TABLE OF CONTENTS

EMEGENCY PUMP OPERATION .......................................................... H-4
SERVICE PARTS ............................................................................ H-5
HYDRAULIC MAINTENANCE COMPONENT SCHEDULE .................... H-6

PRESSURE SETTINGS

General/Periodical Adjustments ....................................................... H-7
Pressure Checks ........................................................................... H-7

INSTRUCTIONS

Implement Pump Pressure Compensator ........................................ H-8
Implement Circuit Pressure Relief Valve ........................................ H-9
DUAL Cutter Heads (Quadro or Blade Type) Pressure Relieve Valve .......... H-10
DUAL Cutter Heads (Quadro or Blade Type) Return Pressure Relief Valve ... H-12
DUAL Cutter Heads (Quadro or Blade Type) Pilot Operated Brake Valve .... H-13
SINGLE Cutter Head (Pro Mac) Pressure Relieve Valve (Option) .......... H-14
Boom Swing Flow Control Valve .................................................... H-16
Boom Swing Cylinder Counterbalance Valve .................................. H-16
Outer Boom Tilt Cylinder Counterbalance Valve ............................. H-17
Break Away Cylinder Pressure Relief Valve .................................... H-17
Turntable Counterbalance Valve .................................................... H-18
Turntable Flow Divider Cartridges ................................................ H-18
Turntable Valve (Pressure Relief Valve) .......................................... H-18
Turntable Valve (Load Check) ........................................................ H-19
Emergency Pump Pressure Relief .................................................. H-19
Traction Charge Pump Pressure Relief Valve .................................... H-21
Traction Pump Pressure Limiter ...................................................... H-23
Hydraulic Reservoir ...................................................................... H-24
Suction Line Filter ........................................................................ H-25
GENERAL TROUBLESHOOTING

Hydraulic System General .................................................................H-26
Oil Cleanliness ..............................................................................H-26
Locating Leak Sources .................................................................H-27
Hoses & Fittings ...........................................................................H-28
Hose Life .......................................................................................H-28
Oil Cooler .....................................................................................H-29
Fluid Contamination .................................................................H-29
Disposing of Waste Oil .............................................................H-29

TROUBLESHOOTING GUIDE .......................................................H-30
This Page Left Intentionally Blank
EMERGENCY PUMP OPERATION

Emergency Pump Assembly is located on left side of machine’s frame behind the engine (Figure 1). The emergency pump relief valve is set to 2900 PSI.

1. Open the battery disconnect switch box cover that located in front of the left front brakes.

2. Turn the battery disconnect switch (Figure 2) to the ON position.

**WARNING**

Make certain all personnel are away from the area before proceeding.

2. Depress emergency pump switch on the main control center panel (Figure 3) and then operate the valve control for the piece of equipment that needs to be stored.

3. Operate emergency pump (Figure 1) 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.)

**CAUTION**

Operate the 24 volt emergency pump in intervals for a maximum of 30 seconds to one minute, 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.
### SERVICE PARTS

<table>
<thead>
<tr>
<th>Description</th>
<th>NORDCO Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suction Strainer (500619)</td>
<td></td>
</tr>
<tr>
<td>Element</td>
<td>500092</td>
</tr>
<tr>
<td>Return Filter (3880323) Right, Left, &amp; Main</td>
<td></td>
</tr>
<tr>
<td>Element</td>
<td>3894289</td>
</tr>
<tr>
<td>Pressure Switch</td>
<td>5193970</td>
</tr>
<tr>
<td>Gasket Kit</td>
<td>ALFT503</td>
</tr>
<tr>
<td>Reservoir Breather</td>
<td>1673250</td>
</tr>
<tr>
<td>Reservoir Breather (Spin On)</td>
<td>21880019</td>
</tr>
<tr>
<td>Pressure Filter (3880259)</td>
<td></td>
</tr>
<tr>
<td>Element</td>
<td>3894289</td>
</tr>
<tr>
<td>Pressure Switch</td>
<td>5193970</td>
</tr>
<tr>
<td>Top Off (Push-Pull) (Option) (460390)</td>
<td></td>
</tr>
<tr>
<td>Element</td>
<td>DMS11AN</td>
</tr>
<tr>
<td>Pump (Push –Pull)</td>
<td>G-199</td>
</tr>
<tr>
<td>Implement Pump (59428201)</td>
<td></td>
</tr>
<tr>
<td>Destroke Valve</td>
<td>1698993</td>
</tr>
<tr>
<td>Coil (24 Volt)</td>
<td>25534045</td>
</tr>
<tr>
<td><strong>DUAL</strong> Cutter Heads (Quadro or Blade Type) <strong>DUEL GEAR PUMP</strong></td>
<td>59428202</td>
</tr>
<tr>
<td><strong>SINGLE</strong> Cutter Heads (Pro Mac) <strong>SINGLE GEAR PUMP</strong></td>
<td>3894282</td>
</tr>
<tr>
<td>2- Hydraulic Oil Coolers – 24 Volt (26740214)</td>
<td></td>
</tr>
<tr>
<td>Temperature Switch</td>
<td>25534045</td>
</tr>
<tr>
<td>Emergency Pump with Relief (59420455)</td>
<td></td>
</tr>
<tr>
<td>24 Volt Electric Motor</td>
<td>50210205</td>
</tr>
<tr>
<td>Pressure Transducer (Pressure Monitoring System) Option</td>
<td>520283</td>
</tr>
<tr>
<td>Hydraulic Reservoir Level Gauge</td>
<td>7030882</td>
</tr>
<tr>
<td>Traction Pump Charge Pump Filter Element</td>
<td>3894282</td>
</tr>
</tbody>
</table>
# HYDRAULIC COMPONENT MAINTENANCE SCHEDULE

<table>
<thead>
<tr>
<th>Item</th>
<th>10 Hours (Day)</th>
<th>50 Hours (Week)</th>
<th>250 Hours (Month)</th>
<th>750 Hours (3 Months)</th>
<th>1500 Hours (6 Months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydraulic Oil</td>
<td>I/F</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil Cleanliness</td>
<td></td>
<td></td>
<td></td>
<td>I/T</td>
<td></td>
</tr>
<tr>
<td>Return Line Filter</td>
<td>I*</td>
<td>I*</td>
<td>I*</td>
<td>I*</td>
<td></td>
</tr>
<tr>
<td>Suction Line Filter</td>
<td>I*</td>
<td>I*</td>
<td>I*</td>
<td>I*</td>
<td></td>
</tr>
<tr>
<td>Pressure Filter</td>
<td>I*</td>
<td>I*</td>
<td>I*</td>
<td>I*</td>
<td></td>
</tr>
<tr>
<td>Hoses and Fittings</td>
<td>I</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil Cooler</td>
<td></td>
<td></td>
<td></td>
<td>CL</td>
<td></td>
</tr>
<tr>
<td>Pressure Checks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ø</td>
</tr>
<tr>
<td>Test hydraulic oil</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cleanliness</td>
<td></td>
<td></td>
<td></td>
<td>I/R</td>
<td></td>
</tr>
<tr>
<td>Replace pressure filter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replace return filter</td>
<td></td>
<td></td>
<td></td>
<td>I/R</td>
<td></td>
</tr>
<tr>
<td>Replace case drain filter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(option)</td>
<td></td>
<td></td>
<td></td>
<td>I/R</td>
<td></td>
</tr>
<tr>
<td>Replace tank breathers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drain &amp; replace oil in</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I/R</td>
</tr>
<tr>
<td>hydraulic tank</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect suction strainer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I/R</td>
</tr>
<tr>
<td>element</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steam clean oil cooler</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I/R</td>
</tr>
</tbody>
</table>

**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.

Ø Monthly pressure checks are recommended.

Fluctuation of hydraulic power may require more frequent checks.
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 – General

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’S APPLIED. Verify that the parking brake knob (yellow) is still in the (ON) position (PUSHED IN)

---

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.

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

<table>
<thead>
<tr>
<th>PRESSURE CHECKS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Implement Pump Pressure Compensator</td>
<td>2500 PSI</td>
</tr>
<tr>
<td>Lt/Rt Hand Cutter Head/ Boom Circuit Pressure Relief Valve</td>
<td>2900 PSI</td>
</tr>
<tr>
<td>Lt/Rt Break Away Cylinder Pressure Relief Valve</td>
<td>2500 PSI</td>
</tr>
<tr>
<td><strong>DUAL</strong> Cutter Heads (Quadro or Blade Type) Pressure Relieve Valve</td>
<td>2600 PSI</td>
</tr>
<tr>
<td><strong>DUAL</strong> Cutter Heads (Quadro or Blade Type) Return Pressure Relief Valve</td>
<td>1200 PSI</td>
</tr>
<tr>
<td><strong>DUAL</strong> Cutter Heads (Quadro or Blade Type) Pilot Operated Brake Valve</td>
<td>170 PSI</td>
</tr>
<tr>
<td><strong>SINGLE</strong> Cutter Head (Pro Mac) Pressure Relief Valve</td>
<td>2500 PSI</td>
</tr>
<tr>
<td>Emergency Pump Pressure Relief Valve (Non Adjustable)</td>
<td>2900 PSI</td>
</tr>
<tr>
<td>Traction Pump Pressure Compensator</td>
<td>5200 PSI</td>
</tr>
<tr>
<td>Traction Motor Charge Pressure Relief Valve</td>
<td>270 PSI</td>
</tr>
</tbody>
</table>

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.
Implement Pump Pressure Compensator

1. The Implement pump is mounted on the back of the series 90 traction pump (Figure 4).

2. Install a pressure gage on the pressure tap on top of the pressure filter (Figure 5). Some brush cutter machines may have a Hydraulic digital gage option (Figure 6) mounted above engine control console.

3. Start engine and push the implement pump toggle switch to the ON position, and read the pressure gauge.

4. If the pressure is HIGHER than 2500 psi, loosen implement pump pressure set screw (Figure 7) located behind the destroke valve (Figure 4).

5. Turn the implement pump pressure compensator adjustment screw (Figure 8) counterclockwise (CCW) until pressure reads 2500 psi.

6. Tighten set screw.

7. If pressure is LOWER than 2500 psi, loosen implement pump pressure set screw (Figure 7).

8. Turn the implement pump pressure compensator adjustment screw (Figure 8) clockwise (CW) until pressure reads 2500 psi.

9. Tighten set screw

If the implement pump pressure compensator adjustment does not increase to 2500 psi the Lt/Rt Hand Cutter Head/Boom pressure relief valve may require adjustment or repair. The Lt/Rt Hand Cutter Head/Boom relief is set to 2900 psi for proper operation.

**THIS IS IMPLEMENT CIRCUIT PRESSURE!**
When adjusting Lt/Rt Hand Cutter Head/Boom Relief Valve always return Implement Pressure Compensator Pressure back to 2500 psi.
Implement Circuit Pressure Relief Valve

1. Install a pressure gage on the pressure tap on top of the pressure filter (Figure 9). Some brush cutter machines may have a Hydraulic digital gage option (Figure 10) mounted above engine control console.

2. Remove the right hand hydraulic control valve bank assembly access cover (Figure 11).

3. The implement pump pressure relief valve is located on the right side of the right hand hydraulic valve Bank Assembly (Figure 12).

4. Loosen the implement pump pressure relief valve lock nut and turn adjusting screw out counterclockwise (CCW) 2 turns.

5. Turn on pump, put implement pump toggle switch in the ON position (Figure 13), and read the gauge pressure.

6. Adjust implement pump compensator by loosening adjusting screw set screw (Figure 14), then turn the implement pump compensator adjusting screw clockwise (CW) until pressure reads 2900 psi.

7. Turn the cutter head/boom relief valve adjusting screw (Figure 12) clockwise (CW) until pressure at gauge just begins to drop. This is considered cracking pressure.

8. Turn the cutter head/boom relief valve adjusting screw (Figure 12) back counterclockwise 1/8 of a turn and tighten the lock nut on valve.

9. Return Implement Pump Pressure Compensator to 2500 psi by turning the implement pump compensator adjusting screw counterclockwise (CW) until pressure reads 2500 psi.

10. Tighten the implement pump compensator set screw, reinstall access cover, and remove hydraulic gauge.

THIS IS IMPLEMENT CIRCUIT PRESSURE! When adjusting Lt/Rt Hand Cutter Head/Boom Relief Valve always return Implement Pressure Compensator Pressure back to 2500 psi.
An experienced, qualified operator of this machine should remain in cab during this test to operate controls and to be able to shut down equipment in an emergency.

1. Lower the Cutters/Boom Assembly that is to be tested/repaired until it is rested on the ground.

2. Turn off engine and lock out battery.

3. Install a gauge at pressure tap for the Cutter Pump Circuit that is being checked (Figure 15 & 16). From the operator’s position, Port (7) is on left side (Figure 15), port (11) is on right side (Figure 16) on both cutter valve manifold blocks.

4. Port (7) is for the INNER (Rear) MOTOR. Port (11) is for the OUTER (Front) MOTOR.

**DUAL Left/Right Hand Cutter Heads Blade Pump Relief Valves**

*WARNING!*

READ, UNDERSTAND, AND FOLLOW INSTRUCTIONS LISTED BELOW FOR THIS PROCEDURE BEFORE ATTEMPTING TEST! FAILURE TO DO SO COULD CAUSE INJURY OR DEATH!
5. Cap off and plug either hose at the cutter motor for the circuit that the pressure relief is being checked on (Figure 17). Both Cap and plug must be able to withstand 2500 psi.

6. For safety and to prevent the accidental operation of the other cutter motor on that boom, disconnect the electrical plug (pig tail) to the Cutter Head On/Off Solenoid not being tested (Figure 18).

7. Remove lockout from battery switch, start engine, depress Cutter Head Interlock (Figure 19) on outside top corners of the control panel, pull the switch to Cutter Head Disk being tested, and read pressure.

8. If pressure is higher than 2500 psi, loosen pressure relief adjusting screw lock nut (Figure 20 & 21), turn adjusting screw counterclockwise (CCW) until pressure reads 2500 psi.

9. Tighten lock nut.

10. If pressure is lower than 2500 psi, loosen pressure relief adjusting screw lock nut (Figure 20 & 21), turn adjusting screw clockwise (CW) until pressure reads 2500 psi.

11. Tighten lock nut.

12. When finished with testing/repair push in disc switch, turn off engine and lock out battery.

13. Then reconnect hose to cutter motor, reconnect Cutter Head On/Off solenoid.

14. Disconnect gauge from pressure tap.

15. Remove lockout / tagout from battery.

16. Start engine, and return cutter boom assembly to boom cradle.
An experienced, qualified operator of this machine should remain in cab during this test to operate controls and to be able to shut down equipment in an emergency.

Advise and clear all personnel away from the machine’s cutter assembly.

1. Lower the Cutters/Boom Assembly that is to be tested / repaired until it is 12 – 18 inches off the ground so that cutters will not contact the ground, debris, or obstructions.

2. Run the cutter disc being tested/repaired for a minute to clear any debris from the cutter disc.

3. Turn off engine and lock out battery.

4. Use a gauge with a long hose (at least 6 foot) so that during test that follows, gauge readings can be observed while standing along the outside edge of the cutter boom as close to the cab as the hose allows.

5. Connect the gauge at the pressure tap for the Cutter Pump Circuit Return Line that is being tested (Figure 22). Port (8) and Port (12) is on the top of each cutter valve manifold blocks. You can temporarily exchange the gauge fittings from pressure port 7 & 11 with the plugs you remove from port 8 & 12.

6. Port (8) is for the INNER (Rear) MOTOR. Port (12) is for the OUTER (Front) MOTOR.
7. For safety and to prevent the accidental operation of the other cutter motor on that boom, disconnect the electrical plug (pig tail) to the Cutter Head On/Off Solenoid not being tested (Figure 23).

8. Remove lockout from battery switch, start engine, depress Cutter Head Interlock (Figure 24) outside top corners of the control panel, pull the switch to Cutter Head Disk being tested (Figure 24).

9. Raise engine to high rpms, while observing the pressure reading on the gauge; push in the cutter disc button (to shut off cutter) being tested. Back pressure in the return line should be 1200 psi as the motor slows down.

10. If pressure is higher than 1200 psi, loosen pressure relief adjusting screw lock nut (Figure 25) turn adjusting screw counterclockwise (CCW) until pressure reads 1200 psi.

11. Tighten lock nut.

12. If pressure is lower than 1200 psi, loosen pressure relief adjusting screw lock nut (Figure 25) turn adjusting screw clockwise (CW) until pressure reads 1200 psi.

13. Tighten lock nut.

**NOTE:** Continue with next Procedure.

---

**DUAL Cutter Pilot Operated Brake Valve (Non Adjustable)**

1. Upon completion of proceeding test (Cutter Motor Return Pressure Relief Valve 1200 PSI) continue with testing Cutter Pilot Operated Brake Valve.

2. After noting the 1200 psi back pressure in the cutter return circuit, as the cutter slows down, at the point where the cutter stops, 170 psi should be readable on the pressure gauge. This pressure should hold steady until bleeding off slowly due to normal system leakage or cutter is turned back on.

3. The Cutter Pilot Operated Brake Valves are nonadjustable (Figure 26).
READ, UNDERSTAND, AND FOLLOW INSTRUCTIONS LISTED BELOW FOR THIS PROCEDURE BEFORE ATTEMPTING TEST! FAILURE TO DO SO COULD CAUSE INJURY OR DEATH!

An experienced, qualified operator of this machine should remain in cab during this test to operate controls and to be able to shut down equipment in an emergency.

1. Lower the Pro Mac Cutter/Boom Assembly that is to be tested/repaired until it is rested on the ground.

2. Turn off engine and lock out battery.

3. Install a gauge at pressure tap for the Cutter Pump Circuit that is being checked (Figure 27). Some brush cutter machines may have a Hydraulic digital gage option (Figure 28) mounted above engine control console.

4. Cap off and plug either hose at the cutter motor for the circuit that the pressure relief is being checked on (Figure 29). Both Cap and plug must be able to withstand 2500 psi.

5. For safety and to prevent the accidental operation of the cutter motor on that the other boom, disconnect the electrical plug (pig tail) to the Cutter Head On Solenoid not being tested (Figure 30).

6. Remove lockout from battery switch, start engine, depress Cutter Head Interlock toggle switch (Figure 31) on outside top corners of the control panel, pull the switch to Cutter Head Disk being tested, and read pressure.

7. If pressure is higher than 2500 psi, loosen pressure relief adjusting screw lock nut (Figure 32), turn adjusting screw counterclockwise (CCW) until pressure reads 2500 psi. Tighten lock nut.

8. If pressure is lower than 2500 psi, loosen pressure relief adjusting screw lock nut (Figure 32), turn adjusting screw clockwise (CW) until pressure reads 2500 psi.

9. Tighten lock nut.

10. When finished with testing/repair push in disc switch, turn off engine and lock out battery.

11. Then reconnect hose to cutter motor, reconnect Cutter Head On/Off solenoid, disconnect gauge from pressure tap, remove lockout from battery, start engine, and return cutter boom assembly to boom cradle.
Hydraulic Gauge Package
(Option)

Cutter Head
Hydraulic Motor
Hoses

SINGLE Cutter Head
(Pro Mac) Controls
(Left Hand Shown)

Normally Open
Solenoid Valve
Din Plug
(Left Side)

Left Hand Cutter Circuit
Pressure Relief Valve
**Boom Swing Flow Control Valves**

Allows operators the ability to set the maximum speed of rotation of the left or right boom swing cylinders. The boom swing flow control valves are located under the cab, next to the corresponding boom assembly (Figure 33 shows the left side).

If adjustment is needed loosen lock nut (Figure 34) and turn counterclockwise (CCW) for more speed; turn clockwise (CW) to slow down boom swing cylinder speed.

---

**Boom Swing Cylinder Counterbalance Valve**

The boom swing cylinder (Figure 35) counterbalance valve maintains the boom swing position during brush cutting operation until pressure in the hydraulic cylinder retract line exceeds the counterbalance pressure setting.

Located under the cab near the hydraulic tank, next to the corresponding boom assembly (Figure 36) shows the left side).

If adjustment is needed loosen lock nut (Figure 36) and turn counterclockwise (CCW) for more speed; turn clockwise (CW) to slow down boom swing cylinder speed.
**Outer Boom Tilt Cylinder Counterbalance Valve**

The outer boom tilt cylinder counterbalance valve maintains the outer boom tilt cylinder (Figure 37) position during brush cutting operation until the pressure in the hydraulic line exceeds the counterbalance pressure setting.

The outer boom tilt cylinder counterbalance valve is located under the cab near the hydraulic tank, next to the corresponding boom assembly (Figure 37 & 38) shows the left side).

If adjustment is needed loosen lock nut (Figure 38) and turn counterclockwise (CCW) for more speed; turn clockwise (CW) to slow down boom swing cylinder speed.

**Break Away Cylinder Pressure Relief Valve**

1. To prevent damage to a boom assembly or the possibility of derailment, the brush cutter is equipped with a boom breakaway feature.

2. In the event either boom is rotated into an immovable object, that boom will automatically rotate back 20 degrees.

3. The left break away cylinder assembly is shown in Figure 39.

4. Break Away Cylinder Pressure Relief Valves are located on the Cutter Head/Boom Valve Banks and are set to 2600 psi (Figures 40 & 41).
Turntable Counterbalance Valve

1. Mounted under hydraulic reservoir right side (Figure 42).

2. Used in the turntable circuit so the turntable cylinders extend and retract at the same rate of speed.

3. First check that there is no debris or damage to the flow divider valve’s cartridges.

4. To check and reset to factory setting loosen the counterbalance adjusting screw lock nut (Figure 42). Turn adjusting screw clockwise (CW) until it bottoms out, and then turn counterclockwise (CCW) ¼ of a turn.

5. Hold in position while tightening down lock nut.

Turntable Flow Divider Cartridges

1. Located under hydraulic reservoir left side (Figure 43).

2. Used to split the oil flow equally to each of the turntable cylinders.

3. Remove the cartridge and inspect for damage. Flush completely with compress air to clear any contaminates from all orifices.

Turntable Valve (Internal Pressure Relief Valve)

The turntable valve comes with a pressure relief valve (Figure 44) that has been factory set to 3000 PSI. The brush cutter uses the implement pump pressure relief valve that is set to 2900 psi to protect the hydraulic circuits and components.

Items 9 thru 14 (Figure 45) are the parts to the turntable relief valve.
Turntable Valve
(Load Check)

The turntable load check valve (Figure 46) prevents the turntable cylinder from lowering as the hydraulic control valve spool is shifted. The implement pump must build up enough pressure to overcome the pressure on the work port and lift the load check poppet (item 6 in figure 45).

Emergency Pump Relief Valve

Emergency Pump Assembly is located on left side of machine’s frame behind the engine (Figure 47). The emergency pump relief valve is set to 2900 PSI.

The following procedure requires 2 or more persons.

1. Install a pressure gage on the boom circuit pressure tap on top of the pressure filter (Figure 48). Some brush cutter machines may have a Hydraulic digital gage option (Figure 49) mounted above engine control console (Implement Setting).

2. Open the battery disconnect switch box cover that located in front of the left front brakes.

3. Turn the battery disconnect switch (Figure 50) to the ON position.

4. On the center control panel, check that the Implement Pump toggle switch is in the OFF position (leave in OFF position during this test).

5. Start engine

Make certain all personnel are away from the area around the cutter assemblies before proceeding.

6. Depress emergency pump switch on the main control center panel (Figure 51) and pull the Right cutter head rotate control valve (RETRACT) (Figure 52).

7. When the right cutter heads is fully retracted read the hydraulic pressure on the gauge.

8. If pressure is higher than 2900 psi remove protective cap (figure 53) and turn adjusting screw counterclockwise (figure 54) (CCW) to decrease pressure.

9. Repeat test and if gauge reads 2900 psi install protective cap.

10. If pressure is lower than 2900 psi remove protective cap (figure 53) and turn adjusting screw clockwise (figure 54) (CW) to increase pressure.
11. Repeat test and if gauge reads 2900 psi install protective cap.

NOTE:

*If the emergency pump pressure relief valve adjustment fails to reach the 2900 psi pressure setting, a test of the Implement Pump Pressure Relief Valve 2900 PSI located right side of the RIGHT Valve Bank Assembly. (See page H-x)*

**CAUTION**

Operate the 24 volt emergency pump in intervals for a maximum of 30 seconds to one minute, 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.
1. Install a 1000 psi hydraulic pressure gauge at transmission charge pump filter pressure tap (M3) (Figure 55). Note some brush cutter machines will have a transmission gauge option (Figure 56) mounted above engine electrical switch panel.

2. The traction charge pump pressure relief valve is located on the left side of the series 90 closed circuit traction pump (Figure 57).

3. The traction charge pump pressure relief regulates the charge pressure to operate the swashplate and to maintain minimum pressure in the low side of the traction loop.

4. Start the engine, engine idle at 1100 rpm, and leave the brush cutter in PARK (1st gear).

5. Check the pressure gauge it should read 350 psi.

6. If the pressure reading is below 350 psi, loosen the traction charge pump pressure relief valve lock nut and turn the adjusting screw (Figure 58) IN clockwise (CW) until the gauge reads 350 psi.

7. If the pressure reading is above 350 psi, loosen the traction charge pump pressure relief valve lock nut and turn the adjusting screw (Figure 58) OUT counterclockwise (CCW) until the gauge reads 350 psi.

8. Tighten the traction charge pump pressure relief valve lock nut.
Hydraulic Gauge Package (Option)

Transmission Charge Pump Pressure Relief Valve

Figure 56

Figure 57

Traction Charge Pump Pressure Relief Valve
LOCK NUT

ADJUSTING SCREW

Figure 58
TRACTION PUMP PRESSURE LIMITER

**WARNING**

All personnel need to be aware of safety concerns & their individual responsibility prior to proceeding.

The following procedure requires 2 or more persons to perform.

1. Set the parking brakes (Figure 59) and turn off engine.

2. On the traction motor install 2 (10,000 psi) pressure gauges in traction (HIGH) pressure gauge ports A & B (Figure 60). Some brush cutter machines may have a Hydraulic digital gage option (Figure 61) mounted above engine control console.

3. Start engine, on the center control console, push the engine speed toggle switch to the HIGHER position until maximum engine (high) rpms is reached.

4. Push the implement pump toggle switch to the ON position.

5. Verify that the booms and cutter head assemblies are stored.

6. Using the turntable valve carefully raise the brush cutter until all FOUR wheels are off the rails a couple of inches.

7. Place that the implement pump switch to the OFF position.

8. Verify that the parking brake is still in the (ON) position (PUSHED IN) (Figure 55).

9. On the center control console engage transmission clutch by:
   a. Checking that the Propulsion EDC joystick is in the (N) NEUTRAL position (Figure 62).
   b. Press the 4th Gear toggle switch (Figure 63).
   c. The engaged light LED should be lit.

**CAUTION**

EDC Must be in Neutral when changing gears!
Do NOT change transmission gears while moving!

10. Move the directional control forward all the way and check pressure at the hydraulic gages (Figure 62).

11. Pressure should be 5200psi on gage (A) (Figure 60), if not go to step 16.

12. Move the joystick back to the NEUTRAL position.

13. Move the directional control rearward all the way and check pressure at gages.

14. Pressure should be 5200 psi on gage B, if not go to step 16.

15. Move the joystick back to the NEUTRAL position.

16. Loosen the lock nut to Traction Pump Limiter Adjustment (A) (Figure 64), and then turn the adjusting screw clockwise to increase the pressure, counterclockwise to decreases the pressure.

17. Move the joystick back to the NEUTRAL position.

18. Loosen the lock nut to Traction Pump Limiter Adjustment (AB (Figure 64), and then turn the adjusting screw clockwise to increase the pressure, counterclockwise to decreases the pressure.
Hydraulic Gauge Package
(Option)

System (High) Pressure Port B
System (High) Pressure Gage Port
Motor Charge Pressure Port (M3)

Figure 60

Figure 61

Figure 62

Figure 63

Transmission Gear
Select Toggle Switch (4th Gear)

Figure 64

Transmission Pump Pressure Limiter (B) Adjustment
Transmission Pump Pressure Limiter (A) Adjustment

Figure 65

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 Brush Cutter 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**

This machine is equipped with a lockout device (Figure 65) 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 the lock from the Lock out device.
3. Turn internal socket head cap screw (Figure 66) out counterclockwise OUT) till it stops.

**Do not try removing screw!**

4. Remove the six front cover cap screws (Figure 66) and remove 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.
GENERAL TROUBLESHOOTING

Troubleshooting is a matter of quickly and logically isolating the cause of a problem and taking corrective action. Operating experience, a thorough understanding of the information in this manual, and accurate maintenance and operation records are the best troubleshooting tools an operator can have. The Brush Cutter is a group of rather simple systems. If you understand the basic workings of these systems individually and how they relate to each other, troubleshooting becomes a relatively simple task.

Local conditions and operating methods may result in problems, causes and remedies not covered in this guide. To use the guide most efficiently, locate a problem that matches the one being experienced and, in a step-by-step method, check the causes listed until the correct remedy is found and the problem solved.

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 SYSTEM - GENERAL

Hydraulic components are precision devices. Careless handling of them or other parts of the system can result in malfunction or failure. In order to ensure efficient operation of components, it is essential, if repairs become necessary, to follow the instructions supplied in the Component Data section of this manual for a particular component. Whether assembling or taking apart, it is important that the internal parts of the component be kept clean. Maintenance and operation are dependent on the conditions under which the equipment is working.

To avoid creating problems when installing or repairing hydraulic components, follow these tips:

1. Clean away the dirt in and around equipment before taking apart lines and removing parts.
2. Cap off all disconnected lines and open ports.
3. Protect the overhaul area from grinding dust, machining chips, and wind driven dirt.
4. Work only on metal or hard finished bench tops that are easy to keep clean.
5. Handle parts carefully to avoid nicks and burrs.
6. Use lint-free cloths to wipe parts.
7. Use smooth burr-less tools, especially when working with O-rings.

8. Lubricate all sliding parts during assembly.

9. Cover sharp grooves and threads with thimble or shim stock when installing O-rings and other seals.

10. Discard all used O-rings to avoid re-uses.

11. Make certain that seals are of the right size and material.

12. Use only recommended replacement parts.

13. Examine all prematurely worn or malfunctioned parts for clues as to the cause of the failure.

14. Test the overhauled device before reinstalling it, if possible.

**OIL CLEANLINESS**

Proper fluid condition is essential for long and productive life of hydraulic components and systems. Thorough precautions should always be observed to insure the hydraulic system is clean:

1. Filter each change of oil to prevent introduction of contaminants into the system.

2. Maintain the proper oil level and regularly service filters, breathers, and reservoirs.

3. Take precautions to prevent moisture contamination. Change fluid whenever contamination occurs because even small amounts of water can affect system performance as well as induce corrosion and oil breakdown.

Our pump manufacturer recommends a target cleanliness level of ISO15/13. Representative sampling should be made at the return line directly ahead of the return line filter. In all sampling, it is critical that the system be running or just shut down. Sampling should be done every 2 months on systems running more than 8 hours per day.

**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.

**HOSES AND FITTINGS**

Inspect all hoses, fittings and components for damage, wear, or leaks. Nordco recommends that all hose, hose assemblies, and/or fittings replaced by the customer equal or exceed the original equipment specifications.

All hoses should be replaced during major overhaul and/or after a maximum of five years of service.

When removing hydraulic hoses, fittings or components the following procedure must be followed:

1. Stop engine
2. Always wear appropriate safety gear.
3. Make certain locks and brakes have been applied.
4. Make certain hydraulic system has been depressurized. Escaping fluid can whip hoses and expel fittings or components at high velocity.
5. Remove hoses, fittings or components slowly to release any trapped pressure.
6. Do not sustain full system flow through system relief valve for more than 10 seconds.
   Full system flow at high pressure through relief valve will create extremely high temperatures.

**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 degrees F (14 degrees 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.
OIL COOLER (EXTERIOR ONLY)

Brush debris from outside of oil cooler with a soft brush. Inspect fins for damage or obstructions every 200 hours of operation. Blow out debris from cooler fins with compressed air as required.

Fluid Contamination

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

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

Old and contaminated oil cannot be improved by topping off with fresh oil. It is more practical to drain the system while the oil is still at working temperature, clean the reservoir and replace with fresh oil.

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.

Disposing of Waste Oil

Dispose of used hydraulic and lubricating oil and filters in an environmentally responsible manner, according to recommendations of the Environmental Protection Agency (EPA), your local and/or State laws, and the recommendations of your employer. Store waste oil only in properly designated containers and dispose of only in authorized fills. Do not pour waste onto the ground, down a sewerage drain, or into any water source. Ground contamination by toxic waste is costly both to you and to the environment.
## HYDRAULIC SYSTEM TROUBLESHOOTING GUIDE

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydraulic pump(s) do not develop pressure</td>
<td>No hydraulic oil in tank (NOTE: if pump is run without oil in tank, pump damage will occur.)</td>
<td>Check oil level. Refill tank.</td>
</tr>
<tr>
<td></td>
<td>Shut-off valve closed. (NOTE: if pump is run with valve closed, pump damage will occur.)</td>
<td>Open valve completely.</td>
</tr>
<tr>
<td></td>
<td>Relief valve bypassing. (NOTE: oil blowing past any relief valve can cause oil to overheat.)</td>
<td>Increase pressure setting on relief valve. (See Pressure checks)</td>
</tr>
<tr>
<td></td>
<td>.Pump is defective.</td>
<td>Refer to pump manual or replace pump.</td>
</tr>
<tr>
<td></td>
<td>Implement pump switch turned off.</td>
<td>Turn on.</td>
</tr>
<tr>
<td>Hydraulic Oil Overheats</td>
<td>Oil viscosity too high (oil too thick)</td>
<td>Drain and add correct oil as specified under &quot;RECOMMENDED LUBRICANTS&quot;.</td>
</tr>
<tr>
<td></td>
<td>Relief valve set too low.</td>
<td>Increase pressure setting on relief valve (see Pressure Checks)</td>
</tr>
<tr>
<td></td>
<td>Oil lines damaged causing excessive internal restriction</td>
<td>Inspect and repair.</td>
</tr>
<tr>
<td></td>
<td>Travel relief set too low</td>
<td>Check and reset</td>
</tr>
<tr>
<td></td>
<td>Oil Cooler fan not working</td>
<td>Check for power to fan, then check fan motor.</td>
</tr>
<tr>
<td></td>
<td>Oil Cooler is not sufficiently cooling the system</td>
<td>Check airflow – check for debris Input air temperature – Clean, repair or replace</td>
</tr>
<tr>
<td>PROBLEM</td>
<td>POSSIBLE CAUSE</td>
<td>SOLUTION</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Track travel not functioning in either</td>
<td>Suction line shut-off valve closed.</td>
<td>Open valve and lock in open position.</td>
</tr>
<tr>
<td>direction.</td>
<td>Clogged suction filter on traction pump.</td>
<td>Check vacuum reading, if more than 10-inches of Hg at working temperature, change filter</td>
</tr>
<tr>
<td></td>
<td>Transmission not in gear.</td>
<td>elements.</td>
</tr>
<tr>
<td></td>
<td>Traction Pump pressure compensator is not reaching set pressure level.</td>
<td>Put in gear, check linkage if necessary.</td>
</tr>
<tr>
<td></td>
<td>Problem with charge pump.</td>
<td>Inspect, repair or replace (See hydraulic instructions).</td>
</tr>
<tr>
<td></td>
<td>Defective traction motor or problem at drive shaft</td>
<td>Inspect, repair or replace.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Repair or replace motor or drive shaft</td>
</tr>
<tr>
<td>Transmission Overheating</td>
<td>Oil level to high</td>
<td>Establish proper oil level</td>
</tr>
<tr>
<td></td>
<td>Engine overheating</td>
<td>Check engine coolant</td>
</tr>
<tr>
<td>Excessive noise - Transmission</td>
<td>Charge pump defective</td>
<td>Repair or replace pump</td>
</tr>
<tr>
<td></td>
<td>Excessive backlash in gear train</td>
<td>Replace bearings and inspect for defective gears</td>
</tr>
<tr>
<td></td>
<td>Auxiliary driven pump bad</td>
<td>Remove pump and check</td>
</tr>
<tr>
<td></td>
<td>Internal problems</td>
<td>Check for contamination of oil</td>
</tr>
<tr>
<td>Turntable extends/retracts at different</td>
<td>Counterbalance Valve needs adjusting</td>
<td>See Hydraulic Troubleshooting</td>
</tr>
<tr>
<td>speeds</td>
<td>Flow divider spool jammed or debris in valve</td>
<td>Remove and blow out cartridges with compress air, inspect. Do not mix cartridges not</td>
</tr>
<tr>
<td></td>
<td>Bad cylinder</td>
<td>interchangeable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inspect, repair, or replace cylinder</td>
</tr>
<tr>
<td>PROBLEM</td>
<td>POSSIBLE CAUSE</td>
<td>SOLUTION</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>----------------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>No cylinders working</td>
<td>Implement pump switch not turned on</td>
<td>Turn on pump switch (cab) control panel</td>
</tr>
<tr>
<td></td>
<td>Check for 2900 psi at pressure filter tap</td>
<td>See hydraulic instructions</td>
</tr>
<tr>
<td>One or two cylinders in same circuit not working</td>
<td>Cylinder piston by-passing <strong>Note:</strong> Faulty cylinder can also affect second cylinder if hosed parallel</td>
<td>Remove, inspect, repair, or replace faulty cylinder</td>
</tr>
<tr>
<td>Boom will not swing</td>
<td>Flow control valves improperly adjusted</td>
<td>Adjust to operators preference</td>
</tr>
<tr>
<td></td>
<td>Cylinder piston by-passing</td>
<td>Remove, inspect, repair, or replace faulty cylinder</td>
</tr>
<tr>
<td></td>
<td>Stuck control valve spool</td>
<td>Remove, inspect, repair, or replace directional control valve.</td>
</tr>
<tr>
<td>Boom will not lift</td>
<td>Stuck control valve spool</td>
<td>Remove, inspect, repair, or replace directional control valve.</td>
</tr>
<tr>
<td></td>
<td>Winch motor brake not releasing</td>
<td>Check to make sure pressure is in line going to winch brake</td>
</tr>
<tr>
<td></td>
<td>Winch motor needs repairs</td>
<td>Remove, inspect, repair, or replace faulty winch motor</td>
</tr>
<tr>
<td>Boom breakaway operates too easily</td>
<td>Relief valve setting too low or stuck open</td>
<td>Inspect, repair, or replace</td>
</tr>
</tbody>
</table>