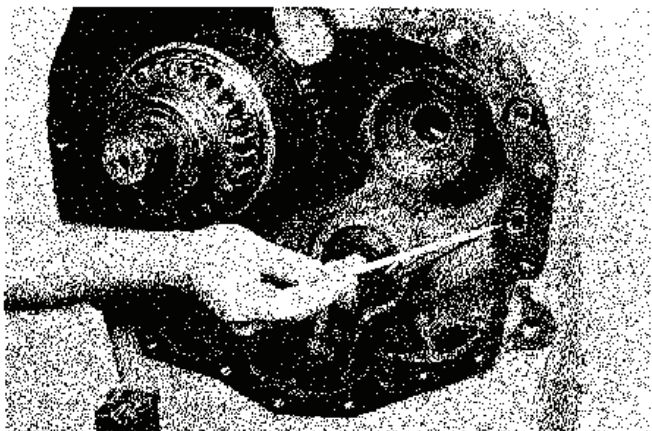
**Figure 10**

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

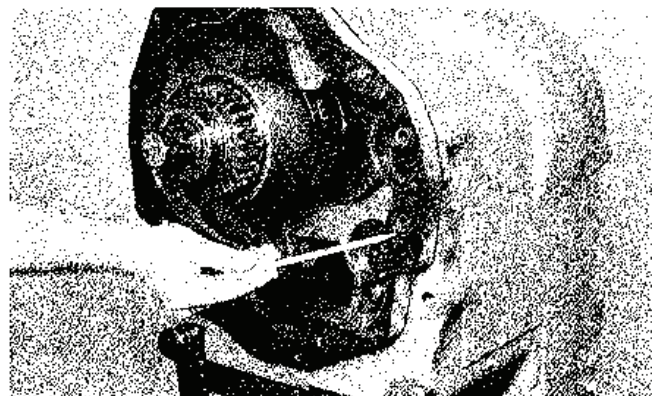




**Figure 11**  
Install 2nd speed clutch pilot bearing.



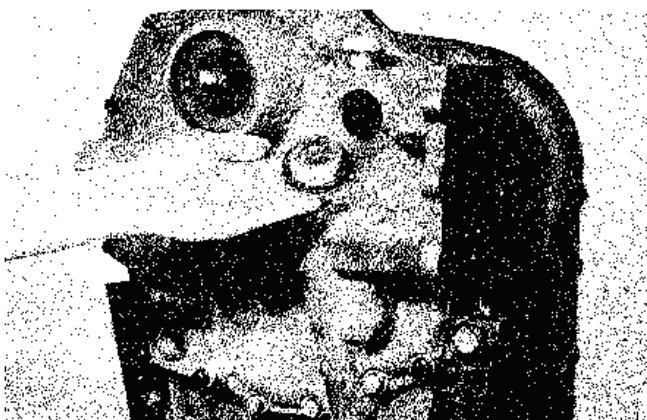
**Figure 12**  
Install transmission case gasket and "O" ring seals.



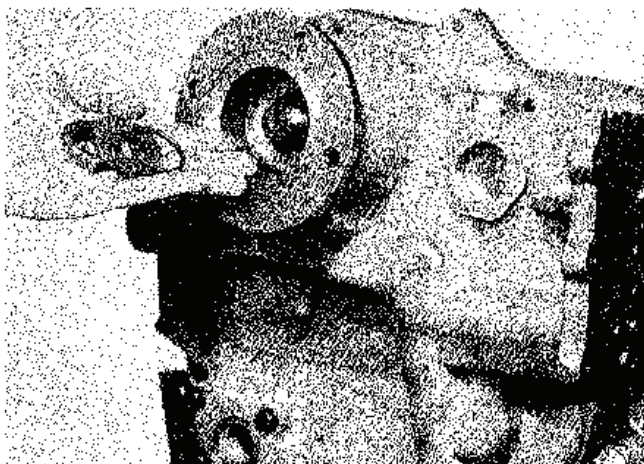
**Figure 13**  
Install housing spacer, gasket and "O" ring seals. **NOTE:** Housing spacer is used with 12 plate clutch modulation only.



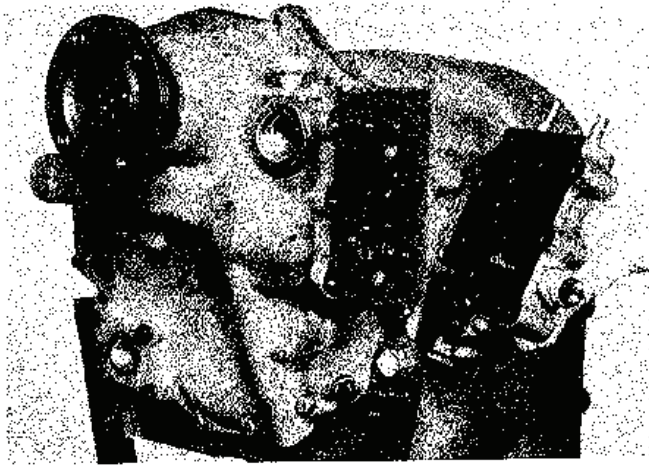
**Figure 14**  
Support front cover with a chain fall. Install alignment studs in transmission case. Position front cover assembly on aligning studs. Turn output flange to align clutch disc hub in clutch. Do not force this operation. With front cover in position against the transmission case install cover to case bolts. Tighten to specified torque.



**Figure 15**  
Install front cover plug.



**Figure 16**  
Install companion flange, flange "O" ring, washer and nut. Torque nut to specified torque. (See elastic stop nut torque chart).



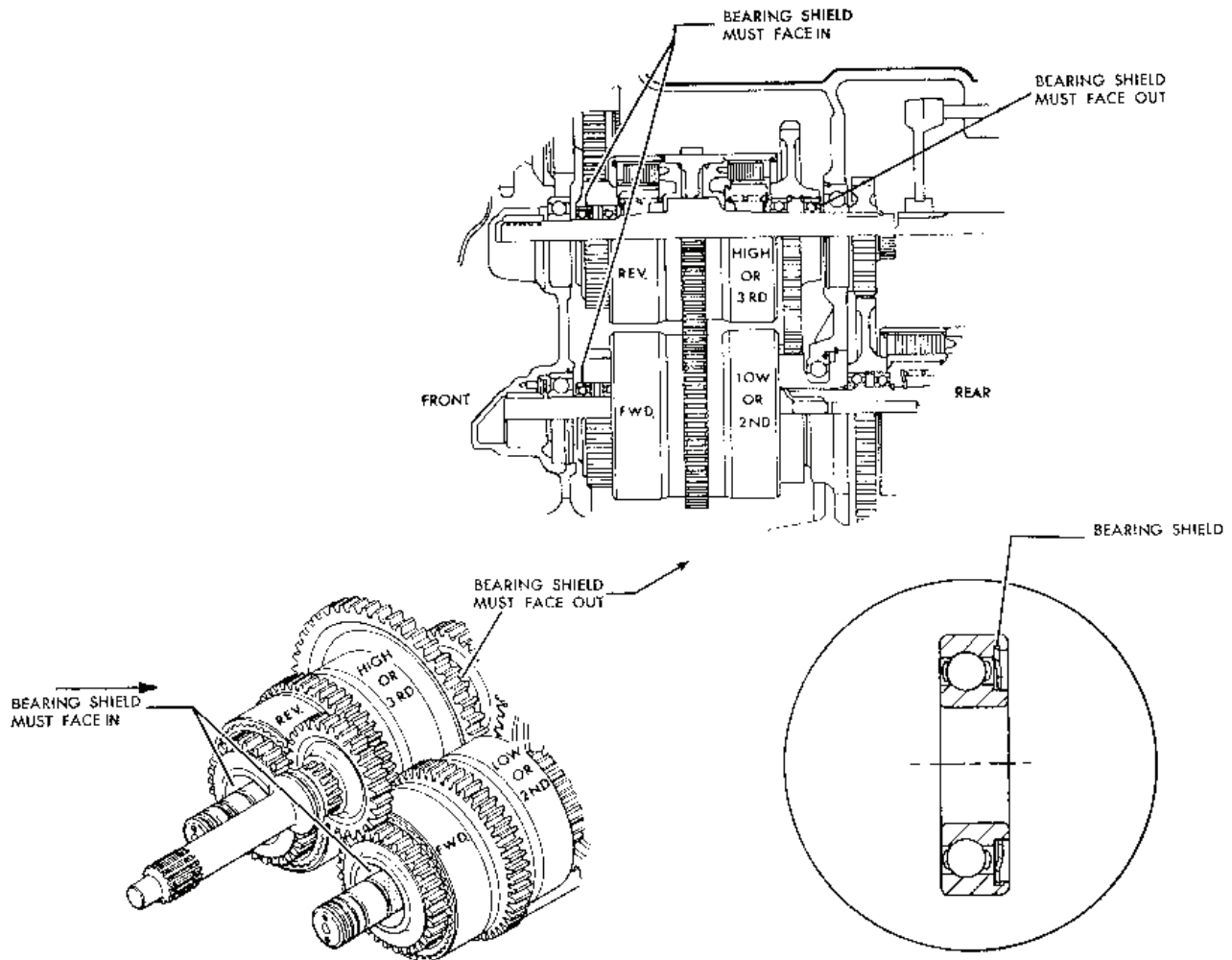
**Figure 17**

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

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

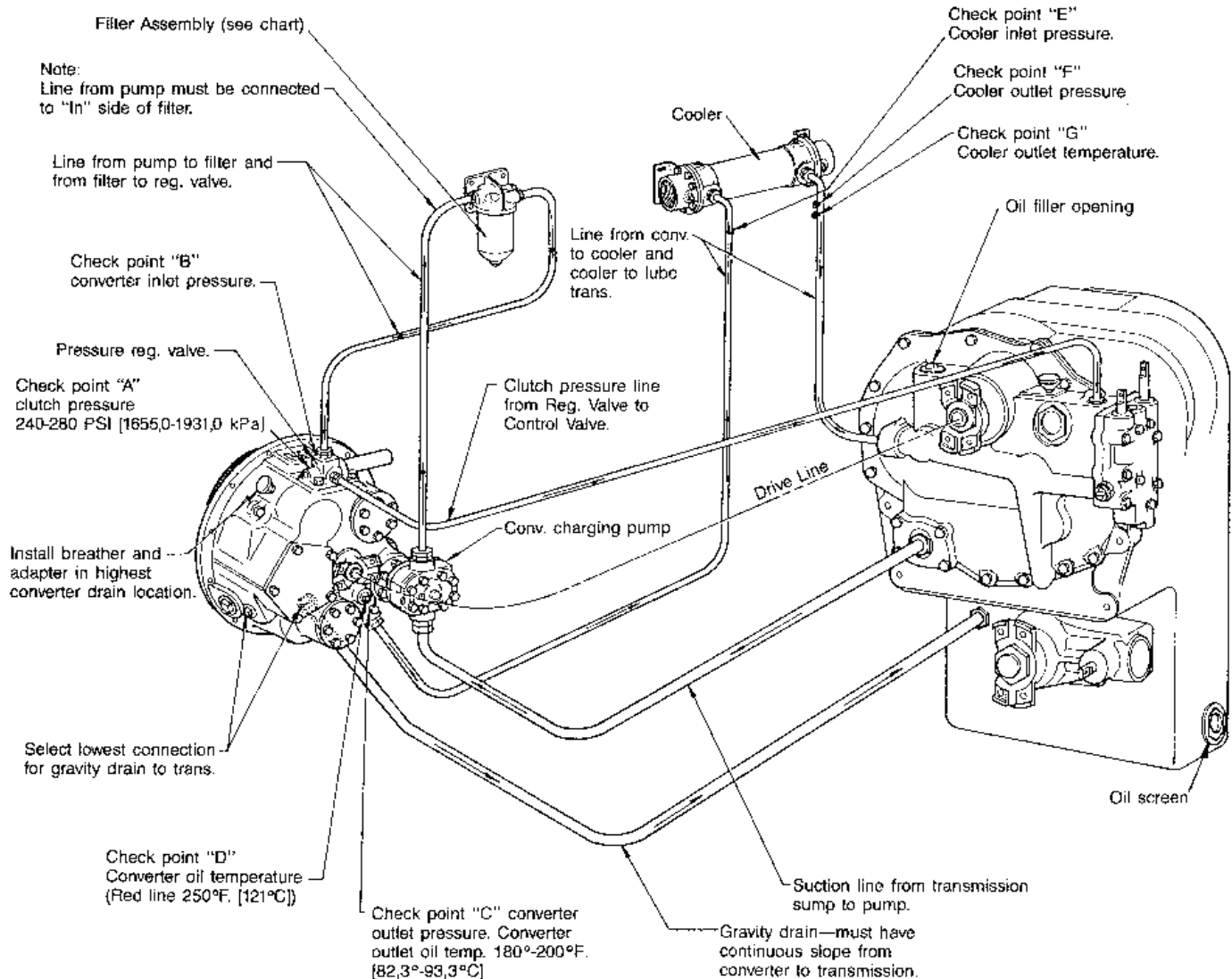
Each disc spring assembly is made up of selected springs to precisely match each part within this assembly. Failure to replace all piston return springs can result in unequal deflection within the spring pack. The result of this imbalance may adversely affect overall life of springs.

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



**SHIELDED BEARING INSTALLATION**

## R32000 - C270/C320 EXTERNAL PLUMBING DIAGRAM



Metric dimensions shown in brackets [ ].

**Note:** Do not deviate any line size.

### FILTER ASSEMBLY CHART

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

### Notes:

#### Hose line operating requirements.

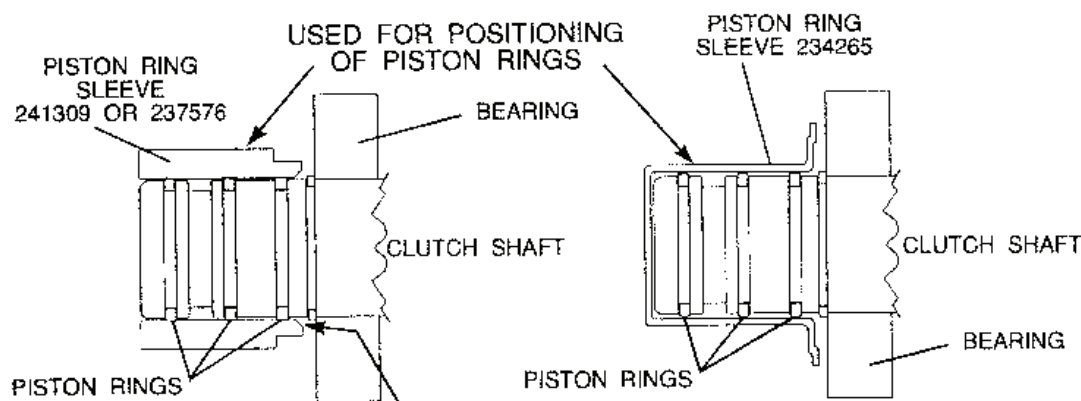
- Pressure Lines**—Suitable for operation from ambient to 250°F. [121,1°C] continuous operating temperature. Must withstand 300 PSI [2068 kPa] continuous pressure with 600 PSI [4137 kPa] intermittent surges. Ref. S.A.E. Spec. No. J517,100R1 Hydraulic Hose Specification.
- Suction Line**—To be protected from collapse by interwoven steel wire. Ref. S.A.E. Spec. No. J517,100R4 Hydraulic Hose Specification. Suitable for operation from ambient to 250°F. [121,1°C]. Continuous operating temperature.
- Gravity Drain Line**—Suitable for operation from ambient to 250°F. [121,1°C] continuous operating temperature. Ref. S.A.E. Spec. No. J517,100R1 Hydraulic Hose Specification.
- All Hose Lines** used must conform to S.A.E. Spec. No. J1019 Test Procedure for High Temp. Transmission Oil Hose.
- See Lubrication Specifications.



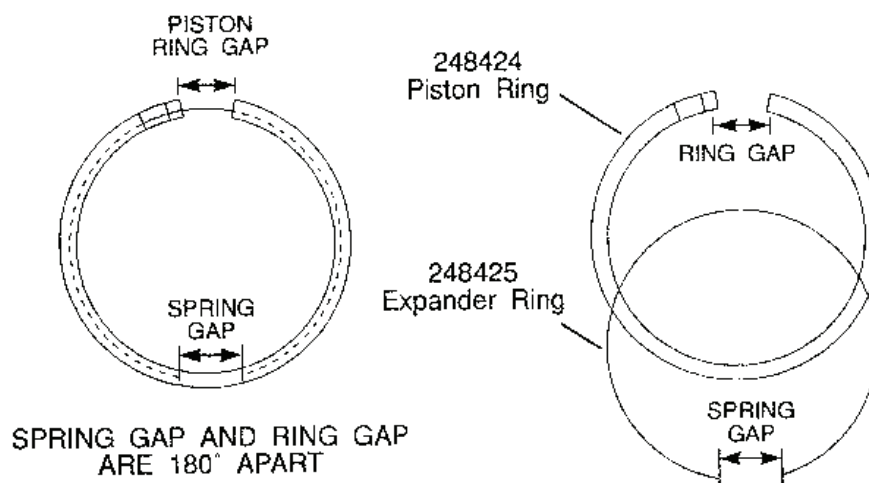
## PROPER INSTALLATION OF TEFLON PISTON RING AND PISTON RING EXPANDER SPRINGS

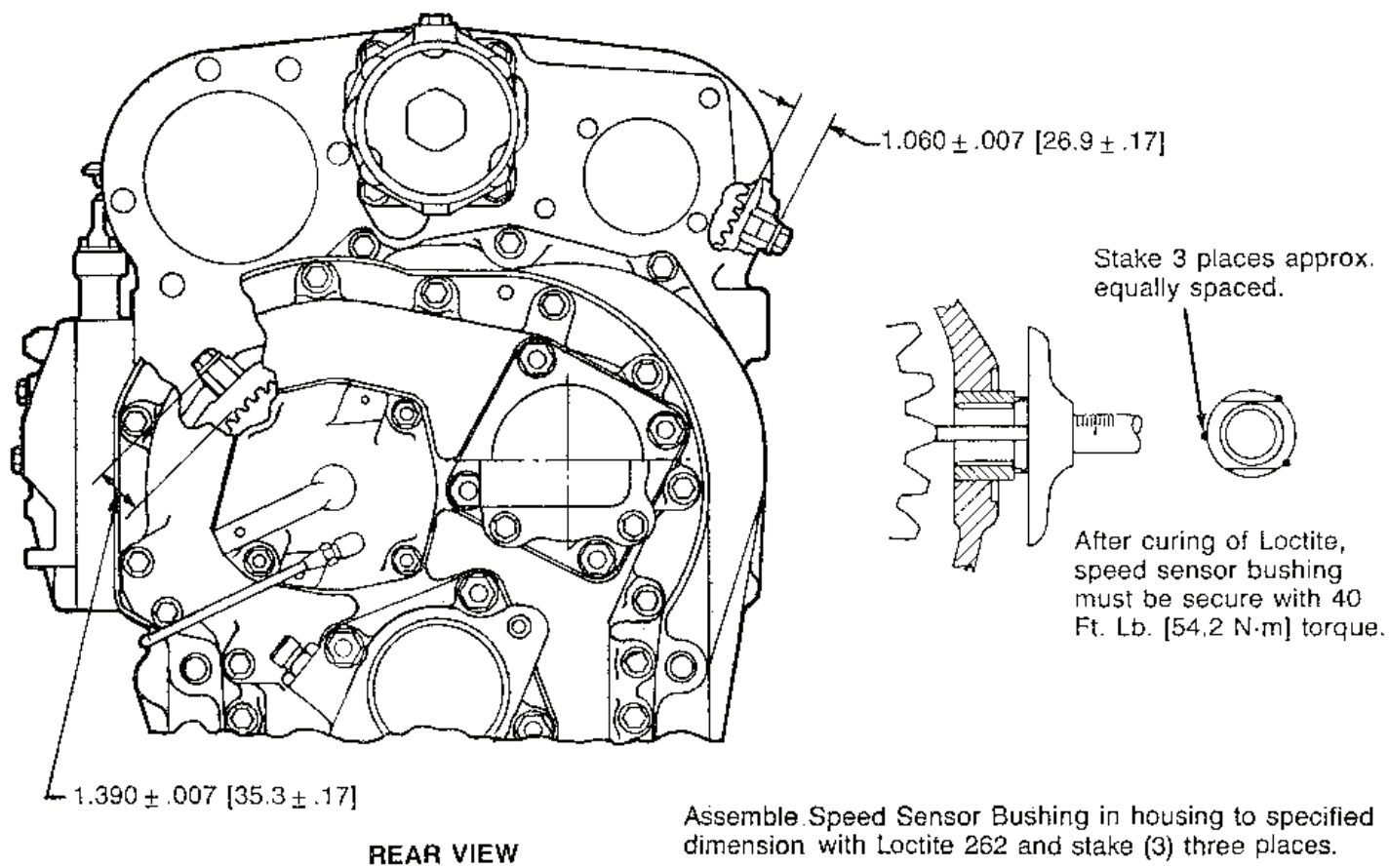
**NOTE: NOT ALL TRANSMISSIONS WILL HAVE TEFLON PISTON RINGS AND EXPANDER SPRINGS**

1. Fill the oil sealing ring grooves with a good grade of grease, this will help stabilize the teflon ring and expander spring in the ring groove for installation.
2. Position the expander spring in the inner groove of the new piston ring, with the expander spring gap 180° from the hook joint gap of the piston ring.
3. Carefully position the piston ring and expander spring on the clutch shaft in the inner most ring groove. Hook the piston piston ring joint.
4. Repeat steps 1, 2 and 3 for the remaining ring or rings making certain all hook joints are fastened securely.
5. Apply a heavy coat of grease to the outer diameter of the rings and clutch shaft. Center the piston ring's in the ring groove.
6. Before installing the clutch assembly in the front cover or converter housing it is recommended a piston ring sleeve P/N's 241309, 237576 or 234265 be used to center all of the piston rings in their respective ring grooves. Use extreme caution to not damage piston rings when installing the clutch shaft in the front trasnmission cover or converter housing.



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

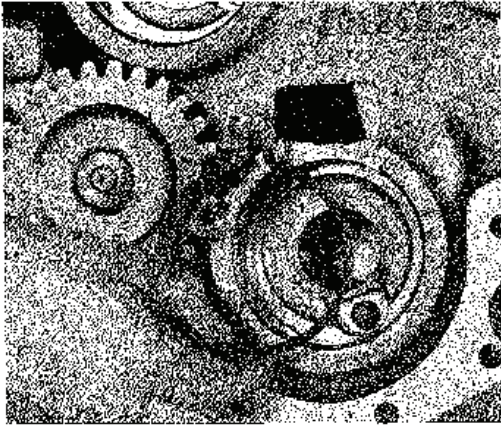




## SPEED SENSOR BUSHING INSTALLATION

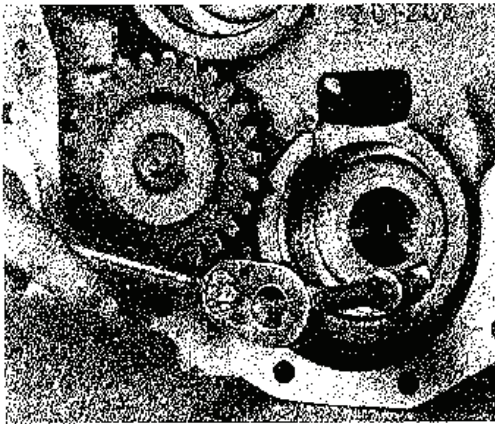
## OIL SEALING RING SLEEVE REMOVAL

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



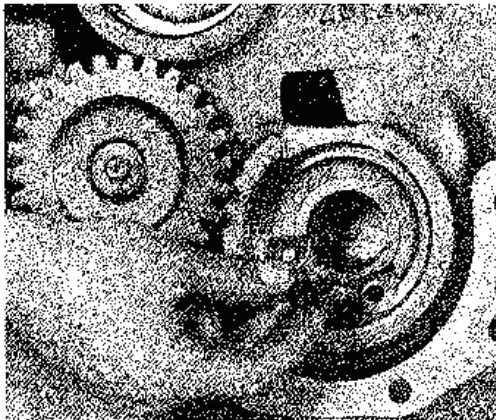
**Figure 1**

Remove clutch front bearing locating ring.



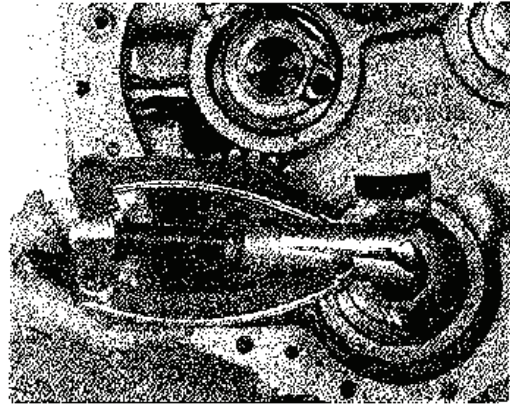
**Figure 2**

Remove oil sealing ring sleeve retainer screw.



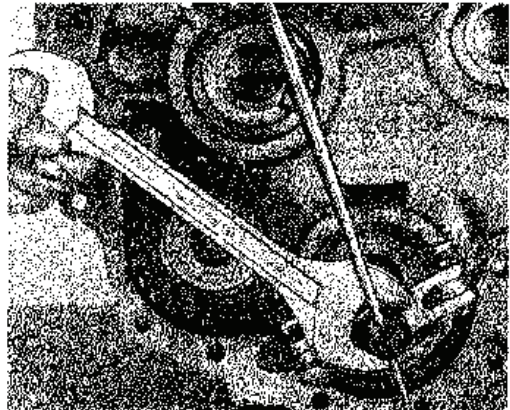
**Figure 3**

Remove screw and sleeve lock.



**Figure 4**

Use a sleeve puller like the one shown.



**Figure 5**

Sleeve being removed.

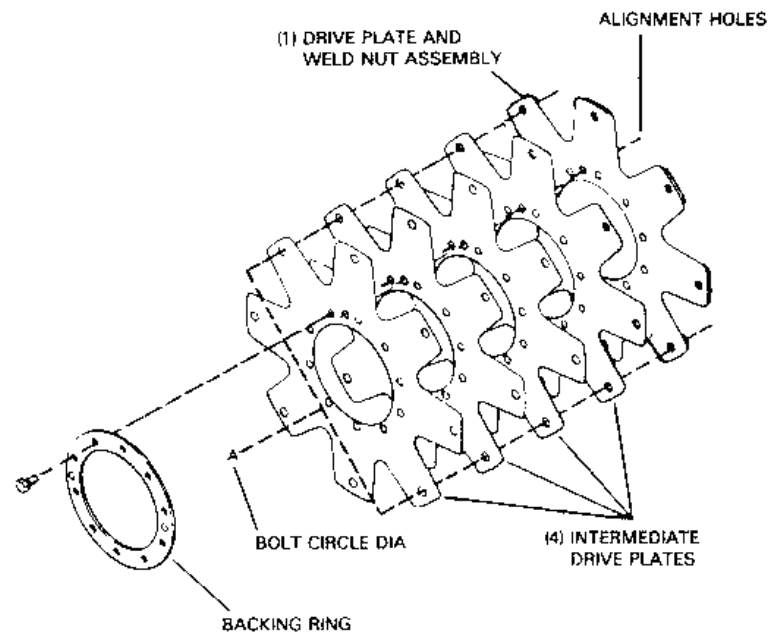
**See cleaning and inspection page.**

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



## 32000 TRANSMISSION CONVERTER DRIVE PLATE INSTALLATION

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



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

13.125" [333,375 mm] Diameter

Kit No. 802335

13.50" [342,900 mm] Diameter

Kit No. 802333

17.00" [431,800 mm] Diameter

Kit No. 802454

Each kit will include the following parts:

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

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

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

SEE PAGE 65 FOR TRANSMISSION TO ENGINE INSTALLATION PROCEDURE

## TRANSMISSION TO ENGINE INSTALLATION PROCEDURE

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

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

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

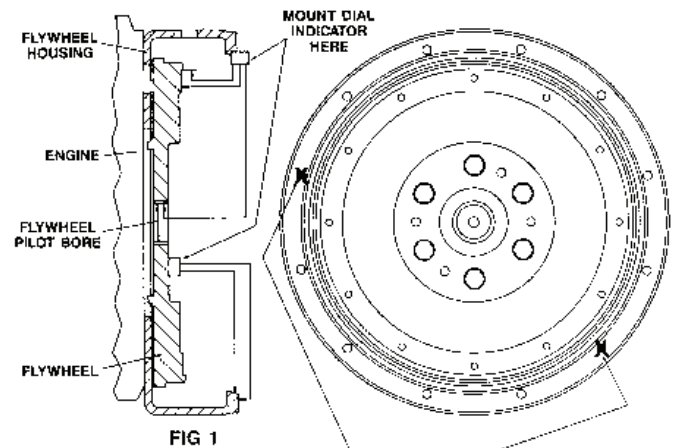


FIG 1

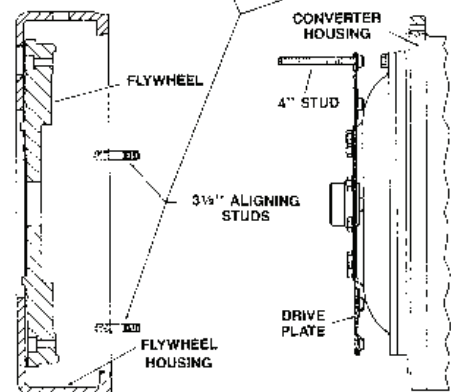


FIG 2

SPECIAL STUD, WASHER AND SELF LOCK NUT FURNISHED BY MACHINE MANUFACTURER.

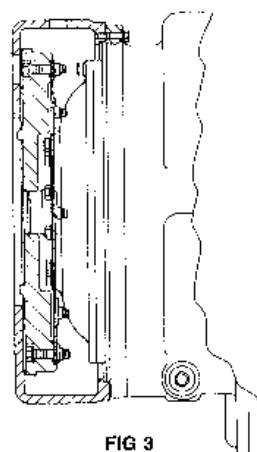


FIG 3

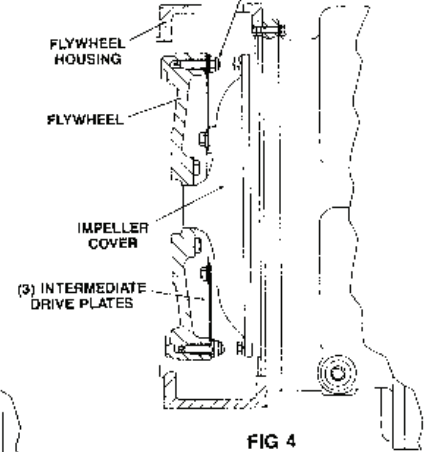


FIG 4

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