# Section E: Hydraulic System

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## I. DESCRIPTION

The hydraulic system includes two Transmission driven pumps, hydraulic cylinders, Oil Cooler, interconnecting hoses (pressure and return), a solenoid valve, and a hydraulic oil reservoir. The Transmission drives the pump when the "raise" contact in the electrical control circuit is activated. Pressure developed by the pump is applied to the lower end of the cylinder through a check valve. The cylinder extends, causing the truck forks to raise. The relief valve within the pump prevents excessive pressure buildup and motor overloading after the cylinder reaches maximum stroke. The check valve prevents return flow to the reservoir when the pump stops, thus preventing the forks/platform from lowering. The solenoid valve mounted on the pump is energized to allow oil to return to the reservoir when the "lower" contact in the electrical circuit is activated.

## II. HYDRAULIC UNIT

### A. General

The hydraulic unit comprises the hydraulic pump directly coupled to the transmission assembly, a pump adapter, and a hydraulic oil reservoir. The unit contains a check valve to prevent return flow and an adjustable relief valve. A solenoid switch (relay) is mounted on the drive motor for control of pump operation.

### B. Cleaning

1. Wash metallic parts in cleaning solvent and dry with compressed air at approximately 40 lbs. psi.
2. Give particular attention to ensure that the oil passages in the adapter strainers and in the pump assembly are free of obstruction.
3. Be sure all solvent is removed from the pump assembly to prevent possible dilution of hydraulic oil at startup.

### C. Inspection and Replacement of Parts

1. Inspect adapter for cracks, deformation, or other damage. Replace if damaged.
2. Inspect all tapped holes and externally threaded parts for stripped threads or other thread defects. Repair minor thread damage with thread chaser or tap; otherwise replace part.
3. Inspect reservoir for dents or other damage. Replace if damaged.
4. Inspect return tubes for dents and deformations. Replace if defective.
5. Check pump assembly by rotating input shaft by hand. Rotation should be smooth with no evidence of binding or scraping of internal parts. Replace if internal wear or tear is suspected.
6. Replace all gaskets and o-rings with new parts.

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## III. HYDRAULIC CYLINDER

### A. General

The hoses which connect the cylinder to the hydraulic pump unit are also considered part of the cylinder.

### B. Removal of Cylinder

1. Be sure the cylinder is fully lowered and pump is not operating. For safety, disconnect electrical leads from pump motor.

2. Disconnect hoses from the hydraulic pump unit and allow hydraulic oil to drain from hoses. Plug ends of hoses to prevent entrance of foreign matter. Dispose of drained hydraulic oil.

### C. Installation of Cylinder

1. Reverse the removal procedure outlined in B above.

2. Replenish hydraulic oil level in hydraulic oil reservoir.

3. Test for smooth operation.

### D. Disassembly of Cylinder.

CAUTION **DISASSEMBLE AND ASSEMBLE HYDRAULIC CYLINDER ONLY UNDER CLEAN WORKING CONDITIONS.**

1. Disconnect hoses from fittings. Plug ends of hoses to prevent entrance of foreign matter.

CAUTION **HANDLE PISTON ROD ASSEMBLY WITH CARE TO PREVENT SCRATCHING, NICKING OR BURRING THE POLISHED SURFACE.**

### E. Cleaning

1. Clean all metallic parts in cleaning solvent and dry with compressed air at approximately 40 lbs. psi.

### F. Inspection and Replacement

1. Inspect all metallic parts for cracks, distortion, corrosion, or other damage. Replace all defective metallic parts.

2. Inspect bore in tube assembly and surface of piston rod assembly for nicks, scratches, burrs, corrosion or other damage. If polishing with a crocus cloth does not remove the defects, replace defective parts.

3. Inspect hoses for cuts, abrasion, and deterioration. Replace if any defects are visually observed.

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4. Replace seals and wipers with new parts.

***NOTE*** - Wet cylinder internal parts with clean hydraulic fluid to facilitate assembly of the cylinder.

## IV. HYDRAULIC SYSTEM TROUBLE SHOOTING CHART

| *FORKS DO NOT RAISE OR RAISE AT LOW RATE (NO LOAD OR NORMAL LOAD)* | |
|---|---|
| **PROBABLE CAUSE** | **REMEDY** |
| 1. Pump motor does not run or lacks power. | 1. Refer to ELECTRICAL SYSTEM TROUBLESHOOTING |
| 2. Low hydraulic oil level. | 2. Add hydraulic oil. |
| 3. Defective or improperly adjusted relief valve. | 3. Replace or adjust relief valve. |
| 4. Defective pump. | 4. Replace pump. |
| 5. Excessive leakage in cylinder. | 5. Repair or replace cylinder. |
| 6. Blockage in system (strainer, ports, hoses). | 6. Disassemble system and remove blockage. |
| 7. Excessive internal leakage in pump unit. | 7. Repair or replace pump unit. |
| *FORKS DRIFT DOWNWARD UNDER LOAD* | |
| **PROBABLE CAUSE** | **REMEDY** |
| 1. Defective check valve. | 1. Repair or replace check valve. |
| 2. Excessive leakage in cylinder. | 2. Repair or replace cylinder. |
| 3. Leakage in pump seals, hoses, or connections. | 3. Replace leaking seals or hoses or tighten connections. |
| *FORKS WILL NOT LOWER OR LOWER AT SLOW RATE* | |
| **PROBABLE CAUSE** | **REMEDY** |
| 1. Defective Solenoid valve. | 1. Replace solenoid valve. |
| 2. Blockage in pump adapter, hoses, or return tube. | 2. Disassemble system and remove blockage. |
| 3. Bent or deformed cylinder rod or dented cylinder housing. | 3. Repair or replace cylinder. |

## V. HYDRAULIC SYSTEM PREVENTIVE MAINTENANCE

### A. Daily Checks and Services

1. Check operation of lift cylinders by raising and lowering forks/platform several times. Operation should be smooth without unusual noises. If operation is otherwise, locate and correct cause of trouble before using the truck.

2. Check system for leaks at pump, cylinder, hoses, and hose connections. Correct any system leaks before using the truck.

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## B. Weekly Check and Service

1. Check level of oil in hydraulic oil reservoir by removing fill plug from inside of reservoir. Add oil if level is below hole. Investigate cause of frequent adding of oil, if frequent adding of oil is required. Replace fill plug.

## C. Monthly Checks and Service

1. Check operation of pump by raising and lowering forks/platform several times with load. Operation should be smooth without unusual noises. If operation is otherwise, locate and correct cause of trouble before using the truck.

2. Check operation of solenoid valve while forks/platform are lowering under load. Lowering should be smooth. If operation is otherwise, locate and correct trouble before using the truck.

## D. Semi-annual Checks and Service

1. At six-month intervals (approximately 1000 hours of operation or more often if operated under extremely dusty conditions) remove, clean and drain the hydraulic reservoir, and refill with new hydraulic oil.