



# Model BC60

## “TRAILBLAZER”

### On-Track Brushcutter



## OPERATION AND MAINTENANCE MANUAL

**APRIL 2012, REV A.**

Re-Order: PB-82

(Revision to Cutter Head Torque Instructions in Maintenance)



This manual is a guide for the operation and routine maintenance of a NORDCO Railroad Maintenance Machine. It covers product technical information, basic operating and maintenance procedures, and safety information and is provided for use by the qualified personnel who will supervise, operate or service the equipment described herein.

Measurements in this manual are given in both metric and customary U.S. unit equivalents.

Personnel responsible for the operation and maintenance of this equipment should thoroughly study the manual before commencing operation or maintenance procedures.



This manual should be considered a permanent part of your machine and should remain with the machine at all times.

Additional copies of this manual are available, at a nominal cost, through our Part Sales Department. Additional service information, parts, and application information is available through these Nordco product support resources:

NORDCO Sales:	<b>Milwaukee, Wisconsin</b> (414) 766-2180 sales@nordco.com
NORDCO Parts:	1-800-647-1724 parts@nordco.com
NORDCO Service:	1-800-445-9258 service@nordco.com

We ask that if you have any comments or suggestions about this manual, let us hear from you. We are here to be of service to you, our customers. Direct your comments and inquiries to:



Technical Documentation Department  
NORDCO Inc.  
245 W. Forest Hill Avenue  
Oak Creek, WI 53154

## HAZARDOUS MATERIAL DATA

In an effort to provide information necessary for your employee safety training program and to meet the requirements of OSHA Hazard Communication Standard 1910.1200, we have OSHA Form 20 Safety Data Sheets available that cover the material contained in this machine.

If you are interested in receiving this information, please refer to the Name, model, and Serial Number of your machine when calling or writing, and direct your inquiries to:



Vice-President of Operations  
NORDCO Inc.  
245 W. Forest Hill Avenue  
Oak Creek, WI 53154  
Fax: (414) 766-2299  
Phone: (414) 766-2288

**SAFETY**

Please read and comply with all of the safety precautions in this manual BEFORE operating this machine.

**GENERAL**

**DO NOT** use this machine for machine operations other than for which it was intended.


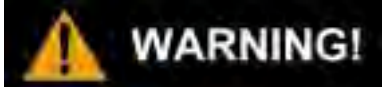
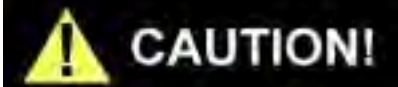
NORDCO is not responsible for any modifications made without authorization or written approval. Replace all NORDCO and OEM parts with genuine NORDCO or OEM parts. Use of non-OEM parts could compromise the safety of your machine.

**FOLLOW SAFETY INSTRUCTIONS**

Carefully read all safety messages in this manual. Learn how to operate the machine and how to use controls properly. Do not let anyone operate this machine without instruction.

**SAFETY ALERT SYMBOLS!**

These are the safety-alert symbols. These symbols means pay attention! Your safety is at risk!

SYMBOL	MEANING
	<p><b>DANGER</b> typically defines the most serious hazards. <b>DANGER</b> usually means that improper use could result in severe bodily harm or even death.</p>
	<p><b>WARNING</b> means that improper use could result in bodily harm and/or extensive machine damage.</p>
	<p><b>CAUTION</b> means that improper use could result in machine damage.</p>

**GENERAL SAFETY TIPS**

Only trained and authorized personnel should be allowed to operate this machine. In addition, all personnel should be aware of the safety concerns and their individual responsibilities **prior to working this machine**. General guidelines include:

1. Handle fuel safely. It is highly flammable and prolonged breathing of fumes may cause bodily harm.
2. Prepare for emergencies. Keep a first aid kit and fire extinguisher handy.
3. Wear good-fitting pants and shirt, no baggy or loose clothing.
4. Safety glasses, safety boots, hearing protection, and a hard hat should be worn at all times.

**SAFETY DURING WORK**

NORDCO recommends the use of a **Command** position. This means that the machine is **never** running unless someone is **at or near** the main control panel. To prevent injury to personnel or damage to the machine, it is highly recommended to:

1. **NEVER** operate the machine when people are within 800 feet of the machine. It is also suggested that this distance be maintained for livestock, houses, buildings, cars, and highways or other roads.
2. **NEVER** operate the machine in areas where people may be hidden from view, near crossings, or in double track territory. If you must operate in double track territory, always keep a lookout for approaching trains and section crews, etc.
3. Continuously be on the lookout for hidden, immovable, and uncuttable objects (such as rocks, boulders, concrete, etc.). Contact with such objects may cause severe machine damage as well as pose a hazard to anyone in the vicinity if the cutter blades came loose and became projectiles. **NOTE: Blades or teeth could travel in excess of 250 mph if they should come loose from the cutter head.**
4. Get in the routine of making frequent visual checks down track for potential dangers so as to be prepared to take immediate action, or to avoid the danger before it occurs.
5. Be careful to avoid having the cutterheads come in contact with the machine, especially when close cutting.
6. Slow down the work cycle and use slower travel speeds in congested or populated areas. Use a commonly understood signal so that others can warn the operator to slow or halt work in a possible hazardous situation.
7. Strong rains, fog, and extremely dusty and blowing conditions can obscure visibility in your work area. Wait for weather to improve before continuing work.
8. Not operate this machine at night.
9. Never operate the machine without noise suppression devices in place (ie., mufflers, cab insulation, engine shroud doors).

10. There are standard guards in place on this machine. These are to be removed **only** when service or maintenance is being performed in that area. Reinstall guards after work has been completed.
11. Check and service the fire extinguisher (if so provided) at regular intervals. Make certain all personnel are trained in its use. Note - Non-use of fire extinguisher still requires that it be recharged at the interval stated on its last inspection notice.
12. There are lockups on this machine that are used for both work and travel. These should be kept clear and free of debris, grease, etc. See **Lockup** section for instructions on their use.
13. Inspect safety decals and replace when they become unreadable or are damaged. (See “Safety Decals” at the end of this Safety section).
14. Keep steps, walkways, and the top of the turntable clear and free of oil, ice, mud, ballast, tools and other loose objects.
15. When mounting and dismounting the machine, use the handrails and steps provided. Do not climb onto the machine in any other manner.
16. Only the number of riders for which seats are available are allowed on this machine during work or travel operations. **DO NOT ALLOW RIDERS ON THIS MACHINE IF SEATS ARE NOT AVAILABLE.**
17. **Never** change the direction of work travel without first bringing the machine to a complete stop.
18. When storing and removing booms from boom cradles, take care not to collide booms with machine.
19. Be aware of the status of the machine lockups at all times.
20. Never shift a manual transmission on the fly.
21. Always apply the parking brake before leaving the cab, before shutting off the engine, when the transmission is in neutral, and when stopping on a grade.
22. Always ensure that rail sweeps are in working condition and functioning properly. If the machine is allowed to run over debris on the top of the rail, the machine could derail.

### SAFETY DURING TRAVEL

Traveling in this machine requires all steps listed above, in addition:

1. Always make certain that lockups provided on this machine are free of debris or grease and are in place prior to travel.
2. Booms should be stored in their cradles during travel.
3. Operate the machine carefully when bad weather conditions exist. Maintain a distance between machines that will allow you room to stop.
4. Strong rains, fog, and extremely dusty and blowing conditions can obscure visibility in your area. Wait for weather situation to improve before continuing travel.

**SAFETY DURING TRAVEL (continued)**

5. Anyone standing near the machine is at risk of being injured. Make certain they keep away from the machine during travel operations.
6. **Never** change direction of travel without bringing the machine to a complete stop.

**SAFETY DURING MAINTENANCE**

1. Alert others in the area that service or maintenance is being performed on this machine. Become familiar with, and use, **your company's lockout/tagout** procedures when performing maintenance on this machine. See **LOCKOUT/TAGOUT REQUIREMENTS** later in this Safety Section for a chart on energy sources located on this machine.
2. Do not start the engine if repairs or work is being performed alone. You should always have at least two people working together if the engine must be run during service. One person needs to remain in the **command** position (at the controls), ready to stop the machine and shut off engine if the need arises.
3. Do not stand under cutterheads when they are raised. When in storage cradle, they should be secured with lockups.
4. Do any inspections or adjustments with the machine turned off and the battery disconnect switch in the OFF position.
5. Always wear HEAVY work gloves when performing maintenance on or near the cutterheads. Teeth are razor sharp, especially when new.

REFER TO THE COMPONENT DATA SECTION FOR MANUALS SUPPLIED BY THE MANUFACTURERS OF COMPONENTS USED ON THIS MACHINE. FOLLOW THEIR SUGGESTED SAFETY GUIDELINES WHEN WORKING ON THEIR COMPONENTS.



**MACHINE SAFETY ALERTS**



**DANGER ALERTS**

Improper use of this machine for any type of operation can cause serious injury or death.

To avoid serious injury or death, make certain that the area around and under the machine is clear of all personnel and obstructions BEFORE travelling or working.

Serious injury or death can result from reaching into working components while machine is running. Make all observations from a distance and SHUT OFF machine while making adjustments.

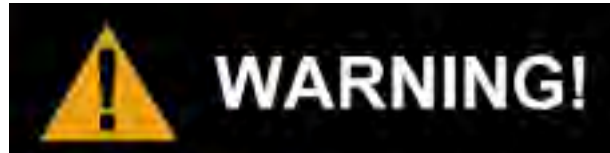
Shut off engine when checking battery electrolyte level. Do not check or fill battery in presence of open flame, sparks, or when smoking. Battery fumes are flammable and/or explosive and if ignited will result in severe bodily injury or death.

Do not ride on tow bar between the machine and the towing vehicle. Falling from a moving vehicle may cause serious injury or death.

Do not side load booms. Using booms in this manner may cause machine to derail, which may cause serious injury or death.

Do not operate this machine within 800 feet of people, livestock, buildings or roads.

**MACHINE SAFETY ALERTS**



**WARNING ALERTS**

Failure to engage all lockup devices before propelling at travel speed can result in injury to personnel and/or extensive damage to the machine.

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

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.

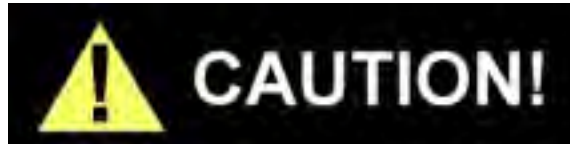
Exhaust emissions caused by the use of the engine on this machine may cause cancer, birth defects, or other reproductive harm if inhaled.

Disconnect the battery before servicing this machine. Failure to do so could result in personal injury from accidental engine startup.

Always extend BOTH cutting arms while in superelevated areas. Failure to do so may cause machine imbalance and possibly may derail the machine.

Always wear HEAVY work gloves when performing maintenance on or near the cutterheads. Teeth are razor sharp, especially when new. Failure to comply could result in personal injury.

**MACHINE SAFETY ALERTS**



**CAUTION ALERTS**

Before starting a new or overhauled engine that has been in storage, consult the engine manufacturer’s manual for initial start instructions. Failure to follow those instructions can result in serious engine damage.

Never shut off battery disconnect switch with the engine running. This could cause damage to the voltage regulator, alternator, and/or electrical system.

Allow engines with turbochargers to idle a few minutes before shutting engine off. Failure to do so may damage engine.

**LOCKOUT AND/OR TAGOUT PROCEDURES**

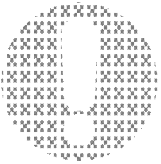
It is your company’s responsibility to develop **Lockout/Tagout Procedures**, train you in their proper and safe use, and to periodically inspect your work area to verify that you are complying with the procedures. **Lockout/Tagout Procedures must be followed!**

**This machine is completely locked out when the ignition switch and battery disconnect switch have been turned to the “OFF” position and their respective covers closed and locked. HOWEVER, some energy is stored in the hydraulic components of this machine; and these must be relieved of pressure prior to service and maintenance.**

NORDCO has provided the means to lockout this machine. NORDCO cannot be held responsible for injury caused by failure to comply with your company’s **Lockout/Tagout Procedures**.

**ENERGY SOURCES**

The list on the following pages provides information on energy sources located on this machine and instructions for inserting manual lockups, if applicable. It is your company’s responsibility to incorporate these instructions into their **Lockout/Tagout Procedures**.

**IMPORTANT NOTICE!**

This machine may have been equipped with both **Manual** and **Power Lockup** devices. Read the energy source information closely and **DO NOT ASSUME ALL LOCKUPS ARE POWERED**.

**LOCKOUT/TAGOUT – PROCEDURES**

When servicing or performing maintenance on:	Energy Source to be locked out:	Use this procedure:
Electrical System (Work and Travel Boxes, Battery, Wiring Harnesses, Junction and Control Boxes)	Electrical	1) Turn the ignition switch to the OFF position. 2) Turn the battery disconnect switch to the OFF position and close and lock the disconnect switch box or engine door cover.  <b>This will cut off electrical power supply to the machine.</b>
Engine	Electrical	1) Turn the ignition switch to the OFF position. 2) Turn the battery disconnect switch to the OFF position and close and lock the disconnect switch box or engine door cover.  <b>This will cut off electrical power supply to the machine and prevent accidental startup of engine while servicing.</b>
Propulsion System	Hydraulic	1) Turn the ignition switch to the OFF position. 2) Turn the battery disconnect switch to the OFF position and close and lock the disconnect switch box or engine door cover.  <b>This will cut off hydraulic pressure to hydraulic components of the machine.</b>
Boom/Cutter Head	Hydraulic Gravity	1) Lower boom until it rests on solid ground. 2) Turn the ignition switch to the OFF position. 3) Turn the battery disconnect switch to the OFF position and close and lock the disconnect switch box or engine door cover.  <b>This will cut off hydraulic pressure to hydraulic components of the machine.</b>
Transmission	Hydraulic Gravity	1) Place transmission in neutral. 2) Turn the ignition switch to the OFF position. 3) Turn the battery disconnect switch to the OFF position and close and lock the disconnect switch box or engine door cover.  <b>This will cut off hydraulic pressure to hydraulic components of the machine.</b>
Brakes	Pressure Gravity	1) Relieve system air pressure. 2) Cage springs using caging bolts provided..

**GENERAL**

This manual contains information for the **Model BC60 “Trailblazer” Brushcutter** machine manufactured by NORDCO INC. Information is provided in this manual for operation and maintenance of the machine. Information regarding operation and maintenance of OEM parts not of NORDCO manufacture can be found at the back of this manual, behind the tab marked “Component Data”.

Become familiar with all safety instructions, controls and instruments before operating this machine. Follow all instructions carefully.

**ABOUT THIS MANUAL**

This manual has been broken down into sections which have been separated by index tabs. Contents of these sections are as follows:

<b>TAB</b>	<b>CONTAINS</b>
Operation	Includes all information necessary to set up and operate the machine.
Maintenance	Includes lubrication, maintenance, and mechanical adjustment instructions.
Troubleshooting	Includes basic troubleshooting for all components on the machine, as well as functional hydraulics, electrical schematics, and cabling locations.
Appendices	Contains information that is subject to periodic updating or has been pre-printed. Refer to the Table of Contents for appendices included in this manual.
Mechanical	Includes individual parts breakdown drawings and lists for each assembly
Hydraulic	Includes all piping and functional drawings for a standard machine; for optional equipment that requires additional drawings, see tab “Customer Options”.
Electrical	Includes all electrical schematics, electrical boxes, remote control boxes, cables and cabling layout drawings for the machine
Component Data	Includes parts breakdowns and service instructions for components installed on the machine that are not of NORDCO’s manufacture.
Customer Options	Includes parts breakdowns, lists, and drawings for all equipment on the machine that is optional.

**OPTIONAL EQUIPMENT**

The specifications that following include **Customer Selectable Features** such as the engine. This means that an engine is required to run the machine, but the customer has a choice as to what type of engine they want to have installed. This differs from **Optional Equipment** such as a remote engine drain system. Optional equipment are those items that are not considered a vital operating part to the machine, but the customer wants them installed. Sheets for the **Optional Equipment** have been included behind the tab **Customer Options**. It is recommended that you know what options you have on your machine.

**SPECIFICATIONS** ☒

**GENERAL**

Weight.....	
Length .....	
Width (with booms retracted) .....	10 feet 2 inches (3.12 m)
Height.....	12 feet (3.65 m)
Travel Speed on Rail .....	35 mph (56 km/h) maximum
Travel Speed on Rail (with Option) .....	50 mph (80 km/h) maximum
Rated Draw Bar Pull (On Rail) .....	15,000 lbs. (6803 kg)
Turntable.....	Hydraulically Operated - Rail to Rail
Wheel Base.....	174 inches (4.11m)
Towing Speed.....	35 mph (56 km/h) maximum (See towing procedure)

**CAPACITIES**

Fuel Tank	
Standard.....	105 Gallons (340 liters)
Second Optional Tank.....	50 Gallons (144 liters)
Hydraulic Oil Tank.....	105 gallons (432 liters)
Oil Cooler.....	30 gpm (114 L/mn)

**ENGINE**

Make/Model .....	Cummins Diesel
Type .....	M11-6
Continuous BHP .....	300 HP @ 2100 RPM

**HYDRAULIC SYSTEM**

Pressure Settings:	
Relief Valve - Track Drive .....	5000 psi (345 bar)
Main Pump (_____GPM) Mfr. ....	
Relief Cartridge (Valve Banks) .....	2500 psi (172 bar)

**PNEUMATIC SYSTEM**

Engine Mounted Compressor .....	10.3 cfm @ 120 psi
Unloading Valve.....	90 psi/110 psi
Relief Valve.....	150 psi
Tanks .....	1 @ 20 gallons
Air Dryer.....	C/R Turbo 2000, with Heater

☒ Items or capacities may vary according to options on your machine.

\* Approximate weight. Actual weight may vary according to options on your machine. Actual weight of your machine is as stenciled.

**ELECTRICAL SYSTEM**

Battery..... Two 12 Vdc, 1300 Cold Cranking Amps  
Alternator ..... 160 AMP  
Ground..... Negative

**DRIVE SYSTEM**

Drive Type..... Dual Axle Drive  
Propulsion Type..... Hydraulic Motor Driven  
4-Speed Transmission

**AXLE/WHEELS**

Axle Size.....5-inch  
Wheel Type..... Forged Steel  
Wheel Size.....24 inch ( 60 cm) diameter  
Brake Type.....Cast Iron or Sintered Shoe

**DIMENSIONAL INFORMATION**

This machine exceeds AAR Plate C Clearance Diagram. Check clearance requirements of your railroad before operating this machine.

**All rights reserved. In view of the constant improvements to our equipment, the specification data and other technical information included in this manual are subject to change. No part of this manual may be reproduced in any form or by any means without our written permission.**



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Before operating this machine, read and understand the Safety Section of this Manual.

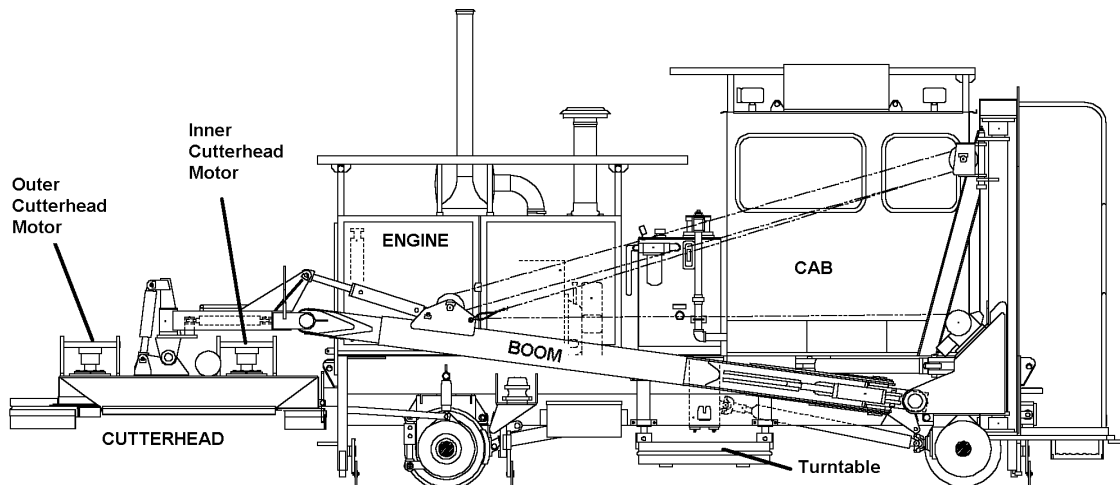


**BEFORE OPERATION**

**IMPROPER USE OF THIS MACHINE FOR ANY TYPE OF OPERATION CAN CAUSE SERIOUS INJURY OR DEATH.**

It is always good practice to become totally familiar with the machines you are going to operate.

The controls for this machine are located in various areas of the Operator Cab, and in some instances are located remotely on this machine. Refer to the following pages for information and location of the controls.



**NON-ARTICULATED BOOM**

The non-articulated boom is standard on this machine. The main boom is lifted by a motor-driven winch operated from the cab. A secondary boom, controlling the tilt of the cutterhead, is positioned by a hydraulic cylinder.

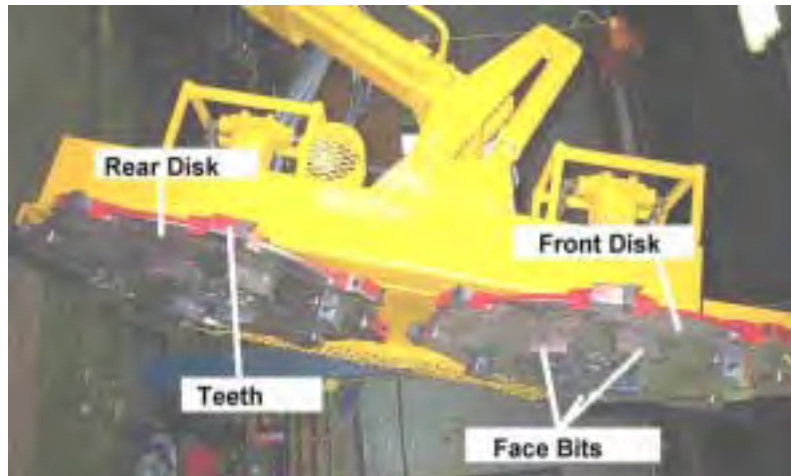
**ARTICULATED BOOM**

Consisting of three booms, the main boom, the secondary boom and the tertiary boom, the articulated boom is lifted and positioned by a series of hydraulic cylinders.

**CUTTER HEAD – SAW-BLADE TYPE**

The cutterhead consists of a front and rear disks, each with teeth and facebits. The Teeth are used for cutting through dense trees and bushes. The face bits pulverize the vegetation.

Each blade is controlled by a hydraulic motor. Rotation of the blades can be reversed by switching the left cutterhead disks with the right cutterhead disks, and switching the position of the hoses on the motors. This requires that both cutterheads be reversed. NOTE: This will change the function of the “pull” or “push” on the corresponding controls in the cab.



The teeth on the saw-blade type cutterhead are razor sharp and care should be taken when working on or in proximity to these cutterheads.

**CUTTER HEAD – BLADE TYPE**

The blade type cutterhead consists of a flywheel disk (Item #7 in drawing to right) with “flail” type blades (items #1 and #2) attached to it. It, too, can be reversed by switching the position of the hoses on the motors. No changeout of blades is required. NOTE: This will change the function of the “pull” or “push” on the corresponding controls in the cab.

Blades should always be installed onto flywheel as shown.

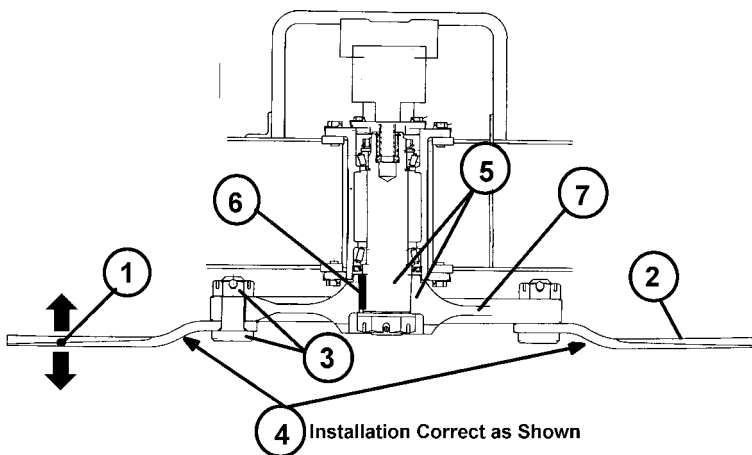
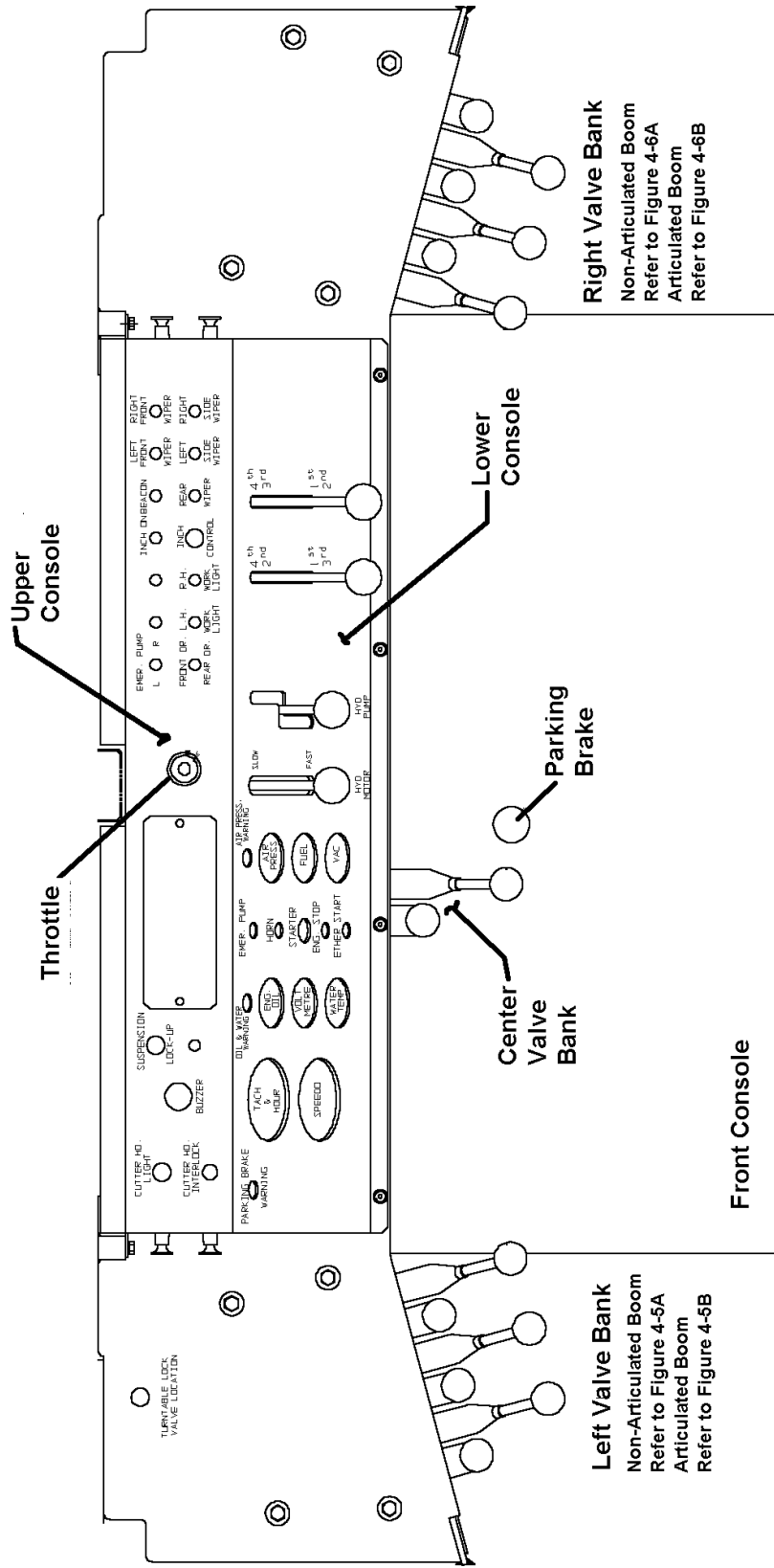


FIGURE 4. CONTROL CONSOLE

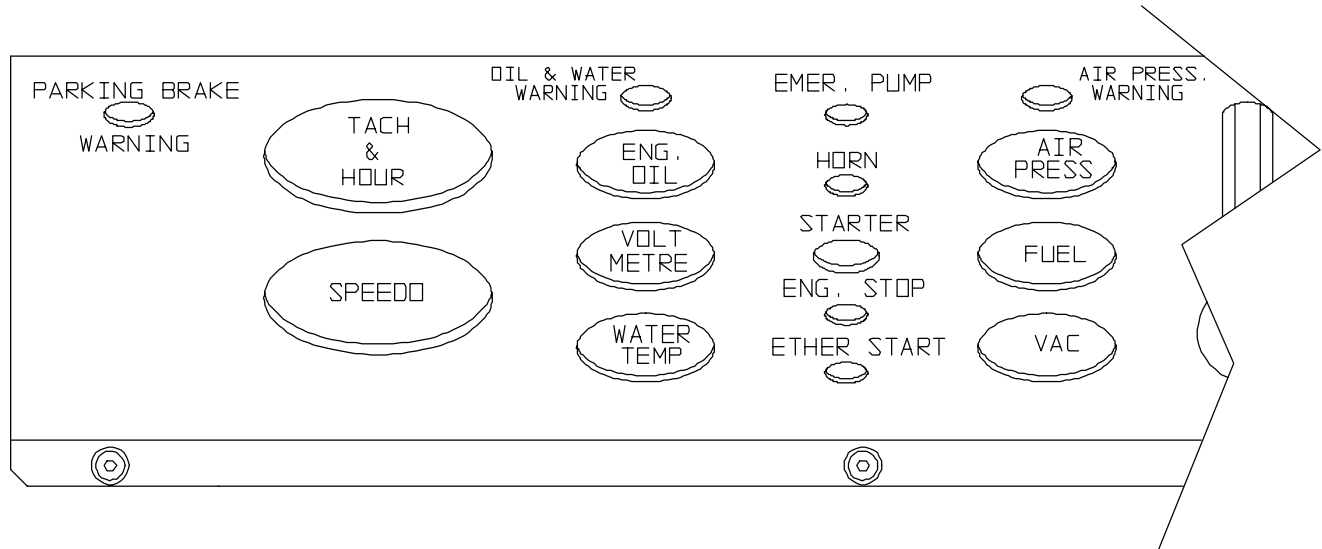


**Right Valve Bank**  
 Non-Articulated Boom  
 Refer to Figure 4-6A  
 Articulated Boom  
 Refer to Figure 4-6B






**Left Valve Bank**  
 Non-Articulated Boom  
 Refer to Figure 4-5A  
 Articulated Boom  
 Refer to Figure 4-5B

**Note:** Center Valve Bank is used on machines with Optional Articulated Booms. This may or may not be on your machine.

**TABLE FIG 4-1. "LOWER" CONSOLE  
Left Side – Gauges and Controls**



**TABLE FIG 4-1. LOWER CONTROL CONSOLE  
Left Side – Gauges and Controls**

INSTRUMENT OR CONTROL	SYMBOL	FUNCTIONAL DESCRIPTION
<p><b>TACH/HOURMETER</b></p>	 	<p>Indicates engine speed in hundreds of rpm.</p> <p>Block numbers on gauge indicate engine hours.</p>
<p><b>Engine TEMPERATURE Gauge</b></p>		<p>Indicates temperature of engine or cooling system.</p> <p>Normal reading is 160° to 185° F (71° - 85° C).</p>
<p><b>VOLTMETER</b></p>		<p>Indicates voltage of battery. Normal reading 13-15 volts.</p>
<p><b>Engine OIL PRESSURE Gauge</b></p>		<p>Indicates oil pressure. Does not indicate oil level. Measurement in psi graduations. Normal reading is 40-60 psi (3-4 bar) at full engine RPM.</p>











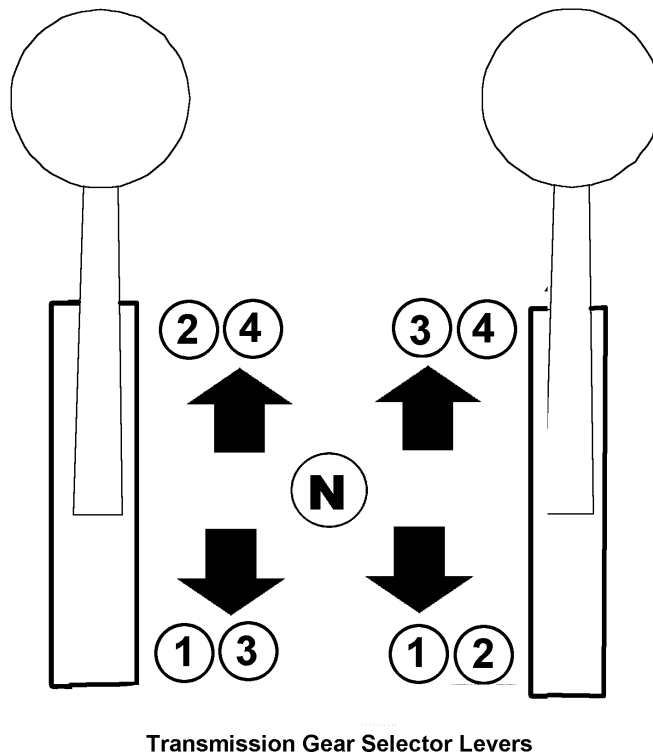
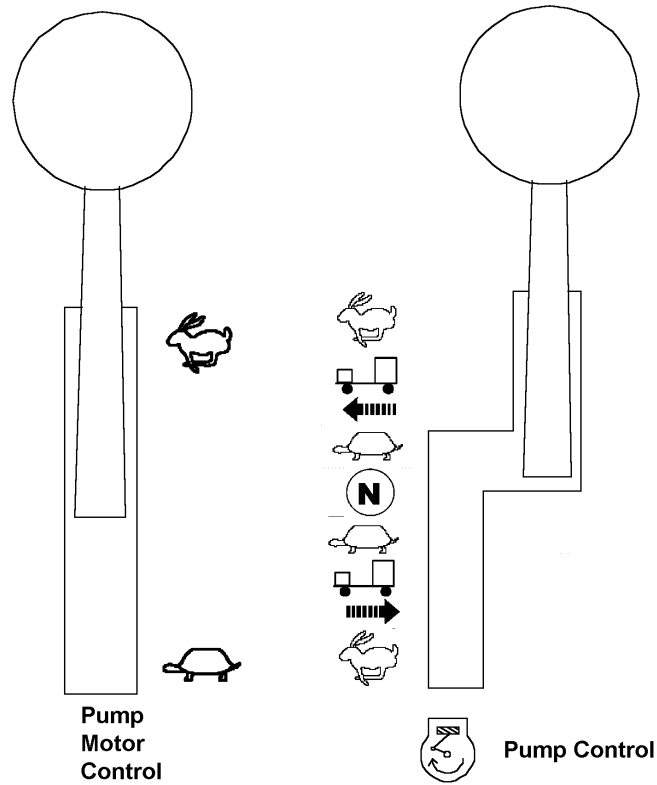
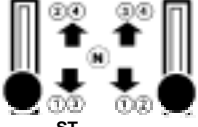
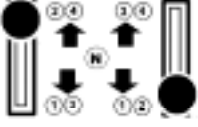
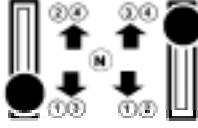
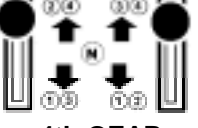
INSTRUMENT OR CONTROL	SYMBOL	FUNCTIONAL DESCRIPTION
FUEL GAGE		Measures the level of diesel fuel in the fuel tank. Do not allow to go into the red zone.
SPEEDOMETER GAGE		Indicates travel speed of machine in either miles per hour or kilometers per hour.
AIR PRESSURE GAGE		Measures air system pressure. Normal reading is 105 to 120 psi.
VACUUM GAGE		Measures restriction in track pump suction line. Change suction line filters when reading exceeds 7" of mercury when hydraulic fluid is 100° F or higher. The colder the hydraulic fluid, the higher the vacuum reading.
STARTER BUTTON		Turn to start engine
PRESS AND HOLD TO START BUTTON		Press and hold while turning starter button. Overrides the low engine oil pressure shut-down switch, allowing engine to start while oil pressure builds up.
ETHER QUICK START BUTTON		Assists in starting of engine when engine is difficult to start in cold weather. Depress for 2 to 3 seconds at a time while engine is turning over.
NORMAL ENGINE STOP BUTTON		On machines with Detroit Diesel Engines only. Use in place of turning key to OFF position.
EMERGENCY HYDRAULIC PUMP SWITCH		Provides a backup hydraulic pump to activate machine components in the event of a catastrophic hydraulic system failure.  <b>NOTE: Do NOT operator for more than 15 seconds at a time.</b>
HORN		Press to sound horn

TABLE FIG 4-2. LOWER CONTROL CONSOLE  
Right Side – Gauges and Controls



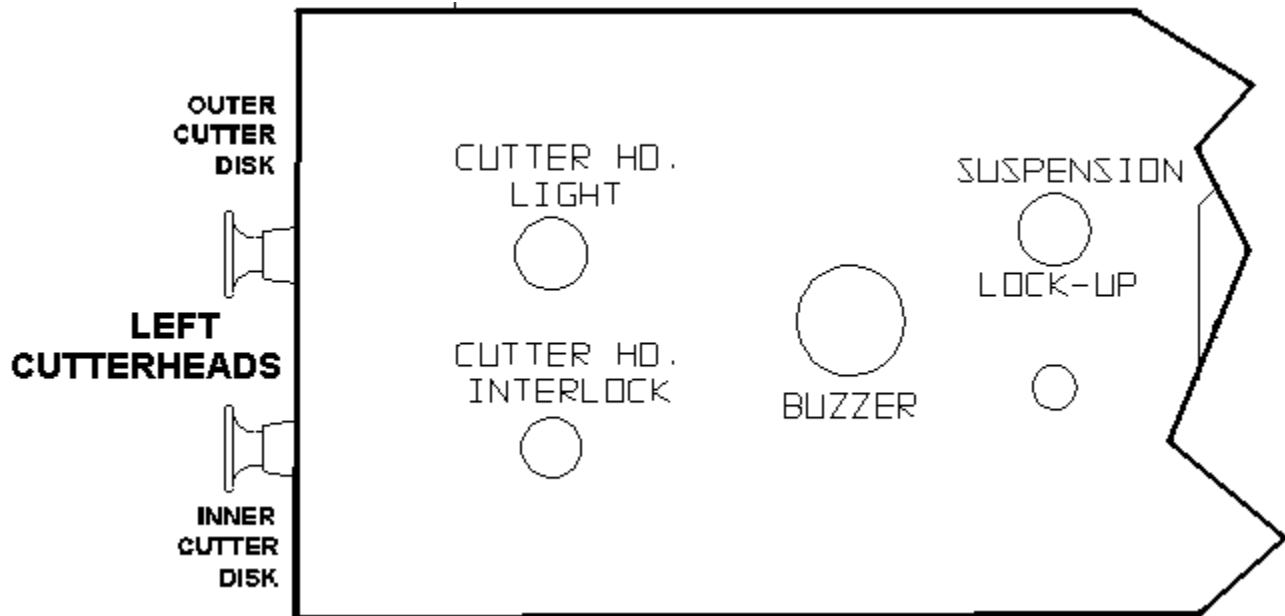
**TABLE FIG 4-2. LOWER CONTROL CONSOLE  
Right Side – Gauges and Controls**

INSTRUMENT OR CONTROL	FUNCTIONAL DESCRIPTION
<b>Pump Control</b>	Pump control must be set to NEUTRAL or engine will not start.
<b>Pump Motor Control</b>	Controls the direction of the machine. Push forward for forward travel, pull back for reverse travel. Speed is increased as control moves from turtle to rabbit. After maximum speed has been attained in a selected gear (see below) using “Pump Control”, move motor control from turtle to rabbit to further increase speed.


INSTRUMENT OR CONTROL	FUNCTIONAL DESCRIPTION
 <p><b>1<sup>ST</sup> GEAR</b></p>	<p><b>1<sup>st</sup> Gear (Low Gear)</b></p> <p>Used for working operations when the slowest possible speeds are required.</p>
 <p><b>2nd GEAR</b></p>	<p><b>2<sup>nd</sup> Gear</b></p> <p>Used during normal working conditions.</p>
 <p><b>3rd GEAR</b></p>	<p><b>3<sup>rd</sup> Gear</b></p> <p>Used for tight cutting conditions and traveling when maximum speed is not a necessity.</p>
 <p><b>4th GEAR</b></p>	<p><b>4<sup>th</sup> Gear (High)</b></p> <p>Used for high speed track travel.</p>



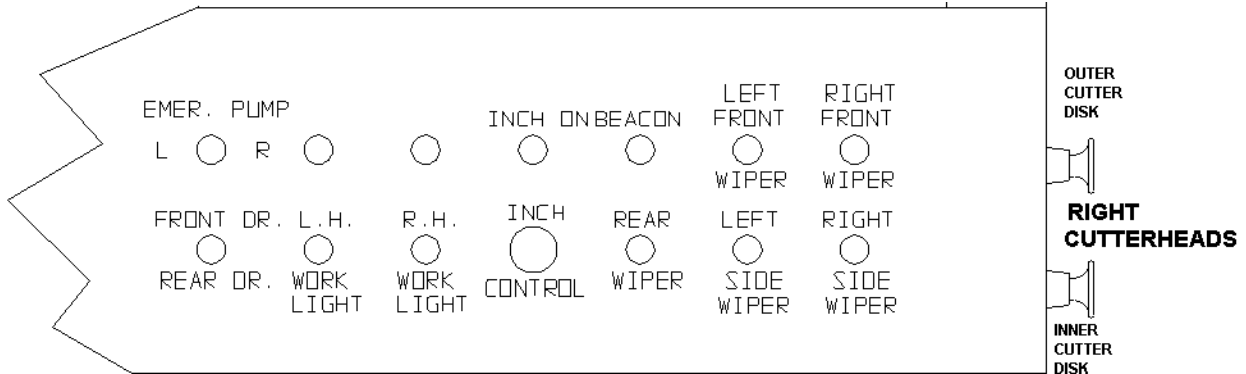
**FIGURE 4-3. UPPER CONTROL CONSOLE LEFT SIDE**



**TABLE 4-3. UPPER CONTROL CONSOLE LEFT SIDE**

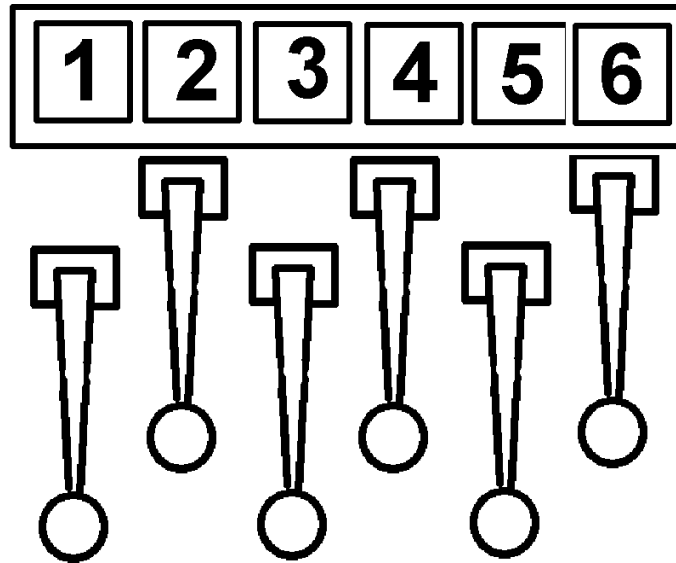
Control	Description
<b>Cutter Disk Select Switch</b> Left Cutter Head On/Off Outer Disk Inner Disk	These switches control the motors on the left hand cutterhead.  Pull switch to start motors. (Must be done after Interlock has been turned on and engine has been reduced to idle speed).  Push switch to stop motors.
<b>Cutter Head Interlock</b>	Energizes the cutterheads. This switch <b>MUST</b> be depressed before cutterhead motors can be started each time ignition is turned on. This is done to prevent accidental startup of cutterheads.  The cutterhead light (above the switch) will light up when the interlock is active.
<b>Buzzer</b>	Buzzer sounds on low air pressure, low oil pressure, and high coolant temperature.
<b>Suspension Lock-Up</b>  	Optional. Makes suspension of machine very firm. This is preferable for some work operations under 12 mph.  NOTE: Do not lockout suspension when working or travelling at speeds greater than 12 mph.

**FIGURE 4-4. UPPER CONTROL CONSOLE  
RIGHT SIDE**



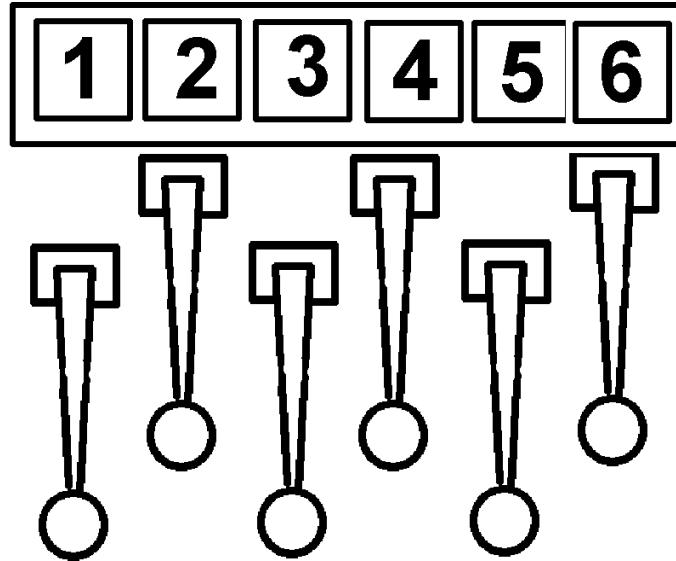
Control	Description
<b>Emergency Pump Selector Switch</b>  <b>On/Off Switch</b>	Activates either left hand or right hand valve bank. Select before activating emergency pump.  For emergency actuation of cylinders and winches in the situation of a hydraulic system failure. Depress in intervals of 15 seconds maximum.
<b>Lights Directional Control (for travel/brake lights)</b>	Select direction of travel. This will set the travel and brake lights for that direction of travel.
<b>LH/Right Hand Work Lights</b>	Turns on worklights for the left or right cutterhead.
<b>Quick Stop Mode (formerly called Inch Control)</b>	The Quick Stop Mode of Braking allows the operator to stop the machine while working at low speeds (Using 2 <sup>nd</sup> or 3 <sup>rd</sup> gear and traveling at 5 mph or slower) using only the brake pedal. When the Quick Stop Mode is activated, application of the brake pedal automatically neutralizes the pump swash plate, enabling the operator to stop the machine more quickly.  For braking at speeds greater than 5 mph, the Quick Stop Mode MUST be deactivated and the track drive system neutralized before using the brake pedal or else the track drive system could become damaged.
<b>Wiper Controls</b>	Selector style switches with OFF/LOW/HIGH selection.
<b>Beacon</b>	Turns beacon On or Off
<b>Right Cutter Head On/Off</b>  <b>Outer Disk</b> <b>Inner Disk</b>	These switches control the motors on the right hand cutterhead.  Pull switch to start motors. Push switch to stop motors.  <b>NOTE: Cutterhead Interlock must be active in order for the motors to be turned on and engine speed reduced to “idle” before motors can be turned on.</b>





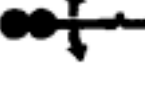

**FIGURE 4-5A. HYDRAULIC CONTROLS  
LEFT VALVE BANK  
(Standard, Non-Articulated Boom Machines)**



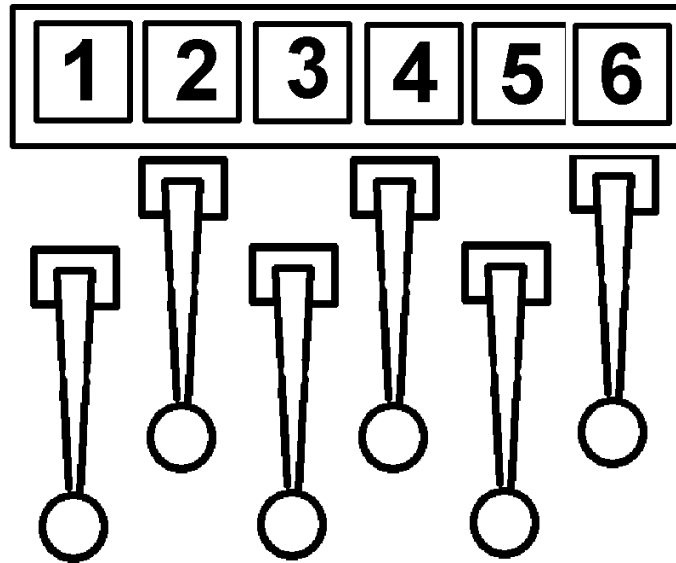
VALVE #	SYMBOL	CONTROLS	FUNCTIONAL DESCRIPTION
1		<b>Turntable</b> Push - Release - Pull -	Lowers turntable Movement stops at last position Raises turntable
2		<b>Cutter Head Tilt</b> Push - Release - Pull -	Tilts head down Movement stops at last position Tilts head up
3		<b>Cutter Head Rotate</b> Push - Release - Pull -	Extends cylinder Movement stops at last position Retracts cylinder
4		<b>Cutter Head Pivot</b> Push - Release - Pull -	Lowers head Movement stops at last position Raises head
5		<b>Boom Swing</b> Push - Release - Pull -	Swings boom counterclockwise (CCW), away from machine Movement stops at last position Swings boom clockwise (CW), toward machine
6		<b>Boom Up/Down</b> Push - Release - Pull -	Lowers boom Movement stops at last position Raises boom

**FIGURE 4-5B. HYDRAULIC CONTROLS  
LEFT VALVE BANK  
(Optional, Articulated Boom Machines)**



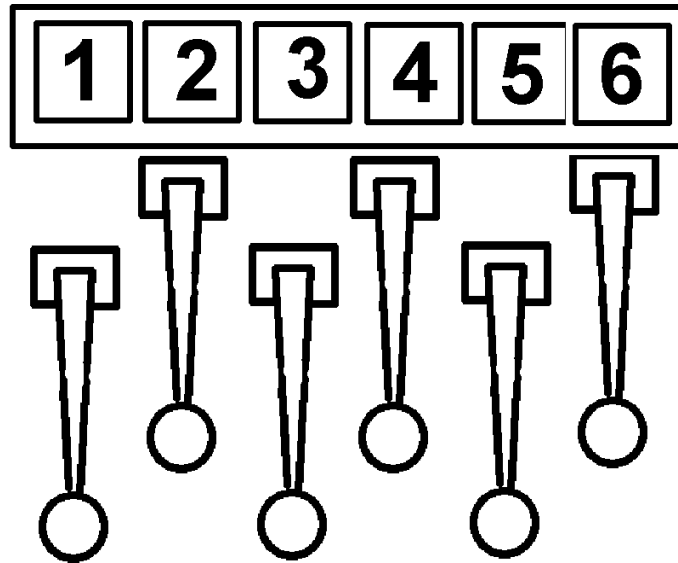
VALVE #	SYMBOL	CONTROLS	FUNCTIONAL DESCRIPTION
1		<b>Cutter Head Tilt</b> Push - Release - Pull -	Tilts head down Movement stops at last position Tilts head up
2		<b>Cutter Head Rotate</b> Push - Release - Pull -	Extends cylinder Movement stops at last position Retracts cylinder
3		<b>Tertiary Boom</b> Push - Release - Pull -	Lowers boom Movement stops at last position Raises boom
4		<b>Secondary Boom</b> Push - Release - Pull -	Lowers boom Movement stops at last position Raises boom
5		<b>Boom Swing</b> Push - Release - Pull -	Swings boom counterclockwise (CCW), away from machine Movement stops at last position Swings boom clockwise (CW), toward machine
6		<b>Main Boom Up/Down</b> Push - Release - Pull -	Lowers boom Movement stops at last position Raises boom

**FIGURE 4-6A. HYDRAULIC CONTROLS  
RIGHT VALVE BANK  
(Standard, Non-Articulated Boom Machines)**



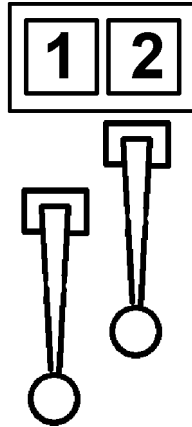
VALVE #	SYMBOL	CONTROLS	FUNCTIONAL DESCRIPTION
1		<b>Boom Up/Down</b> Push - Release - Pull -	Lowers boom Movement stops at last position Raises boom
2		<b>Boom Swing</b> Push - Release - Pull -	Swings boom counterclockwise (CCW), away from machine Movement stops at last position Swings boom clockwise (CW), toward machine
3		<b>Cutter Head Pivot</b> Push - Release - Pull -	Lowers head Movement stops at last position Raises head
4		<b>Cutter Head Rotate</b> Push - Release - Pull -	Extends cylinder Movement stops at last position Retracts cylinder
5		<b>Cutter Head Tilt</b> Push - Release - Pull -	Tilts head down Movement stops at last position Tilts head up
6		<b>Boom Breakaway</b> Pull Only -	Resets both boom breakaway cylinders

**FIGURE 4-6B. HYDRAULIC CONTROLS  
RIGHT VALVE BANK  
(Optional, Articulated Boom Machines)**



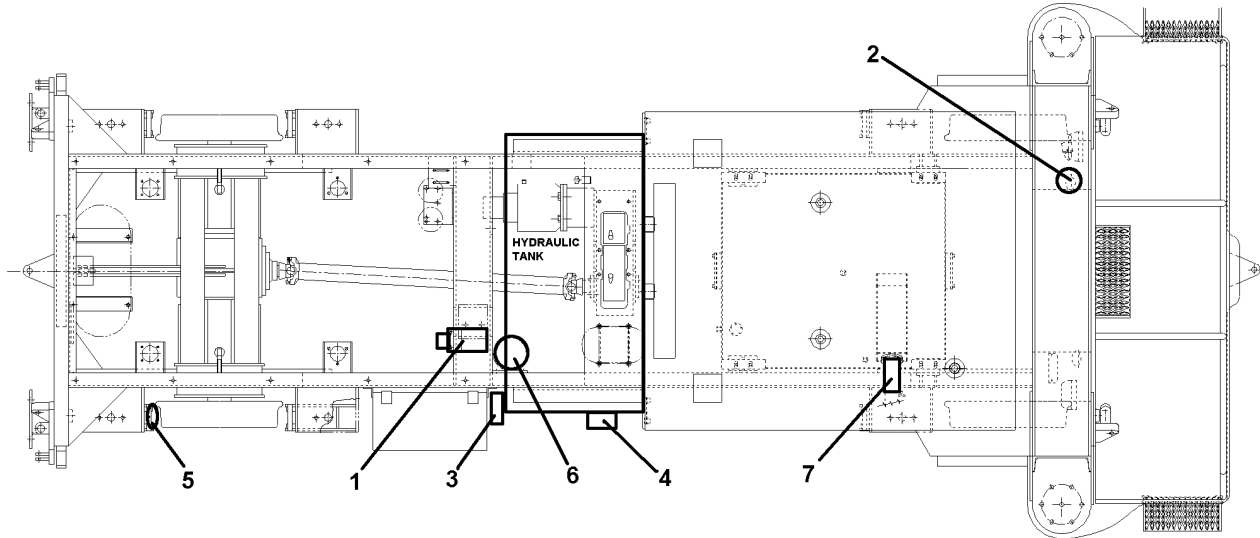
VALVE #	SYMBOL	CONTROLS	FUNCTIONAL DESCRIPTION
1		<b>Main Boom Up/Down</b> Push - Release - Pull -	Lowers boom Movement stops at last position Raises boom
2		<b>Boom Swing</b> Push - Release - Pull -	Swings boom counterclockwise (CCW), away from machine Movement stops at last position Swings boom clockwise (CW), toward machine
3		<b>Secondary Boom</b> Push - Release - Pull -	Lowers boom Movement stops at last position Raises boom
4		<b>Tertiary Boom</b> Push - Release - Pull -	Lowers boom Movement stops at last position Raises boom
5		<b>Cutter Head Rotate</b> Push - Release - Pull -	Extends cylinder Movement stops at last position Retracts cylinder
6		<b>Cutter Head Tilt</b> Push - Release - Pull -	Tilts head down Movement stops at last position Tilts head up

**FIGURE 4-7. HYDRAULIC CONTROLS  
CENTER VALVE BANK  
(Optional, Articulated Boom Machines)**



VALVE #	SYMBOL	CONTROLS	FUNCTIONAL DESCRIPTION
1		<b>Turntable</b> Push - Release - Pull -	Raises machine Movement stops at last position Lowers machine
2		<b>Boom Breakaway</b> Pull -	Resets boom cylinder (both sides)  In the event that a boom is driven into an immovable object, the boom will automatically rotate back about 20°. This rotation gives the operator additional time to take action to avoid the obstruction, the possibility of derailment and potential damage to the boom assembly.  <b>Note: If this occurs, stop machine, back up, reset breakaway, lift boom to pass obstacle and continue traveling.</b>

**TABLE OP-7  
REMOTE CONTROLS AND INDICATORS**



Item	Control or Instrument	Function
1	Emergency Pump	Located on frame near the engine. Pump is used when there is a loss of system pressure and movement of hydraulic cylinders is necessary. System pressure is supplied by electric pump. The control for the emergency pump is located on the main console in the cab.
2	Top Off Pump	The top off pump can be either an electric or manual pump that is used for filling the hydraulic tank.
3	Battery Disconnect Switch	Located next to the battery box. Two position switch marked with "ON/OFF" plaque. This must be OFF and cover locked during service.
4	Hydraulic Oil Tank Sight Level and Optional Oil Temperature Gauge	Located on hydraulic oil tank, it indicates the level of hydraulic oil in the tank.  Located on the bottom of the hydraulic oil sight level. Indicates temperature of the hydraulic oil. Normal operating temperature is 80° to 180° F (49° to 72° C).
5	Air System Controls	Air System Drain, Air Tanks Water Drain, Purge Tank Drain. Pull cord to release.
6	Air Dryer	Removes moisture from air in air system.
7	Fuel Filler	Fill machine with fuel through opening.

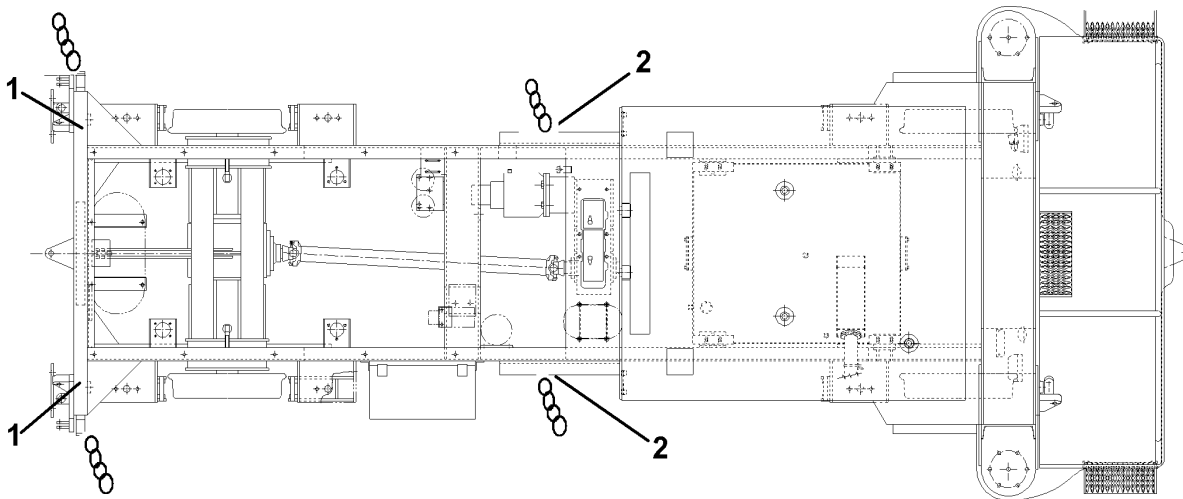


**LOCK-UPS**

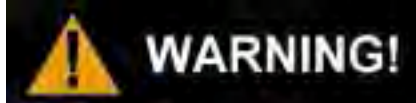


**FAILURE TO ENGAGE ALL LOCKUP DEVICES BEFORE PROPELLING AT TRAVEL SPEED CAN RESULT IN INJURY TO PERSONNEL AND/OR DAMAGE TO THE MACHINE.**

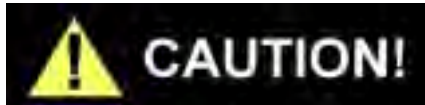
Use the following procedures to install or remove lock-ups. Note: With the exception of the suspension lockout, all lockups are to be in place during travel.



LOCKUP	PROCEDURE
Cutter Head	For travel mode, after positioning booms so that they are supported in the boom cradles, secure cutterheads using chain and hook. Remove chain and hook for work mode.
Turntable	<p>Attach lockup chains. Raise turntable to maximum height. Engage attachment lock using control in cab. Lower turntable onto hooks. Insert pin to prevent rotation.</p> <p><b>Note: Turntable locks MUST be removed prior to lowering or locks will be damaged.</b></p> <p><b>Note: Not all machines have power locks for turntables. Some have pins and chains only.</b></p>



**EXHAUST EMISSIONS CAUSED BY THE USE OF THIS MACHINE MAY CAUSE CANCER, BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM IF INHALED.**



**BEFORE STARTING A NEW OR OVERHAULED ENGINE THAT HAS BEEN IN STORAGE, CONSULT THE ENGINE MANUFACTURERS MANUAL FOR INITIAL START INSTRUCTIONS. FAILURE TO FOLLOW THOSE INSTRUCTIONS CAN RESULT IN SERIOUS ENGINE DAMAGE.**

#### **Engine Operation**

1. Check engine oil level, engine coolant level, fuel oil level, and hydraulic oil level before attempting to start engine.
2. Ensure that pump suction line gate valves are fully open.
3. Ensure that parking brake is applied, track travel pump control is in NEUTRAL position, and track travel motor control is at low (turtle) position.
4. Set master cut-off switch to ON position.
5. Disengage clutch (if clutch is provided) if the outside temperature is below 32° F (0° C).
6. Set throttle control slightly open.
7. Depress shut-down override and hold (except for Detroit Diesel Engines), turn key to turn over engine until engine starts, releasing override button a few seconds after engine starts.
8. In cold weather, when engine is difficult to start, depress ether assist button for 2-3 seconds at a time while turning over engine. (Note: Ether assist button is optional).
9. Release shutdown override when engine warning light goes out.
10. Allow engine to idle until it warms up, then bring engine slowly to full rpm by rotating throttle control slowly
11. If clutch was disengaged, allow engine to run for at least one minute at full rpm. Shut engine off before engaging clutch. Then restart engine with clutch engaged. Slowly rotate throttle to reach full engine rpm.
12. Perform the startup check on the next page.

TABLE OP-8. STARTUP CHECKS AND PROCEDURES

**GAUGE READINGS CHECKED:**

- Tachometer/Hourmeter: 2250 rpm (under load)
- Voltmeter: 13 to 15 Volts
- Engine Temperature: 160° to 185° F (71° to 85° C)
- Engine Oil Pressure: 40 to 60 psi, 3 to 4 bar, 276 to 414 kPa

**LIGHT/HORN STATUS**

- LIGHTS FUNCTION:
  - Travel Lights
  - Work Lights
  - Brake or Marker Lights
- HORNS/ALARMS FUNCTION:
  - Travel Alarm
  - Horn Buttons (All Boxes)
  - Horn Button (Remote Operator Boxes)

**OPERATOR CONTROLS FUNCTION**

- Air Brakes

**LOCK-UP DEVICES ENGAGED**

- Cutter Head
- Turntable

**MACHINE FLUID LEVEL CHECK (See recommended fluids in Maintenance Section)**

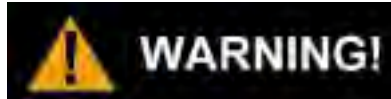
- Hydraulic Oil Tank is full
- Fuel Tank is full
- Engine Oil Reservoir is full

**MACHINE INSPECTION (With machine running)**

- Inspect for Leaks. Pay particular attention to hydraulic and fuel lines.
- Inspect all controls, wiring and switches for secure mounting

**MACHINE INSPECTION (With Machine Off)**

- Inspect for Leaks. Pay particular attention to hydraulic and fuel lines.
- Inspect all controls, wiring and switches for secure mounting
- Battery Disconnect Switch OFF
- Inspect Cutterheads (See “Daily” Instructions in Maintenance Section for detailed instructions on this inspection.

**MACHINE WARMUP PROCEDURE****HYDRAULIC FLUID WARMUP**

**DO NOT ENGAGE THE CLUTCH UNLESS THE HYDRAULIC FLUID IS AT LEAST 32° F (0° C). RUNNING THE HYDRAULICS AT TEMPERATURES BELOW THIS LEVEL MAY CAUSE EXTENSIVE DAMAGE TO THE MACHINE.**

The machine can be used ONLY after the hydraulic fluid has reached a minimum temperature of 60° F (\_\_\_°C).

Track drive pump vacuum readings of 10-inches of mercury or higher are not permissible except during cold starts. It is recommended that the track drive suction filter elements be changed if the vacuum reading exceeds 7-inches of mercury at a hydraulic oil temperature of 100°F (\_\_\_°C) or higher.

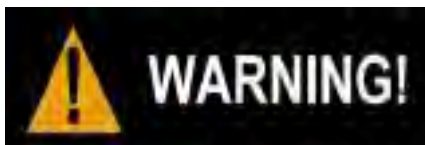
To avoid high track drive pump vacuum readings in cold weather, change the track drive pump suction filter elements more frequently.

## TRAVEL

It is important that you read about and understand all operating controls, Cautions, Warnings, and Dangers before traveling.



To avoid serious injury or death, make certain that the area around and under the machine is clear of all personnel and obstructions BEFORE travelling or working.



Failure to engage all lockup devices before propelling at travel speed can result in injury to personnel and/or extensive damage to the machine.

**PROPELLING (TRACK TRAVEL OPERATION)**

Before propelling this machine, make certain that all lockups are in their proper position. Check that suspension is not locked out (for machines with optional suspension lockouts).

**NOTE: The track drive system is strong enough to overpower the braking system. For this reason, ALWAYS NEUTRALIZE THE TRACK DRIVE SYSTEM SLOWLY BEFORE APPLYING THE BRAKES.**

**NOTE: All movements of the pump and motor control levers carried out in the following instructions MUST be carried out SLOWLY and SMOOTHLY.**

1. Ensure that engine is at full throttle and the hydraulics and transmission are warmed up. Refer to "Engine Startup", earlier in this section.
2. Engage the 4 speed mechanical transmission by setting the transmission levers in the desired position as indicated on the decal. NOTE: **Never shift the mechanical transmission "on-the-fly"**.
3. Release the parking/emergency brake.
4. To **Accelerate**: Slowly move the pump control lever in the desired direction until the required speed is attained. If more speed is required after the pump control lever has been moved to its fullest extent, move the motor control lever from the "Low" position (turtle) towards the "High" position (rabbit). To **Decelerate (slow down)**: Slowly move the motor control lever from "High" (rabbit) towards "low" (turtle). If less speed is required after the motor control lever has been moved all the way to "Low", slowly move the pump control lever towards the "N" (neutral) position.

5. To Change Direction: Bring the machine to a complete stop. Move the pump control lever in the opposite direction and follow the instructions outlined in item #4, above. **NEVER CHANGE DIRECTION OF THE MACHINE WITHOUT FIRST BRINGING THE MACHINE TO A COMPLETE STOP.**

## **BRAKING**

Two foot pedals operate the service brakes. For normal brake operation, either brake pedal may be depressed to apply the brakes. Releasing of the brake pedal releases the brake.

### **IMPORTANT**

**The track drive system is strong enough to overpower the braking system. For this reason, the pump swash plate must be neutralized before braking.**

**Under certain conditions described below, this can be taken care of automatically, using the Quick Stop Mode. Otherwise, the operator must manually neutralize the track drive system using the control levers (SLOWLY).**

### **QUICK STOP MODE OF BRAKING (5 MPH or SLOWER)**

The Quick Stop Mode of Braking allows the operators to stop the machine while working at low speeds (5 mph or slower) using only the brake pedal. When the Quick Stop Mode is activated, application of either brake pedal automatically neutralizes the pump swash plate, enabling the operator to stop the machine more quickly.

Use Quick Stop Mode only while working in second or third gears and when working at speeds slower than 5 mph.

For speeds greater than 5 mph, the Quick Stop Mode **MUST** be deactivated and the track drive system neutralized or the track drive system could become damaged.

## **PARKING/EMERGENCY BRAKES**

Your machine is equipped with a fail-safe brake system. If there is a loss of air pressure, the brakes are spring applied.

The parking brake is activated by a valve located on the control panel. This valve exhausts air from the spring brake chambers, permitting spring force to apply the service brakes. To operate the parking brake:

1. Pull valve to apply brakes.
2. Push valve to release brakes.

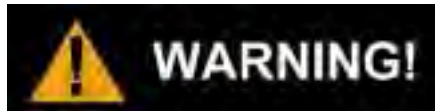
**Always apply the parking/emergency brake before leaving the cab and when stopping for extended periods.**

### Machine Setup

There are some adjustments which may have to be made due to varying conditions such as rail height and base width. Adjustments must be made to compensate for these conditions before operations can begin.



SERIOUS INJURY OR DEATH CAN RESULT FROM REACHING INTO MOVING COMPONENTS WHILE THE MACHINE IS RUNNING. MAKE OBSERVATIONS FROM A SAFE DISTANCE.



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.

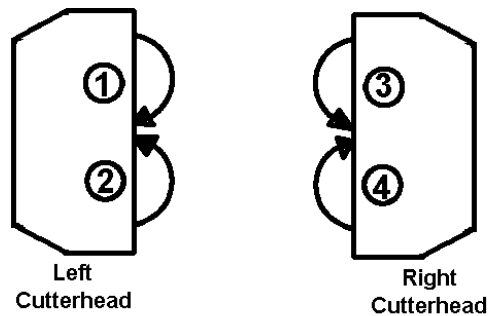
Read and understand all OPERATION procedures, warnings, and cautions before making adjustments.

#### CUTTER HEAD ROTATION – BLADE TYPE HEADS

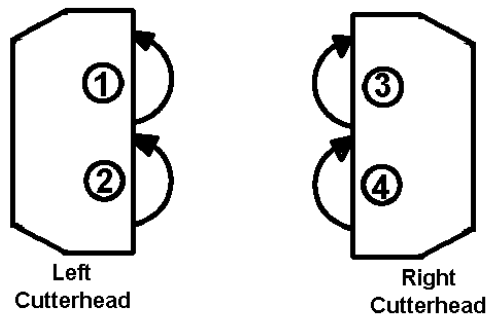
There are two acceptable configurations for the direction of rotation of the cutterhead assemblies.

Configuration 1, as shown in the drawing to the right, will keep more of the debris around the track area when cutting. To use this rotation configuration, switch the hose connections to the outer cutterhead motors on the left and right cutterheads.

Configuration 2, also shown on the drawing, will direct more debris away from the machine, so it is **IMPORTANT** that you pay attention to your surroundings when using this configuration. Make certain you are not around houses, buildings, or roads where people may be present. **Note: This is the standard rotation configuration of the machine as it is shipped from the factory.**



Configuration 1



Configuration 2

**CUTTER HEAD ROTATION – SAW BLADE HEADS**

The preferred direction of rotation may depend on the type of vegetation and surroundings.

Ensure that all cutter disks are rotating in the proper direction so that the “front” of the teeth contact the vegetation.

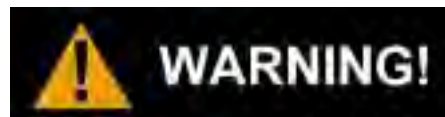
Unlike the “blade type” cutterheads, it is not recommended to change the rotation configuration of the “saw-blade” type cutterheads.



## MACHINE OPERATION



**TO AVOID SERIOUS INJURY OR DEATH, MAKE CERTAIN THAT THE AREA AROUND AND UNDER THE MACHINE IS CLEAR OF ALL PERSONNEL AND OBSTRUCTIONS BEFORE TRAVELLING OR WORKING.**



**FAILURE TO ENGAGE ALL LOCKUP DEVICES BEFORE PROPELLING AT TRAVEL SPEED CAN RESULT IN INJURY TO PERSONNEL AND/OR DAMAGE TO THE MACHINE.**

## GENERAL OPERATION

1. Make certain all STARTUP procedures have been followed before beginning working operations.
2. Make certain all lockups have been removed and stored (as required).
3. Make certain that the hydraulic oil has been warmed to a minimum of 60° F (\_\_\_°C) before operating the machine.
4. Depress the **Cutterhead Interlock** button.
5. Reduce engine to idle speed slowly.
6. Check to make sure that it is safe to operate the cutterheads. **Know and understand ALL safety WARNINGS, CAUTIONS, and DANGERS before starting the cutterhead motors.**
7. Pull the “Motor Start” control buttons for the Cutterhead motors. (Two on each side of upper control console.)
8. If working at speeds less than 12 mph, engage optional suspension lockout.
9. Set booms in position and travel down track. **DO NOT SWING BOOMS!**
10. Angle cutterhead down with a forward angle of attack (toward front of machine). **DO NOT CUT IN REVERSE! DO NOT ATTEMPT TO CUT TREES OR SHRUBS MORE THAN 4-INCHES IN DIAMETER!**
11. Maintain ground clearance of 12-inches.
12. Use the **Quick Stop Mode** of braking only when in 2<sup>nd</sup> or 3<sup>rd</sup> gear and when traveling at speeds less than 5 mph.

NOTE: Use winch to raise boom over short obstacles. For taller obstacles, reverse the machine and wing boom in to clear obstruction.

**Emergency Procedures**

1. If a hydraulic hose fails, shut down the machine immediately, determine cause of failure, correct condition.
2. If indications on gauges are not within the normal range, shut down the engine. Repair before further operation.
3. Emergency cylinder actuation requires the electric emergency pump. See below.

**Emergency Pump (Optional)**

For operation of cylinders only:

Depress emergency pump switch in the control console panel and then operate the required valve handle to move the attachment as required. Set the valve bank selector switch (if provided) in the correct position for the left hand or right hand bank. Operate the pump in intervals, for a maximum of 15 seconds at a time. The pump is designed for emergency use only and should not be used for extended periods of time.

**EMERGENCY STOPPING**

**The emergency shutdown should be used only when the engine does not respond to the normal stop engine procedure or in the event of an emergency where time is critical.**

To shut down the engine and stop all machine functions, push the EMERGENCY STOP pushbutton located on any of the control boxes.

Never use the emergency shutdown system except in an emergency. **DO NOT USE THIS METHOD AS A SHORTCUT TO TURNING OFF THE ENGINE!!**

**AFTER OPERATION****Parking or Locating Machine**

1. Park or locate machine on level track area, if possible; and where it will not be exposed to excessive dust.
2. If the machine was towed, disconnect towing vehicle and set the brakes. Move the towing vehicle well clear of the parked machine.

**Rotating Machine**

The machine has a turntable which allows the machine to be lifted off of the tracks and rotated. The only function of this turntable is to rotate the machine. The turntable base is stored under the machine and is attached to the turntable cylinder at all times. The turntable is operated by a valve handle on the right side of the control console, or by a valve on the outside of the machine.

To lift and rotate the machine, proceed with the following steps:

1. Raise all assemblies clear of the track structure and any obstacles.
2. Remove the lockup chains and hooks (where provided) from the turntable.
3. Remove rotate lock pin.
4. Raise and rotate the machine.
5. Ensure that the wheel flanges are properly aligned with the rail.
6. Lower the machine.
7. Completely retract the turntable.
8. Install the lockup chains and hooks (where provided).
9. Install the rotate lock pin.

NOTE: Two turntable mounting positions are provided so that the machine can be balanced depending on the attachments installed.

**Towing**

Maximum towing speed is 35 mph. Reduce speed accordingly as dictated by weather or track conditions. Remember that the machine weight may approach the weight of the towing vehicle. Maintain increased stopping distance accordingly.

It is strongly recommended that the drive shafts be removed before towing the machine. If this is not possible, limit towing to a maximum of 10 miles.

## **MAINTENANCE AND SERVICE**

### **REQUESTING ASSISTANCE**

If you have any questions regarding maintenance and service on this machine, please call your local Nordco Representative or:

Nordco Service Manager  
(414) 769-4603 (Wisconsin)  
1-800-445-9258 (USA and Canada)

### **LUBRICATION AND MAINTENANCE**

Service points on this machine (adjustments, inspections, lubrication, etc.) are indicated on the following illustration. The items listed are preceded by a “D1, W1, M1, Q1 and A1” designation. These points service interval (D=Daily, W=Weekly, M=Monthly, Q=Quarterly and A=Annually) for this point of the machine. Maintenance instructions are given for each and are separated by Service Interval Designation.








NOTE: Engine lubrication and maintenance instructions are included in this manual as a reference tool only. It is NOT meant to substitute for the instructions given in the Engine Manufacturer’s Manual. If you no longer have a manual, contact Nordco Parts Sales for the local distributor of your engine.

## LUBRICATION AND MAINTENANCE NOTES

The following are suggested notes and guidelines when performing maintenance on this machine.:

1. Always make certain that the engine has been turned off and the battery disconnect has been turned to the OFF position before performing maintenance on this machine.
2. NEVER clean, adjust, repair, or lubricate the machine while it is running unless specifically required and providing all necessary precautions have been taken.
3. When performing maintenance on the brakes, exercise caution if the spring brake is disassembled. Follow the brake manufacturer’s instructions on the outside of the canister before attempting to disassemble the brake housing. The springs in the brake chamber are under tremendous compression.
4. Use caution when draining hot fluids from the machine. Splashing hot fluid can cause serious burns.
5. Never open the engine radiator cap while engine coolant is hot.
6. **NEVER** attempt to work under the machine while it is raised on the turntable unless special support blocks provided by Nordco are utilized.
7. Always ensure that all lubricating oils, fluids, and filters are clean and maintained as outlined in this section. It is important that lubrication is performed at the time intervals stated, or else machine damage could occur.
8. Always ensure that the engine radiator and oil cooler are kept clean and free of debris. Also ensure that the cooling fins are in good shape and not bent over.
9. Do not operate any hydraulic components until the hydraulic oil has reached a temperature of 60° F.
10. Always ensure that the pump suction lines and ball valves are open and not blocked, closed or collapsed.
11. Do not position booms more than two feet above storage cradle when performing maintenance on the booms. This will prevent damage to the swing cylinders.
12. Do not use head rotate function to clear cutterhead of debris. Best technique for cleaning cutterheads is by hand, **after shutting down machine and turning the battery disconnect to the OFF position.**
13. Boom swing cylinder speed is factory set. Adjustments without prior approval from Nordco will void warranty.
14. Routine inspection of the clutch (if so equipped) should be performed. A properly engaged clutch requires 120 to 150 lbs. of force to engage.
15. Cutter blades that are installed too loosely may become fractured and will cause noticeable vibration during working operations.
16. Before starting the machine, inspect it for obvious defects and correct any problems discovered.
17. Inspect brake shoes for ice, and remove if present, before operation of the machine. If ice is allowed to build up on brake shoes, braking efficiency is greatly reduced.
18. Do not stand under cutterheads to perform maintenance.
19. Replace glass in cab if damaged. The structural integrity of the glass can be greatly diminished if nicks or damages occur to the outside.

**RECOMMENDED LUBRICANTS**

KEY TO SYMBOLS USED (In Maintenance Section Only)			
 Grease Daily	 Fill Daily (Hydraulic Oil)	 Grease Weekly (EP90)	 Detailed Instructions Follow
 Oil Daily (Engine Oil)	 Fill Daily (Anti-Freeze)	 Grease Monthly	

**RECOMMENDED GREASES  
(NGLI #2)**

BRAND	DESCRIPTION/TYPE
Lubriplate	3000
Texaco	MolyTex EP2
Mobil	MobilGrease Special
Conoco	Super Sta M
Amoco	Rykon Premium Moly 2
Chevron	Moly Grease EP2

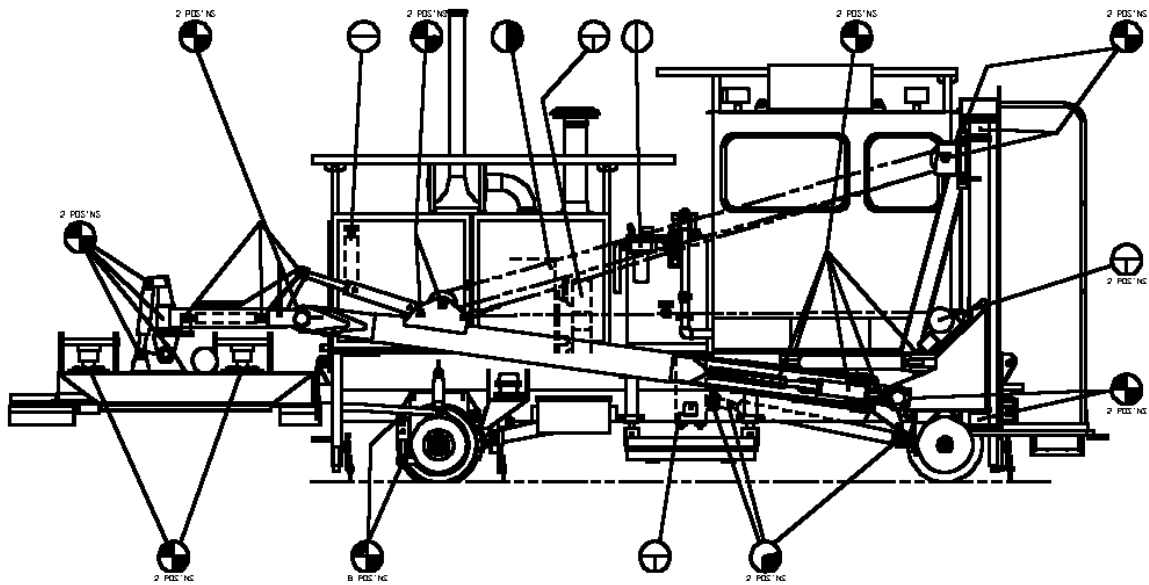
**RECOMMENDED HYDRAULIC OILS  
(ISO #46)**

BRAND	DESCRIPTION/TYPE
Texaco	Rando Oil HD-46
Mobil	DTE-15M
Conoco	Super Hydraulic Oil #46
Amoco	Rykon Oil #46
Citgo	Hydraulic A/W Oil #46

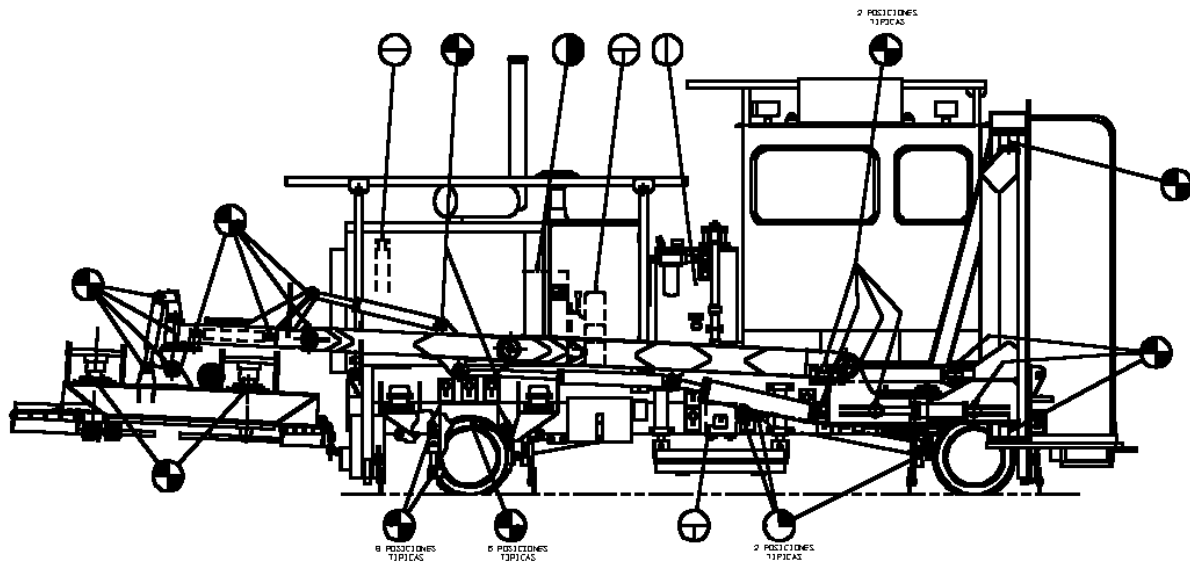
**RECOMMENDED ENGINE OILS**

BRAND	NORMAL TEMPERATURE SAE40	TEMPS UNDER 32°F SAE15W-40
Texaco	URSA Super Plus	URSA Super Plus
Mobil	Delvac 1240	Delvac Super 1200
Conoco	Fleet HD40	Fleet HD Multi-Grade
Amoco	300 Motor Oil	Premier II
Citgo	Citgard 500	Citgard 500

**LUBRICATION AND MAINTENANCE**




















NON-ARTICULATED BOOM MACHINE



ARTICULATED BOOM MACHINE

**DAILY (OR 8 HOURS, WHICHEVER COMES FIRST)**

**Key:**  = Refer to Lube Chart  
 = Refer to Mfr’s Manual in Component Data  = More Detailed Instructions Follow

LOC	ITEM	SYM	TASK
ENGINE	D1.	 	Check Engine Oil Level and Quality
	D2.	 	Check Engine Coolant Level and Quality
	D3.		Check Fuel Filter
	D4.		Inspect Cooling Fan on Engine (Cummins Engine Only)
	D5.		Inspect V-Belt for proper tension and condition
	D6.		Check Air Cleaner Indicators
	D7.		Drain Water Separator/Fuel Water Trap on Engine (if so equipped)
	D8.		Inspect Air Cleaner Dust Unloading Valve
	D9.		Inspect Engine Exhaust and Intake System for leaks and rain cap for fit.
	D10.		Check Case Drain Filter Indicator after resetting indicator
	D11.		- Reserved for Future Use -
HYD.	D12.		Check Hydraulic Oil Level and Quality (looking at gauge). Fill as necessary.
	D13.		Inspect Hoses and Fittings for Leaks
	D14.		Check Return Line Filter Condition Indicator
	D15.		- Reserved for Future Use -
	D16.		- Reserved for Future Use -
MISCELLANEOUS	D17.		Inspect Electrical Connections/Harnesses for Tightness
	D18.		Drain Air Tanks
	D19.		Fill Fuel Tank (end of day)
	D20.	 	Clean Windows on Cab
	D21.		Inspect wheels, wheel nuts, brake shoes and check gap between brake shoes and wheels
	D22.		Check all brake chamber caging bolts
	D23.		Inspect rail sweeps and adjust as required
	D23.		Inspect rail sweeps and adjust as required
	D24.		Check machine for cracks or other structural damage
	D25.		Clean debris from machine before letting machine sit idle
	D26.		Grease brake lever pivot
	D27.		Grease Optional Clutch
	D28.		- Reserved for Future Use -
	D29.		- Reserved for Future Use -
D30.		- Reserved for Future Use -	
CUTTER HEAD	D31.		Perform check on cutterhead – Blade Type Head
	D32.	 	Perform check on cutterhead – Saw-Blade Head
	D33.		- Reserved for Future Use -
	D34.		- Reserved for Future Use -
BOOM	D35.		Grease Boom Pivot Points
	D36.		Grease upper sheave assembly
	D37.		- Reserved for Future Use -



Detailed Daily Instructions

**D20. Clean Cab Windows (Lexan Windows)**

**CLEANING PROCEDURES**

1. Wash with a mild solution of soap\* or detergent and lukewarm water.
2. Using a soft cloth or sponge, gently wash the sheet to loosen dirt and grime and rinse well with clean water.
3. To prevent water spotting, thoroughly dry with chamois or cellulose sponge.

\*Compatible soaps and detergents:

Windex, Joy, Fantastik, Top Job, Mr. Clean, Formula 409

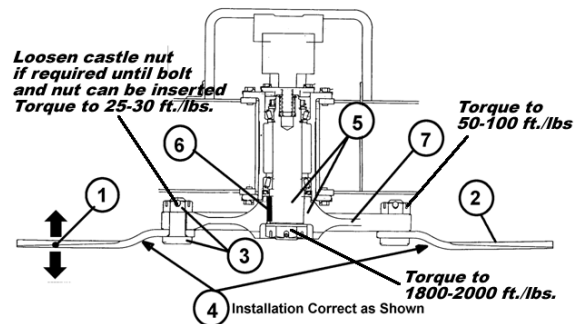
**For more detailed instructions on how to remove grease, graffiti, etc., refer to the "Lexgard" Instructions in the component data section of this manual.**



1. **DO NOT** use abrasive or highly alkaline cleaners on LEXGARD laminates.
2. **Never** scrape LEXGARD laminates with squeegees, razor blades, or other sharp instruments. This may mar or gouge the MARGARD coating.
3. Benzene, gasoline, acetone or carbon tetrachloride should never be used on LEXGARD laminates.
4. **DO NOT** clean LEXGARD in hot sun or at elevated temperatures.

**D31. Perform Check On Cutterhead – Blade Type Heads**

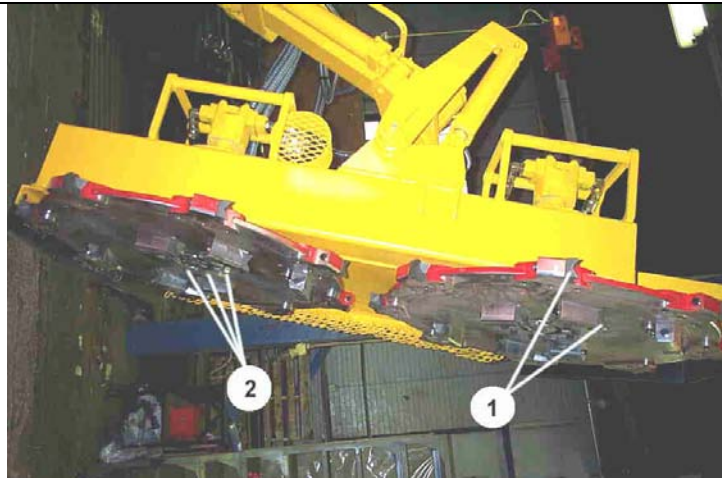
1. Inspect all blades for proper installation: hold end of blade, apply force up and down to check vertical play. A properly installed blade will have minimal play.
2. Inspect blades for physical damage such as cracks, missing pieces, or anything that would cause excessive vibrations.
3. Insure that crossbolts and crossbolt nuts are installed.
4. Make sure blades are diametrically opposed, and that blades are same physical type (length, width, etc.)
5. Inspect flywheel/shaft connection: There should be no play when hand force is applied to the flywheel. Free play indicates that the cutter shaft nut is not properly torqued and/or the cartridge bearings are worn.
6. Insure that cotter KEY in cutter shaft is properly installed.
7. Check the flywheel for visible cracks. Pay particular attention to the area surrounding the pin/blade holes.



- Engineering instructions for proper torque:
- A. Tighten blade castle nuts to 50-100 ft./lbs. to properly seat components.
  - B. Loosen castle nuts as required so that hole in pin can be accessed and bolt and nut can be inserted. Should be approximately 1/8-1/4 turn.
  - C. Insert and fasten bolt and nut. Torque to 25-30 ft./lbs.
  - D. After assembly, make certain that the blades can rotate relative to the flywheel without using excessive force. **USE LEATHER GLOVES** when testing.

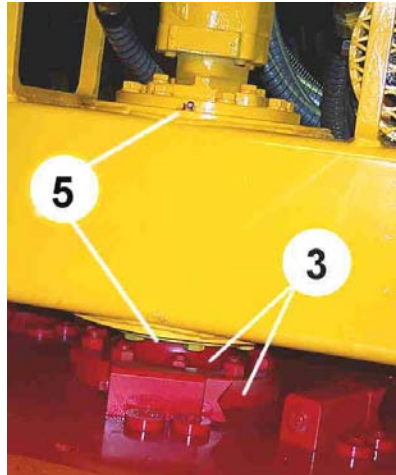
**D32. Perform Check On Cutterhead – Saw-Blade Heads**

1. Inspect disks for missing teeth and/or damaged or chipped teeth.
2. Check that all hardware and tooth securing devices are properly in place.
3. Inspect disk/shaft connection: There should be no play when hand force is applied to the flywheel. Free play indicates that the cutter shaft nut is not properly torqued and/or the cartridge bearings are worn.
4. Insure that cotter KEY in cutter shaft is properly installed.
5. Grease cutterhead until grease can be seen exiting between cutterhead frame and flywheel.






**For more detailed instructions on the maintenance of the saw blade, refer to the QUADCO Manual in the component data section of this manual.**








**Make certain heavy duty gloves are worn at all times when performing maintenance near or on the saw-blade heads!**





**WEEKLY (OR 40 HOURS, WHICHEVER COMES FIRST)**

**Key:**  = Refer to Lube Chart  
 = Refer to Mfr's Manual in Component Data  = More Detailed Instructions Follow

LOC	ITEM	SYM	TASK
	<b>W1.</b>		Perform all Daily Lubrication and Maintenance Procedures
	<b>W2.</b>		Check Battery level and inspect/clean contact points and cables
	<b>W3.</b>		Check Transmission Fluid Level/Quality
	<b>W4.</b>		Check Fluid Level – 3 Pump Drive and clean breather
	<b>W5.</b>		Check Clutch Disconnect for Proper Engagement (Optional)
	<b>W6.</b>		Check Optional A/C Filter (During peak operation)
	<b>W7.</b>		Check Oil Level in Axle Housings and clean breathers
	<b>W8.</b>		Check Oil Level in Winches
	<b>W9.</b>		Check A/C filter during periods of heavy usage
	<b>W10.</b>		Clean Engine Air Filter Elements
	<b>W11.</b>		Blow Clean Radiator and Oil Cooler
	<b>W12.</b>		Inspect Engine Fan for Condition
	<b>W13.</b>		Inspect torque arms on front and rear axle assemblies
	<b>W14.</b>		Inspect torque arms on front and rear axle assemblies

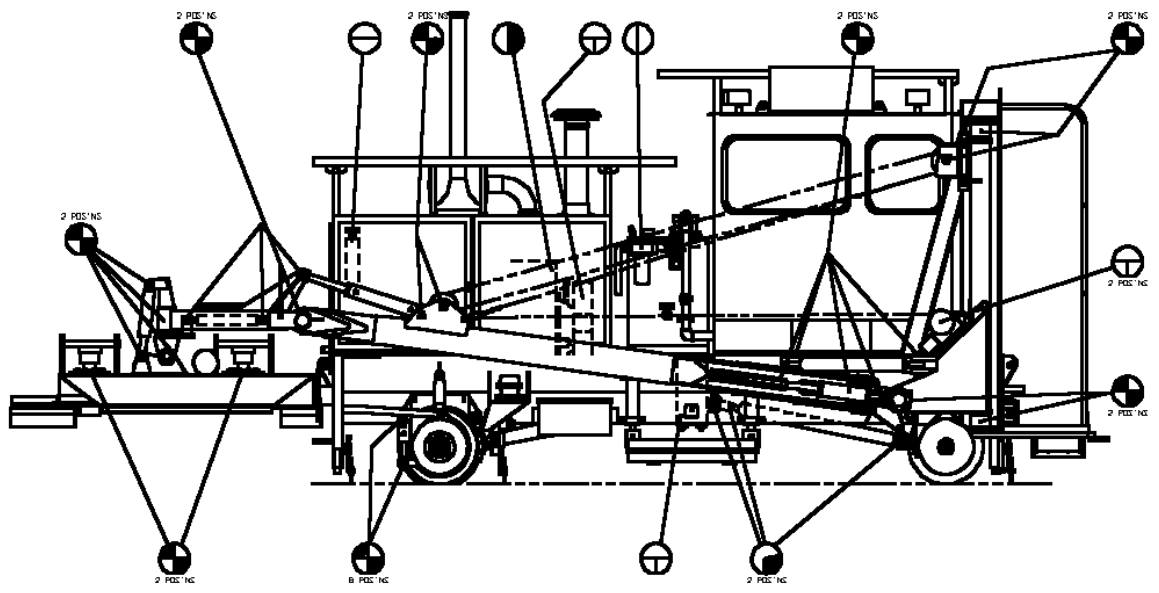
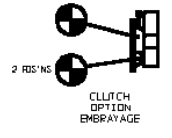
**Detailed Weekly Instructions**

<b>W6. Check Clutch Disconnect for Proper Engagement (Optional)</b>	
<p>When the clutch handle is disengaged, it should take 150 ft/lbs to engage and to snap in place. This should be done with a torque wrench which can be attached to the clutch handle at the base.</p> <p>If adjustment is needed, remove the inspection cover on the clutch housing.</p> <p>W6-Clutch inspection and adjustment</p> <ul style="list-style-type: none"> <li>- when the clutch handle is disengaged , it should take 150 ft LBS to engage and to snap in place</li> <li>- this should be done with a torque wrench which can be attached to the clutch handle at the base.</li> <li>- -If adjustment is needed , remove the inspection cover on the clutch housing</li> <li>- by looking at the clutch assembly , there is a spring loaded pin that can be depressed and the large</li> <li>- Adjusting nut can be freely advanced to the next increment , at this time check the torque it takes to snap the clutch in place.</li> <li>- If not enough go to next increment.</li> </ul>	

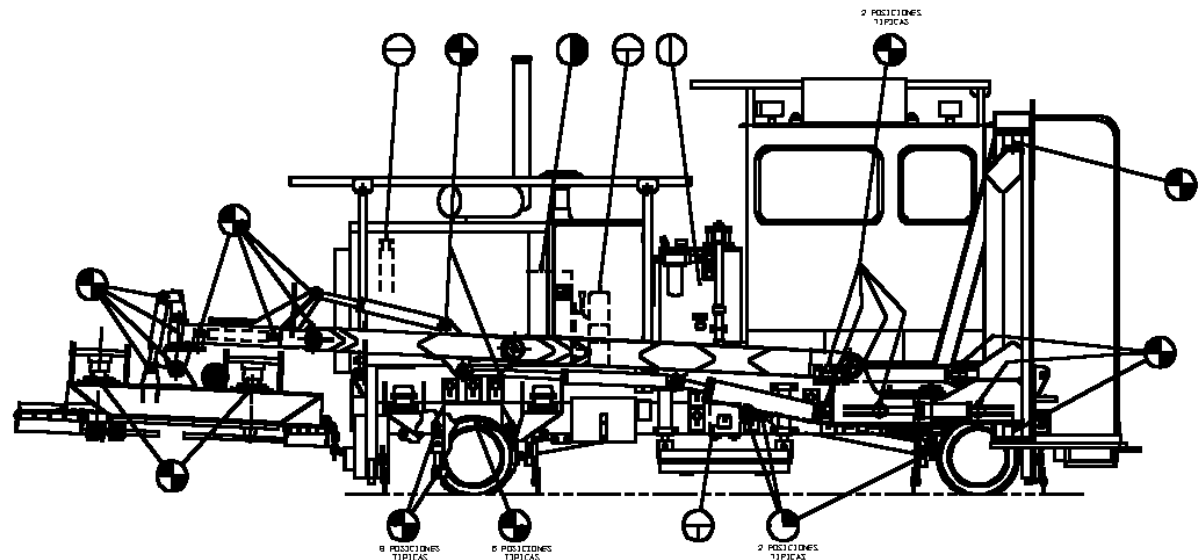
<b>W12. Blow Clean Radiator and Oil Cooler</b>	

<b>W14. Inspect torque arms on front and rear axle assemblies</b>	






**LUBRICATION AND MAINTENANCE**



NON-ARTICULATED BOOM MACHINE



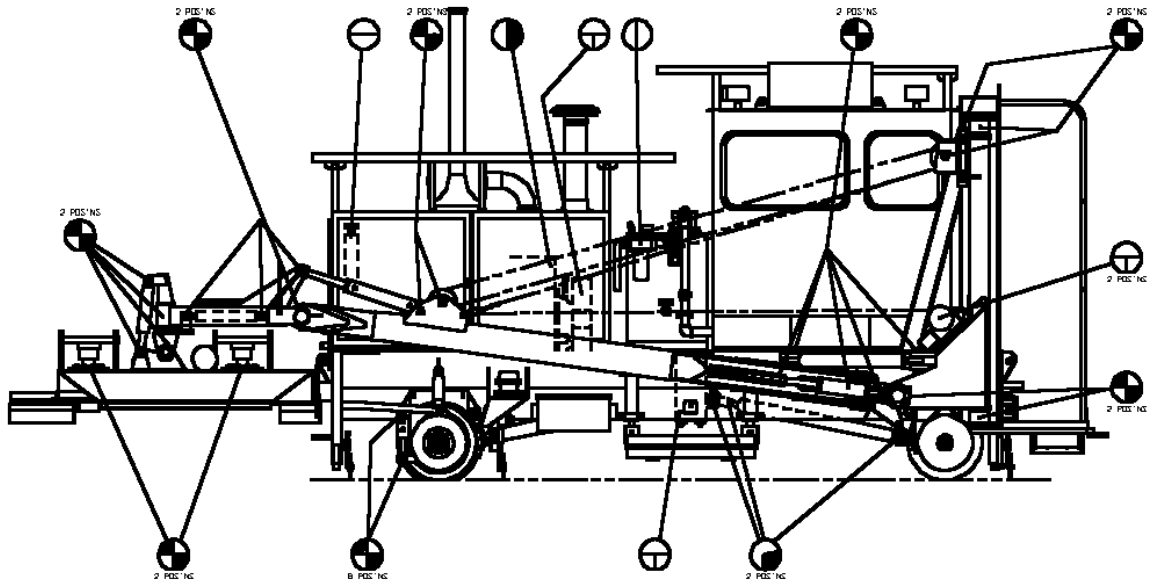
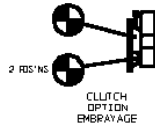
ARTICULATED BOOM MACHINE

<b>MONTHLY (OR 150 HOURS, WHICHEVER COMES FIRST)</b>			
<b>Key:</b>  = Refer to Lube Chart  = Refer to Mfr's Manual in Component Data  = More Detailed Instructions Follow			
LOC	ITEM	SYM	TASK
	<b>M1.</b>		Perform all Daily and Weekly Lubrication and Maintenance Procedures
	<b>M2.</b>		Change engine oil and oil filter
	<b>M3.</b>		Change engine fuel filter and fuel/water separator element
	<b>M4.</b>		Change engine coolant filter
	<b>M5.</b>		Inspect oil level in broom drive and check chain tension
	<b>M6.</b>		Ensure torque of flywheel nuts is within specifications (using torque wrench)
	<b>M7.</b>		Inspect cylinder lugs and spherical bearings and replace as required
	<b>M8.</b>		Inspect engine crankcase breather for air flow
	<b>M9.</b>		Inspect engine cooling system (leaks, connections, and hoses)
	<b>M10.</b>		Check air compressor coolant lines
	<b>M11.</b>		Ensure engine mounts, fuel tank mounts and hydraulic tank mounts are secure
	<b>M12.</b>		Lubricate throttle cable with graphite
	<b>M13.</b>		Test insulation of axles (if insulated)
	<b>M14.</b>		- Reserved for Future Use -
	<b>M15.</b>		- Reserved for Future Use -
	<b>M16.</b>		- Reserved for Future Use -
	<b>M17.</b>		- Reserved for Future Use -
	<b>M18.</b>		- Reserved for Future Use -

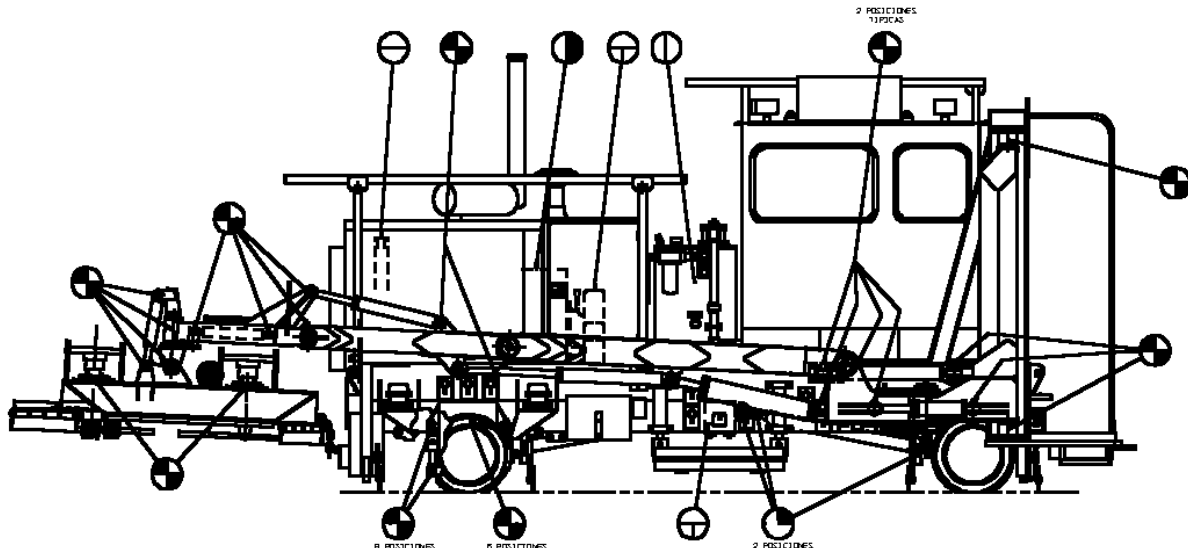
**Detailed Monthly Instructions**

<b>M6. Ensure torque of flywheel nuts is within specifications (using torque wrench)</b>	
<b>M7. Inspect cylinder lugs and spherical bearings and replace as required</b>	

LUBRICATION AND MAINTENANCE






NON-ARTICULATED BOOM MACHINE









ARTICULATED BOOM MACHINE



**QUARTERLY (OR 500 HOURS, WHICHEVER COMES FIRST)**

**Key:**  = Refer to Lube Chart  
 = Refer to Mfr's Manual in Component Data  = More Detailed Instructions Follow

LOC	ITEM	SYM	TASK
	<b>Q1.</b>		Perform all Daily, Weekly and Monthly Lubrication and Maintenance Procedures
	<b>Q2.</b>		Change fluid in transmission
	<b>Q3.</b>		Change fluid in axle housing
	<b>Q4.</b>		Change fluid in 3-pump drive
	<b>Q5.</b>		Change fluid in winches
	<b>Q6.</b>		Replace track travel suction filter elements
	<b>Q7.</b>		Replace charge pump pressure filter element
	<b>Q8.</b>		Replace hydraulic and fuel tank breathers and filler screens
	<b>Q9.</b>		Inspect radiator and oil cooler and steam clean if necessary
	<b>Q10.</b>		Measure wheel diameters for uniform wear within set
	<b>Q11.</b>		Inspect engine cooling system for contamination and test anti-freeze rating
	<b>Q12.</b>		Inspect axle bearing housing wear pads for wear
	<b>Q13.</b>		- Reserved for Future Use -
	<b>Q14.</b>		- Reserved for Future Use -
	<b>Q15.</b>		- Reserved for Future Use -
	<b>Q16.</b>		- Reserved for Future Use -
	<b>Q17.</b>		- Reserved for Future Use -
	<b>Q18.</b>		- Reserved for Future Use -

**Detailed Quarterly Instructions**

<b>Q2. Change fluid in transmission</b>	

<b>Q3. Change fluid in axle housing</b>	

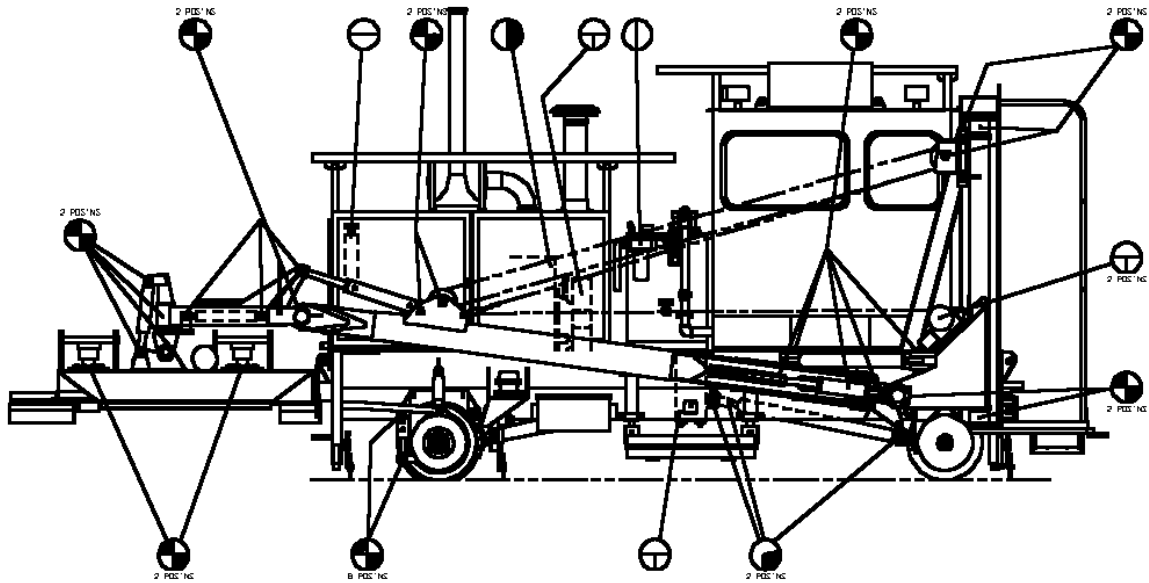
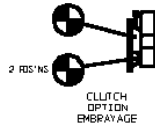
<b>Q4. Change fluid in 3-pump drive</b>	

<b>Q5. Change fluid in winches</b>	

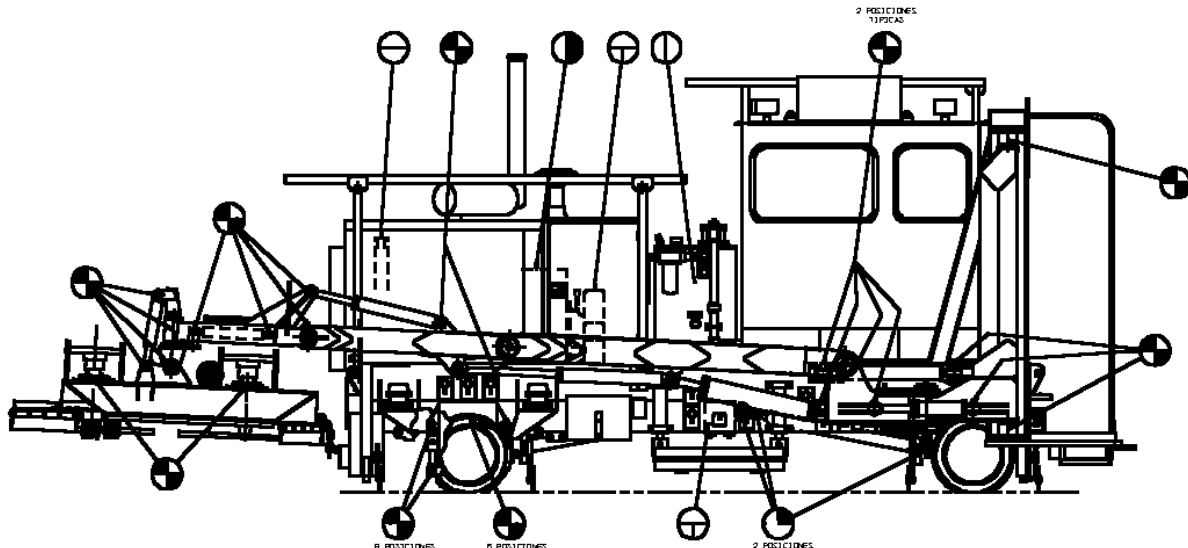
<b>Q6. Replace track travel suction filter elements</b>	
<p>Replace when vacuum reading exceeds 10-inches of mercury during operation when the hydraulic temperature is at 140° - 160° F. Change elements more frequently for cold weather operation to keep the vacuum reading as low as possible.</p>	

<b>Q7. Replace charge pump pressure filter element</b>	
<p>Replace each time track travel filter elements are replaced or if there is a loss of performance and/or control of the track travel pump to a maximum of 600 hours between changeouts.</p>	





LUBRICATION AND MAINTENANCE



NON-ARTICULATED BOOM MACHINE



ARTICULATED BOOM MACHINE

<b>YEARLY (OR 2000 HOURS, WHICHEVER COMES FIRST)</b>			
<b>Key:</b>  = Refer to Lube Chart  = Refer to Mfr's Manual in Component Data  = More Detailed Instructions Follow			
LOC	ITEM	SYM	TASK
	<b>Y1.</b>		Perform all Daily, Weekly, Monthly, and Quarterly Lubrication and Maintenance Procedures
	<b>Y2.</b>		Drain and clean hydraulic tank. Replace fluid and wash/replace strainers
	<b>Y3.</b>		Drain and clean fuel tank
	<b>Y4.</b>		Test A/C performance and charge with refrigerant, if required
	<b>Y5.</b>		Replace air dryer desiccant cartridge, if equipped
	<b>Y6.</b>		Inspect Suction Strainer Element
	<b>Y7.</b>		- Reserved for Future Use -
	<b>Y8.</b>		- Reserved for Future Use -
	<b>Y9.</b>		- Reserved for Future Use -
	<b>Y10.</b>		- Reserved for Future Use -
	<b>Y11</b>		- Reserved for Future Use -

**Detailed Yearly Instructions**

<b>Y5. Replace air dryer desiccant cartridge, if equipped</b>	

**TROUBLESHOOTING - GENERAL**

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 machine 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.

This troubleshooting guide has been broken down into four sections, engine, hydraulics, electrical, and mechanical/pneumatic; and is intended to give you basic troubleshooting guidelines.

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.

For your convenience we have included copies of the electrical and hydraulic functional schematics as well as the cabling diagrams and logic board layouts drawings. These are included at the end of the Troubleshooting Section.

## ENGINE TROUBLESHOOTING

When the temperature of diesel fuel is elevated, as occurs when the fuel is circulated through an operating engine, it may pose the following hazards which should be guarded against. Refer to the engine manual for details.



Before starting a new or overhauled engine that has been in storage, consult the engine manufacturer's manual for initial start instructions. Failure to follow those instructions can result in serious engine damage.



Exhaust emissions caused by the use of the engine on this machine may cause cancer, birth defects, or other reproductive harm if inhaled.



Never shut off battery disconnect switch with the engine running. This could cause damage to the voltage regulator, alternator, and/or electrical system.

The following precautions should be taken to minimize the possibilities of injuries from heated diesel fuel:

1. Whenever possible, it is recommended that the engine and fuel be given an opportunity to cool down to ambient temperature before performing service operations which could result in the spillage of fuel from the engine or machine fuel system. When this is not possible, protective clothing (face shield, insulated gloves, apron) should be worn when performing these operations.
2. Keep open flames, sparks or other potential ignition sources away and do not smoke during vehicle refueling and service operations which could result in the escape of liquid or vaporized diesel fuel.
3. Engine or machine fuel systems service operations should be performed in a well ventilated area that is kept free of bystanders.

**Refer to the engine manufacturer's operation manual for troubleshooting your engine.**

## ELECTRICAL TROUBLESHOOTING

## INSPECTION

Inspect the electrical system for clues to the malfunction. Check to see if the unit can be operated without further damage to the system. Always check these items before turning on switches or running the machine:

1. Look for bare wires that could cause grounds or shorts. Shorted wires can damage the charging system.
2. Look for loose or broken wires.
3. Inspect all connections, especially battery connection points. Cleaning harness connectors or ground connections can often correct what appears to be a malfunction.
4. Check the battery electrolyte level. Continued loss of electrolyte fluid indicates overcharging or cracked battery case.
5. Inspect for overheated parts after the unit has been stopped for a while. They will often smell like burned insulation. Put your hand on the alternator. Heat in these parts, when the machine has not been operated for some time, is a sure clue to charging circuit problems.

Many electrical failures cannot be detected even if the machine is started. If your visual inspection does not indicate the possible malfunction refer to the electrical system troubleshooting guide that follows.

The Electrical Schematic for this machine can be found at the back of this TROUBLESHOOTING section and behind the Electrical tab of the manual.



Disconnect the battery before servicing this machine. Failure to do so could result in personal injury from accidental engine startup.



Never shut off battery disconnect switch with the engine running. This could cause damage to the voltage regulator, alternator, and/or electrical system.

PROBLEM	POSSIBLE CAUSE	SOLUTION
<b>Battery uses too much water</b>		
<b>Cracked Battery Case</b>	Frozen battery	Keep battery fully charged in cold weather. Replace battery.
<b>Low Battery Output</b>	Low water level.	Add distilled water.
	Dirty or wet battery top causing discharge.	Clean and wipe dry battery top.
	Corroded or loose battery cables	Clean and tighten battery cables.
	Broken Battery post.	Wiggle battery post by hand. If post wiggles or turns, replace battery.
	Wrong size replacement battery.	Replace battery with type specified under "Machine Specifications".
<b>Starting Motor will not turn.</b>	Battery disconnect switch turned off.	Turn switch to "ON" position
	Defective ignition switch	Repair or replace.
	Directional Control not set to Neutral	Lift control handle up to unlock and move to Neutral position.
	Bad solenoid	Replace solenoid
	Corroded battery terminals..	Inspect and clean if necessary
<b>Hourmeter does not work.</b>	Hourmeter Gauge Defective.	Replace Hourmeter
	Wiring harness defective	Repair or replace wiring harness
	Corroded or failed hourmeter groundwire	Replace groundwire
<b>Voltmeter does not work.</b>	Voltmeter Gauge Defective	Replace voltmeter
	Wiring Harness defective	Repair or replace wiring harness
	Regulator defective	Repair or replace
<b>Engine Oil Pressure Gauge does not work.</b>	Pressure Gauge Defective.	Replace gauge
	Wiring Harness defective	Repair or replace wiring harness
<b>Engine Oil Pressure Gauge always reads "HIGH"</b>	High Oil Viscosity	Drain and add correct oil as specified under "RECOMMENDED LUBRICANTS"
	Wiring harness	Check wiring harness. Repair or replace
	Engine Oil Pressure Gauge defective.	Repair or replace
	Defective pressure sensor	Replace sensor
<b>Engine Oil Pressure Gauge always reads "LOW"</b>	Low oil level.	Stop engine, check level. If low fill to desired level.
	Low oil viscosity.	Drain and add correct oil as specified under "RECOMMENDED LUBRICANTS"
	Wiring harness	Repair or replace.
	Gauge defective.	Replace gauge.
	Defective pressure sensor.	Replace sensor.



<b>PROBLEM</b>	<b>POSSIBLE CAUSE</b>	<b>SOLUTION</b>
<b>Horn does not sound</b>	Connection at horn loose	Tighten connection
	Wiring harness defective	Check harness, repair or replace
	Horn circuit breaker tripped	Reset circuit breaker
	Horn defective	Check horn, repair or replace
	Horn relay defective	Check relay
	Horn switch defective	Check switch, repair or replace
<b>Backup Alarm does not sound</b>	Backup alarm switch not turned on.	Turn on backup alarm
	Connection at alarm loose	Tighten connection
	Wiring harness defective	Check harness, repair or replace
	Alarm circuit breaker tripped	Reset circuit breaker
	Alarm defective	Check alarm, repair or replace
	Alarm relay defective	Check relay
	Alarm switch defective	Check switch, repair or replace
<b>Travel lights do not work</b>	Wiring harness defective	Check harness, repair or replace
	Connection at light loose	Tighten connection
	Circuit breaker tripped	Reset circuit breaker
	Switch defective	Check switch, repair or replace
	Connection at switch loose	Tighten connection
	Light defective	Replace light
	Connection at circuit breaker panel loose	Tighten connection
<b>Work lights do not work</b>	Wiring harness defective	Check harness, repair or replace
	Connection at light loose	Tighten connection
	Circuit breaker tripped	Reset circuit breaker
	Switch defective	Check switch, repair or replace
	Connection at switch loose	Tighten connection
	Light defective	Replace light
	Connection at circuit breaker panel loose	Tighten connection
<b>Cooling Fan not working</b>	Loose connection at back of fan	Tighten connection
	Loose connection at circuit breaker panel	Tighten connection
	Loose connection on relay	Tighten connection
<b>Brake lights do not work</b>	Wiring harness defective	Check harness, repair or replace
	Connection at light loose	Tighten connection
	Circuit breaker tripped	Reset circuit breaker
	Switch defective	Check switch, repair or replace
	Connection at switch loose	Tighten connection
	Light defective	Replace light
	Connection at circuit breaker panel loose	Tighten connection

## HYDRAULIC TROUBLESHOOTING

## HYDRAULIC SYSTEM

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

## INSPECTION

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

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



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

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

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

## FLUID CONTAMINATION

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

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

## LOCATING LEAK SOURCES

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

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

Most leaks occur at fittings, but too often, finding the fitting that is leaking is difficult because the fluid runs along the hose and drips off at some other point. Leaks in high pressure lines sometimes are difficult to pin-point because the fluid comes out as a mist.

Once you find the location of a leak, the specific cause has to be determined before it can be corrected. A scratch in a fitting seat or a cut in a seal lip that is big enough to leak excessively can still be too small to find with the naked eye. The use of a magnifying glass would assist you.

#### HOSE LIFE

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

High oil temperatures (over 200 degrees Fahrenheit, 93 degrees Celcius) 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.

The Functional Hydraulic Schematic for this machine can be found at the back of this TROUBLESHOOTING section and behind the "Hydraulic" tab.

<b>PROBLEM</b>	<b>POSSIBLE CAUSE</b>	<b>SOLUTION</b>
<b>Hydraulic pump does not develop pressure</b>	No hydraulic oil in tank (NOTE: if pump is run without oil in tank, pump damage will occur.)	Check oil level. Refill tank.
	Shut-off valve closed. (NOTE: if pump is run with valve closed, pump damage will occur.)	Open valve completely.
	Main relief valve bypassing. (NOTE: oil blowing past any relief valve can cause oil to overheat.)	Adjust pressure setting on relief valve.
	Pump is defective.	Refer to pump manual or replace pump.
<b>Hydraulic pump excessively noisy</b>	Cold oil.	Allow unit to warm up.
	Low oil level.	Check and add oil.
	Oil viscosity too high (oil too thick)	Drain and add correct oil as specified under "RECOMMENDED LUBRICANTS".
	System relief valve set too low.	Increase pressure setting on relief valve (see Pressure Checks)
	Intake hose to pump restricted.	Inspect and repair.
	Defective pump.	See pump manual, repair or replace pump.
<b>Hydraulic Oil Overheats</b>	Oil viscosity too high (oil too thick)	Drain and add correct oil as specified under "RECOMMENDED LUBRICANTS".
	Oil lines damaged causing excessive internal restriction	Inspect and repair.
	Dirty oil cooler fins	Wash or blow clean
	Oil cooler check valve by-passing	Inspect or repair
	One of the high pressure relief valves is by-passing	Clean, adjust, repair or replace as necessary.
<b>Hydraulic Oil Foams</b>	Water in oil	Inspect oil for water. Drain and add correct oil as specified under "RECOMMENDED LUBRICANTS".
	Using wrong oil	Drain and add correct oil as specified under "RECOMMENDED LUBRICANTS".
	Low hydraulic level	Check level. Refill tank.
	Damaged hydraulic oil lines	Inspect, repair or replace.
	Air leak in suction line to hydraulic pump or pump shaft seal leaking	Inspect, repair or replace.

<b>PROBLEM</b>	<b>POSSIBLE CAUSE</b>	<b>SOLUTION</b>
<b>Track travel not functioning in one direction. (Other direction is normal)</b>	Pump stroking linkage slipped, and not positioned correctly.	Align linkage and tighten.
	Faulty control on pump.	Inspect, repair or replace.
	Motor high pressure relief valve stuck open (located on rear block of motor)	Interchange location of two relief valves and see if change in travel direction or malfunction. Clean, inspect or change relief valve if necessary.
<b>Track travel not functioning in either direction.</b>	Suction line shut-off valve closed.	Open valve and lock in open position.
	Clogged suction filter.	Check vacuum reading, if more than 10-inches of Hg at working temperature, change filter elements.
	Suction line gate valve closed.	Open valve and lock in the open position.
	Four speed transmission not in gear	Put in gear, check linkage if necessary.
	Pump control block faulty.	Inspect, repair or replace.
	Pump control cable faulty.	Inspect, repair or replace.
<b>Track travel slow in either direction.</b>	Shifting linkage not putting motor lever into correct position for high speed.	Check linkage and tighten.
	Faulty pump control.	Inspect, repair or replace.
	Low charge pressure a) clogged suction or charge pressure filter. b) Excessive leakage in pump or motor.	a) Change elements. b) Change both pump and motor and repair old units.
Note: for more hydrostatic trackdrive problems, please refer to component manufacturer's manual.		

MECHANICAL TROUBLESHOOTING

INSPECTION

Inspect the mechanical system for clues to the malfunction. Check to see if the unit can be operated without further damage.



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.

<b>PROBLEM</b>	<b>POSSIBLE CAUSE</b>	<b>SOLUTION</b>
<b>Machine will not propel.</b>	Main pump not developing pressure.	See Hydraulic Troubleshooting.
	Brakes not releasing.	See next problem.
	Propulsion relief setting too low.	Increase relief setting.
	Defective motor or broken drive shaft.	Repair or replace motor or shaft.
<b>Brakes will not release</b>	Air Pressure too low.	Adjust regulator setting
	Brake cylinder bypassing air.	Inspect and replace cylinder
<b>Brakes will not apply.</b>	Broken brake spring.	Inspect spring and replace if necessary.
	Brake shoes worn.	Inspect shoes and replace it necessary.
<b>Boom won't lift or lower</b>	Lockup engaged.	Disengage lock.
	Obstruction at pinch points.	Remove obstruction
	Pressure problem at lift cylinder.	Adjust main relief or replace cylinder
	Carrier bushings not lubricated.	Grease bushings
	Stuck control valve spool	Inspect and repair
	Winch motor defective	Inspect, repair or replace.
	Piston bypassing (Articulated Boom)	Repair cylinder
<b>Boom will not swing</b>	Flow control valves improperly adjusted	Inspect and adjust as necessary
	Piston bypassing	Repair cylinder
	Stuck control valve spool	Inspect or repair
<b>Boom Breakaway Operates too easily</b>	Relief valve setting too low or stuck open	Inspect and replace as necessary
<b>Cutterhead won't maintain RPM</b>	Engine not at full RPM	Adjust throttle
	System pressure problem	Adjust system pressure
	Defective cutterhead motor	Repair or replace motor
<b>Excessive Vibration in Cutterhead</b>	Unevenly distributed blades or missing teeth	Replace blades.
	Lack of lubrication in the blade shaft housing	Fill with grease until grease exits other side of cutterhead housing (blade side)
	Blade cartridge shaft bearing failure	Replace bearing
	Defective cutterhead motor	Repair or replace motor
	Cracked or damaged blade	Replace blade
<b>Cutterheads will not rotate</b>	Motor defective	Inspect, repair or replace as necessary
	Relief valve faulty	Inspect, repair or replace as necessary
	Pump Defective	Inspect, repair or replace as necessary

<b>PROBLEM</b>	<b>POSSIBLE CAUSE</b>	<b>SOLUTION</b>
<b>Excessive Noise in Transmission</b>	Parking brake applied.	Release brake
	Oil level too low.	Add oil.
<b>Transmission jumps out of Gear</b>	Shift cable out of adjustment.	Readjust
	Foreign object jamming shifter arm	Remove
	Damaged shifter fork spring	Replace
	Transmission mounting bolts loose.	Tighten
<b>Axle Vibration During Speed Changes</b>	Torque link pins or bearings are damaged	Repair or replace
<b>Axle Housing Running Hot</b>	Parking brake left on	Disengage
	Oil Level Low	Fill to level plug
	Pinion Bearing Damaged.	Repair or replace
<b>Excessive Vibration During High Speed Travel</b>	Journal bearings are dry	Replace
	Suspension wear plates are worn	Replace
	Universal joints worn	Replace
	Uneven wheel diameters.	Resurface or replace
<b>Low Air Pressure (90-120 psi is normal)</b>	Faulty air compressor pressure governor	Adjust governor setting or replace if necessary
	Faulty air compressor	Refer to engine manual
	Leaking hoses or leaking diaphragm in air brake chamber	Check air leak with foot valve in applied position
<b>Air Pressure Correct, but brakes will not apply</b>	Foot valve not working	Repair or replace
	Quick release valve malfunctioning	Repair or replace
<b>Parking/Emergency Brake won't Release</b>	Low air pressure	Adjust air compressor governor
	Faulty parking/emergency brake control	Inspect, repair or replace as necessary