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(In order of appearance)

FUNCTIONAL HYDRAULIC SCHEMATICS

 S/N 760287 - 760402 (97760005 – Rev D)

 S/N 760403 and Above (97760009 – No Rev)

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EMERGENCY PUMP (24 Volts)

NOTE:

The Nordco TRIPP has AIR BRAKES, see the pneumatic manual section for emergency procedures for towing machine with no air pressure to overcome the spring applied parking brakes.

NOTE:

Two people are required for this operation, one person to operate the emergency pump and the other person to operate the machine controls.



CAUTION:

Check that all lock ups are disengaged for the components that need to be raised to their travel position.

1. Make sure the Battery Switch and Main Ignition Switch are turned on.
2. Turn on the emergency pump by holding the switch shown in (Figure 1) located under the propulsion manifold. Make sure the Circuit Breaker is pushed in.
3. Emergency Pump is located at right rear of machine on the machine's frame (Figure 2).

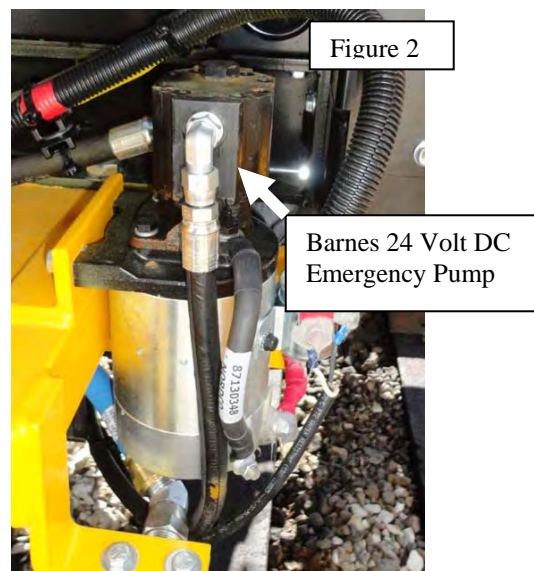
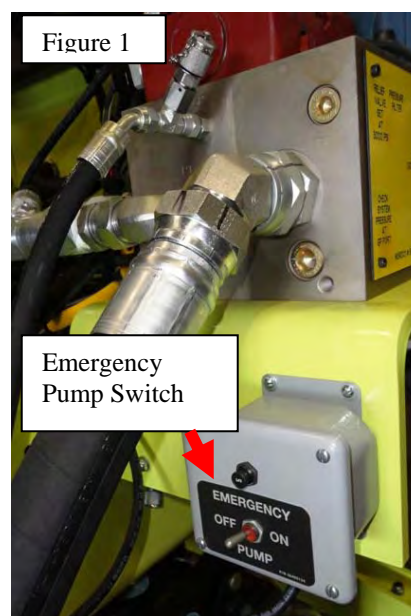


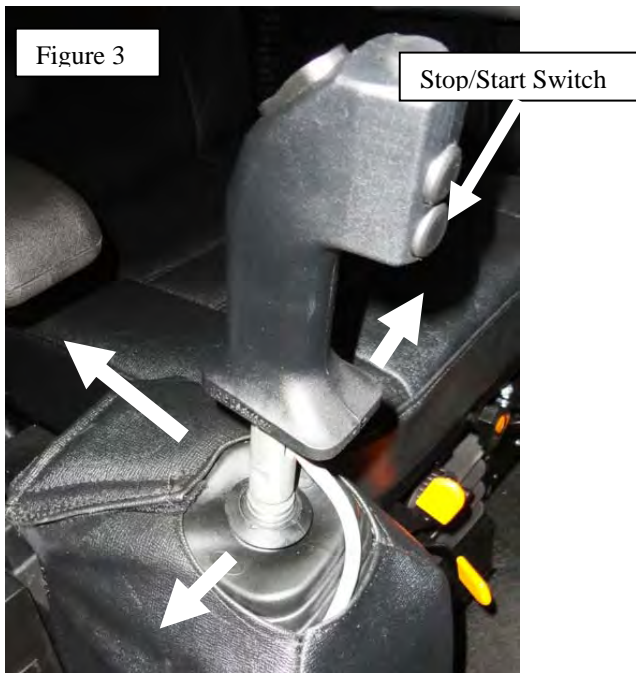
CAUTION:

Operate the emergency pump in intervals for a maximum of 15 seconds at a time. The emergency pump is designed for emergency use ONLY and is NOT to be run continuously.

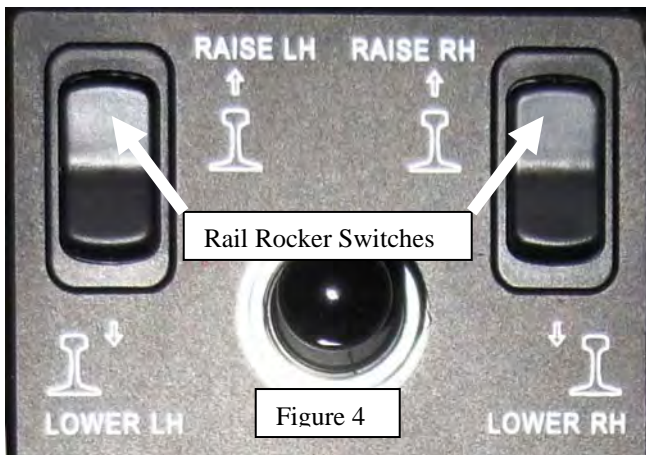
4. While the pump is running, pull back the Joystick Valve in the cab to raise the Tie Remover Work Head (Figure 3) and move the Joystick Valve to the left or right as necessary to retract the Tie Remover Work Head (Figure 3).
5. Press and release the Start/Reset Switch on the Joystick to open the Rail Clamps if necessary. See (Figure 3).

6. Press and hold the Raise Rail Lifter switches on the LH Operator Panel (Figure 4) to raise the Rail Lifter. Both switches must be pressed to raise both sides of the Rail Lift Work Head.
7. Release both switches when the Rail Lifter is raised completely.
8. After the Work Head and Rail Lifter have been raised and locked, turn off the emergency pump by releasing the toggle switch.
5. Engage air lock ups





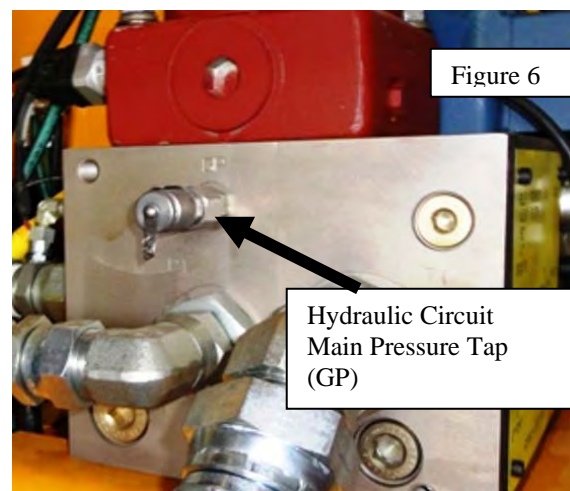
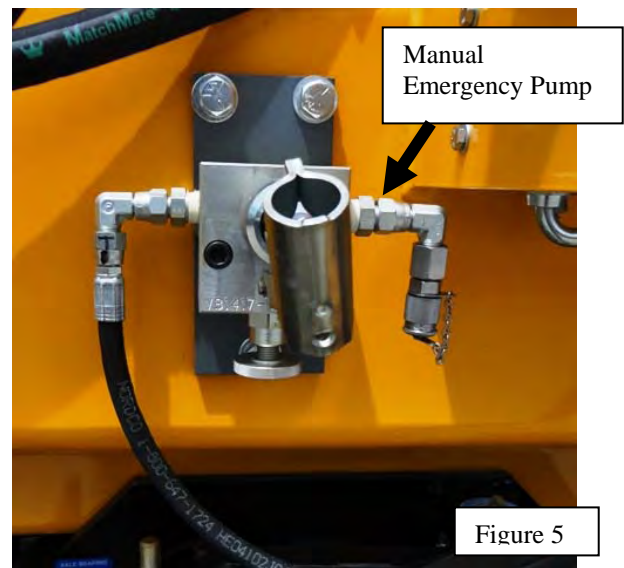
Move the Joystick **LEFT** or **RIGHT** to **RETRACT** the Work Head.
Pull the Joystick **BACK** to **RAISE** the Work Head.



EMERGENCY PUMP USE – MANUAL PUMP

1. Make sure the Battery Switch and Main Ignition Switch are turned on.
2. Attach one end of the hose (found in the tool box) to hand pump (Figure 5) and the other end of the hose to the main pressure tap on the propulsion manifold (Figure 6).

3. Pressurize the hand pump by moving the hand valve lever (lever with round knob) on the pump toward the pump and pull back the Joystick Valve in the cab to raise the Tie Remover Work Head (Figure 3) and move the Joystick Valve to the left or right as necessary to retract the Tie Remover Work Head (Figure 3).
4. Press and release the Start/Reset Switch on the Joystick to open the Rail Clamps if necessary. See (Figure 3).
5. Press and hold the Raise Rail Lifter switches on the LH Operator Panel (Figure 4) to raise the Rail Lifter. Both switches must be pressed to raise both sides of the Rail Lift Work Head.
7. Release both switches when the Rail Lifter is raised completely.
8. After the Work Head and Rail Lifter have been raised, engage air lock ups



HYDRAULIC COMPONENT SCHEDULE

Hydraulic Component Schedule					
Item	10 Hours (Day)	50 Hours (Week)	150 Hours (Month)	500 Hours (3 Months)	2000 Hours (6 Months)
Hydraulic Oil Level	I/F				
Oil Cleanliness	I			I/T	
Check Hydraulic Oil Filter Indicators (option)	I		I		
Check hoses & fittings for leaks	I	I*	I		
Check top off filter indicator Gauge (optional) while in use	I/R				
Oil Cooler			CL		
Pressure Checks			UT		
Test hydraulic oil cleanliness				I/R	
Replace pressure filter				I/R	
Replace return filter				I/R	
Replace case drain filter (option)				I/R	
Replace tank breathers				I/R	
Drain & replace oil in hydraulic tank					I/R
Inspect suction strainer element					I/R
Steam clean oil cooler					I/R

Key:

Some maintenance requires that a two step procedure be performed. For example, I/F requires inspection and Filling.

A = Adjust
L = Lube
F = Fill

C = Change
R = Replace

CL = Clean
S = Service

I = Inspect
T = Test

* Hydraulic filters require inspection during the first 40 hours of service and at designated Intervals thereafter.

☉ Monthly pressure checks are recommended. Fluctuation of hydraulic power may require more frequent checks.

SERVICE PARTS

Description	NORDCO Part Number
(Non Nordco P/N in parentheses):	
Suction Strainer (3879255) (2 Locations)	
Element	3894255
Gasket.....	35552965
Return Filter (3880323) (2 Locations)	
Element	3894289
Pressure Switch	5193975
Gasket Kit.....	(ALFT503)
Pressure Filter (3880256)	
Element	3894289
Pressure Switch.....	5193971
Case Drain Filter (3880351) (option)	
Element.....	3890145
Pressure Switch.....	5193969
Reservoir Breather/Air Relief Valve.....	1673250
Dual Top-Off Pump Push-Pull (option) (96760285)	
Element	1673250
Dual Top-Off w/Electric Pump (option) (460556)	
Element	3894262
Rotary Top-Off Pump Assy (option) (96760060)	
Element	(Zinga AE-10)
Pump Destroke Valve (54218493)	
Coil	25534036

Pressure Settings

GENERAL

Pressure to the various devices in the hydraulic system is controlled by the Compensator, Pressure Reducing Valves, Counterbalance Valves, and Relief Valves. It is important for the proper operation of the machine that pressures are maintained at the correct levels as shown below. . Adjustments may also be necessary anytime the machine is not operating normally. Test and adjust pressure as shown on the following pages.

PRESSURE SETTINGS

Left Pump Pressure Relief Valve	2500 PSI
Right Pump Pressure Relief Valve.....	2300 PSI

PROPULSION MANIFOLD

Main System Pressure Relief Valve.....	3000 PSI
Propel Cross Over Reliefs	2900 PSI
Joystick Pressure Relief Valve.....	750 PSI
Forward/Reverse Travel Pressure Switch.....	150 PSI

WORK HEAD ASSEMBLY MANIFOLD

Tie Remover Up/Down Cylinder Pressure Relief Valve.....	1000 PSI
Rail Lift Pressure Relief Valve.....	750 PSI

TIE GRIP MANIFOLD

Tie Grip Cylinder Pressure Relief Valve.....	1500 PSI
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Always turn off machine when performing maintenance, making adjustments, or whenever unintended movement of machine could occur; unless directed otherwise. Failure to comply could result in personal injury and/or damage to the machine.

LT/RT Pump Pressure Compensator

Turn OFF the engine and install a pressure gauge at the pressure tap on each of the two hydraulics pumps mounted on the rear of the engine (Figure 7). This allow a mechanic to adjust pump pressure in the event of system failure and to allow a mechanic to find out which pump is not operating correctly.

Start the engine and push the hydraulic pump rocker switch to the ON position.

If the pressure on the **RIGHT PUMP** (as viewed from the rear of the machine) is higher than 2300 psi loosen the lock nut on the right pump pressure compensator adjustment screw (Figure 8) and turn the adjusting screw counterclockwise (CCW) until pressure reads 2300 psi. Tighten lock at new location.

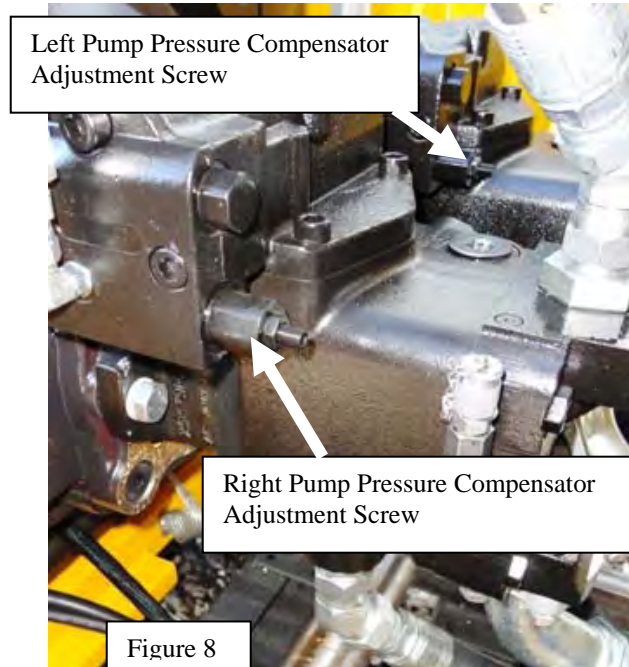
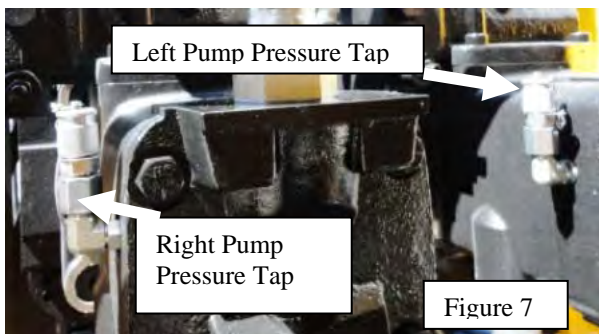
If pressure on the **RIGHT PUMP** (as viewed from rear of the machine) is lower than 2300 psi loosen (Figure 8) loosen the lock nut on the right pumps pressure compensator adjustment screw and turn the adjusting screw clockwise (CW) until pressure reads 2300 psi. Tighten lock nut at new location.

If the pressure on the **LEFT PUMP** (as viewed from the rear of the machine) is higher than 2500 psi loosen the lock nut on the left pump pressure compensator adjustment screw (Figure 8) and turn the adjusting screw counterclockwise (CCW) until pressure reads 2500 psi. Tighten lock nut at new location.

If pressure on the **LEFT PUMP** (as viewed from rear of the machine) is lower than 2500 psi loosen (Figure 8) loosen the lock nut on the left pump pressure compensator adjustment screw and turn the adjusting screw clockwise (CW) until pressure reads 2500 psi. Tighten lock nut at new location.

If the pressure readings for either or both pumps do not increase to their system operating pressure, the main system relief valve may require adjustment or repairs. The main system relief valve must be set to 3000 psi for proper operation.

2500 PSI IS SYSTEM PRESSURE!



MANIFOLD, PROPULSION

Main System Pressure Relief Valve 3000 PSI

The main hydraulic system pressure relief valve is located below the hydraulic high pressure filter (Right rear of machine) see (Figure 9). Turn off engine and install a pressure gage at the gage port labeled GP on Propulsion Manifold (Figure 9).

Loosen the main pressure relief valve labeled (RV) adjusting screw lock nut (Figure 9), and turn the adjusting screw all the way in clockwise (CW).

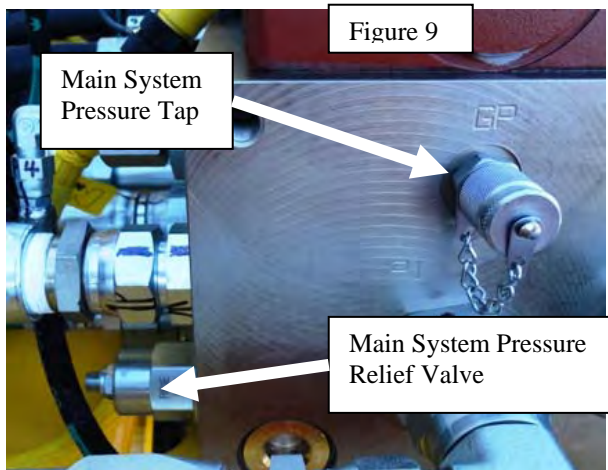
Turn on pump, gage should read 2500 psi (pump pressure). To set and adjust main system relief you need to adjust the LEFT pump pressure compensator pressure setting to 3000 psi (Figure 8).

With the LEFT pump pressure compensator set to 3000 psi. Turn main pressure relief valve adjustment screw (Figure 9) counterclockwise (CCW) until the diesel engine just begins to load up & the needle on the gage drops slightly, then turn back in clockwise (CW) a quarter of a turn (gauge will read about 3000 psi).

Tighten lock nut.

Return the LEFT Pump Compensator Pressure Relief back to 2500 psi.

2500 PSI IS SYSTEM PRESSURE!



Propel Cross Over Relief Valves Setting 2900 Psi



MAKE CERTAIN BRAKES ARE FULLY ENGAGED AND CAN HOLD MACHINE STATIONARY BEFORE CONTINUING WITH THESE ADJUSTMENTS.

FAILURE TO DO SO MAY CAUSE SEVERE BODILY HARM

Set parking brake and turn off the engine.

Turn main system pressure relief valve adjustment screw (Figure 9) to full clockwise position (maximum pressure).

Install a pressure gage on the pressure tap label **GA2** (FORWARD PROPEL) on the propulsion manifold (Figure 10).

Propel Cross Over Relief Valves are located on the right side behind the cab on the propel manifold assembly (Figure 11).

Turn both (RVA & RVB) crossover relief valve adjustments screws to full clockwise (CW) position (maximum pressure) (Figure 11).

Loosen LEFT Pump Pressure Compensating Screw lock nut (Figure 8).

Start engine, turn on the pump, and VERIFY that the brakes are ON.

Have operator Press **Forward** propulsion pedal in cab while checking that the pressure at (GA2) (Figure 10) is 2900 PSI.

If necessary, adjust pressure:

- Remove protective cover, loosen the locknut on RVA cross over relief valve (Figure 11).
- If pressure is less than 2900 PSI turn the cross over relief valve screw clockwise until the pressure on the gage reads 2900 psi.
- If pressure is more than 2900 PSI turn the cross over relief valve screw counterclockwise until the pressure on the gage reads 2900 psi.
- Tighten locknut and install protective cap.

Turn off the engine and pump.

Move the pressure gage from the pressure tap label **GA2** (FORWARD PROPEL) to the pressure tap label **GB2** (REVERSE PROPEL) on the propulsion manifold (Figure 10).

Start engine, turn on the pump, and VERIFY that the brakes are ON.

Have operator Press **REVERSE** propulsion pedal in cab while checking that the pressure at (GB2) (Figure 10) is 2900 PSI.

If necessary, adjust pressure:

- Remove protective cover; loosen the locknut on RVB cross over relief valve (Figure 11).
- If pressure is less than 2900 PSI turn the cross over relief valve screw clockwise until the pressure on the gage reads 2900 psi.
- If pressure is more than 2900 PSI turn the cross over relief valve screw counterclockwise until the pressure on the gage reads 2900 psi.
- Tighten locknut and install protective cap.

Stop engine and turn off pump.

Install the pressure gauge on the left pump pressure tap (Figure 7).

Start engine and turn on the pump.

Adjust left pump compensator counterclockwise (Figure 8) to system operating pressure (2500 psi). The system pressure is now controlled by the left pump's compensator.

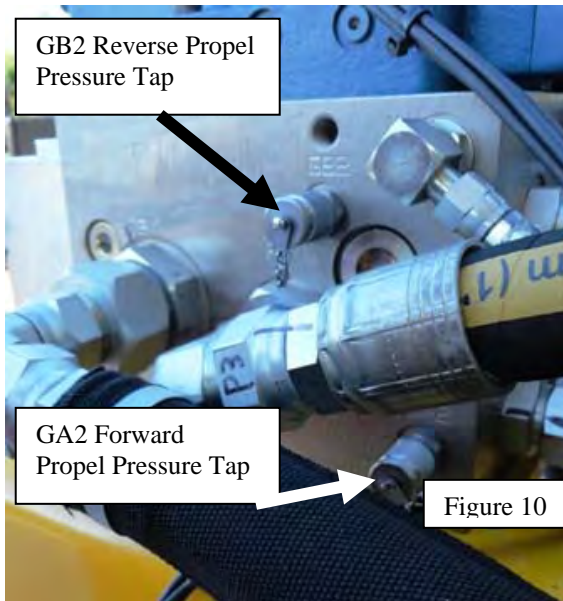


Figure 10

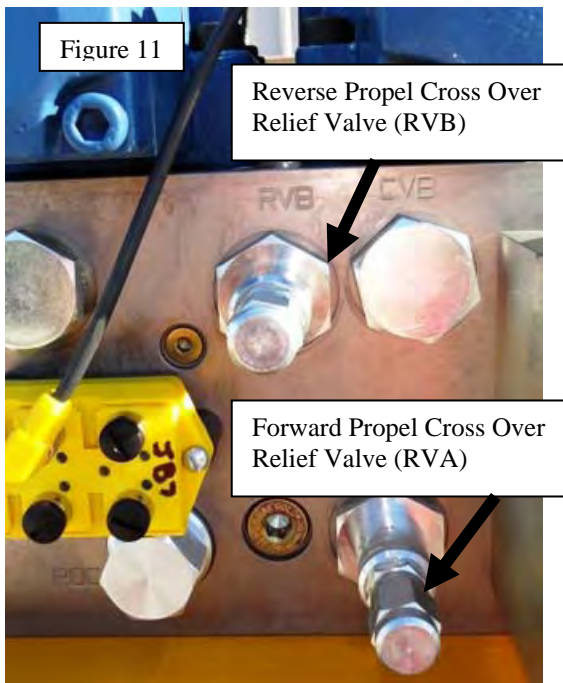


Figure 11

Up/Down Tie Remover JOYSTICK PRESSURE REDUCING VALVE 750 PSI

Located on frame under the propulsion valve.

Install a pressure gage on the tie remover up/down cylinder pressure reducing valve tap (Figure 12).

Start engine and turn on pump and read the pressure gage and it should 750 psi.

This joystick pressure reducing valve is factory set and is not adjustable.

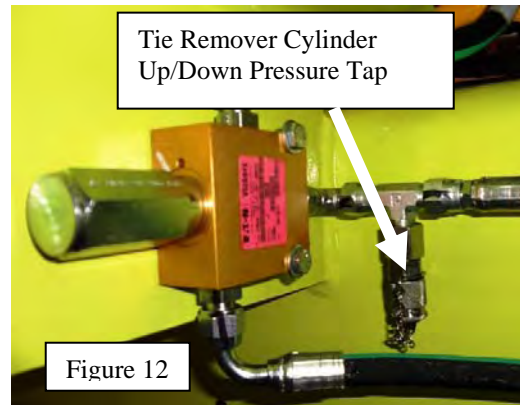


Figure 12

Propulsion (Towing) By Pass Valve

Two way valve that is locked in the closed position (Figure 12). If the Cribber needs to be towed the valve is turned 90 degrees CLOCKWISE to allow hydraulic oil to flow in a loop through the two propulsion motors to keep them lubricated.

NOTE: The handle on the By Pass Valve may have been removed and repositioned.

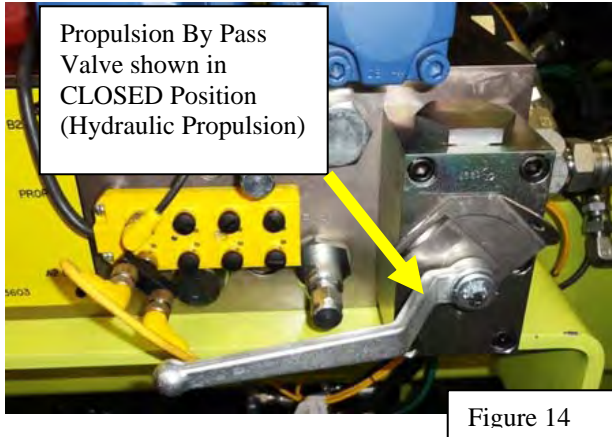
Figures 13 & 14 shows factory positions:

1. With the handle at 9:00 o'clock the Cribber will have hydraulic propel.
2. When the by pass valve is turned 90 degrees counterclockwise (12:00 o'clock), Cribber can be towed.

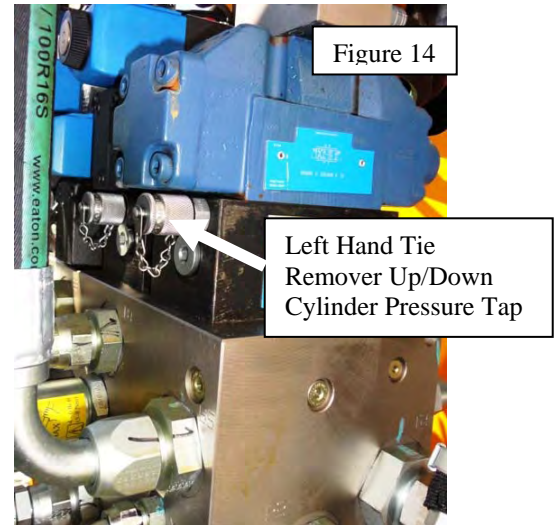
This valve is normally locked to prevent accidental by passing.



Figure 13

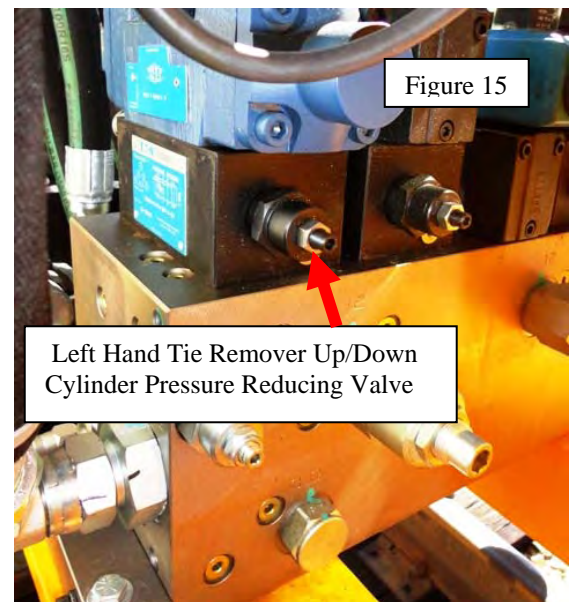
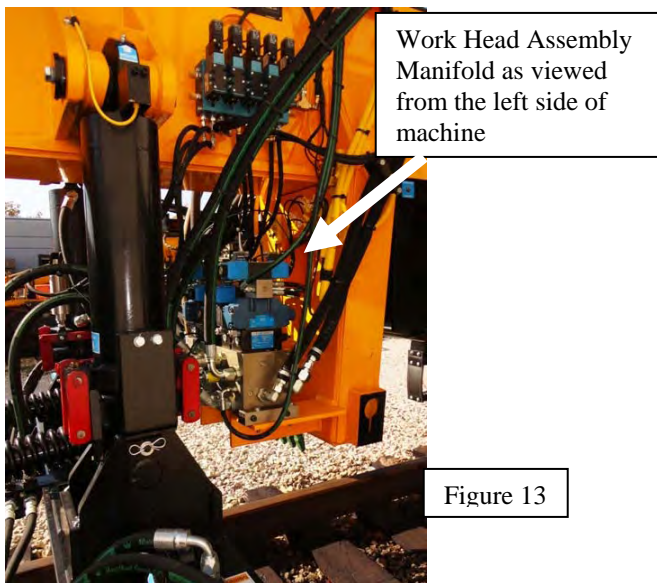


If pressure is lower than 1000 psi, loosen lock nut from pressure reducing screw (Figure 15). Turn the screw clockwise (CW) until pressure reads 500 psi. Tighten lock the nut.



MANIFOLD, WORK HEAD

Located under tripp frame behind rail lift mechanism (Figure 13).



Right or Left Hand TIE REMOVER UP/DOWN CYLINDER PRESSURE REDUCING VALVE 1000 PSI

Install a pressure gage on the tie remover up/down cylinder pressure reducing valve tap (Figure 14) located under tripp frame behind the rail lift mechanism.

Start engine and turn on pump and read the pressure gage and it should 1000 psi.

If pressure is higher than 1000 psi, loosen lock nut (Figure 15) from pressure reducing screw. Turn the screw counterclockwise (CCW) until pressure reads 500 psi. Tighten the lock nut.

Right or Left Hand TIE REMOVER UP/DOWN CYLINDER COUNTERBALANCE VALVE

Work Head up/down cylinder should not drift down while a tie is being removed or inserted.

To reset factory's initial setting, loosen lock not (Figure 16) and turn counterbalance valve adjusting screw clockwise (CW) all the way in. Then 3 turns counterclockwise (CCW) back out. Tighten lock nut.

If more adjustment is needed, adjust in ¼ turn increments.



Left Hand Tie Remover Up/Down
Cylinder Counterbalance Valve

Figure 16

Right/Left Hand RAIL LIFT PRESSURE REDUCING VALVE 750 PSI

Install a pressure gage on the rail lift pressure reducing valve tap (Figure 17) being checked.

Start engine and turn on pump.

Read the pressure gage and it should 750 psi.

If pressure is higher than 750 psi, remove protective cap (Figure 18) and loosen lock nut from pressure reducing screw. Turn the screw counterclockwise (CCW) until pressure reads 750 psi. Tighten the lock nut.

If pressure is lower than 750 psi, remove protective cap (Figure 18) and loosen lock nut from pressure reducing screw. Turn the screw clockwise (CW) until pressure reads 750 psi. Tighten lock the nut.

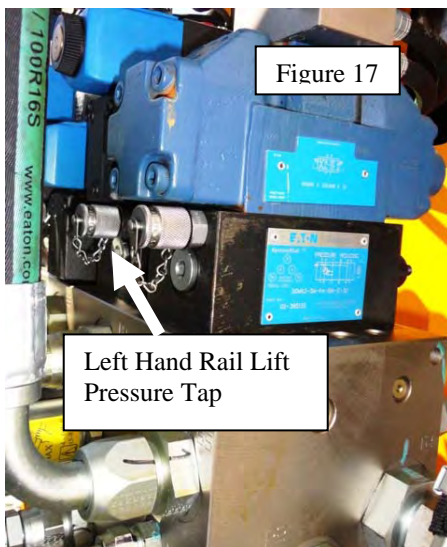


Figure 17

Left Hand Rail Lift
Pressure Tap

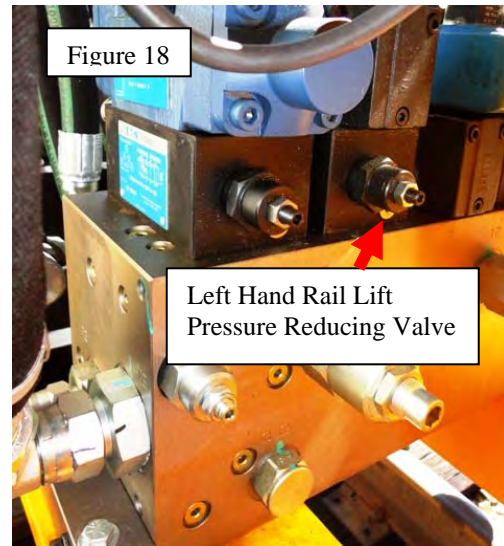


Figure 18

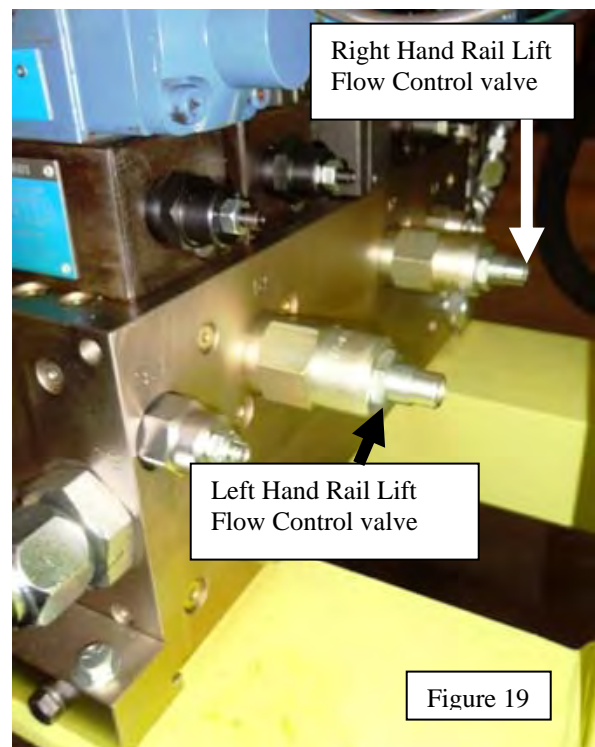
Left Hand Rail Lift
Pressure Reducing Valve

Left/Hand RAIL LIFT CYLINDER FLOW CONTROL VALVE

The rail lift cylinder flow control valve regulates the speed of the rail lift cylinder as it travels up and down.

To adjust the speed of a rail lift cylinder loosens up the lock nut (Figure 19). Turn adjusting screw clockwise to decrease flow or counterclockwise to increase flow (speed). Tighten lock nut.

Initial factory setting is turn adjusting screw clockwise (CW) all the way in, then 4 turns counterclockwise (CCW) back out.



Right Hand Rail Lift
Flow Control valve

Left Hand Rail Lift
Flow Control valve

Figure 19

MANIFOLD, TIE GRIP

As viewed from operator seat left hand tie grip manifold is located under the left hand tie remover up/down cylinder and the right hand tie grip manifold is located under the right hand tie remover up/down cylinder (Figure 20).

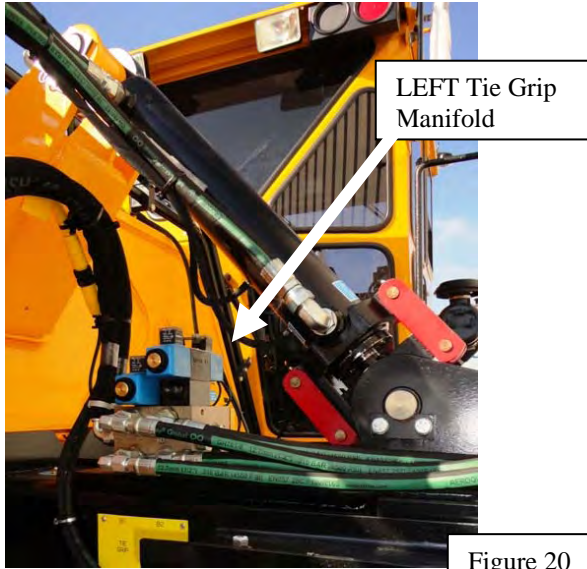


Figure 20

Left/Hand TIE GRIP TILT CYLINDER FLOW CONTROL VALVE

Tie grip tilt cylinder flow control valves regulates the speed of the cylinder as it travels in/out.

To adjust the speed of the tie grip tilt cylinder loosens up the lock nut (Figure 21). Turn adjusting screw clockwise to decrease flow or counterclockwise to increase flow (speed). Tighten lock nut.

Initial factory setting for both (up or down) flow controls is turn adjusting screw clockwise (CW) all the way in, then 4 turns counterclockwise (CCW) back out.

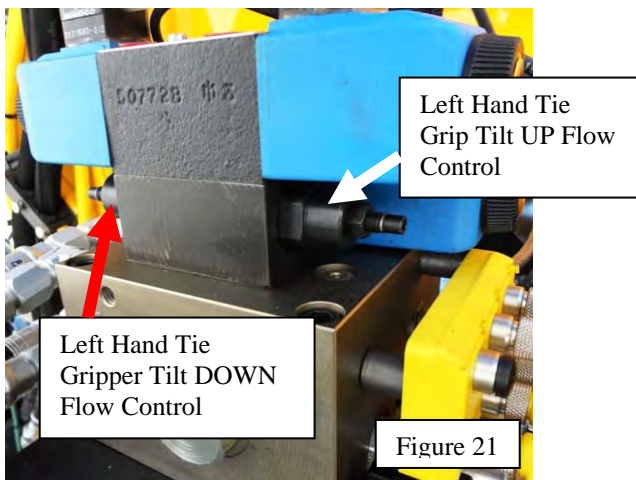


Figure 21

Left/Hand TIE GRIP CYLINDER PRESSURE REDUCING VALVE (Low Position) 1500 PSI

Install a pressure gage on the tie grip cylinder pressure tap (Figure 22) that is being tested.

Start engine, turn on pump and turn the grip force switch counterclockwise to the low position and read the pressure gage and it should 1500 psi.

If pressure is higher than 1500 psi, remove protective cap (Figure 23) and loosen lock nut from pressure reducing screw. Turn the screw counterclockwise (CCW) until pressure reads 1500 psi. Tighten the lock nut.

If pressure is lower than 1500 psi, remove protective cap (Figure 23) and loosen lock nut from pressure reducing screw. Turn the screw clockwise (CW) until pressure reads 1500 psi. Tighten lock the nut.



Figure 22

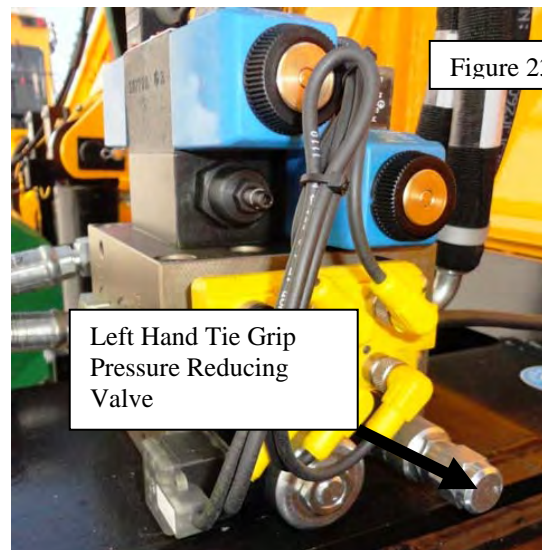


Figure 23

PROPEL PRESSURE SWITCH

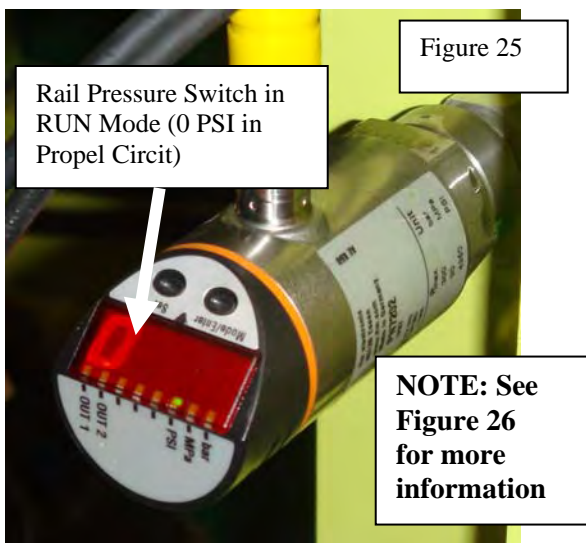
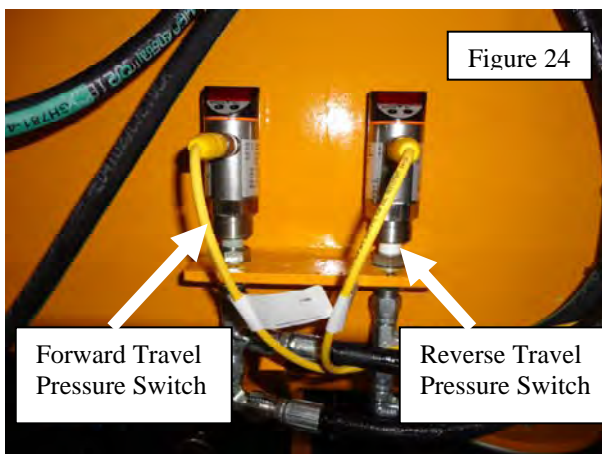
Normally open switches, are set at 150 psi (Figure 24) and are located on the right side (rear) beneath the propulsion manifold .

The **LEFT** Pressure Switch reads the hydraulic pressure in the **forward** propel hydraulic Line and the **RIGHT** Pressure Switch reads the hydraulic pressure in the **reverse** propel hydraulic Line.

When more than 150 psi is in either propel hydraulic circuit the switch closes and the following occurs:

1. Releases the brakes in DEADMAN MODE
2. Turns OFF brake lights
3. Turns ON reverse direction travel alarm

When the pressure sensor is on, the normal mode of operation is RUN mode, which shows the current pressure of the system (Figure 25).



USING THE EFECTOR 500 PRESSURE SENSOR TRIPLE REDUNDANCY SYSTEM.

Pressure sensor w/fault indicator, pressure gauge with min/max indicated, box with green and red lights indicating status of pressure/torque in screw motors.

Please note that there are time limits preset within the sensor that require you to perform the set functions within 15 seconds or else the sensor will set itself back unchanged.

To set the parameters of the sensor:

1. Press MODE/ENTER (Figure 24 item 5) once to get to the display mode.
2. Press MODE/ENTER until you get to the parameter that you need to reset.
3. Press SET (Figure 24 item 4) once to see the parameter value.

This value is displayed for 15 seconds. (If you do not enter any value during that time, the sensor returns to Run mode and you have to start over.)

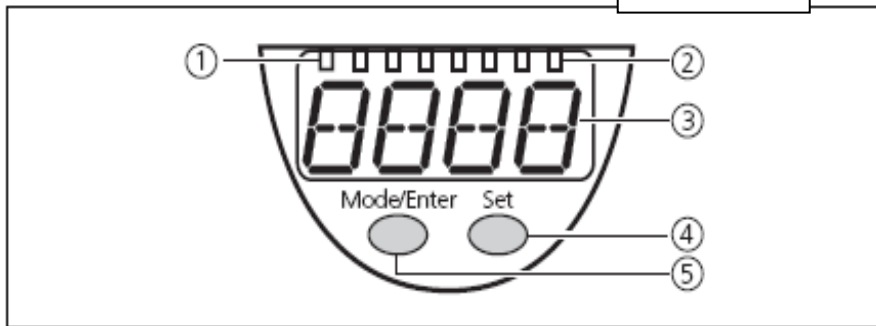
4. Once the parameter value is on the screen, press and hold the SET button. This will cause the value to start blinking for 5 seconds. When this happens, you can reset the value by increments by pressing and releasing the set button until the correct setting appears, or by holding the Set button and scrolling through the settings.

Note: The unit is programmed to increase the setting from the current, until maximum setting is reached and then will start at the lowest setting.

5. Once the new setting has been reached, press the MODE/ENTER button briefly. The parameter is displayed again and the new value is set.
6. Repeat as necessary for additional changes.
7. When changes are complete, wait 15 seconds to go back to the RUN mode. (It's faster than going through the entire menu again).
8. To lock out the sensor so that "accidental" changes cannot be made to it: Press and hold both the MODE/ENTER button and SET button until "Loc" is displayed. (To unlock, press and hold both buttons until "uLo" is displayed)

Refer to the next page or to the Efector Manual behind the "Other" Tab at the back of this manual for more information regarding this sensor.

Controls and indicating elements Figure 26



①	3 (4) x LED green	Lighting LED = set display unit.
②	2 x LED yellow	Switching status; lights if the respective output has switched.
③	4-digit alphanumerical display	Display of the system pressure, display of parameters and parameter values.
④	Set button	Setting of the parameter values (scrolling by holding pressed; incremental by pressing briefly).
⑤	Mode / Enter button	Selection of the parameters and acknowledgement of the parameter values.

The pressure sensor has Nordco factory set minimums and maximums, which are as follows:

PARAMETER (as displayed)	DESCRIPTION	SETTING
SP1	Maximum Pressure – High Limit Value	1460 psi
rP1	Maximum Pressure – Low Limit Value	1400 psi
OU1	Configuration of Green LED Output	Hno
SP2	Minimum Pressure – High Limit Value	2000 psi
rP2	Minimum Pressure – Low Limit Value	1940 psi
OU2	Configuration of Red LED Output	Hno
EF (Enhanced Functions)	Hit the set button to access the functions below:	
dS1	Switch On Delay for Green LED on Torque Monitor Box	0.0 sec
dr1	Switch Off Delay for Green LED on Torque Monitor Box	2.0 sec
dS2	Switch On Delay for Red LED on Torque Monitor Box	0.0 sec
dr2	Switch Off Delay for Red LED on Torque Monitor Box	2.0 sec
P-n	Output polarity	Pnp
dAP	Damping	30
diS	Setting of the display	dl
Uni	Display unit	PSI
	Electronically locking active?	YES

Suction Line Filter

This machine is equipped with a lockout device as a replacement for a handle on both suction strainers. This lockout prevents the valve from being opened or closed without the operator’s knowledge.

Suction line strainers are located on the rear side of the two hydraulic reservoirs (Figure 27) shows the right reservoir.

Remove and inspect the filter after the first 40 hours of operation and every month thereafter. Clean as required.

To access suction line filter cartridge:

1. Turn off engine.
2. Remove Lock out device & plug (Figure 28).
3. Turn socket head cap screw (Figure 26) counter clockwise (OUT) till it stops. Do not try removing screw!
4. Remove the six front cover cap screws and lift off the front cover.
5. Remove and clean suction line strainer.
6. When suction line strainer is cleaned reinstall.
7. Install front cover and six cap screws.
8. Turn socket head cap screw (Figure 26) clockwise (IN) till it stops.
9. Replace the plug.
10. Put padlock (Lockout) back on and secure.

NOTE:

If for any reason removal of suction line filter for any length of time is necessary, you must seal the hydraulic tank to prevent external contamination.



Figure 27

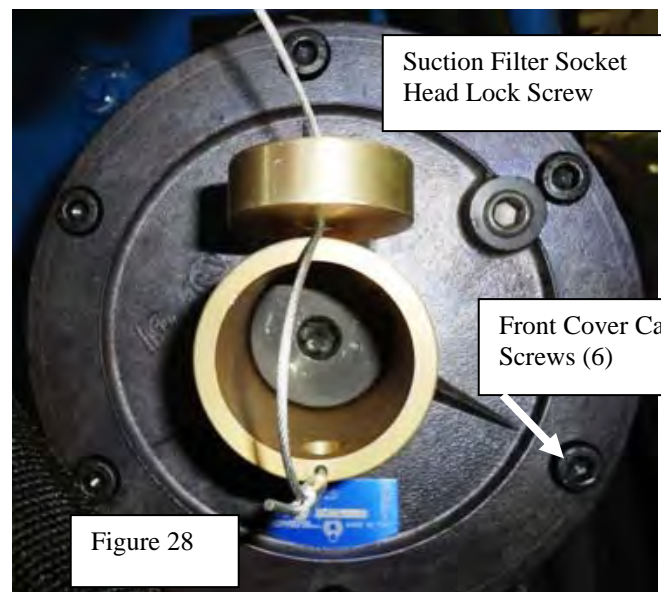


Figure 28

TROUBLESHOOTING

Particularly after start-up of an installation, components should be checked regularly at short intervals for correct operation and possible leakage.

INSPECTION

Inspect the hydraulic system for clues to the malfunction. Check to see if the unit can be operated without further damage. If not, shut down machine immediately. Always check these items before starting the machine:

1. Check hydraulic oil level.
2. Look for loose or disconnected hoses. An oil spot below the machine is a good indication of a loose hose or hydraulic component.
3. Make certain shut-off valve on suction strainer is OPEN. Opening valve can often correct what appears to be a malfunction.
4. Inspect all vital hose connections, especially at main pump and the main pump hose connection at the manifold.
5. Look for cover damage and/or indications of twisted, worn, crimped, brittle, cracked, or leaking hoses. Hoses with their outer cover worn through or otherwise damages should be considered unfit for further service.



Tighten fittings only when system is not pressurized. High pressure leaks can cause personal injury.

While machine is running, and before working, inspect for leaks. If the machine has not been run for some time, oil may thicken causing a variety of malfunctions. If this is true, make certain that the oil tank has been properly drained, cleaned and refilled.

If your visual inspection does not indicate the possible malfunction, refer to the troubleshooting guide that follows.

FLUID CONTAMINATION

Contamination comes in many forms. It may be air, water and cutting oils, rust, chips and grit. It is usually easier to keep contaminants **out** of a system rather than remove them after they are **in** the system.

Bulk handling and the re-use of oil containers almost guarantees you that "new" oil will be dirty. Make it a practice to filter all "new" oil before adding it to your system. Make it another practice to change filters on a regular basis **before** they become clogged.

LOCATING LEAK SOURCES

Petroleum oils are used in most hydraulic application to lubricate parts as well as transmit power. As oil temperature increases, however, the lubricating film thins out. The result is rubbing parts supported by the oil film move closer together; friction and wear increase; seal materials age more quickly, become stiff and hard, and may readily permit leakage.

The first step in locating leaks is to eliminate the possibility that an over-filled reservoir or spill created the "suspected" leak. The next step would be to clean the suspected area and watch. Leaks usually occur in fittings, hoses, O-rings, and other seals.

Most leaks occur at fittings, but too often, finding the fitting that is leaking is difficult because the fluid runs along the hose and drips off at some other point.

Leaks in high pressure lines sometimes are difficult to pin-point because the fluid comes out as a mist. Once you find the location of a leak, the specific cause has to be determined before it can be corrected. A scratch in a fitting seat or a cut in a seal lip that is big enough to leak excessively can still be too small to find with the naked eye. The use of a magnifying glass would assist you.

HOSE LIFE

Hose leakage or failure many times occurs where the end fitting grips the hose. Check the system for pressure spikes or surge. If bulges or bubbles occur on a flexible hose, a leak is taking place within the layers. The hose should be replaced.

High oil temperatures (over 200 degrees Fahrenheit, 93 degrees Celsius) quickly harden or stiffen a rubber hose. When pressure pulses flex a hardened hose, it fails by cracking. Every increase of 25° F (14° C) cuts hose life in half. Use a replacement hose rated for actual fluid temperatures. Keep a log of hose use so replacement can be made before failure occurs.

If a hose is installed with a twist in it, high operating pressures tend to force it straight. This can loosen the fitting or even burst the hose at the point of the strain.

HYDRAULIC SYSTEM TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSE	SOLUTION
Hydraulic pump does not develop pressure	<p>No hydraulic oil in tank (NOTE: if pump is run without oil in tank, pump damage will occur.)</p> <p>Shut-off valve closed. (NOTE: if pump is run with valve closed, pump damage will occur.)</p> <p>Main relief valve bypassing. (NOTE: oil blowing past any relief valve can cause oil to overheat.)</p> <p>Main pump compensator setting is too low.</p> <p>Pump is defective.</p> <p>Destroke valve stuck.</p> <p>Pump switch turned off.</p>	<p>Check oil level. Refill tank.</p> <p>Open valve completely.</p> <p>Increase pressure setting on relief valve. (See Pressure checks)</p> <p>Adjust compensator setting. (See Pressure Checks)</p> <p>Refer to pump manual or replace pump.</p> <p>Repair or replace.</p> <p>Turn on.</p>
Hydraulic pump excessively noisy	<p>Cold oil.</p> <p>Low oil level.</p> <p>Oil viscosity too high (oil too thick)</p> <p>System relief valve set too low.</p> <p>Intake hose to pump restricted.</p> <p>Defective pump.</p>	<p>Allow unit to warm up.</p> <p>Check and add oil.</p> <p>Drain and add correct oil as specified under "RECOMMENDED LUBRICANTS".</p> <p>Increase pressure setting on relief valve (see Pressure Checks)</p> <p>Inspect and repair.</p> <p>See pump manual, repair or replace pump.</p>
Hydraulic Oil Overheats	<p>Oil viscosity too high (oil too thick)</p> <p>System relief valve set too low.</p> <p>Oil lines damaged causing excessive internal restriction</p> <p>Travel relief set too low</p>	<p>Drain and add correct oil as specified under "RECOMMENDED LUBRICANTS".</p> <p>Increase pressure setting on relief valve (see Pressure Checks)</p> <p>Inspect and repair.</p> <p>Check and reset</p>

PROBLEM	POSSIBLE CAUSE	SOLUTION
<p>Hydraulic Oil Foams</p>	<p>Water in oil</p> <p>Using wrong oil</p> <p>Low hydraulic level</p> <p>Damaged hydraulic oil lines</p> <p>Air leak in suction line to hydraulic pump or pump shaft seal leaking</p>	<p>Inspect oil for water. Drain and add correct oil as specified under "RECOMMENDED LUBRICANTS".</p> <p>Drain and add correct oil as specified under "RECOMMENDED LUBRICANTS".</p> <p>Fill</p> <p>Inspect, repair or replace.</p> <p>Inspect, repair or replace.</p>
<p>Hydraulic Oil Filter Restriction Indicator Light stays on all the time (optional equipment)</p> <p>Note: Hydraulic oil must be close to operating temperature (not cold) otherwise indicator may light up</p>	<p>Restricted hydraulic oil filter.</p> <p>Hydraulic oil filter restriction switch</p>	<p>Replace filter.</p> <p>Replace switch.</p>
<p>Machine will not propel</p>	<p>Brakes on/not releasing</p> <p>(Towing) Propulsion By Pass Valve is OPEN</p> <p>Hydraulic pump not developing pressure</p> <p>Main relief is defective – debris in valve allowing fluid back to tank</p> <p>One or both counterbalance valves is defective – debris in valve allowing fluid back to tank</p> <p>Defective hydraulic motor</p> <p>Propel directional control valve spool will not shift</p>	<p>See air brake section in pneumatic section.</p> <p>CLOSE (Towing) Propulsion By Pass Valve</p> <p>Inspect, repair, or replace hydraulic motor.</p> <p>Inspect, repair, or replace main relief valve.</p> <p>Debris in valve, disassemble, inspect, clean, repair, or replace valve.</p> <p>Disassemble, inspect, clean, repair, or replace motor.</p> <p>Disassemble, inspect, clean, repair, or replace motor.</p> <p>.</p>

PROBLEM	POSSIBLE CAUSE	SOLUTION
Excessive noise and/or vibration	Insufficient hydraulic fluid cause cavitation Air in hydraulic system Hydraulic fluid viscosity above acceptable limits	Check and add fluid to hydraulic tank Purge air, tighten fittings, and check inlets for leaks. Allow hydraulic oil to reach operating range.
Multiple Actuators response are sluggish	Check system relief valve Check pump pressure compensator setting Internal system leaks Hydraulic fluid viscosity above acceptable limits Check the actuators manifold or valves	System relief valve must be above pump pressure compensator setting Check and adjust Worn internal parts in pump Inspect & repair Allow hydraulic oil to reach operating range. Disassemble and repair
An individual work head (operation) function is slow or does not work	Check pressure reducing setting for that operation Directional control valve spool not shifting	See Hydraulic Instructions Disassemble, inspect, repair or replace valve.

Post-Troubleshooting

After troubleshooting and eliminating the problems, be sure to follow correct procedures in restarting the machine. The items to be checked include the following:

- ✓ check to ensure replaced components are the correct units,
- ✓ ensure hydraulic connections are correct and tightened,
- ✓ ensure electrical connections are correct and tight,
- ✓ be sure pump and hydraulic motor housing cases are filled with clean oil (if required),
- ✓ properly set adjustable components,
- ✓ remove electrical interlocks,
- ✓ alert personnel to stand clear before starting the machine, and
- ✓ after the system is running, bleed the air and set the pressures to the proper settings.

Effective hydraulic system maintenance and troubleshooting is critical to reducing your hydraulic system downtime. While these guidelines do not address every possible problem, they offer a basic day-to-day approach to troubleshooting your hydraulic system.