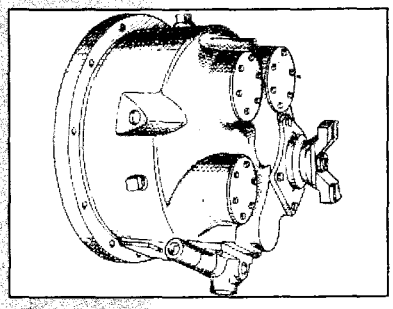
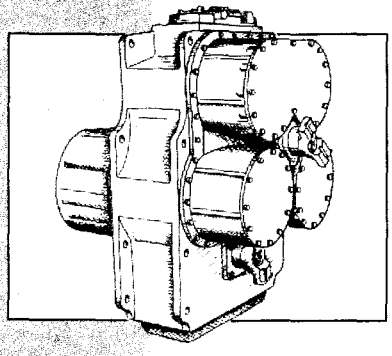
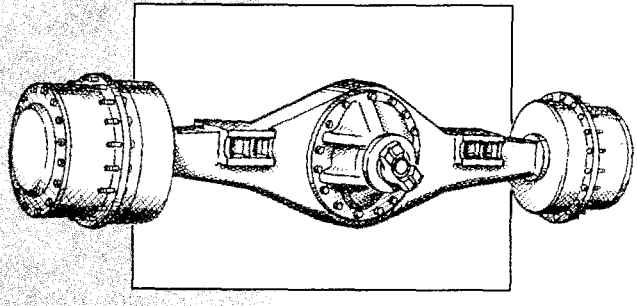
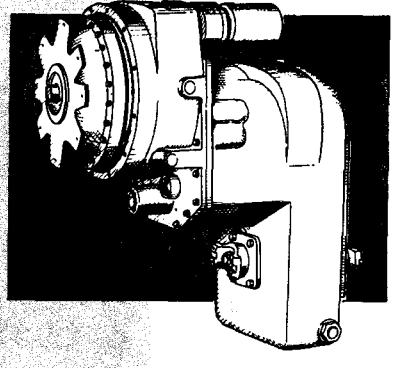
Maintenance and Service Manual









T 12000

Powershift Transmission

3, 4, & 6 SPEED LONG DROP

DANA SPICER CLARK-HURTH

SM T12-3,4,6, LD Rev. 7-96

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, troubleshooting, 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 [ ].

T12000
TRANSMISSION ASSEMBLY

The transmission and hydraulic torque converter 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.

The electric shift control valve is located in the vehicle's operator compartment. The function of the control is to energize the selected solenoid valves thus directing the oil under pressure to the selected directional and range (gear) clutches. The purpose of the range 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 axle can be disconnected or connected by manual, pneumatic, or hydraulic shifting.

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

The direction or speed clutch assembly consists of a drum with slots 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 tangs 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, the electric shift control lever is placed in the desired position. This energizes the selected direction and range (gear) solenoids allowing the oil under pressure to flow through tubes and passages to the selected clutch shafts. Oil sealing rings are located on the clutch shaft. These rings direct oil under pressure through a drilled passageway in the shaft to a desired clutch. Pressure of the oil forces the piston and discs against the heavy back-up plate. The discs with tangs 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 or clutch drum which allow quick escape for oil when the pressure to the piston is released.

HOW THE UNITS OPERATE

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

The pressure regulating valve maintains pressure to the transmission solenoid valves for actuating the direction and speed clutches. 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 the closed position. When a specific pressure is achieved, the valve spool works against the spring until an exhaust port is exposed along the side of the bore. This sequence of events provides the proper system pressure. This requires a small portion of the total volume of oil used in the system.

The remaining volume of oil is directed out through an external oil cooler and into the lube inlet port. From the lube inlet port oil goes through the forward-reverse shaft, lubricating the forward and reverse clutches, with the remainder going to the torque converter. After entering the converter, the oil is directed through the converter blade cavity and exits in the passage between the turbine shaft and impeller hub. The oil then lubes the impeller hub bearing with the remainder going to the 3rd-4th clutch shaft and 1st-2nd clutch shaft to lubricate those clutches and shaft bearings. 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 of the 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 R.P.M. Therefore, we can say that as the output shaft is decreasing in speed the torque multiplication is increasing.

With the engine running and the electric shift control lever in neutral position, oil pressure from the regulating valve is blocked at the solenoid control valves, and the transmission is in neutral. Movement of the control lever will energize the forward or reverse solenoid valves and selected range (gear) solenoid, directing oil under pressure to the selected direction and range (gear) clutches.

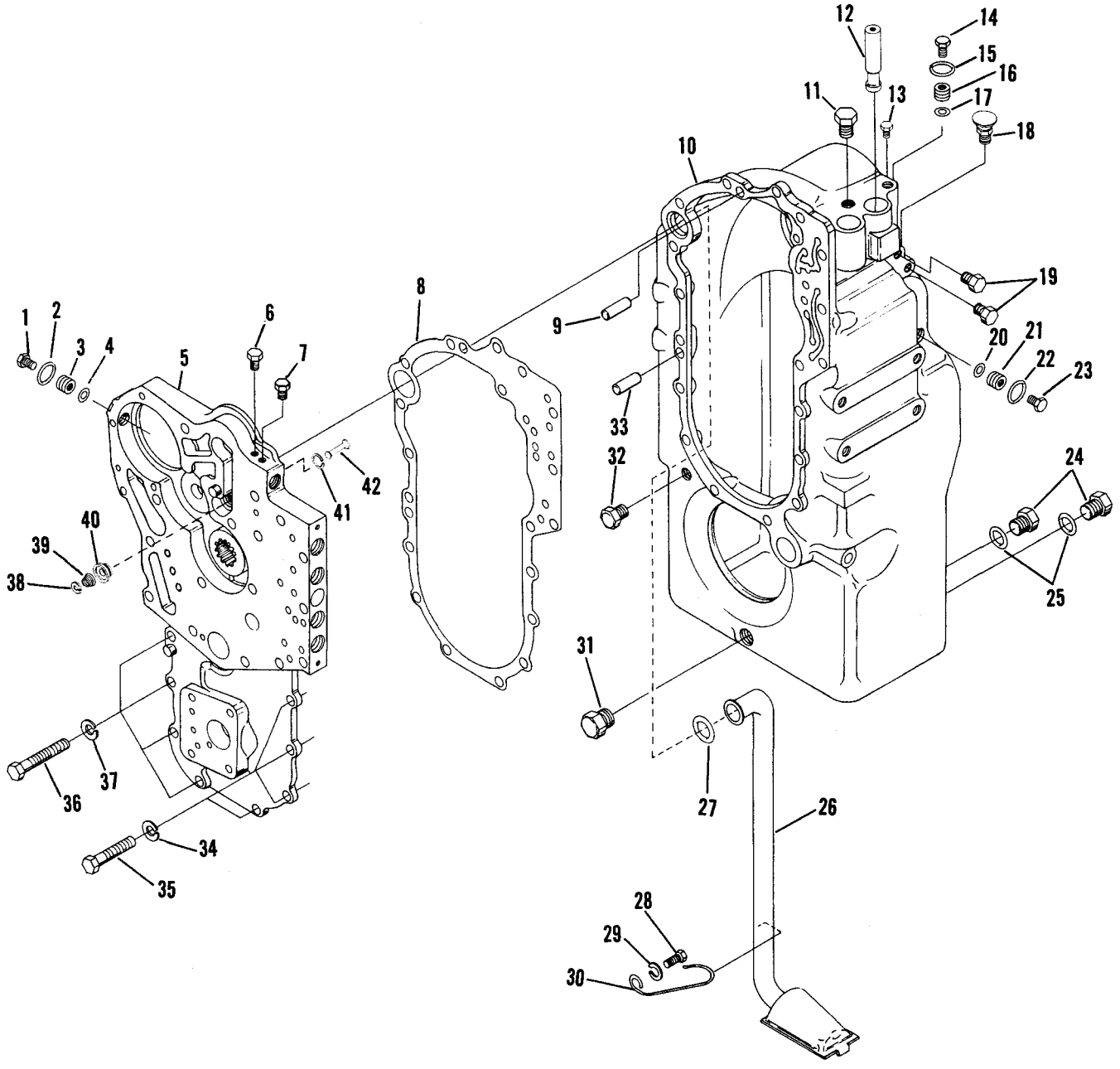
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Figure A

T12000
TRANSMISSION CASE AND PLATE GROUP

ITEM	DESCRIPTION	QUANTITY
1	Sensor Port Plug	1
2	Sensor Port Plug Washer	1
3	Sensor Adjusting Bushing	1
4	Sensor Bushing Shim	AR
5	Spacer Plate	1
6	Pipe Plug	1
7	Outlet Temperature Port Plug	1
8	Plate to Transmission Case Gasket	1
9	Plate to Transmission Case Dowel Pin	1
10	Transmission Case	1
11	Filler Plug	1
12	Diverter Sleeve	1
13	Pipe Plug	1
14	Auto Shift Sensor Port Plug	1
15	Sensor Port Plug "O" Ring	1
16	Sensor Adjusting Bushing	1
17	Sensor Bushing Shim	AR
18	Air Breather	1
19	Pipe Plug	2
20	Sensor Bushing Shim	AR
21	Sensor Adjusting Bushing	1
22	Sensor Port Plug "O" Ring	1
23	Speed Sensor Plug	1
24	Oil Level Plug	2
25	Plug "O" Ring	2
26	Tube and Screen Assembly	1
27	Oil Supply Tube Seal Ring	1
28	Retainer Clip Screw	1
29	Retainer Clip Screw Lockwasher	1
30	Oil Supply Tube Retainer Clip	1
31	Magnetic Drain Plug	1
32	Drain Back Port Plug	1
33	Plate to Transmission Case Dowel Pin	1
34	Plate to Transmission Case Screw Lockwasher	4
35	Plate to Transmission Case Screw	4
36	Plate to Transmission Case Screw	4
37	Plate to Transmission Case Screw Lockwasher	4
38	Poppet Retainer Washer	1
39	Safety Valve Spring	1
40	Safety Valve Seat	1
41	Seat Snap Ring	1
42	Safety Valve Poppet	1

AR - As Required

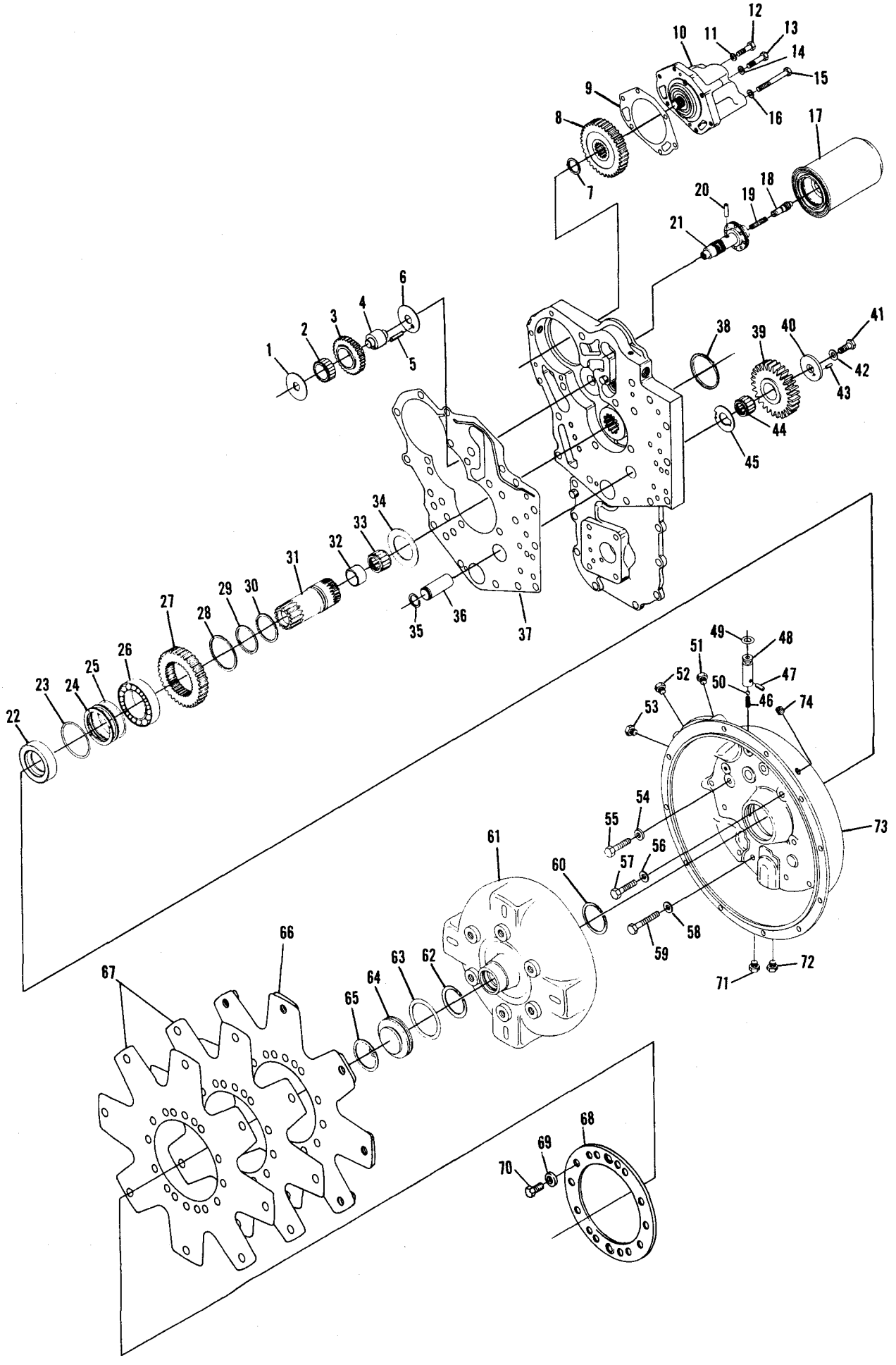
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Figure B

T12000
CONVERTER GROUP

ITEM	DESCRIPTION	QUANTITY
1	Pump Drive Idler Thrust Washer	1
2	Idler Gear Bearing	1
3	Pump Drive Idler Gear	1
4	Pump Drive Idler and Pilot Shaft	1
5	Pump Drive Idler and Pilot Shaft Dowel	1
6	Pump Drive Idler Thrust Washer	1
7	Pump Drive Gear Retainer Snap Ring	1
8	Pump Drive Gear	1
9	Charging Pump Gasket	1
10	Charging Pump	1
11	Pump Mounting Screw Lockwasher	1
12	Pump Mounting Screw	1
13	Pump Mounting Screw	1
14	Pump Mounting Screw Lockwasher	1
15	Pump Mounting Screw	4
16	Pump Mounting Screw Lockwasher	4
17	Filter Assembly	1
18	Piston	1
19	Spring	1
20	Pin	1
21	Sleeve	1
22	Converter Housing Oil Seal	1
23	Oil Distributor Ring "O" Ring	1
24	Oil Distributor Ring	1
25	Oil Distributor Ring "O" Ring	1
26	Torque Converter Bearing	1
27	Impeller Hub Gear	1
28	Stator Support Snap Ring	1
29	Stator Support Piston Ring	1
30	Stator Support Piston Ring Expander	1
31	Stator Support	1
32	Bushing	1
33	Bearing	1
34	Impeller Hub Gear Washer	1
35	Idler Shaft Snap Ring	1
36	Idler and Pilot Shaft	1
37	Housing to Plate Gasket	1
38	Stator Support Snap Ring	1
39	Reverse Idler Gear	1
40	End Plate	1
41	Reverse Idler End Plate Capscrew	1
42	End Plate Capscrew Washer	1
43	End Plate to Shaft Roll Pin	1
44	Reverse Idler Gear Bearing	1
45	Thrust Washer	1
46	Spring	1
47	Pin	1
48	Ball Check Valve	1
49	"O" Ring	1
50	Ball	1
51	Regulator Pressure Port Plug	1
52	Plug	1
53	Plug	1
54	Converter Housing to Plate Screw Lockwasher	6
55	Converter Housing to Plate Screw	6
56	Converter Housing to Plate Screw Lockwasher	1
57	Converter Housing to Plate Screw	1
58	Converter Housing to Transmission Case Screw Lockwasher	10
59	Converter Housing to Transmission Case Screw	10
60	Turbine Hub Snap Ring	1
61	Torque Converter Assembly	1
62	Turbine Hub Snap Ring	1
63	Torque Converter Plug "O" Ring	1
64	Torque Converter Plug	1
65	Plug Snap Ring	1
66	Drive Plate Weld Nut Assembly	1
67	Drive Plate	2
68	Drive Plate Backing Ring	1
69	Drive Plate Mounting Screw Lockwasher	5
70	Drive Plate Mounting Screw	5
71	Plug	1
72	Plug	1
73	Converter Housing	1
74	Plug	1

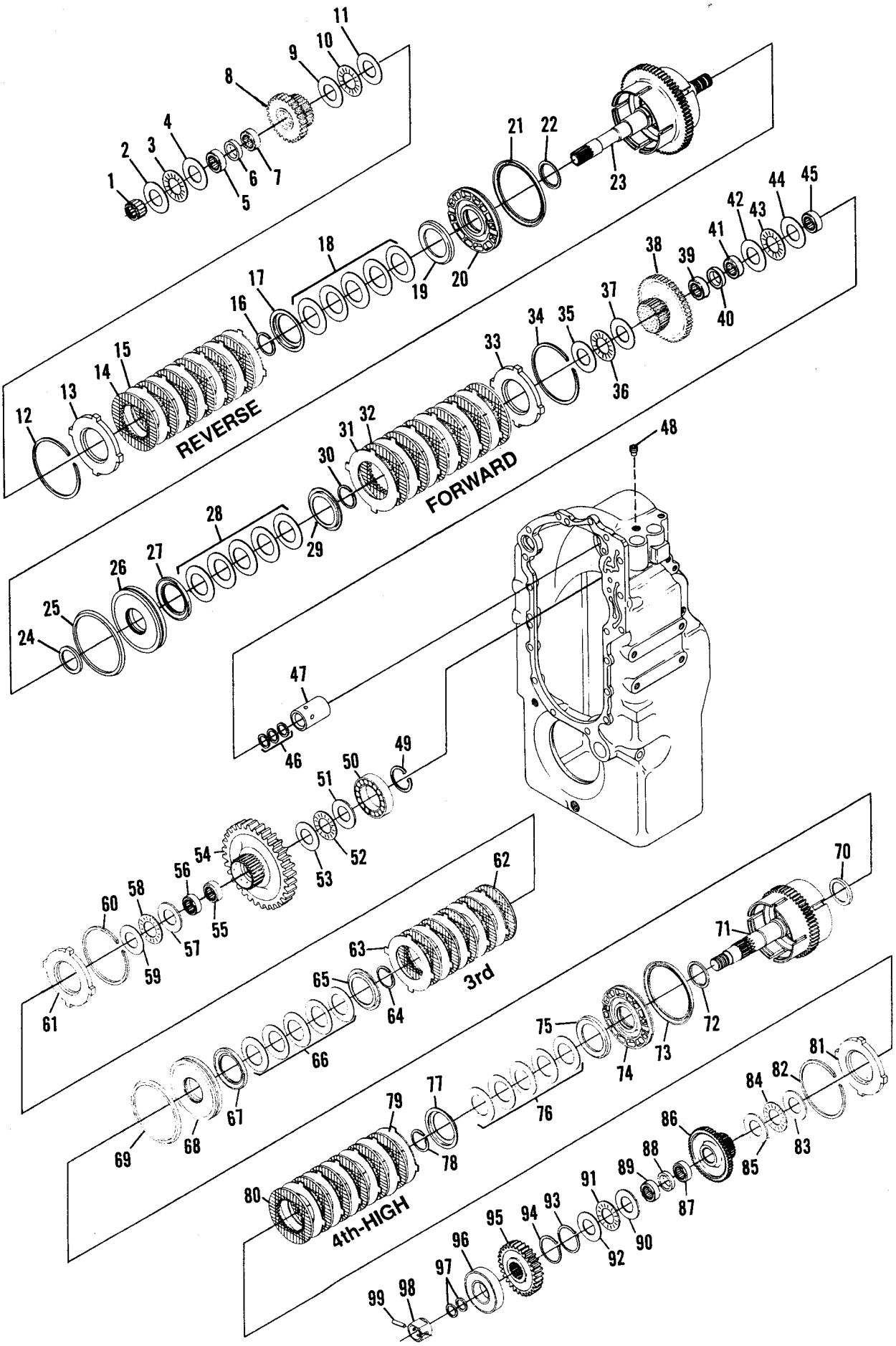

Figure C

T12000
FORWARD-REVERSE, 3RD AND 4TH-HIGH CLUTCH GROUP

ITEM	DESCRIPTION	QUANTITY
1	Turbine Shaft Front Bearing	1
2	Clutch Gear Thrust Washer	1
3	Clutch Gear Thrust Washer Bearing	1
4	Clutch Gear Thrust Washer	1
5	Bearing	1
6	Spacer	1
7	Bearing	1
8	Reverse Clutch Gear	1
9	Clutch Gear Thrust Washer	1
10	Clutch Gear Thrust Washer Bearing	1
11	Clutch Gear Thrust Washer	1
12	End Plate Snap Ring	1
13	End Plate	1
14	Inner Disc	6
15	Outer Disc	6
16	Retainer Snap Ring	1
17	Snap Ring Retainer	1
18	Disc Spring Assembly	5
19	Clutch Piston Wear Plate	1
20	Clutch Piston	1
21	Clutch Piston Seal—Outer	1
22	Clutch Piston Seal—Inner	1
23	Turbine Shaft, Drum and Plug Assembly	1
24	Clutch Piston Seal—Inner	1
25	Clutch Piston Seal—Outer	1
26	Clutch Piston	1
27	Clutch Piston Wear Plate	1
28	Disc Spring Assembly	5
29	Snap Ring Retainer	1
30	Retainer Snap Ring	1
31	Outer Disc	6
32	Inner Disc	6
33	End Plate	1
34	End Plate Snap Ring	1
35	Clutch Gear Thrust Washer	1
36	Clutch Gear Thrust Washer Bearing	1
37	Clutch Gear Thrust Washer	1
38	Forward Clutch Gear	1
39	Bearing	1
40	Spacer	1
41	Bearing	1
42	Clutch Gear Thrust Washer	1
43	Clutch Gear Thrust Washer Bearing	1
44	Clutch Gear Thrust Washer	1
45	Turbine Shaft Rear Bearing	1
46	Piston Ring	3
47	Oil Distributor Sleeve	1
48	Retainer Screw	1
49	Rear Bearing Retaining Snap Ring	1
50	Rear Bearing	1
51	Clutch Gear Thrust Washer	1
52	Clutch Gear Thrust Washer Bearing	1
53	Clutch Gear Thrust Washer	
54	3rd Clutch Gear	1
55	Bearing	1
56	Bearing	1
57	Clutch Gear Thrust Washer	1
58	Clutch Gear Thrust Washer Bearing	1
59	Clutch Gear Thrust Washer	1
60	End Plate Snap Ring	1
61	End Plate	1
62	Inner Disc	5
63	Outer Disc	5
64	Retainer Snap Ring	1
65	Snap Ring Retainer	1
66	Disc Spring Assembly	5
67	Clutch Piston Wear Plate	1
68	Clutch Piston	1
69	Clutch Piston Seal—Outer	1
70	Clutch Piston Seal—Inner	1
71	High and 3rd Shaft, Drum and Plug Assembly	1
72	Clutch Piston Seal—Inner	1
73	Clutch Piston Seal—Outer	1
74	Clutch Piston	1
75	Clutch Piston Wear Plate	1
76	Disc Spring Assembly	5
77	Snap Ring Retainer	1
78	Retainer Snap Ring	1
79	Outer Disc—1st Clutch	6
80	Inner Disc—1st Clutch	6
81	End Plate	1
82	End Plate Snap Ring	1
83	Clutch Gear Thrust Washer	1
84	Clutch Gear Thrust Washer Bearing	1
85	Clutch Gear Thrust Washer	1
86	4th Clutch Gear	1
87	Bearing	1
88	Bearing Spacer	1
89	Bearing	1
90	Clutch Gear Thrust Washer	1
91	Clutch Gear Thrust Washer Bearing	1
92	Clutch Gear Thrust Washer	1
93	Gear Hub Snap Ring	1
94	Gear Hub Snap Ring	1
95	1st Drive Gear	1
96	Bearing and Seal Assembly	1
97	Piston Ring	2
98	Oil Distributor Sleeve	1
99	Sleeve Locating Screw	1

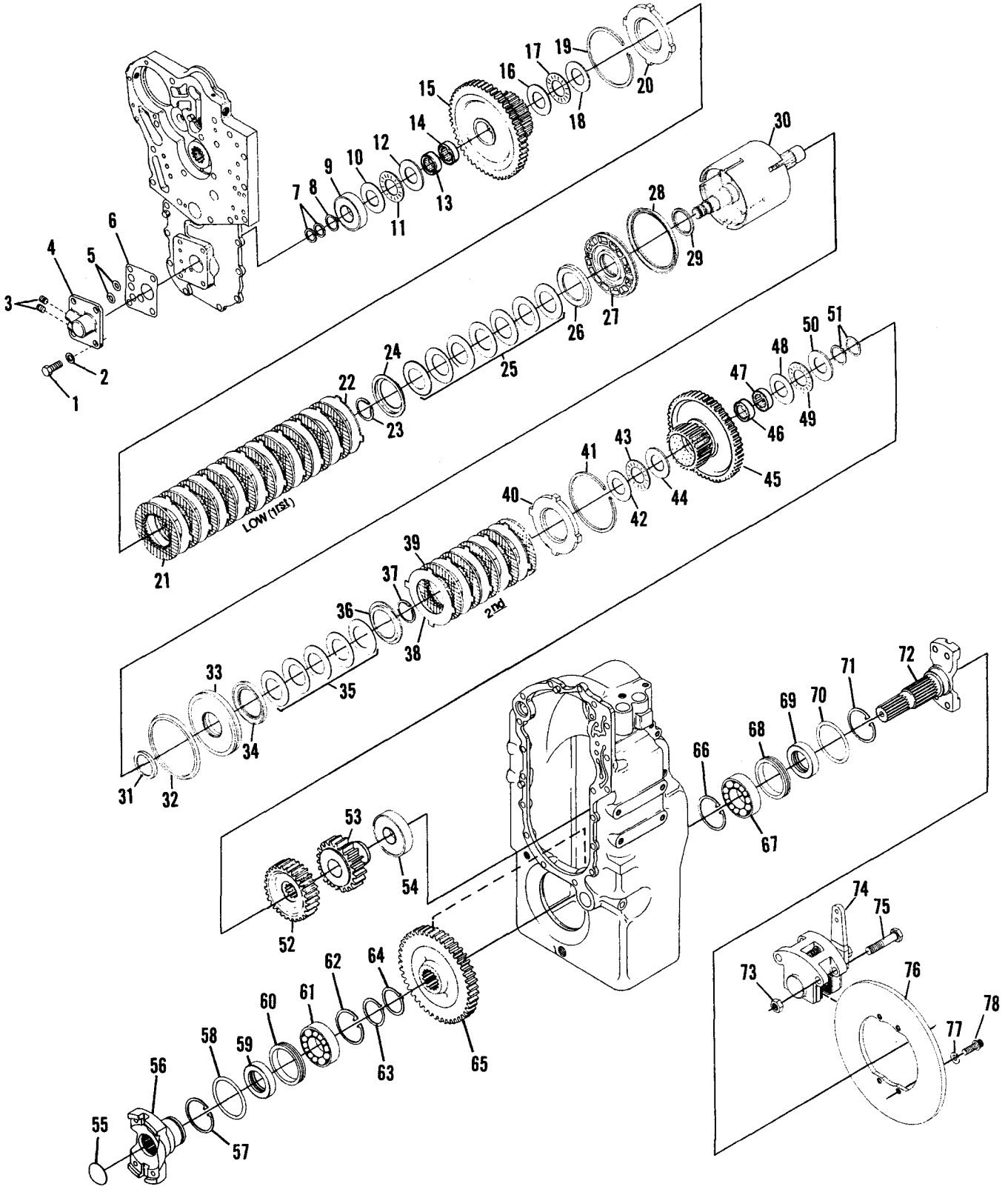

Figure D

T12000
LOW (1ST), 2ND, AND OUTPUT SHAFT GROUP
(WITH BRAKES)

ITEM	DESCRIPTION	QUANTITY
1	Distributor Cap Mounting Screw	4
2	Distributor Cap Mounting Screw Lockwasher	4
3	Distributor Cap Plug	2
4	1st and 2nd Distributor Cap	1
5	Distributor Cap "O" Ring	2
6	Distributor Cap Gasket	1
7	Piston Ring	2
8	Bearing Retaining Snap Ring	1
9	Bearing and Seal Assembly	1
10	Clutch Gear Thrust Washer	1
11	Clutch Gear Thrust Washer Bearing	1
12	Clutch Gear Thrust Washer	1
13	Bearing	1
14	Bearing	1
15	1st Clutch Gear Bearing	1
16	Clutch Gear Thrust Washer	1
17	Clutch Gear Thrust Washer Bearing	1
18	Clutch Gear Thrust Washer	1
19	End Plate Snap Ring	1
20	End Plate	1
21	Inner Disc—1st Clutch	10
22	Outer Disc—1st Clutch	10
23	Retainer Snap Ring	1
24	Snap Ring Retainer	1
25	Disc Spring Assembly	7
26	Clutch Piston Wear Plate	1
27	Clutch Piston	1
28	Clutch Piston Seal—Outer	1
29	Clutch Piston Seal—Inner	1
30	1st and 2nd Shaft, Drum and Plug Assembly	1
31	Clutch Piston Seal—Inner	1
32	Clutch Piston Seal—Outer	1
33	Clutch Piston	1
34	Clutch Piston Wear Plate	1
35	Disc Spring Assembly	5
36	Snap Ring Retainer	1
37	Retainer Snap Ring	1
38	Outer Disc—2nd Clutch	5
39	Inner Disc—2nd Clutch	5
40	End Plate	1
41	End Plate Snap Ring	1
42	Clutch Gear Thrust Washer	1
43	Clutch Gear Thrust Washer Bearing	1
44	Clutch Gear Thrust Washer	1
45	2nd Clutch Gear	1
46	Bearing	1
47	Bearing	1
48	Clutch Gear Thrust Washer	1
49	Clutch Gear Thrust Washer Bearing	1
50	Clutch Gear Thrust Washer	1
51	2nd Clutch Gear Hub Snap Ring	2
52	Output Drive Gear	1
53	3rd Driven Gear	1
54	Rear Bearing	1
55	Flange Plug	1
56	Output Flange	1
57	Output Shaft Bearing Snap Ring	1
58	Oil Seal Sleeve "O" Ring	1
59	Output Shaft Oil Seal	1
60	Oil Seal Sleeve	1
61	Output Shaft Bearing	1
62	Output Shaft Bearing Snap Ring	1
63	Flange Retaining Ring	1
64	Gear Retaining Ring	1
65	Output Shaft Gear	1
66	Output Shaft Gear Bearing Snap Ring	1
67	Output Shaft Bearing	1
68	Oil Seal Sleeve	1
69	Output Shaft Oil Seal	1
70	Output Shaft Sleeve "O" Ring	1
71	Output Shaft Bearing Snap Ring	1
72	Output Shaft and Brake Flange	1
73	Caliper Assembly Capscrew Locking Nut	2
74	Caliper Brake Assembly	1
75	Caliper Assembly Mounting Capscrew	2
76	Brake Disc	1
77	Brake Disc Capscrew Lockwasher	4
78	Brake Disc Capscrew	4

T12000
ELECTRIC CONTROL GROUP
DUAL MODULATION

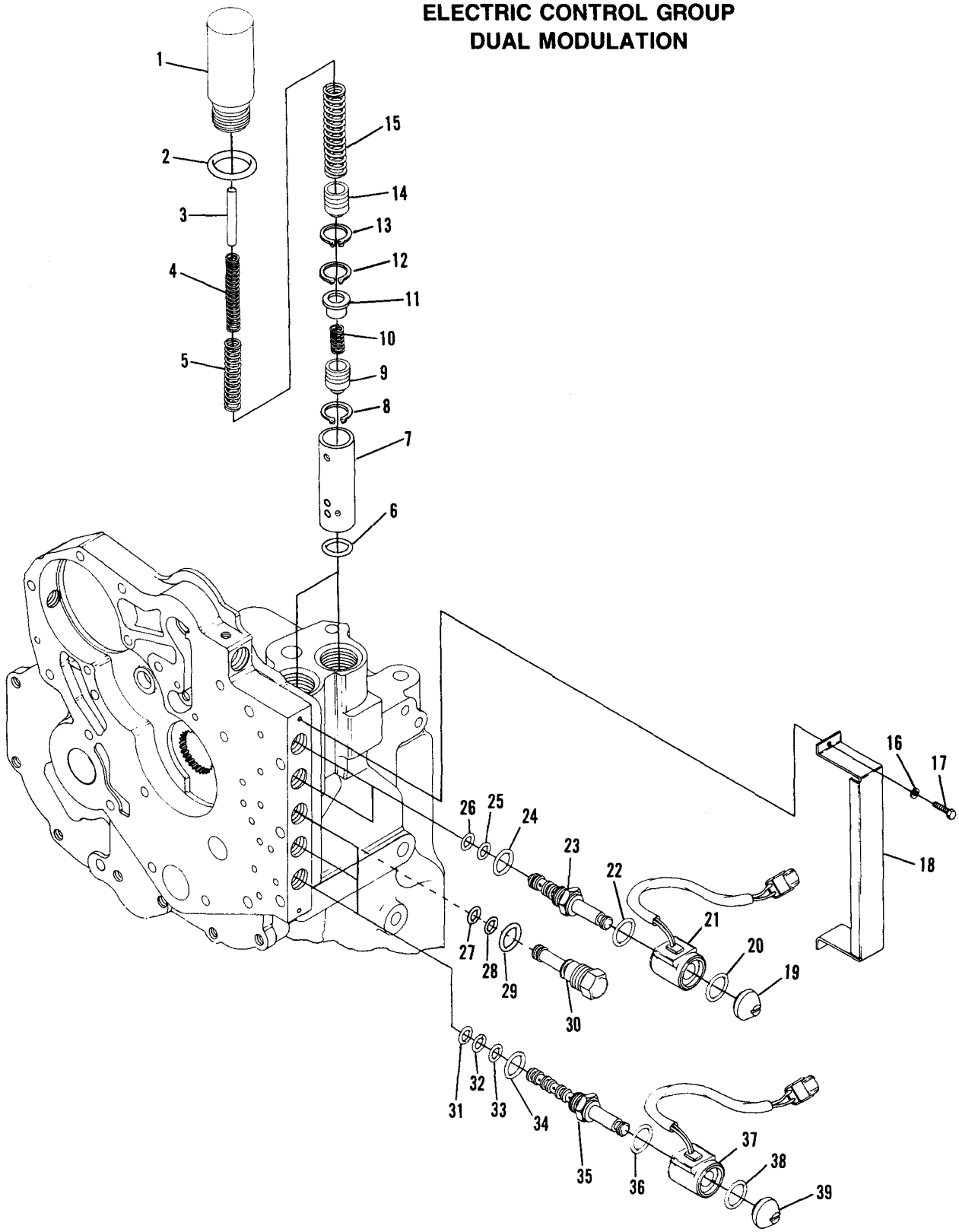

Figure F

T12000
CONTROL VALVE GROUP
DUAL MODULATION

ITEM	DESCRIPTION	QUANTITY
1	Modulator Valve Housing	2
2	Modulator Housing "O" Ring	2
3	Stop Pin	2
4	Spring — Inner	2
5	Spring — Middle	2
6	Sleeve "O" Ring	2
7	Modulation Housing Sleeve	2
8	Modulation Housing Sleeve Snap Ring	2
9	Regulator Spool	2
10	Spring	2
11	Spring Retainer	2
12	Spring Retainer Snap Ring	2
13	Accumulator Spool Snap Ring	2
14	Accumulator Spool	2
15	Spring — Outer	2
16	Cover Screw Lockwasher	2
17	Cover Screw	2
18	Protective Cover	1
19	Valve Cartridge Retainer Nut	2
20	Nut to Coil "O" Ring	2
21	Solenoid Coil	2
22	Coil to Cartridge "O" Ring	2
23	Valve Cartridge, 2 Way, Used at Rev. and Fwd. Incl. Items 24, 25, 26	2
24	Cartridge "O" Ring	2
25	Cartridge "O" Ring	2
26	Cartridge "O" Ring	2
27	Cartridge "O" Ring	1
28	Cartridge "O" Ring	1
29	Cartridge "O" Ring	1
30	Solenoid Bore Plug, Used at Fwd.-High and Fwd.-Low, Incl. Items 27, 28, 29. Bore Plug Used with 3 Speed Only	1
31	Cartridge "O" Ring	2
32	Cartridge "O" Ring	2
33	Cartridge "O" Ring	2
34	Cartridge "O" Ring	2
35	Valve Cartridge, 4 Way, Used at 1st and 2nd-3rd, Incl. Items 31, 32, 33, 34	2
36	Coil to Cartridge "O" Ring	2
37	Solenoid Coil	2
38	Nut to Coil "O" Ring	2
39	Valve Cartridge Retainer Nut	2

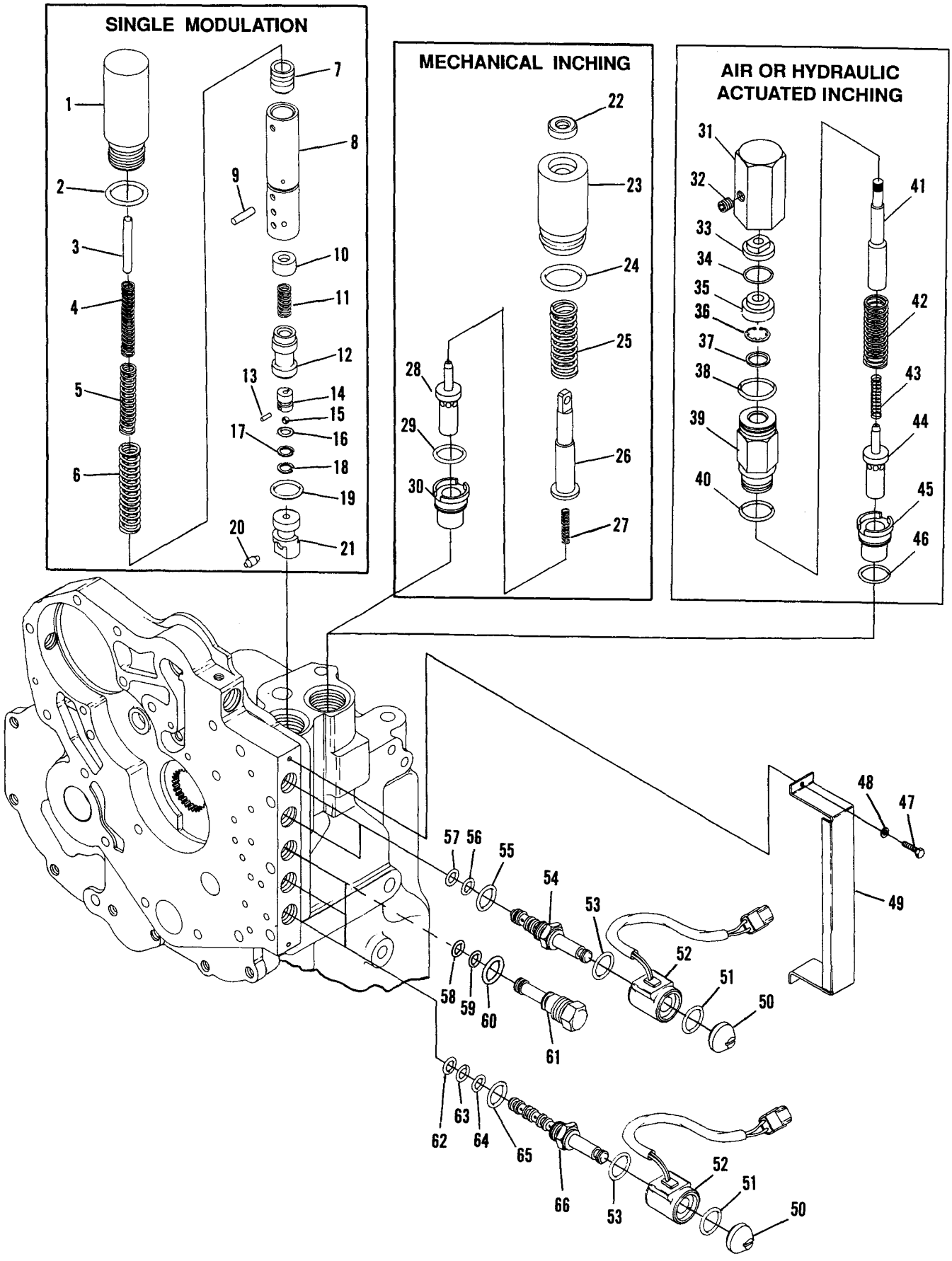
SINGLE MODULATION
MECHANICAL INCHING
AIR OR HYDRAULIC ACTUATED INCHING
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Figure G

T12000
CONTROL VALVE GROUP WITH SINGLE MODULATION, INCHING

ITEM	DESCRIPTION	QUANTITY
1	Modulator Valve Housing	1
2	Modulator Housing "O" Ring	1
3	Stop Pin	1
4	Spring — Inner	1
5	Spring — Middle	1
6	Spring — Outer	1
7	Accumulator Spool	1
8	Modulation Housing Sleeve	1
9	Pin	1
10	Regulator Spool Stop	1
11	Spring	1
12	Regulator Spool	1
13	Pin	1
14	Regulator Spool Sleeve	1
15	Ball	1
16	Spool Sleeve "O" Ring	1
17	Snap Ring	1
18	Snap Ring	1
19	Sleeve "O" Ring	1
20	Shuttle Spool	1
21	Shuttle Sleeve	1
22	Oil Seal	1
23	Inching Housing	1
24	Inching Housing "O" Ring	1
25	Inching Return Spring	1
26	Inching Actuator Rod	1
27	Inching Regulator Spring	1
28	Inching Spool	1
29	Inching Sleeve "O" Ring	1
30	Inching Sleeve	1
31	Hydraulic Inching Cover	1
32	Hydraulic Inching Cover Plug	3
33	Hydraulic Inching Upper Piston	1
34	Hydraulic Inching Upper Piston Seal	1
35	Hydraulic Inching Lower Piston	1
36	Hydraulic Inching Body Snap Ring	1
37	Hydraulic Inching Body Seal	1
38	Hydraulic Inching "O" Ring	1
39	Hydraulic Inching Body	1
40	Hydraulic Inching Body to Case "O" Ring	1
41	Hydraulic Inching Actuator Rod	1
42	Hydraulic Inching Return Spring	1
43	Hydraulic Inching Regulator Spring	1
44	Hydraulic Inching Spool	1
45	Hydraulic Inching Sleeve	1
46	Hydraulic Inching "O" Ring	1
47	Cover Screw	2
48	Cover Screw Lockwasher	2
49	Protective Cover	1
50	Valve Cartridge Retainer Nut	4
51	Nut to Coil "O" Ring	4
52	Solenoid Coil	4
53	Coil to Cartridge "O" Ring	4
54	Valve Cartridge	2
55	Cartridge "O" Ring	2
56	Cartridge "O" Ring	2
57	Cartridge "O" Ring	2
58	Cartridge "O" Ring	1
59	Cartridge "O" Ring	1
60	Cartridge "O" Ring	1
61	Solenoid Bore Plug (Used with 3 Speed Only)	1
62	Cartridge "O" Ring	2
63	Cartridge "O" Ring	2
64	Cartridge "O" Ring	2
65	Cartridge "O" Ring	2
66	Valve Cartridge	2

3 SPEED
ASSEMBLY INSTRUCTIONS

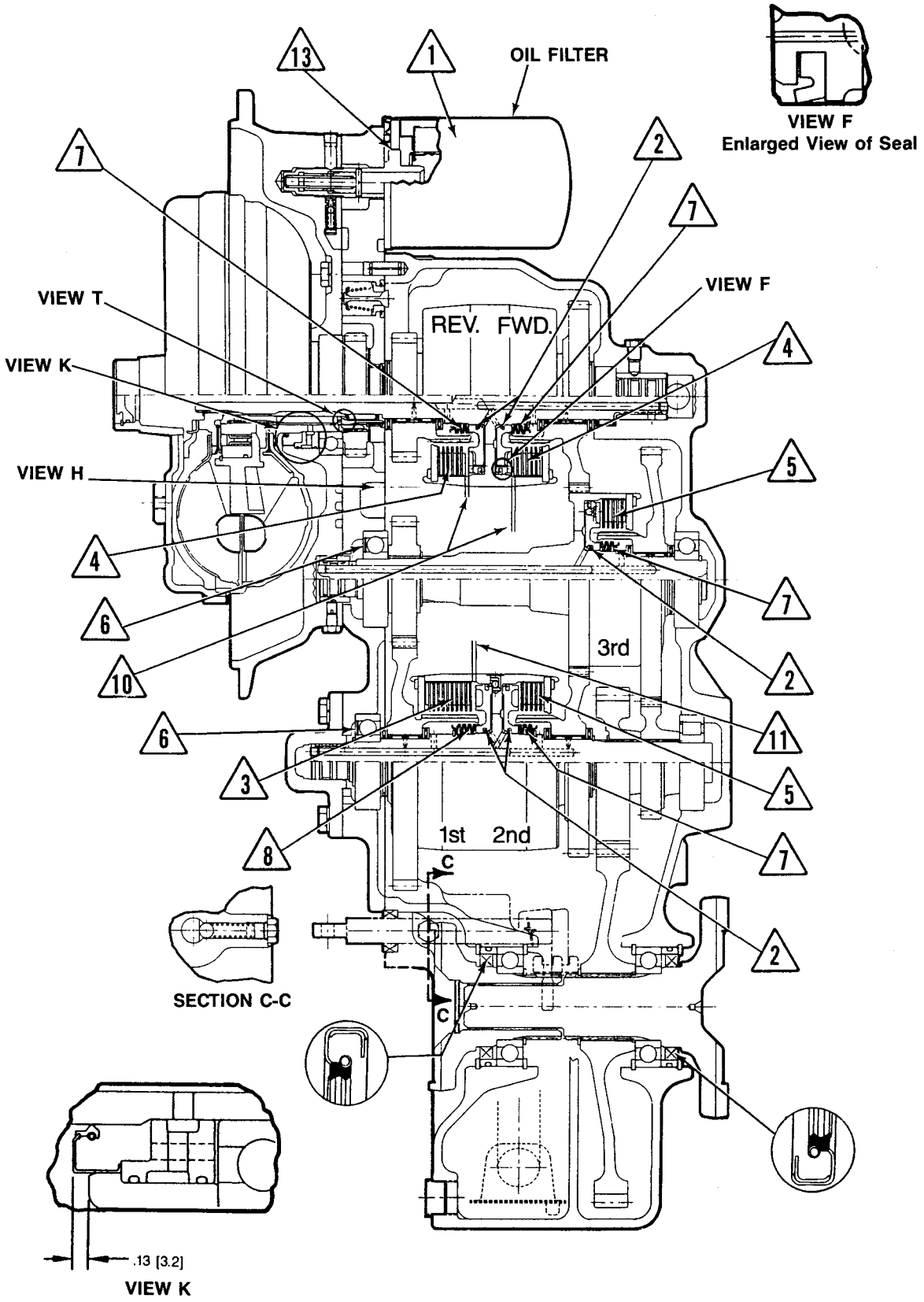


Figure H

4 - 6 SPEED
ASSEMBLY INSTRUCTIONS

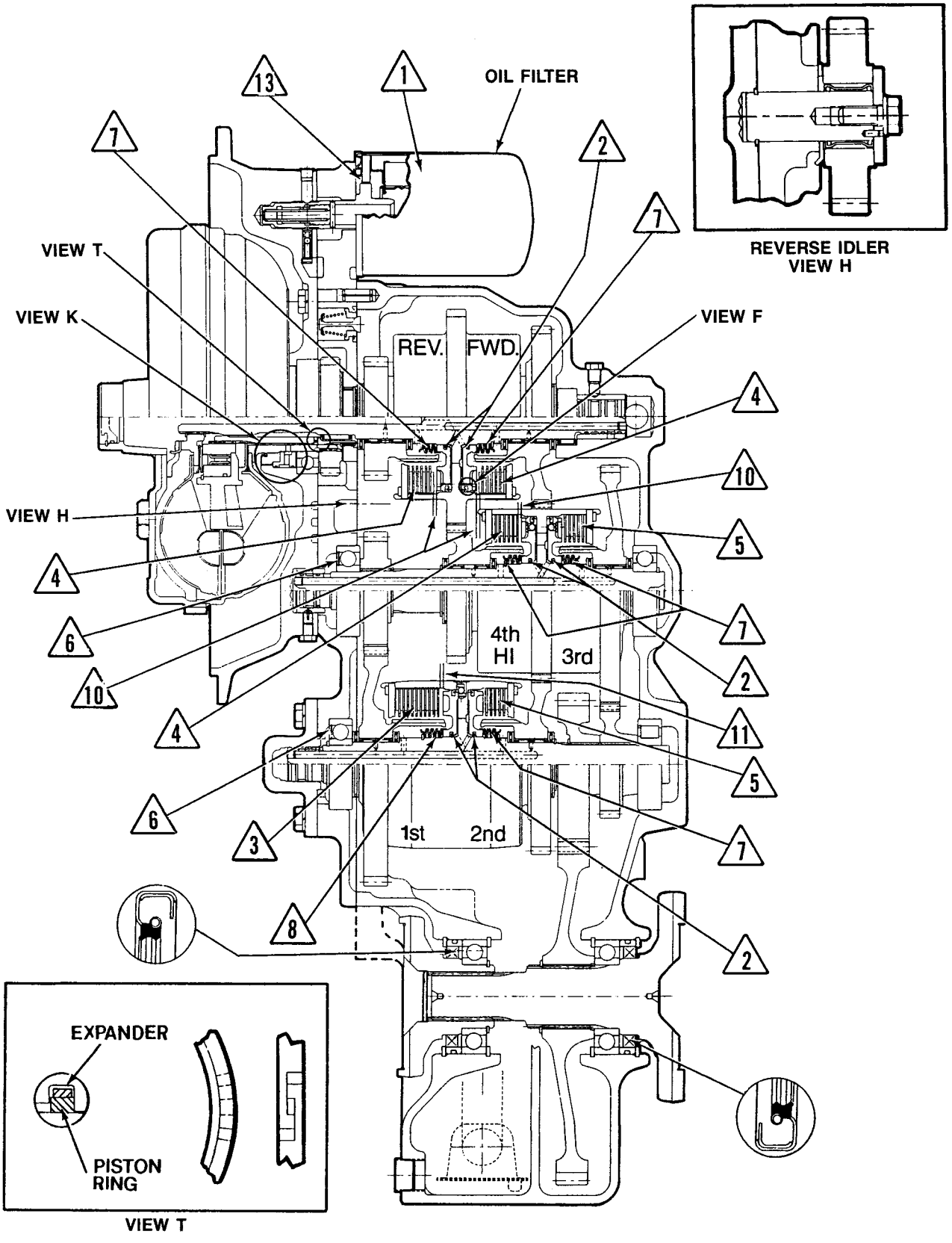


Figure I

△1 Assemble oil filter and tighten to 20-25 lbf·ft [27-34 N·m].

△2 Teflon seals must be sized prior to assembly.

△3 10 outer steel plates — 10 inner plates — Alternately assemble, starting with outer steel plate.

△4 6 outer steel plates — 6 inner plates — Alternately assemble, starting with outer steel plate.

△5 5 outer steel plates — 5 inner plates — Alternately assemble, starting with outer steel plate.

△6 Shield bearing — assemble with shield as shown.

△7 Fwd., Rev., 2nd, 3rd, and 4th-High clutch return disc springs. Concave side of first disc spring to be placed against clutch piston wear sleeve. Remaining four springs to be stacked alternately as shown.

△8 Low clutch return disc springs concave side of first disc spring to be placed against clutch piston wear sleeve. Remaining six springs to be stacked alternately as shown.

△10 Clearance between clutch piston and steel separator plate to be .048-.108 [1.22-2.74]. If over .108 [2.74] clearance, add one steel outer disc under end plate.

△11 Clearance between clutch piston and steel separator plate to be .080-.135 [2.03-3.43]. If over .135 [3.43] clearance, add one steel outer disc under end plate.

△13 Tighten regulator sleeve to 45-50 lbf·ft [61-68 N·m].

△14 Use solenoid bore plug in middle position for 3-speed version only.

△15 Solenoid cartidge to be assembled and tightened to 16-20 lbf·ft [22-27 N·m].

△16 Assemble speed sensor bushing to specifications shown with a max. of 3 shims. Apply Loctite No. 577 and torque bushing 45 to 50 lbf·ft[61-68 N·m].

△19 M10 Screw.

△20 M10 Screw.

△21 M8 Screw.

△22 M8 Screw.

△23 M10 Screw.

△24 M8 Screw.

△25 M8 Screw.

△26 M10 Screw.

△27 M8 Nut.

△28 M8 Nut.

△29 M10 Nut.

△30 Tighten all cartridge nuts to 4-5 lbf·ft [5-7 N·m].

ASSEMBLY NOTES:

Use Permatex and Loctite only where specified.

All lead in chamfers for oil seals, piston rings, and "O" rings must be smooth and free from burrs. Inspect before assembly.

Lubricate all piston ring grooves and "O" rings with oil before assembly.

Apply a thin coat of grease between seal lips on lip type seals prior to assembly.

Apply a thin coat of Permatex No. 2 or Loctite No. 641 to O.D. of all oil seals before assembly.

Apply a thin coat of Loctite No. 592 or No. 506 Dryseal to all pipe plugs.

Where precoated pipe plugs are not used, apply a thin coat of Loctite No. 592 or 506 Dryseal to pipe plugs.

After assembly of parts using Loctite or Permatex, there must not be any free or excess material which might enter the oil circuit.

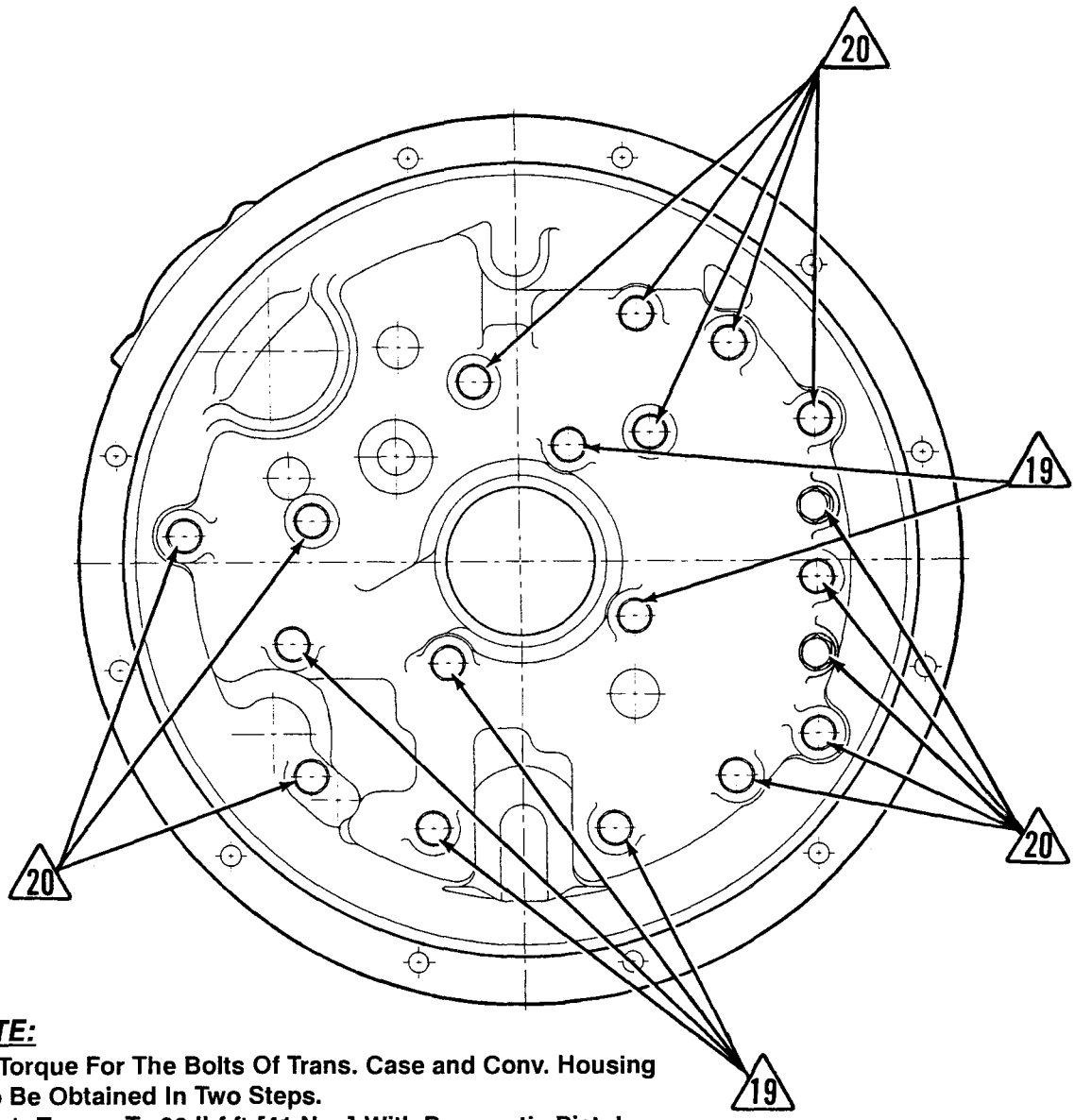
△19 & △20 Clean mounting surfaces and tapped holes with solvent. Dry thoroughly, being certain tapped holes are dry and clean. Install components and special self-locking screws. Tighten screws to proper torque per chart.

NOTE:

Assembly of components must be completed 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 tapped holes must be removed with the proper tap and cleaned with solvent. Dry holes thoroughly and use a new screw for reinstallation.

If special capscrews are not available, clean epoxy away from threads and dry thoroughly. Apply Loctite #262 thread locker to threads. Install capscrews in the proper locations and tighten to specified torque (See Torque Chart).

Figure J



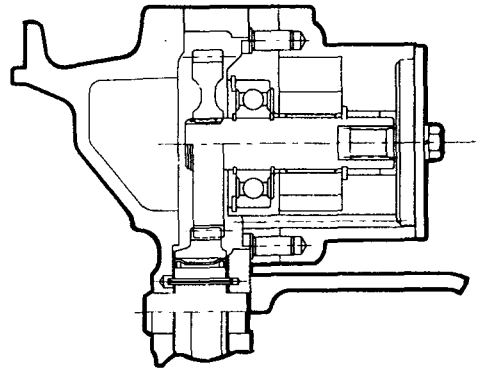
NOTE:

The Torque For The Bolts Of Trans. Case and Conv. Housing Is To Be Obtained In Two Steps.
Step 1: Torque To 30 lbf·ft [41 N·m] With Pneumatic Pistol.
Step 2: Torque To 55 lbf·ft [75 N·m].
Both Steps Starting At The Center, Ending At The Outer Side.

TORQUE SPECIFICATION FOR LUBRICATED OR PLATED SCREWS AND NUTS				
NOMINAL SIZE	GRADE 8.8 or 9.8		GRADE 10.9	
	COURSE THREAD		COURSE THREAD	
	lbf·ft	[N·m]	lbf·ft	[N·m]
M8	15-18	[20-25]	22-26	[30-35]
M10	30-37	[40-50]	44-48	[60-65]
M12	50-55	[65-75]	74-81	[100-110]

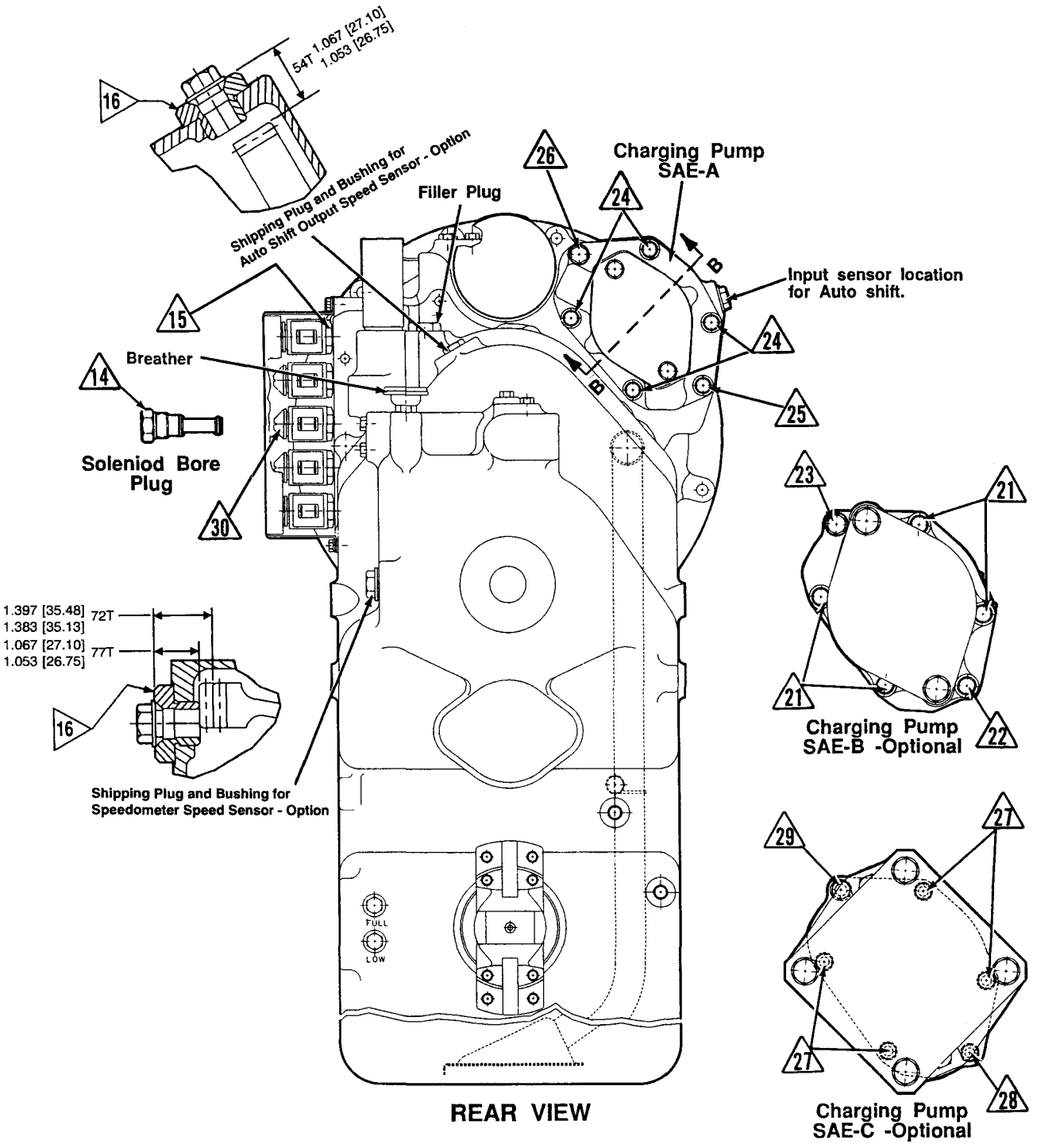
PIPE PLUG TORQUE CHART		
THREAD NPTF	TORQUE	
	lbf·ft	[N·m]
1/16-27	5-7	[7-9]
1/8-27	7-10	[9-14]
1/4-18	15-20	[20-27]
3/8-18	25-30	[34-41]
1/2-14	30-35	[41-47]
3/4-10	40-45	[54-61]

PERMANENT PLUG METRIC		
THREAD SIZE	TORQUE	
	lbf·ft	[N·m]
M18 X 1.5 6H	25-30	[34-41]
M26 X 1.5 6H	45-50	[61-68]



SECTION B-B

Figure K



TORQUE SPECIFICATION FOR LUBRICATED OR PLATED SCREWS AND NUTS								
NOMINAL SIZE	GRADE 5				GRADE 8			
	FINE THREAD		COARSE THREAD		FINE THREAD		COARSE THREAD	
	lbf·ft	[N·m]	lbf·ft	[N·m]	lbf·ft	[N·m]	lbf·ft	[N·m]
.2500	9-11	[12-15]	8-10	[11-14]	11-13	[15-18]	9-11	[12-15]
.3125	16-20	[22-27]	12-16	[16-22]	28-32	[38-43]	26-30	[35-41]
.3750	26-29	[35-39]	23-25	[31-34]	37-41	[50-56]	33-36	[45-49]
.4375	41-45	[56-61]	37-41	[50-56]	58-64	[79-87]	52-57	[71-77]
.5000	64-70	[87-95]	57-63	[77-85]	90-99	[122-134]	80-88	[108-119]
.5625	91-100	[123-136]	82-90	[111-122]	128-141	[174-191]	115-127	[156-172]
.6250	128-141	[174-191]	113-124	[153-168]	180-198	[224-268]	159-175	[216-237]
.7500	223-245	[302-332]	200-220	[271-298]	315-347	[427-470]	282-310	[382-420]

Figure L

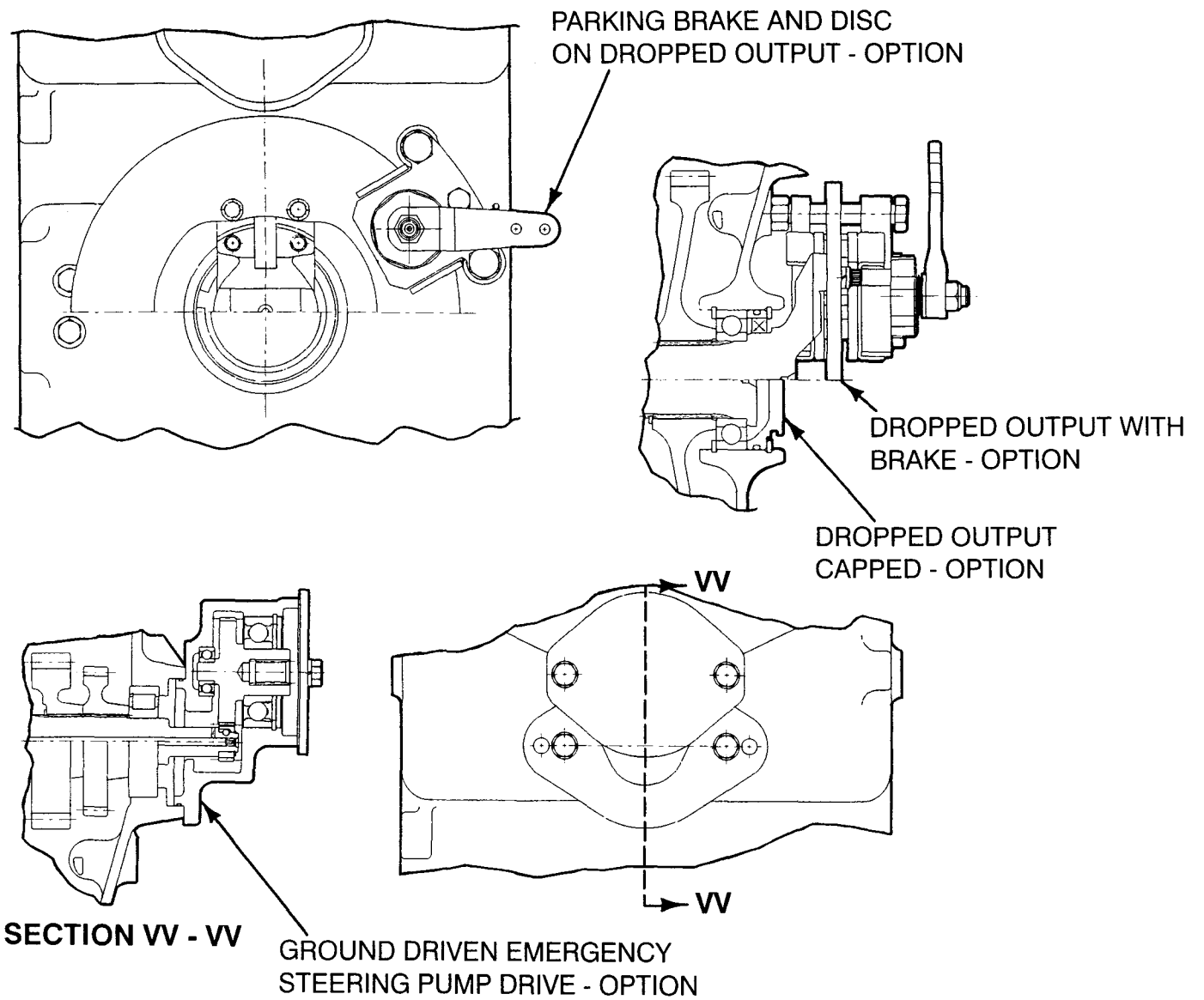

PARKING BRAKE AND DISC
ON DROPPED OUTPUT - OPTION
DROPPED OUTPUT WITH
BRAKE - OPTION
DROPPED OUTPUT
CAPPED - OPTION
VV
VV
SECTION VV - VV
GROUND DRIVEN EMERGENCY
STEERING PUMP DRIVE - OPTION

Figure M

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 T12000 3, 4, and 6 speed long drop output transmission with many options. The units are very similar to troubleshoot, disassemble, repair, and reassemble.

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

DISASSEMBLY

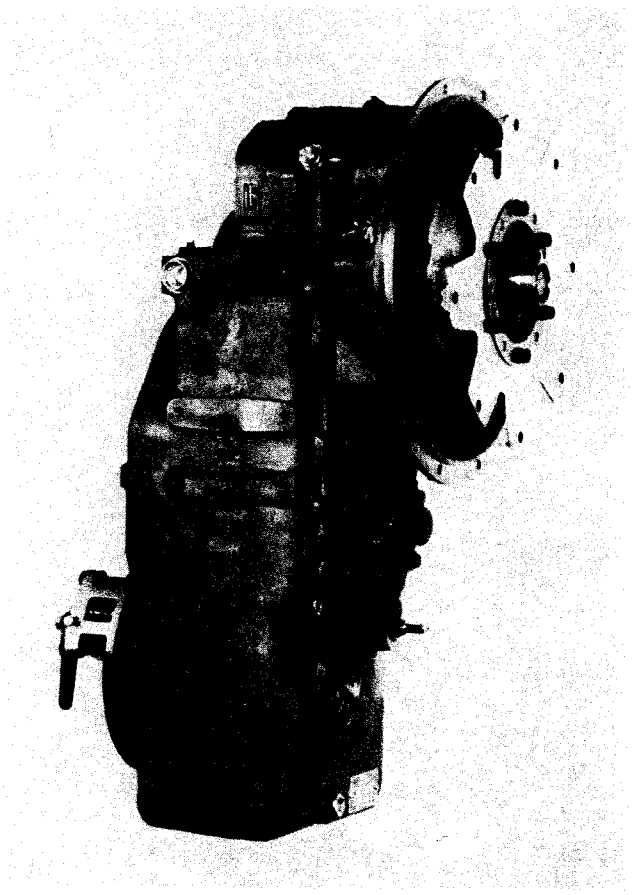


Figure 1
Side view of T12000 long drop transmission.

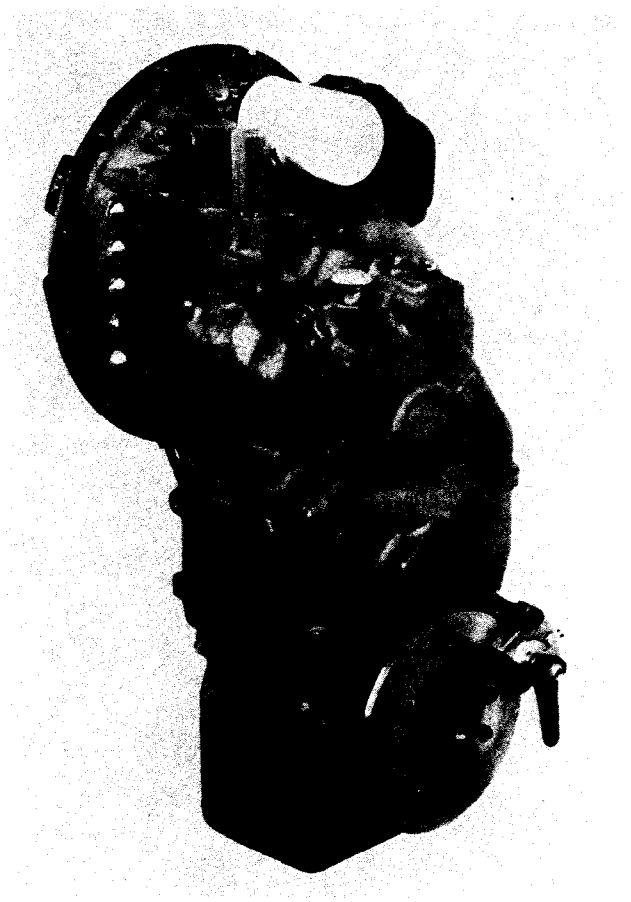


Figure 2
Rear view showing disc brake and electric control.

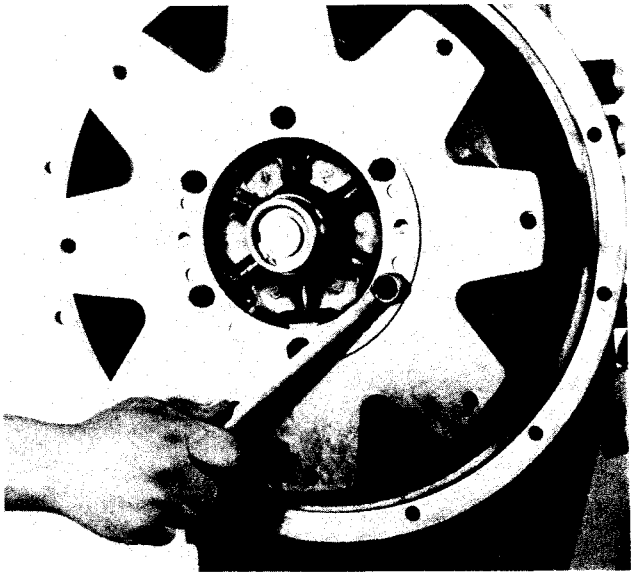


Figure 3
Remove drive plate attaching capscrews and washers. Remove drive plate and backing ring.

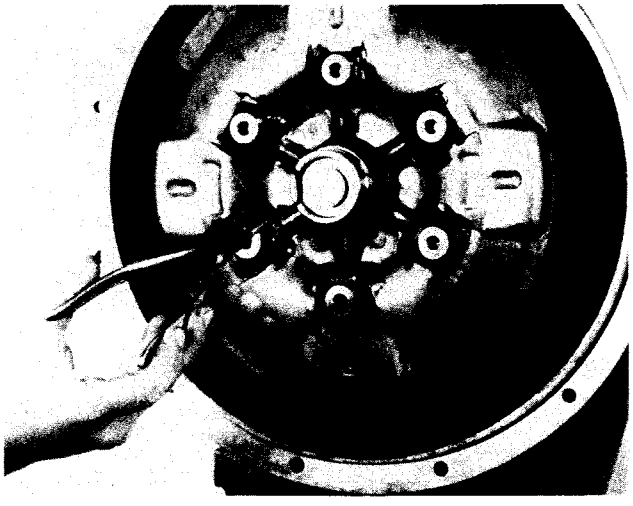


Figure 4
Remove torque converter plug retainer ring.

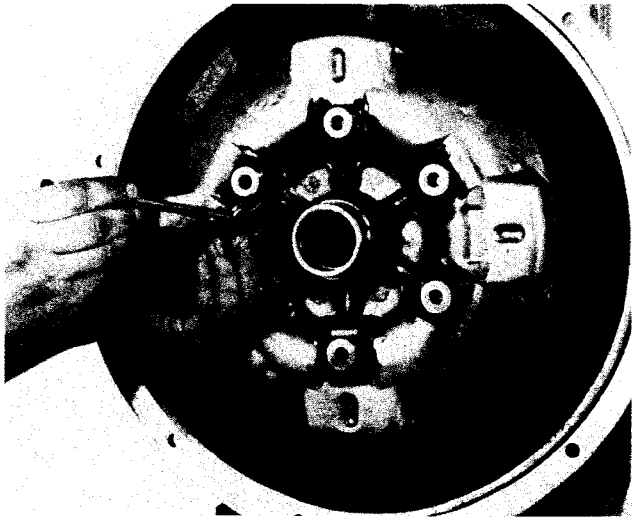


Figure 5
Remove plug and "O" ring.

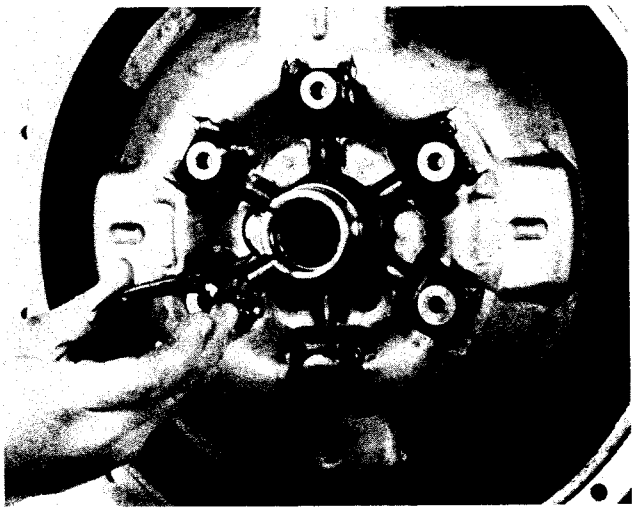


Figure 6
Remove torque converter to turbine shaft retainer ring.

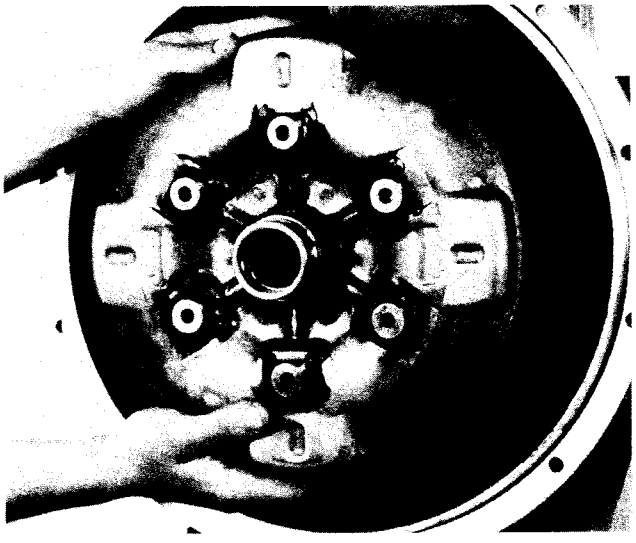


Figure 7
Remove torque converter assembly.

Figure 8
Remove torque converter to shaft locating ring.

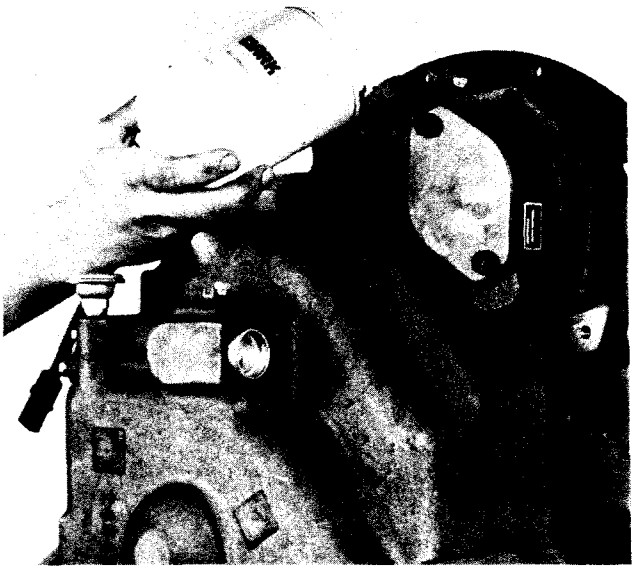


Figure 9
Remove oil filter assembly.

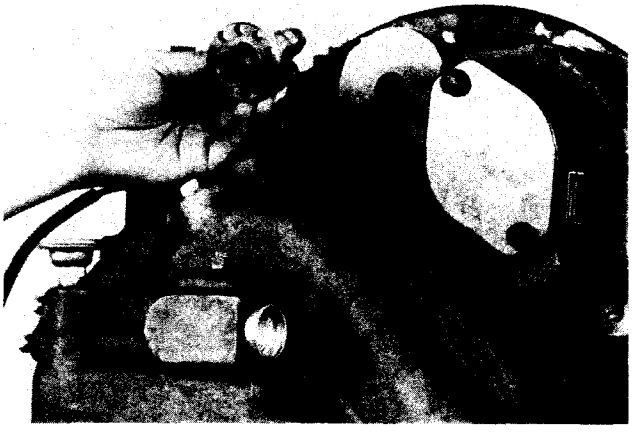


Figure 10
Remove pressure regulator and regulator sleeve.
NOTE: Special tool can be fabricated. (See Figure 389A.)

Figure 11
Remove charging pump permanent pump hole cover. (Not used when auxiliary pump is used.)

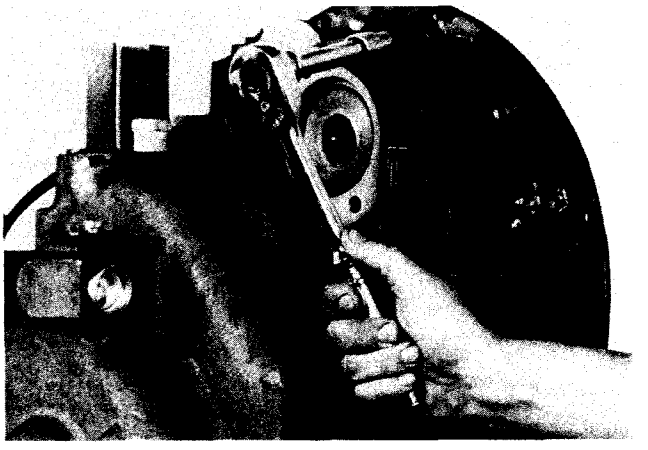


Figure 12
Remove pump mounting bolts and washers. Remove pump and gasket.

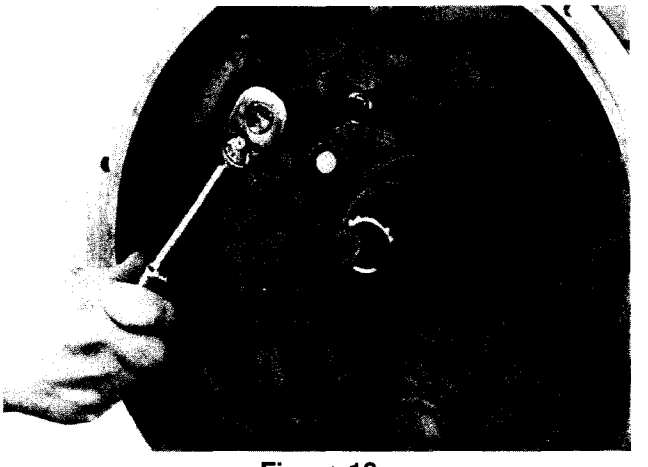


Figure 13
Remove converter housing to transmission case bolts and washers.

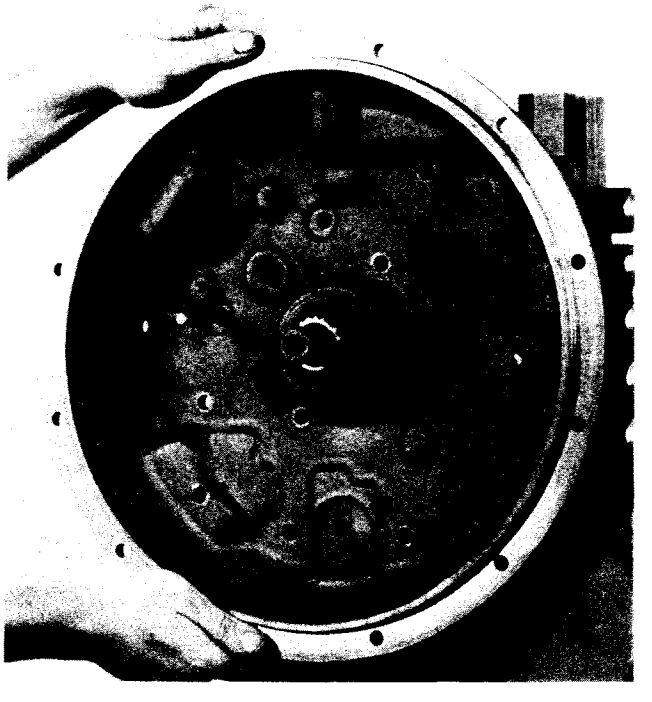


Figure 14
Remove converter housing and gasket.

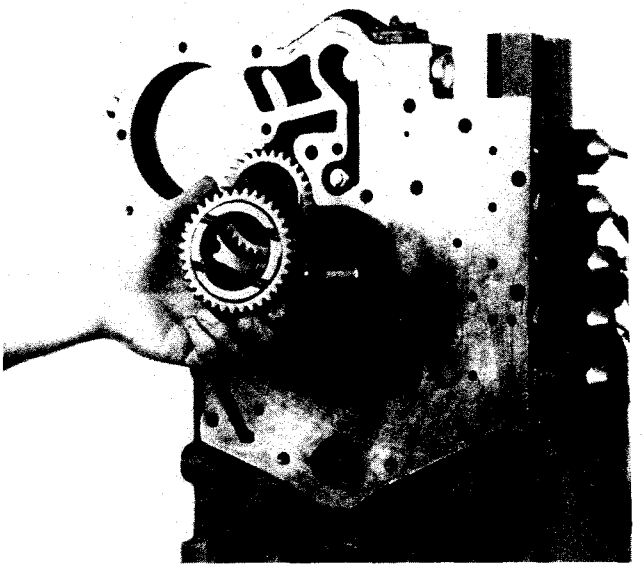


Figure 15
Remove impeller hub gear.

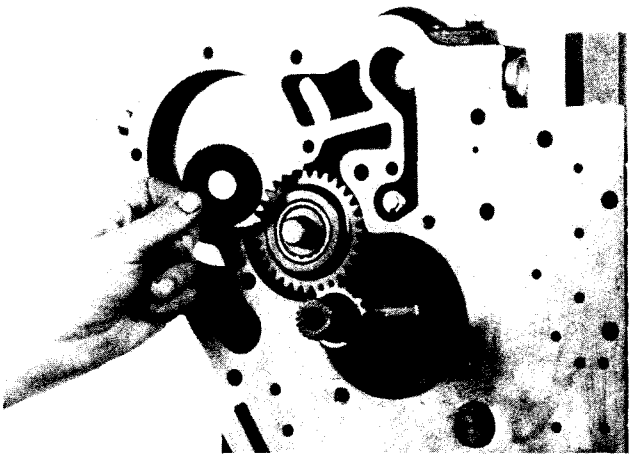


Figure 16
Remove pump drive idler gear washer.

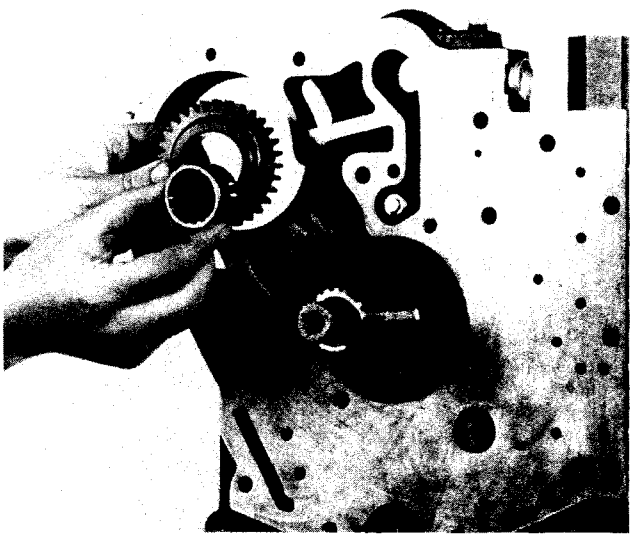


Figure 17
Remove pump drive gear and bearing. Remove gear shaft and washer.

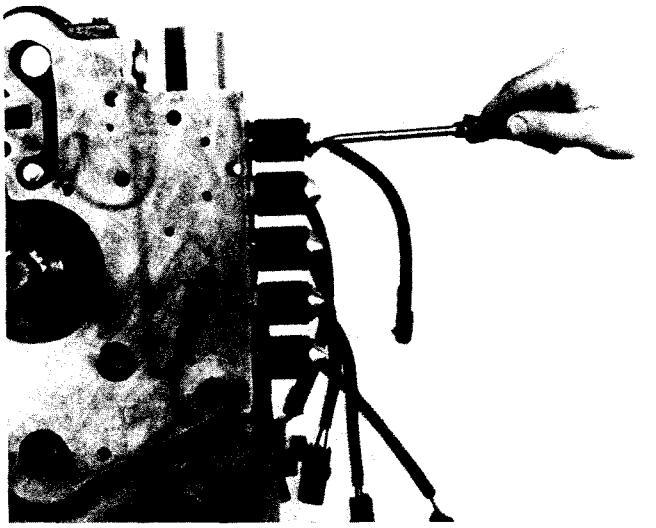


Figure 18
Remove solenoid valve cartridge retainer nut and "O" ring.

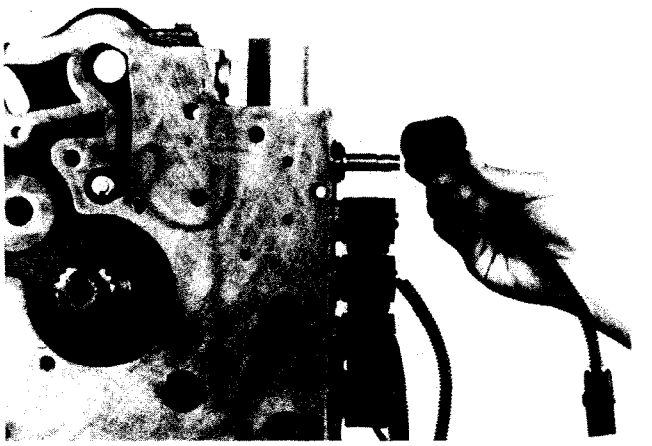


Figure 19
Remove solenoid coil and "O" ring.

Figure 20
Loosen solenoid valve cartridge.

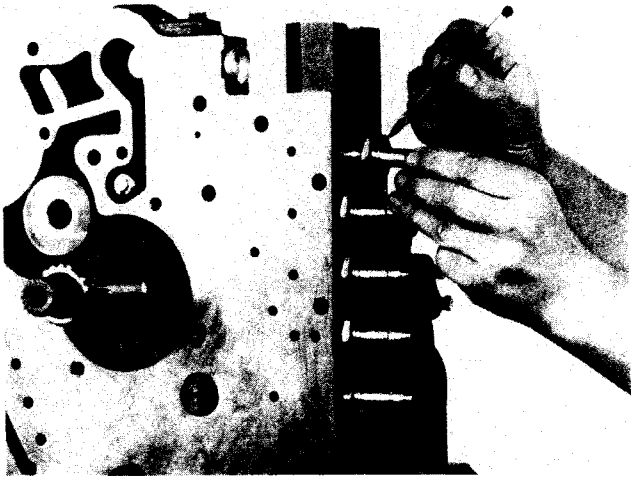


Figure 21
Remove valve. Repeat procedures Figures 18 through 21 for remaining solenoid valves. **NOTE:** A 3 speed will have a bore plug in the center bore. Remove bore plug.

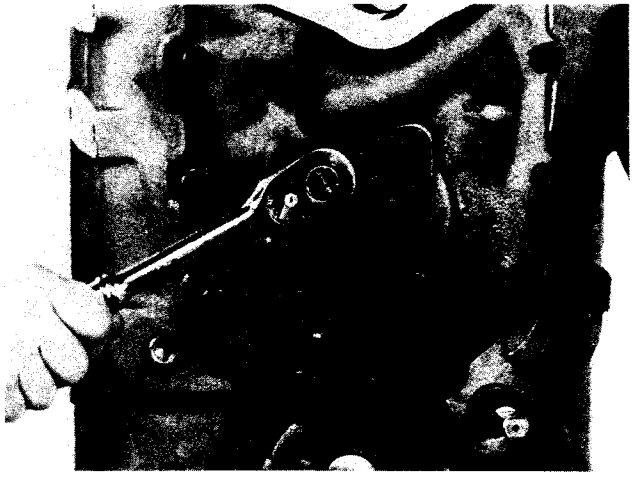


Figure 22
Remove 1st and 2nd clutch oil distributor capscrews.

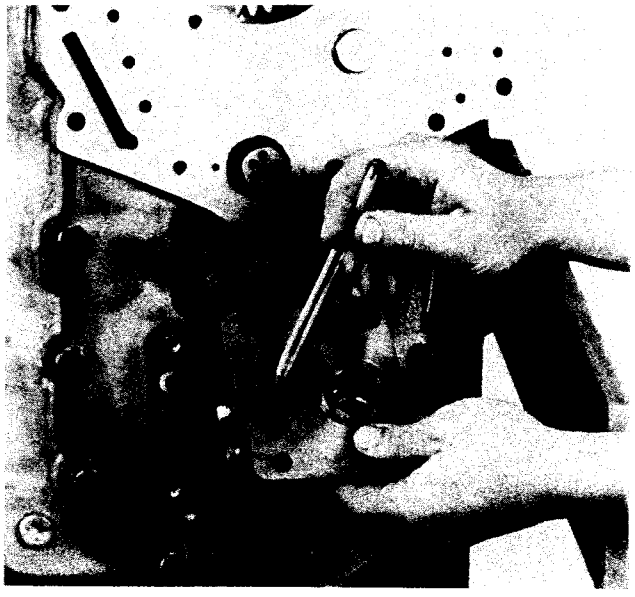


Figure 23
Remove oil distributor and "O" rings

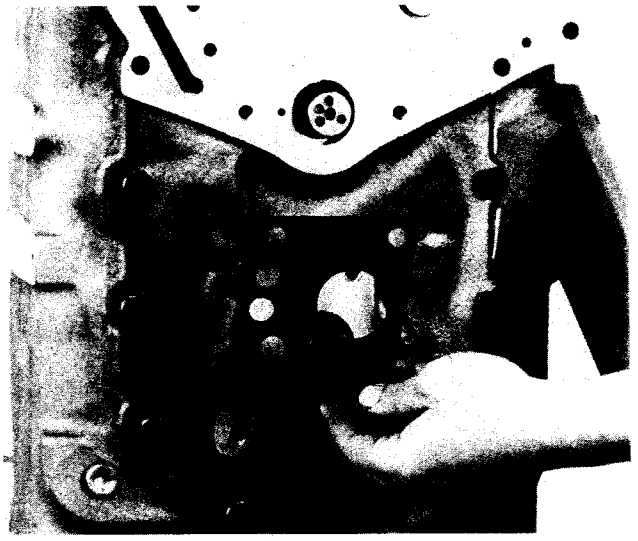


Figure 24
Remove distributor gasket.

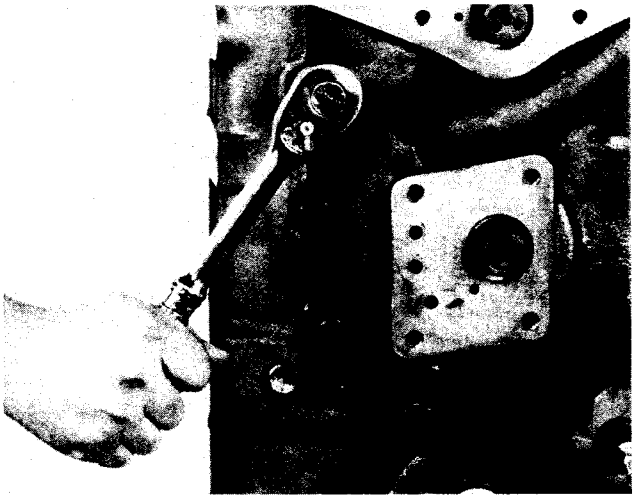


Figure 25
Remove spacer plate bolts and washers.

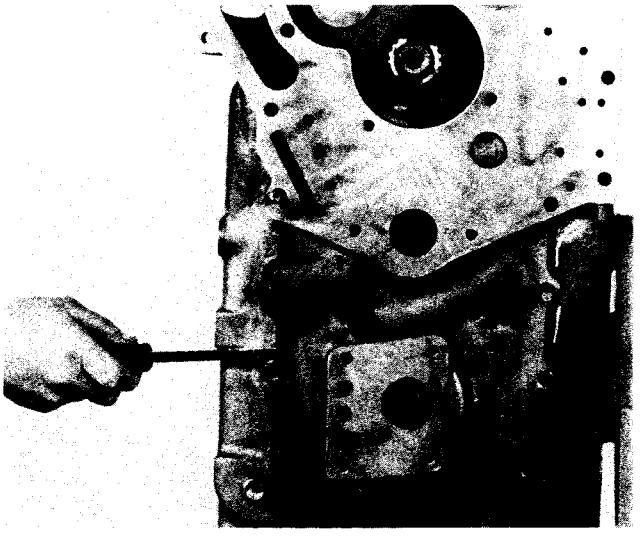


Figure 26
Pry spacer plate away from transmission case at dowel pin holes. Note aligning studs to facilitate spacer removal.

Figure 27
Remove spacer plate and gasket.

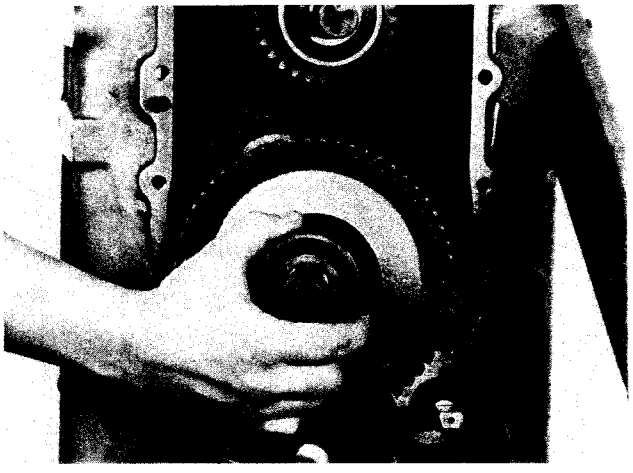


Figure 28
Remove 1st and 2nd clutch assembly.

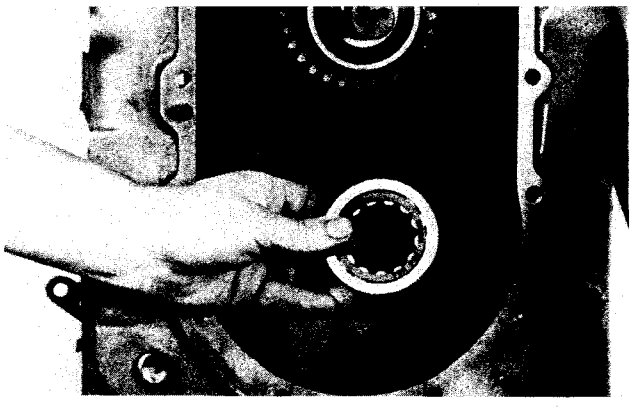


Figure 29
Remove clutch shaft rear bearing.

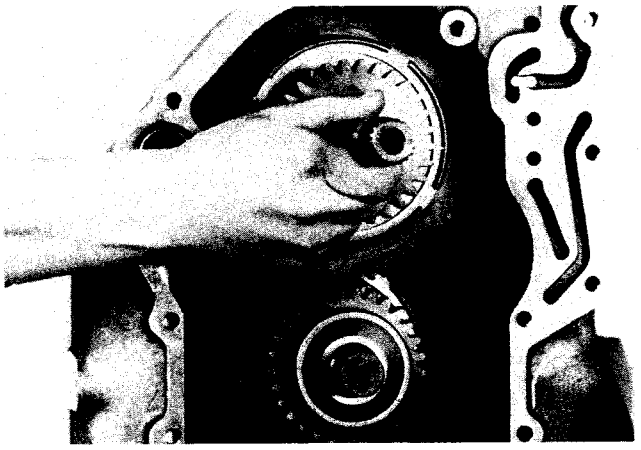


Figure 30
Remove forward and reverse clutch assembly.

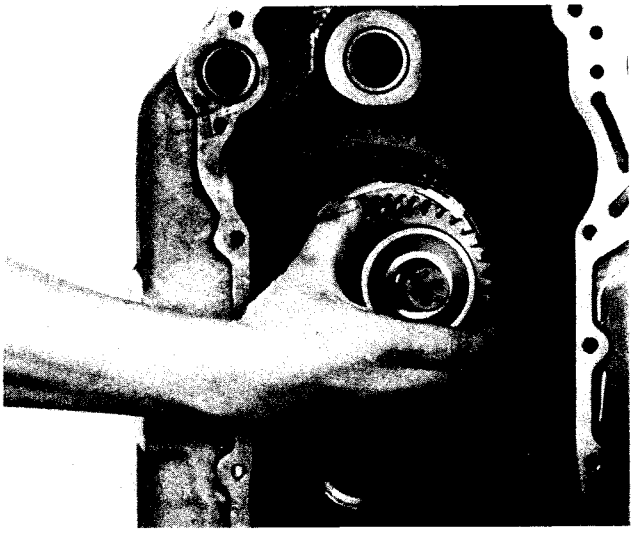


Figure 31
Remove high and 3rd clutch assembly. **NOTE:** A 3 speed will only have 3rd clutch.

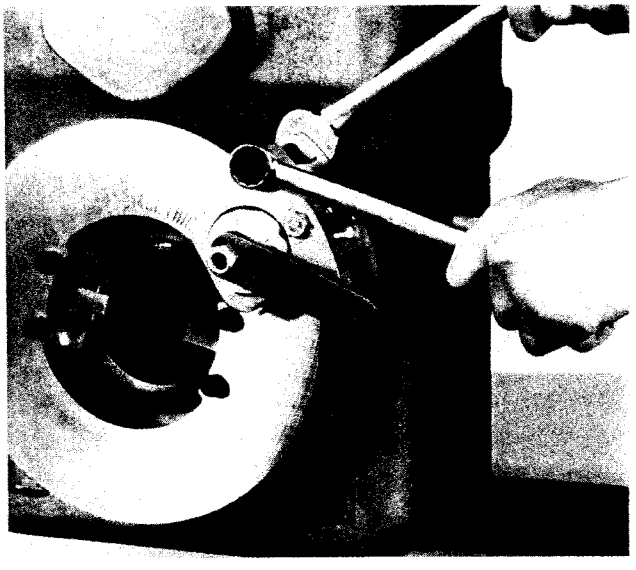


Figure 32
Remove parking brake caliper assembly bolts from brake and housing. **NOTE:** Brake is an option and will not be on all units.

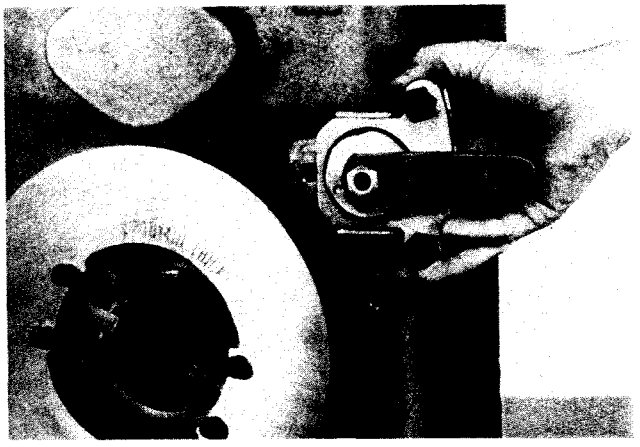


Figure 33
Remove brake caliper assembly.

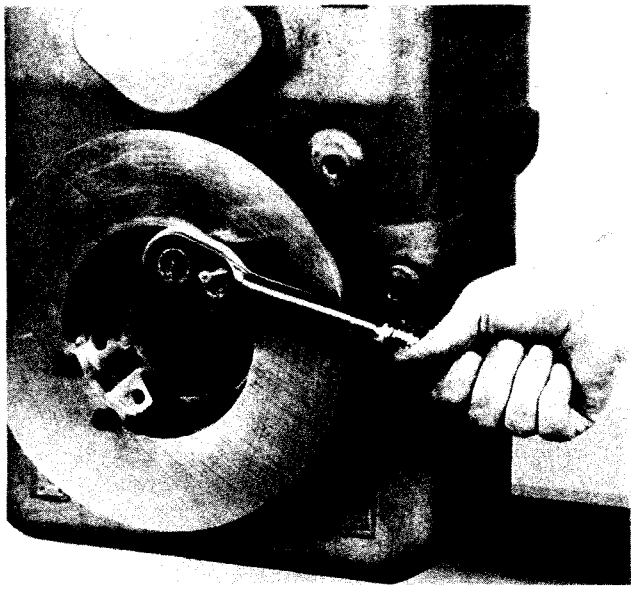


Figure 34
Remove brake disc to output flange capscrews.

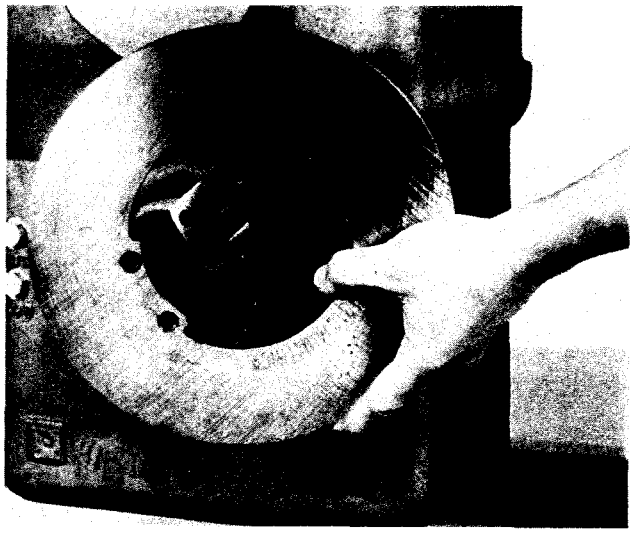


Figure 35
Remove brake disc. **NOTE:** If front axle disconnect is not used, proceed to Figure 41.

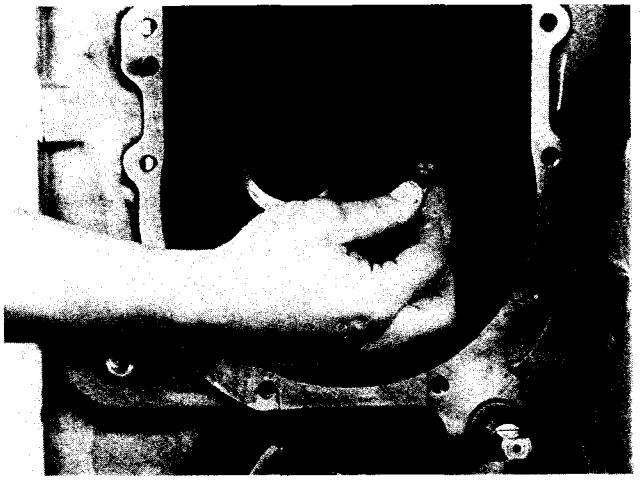


Figure 36
Remove shift fork to shift rail lockscrew.

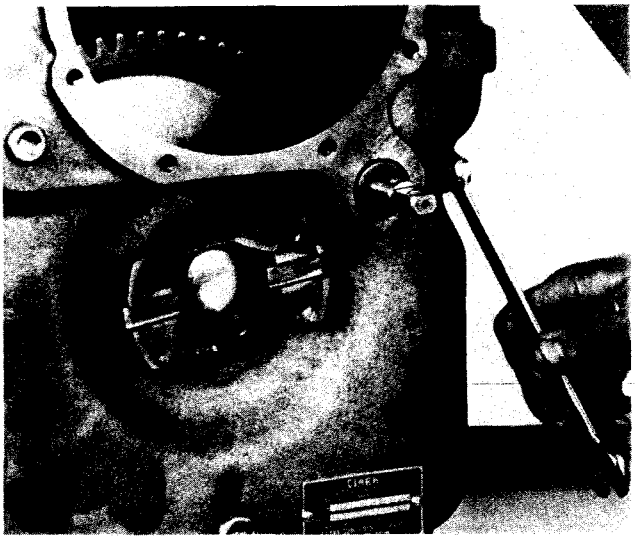


Figure 37
Remove shift rail detent spring plug and "O" ring.
Caution: Plug is under spring pressure.

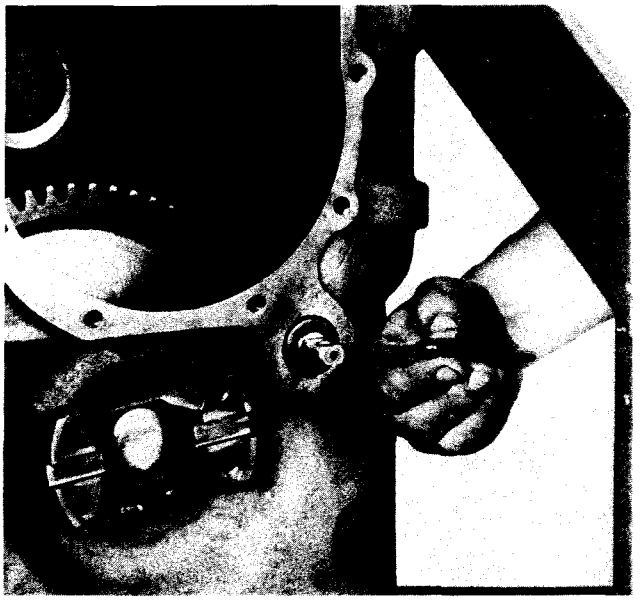


Figure 38
Remove detent spring, ball, and overshift stop pin.

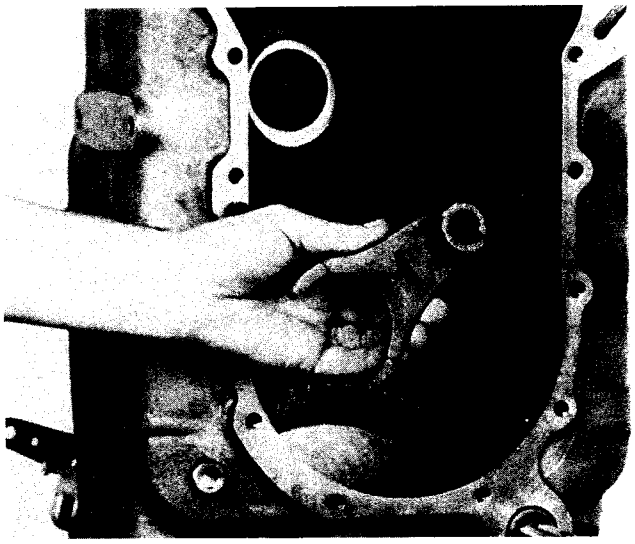


Figure 39
Remove shift fork.

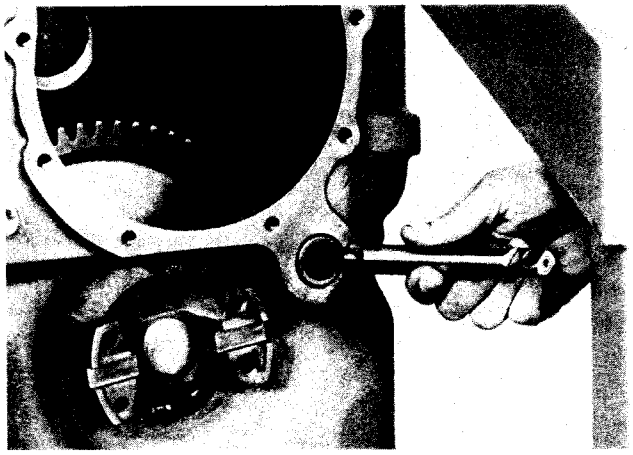


Figure 40
Remove shift rail.

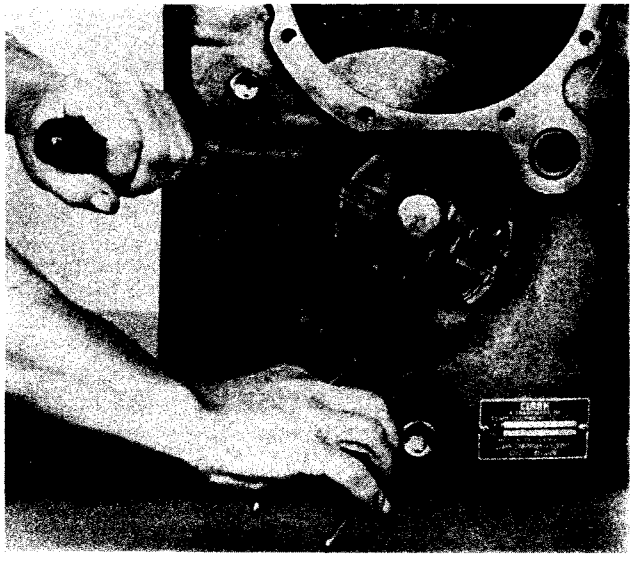


Figure 41
Remove front output flange retainer ring from ring groove. Carefully pry flange and seal assembly from bearing bore.

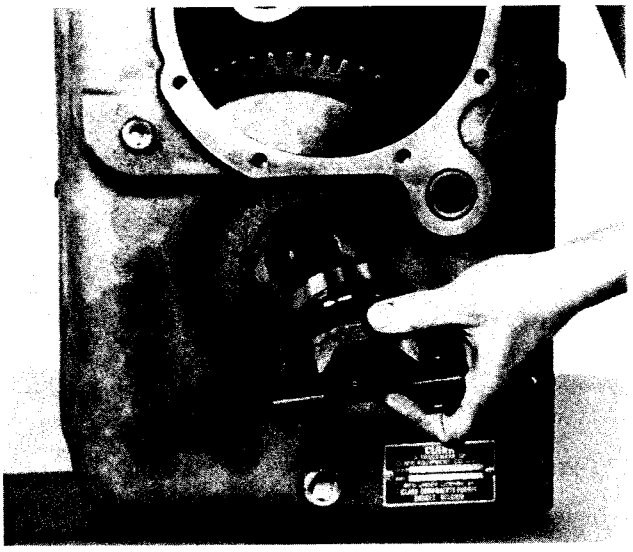


Figure 42
Remove flange, bearing and seal assembly.

Figure 43
Remove disconnect shift hub (used on models with disconnect only).

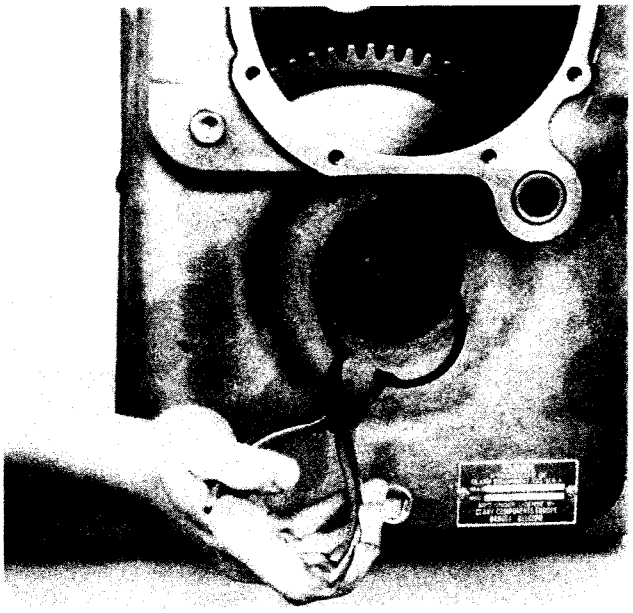


Figure 44
Remove front bearing locating ring.

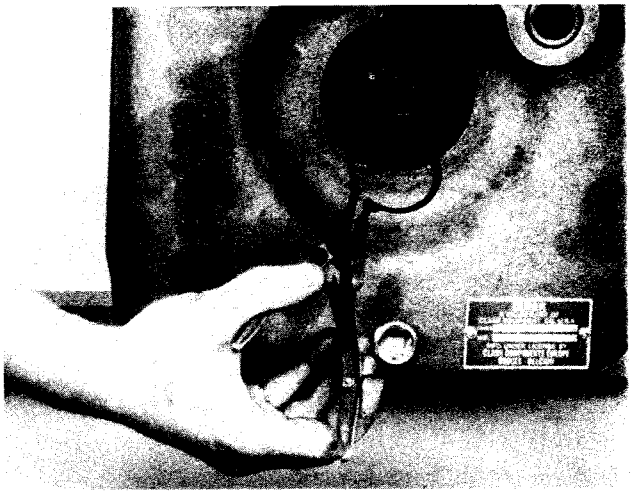


Figure 45
Remove output gear to shaft retainer ring.

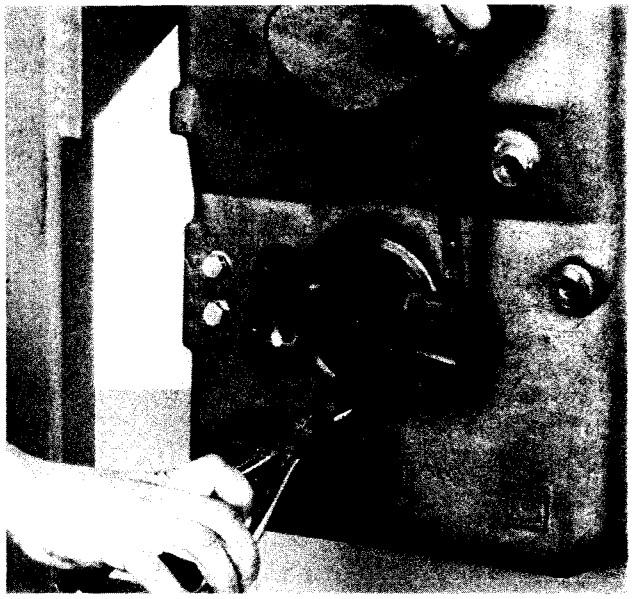


Figure 46
Remove rear output flange retainer ring from ring groove. Carefully pry flange and bearing assembly from bearing bore and output gear.

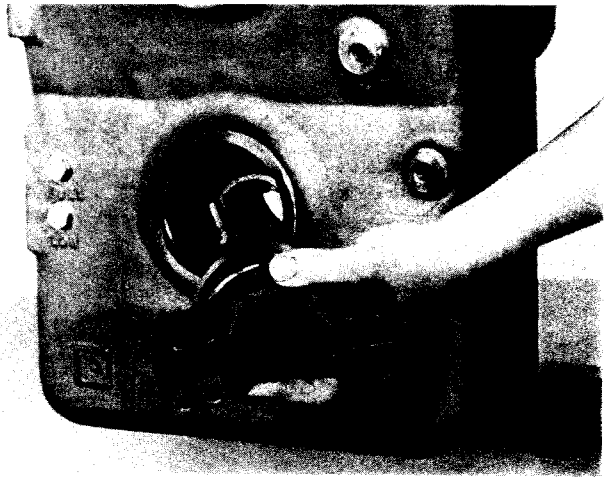


Figure 47
Remove flange, bearing and seal assembly.

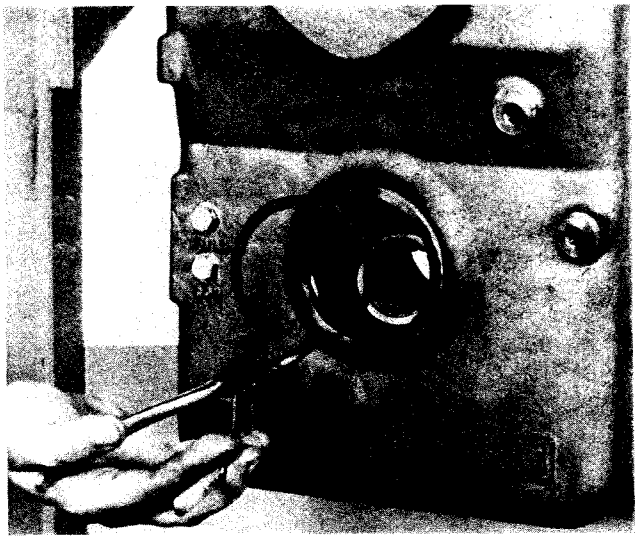


Figure 48
Remove rear bearing locating ring.

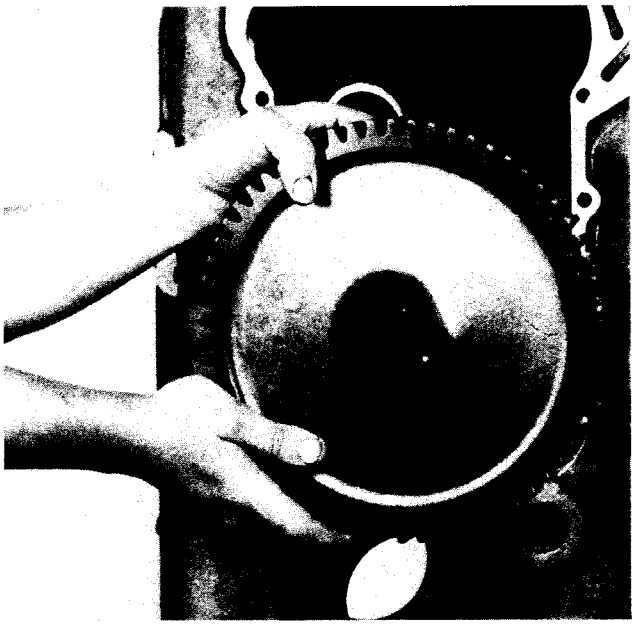


Figure 49
Remove output shaft gear.

Figure 50
Remove oil supply tube clip screw and clip.

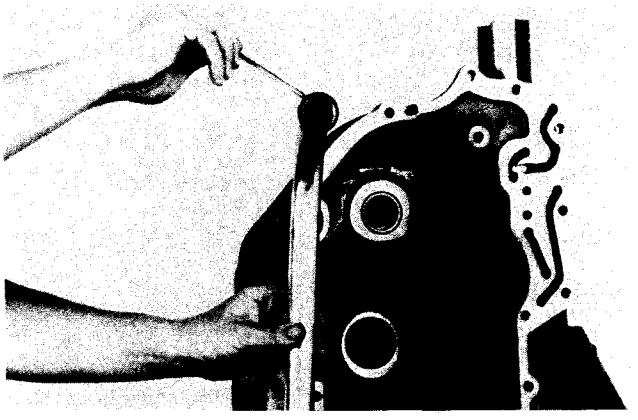


Figure 51
Remove supply tube and screen assembly.

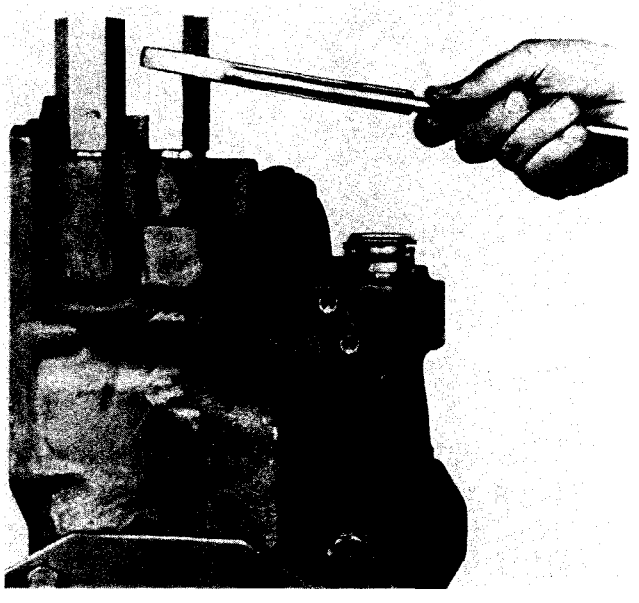


Figure 52
Remove modulator valve housing. **NOTE:** For single modulation and mechanical inching see page 86.

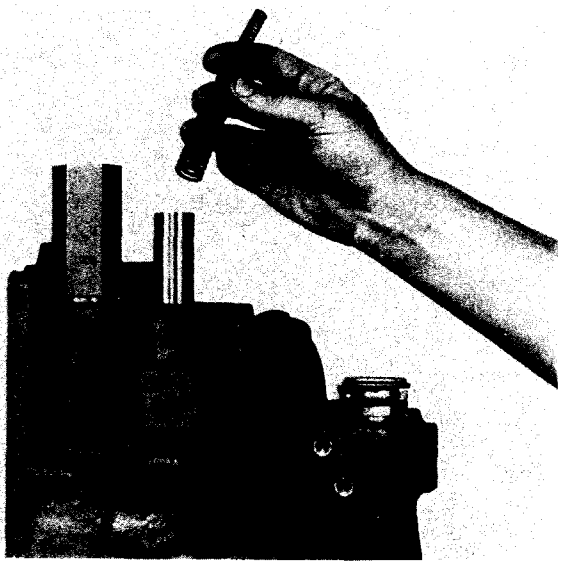


Figure 53
Remove inner, middle, and outer springs.

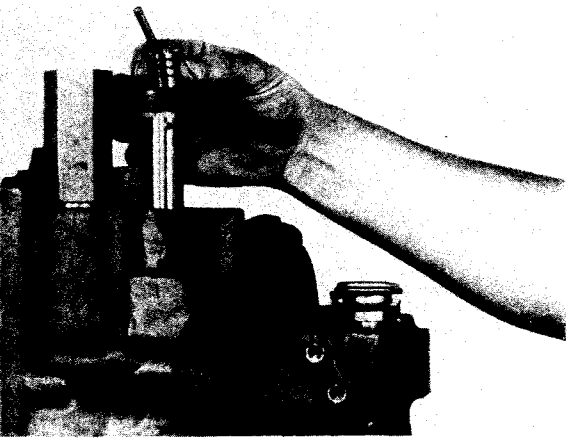


Figure 54
Remove valve spring stop pin and accumulator spool.

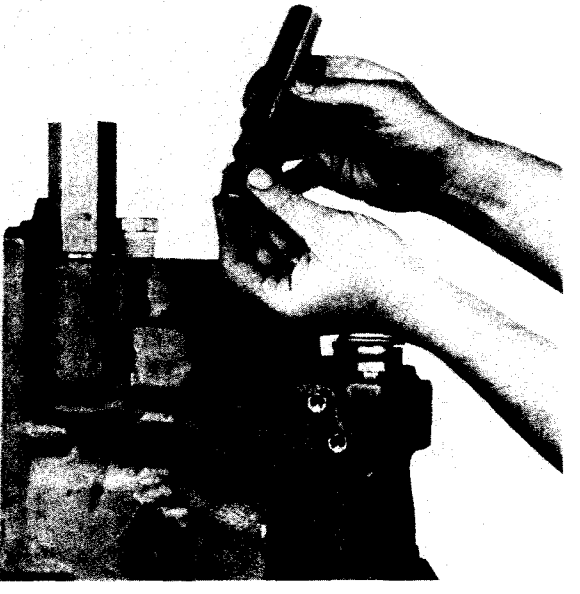


Figure 55
Remove modulator housing sleeve and regulator spool assembly.

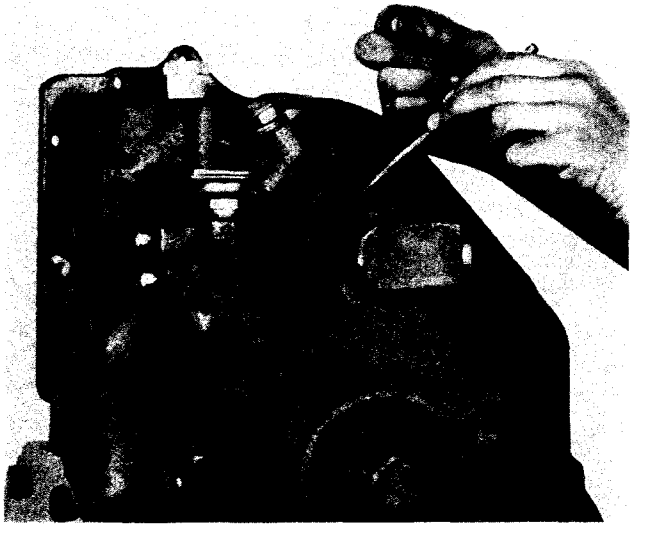


Figure 56
Remove oil sleeve distributor lockscrew plug. Remove lockscrew.

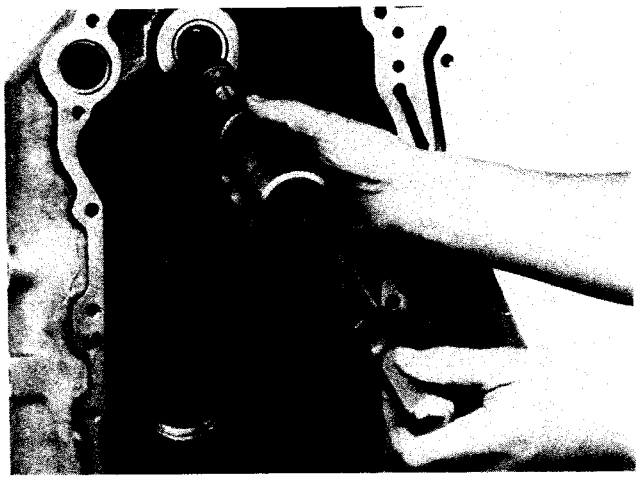


Figure 57
Use a hammer puller as shown to remove distributor sleeve and pilot bearing.

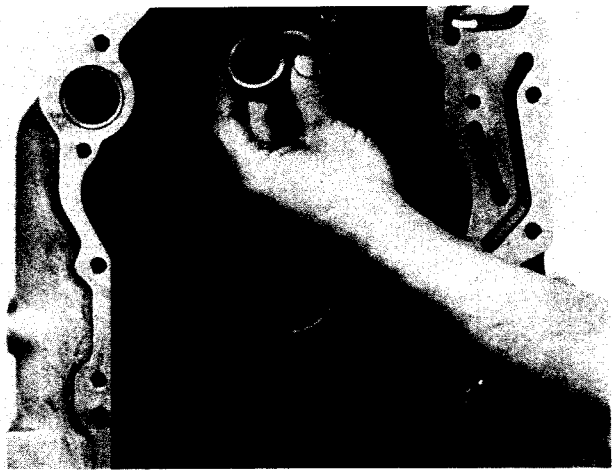


Figure 58
Pilot bearing and oil distributor sleeve removed.

DISASSEMBLY AND REASSEMBLY OF LOW (1ST) AND 2ND CLUTCH

DISASSEMBLY
LOW (1ST) BEING DISASSEMBLED

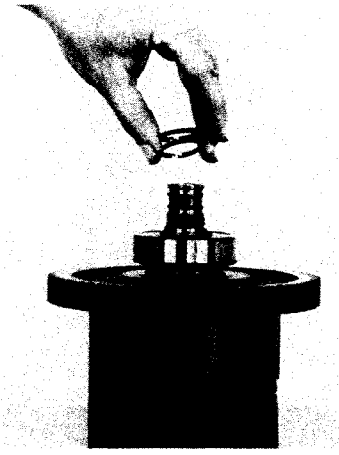


Figure 59
Remove clutch shaft oil sealing rings.

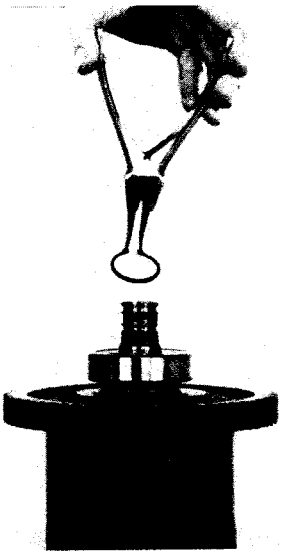


Figure 60
Remove front bearing retainer ring.

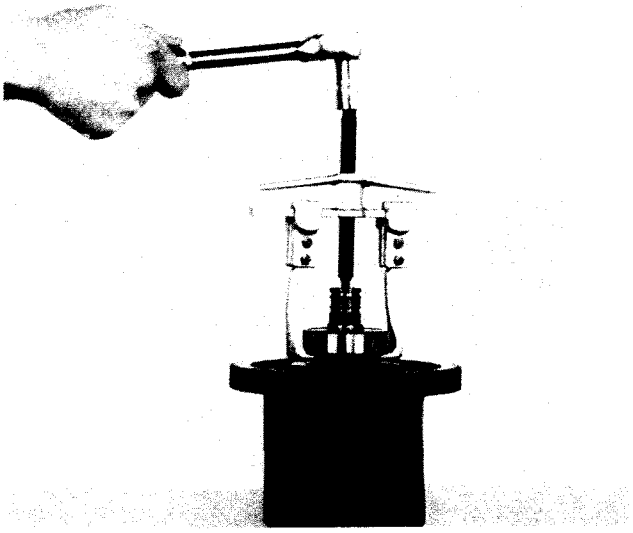


Figure 61
Remove front bearing.

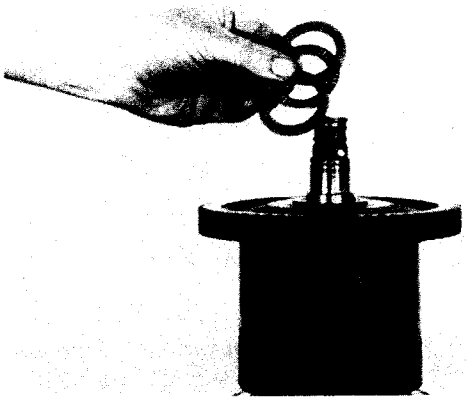


Figure 62
Remove outer thrust washer, bearing, and inner thrust washer.

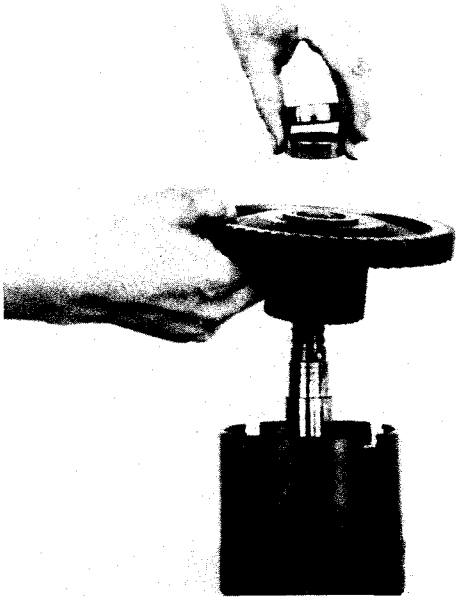


Figure 63
Remove clutch gear and disc hub. Remove clutch gear bearings.

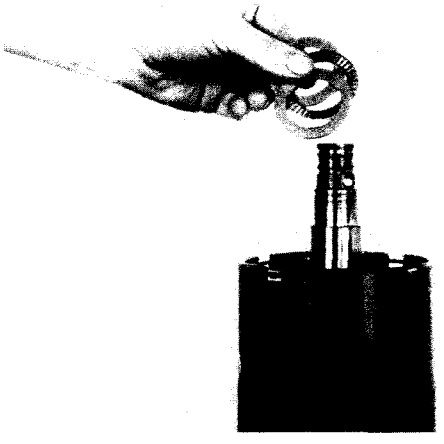


Figure 64
Remove outer thrust washer, thrust bearing, and inner thrust washer.

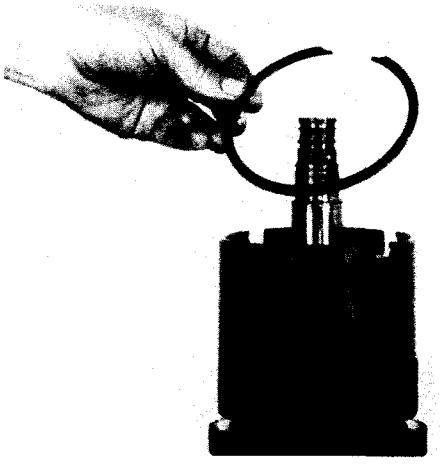


Figure 65
Remove clutch disc end plate retainer ring.

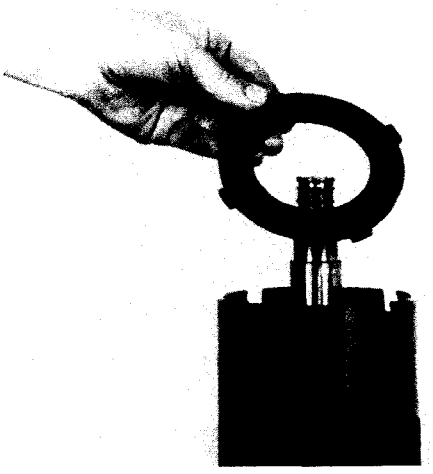


Figure 66
Remove clutch disc end plate.

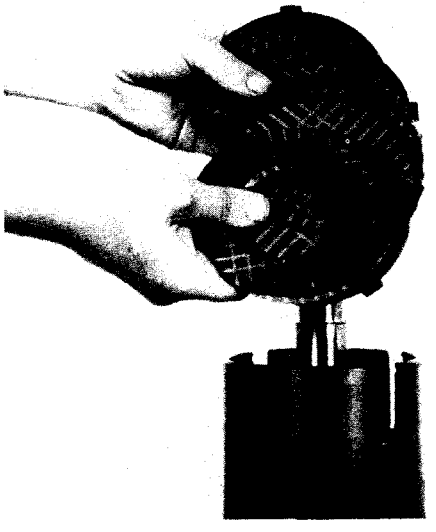


Figure 67
Remove inner and outer clutch discs.

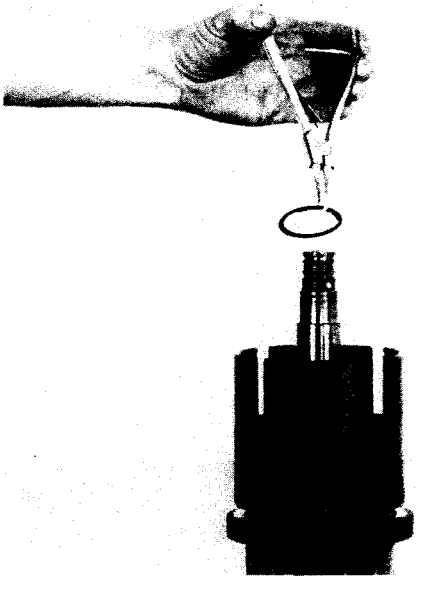


Figure 68
Compress disc springs and remove retainer ring.

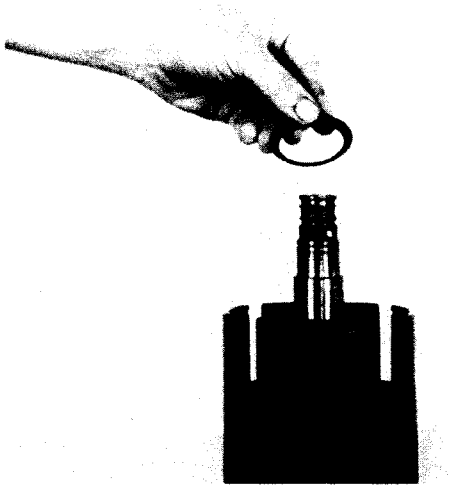


Figure 69
Remove retainer ring retainer.

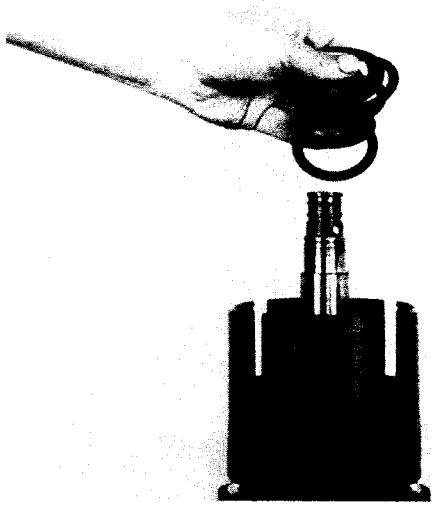


Figure 70
Remove disc springs. **NOTE:** See page 71.

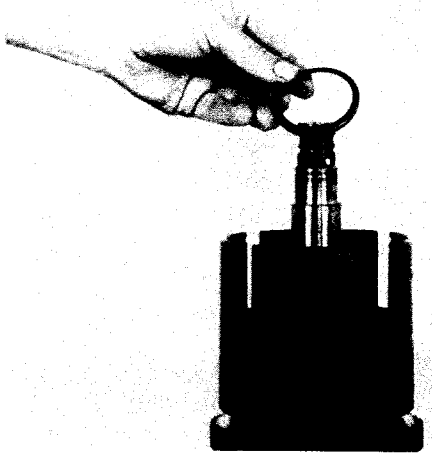


Figure 71
Remove clutch piston wear plate.

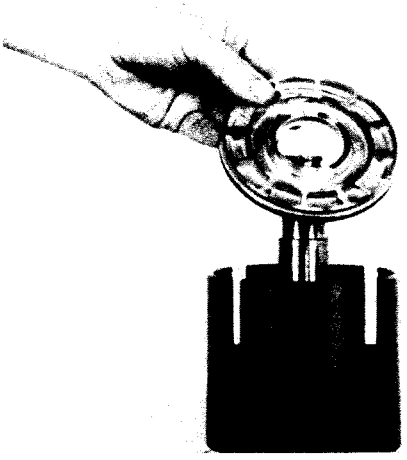


Figure 72
Turn clutch over and tap clutch shaft on a block of wood to remove clutch piston.

2ND CLUTCH DISASSEMBLY

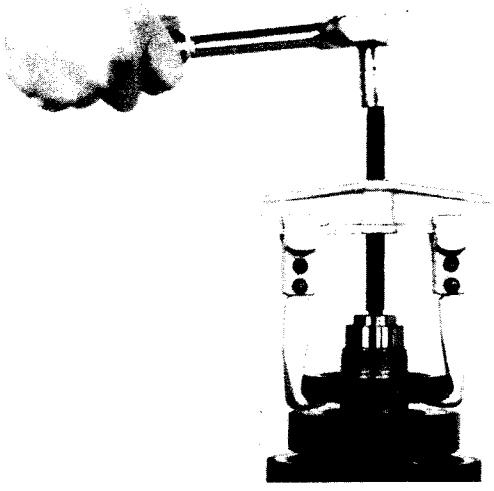


Figure 73
Using a gear puller as shown, remove gear and rear bearing inner race.

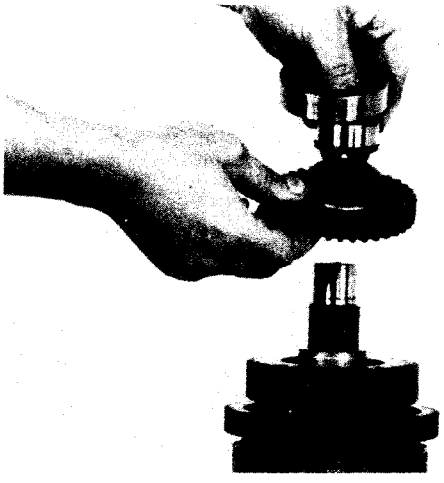


Figure 74
Remove inner race and 3rd clutch driven gear. **NOTE:** Clutch shaft rear bearing was removed in Figure 29.

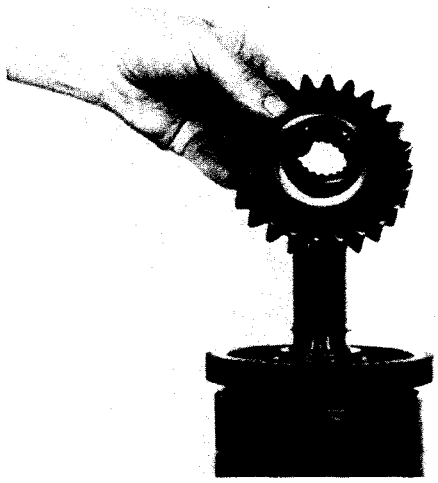


Figure 75
Remove output drive gear from shaft.

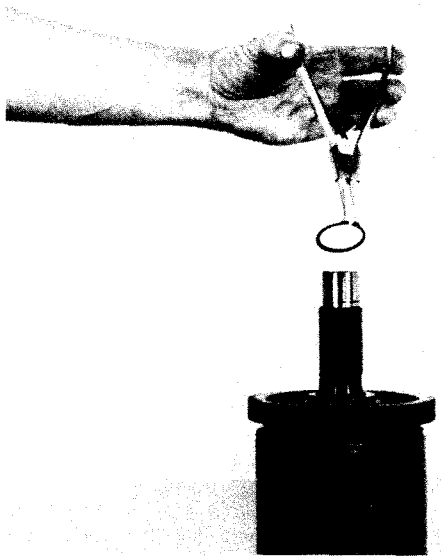


Figure 76
Remove gear locating ring from shaft.

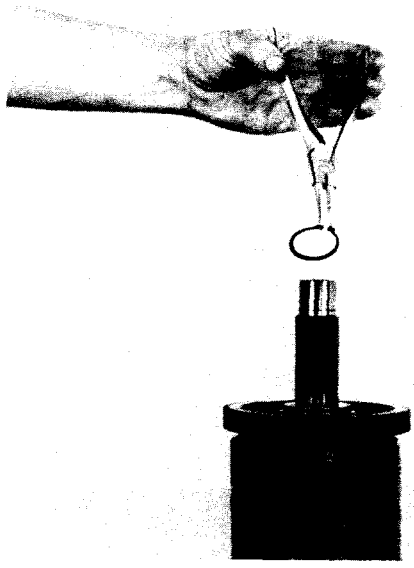


Figure 77
Remove thrust bearing and clutch gear retainer ring.

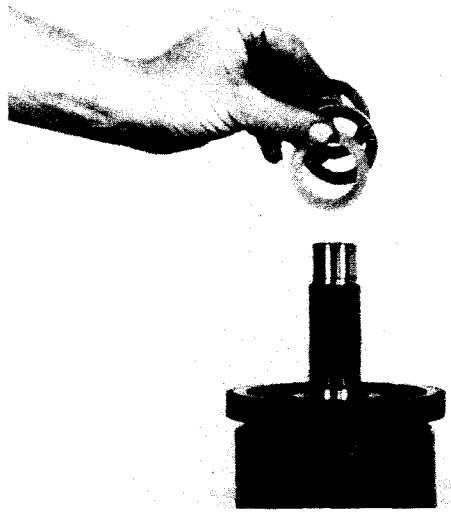


Figure 78
Remove outer thrust washer, thrust bearing, and inner thrust washer.

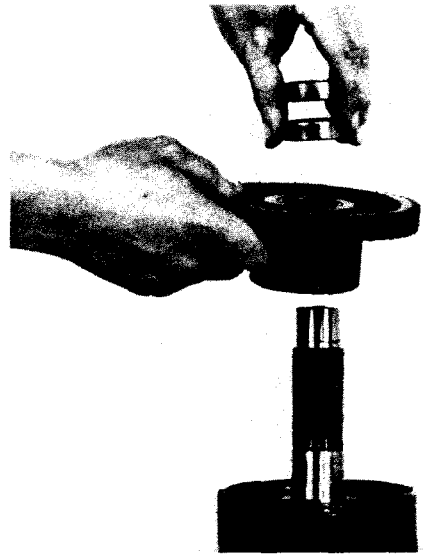


Figure 79
Remove clutch gear and hub and gear bearings.

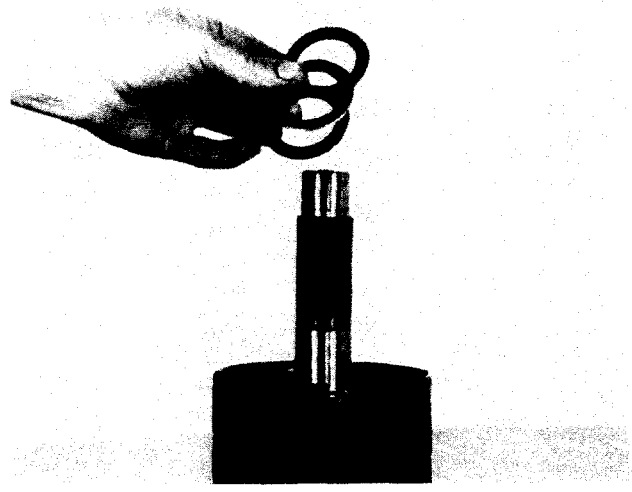


Figure 80
Remove outer thrust washer, thrust bearing, and inner thrust washer.

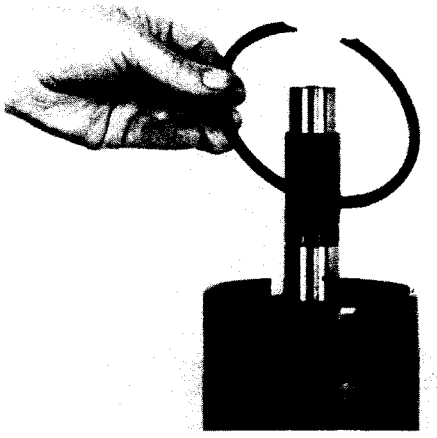


Figure 81
Remove clutch disc end plate retainer ring.

Figure 82
Remove end plate.

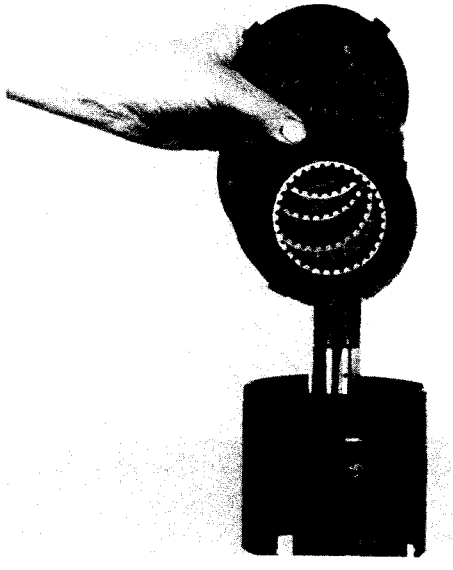


Figure 83
Remove clutch discs.

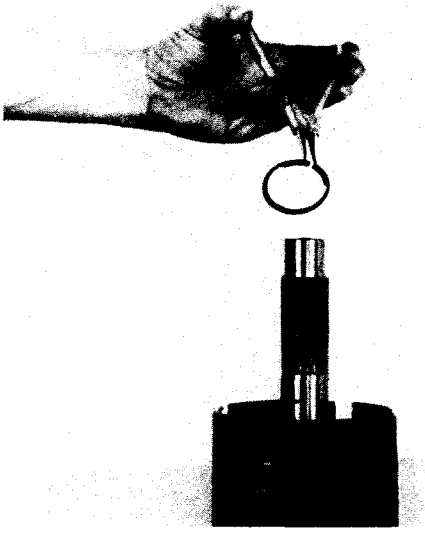


Figure 84
Compress disc springs and remove retainer ring.

Figure 85
Remove retainer ring retainer.

Figure 86
Remove disc springs. **NOTE:** See page 71.

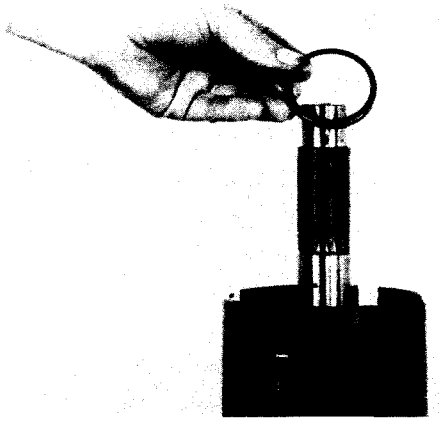


Figure 87
Remove clutch piston wear plate.

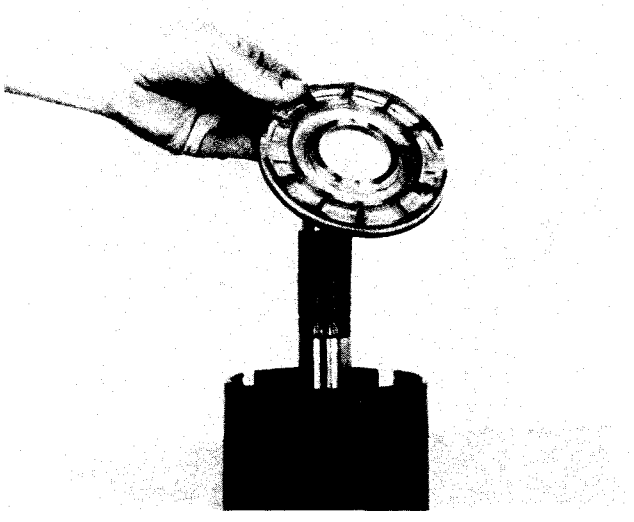


Figure 88
Remove clutch piston.

REASSEMBLY OF LOW (1ST) AND 2ND CLUTCH ASSEMBLY
(See Cleaning and Inspection Page)

2ND CLUTCH BEING REASSEMBLED

Figure 89
Two bleed valves in clutch drum must be clean and free of any foreign material.

Figure 90
Install clutch piston outer seal ring.

Figure 91
Install clutch piston inner seal ring. **NOTE:** Ring must be sized before installing in clutch drum. Sizing is best accomplished by rotating piston while holding a round object against the new seal ring. Rotate piston until seal ring is flush with ring groove in piston.

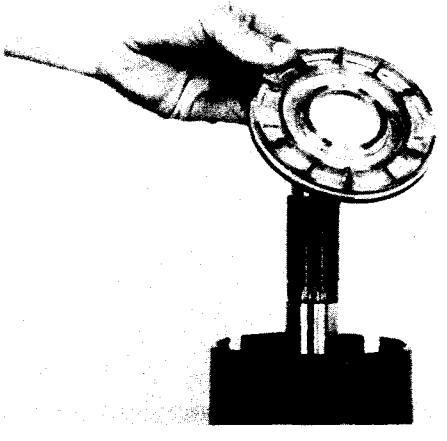


Figure 92
Position piston in clutch drum, using caution as not to damage piston sealing rings.

Figure 93
Install clutch piston wear plate.

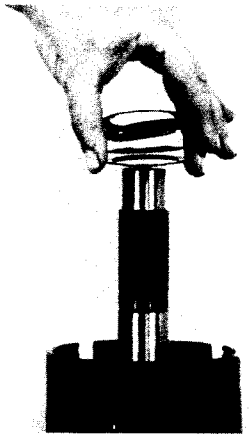


Figure 94
Install piston return disc springs. First spring with large diameter of bevel toward wear plate. Alternate five (5) springs. **NOTE:** See page 71.

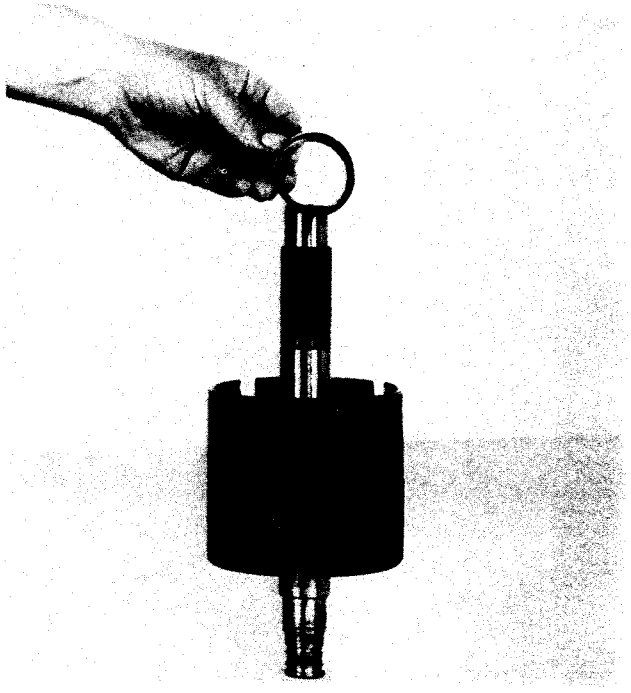


Figure 95
Position return spring ring retainer on clutch shaft.

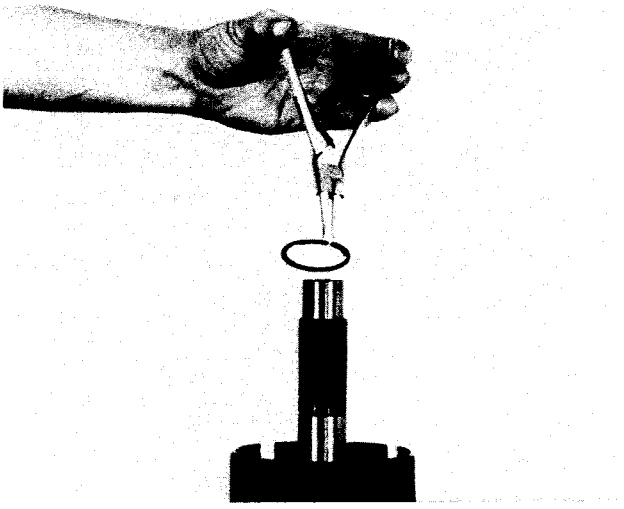


Figure 96
Start ring on shaft with snap ring pliers. Use a sleeve with the proper inner diameter to fit over shaft and against retainer ring. A sharp blow with a soft hammer will compress springs and seat retainer ring. Be sure ring is in full position in groove.

Figure 97
Install first steel (outer) clutch disc.

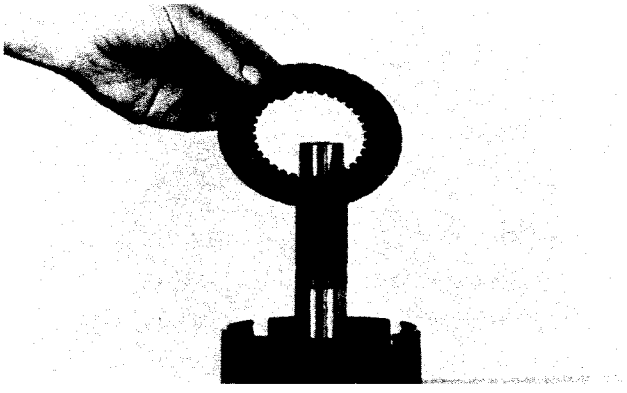


Figure 98
Install first friction (inner) clutch disc. Alternate steel and friction until five (5) steel and five (5) friction discs are in position.

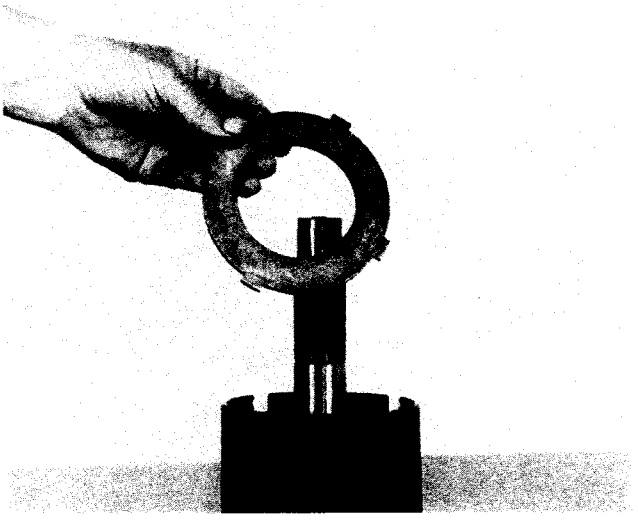


Figure 99
Install clutch disc end plate.

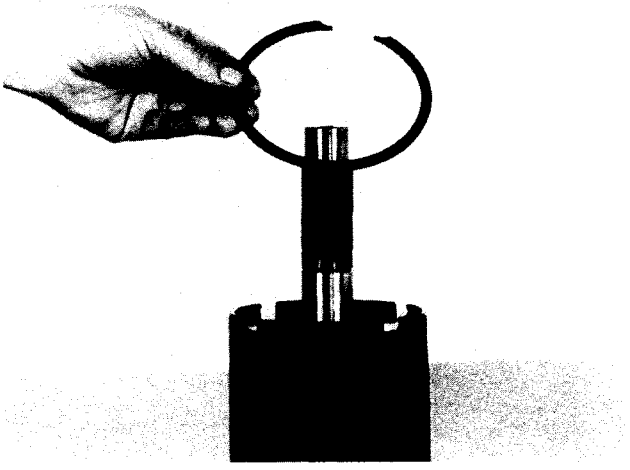


Figure 100
Install end plate retainer ring.

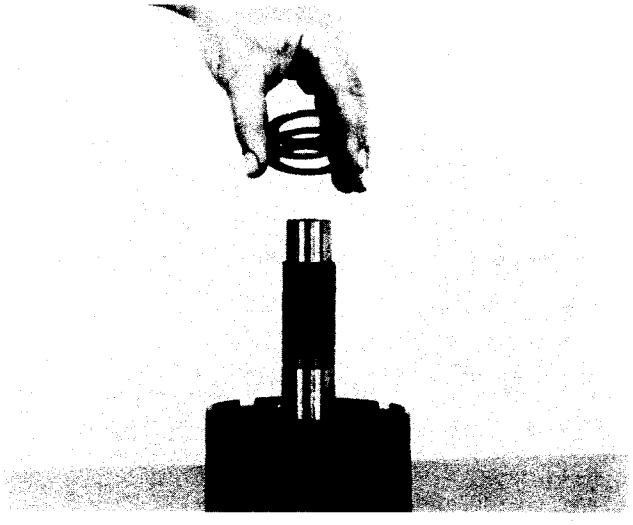


Figure 101
Position thrust bearing inner washer on clutch shaft. Install outer thrust bearing washer against thrust bearing. Position thrust bearing on clutch shaft against inner thrust bearing washer.

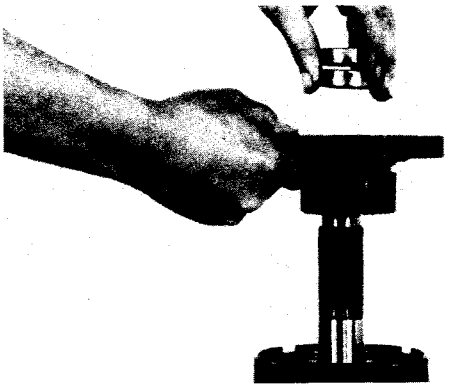


Figure 102
Press needle bearings in clutch gear and disc hub, being certain bearings are pressed flush with face of gear on both sides. Install the clutch gear in the clutch assembly by aligning the clutch hub teeth with the clutch inner discs. Be sure the clutch hub is in full position in the clutch assembly. Do not force this operation.

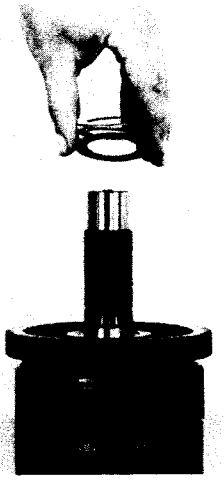


Figure 103
Position thrust bearing inner washer on clutch shaft. Position thrust bearing on clutch shaft against inner thrust bearing washer. Install outer thrust bearing washer against bearing.

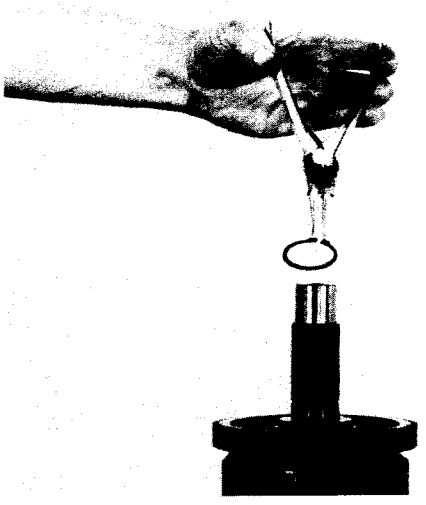


Figure 104
Install thrust washer retainer ring.

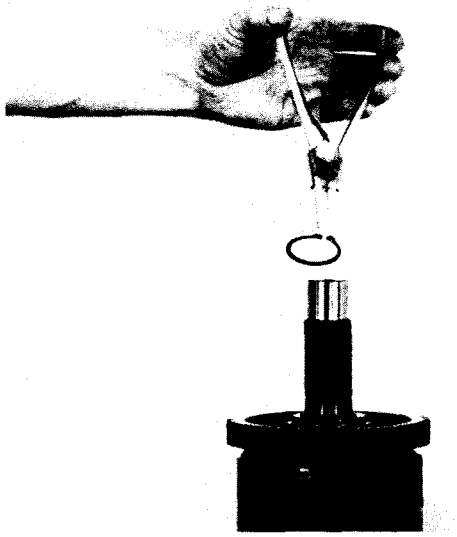


Figure 105
Install clutch shaft gear locating ring.

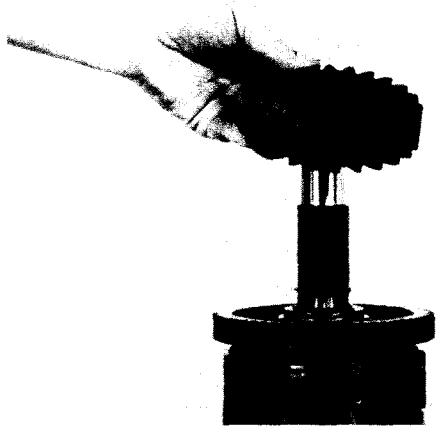


Figure 106
Install clutch shaft output drive gear on clutch shaft with long hub of gear up.

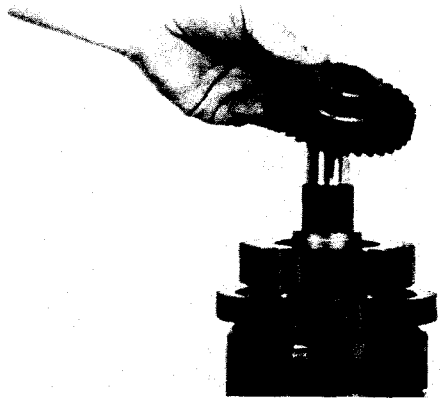


Figure 107
Install 3rd driven gear on clutch shaft with long hub of gear up.

Figure 108
Install rear bearing inner race on clutch shaft with bearing race shoulder down.

REASSEMBLY OF LOW (1ST) CLUTCH
(See cleaning and inspection page)

Figure 109
Install clutch piston outer seal ring.

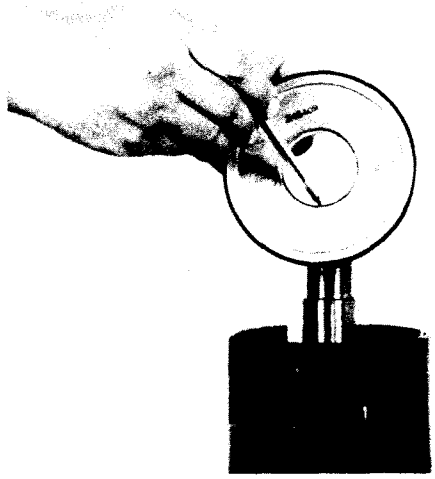


Figure 110
Install inner clutch piston seal ring. Size inner ring as explained in Figure 91.

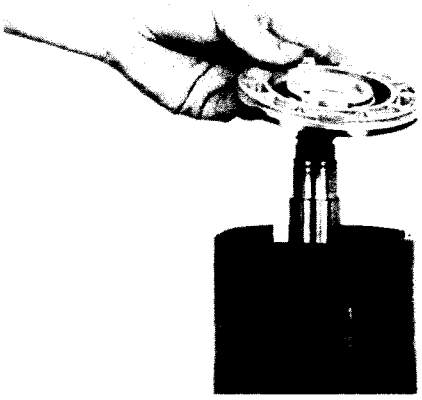


Figure 111
Position piston in low clutch drum as shown. Use caution as not to damage inner and outer piston sealing rings.

Figure 112
Position clutch piston wear plate on piston.

Figure 113
Install piston return disc springs. First spring with large diameter of bevel toward wear plate. Alternate seven (7) springs. **NOTE:** See page 71.

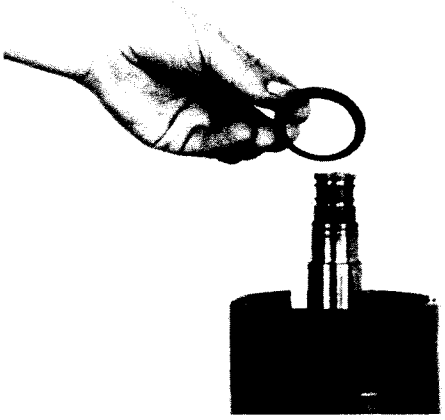


Figure 114
Position return spring retainer on clutch shaft.

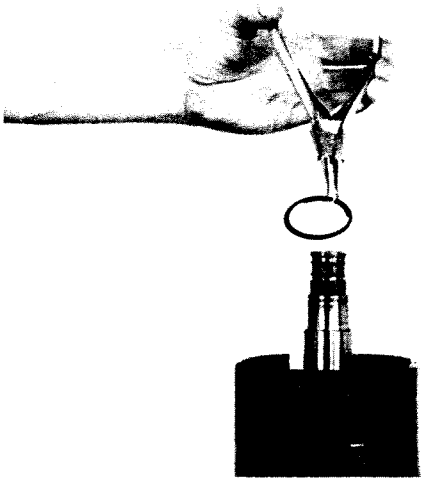


Figure 115
Start ring on shaft with snap ring pliers.

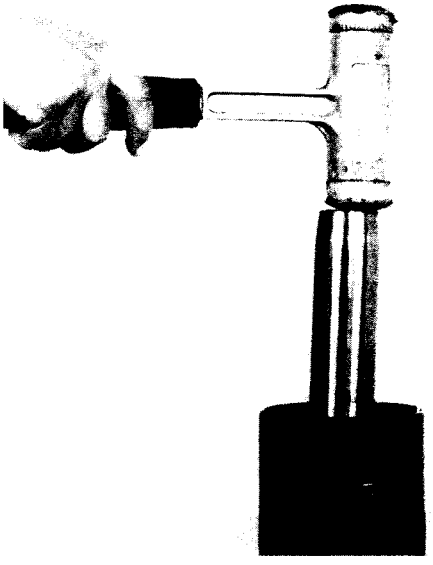


Figure 116
Use a sleeve with the proper inner diameter to fit over shaft and against retainer ring. A sharp blow with a soft hammer will compress springs and seat retainer ring. Be sure ring is in full position in groove.

Figure 117
Install first steel (outer) clutch discs.

Figure 118
Install first friction (inner) clutch disc. Alternate steel and friction until ten (10) steel and ten (10) friction discs are in position.

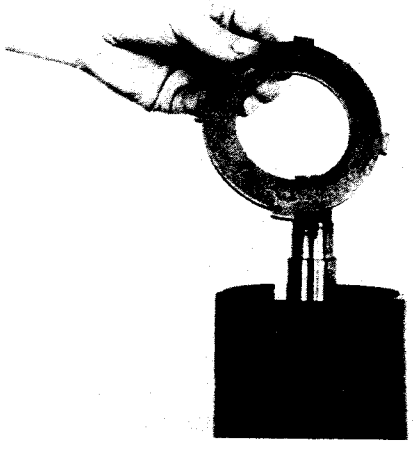


Figure 119
Install clutch disc end plate.

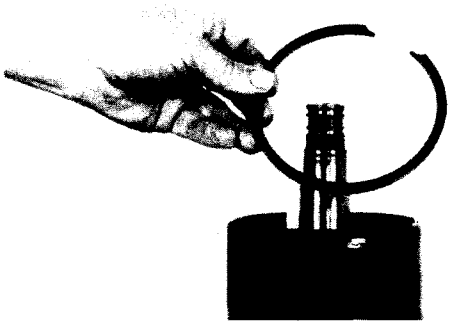


Figure 120
Install end plate retainer ring.

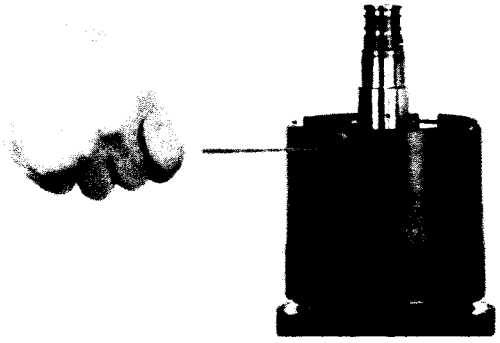


Figure 121
NOTE: Low (1st) clutch pack must be checked for clutch disc clearance.

Stand the clutch assembly on end as shown.

Measure the distance between the clutch end plate and the end plate retainer ring by inserting a feeler gauge or taper gauge through the slots in the clutch drum.

The required clearance is .080-.135 [2,03-3,43].

If the clearance is greater than .135 [3,43], add one steel disc under the end plate.

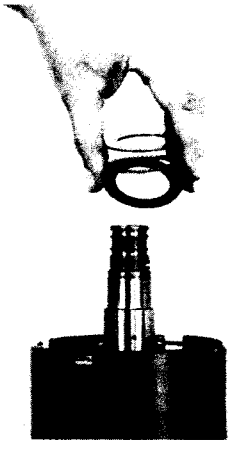


Figure 122
Position thrust bearing inner washer on clutch shaft. Position thrust bearing on clutch shaft against inner thrust bearing washer. Install outer thrust bearing washer against bearing.

Figure 123
Press bearings in clutch gear and disc hub, being certain bearings are pressed flush with face of gear on both sides. Install the clutch gear in the clutch assembly by aligning the clutch hub teeth with the clutch inner discs. Be sure the clutch hub is in full position in the clutch assembly. Do not force this operation.

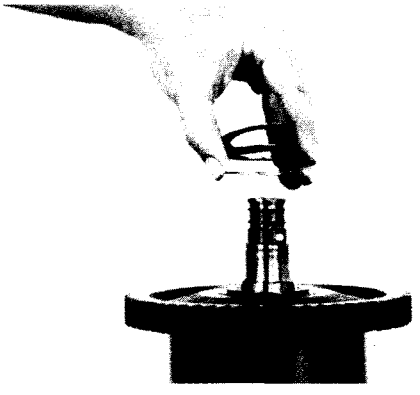


Figure 124
Position inner thrust washer on shaft. Position thrust bearing on shaft. Position outer thrust washer on shaft.

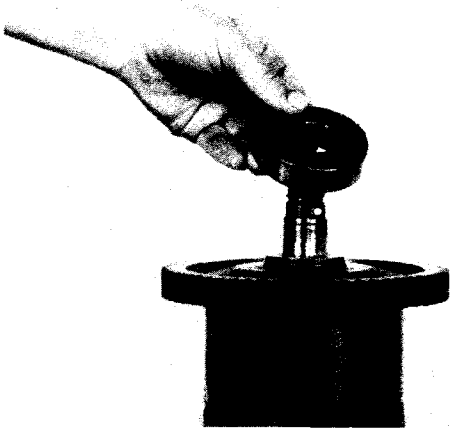


Figure 125
Install clutch shaft front bearing. **NOTE:** Bearing has a shield in it. This shield must be up.

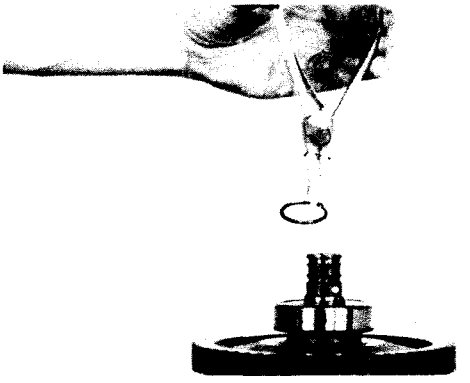


Figure 126
Install front bearing retainer ring.

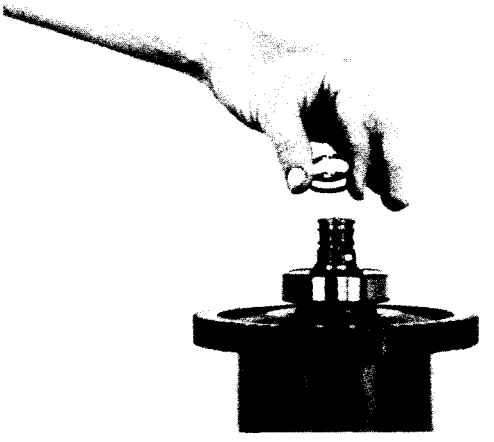


Figure 127
Install clutch shaft oil sealing rings. Grease rings to facilitate reassembly into front housing.

DISASSEMBLY AND REASSEMBLY OF 3RD AND 4TH (HIGH) CLUTCH 4TH CLUTCH USED ON 4 & 6 SPEED MODELS ONLY

DISASSEMBLY

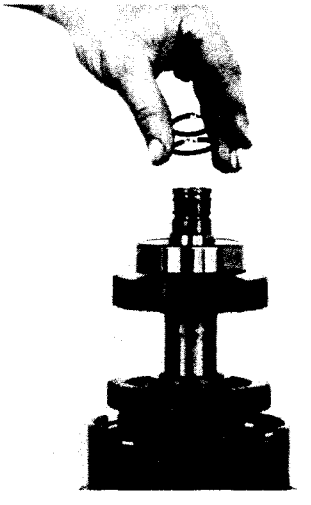


Figure 128
Remove clutch shaft oil sealing rings.

4TH CLUTCH (HIGH) DISASSEMBLY

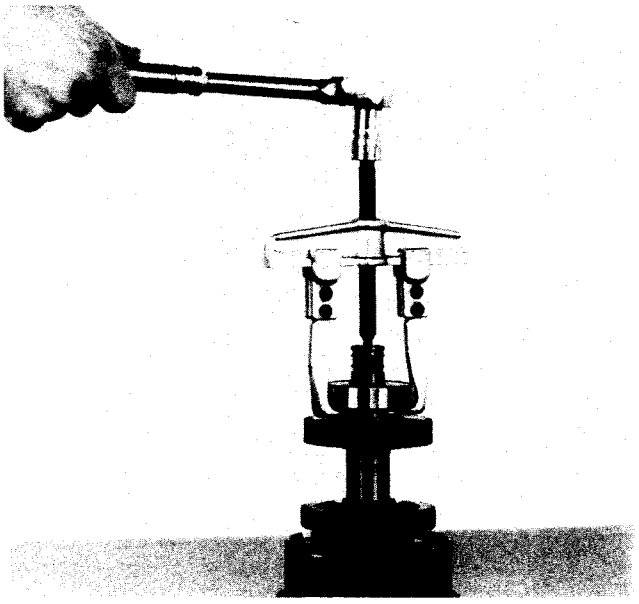


Figure 129
Using a gear puller as shown, remove front bearing.

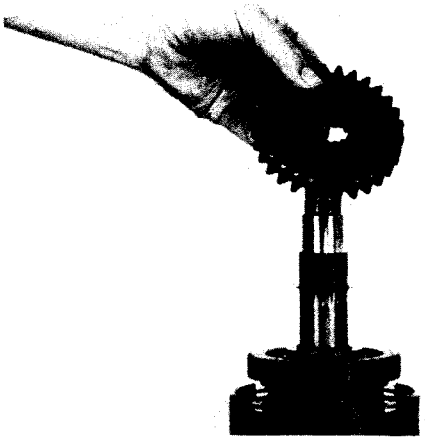


Figure 130
Remove clutch gear.

Figure 131
Remove clutch gear locating ring. For 3 speed models, proceed to Figure 144.

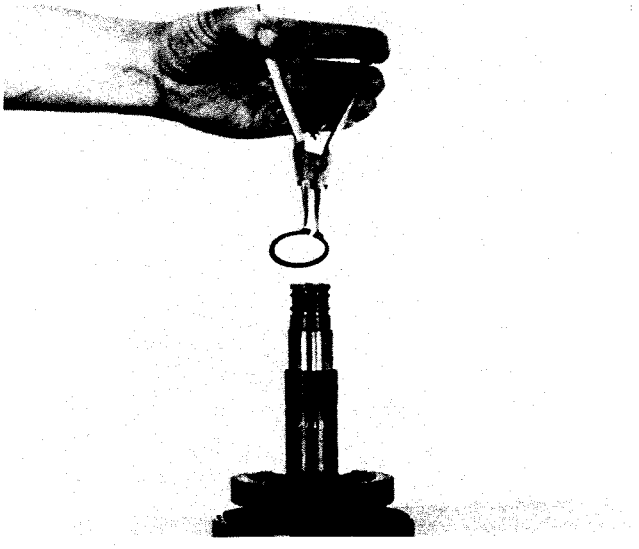


Figure 132
Remove outer thrust washer retainer ring.

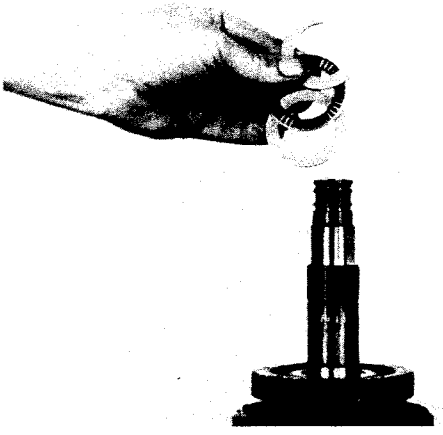


Figure 133
Remove outer thrust washer, thrust bearing, and inner thrust washer.

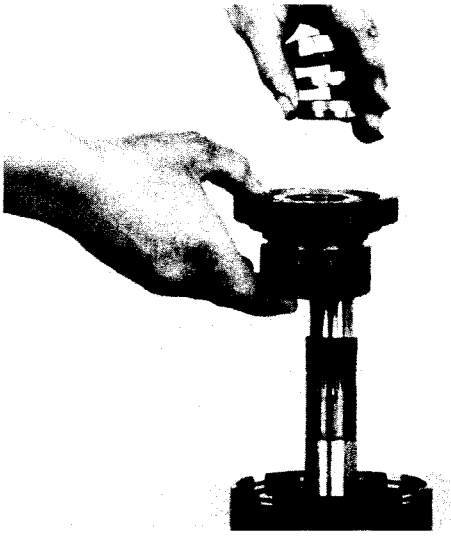


Figure 134
Remove clutch gear and disc hub. Remove bearings and spacer from clutch gear.

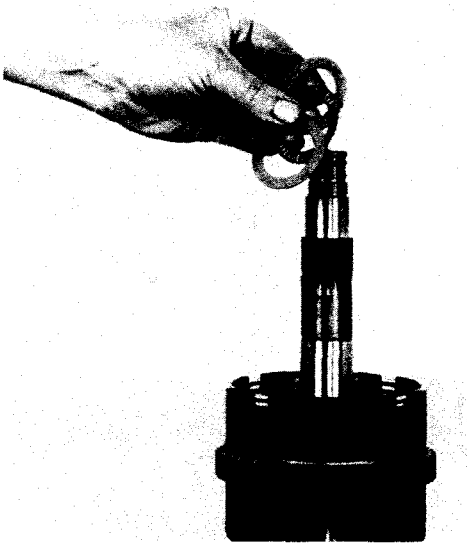


Figure 135
Remove outer thrust washer, thrust bearing, and inner thrust washer.

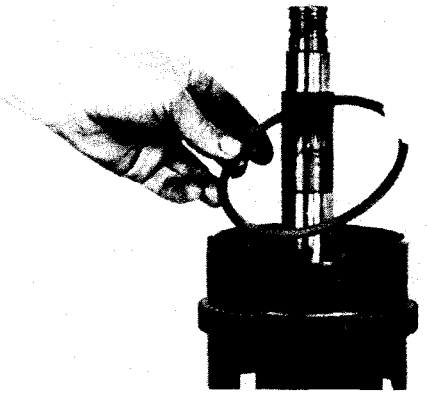


Figure 136
Remove end plate retainer ring.

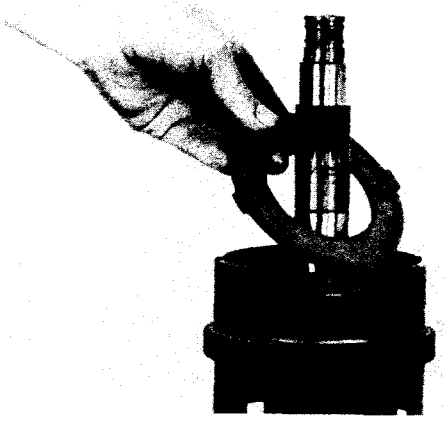


Figure 137
Remove end plate.

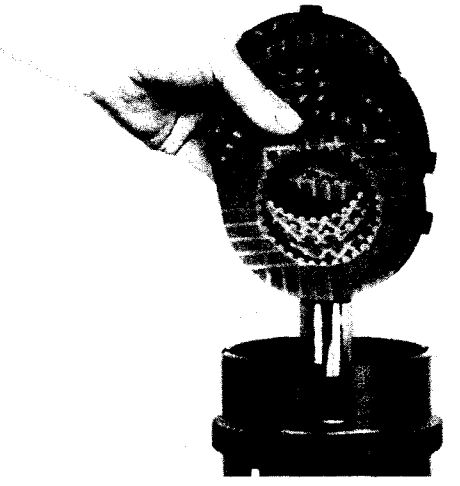


Figure 138
Remove clutch discs.

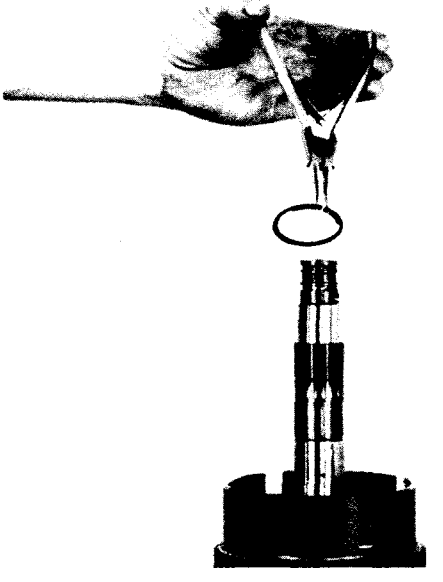


Figure 139
Compress disc springs and remove retainer ring.

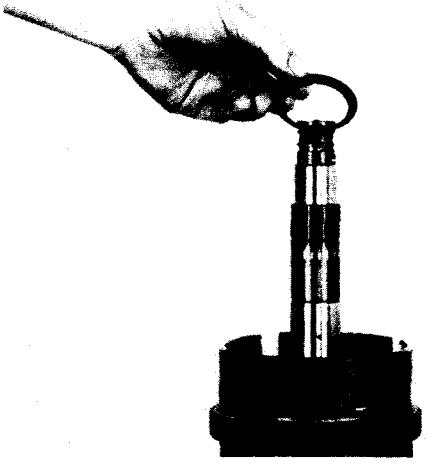


Figure 140
Remove retainer ring retainer.

DISASSEMBLY OF (3RD) CLUTCH

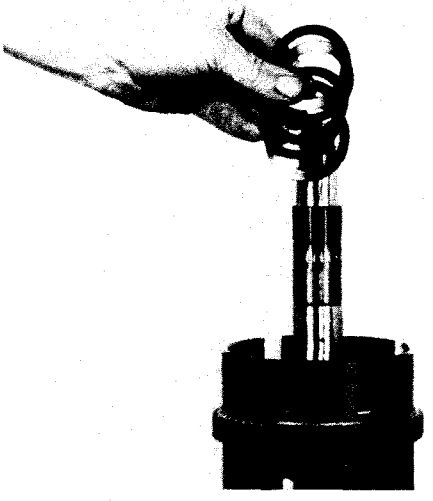


Figure 141
Remove disc springs. **NOTE:** See page 71.

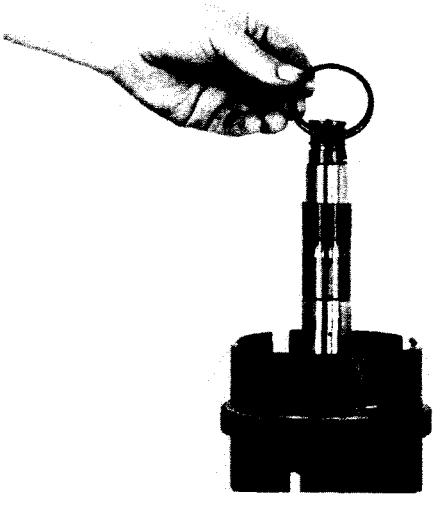


Figure 142
Remove clutch piston wear plate.

Figure 143
Remove clutch piston.

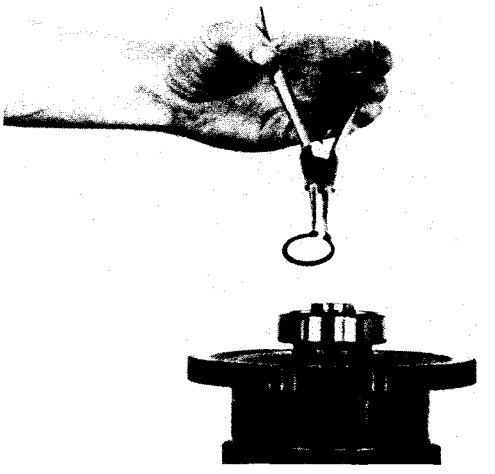


Figure 144
Remove 3rd clutch rear bearing retainer ring.

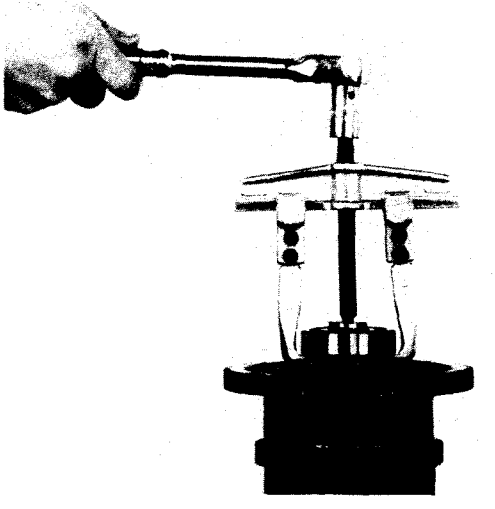


Figure 145
Remove bearing.

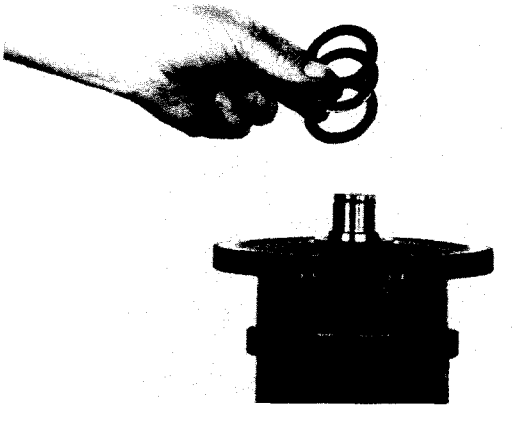


Figure 146
Remove outer thrust washer, thrust bearing, and inner thrust washer.

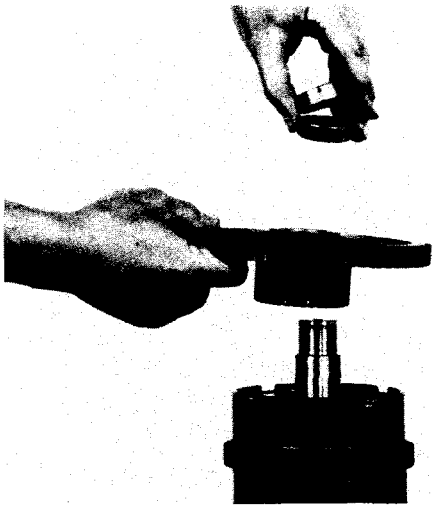


Figure 147
Remove 3rd gear and gear bearings.

Figure 150
Remove end plate.

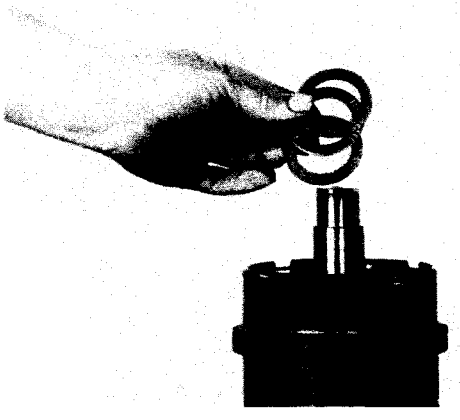


Figure 148
Remove outer thrust washer, thrust bearing, and inner thrust washer.

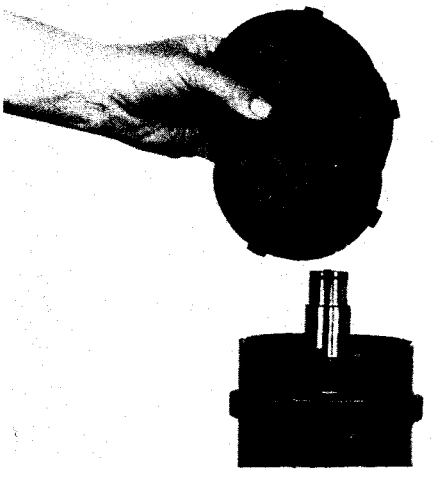


Figure 151
Remove clutch discs.

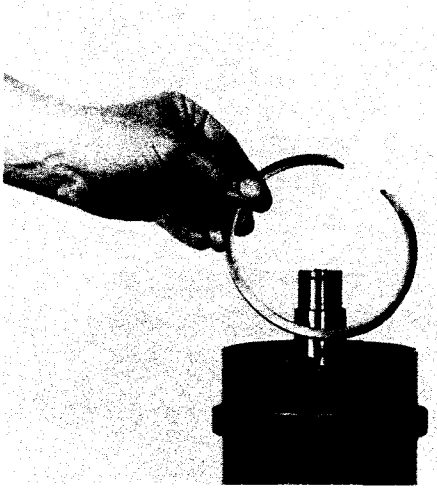


Figure 149
Remove end plate retainer ring.

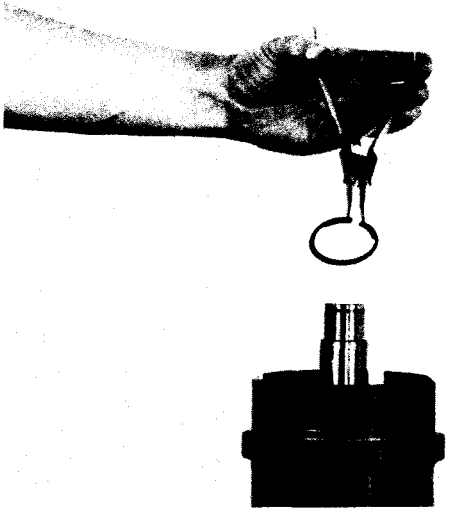


Figure 152
Compress disc springs and remove retainer ring.

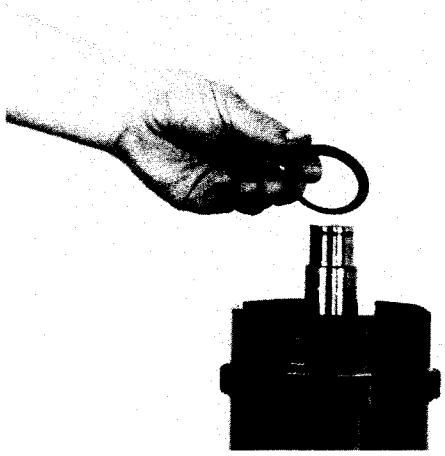


Figure 153
Remove retainer ring retainer.

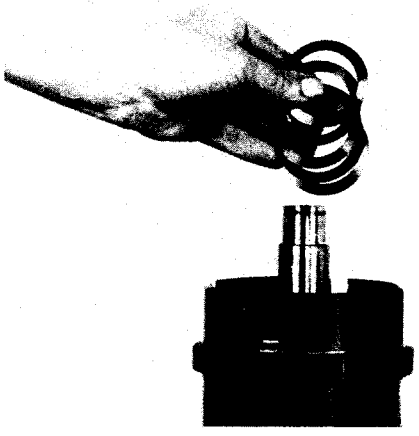


Figure 154
Remove disc springs. **NOTE:** See page 71.

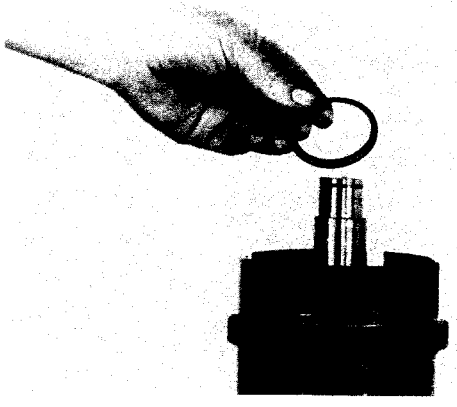


Figure 155
Remove clutch piston wear plate.

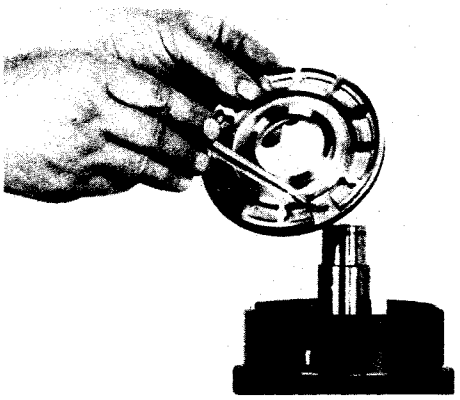


Figure 156
Remove clutch piston.

REASSEMBLY OF 4TH (HIGH) CLUTCH
(See cleaning and inspection page)

(For 3 speed, proceed to Figure 177)

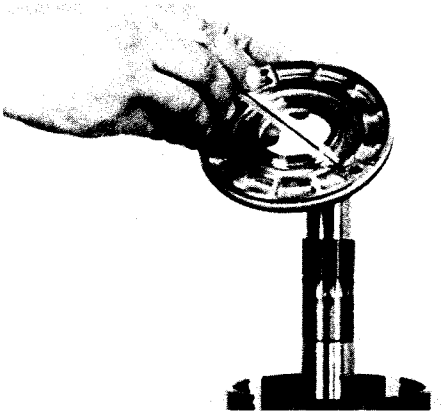


Figure 157
Clutch piston bleed ball must be clean and free of any foreign material.

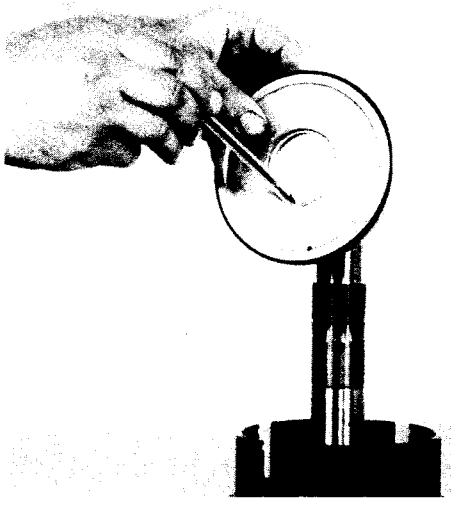


Figure 158
Install inner and outer clutch piston seal rings. Size inner ring as explained in Figure 91. Install clutch piston in clutch drum. Use caution as not to damage sealing rings.

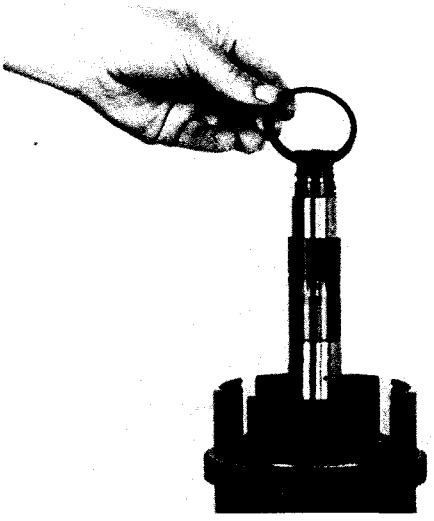


Figure 159
Install clutch piston wear plate.

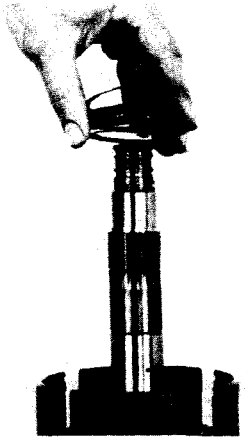


Figure 160
Install piston return disc springs. First spring with large diameter of bevel toward wear plate. Alternate five (5) springs. **NOTE:** See page 71.

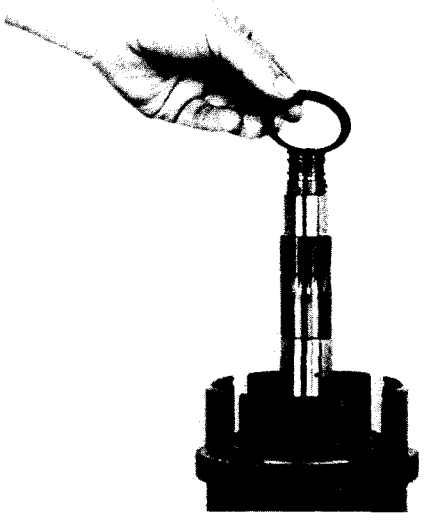


Figure 161
Position return spring ring retainer on clutch shaft.

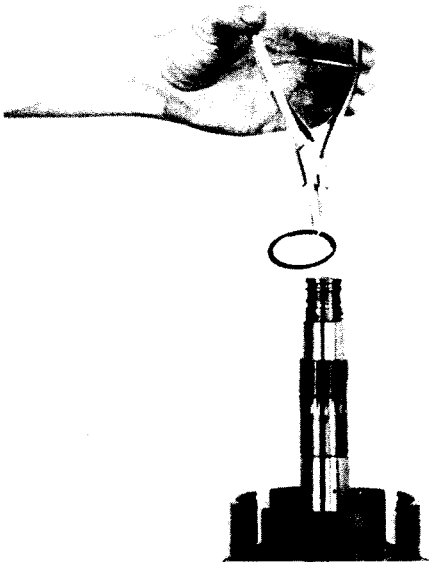


Figure 162
Start ring on shaft with snap ring pliers.

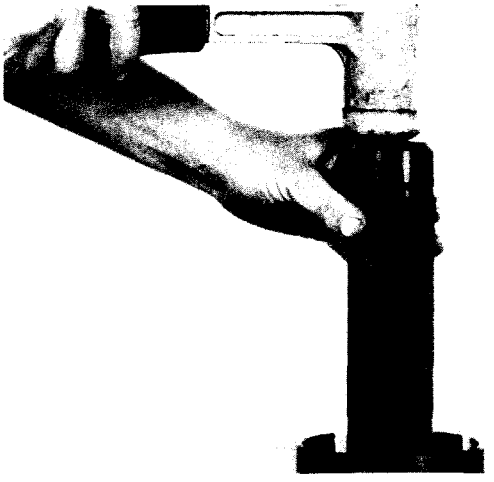


Figure 163
Use a sleeve with the proper inner diameter to fit over shaft and against retainer ring. A sharp blow with a soft hammer will compress springs and seat retainer ring. Be sure ring is in full position in groove.

Figure 164
Install first steel (outer) clutch disc.

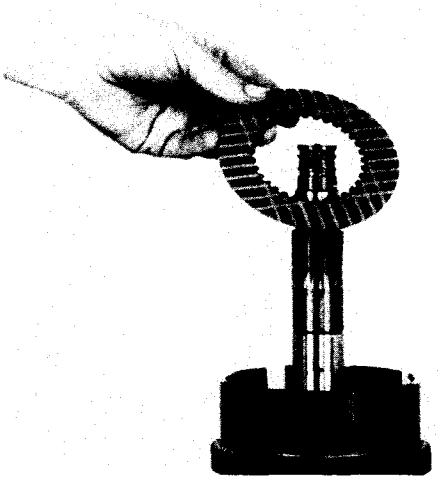


Figure 165
Install first friction (inner) clutch disc. Alternate steel and friction until six (6) steel and six (6) friction discs are in position.

Figure 166
Install clutch disc end plate.

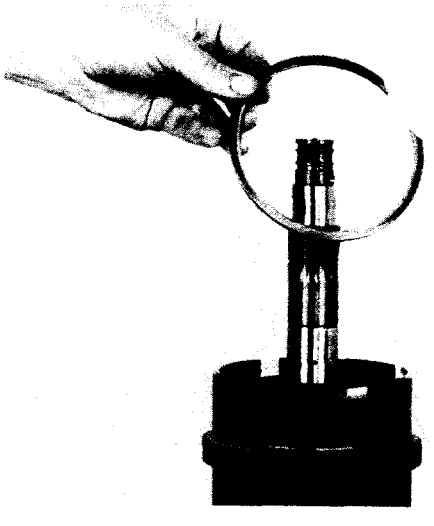


Figure 167
Install end plate retainer ring.

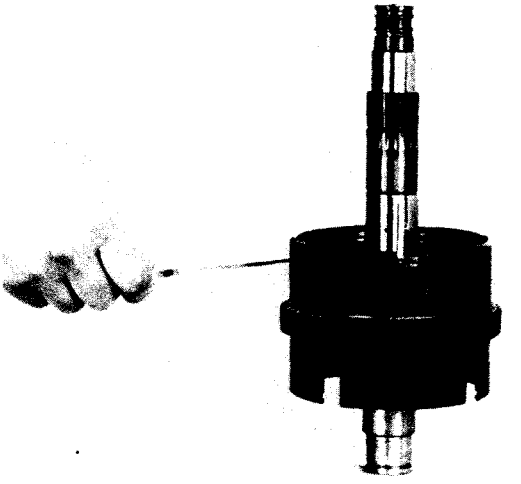


Figure 168
NOTE: 4th (high) clutch pack must be checked for clutch disc clearance.

With the clutch assembly on end, the clutch discs will fall to the piston.

Measure the distance between the clutch end plate and the end plate retainer ring by inserting a feeler gauge or taper gauge through the slots in the clutch drum.

The required clearance is .048-.108 [1,22-2,74].

If the clearance is greater than .108 [2,74], add one steel disc under the end plate.

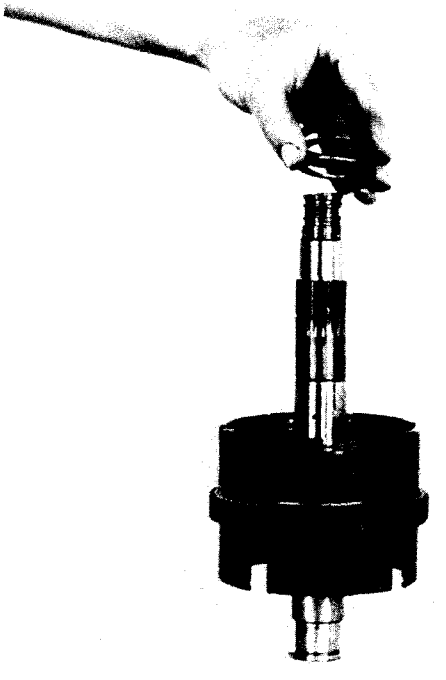


Figure 169
Position thrust bearing inner washer on clutch shaft. Position thrust bearing on clutch shaft. Install outer thrust bearing washer against thrust bearing.

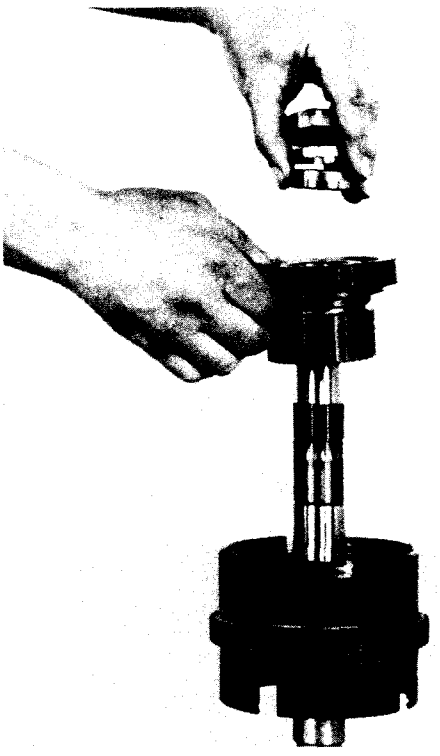


Figure 170
Press one bearing in clutch gear. Install bearing spacer next to bearing. Press second bearing in gear, being certain bearings are pressed flush with face of gears on both sides. Install the clutch gear in the clutch assembly by aligning the clutch hub teeth with the clutch inner discs. Be sure the clutch hub is in full position in the clutch assembly. Do not force this operation.

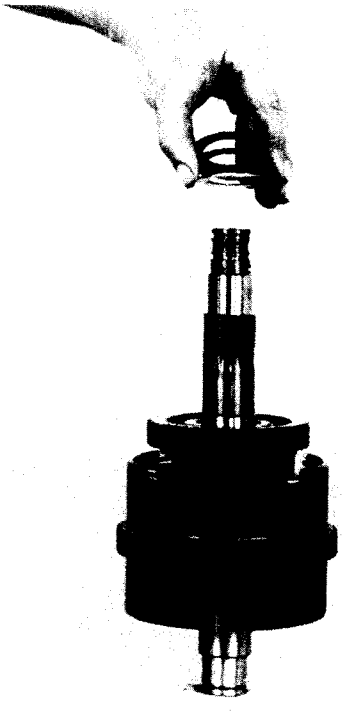


Figure 171
Position inner thrust washer on shaft. Position thrust bearing on shaft. Position outer thrust washer over thrust bearing.

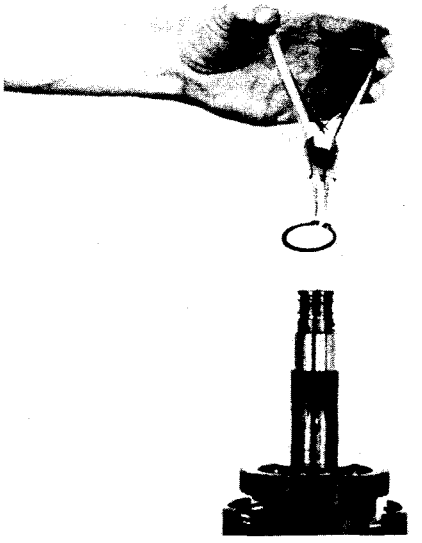


Figure 172
Install thrust washer retainer ring.

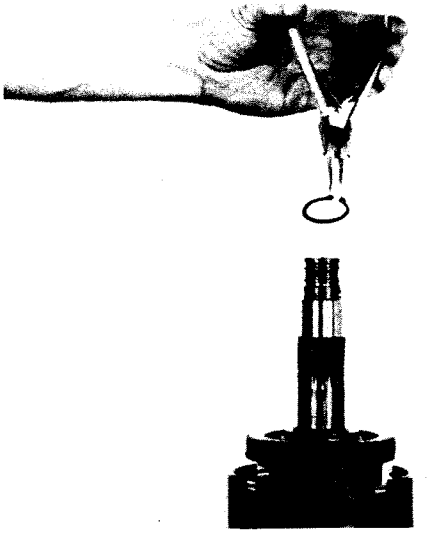


Figure 173
Install clutch shaft gear locating ring.

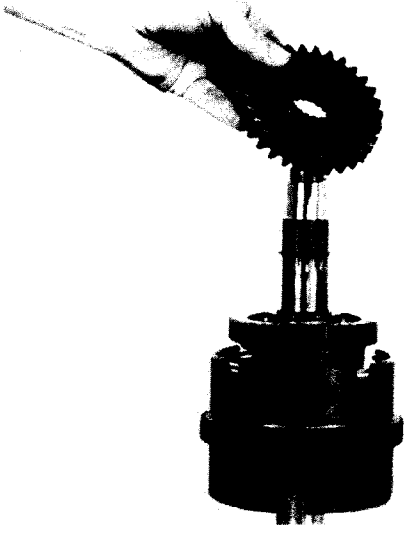


Figure 174
Position gear on clutch shaft.

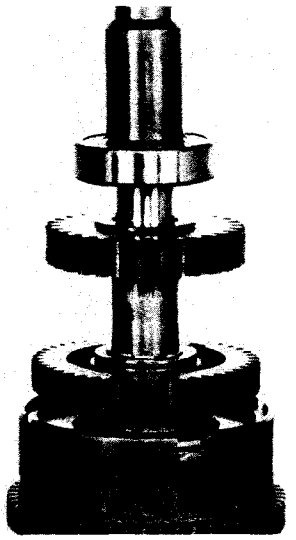


Figure 175
Install clutch shaft front bearing. **NOTE:** Bearing has a shield in it. This shield must be up.

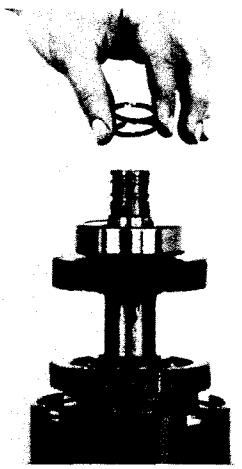


Figure 176
Install clutch shaft oil sealing rings. Grease rings to facilitate reassembly into front housing.

3RD CLUTCH REASSEMBLY

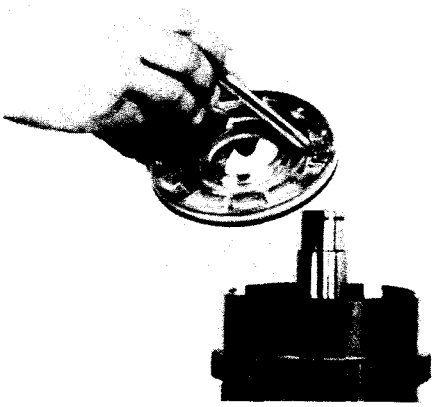


Figure 177
Clutch piston bleed ball must be clean and free of any foreign material.

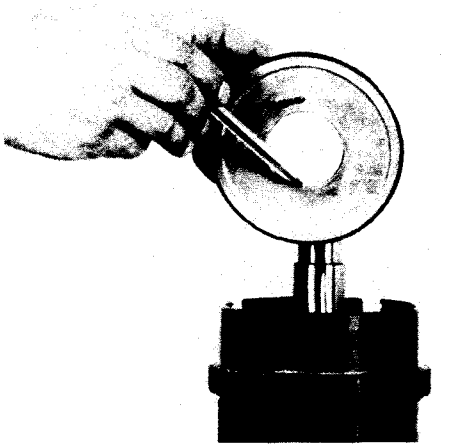


Figure 178
Install inner and outer clutch piston seal rings. Size inner ring as explained in Figure 91. Install clutch piston in clutch drum. Use caution as not to damage sealing rings.

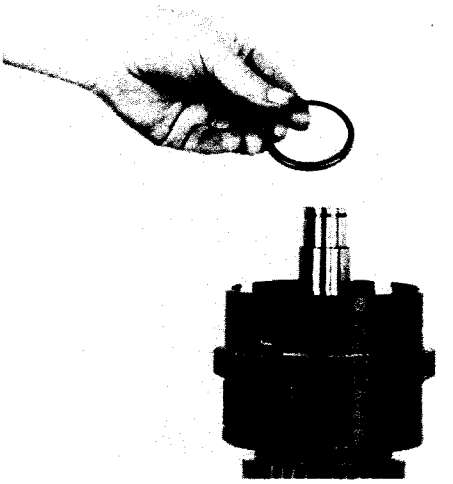


Figure 179
Install clutch piston wear plate.

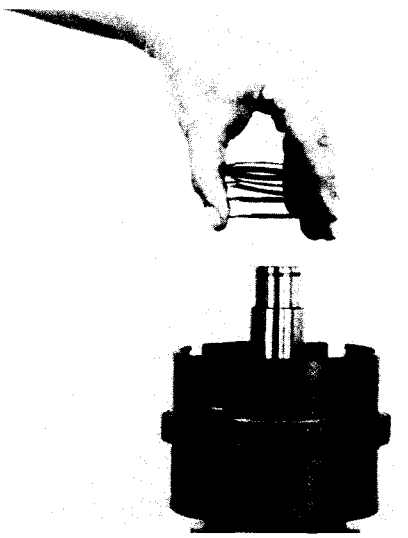


Figure 180
Install piston return disc springs. First spring with large diameter of bevel toward wear plate. Alternate five (5) springs. **NOTE:** See page 71.

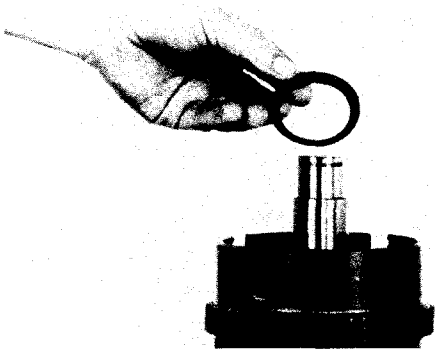


Figure 181
Position return spring ring retainer on clutch shaft.

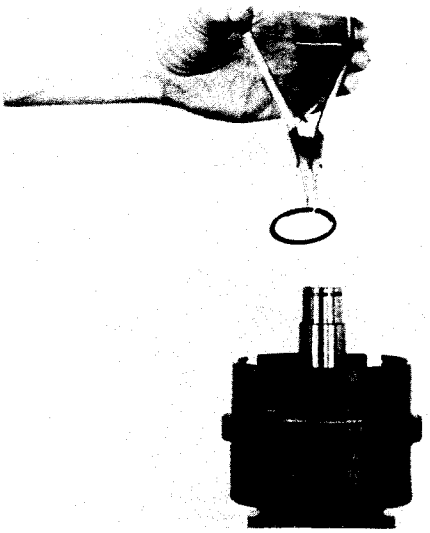


Figure 182
Start ring on shaft with snap ring pliers.

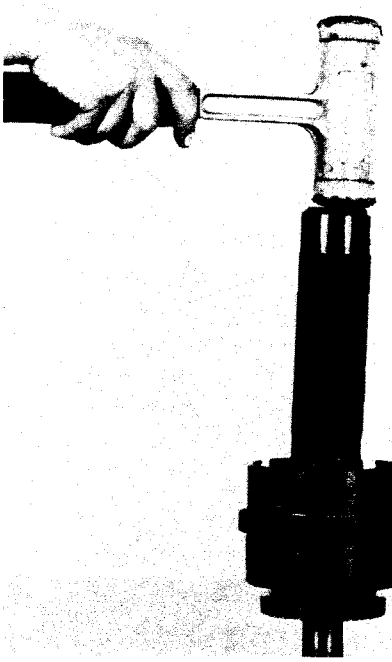


Figure 183
Use a sleeve with the proper inner diameter to fit over shaft and against retainer ring. A sharp blow with a soft hammer will compress springs and seat retainer ring. Be sure ring is in full position in groove.

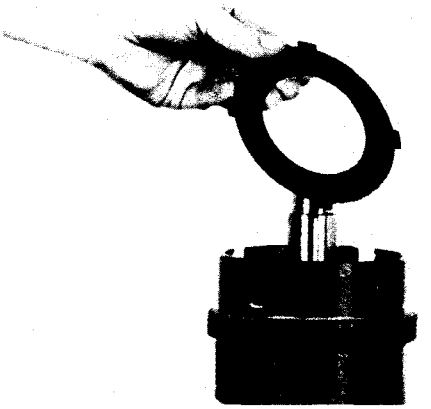


Figure 184
Install first steel (outer) clutch disc.

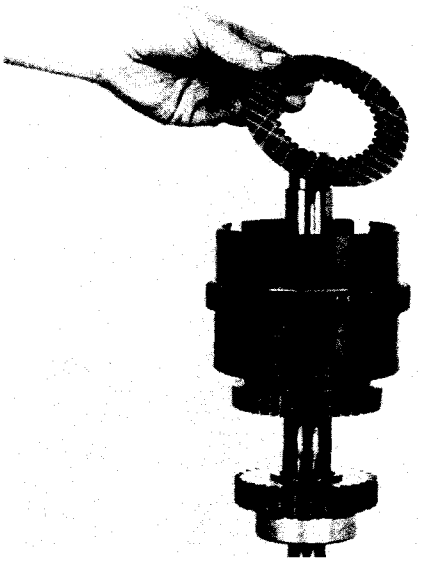


Figure 185
Install first friction (inner) clutch disc. Alternate steel and friction until five (5) steel and five (5) friction discs are in position.

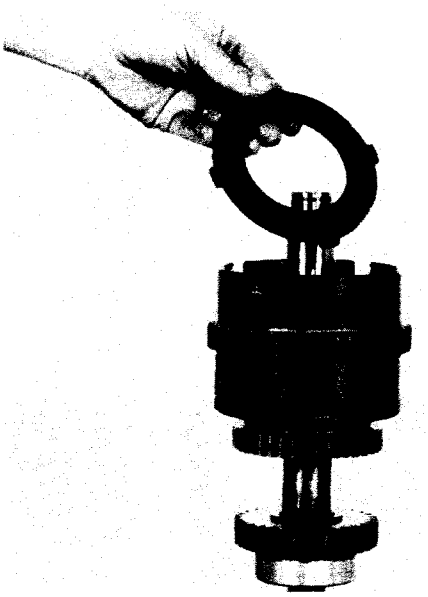


Figure 186
Install clutch disc end plate.

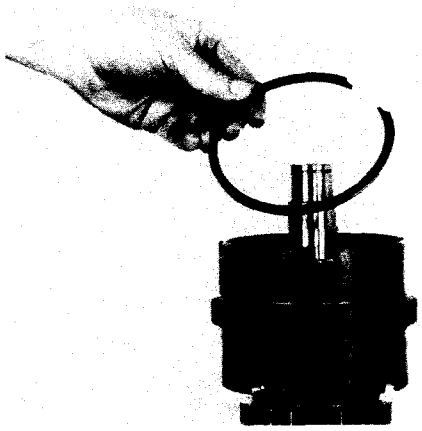


Figure 187
Install end plate retainer ring.

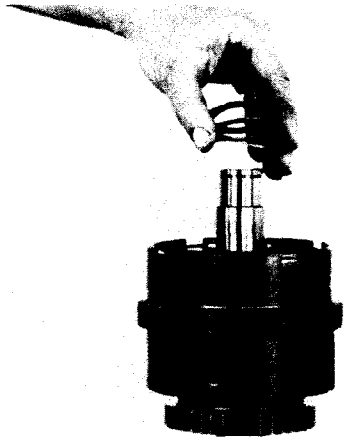


Figure 188
Position thrust bearing inner washer on clutch shaft. Position thrust bearing against inner washer. Install outer thrust washer on thrust bearing.

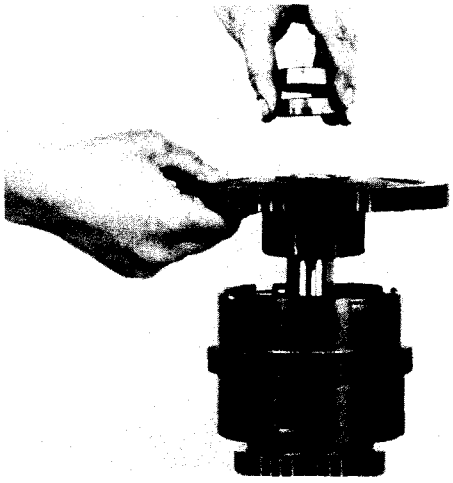


Figure 189
Press bearings in clutch gear and disc hub, being certain bearings are pressed flush with face of gear on both sides. Install the clutch gear in the clutch assembly by aligning the clutch hub teeth with the clutch inner discs. Be sure the clutch hub is in full position in the clutch assembly. Do not force this operation.

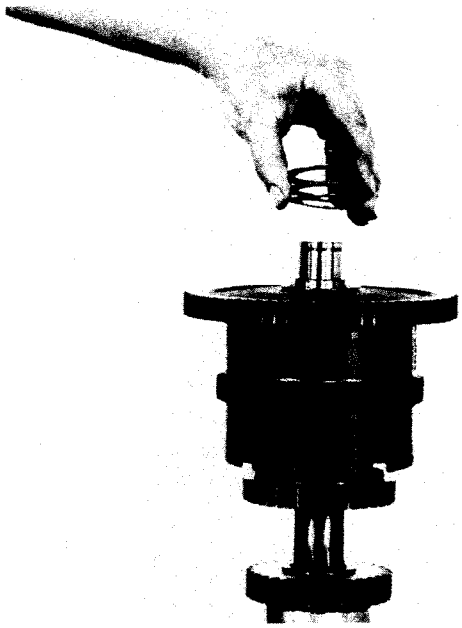


Figure 190
Position thrust bearing inner washer on clutch shaft. Position thrust bearing on shaft against washer. Install outer thrust bearing washer against thrust bearing.

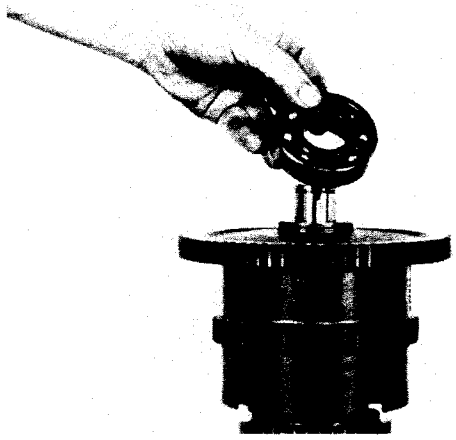


Figure 191
Install clutch shaft rear bearing.

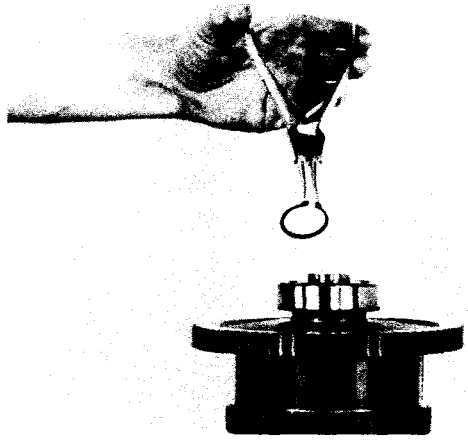


Figure 192
Install bearing retainer ring.

DISASSEMBLY AND REASSEMBLY OF FORWARD AND REVERSE CLUTCHES

NOTE: A 3 speed transmission will not have external gear teeth on the forward and reverse clutch drum.

REVERSE CLUTCH BEING DISASSEMBLED

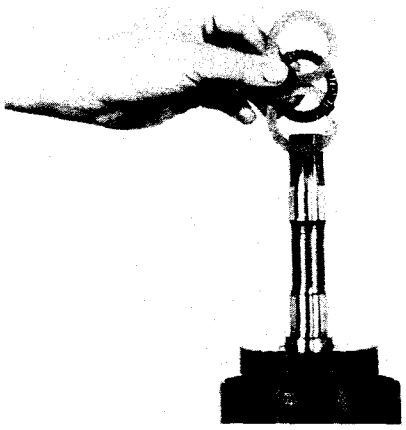


Figure 193
Remove outer thrust washer, thrust bearing, and inner thrust washer.

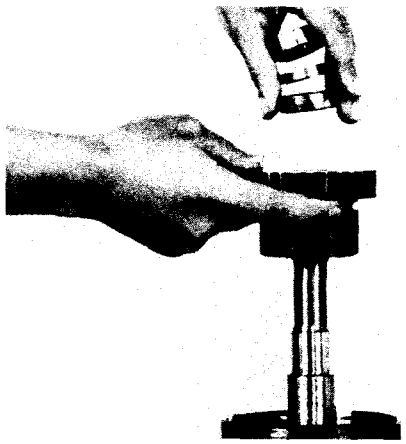


Figure 194
Remove bearings and spacer from clutch gear.

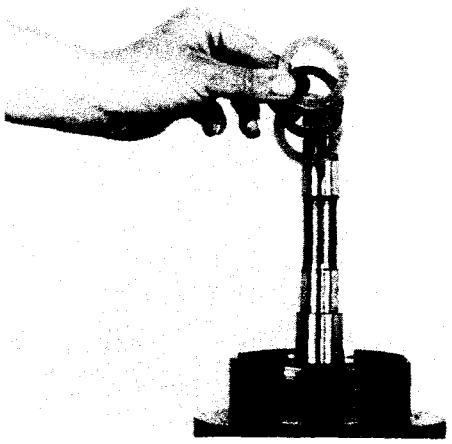


Figure 195
Remove outer thrust washer, thrust bearing, and inner thrust washer.

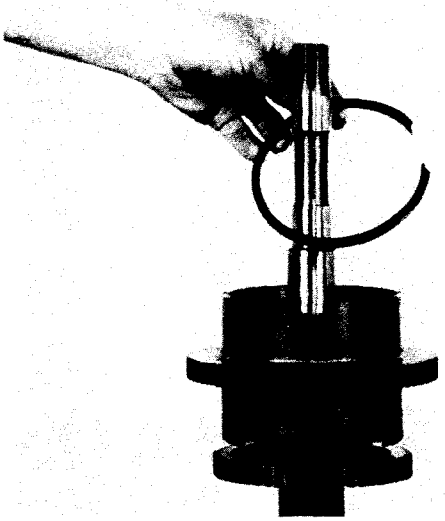


Figure 196
Remove end plate retainer ring.

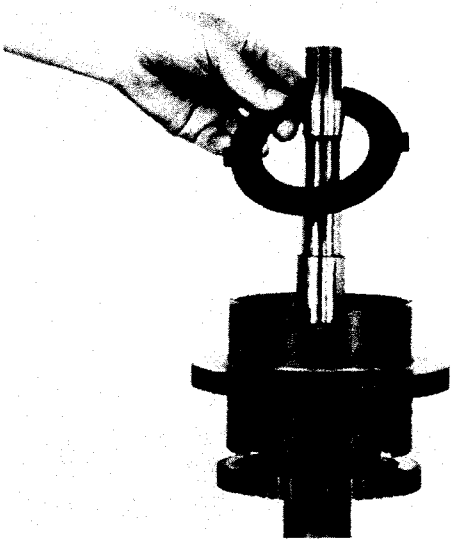


Figure 197
Remove end plate.

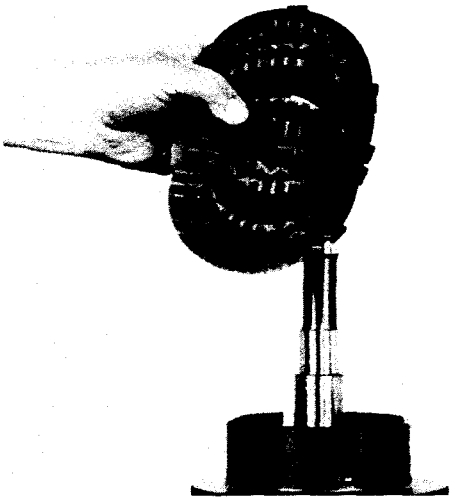


Figure 198
Remove clutch discs.

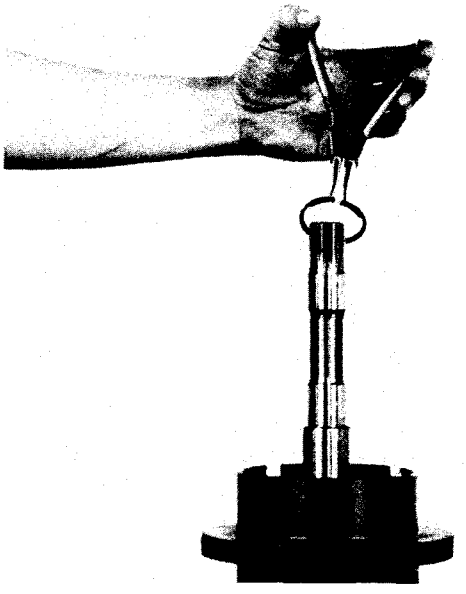


Figure 199
Compress disc springs and remove retainer ring.

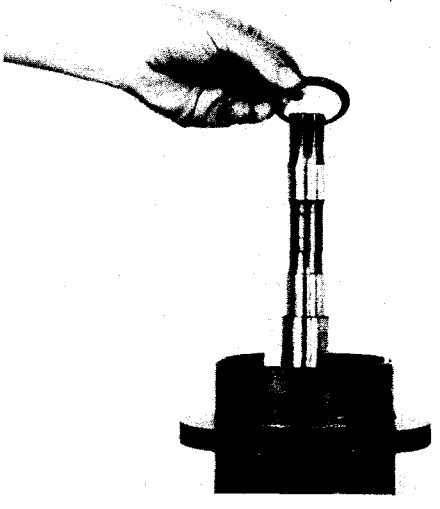


Figure 200
Remove retainer ring retainer.

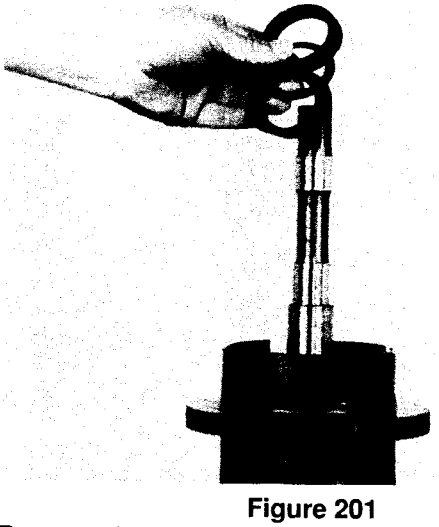


Figure 201
Remove disc springs. **NOTE:** See page 71.

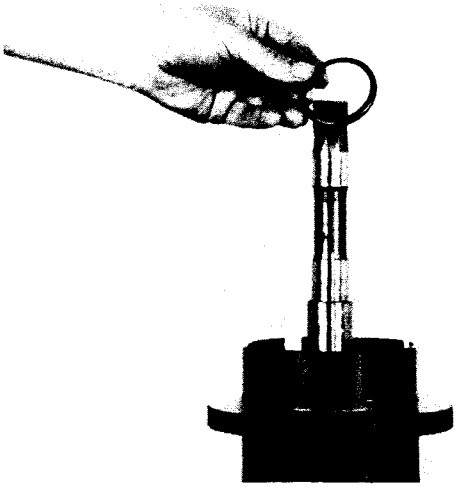


Figure 202
Remove clutch piston wear plate.

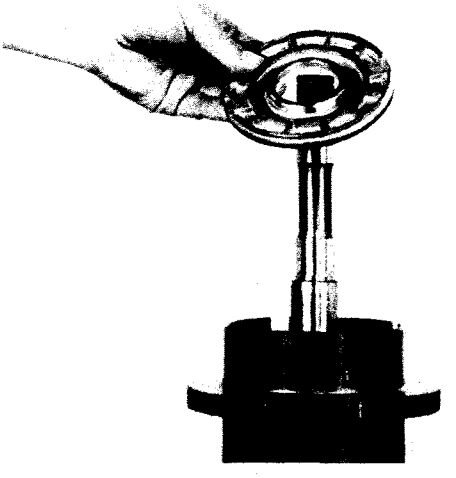


Figure 203
Remove clutch piston.

DISASSEMBLY OF FORWARD CLUTCH

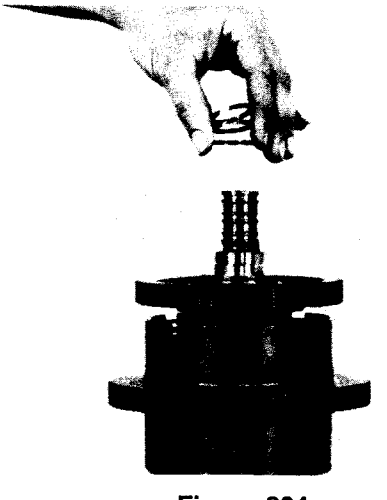


Figure 204
Remove clutch shaft oil sealing ring.

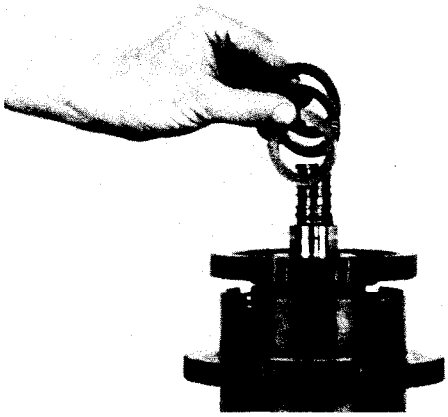


Figure 205
Remove outer thrust washer, thrust bearing, and inner thrust washer.

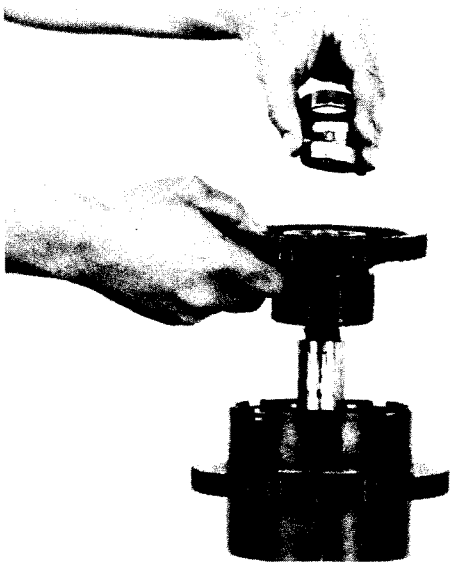


Figure 206
Remove bearings and spacer from clutch gear.

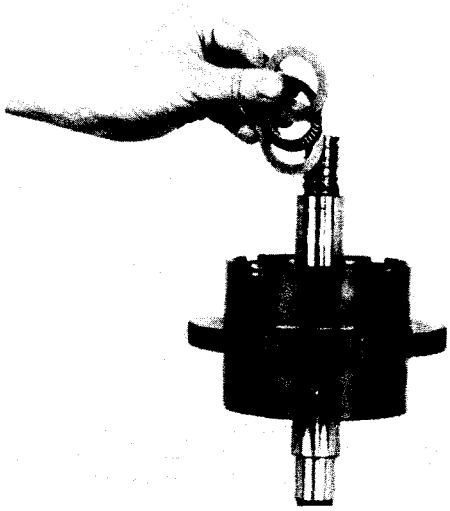


Figure 207
Remove outer thrust washer, thrust bearing, and inner thrust washer.

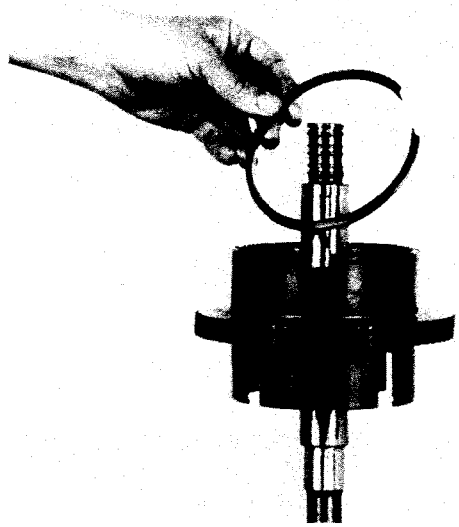


Figure 208
Remove end plate retainer ring.

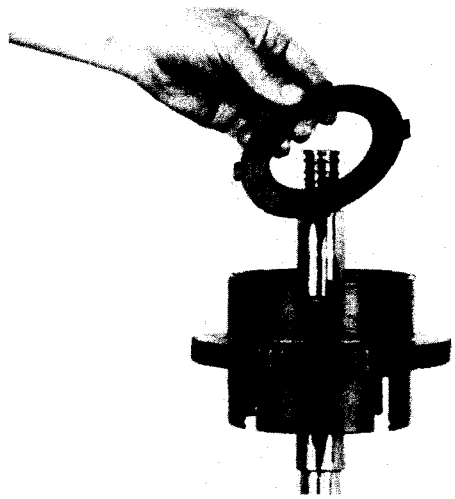


Figure 209
Remove end plate.

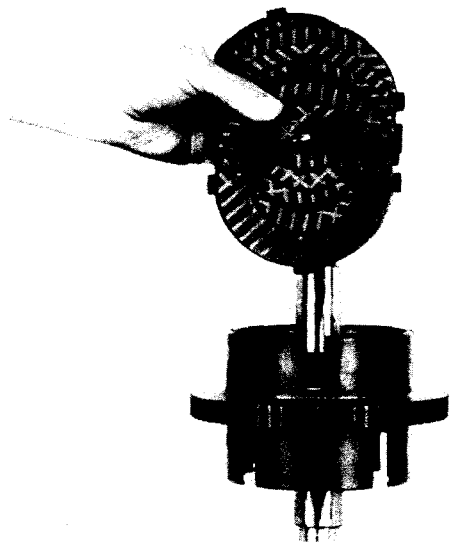


Figure 210
Remove clutch discs.

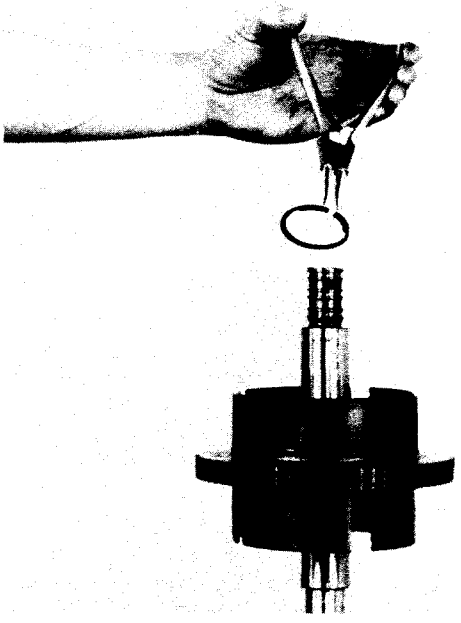


Figure 211
Compress disc springs and remove retainer ring.

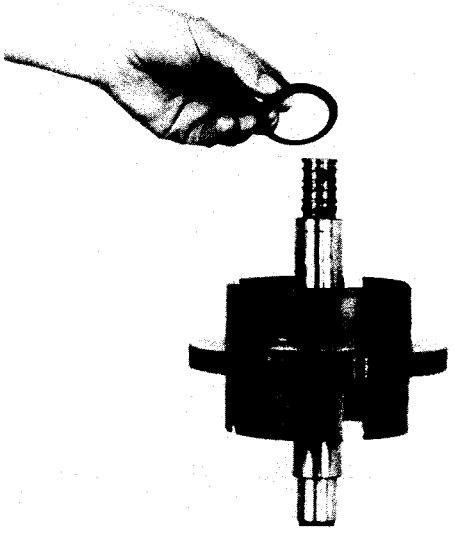


Figure 212
Remove retainer ring retainer.

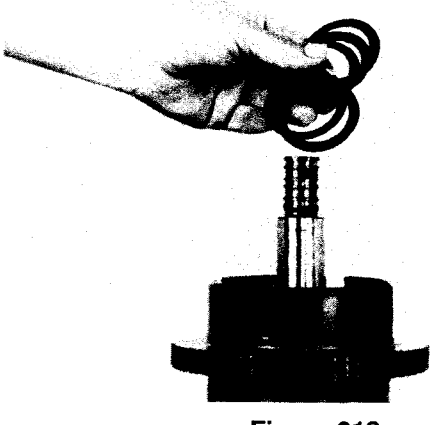


Figure 213
Remove disc springs. **NOTE:** See page 71.

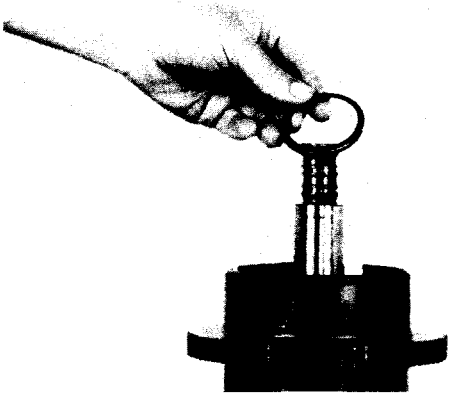


Figure 214
Remove clutch piston wear plate.

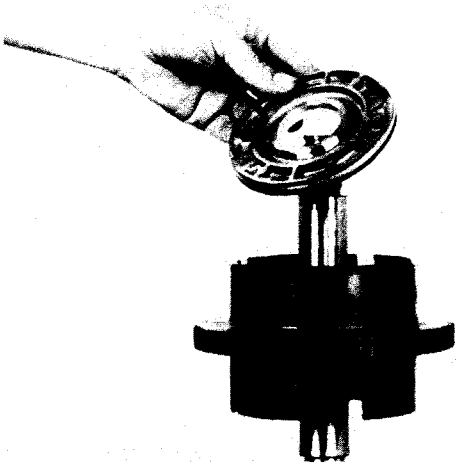


Figure 215
Remove clutch piston.

REASSEMBLY OF FORWARD CLUTCH
(See cleaning and inspection page)

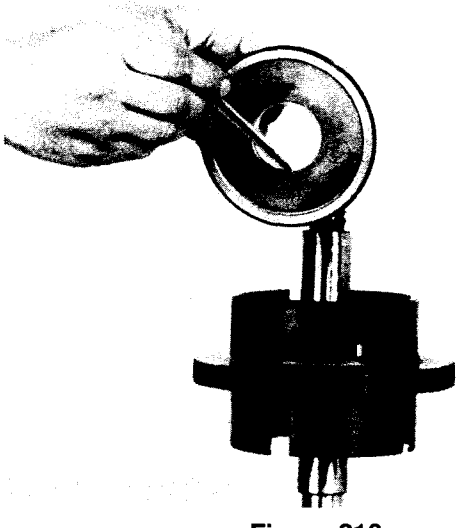


Figure 216
Clutch piston bleed orifice must be clean and free of any foreign material. Install inner and outer piston seal rings. Size inner ring as explained in Figure 91.

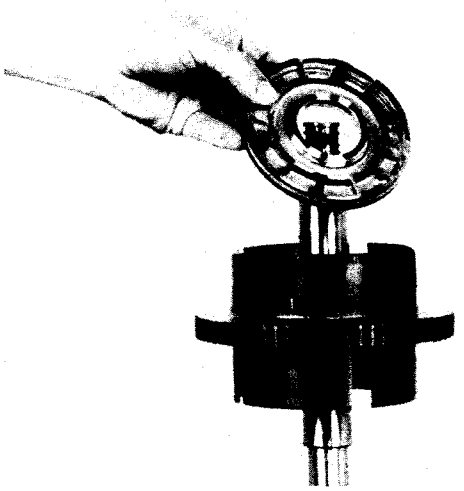


Figure 217
Install clutch piston in clutch drum. Use caution as not to damage sealing rings.

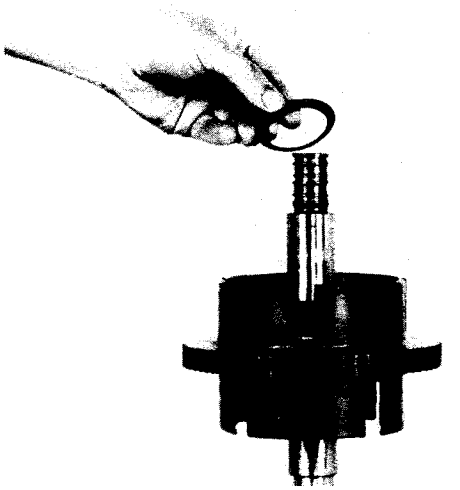


Figure 220
Position return spring ring retainer on clutch shaft.

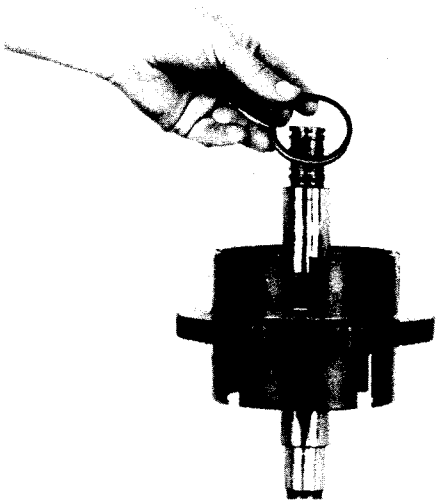


Figure 218
Install clutch piston wear plate.

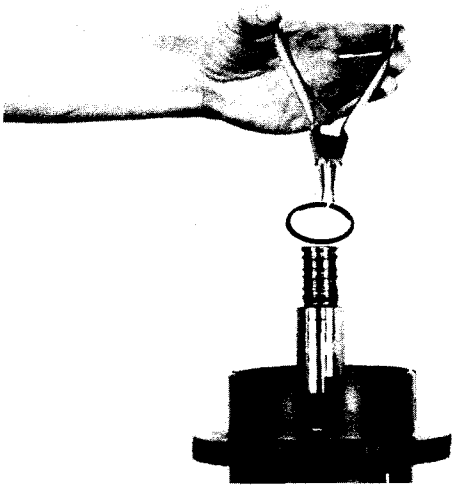


Figure 221
Start ring on clutch with snap ring pliers.

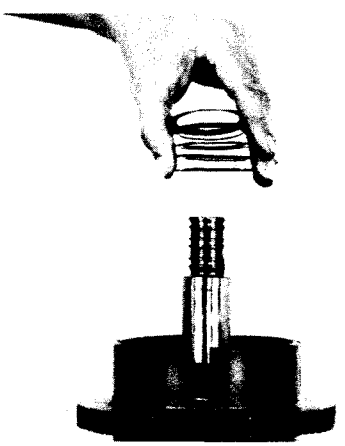


Figure 219
Install piston return disc springs. First spring with large diameter of bevel toward wear plate. Alternate five (5) springs. **NOTE:** See page 71.

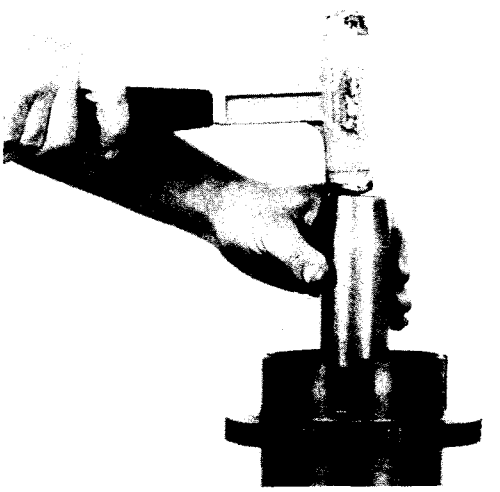


Figure 222
Use a sleeve with the proper inner diameter to fit over shaft and against retainer ring. A sharp blow with a soft hammer will compress springs and seat retainer ring. Be sure ring is in full position in groove.

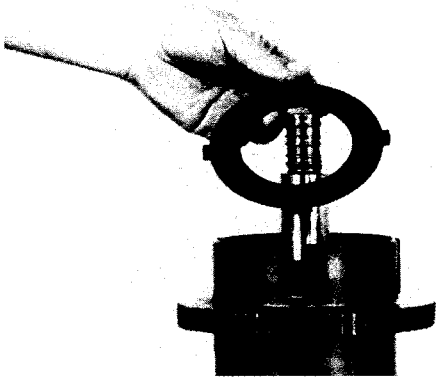


Figure 223
Install first steel (outer) clutch disc.

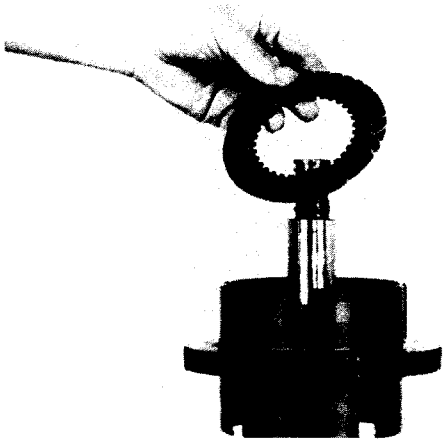


Figure 224
Install first friction (inner) clutch disc. Alternate steel and friction until six (6) steel and six (6) friction discs are in position.

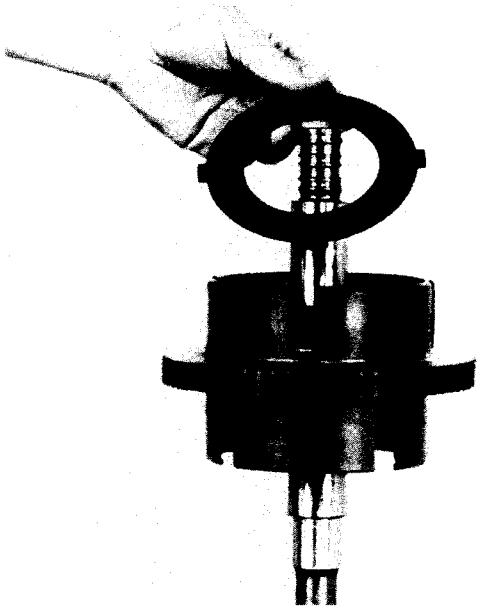


Figure 225
Install clutch disc end plate.

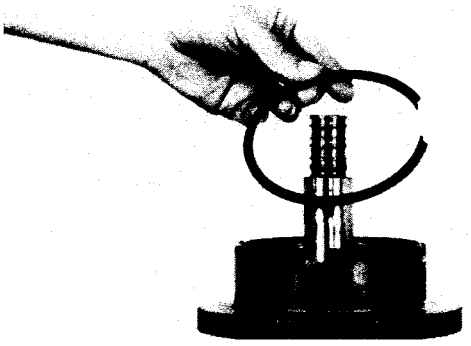


Figure 226
Install end plate retainer ring.

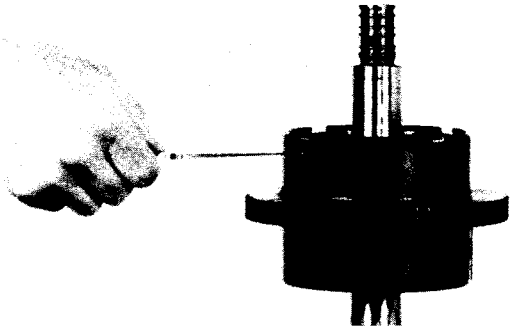


Figure 227
NOTE: Forward clutch pack must be checked for clutch disc clearance.

Stand the clutch assembly on end as shown.

Measure the distance between the clutch end plate and the end plate retainer ring by inserting a feeler gauge or taper gauge through the slots in the clutch drum.

The required clearance is .048-.108 [1,22-2,74].

If the clearance is greater than .108 [2,74], add one steel disc under the end plate.

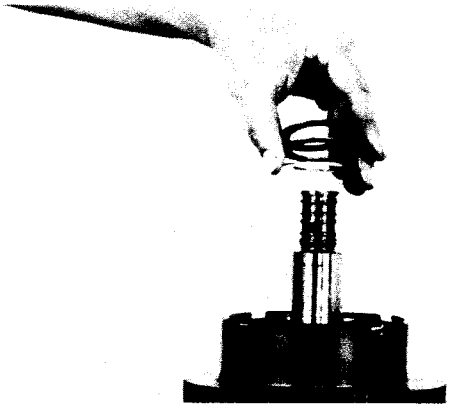


Figure 228
Position thrust bearing on clutch shaft against inner thrust bearing washer. Position thrust bearing inner washer on clutch shaft. Install outer thrust bearing washer against thrust bearing.

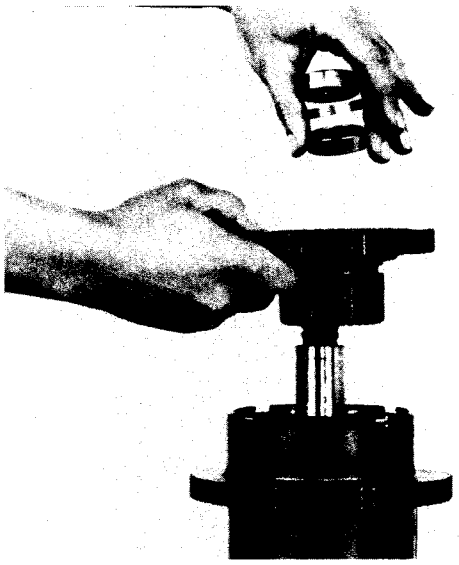


Figure 229
Press one bearing in clutch gear, flush with face of gear. Install bearing spacer next to bearing. Press second bearing in gear, flush with face of gear. Install the clutch gear in the clutch assembly by aligning the clutch hub teeth with the clutch inner discs. Be sure the clutch hub is in full position in the clutch assembly. Do not force this operation.

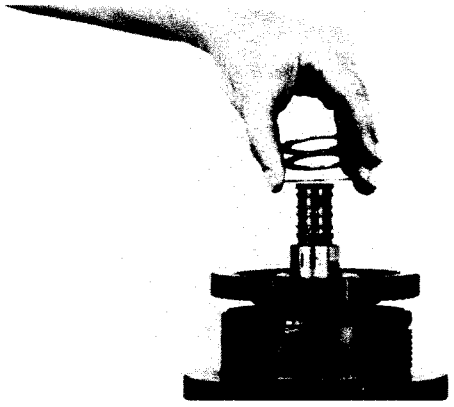


Figure 230
Position inner thrust washer on shaft. Position thrust bearing on clutch shaft against inner thrust bearing washer. Position outer thrust washer on shaft.

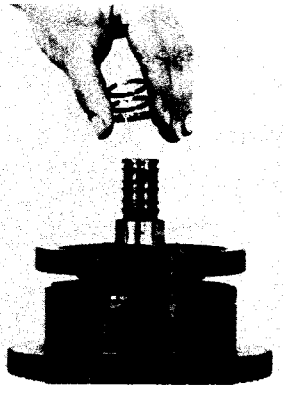


Figure 231
Install clutch shaft oil sealing rings. Grease rings to facilitate reassembly into front housing.

REVERSE CLUTCH REASSEMBLY

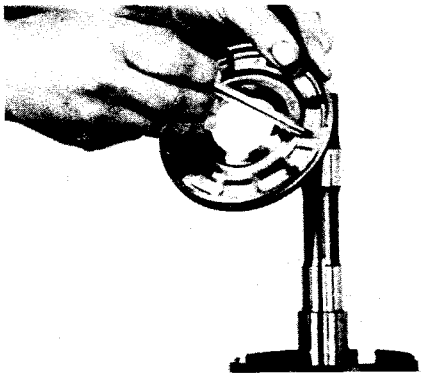


Figure 232
Clutch piston bleed orifice must be clean and free of any foreign material.

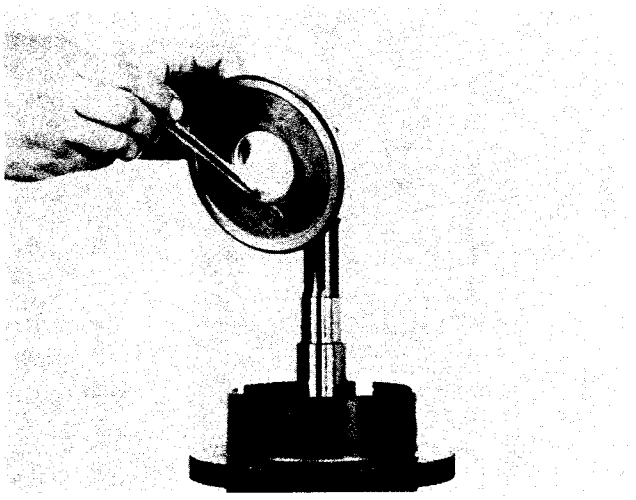


Figure 233
Install inner and outer clutch piston seal rings. Size inner ring as explained in Figure 91. Install clutch piston in clutch drum. Use caution as not to damage sealing rings.

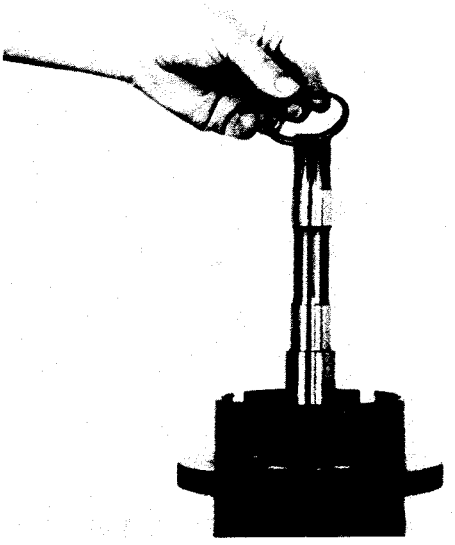


Figure 234
Install clutch piston wear plate.

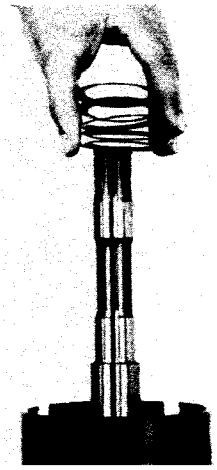


Figure 235
Install piston return disc springs. First spring with large diameter of bevel toward wear plate. Alternate five (5) springs. **NOTE:** See page 71.

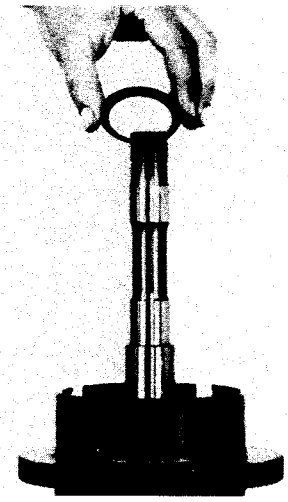


Figure 236
Position return spring ring retainer on clutch shaft.

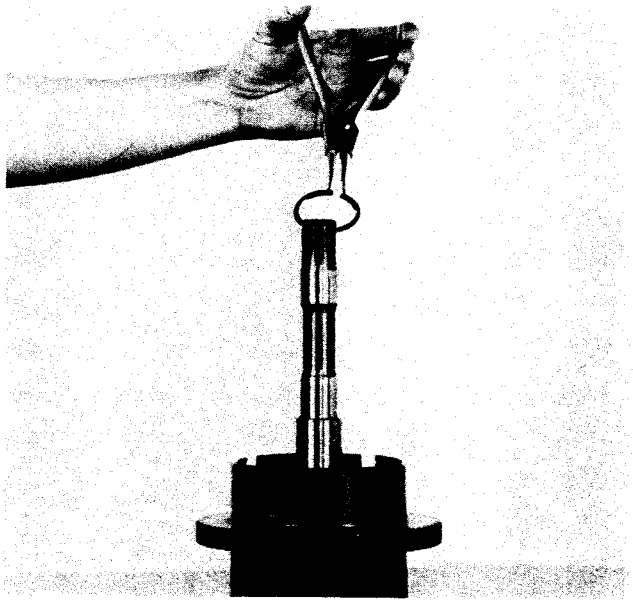


Figure 237
Start ring on shaft with snap ring pliers.

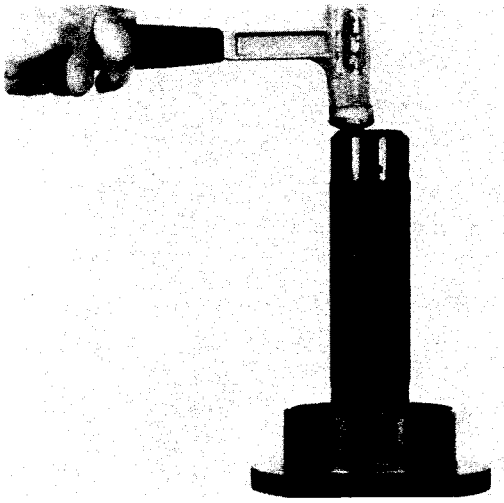


Figure 238
Use a sleeve with the proper inner diameter to fit over shaft and against retainer ring. A sharp blow with a soft hammer will compress springs and seat retainer ring. Be sure ring is in full position in groove.

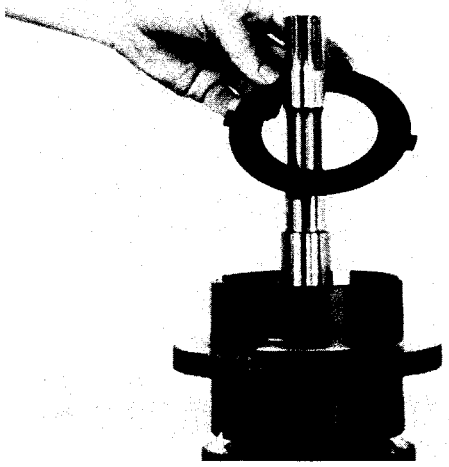


Figure 239
Install first steel (outer) clutch disc.

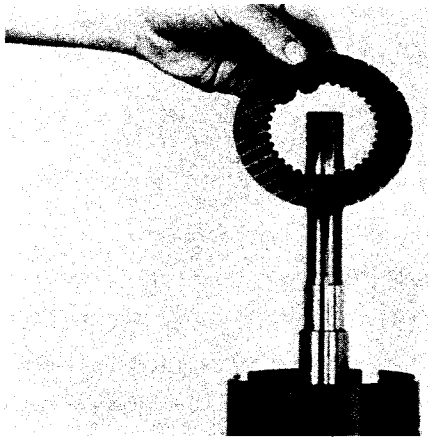


Figure 240
Install first friction (inner) clutch disc. Alternate steel and friction until six (6) steel and six (6) friction discs are in position.

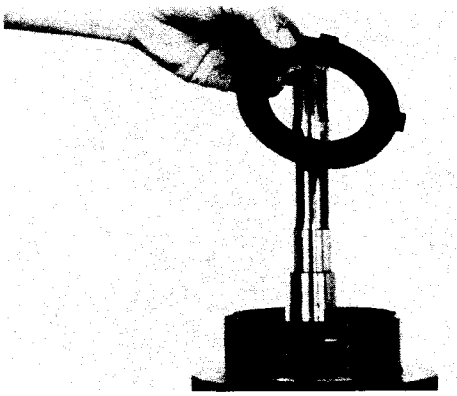


Figure 241
Install clutch disc end plate.

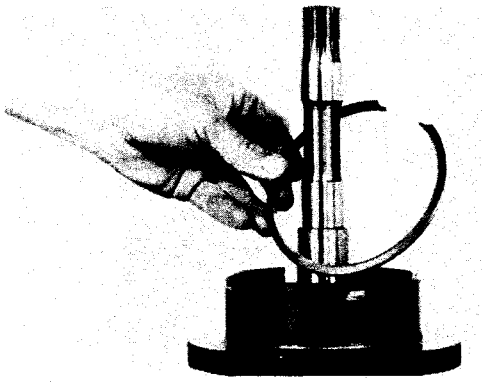


Figure 242
Install end plate retainer ring.

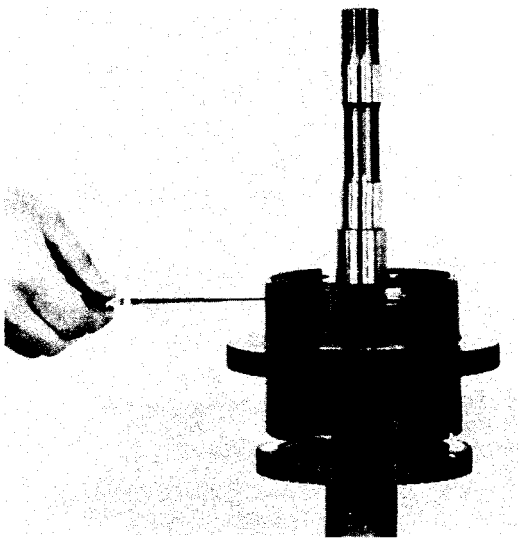


Figure 243
NOTE: Reverse clutch pack must be checked for clutch disc clearance.

Stand the clutch assembly on end as shown.

Measure the distance between the clutch end plate and the end plate retainer ring by inserting a feeler gauge or taper gauge through the slots in the clutch drum.

The required clearance is .048-.108 [1,22-2,74].

If the clearance is greater than .108 [2,74], add one steel disc under the end plate.

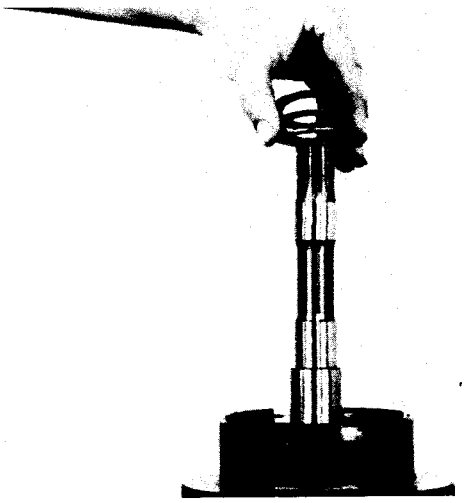


Figure 244
Position thrust bearing inner washer on clutch shaft. Position thrust bearing on clutch shaft against inner thrust bearing washer. Install outer thrust bearing washer against bearing.

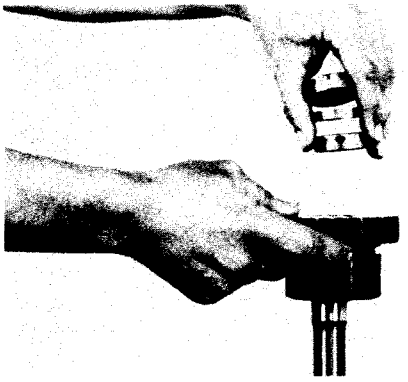


Figure 245
Press one bearing in clutch gear, flush with face of gear. Install bearing spacer next to bearing. Press second bearing in gear, flush with face of gear. Install the clutch gear in the clutch assembly by aligning the clutch hub teeth with the clutch inner discs. Be sure the clutch hub is in full position in the clutch assembly. Do not force this operation.

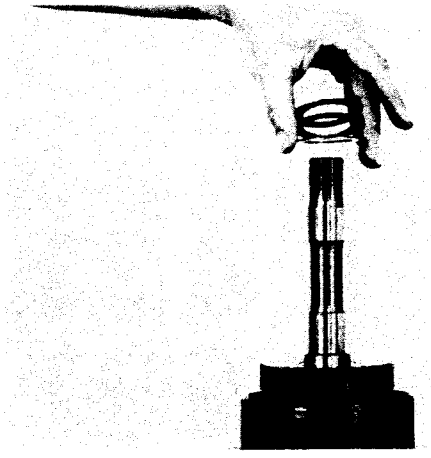


Figure 246
Position inner thrust washer on shaft. Position thrust bearing on shaft. Position outer thrust washer on shaft.

REGULATOR VALVE DISASSEMBLY AND REASSEMBLY

DISASSEMBLY

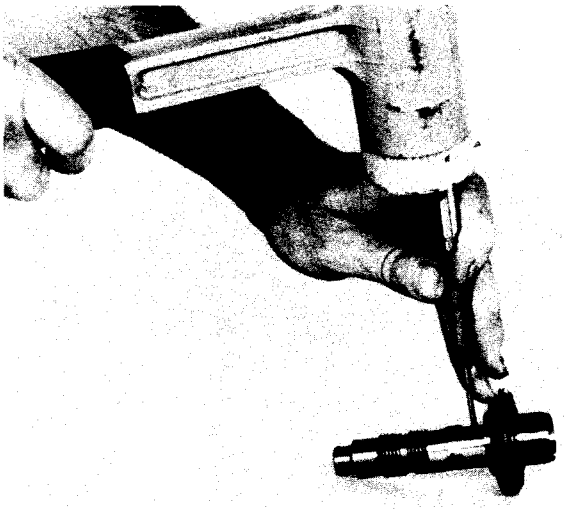


Figure 247
Tap pin from regulator valve sleeve. Use caution as valve spool is under spring pressure.

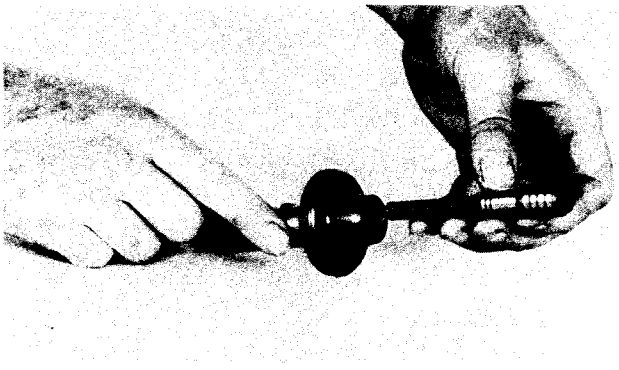


Figure 248
Remove regulator valve piston and pressure regulator valve spring.

REASSEMBLY
(See cleaning and inspection page)

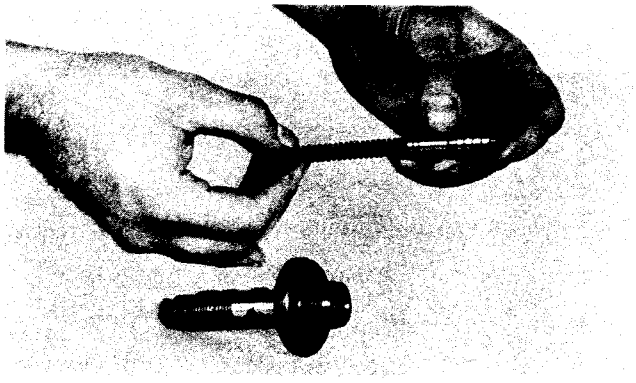


Figure 249
Position pressure regulator valve spring into regulator valve piston.

Figure 250
Install pressure regulator valve spring and regulator valve piston as an assembly into regulator valve sleeve.

Figure 251
Compress valve spring and valve and install pin into regulator valve sleeve.

DISASSEMBLY AND REASSEMBLY OF DUAL MODULATED VALVE ASSEMBLY

For single modulation and mechanical inching see page 86.

DISASSEMBLY

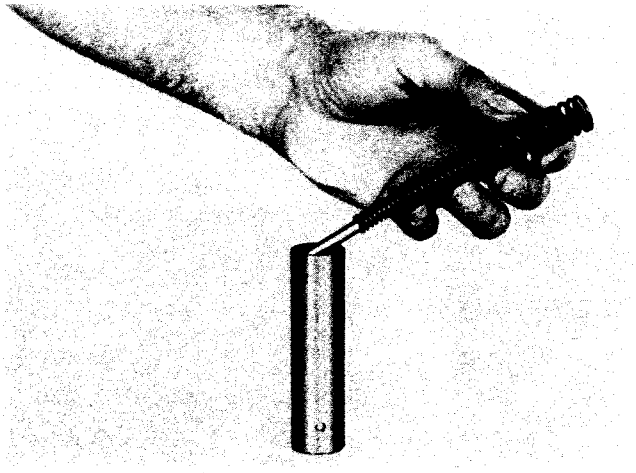


Figure 252
Remove inner, middle, and outer spring and stop pin from modulation housing sleeve. Reference Figure 53.

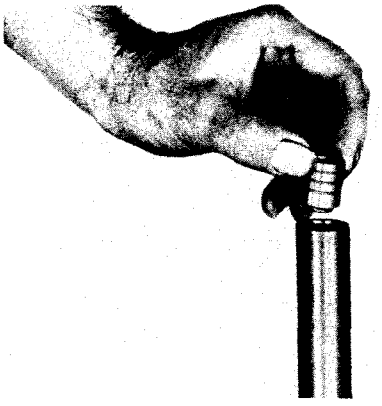


Figure 253
Remove accumulator spool. Reference Figure 54.

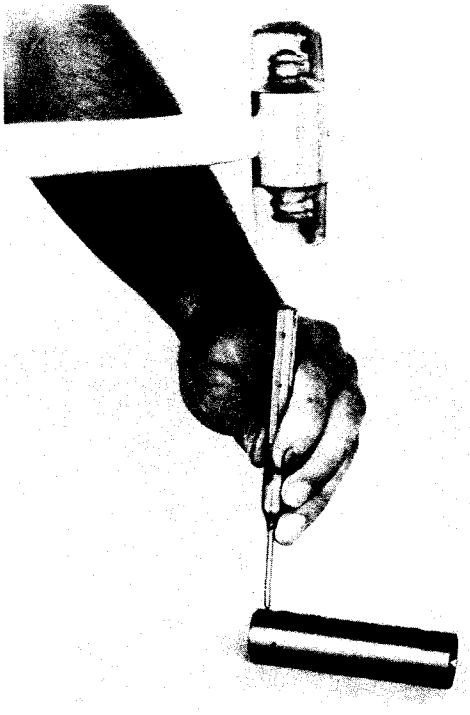


Figure 254
Remove cross pin from sleeve.

NOTE: Some units will have two cross pins the same length. Some units will have two pins of different lengths. The longest pin goes in the bottom hole.

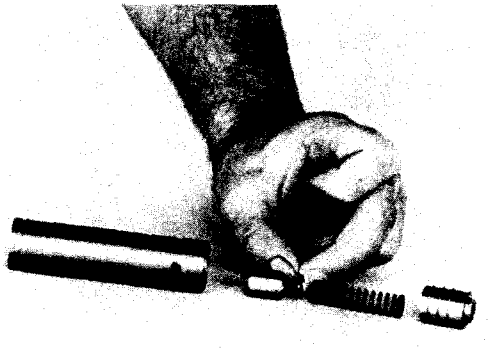


Figure 255
Remove regulator spool, spring, retainer spring, and spacer spring from housing sleeve.

REASSEMBLY
(See cleaning and inspection page)

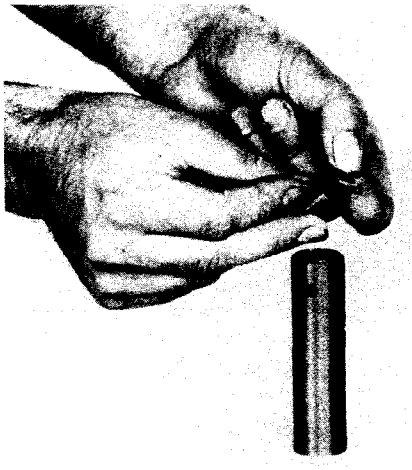


Figure 256
Install spring spacer in spring retainer.

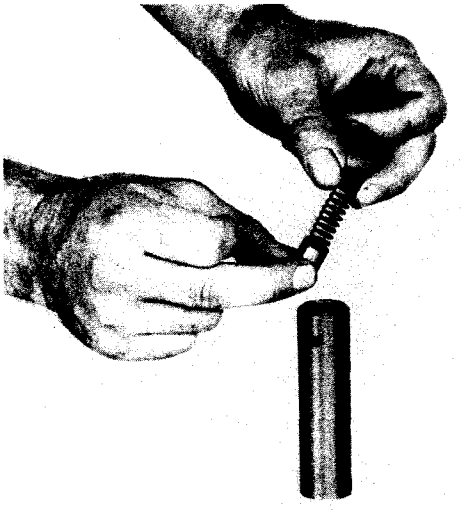


Figure 257
Install spring in spring retainer.

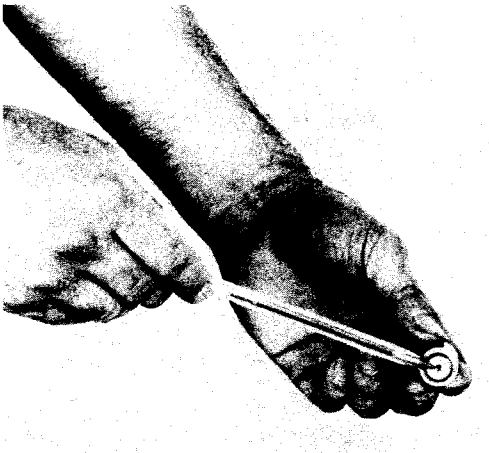


Figure 258
Check orifice in regulator spool to be free and clear of any foreign material.

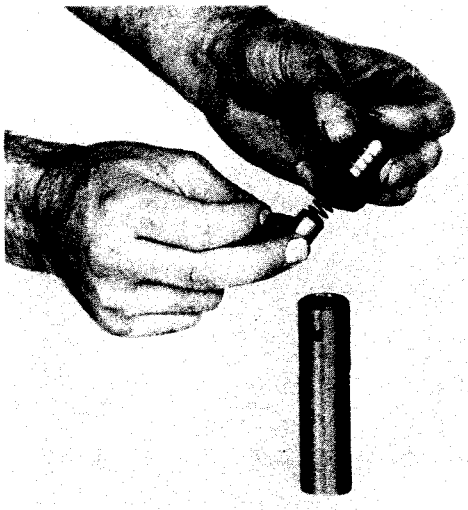


Figure 259
Install spring retainer, spring, and regulator valve in sleeve against inner cross pin.

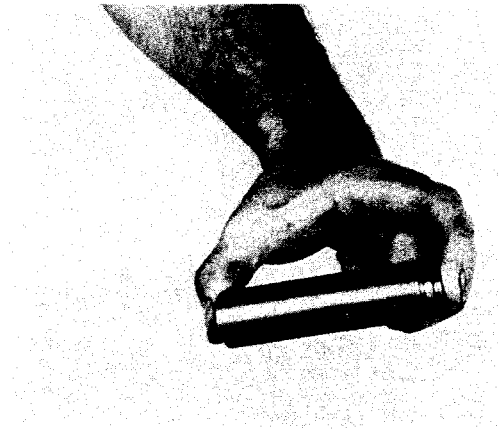


Figure 260
Compress regulator spool and spring in sleeve far enough to install cross pin.

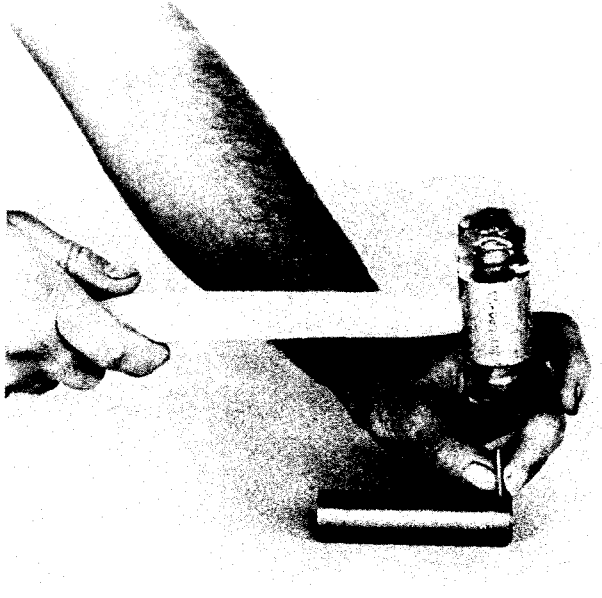


Figure 261
Install cross pin. See note after Figure 254.

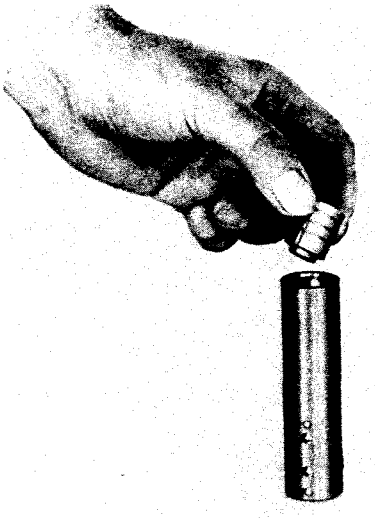


Figure 262
From opposite end, position accumulator spool in sleeve as shown.

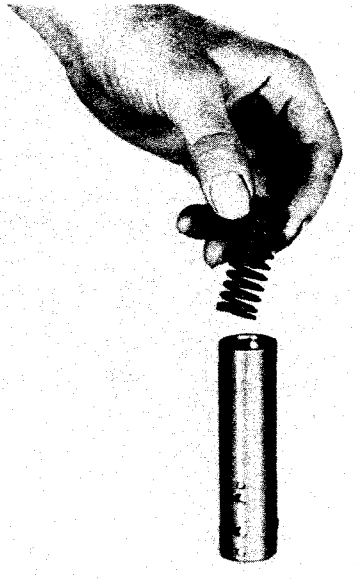


Figure 263
Install outer accumulator spring.

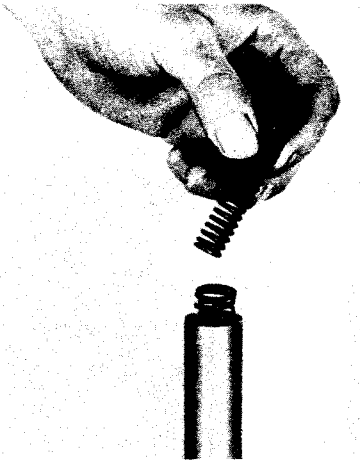


Figure 264
Install middle spring.

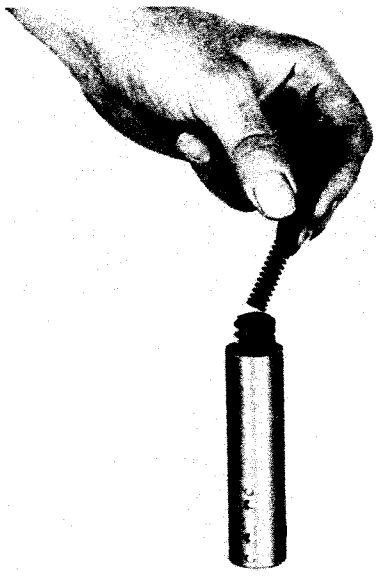


Figure 265
Install inner spring.

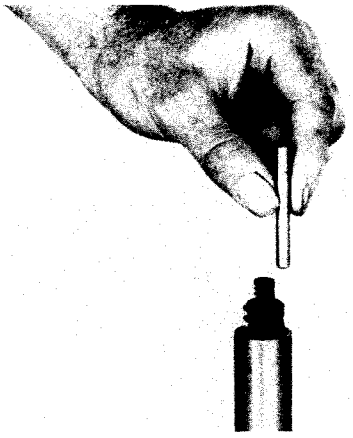


Figure 266
Install stop pin in inner spring.

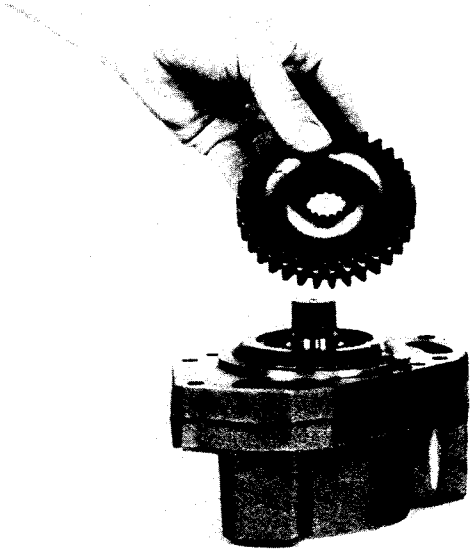


Figure 267
If charging pump or pump drive gear are to be replaced, remove retainer ring and drive gear.

DISASSEMBLY AND REASSEMBLY OF SPACER PLATE

DISASSEMBLY

Figure 268
Remove reverse idler gear end plate capscrew and washer.

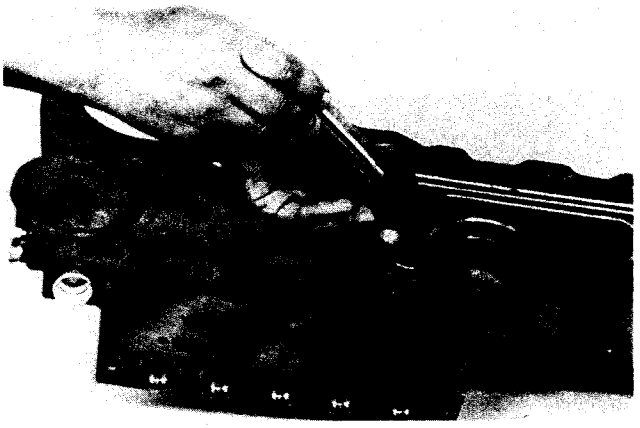


Figure 269
Remove end plate and dowel pin.

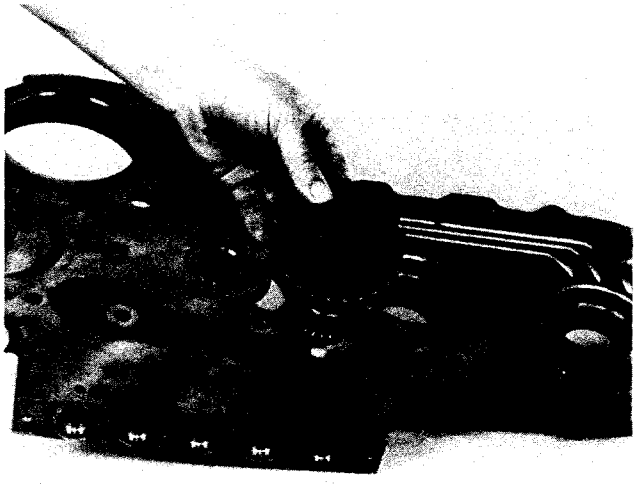


Figure 270
Remove reverse idler gear.

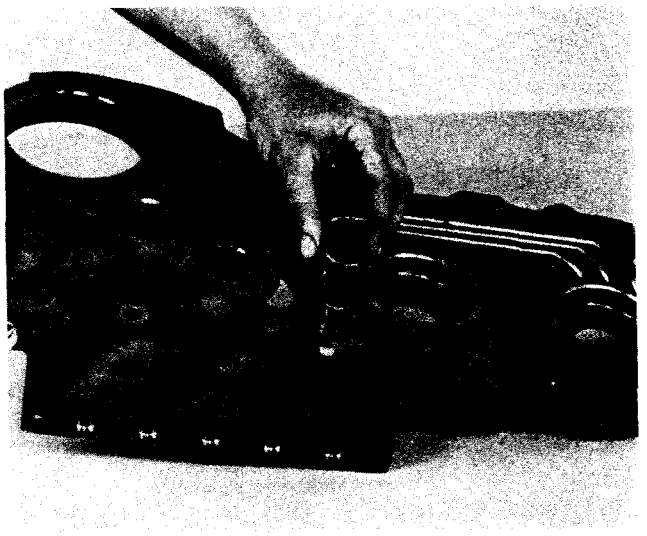


Figure 271
Remove reverse idler gear bearing.

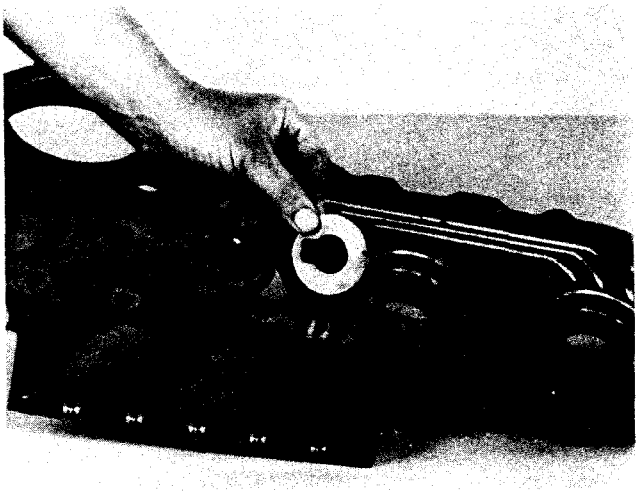


Figure 272
Remove idler gear tanged thrust washer.

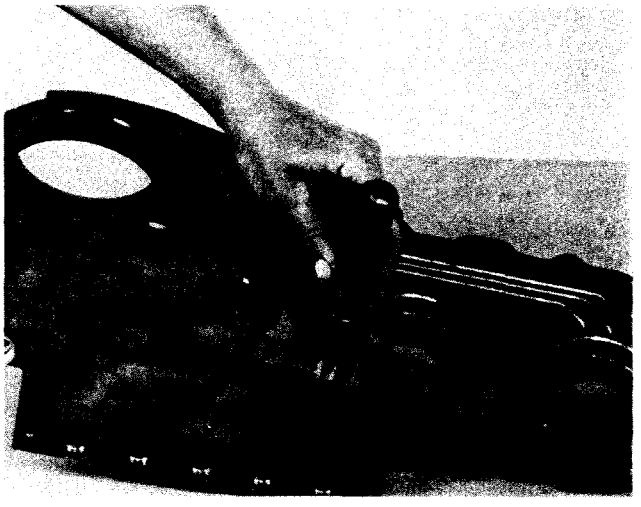


Figure 273
If reverse idler shaft is to be replaced, support spacer plate around idler shaft opening and press idler shaft from spacer. Do not drive on idler shaft as doing so may cause damage to spacer plate.

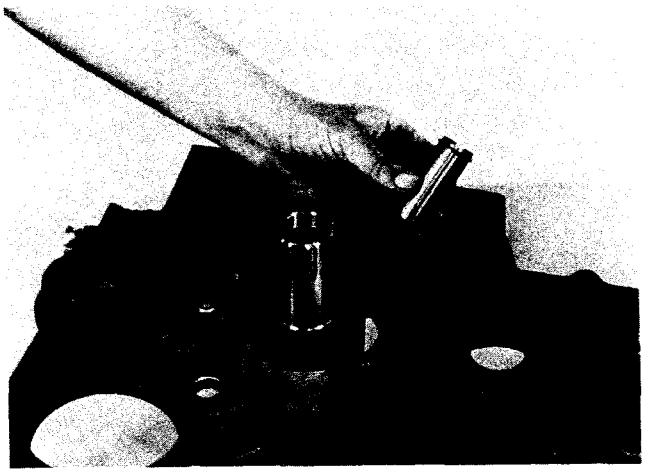


Figure 274
Idler shaft and locating ring removed.

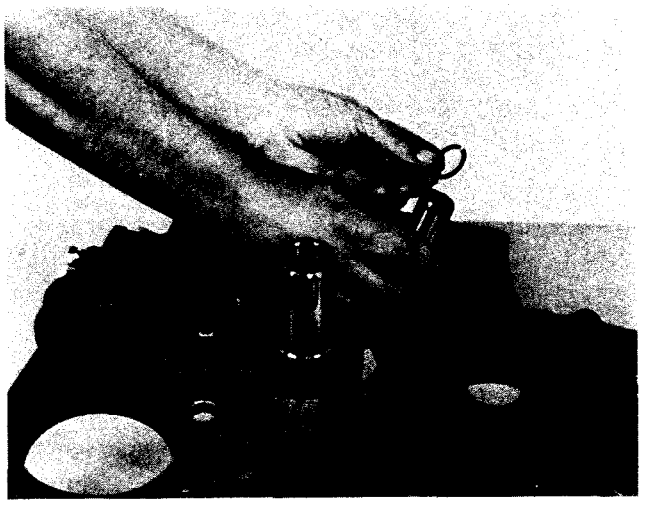


Figure 275
Remove locating ring from idler shaft.

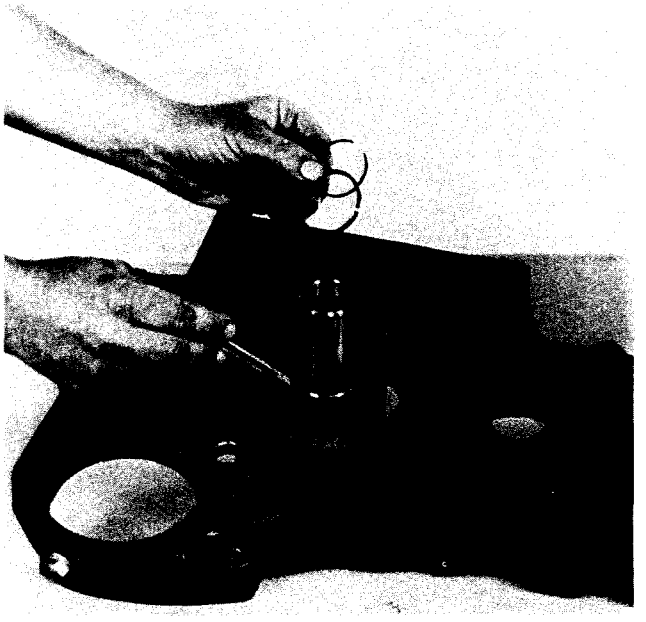


Figure 276
Remove stator support oil sealing ring and expander ring.

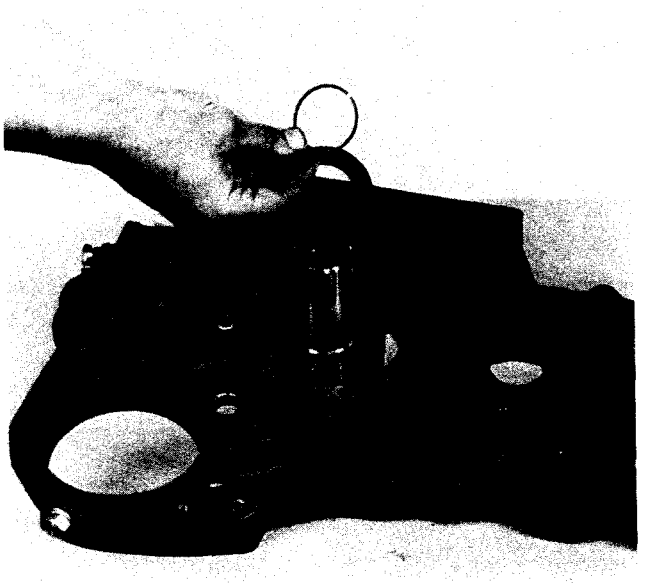


Figure 277
The stator support is held in place by two retaining rings. Remove converter end retainer ring from groove. Remove thrust washer.

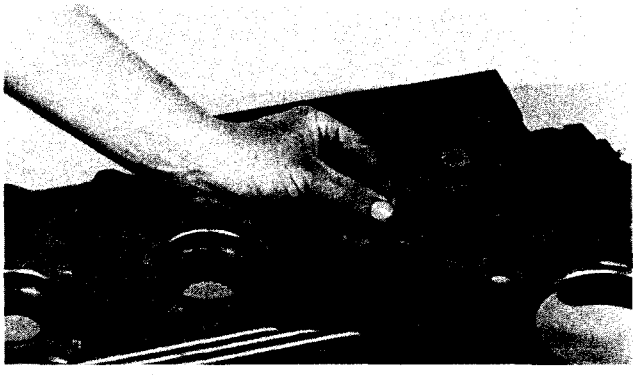


Figure 278
Push support toward transmission side far enough to expose retainer ring. Remove retainer ring.

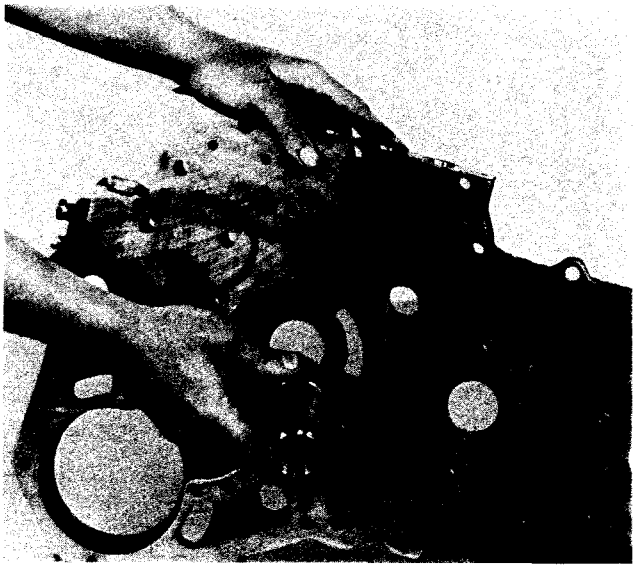


Figure 279
From converter end, remove stator support.

Figure 280
If support bushing or bearing is to be replaced, remove from stator support.

Figure 281
Compress converter safety valve spring and remove retaining washer. Remove safety valve spring. Turn spacer over and remove safety valve poppet.

REASSEMBLY OF SPACER PLATE
(See cleaning and inspection page)

Figure 282
From transmission side of spacer plate, position converter safety valve poppet in bore in spacer.

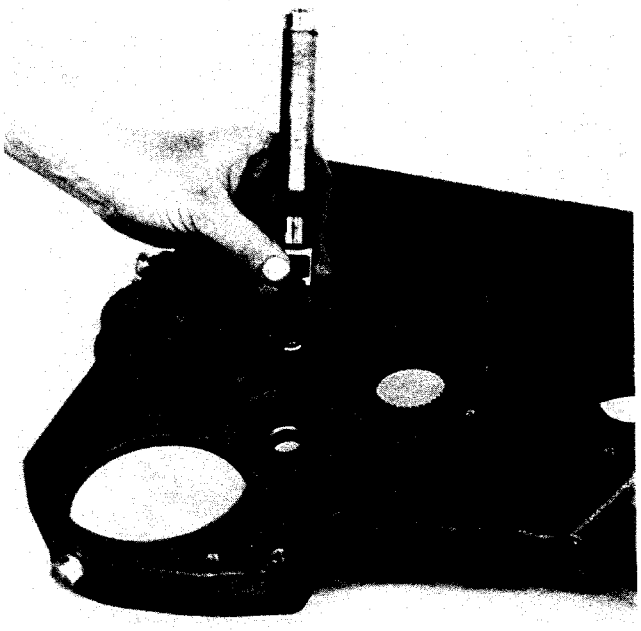


Figure 283
Turn spacer over and position safety valve spring on poppet. Compress spring and install poppet retaining washer. **NOTE:** End of spring must go in recessed side of washer.

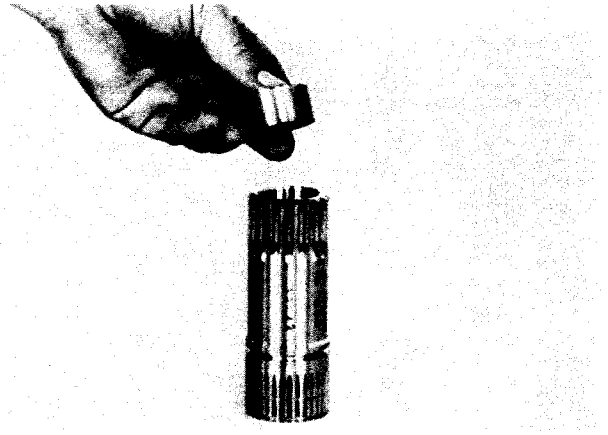


Figure 284
If stator support bushing was removed, install bushing in support.

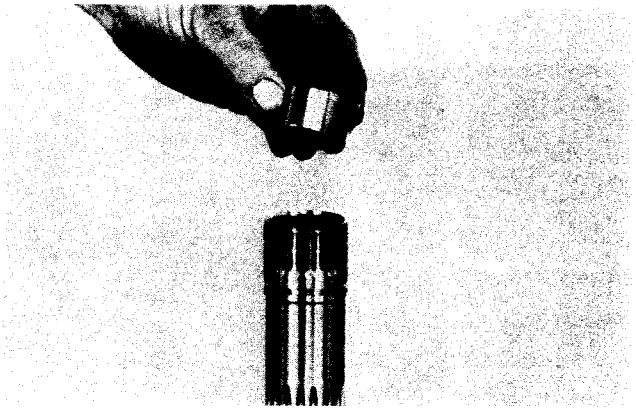


Figure 285
Install needle bearing in stator support.

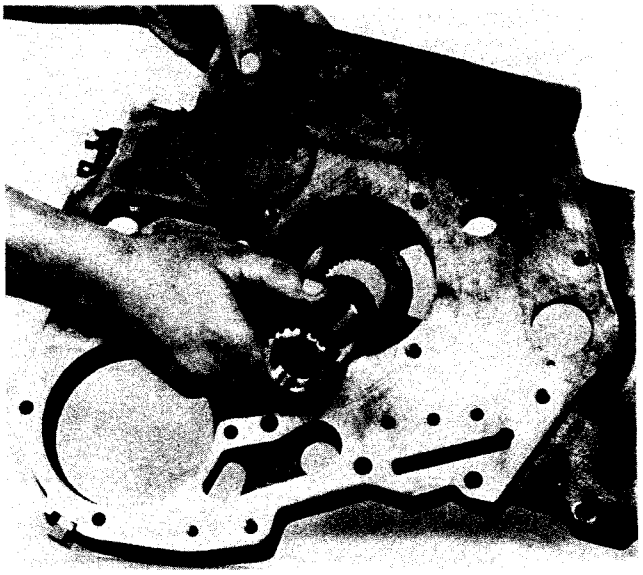


Figure 286
Install stator support through spacer plate.

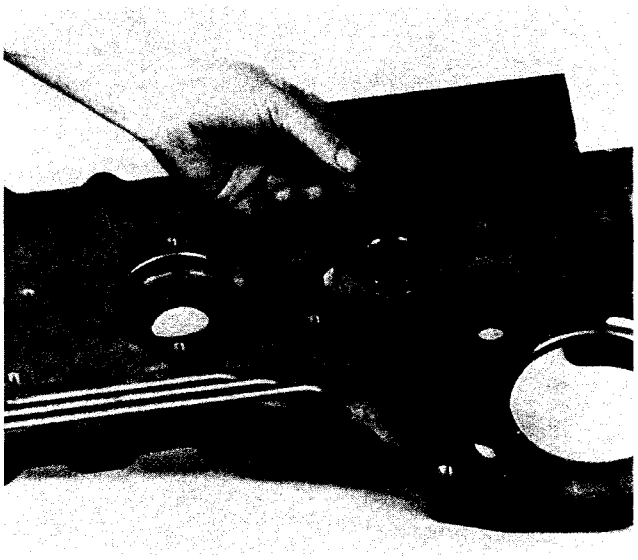


Figure 287
Install stator support locating ring.

Figure 288
Push support back through spacer until locating ring shoulders in support bore. Turn spacer plate over and install impeller hub gear washer and support retaining ring.

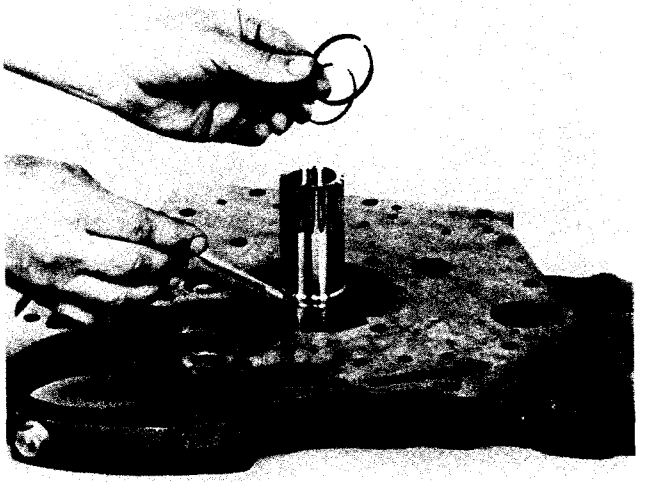


Figure 289
Install stator support oil sealing ring expander ring. Install oil sealing ring on expander ring. **NOTE:** Expander spring gap to be 180 degrees from sealing ring hook joint.

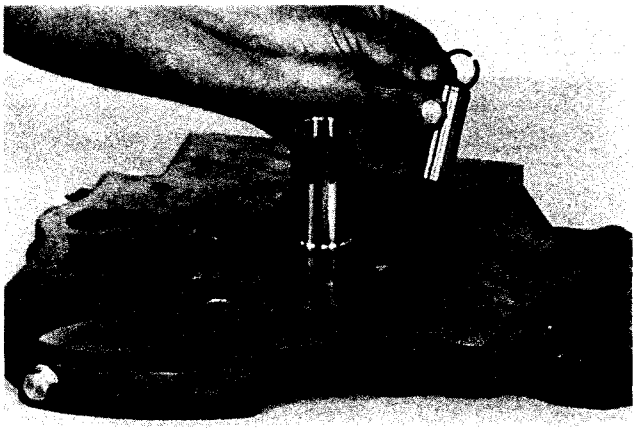


Figure 290
Install locating ring on reverse idler shaft.

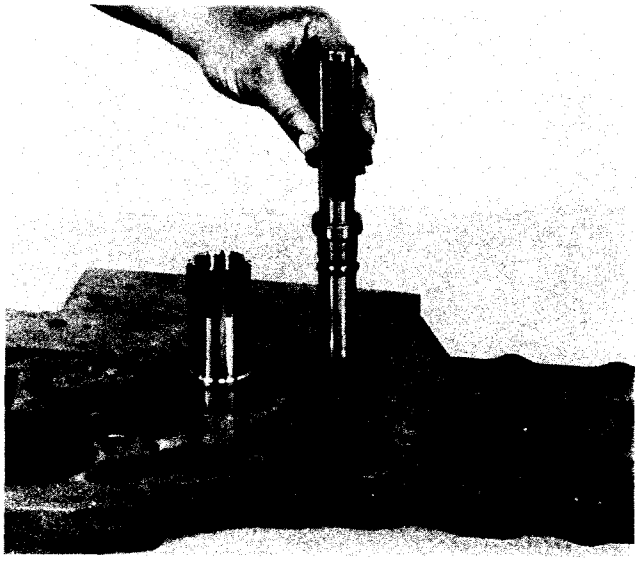


Figure 291
Support spacer plate and press reverse idler shaft into position and tight against locating ring.

Figure 292
Turn spacer plate over and position tanged thrust washer on shaft, being certain tang in washer is in notch in spacer plate.

Figure 293
Position idler gear needle bearing on shaft. Lubricate bearing.

Figure 294
Position idler gear on bearing.

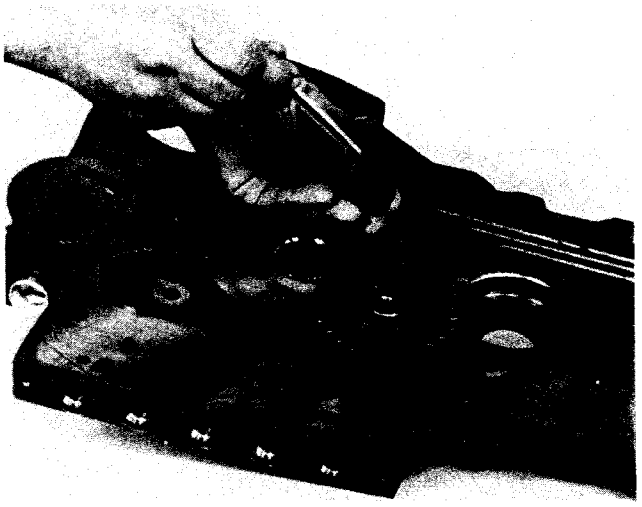


Figure 295
Position idler gear end plate and roll pin on idler shaft, aligning roll pin with hole in idler shaft.

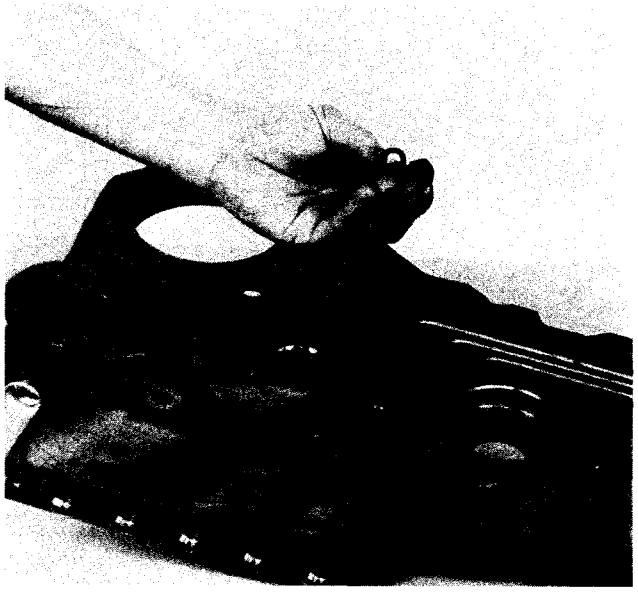


Figure 296
Install end plate capscrew and washer.

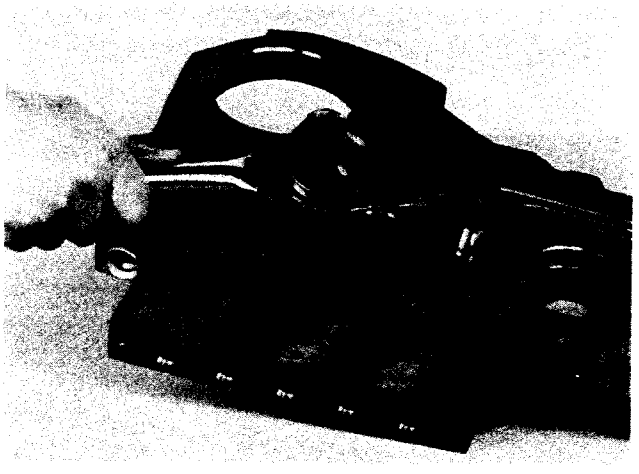


Figure 297
Tighten capscrew to specified torque. See torque chart.

FRONT OUTPUT FLANGE DISASSEMBLY AND REASSEMBLY (FLANGE USED WITH FRONT DISCONNECT)

DISASSEMBLY

NOTE: Unless disconnect front and rear flange bushings are to be replaced, DO NOT remove bushing or expansion plug.

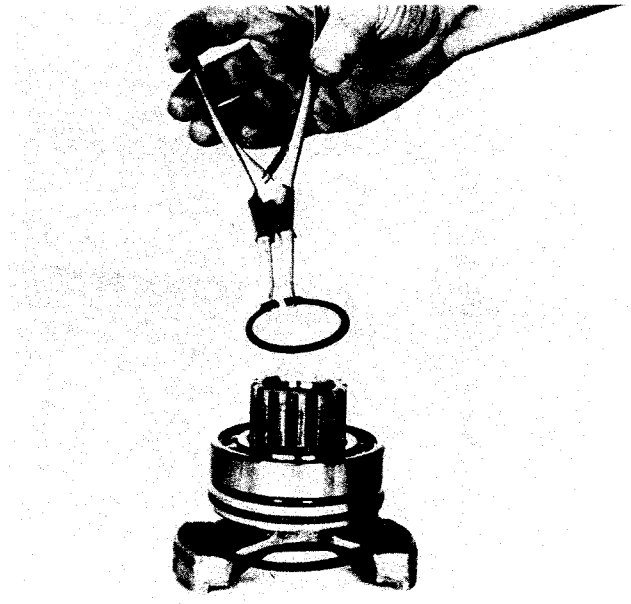


Figure 298
Remove flange to bearing retainer ring.

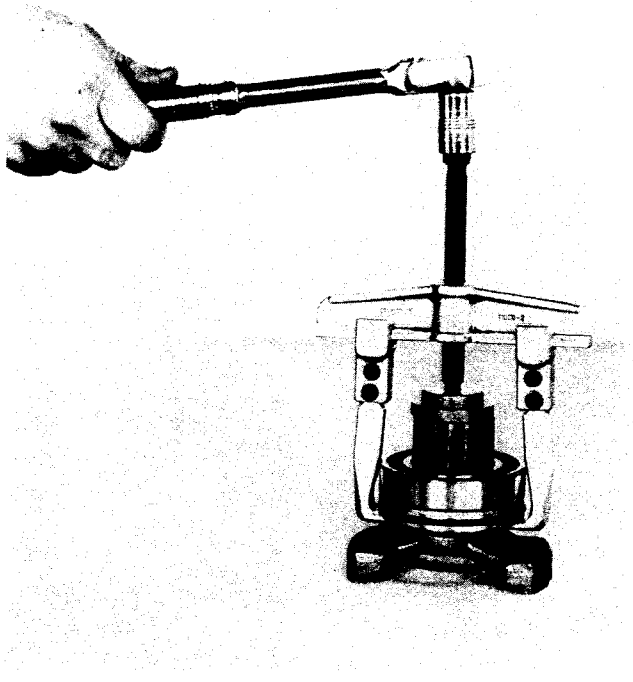


Figure 299
Using a bearing puller as shown, remove bearing.

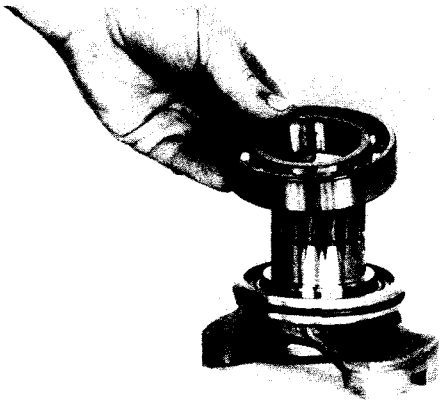


Figure 300
Bearing removed.

Figure 301
Oil seal sleeve and "O" ring removed.

Figure 302
Remove oil seal from sleeve.

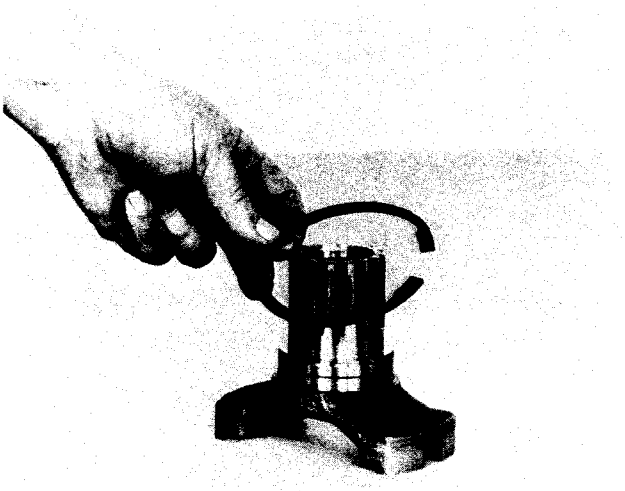


Figure 303
Remove oil seal retainer ring from output flange.

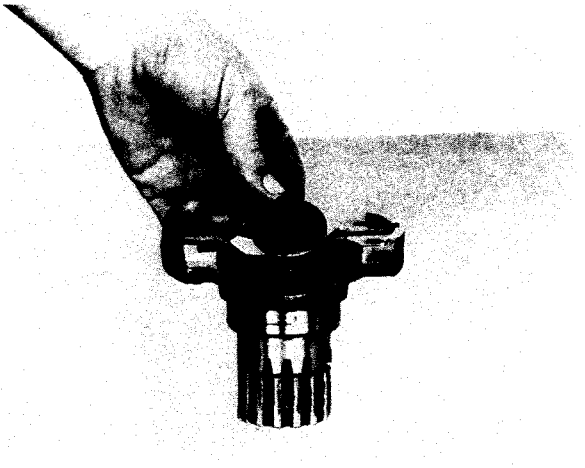


Figure 304
Tap expansion plug from flange. (See note at top of page 51.)

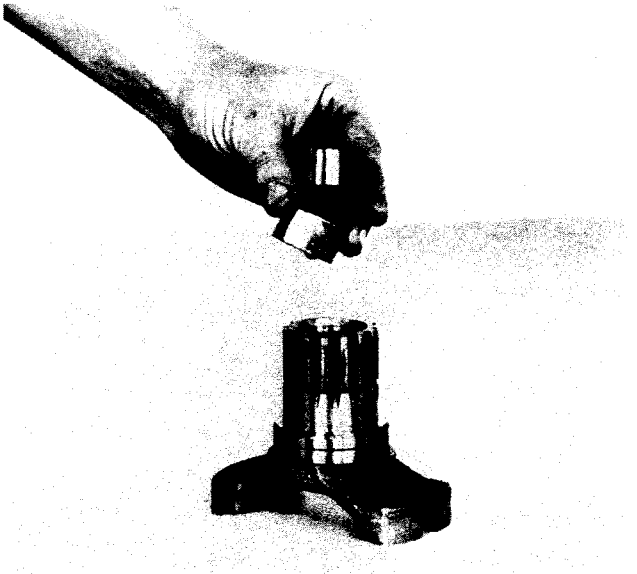


Figure 305
Remove output bushing. (See note at top of page 51.)

REASSEMBLY
(See cleaning and inspection page)

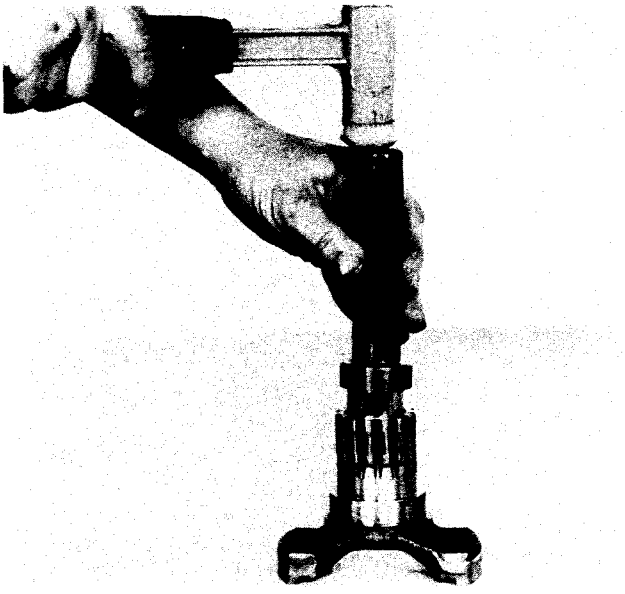


Figure 306
Install new inner and outer flange bushings to dimensions shown in Figure 307B. **NOTE:** Bushings used only with front disconnect.

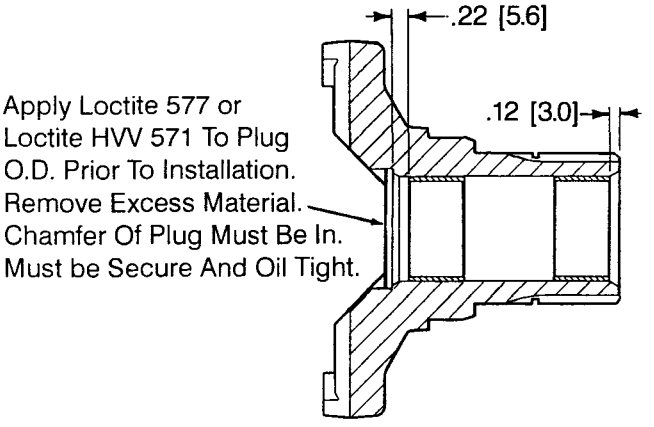


Figure 307B

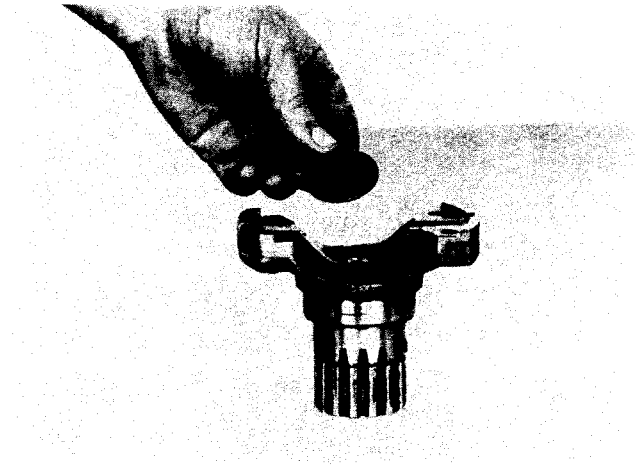


Figure 307
Apply a light coat of Loctite #577 to the outer edge of expansion plug. Install plug in flange. **NOTE:** See Figure 307A for expansion plug installation tool fabrication. It is imperative plug be installed properly to prevent oil leakage.

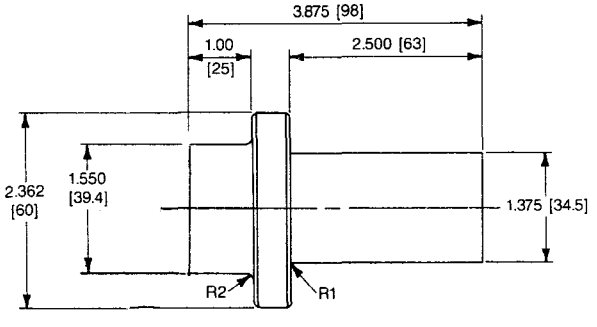


Figure 307A

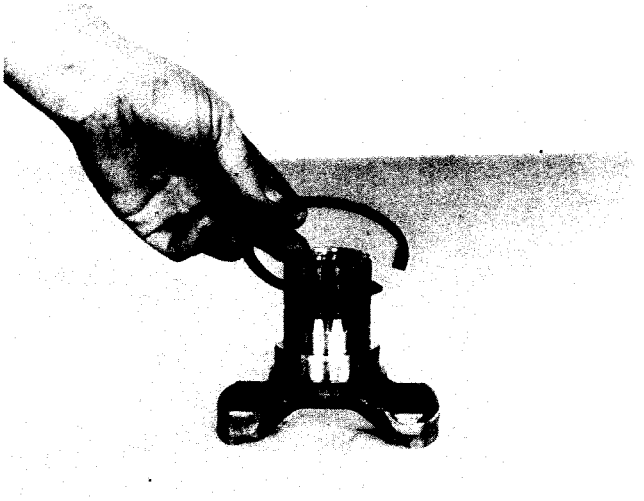


Figure 308
Position retainer ring on output flange.

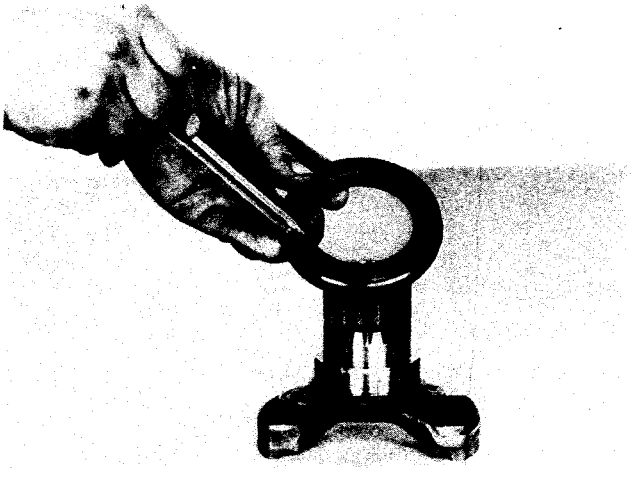


Figure 309
Apply a very light coat of Permatex #2 to the outer diameter of the output flange oil seal. Press oil seal in oil seal sleeve. Oil seal must be flush with one side of face of oil seal sleeve, and lip of seal must be in.

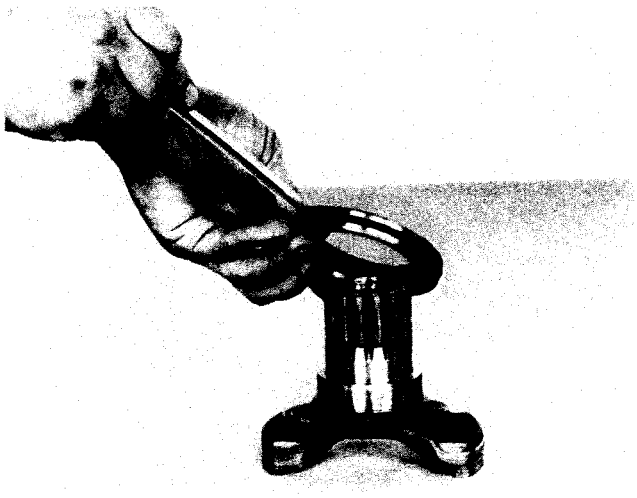


Figure 310
Install new "O" ring on oil seal sleeve. Position oil seal sleeve assembly on output flange. **NOTE:** Recessed portion of oil seal and sleeve must be up, with lip of seal up. This leaves a space between oil seal and output bearing.

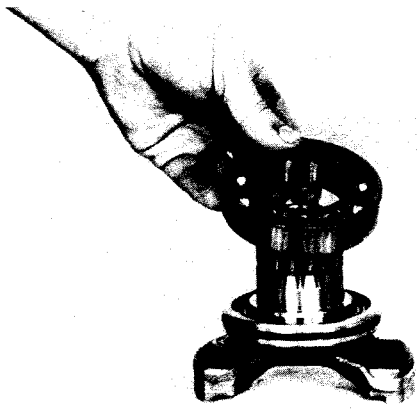


Figure 311
Press bearing on output flange.

Figure 312
Install bearing to flange retainer ring.

REAR OUTPUT FLANGE DISASSEMBLY AND REASSEMBLY

DISASSEMBLY

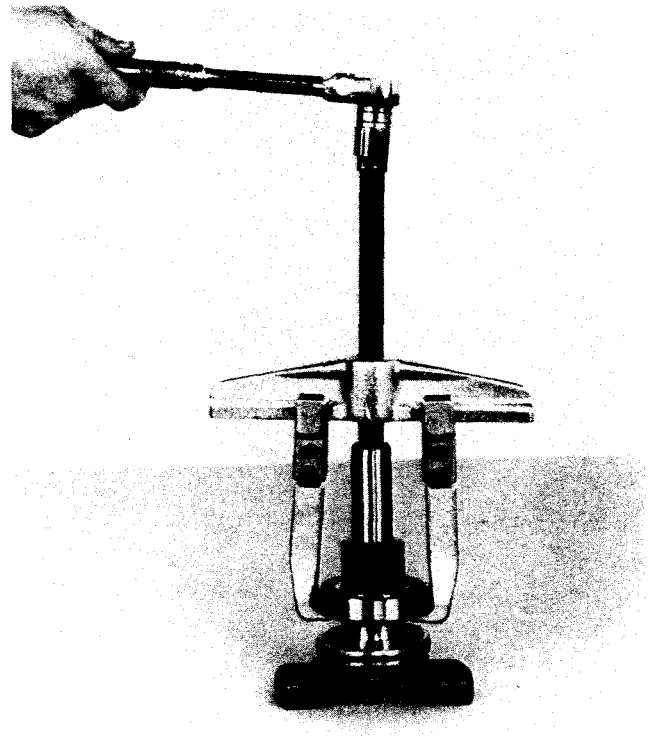


Figure 313
Using a bearing puller as shown, remove bearing.

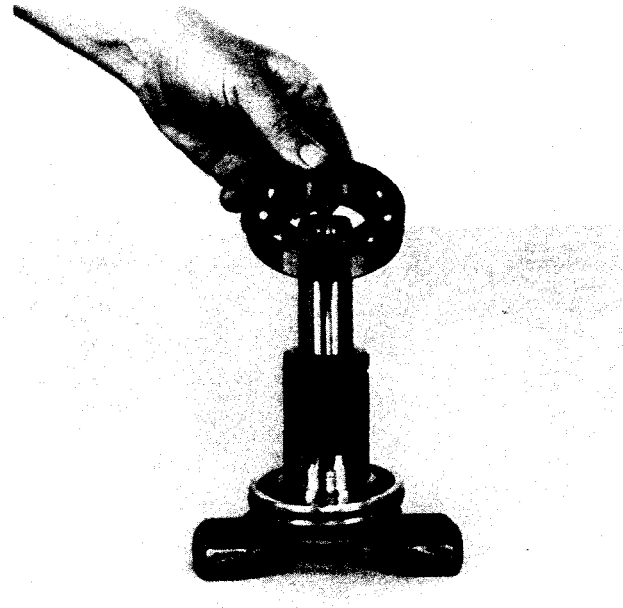


Figure 314
Bearing removed.

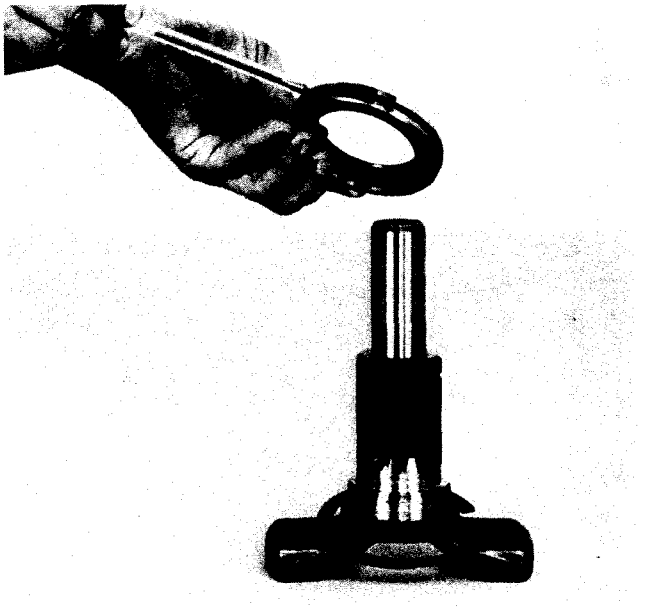


Figure 315
Oil seal sleeve and "O" ring removed.

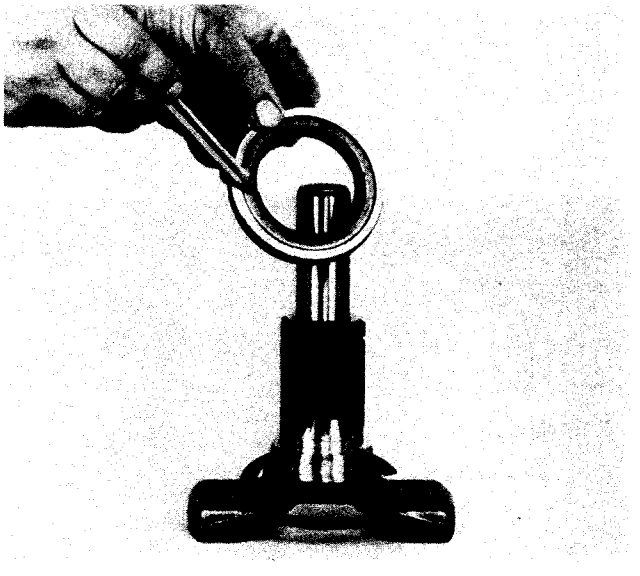


Figure 316
Remove oil seal from sleeve.

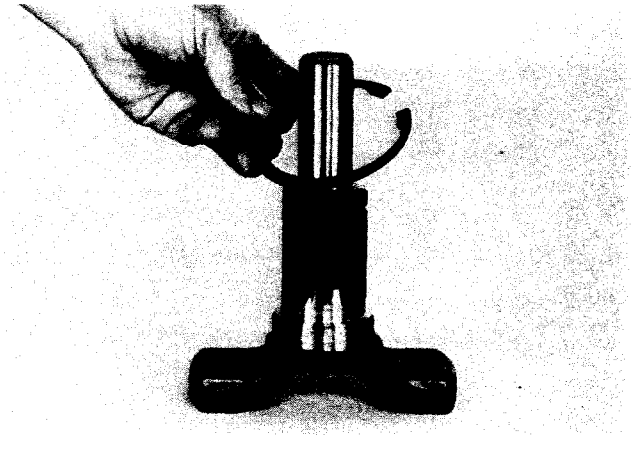


Figure 317
Remove oil seal retainer ring from output flange.

REASSEMBLY
(See cleaning and inspection page)

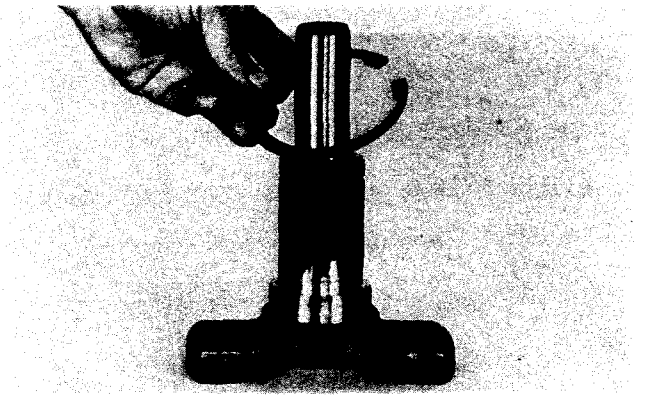


Figure 318
Position bearing retainer ring on output flange.

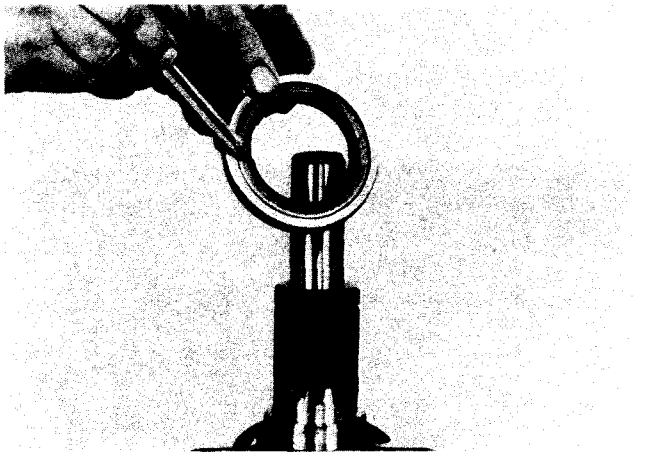


Figure 319
Apply a very light coat of Permatex #2 to the outer diameter of the output flange oil seal. Press oil seal in oil seal sleeve. Oil seal must be flush with one side of face of oil seal sleeve, and lip of seal must be in.

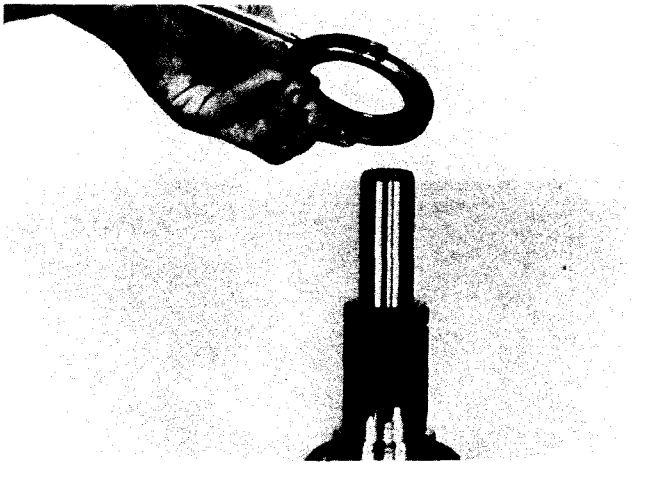


Figure 320
Install new "O" ring on oil seal sleeve. Position oil seal sleeve assembly on output flange. **NOTE:** Recessed portion of oil seal and sleeve must be up, with lip of seal up. This leaves a space between oil seal and output bearing.

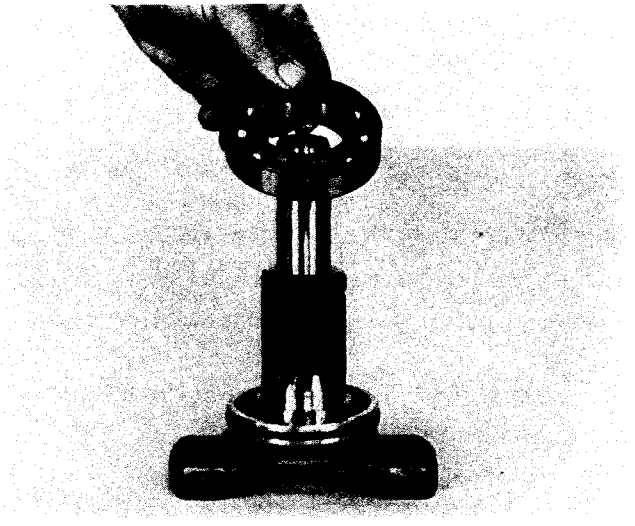


Figure 321
Press bearing on output flange.

DISASSEMBLY AND REASSEMBLY OF CONVERTER HOUSING

DISASSEMBLY

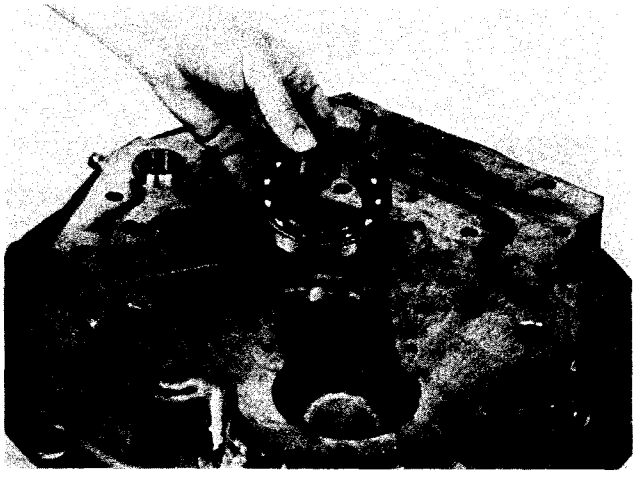


Figure 322
Remove torque converter bearing.

Figure 323
Remove oil distributor and "O" rings.

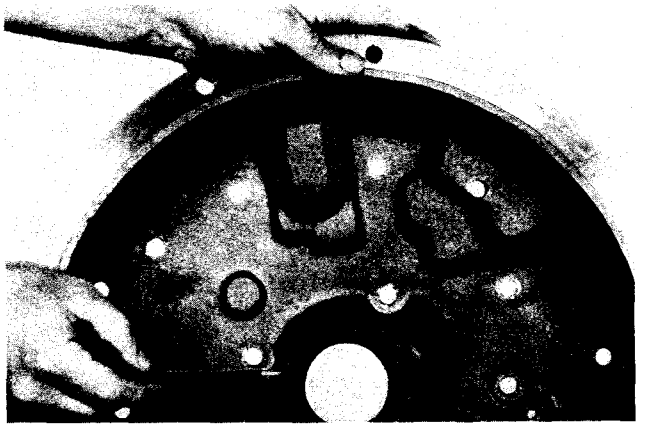


Figure 324
Remove converter oil seal.

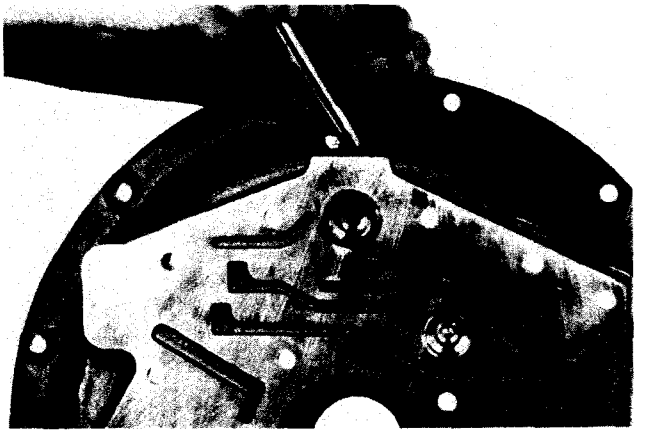


Figure 325
Remove converter housing plug. (High and 3rd Clutch Shaft.) Remove oil distributor sleeve set screw.

Figure 326
Using a hammer puller as shown, remove oil distributor sleeve. (High and 3rd.)

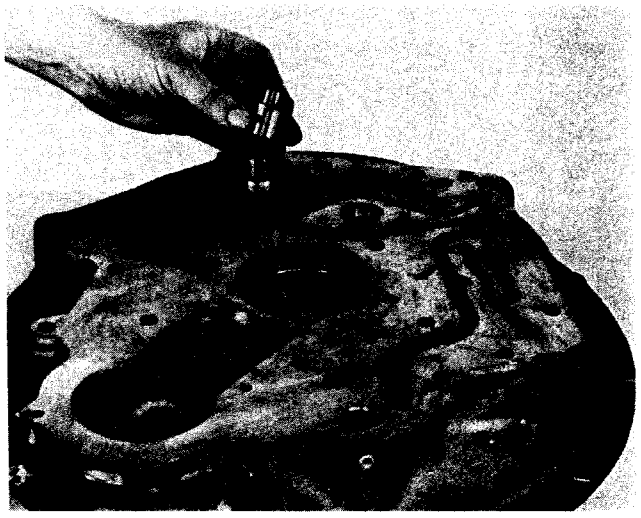


Figure 327
Sleeve removed.

REASSEMBLY OF CONVERTER HOUSING
(See cleaning and inspection page)

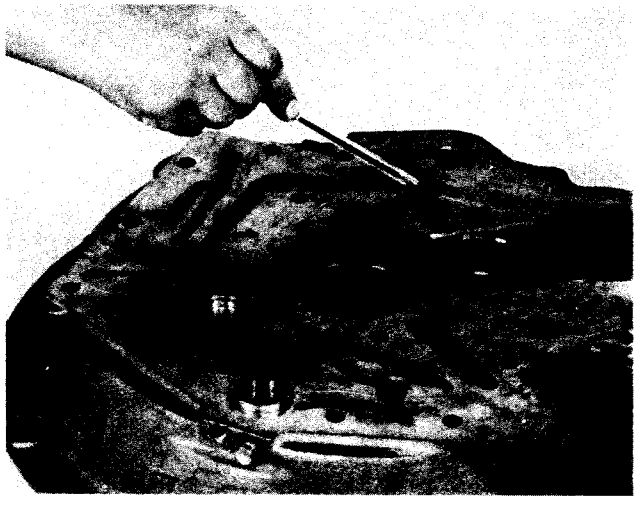


Figure 328
Make sure pressure regulator check ball assembly is clean and free of foreign material.

Figure 329
Apply a very light coat of Permatex #2 to the outer diameter of the converter housing oil seal. Press seal in housing with lip of seal in.

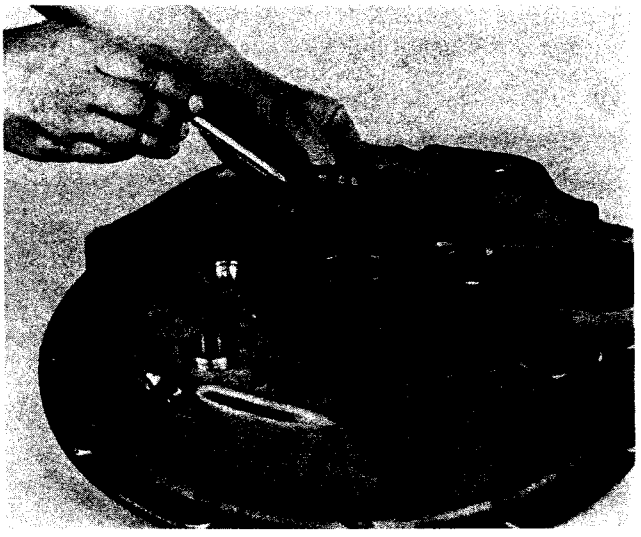


Figure 330
Install new "O" rings on converter housing oil distributor. Install oil distributor in converter housing with long hub toward oil seal.

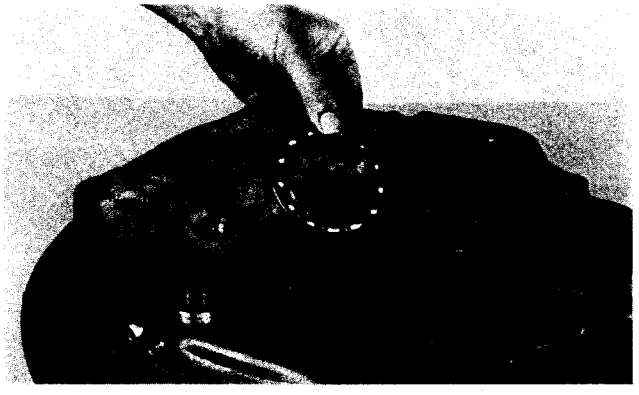


Figure 331
Press converter bearing in housing against shoulder.

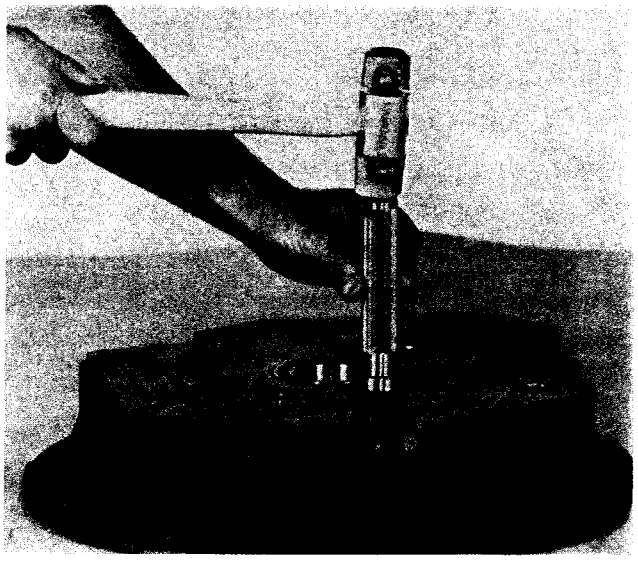


Figure 332
Install high-3rd clutch shaft oil distributor sleeve in converter housing with inside diameter chamfer up and the notch in the distributor aligned up with the retaining set screw hole in the converter housing.

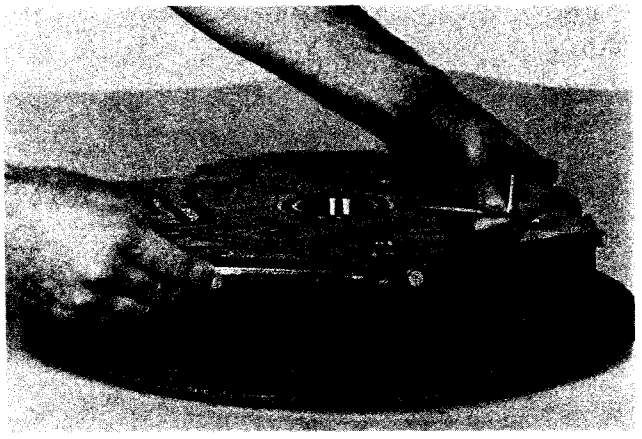


Figure 333
Apply Loctite #243 to threads of sleeve set screw. (**NOTE:** This set screw has a hole in it. Use caution as not to allow any Loctite to plug hole.) Install set screw in converter housing and in oil distributor.

Figure 334
Install set screw plug.

REASSEMBLY OF TRANSMISSION
(See cleaning and inspection page)

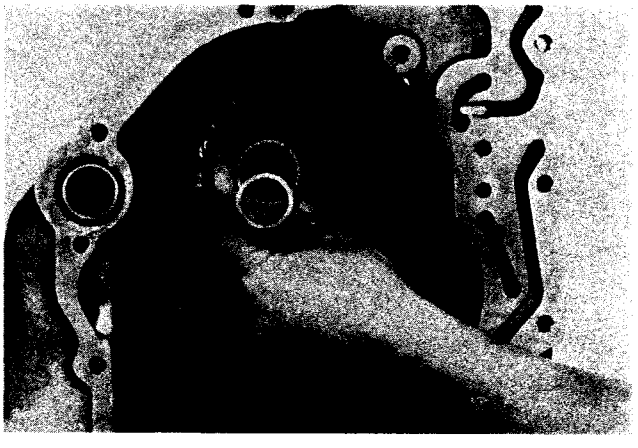


Figure 335
Install forward-reverse oil distributor sleeve in transmission case with inside diameter chamfer out, (toward front of transmission), and the notch in the distributor aligned up with the retaining set screw hole in the transmission case.

Figure 336
Install set screw in transmission case and in oil distributor sleeve. Install set screw plug.

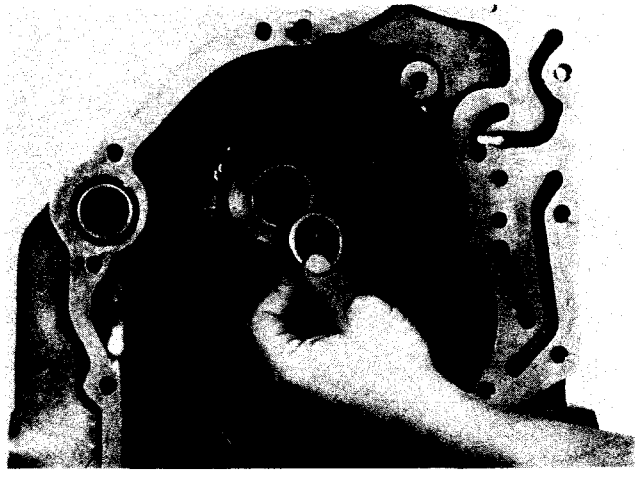


Figure 337
Install reverse and forward clutch shaft rear bearing in transmission case.

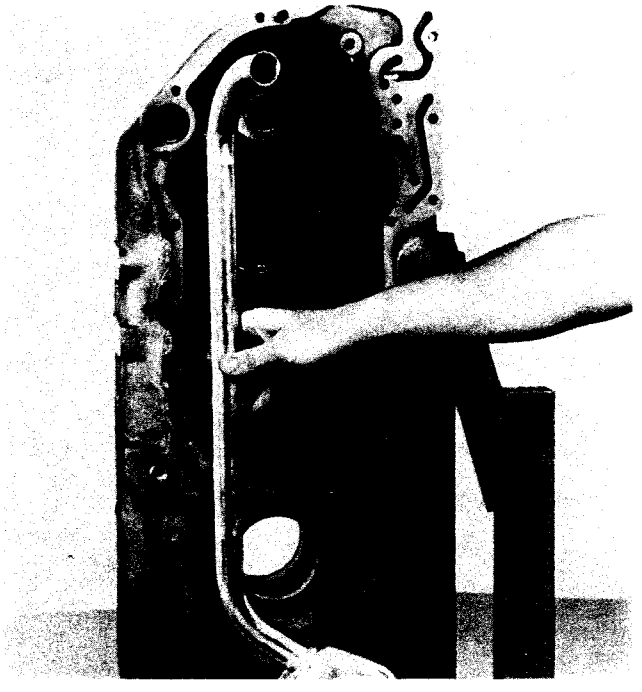


Figure 338
Position supply tube and screen assembly in transmission case sump.

Figure 339
Push supply tube through opening in case and install "O" ring.

Figure 340
Install supply tube clip and screw and lockwasher in case and tighten to specified torque. See torque chart.

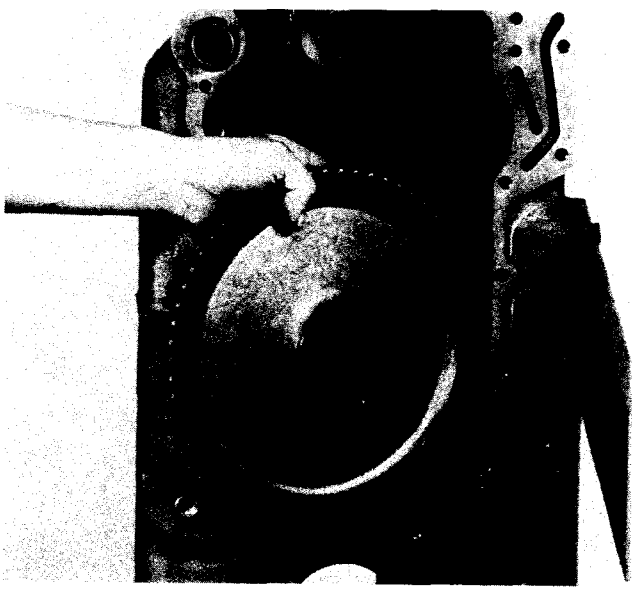


Figure 341
Position output gear in transmission case with long hub of gear toward front of case.

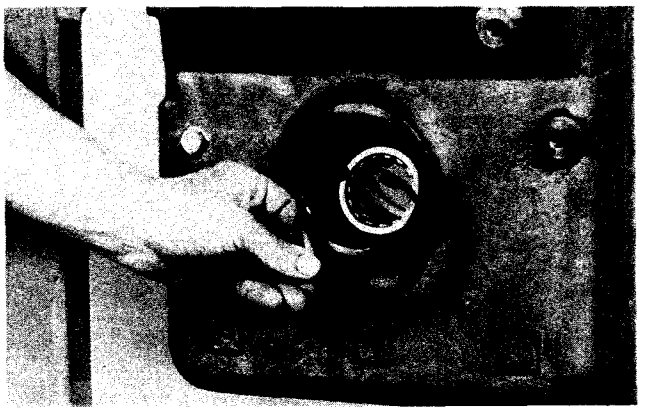


Figure 342
Install output shaft inner bearing locating ring in rear of transmission case.

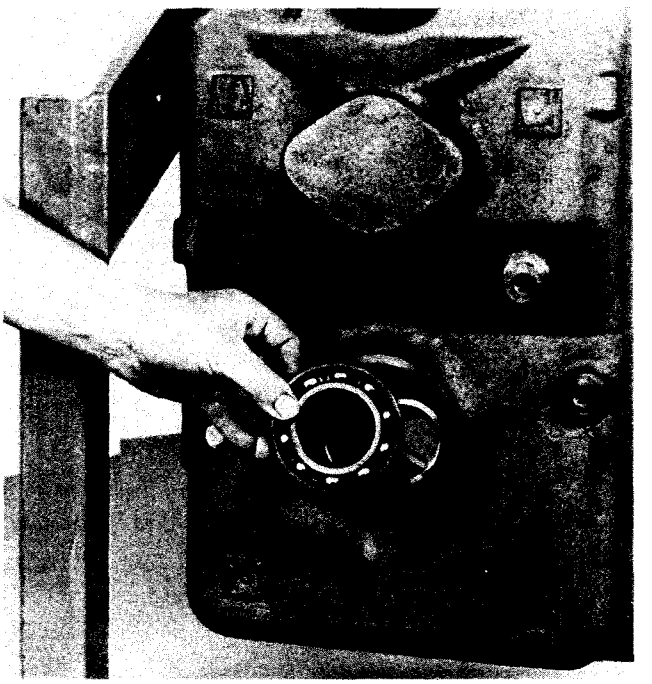


Figure 343
Install rear bearing in case against locating ring.

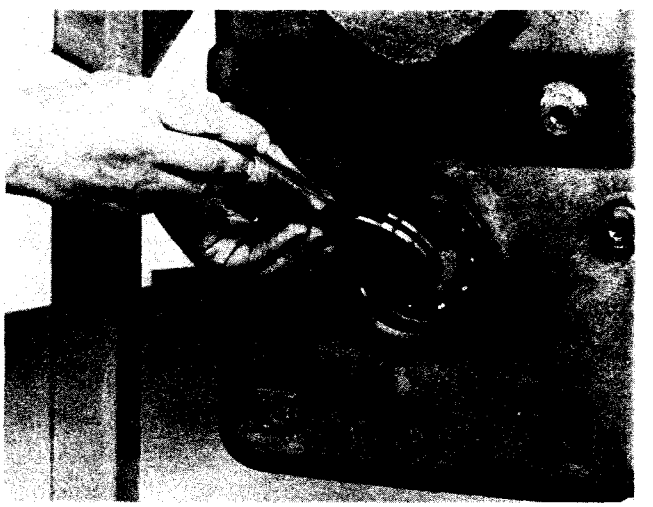


Figure 344
Install new "O" ring on rear oil seal sleeve.

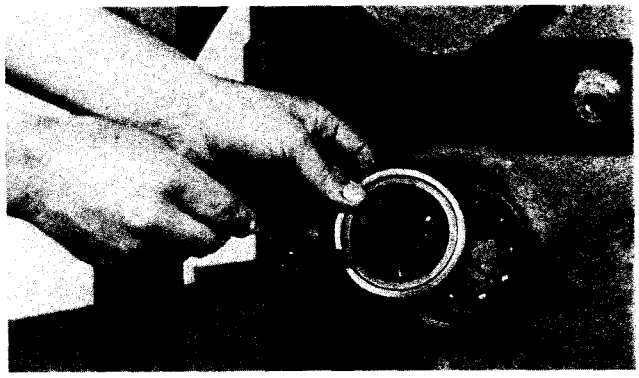


Figure 345
Apply a very light coat of Permatex #2 to the outer diameter of the output flange oil seal. Press oil seal in oil seal sleeve. Oil seal must be flush with one side of face of oil seal sleeve and lip of seal must be in.

Position oil seal sleeve in transmission case with recessed portion of oil seal toward output bearing. This leaves a space between oil seal and output bearing.

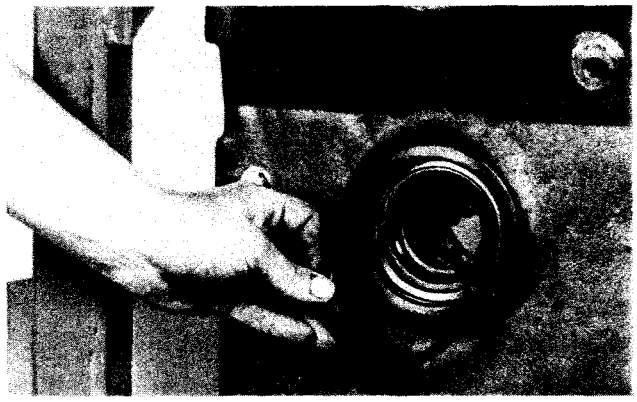


Figure 346
Install oil seal sleeve retainer ring.

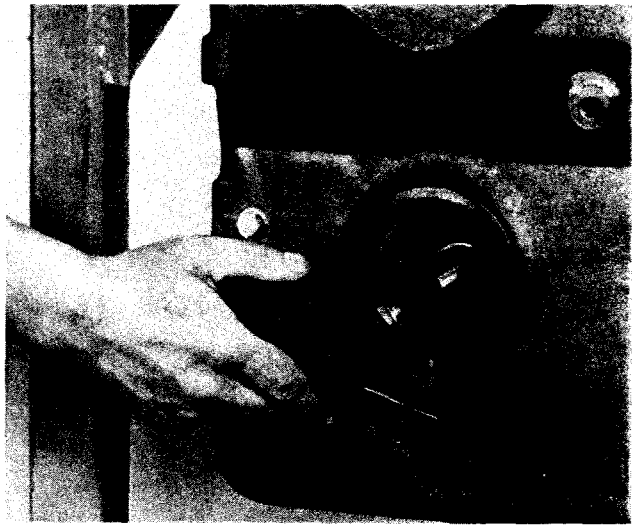


Figure 347
Install rear output flange and shaft through output oil seal. Align splines on shaft with splines on output gear. Install shaft through gear. Use caution as not to damage oil seal. Tap shaft into position.

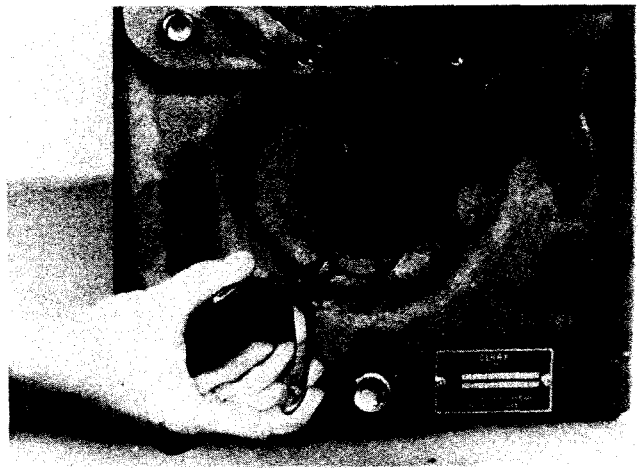


Figure 348
Install output shaft to output gear retainer ring. **NOTE:** If disconnect to the front is not used, proceed to Figures 350 and 351.

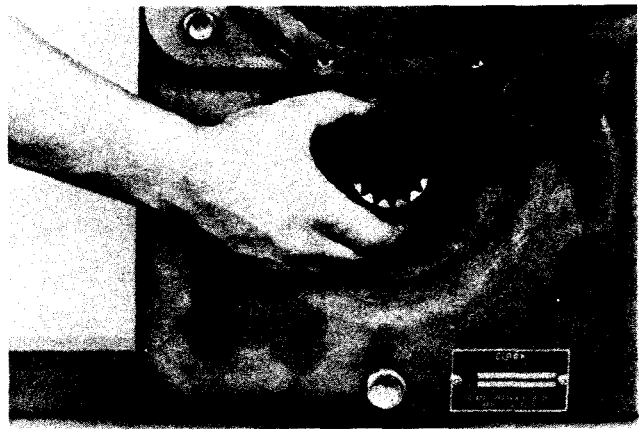


Figure 349
Position shift hub on output shaft.

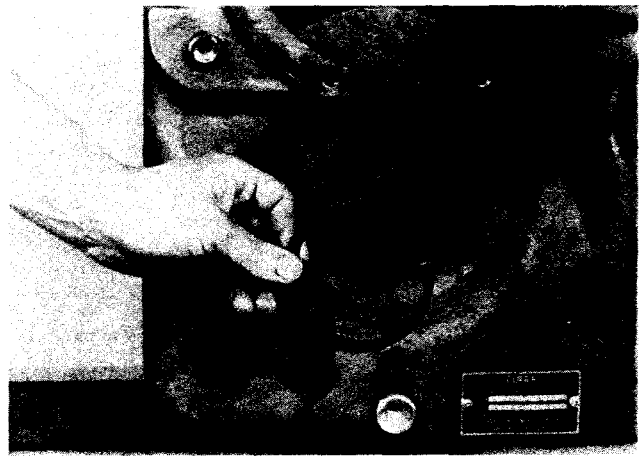


Figure 350
Install front output shaft bearing locating ring.

Figure 351
Position front output flange and bearing assembly on output shaft. Using snap ring pliers as shown, squeeze snap ring ends together and tap flange assembly into case until snap ring can seat in snap ring groove.

If transmission is less disconnect, proceed to Figure 358.

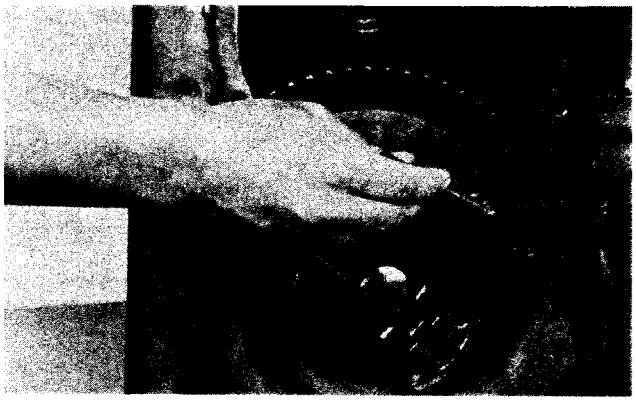


Figure 352
Apply Permatex #2 to outer diameter of shift rail oil seal. Install seal in case with lip of seal in.

Figure 353
Position shift fork in shift hub on output shaft. Install shift rail through oil seal. Align fork and rail.

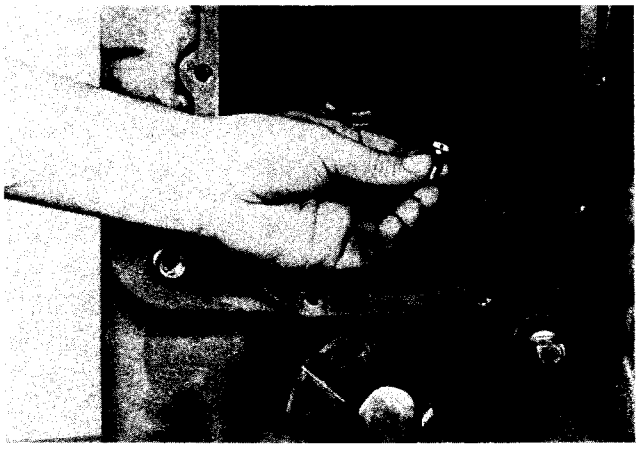


Figure 354
Install shift fork to rail lockscrew. Tighten securely and lockwire to prevent loosening.

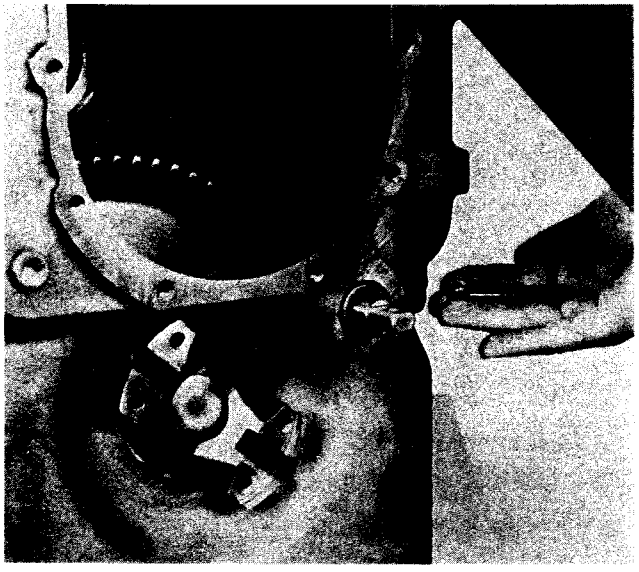


Figure 355
Position detent ball, spring, and overshift pin, as shown.

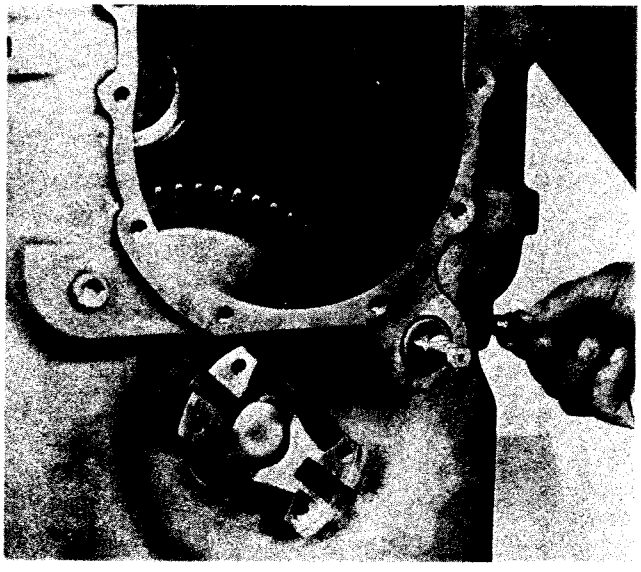


Figure 356
With new "O" ring in position, install detent plug.

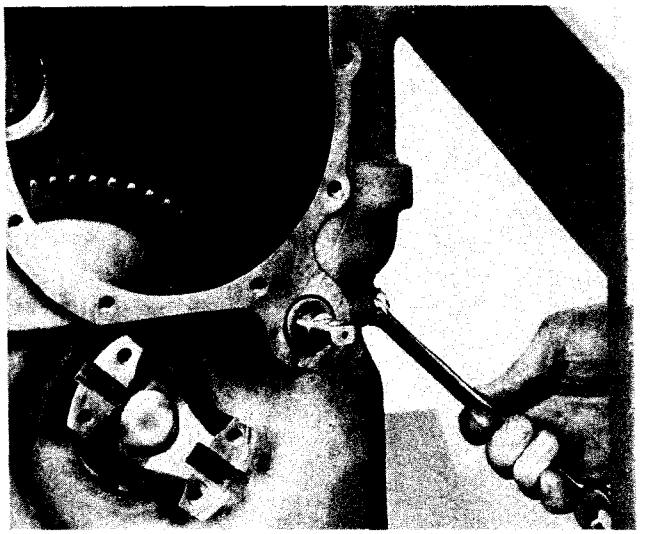


Figure 357
Tighten plug securely.

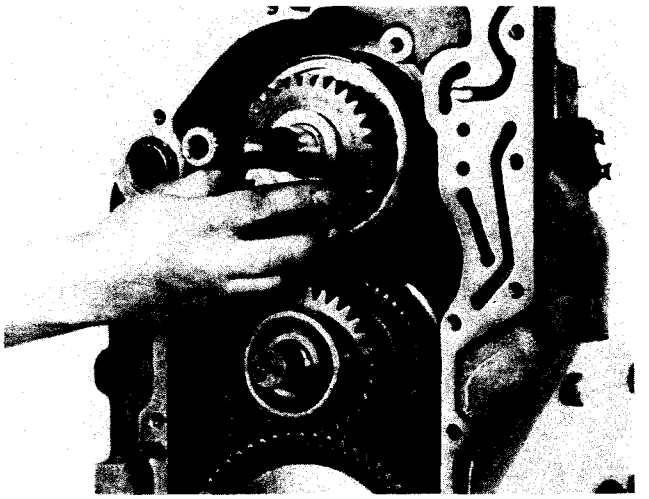


Figure 360
Position forward and reverse clutch in top bore.

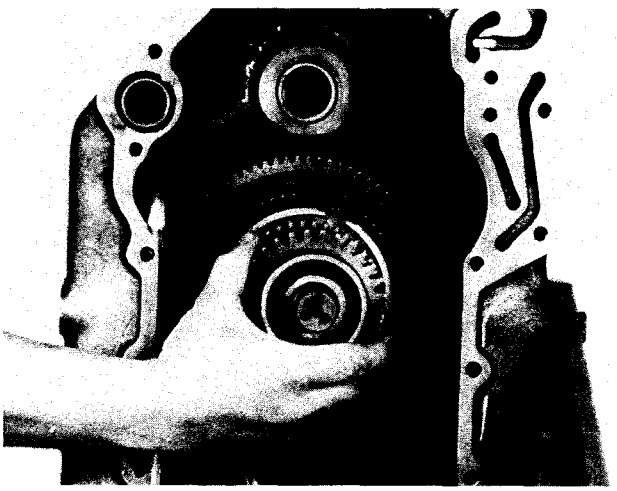


Figure 358
Position 4th high and 3rd clutch assembly in center bore in transmission case. **NOTE:** 3 speed transmission will only have 3rd clutch.

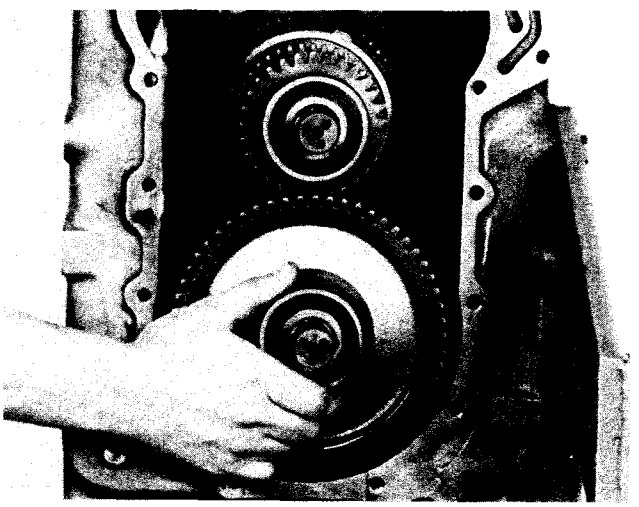


Figure 359
Position 1st and 2nd clutch assembly in bottom bore in transmission case.

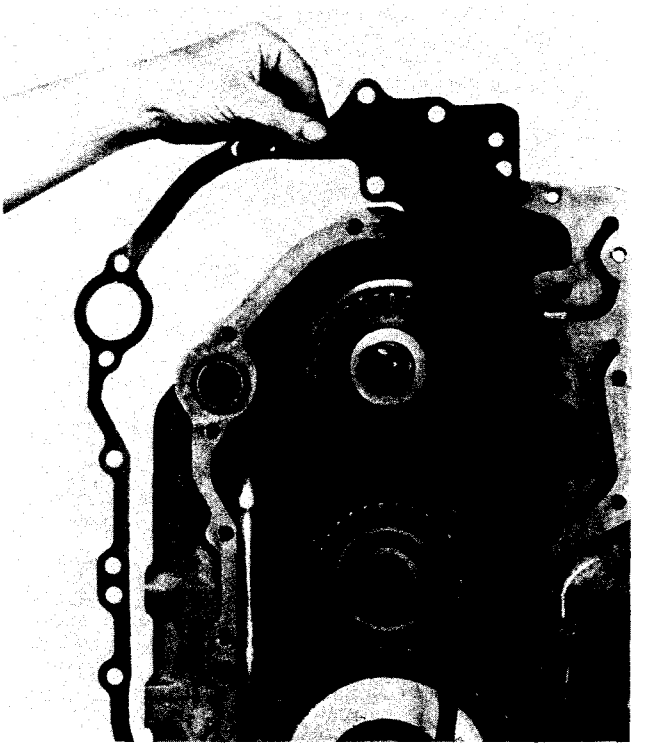


Figure 361
Position new transmission case to converter housing gasket on transmission case. A light coat of grease will hold gasket in position. **NOTE:** The use of aligning studs will facilitate spacer plate to transmission case installation.

Figure 362
Install spacer plate assembly on transmission, aligning clutch shafts with opening in spacer plate. Use caution as not to damage oil sealing rings. Spacer plate must be tight against transmission case. Do not use bolts to pull spacer plate and case together. Tap spacer plate into position at dowel pins. Install spacer plate to transmission case capscrews.

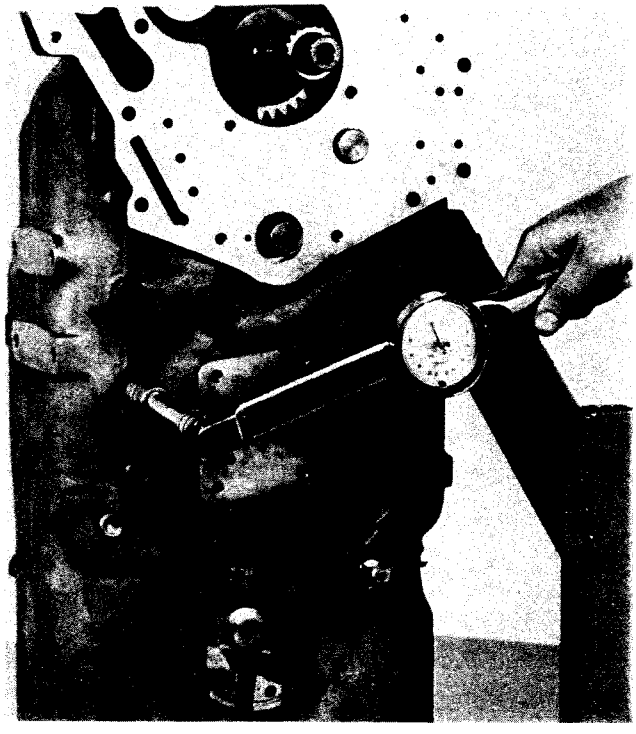


Figure 363
See "**NOTE**" on Figure J for proper capscrew installation and torque.

Figure 364
With roll pin in position in pump idler shaft, install inner washer and shaft in spacer aligning pin with hole in washer and spacer.

Figure 365
Position needle bearing on shaft.

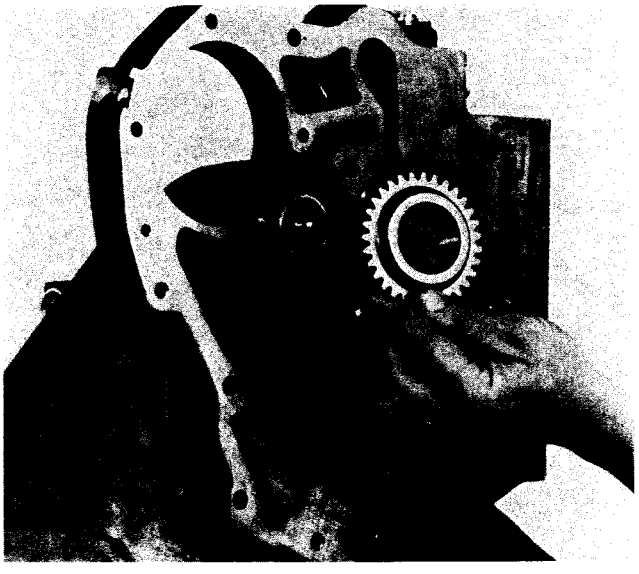


Figure 366
Install idler gear on bearing.

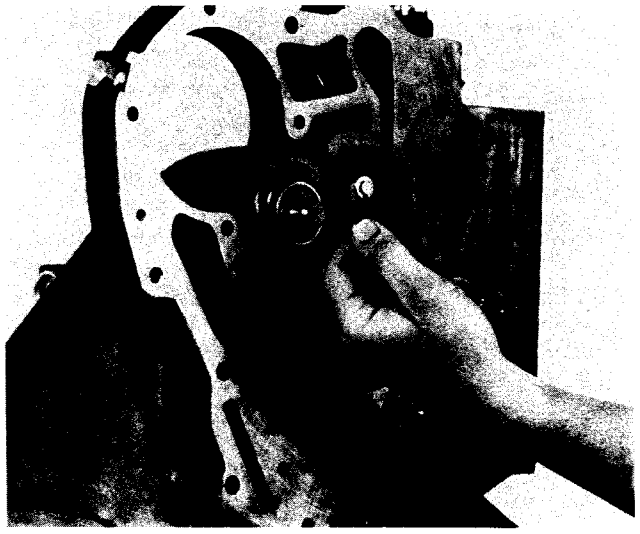


Figure 367
Align hole in outer washer with pin in shaft and install washer.

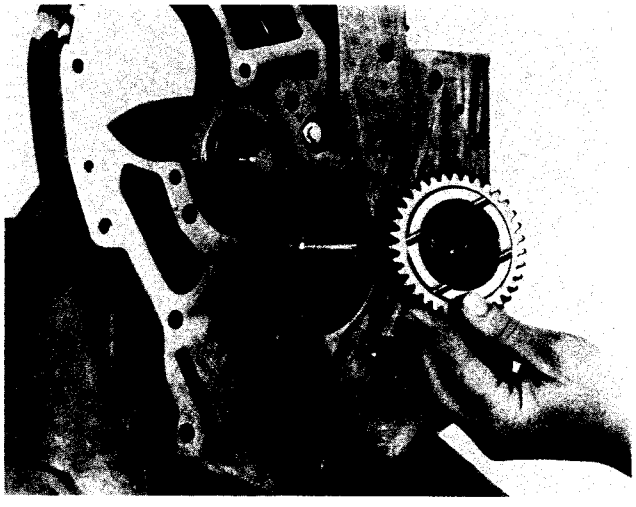


Figure 368
Position impeller hub gear on stator support.

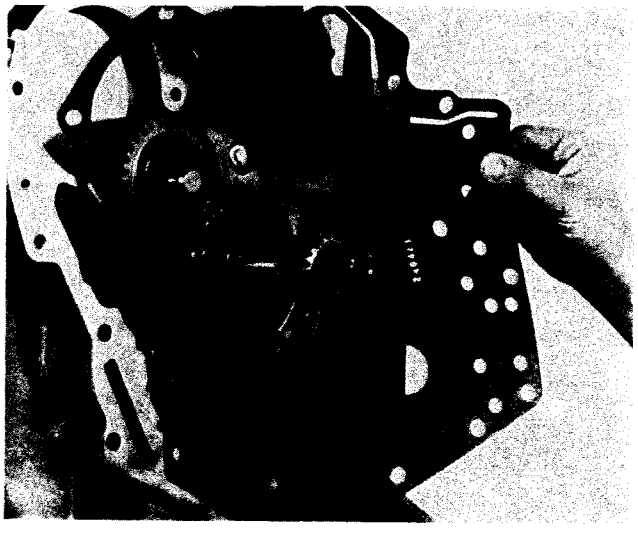


Figure 369
Position spacer to converter housing gasket on spacer. A light coat of grease will hold gasket in place.

ELECTRIC CONTROL VALVE REASSEMBLY

A bore plug is used in the center hole on 3 speed only.

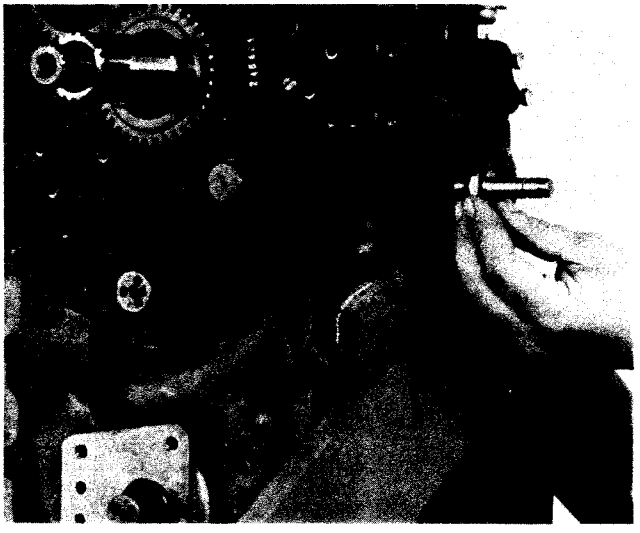


Figure 370
Install solenoid cartridges as explained above.

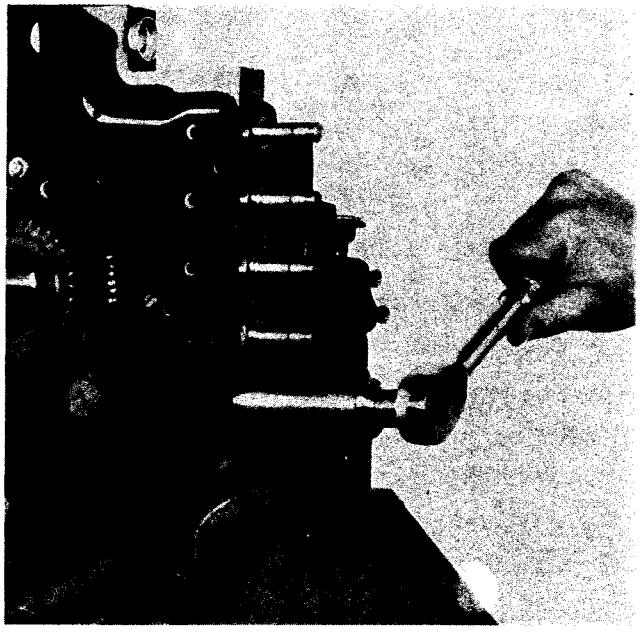


Figure 371
Tighten cartridges 16-20 lbf•ft torque [21,7-27,1 N•m].

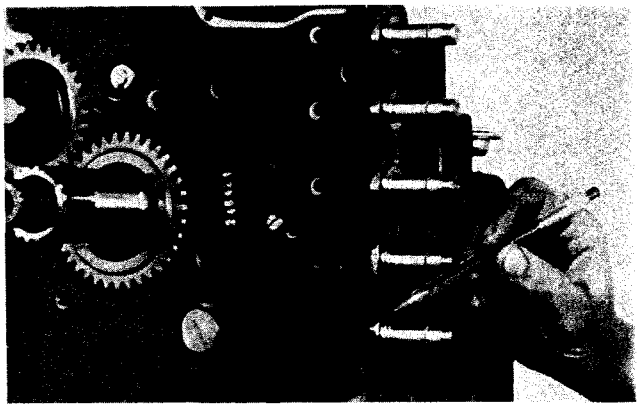


Figure 372
Install new "O" rings on cartridges.

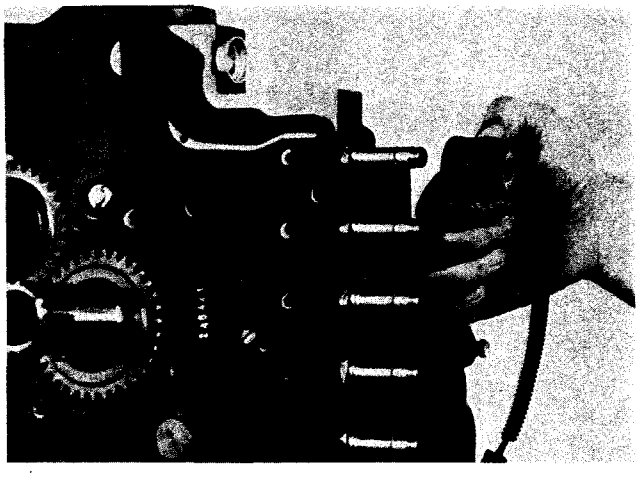


Figure 373
Position solenoid coil on cartridge.

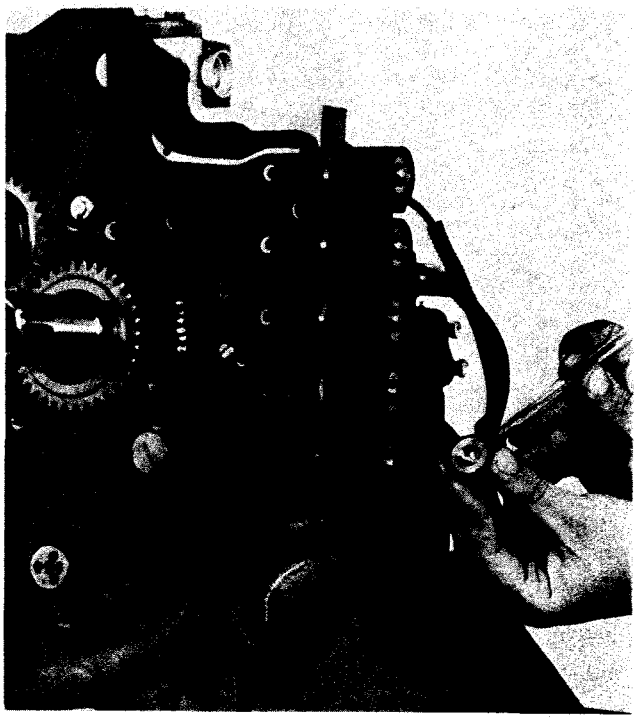


Figure 374
With new "O" ring in position, install coil to cartridge nut.

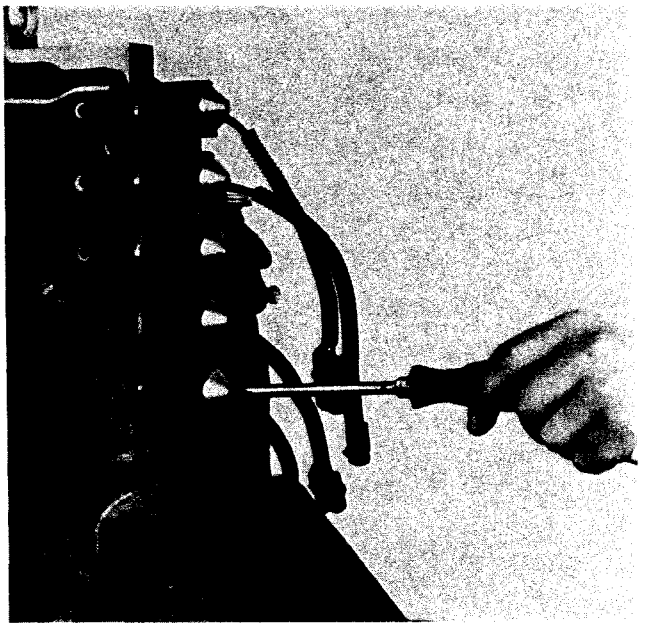


Figure 375
Tighten cartridge nut per assembly instruction drawing.

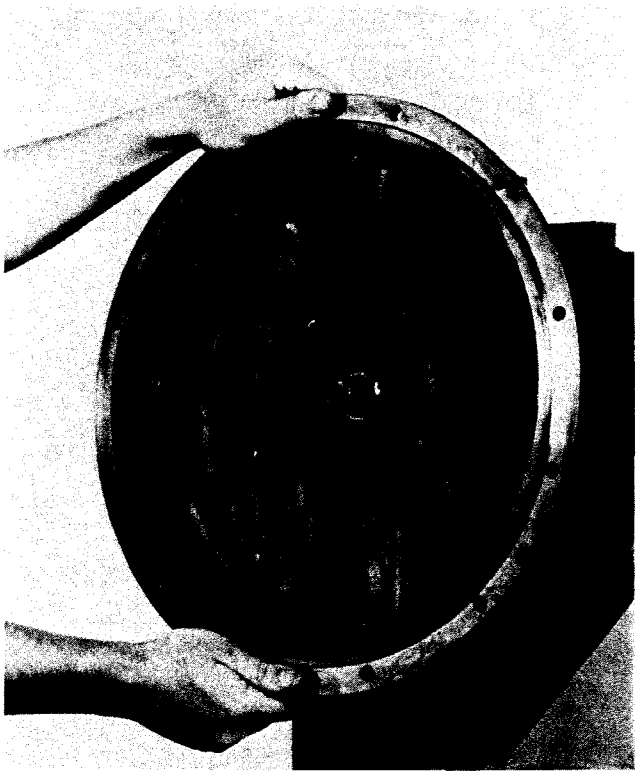


Figure 376
The use of aligning studs will facilitate converter housing to spacer installation. The transmission could be laid down to align the end of the clutch shafts into sealing ring sleeves in converter housing. Do not force this operation. Converter housing must be tight against transmission spacer. **NOTE: Do not use bolts to pull converter housing in place.**

Install converter housing to transmission case screws and lockwashers. See Figures J and K for proper screw location and installation.

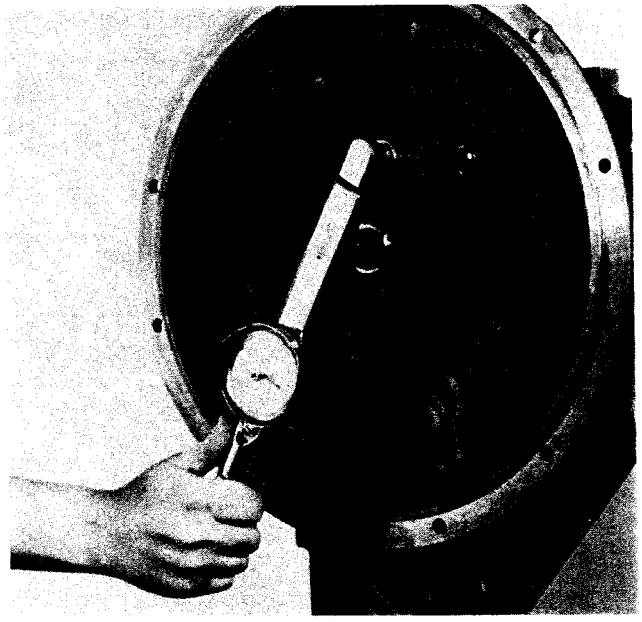


Figure 377
Tighten bolts to specified torque. See Figures J and K for proper screw location and installation.

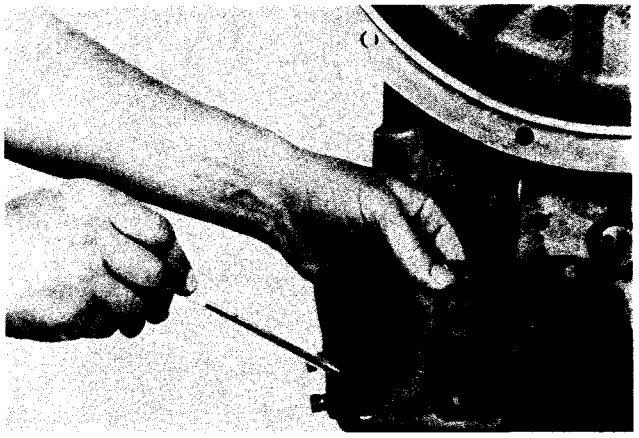


Figure 378
Position new "O" rings and gasket on the 1st and 2nd clutch shaft oil distributor cap.

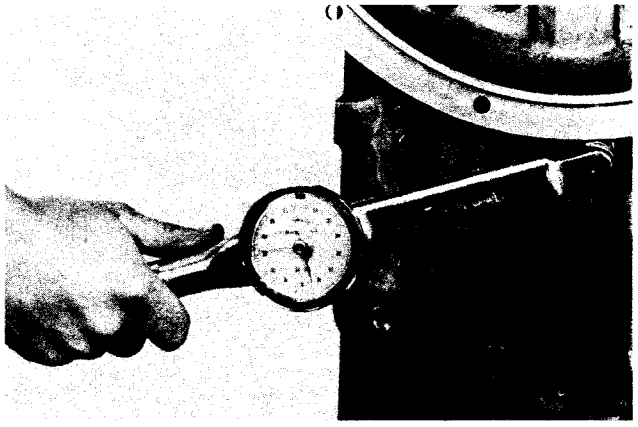


Figure 379
Install distributor cap on clutch shaft. Use caution as not to damage clutch shaft oil sealing rings. Install capscrews and washers. Tighten to specified torque. See torque chart.

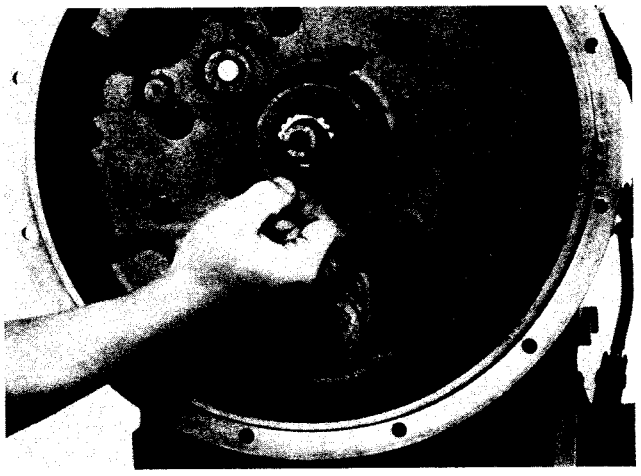


Figure 380
Install converter locating ring on turbine shaft.

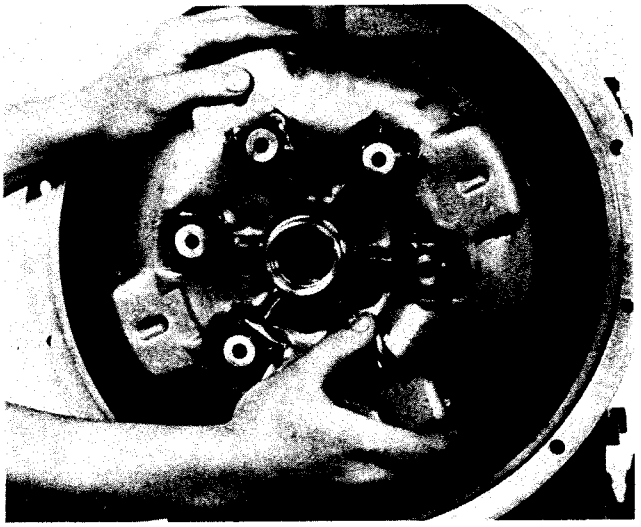


Figure 381
Position converter assembly on stator support and turbine shaft.

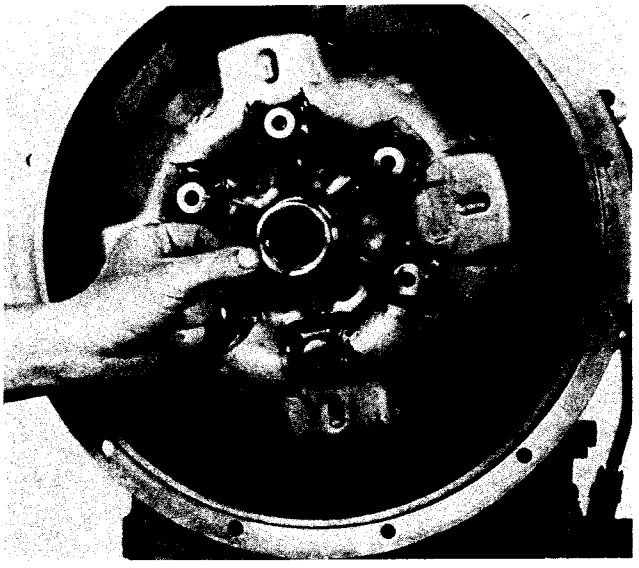


Figure 382
Install converter assembly retainer ring.

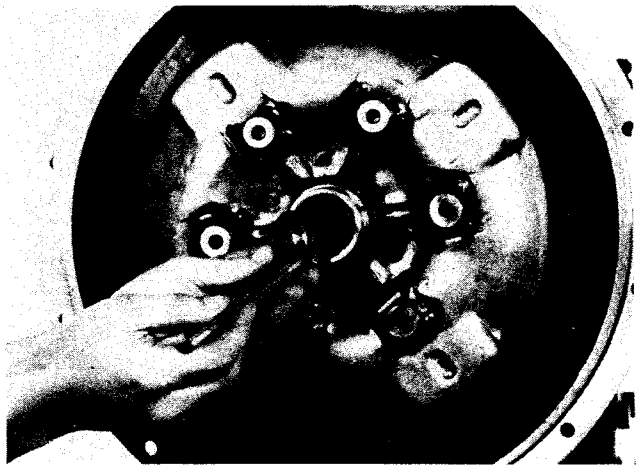


Figure 383
With new "O" ring in place, install bore plug in converter assembly.

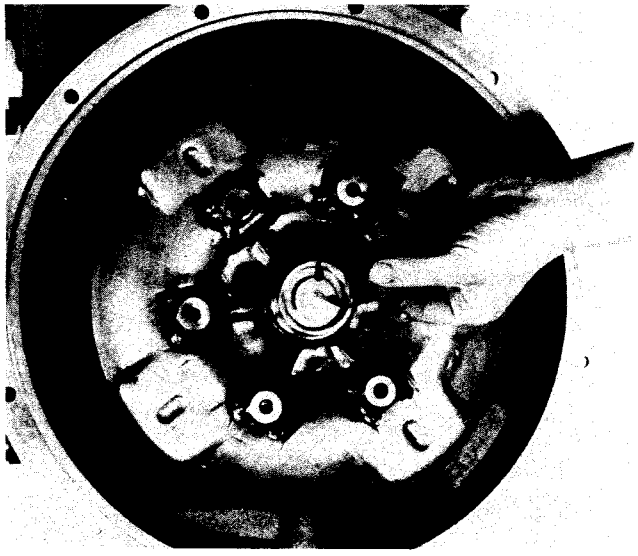


Figure 384
Install bore plug retainer ring.

Figure 385
With new gasket in place, install charging pump in converter housing.

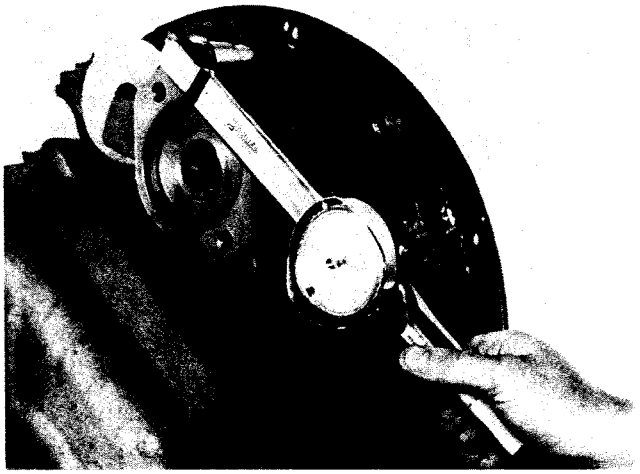


Figure 386
Install charging pump to converter housing bolts and washers and tighten to specified torque. See torque chart.

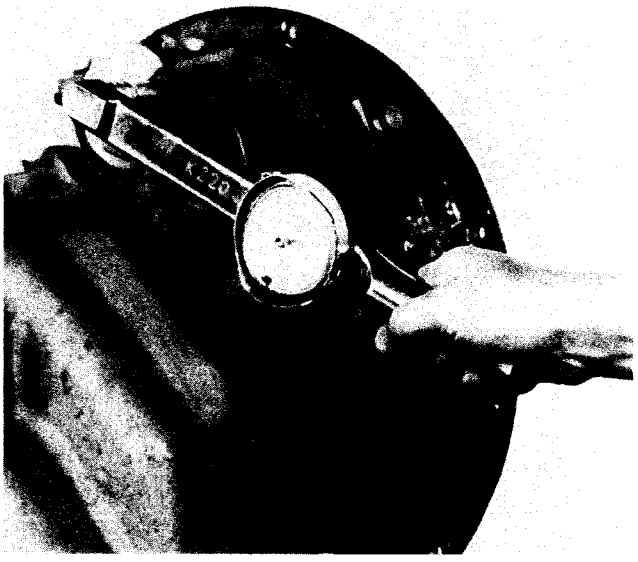


Figure 387
If auxiliary pump is used, it is not necessary to install the permanent pump hole cover. With new gasket in place, install pump hole cover on charging pump. Install bolts and washers and tighten to specified torque. See torque chart.

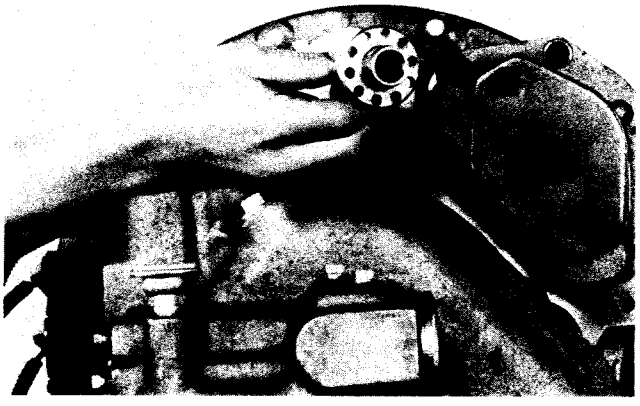


Figure 388
Install regulator sleeve assembly in converter housing.

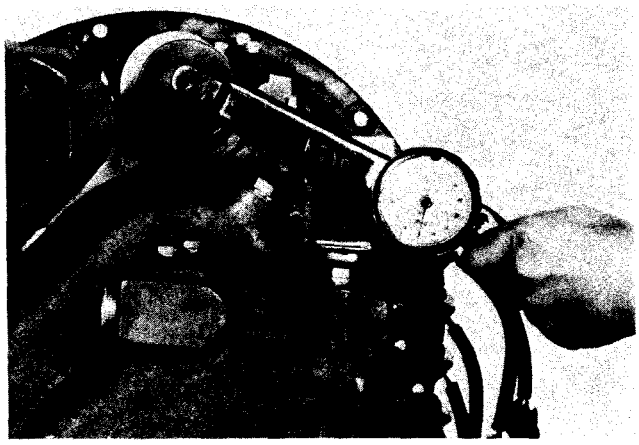


Figure 389
Using a special tool as shown in Figure 389A, tighten sleeve to 45-50 lbf•ft [61,1-67,7 N•m].

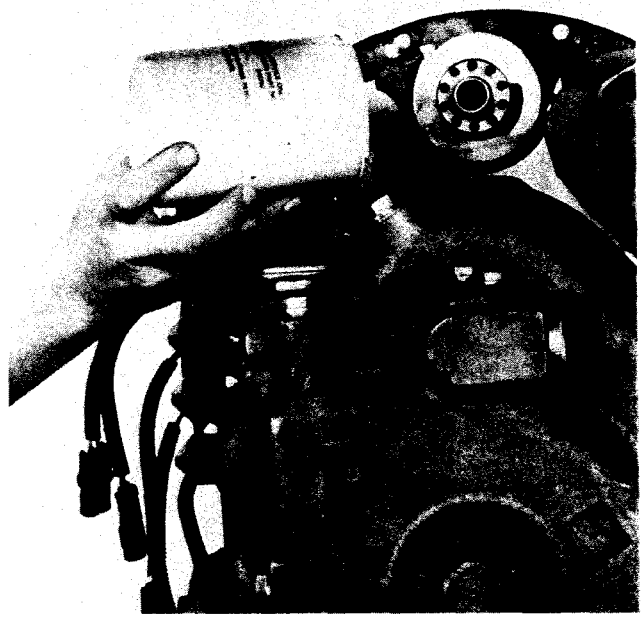


Figure 390
Install oil filter on regulating valve. Tighten filter to 20-25 lbf•ft [27-34 N•m].

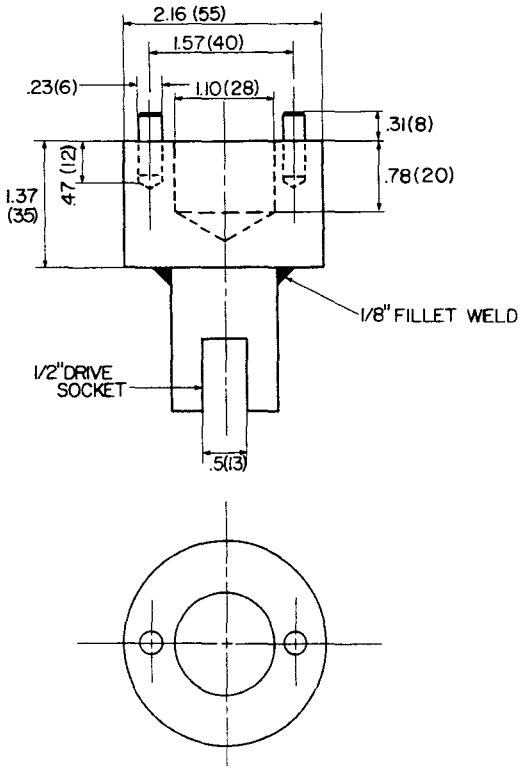


Figure 389A

INSTALLATION OF DUAL MODULATION

For single modulation and mechanical inching see page 86.

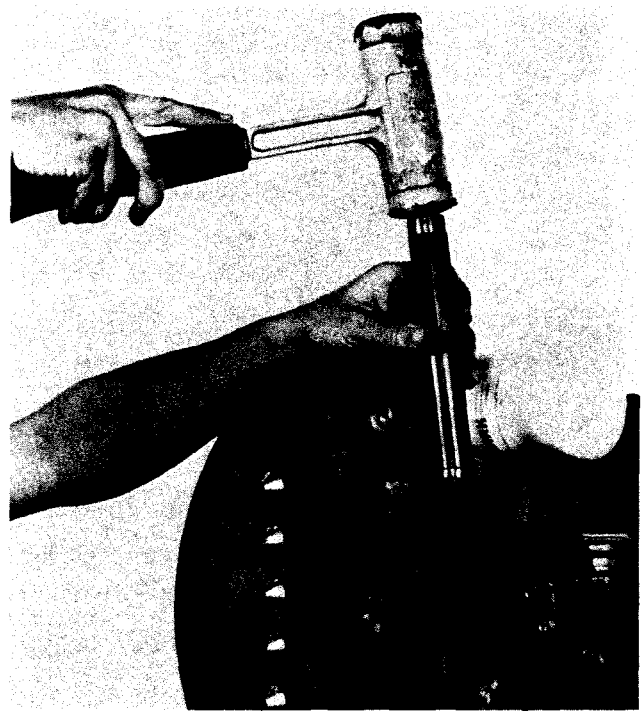


Figure 391
Install modulation diverter in transmission case.

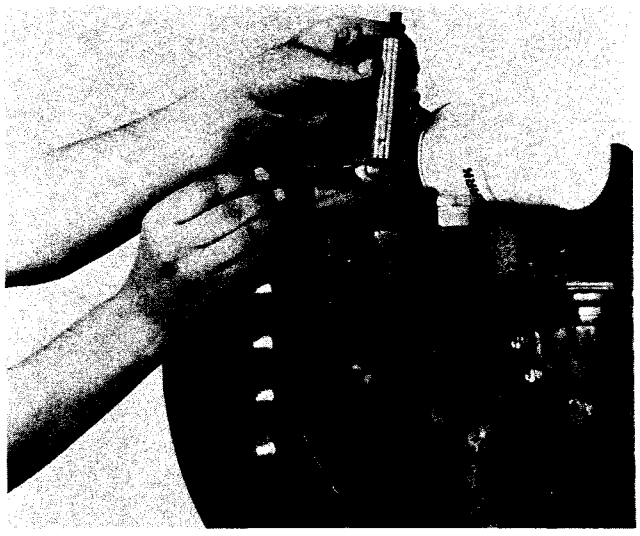


Figure 392
Position a new "O" ring on lower end of the modulation valve sleeve and spring assembly. Install "O" ring on other valve sleeve.

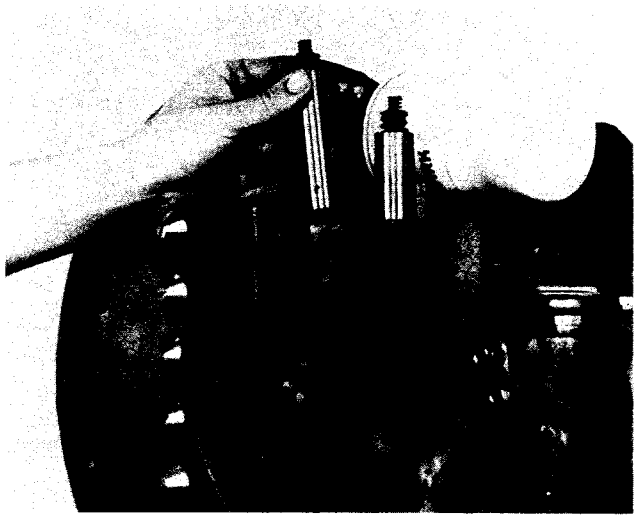


Figure 393
Install valve or valves in transmission case.

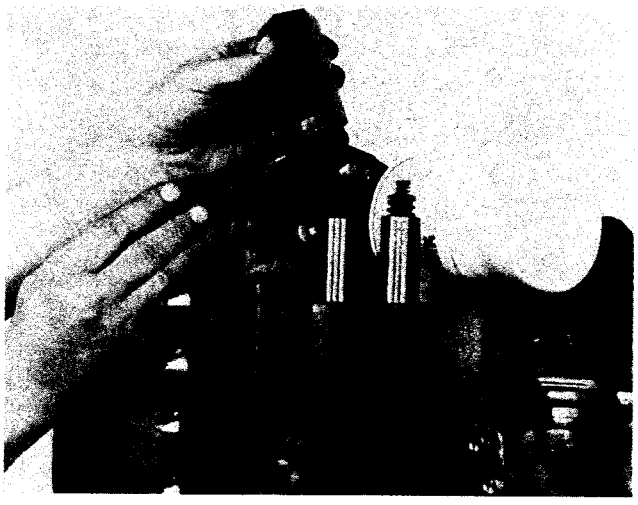


Figure 394
Position a new "O" ring on modulator valve housing.

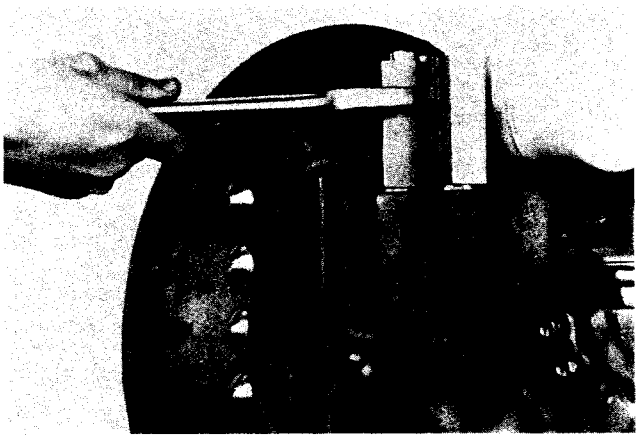


Figure 395
Install housing over sleeve and spring assembly and tighten securely.

If parking brake is not used, proceed to Figure 400.

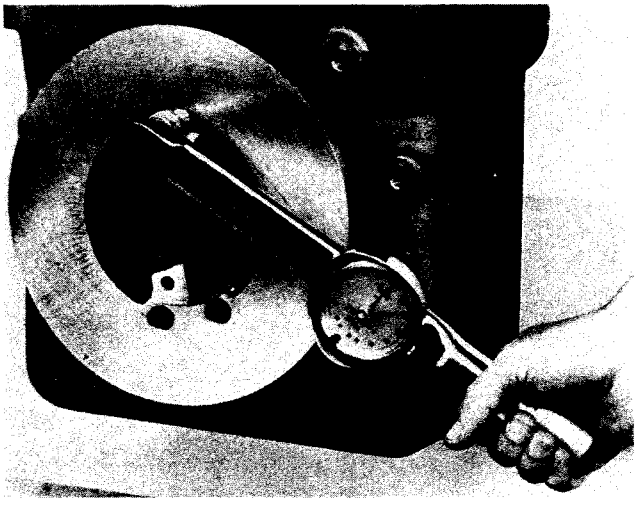


Figure 396
Position parking brake disc on output flange. Install capscrews and washers and tighten to specified torque. See torque chart.

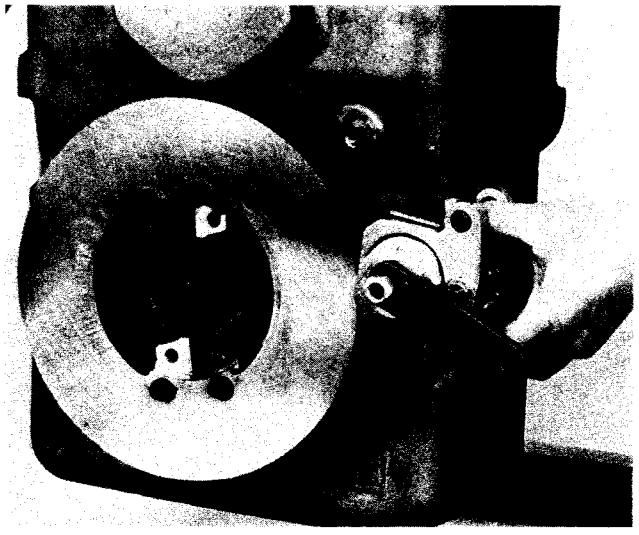


Figure 397
Position caliper brake assembly on brake disc.

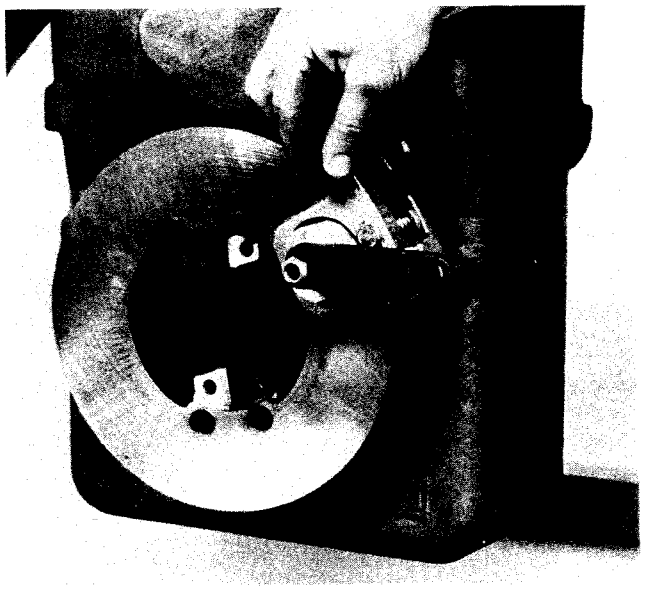


Figure 398
Install caliper brake mounting screw through brake assembly and through locknut. Apply Loctite #262 to threads and install screw in transmission case.

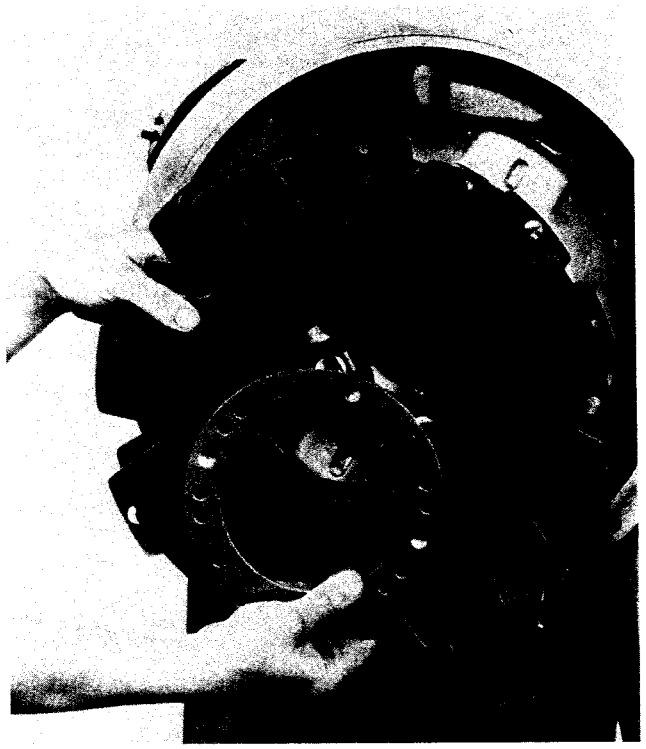


Figure 400
See special section on page 74 for drive plate installation.

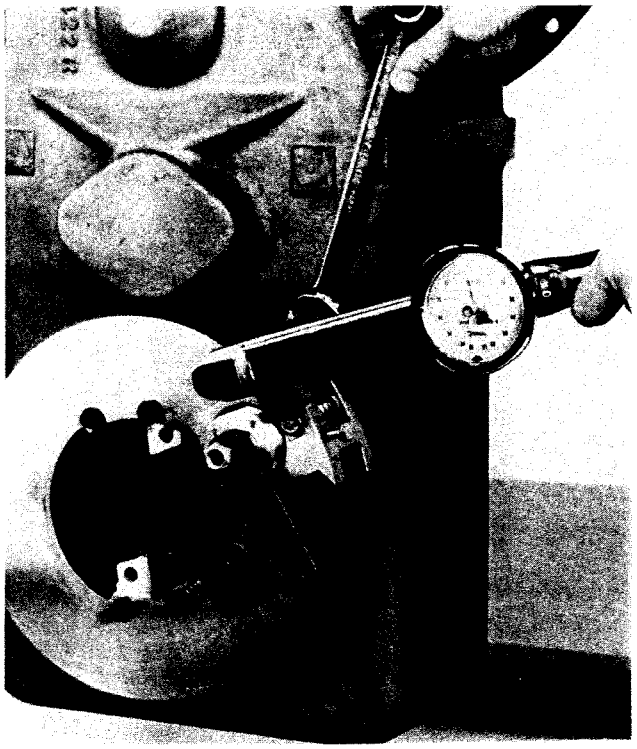
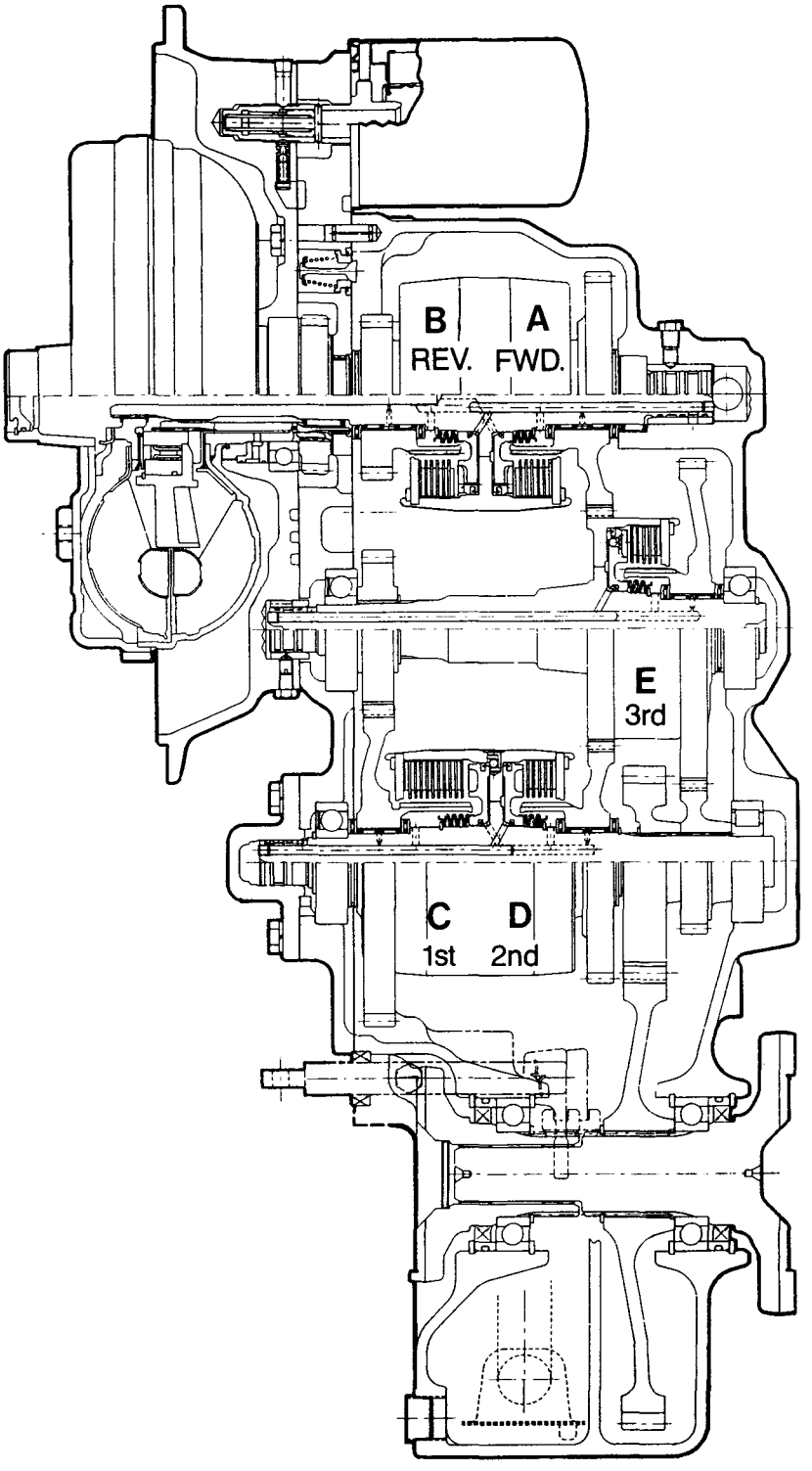


Figure 399
Mounting screws to be installed to allow free movement of caliper pads to disc. Tighten jam nut. See torque chart. See page 81 for brake information.

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

NOTES

CLUTCH ENGAGEMENT



CLUTCH ENGAGEMENT FOR 3 SPEED T12000 POWER SHIFT TRANSMISSION

FORWARD

SHIFT SPEED	DIRECTION CLUTCH	SPEED CLUTCH
1st	A	C
2nd	A	D
3rd	A	E

REVERSE

SHIFT SPEED	DIRECTION CLUTCH	SPEED CLUTCH
1st	B	C
2nd	B	D
3rd	B	E

CLUTCH ENGAGEMENT

CLUTCH ENGAGEMENT FOR 4 SPEED T12000 POWER SHIFT TRANSMISSION

FORWARD

SHIFT SPEED	DIRECTION CLUTCH	SPEED CLUTCH
1st	A	C
2nd	A	D
3rd	A	E
4th	F	E

REVERSE

SHIFT SPEED	DIRECTION CLUTCH	SPEED CLUTCH
1st	B	C
2nd	B	D
3rd	B	E

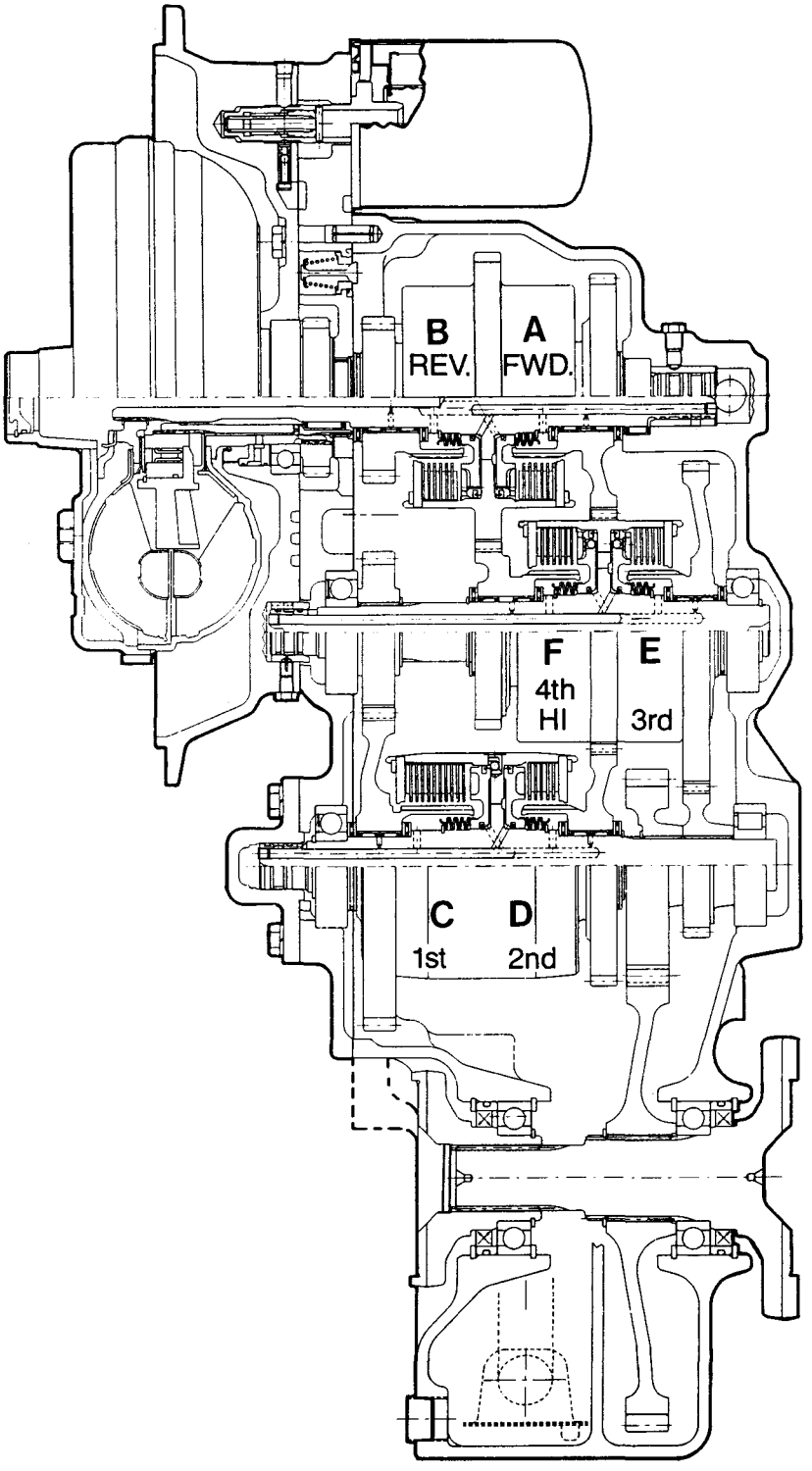
CLUTCH ENGAGEMENT FOR 6 SPEED T12000 POWER SHIFT TRANSMISSION

FORWARD

SHIFT SPEED	DIRECTION CLUTCH	SPEED CLUTCH
1st	A	C
2nd	F	C
3rd	A	D
4th	F	D
5th	A	E
6th	F	E

REVERSE

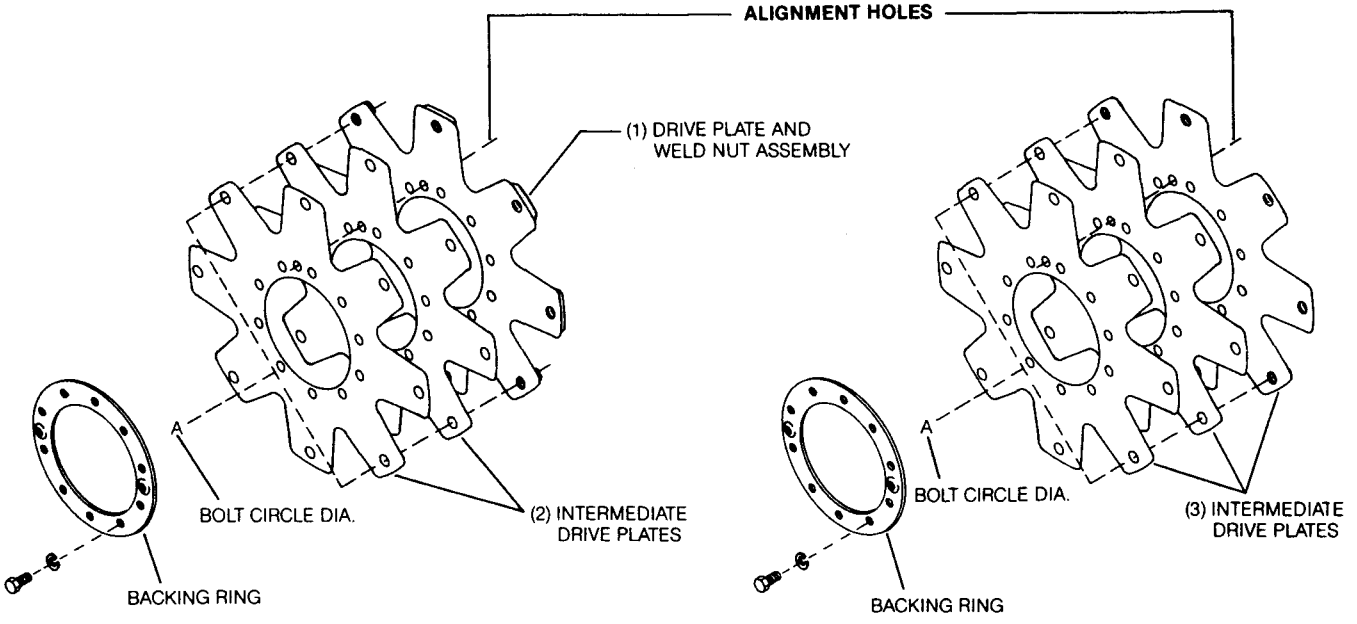
SHIFT SPEED	DIRECTION CLUTCH	SPEED CLUTCH
1st	B	C
2nd	B	D
3rd	B	E



DRIVE PLATE INSTALLATION

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

Note two (2) kits have two (2) intermediate drive plates and one (1) drive plate and weld nut assembly. Two (2) kits with three intermediate drive plates.



"A" Dimension (Bolt Circle Diameter)

11.380" [288,900 mm] Diameter
Kit No. 802501

13.125" [333,38 mm] Diameter
Kit No. 802424

13.500" [342,90 mm] Diameter
Kit No. 802425

Each Kit will include the following parts:

2 Intermediate Drive Plates.
1 Drive Plate and Weld Nut Assembly.
1 Backing Ring.
6 Mounting Screws.
6 Lock Washers.
1 Instruction Sheet.

"A" Dimension (Bolt Circle Diameter)

11.380" [288,900 mm] Diameter
Kit No. 802543

13.125" [333,38 mm] Diameter
Kit No. 802426

13.500" [342,90 mm] Diameter
Kit No. 802427

Kit will include the following parts:

3 Intermediate Drive Plates.
1 Backing Ring.
6 Mounting Screws.
6 Lock Washers.
1 Instruction Sheet.

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

Position drive plate and weld nut assembly on torque converter assembly with weld nuts toward converter. Align intermediate drive plates and backing ring with holes in torque converter assembly. **NOTE**: Two dimples 180° apart in backing ring must be out (toward engine flywheel). Install capscrews and washers. Tighten 26 to 29 ft. lbs. torque [35 - 39 N.m].

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 & housing for conformance to standard SAE No. 3 per SAE J927 and J1033 tolerance specifications for pilot bore size, pilot bore runout and mounting face flatness. Measure and record engine crankshaft end play.

3. Install two 2.50 [63,500 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. Rotate the transmission torque converter to align the locating stud in the drive plate with the flywheel drive plate mounting screw hole positioned in step No. 3. Locate transmission on flywheel housing.

   Aligning drive plate to flywheel and transmission to flywheel housing guide studs, 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 26 to 29 lbf·ft torque [35 - 39 N·m]. This will require tightening each screw and rotating the engine flywheel until the full amount of eight (8) screws have been tightened to specified torque.

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.

   *Does not apply to units having 3 intermediate drive plates. See Fig. 4.

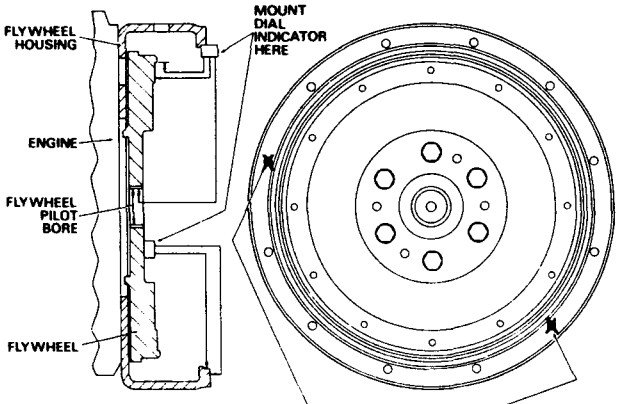


FIG 1

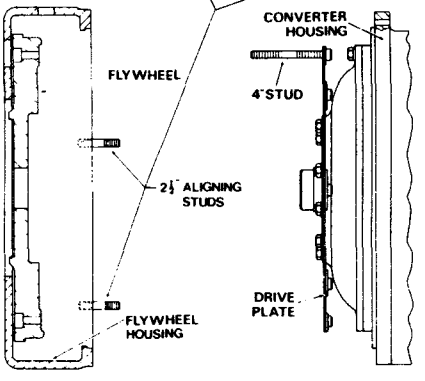


FIG 2

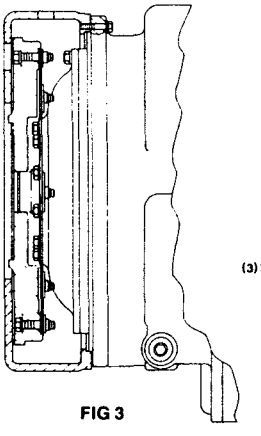


FIG 3

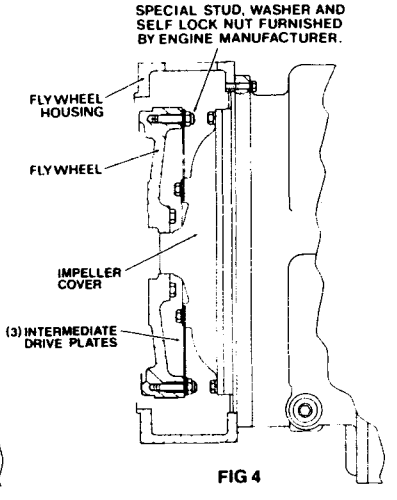


FIG 4

SPECIFICATIONS AND SERVICE DATA—POWER SHIFT TRANSMISSION AND TORQUE CONVERTER

TRANSMISSION OUT PRESSURE	With transmission outlet oil temperature, 180° - 200° F. [82,3° - 93,3° C] and transmission in **NEUTRAL.** Operating specifications: 25 P.S.I. [173 kPa] minimum pressure at 2000 R.P.M. engine speed **AND** a maximum of 100 P.S.I. [690 kPa] outlet pressure with engine operating at no-load governed speed.
CONTROLS	Speed Selection — Electric.
CLUTCH TYPE	Multiple discs, hydraulically actuated, spring released, automatic wear compensation, and no adjustment. All clutches oil cooled and lubricated.
CLUTCH INNER DISC	Friction.
CLUTCH OUTER DISC	Steel.
OIL FILTRATION	Full flow oil filter safety by-pass, also strainer screen in sump at bottom of transmission case.
CLUTCH PRESSURE	185 P.S.I. [1275,5 kPa] minimum — With parking brake set **(see note)**, oil temperature 180° - 200° F. [82,2° - 93,3° C], engine at idle (400 to 600 R.P.M.), shift thru direction and speed clutches. All clutch pressure must be equal within 5 P.S.I., [34,5 kPa]. If clutch pressure varies in any one clutch more than 5 P.S.I., [34,5 kPa] repair clutch. Normal operating pressure 240-280 P.S.I. [1654,8 - 1930,5 kPa] at 2000 R.P.M. **NOTE: Never use service brakes while making clutch pressure checks. Units having brake actuated declutching in forward and/or reverse will not give a true reading.** **ALWAYS USE PARKING BRAKE WHEN MAKING CLUTCH PRESSURE CHECKS.**

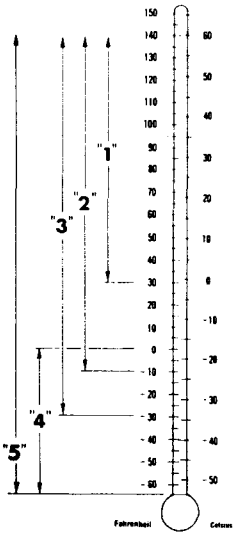
LUBRICATION

TYPE OF OIL	See Lube Chart.
CAPACITY	Consult Operator's Manual on applicable machine model for system capacity. Torque Converter, Transmission, and allied hydraulic system must be considered as a whole to determine capacity.
CHECK PERIOD	Check oil level DAILY with engine running at 500 - 600 R.P.M. and oil at 180° to 200° F. [82,2°-93,3°C]. Maintain oil level to FULL port.
**NORMAL DRAIN PERIOD	Every 1000 hours, change oil filter Every 1000 hours, drain and refill system as follows: Drain with oil at 150° to 200°. [65,6°-93,3° C]. (a) Drain transmission. (b) Oil filter, remove and discard. Install new oil filter. (c) Refill transmission to **LOW** port. (d) Run engine at 500-600 R.P.M. to prime converter and lines. (e) Recheck level with engine running at 500 - 600 R.P.M. and add oil to bring level to **LOW** port. When oil temperature is hot (180° - 200° F.) [82,2°- 93,3° C] make final oil level check. **BRING OIL LEVEL TO FULL PORT.**

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

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

RECOMMENDED LUBRICANTS FOR CLARK-HURTH POWER SHIFTED TRANSMISSION AND TORQUE CONVERTERS
Prevailing Ambient Temperature



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 (e) Engine Oil:-Grade 10 API-CD/SE or CD/SF (f) Quintolubric 822-220 (Non Phosphate Ester Fire Resistant Fluid
Temperature Range "3"	(a) *Dexron (b) *Dexron II D - **See Caution Below**
Temperature Range "4"	(a) MIL-L-46167 (b) MIL-L-46167 A
Temperature Range "5"	(a) Conoco High-Performance Synthetic Motor Oil — Spec. No. 6718.

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

PREFERRED OIL VISCOSITY: Select highest oil viscosity compatible with prevailing ambient temperatures and oil application 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: T12000, 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 transmission 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.

SERVICING MACHINE AFTER TRANSMISSION OVERHAUL

The transmission, torque converter, and its allied hydraulic system are important links in the driveline 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 complete.

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. Reassemble all components and use only type oil recommended for lubrication section. Fill transmission through filler opening until fluid comes up to **LOW** port on transmission.

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

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

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

   Bring oil level to **FULL** port to run freely from **UPPER** oil level plug hole.

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

PORT (71) — "TO COOLER" TEMPERATURE

PORT IS TO BE USED FOR "OIL TO COOLER" TEMPERATURE PICK-UP. GAUGE IS TO BE LOCATED IN THE OPERATOR COMPARTMENT. SEE OIL TEMPERATURE GAUGE SPECIFICATION.

PORT (32) — "TO COOLER" PRESSURE

1. PRESSURE MUST BE MEASURED DURING NORMAL VEHICLE TEST PROCEDURE.

TEST CONDITIONS:
1. "TO COOLER" OIL TEMPERATURE 180-220°F [82-104°C]
2. TRANSMISSION IN NEUTRAL

OPERATING SPECIFICATIONS:
1. 25 psi [173 kPa] MINIMUM PRESSURE AT 2000 rpm ENGINE SPEED AND A MAXIMUM OF 100 PSI [690 kPa] OUTLET PRESSURE AT NO LOAD GOVERNED SPEED

PORT (31) — CLUTCH PRESSURE

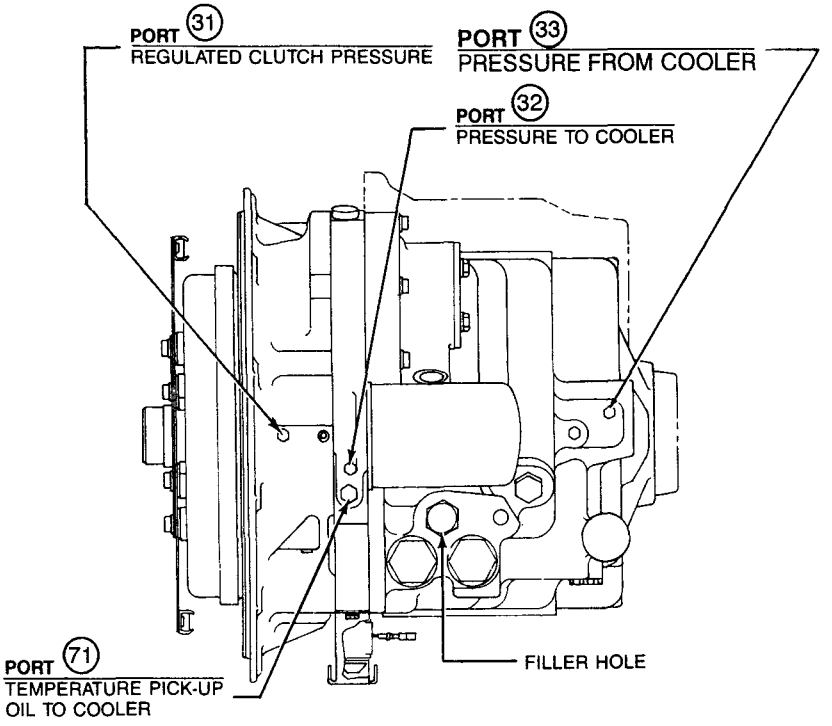
IT IS RECOMMENDED THAT CLUTCH PRESSURE BE MONITORED BY A GAUGE LOCATED IN THE OPERATOR COMPARTMENT. NORMAL OPERATING PRESSURE 240-280 PSI [1655-1930 kPa] at 2000 RPM.

PORT (45) and (46) — BACKUP WARNING

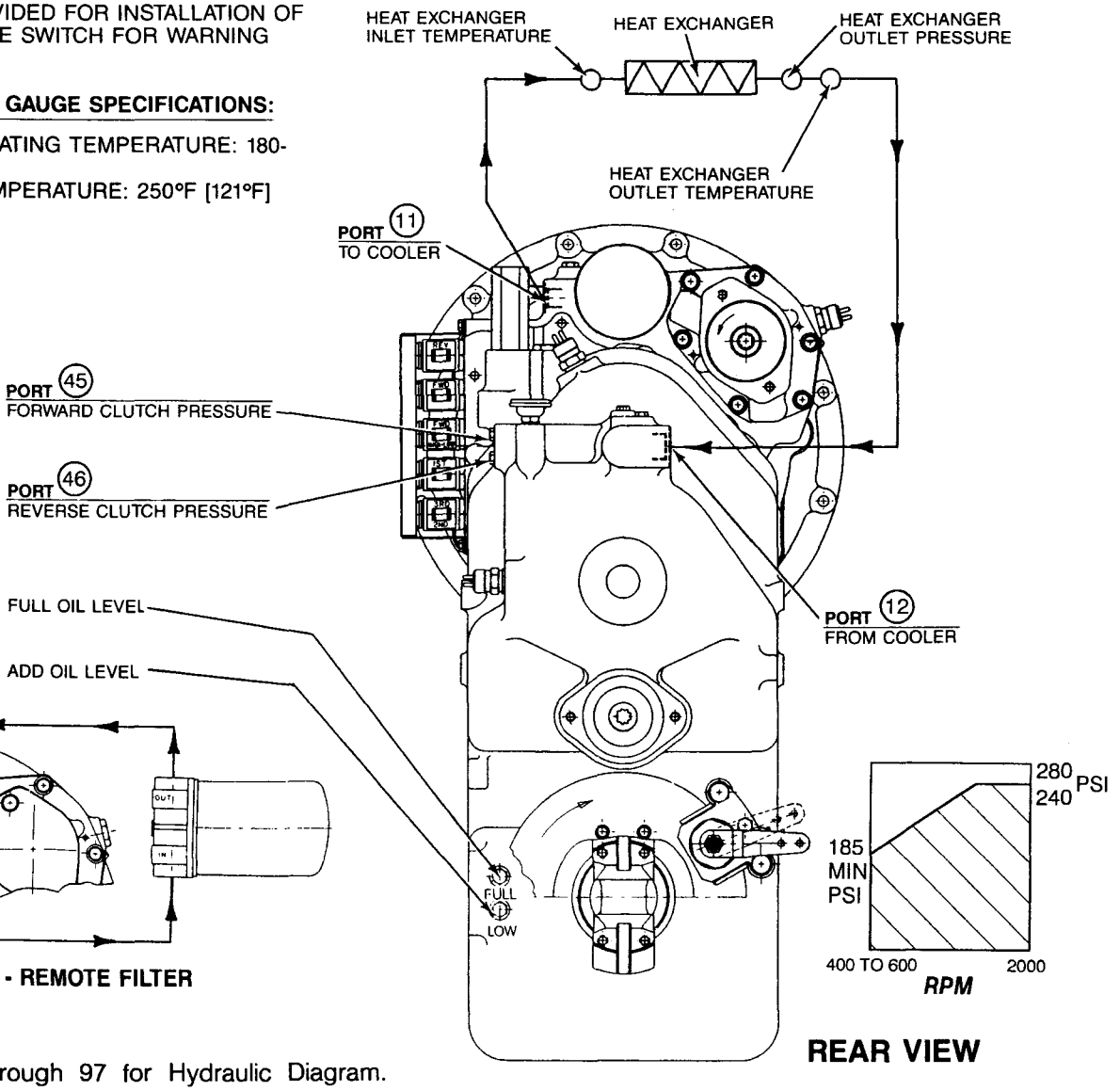
THIS PORT IS PROVIDED FOR INSTALLATION OF BACK-UP PRESSURE SWITCH FOR WARNING LIGHT OR HORN.

OIL TEMPERATURE GAUGE SPECIFICATIONS:

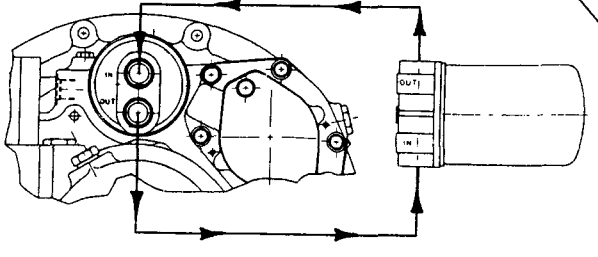
1. NORMAL OPERATING TEMPERATURE: 180-250°F [82-121°C]
2. RED LINED TEMPERATURE: 250°F [121°F]



TOP VIEW



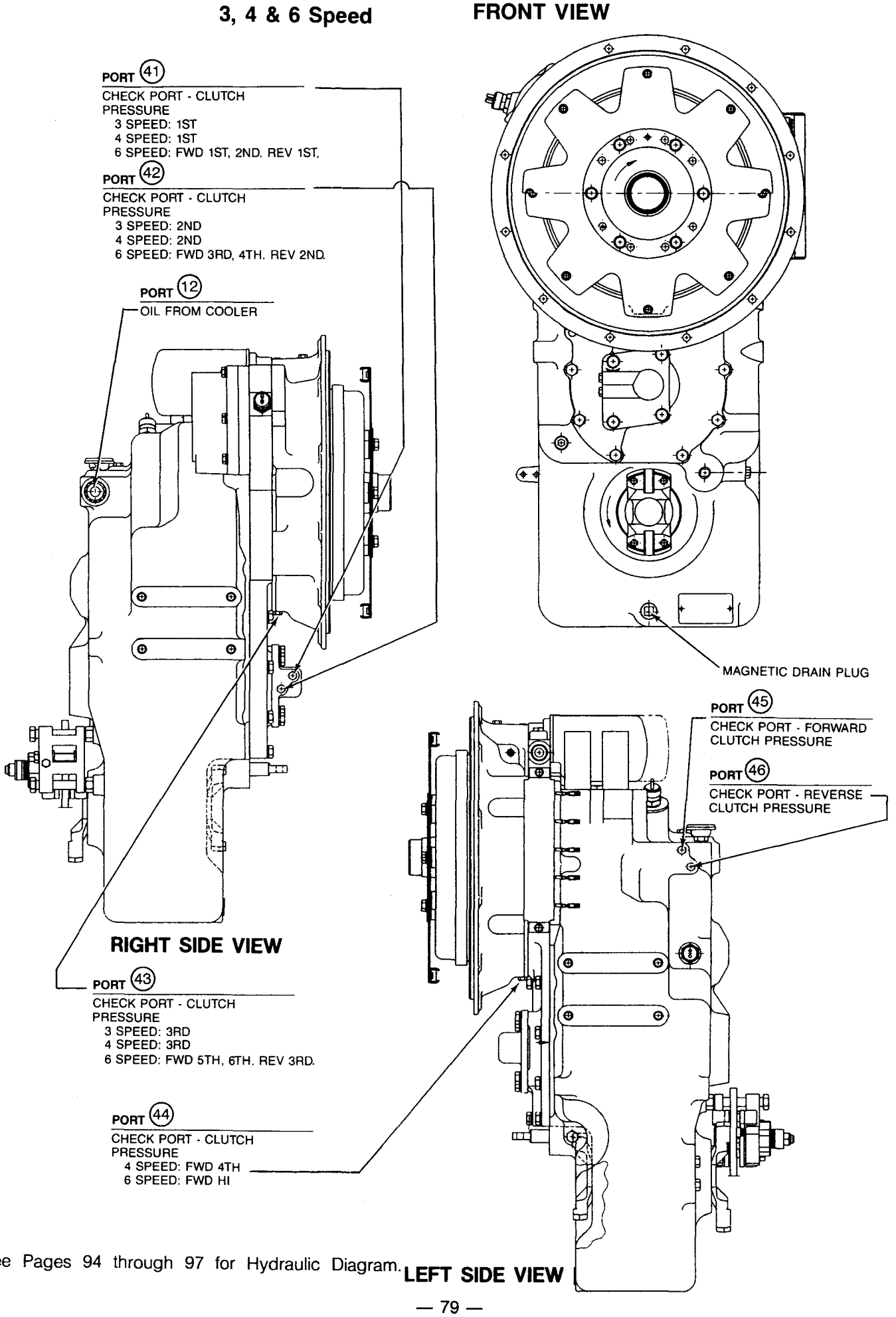
REAR VIEW



OPTION - REMOTE FILTER

See Pages 94 through 97 for Hydraulic Diagram.

3, 4 & 6 Speed



See Pages 94 through 97 for Hydraulic Diagram.

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.

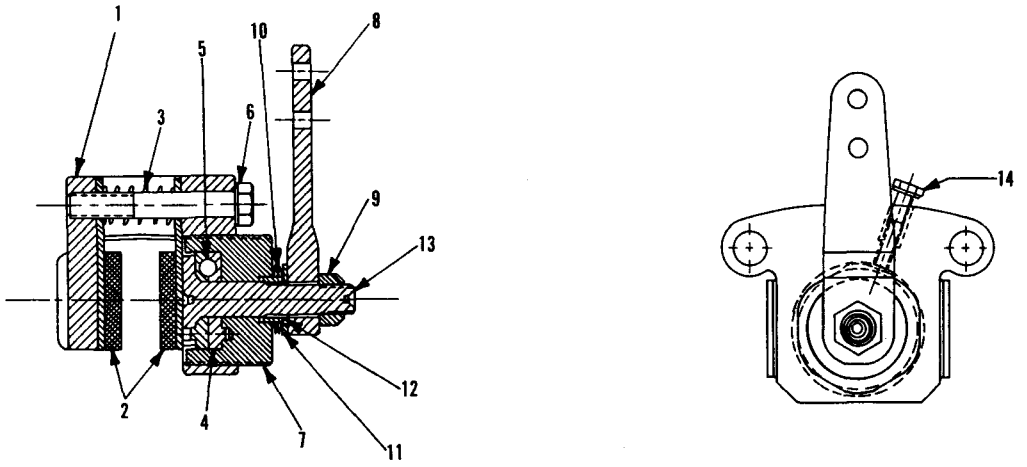
Replacement of spring load oil seals, "O" rings, metal sealing rings, gaskets, and snap rings is more economical when unit is disassembled than premature overhaul to replace these parts at a future time. Further loss of lubricant through a worn seal may result in failure of other more expensive parts 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.



T12000
CALIPER BRAKE ASSEMBLY

ITEM	DESCRIPTION	QUANTITY
1	Housing	1
2	Lining	2
3	Spring	1
4	Cam Plate	1
5	Ball	1
6	Capscrew	1
7	Body (Module)	1
8	Lever	1
9	Nut	1
10	Belleville Spring	1
11	Retainer	1
12	Retainer Ring	1
13	Piston	1
14	Capscrew	1

PARKING BRAKE LINING AND PISTON REPLACEMENT PROCEDURE

DISASSEMBLY

1. Loosen and remove lever retaining nut (item 9) from brake module and piston assembly (item 13). Remove lever (item 8).
2. Depress retainer (item 11) and remove retaining ring (item 12) from lever end of brake module (item 7).
3. Remove retainer (item 11) and five (5) belleville springs (item 10) from piston (item 13).
4. Remove piston (item 13), two cam plates (item 4), and three balls (item 5) from brake module (item 7).

REASSEMBLY

5. Lubricate three new balls (item 5) with high compression grease and place in ramps of new cam plates (item 4).
6. Install new cam plates (item 4) in brake module (item 7) making sure locking lugs are aligned properly in brake module (item 7).
7. Install piston (item 13) in brake module (item 7) making sure piston aligns properly on cam plates (item 4).
8. Install five (5) belleville springs (item 10) and retainer (item 11) on lever end of piston (item 13).
9. Depress retainer (item 11) and install retaining ring (item 12) in groove on piston (item 13).
10. Install brake module assembly (item 7) on housing (item 1).
11. Position lever (item 8) in a convenient location for actuation rod. Install lever (item 8) and lever retaining nut (item 9) on brake module assembly (item 7). Snug lever retaining nut (item 9).
12. Adjust brakes per instructions.

PARKING BRAKE ADJUSTMENT
(Mechanical Applied)

With the brake assembled on the transmission with a free floating operation of the caliper, adjust caliper as follows:

NOTE: Do not use operating lever (item 8) as a means to turn the module body (item 7). To use the lever will cause the piston to extend and cause a false setting.

Module capscrews (item 14) must be loose before brake adjustment.

1. Screw brake module (item 7) in until linings contact disc. Back module (item 7) off until a flat on module lines up with capscrew (item 14). Torque capscrews (item 14) 8-10 lbf·ft [11-14 N·m].
2. Remove lever retaining nut (item 9). Remove lever (item 8).
3. Reposition lever (item 8) to desired angle of operation.
4. Install retaining nut (item 9) and tighten to 10 lbf·ft torque [13,6 N·m].

TROUBLESHOOTING GUIDE FOR THE T12000 TRANSMISSION

The following information is presented as an aid to isolating and determining the specific problem area in a transmission that is not functioning correctly.

When troubleshooting a "transmission" problem, it should be kept in mind that the transmission is only the central unit of a group of related powertrain components. Proper operation of the transmission depends on the condition and correct functioning of the other components of the group. Therefore, to properly diagnose a suspected problem in the transmission, it is necessary to consider the transmission fluid, charging pump, torque converter, transmission assembly, oil cooler, filter, connecting lines, and controls, including the engine, as a complete system.

By analyzing the principles of operation together with the information in this section, it should be possible to identify and correct any malfunction which may occur in the system.

T12000 TRANSMISSION

T12000 (powershift with torque converter transmission troubles fall into two general categories: mechanical problems and hydraulic problems).

In addition to the mechanical components, all of which must be in the proper condition and functioning correctly, the correct functioning of the hydraulic circuit is most important. Transmission fluid is the "life blood" of the transmission. It must be supplied in an adequate quantity and delivered to the system at the correct pressures to ensure converter operation, to engage and hold the clutches from slipping, and to cool and lubricate the working components.

TROUBLESHOOTING PROCEDURES

Stall Test: Use a stall test to identify transmission, converter, or engine problems.

Transmission Pressure Checks: Transmission problems can be isolated by the use of pressure tests. When the stall test indicates slipping clutches, then measure clutch pack pressure to determine if the slippage is due to low pressure or clutch plate friction material failure. In addition, converter charging pressure and transmission lubrication pressure may also be measured.

Mechanical Checks: Prior to checking any part of the system for hydraulic function (pressure testing), the following mechanical checks should be made:

There are only two mechanical linkages available on the transmission.

1. Mechanical inching from brake pedal to inching valve on transmission.
2. Linkage from axle disconnect to disconnect actuator.

Check the parking brake and inching pedal for correct adjustment and travel. Be sure the pedal moves freely and returns fully.

Be sure all lever linkage is properly connected and adjusted in each segment and at all connecting points.

The controls are actuated electrically. Check the wiring and electrical components.

Be sure that all components of the cooling system are in good condition and operating correctly. The radiator must be clean to maintain the proper cooling and operating temperatures for the engine and transmission. Air clean the radiator, if necessary.

The engine must be operating correctly. Be sure that it is correctly tuned and adjusted to the correct idle and maximum no-load governed speed specifications.

Hydraulic Check: Also, before checking the transmission clutches, torque converter, charging pump, and hydraulic circuit for pressure and rate of oil flow, it is important to make the following transmission fluid check:

Check oil level in the transmission. The transmission fluid must be at the correct (full level). All clutches and the converter and its fluid circuit lines must be fully charged (filled) at all times. See NOTE below.

NOTE: The transmission fluid must be at operating temperature of [82-93° C] 180-200° F to obtain correct fluid level and pressure readings. DO NOT ATTEMPT TO MAKE THESE CHANGES WITH COLD OIL.

To raise the oil temperature to this specification it is necessary to either operate (work) the vehicle or run the engine with converter at "stall."

CAUTION: Be careful that the vehicle does not move unexpectedly when operating the engine and converter at stall R.P.M.

CONVERTER STALL PROCEDURE

1. Put the vehicle against a solid barrier, such as a wall, and/or apply the parking brake and block the wheels.
2. Put the directional control lever in FORWARD (or REVERSE, as applicable).
3. Put the speed control lever in 3rd (3 speed) (HIGH) or 6th (6 speed).

   With the engine running, slowly increase engine speed to approximately one-half throttle and hold until transmission (converter outlet) oil temperature reaches the operating range.

CAUTION: Do not operate the converter at stall condition longer than 30 seconds at one time, shift to neutral for 15 seconds and repeat the procedure until desired temperature is reached. Excessive temperature ([120° C] 250° F maximum) will cause damage to transmission clutches, fluid, converter, and seals.

TROUBLESHOOTING GUIDE

Refer to the following troubleshooting guide for the diagnosis of typical transmission troubles.

LOW CLUTCH PRESSURE

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

LOW CHARGING PUMP OUTPUT

1. Low oil level.	1. Fill to proper level.
2. Suction screen plugged.	2. Clean suction pump.
3. Defective charging pump.	3. Replace pump.

OVERHEATING

1. Worn oil sealing rings.	1. Remove, disassemble, and rebuild converter assembly.
2. Worn charging pump.	2. Replace.
3. Low oil level.	3. Fill to proper level.
4. Dirty oil cooler.	4. Clean cooler.
5. Restriction in cooler lines.	5. Change cooler lines.

NOISY CONVERTER

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

LACK OF POWER

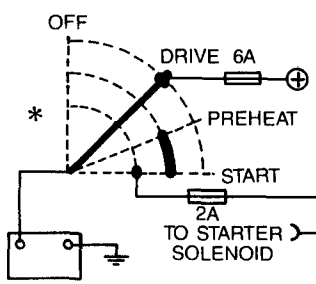
1. Low engine R.P.M. at converter stall.	1. Tune engine check governor.
2. See "Overheating" and make same checks.	2. Make corrections as explained in "Overheating."

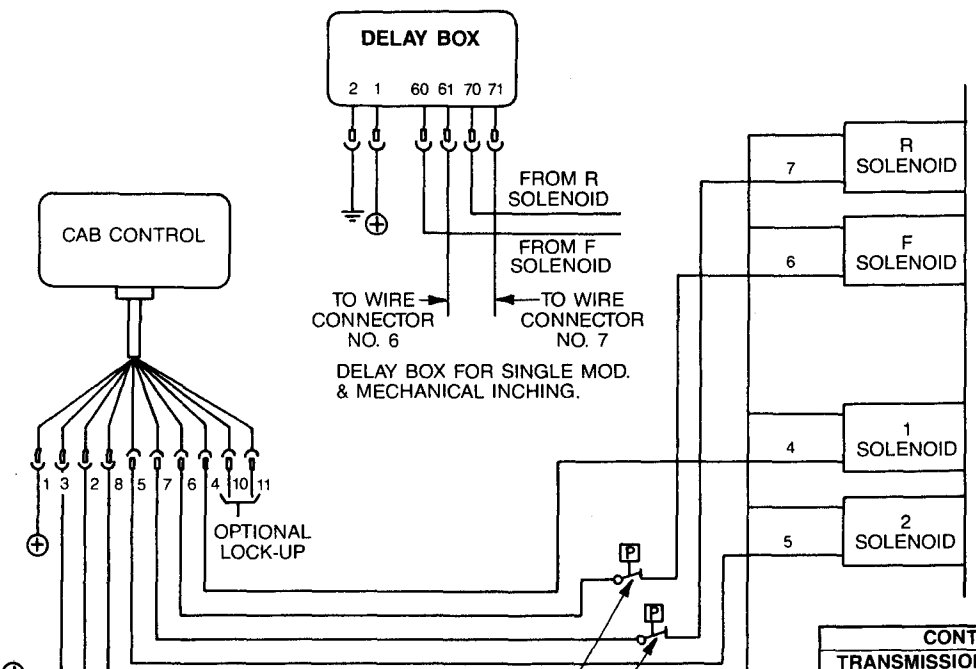
CLARK-HURTH WILL NOT SUPPLY ITEMS INDICATED WITH *

OPERATING VOLTAGE: 9VDC - 15VDC FOR 12VDC SOLENOIDS,
OR: 18VDC - 28VDC FOR 24 VDC SOLENOIDS
: 9VDC - 28VDC FOR DELAY BOX AT 25°C
OPERATING TEMPERATURES: -20°C/+70°C

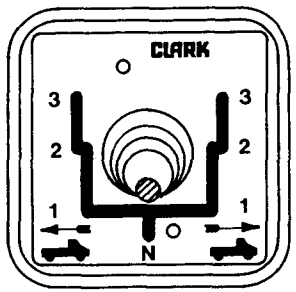
CAB CONTROL	
CAB CONTROL POSITION	CONTACTS CLOSED BETWEEN WIRES
F3	1-6 / 1-8 / 10-11
F2	1-5 / 1-6 / 1-8 / 10-11
F1	1-4 / 1-5 / 1-6 / 1-8 / 10-11
N	2-3
R1	1-4 / 1-5 / 1-7 / 1-8 10-11
R2	1-5 / 1-7 / 1-8 / 10-11
R3	1-7 / 1-8 / 10-11
CONTACT 10-11 OPENS IN ALL INTERMEDIATE POSITIONS	

WIRE NO.	COLOR CODE	WIRE NO.	COLOR CODE
1	WHITE	6	BLUE
2	BLACK	7	BROWN
3	RED	8	GRAY
4	YELLOW	10	VIOLET
5	GREEN	11	PINK





3 SPEED



3 FWD - 3 REV

CLUTCHES ENGAGED	
FORWARD (FWD)	REVERSE (REV)
1st - FWD - 1st	1st - REV - 1st
2nd - FWD - 2nd	2nd - REV - 2nd
3rd - FWD - 3rd	3rd - REV - 3rd

CONTROL VALVE	
TRANSMISSION GEAR	ACTIVATED SOLENOIDS
F3	F
F2	F / 2
F1	F / 1 / 2
N	1 / 2
R1	R / 1 / 2
R2	R / 2
R3	R

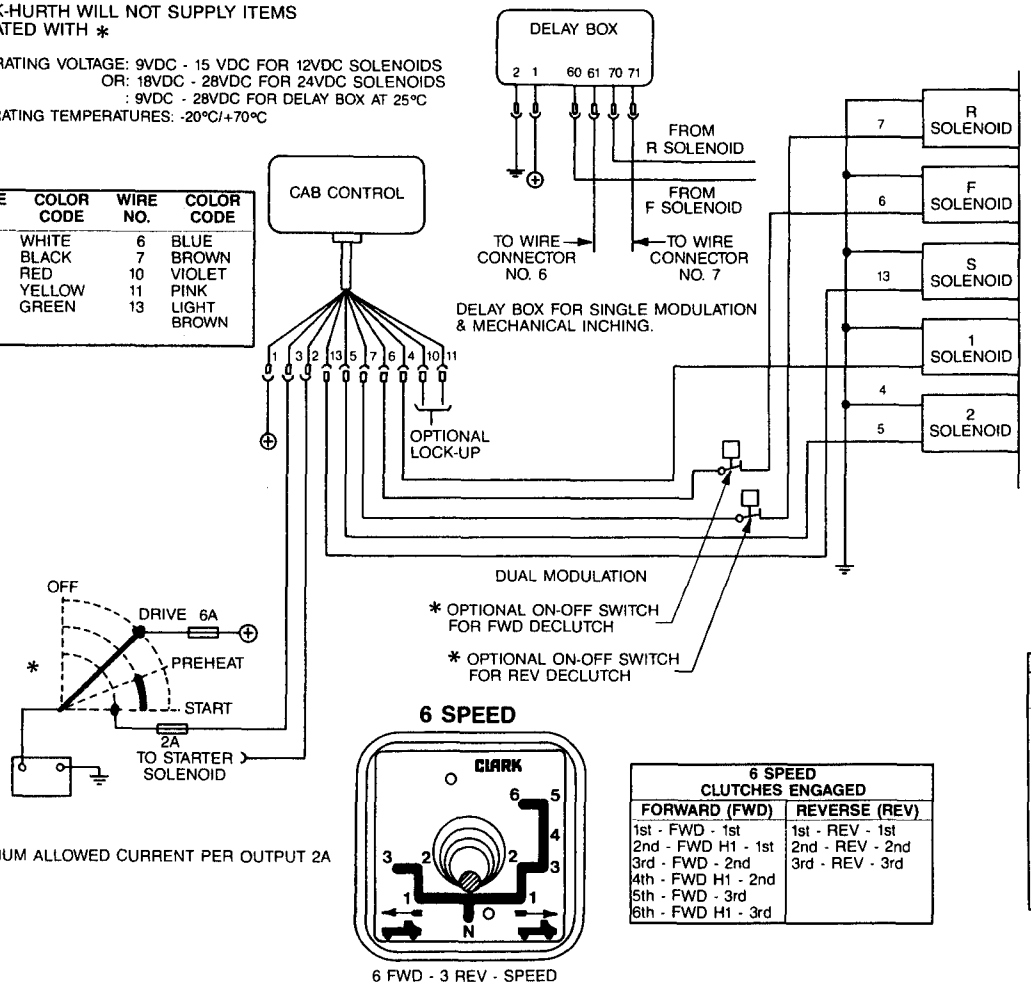
MAXIMUM ALLOWED CURRENT PER OUTPUT 2A

ELECTRIC SOLENOID CONTROL WIRING DIAGRAM
3 SPEED

CLARK-HURTH WILL NOT SUPPLY ITEMS INDICATED WITH *

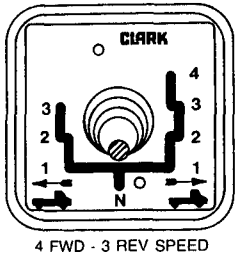
OPERATING VOLTAGE: 9VDC - 15 VDC FOR 12VDC SOLENOIDS
OR: 18VDC - 28VDC FOR 24VDC SOLENOIDS
: 9VDC - 28VDC FOR DELAY BOX AT 25°C
OPERATING TEMPERATURES: -20°C/+70°C

WIRE NO.	COLOR CODE	WIRE NO.	COLOR CODE
1	WHITE	6	BLUE
2	BLACK	7	BROWN
3	RED	10	VIOLET
4	YELLOW	11	PINK
5	GREEN	13	LIGHT BROWN



MAXIMUM ALLOWED CURRENT PER OUTPUT 2A

4 SPEED



4 FWD - 3 REV SPEED

4 SPEED CLUTCHES ENGAGED	
FORWARD (FWD)	REVERSE (REV)
1st - FWD - 1st	1st - REV - 1st
2nd - FWD - 2nd	2nd - REV - 2nd
3rd - FWD - 3rd	3rd - REV - 3rd
4th - 4th - 3rd	

4 SPEED

CAB CONTROL	
CAB CONTROL POSITION	CONTACTS CLOSED BETWEEN WIRES
F4	1-6 / 1-13 / 10-11
F3	1-6 / 10-11
F2	1-5 / 1-6 / 10-11
F1	1-4 / 1-5 / 1-6 / 10-11
N	2-3
R1	1-4 / 1-5 / 1-7 / 10-11
R2	1-5 / 1-7 / 10-11
R3	1-7 / 10-11

CONTROL VALVE	
TRANSMISSION GEAR	ACTIVATED SOLENOIDS
F4	F / S
F3	F
F2	F / 2
F1	F / 1 / 2
N	1 / 2
R1	R / 1 / 2
R2	R / 2
R3	R

CONTACT 10-11 OPENS IN ALL INTERMEDIATE POSITIONS

6 SPEED

CAB CONTROL	
CAB CONTROL POSITION	CONTACTS CLOSED BETWEEN WIRES
F6	1-6 / 1-13 / 10-11
F5	1-6 / 10-11
F4	1-6 / 1-5 / 1-13 / 10-11
F3	1-6 / 1-5 / 10-11
F2	1-6 / 1-5 / 1-4 / 1-13 / 10-11
F1	1-6 / 1-5 / 1-4 / 10-11
N	2-3
R1	1-7 / 1-5 / 1-4 / 10-11
R2	1-7 / 1-5 / 10-11
R3	1-7 / 10-11

CONTROL VALVE	
TRANSMISSION GEAR	ACTIVATED SOLENOIDS
F6	F / S
F5	F
F4	F / 2 / S
F3	F / 2
F2	F / 1 / 2 / S
F1	F / 1 / 2
N	1 / 2
R1	R / 1 / 2
R2	R / 2
R3	R

6 SPEED

6 FWD - 3 REV - SPEED

6 SPEED CLUTCHES ENGAGED	
FORWARD (FWD)	REVERSE (REV)
1st - FWD - 1st	1st - REV - 1st
2nd - FWD H1 - 1st	2nd - REV - 2nd
3rd - FWD - 2nd	3rd - REV - 3rd
4th - FWD H1 - 2nd	
5th - FWD - 3rd	
6th - FWD H1 - 3rd	

ELECTRIC SOLENOID CONTROL WIRING DIAGRAM 4 AND 6 SPEED

SINGLE MODULATION AND MECHANICAL INCHING REMOVAL

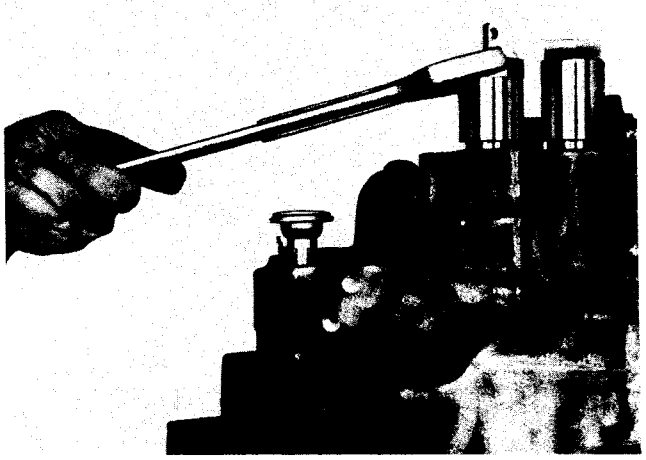


Figure 1
Remove inching valve housing.

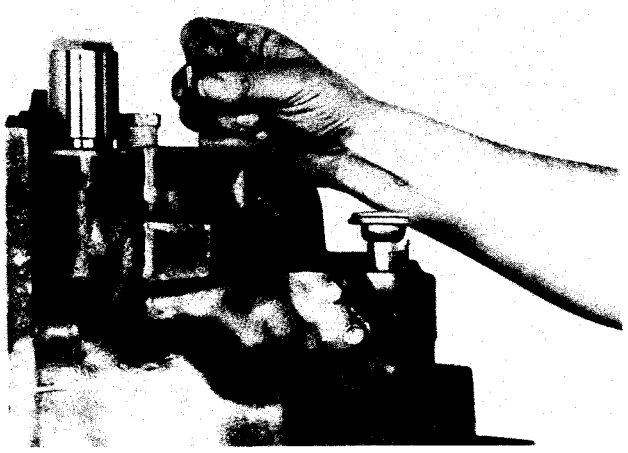


Figure 4
Remove inching spool.

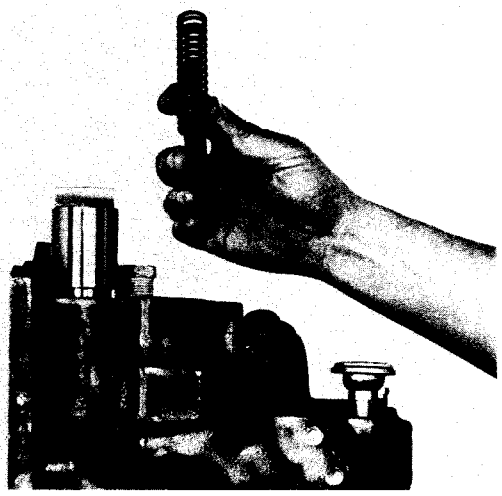


Figure 2
Remove inching return spring, actuator rod, and regulator spring.

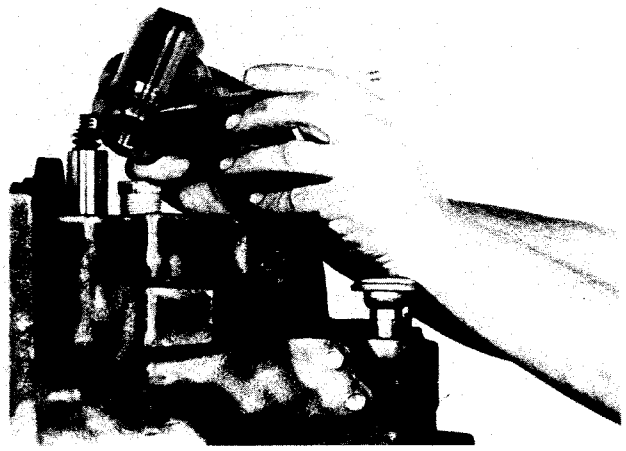


Figure 5
Remove modulator valve housing and "O" ring.

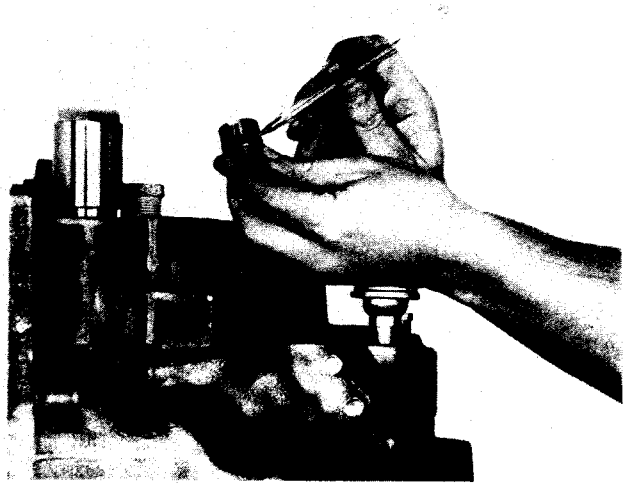


Figure 3
Remove inching sleeve and "O" ring.

Figure 6
Remove modulator valve outer, middle, and inner springs and spring stop.

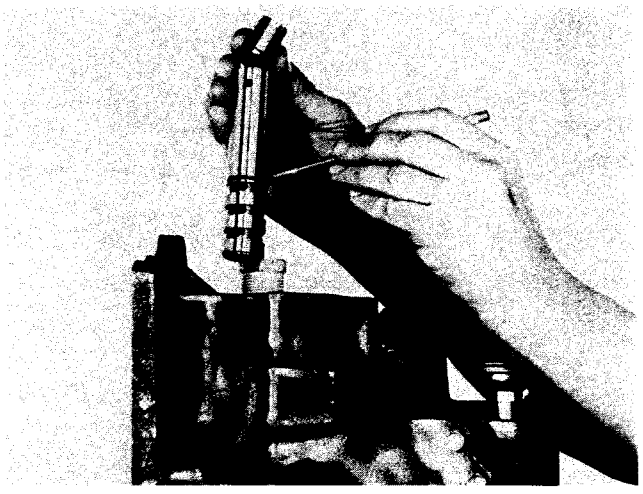


Figure 7
Remove modulation housing sleeve and accumulator spool.

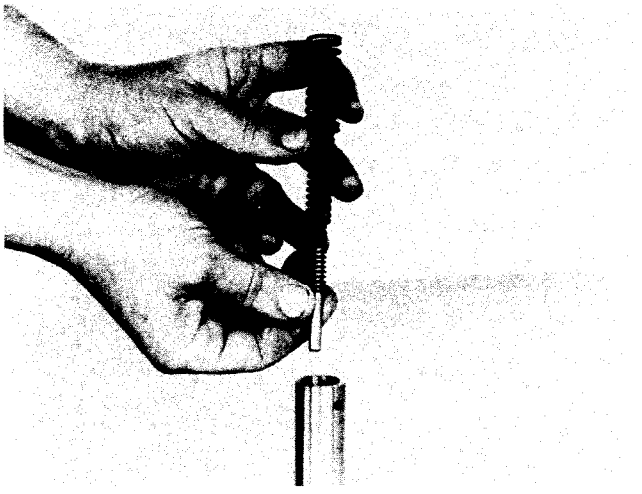


Figure 10
Remove modulator valve outer, middle, and inner springs and spring stop.

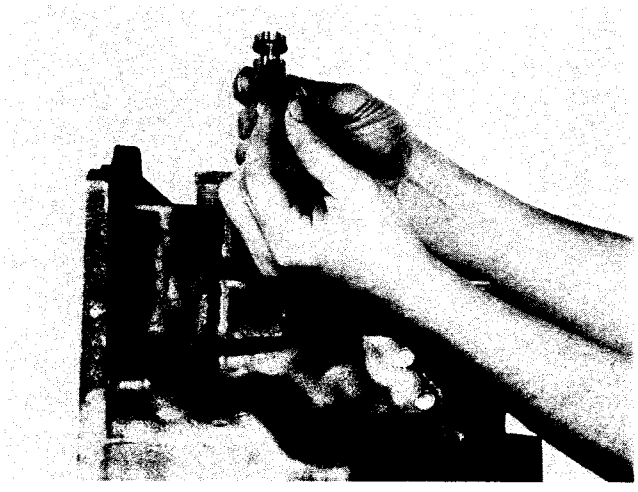


Figure 8
Remove shuttle sleeve and spool.

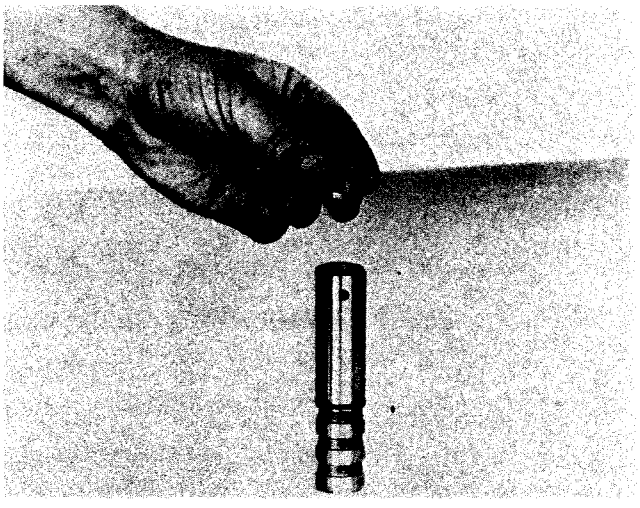


Figure 11
Remove accumulator spool.

DISASSEMBLY AND REASSEMBLY OF SINGLE MODULATOR VALVE ASSEMBLY

DISASSEMBLY

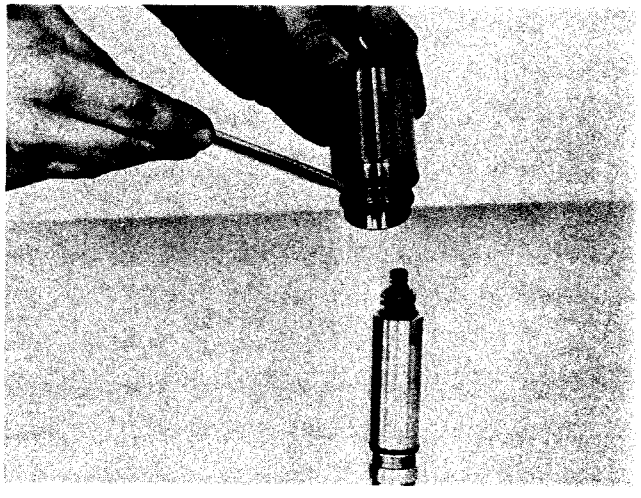


Figure 9
Remove modulator valve body "O" ring.

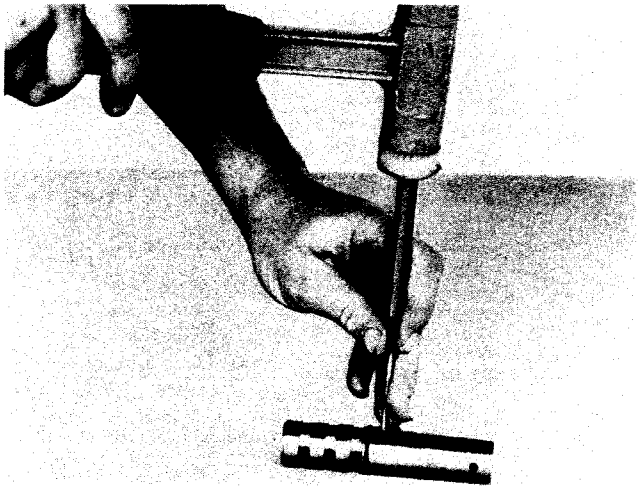


Figure 12
Remove modulator sleeve pin.

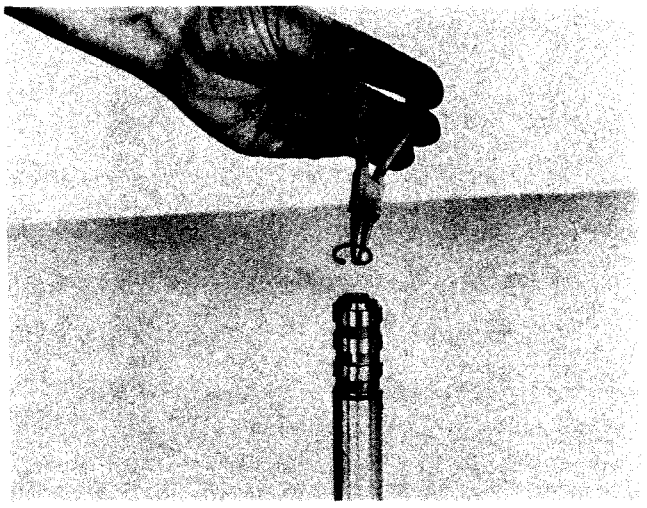


Figure 13
Remove regulator spool assembly retainer ring.

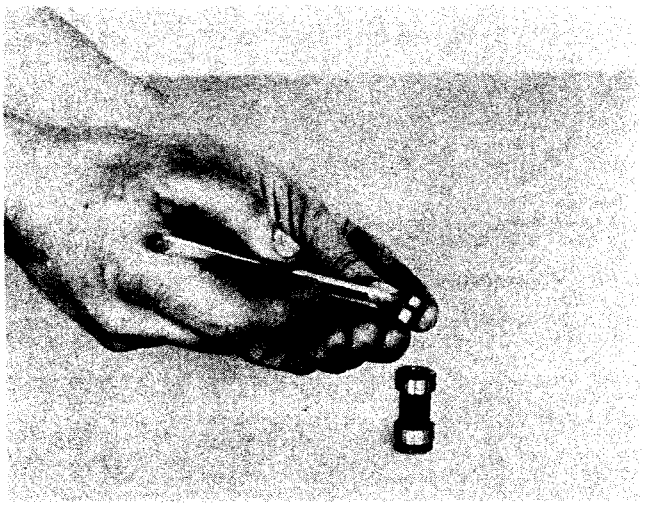


Figure 16
Remove regulator spool sleeve assembly. Remove "O" ring.

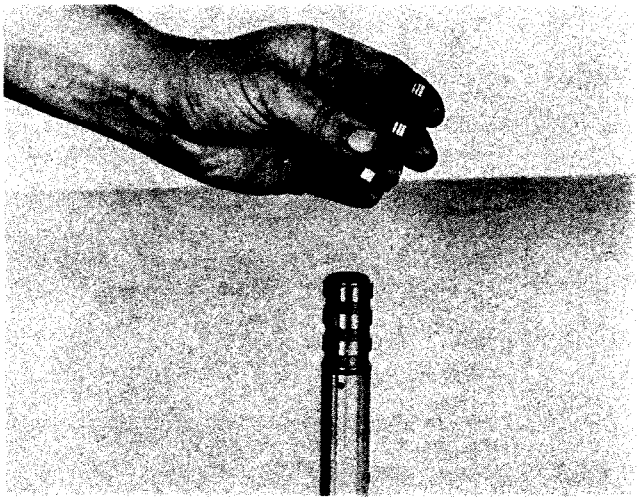


Figure 14
Remove regulator spool stop, spring, and spring and sleeve assembly.

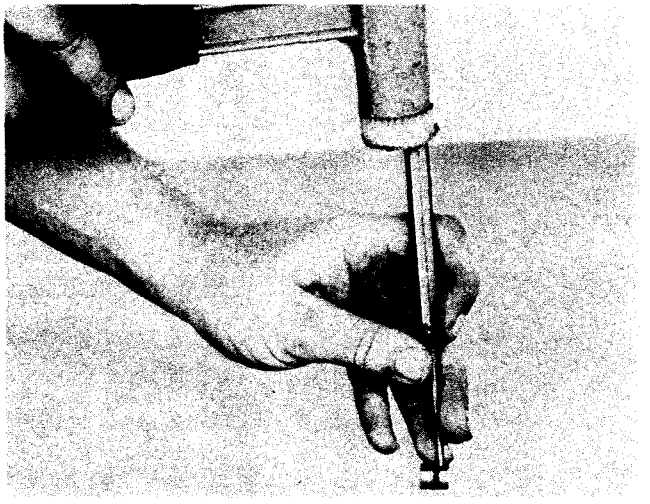


Figure 17
Remove sleeve check ball retainer pin.

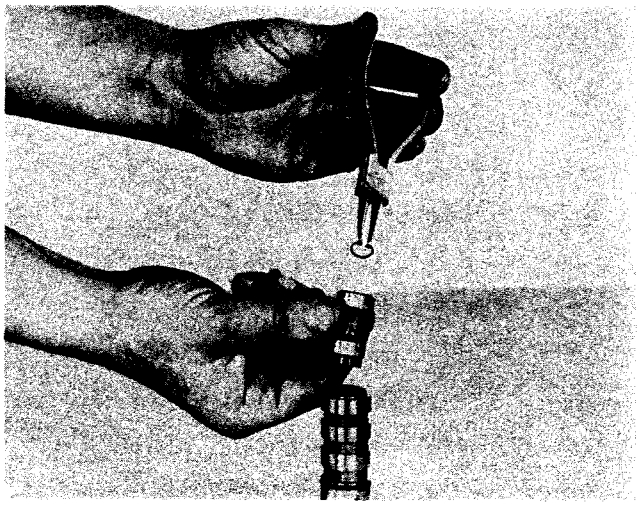


Figure 15
Remove regulator spool sleeve retainer ring.

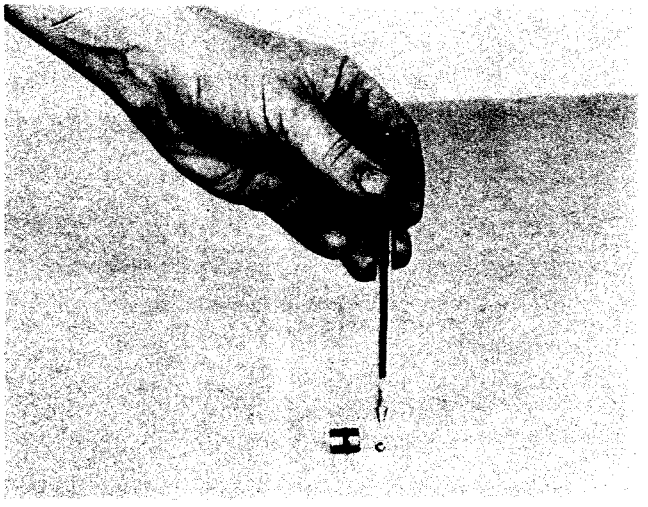


Figure 18
Remove check ball.

REASSEMBLY
(See Cleaning and Inspection Page)

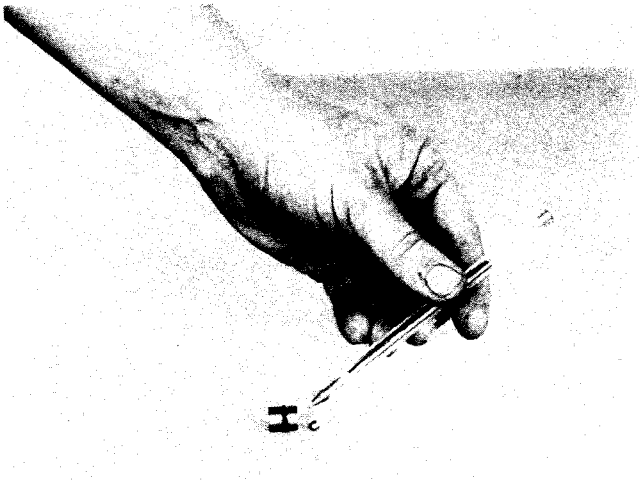


Figure 19
Install a new "O" ring on regulator spool sleeve. Position check ball in sleeve.

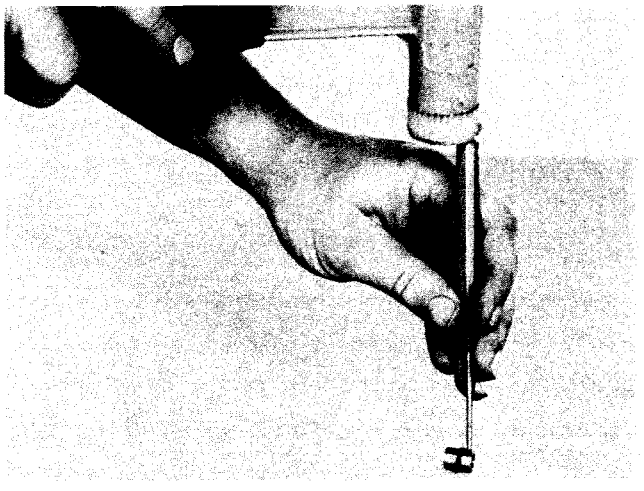


Figure 20
Install check ball retainer pin.

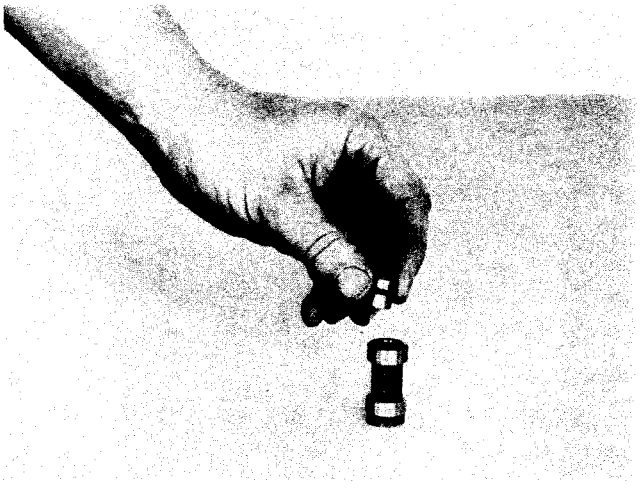


Figure 21
Position sleeve and ball assembly in regulator spool with check ball retainer pin up.

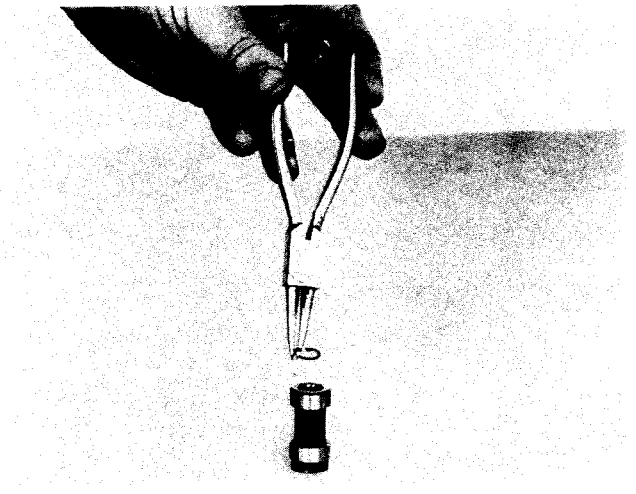


Figure 22
Install sleeve retainer ring.

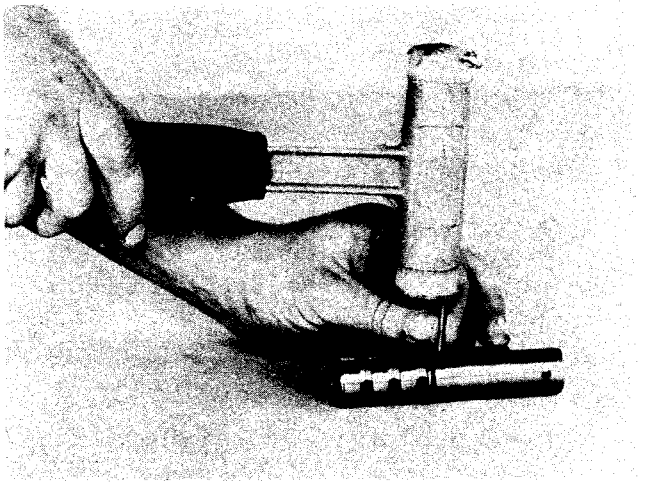


Figure 23
Install housing sleeve pin.

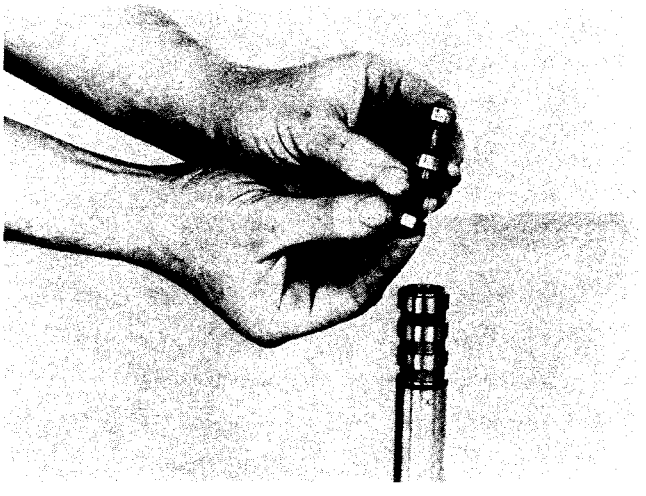


Figure 24
Install regulator spool stop, spring, and regulator spool and sleeve assembly in housing sleeve.

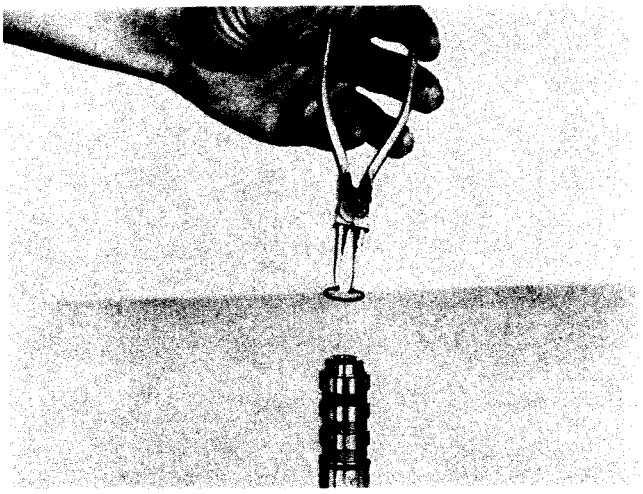


Figure 25
Compress regulator spool spring and install retainer ring.

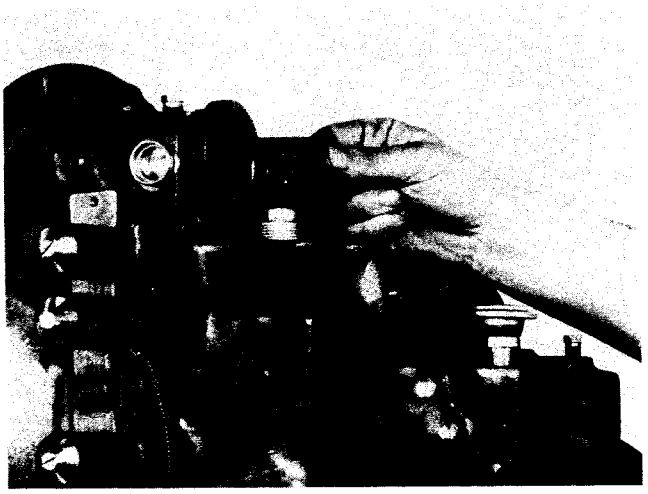


Figure 28
Install inching regulator spool spring.

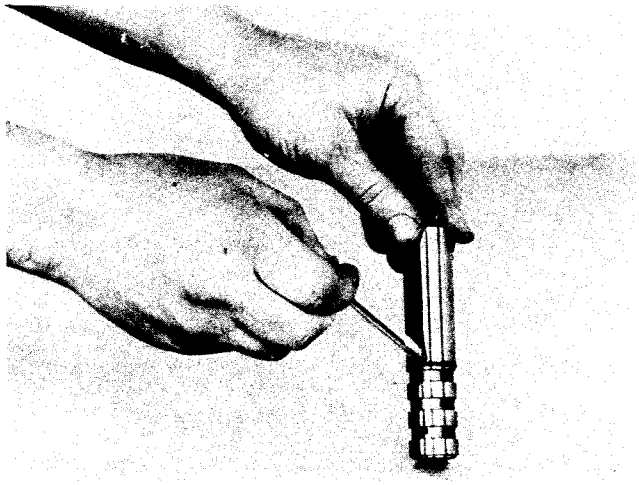


Figure 26
Position new "O" ring on modulation sleeve.

Figure 29
Install inching actuator rod over spring.

SINGLE MODULATION AND MECHANICAL INCHING INSTALLATION

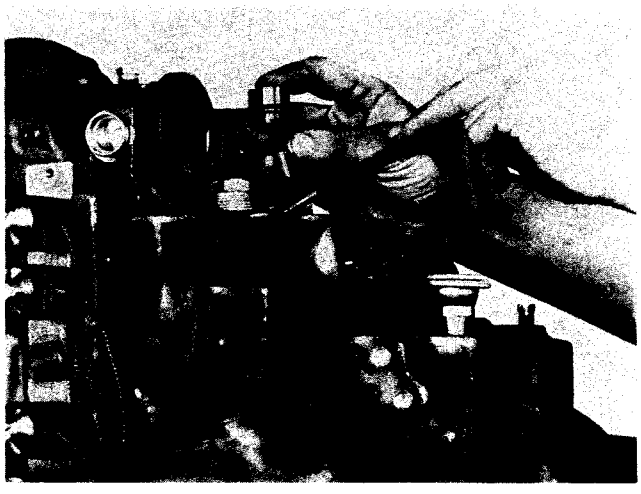


Figure 27
Install a new "O" ring on inching sleeve. Install inching spool in sleeve. Install spool and sleeve in inching control bore.

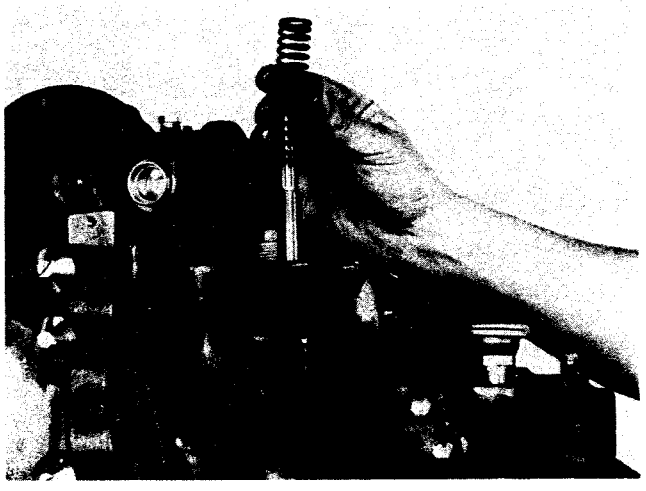


Figure 30
Install inching return spring.

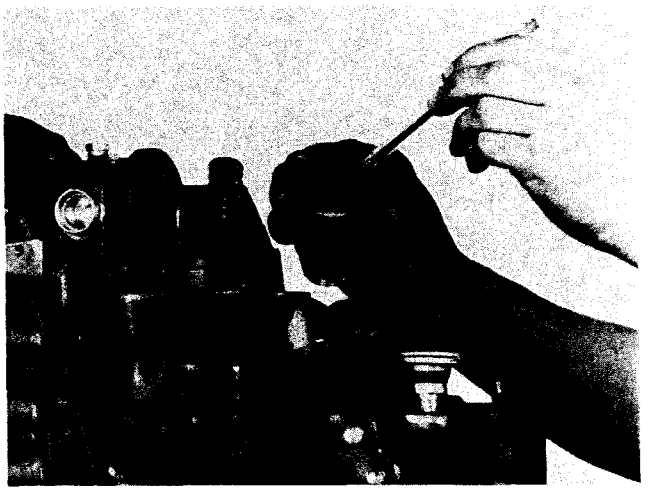


Figure 31
With new actuator rod oil seal in position and new "O" ring on inching housing, install housing over actuator rod and thread into inching bore.

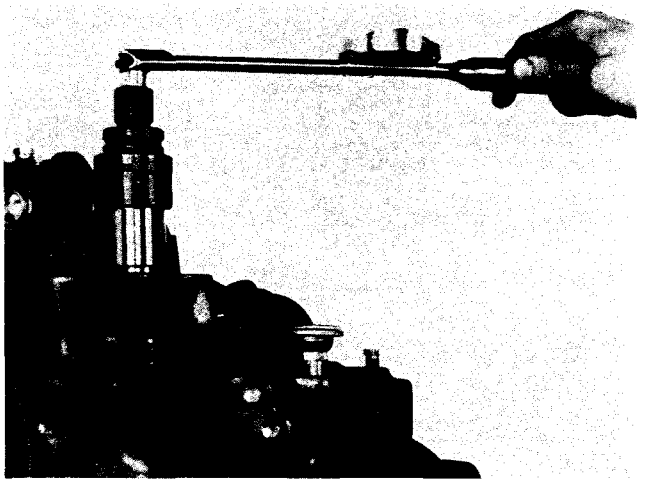


Figure 32
Tighten inching valve housing to specified torque. See assembly instruction drawing.

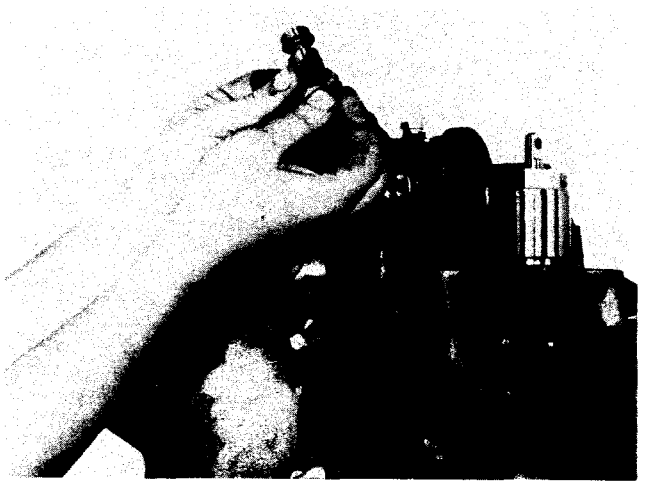


Figure 33
Position shuttle spool in shuttle sleeve. Install spool and sleeve in modulator valve bore.

Figure 34
With new "O" ring in position, install modulation housing sleeve assembly in bore.

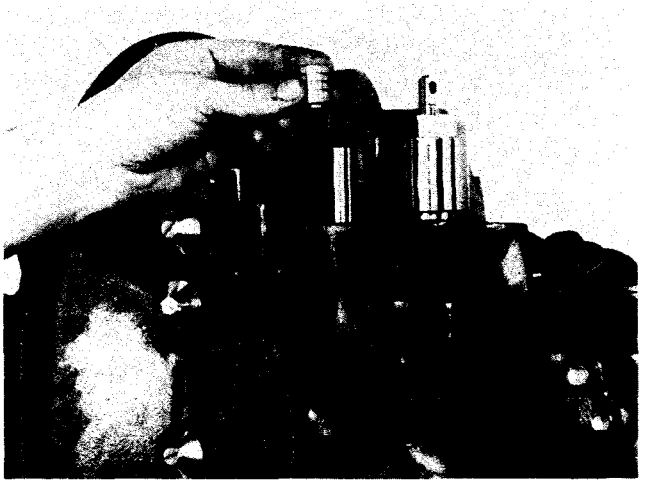


Figure 35
Install accumulator spool in housing sleeve as shown.

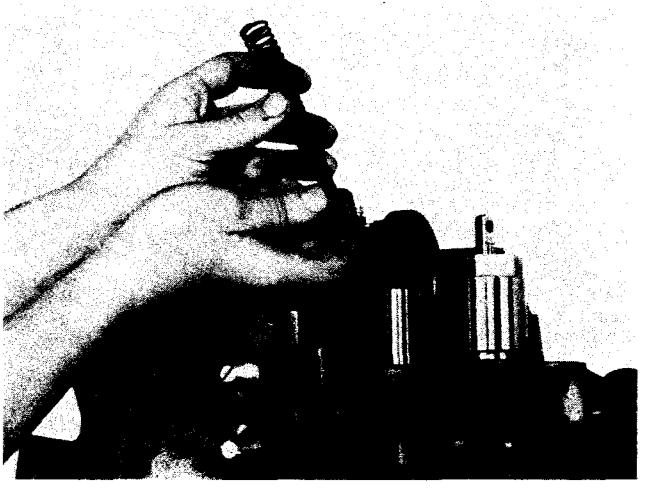


Figure 36
Install stop pin, inner, middle, and outer springs in accumulator and housing sleeve.

Figure 37
Position a new "O" ring on modulator valve housing. Thread housing into valve bore.

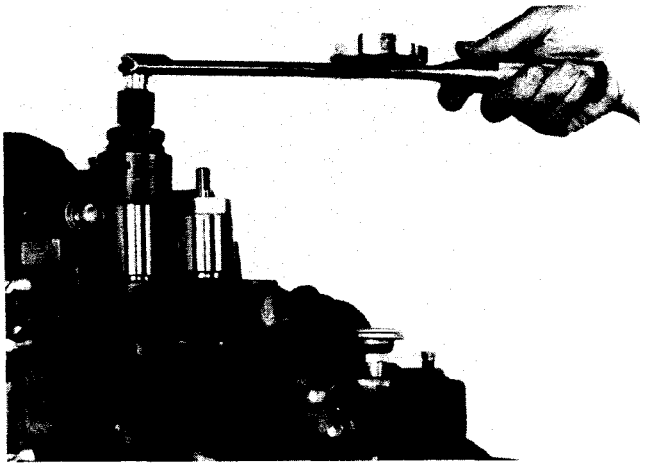


Figure 38
Tighten modulator valve housing to specified torque. See assembly instruction drawing.

NOTES

T-12000 3 SPEED HYDRAULIC DIAGRAM WITH DUAL MODULATION

See Pages 78 and 79 for Port Location

CONNECTION POINTS AND MEASURE POINTS CORRESPOND WITH PORTS WITH SAME NUMBER ON THE EXTERNAL PLUMBING AND PRESSURE

CLARK-HURTH WILL NOT SUPPLY ITEMS CHECK POINT SHEET INDICATED WITH *

HOSE LINE OPERATING REQUIREMENT

PRESSURE LINES - SUITABLE FOR OPERATION FROM AMBIENT TO 250°F [121°C] CONTINUOUS OPERATING TEMPERATURE. MUST WITHSTAND 300 psi [2065 kPa] CONTINUOUS PRESSURE, WITH 600 psi [4137 kPa] INTERMITTENT SURGES. REFERENCE SAE NO. J517,100R1 HYDRAULIC HOSE SPECIFICATION

ALL HOSE LINES USED MUST CONFORM TO SAE SPEC NO. J1019 TESTS AND PROCEDURES FOR HIGH TEMPERATURE TRANSMISSION OIL HOSE

ALL HOSE LINES AND FITTINGS .75 [19.0] ID UNLESS NOTED

OIL SPECIFICATION

SEE SERVICE MANUAL FOR LUBRICATION SPECIFICATIONS

PORT 71 - "TO COOLER" TEMPERATURE

GAUGE IS TO BE LOCATED IN THE OPERATOR COMPARTMENT

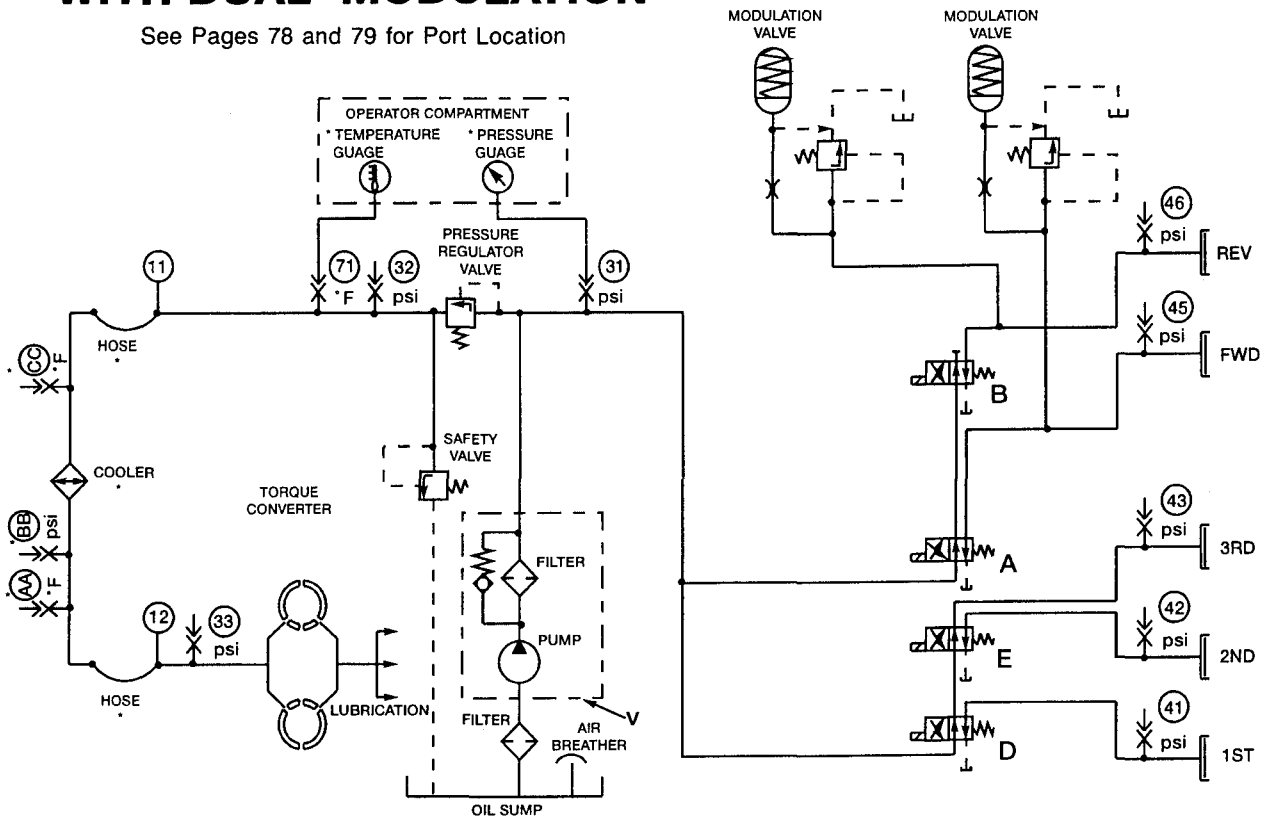
OIL TEMPERATURE GAUGE SPECIFICATIONS:
NORMAL OPERATING TEMPERATURE:
180-250°F [82-121°C]
RED LINE TEMPERATURE:
250°F [121°C]
MAXIMUM OPERATING TEMPERATURE:
300°F [149°C]

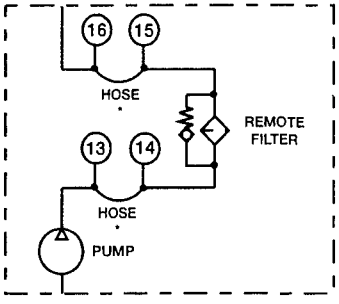
PORT 32 - "TO COOLER" PRESSURE

PRESSURE MUST BE MEASURED DURING NORMAL VEHICHLE "PRODUCTION LINE" TEST. "TO COOLER" PRESSURE EQUALS THE TOTAL PRESSURE DROP OF THE HEAT EXCHANGER, HEAT EXCHANGER LINES AND BACK PRESSURE OF THE TRANSMISSION LUBRICATION SYSTEM

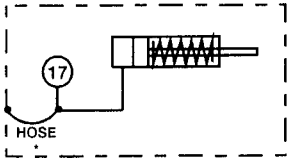
TEST CONDITIONS:
1. "TO COOLER" OIL TEMPERATURE
180-220°F [82-104°C]
2. TRANSMISSION IN NEUTRAL

OPERATING SPECIFICATIONS:
25 psi [173 kPa] MIN PRESSURE AT 2000 RPM ENGINE SPEED AND MAX OF 100 psi [690 kPa] OUTLET PRESSURE AT NO LOAD GOVERNED SPEED





VIEW V
REMOTE FILTER - OPTION



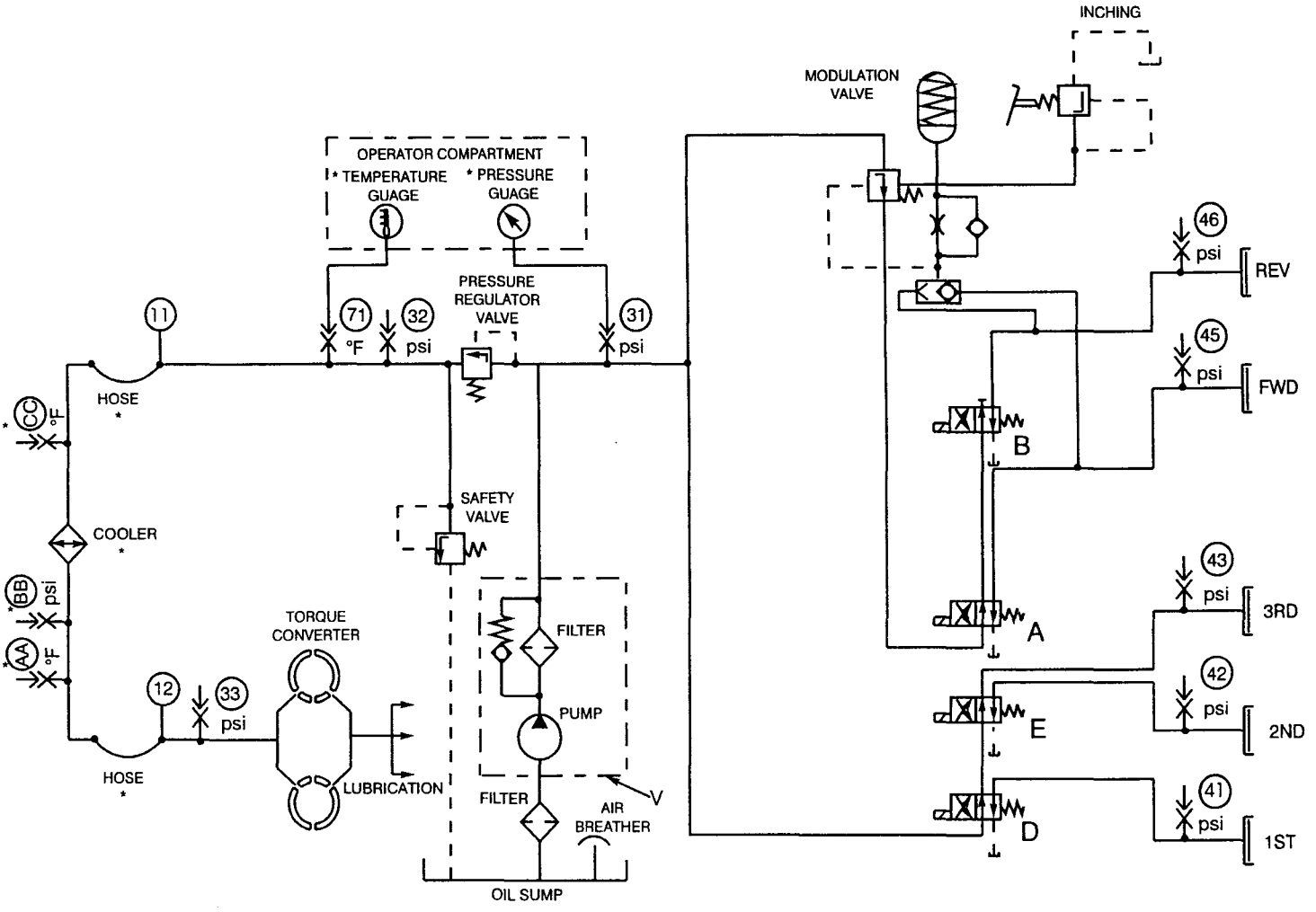
AIR/HYDRAULIC DISCONNECT - OPTION

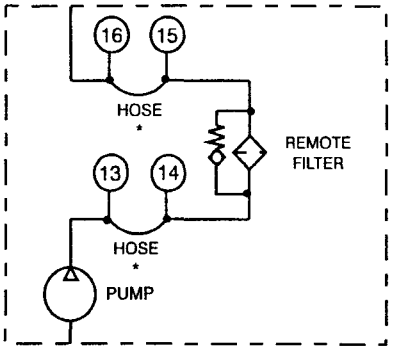
3 SPEED SHIFT DIAGRAM

	FWD			REVERSE			NEUTRAL		
	1	2	3	1	2	3	1	2	3
B				X	X	X			
A	X	X	X						
E	X	X		X	X		X	X	
D	X			X			X		

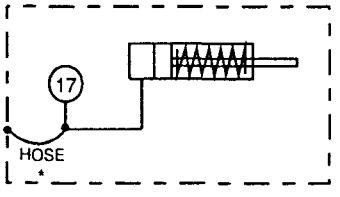
X = SOLENOID ENGAGED

T-12000 3 SPEED HYDRAULIC DIAGRAM WITH MODULATION AND INCHING





VIEW V
REMOTE FILTER - OPTION



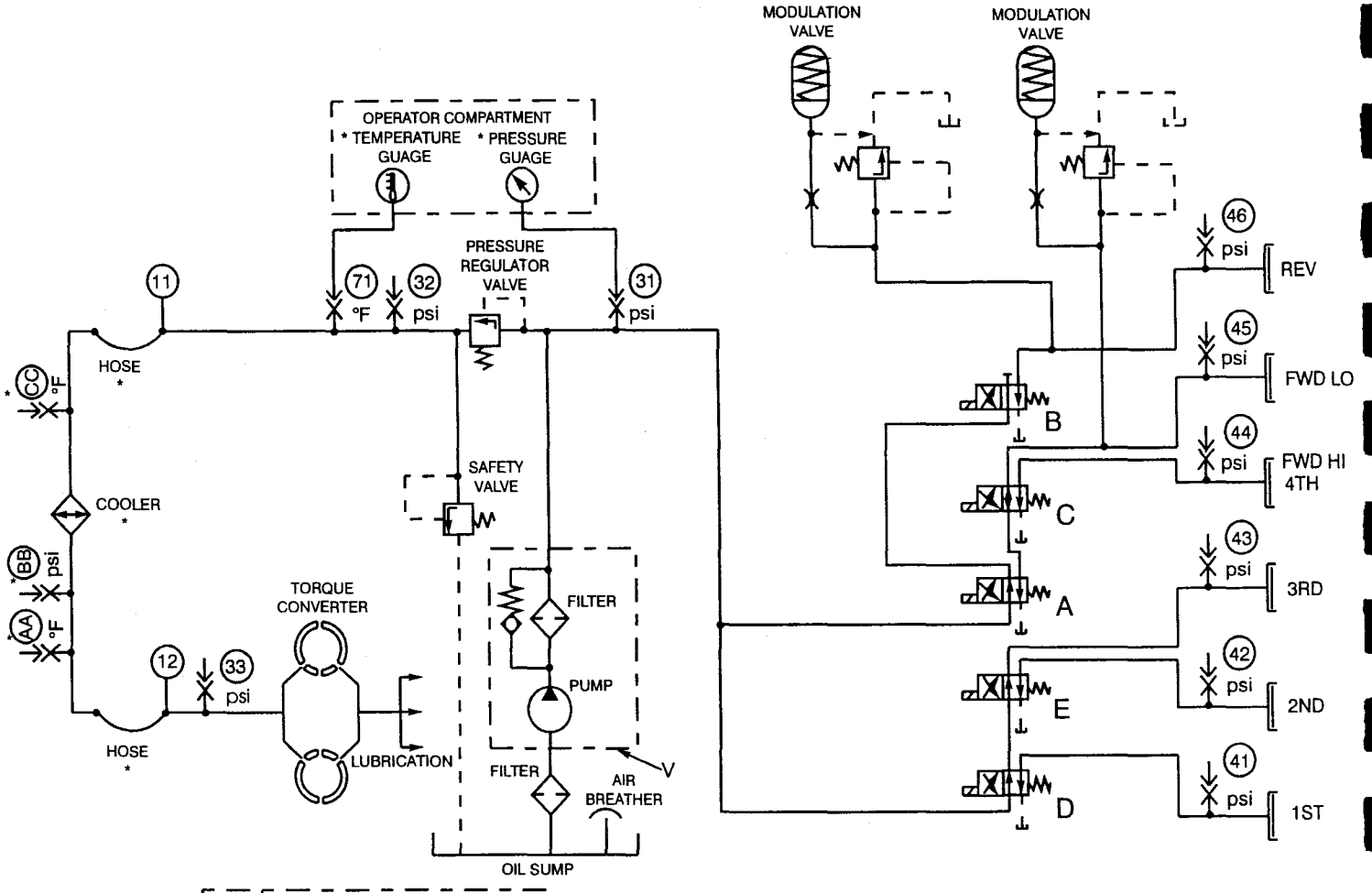
AIR/HYDRAULIC
DISCONNECT - OPTION

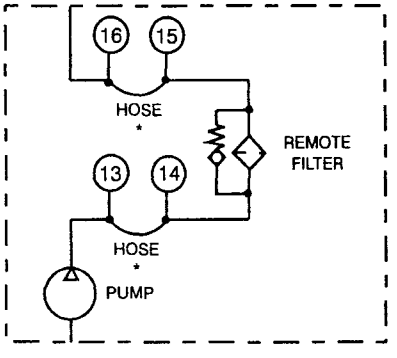
3 SPEED SHIFT DIAGRAM

	FWD			REVERSE			NEUTRAL		
	1	2	3	1	2	3	1	2	3
B				X	X	X			
A	X	X	X						
E	X	X		X	X		X	X	
D	X			X			X		

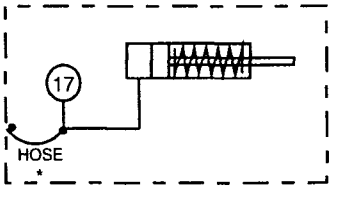
X = SOLENOID ENGAGED

T-12000 4&6 SPEED HYDRAULIC DIAGRAM WITH DUAL MODULATION





VIEW V
REMOTE FILTER - OPTION



AIR/HYDRAULIC
DISCONNECT - OPTION

3 SPEED SHIFT DIAGRAM

	FOWARD				REVERSE			NEUTRAL		
	1	2	3	4	1	2	3	1	2	3
B					X	X	X			
C				X						
A	X	X	X	X						
E	X	X			X	X		X	X	
D	X				X			X		

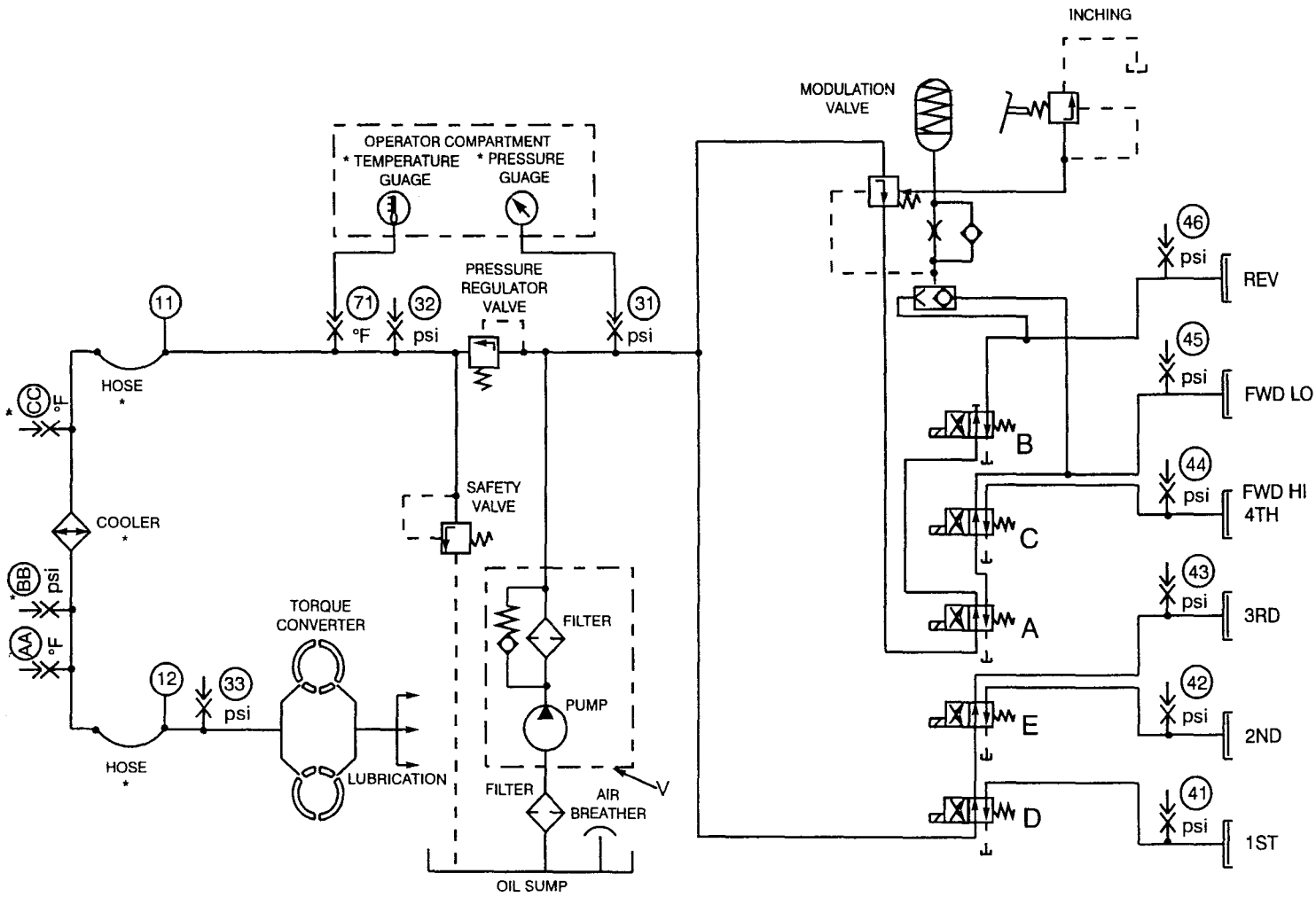
X = SOLENOID ENGAGED

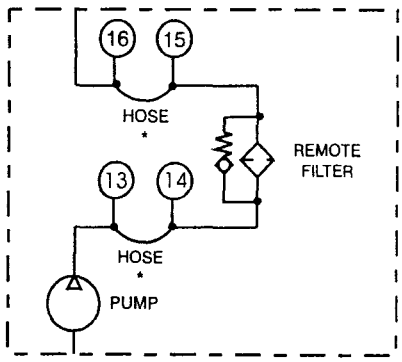
6 SPEED SHIFT DIAGRAM

	FOWARD						REVERSE			NEUTRAL		
	1	2	3	4	5	6	1	2	3	1	2	3
B							X	X	X			
C		X		X		X						
A	X	X	X	X	X	X						
E	X	X	X	X				X		X	X	
D	X	X								X		

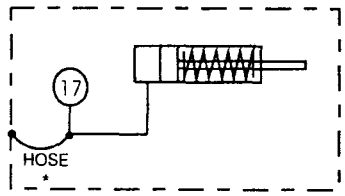
X = SOLENOID ENGAGED

T-12000 4&6 SPEED HYDRAULIC DIAGRAM WITH MODULATION AND INCHING





VIEW V
REMOTE FILTER - OPTION



AIR/HYDRAULIC
DISCONNECT - OPTION

4 SPEED SHIFT DIAGRAM

	FORWARD				REVERSE			NEUTRAL		
	1	2	3	4	1	2	3	1	2	3
B					X	X	X			
C				X						
A	X	X	X	X						
E	X	X			X	X		X	X	
D	X				X			X		

X = SOLENOID ENGAGED

6 SPEED SHIFT DIAGRAM

	FORWARD						REVERSE			NEUTRAL		
	1	2	3	4	5	6	1	2	3	1	2	3
B							X	X	X			
C		X		X		X						
A	X	X	X	X	X	X						
E	X	X	X	X			X	X		X	X	
D	X	X					X			X		

X = SOLENOID ENGAGED