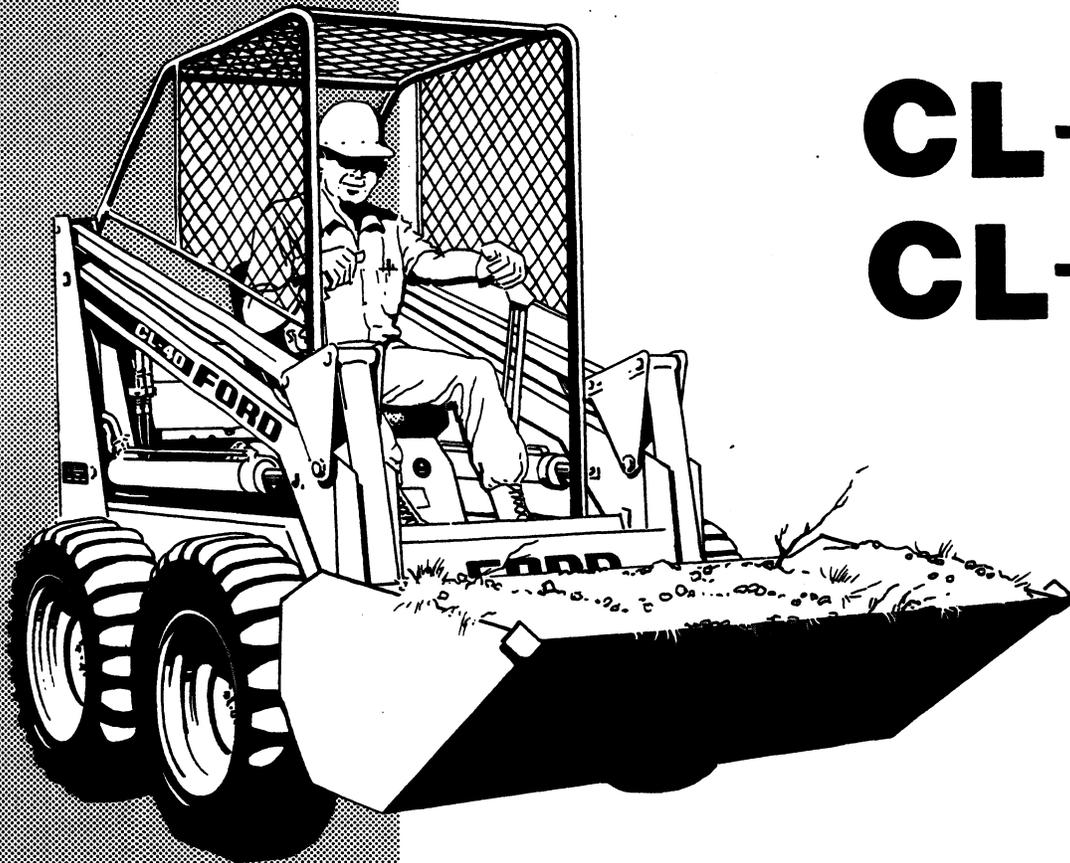


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# FORD

## Compact Loader



**CL-30**  
**CL-40**

# repair manual

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## **Foreword**

**This manual contains service information for the Ford Series CL 30 and CL 40 Compact Loaders. Information is provided on description and operation, trouble shooting, tests and adjustments, component overhaul, lubrication and specifications.**

**Refer to the appropriate engine manual for information concerning the engine, its components, specifications and repair.**

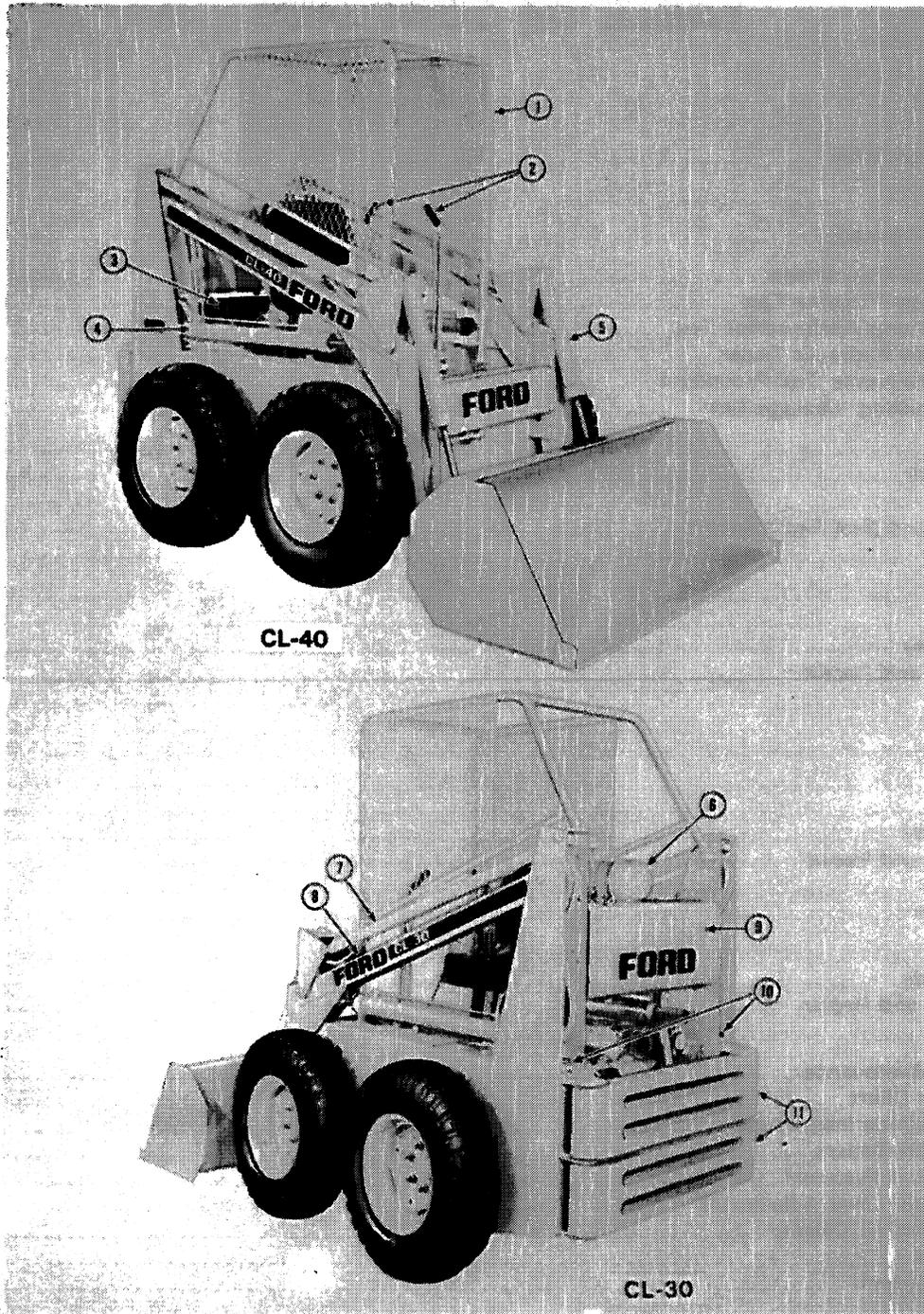
**Keep this manual, along with your other service literature, available for ready reference.**

**SERVICE DEPARTMENT  
Ford Tractor Operations  
Ford Motor Company**

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## DESCRIPTION AND OPERATION



**Figure 1**  
**Ford CL-30 and CL-40 — Compact Loader**

- |                       |                      |                            |
|-----------------------|----------------------|----------------------------|
| 1. Operator's Guard   | 5. Bucket Cylinder   | 9. Hydraulic Oil Reservoir |
| 2. Operating Controls | 6. Air Cleaner       | 10. Fuel Tank Caps         |
| 3. Engine             | 7. Self Leveling Arm | 11. Counterweights         |
| 4. Lift Cylinder      | 8. Lift Arm          |                            |

# DESCRIPTION AND OPERATION

The Ford CL 30 and CL 40 Compact Loaders, Figure 1, are self contained, hydrostatic drive, four-wheel drive front end loaders. An engine driven pump provides hydraulic power to drive the loader through separate circuits on each side of the vehicle. Double acting cylinders lift and dump the loader bucket through a separate hydraulic circuit.

The drive system is comprised of three basic units; the pumps, the hydraulic motors and the chain drive. The pumps are the source of pressure and volume and they determine the direction of flow of oil in the drive circuit. The hydraulic motors power the unit utilizing a high torque, low rpm design. The chain drive transfers power from the hydraulic motors to the wheels.

Steering is accomplished by a lever and linkage arrangement which controls the hydraulic drive circuit on each side of the vehicle. With the drive control levers in the neutral position, no oil flow occurs. When the control levers are pushed forward, oil is pumped to the drive motors moving the unit forward. When the control levers are pulled backward, the oil flow to the drive motors is reversed, moving the unit backward.

Turning is accomplished by regulating the oil flow in the drive circuits. Difference in hydraulic oil flow drives one side faster or slower than the other and results in a turning movement. One side full forward and the other full reverse provides a full pivot turn.



**CAUTION:** *If the loader is to be parked on an incline, lower the bucket so the cutting lip contacts the ground, and securely block the loader wheels. Always try to park the loader on level ground.*

The engines are covered in separate engine manuals.

The frame assembly is built of heavy steel, electrically welded to form an integral unit. Additional reinforcing provides maximum resistance to stress.

## TROUBLE SHOOTING

The following paragraphs contain trouble shooting information that may be helpful when a problem is encountered with the loader. Each symptom is followed by a list of possible causes and suggested corrective action. To isolate the possible cause, proceed in a systematic manner to determine the faulty component. These paragraphs DO NOT cover all possible malfunctions or deficiencies that may occur.

### Engine

For problems related to the engine, refer to the trouble shooting portion of the appropriate engine manual. Study the engine manual carefully for complete information on the operation, care and maintenance of the engine.

**NOTE:** For units within Warranty, it is suggested the dealer review the engine manufacturer's warranty forms before performing repairs.

SYMPTOM	CAUSE	CORRECTIVE ACTION
<b>ENGINE</b>		
Refer to the appropriate engine manual.		
<b>ELECTRICAL</b>		
<b>Improper Ammeter Indication</b>	<ol style="list-style-type: none"> <li>1. Battery discharged</li> <li>2. Loose cable connections</li> <li>3. Defective ammeter</li> <li>4. Alternator not operating</li> <li>5. Defective regulator</li> </ol>	<ol style="list-style-type: none"> <li>1. Check battery and charge if necessary.</li> <li>2. Check connections at battery, ammeter, regulator and plug connector of wiring harness.</li> <li>3. Replace.</li> <li>4. Refer to engine manual.</li> <li>5. Replace.</li> </ol>

# TROUBLE SHOOTING

SYMPTOM	CAUSE	CORRECTIVE ACTION
<b>DRIVE SYSTEM</b>		
<b>A. System Noisy</b>	1. Air in system	1. Check reservoir oil level, replenish if required, and purge system of air.
	2. Loose suction line	2. Tighten connections.
	3. Clogged suction filter	3. Replace filter element.
	4. Oil too thick	4. Replace with correct grade of oil.
	5. Oil cold and stiff	5. Run system at low speed and no load until warm.
	6. Internal pump or motor damage	6. Disassemble, inspect and repair.
<b>B. System Overheating</b>	1. Internal leakage	1. Isolate and repair.
	2. Fluid level low	2. Replenish reservoir oil level.
	3. Oil cooler blocked	3. Clean oil cooler externally and flush internally.
<b>C. System Not Developing Pressure</b>	1. Relief valve damaged or malfunctioning	1. Install a new relief valve.
	2. Internal leakage in pump or motor	2. Isolate and repair.
	3. Pump drive failure	3. Locate and repair.
	4. Control linkage failure	4. Locate and repair.
	5. Charge pump defective or worn	5. Repair or replace charge pump components.
<b>D. Loss of Fluid</b>	1. Loose fittings	1. Check and tighten hose and tube connections.
	2. Ruptured hydraulic line	2. Locate and repair.
	3. Leaking gaskets or seals in pump or motor	3. Visually inspect mating sections of pump, shaft seal areas, etc., for signs of leakage. Repair as required.
<b>E. Pump Vibration</b>	1. Clogged pump	1. Clean.
	2. Loose pump mounts	2. Tighten.
	3. Defective bearings	3. Repair or replace.
<b>F. Warning Light Glows Red</b>	1. Non-bypass filter clogged.	1. Install new filter cartridge.

# HYDRAULIC SYSTEM OPERATION

SYMPTOM	CAUSE	CORRECTIVE ACTION
<b>LOADER SYSTEM</b>		
<b>A. Loss of Fluid</b>	1. Loose fittings	1. Check and tighten all hose and tube connections.
	2. Ruptured hydraulic line.	2. Locate and repair.
	3. Pump seal blown	3. Replace seal.
<b>B. "Drift" of Lift or Bucket Cylinders</b>	1. External cylinder leakage	1. Replace cylinder.
	2. Internal cylinder leakage.	2. Replace packings and seals.
	3. Leakage at lines or fittings.	3. Locate and repair.
	4. Internal valve leakage.	4. Replace valve.

## HYDRAULIC SYSTEM OPERATION

The hydraulic system of the Ford CL-30 and CL-40 Compact Loaders operates both the loader and drive systems. The hydraulic system is powered by a 3-section tandem pump.

The front section (7), Figure 2, is a fixed displacement, vane-type pump which provides hydraulic power to the loader. It also functions as the charging pump for the remaining two sections of the pump, each of which powers a drive motor to propel the wheels on one side of the loader.

The front pump section is supplied with oil directly from the reservoir (13), Figure 2, and supplies oil to the loader control valve (5), where it is directed to the bucket cylinders (1) and (2), or to the lift cylinders (3) and (4).

From the loader control valve, the oil flows towards the backpressure valve (10). This backpressure valve maintains the system backpressure at  $65 \pm 5$  psi ( $4.57 \pm .35$

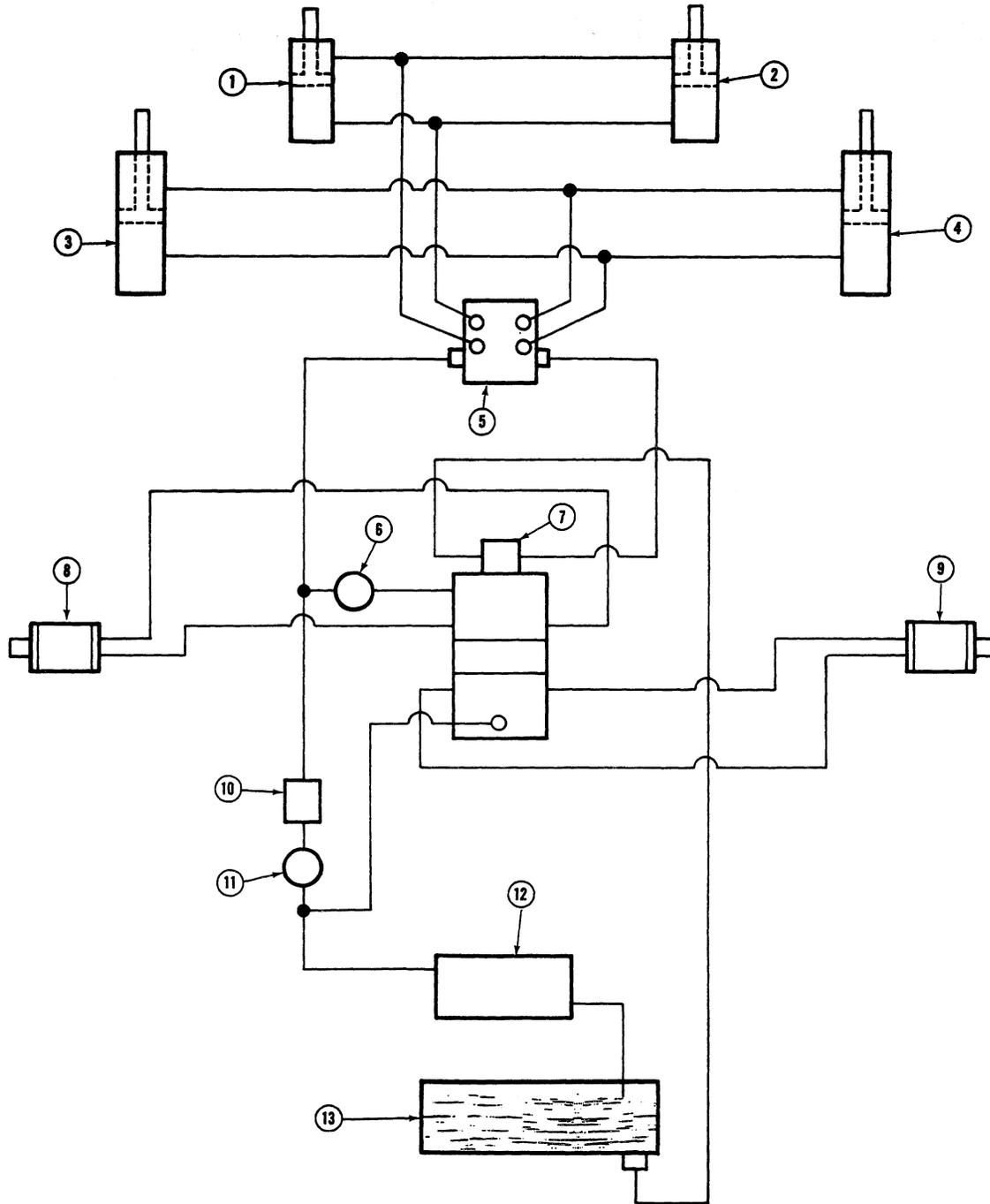
kg/cm<sup>2</sup>) to provide charging oil pressure to the variable displacement drive pumps.

To arrive at the drive pumps, the backpressure oil must first pass through a non-bypass oil filter (6). Here the transmission oil pressure warning light sensor is located. If there is insufficient oil pressure to the drive pumps, the warning light will glow red.

Within the drive pumps, the charging oil replenishes the oil lost from the drive circuits through normal internal leakage. Oil not required for this purpose circulates through the pump housings for lubrication and cooling.

The quantity of oil exceeding the setting of the backpressure valve (10) flows on through to the filter (11). Beyond the filter, this flow is joined by the oil flow (lubricating and cooling oil) from the drive pumps and the combined flow continues through the hydraulic oil cooler (12) and into the reservoir (13).

# HYDRAULIC SYSTEM OPERATION



**Figure 2**  
**Hydraulic System Schematic**

- 1. L.H. Bucket Cylinder
- 2. R.H. Bucket Cylinder
- 3. L.H. Lift Cylinder
- 4. R.H. Lift Cylinder
- 5. Loader Control Valve

- 6. Non-By Pass Filter
- 7. Loader Pump
- 8. L.H. Drive Motor
- 9. R.H. Drive Motor
- 10. Back Pressure Valve

- 11. Hydraulic Oil Filter
- 12. Hydraulic Oil Cooler
- 13. Oil Reservoir

# PRESSURE TESTS AND ADJUSTMENTS

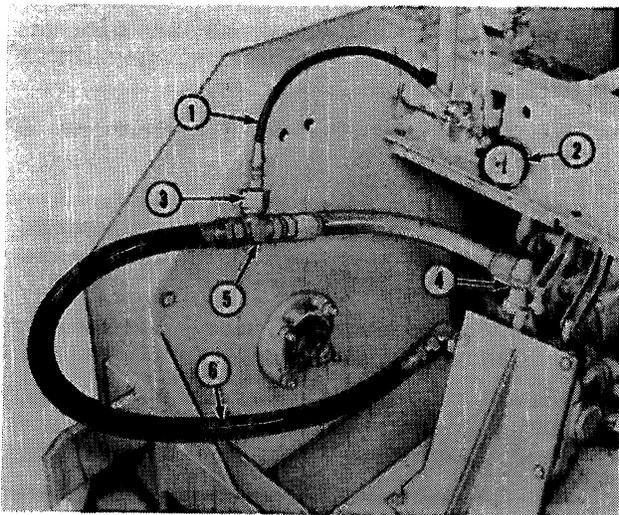
## PRESSURE TESTS AND ADJUSTMENTS

The hydraulic pump must deliver a specified amount of oil through the loader circuits within prescribed pressure limits. If the pump flow and/or system pressure falls below that specified, the efficiency of the hydraulic system will be impaired. If the system is not operating properly, the trouble usually can be traced to specific areas in the system. Because it is sometimes difficult to identify the particular malfunctioning component, hydraulic tests have been designed to assist the mechanic to diagnose trouble areas quickly.

### Loader System Relief Pressure Test

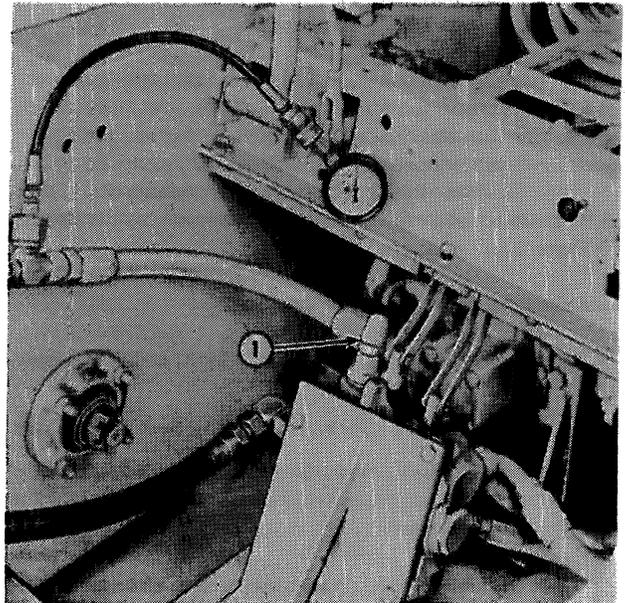
The loader system relief pressure is checked with a pressure gauge installed at the inlet elbow of the loader control valve. See Figure 3.

1. Install a 0-5000 psi (0 - 351.5 kg/cm<sup>2</sup>) pressure gauge into the loader control valve pressure line as shown in Figure 3.
2. Operate the engine at maximum speed, then fully retract the bucket cylinders and observe the pressure gauge. The gauge should indicate 1550 ± 50 psi (109.0 ± 3.5 kg/cm<sup>2</sup>).
3. If the pressure reading is not within specifications, adjust the relief valve, Figure 3-A, by removing the cap nut, loosening the jam nut and tightening or loosening the adjusting screw as required.



**Figure 3**  
**Loader System Relief Pressure Test**

- |                     |                        |
|---------------------|------------------------|
| 1. D-19 Hose        | 4. System Relief Valve |
| 2. 0-5000 psi Gauge | 5. N-86-A Tee          |
| 3. D-18 Reducer     | 6. 292454 Hose         |



**Figure 3A**  
**Lift/Tilt Relief Valve**

1. Relief Valve

**NOTE:** If the system relief pressure is being set for a backhoe installation, the pressure should be set for 2000 ± 50 psi (140.6 ± 3.5 kg/cm<sup>2</sup>).

4. When the specified pressure has been obtained, tighten the jam nut to lock the adjusting screw and reinstall the cap nut.
5. Recheck the relief pressure to verify the setting.

### Drive System Pressure Test

The drive system pressure is checked at the test port located in the outlet port fittings to which the motor hoses connect.

1. Remove both hoses from the motor to test the pump section. Cap both motor ports and plug both of the hoses. See Figure 4.
2. Locate the hose at which the pressure is to be checked and install a 0-5000 psi (0 - 351.5 kg/cm<sup>2</sup>) pressure gauge as shown in Figure 4.
3. Start the engine and operate it at full governed rpm. Ease the appropriate control lever fully forward or rearward as required to obtain a pressure reading. The gauge should indicate a pressure of: Ford CL-30 and CL-40 — 2500 ± 50 psi (175.7 ± 3.5 kg/cm<sup>2</sup>).
4. If the pressure is not to specification, install a new relief valve assembly as the relief valve is not adjustable.

# PRESSURE TESTS AND ADJUSTMENTS

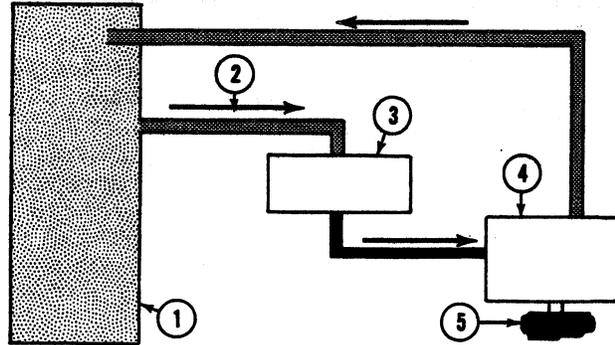
## Hydraulic Pump Performance Test

The hydraulic pump performance test is performed with the loader pump isolated from the lift bucket circuits so the system leakage is not a factor in the test. With the hydraulic tester properly installed, all pumped oil is directed to the hydraulic test unit measured at the desired load and returned to the reservoir as illustrated in Figure 5.

### Installing the Hydraulic Tester

1. Disconnect the loader pump high pressure hose from the control valve.
2. Connect the hose to the inlet of the hydraulic tester.
3. Connect one end of the other tester hose to the outlet of the hydraulic tester and route the opposite end to the loader reservoir.

**IMPORTANT:** Do not under any circumstances exceed the system relief pressure of  $1550 \pm 50$  psi ( $109.0 \pm 3.5$  kg/cm<sup>2</sup>). Excessive pressures will cause major pump damage.



**Figure 5**  
**Pump Performance Test**

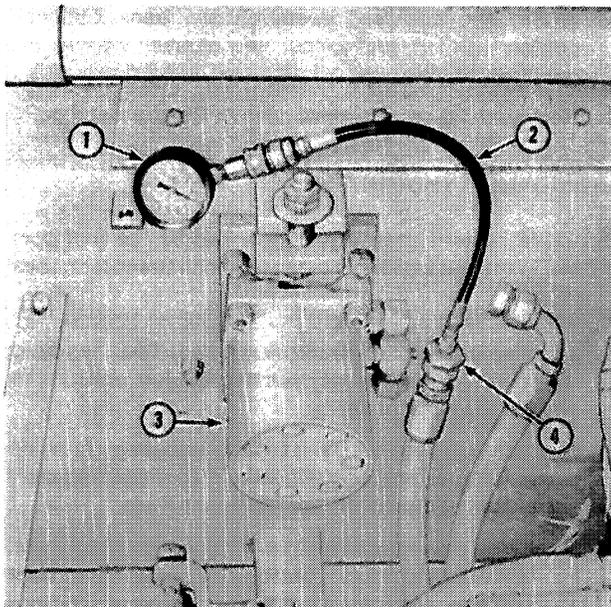
- |                            |                     |
|----------------------------|---------------------|
| 1. Hydraulic Oil Reservoir | 4. Hydraulic Tester |
| 2. Oil Flow                | 5. Loading Valve    |
| 3. Pump                    |                     |

### Pump Performance Test Procedure

**NOTE:** This test is not recommended for variable displacement drive pumps because the inadvertent reversing of the oil flow may damage the test unit. Further, precise test results are difficult due to variations in engine speeds and swash plate angles, both of which affect pump volume.

1. Set the tester load valve to no load (fully open) and the flow meter at 75 gpm (62.5 Imp. gpm) (283.9 liters per minute).
2. Start the loader engine and adjust the throttle to 2000 rpm.
3. Heat the oil in the system by closing the load valve to 1000 psi (70.3 kg/cm<sup>2</sup>). Reduce the load valve setting to zero psi when the oil temperature reaches  $180^\circ \text{ F} \pm 15^\circ \text{ F}$  ( $82.2 \pm 9.4^\circ \text{ C}$ ).
4. Record the flow meter gpm reading at 2000 engine rpm, zero psi, and  $180^\circ \text{ F} \pm 15^\circ \text{ F}$  ( $82.2 \pm 9.4^\circ \text{ C}$ ).
5. Gradually increase the pressure to  $1550 \pm 50$  psi ( $109.0 \pm 3.5$  kg/cm<sup>2</sup>). Correct the reduced engine speed to 2000 rpm by increasing the throttle setting.
6. Record the gpm reading on the flow meter at 2800 engine rpm, 1750 psi (123.0 kg/cm<sup>2</sup>) system pressure and  $180^\circ \text{ F} \pm 15^\circ \text{ F}$  ( $82.2 \pm 9.4^\circ \text{ C}$ ).

**NOTE:** The readings taken at no-load psi and 1750 psi (123.0 kg/cm<sup>2</sup>) system pressure must be taken at a constant 2000 engine rpm. If the engine rpm is not constant, the volume readings will not give the desired results when determining pump efficiency.



**Figure 4**  
**Drive System Pressure Test**

- |                     |                       |
|---------------------|-----------------------|
| 1. 0-5000 psi Gauge | 3. Drive Motor (R.H.) |
| 2. D-19 Hose        | 4. D-30 Reducer       |

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# CONTROL VALVES

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7. Determine pump efficiency by dividing the no load psi volume into the volume under 1750 psi (123.0 kg/cm<sup>2</sup>) system pressure. The efficiency must be approximately 65% or more. A pump that is less than 65% efficient will generate sufficient heat to be detrimental to the system and should be replaced.
8. To determine if the loader pump is cavitating (not receiving sufficient oil to charge the pump at all speeds), set the load valve at no load psi and the throttle at 1000 rpm, then record the flow. Increase the speed to 2000 rpm and record the flow. The pump is a positive displacement pump and when it is capable of producing system pressure, the no load volume at 2000 rpm should be twice the no load volume at 1000 rpm. If the volume is not doubled, a restriction in the suction line or filter is evident because sufficient oil is not entering the pump.

## Cylinder Packing Leakage Test

If cylinder leakage at the packing is suspected, a simple test can be performed to determine if oil is leaking to the low pressure side of the cylinder.

1. Start the loader and extend or retract the cylinder to its full length.
2. Remove the hose from the low pressure side of the cylinder.
3. Actuate the control lever and hold. This will exert system pressure on the packings.
4. Note the quantity of oil leaking from the hose port of the cylinder.



**CAUTION:** Do not get under the bucket or reach through the lift arms when the loader is raised.

Various factors contribute to the volume of packing leakage. Each of these factors should be considered prior to installation of new packings.

- Leakage increases proportionally with an increase in temperature and pressure.
- Cylinders containing single piston packings will leak more in one direction, depending on the direction of the V-facing of the packing.
- All cylinder packings leak in small quantities for packing-to-cylinder barrel lubricating purposes.
- Cylinder dimensions must be considered because an increase in the surface provides additional area for leakage.

## CONTROL VALVES

### Valve Removal

The control valve is secured to its mounting plate with mounting bolts. Depending upon the service required, it may not be necessary to remove the complete valve body. The relief valve in the lift bucket control valve, for example, may be serviced with the valve body in place.

1. Relieve hydraulic pressure by actuating the control levers.
2. Disconnect the pump pressure hose at the valve coupling.
3. Tag and disconnect the cylinder-to-valve hoses at the control valve.
4. Disconnect the oil return hose at the valve coupling.

**NOTE:** Cap all valve hose openings with suitable plugs or caps to prevent the entry of dirt.

5. Remove the valve mounting bolts and the valve.

### Disassembly

The lift bucket control valve and auxiliary control valve are disassembled in a similar manner. Refer to Figure 6.

1. Plug the control valve inlet and outlet ports. Clean the body in a suitable solvent and dry with compressed air.
2. Remove the bonnet, snap ring, and stop disc from the valve body. Remove the parts connected to the spool.
3. Remove all parts connected to the front of the spool.
4. Push the spool into the housing from the front of the valve until the front seal is exposed. Remove the front seal. Pull the spool out of the housing from the front end.

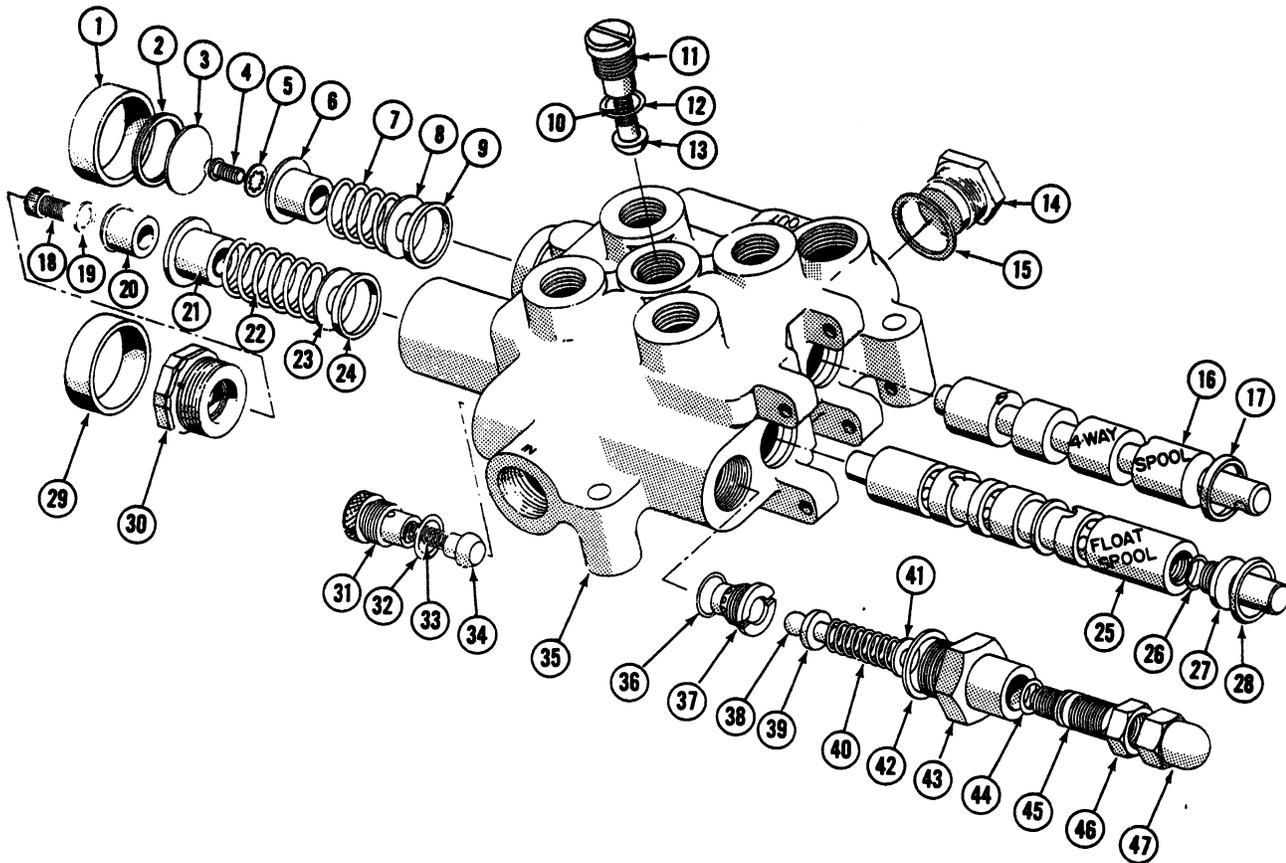
**NOTE:** Be careful not to scratch or damage the spool or bore when removing the spool.

5. Remove the back seal.

### Inspection

The majority of valve failures occur because of dirt and other foreign matter entering the valve, causing marring and erosion. Inspect the valve body bores and poppet seats for evidence of scoring and distortion. Minor imperfections can be corrected using crocus cloth, emery cloth, or fine lapping compound. Use extreme care when using burnishing materials to assure that all particles are removed from the valve body.

# CONTROL VALVES



**Figure 6**  
**Lift and Tilt Valve Assembly**

- |                         |                               |                         |
|-------------------------|-------------------------------|-------------------------|
| 1. Rubber Bonnet        | 17. Seal                      | 33. Check Poppet Spring |
| 2. Snap Ring            | 18. Float Detent Adapter      | 34. Check Poppet        |
| 3. Stop Disc            | 19. 1/4 in. Lock Washer       | 35. Housing             |
| 4. 1/4 in. Bolt         | 20. Float Detent Plunger      | 36. O-Ring              |
| 5. Lock Washer          | 21. Float Spring Collar       | 37. Relief Valve Seat   |
| 6. Stop Collar          | 22. Float Centering Spring    | 38. Relief Valve Ball   |
| 7. Centering Spring     | 23. Stop Washer               | 39. Spacer              |
| 8. Stop Washer          | 24. Seal                      | 40. Relief Spring       |
| 9. Seal                 | 25. Float Spool               | 41. Washer              |
| 10. Check Poppet Spring | 26. Float Spool Adapter Spool | 42. Gasket              |
| 11. Check Ball Plug     | 27. Float Spool Adapter       | 43. Relief Valve Body   |
| 12. O-Ring              | 28. Seal                      | 44. O-Ring Screw        |
| 13. Check Poppet        | 29. Rubber Bonnet             | 45. Adjusting Screw     |
| 14. Plug                | 30. Float Detent              | 46. Jam Nut             |
| 15. Gasket              | 31. Check Ball Plug           | 47. Acorn Cap           |
| 16. 4-Way Spool         | 32. O-Ring Plug               |                         |

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## CONTROL VALVES

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1. Inspect the spools for scratches, wear, and other damage. Where evidence of distortion, cracks, or damage is evident, install a new control valve assembly. Small scratches may be removed with emery or crocus cloth.
2. Inspect the check valve seats for evidence of damage or wear. Minor imperfections may be removed using a fine lapping compound.
3. Inspect the circuit check valve poppets for distortion or pits; install new poppets if defective.
4. Inspect the relief valve components for breaks, burrs, or distortion that could contribute to malfunctioning. Inspect the relief valve poppet seat for cracks, pits, or other damage. Install new parts as required.
5. Inspect springs for evidence of set, cracks, or other damage. Discard damaged springs.

**NOTE:** In attempting to determine the "set" of springs, compare the springs with new springs from parts stock. Compare the height of the new spring to the height of the old spring.

### Assembly and Seal Replacement

Coat all parts with clean hydraulic oil to facilitate reassembly and to provide initial lubrication. Use small amounts of petroleum jelly to hold the O-Rings in place during assembly. Always install new O-Rings and spool seals.

1. Thoroughly clean both seal grooves.
2. Replace the spool through the front of the housing, being certain that the end having the bolt hole enters first. Push the spool into the valve until the spool end touches the back seal groove.
3. Insert a new seal in the back groove, being careful that the U-cup of the seal is placed toward the valve body. It is helpful to pinch one side of the seal, causing the seal to bend into a shape slightly smaller than the seal groove in the valve. When the seal has been properly placed in the seal groove, straighten the seal by running a smooth rod around the exposed surface of the seal until there is a perfect fit. To check this, run a finger around the exposed edge of the seal. There should be a smooth, perfect ridge with no kinks.
4. Insert the special tool provided in the seal kit into the valve body from the back, and through the seal until the shoulder of the tool touches the valve housing.

5. Push the spool into the housing from the front, keeping a firm grip on the special tool until the shoulder of the tool touches the valve housing. In pushing the spool through the housing, a slight twisting of the spool and special tool will assist in the movement.

**NOTE:** Do not push the spool too far, as this may allow the rear seal to enter the grooves of the spool and cut the new seal.

6. Install the front seal in the same manner as described for the rear seal. Be certain the U-cup side of the seal is toward the valve housing.
7. Insert the special tool into the front of the spool bore and with a twisting motion, carefully push the tool through the new seal until the spool shoulder is met. With a twisting motion, push the spool back against the special tool until 1/4 in. of the polished surface of the spool remains exposed at the front of the valve. Remove the special tool from the front of the valve.
8. Reassemble all parts removed from the front of the spool.
9. Reassemble parts bolted to the spool. Tighten the bolt to 10 lbs. ft. (1.38 kgm) of torque. Reinstall the stop disc, snap ring, and bonnet.

### Installation

1. Secure the control valve to the frame using the mounting bolts previously removed. Tighten the mounting bolts securely.

**NOTE:** Be careful not to overtighten the mounting bolts. Severe stress on the valve body may cause distortion in the internal passages of the body and contribute to an early failure.

2. Connect the high pressure hoses securely to their respective ports. Connect the return hose to the outlet port.
3. Start the loader engine and actuate the control levers to purge the system of air.

**IMPORTANT:** Check all hydraulic connections for leakage. If leakage is observed, shut off the loader engine, relieve all hydraulic pressure, and tighten the connections. Do not tighten any hydraulic connections while the system is under pressure.

4. Perform the system relief valve pressure check when the lift bucket valve has been overhauled.

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# CYLINDERS

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## CYLINDERS

The lift and bucket cylinders are 2-1/2 in. double-acting. The lift and bucket cylinders are identical in construction and vary only in length. The cylinders may be repacked without completely removing the cylinder from the machine.

### Removal

All loader cylinders are easily removed from the loader frame. Basic procedures to be followed in the removal of lift and bucket cylinders are as follows:

1. Make sure the loader bucket and lift arms are properly supported and in a stable position to prevent movement when the cylinders are removed.
2. With the loader engine shut off, actuate the control levers to eliminate pressure in the system.

**NOTE:** For the purpose of cleanliness, the cylinders should be removed from the loader for servicing. However, the collar nut may be loosened prior to removing the cylinder from its anchor position. Because of the high torques required to secure the collar nut, considerable force is required to loosen it. The cylinder anchor points and pins installed provide a good anchor position while exerting force.

3. Disconnect the hoses at the cylinder. Cap or plug the cylinder ports and hose ends to prevent the entry of dirt or foreign matter.
4. Remove the hex bolts and pins anchoring the rod and base end of the cylinder to the loader.

**IMPORTANT:** Use care in handling of the cylinders. Dropping and mishandling can cause severe damage to the cylinder barrel and subsequently affect cylinder operation.

5. Clean the external surface of the cylinder of dirt, grease, and other material. Use a suitable cleaning solvent and dry the cylinder with compressed air.

### Disassembly

Lift and bucket cylinders are identical in construction, and disassembly of the cylinders is the same. Refer to the exploded view, Figure 7.

1. If not previously loosened, secure the cylinder in a vise and loosen the collar nut, using a spanner or chain wrench.

**NOTE:** To prevent cylinder wall distortion, the cylinder must be secured in a vise as near as possible to the closed end.

2. Remove the piston rod assembly from the cylinder barrel. Be careful not to damage the chrome finish of the piston rod.

**NOTE:** Removal is normally accomplished by inserting a bar through the rod end and with a twisting motion, pull the rod out of the barrel. It may become necessary to use a jack or mechanical force to remove the rod and packing.

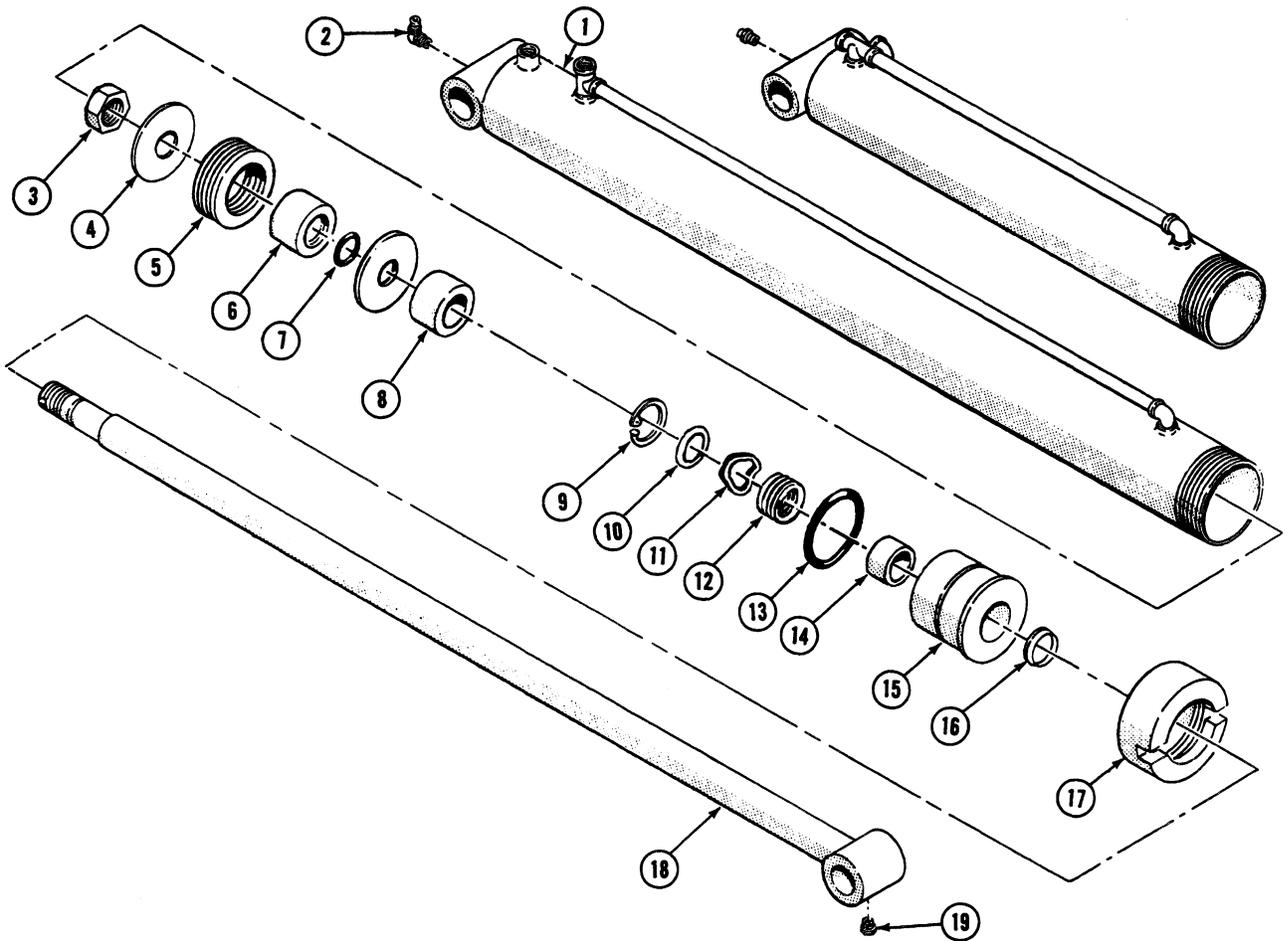
3. Remove the piston nut by securing the rod trunnion in a vise, support the piston, then remove the nut.
4. Remove the retainer, piston, piston packing, piston O-Ring and retainer from the cylinder rod.
5. Slide the spacer and gland off the cylinder rod.
6. Remove the lock ring, washers and gland packing from the ID of the gland.
7. Remove the cylinder rod wiper ring from the gland.
8. Slide the collar nut off the cylinder rod.

### Inspection and Repair

A careful inspection of all cylinder components is essential for a satisfactory repair. Small nicks, burrs, scratches, and other damage can be hidden by oil film.

1. Clean all of the cylinder components in a suitable solvent and dry with compressed air.
2. Inspect the cylinder rod for straightness, scoring, thread condition, burrs, or excessive wear. Minor damage can be corrected, using crocus cloth or emery cloth, or a fine file.
3. Examine the packing glands for cracks, scores, burrs, and other damage. Install a new packing gland if there is evidence of non-repairable damage.
4. Examine gland packings for distortion, frayed edges, or excessive wear. Discard packings that show evidence of leaking and/or other damage.
5. Inspect the spacers and washers for cracks, scores, burrs, flatness, and other damage. Install new parts where required.
6. Examine the piston packing assembly for damage. Packing assemblies showing signs of damage such as frayed edges, distortion, crimping, or excessive wear should be discarded and new assemblies installed.
7. Inspect the cylinder barrel for scoring, thread condition, dents, or other damage. Replace damaged cylinder barrels.
8. Carefully check O-Ring grooves for burrs and inspect the wiper seal in the packing nut. If wear or damage is indicated, install a new wiper.

# CYLINDERS



**Figure 7**  
**Lift and Bucket Cylinders**

- 1. Cylinder Tube
- 2. Lube Fitting
- 3. Bushing
- 4. Retainer
- 5. Piston Packing
- 6. Piston
- 7. Piston O-Ring

- 8. Spacer
- 9. Lock Ring
- 10. Washer
- 11. Washer
- 12. Gland Packing
- 13. Gland O-Ring
- 14. Bushing

- 15. Gland
- 16. Wiper Ring
- 17. Collar
- 18. Shaft
- 19. Lube Fitting

## CYLINDERS

### Assembly

Reassembly procedures are most important in obtaining effective repair. Use care in the assembly of the cylinder and components. Complete packing sets should be installed when cylinders are reassembled, unless the existing packings have had little or no use.

**NOTE:** The piston packings and gland packings with required O-Rings are serviced as a repair kit.

1. Lubricate the piston rod with hydraulic oil to aid in easier installation of the packing nut, wiper, gland, and gland packing.
2. Slide the collar, threads toward piston end, on the piston rod.
3. Slide the gland, wiper, bushing and packing installed, on the rod. Make sure the packing is properly positioned.
4. Install the gland washers and lock ring.
5. Slide the spacer and retainer onto the cylinder rod. Install the piston, piston packing and piston O-Ring as an assembly on the cylinder rod.
6. Install the retainer and secure the components with the piston packing lock nut. Torque the assembly to 150 - 175 lbs. ft. (20.74 - 24.20 kgm).
7. Lubricate the piston end of the rod assembly and the cylinder tube with hydraulic oil. Position the piston in the cylinder tube and carefully start the lips of the packing into the tube. Slowly force the piston into the cylinder tube using a rotating or wobbling motion. With the cylinder held vertically, push the piston and rod into the cylinder.
8. Push the gland into the cylinder so that the O-Ring is not damaged.
9. Thread the collar nut on the cylinder and tighten to a torque of 125 - 150 lbs. ft. (17.29 - 20.74 kgm).

### Installation

1. Position both the bucket and lift cylinders with the cylinder rod end toward the front of the loader. Secure the cylinders in their respective locations with the retaining bolts previously removed.

**IMPORTANT:** Before securing the cylinders to their anchoring positions, be sure the hose ports on lift cylinders are facing up and hose ports on bucket cylinders are facing down.

2. Connect the cylinder hoses to the cylinders.
3. Start the loader and operate the engine and loader at 1200 to 1500 rpm to purge the system of air.

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4. Check all hydraulic connections for leakage. If leakage is observed, shut off the engine, release all hydraulic pressure and tighten the connection.

## LOADER PUMP (VANE PUMP)

### A. Removal

1. Disconnect and plug the pressure and suction lines at the pump connections.
2. Remove the two pump mounting bolts which secure the vane pump to the front drive pump.
3. Remove the vane pump from the drive shaft.

### B. Disassembly

Prior to disassembly of the hydraulic pump, clean the pump body with a suitable solvent. Do not permit cleaning solvent to enter the pump. Scribe a mark across the side of the pump for proper component orientation during reassembly. Figure 8 illustrates an exploded view of the vane-type hydraulic pump.

1. Secure the pump body in a soft jawed vise and remove the four cover bolts.
2. Remove the cover plate, O-Ring, spring, and pressure plate.
3. Note the position of the cam ring identification arrow in relation to the drive shaft. Then remove the cam ring.

**NOTE:** The cam ring arrow indicates the direction of rotation.

4. Remove the rotor and vanes. Separate the vanes from the rotor.

### C. Inspection and Repair

1. Inspect the vanes, rotor and cam ring for wear and scoring.
2. Inspect the pressure plate for wear or scoring.
3. Inspect the shaft bushing of the pressure plate for wear.

**NOTE:** Minor imperfections can be removed by buffing with crocus or emery cloth. Flat surfaces can be touched up by lightly stoning with a hard stone. Major damage will require installing new parts.