Technical Manual

⚠ WARNING

Do not weld or grind near oil lines.

Do not hammer bit or steel.

Boom swing limit circuits must be maintained in proper working condition.

Never stand directly under a boom or feed.

Equipment Cautions

The following are good practices to observe for protecting the equipment, drills, etc. from damage, and to provide maximum life for the MK20HE Jumbo drilling unit.

△ CAUTION

Follow manufacturer's recommendations for lubrication and service intervals and lubricants.

Inspect hose retainers and hoses at frequent intervals for indication of wear, looseness, cracking or fraying. Repair or replace as required.

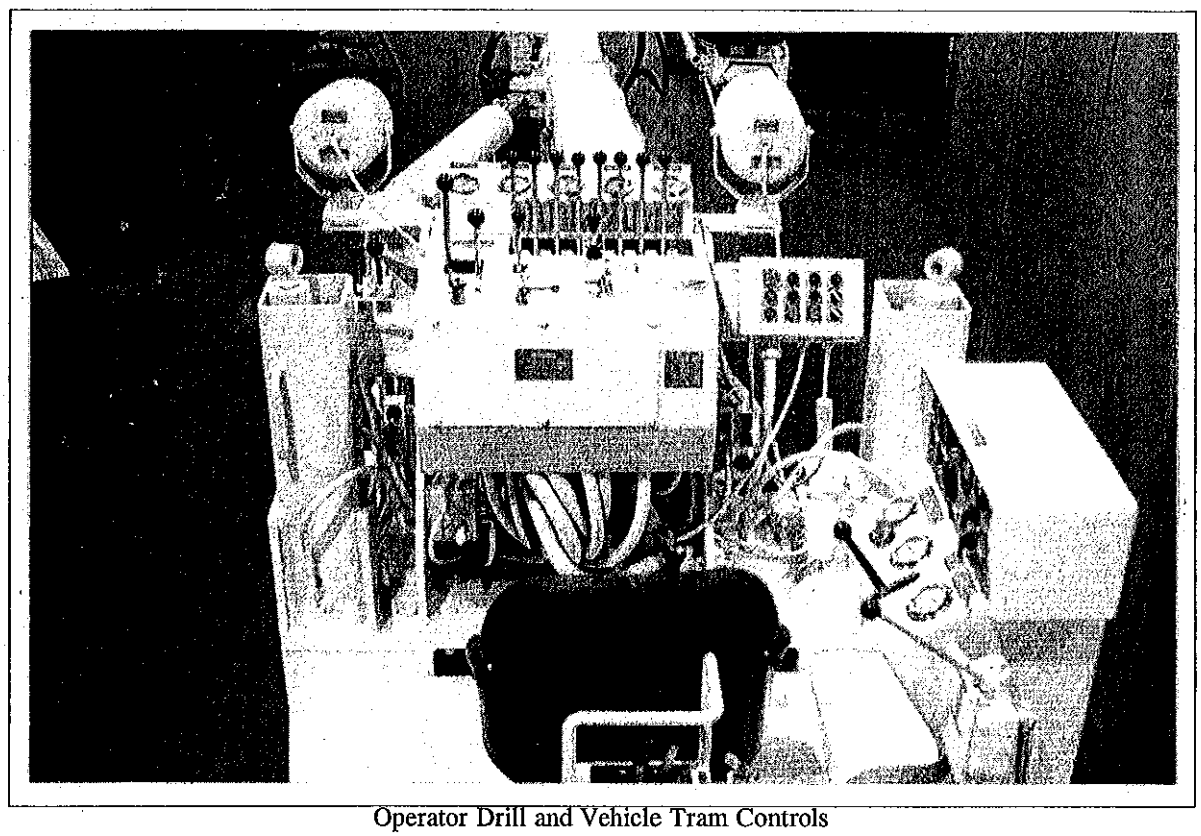
Check all bolts, nuts and adjustments frequently for proper tension.

Check the hydraulic reservoir fluid level regularly. Be certain that it is always filled to the proper level with the recommended hydraulic fluid. Do not mix types of fluid.

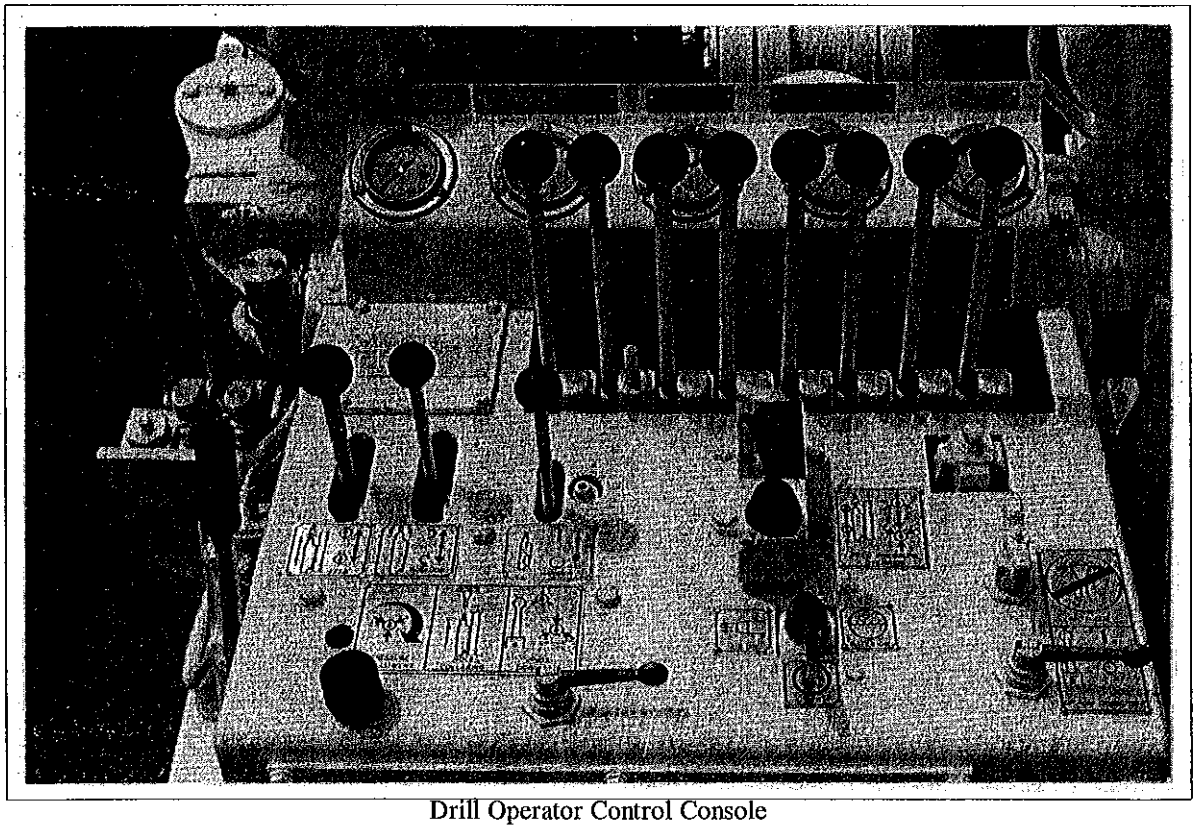
Shut down the electrical motors or diesel engine immediately if a leak is detected in the hydraulic system.

Shut down the MK20HE if any gauge indicates a malfunction.

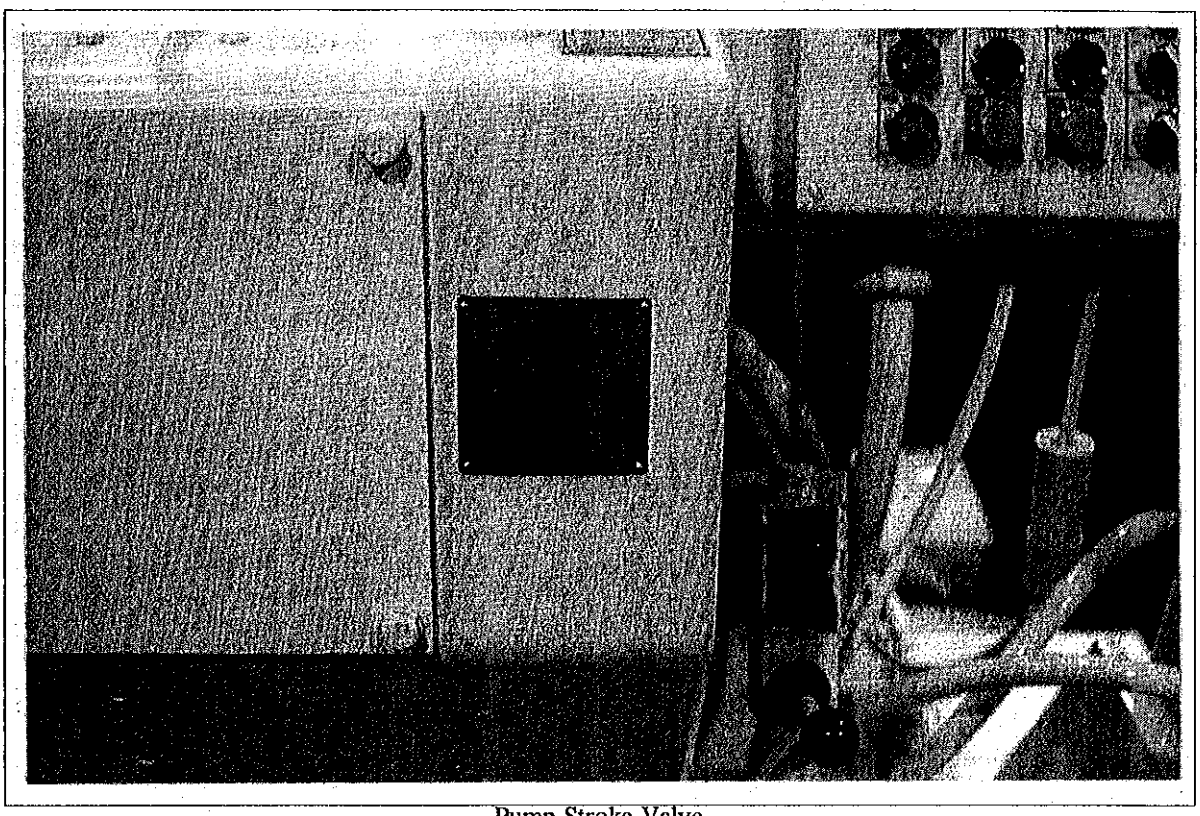
Shut down engine immediately if overheating is indicated.



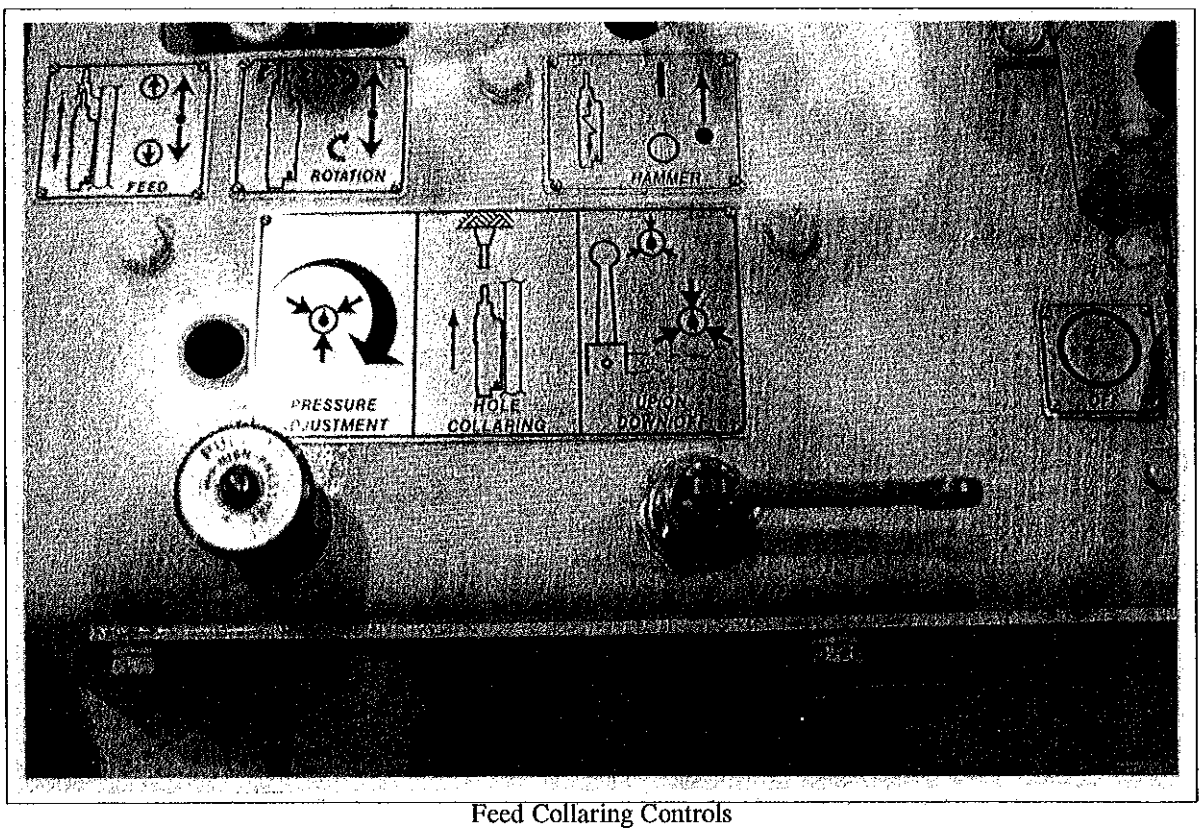
Operator Drill and Vehicle Tram Controls



Drill Operator Control Console



Pump Stroke Valve



Feed Collaring Controls

- Hose reel rotates freely
- Hoses line up properly
- At least 70 % of hose adjustment left for retightening on feed hose tensioner
- Centralizer liners in alignment
- All fasteners and fittings installed securely
- No sharp edges on wear slides
- No binding, interferences etc.
- Check for leaks, lubrication and cosmetics

Maintenance Notes:

1. Drive cables and hoses should be checked frequently and retightened if loose. **This is especially critical on new machines, or on units with newly replaced cables or hoses.** Even the highest quality pre-stretched cable will stretch somewhat when initially put into service. It is especially important to keep the retract cable tight, as it may catch on the triggering mechanism for actuating the ADC cam valve and cause damage to the assembly.

NOTE

Cables should be replaced only with .38 Dia. 6X37 class (extra flexible) IWRC, improved plow steel, pre-stretched wire rope.

2. Wear strips should be checked periodically and adjusted as required to remove excess clearance. Some clearance is desirable and necessary (typically .030-.060 in. total) but excessive clearance will lead to premature drill front end problems and excessive shank usage.

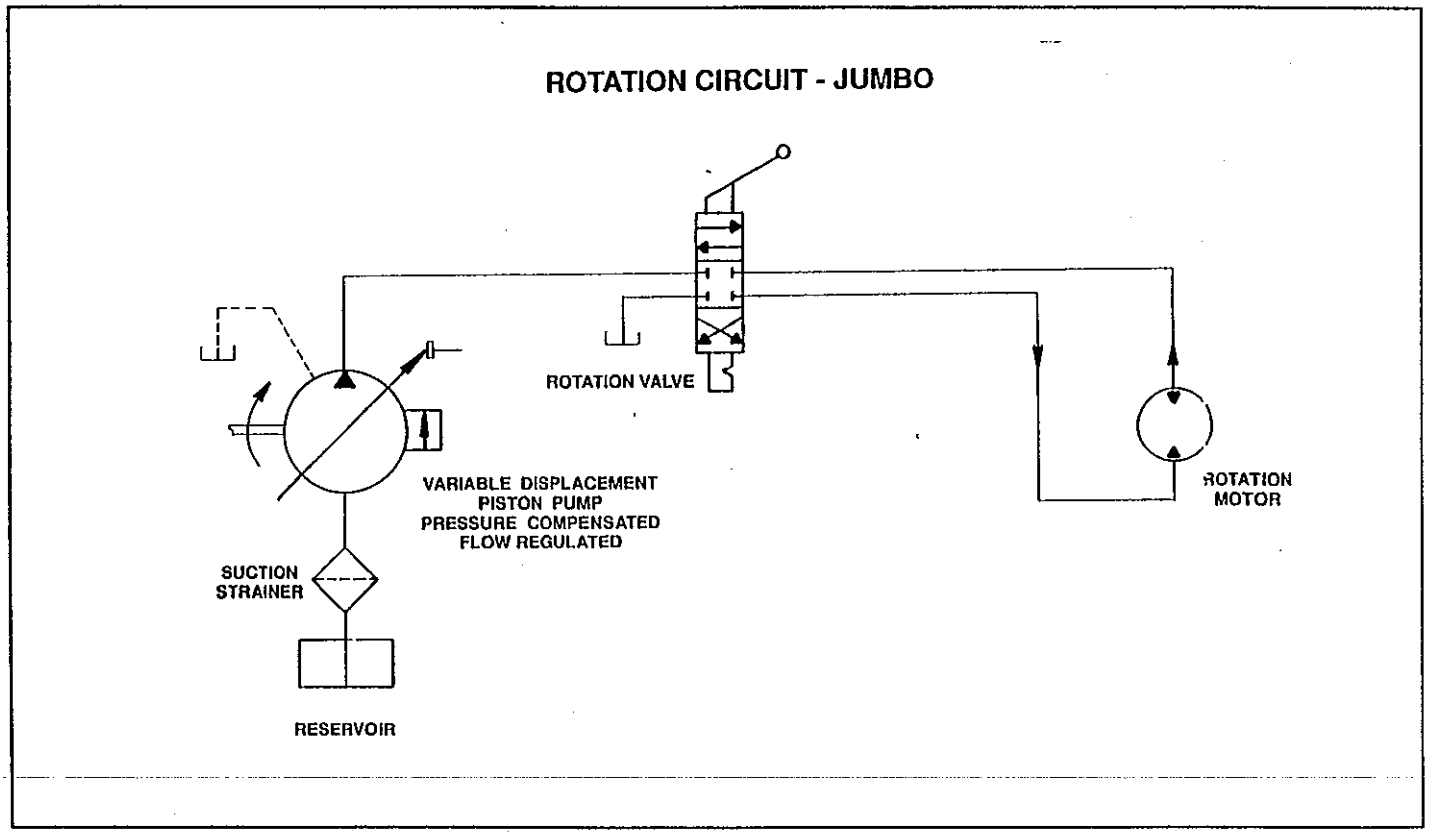
3. Inspect hose drum frequently to insure that the drum rotates freely and that no flat spots have developed. The drum should be kept free of compacted rock dust, etc. The drum is fitted with sealed, lubricated bearings. Also inspect hoses for damage to the outer cover. Hoses should fit within the grooves and should not "ride up" on the edges of the grooves. Hoses should always be replaced with the same size and type.

Independent Drill Rotation Circuit

For increased hydraulic efficiency, jumbos are equipped with independent drill rotation pumps. This is a Sundstrand L38 (18 series open circuits) variable displacement pressure compensated axial piston with maximum displacement stops.

The pumps provide a separate flow of oil to the drill rotation motor. The maximum displacement of the pump is usually adjusted to approximately 10 gpm (38 $^{1}/_{m}$) output flow and the compensator pressure is set at 2500 psi (152 bar).

The three section drill control valve is modified to isolate the pressure leg of the rotation circuit from the feed and hammer high pressure common through port and is provided with a separate inlet port. Return oil from the rotation motor dumps into the common return through-port of the valve.



Pressure Compensator Control

The following adjustment is applicable for the pressure compensator function on the pressurecompensator control. the flow and pressure compensator control and the remote pressure compensator control. The standard pressure compensator adjustment range is 500 to 3000 psi (35 BAR to 210 BAR) . It is necessary to refer to the machine specifications for specific control settings and any procedures peculiar to adjusting the control on each machine.

1. Using an appropriate adapter. connect a high pressure gauge (5000 psi) into the pressure line from the pump.

△ CAUTION

TO SET THE PRESSURE COMPENSATOR REQUIRES DEADHEADING THE PUMP. TAKE NECESSARY PRECAUTIONS OF SECURING THE WORK FUNCTION SO NO MOVEMENT OF THE LOAD OCCURS.

2. Start the prime mover and allow fluid to reach normal operating temperature.
3. Note the high pressure gauge reading which is the pressure setting of the pressure compensator. Refer to machine specifications for proper pressure setting.
4. To adjust the pressure compensator loosen the locknut. Then, using appropriate hex wrench. turn the adjusting screw clockwise to increase setting or counterclockwise to decrease setting.

Drill Control System

Rotation

The rotation section is comprised of a directional valve and an inlet section. The pressure setting of the rotation circuit is normally 2200 - 2500 psi maximum and the flow rated at 10 gpm (38 1/m). All adjusted at the pump.

Feed

The feed circuit is somewhat different in that two (2) internal relief cartridges and one (1) external relief valve are used. The cartridge in the compensator section is for the feed override function, and is set at 2500 psi.

Feed pressure is controlled by the remote relief cartridge, which is located in the end of the valve manifold. Feed pressure is usually set at 800-1000 psi (55.2-68.9 bar). Also connected to this circuit are the collaring on/off and pressure adjustment valves. The feed pressure will correspond with the lowest relief setting which is in fluid communication with the feed compensator. For instance, with the feed override valve in its normal position and the collaring valve in the "on" (up) position, the feed pressure will be controlled by the collaring relief valve (usually set at approximately 600 psi). When the collaring valve is shifted to the "off" position, the next lowest relief setting in communication with the compensator is the relief cartridge which controls feed pressure during normal drilling (800-1000 psi). When the feed override valve is shifted, this relief is isolated from the compensator, and the feed override relief takes over (2500 psi).

Hammer (Oscillator)

The compensator used for the oscillator circuit is basically the same as the one in the feed circuit. The relief cartridge is capable of controlling pressure (by throttling the flow) in a range from 1500-2000 psi for hole collaring to full system pressure for drilling. Fluid is supplied to the oscillator at collaring pressure when the valve lever is activated. As the bit makes contact with the rock, feed pressure increases. This increase in feed pressure is sensed by the oscillator relief cartridge, and the compensator opens to allow more flow to the oscillator. Higher flow results in higher pressure. Oscillator pressure will increase until the pressure in the feed circuit reaches approximately 600 psi (41.4 bar), at which time oscillator pressure should reach main system pressure.

Feed Paralleling System

(LIFT AND SWING)

Because the function of both the lift and the swing paralleling system are identical, only the principle will be discussed in this section. The parallel system in comprised of a master cylinder, mounted at the boom base, and a slave cylinder, mounted at the positioner. In the vertical plane, the positioner dump cylinder is also the slave. In the horizontal plane, the positioner swing cylinder is also the slavee. When the boom lift handle is operated at the console. fluid is directed to the boom lift cylinder. The master cylinder is forced to move because of a direct mechanical link. As the master cylinder moves, fluid is displaced from the end of the cylinder toward which the piston is moving. That fluid moves to the same end of the slave cylinder. As each cylinder has the same displacement, the positioner will maintain parallel movement. The boom swing will work on the same principle, but in the horizontal plane. When fluid is directed to the boom swing cylinder, the master cylinder also moves because of a direct mechanical link. Even though these cylinders have different dimensions, their displacement is the same. When the master cylinder is forced to move, the slave creates parallel movement of the positioner.

Each parallel system is equipped with an externally mounted dual counterbalance valve. This valve performs the following functions:

1. Prevents fluid from returning to the reservoir through the control valve spool when parallel system is functioning.
2. Provides a relief path the excessive pressure in parallel system. When operating the positioner dump or positioner swing control handle, fluid is directed through the external counterbalance valve to the cylinder being operated. Because the master cylinder is mechanically locked in its position, the fluid is directed to the positioner cylinder. This allows independent operation of the positioner dump and swing.

Parallelism Trouble-shooting

The master/slave paralleling system relies on fluid transfer to maintain accuracy. There are several types of problems which can result in a loss of parallelism.

1. Air in the circuit. Since air is compressible, any air trapped in either cylinder will compress under hydraulic pressure and result in a loss of parallelism. The symptom is usually that slave cylinder (refer to drawing) will lag when movement has started. Bleeding the air from the circuit is the cure for the problem.
2. Fluid leaking back through the counterbalance valve. The positioner swing the positioner dump valve sections contain motor spools.

   When these valves are in the neutral position the external counterbalance valve inlets are connected to the tank. This means that if the CB valves are leaking back there is not an equal transfer of fluid from the master to the slave cylinder. Check by removing the inlet lines at the counterbalance valve and plugging them. Leave the ports on the CB valve open and operate the boom lever controlling the suspect function. If any fluid is observed dripping or leaking from the open ports of the CB valve the valve is defective, contaminated or out of adjustment. Follow the procedure on the drawing to check adjustment.
3. External cylinder or hose leaks. With the machine at operating temperature operate the boom swing or lift. Inspect the unit for external leaks and repair as indicated.
4. Excessive wear in boom pins and bushings. By using a pry bar and operating boom functions check the boom and positioner unit for wear at all pins and bushings. Repair as required.
5. Internal fluid bypass in the cylinders. Fluid that bypasses the cylinder piston packings does not cause appropriate movement of the slave cylinder. By performing the previous checks and finding nothing wrong the process of elimination would indicate leaking piston packings.