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DRAWINGS (In order of appearance)

FUNCTIONAL HYDRAULIC SCHEMATICS

S/N 720131 and Above	(97720011)
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EMERGENCY PUMP USE – ELECTRIC PUMP

Tools And Equipment Required For These Procedures:

- 3/4-Inch Combination Wrench
- Company Furnished Padlock
- Pump Hose (Found In Toolbox)
- Lock Pins (Found In Toolbox)

For All Components Except Brakes:

1. Turn ignition switch to the OFF position.
2. Attach one end of the hose (found in the toolbox) to the pressure port on the emergency pump. Attach the other end of the hose to the quick disconnect at the brake valve (Figure 2).

Emergency Pump Pressure Port Quick Connect



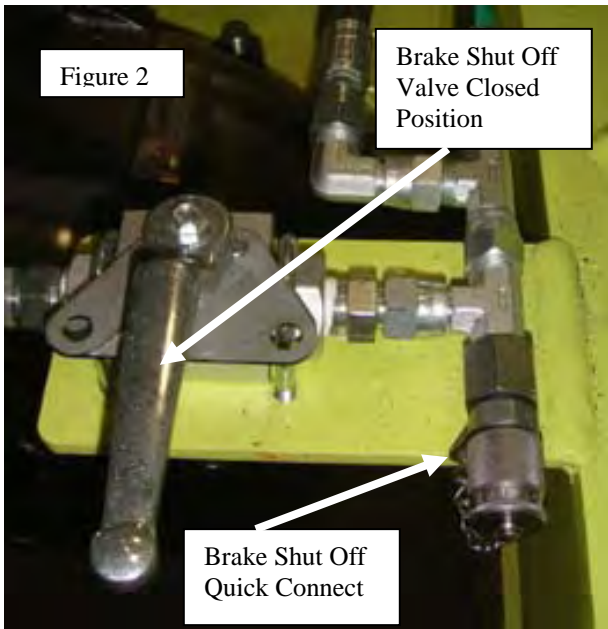
Figure 1

3. Pressurize the hydraulic system by turning on the emergency pump switch located left side/front of machine.
4. Operate 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. Raise all components to the point where you can insert lockups. Insert lockup pins.
5. Continue on to lock off brakes for towing.

Figure 2

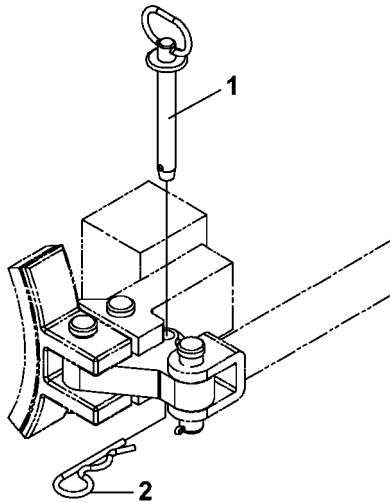
Brake Shut Off Valve Closed Position

Brake Shut Off Quick Connect



For the Hydraulic Brakes:

6. With the machine on level track, chock ALL wheels to prevent movement.
7. Close the Brake Shut Off Valve at the front right drive wheel valve, behind fuel tank and lock in the CLOSED position. (CLOSED is perpendicular to the hose line, OPEN is parallel to the hose line (Figure 2). Attach one end of the hose (found in the toolbox) to the quick disconnect at the brake shut off valve and attach the other end of the hose to the emergency pump quick disconnect (Figure 1).
8. Turn on the emergency pump switch at the control box (left side/front of machine) until the both hydraulic brake cylinders have collapsed and the brakes are released.
 9. Install the lockpins (1) and hairpin cotters (2) as shown in drawing to right.
 10. Turn off emergency pump, remove hose and wheel chocks, and perform towing as required.
 11. Once you have towed to a site to perform maintenance on the hydraulic system, open the ball valve (closed under step 7) and lock in the OPEN position.

**EMERGENCY PUMP USE – MANUAL PUMP**

Tools And Equipment Required For These Procedures:

¾-Inch Combination Wrench
 Company Furnished Padlock
 Hand Pump Hose (Found In Toolbox)
 Lockpins (Found In Toolbox)



For All Components Except Brakes:

1. Turn ignition switch to the OFF position.
2. Attach one end of the hose (found in the toolbox) to hand pump and the other end of the hose to the quick disconnect at the brake lock valve.
3. Pressurize the hand pump by moving the hand valve lever (lever with round knob) on the pump toward the pump.
4. Continue pumping until all components are raised to the point where you can insert lockups. Insert lockup pins.
5. Continue on to lock off brakes for towing.

For the Hydraulic Brakes:

8. With the machine on level track, chock ALL wheels to prevent movement.
9. Close the Brake Shut Off Valve at the front right drive wheel valve, behind fuel tank and lock in the CLOSED position. (CLOSED is perpendicular to the hose line, OPEN is parallel to the hose line.)
10. Attach one end of the hose (found in the toolbox) to the hand pump. Attach the other end of the hose to the quick disconnect at the brake valve.
11. Pressurize the hand pump by moving the hand valve lever (lever with round knob) on the pump toward the pump.
12. Continue pumping until the hydraulic brake cylinder has collapsed and has released the brakes.
13. Install the lockpins (1) and hairpin cotters (2) as shown in drawing above.
14. Release hand pump pressure by moving the hand valve lever on the pump away from the pump, , remove hose and wheel chocks, and perform towing as required.
14. Once you have towed to a site to perform maintenance on the hydraulic system, open the Brake Shut – Off Valve

HYDRAULIC COMPONENT SCHEDULE

<i>Hydraulic Component Schedule</i>					
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 			 T		
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 C = Change CL = Clean I = Inspect
 L = Lube R = Replace S = Service T = Test
 F = Fill

* 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
Filters (Non Nordco P/N in parentheses):	
Suction Strainer (3879255)	
Element	3894255
Gasket.....	35552965
Return Filter (3880323)	
Element	3894289
Pressure Switch	5193975
Gasket Kit.....	(ALFT503)
Reservoir Breather	
Element.....	1673251
Relief Valve.....	1677206
Pressure Filter (3880252)	
Element	3894289
Pressure Switch.....	5193970
Case Drain Filter (3880353) (option)	
Element	3890145
Reservoir Breather/Air Relief Valve	1673250
Reservoir Breather – Used with Dual Top Off Pump Assy – Silica Jell (BNSF option)	
Breather.....	1673252
Dual Top-Off Pump Push-Pull (option) (96310020)	
Element	3894262
Dual Top-Off w/Electric Pump (option) (460556)	
Element	3894262
Rotary Top-Off Pump Assy (option) (96310042)	
Element	(Zinga AE-10)

HYDRAULIC ADJUSTMENTS

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

Propulsion Manifold	
Main System Pressure (Pump Pressure Compensator)	2450 PSI
Main Pressure Relief	3000 PSI
Propel Cross Over Reliefs	2900 PSI
Rail Lift Manifold	
RT/LT Work Head Assy Raise/Lower Pressure Reducing.....	500 PSI
RT/LT Rail Clamp Open/Close.....	4750 PSI
Joystick Pressure Reducing.....	1500 PSI
RH/LH Work Head Manifold	
Work Head Up/Down Pressure Reducing.....	1000 PSI
Tie Grip In/Out Pressure Reducing.....	2000 PSI
Finger Lift Up/Down Pressure Reducing Valve.....	700 PSI
Flip Up/Down Pressure Reducing	700 PSI
Tie Grip Pin Lift Pressure Reducing.....	700 PSI
Plate Box Pressure Reducing.....	1250 PSI
Plate Insert In/Out Pressure Reducing.....	1550 PSI
Plate Insert (Pilot Operated Valve) Pressure Reducing	600 PSI
RT/LT (At Rail) Pressure Switch	1450 PSI
Emergency Pump Relief Valve	
MacBone Air Conditioner Pressure Relief	1500 PSI
	2500 PSI



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.

INSTRUCTIONS

PROPULSION MANIFOLD

Pump Pressure Compensator 2450 PSI

Install a pressure gage on the pressure tap label (G P) on the propulsion manifold (Figure 2).

Turn on pump and read pressure.

Loosen pump pressure compensator adjusting screw lock nut (Figure 1).

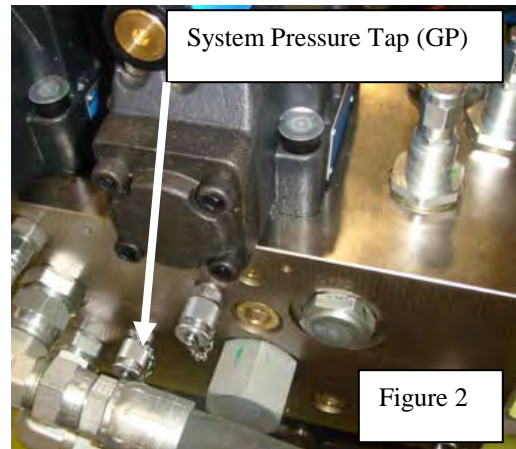
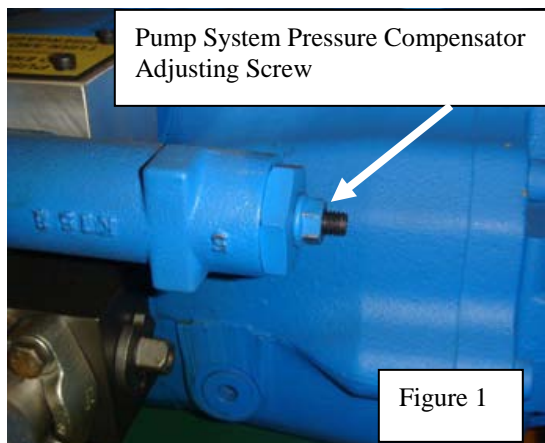
If pressure is higher than 2450 psi, turn adjusting screw counterclockwise (CCW) until pressure reads 2450 psi. Hold adjusting screw at new location while tightening lock nut.

If pressure is lower than 2450 psi, turn adjusting screw clockwise (CW) until pressure reads 2450 psi. Hold adjusting screw at new location while tightening lock nut.

If the pump pressure compensator adjustment does not increase to 2450 psi the main system relief may require adjustment/repair. The main system relief is set to 3000 psi for proper operation.

THIS IS SYSTEM PRESSURE!

When adjusting Main Pressure Relief and/or Cross Over Relief(s) always return Pump Pressure Compensator back to 2450 psi.



Main Pressure Relief valve 3000 PSI

Install a pressure gage on the pressure tap label (GP) on the propulsion manifold (Figure 2).

On the propulsion manifold opposite side of the pressure tap is the Main Relief Valve (RVP) (Figure 3). Remove protective cap and loosen lock nut on relief valve adjusting screw and turn relief valve adjusting screw to full clockwise (CW) position (maximum pressure).

Loosen PUMP COMPENSATOR adjusting screw lock nut (Figure 1).

Turn pump pressure compensator adjusting screw counterclockwise (CCW) (about 2-3 turns), but do not remove screw. Leave enough thread engagement to prevent leakage. Start engine and turn on the Pump.

Turn pump compensator adjusting screw clockwise (CW) until 3000 psi has been reached. Read this pressure at the (GP) (Figure 2) pressure tap on the propulsion manifold.

Turn main relief valve adjusting screw (RVP) (Figure 3) counterclockwise (CCW) until pressure at gauge just begins to drop. This is considered cracking pressure. Turn back 1/8 of a turn and tighten nut on valve.

Return Pump Pressure Compensator to 2450 psi (see above).

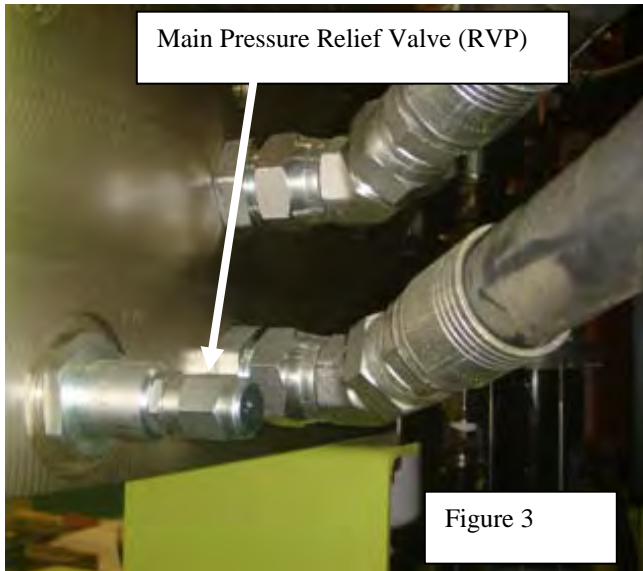


Figure 3

Propel Cross Over Relief 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

Turn Brake Shut –Off valve (above LH Front drive wheel) to **CLOSED** position to disable brakes. Handle will be perpendicular to hose (Figure 5).

Install pressure gage on the pressure tap label (**GP**) on the propulsion manifold (Figure 2) and on the pressure tap label **GB** (reverse propel) on the propulsion manifold (Figure 4).

Turn both (RVA & RVB) crossover relief valve adjustments screws to full clockwise (CW) position (maximum pressure) (Figure 4).

Loosen System Pressure Compensating Screw lock nut (Figure 1).

Start engine and turn on the Pump.

Turn pump compensator adjusting screw (Figure 1) clockwise (CW) until 2900 psi has been reached. Read this pressure at the (GP) pressure tap on the propulsion manifold (Figure 2).

Manually override the propel reverse directional control valve (B) by pushing in the **push pin** (Figure 6) while adjusting (**RVB**) valve counterclockwise (CCW) until pressure at gauge just begins to drop. This is

considered cracking pressure. Turn back 1/8 of a turn and tighten locknut. Turn off pump and engine. Move pressure gage to the pressure tap label **GA** (forward propel) on the propulsion manifold.

Manually override the forward directional control valve (A) by pushing in the **push pin** (Figure 6) while adjusting (**RVA**) valve counterclockwise (CCW) until pressure at gauge just begins to drop.

Adjust pump pressure compensator adjusting screw counterclockwise (CCW) to system operating pressure (2450 psi). Tighten lock nut on adjusting screw.

Open Brake Shut-Off Valve

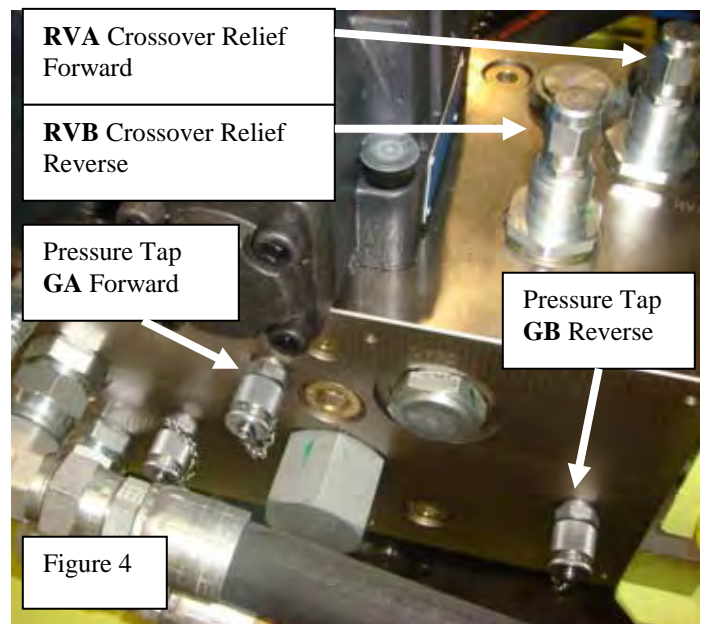


Figure 4

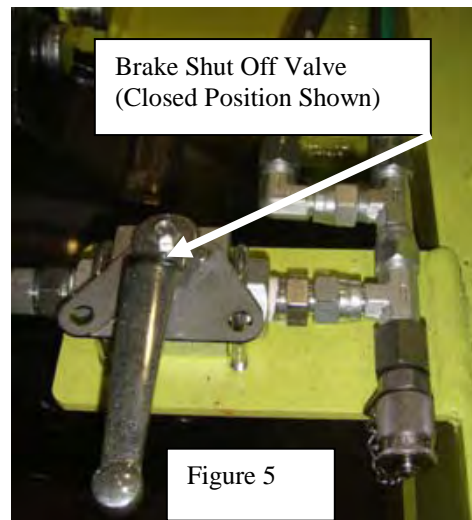
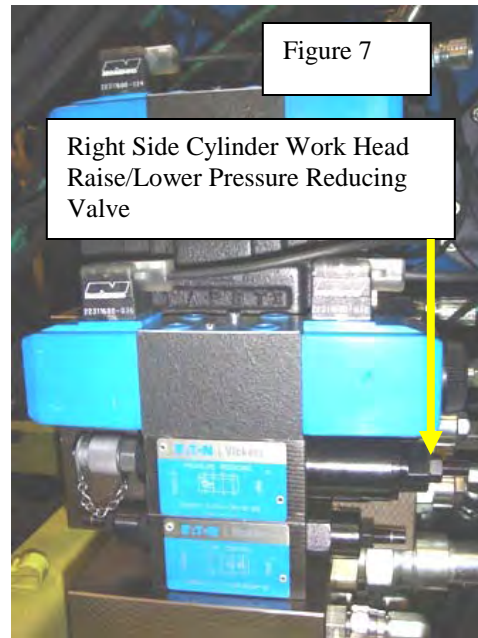
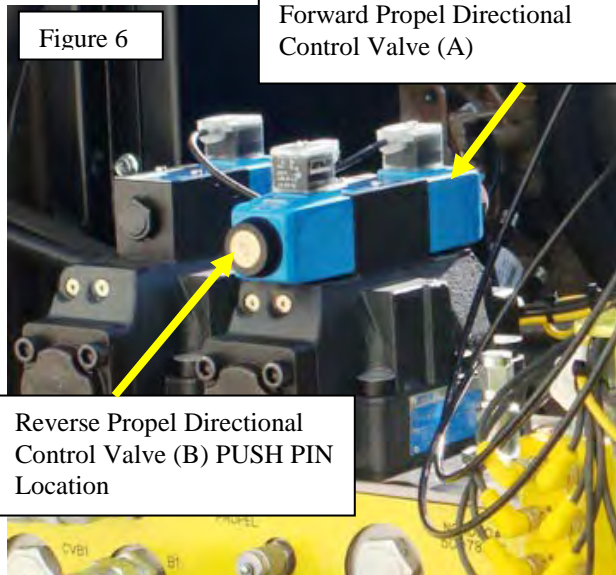


Figure 5



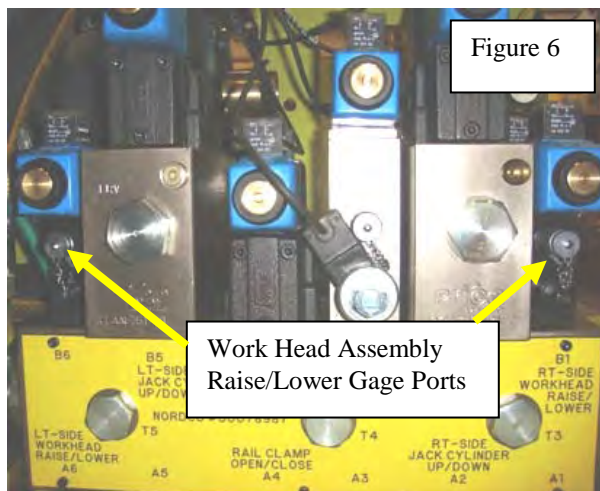
RAIL LIFT MANIFOLD

RT/LT Work Head Assembly Raise/Lower Pressure Reducing Valve 500 PSI

Install gage (Right or Left) at Work Head Assembly Raise/Lower Cylinder pressure tap (Figure 6) and turn on pump.

Loosen work head assembly raise/lower pressure reducing valve adjusting screw lock nut located on second valve from bottom of valve stack. (Figure 7 shows RT side). If pressure is higher than 500 psi, turn the adjusting screw counterclockwise (CCW) until pressure reads 500 psi, tighten lock nut.

If pressure is lower than 500 psi, turn the adjusting screw clockwise (CW) until pressure reads 500 psi, tighten lock nut.

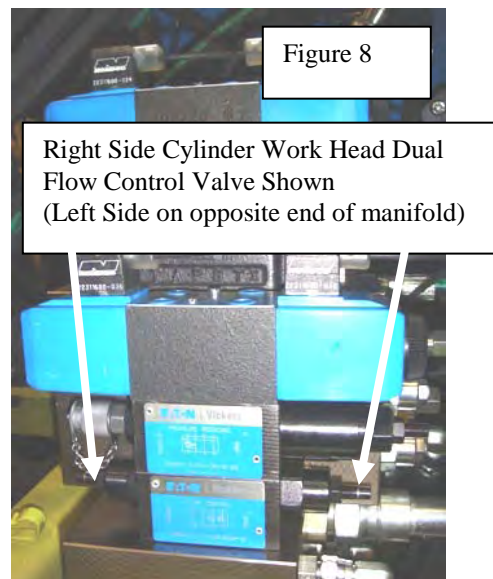


RT/LT Work Head Assembly Raise/Lower Flow Control Valves

Dual Flow Control Valves are adjustable non-compensated flow restrictors. An internal check valve around the regulated orifice allows free flow in one direction and metered flow in the other.

The Work Head Assembly cylinders should descend & raise evenly.

To adjust speeds of cylinder up or down loosen up lock nut (Figure 8). Turn adjusting screw clockwise to decrease flow or counterclockwise to increase flow (speed). Tighten lock nut.



RT/LT Side Jack Up/Down Counterbalance Valve

Used to control the rail from dropping as jack cylinders retract.

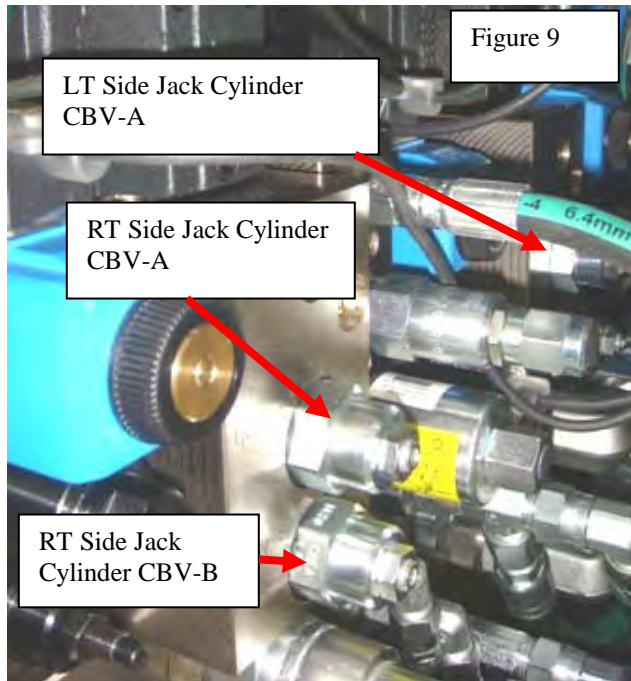
If the rail leaks down as operator is pushing in a tie plate under the raised rail or there is chatter while lowering a rail the counterbalance valve may need adjustment.

To check operate rail jack cylinder in question manually raise rail with jack cylinder in question. Loosen **(CBV-A)** lock nut (Figure 9) and turn adjusting screw clockwise (CW) until rail starts to drift down, then turn adjusting screw out counterclockwise (CCW) an additional ¼ of a turn.

Watch to see if rail drifts down (does not hold) and when you lower rail if cylinder chatters.

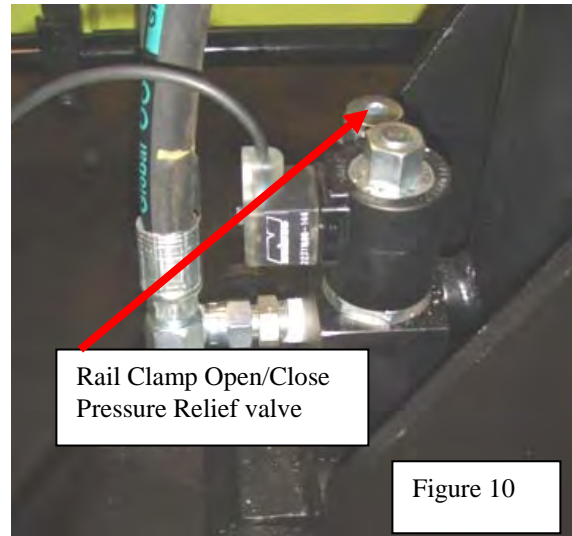
Turn adjusting screw **out** ¼ of a turn counterclockwise (CCW) at a time until rail lift holds and/or does not chatter when rail is lowered.

Tighten lock nut.



Rail Clamp Open/Close Pressure Relief Valve 4750 PSI

Located at Rail Clamp Cylinder (Figure 10) - Factory Preset to 4750 PSI



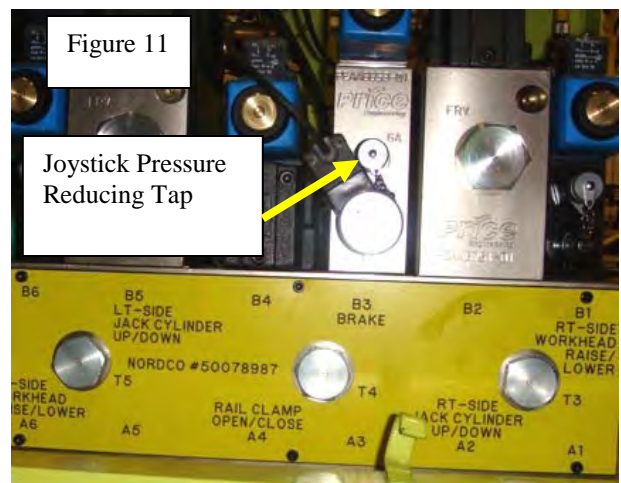
Joystick Pressure Reducing Valve 1500 PSI

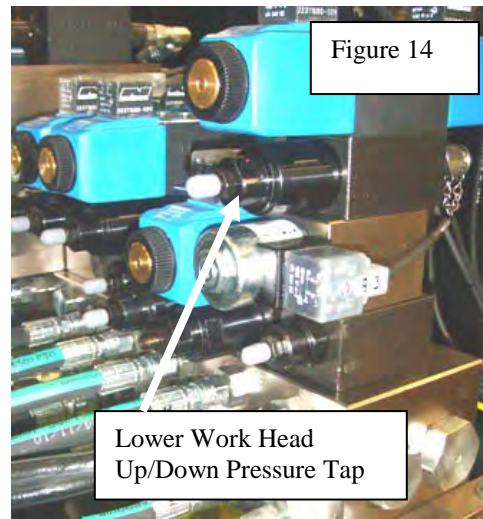
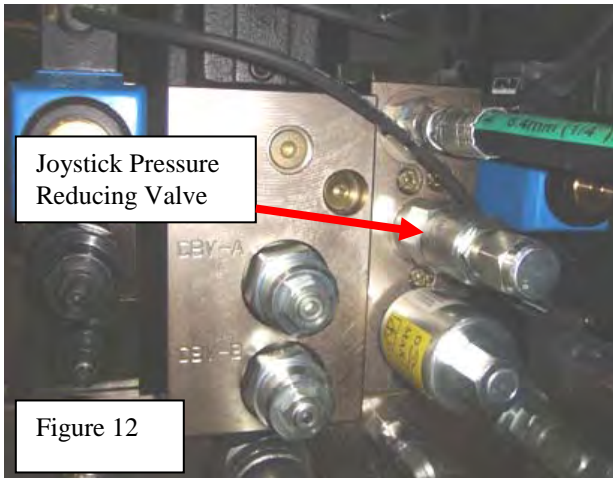
Install gage at joystick pressure port and turn on pump (Figure 11).

Loosen joystick pressure reducing valve adjusting screw lock nut.

If pressure is higher than 1500 psi, remove protective cap (Figure 12) and turn the adjusting screw counterclockwise (CCW) until pressure reads 500 psi, tighten lock nut.

If pressure is lower than 1500 psi, turn the adjusting screw clockwise (CW) until pressure reads 500 psi, tighten lock nut.





LEFT or RIGHT WORK HEAD MANIFOLD

Illustrations shown below are Right Work Head Manifold

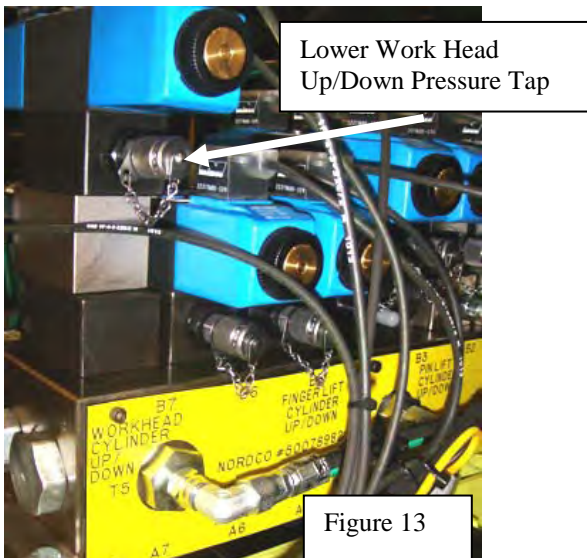
Lower Work Head Up/Down Pressure Reducing Valve 1000PSI

Install a gage at lower work head up/down pressure tap (Figure 13) and turn on pump.

Loosen lower work head up/down pressure reducing valve adjusting screw lock nut (Figure 14).

If pressure is higher than 1000 psi, turn the adjusting screw counterclockwise (CCW) until pressure reads 1000 psi and tighten lock nut.

If pressure is lower than 1000 psi, turn the adjusting screw clockwise (CW) until pressure reads 1000 psi and tighten lock nut.

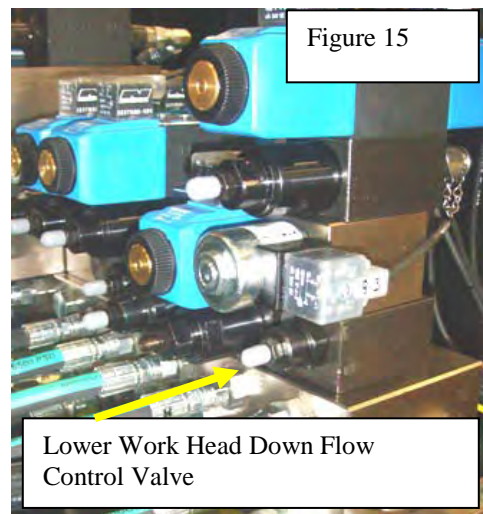


Lower Work Head Down Flow Control Valve

Controls speed lower work head cylinder as it travels down. Allows full flow in raise direction.

Turn on pump, set engine to high speed, and allow oil to reach normal operating temperature.

Loosen lock nut (Figure 15) and turn adjusting screw counterclockwise (CCW) for more speed; turn clockwise (CW) to slow down rod travel speed.



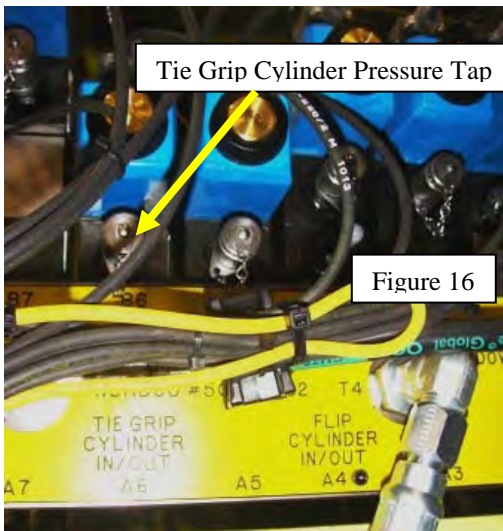
Tie Grip Cylinder In/Out Pressure Reducing Valve 2000 PSI

Install a gage at tie grip pressure tap (Figure 16) and turn on pump.

Loosen tie grip in/out pressure reducing adjusting screw lock nut (Figure 17).

If pressure is higher than 2000 psi, turn the adjusting screw counterclockwise (CCW) until pressure reads 2000 psi and tighten lock nut.

If pressure is lower than 2000 psi, turn the adjusting screw clockwise (CW) until pressure reads 2000 psi and tighten lock nut.



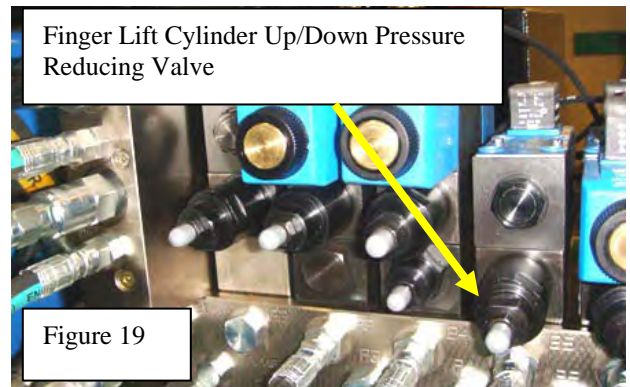
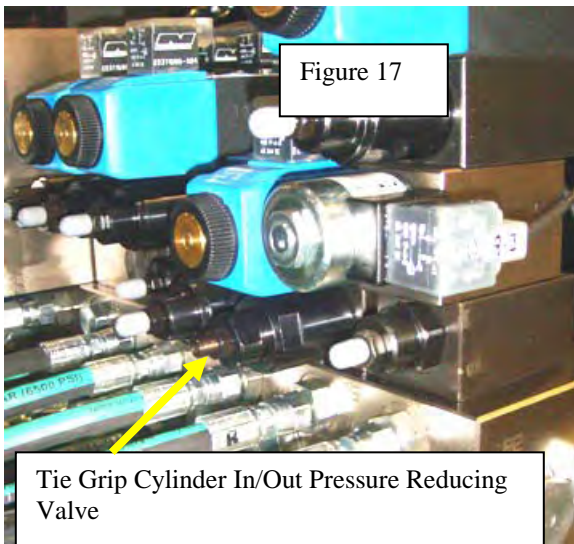
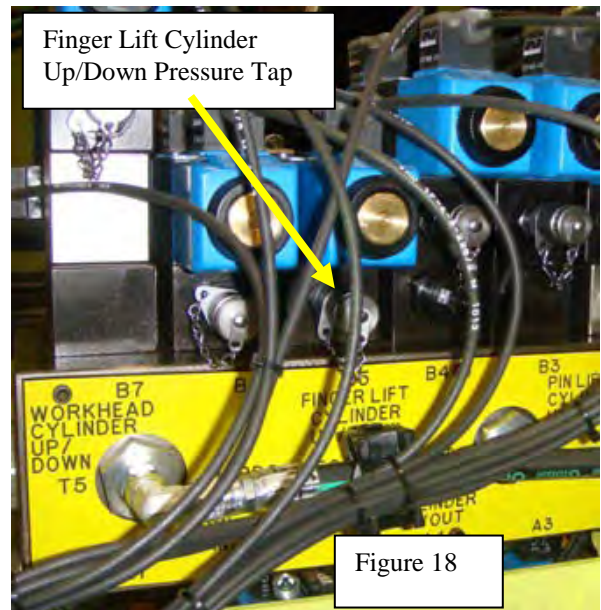
Finger Lift Cylinder Up/Down Pressure Reducing Valve 700 PSI

Install a gage at finger lift cylinder up/down pressure tap (Figure 18) and turn on pump.

Loosen finger lift up/down pressure reducing adjusting screw lock nut (Figure 19).

If pressure is higher than 700 psi, turn the adjusting screw counterclockwise (CCW) until pressure reads 700 psi and tighten lock nut.

If pressure is lower than 700 psi, turn the adjusting screw clockwise (CW) until pressure reads 700 psi and tighten lock nut.



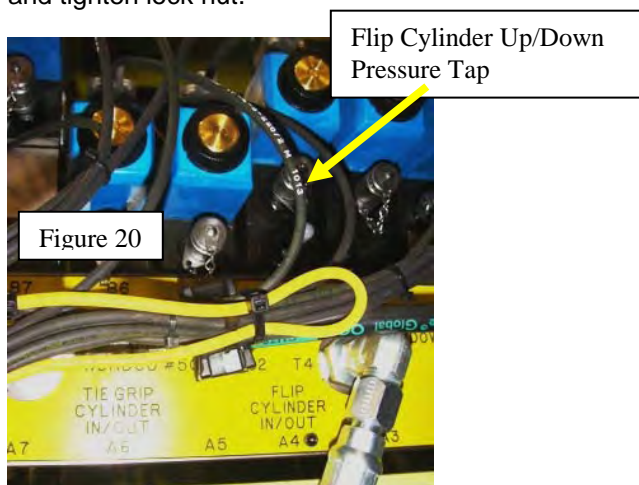
Flip Cylinder Up/Down Pressure Reducing Valve 700PSI

Install a gage at flip cylinder up/down pressure tap (Figure 20) and turn on pump.

Loosen flip cylinder pressure reducing adjusting screw lock nut (Figure 21).

If pressure is higher than 700 psi, turn the adjusting screw counterclockwise (CCW) until pressure reads 700 psi and tighten lock nut.

If pressure is lower than 700 psi, turn the adjusting screw clockwise (CW) until pressure reads 700 psi and tighten lock nut.



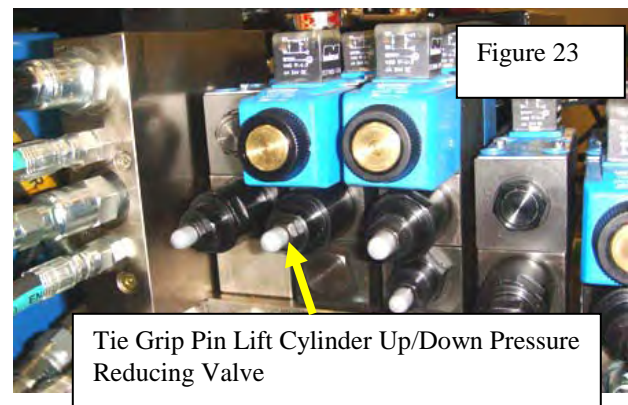
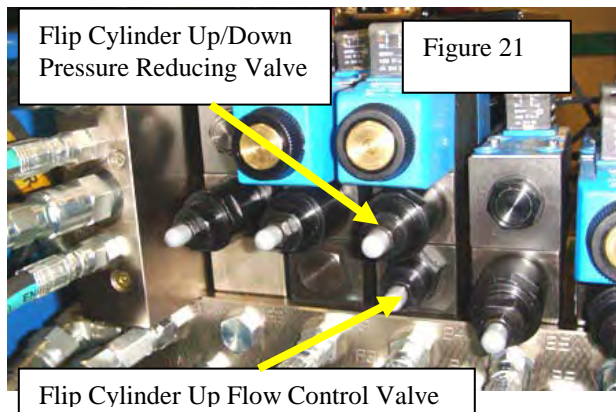
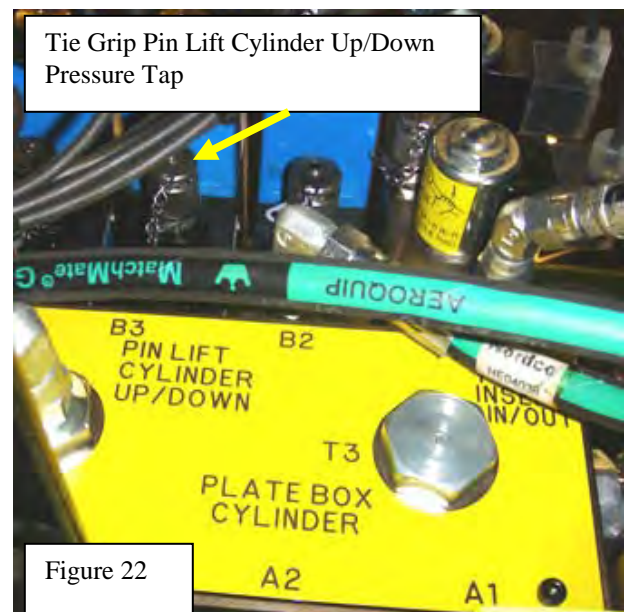
Tie Grip Pin Lift Cylinder Up/Down Pressure Reducing Valve 700 PSI

Install a gage at Tie Grip Pin Lift Cylinder up/down pressure tap (Figure 22) and turn on pump.

Loosen tie grip pin lift cylinder up/down pressure reducing valve adjusting screw lock nut (Figure 23).

If pressure is higher than 700 psi, turn the adjusting screw counterclockwise (CCW) until pressure reads 700 psi and tighten lock nut.

If pressure is lower than 700 psi, turn the adjusting screw clockwise (CW) until pressure reads 700 psi and tighten lock nut.



Flip Cylinder Up/Down Flow Control Valve

Controls speed work head cylinder as it travels up or down and allows full flow in reverse direction.

Turn on pump, set engine to high speed, and allow oil to reach normal operating temperature.

Loosen lock nut (Figure 21), turn adjusting screw counterclockwise (CCW) for more speed; turn clockwise (CW) to slow down rod travel speed.

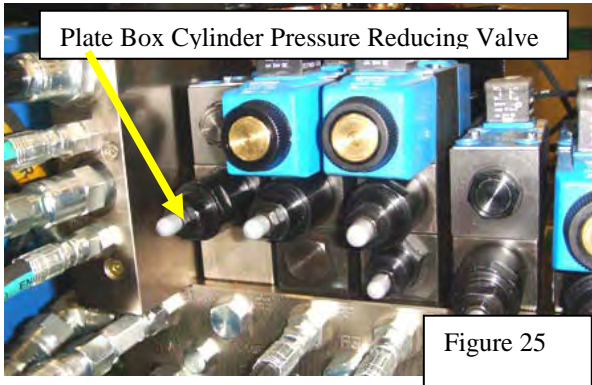


Plate Box Cylinder Pressure Reducing Valve 1250 PSI

Install a gage at plate box pressure tap (Figure 24) and turn on pump.

Loosen plate box pressure reducing adjusting screw lock nut (Figure 25).

If pressure is higher than 1250 psi, turn the adjusting screw counterclockwise (CCW) until pressure reads 1250 psi and tighten lock nut.

If pressure is lower than 1250 psi, turn the adjusting screw clockwise (CW) until pressure reads 1250 psi and tighten lock nut.

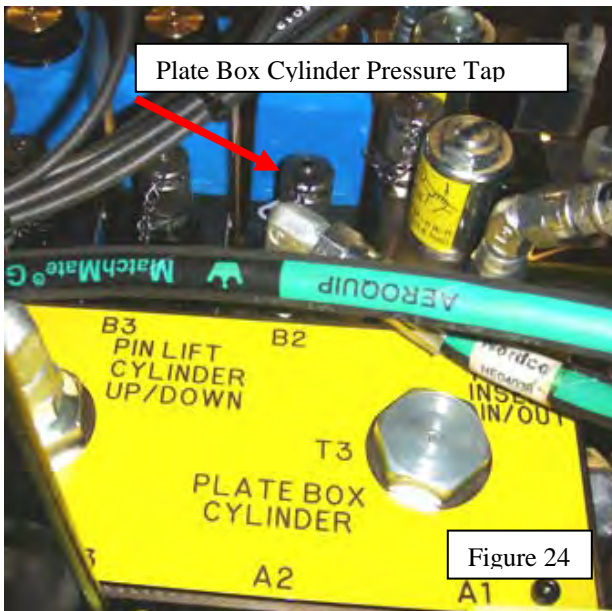


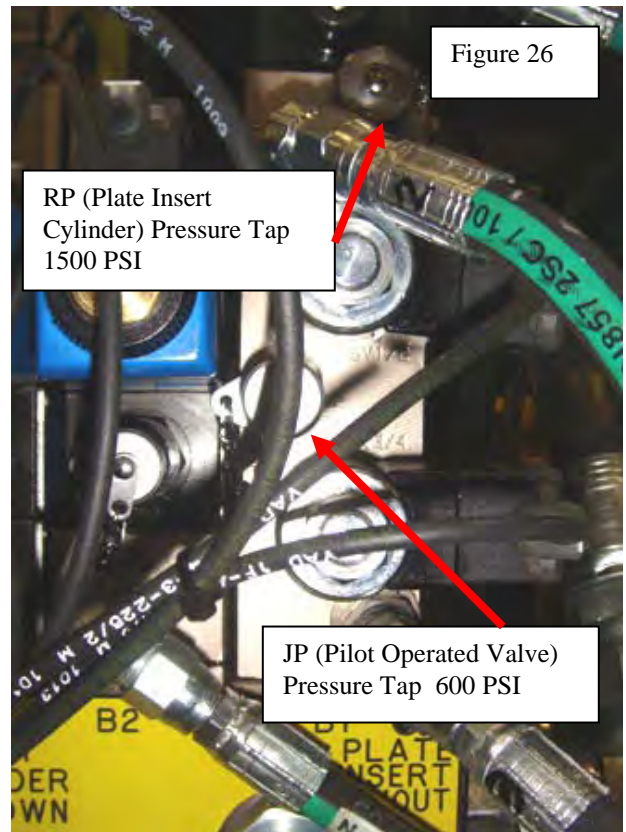
Plate Insert In/Out Cylinder Pressure Reducing Valve 1550 PSI

Install a gage at plate in/out cylinder pressure tap (Figure 26) and turn on pump.

Loosen plate insert pressure reducing adjusting screw lock nut (Figure 27).

If pressure is higher than 1550 psi, turn the adjusting screw counterclockwise (CCW) until pressure reads 1550 psi and tighten lock nut.

If pressure is lower than 1550 psi, turn the adjusting screw clockwise (CW) until pressure reads 1550 psi and tighten lock nut.



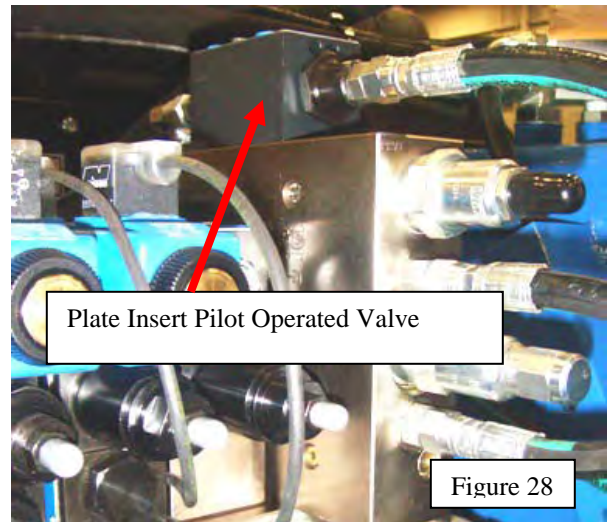
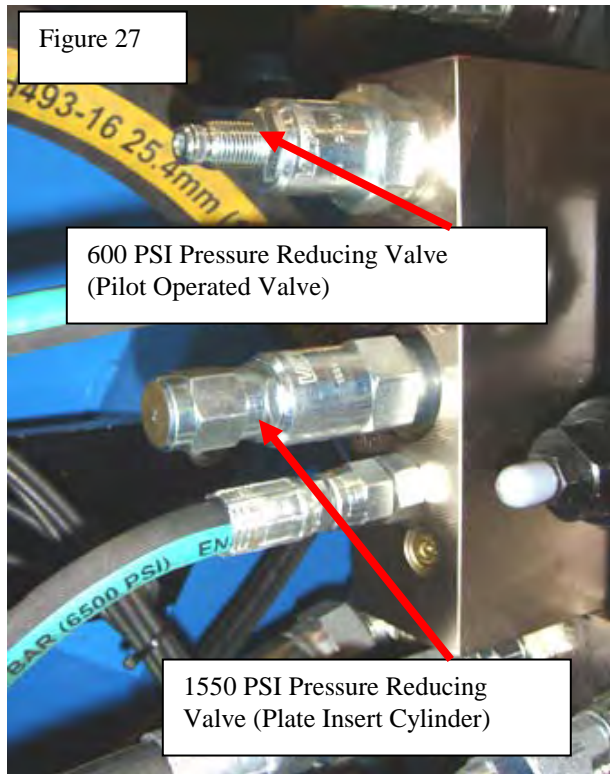


Plate Insert (Pilot Operated Valve) Pressure Reducing Valve 600 PSI

Reduces pressure to the Pilot Operated Valve for the plate insert directional control valve (Figure 28).

Install a gage at Plate Insert (Pilot Operated Valve) pressure tap (Figure 26) and turn on pump.

Remove protective cap and loosen plate insert in/out pressure reducing adjusting screw lock nut (Figure 27).

If pressure is higher than 600 psi, turn the adjusting screw counterclockwise (CCW) until pressure reads 600 psi. Tighten lock nut.

If pressure is lower than 600 psi, turn the adjusting screw clockwise (CW) until pressure reads 600 psi. Tighten lock nut.

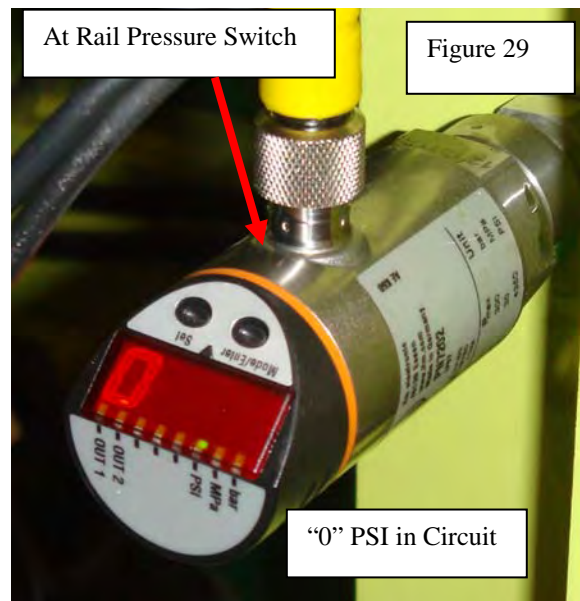
RT/LT (At Rail) Pressure Switch 1450 PSI

Normally open switch, factory set at 1450 psi (Figure 29).

At Rail Pressure Switch reads the pressure spike in the Horizontal Cylinder Retract hydraulic Line.

Switch closes when pressure is reached to complete circuit to the **END INSERTION CYCLE**. The Plate Insertion LED lamp illuminates on control panel.

Efector Pressure Switch adjustment instructions are in the component data section of the manual.

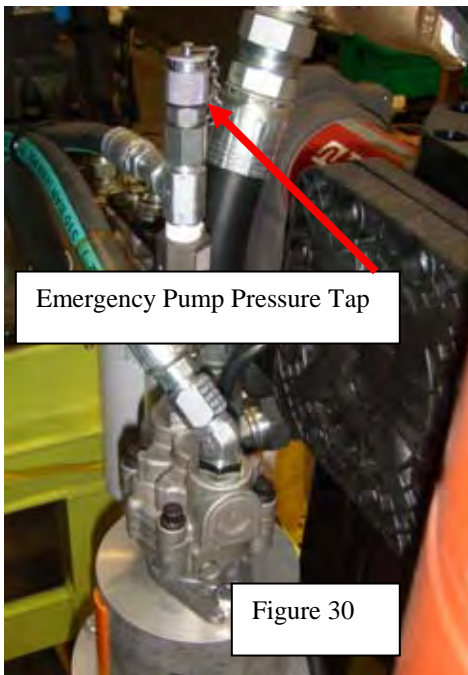


**Emergency Pump Pressure Relief valve
1500 PSI (OPTION)**

Install a pressure gage at the emergency pump pressure tap (Figure 30). Turn on emergency pump switch at upper control panel and read pressure at gage.

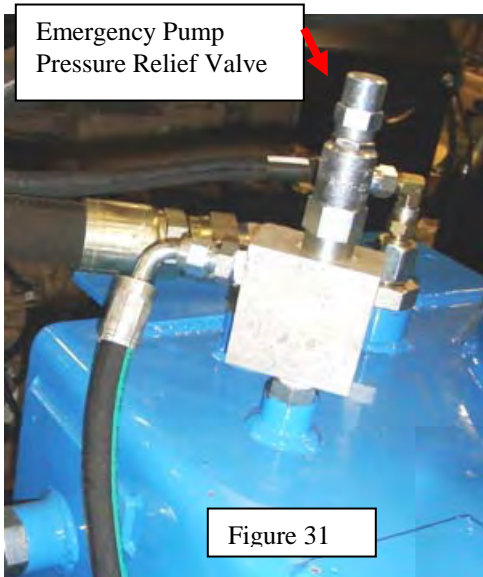
If pressure is higher than 1500 psi remove protective cap and loosen up lock nut (Figure 31). Turn adjusting screw counterclockwise to decrease pressure. Tighten lock nut & install cap.

If pressure is lower than 1500 psi remove cap and loosen up lock nut. Turn adjusting screw clockwise to increase pressure. Tighten lock nut and install cap.



Emergency Pump Pressure Tap

Figure 30



Emergency Pump Pressure Relief Valve

Figure 31

MacBone Air Conditioner Pressure Relief Valve 2500 PSI (OPTION)

Tee in a gage at the hose connection from the hydraulic pump pressure tap (Figure 32) and turn on pump.

Remove protective cap and loosen plate insert in/out pressure reducing adjusting screw lock nut (Figure 27).

If pressure is higher than 600 psi, turn the adjusting screw counterclockwise (CCW) until pressure reads 600 psi. Tighten lock nut.

If pressure is lower than 600 psi, turn the adjusting screw clockwise (CW) until pressure reads 600 psi. Tighten lock nut.

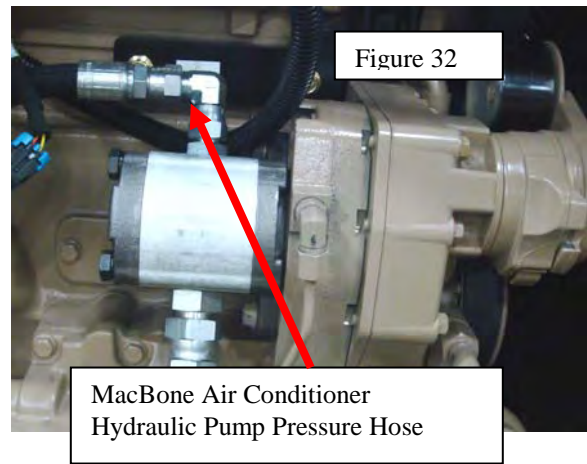


Figure 32

MacBone Air Conditioner Hydraulic Pump Pressure Hose

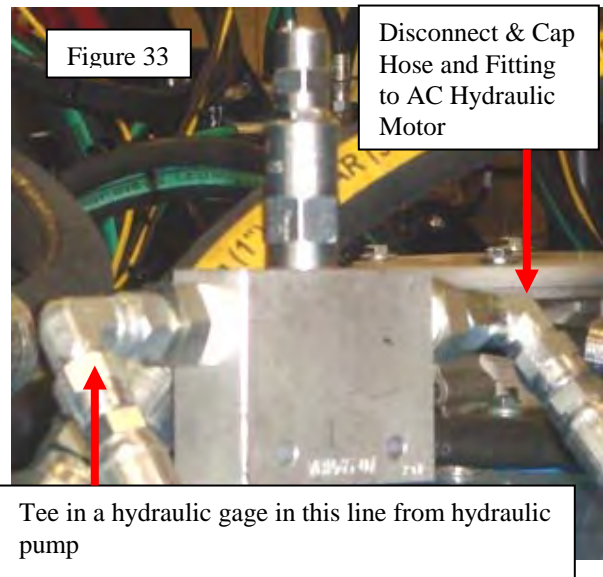


Figure 33

Disconnect & Cap Hose and Fitting to AC Hydraulic Motor

Tee in a hydraulic gage in this line from hydraulic pump

TROUBLESHOOTING

General

Many of the failures in a hydraulic system show similar symptoms: a gradual or sudden loss of high pressure, resulting in loss of power or speed in the cylinders. In fact, the cylinders may stall under light loads or may not move at all. Often the loss of power is accompanied by an increase in pump noise, especially as the pump tries to build up pressure.

Any major component (pump, relief valve, directional valve, or cylinder) could be at fault. Sometimes the problem can easily be traced, simply by following the checklist below, other times it may need a little more time troubleshooting. We have given a suggested procedure beginning on the next page.

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 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 damaged 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.

FLUID 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	Pump switch turned off. No hydraulic oil in tank Shut-off valve closed. Main relief valve bypassing. Main pump compensator setting is too low. Pump is defective. Destroke valve stuck.	Turn on pump. Check oil level. Refill tank. Check for pump damage. Open valve completely. Check for pump damage. Increase pressure setting on relief valve. (See Pressure checks) Adjust compensator setting. (See Pressure Checks) Refer to pump manual or replace pump. Repair or replace.
Hydraulic pump excessively noisy	Cold oil. Low oil level. Oil viscosity too high (oil too thick) System relief valve set too low. Intake hose to pump restricted. Defective pump.	Allow unit to warm up. Check and add oil. Drain and add correct oil as specified under "RECOMMENDED LUBRICANTS". Increase pressure setting on relief valve (see Pressure Checks) Inspect and repair. See pump manual, repair or replace pump.
Hydraulic Oil Overheats	Hydraulic reservoir oil level low Oil viscosity too high (oil too thick) System relief valve set to low Orifice, hydraulic passage way, or other internal restriction. Inspect oil cooler – insufficient air flow. input air temperature, debris in cooling fins.	Add hydraulic oil to proper level Drain and add correct oil as specified under "RECOMMENDED LUBRICANTS" Increase pressure setting (see pressure checks). Inspect, repair, or replace. Check filters Clean, repair, or replace oil cooler.

PROBLEM	POSSIBLE CAUSE	SOLUTION
Hydraulic Oil Foams	<p>Water in oil</p> <p>Using wrong oil</p> <p>Low Hydraulic oil level</p> <p>Air leak in suction line to hydraulic pump or pump shaft seal leaking.</p>	<p>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 reservoir to recommended level</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 (dirty) oil filter</p> <p>Hydraulic Oil Filter Restriction Indicator switch defective</p>	<p>Replace filter</p> <p>Replace switch</p>
Machine will not propel	<p>Brakes on/not releasing</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 brake section below.</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>

PROBLEM	POSSIBLE CAUSE	SOLUTION
Brakes will not release	Brake lock valve closed. Brake directional control valve	Open lock valve. Check spool for free motion and that solenoid is being energized.
Rail Jack Cylinder drifts down or chatters	Counterbalance valve(s) out of adjustment Debris in counterbalance valve	See Hydraulic Instructions Disassemble, inspect, repair, or replace.
Rail Jack Cylinder drifts down or chatters	Counterbalance valve(s) out of adjustment Debris in counterbalance valve	See Hydraulic Instructions Disassemble, inspect, repair, or replace.
Multiple work head functions -- response is sluggish	Check system relief valve Check pump pressure compensator setting Internal system leaks Hydraulic fluid viscosity above acceptable limits Check for problems in the valve's manifold	See Hydraulic Instructions See Hydraulic Instructions Worn internal parts – bad o-rings – Inspect and repair Allow hydraulic oil to reach operating range. Disassemble, inspect, and repair
RT/LT Work Head Assembly Raise/Lower Cylinder does not lower	Locking valve not working	Check if coil is energized and valve spool shifts.
RT/LT Work Head Assembly Raise/Lower Cylinder does not raise or lower	Check pressure reducing setting Check flow control valves Directional control valve spool not shifting	See Hydraulic Instructions See Hydraulic Instructions Disassemble, inspect, repair or replace valve.
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.

<p>A Lock Up does not disengage</p>	<p>Check that lock up switch is in the unlock position</p> <p>Lock up solenoid valve not shifting</p> <p>Check that cylinder is fully retracted to allow lock up mechanism move</p> <p>Flow control valve in manifold needs adjusting or debris blocking flow</p> <p>With RPI in WORK MODE & when ELECTRICAL INTERLOCK BUTTON is pulled out the work head assembly should raise slightly first to allow lock ups to disengage.</p>	<p>Put switch in unlock position</p> <p>Check that coil is energized. If valve spool does not shift - disassemble, inspect, repair or replace valve.</p> <p>Retract cylinder and try lock up again</p> <p>Disassemble, inspect, repair, adjust or replace.</p> <p>Diagnose, inspect, & repair.</p>
<p>Rail clamp does not hold rail</p>	<p>Check pressure relief setting</p> <p>Bad cylinder</p>	<p>See Hydraulic Instructions</p> <p>Inspect, repair, or replace rail clamp cylinder</p>

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.