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Release/Revisions

Release/Rev	Date	Change Description
Rev. A	1/15/2013	First Release
Rev. B	5/14/2013	Update 24 Volt Emergency Pump Procedures & "Add Cage Bolt Procedures"

24 Volt Emergency Hydraulic Pump

Procedure for work head components:

This operation will require two or more personnel to perform.

In the event of diesel engine malfunction or main hydraulic circuit failure it may be necessary to use the emergency pump to raise the machine's components for traveling purposes.

Tools and equipment required for this procedure: **(Found in Toolbox)**

Company Furnished Padlock
 1/4" Pump Hose w/Stauff ends

There are two styles of 24 volt emergency pump option packages available. Figure 1 shows the standard 24 volt emergency hydraulic pump and figure 2 shows the little giant 24 volt emergency hydraulic pump. The emergency pump and switch is located at the front of the machine on the left side.

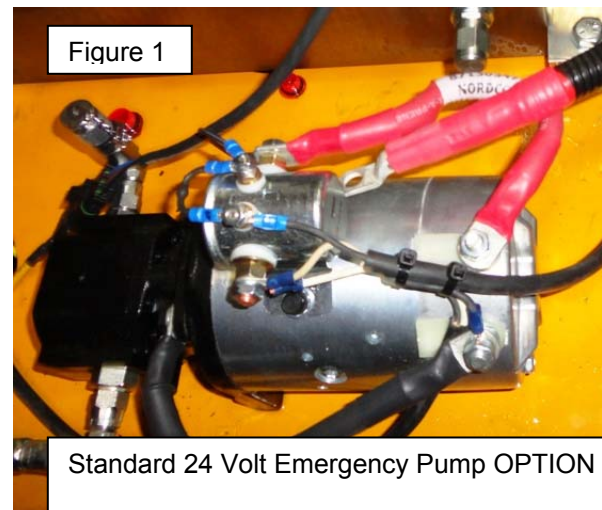
1. Turn the main pump ball valve to the CLOSED position (Figure 6). (Indicator line on ball valve will be perpendicular to flow of the pressure line.)
2. Attach one end of the hose (found in the toolbox) to the main system pressure port on the Propulsion Manifold (Figure 3). Attach the other end of the hose to the emergency pump pressure tap (Figure 4 or 5).
3. Turn the battery disconnect switch (Figure 7) to the ON position and at the logic control box turn the ignition switch to the ON position to activate controls.
4. At the logic control box, set the Travel/Work Mode switch to the travel position. This will provide an up signal to the work head components.
5. Cycle the emergency pump switch (Figure 8 or 9) to the ON position until you can insert the lockup pins.

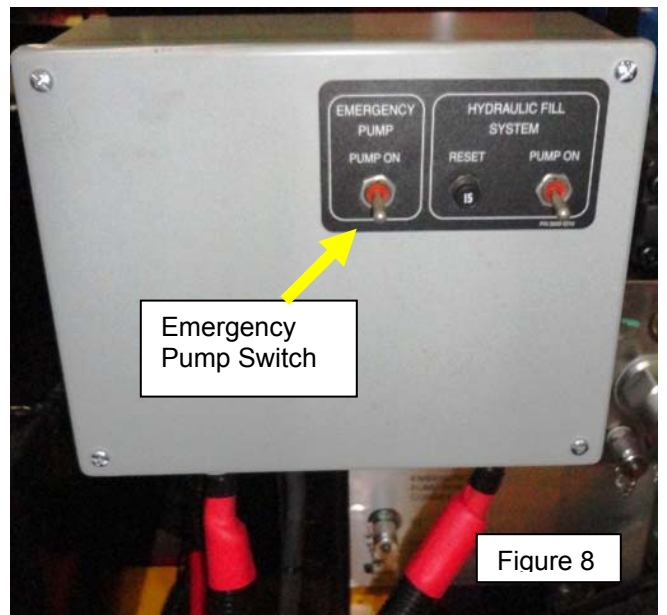
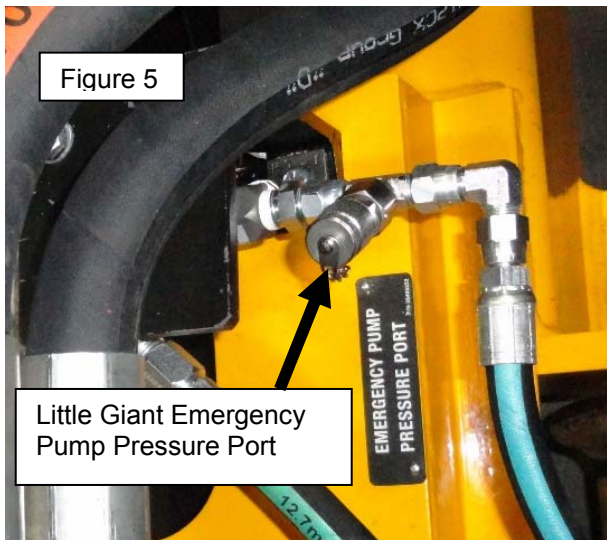
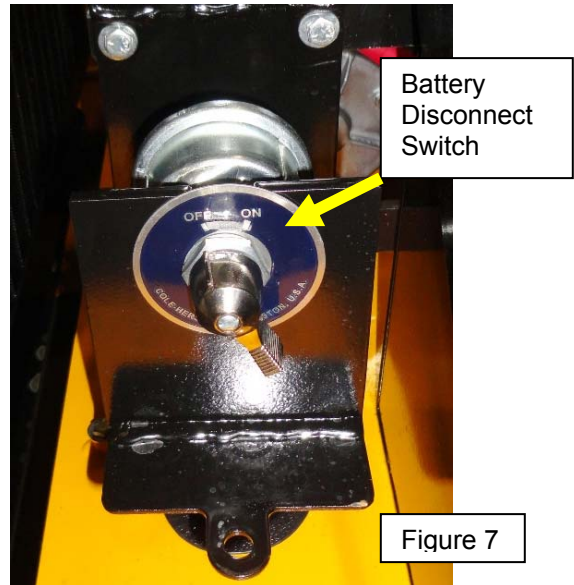
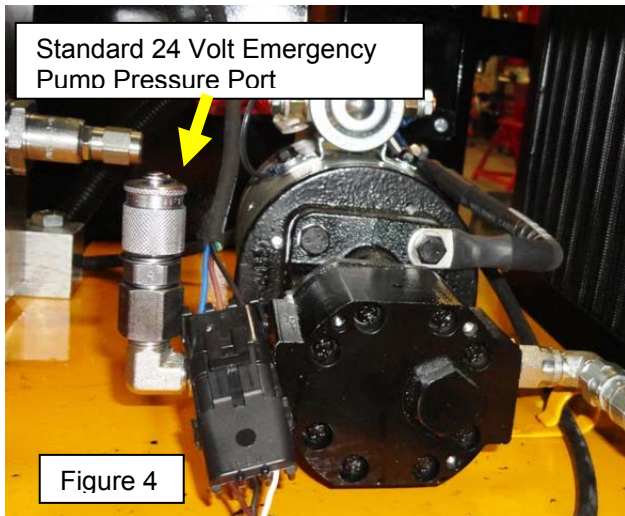
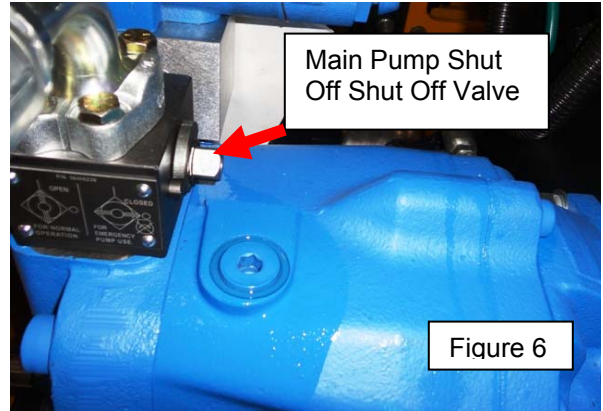
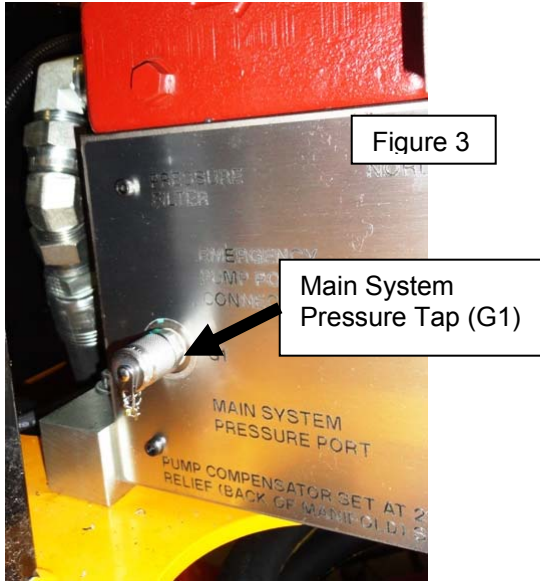


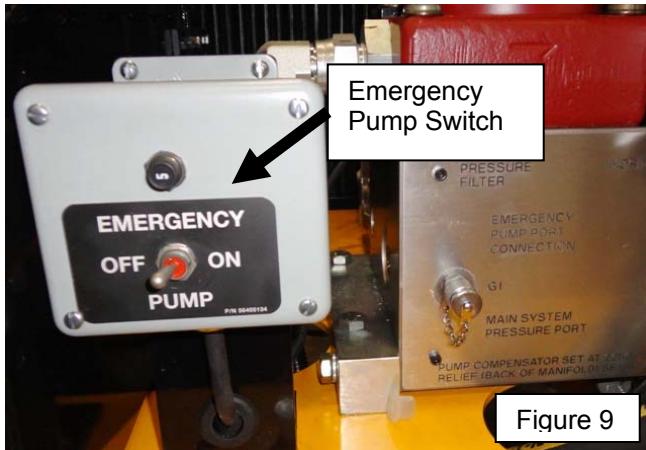
Operate the 24 volt emergency hydraulic pump in intervals for a maximum of 30 seconds to one minute, and then let electric motor cool for one minute before using again.

The 24 volt emergency hydraulic pump is designed for emergency use ONLY and is NOT to be run continuously.

6. When all work head components are in the locked position, continue on to releasing the brakes for towing if necessary by following the Brake Lock-Off procedure below.
7. Disconnect the hydraulic hose connecting the emergency pump and Propulsion Manifold and return it to the tool box.
8. Turn the main pump ball valve to the OPEN position (Figure 6). (Indicator line on ball valve will be in line to the flow of the pressure line.)
9. Replace protective caps to the ports on the emergency pump and Propulsion Manifold.







24 Volt Emergency Hydraulic Pump procedure for Brake Lock-Off for towing the machine or to replace or repair brake shoes.

The Brake Lock-Off was designed to allow collapsing of the brake cylinder without having to energize any other components.



Nordco recommends the use of the emergency pump during replacement of brake shoes, whether or not hydraulic power is available. Instructions are written for use with emergency pumps.

Tools And Equipment Required For These Procedures (Found In Toolbox) :

Company Furnished Padlock
 ¼” Pump Hose w/Stauff ends
 Lock pins with hair pin cotters

1. Chock ALL wheels to prevent movement.
2. Turn the main pump ball valve to the CLOSED position (Figure 6). (Indicator line on ball valve) will be perpendicular to flow of the pressure line.)
3. Turn the brake lock-off valve behind the brake valve stack on the machine’s left side (Figure 10) to the CLOSED position. (CLOSED is perpendicular to the hose line, OPEN is parallel to the hose line.)

4. Attach one end of the hose (found in the toolbox) to the emergency pump pressure tap (Figure 3) and attach the other end of the hose to the brake line quick disconnect located at the brake valve (Figure 10).
5. Turn the battery switch (Figure 7) to the ON position. Cycle the emergency pump switch (Figure 8 or 9) ON until the hydraulic brake cylinders have collapsed and the brakes are released enough to insert the lock pins.



Operate the 24 volt emergency hydraulic pump in intervals for a maximum of 30 seconds to one minute, and then let electric motor cool for one minute before using again.

The 24 volt emergency hydraulic pump is designed for emergency use ONLY and is NOT to be run continuously.

6. Have someone install two brake lock pins (1) and hairpin cotters (2) as shown in figure 11 on the two brake cylinder assemblies (Figure 12).
7. Turn the brake lock-off valve to the OPEN position (Figure 10) and verify that the brake shoes are locked OFF with pins inserted on all 4 wheels if towing the machine. Then return the brake lock-off valve to the CLOSED position.
8. If any of the brake shoes stay in contact with a wheel, the cage bolt (Figure 13) needs to be adjusted. Follow steps 9-14 to adjust cage bolts if needed, if not proceed to step 15.
9. Turn the brake shut off valve (Figure 10) to the CLOSED position.
10. Cycle the emergency pump switch (Figure 8 or 9) ON per pump operation caution above, until the hydraulic brake cylinders have collapsed.
11. Tighten the cage bolt (Figure 13) **IN** clockwise (CW) until the brake lock pin is snugly pressed against the frame components.
12. To be able to install and remove the brake lock pin (figure 12) turn the cage bolt **OUT** counterclockwise (CCW) ¼ of turn.
13. Turn the brake lock-off valve to the OPEN position (Figure 10) and verify that the brake shoes are locked OFF with pins inserted on all 4 wheels.

14. If any of the brake shoes stay in contact with a wheel, return the brake lock-off valve to the CLOSED position and repeat steps 9-14, if not proceed to step 15.
15. Remove the emergency pump hose and return to the toolbox.
16. Replace protective caps to the ports on the emergency pump and brake lock-off valve.
17. Turn brake lock-off valve to OPEN position.
18. Turn the main pump ball valve to the OPEN position (Figure 6). (Indicator line on ball valve will be in line to the flow in the pressure line.)
19. Remove wheel chocks after machine is hooked up to another machine that has its brakes applied.

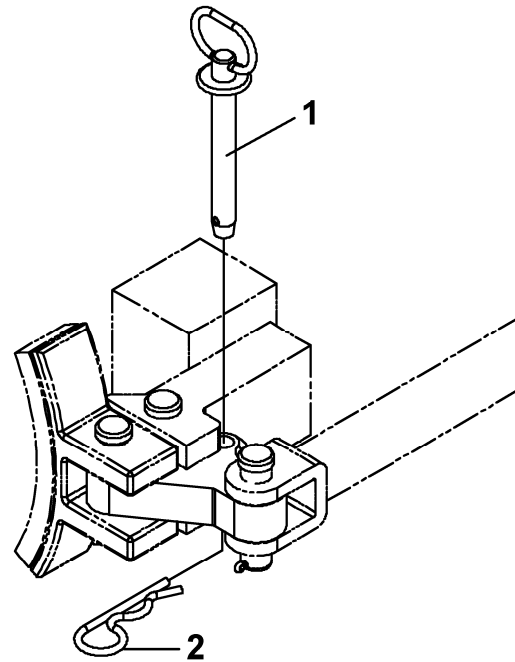


Figure 11

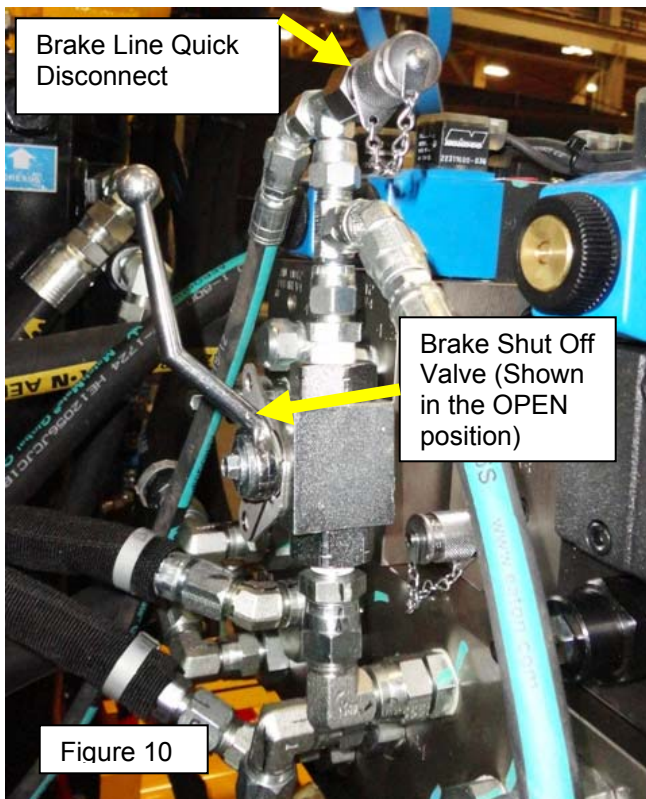


Figure 10



Figure 12

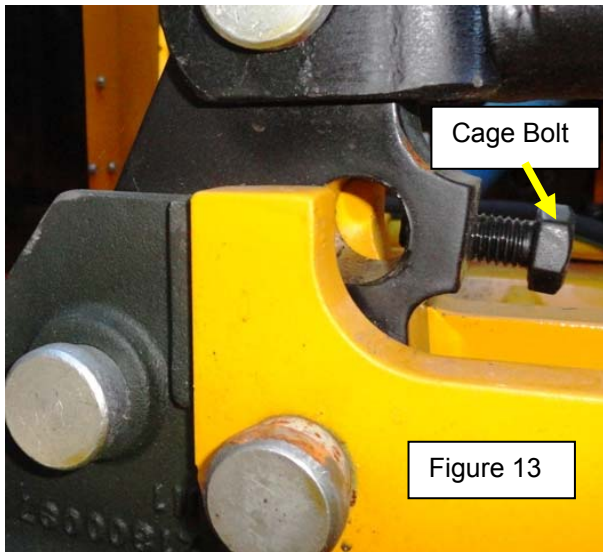


Figure 13

24 Volt Emergency Hydraulic Pump to raise the Turntable Cylinder:

1. If the machine has an engine or main hydraulic pump failure with the turntable cylinder rod extended use the following procedure.
2. Turn the main pump ball valve to the closed position (Figure 6). (Indicator line on ball valve will be perpendicular to flow in the pressure line.)
3. The turntable valve is located on the right side of the machine (Figure 14).
4. The Turntable Valve (Figure 15) has a locking pin (A) & bracket that locks the turntable directional control valve (C) in the DOWN position. (Machine is "DOWN" on track). Hydraulic oil is directed to retract side of the turntable cylinder in this position. Ensure the turntable valve is in the "DOWN" position.
5. Attach one end of the hose (found in the toolbox) to the quick disconnect at the pressure tap of the 24 volt emergency hydraulic pump (Figure 4 or 5) and attach the other end of the hose to the turntable valve pressure tap (Figure 14).
6. Turn the battery switch (Figure 7) to the ON position. Cycle the emergency pump switch ON (Figure 8 or 9) until the turntable cylinders is fully retracted (machine in "DOWN" position).

CAUTION

Operate the 24 volt emergency hydraulic pump in intervals for a maximum of 30 seconds to one minute at a time. The 24 volt emergency pump is designed for emergency use ONLY and is NOT to be run continuously.

7. Disconnect the hose and return it to the tool box.
8. Replace protective caps to the ports on the emergency pump and turntable valve.
9. Turn the main pump ball valve to the OPEN position (Figure 6) (Indicator line on ball valve will be in line with the flow of the pressure line.)

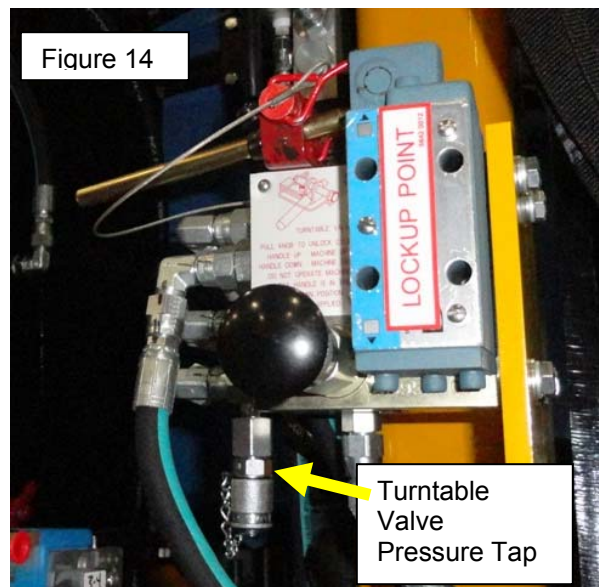


Figure 14

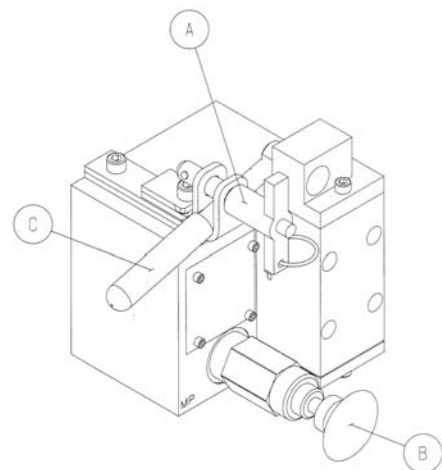


Figure 15

Emergency Hydraulic Hand Pump

For Work Head Components:

Tools and equipment required for this procedure (Found In Toolbox):

Company Furnished Padlock
 1/4" Pump Hose w/Stauff ends Emergency
 Hand Pump Handle

This procedure requires two personnel to perform.

In the event of diesel engine malfunction or main hydraulic circuit failure it may be necessary to use the emergency pump to raise the machine's components for traveling purposes.

1. Turn the main pump ball valve to the CLOSED position (Figure 18). (Indicator line on ball valve will be perpendicular to flow of the pressure line.)
2. Attach one end of the hose (found in the toolbox) to the main system pressure port on the Propulsion Manifold (Figure 16). Attach the other end of the hose to the emergency hydraulic hand pump pressure tap (Figure 17).
3. Turn the battery disconnect switch (Figure 19) to the ON position and at the logic control box turn ignition switch to the ON position to activate controls.
4. At the logic control box set the Travel/Work Mode switch to the travel position. This will provide an up signal to the work head components.
5. Pressurize the emergency hydraulic hand pump by turning the pressure release knob (Figure 20) clockwise (CW) until tight. Using the emergency hydraulic hand pump handle, stroke the pump lever downward repeatedly to pressurize the pump.
6. Continue pumping until all work head components have been raised to the point where you can insert lockup pins.
7. Insert the work head component's lockup pins.
8. Release the emergency hydraulic hand pump by turning the pressure release knob (Figure 20) counterclockwise (CCW).
9. Remove hose and return it and the emergency hydraulic hand pump handle to the toolbox.

10. Turn the main pump ball valve to OPEN position (Figure 18) (Indicator line on ball valve will be in line to the flow in the pressure line.)

11. Continue on to Brake Lock-Off procedure if towing is required.

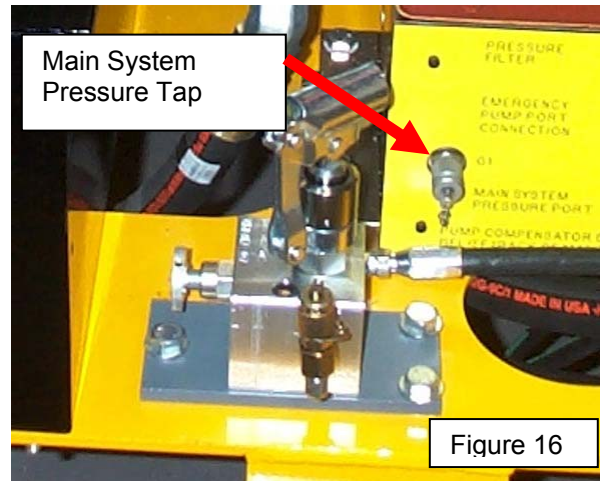


Figure 16

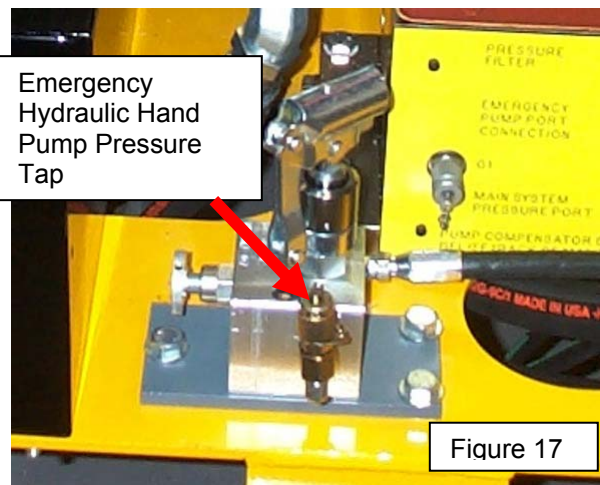


Figure 17

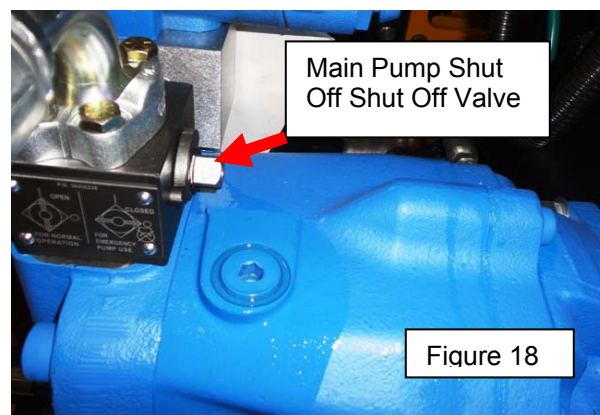


Figure 18

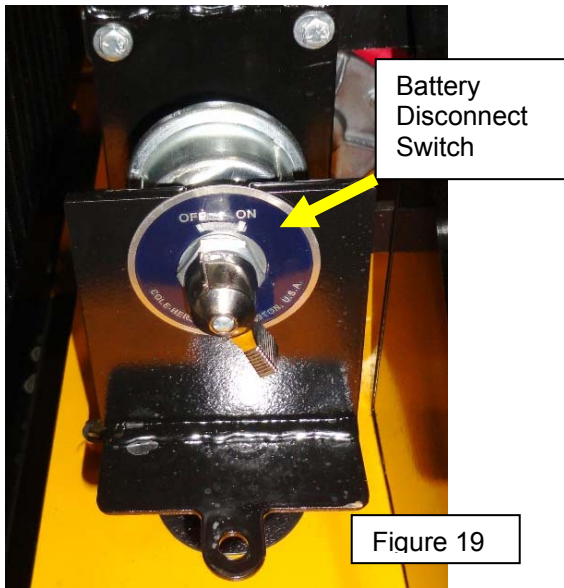


Figure 19

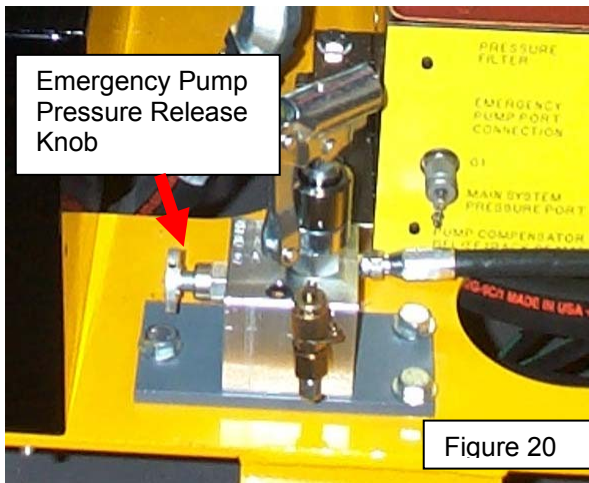


Figure 20

Emergency Hydraulic Hand Pump procedure for Brake Lock-Off for towing the machine or to replace or repair brake shoes.

Tools and Equipment Required For These Procedures (Found In Toolbox):

- Company Furnished Padlock
- 1/4" Pump Hose w/Stauff ends Hand
- Lock pins with hair pin cotters
- Emergency Hand Pump Handle

The brake lock-off valve was designed to allow collapsing of the brake cylinder without having to energize any other components.

CAUTION

Nordco recommends the use of the emergency pump during replacement of brake shoes, whether or not engine driven hydraulic power is available.

Instructions are written for use with manual emergency pump.

1. Chock ALL wheels to prevent movement.
2. Turn the main pump ball valve to the CLOSED position (Figure 18). (Indicator line on ball valve will be perpendicular to flow of the pressure line.)
3. Turn the brake lock -off valve at the brake valve stack on the machine's left side (Figure 21) to the CLOSED position. (CLOSED is perpendicular to the hose line, OPEN is parallel to the hose line.)
4. Attach one end of the hose (found in the toolbox) to the emergency hydraulic hand pump pressure tap (Figure 17) and attach the other end of the hose to the brake line quick disconnect located at the brake valve (Figure 21).
5. Pressurize the emergency hydraulic hand pump by turning the pressure release knob (Figure 20) clockwise (CW) until tight. Using the emergency hydraulic hand pump handle, stroke the pump lever downward repeatedly to pressurize the pump.
6. Continue pumping until the hydraulic brake cylinders have collapsed and the brakes are released enough to insert the brake lock pins .
7. Have someone install two brake lock pins (1) and hairpin cotters (2) as shown in figure 21 on the two brake cylinder assemblies (Figure 23).
8. Turn the brake lock-off valve to the OPEN position (Figure 20) and verify that the brake shoes are locked OFF with brake lock pins inserted on all 4 wheels.
9. If any of the brake shoes stay in contact with a wheel, the cage bolt (Figure 24) needs to be adjusted. Follow steps 10-15 steps to adjust cage bolts if needed, if not proceed to step 16.
10. Turn the brake lock-off valve (Figure 10) to the CLOSED position.

11. Pressurize the emergency hydraulic hand pump by turning the pressure release knob (Figure 20) clockwise (CW) until tight. Using the emergency hydraulic hand pump handle, stroke the pump lever downward repeatedly to pressurize the pump until the hydraulic brake cylinders have collapsed.
12. Tighten the cage bolt (Figure 24) **IN** clockwise (CW) until the brake lock pin is snugly pressed against the frame components.
13. To be able to install and remove the brake lock pin (figure 23) turn the cage bolt (Figure 24) **OUT** counterclockwise (CCW) ¼ of turn.
14. Release the emergency hydraulic hand pump by turning the pressure release knob (Figure 18) counterclockwise (CCW).
15. Turn the brake lock-off valve to the OPEN position (Figure 21) and verify that the brake shoes are locked OFF with brake pins installed on all 4 wheels if towing the machine. (If any brake shoes stay in contact with a wheel repeat steps 10-15. If not proceed to step 16).
16. Remove the emergency pump hose and return it and the emergency hydraulic hand pump handle to the toolbox.
17. Replace protective caps to the ports on the emergency pump and brake lock-off valve.
18. Turn the main pump ball valve to the OPEN position (Figure 16) (Indicator line on ball valve) will be in line to the flow in the pressure line.
19. Remove the chocks after the machine is hooked up to another machine that has its brakes applied.
20. Perform towing as required.

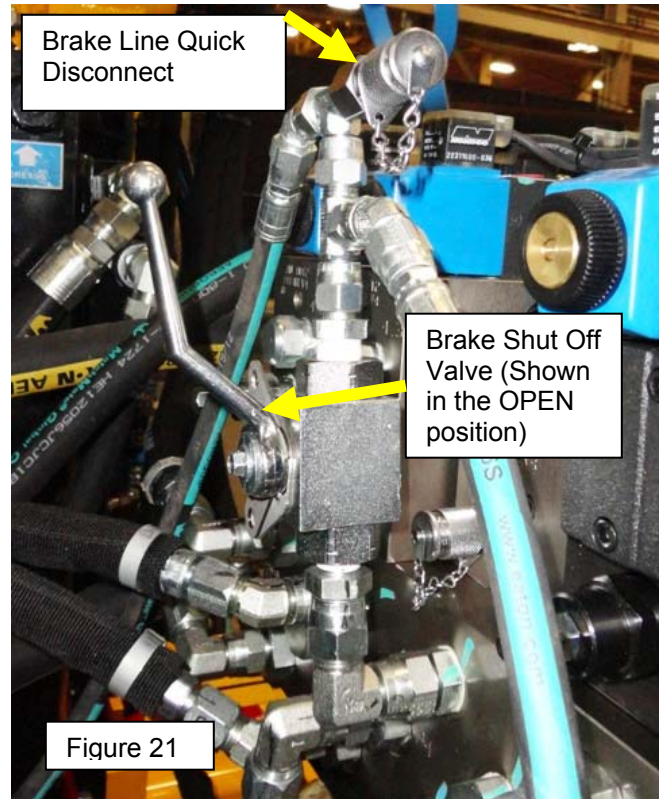


Figure 21

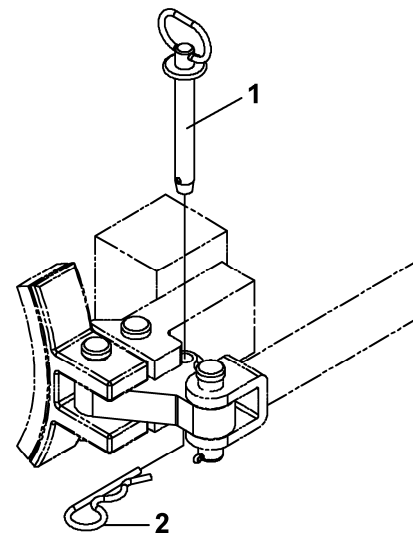
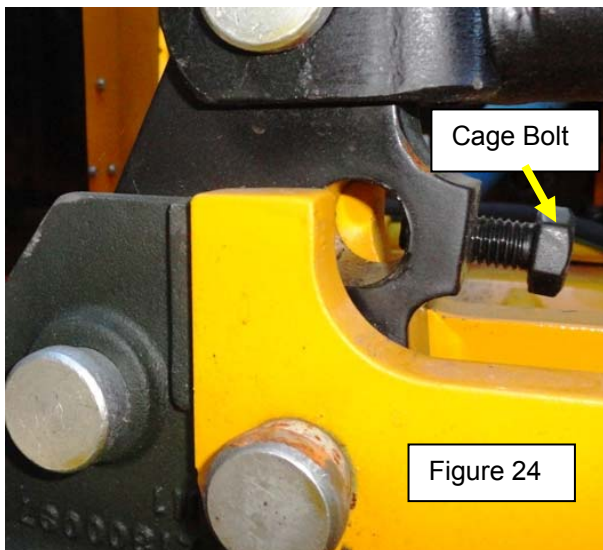


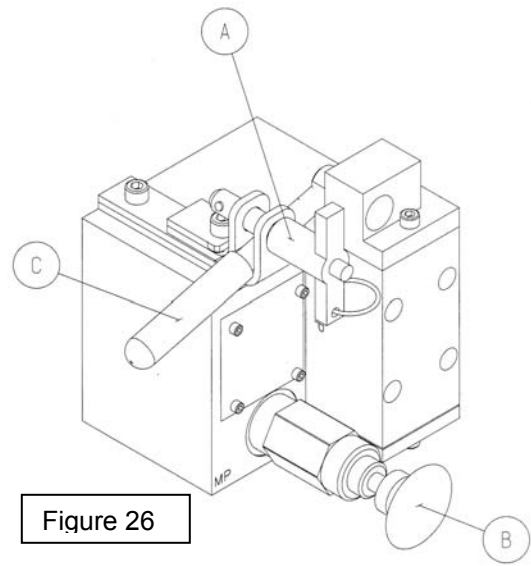
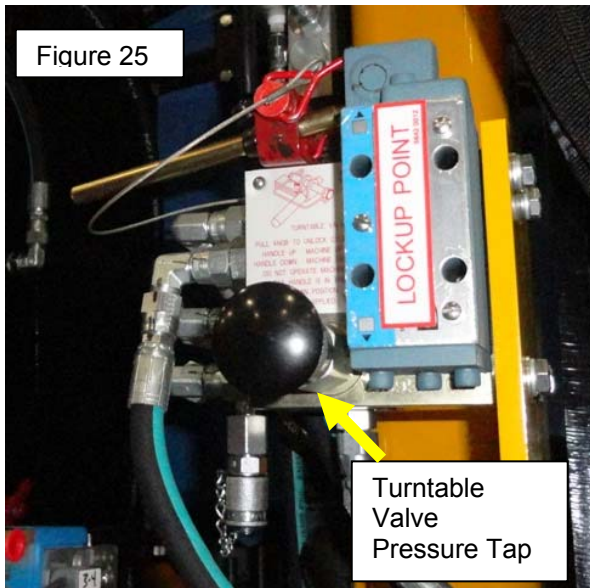
Figure 22



4. The Turntable Valve (Figure 26) has a locking pin (A) & bracket that locks the turntable directional control valve (C) in the DOWN position (MACHINE IS "DOWN" ON THE TRACK) Hydraulic oil is directed to retract side of the turntable cylinder in this position. Ensure the turntable valve is in the "DOWN" position.
5. Attach one end of the hose (found in the toolbox) to the quick disconnect at the pressure tap of the emergency hydraulic hand pump (Figure 20) and attach the other end of the hose to the turntable valve pressure tap (Figure 26).
6. Pressurize the emergency hydraulic hand pump by turning the pressure release knob (Figure 20) clockwise (CW) until tight. Using the emergency hydraulic hand pump handle, stroke the pump lever downward repeatedly to pressurize the pump.
7. Continue pumping until the Turntable Cylinder is retracted fully (machine DOWN position).
8. Remove the emergency pump hose and return it and the pump handle to the tool box.
9. Reinstall the protective caps to the turntable valve and emergency hand pump pressure port connections.
10. Turn the main pump ball valve to OPEN position (Figure 18) (Indicator line on ball valve will be in line to the flow of the pressure line.)

Emergency Hydraulic Hand Pump to raise the turntable cylinder:

1. If the machine has an engine or main hydraulic pump failure with the turntable cylinder rod extended use the following procedure.
2. Turn the main pump ball valve to the CLOSED position (Figure 18). (Indicator line on ball valve will be perpendicular to flow of the pressure line.)
3. The turntable valve is located on the right side of the machine (Figure 25).



HYDRAULIC COMPONENT MAINTENANCE SCHEDULE

<i>Hydraulic Component Maintenance 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
Suction Strainer (3879255)	
Element	3894323
Gasket.....	35552965
Return Filter (3880323)	
Element	3894289
Pressure Switch	5193975
Gasket Kit	(ALFT503)
Pressure Filter (3880251)	
Element	3894289
Pressure Switch	519397
Case Drain Filter (3880353) (option)	
Element	3890145
Pressure Switch	5193974
Hydraulic Tank 79151460	
Hydraulic Gauge Liquid Level w/Thermometer.....	5193974
Oil Temperature Switch	5194780
Hydraulic Oil Level Switch	5194901
Reservoir Cover Gasket Oil	35558470
Reservoir Breather	
Element	1673251
Relief Valve	1677206
Reservoir Breather/Air Relief Valve	1673250
Reservoir Breather (Used with Dual Top Off Pump Assy – Silica Jell)	
Breather.....	1673252

Main Pump PVM 98

24 Volt Pump	59427960
24 Volt Unloading Valve	37750013
24 Volt Coil	507848
24 Volt Single Solenoid	1699084
Ball Valve (Shut Off)	1607046

Emergency Pump (59427960)

24 Volt Electric Motor	50210205
Pump	59420455

Dual Top-Off Pump Push-Pull (option) (96310020)

Push Pull Pump	59424140
Element 3 Micron Zinga SE-3	3894035

Dual Top-Off w/ 24 Volt Electric Pump (96412769)

24 Volt Top Off Pump.....	59427805
Element 3.5 Micron Schroeder LMZW10.....	3894262
Gauge Filter Service.....	7006530

Rotary Top-Off Pump Assy (option) (96310042)

Element.....	(Zinga AE-10)
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24 Volt Oil Cooler (option) (26740210)

24 Volt Motor & Fan	50211530
Temperature Switch	5194800
Shroud	38040012
Oil Cooler Core	60570039

HYDRAULIC VALVE 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 checks can be performed anytime. Flow controls adjustments are performed after the hydraulics oil is warmed up (oil temperature has reached 100° F minimum).

Before performing these checks, read and understand all OPERATION instructions, warnings and cautions. These testing procedures require at least two workers in order to be performed correctly.



All checks should be performed with the machine’s BRAKE LOCK VALVE in the locked position and wheels chocked.

PRESSURE SETTINGS

Propulsion Manifold

Table with 2 columns: Component Name and Pressure (PSI). Rows include Main System Pressure (2250 PSI), Main Pressure Relief (3000 PSI), Propel Cross Over Reliefs (2900 PSI), and Nipper Up/Down Pressure Reducing Valve (1200 PSI).

Left Main Manifold

Table with 2 columns: Component Name and Pressure (PSI). Row includes Brake Pressure Reducing Valve (1500 PSI).

Right Main Manifold

Table with 2 columns: Component Name and Pressure (PSI). Row includes Push Rail In Pressure Relief Valve (500 PSI).

Left/Right Feed Guide Roller Manifold

Table with 2 columns: Component Name and Pressure (PSI). Row includes Guide Roller Up/Down Pressure Reducing Valve (1000 PSI).

Table with 2 columns: Component Name and Pressure (PSI). Row includes Emergency Pump Relief Valve (1500 PSI).

Table with 2 columns: Component Name and Pressure (PSI). Row includes MacBone Air Conditioner Pressure Relief (2500 PSI).

GENERAL HYDRAULIC REPAIR PROCEDURES

Follow the procedures established for your company's **lockout/tagout** procedures of energy isolating devices whenever maintenance is done. It has to be done before performing any repairs where release of pressurized hydraulic oil or unexpected start-up of the machine could cause injury.

See **LOCKOUT/TAGOUT REQUIREMENTS** in the Safety Section of the Operating & Maintenance Manual for a chart on energy sources located on this machine.

Only trained and authorized personnel should be allowed to operate and / or repair the CX Hammer.

If you are unsure of any of the tasks listed in this document, consult your Supervisor and always refer to the Operating and Maintenance Manual for the CX Hammer.

For tasks beyond a machine operator's knowledge, experience and training, the machine operator must seek assistance from a supervisor, a trained mechanic, or other "qualified" person.

Prior to performing any maintenance conduct a job briefings with any additional persons involved including those on adjacent equipment.

There is a danger of scalding when working with hydraulic oil that has reached operating temperature.

Serious personal injury or death may result if hydraulic oil penetrates the skin. Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines.



All hydraulic circuit repairs should be performed with the machine's BRAKE LOCK VALVE in the locked position and wheels chocked.

Tighten all connections before applying pressure. Protect hands and body from high pressure fluids. If an accident occurs, see a doctor immediately.

The following procedure is designed to lead the operator / mechanic through the steps required to shut the machine down and prepare it for performing mechanical maintenance work. This procedure is intended to release stored hydraulic pressure to make the machine safe to begin repairs.

1. Start the engine and turn the hydraulic pump toggle switch to the ON position.
2. Place the Travel/Work Mode toggle switch is in the TRAVEL position.
3. This will raise work heads, nipper hooks, gager, to allow insertion of the lockup devices.
4. Manually insert all lock up devices – or place the Power Lock Up Toggle Switches in the ENGAGED position.



Cylinders must have lock up devices installed to prevent a cylinder from drifting down and the release of pressurized hydraulic oil during repairs of that hydraulic circuit.

5. Turn OFF the hydraulic pump toggle switch.
6. Turn the ignition switch to the OFF position.
7. Turn the battery disconnect switch to the OFF position and close, secure and tag the disconnect switch box.

8. Manually shift the hydraulic directional control valve for the circuit that is to be worked on to relieve the trapped hydraulic oil pressure!
9. Use caution and crack each hose fittings (1/8 – 1/4) of a turn (CCW) at the hydraulic cylinder (being worked on) to allow any pressurized oil to bleed off.



Manually shifting a hydraulic directional control valve will NOT relieve the trapped hydraulic oil pressure for the following CX Hammer circuits:

1. There is a Pilot Operated Check Valve in each Guide Roller Up Circuit so there will be pressurized hydraulic oil after engine is turned off.
2. There is a Counterbalance Valve in each of the rod end of the Gun (UP) Circuit so there will be pressurized hydraulic oil after engine is turned off.
3. There is a Pilot Operated Check Valves in each Gager Up Circuit between each gager valve stack and the rod end of all four gager cylinders so there will be pressurized hydraulic oil after engine is turned off.

NOTE: There is an option package (Manual Gager Manifold Pressure Relief Button) available for gager up circuit, see page xx for releasing trapped hydraulic pressure.



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.

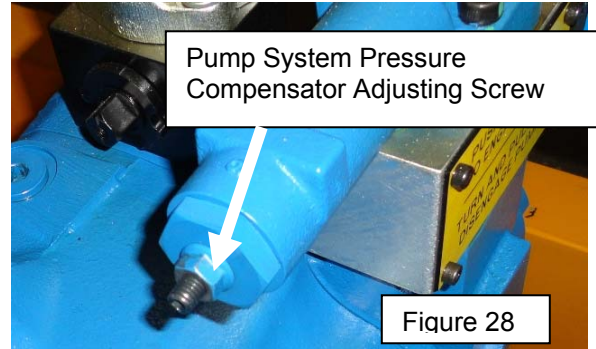
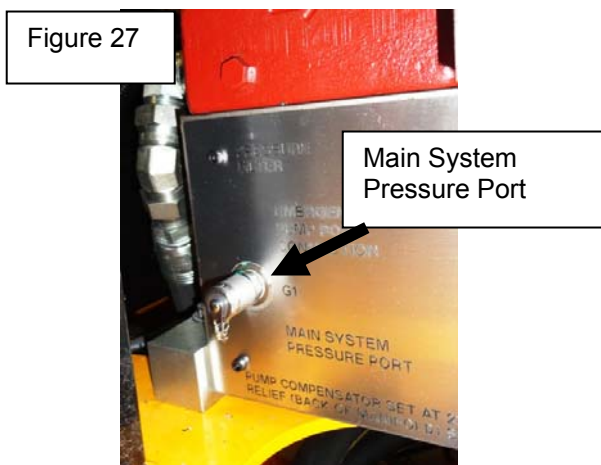
Hydraulic Pump Pressure Compensator

1. Install a hydraulic pressure gage on main system pressure port (Figure 27) located on the propulsion manifold.
2. Start the engine, turn the hydraulic pump toggle switch to the ON position, and read the hydraulic pressure.
- 3. If the pressure is higher than 2250 psi.**
4. Loosen the pump pressure compensator adjusting screw lock nut (Figure 28).
5. Turn the pump pressure compensator adjusting screw counterclockwise (CCW) until pressure reads 2250 psi.
6. Hold the pump pressure compensator adjusting screw at new location while tightening lock nut.
- 7. If the pressure is lower than 2250 psi.**
8. Loosen the pump pressure compensator adjusting screw lock nut (Figure 28).
9. Turn the pump pressure compressor adjusting screw clockwise (CW) until pressure reads 2250 psi.
10. Hold the pump pressure compensator adjusting screw at new location while tightening the lock nut.

If the pump pressure compensator adjustment does not increase to 2250 psi the main system relief may require adjustment/repair. The main system relief is set to 3000 psi for machine operation.

THIS IS SYSTEM PRESSURE!

When adjusting Main Pressure Relief and/or Cross Over Relief(s) always return Pump Pressure Compensator back to 2250 psi.



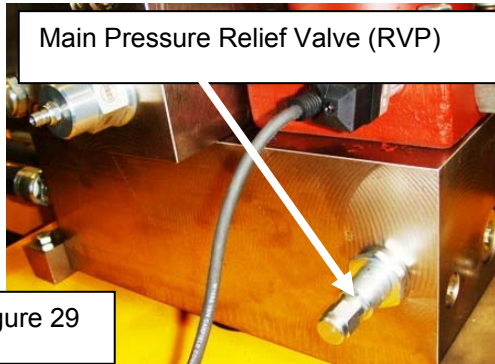
Main System Pressure Relief Valve

1. Install a hydraulic pressure gage on main system pressure port (Figure 27) located on the propulsion manifold.
2. Locate the Main System Pressure Relief Valve (Figure 29) is on the propulsion manifold opposite the main system pressure port.
3. Remove the protective cap and loosen the lock nut on the main system pressure relief valve adjusting screw (Figure 29).
4. Turn the main system pressure relief valve adjusting screw to full clockwise (CW) position (maximum pressure).
5. Loosen the Pump Pressure Compensator adjusting screw lock nut (Figure 28).
6. Turn the pump pressure compensator adjusting screw counterclockwise (CCW) (about 2-3 turns), but do not remove screw. Leave enough thread engagement to prevent leakage.
7. Start the engine, turn the hydraulic pump toggle switch to the ON position.
8. Turn the pump pressure compensator adjusting screw clockwise (CW) until 3000 psi has been reached. Read this pressure at the (Figure 27) pressure tap on the propulsion manifold.
9. Turn the main pressure relief valve adjusting screw (RVP) (Figure 29) counterclockwise (CCW) until pressure at gauge just begins to drop. This is considered cracking pressure.
10. Turn the main pressure relief valve back IN 1/8 of a turn clockwise (CW).
11. Tighten the main system pressure relief valve lock nut.
12. Turn the pump pressure compressor adjusting screw clockwise (CW) until pressure reads 2250 psi.

13. Hold the pump pressure compensator adjusting screw at new location while tightening the lock nut.

THIS IS SYSTEM PRESSURE!

When adjusting Main Pressure Relief and/or Cross Over Relief(s) always return Pump Pressure Compensator back to 2250 psi.



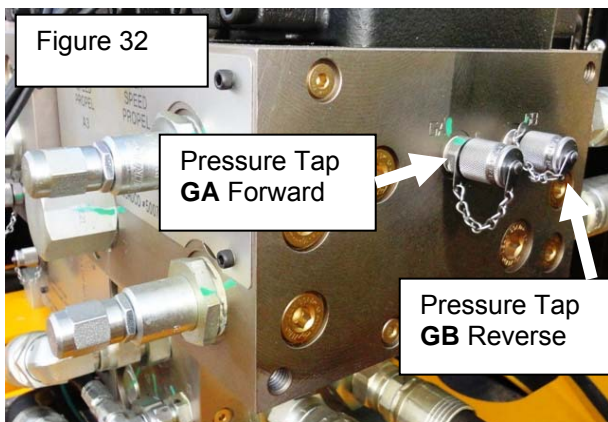
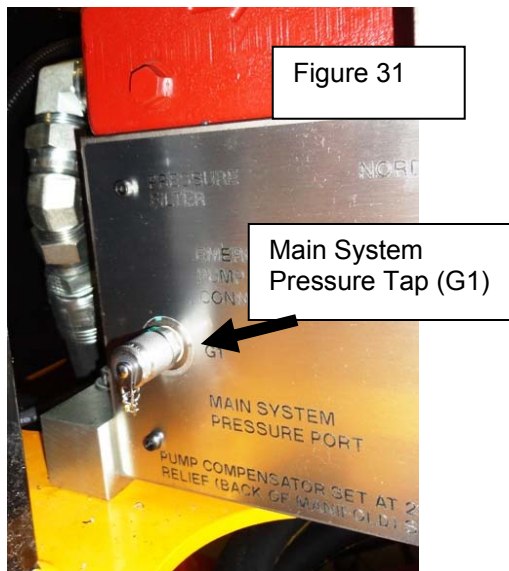
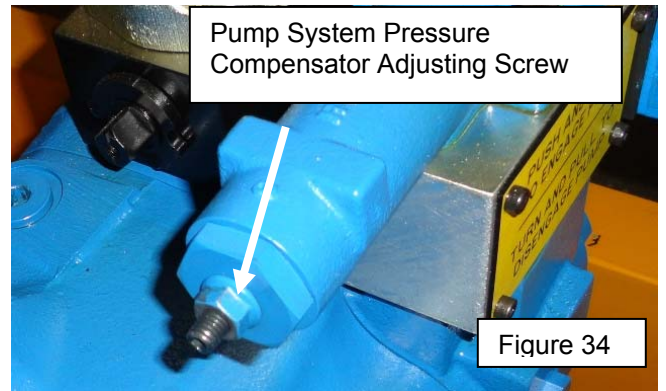
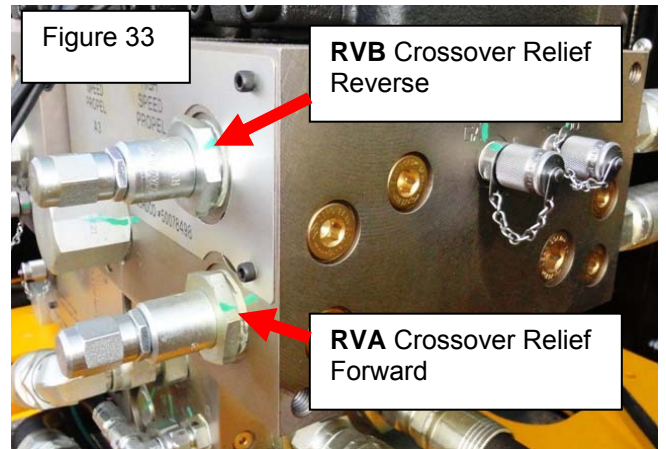
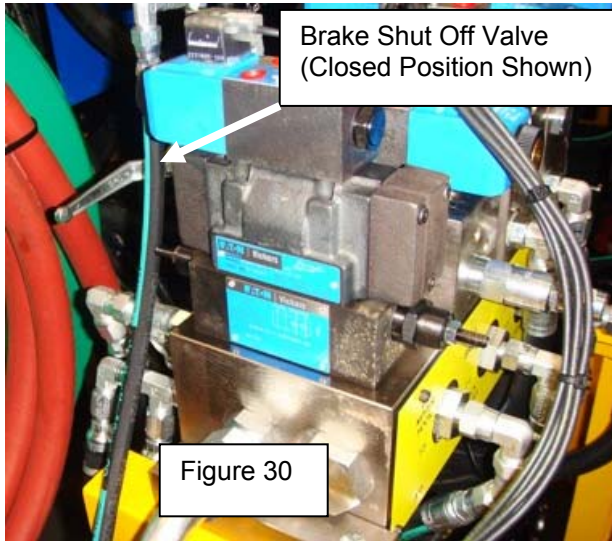
Propel Cross Over Pressure Relief Valve



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

1. Turn Brake Lock –Off valve (behind Left Manifold) to **CLOSED** position to disable brakes. Handle will be perpendicular to hose (Figure 30).
2. Install a hydraulic pressure gage on the propulsion manifold main system pressure port (Figure 31) and on the reverse propel pressure port label **GB** on the right side of the propulsion manifold (Figure 32).
3. Remove the protective caps from both (RVA & RVB) propel crossover pressure relief valve adjustments screws (Figure 33).
4. Loosen the lock nut from both (RVA & RVB) propel crossover pressure relief valve adjustments screws.
5. Turn both (RVA & RVB) propel crossover pressure relief valve adjustments screws to full clockwise (CW) position (maximum pressure) (Figure 33).
6. Loosen the pump pressure compensating adjusting screw lock nut (Figure 34).
7. Start the engine and turn the hydraulic pump toggle switch to the ON position.

8. Check that the Travel/Work Mode toggle switch is in the TRAVEL position.
9. Turn the pump pressure compensator adjusting screw (Figure 34) clockwise (CW) until 2900 psi is reached. Read this pressure at the main system pressure port (Figure 31).
10. Manually override, the reverse propel directional control valve (B) by pushing in the **push pin** (Figure 35) while adjusting (**RVB**) reverse propel crossover relief valve counterclockwise (CCW) until the pressure reading on the hydraulic gauge (pressure port GB) begins to drop. This is considered cracking pressure.
11. Turn the reverse propel crossover relief valve (RVB) back IN 1/8 of a turn clockwise (CW).
12. Tighten the reverse propel crossover pressure relief valve lock nut and install protective cap.
13. Turn off the hydraulic pump and diesel engine.
14. Remove the gauge installed on the reverse propel pressure port label **GB** & move it the forward propel pressure port label **GA** on the right side of the propulsion manifold (Figure 32).
15. Manually override the forward propel directional control valve (A) by pushing in the **push pin** (Figure 35) while adjusting (**RVA**) forward propel crossover relief valve (Figure 33) counterclockwise (CCW) until the pressure reading on the hydraulic gauge (pressure port GA) begins to drop. This is considered cracking pressure.
16. Turn the forward propel crossover relief valve (RVA) back IN 1/8 of a turn clockwise (CW).
17. Tighten the forward propel crossover pressure relief valve lock nut and install protective cap.
18. Adjust pump pressure compensator adjusting screw (Figure 34) counterclockwise (CCW) to system operating pressure (2250 psi).
19. Tighten the pump pressure compensator adjusting screw lock nut.
20. Open Brake Lock-Off Valve (Figure 30).
21. Remove the hydraulic gauges.



**Nipper Up/Down
Pressure Reducing Valve**

Nipper “UP” PRESSURE SETTING

1. Plug a hydraulic pressure gage at the pressure port for the nipper “UP” valve (Figure 36).
2. Start the engine and turn the hydraulic pump toggle switch to the ON position.
3. Check that the Travel/Work Mode toggle switch is in the WORK position.
4. Energize Nipper UP valve if not already on.
- 5. If the nipper UP pressure is higher than 1200 psi.**
6. Loosen the lock nut on nipper up pressure reducing valve adjusting screw (Figure 37).
7. Turn the nipper UP pressure reducing adjusting screw counterclockwise (CCW) until pressure reads 1200 psi.
8. Tighten the nipper UP pressure reducing valve adjusting screw lock nut at new location.
- 9. If the nipper UP pressure is lower than 1200 psi.**
10. Loosen the lock nut on nipper up pressure reducing valve adjusting screw.
11. Turn the nipper UP pressure reducing valve adjusting screw clockwise (CW) until pressure reads 1200 psi.
12. Tighten the nipper UP pressure reducing valve adjusting screw lock nut at new location.

Nipper “DOWN” PRESSURE SETTING

1. Plug a hydraulic gage at the pressure port for the DOWN valve (Figure 36).
2. Start the engine and turn the hydraulic pump toggle switch to the ON position.
3. Check that the Travel/Work Mode toggle switch is in the WORK position.
4. With the UP valve de-energized or DIN connector off coil, manually override DOWN Valve.
- 5. If the nipper DOWN pressure is higher than 1200 psi.**
6. Loosen the lock nut on nipper DOWN pressure reducing valve adjusting screw (Figure 37).

7. Turn the nipper Down pressure reducing valve adjusting screw counterclockwise (CCW) until pressure reads 1200 psi.
8. Tighten the nipper DOWN pressure reducing valve adjusting screw lock nut at new location.
- 9. If the nipper DOWN pressure is lower than 1200 psi.**
10. Loosen the nipper DOWN pressure reducing valve adjusting screw lock nut (Figure 37).
11. Turn the nipper DOWN pressure reducing valve adjusting screw clockwise (CW) until pressure reads 1200 psi.
12. Tighten the nipper DOWN pressure reducing valve adjusting screw lock nut at new location.

Propulsion Manifold

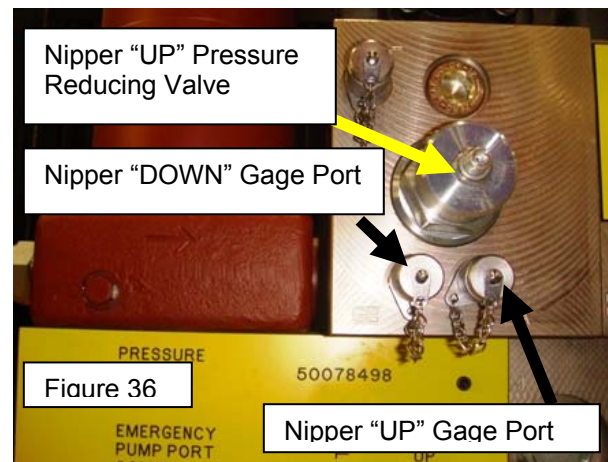


Figure 36

Propulsion Manifold

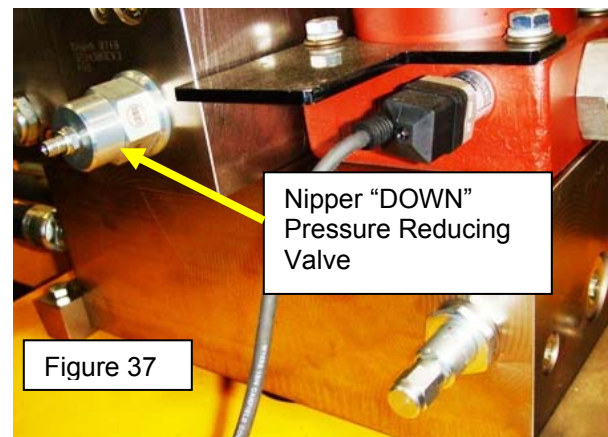


Figure 37

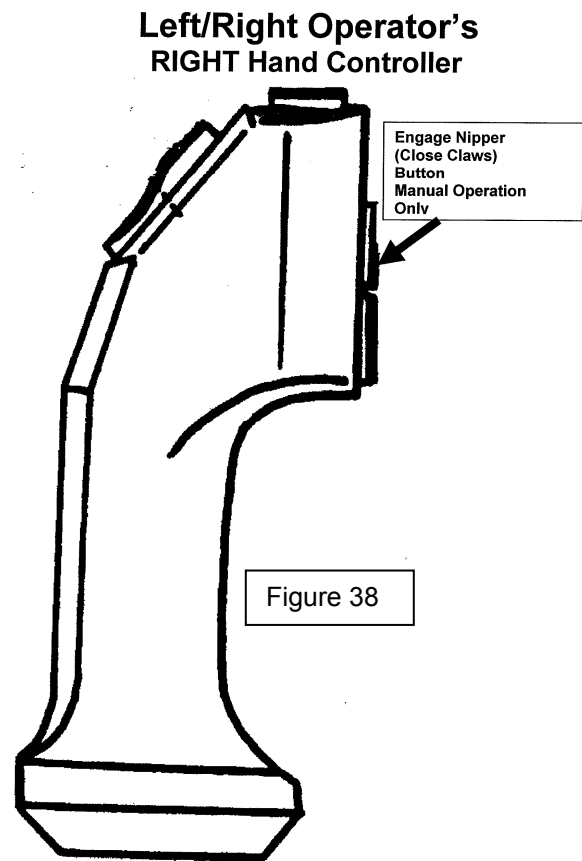
LEFT MAIN MANIFOLD

Nipper Hooks CLOSE Flow Control Valve

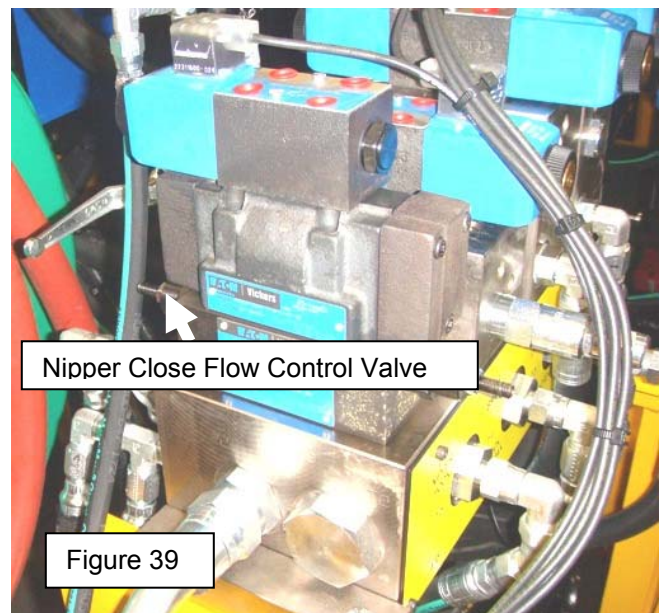
Located in the center of the machine, between the work heads is the nipper assembly. It is used to pull the tie up to the rail to secure the tie plate to the tie during spiking operations.

1. To return the nipper hooks flow control valve to the factory setting:
2. Loosen the CLOSE flow control valve adjusting screw lock nut (Figure 39)
3. Turn the nipper hooks CLOSE flow control valve adjusting screw (Figure 39) counterclockwise (CCW) all the way out, then one half of a turn clockwise (CW) back in.
4. Tighten the CLOSE flow control valve adjusting screw lock nut (Figure 39)
5. To check the nipper hooks close operation speed:
6. Start the engine and turn the hydraulic pump toggle switch to the ON position.
7. Check that the Travel/Work Mode toggle switch is in the WORK position.
8. Disengage the nipper lock-ups:
 - a. Manual lock up – handle is in outer slot.
 - b. Hydraulic lock up – Place the Nipper Lock Up Toggle Switch in the Disengage Position.
9. Place the nipper auto/manual toggle switch in the manual position.
10. Press and release the **NIPPER ENGAGE** pushbutton on either operator's right hand controller (Figure 38). (Nipper Set button will not function in auto-nipper mode)
11. This will cause the nipper frame to lower and stop once it contacts the tie. The nipper hooks will then close around the tie and the frame will pull up on the tie.
12. If the speed of the nipper hooks CLOSE needs to be adjusted further:
13. Loosen the nipper hook CLOSE flow control valve adjusting screw lock nut (Figure 39).
14. Turn the nipper hook flow control valve adjusting screw clockwise to decrease flow or counterclockwise to increase flow (speed).

15. Tighten the CLOSE flow control valve adjusting screw lock nut (Figure 39)



Left Main Manifold



LEFT MAIN MANIFOLD

**Nipper Hooks OPEN
Flow Control Valve**

Located in the center of the machine, between the work heads is the nipper assembly. It is used to pull the tie up to the rail to secure the tie plate to the tie during spiking operations.

1. To return the nipper hooks flow control valve to the factory setting:
2. Loosen the OPEN flow control valve adjusting screw lock nut (Figure 41)
3. Turn the nipper hooks OPEN flow control valve adjusting screw (Figure 40) counterclockwise (CCW) all the way out, then one half of a turn clockwise (CW) back in.
5. Tighten the OPEN flow control valve adjusting screw lock nut (Figure 41)
6. To check the nipper hooks OPEN operation speed:
7. Start the engine and turn the hydraulic pump toggle switch to the ON position.
8. Check that the Travel/Work Mode toggle switch is in the WORK position.
9. Disengage the nipper lock-ups:
 - a. Manual lock up – handle is in outer slot.
 - b. Hydraulic lock up – Place the Nipper Lock Up Toggle Switch in the Disengage Position.
10. Place the nipper auto/manual toggle switch in the manual position.
11. Press and release the **NIPPER ENGAGE** pushbutton on either operator’s right hand controller (Figure 40). (Nipper Set button will not function in auto-nipper mode)
12. This will cause the nipper frame to lower and stop once it contacts the tie. The nipper hooks will then close around the tie and the frame will pull up on the tie.
13. Press and release the **NIPPER DISENGAGE** pushbutton on either operator’s left hand controller. (Nipper button not functional in auto-nipper mode)
14. This will cause the nipper frame to lower the tie. The nipper hooks will then OPEN and the nipper frame to raise o the lock up position.

15. If the speed of the nipper hooks OPEN needs to be adjusted further:
16. Loosen the nipper hook OPEN flow control valve adjusting screw lock nut (Figure 41).
17. Turn the nipper hook flow control valve adjusting screw clockwise to decrease flow or counterclockwise to increase flow (speed).
18. Tighten the OPEN flow control valve adjusting screw lock nut (Figure 41)

**Left/Right Operator’s
LEFT Hand Controller**

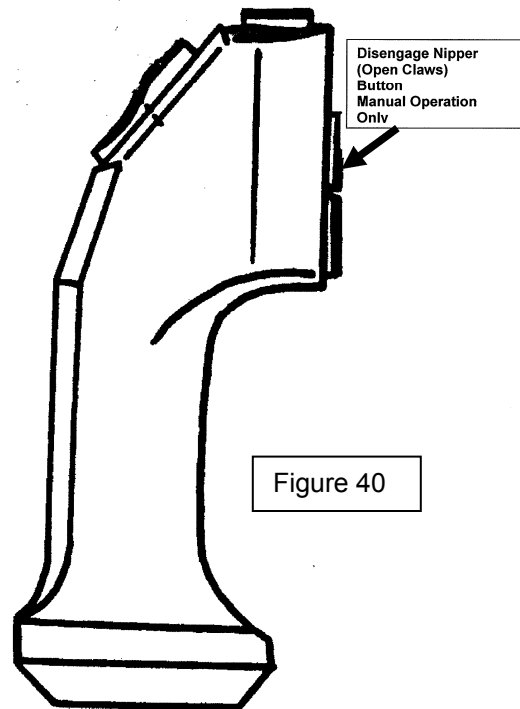


Figure 40

Left Work Head Manifold

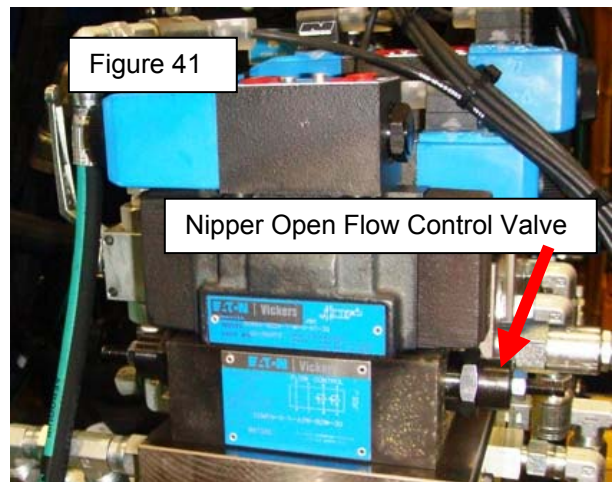


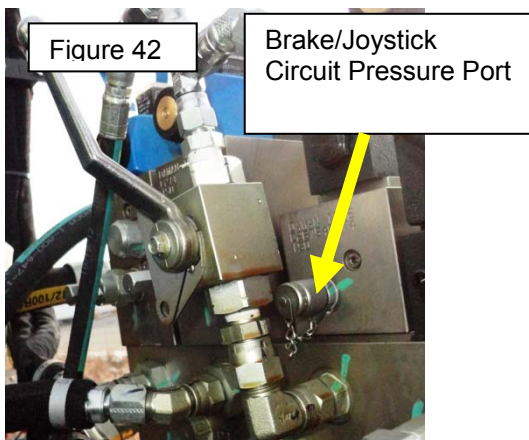
Figure 41

Nipper Open Flow Control Valve

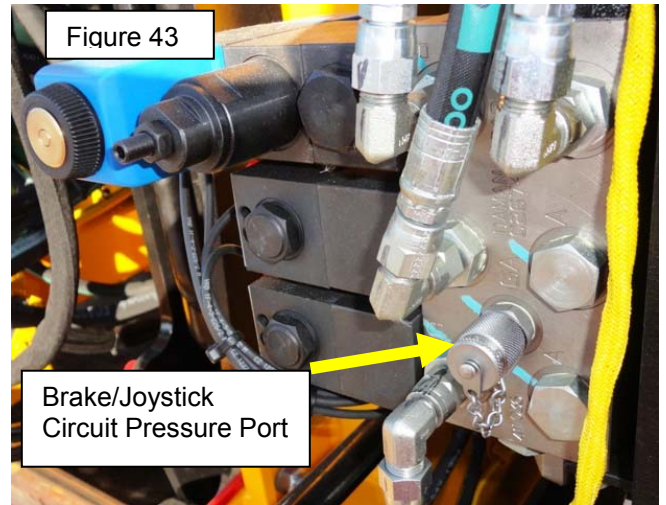
Brake/Joystick Pressure Reducing Valve

1. Plug a hydraulic gage at the brake/joystick circuit pressure port located next to the brake shut off valve (Figure 42) or at the left guide roller manifold (Figure 43).
2. Start the engine and turn the hydraulic pump toggle switch to the ON position.
3. Check that the Travel/Work Mode toggle switch is in the TRAVEL position.
4. **If pressure is higher than 1500 psi.**
5. Remove the protective cap from the brake/joystick pressure reducing valve adjusting screw (Figure 44).
6. Loosen the lock nut on the brake/joystick pressure reducing valve adjusting screw.
7. Turn the brake/joystick pressure reducing valve adjusting screw counterclockwise (CCW) until pressure reads 1500 psi.
8. Tighten lock nut at new location and install protective cap.
9. **If pressure is lower than 1500 psi.**
10. Remove the protective cap from the brake/joystick pressure reducing valve adjusting screw (Figure 44).
11. Loosen the lock nut on the brake/joystick pressure reducing valve adjusting screw.
12. Turn brake/joystick pressure reducing valve adjusting screw clockwise (CW) until pressure reads 1500 psi.
13. Tighten the lock nut at new location and install protective cap.

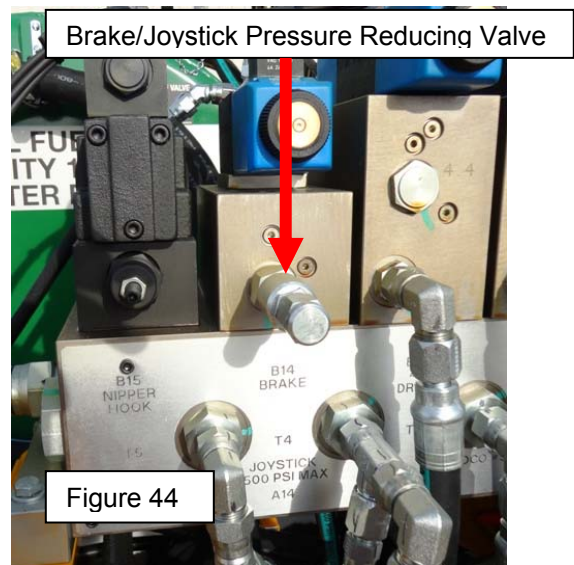
Left Main Manifold



Left Guide Roller Manifold



Left Work Head Manifold



Gun # 1 & # 2 Counterbalance Valve Left Operator

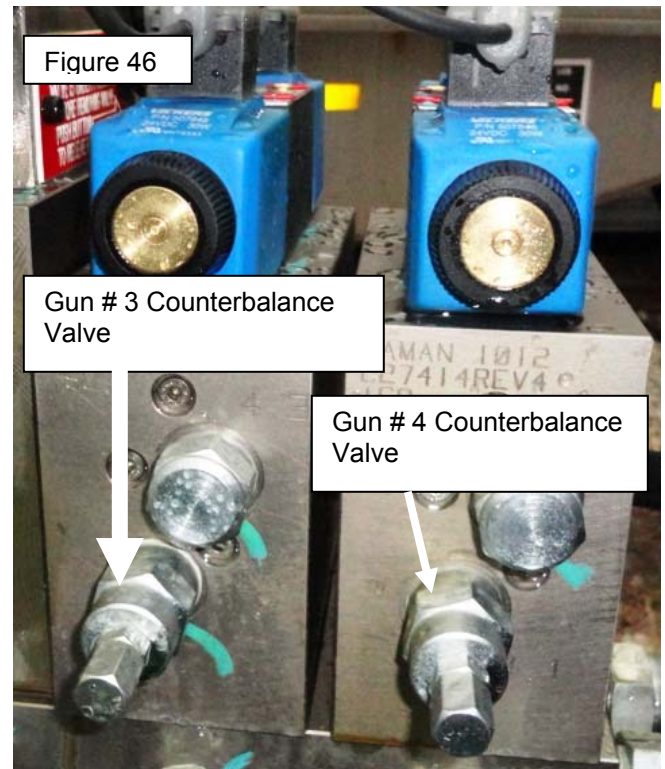
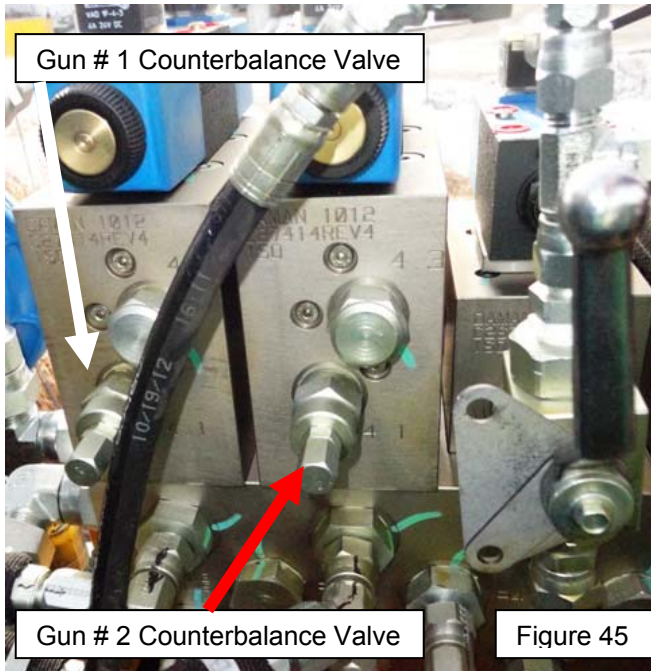
The gun 1 & 2 counterbalance valves prevent the gun assemblies from drifting down.

1. If after one minute a gun assembly has drifted down:
2. To reset to factory's setting, remove the counterbalance valve's protective cap for the gun being adjusted (Figure 45).
3. Loosen the gun counterbalance valve lock not
4. Turn the counterbalance valve adjusting screw counterclockwise (CCW) all the way out. Then 3 1/4 turns clockwise (CW) back in.

5. Tighten the counterbalance valve adjusting screw lock nut & install protective cap.
6. If gun continues to drift down within a minute, turn **out** (CCW) gun counterbalance valve's adjusting screw ¼ turn.
7. Recheck for gun drift down and for smooth operation (not jerky) after gun counterbalance valve is adjusted.

6. If gun continues to drift down within a minute, turn **out** (CCW) gun counterbalance valve's adjusting screw ¼ turn.
7. Recheck for gun drift down and for smooth operation (not jerky) after gun counterbalance valve is adjusted.

Left Work Head Manifold



Right Work Head Manifold

RIGHT MAIN MANIFOLD

Gun # 3 & # 4 Counterbalance Valve (Right Operator)

The gun 3 & 4 counterbalance valves prevent the gun assemblies from drifting down.

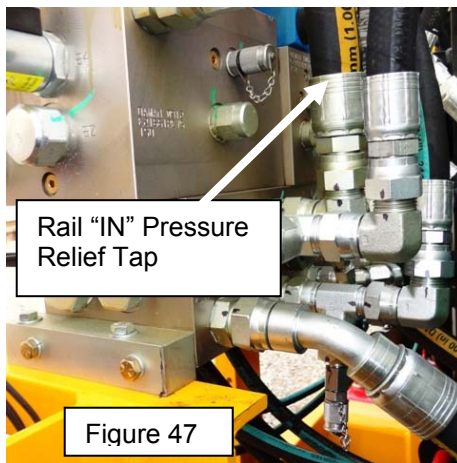
1. If after one minute a gun assembly has drifted down:
2. To reset to factory's setting, remove the counterbalance valve's protective cap for the gun being adjusted (Figure 46).
3. Loosen the gun counterbalance valve lock not.
4. Turn the counterbalance valve adjusting screw counterclockwise (CCW) all the way out. Then 3 1/4 turns clockwise (CW) back in.
5. Tighten the counterbalance valve adjusting screw lock nut & install protective cap.

Push Rail In Pressure Relief Valve

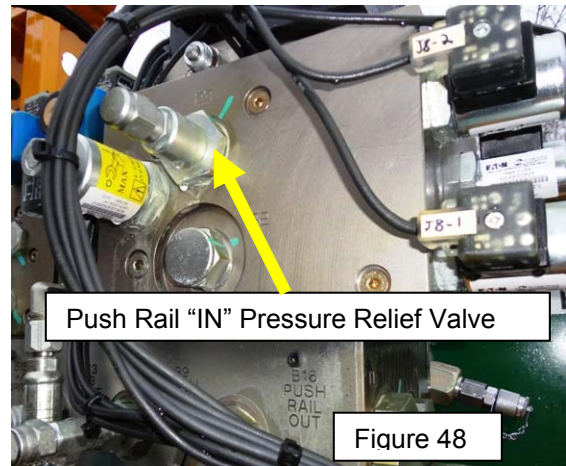
1. Install a hydraulic gage at the rail in pressure tap (Figure 47) located on the back side of the right work head manifold assembly.
2. Start the engine and turn the hydraulic pump toggle switch to the ON position.
3. Check that the Travel/Work Mode toggle switch is in the TRAVEL position.
4. Remove the push rail IN relief valve adjusting screw protective cap (Figure 48).
5. Loosen the push rail IN relief valve adjusting screw lock nut.
6. Remove the din connector to the rail IN solenoid (Figure 49).
7. Select a narrow gage.

8. Set any gun to bring the outside gager arms against the rail.
9. Manually run the inside gager arms against the rail & note the pressure reading on the gage.
- 10. If the push rail IN pressure relief valve pressure reading is higher than 500 psi.**
11. Turn the push rail IN pressure relief valve adjusting screw counterclockwise (CCW) until pressure reads 500 psi.
12. Tighten the push rail IN pressure relief valve adjusting screw lock nut and install protective cap.
13. If the push rail IN pressure relief valve pressure reading is lower than 500 psi
14. Turn the push rail IN pressure relief valve adjusting screw clockwise (CW) until pressure reads 500 psi.
15. Tighten the push rail in pressure relief valve adjusting screw lock nut and install protective cap.

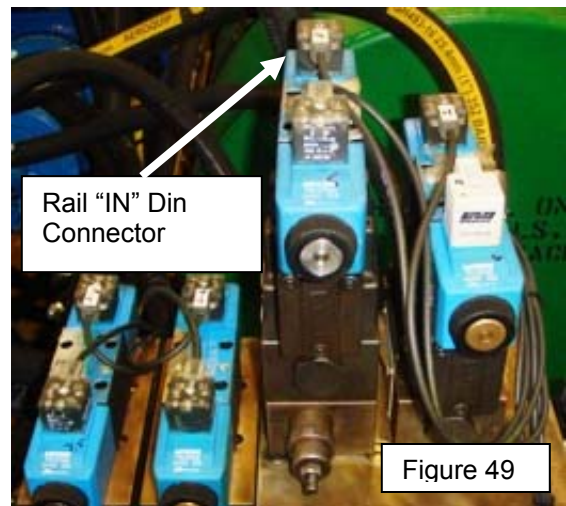
Right Work Head Manifold



Right Work Head Manifold



Right Work Head Manifold

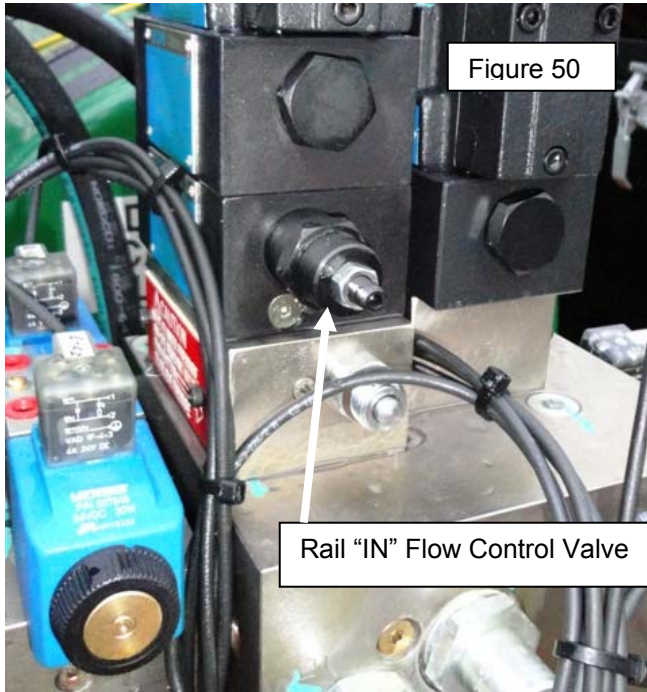


Push Rail In Flow Control Valve

1. To adjust the speed of the push rail in flow control valve loosen up the adjusting screw lock nut (Figure 50).
2. Start the engine and turn the hydraulic pump toggle switch to the ON position.
3. Check that the Travel/Work Mode toggle switch is in the TRAVEL position.
4. Turn the push rail IN flow control valve adjusting screw clockwise to decrease flow or counterclockwise to increase flow (speed).
5. Tighten the push rail IN flow control valve adjusting screw lock nut.

6. To reset to factory setting:
7. Turn the nipper hook flow control valve adjusting screw clockwise (CW) all the way in, then 5 turns counterclockwise (CCW) back out.

Right Main Manifold



10. Turn the guide roller pressure reducing valve adjusting screw clockwise (CW) until pressure reads 1000 psi.
11. Tighten lock nut at new location.

Feed/Guide Roller Manifold (Left Side)

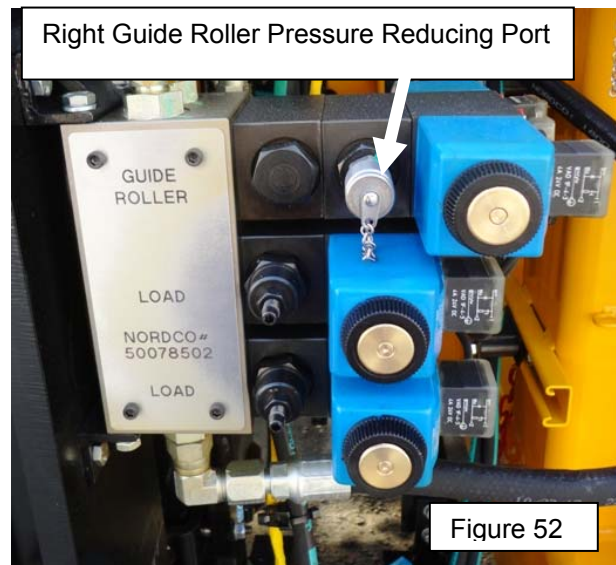


FEED/GUIDE ROLLER MANIFOLDS

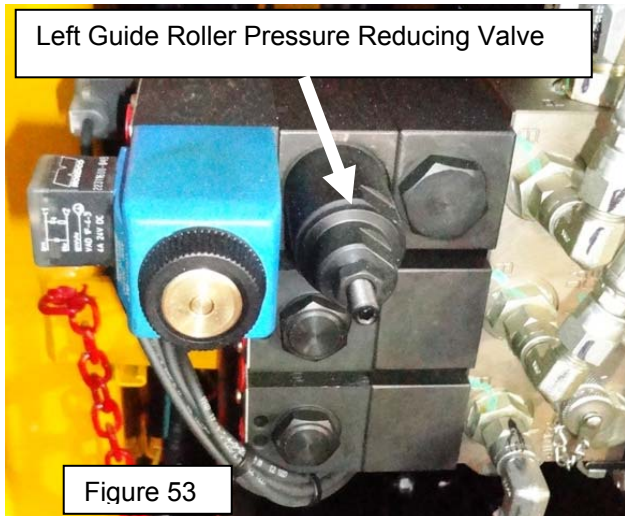
Guide Roller Pressure Reducing Valve

1. Plug in a hydraulic gage at the guide roller pressure port that is being tested (Figure 51 or 52).
2. Start the engine and turn the hydraulic pump toggle switch to the ON position.
3. Check that the Travel/Work Mode toggle switch is in the TRAVEL position.
4. **If pressure is higher than 1000 psi.**
5. Loosen the guide roller pressure reducing valve adjustment screw lock nut (Figure 53 or 54).
6. Turn the guide roller pressure reducing valve adjusting screw counterclockwise (CCW) until pressure reads 1000 psi.
7. Tighten lock nut at new location.
8. **If pressure is lower than 1000 psi.**
9. Loosen the lock nut on the brake/joystick pressure reducing valve adjusting screw (Figure 53 or 54).

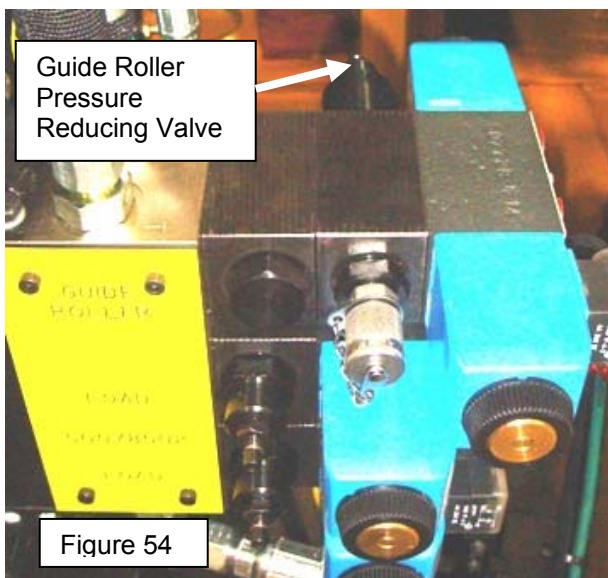
Feed/Guide Roller Manifold (Right Side)



Feed/Guide Roller Manifold (Left Side)



Feed/Guide Roller Manifold (Right Side)



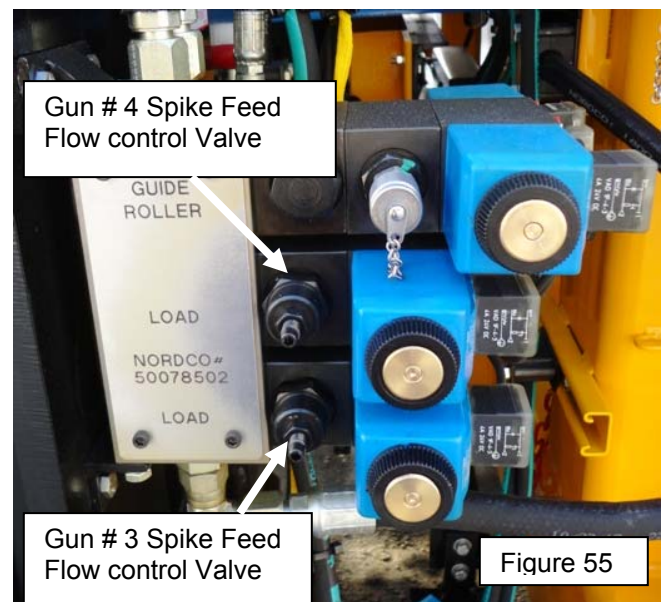
Gun Load Flow Control Valve (Spike Feed)

The gun load flow control valves are located in the guide roller manifolds in front of the left/right gun assemblies. The gun load flow control valve regulates the speed of the spike feed cylinder.

1. To return a gun load flow control valve to the factory setting:
2. Loosen the gun load flow control valve lock nut for the spike cylinder that needs adjusting (Figure 55 & 56).

3. Turn the gun load flow control valve adjusting screw clockwise (CW) all the way in, then 6 ½ turns counterclockwise (CCW) back out.
4. To check for consistent spike feed operation:
5. Check that the spike tray for that spike cylinder has plenty of spikes
6. Start the engine and turn the hydraulic pump toggle switch to the ON position.
7. Check that the Travel/Work Mode toggle switch is in the WORK position.
8. Press and release the load pushbutton (Figure 57) on the hand controller for the spike feed cylinder being tested.
9. The spike should consistently protrude from the jaw assembly as spikes are fed.
10. If spikes are not feeding properly:
11. Turn the gun load flow control adjusting screw in small increments clockwise to decrease flow or counterclockwise to increase flow (speed).
12. Tighten the gun load flow control valve adjusting screw lock nut.
13. If problems with loading spikes persist after adjusting the gun load flow control valve refer to the mechanical troubleshooting guide at the end of the instructions.

Feed/Guide Roller Manifold (Right Side)



Feed/Guide Roller Manifold (Left Side)

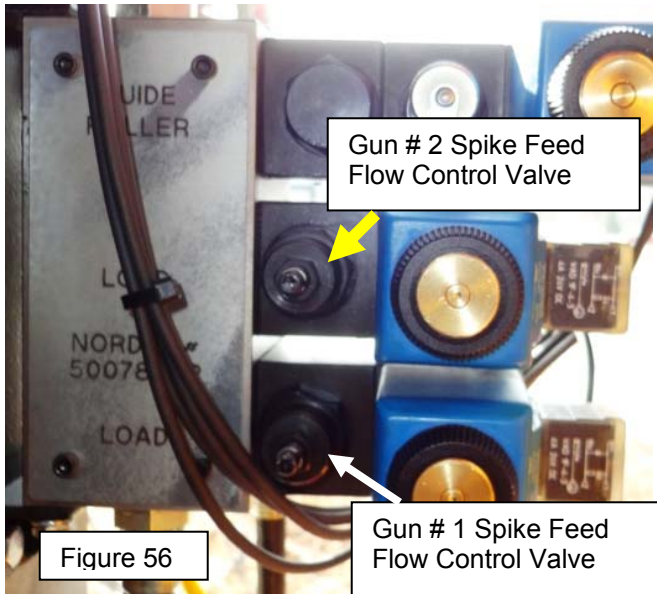


Figure 56

Right & Left Hand Controller

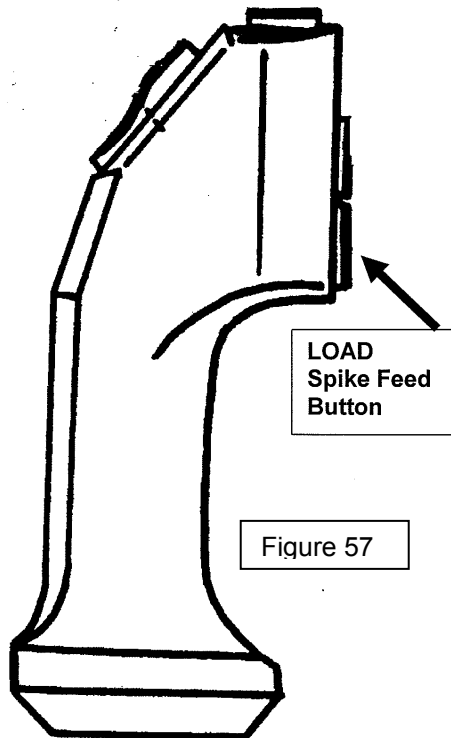


Figure 57

Spotting Right/Left Counterbalance Valve

The right/left spotting counterbalance valve is used to hold the position of the hammer assembly as spikes are driven.

Right/left spotting counterbalance valves are mounted on the machine's frame in front of each hammer assembly.

1. To return a spotting counterbalance valve to factory's setting:
2. Loosen the spotting counterbalance adjusting screw lock nut (Figure 58).
3. Turn the spotting counterbalance valve adjusting screw clockwise (CW) all the way in.
4. Then turn the spotting counterbalance valve adjusting screw back out 1 ¼ turns counterclockwise (CCW).
5. Tighten the spotting counterbalance valve lock nut.
6. If the right or left spotting cylinder (hammer) fails to hold position as spikes are being driven, turn **out** (CCW) adjusting screw ¼ turn and recheck.



Figure 58

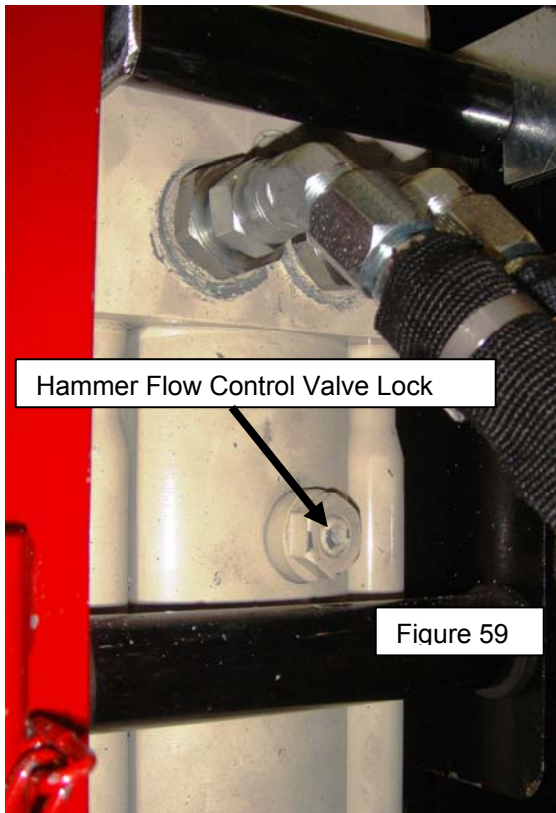
Right/Left Spotting Cylinder Counterbalance Valves

Hammer Flow Control Valve

A hammer flow control valve is located in each hammer (Figure 59).

The hammer flow control valve is used to adjust the rapping frequency between the guns as spikes are driven into the tie (all guns should sound alike).

1. To check or return the hammer flow control valve to it's factory setting:
2. Loosen the hammer flow control lock nut (Figure 59).
3. Turn the hammer flow control valve adjustment screw clockwise (CW) all the way in.
4. Then turn the hammer flow control valve one full turn counterclockwise (CCW) out.
5. Hold the hammer flow control valve adjusting screw in position while tightening lock nut.
6. Minute adjustments (in or out) from the initial factory setting to adjust the frequency between the four guns but do not exceed 1 ½ turns counterclockwise out.
7. Medium to fast hammering is acceptable:
 - a. IN clockwise (CW) to slow down.
 - b. OUT counterclockwise (CCW) to speed up.



Hammer Accumulator



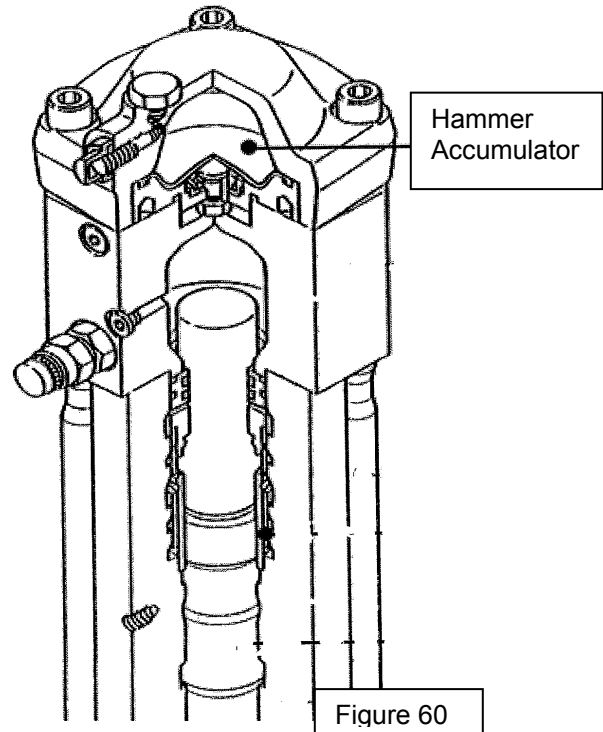
Each of the four hammers has an accumulator that is under high pressure!

The accumulator is filled with nitrogen gas at Nordco Inc. to 950 PSI at 70 degrees ambient temperature of the accumulator.

Refer to the (KF3BN Hydraulic Hammer) in the Component Data Section of this manual **BEFORE** attempting any repairs or checking the nitrogen pressure.

The hammer bladder accumulator (Figure 60) is used to maintain continuous oil flow during valve shift within the hammer. The accumulator acts as a variable size reservoir for the oil, allowing for continuous oil flow during the time the piston is changing direction. This absorbs (reduces) the pulsations in the hydraulic circuit.

Check the accumulator nitrogen gas pressure if spikes are not driven all the way down (high spikes).



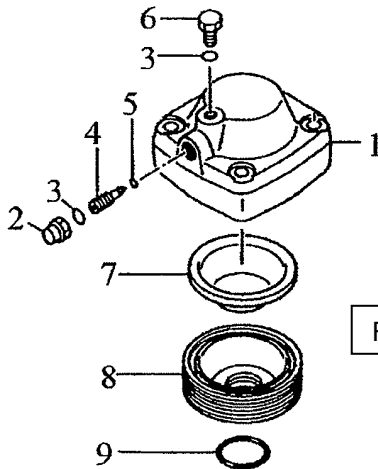


Figure 61

Accumulator

- 1 – Accumulator Cap
- 2 – Cap
- 3 – O-Ring
- 4 – Valve
- 5 – O-Ring
- 6 – Fitting
- 7 – Diaphragm
- 8 – Accumulator Body
- 9 – O-Ring

HYDRAULIC RESERVOIR

Oil Level

Inspect the oil level on a daily basis (or every 10 hours of operation) by reading the sight gauge located on the left side of the reservoir. At full level, the oil should be to the top of the sight gauge. The CX Hammer hydraulic system uses SAE-20 (ISO 46) oil (UNLESS OTHERWISE STENCILLED ON THE HYDRAULIC TANK). See recommend lubricants in the maintenance section of this manual. Before filling the system with hydraulic oil, be sure that the fluid is as specified and that it is clean. Do not use cloth strainers or fluid that has been stored in contaminated containers.

Inspection of Oil

Care should be taken to keep the hydraulic oil free of dust, water, sealing compounds and other foreign matter. While using the sight gauge, verify oil quality. If oil becomes dark or milky colored, it should be changed as soon as possible.

NOTE: Never add hydraulic oil to reservoir by any other means than through a manual/electric pump and filter.

NEVER OVERFILL RESERVOIR.

Never use hydraulic brake fluid in lieu of hydraulic oil.

Suction Line Filter

The CX Hammer is equipped with a lockout device as a replacement for a handle on the suction strainer. This lockout prevents the valve from being opened or closed without the operator’s knowledge.

The suction line strainer is located on the reservoir, remove and inspect the filter after the first 40 hours of operation and refer to Hydraulic Component Maintenance Schedule inspection for designated intervals.

To access suction line filter cartridge:

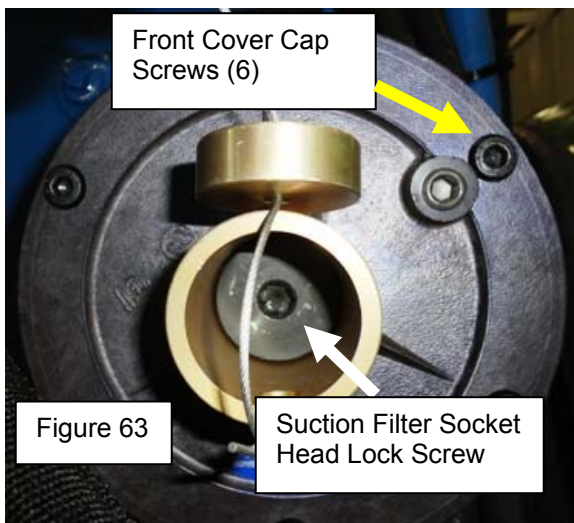
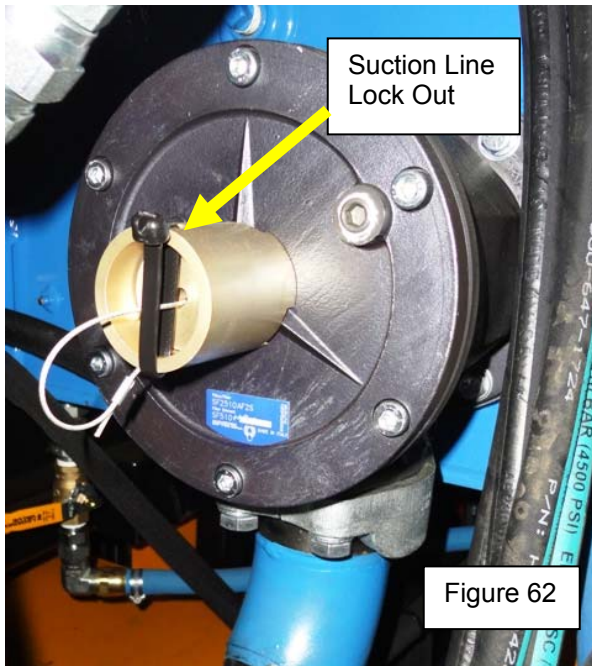
1. Turn off engine.
2. Remove Lock out device & plug (Figure 62).
3. Turn internal socket head cap screw (figure 63) out counterclockwise (OUT) till it stops.

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 suction line socket head lock screw clockwise (IN) till it stops.
9. Replace the plug.
10. Put padlock (Lockout) back on.

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

Contamination on the outlet side of the filters can be flushed into the system and cause malfunctions. Contamination on the inlet side reduces the life of the filter element.



24 Volt Emergency Hydraulic Pump Pressure Relief Valve

This will require, one person to operate controls and switches in cab & another person to read gauge and adjust emergency pump.

Emergency pump (figure 64) is located on left side of machine behind the propulsion manifold.

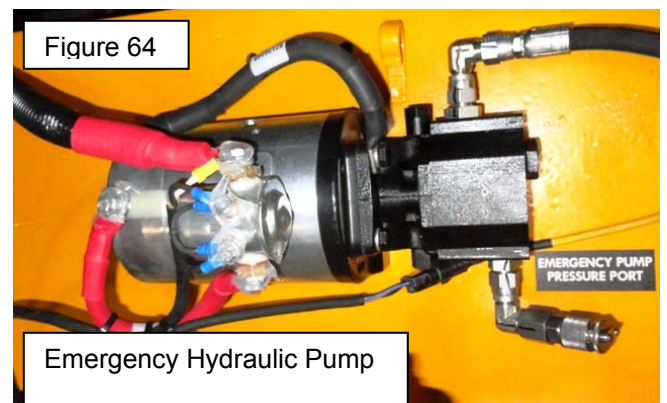
1. Install a pressure gage (0-3000 psi) at pressure tap on the main system pressure port (Figure 65).
2. Turn the implement pump ball valve to closed position (Figure 66) (Indicator line on ball valve off) will be perpendicular to flow in the pressure line.

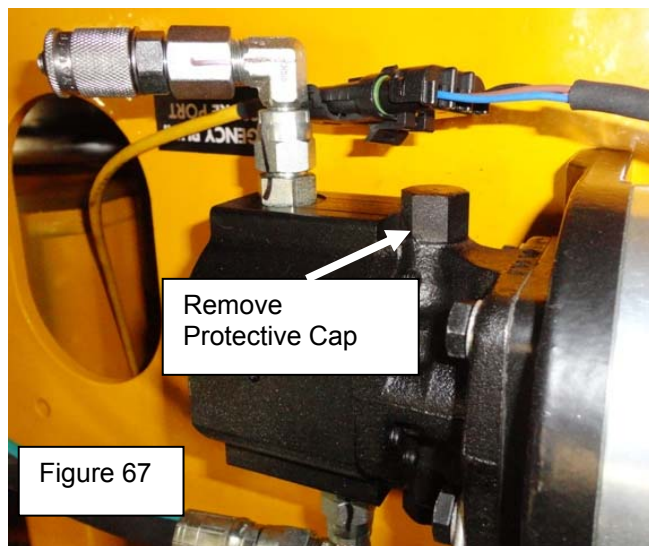
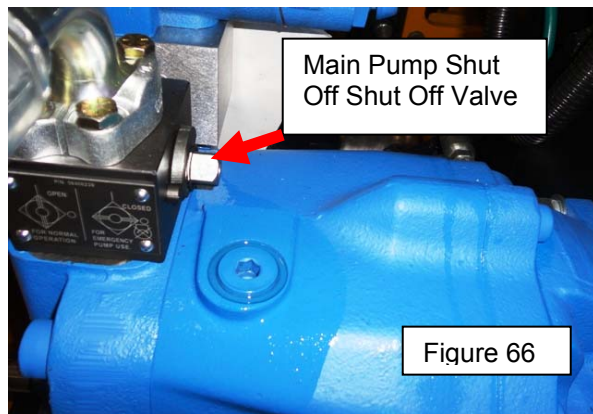
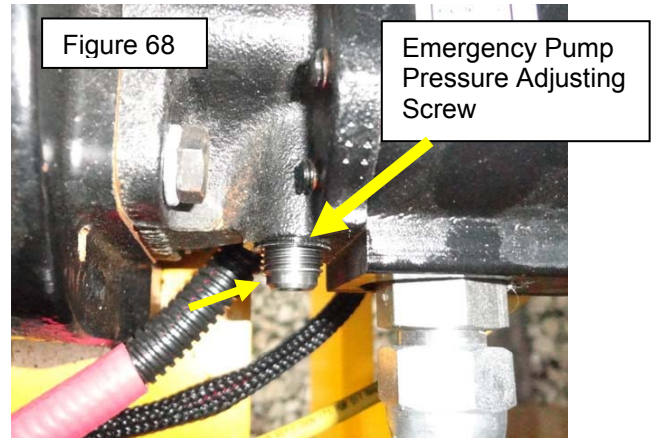
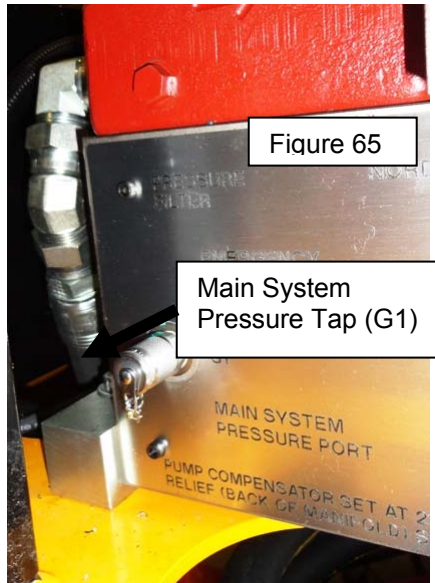
3. Turn the battery disconnect switch to the ON position and at the logic control box turn ignition switch to the ON position to activate controls.
4. At the logic control box sets the Travel/Work Mode switch to the travel position. This will raise all workhead components to the lock up position.
5. Place emergency pump switch to the ON position read the maximum hydraulic pressure reached.

CAUTION

Operate the 24 volt emergency pump in intervals for a maximum of 30 seconds to one minute, and then let electric motor cool for one minute before using again. The 24 volt emergency pump is designed for emergency use ONLY and is NOT to be run continuously.

6. If pressure is higher than 2250 psi remove protective cap (Figure 67) and turn adjusting screw counterclockwise (figure 65) (CCW) to decrease pressure.
7. Repeat test and if ok install protective cap.
8. If pressure is lower than 2250 psi remove protective cap (figure 67) and turn adjusting screw clockwise (figure 67) (CW) to increase pressure.
9. Repeat test and if ok install protective cap.
10. When finished and before turning on implement hydraulic pump, open the main pump ball valve (Figure 66) (Indicator line on shut off) will be in line to flow.





Emergency Pump Pressure Relief valve 1500 PSI (Little Giant OPTION)

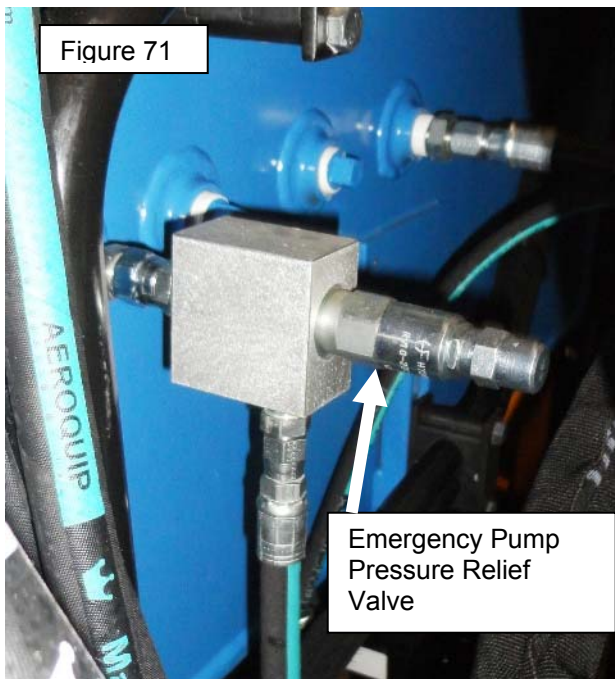
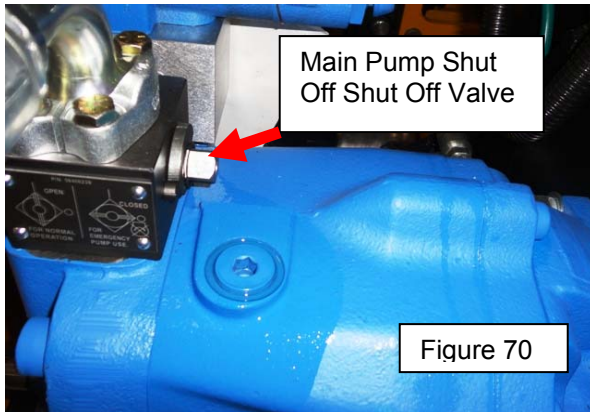
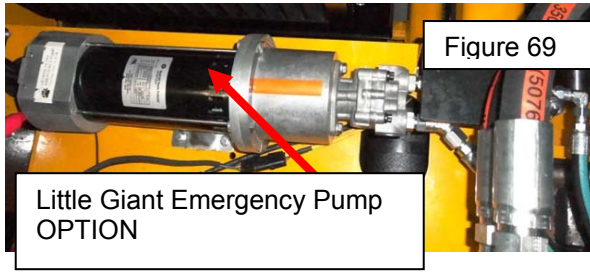
1. Install a pressure gage on the emergency pump pressure tap (Figure 69).
2. Turn the main pump ball valve to close position (Figure 70) (Indicator line on ball valve off) will be perpendicular to flow in the pressure.
3. Turn the battery disconnect switch to the ON position and at the logic control box turn ignition switch to the ON position to activate controls.
4. At the logic control box, set the Travel/Work Mode switch to the travel position. This will raise all workhead components to the lock up position.
5. Place emergency pump switch to the ON position read the maximum hydraulic pressure reached.

CAUTION

Operate the 24 volt emergency pump in intervals for a maximum of 15 seconds at a time. The 24 volt emergency pump is designed for emergency use ONLY and is NOT to be run continuously.

6. If pressure is higher than 1500 psi remove the protective cap and loosen up lock nut (Figure 71).
7. Turn adjusting screw counterclockwise to decrease pressure.
8. Tighten lock nut & install cap.
9. If pressure is lower than 1500 psi remove cap and loosen up lock nut (Figure 71). Turn adjusting screw clockwise to increase pressure.

10. Tighten the emergency pump pressure relief valve adjusting screw lock nut and install cap (Figure 71).
11. When finish with test/repairs open the main pump ball valve (Figure 70) (BEFORE starting engine) (Indicator line on shut off) will be in line to flow.



Manual Gager Manifold Pressure Relief Button (OPTION)



Gager Up Because of Pilot Operated Check Valves in the Circuit there is pressurized hydraulic oil between each gager valve stack and the rod end of all four gager cylinders after the engine is turned off.

BEFORE PERFORMING ANY HYDRAULIC REPAIRS ON ANY GAGER COMPONENT DO THE FOLLOWING:

1. Before performing any maintenance on any component in the gager mechanism perform the following:
2. The manual gager manifold pressure relief button (Figure 73) is used to release trapped pressurized hydraulic oil in both the Gager Push Rail IN & the Gager Push Rail OUT circuit after .
3. Place the machine in the TRAVEL mode. This will raise the gager lever arms to allow insertion of the lockup devices. (Figure 72).
4. Locate the lock lockup pins. Depending on the S/N range of your machine, the pins are either stored on the outside face of the gager housing or on the frame next to the housing.
5. Insert lockup pin into hole in gager housing. (Look for “Lockup Point” sticker on housing)
6. Turn the ignition switch to the OFF position.
7. Turn the battery disconnect switch to the OFF position and close and lock the disconnect switch box.

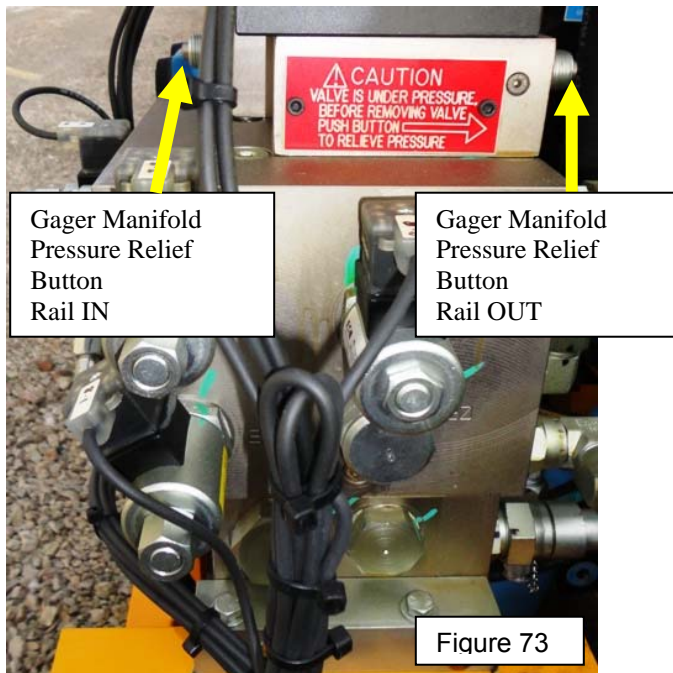


After performing steps 1 thru 7, manually shifting either gager directional control valves will NOT relieve the trapped hydraulic oil pressure!!

- 8. Press both gager manifold pressure relief button (Figure 73) to release the trapped pressure between the gager valve stack and the rod end of all four gager cylinders.
- 9. Use caution crack both hose fittings (1/8 – 1/4) of a turn (CCW) at the gager cylinder (being worked on) to allow any pressurized oil to bleed off.
- 10. Servicing or performing maintenance on the gager hydraulic circuit.



Figure 72
Right Main Manifold



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

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
<p>Hydraulic Oil Foams</p>	<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>
<p>Machine will not propel</p>	<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 pump.</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 valve.</p>

PROBLEM	POSSIBLE CAUSE	SOLUTION
Brakes will not release	Brake lock-off valve closed. Brake directional control valve	Open lock-off valve. Check spool for free motion and that solenoid is being energized.
Brakes will not apply.	Brake valve not shifting. Broken brake spring. Brake shoes worn.	Check valve spool for free motion and that solenoid is being energized. Inspect spring and replace if necessary. Inspect shoes, and replace if necessary.
Work Head Assembly does not operate.	Pump switch off. Faulty valve. Pump not producing pressure. Work/Travel switch in Travel position.	Turn pump switch on. Inspect, repair, or replace valve. See Hydraulic Troubleshooting. Switch to Work position.
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
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.
Spikes not feeding completely into jaws.	Feed valve flow control not open far enough.	Adjust flow control at feed valve solenoid.
Spikes not going in straight.	Flow control not properly set.	Set flow control (if too fast or too slow this will cause misfeed)

PROBLEM	POSSIBLE CAUSE	SOLUTION
<p>A Lock Up does not disengage (OPTIONS)</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>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>Spike will not feed when pushbutton is pressed.</p>	<p>Feed valve is not shifting.</p> <p>Feed cylinder and spring defective.</p> <p>Feed valve flow control improperly adjusted.</p>	<p>Check valve spool for free motion and that solenoid is being energized.</p> <p>Repair or replace.</p> <p>Adjust feed valve flow control.</p>
<p>Spike Jaws do not stop at ready position.</p>	<p>Driving valve not centering.</p>	<p>Check valve spool for free motion and that solenoid is being energized.</p>
<p>Drive Cylinder will not retract when pushbutton is released.</p>	<p>UP Valve not shifting.</p>	<p>Check valve spool for free motion and that solenoid is being energized.</p>
<p>Gager Valves Not Shifting (OPTION)</p>	<p>Check if the LED light on the Din/Suppression Diode is lit. If no, see electrical.</p> <p>If yes, check valve solenoid and spool</p>	<p>Replace if defective. To check spool:</p> <ul style="list-style-type: none"> Remove Coil Remove solenoid stem Rotate spool.
<p>Rail not being pushed out to gage, during automatic sequence. (Gager OPTION)</p>		<p>Gager cylinder relief valve not set correctly. Adjust cylinder relief valve. Rail-Out Valve not shifting. See Table 6, Common Solutions.</p>

PROBLEM	POSSIBLE CAUSE	SOLUTION
Right/Left Spotting fails to stay in position as spikes are being driven	Counterbalance valve(s) not working	Adjust to factory settings Inspect for damage
	Internal leakage in right/left spotting cylinder	Disassemble, inspect, repair or replace right/left spotting cylinder
Forward/Back Spotting Cylinder fails to stay in position as spikes are being driven	Leakage through pilot operated check valves	Remove cartridges and check for debris or damage – repair or replace
	Internal leakage in forward/back spotting cylinder	Disassemble, inspect, repair or replace forward/back spotting cylinder

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.