

## Main Hydraulic Pump Removal



**CAUTION**

**SAFE PARKING.** Before working on truck:

1. Park truck on a hard, level and solid surface, such as a concrete floor with no gaps or breaks.
2. Put upright in vertical position and fully lower the forks or attachment.
3. Put ail controls in neutral. Turn key switch OFF and remove key.
4. Disconnect the battery.
5. Apply the park brake and block the wheels.

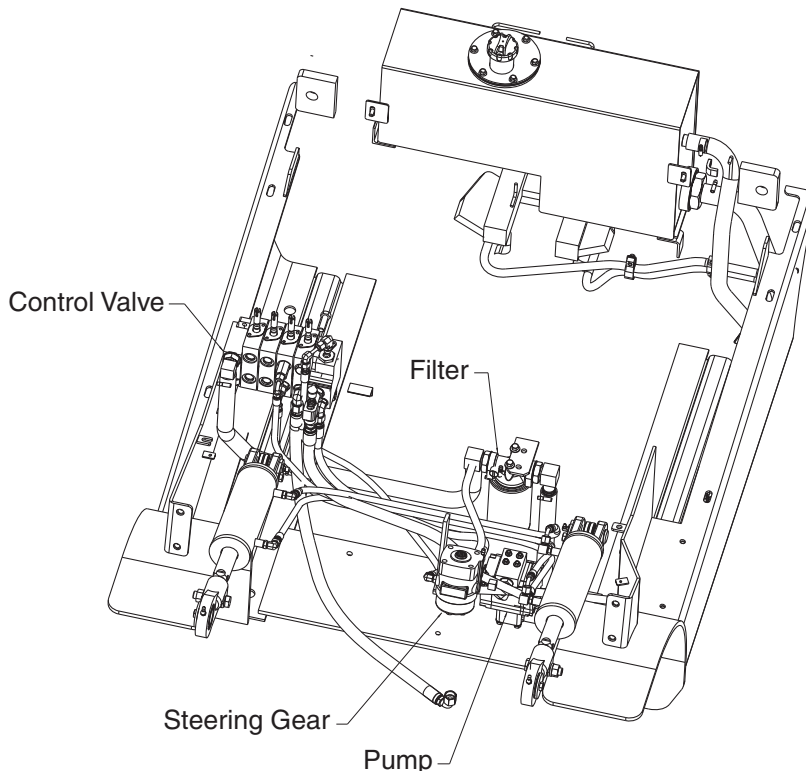
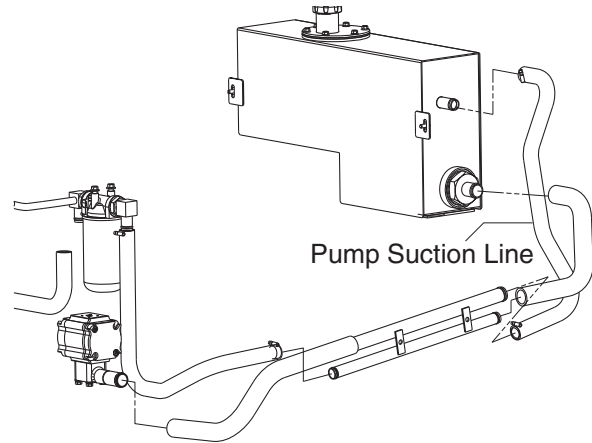
The main hydraulic pump is located beneath the flow plate. The pump can be removed from the truck without removing the pump and motor assembly.

Serviceable items are the pump, motor and the suction line filter. Other components such as hoses, fittings and clamps are non-serviceable and should be replaced if faulty.

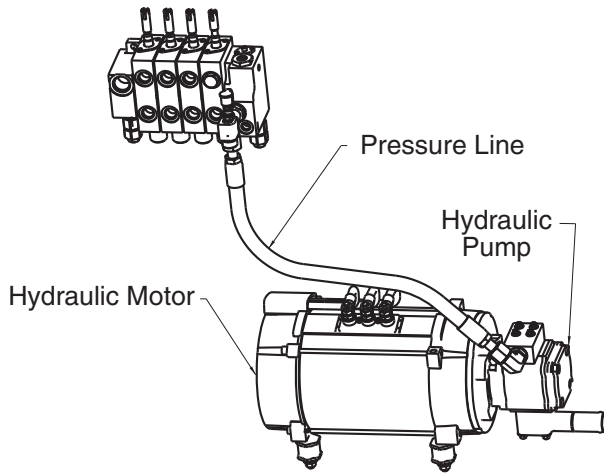
**NOTE**

Capacity of hydraulic sump is 24 L (6.3 gal).

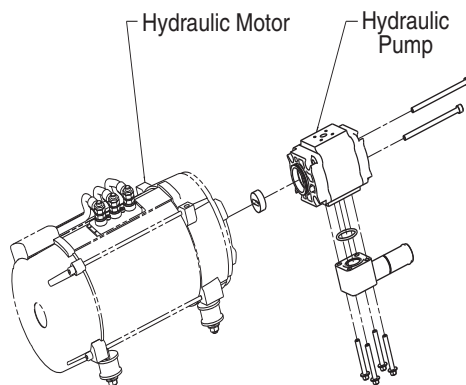
1. Place a drip pan under the hydraulic pump for oil that will drain from the pump and hoses when they are disconnected.
2. Disconnect suction line from pump and plug the line.



3. Disconnect the pressure line from the pump. Cap the hose and set aside.



4. Remove the pump mounting fasteners. The ground strap will come off with the fasteners.



4. Connect pump outlet hose and tighten. Use two wrenches to tighten hose fittings to prevent twisting of lines.

### NOTE

**Always clean or replace hydraulic sump suction screen fitting when installing new or rebuilt pump. See Section 1, Main Hydraulic Filters and Fluid Maintenance.**

5. Refill sump as necessary using Clark Specification MS-68 hydraulic fluid. See Section 1 for description of sump tank fill levels.
6. Reinstall hose and cable support bracket.
7. Check operation of hydraulic system. See Section 1, Main Hydraulic Filters and Fluid Maintenance.
8. Check fluid level of sump again. Add fluid as necessary.

### Routine Maintenance

- No maintenance is necessary other than periodic checks for tightness of the mounting bolts and port fittings plus visual examination for oil leaks. The unit should be kept externally clean.
- The unit must be operated on clean hydraulic fluid. Directions for filter service in this Group must be adhered to. A fluid cleanliness level of ISO4406 17/14 or better is recommended to give maximum life.

## Main Hydraulic Pump Installation

### IMPORTANT

**Keep all components clean during installation.**

1. Be sure new or serviced pump is well lubricated before installation.
2. Install pump onto motor. Install and tighten cap-screws.
3. Slide suction hose and clamp into place and tighten.

## **GROUP 30**

### **HYDRAULIC CONTROL VALVE/LIFT CIRCUIT**

#### **Hydraulic Control Valve/Lift Circuit**

**Specifications and Description ..... Section 1**

**Hydraulic System Schematic ..... Section 2**

**Hydraulic System Troubleshooting ..... Section 3**

**Hydraulic System Pressure Checks  
and Adjustments ..... Section 4**

**Hydraulic Control Valve Removal  
and Replacement ..... Section 5**

#### **IMPORTANT**

Other hydraulic-related components and circuits are described and illustrated in Group 25, "Steering Column and Gear", Group 26 "Steer Axle", Group 29, "Hydraulic Sump, Filters and Pump", Group 32, "Tilt Cylinders", and Group 34, "Uprights". Refer to these other groups for hydraulic components not covered in this group.

## Section 1

# Hydraulic Control Valve/Lift Circuit Specifications and Description

### Specifications

Hydraulic Fluid Type: Clark specification MS-68 (Clark part #1802155 and #1800236)

Main Relief Valve Setting: 20.6 to 21.1 MPa (2988 to 3060 psi) at rated flow.

Auxiliary Relief Valve Setting: 13.7 to 14.2 kPa (1987 to 2060 psi) at rated flow.

Rated Flow: 70 L/min (18.5 gpm).

Maximum Pressure Drop at Rated Flow:

Inlet to outlet: 700 kPa (101 psi).

Lift spool (spool #1):

- Inlet to cylinder port: 1471 kPa (213 psi)
- Cylinder port to outlet: 981 kPa (142 psi).

Tilt spool (spool #2):

- Inlet to cylinder port: 6718 kPa (981 psi)
- Cylinder port to outlet: 15203 kPa (2205 psi).

Auxiliary spools (spools #3 and #4):

- Inlet to cylinder port: 1903 kPa (246 psi)
- Cylinder port to outlet: 489 kPa (71 psi).

### Service Intervals

Hydraulic System Relief Pressure Check: Every year or every 2000 hours of operation.

### Description

The following description focuses primarily on hydraulic circuitry controlled by the main hydraulic control valve, that is, the lift/tilt/aux circuit. Various other hydraulic systems come into play, however, and are mentioned. The entire hydraulic system is depicted in the schematics in Section 2 (next page).

Descriptions of the braking and steering circuits are given in Groups 23 and 25.

The main hydraulic pump (described in Group 29) is driven by the pump motor and draws fluid from the sump through a particle-blocking suction screen.

The main hydraulic control valve features an open-center, parallel-circuit type modular design. It has the main (lift/tilt) pressure relief valve (steering pressure relief valve located in the steering control assembly (Orbitrol)), a secondary pressure relief valve for optional auxiliary components, a lift spool, a tilt spool with an integral counterbalance valve, optional auxiliary spools, and adjustable pressure-compensated flow controls. All spools are low-leakage design.

The main hydraulic valve has from two to four valve sections. Each section performs a separate function; standard two spool assemblies have a inlet/lift section (with fluid inlet port), a tilt section, and an outlet section. A third and fourth section may be added to control auxiliary components.

When lift attachments are used, an auxiliary section may be added to the outer (RH) side of the standard (lift/tilt only) main valve. The optional auxiliary sections also have an adjustable relief valve and can be assembled with optional flow control levels.

The valve spools are arranged in standard sequence (from the operator's position) to first provide lift control, then tilt, and finally auxiliary control. The control levers are spring-loaded (by the valve spool centering springs) to return them to neutral when released. Oil flow is controlled by the amount or distance the control handles are

moved. Excess oil flow is returned to the sump. A check valve prevents reverse flow.

When all the control valve spools are in neutral, the micro switch turns the pump motor OFF and not fluid flows. When a spool is partially shifted and the associated cylinder or other actuator has not reached its end-of-travel, some of the fluid flows to the cylinder (actuator) and the rest flows to the sump line. In both cases, the pressure in the system should be less than the amount required to open the relief valves.

The main relief valve vents flow to the sump when one of the following conditions is present:

- The operator continues to hold the lift control in the lift position after the lift mechanism reaches its end-of-travel.
- Too heavy a load is being lifted.
- The operator continues to hold the tilt control in the tilt position after the tilt mechanism has reached its end-of-travel (This is called "tilt bypass.")
- Auxiliary relief fails to operate.

The auxiliary relief valve vents flow to the sump when the operator continues to hold the attachment control in the operated position after the attachment reaches its end-of-travel.

Main and auxiliary relief pressure settings can be checked through a gauge port on the main valve.

A tilt-lock valve built into the main control valve assembly locks the upright into its current tilt position when the truck is turned off. A load lowering flow valve mounted on the upright limits the speed at which the operator can lower a load, decreasing the speed for heavier loads. A velocity fuse built into one of the lift cylinder ports prevents the upright from falling rapidly should a hydraulic line rupture or be disconnected.

### NOTE

**Hydraulic plumbing arrangement is illustrated in Group 29.**