Technical Manual

This manual is divided into major sections covering various serviceable components and systems of the Rotary Blast Hole Drill. These sections and their contents are organized by thumb index tabs shown below and right — blue ink tab marks. To use this manual, grasp the right hand side of the book between thumb and fingers. Bend pages back to find the start of the corresponding sections in this index tab.

PREVENTIVE MAINTENANCE – continued

DANGER: REMOVE ELECTRICAL POWER FROM MACHINE BEFORE PERFORMING ANY OF THE FOLLOWING INSPECTIONS:

- Inspect electrical cabinets; any discolored wires or components indicate overheating conditions have occured.
- Look for moisture, fungus or mildew in electrical cabinets. If found clean with approved solvents only, or compressed air.
- Check all electrical cabinets for messy or torn fasteners, cable armor or grommets, loose insulation
- Inspect electrical motors for discolored commutators or worn brushes.

These inspection points are representative of typical preventive maintenance routines. Use Section 10 as a detailed guide for all areas of machine inspection and suggested scheduled periods.

1. ANNUNCIATOR — A warning panel which relays vital equipment status information. A flashing light and buzzer indicate a problem. Some faults will result in machine function shutdown while others are a warning only. See Annunciator Panel on page 2—8 for more detail.

2. SPARE

3. HYD. PRESS. AUX. NO. 1 — Provides digital readout of pressure in auxiliary hydraulic system for valve banks numbers 1 and 2. With all these valves in neutral position pressure should be about 250 psi. (172 kPa. x 10).

4. HYD. PRESS. AUX. NO. 2 — Provides digital readout of pressure in auxiliary hydraulic system for hoist/pulldown brakes, propel brakes, and upper stem rack latches. With all brakes set and latches closed pressure will be about 400 psi. (275 k Pa. x 10).

5. CLOCK — Optional item.

6. AUXILIARY AIR PRESS. — This digital display shows pressure in auxiliary air compressor system. Normal readings displayed should be between 80 and 100 psi. (55 - 70 kPa. x 10). See section 6 of this manual for information about this system.

7. ROTATION SPEED — This digital display indicates drill stem speed in rpm.

8. HOLE DEPTH — Provides digital display of drilled hole depth in feet (meters). See also items 15, 16, 17, and 21.

9. DRILLING AIR PRESS. — Provides digital readout of pressure in output air line of main air compressor. With stem air switch (item 25) in ON position, air pressure should be between 25 and 35 psi. (17 - 24 kPa. x 10) during drilling operation. See Section 5 of this manual for drill air system detail.

10. ROTATION TORQUE — This digital display indicates percent (%) of torque exerted by D.C. motor mounted on rotary gear case in mast. Display will blink when 100% of rated motor torque is exceeded, provided that Alarm on/off switch (item 17) is in ON position. Beeper (item 21) will sound and display will continue to blink when motor torque reaches or exceeds 150% of rated for sustained period of 3 seconds, again provided that Alarm on/off switch (item 17) is in ON position. Audible alarm stops below 150% rated motor torque, and display ceases blinking below 100%.

36. HYDRAULIC FILTERS - NO. 2 PUMP — A red light for indicating status of main hydraulic system in-line filter that is located below Pump No. 2 in hydraulic room. When this light is lit, filter is clogged. Replace filter element.

37. HYDRAULIC FILTERS - AUX. SYSTEM — A red light for indicating status of auxiliary hydraulic system in-line filter that is located on deck in corner of hydraulic room below Valve Bank No. 1. When this light is lit, filter is clogged. Replace filter element.

38. DUST SUPPRESSION - FLOW CONTROL — On drills equipped with WET type dust suppression system, this dial is used to adjust water flow rate in system when operating (selector switch item 27). Dial is calibrated from 0 to 10, with 10 being maximum flow rate. On drills equipped with DRY type dust suppression system, this dial is **not** functional. There is a slight time lag between dial adjustment and flow rate response built into this system. Changing dial one unit requires 1.5 seconds before flow rate increases or decreases. Visual evidence of flow change is further delayed due to length of fluid stream from tank to drill bit.

39. HEATER — This off/on switch controls heater in operator's cab. Thermostat for heater is integral with heating unit. Some drills are not equipped with this heater.

DIESEL ENGINE CONTROLS:

40. A temperature gauge that provides the operator with visual indication of the actual operating temperature of the engine's cooling system.

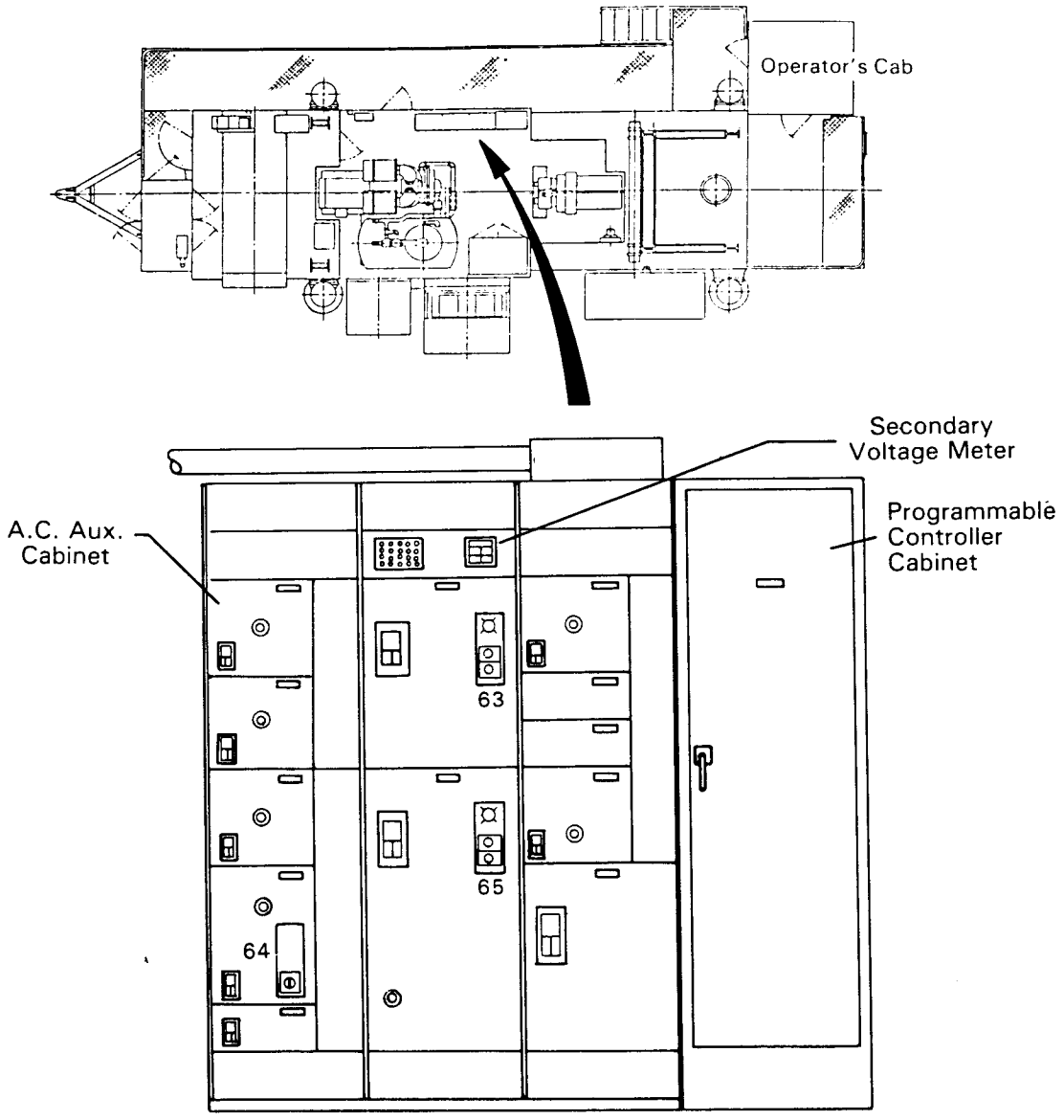
41. SHUTDOWN switch — This toggle switch, when moved to its OFF position, will shutdown the engine. This switch must be in its RUN position during startup and operation.

42. A pressure gauge that provides the operator with visual indication of the engine oil pressure during operation.

NOTES:

STARTING CONTROLS are located on the face of the A.C. auxiliary cabinet (motor control center) in the machinery house. They are used to start-up or shutdown the four main systems for drill operation. The following number list identifies these controls for easy location on the sketch provided.

CAUTION: Understand operating procedures, sequences, and controls before starting this machine.



63. MAIN AIR COMPRESSOR — Start and stop pushbuttons that control the A.C. motor which drives the drill air compressor. The green light above them will come on when the compressor's sump oil pressure reaches 25 to 30 psi (172 to 207 kPa) and there is no overtemperature or overpressure condition

Main hydraulic system pumps charge pressure should stabilize at 240 psi (1655 kPa) within 30 seconds from start-up. Observe this pressure on the two lower gauges mounted above pump no. 2 in the hydraulic room. If this charge pressure is **not** reached within 30 seconds, then release the start button and depress the STOP pushbutton. Eliminate the cause of the low charge pressure before running the pumps.

Start the drill air compressor next. Depress START pushbutton for the MAIN AIR COMPRESSOR and hold it until the green light above it is lit. The Sullair air compressor has a sump oil pressure gauge mounted on it. This gauge should register sump pressure of at least 30 psi (207 kPa) within 30 seconds from start-up. If it does **not**, release the start button and depress the STOP pushbutton. Eliminate the cause of the low sump oil pressure before running the Sullair air compressor.

Now start the HOUSE FILTER FAN. Place its selector switch in the REV. position and **hold** it there for 15 to 30 seconds. Release the selector switch. It will automatically return to its OFF position. Let the fan stop rotating in the reverse direction **completely**, and then move the selector switch to its ON position. The sound of the unit will indicate to you that it is operating.

Do not be alarmed if the reading on the A.C. Voltmeter on the face of the A.C. Auxiliary Cabinet fluctuates somewhat during the start-up of these systems. When the operating level of each system is attained, the reading will stabilize. It is best to allow each system to stabilize at its operating rotation before starting up the next system.

When these three systems are running, check the filters on the hydraulic system and air system by inspecting the indicators on them. If any indicate being plugged or dirty, shutdown and change or clean the affected filter elements.

NOTE: Filters in the hydraulic systems, both in-line and vacuum, may indicate a plugged or dirty condition at start-up because of cold fluid in the system. Before changing or cleaning any filter(s), allow the systems to operate for a period of 30 minutes, or one sufficient to let the fluids warm up, then check the filters again. If a plugged or dirty condition is still indicated, shutdown and change or clean the filter(s) as indicated.

After all systems are running satisfactorily, leave the machinery house (be sure to close the door) and go to the Operator's Cab. Observe the Annunciator Panel and digital displays on the Drilling Control Station.

Annunciator Panel lights should be **off**. If they are off, TEST the lights. If the WARNING buzzer is sounding and light(s) flashing, ACKnowledge the malfunction(s) and then investigate the problem(s). Refer to the Annunciator Panel on page 2—8 of this manual for more detail.

SEE DANGER ON PRECEEDING PAGE.

LOWERING MAST — Before starting this operation remove all loose items from the drill table, the mast catwalks, and the mast head. Secure the winch line to its anchor on the drill table and place the stem(s) in their rack(s). Lower the rotary gear case against the bottom stops at the drill table. Arrange the rear deck area around the drill table for lowering the mast and close the left side door in the operator's cab.

WARNING: Drill control is provided with an interlock that will NOT permit raising or lowering the mast unless the rotary gear case is positioned against the bottom stops in the mast. By-passing this limit interlock to raise or lower the mast can result in major damage to the machine and could cause bodily injury or death to personnel.

Check the clearance in front of the machine. Total length of the machine is about 77 feet (23.5 meters) with the mast in its fully lowered position.

Position the front jack(s) so that the pad(s) just touch the ground and do not support the machine. Level the machine laterally with the two rear jacks. Make sure the Drill/Standby/Propel selector switch on the Drilling Control Station is in STANDBY. Close the left side door in the operator's cab.

IMPORTANT NOTE: On machines equipped with angle drilling (optional), the mast **must** be returned to the vertical position from its last angle setting and the keeper pins **must** be in place between the two brace sections each side before proceeding with this lowering operation.

If applicable, remove the anchor pins from the angle drilling mast braces and the support structure. **BE SURE** the keeper pins are in place in the mast braces (mast vertical). The machine being level laterally across the **rear** jacks will assist in removing the anchor pins.

WARNING: Attempting to remove the mast brace anchor pins at the support structure above the machinery house roof with the mast in any angle position other than full vertical could result in the braces being overloaded and failing, resulting in dire circumstances.

DANGER: Never permit personnel to stand on the machinery house roof, or work there, while raising or lowering the mast. Failure to comply with this instruction could result in bodily injury or death.

Remove the handheld portable mast control lever assembly from its storage compartment in the Propel Control Station. Plug its cable lead into the quick connect outlet on the right side of the Drilling Control Station. Take the mast control lever out the front doorway of the operator's cab and stand on the walkway.

While standing on the walkway in front of cab, unlatch the two latch pins in the mast

Next, place the deck bushing with its flange up over the upper (male thread) end of the stabilizer. Screw the lifting bail onto the stabilizer and attach the winch line to the lifting bail. Lift the stabilizer and lower it through the opening in the drill table until the deck bushing seats. Install the deck bushing locks. Clamp stabilizer with the stem locks by moving the control lever to the LOCK position. Unhook the winch line and remove the lifting bail from the stabilizer. Lubricate the male threads of the stabilizer with a good quality drill pipe thread lubricant.

Now, move stem rack lever up to raise the rack to full UP position to release the lock (if machine has more than one rack, they all work the same). Then move lever down until the rack lowers into position under the rotary gear box and over the stabilizer.

CAUTION: If machine is angle drilling, the steady guide must be lowered and the jaws engaged with the stem before it is removed from the stem rack pot.

Press the Rotation ON button (green light should come on) and move the Stem Rotation switch to its FWD 1 position. Move the Drill/Standby/Propel selector switch to its DRILL position. SLOWLY lower the rotary gear case until the cross-over screws onto the drill stem. When the drill stem rotates, return the Stem Rotation switch to the OFF position, if the steady guide is not being used. If the steady guide is being used, the stem should be rotated while it is being hoisted out of the stem holder.

Hoist the gear box and stem high enough to clear the lower stem rack pot, then press and hold the Stem Release pushbutton to open upper stem latch. Raise rack to full UP or stored position, and then release the Stem Release pushbutton.

IMPORTANT: The stem should be rotating while moving (hoist or lowering) if the steady guide is engaged.

CAREFULLY lower the rotary gear case and stem to the stabilizer. Place the Stem Rotation switch in its FWD 1 position to engage the threads. After the stem and stabilizer are threaded together, return the Stem Rotation switch to its OFF position, move the Hoist/Pulldown lever to neutral, and release the Stem Lock.

Next, raise the rotary gear case until the stabilizer is above the drill table far enough to allow addition of the drill bit. Place the drill bit pot in the drill table opening. Now, place the bit in the pot and lubricate the threads with a good quality drill pipe thread lubricant. Lower the rotary gear case until the stabilizer reaches the bit. Move the Stem Rotation switch into its FWD 1 position and VERY CAREFULLY thread it onto the drill bit. Return the Stem Rotation switch to OFF when the bit and stabilizer are threaded together.

AUTOMATIC DRILL CONTROL (ADC) — To place the machine in the automatic drilling mode, move the MODE toggle switch to AUTO. Press the Rotation ON button. Move the Drill/Standby/Propel selector switch to DRILL. If applicable, lower the dust skirts. Now move the Stem Rotation pistol grip switch from OFF to the FWD 2 position and set the Stem Speed dial for a low rpm. Set the OIL PRES. LIMIT dial to 30.

CAUTION: DO NOT move the drill MODE toggle switch when the main hydraulic pump(s) are stroked. Always place the Hoist/Pulldown control lever in NEUTRAL (centered) position before making a drill control mode change.

Slowly lower the rotary gear case and drill string until the drill bit is ready to enter the ground, then stop it.

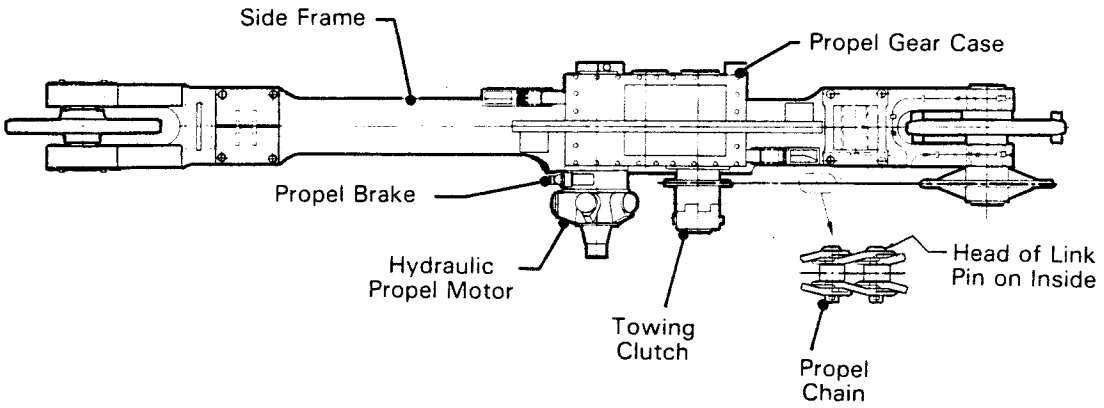
REMINDER: The hoist/pulldown speed is determined by the amount the Hoist/Pulldown control lever is moved from the neutral (center) position. Set the OIL PRES. LIMIT dial to the desired position for the bit load expected in the strata to be drilled.

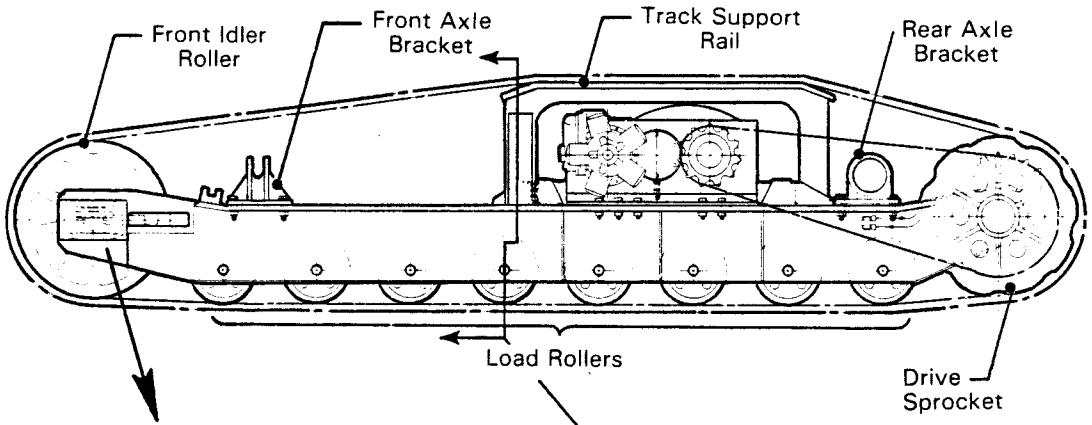
Turn ON the STEM AIR and the Dust Suppression system. If a Wet suppression system is used, adjust the liquid flow rate with the Dust Suppression dial control to suit the drilling conditions. Select the hole depth desired with the DEPTH digiswitch on the Drilling Control Station and zero the counting program by pushing the INITIAL button. Be sure the ALARM toggle switch is set at ON position. Set the BITLOAD/PSI. toggle switch as desired to monitor the pulldown system. The BITLOAD setting is suggested for drilling.

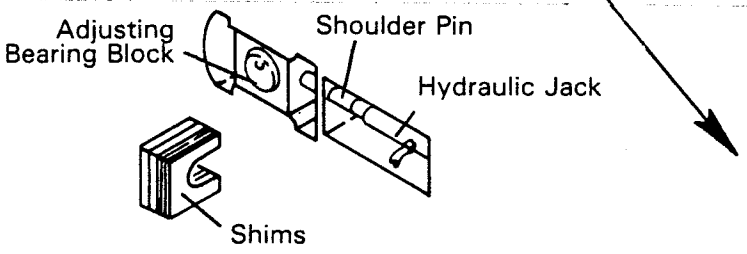
Slowly lower the drill string and start drilling the hole. When the stabilizer is below the surface, a depth that will vary with equipment used but generally between 4 and 6 ft. (1.2 and 1.8 m), increase the Stem Speed to that required for drilling and slowly increase the bit load with the Hoist/Pulldown control lever until it is at full PULLDOWN displacement. Now remove your hand from the Hoist/Pulldown lever. The drill will operate within the limits set, until the hole depth desired is reached or the Hoist/Pulldown control lever is returned to neutral. When the drill bit reaches the depth selected by the Depth digiswitch, drill string pulldown will stop and the DEPTH beeper will sound.

The operator should adjust the oil pressure limit to provide the pulldown force recommended by the manufacturer of the drill bit being used, that is suitable to each drilling condition. The rotary motor current limit is preset and should not be altered. The drilling air pressure limit is also preset and should only be altered by qualified drill personnel. Transducers in each of these three systems monitor the main hydraulic system pressure, the drilling air pressure, and the rotary motor amperage. These transducers

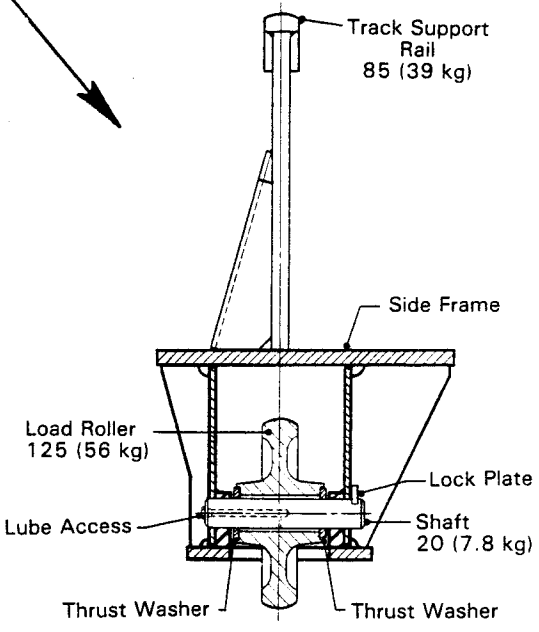
This type of axle mounting provides for the rocking motion of the crawlers, to compensate for uneven ground.



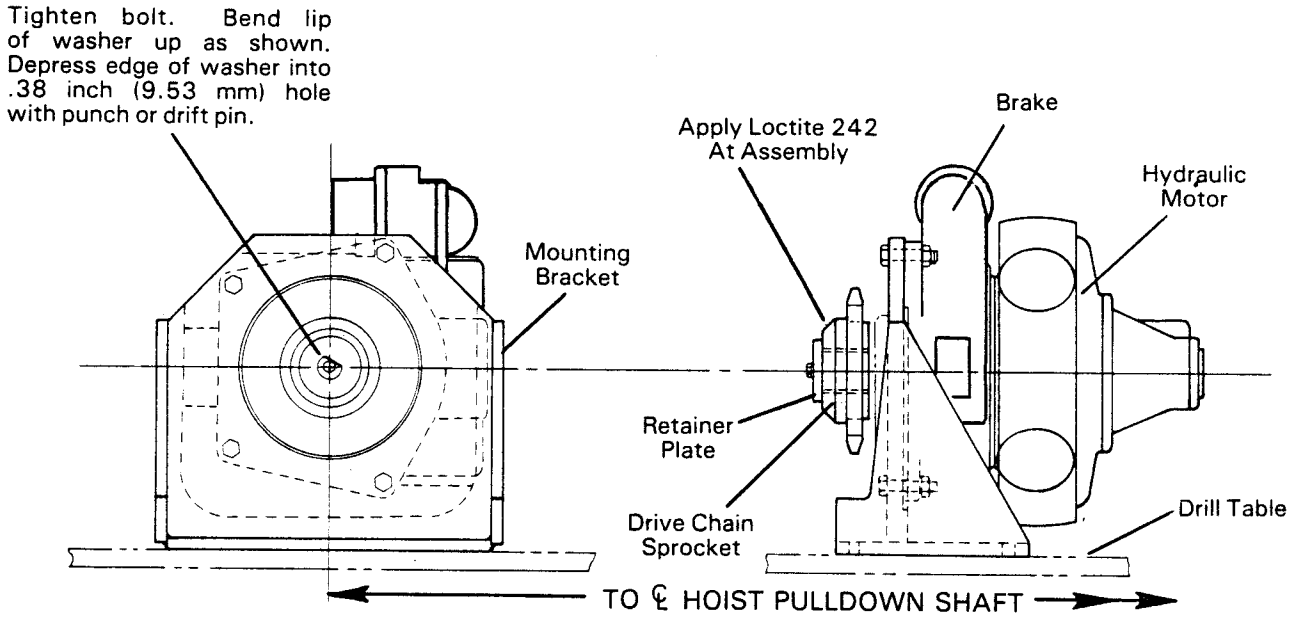




NOTE: See Section 8 for tightening and torque of bolt class.

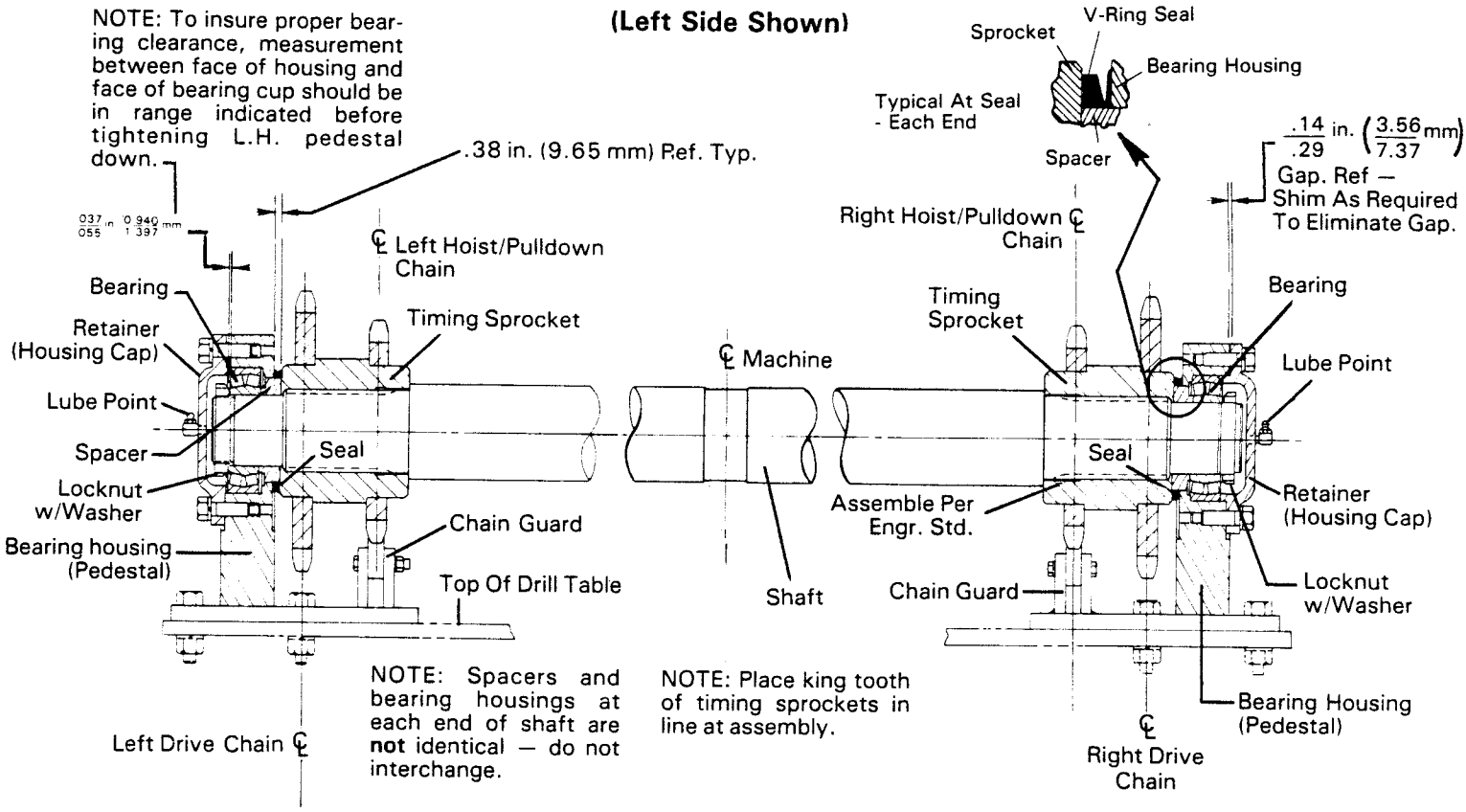


LOAD ROLLER ASSEMBLY



HOIST/PULLDOWN MOTOR ASS'Y.

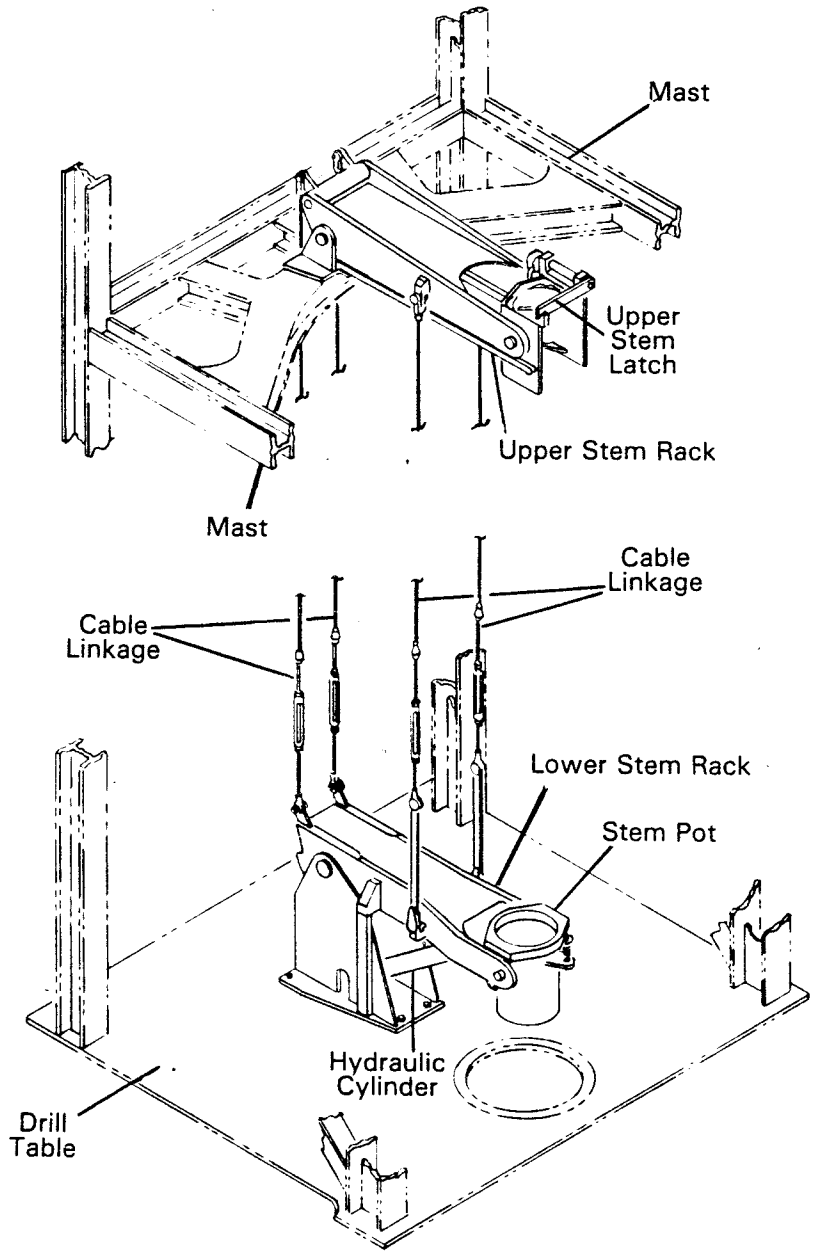
(Left Side Shown)



HOIST/PULLDOWN SHAFT ASS'Y.

The stem is supported by a pot on the bottom bracket and locks in place with a rotating locking latch on the top bracket.

The rotating locking latch is operated by a proximity switch located in the lower stem holder or pot. To operate the switch, the operator pushes and holds the STEM RELEASE button on the Drilling Control Sation and at the same time hoists the drill stem. When the stem clears the proximity switch, the rotating locking latch opens.



dial change requires 1.5 seconds before the flow rate will increase or decrease. Visual evidence of any flow change is further delayed due to the length of the fluid stream from the water tank to the drill bit.

A sediment collector, assembled in the suction line between the water tank and the pump, traps impurities. It is equipped with a 64 mesh screen (about 200 microns rated), that should be checked weekly if unfiltered water is used in the tank, or monthly if the water is filtered. Clean the filter screens when dirty, and return it to the sediment collector housing.

The pressure relief valve is set to relieve system pressure at 90 psi (621 kPa). It is preset and does not require adjustment. This valve routes the water directly to the tank when the system pressure exceeds its setting.

There are two (2) manual shutoff valves in the system to assist with maintenance. The globe valve in the bypass line can be opened to drain the delivery line and the suction line back to tank. The manual shutoff valve in the suction line must be open also to accomplish this drainage operation. This globe valve should be closed for system operation. The manual shutoff valve in the suction line can be closed to isolate the water in the tank for maintenance to the sediment collector, or the pump, or the relief valve. This manual shutoff valve **must be open for system operation.** A plugged tee in the suction line provides another access point.

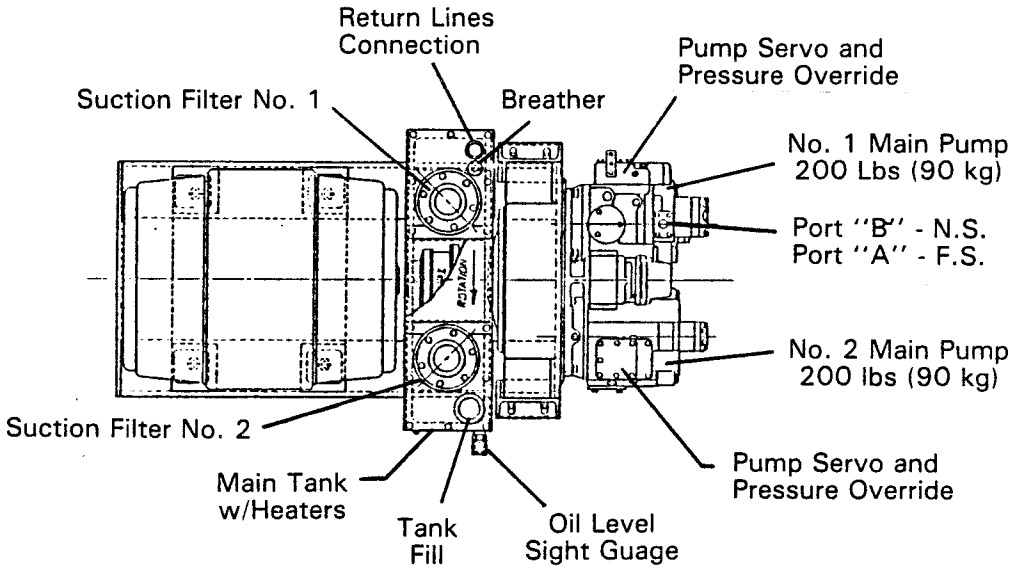
WARNING: To avoid unwarranted accidents involving personnel, always drain the delivery line before performing work on the flow control valve piping.

Both water level switches are float type switches. When the water level in the tank is too low to close the contacts in the lower switch, then the pump and the system will not operate. If the system is operating and the water level in the tank falls low enough to open the contacts in the lower level switch, then the pump and the system will shutdown. This situation will be indicated by the green light in the operator's cab going off. The upper level switch activates the alarm on the annunciator panel in the cab when the water level in the tank falls below it. This is an initial warning that the water tank will soon need to be filled.

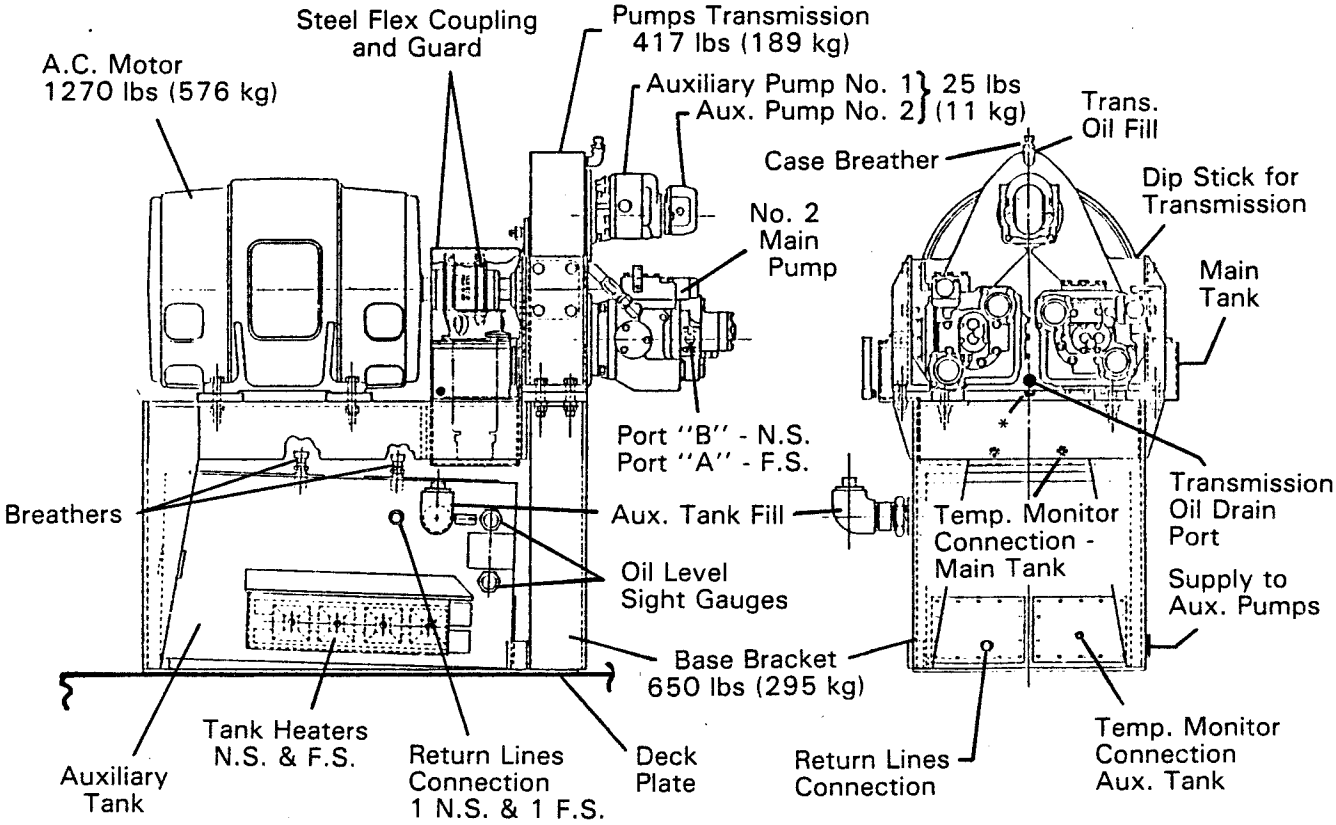
To fill the tank, connect the supply line from the mine's mobile water supply equipment to the tank fill line. Start the water pump on the supply ring, and open the globe valve in the tank fill line. When the water tank is full, shutdown the pump on the supply rig, and close the globe valve in the tank fill line. The tank can be filled until the water comes out of the vent pipe on top of the tank to make sure it is full to capacity. The tank is drained thru this same tank fill line by opening the valve.

For this system to operate in sub-freezing temperatures, the water tank must be equipped with electric heaters, and the system components must be insulated. This cold weather equipment is optional. It consists of a fully insulated water tank that has an enclosed, heated compartment on the front end for the pump, the flow control valve assembly, and the other system components. Immersed resistance heaters (two minimum; six maximum)

NOTE: Oil Level Switch in Main Hydraulic Tank is Located in Top of Tank between Suction Filters and under Motor Coupling.



Weight of Assembly with Oil - 4200 lbs (1905 kg)



HYDRAULIC PUMPS and RESERVOIR ASSEMBLY

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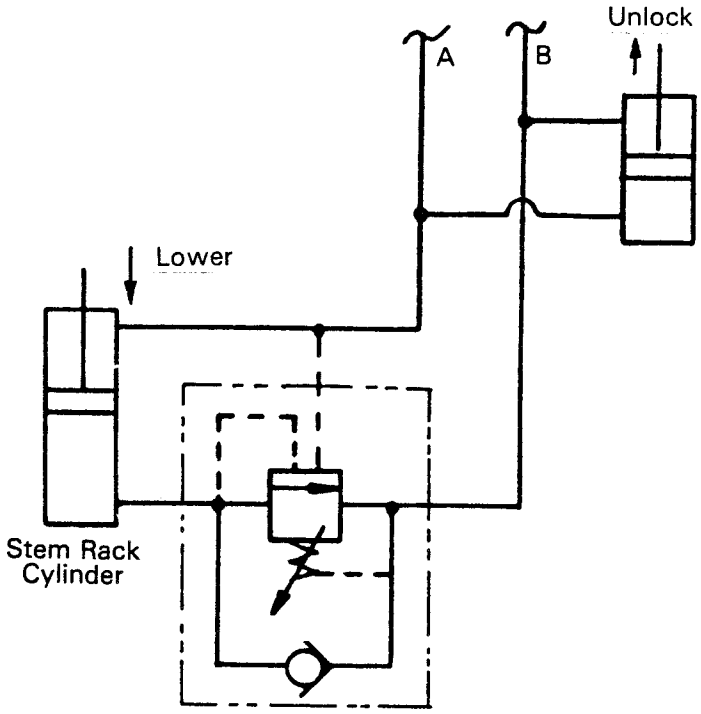
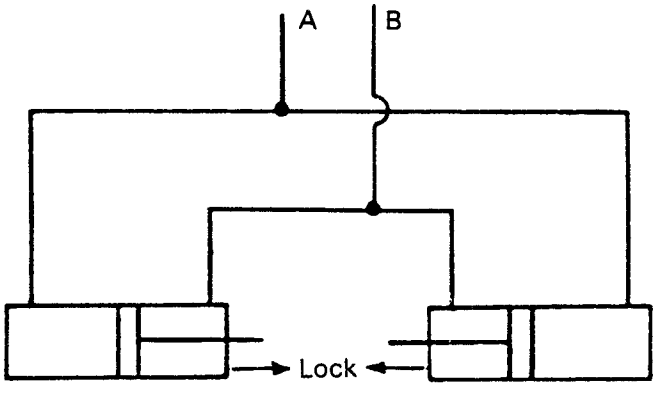
The circuit for each stem rack is shown here. A counterbalance valve equipped with a check bypass is mounted in the extend (raise) port of the cylinder. Its pilot line connects to the retract (lower) line. A double acting cylinder, that operates the stem rack safety lock, is piped in parallel to the stem rack raise and lower cylinder.



The counterbalance valve holds fluid in the cylinder until a pilot pressure from the lowering line activates it to allow fluid flow out the head end of the cylinder. In this manner the lowering function of the stem rack is controlled. The check in the counterbalance valve allows fluid flow to the head end of the cylinder when raising the stem rack and holds the cylinder in position when fluid flow ceases, even when the hydraulic system is shut down. This counterbalance valve has a built-in pressure relief connected to the extend (raise) line that protects the cylinder from being overloaded. This counterbalance valve should be adjusted so it operates at a pilot pressure from the lowering line of 1000 psi (690 kPa x 10). This setting will cause the valve to relieve pressure in the cylinder head if it exceeds 3000 psi (20.69 MPa) since its pilot ratio is 3 to 1.

STEM LOCKS on the drill table at the drill string opening hold the drill string components for assembly and disassembly. Double acting cylinders extend and retract the rams in the two stem lock assemblies. These two cylinders are connected in parallel. Valve 7 in Bank No. 2 controls the two stem lock cylinders.



NOTE: Since the stem lock cylinders are connected in parallel, they will probably **not** move in unison. One of them will move, and then the other, depending on the resistance encountered by each.

3. Synthetic hydraulic fluids are not recommended. Generally, their viscosities are too low for the operating temperatures involved and their cost is very high when compared with the premium grade hydraulic oils.

COST OF HYDRAULIC FLUID – The overall cost picture reveals that the extra cost of a premium hydraulic oil is very small when compared to the cost of downtime that will result if proper hydraulic fluids are not used and these fluids are not maintained. The wrong hydraulic fluid can result in difficulties such as:

1. Premature wear in hydraulic components.

2. Filter clogging.

3. High contaminant level in hydraulic fluid.

4. Early breakdown of the hydraulic fluid.

5. Premature failures.

6. Sticking valves.

SPECIFICATIONS – We recommend that the following information be made availabe to your petroleum supplier to assist him in selecting the proper fluid for your Dresser hydrostatic drive.

Final acceptance of all fluids supplied to this standard will be based upon satisfactory performance in the application for which it is intended, and does not relieve the hydraulic fluid supplier of responsibility for performance of brand name products.

NOTES:

HYDRAULIC TROUBLESHOOTING

Any hydraulic system is a precision unit. Proper care of the system will give continued smooth operation. KEEP THIS SYSTEM CLEAN and do not neglect it.

The most important troubleshooting tool is not in your tool box. It's right under your hard hat. Before picking up any tools, THINK thru the problem.

First, trace the flow thru each component. This will tell you exactly how each component relates to other components within the system.

Next, analyze the pressure and flow. Pressue causes force and flow causes movement. If a system lacks force, it is caused by lack of pressure. Likewise, the lack of speed is caused by lack of flow.

Now, establish a logical checking sequence. First, determine the problem by talking with the operator. This will tell you what the symptoms are, or what is different about its present operation.

Above all, NEVER MAKE ASSUMPTIONS. Many times you may assume that the tank has sufficient oil or that a relief valve is adjusted at the correct setting. CHECK AND MAKE CERTAIN YOUR ASSUMPTIONS ARE CORRECT.

Always compare measurements taken to specifications. Check items in this manual, on the schematic drawings or vendor information. Don't waste time looking for problem that may not even exist.

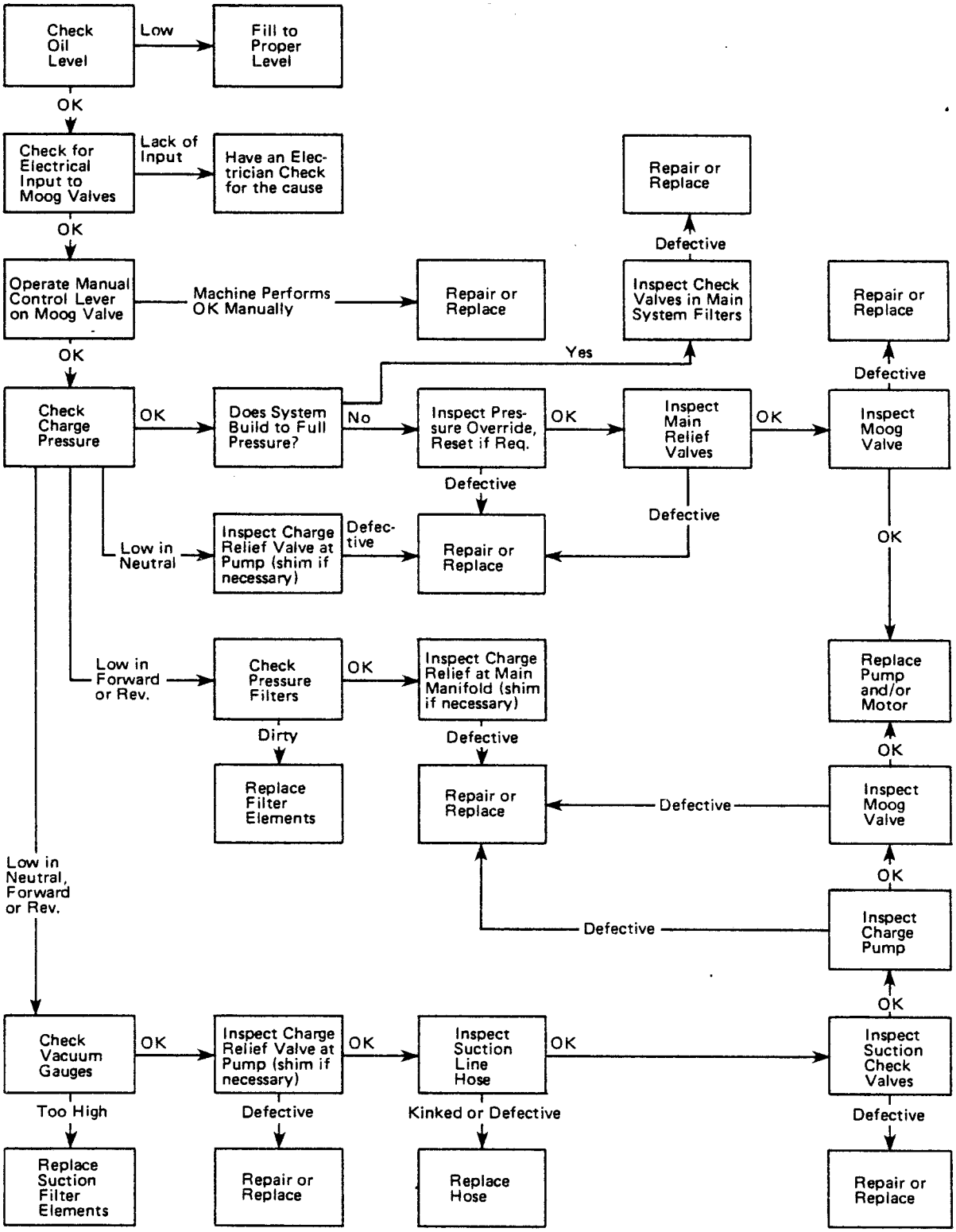
Trace the problem to its origin. If you fix the symptom and not the cause it will come back to haunt you every time.

DOWNTIME IS EXPENSIVE! USE YOUR HEAD BEFORE YOU USE YOUR HAND TOOLS.

If, in spite of all precautions, improper operation does occur, cause generally traces to one of the following:

1. Use of wrong viscosity or type of oil.
2. Insufficient fluid in the system.
3. Presence of air in the system.
4. Mechanical damage or failure.
5. Internal or external leakage.
6. Dirt, water, or sludge in the system.
7. Improper adjustment.
8. Overheating.

SYSTEM WILL NOT OPERATE IN EITHER DIRECTION



Refer to parts sketch following.

NO./LTR	DESCRIPTION	QTY.
50	BEARING – REAR	1
51	GASKET FRONT COVER	1
52	PIN	2
53	COVER – FRONT	1
54	WASHER – PLAIN	13
55	SCREW – HEX. HD.	8
57	SCREW	2
58	NAMEPLATE	1
59	O-RING	1
60	PLUG	1
61	PLUG	1
62	HOUSING	1
63	O-RING	1
64	PIN	2
65	SCREW – HEX. HD.	6
66	WASHER – PLAIN	6
67	TRUNNION	2
68	TRUNNION SHIM KIT	1
69	O-RING	2
70	BEARING TRUNNION	2
78	GASKET	1
91	O-RING	1
92	O-RING	3
94	HOSE ASSEMBLY	1
95	HOSE ASSEMBLY	1
96	CONNECTOR	1
102	SCREW – HEX. HD.	4
103	CONNECTOR	1

This list is for identification of parts only. Specific part numbers are necessary to order replacement parts. For part numbers consult the Parts Book.

TROUBLESHOOTING CHART – MAIN PUMP CONTROLLER
(Moog Series 63-500)

Potential Trouble	Probable Cause	Remedy
Controller does not respond to command.	1. Electronic control does not function.	Replace electronic control.
	2. Open electronic control cable.	Replace electronic control cable.
	3. Open coil or open coil lead.	Replace torque motor assembly (13).
	4. Contamination wedged in air gap.	Clean air gaps.
	5. Jammed spool.	Clean bushing (24) and spool (23).
Main Pump output flow or motor output in one direction only. Limited or no response to command signal.	1. Electronic control not functioning properly.	Replace electronic control.
	2. Plugged inlet orifices.	Replace torque motor assembly (13).
	3. Plugged hydraulic amplifier assembly.	Replace hydraulic amplifier screens (15). Replace torque motor assembly (13).
	4. Contamination wedged in air gap.	Clean air gaps.
	5. Jammed spool.	Clean bushing (24) and spool (23).
	6. Null adjust erroneously adjusted hardover.	Readjust null.
Hydraulic motor slowly rotates when electronic control returns to neutral.	1. Incorrect null adjustment.	Readjust null.
	2. Filters silted with contamination.	Replace screens and filters (15 & 16).
	3. Partially plugged inlet orifice.	• Replace hydraulic amplifier assembly.
	4. Partially plugged torque motor assembly.	Replace hydraulic amplifier screens and filter (15 & 16). Replace torque motor assembly (14).
	5. Contamination wedged in air gap.	Clean air gaps.

x. Apply hydraulic system pressure to the controller and check for leaks. If any leaks are found that cannot be rectified by replacing o-rings and/or sealing plates, remove the discrepant component and return it for repair or replacement.

NOTE: If the system components are drifting or hardover, adjust the mechanical null of the controller as described previously in this section of the manaul.

WARNING: If this test is done onboard the DRESSER drill, make sure the area around the machinery, that will move when the main pump is stroked, is clear of all personnel to avoid accidents.

y. Align the motor cap gasket (7) and motor cap (6) on the controller body (25). Assemble the two socket head capscrews (4) with lockwashers (5) thru the motor cap to the body. Torque these two capscrews to 42 in.-lbs. (4.76 Nm) using the proper torque wrench and a 9/64 inch Allen wrench.

z. Install a new nameplate (8) and caution plate (9) to the motor cap, if they were removed.

aa. Perform a functional checkout. Rotate the manual override lever and observe the output of the main pump. The rate of flow of hydraulic fluid thru the respective control ports should be approximately equal when the lever is positioned hardover in either direction.

bb. If a noticeable variance in pump output flow exists, remove the motor cap assembly. Carefully realign the mating surfaces of the motor cap assembly (6) and the controller body (25), and then reassemble them together.

cc. Repeat steps aa. and bb. as required to achieve nearly equal pump output flow in both directions.

dd. Readjust the mechanical null of the main pump controller as described previously in this section of the manual.

NOTES:

NOTE: A surge or rapid increase in the case drain flow during a portion of one motor revolution is indication of a bad piston or hydrostatic pad. If this situation is observed, the motor should be replaced even though its case drain leakage rate is within the acceptable range.

The following data list is typical case drain leakage rates for new or rebuilt Staffa motors, Model B-080 and B-100, used on DRESSER blast hole drills.

Pressure psi (MPa)	Leakage Rate gal/min (liters/min)
1000 (6.9)	0.90 (3.4)
2000 (13.8)	1.14 (4.3)
3000 (20.7)	1.51 (5.7)
4000 (27.6)	2.25 (8.5)

NOTE: These rates derived by Staffa from Production Test Rig figures using oil having a viscosity of 230 SSU.

This data for reference only.

NOTES:

31. Remove cause and reassemble as before.

32. When shaft turns properly, the pump is ready to be installed.

BEARING REPLACEMENT – In the event of bearing failure, the bearings may be replaced if the gears have not cut a track in the housing deeper than .015 inches (.381 mm).

To remove the old bearings, disassemble the pump. See AUXILIARY SYSTEM PUMP DISASSEMBLY in this section of the manual.

Using a small keyhole-type hacksaw, cut thru the bearing opposite the oil groove. Be sure the saw cuts completely thru the bearing shell, but cut as little as possible into the aluminum bore.

After the cut is made, grip the bearing with vise-grip pliers and remove with a twisting motion (body bearings). Flange bearing can be wedged out with a screwdriver. Take care not to damage the bores. After removal, wash the parts thoroughly in clean solvent and blow dry.

Press in the body bearing so that they protrude above the surface .220/.230 inches (5.59/5.84 mm). Press flange bearing in .090 inches (2.29 mm) below surface. The split in the bearing goes in the same location as was the oil groove in the bronze bearing. If the flange has protruding bearing, then when replaced, the bearing must be protruding .220/.230 inches (5.59/5.84 mm) above the surface.

Install the remaining parts of the repair kit and replace pump on the machine. No break-in is necessary.

• The line (terminal) pressure gauge is connected to the dry side of the receiver downstream from the check valve and continually monitors this air pressure.

• The sump pressure gauge continually monitors the sump pressure at the various load and/or unload conditions.

• The discharge temperature gauge monitors the temperature of the air leaving the compressor unit. The normal operating reading is approximately 180°F (82°C) unless the ambient temperature exceeds 80°F (27°C), then the reading will be approximately 100°F (38°C) above the ambient temperature.

• The air filter restriction indicator gauge monitors the condition of the air intake filter and signals when filter maintenance is required (20 inches or 91 cm of water).

• The hourmeter records accumulative hours of operation for the compressor and is useful for planning and logging service operations.

• The separator maintenance gauge monitors the condition of the separator element and indicates when element restriction is excessive [10 PSIG (69 kPa)].

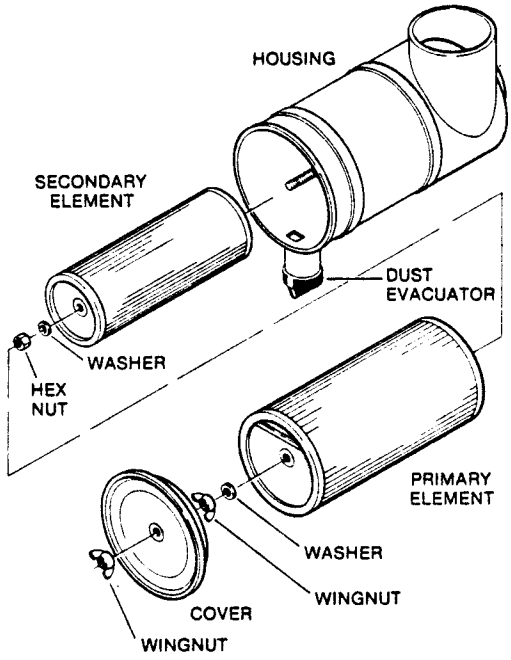
• The bearing lube filter maintenance gauge monitors the condition of the bearing lube filter element and indicates when the element should be changed.

NOTES:

AIR FILTER MAINTENANCE

Refer to Figure 5-10. Air filter maintenance should be performed when indicated by the maintenance gauge. The air filters supplied with the compressor have cleanable-type elements. Below you will find procedures on how to replace and how to clean the air filter element.

FIGURE 5-10 AIR FILTER ELEMENT



AIR FILTER ELEMENT REPLACEMENT

1. Clean exterior of air filter housing.
2. Remove the air filter cover by loosening wingnuts securing the cover.
3. Remove the internal cover plate.
4. Remove element and clean the interior of the housing using a damp cloth. **DO NOT** blow dirt out with compressed air.
5. At this time clean or replace the element.
6. Reassemble in the reverse order of the disassembly.

AIR FILTER ELEMENT CLEANING—The filter element is cleanable by one of two methods. One method is by washing with a mild household detergent and water. The other method is cleaning with compressed air. The maximum amount of times that an element should be cleaned is six (6) times, however, the element should be used no longer than a period of one (1) year without changing.

Prior to cleaning an element, check the element for damage. Damaged elements are to be replaced.

When cleaning an element, never exceed the recommended maximum pressures for water [40 PSI (276 kPa)] or compressed air [30 PSI (207 kPa)].

DO NOT strike the element against any hard surface to dislodge dust. This will damage

piston. The rod is put into place via the "in" port of the valve. Rotate the piston if the hole in the piston does not line up with the "in" port. Once the rod is in place, hold while removing the capscrew

5. Remove the actuator disc and the piston and replace the seals on each.

6. Replace the actuator disc and piston. Be sure that the spacer pipe is aligned perpendicular to the disc. This is to assure proper travel of the piston and disc. Lastly, tighten the Nyloc capscrew.

7. Install the spring.

8. Install the new end caps on both ends of the housing.

RUNNING BLOWDOWN VALVE MAINTENANCE – Refer to Figure 5-19. When it becomes necessary to make repairs on running blowdown valve No. 047192, use repair kit No. 013708 and follow the instructions provided below.

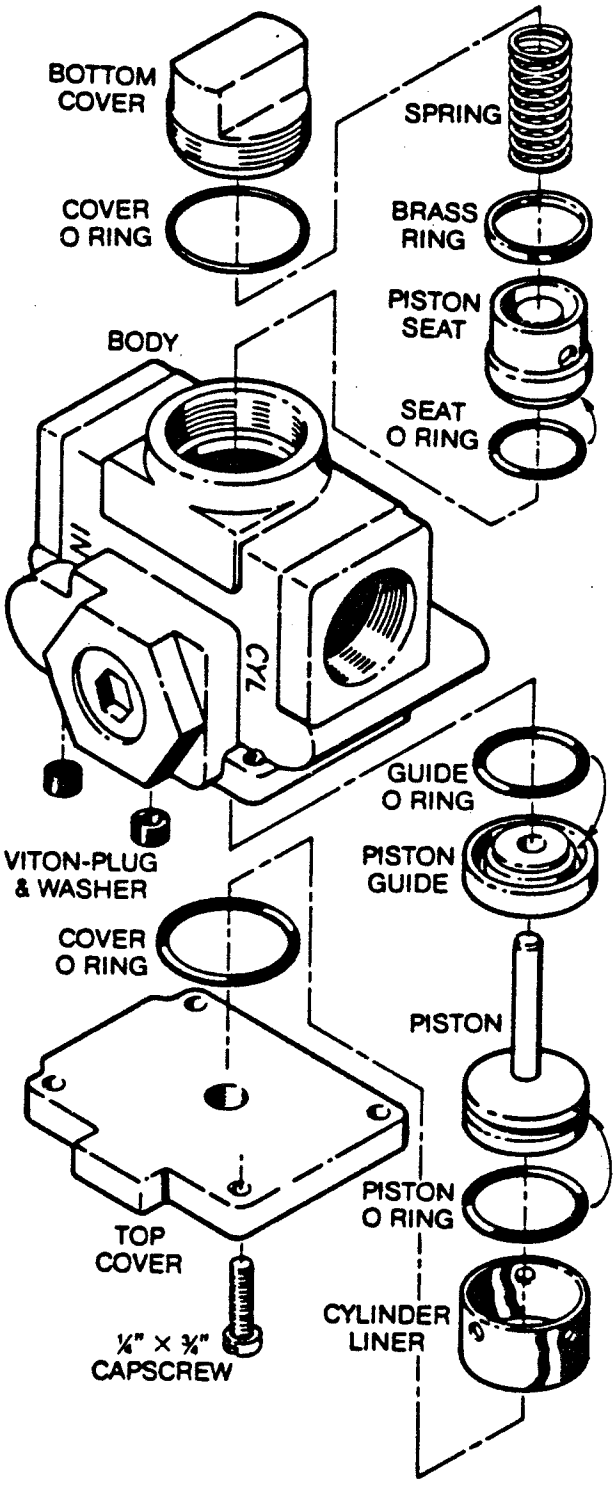
1. Unscrew the bottom cover from the main body.

2. Remove the cover O-ring, spring, brass ring and piston seat.

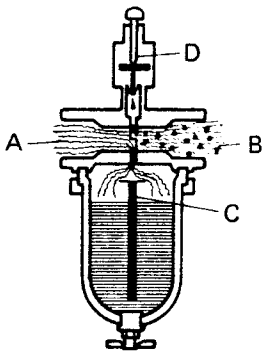
3. Remove the piston seat O-ring from the piston seat and discard. Replace with a new O-ring supplied in the repair kit.

4. Remove the four (4) ¼ x ¾ inches (19 mm) long capscrews from the top cover.

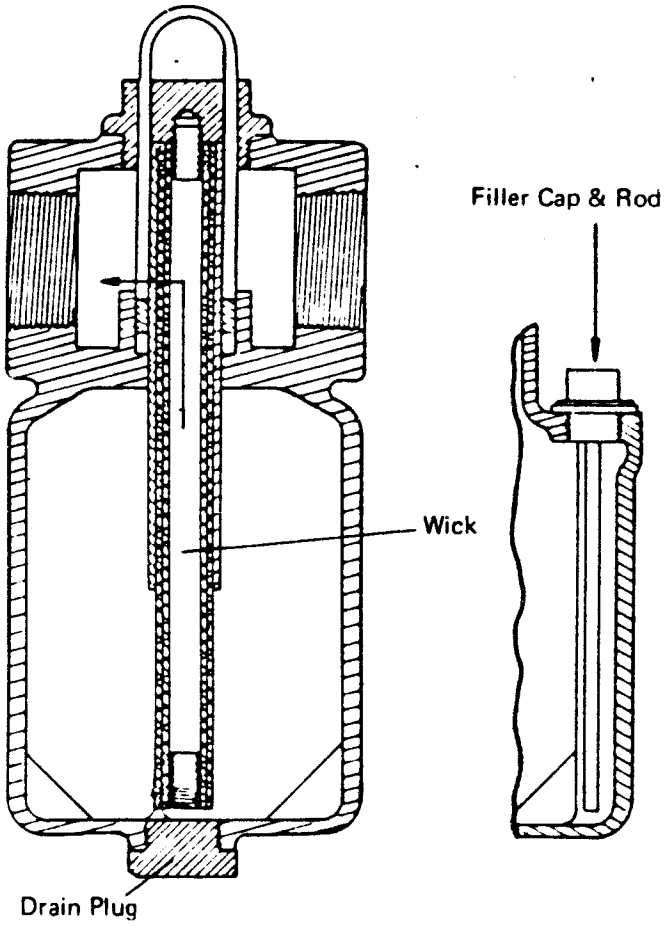
FIGURE 5-19 RUNNING BLOWDOWN VALVE



Operation of the lubricator is simple. Air enters the lubricator at point A. The oil bowl is pressurized by admitting air via the reversible venturi tube, B. Air flowing thru the lubricator creates a reduced pressure area as it passes thru the venturi section. Therefore, oil is forced to flow up the siphon tube, C, to the chamber above the drip gland. Here, the flow of oil is controlled by a needle valve, D, and permitted to drip at the desired rate of feed from the drip gland thru the sight chamber and into the air line. As oil enters the air stream, it is atomized into an airborne oil fog which is carried thru the air system.



ANTI-FREEZER (optional) — If the blast hole drill is to operate in cold climates, it is equipped with an anti-freezer unit. This anti-freezer unit is installed between the intake air filter and the compressor to prevent icing and freeze-up conditions in the air system. The unit introduces methyl alcohol vapor into the air supply, which mixes with the water vapor in the air entering the compressor. As shown in the illustration, it contains an alcohol chamber at the bottom and a vapor chamber at the top. The plug located at the top of the unit is fitted with a central rod. This rod is covered with a tubular wick, which carries the alcohol up into the vapor chamber as fast as it evaporates into the air flow. The adjusting sleeve is mounted over the wick, and may be raised or lowered to increase or decrease the amount of wick exposed to the vapor chamber. A wire loop is attached to the top of the sleeve for this purpose.



In severe cold weather, the sleeve should be lowered to the maximum depth, leaving the wick completely exposed in the vapor chamber. As the temperature moderates, the sleeve should be raised to reduce the amount of methyl alcohol being vaporized. The frequency of filling depends upon weather conditions. USE ONLY METHYL ALCOHOL THAT IS DISTILLED FROM WOOD. DO NOT USE ETHYL ALCOHOL OR RADITOR ANTI-FREEZE. Capacity of the alcohol chamber is one (1) U.S. quart (.9 liter).

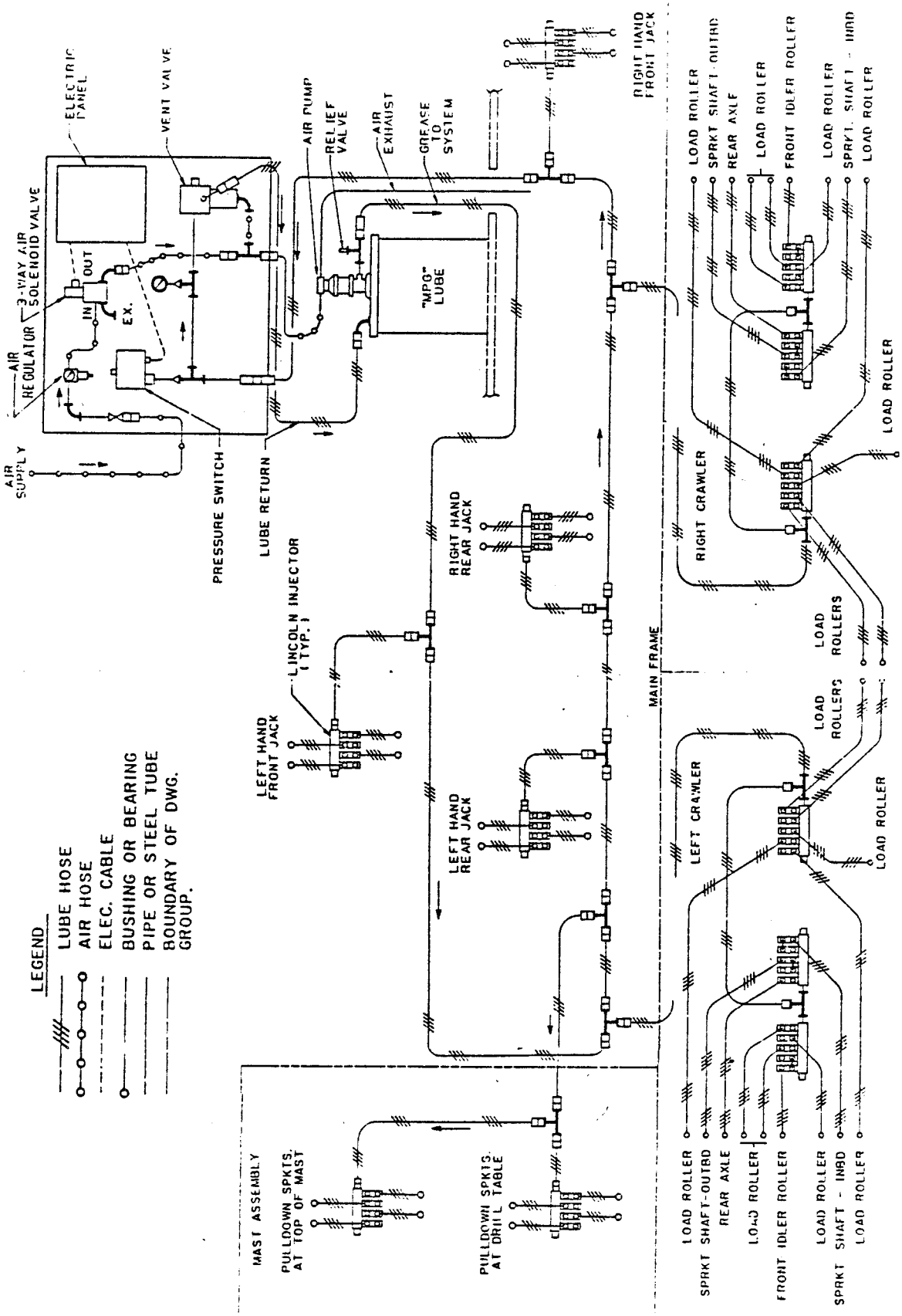
CAUTION: Contact with or swallowing of lube products can prove harmful. Lubrication system operates under pressure. Relieve pressure in system before performing maintenance.

LUBRICATION SPECIFICATIONS – GREASES

CODE OR SYMBOL NO.	ASTM	MPG or TEST	RGL	OGL TYPE B	OGL TYPE H
Penetration Worked 60X					
Summer, NLGI	D-271	2	semi-	1	–
Winter, NLGI		1	fluid	0	–
Penetration Worked 10,000, Max. Change	D-217	10%	–	–	–
Dropping Point, Min. °F (°C)	D-566	350 (177)	–	325 (163)	–
Base Oil Viscosity @ 210°F (99°C), Min.	D-446	75 SUS	140 SUS	2000 SUS	2000 SUS
Oxidation Stability Max. psi (kPa) Drop—100 Hrs.	D-942	10 (68)	–	–	–
Water Resistance Max. Loss @ 100°F (38°C)	D-1264	20%	–	10%	10%
Texture	Visual	Buttery	–	Adhesive	Tacky
EP Timken, Min. OK, lbs. (kg)	–	35 (16)	–	35 (16)	35 (16)

SPECIFICATION – OILS

CODE OR SYMBOL NO.		ASTM or Test	MO	OIL PO
Pour Point °F (°C), Max.	Summer	D-97	5 (-15)	15 (-9)
	Winter		0 (-18)	15 (-9)
Flash Point °F (°C), Min.	Summer	D-92	450(232)	410 (210)
	Winter		420(216)	410 (210)
Viscosity @ 100°F (38°C) SUS		D-446	–	150 min.



AUTOMATIC LUBRICATION SYSTEM SCHEMATIC

Section 8 – Engineering Data (cont.) Page

This section contains general information not specific to an individual machine. It is provided as general reference material for maintenance personnel.

Should additional specific data be required in these subject areas contact the DRESSER Service Department.

SHRINK FIT COMPONENTS

Instructions for installation and removal of shrink fit components with tapered bores:

INSTALLATION

1. Thoroughly clean the seating surface on the shaft and the tapered bore of the component, using a recommended standard safety solvent, such as the "Stoddard" type solvents, and wipe dry with a cloth.

2. Remove any scoring or high spots on either part, and check with "Bluing" by spotting the cold component on the shaft by hand to obtain at least 75% fit.

   In case you do not have 75% fit, the component should be scraped until the desired fit is indicated by repeating the bluing and cold fitting.

3. Break all sharp edges of the key with a fine file so there will be approximately .015 inch (.381 mm) radius at each edge. Fit the key to the shaft, taking care to avoid upsetting the metal of the shaft next to the key. The key should be tight in the shaft, but not so tight that it must be hammered in place.

4. The cold component must be tried on the shaft to make certain it does not bind on the key.

5. Mount the component cold on the shaft, and snap it into position by hand.

6. Measure the cold position using a micrometer depth gauge as indicated in Figure 6. Record the measurement. Mark where the depth gauge was resting, so measurements can be made from the same position after the component has been mounted.

7. Remove the component from the shaft, and thoroughly clean all bluing marks from the bore and shaft. Remove or protect seals or other items that may be damaged by heat.

8. With the component removed, heat in a suitable oven or other means of dry heat. Control the temperature as directed, using values indicated in Table 4.

   A. **DO NOT USE OIL OR WATER TO HEAT COMPONENT.**

   B. **COMPONENT TEMPERATURE MUST NEVER EXCEED 350 DEGREES F. (177 DEGREES C.).**

WARNING (cont.): **used. This could cause damage to a part, a person or some other parts.**

Do not over-weld when adding attachments, such as lugs, to a part as this may cause more damage. A good rule of thumb is that the combined fillet welds should be of the same size as, or .13 inch (3 mm) less than, the thickness of the lug or attachment, whichever is the thinner part.

STEP 4 – Preparation of the Defect or Worn Part

Proper preparation is half the job; therefore, it is important to evaluate each part on its own merit. Some points to consider are as follows:

1. How large is the crack or defect?
2. Is the crack completely thru the thickness?
3. Will distortion be a factor?
4. Can two welders weld opposite each other in order to control distortion, or must all the repair be done from one side?
5. Will the welder be able to withstand the preheat, if required?
6. Can the welder get into a position to do a good job?
7. Does the cost of repairing the part compare favorably to buying a new part?

These points are important factors when evaluating how the defect should be prepared for welding. A welder can repair most defects, add modifications, or repair worn parts as long as good equipment is available to him, such as the correct clothing, headgear, exhaust systems or respirators, and platforms for the job. If the welder is kept comfortable and given the required equipment and consideration, a quality job can be expected.

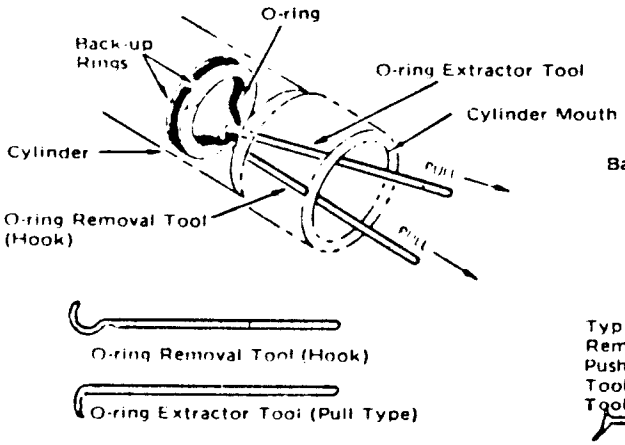
Methods of metal removal to be considered are:

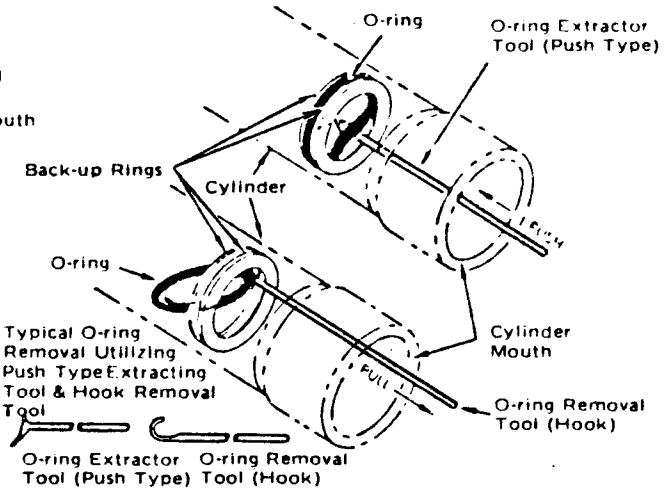
1. Air carbon arc gouging.
2. Grinding.
3. Machining.
4. Oxyfuel burning.

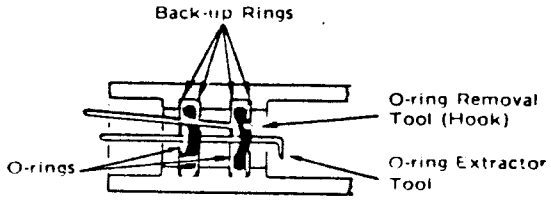
DO NOT USE pointed, sharp-edged, or hardened steel tools (screwdrivers, church keys, or knives) for removal or installation of backup rings or seals. Soft-metal tools of brass or aluminum (plastic, wood or phenolic rod when formed into desired shape) save the critical surfaces.

Tool surfaces need to be well rounded, polished and no burrs on working end. This obviously prevents scratches. (Typical O-ring tools shown in previous sketch.)

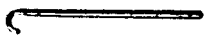
Removal from cylinders and pistons means every effort is needed to avoid contact with machined surfaces.



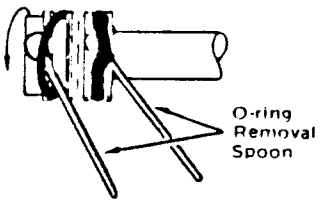




Typical Dual O-ring Internal Extraction & Simultaneous Removal

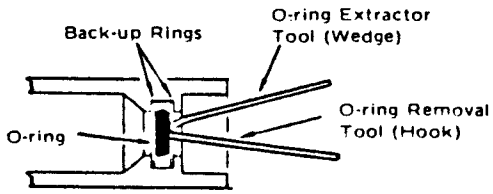


O-ring Removal Tool (Hook)



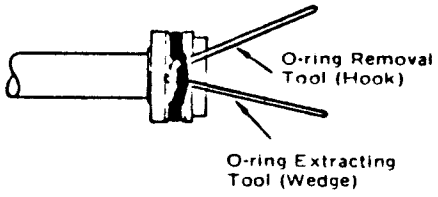
Typical External O-ring Removal Utilizing O-ring Removal Spoon

CAUTION: Do Not Permit Unnecessary Contact of Tools With Bearing and Cylinder Wall Surfaces. Avoid Dropping Tools Into Cylinders



Typical Single O-ring Internal Extraction Utilizing Wedge Type Extracting Tool & Hook Removal Tool

O-ring Extractor Tool (Wedge)

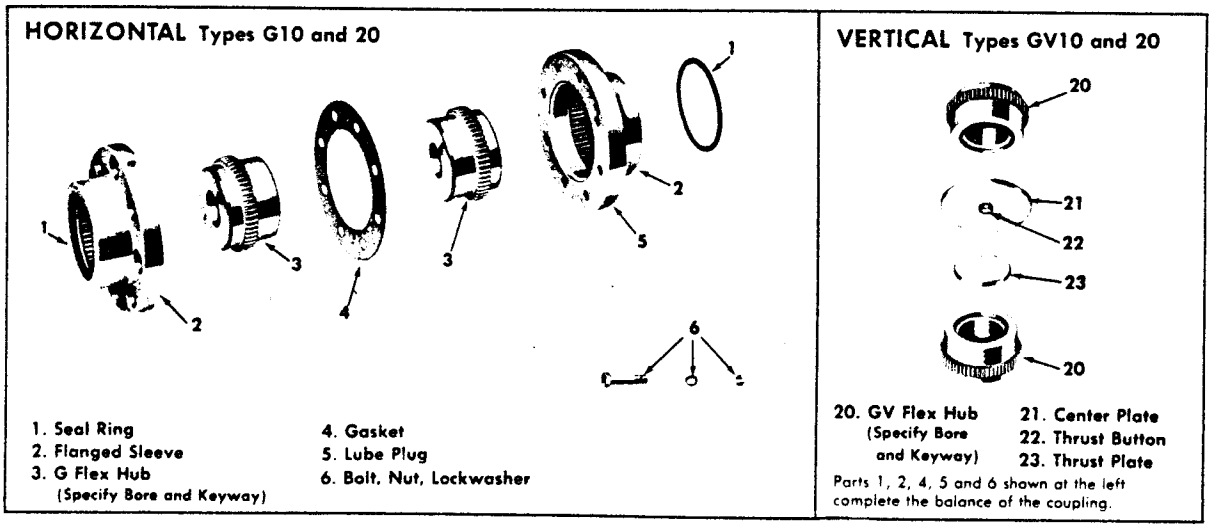


Typical Single O-ring Removal Utilizing Wedge Type Extracting Tool and Hook Type Removal Tool

NOTE: After O-ring is Dislodged from Groove, Hold Spoon Tool Stationary Simultaneously Rotate and Withdraw Piston from Ring

GEAR COUPLING – TYPE G AND GV

G TYPE INSTALLATION (HORIZONTAL)

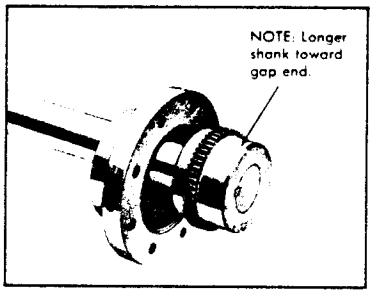


1. Clean all parts. Heat hubs in an oven or use suitable dry heat. DO NOT rest gear teeth on container bottom or apply a flame directly to gear teeth.

   Pack sleeve teeth with grease and lightly coat seals with grease BEFORE assembly. DO NOT use cup grease. DO NOT DAMAGE SEALS.

   Use a dial indicator to align dynamically balanced couplings, and assemble parts with mating match marks aligned. Mount indicator on one hub and take readings for OFF-SET check on O.D. of other hub. The difference between minimum and maximum readings DIVIDED by two should not exceed the values in Table 10. For ANGULAR check, take readings on either face of other hub. The difference between the minimum and maximum readings should not exceed the values in Table 10.

2. MOUNT FLANGED SLEEVES, SEAL AND HUBS – Place flanged sleeves WITH seal rings on shafts before mounting hubs.



2 MOUNT FLANGED SLEEVES, SEALS AND HUBS

CAUTION: DO NOT DAMAGE SEALS. Mount hubs on respective shafts, as shown so each hub is flush with its shaft end. Position equipment in approximate alignment with approximate gap specified in Table 10.

is located, rather than a false lead. Where possible, make tests under two different conditions (i.e., stall and no-load) to confirm conclusions.

Once faulty stage is located, determine the actual part that failed. Often an ohmmeter helps here, but may offer erroneous indications. If a semi-conductor, magnetic amplifier or other complex device is suspected, replace it rather than try to prove it bad by test. This saves time and tests just as well. This assumes that spares exist, as they should.

PERFORMANCE: Replace or repair faulty part, than prove this action correct by checking that system functions properly. Many electricians feel the job complete with machine in operation. A good electrician determines the cause of failure, then takes necessary steps to prevent further failure. Cause may be the improper function of another part or circuit, improper use or overloading of a device, either by supplier or user; perhaps the effect of external conditions of dirt, moisture, temperature, or normal life has been exceeded. A good electrician determines cause of failure and takes preventative steps.

TYPES OF FAILURES: The preceeding material, general in nature, allowed development of a procedure of troubleshooting for any problem. The following discusses certain failures in more detail.

Most failures are circuit opening, wire breaks, resistors or coils opening, faulty contacts, etc. An open circuit's best feature is that current cannot flow, so the best check is for current flow.

Current measurements are difficult since opening a circuit and inserting the proper instrument is required. Generally, it's better to use Ohm's law and seek a voltage drop caused by the current using a voltmeter that connects easier.

Voltage measurements indicate an open circuit only if readings are properly understood. Voltage across an open circuit generally is higher than expected. Special conditions such as a sneak circuit provide nearly normal voltage across an open circuit. The following is one example.

Assume a motor field is open. If normal voltage is almost the same as exciter voltage, the reading across the field will be almost identical, whether field is open or not. Likewise, if several motor fields connect in parallel, voltage across the group changes little with one open field. While the voltage differs somewhat, this difference well could be attributed to a change in exciter voltage or an inaccurate meter. In these cases, find the trouble by measuring voltage across each field coil. This emphasizes an earlier point, use care in selecting a test point and eliminate confusing readings.

has been removed and the circuit grounded. Feeling of excessive heat may indicate an overloaded condition and should be corrected.

TIGHTENING operation should be done on all connections that has worked loose due to vibration, etc. Loose parts are a definite hazard because they may fall out of place and damage nearby components. The importance of firm mounting and tight connections cannot be overemphasized. Always replace missing or broken bolts with proper size and use the correct tools.

ADJUSTING should be done when inspection indicates that it is required to maintain normal operating conditions. Specific adjustment is contained in the "Mechanical Adjustment Section" of this manual, the electrical manual or the component manfacturer's manual.

LUBRICATION refers primarily to the application of CORRECT LUBRICANT in the CORRECT AMOUNT to bearings and other rotating parts. It also means the application of a light oil to door hinges or other sliding surfaces. Use only clean and proper lubricant.

Planned maintenance, common sense and good judgment is less costly and more effective than panic maintenance. Action taken on recommendations made on the following suggested inspection Check List, or Lists by your maintenance department, should reduce repair, maintenance cost, and increase production.

Whenever a problem is indicated, the inspector should briefly explain it on the maintenance report (end of this section) along with his signature. Then, an authorized person should explain briefly a solution to the problem. Now, set a date and time to, and above all, CORRECT THE PROBLEM.

NOTES:

WEEKLY MECHANICAL INSPECTION

CRAWLERS:

1. Check all bolts for tightness

2. Any stress marks evident on any plates:
   Paint cracks or ripples?
   Actual distortion on plates?

3. Any cracks in any castings?

4. Are there any cracks in welds:
   Main joints vertical or horizontal?
   Reinforcing plate weld cracks?

5. Visually inspect all sprocket assemblies:
   Any cracks in castings?
   Any excess wear on sprockets?
   Are bearings in good condition?
   Any problem with shafting?
   Is the lubrication adequate?

6. Visually inspect all idler roller assemblies:
   Any cracks in castings?
   Any excess wear on rollers?
   Are bearings in good condition?
   Any problems with shafting?
   Is the lubrication adequate?
   Any problem with seals?

7. Are the guards all in place?

8. Are all the bolts secure?

9. Visually inspect the crawler belts:
   Any broken or cracked shoes?
   Excess wear on any shoes?
   Is the crawler belt tightness correct?
   Are the bolts tight in crawler pins?
   Any bent crawler shoe pins?