SECTION

D

SERVICING THE CONTROL VALVE AND ORBITAL MOTOR

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INTRODUCTION

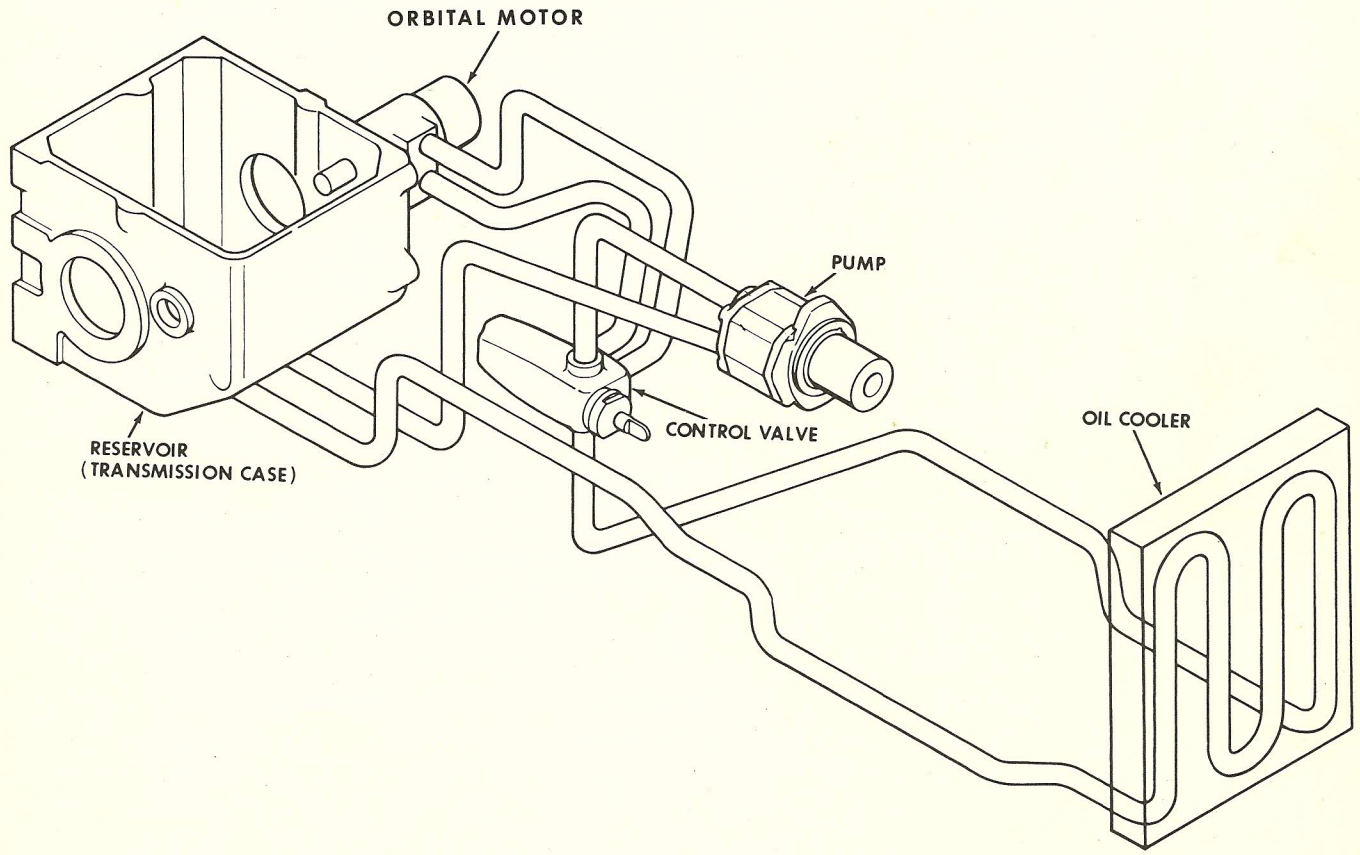
General

Hydra-Static Drive consists of a two speed spur gear transmission and reservoir, a gear type pump driven by the engine, a one spool control valve, orbital motor and oil cooler.

The Hydraulic Pump is mounted to and driven directly by the engine. The pump operates continuously whenever the engine is running, drawing oil from the reservoir (transmission case) and circulating this oil thru the control valve, orbital motor, cooler and back to the reservoir.

The Control Valve contains the valve spool and relief valve. The valve spool contains lands and grooves to obtain metering control of the oil from the pump to the orbitol motor or back to the reservoir. The spool is a three position spool, Forward, Neutral, and Reverse. The spool is manually moved by the operator either to or from these three positions. A system pressure relief valve is built into the control valve to protect the system components against excessive pressure damage.

The Orbit Motor is a positive displacement gerotor bi-directional type motor driven by pressurized hydraulic oil. The orbital motor consists of a rotor and stator, commutator, coupling shaft and body.



OIL FLOW
Neutral
(Refer to Figure D-1)
Reservoir, Filter and Pump

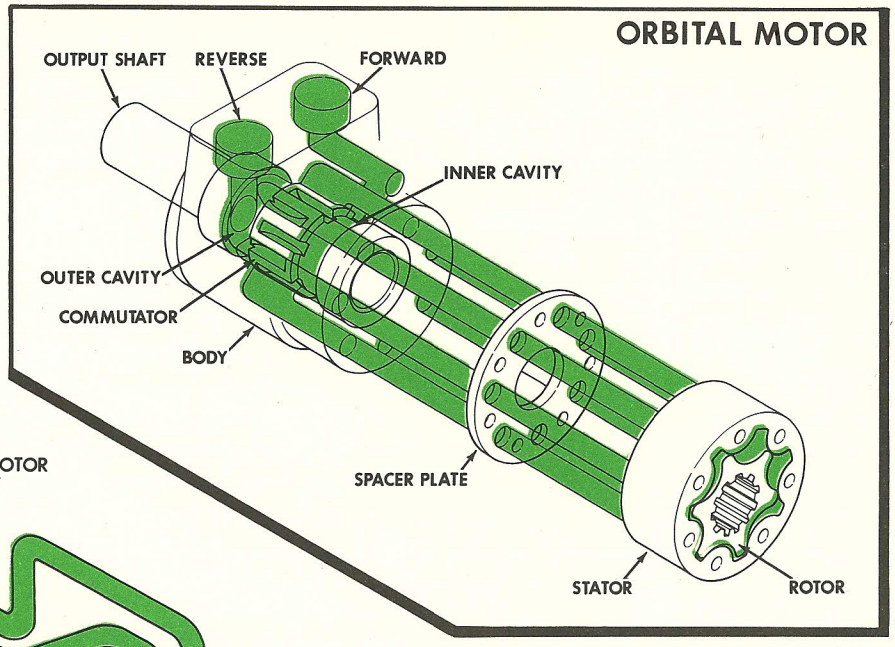
Whenever the engine is running the hydraulic pump operates continously, drawing oil from the reservoir (transmission case) thru the filter screen and delivering this oil thru tubing to the control valve.

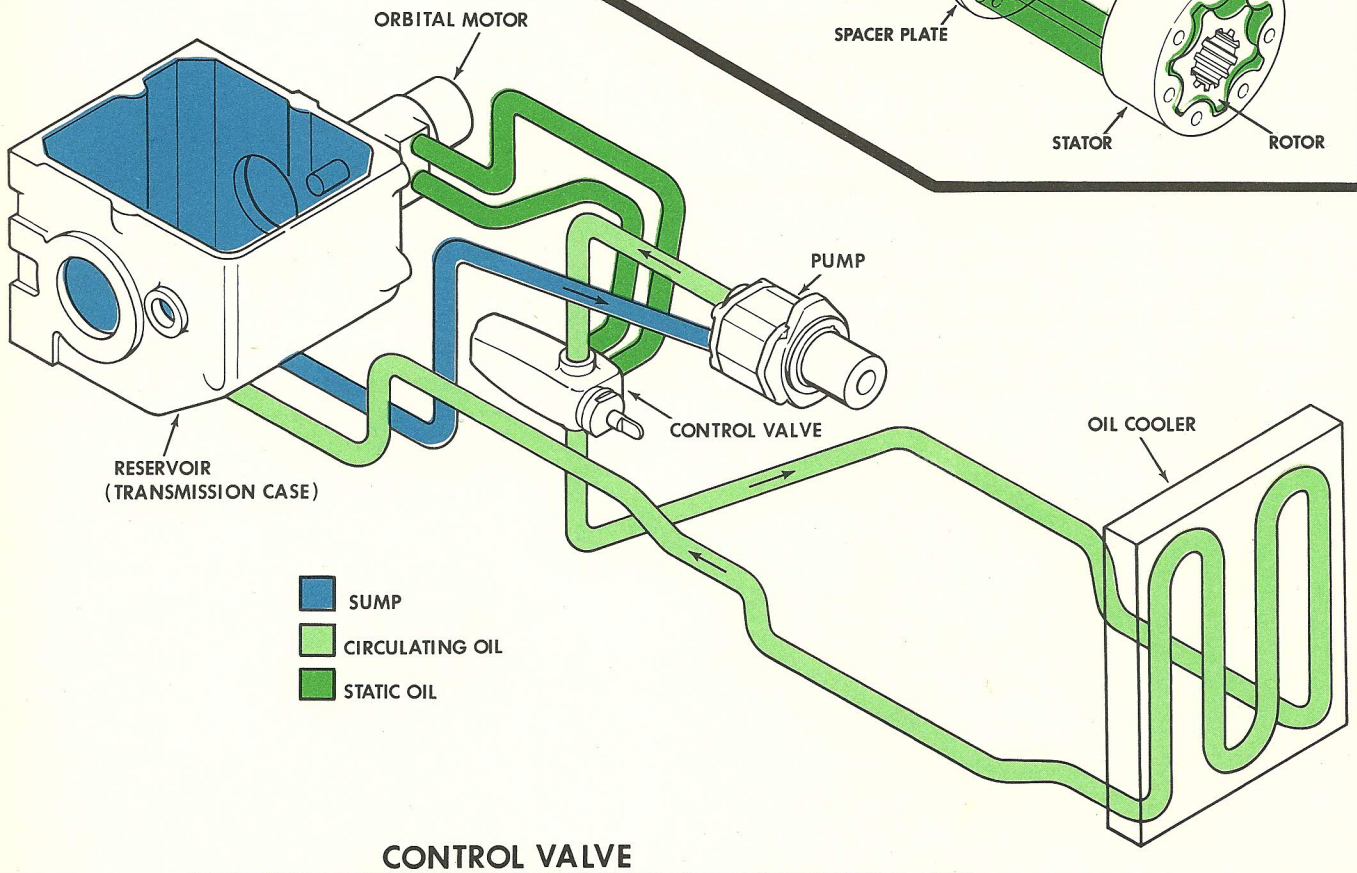
Control Valve

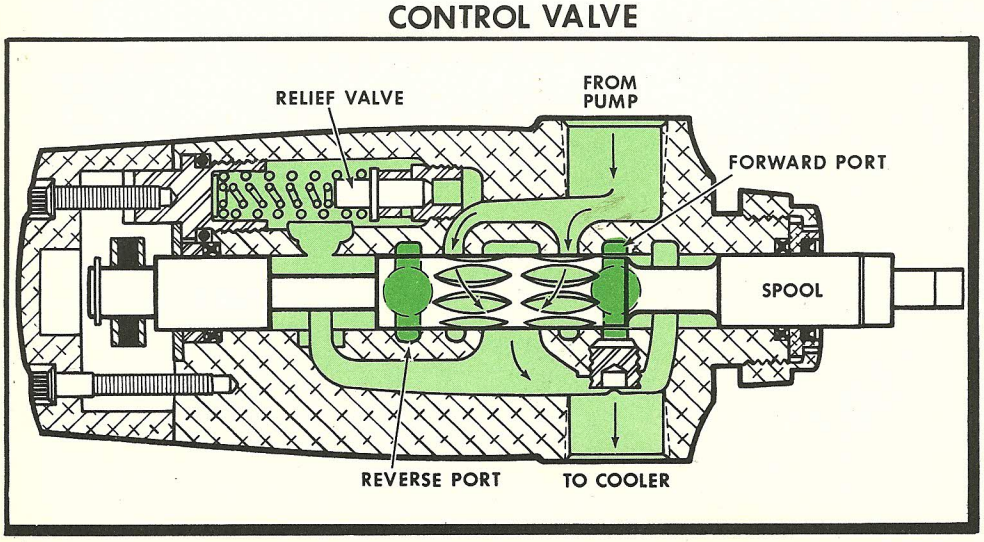
With the speed control lever in the neutral position the control valve spool is also in the neutral position. This blocks off the flow of oil, to either port leading to the orbital motor, thus all the oil coming from the hydraulic pump flows directly back to the reservoir. The relief valve in the control valve protects the system against excessive pressure. In the neutral position there is no high pressure so the relief valve would remain seated.

Orbital Motor

The flow of oil is by-passed at the control valve, therefore the orbital motor is unable to turn. The oil that is in the orbital motor and lines coming to it is of a static nature.







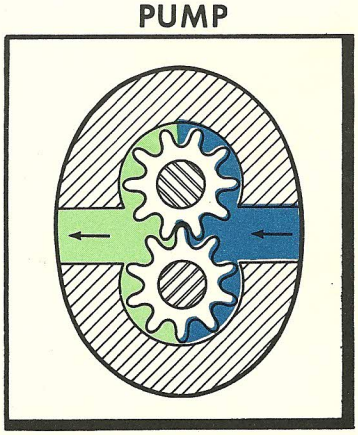


Figure D-1

OIL FLOW

Forward

(Refer to Figure D-2)

Reservoir, Filter and Pump

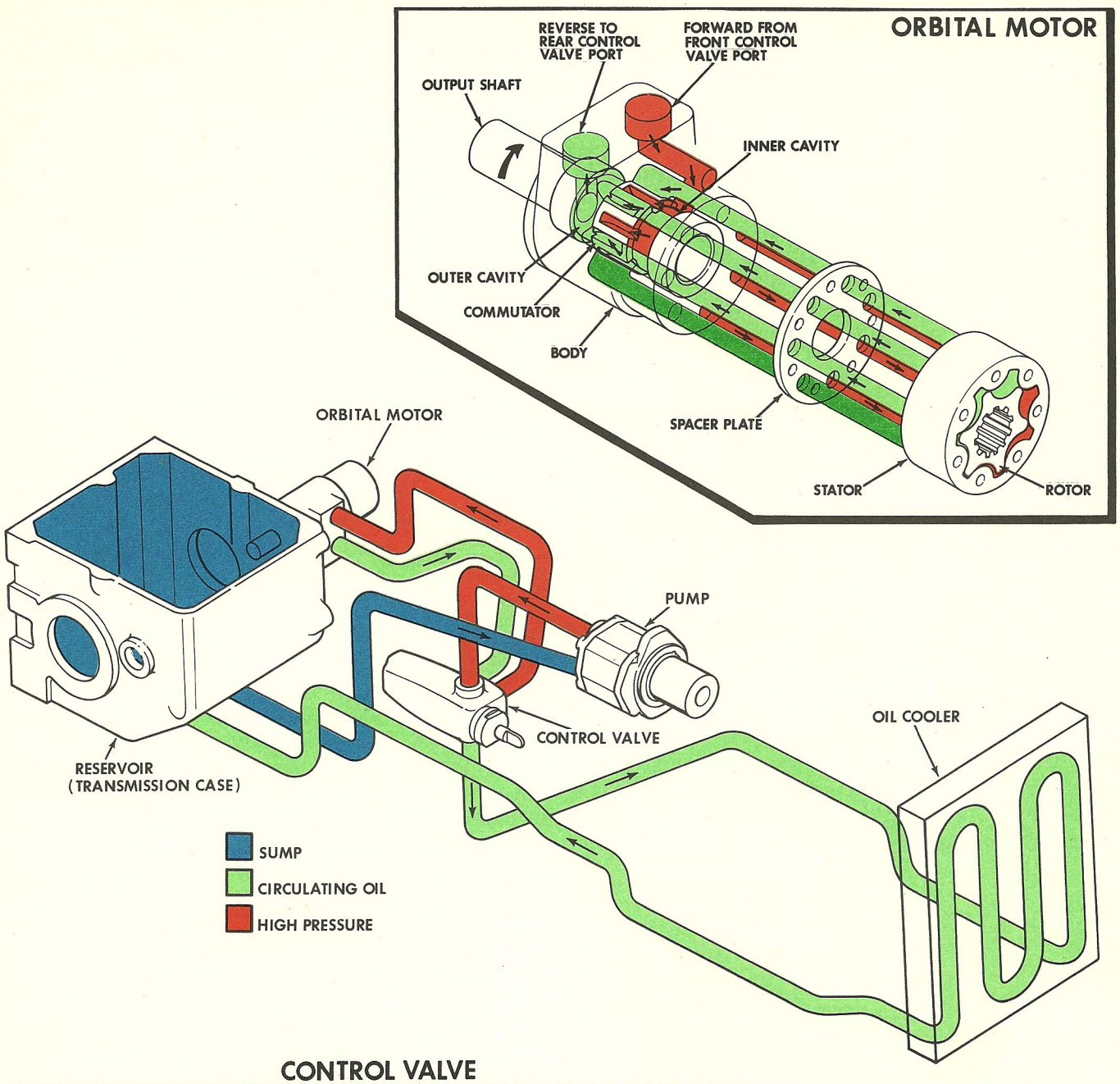
Whenever the engine is running, the hydraulic pump operates continously, drawing oil from the reservoir (transmission case) thru the filter screen and delivering this oil thru tubing to the control valve.

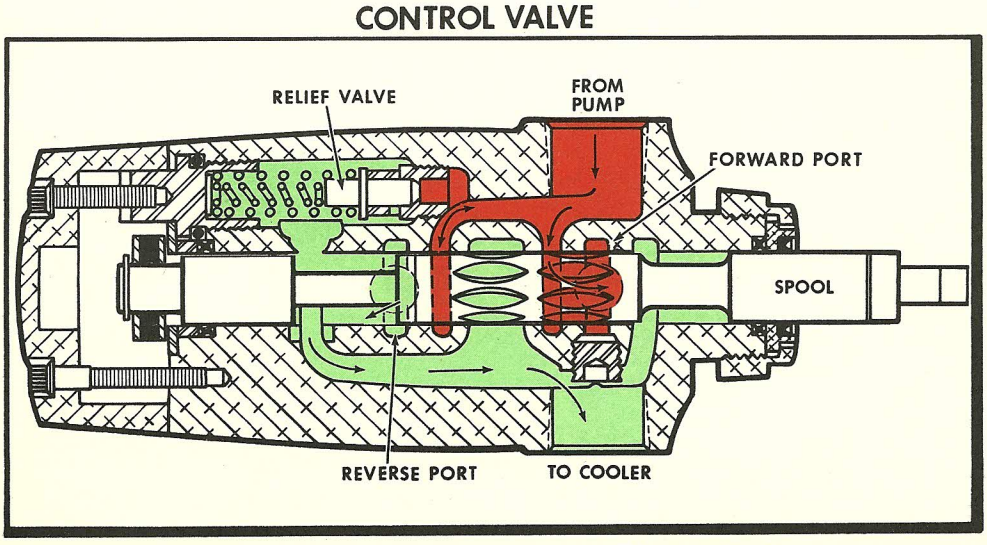
Control Valve

With the speed control lever in the Forward position the control valve spool is moved forward blocking off the return port allowing the pressurized oil to flow out the front port of the control valve to the top port of the orbital motor. While at the same time opening the rear port in the control valve, allowing the oil to flow back from the bottom port of the orbital motor thru the control valve back thru the oil cooler and return to the reservoir (transmission).

Orbital Motor

With the spool in the forward position the oil from the control valve enters the top port of the orbital motor. The oil then enters the inner cavity of the commutator and is distributed out thru cavities in the commutator to ports in the body leading to the rotor and stator. Thus the pressurized oil entering between the rotor and stator causes the rotor to turn because the stator is fixed to the motor body. Rotation of the rotor is transmitted to the output shaft thru a coupling shaft.





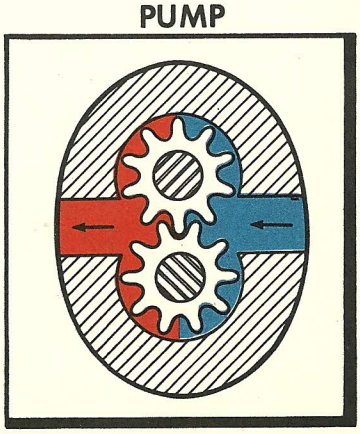


Figure D-2

OIL FLOW

Reverse

(Refer to Figure D-3)

Reservoir, Filter and Pump

Whenever the engine is running the hydraulic pump operates continously, drawing oil from the reservoir (transmission case) thru the filter screen and delivering this oil thru tubing to the control valves.

Control Valve

With the speed control lever in the Reverse position the control valve spool is moved rearward, blocking off the return port allowing the pressurized oil to flow out the rear port of the control valve to the bottom port of the orbital motor. While at the same time opening the front port in the control valve, allowing the oil to flow back from the top port of the orbital motor thru the control valve back thru the oil cooler and return to the reservoir (transmission case). case).

Orbital Motor

With the spool in the reverse position, the oil from the control valve enters the bottom port of the orbital motor. The oil then enters the outer cavity of the commutator and is distributed out thru cavities in the commutator to ports in the body leading to the rotor and stator. Thus the pressurized oil entering between the rotor and the stator cause the rotor to turn because the stator is fixed to the motor body. Rotation of the rotor is transmitted to the output shaft thru a coupling shaft.

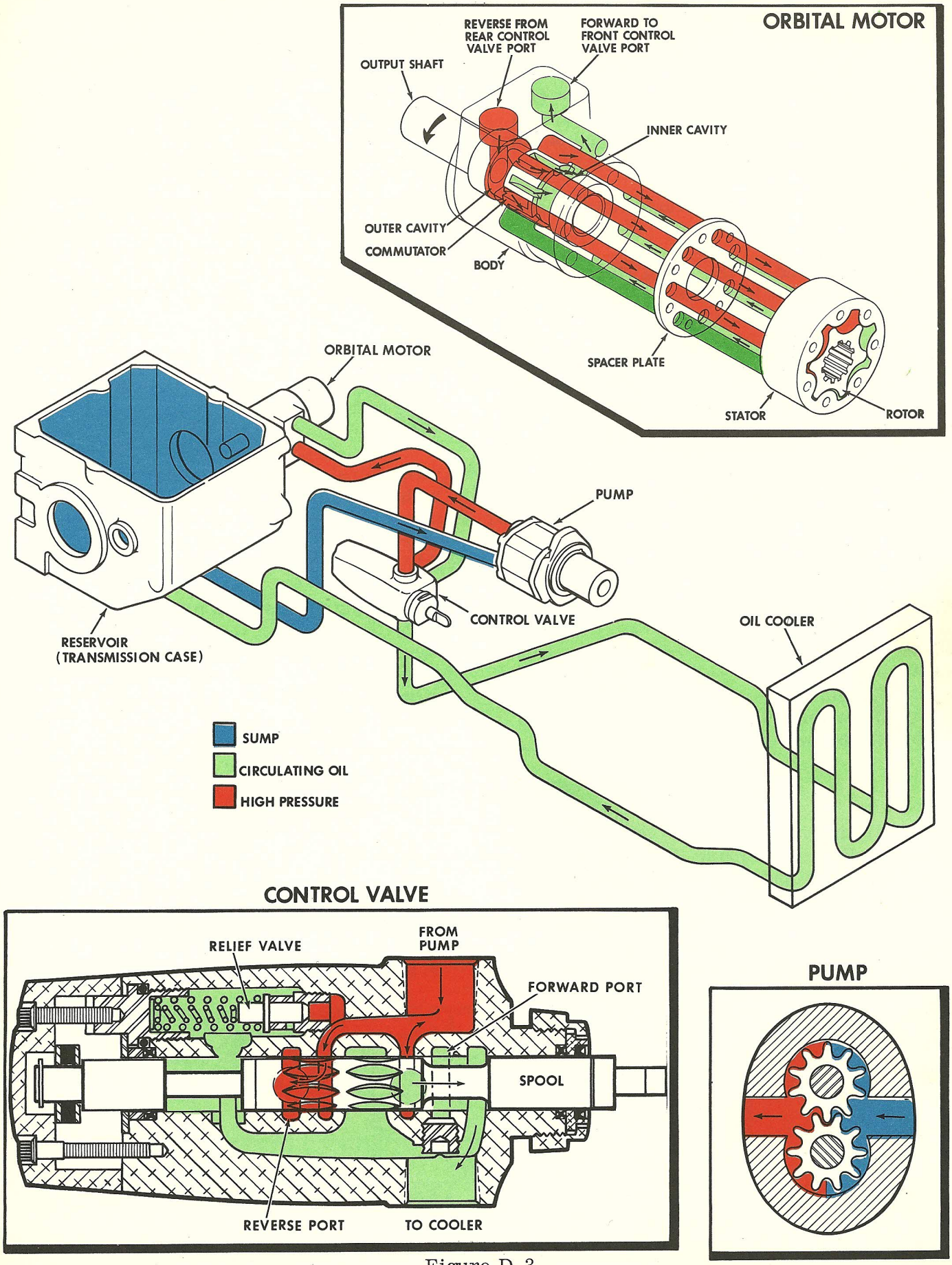


Figure D-3

CONTROL VALVE
(Refer to Figure D-4)
Disassembly

1. Remove the valve spool end cap (23) scraper seal (22), seal retainer (21) and quad ring (20) from the front end of the valve assembly.

2. Remove the ferry head capscrews (1) and end cap (2).

3. Grasp the end of the spool (16) and pull out of the valve body (19).

4. Remove the snap ring (15), retainer (13), spacer (14), retainer (13), relief valve plug retainer (12), spacer (11) and quad ring (10) from the spool (18).

5. Remove the relief valve plug (3), "O" ring (4), shim (5), outer spring (6), inner spring (7), poppet (8) and poppet seat (9).

6. Remove the plug (16) with "O" ring (17).

Inspection

The Valve Body must be inspected for grooves, deep scratches and excessive wear. If the valve body has damaged threads, cracks or groove marks the body and spool must be replaced.

The Valve Spool must be inspected for grooves, deep scratches and excessive wear. Check to see if the spool fits it's respective body bore with a hand pressure and without excessive side clearance. If it is loose, scored or damaged the spool and body must be replaced.

Replace all "O" rings and oil seals during assembly.

Outer Spring (6) Inspection

Free Length ---------- 1.65
Total Coils ---------- 11.5
Active Coils ---------- 9.5
Wire Diameter ---------- .1055
250 lbs. per inch

Inner Spring (7) Inspection

Free Length ---------- 1.23
Total Coils ---------- 15
Active Coils ---------- 13
Wire Diameter ---------- .059
95 lbs per - inch

Reassembly

1. Install the relief valve poppet seat (9) poppet (8), inner spring (7), outer spring (6), shim (5) and plug (3) with a new "O" ring (4) in the valve body (19).

2. Install the quad ring (10) spacer (11), relief valve plug retainer (12), retainer (13), spacer (14), retainer (13) and snap ring (15) on the rear of the valve spool (19) into the valve body (19).

3. Install a new seal (22) in the retainer (21) with the lip towards the larger diameter opening.

4. Install the quad ring (20). retainer (21) with seal (22) and valve spool end cap (23).

5. Install the plug (16) with "O" ring (17).

6. Install the end cap (2) using the ferry head capscrews (1).

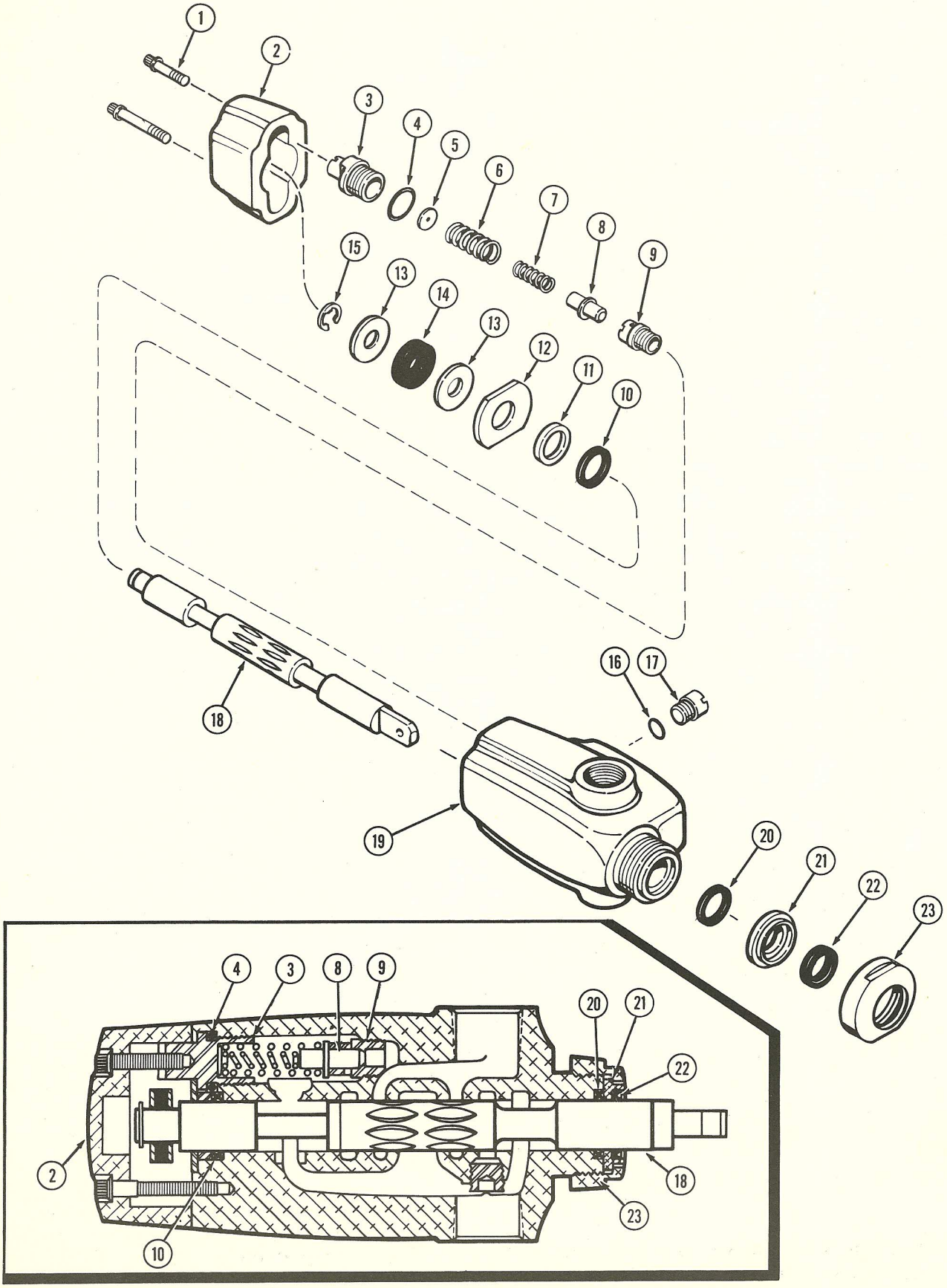


Figure D-4

ORBITAL MOTOR
(Refer to Figure D-5)
Disassembly

IMPORTANT

Before removing the orbit motor thoroughly clean the area around the orbit motor to prevent the entry of foreign material into the lines and transmission. Also make sure the disassembly area is clean.

CAUTION

If a vise is used, avoid excess pressure which will distort the housing. Clamp across the port area not the housing.

1. Remove the seven capscrews and washers (20) and the end cap (19).

2. Using an indelible pencil mark a line across the stator, rotor and motor body in line with the key way in the shaft for proper assembly.

3. Remove the spacer (18) stator and rotor assembly (17) and spacer (16).

4. Remove the thrust bearing (15) and coupling shaft (14).

5. Remove key (9) and mounting flange capscrews (13) and washers.

6. Tap lightly on the mounting flange (2) and remove from motor shaft (8).

7. Remove "O" ring (5) and quad ring (4) from inside the mounting flange (2).

8. With a small screwdriver, or knife remove the oil seal (1) from the outside of the mounting flange (2).

9. Remove bearing race (6) thrust bearing (7) and motor shaft (8).

10. Remove plug (11) with "O" ring (12).

Inspection

Clean all parts before inspection being careful not to damage any machined surfaces.

Check the thrust bearing for excess wear, scratches and scoring. A polished pattern on the spacer plate and end plate due to rotor action is normal.

Check the rotor to stator clearance using narrow feeler gauge (refer to inset A) the clearance should not exceed .005 inch.

Check rotor to stator thickness (inset B) with a micrometer. If rotor thickness is more than .002" less than the thickness of the stator, replace stator and rotor.

Reassembly

1. Install the plug (11) with a new "O" ring (12).

2. Install the motor shaft (8) thrust bearing (7) and bearing race (6).

3. Install a new oil seal (1) lip out, quad ring (4) and "O" ring (5) in the mounting flange (2).

4. Install the mounting flange on the motor shaft and secure to motor body using capscrews and washers (13). Torque capscrews evenly to 225-275 inch pounds.

5. Install the coupling shaft (14) in the motor shaft.

NOTE Make sure the key way in the shaft is lined up with the mark made during disassembly. If no mark was made turn the shaft so the key way is directly between the ports.

6. Install the thrust bearing (15) and spacer plate (16). Make sure the spacer plate is lined up with the mark made during disassembly.

7. Install the stator-rotor assembly (17) in alignment with the mark made during disassembly. If no mark was made or new assembly used the rotor must be installed 15° off the center line of the shaft keyway. Refer to inset C.

8. Install spacer (18) end cover (19) and secure with capscrews and washers (20). Torque capscrews evenly to 175-200 inch pounds.

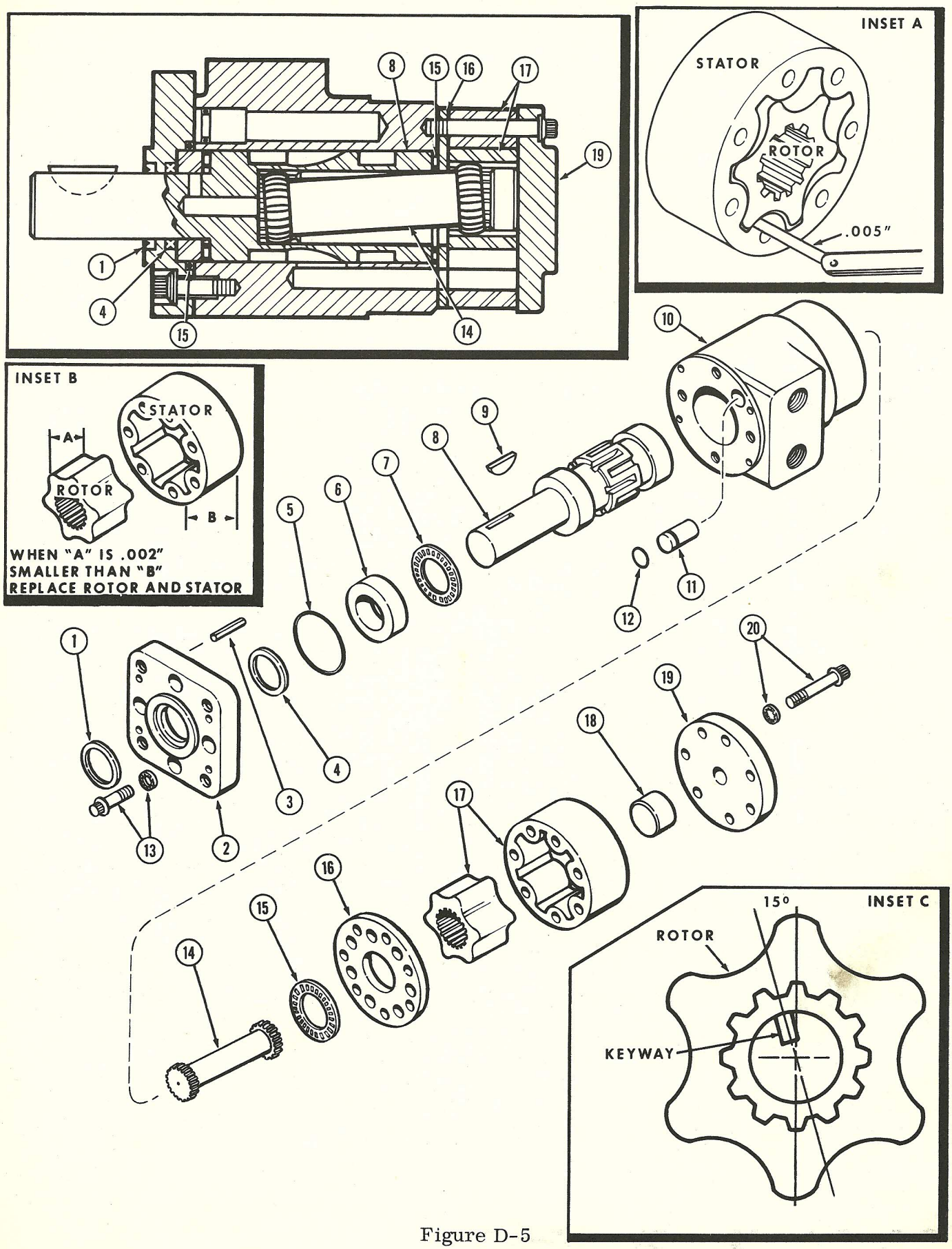


Figure D-5

OIL FLOW AND PRESSURE CHECK

To check all the hydraulic components used in the power train, only one installation of the Hydra-Sleuth is necessary. Refer to Figure D-6.

1. Remove the line between the pump outlet and the control valve inlet. Also remove the two lines between the control valve and orbital motor. Install 3/4" pipe plugs in the outlet ports of the control valve. Remove the return line from the control valve to oil cooler.

NOTE The removal of both the lines between the control valve and orbital motor serves mainly as a safety factor in preventing the tractor from being accidently operated.

2. For all Sleuth line and fitting, use 1/2" I.D. material having at least a pressure rating of 2000 PSI. All lines should be approximately the same length as the tubing that was removed. Any excessive lengths of lines may cause incorrect flow and pressure readings.

3. Starting at the pump outlet, install a hose, tee, on-off valve and hose that will connect to the control valve. Then install a hose from the tee to the inlet of the Hydra-Sleuth. Then connect a hose to the control valve outlet, a tee and a hose going to the heat exchanger inlet. Also connect the outlet of the Hydra-Sleuth to the tee in the line between the control valve outlet and heat exchanger.

Pump Check

1. Close the on-off valve and fully open the load valve of the Hydra-Sleuth.

2. Start and run the engine at 3250 RPM until the system temperature is approximately 120°F.

3. Note the GPM of flow at zero PSI. Slowly close the load valve, the flow must not decrease more than 2-1/2 GPM from zero PSI to 1000 PSI.

4. If the pump output drops off more than 2-1/2 GPM either the intake screen is plugged or the pump is worn and must be rebuilt or replaced.

Control Valve Check

1. Open the on-off valve and fully open the load valve of the Hydra-Sleuth.

2. Start and run the engine at 3250 RPM, until the system temperature is approximately 120°F.

3. Move the speed control lever to either forward or reverse and slowly close the load valve of the Hydra-Sleuth. The leakage in the control valve from zero PSI to 1000 PSI should not exceed 1/2 GPM more than the leakage of the pump, as determined under "Pump Check" above.
EXAMPLE If the output of the pump is 7 GPM at zero PSI and is 5-1/2 GPM at 1000 PSI, the drop would be 1-1/2 GPM. Therefore, the acceptable leakage at the control valve could be 2 GPM, because of the pump drop of 1-1/2 GPM plus 1/2 GPM allowable leakage at control valve.

4. If the control valve leakage is more than 1/2 GPM, either the relief valve setting will require adjusting or the control valve body may be cracked.

Relief Valve Check

1. To check the relief valve, slowly close the load valve of the Hydra-Sleuth further than 1000 PSI as in step 3 under Control Valve Check.

Relief Valve Check(continued)

2. The relief valve should open between 1250-1500 PSI. If the relief valve opens at a higher or lower pressure, the relief valve can be adjusted.

3. To Decrease Relief Valve Pressure; the relief valve adjusting plug can be turn out one half turn (only) which will reduce the pressure setting approximately 100 PSI - or shims can be removed, reducing the relief valve pressure setting approximately 200 PSI per shim.

4. To Increase Relief Valve Pressure; the relief valve adjusting plug can be turned in one half turn (only) which will increase the pressure setting approximately 100 PSI or shims can be added, increasing the pressure setting approximately 200 PSI per-shim. There should never be a total of more than five shims used in the relief valve.

Control Valve Recheck

1. Repeat the steps 1 thru 4 under control valve check. If the leakage exceeds 1/2 GPM more than the leakage of the pump at 1000 PSI, at full governed no load engine speed, the control valve housing is cracked and must be replaced.

.Orbital Motor

If the Hydraulic Pump and Control Valve Check out as described above, and adequate tractor performance cannot be obtained, the orbital motor will have to be rebuilt or replaced.

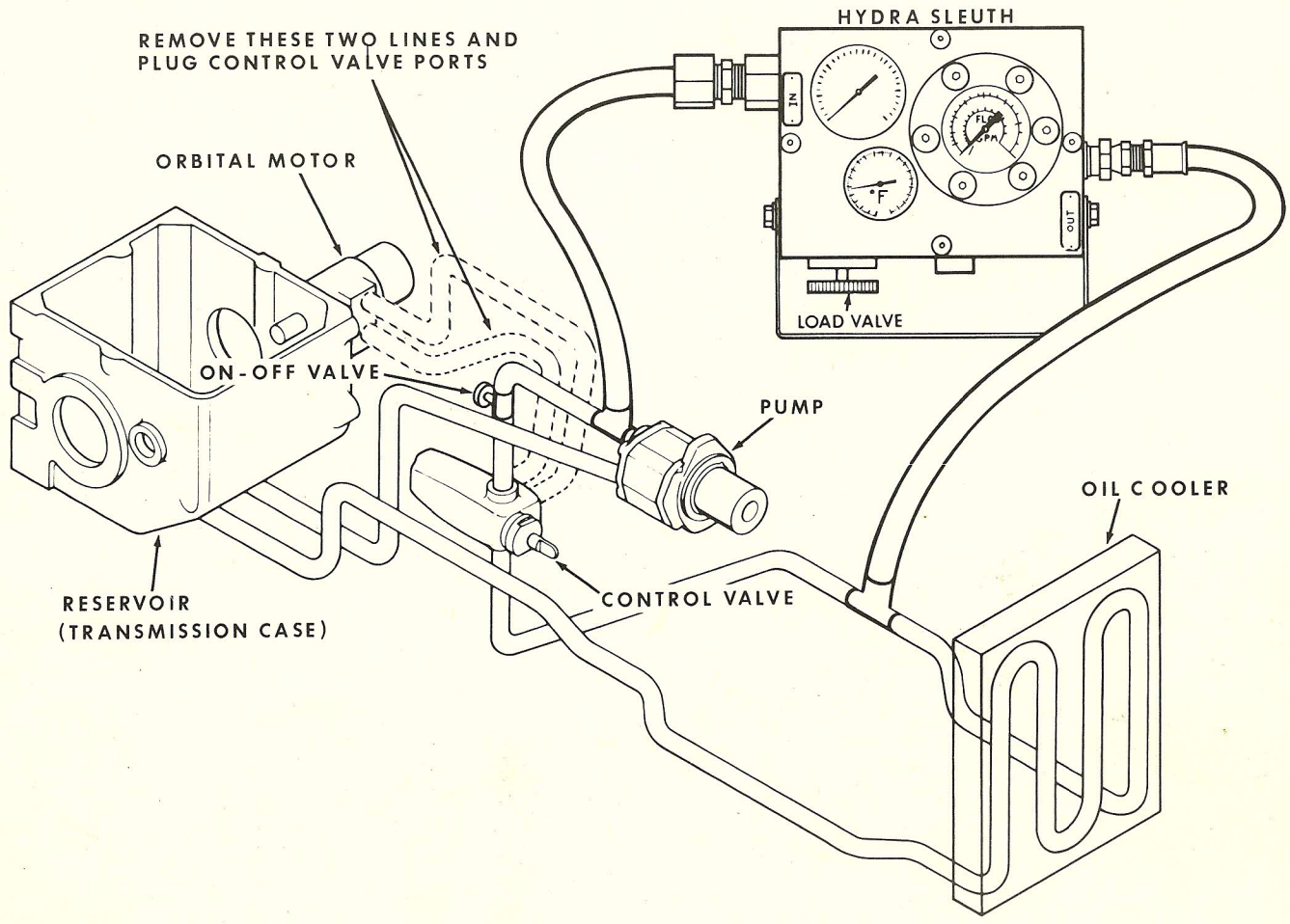


Figure D-6

NOTE: The J. I. Case Company reserves the right to make improvements in design or changes in specifications at any time without incurring any obligation to install them on units previously sold.