Anchor Applicator
Model F

Operation and Maintenance Manual

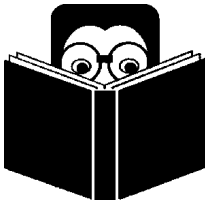
Applies to S/N 680287-680313
Reorder Part: 4945 6800
Last Revision: Rev. B
JANUARY 2008

Read and fully understand the precautions contained in this manual before operating or servicing this machine. Refer to Section 1 for important safety information.

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 either as a part (Operation Manual only) or a whole (operation and parts manual), 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:	**Milwaukee, Wisconsin** (414) 766-2180 sales@nordco.com
NORDCO Parts:	**Milwaukee, Wisconsin** 1-800-647-1724 parts@nordco.com **Oshawa, Ontario, Canada** (905) 579-4058, Ext. 224 oshsales@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

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SAFETY

Please read and comply with all of the safety precautions in this manual and those supporting optional equipment for this machine.

GENERAL

DO NOT use this option for work 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.

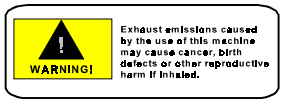
FOLLOW SAFETY INSTRUCTIONS

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.

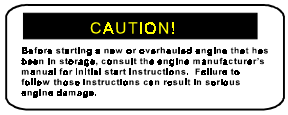
SAFETY ALERT SYMBOLS!

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

DANGER typically defines the most serious hazards. **DANGER** usually means that improper use could result in severe bodily harm or even death.



WARNING means that improper use could result in severe bodily harm and/or extensive machine damage.



CAUTION means that improper use could result in machine damage.

GENERAL SAFETY TIPS

Only trained and authorized personnel should be allowed to operate this machine. In addition, all personnel at the worksite (gang) 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. Protect against flying pieces of metal and debris by wearing safety glasses or goggles.

4. Wear good-fitting pants and shirt, no baggy or loose clothing.

5. Protect your head and eyes from flying debris by wearing a hard hat and safety goggles/glasses.

6. Wear leather gloves to protect your hands from vibration or flying metal particles.

7. Use safety-toed work boots.

SAFETY DURING WORK

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

1. Make certain that no one is in the path of this machine. Whether in work or travel mode, make certain that all personnel have left the area before moving this machine.

2. Make certain that the steps and path for entering or exiting the machine are clear of mud, debris, equipment, and any other obstacles that may prevent emergency exit from the machine.

3. Always use the steps and handles provided for entering or exiting this machine.

4. **NEVER** exit the machine while the machine is moving.

5. 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.

6. Halt work if visibility is poor. Strong rains, fog, and extremely dusty and blowing conditions can obscure visibility in your work area. Wait for weather to improve before continuing work.

7. Anyone standing near the machine is at risk of being injured. Make certain they keep away from the workheads and any other moving assembly during working operations.

8. 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.

9. Check and service the fire extinguisher (if so equipped) 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.

11. 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.

SAFETY DURING WORK (Continued)

12. Inspect hazard decals and replace when they become unreadable or are damaged. (See “Hazard Decals” at the end of this Safety section).

13. Seatbelts should be used at all times. Whenever the engine is running, the operator should be in his/her seat at either the operator station (Work or Travel Stations) with the seat belt properly installed.

14. Keep the station floors and logic box console free of tools and/or personal items.

SAFETY DURING TRAVEL

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

1. Riders on this machine during travel are limited to the amount of seats available. Never allow the total number of personnel riding on this machine to exceed the number of seats available.

2. Always make certain that lockups provided on this machine are free of debris or grease and are in place prior to travel.

3. Operate the machine carefully when bad weather conditions exist. Icy or wet conditions limit the stopping ability of the brake system. Maintain a distance between machines that will allow you room to stop.

4. Halt travel if visibility is poor. Strong rains, fog, and extremely dusty and blowing conditions can obscure visibility in your area. Wait for weather situation to improve before continuing travel.

5. A travel alarm has been provided on this machine that signals others that you have changed your direction of travel. Make certain it is working properly **BEFORE** travel. Use a signal person in high traffic areas where noise may drown out the alarm and whenever the operators view is obstructed.

6. Anyone standing near the machine is at risk of being injured. Make certain they keep away from the machine during travel operations.

SAFETY DURING MAINTENANCE

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.

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.

MACHINE SAFETY ALERTS

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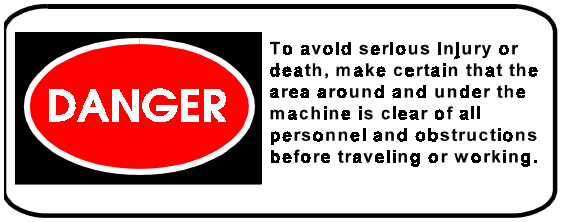	37, 61, 71
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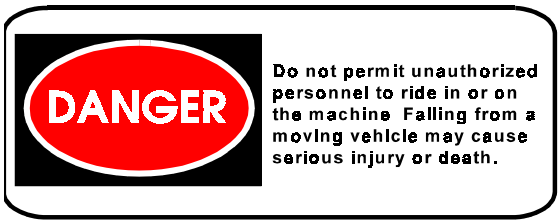
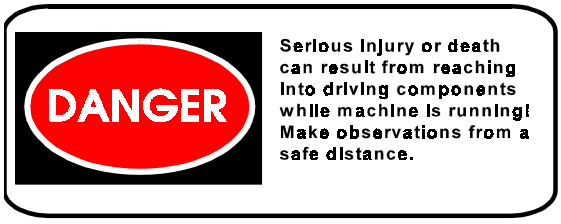
	37, 61
	38

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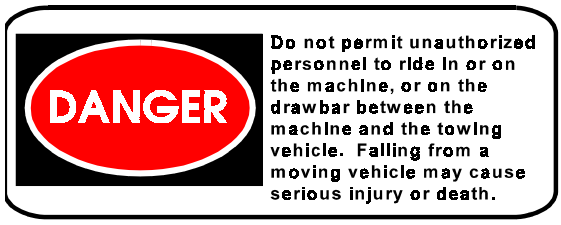
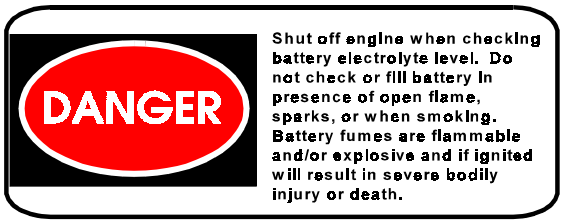
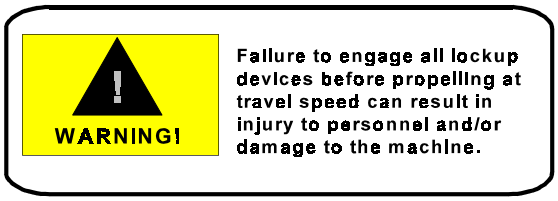
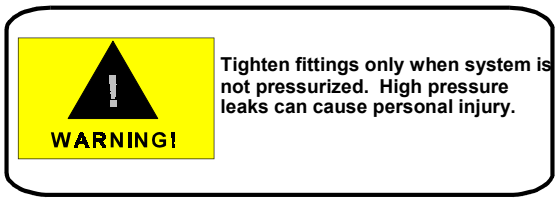
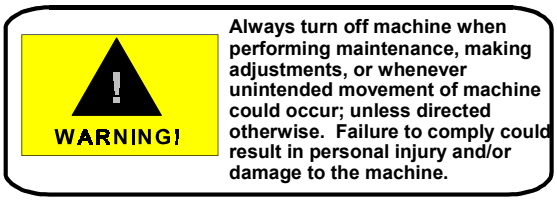
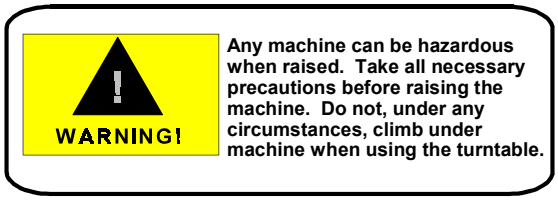
	68
	81
	35
	77, 105
	38, 71, 99, 109
	68

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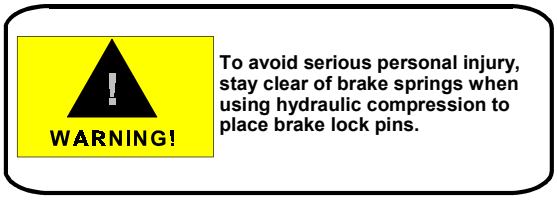
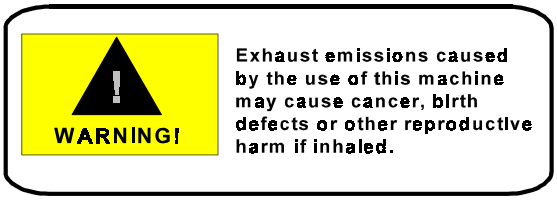
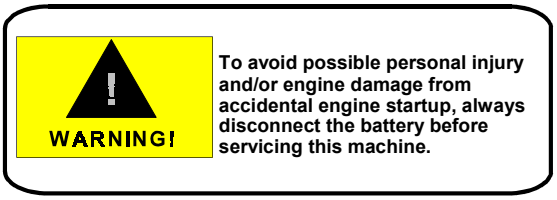
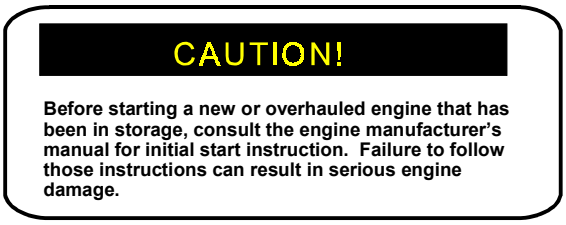
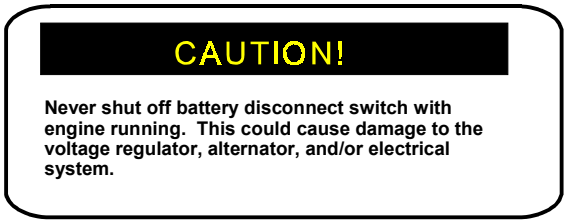
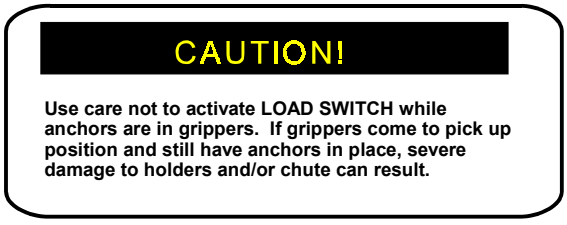
	69
	33, 100
	71, 101
	33, 100
	67, 100, 101
	62

WORDING	FOUND ON PAGE
CAUTION! Make adjustment is correct on both arms to prevent twisting damage to the jaw arm assembly.	50
CAUTION! **Under no circumstances apply a single anchor unless the machine has been properly prepared for this type of operation. Applying a single anchor without making the proper adjustments will damage the unload gripper cylinder rod.**	64
CAUTION! **Both clamp arm stops must be adjusted so that they bear against the top of the rail evenly when the clamp arm is down. If improperly adjusted, the twisting force exerted on the clamp arm could cause serious damage to the clamp arm assembly.**	48, 49

LOCKOUT AND/OR TAGOUT REQUIREMENTS

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!**

NORDCO machines are 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 brake springs, cylinders and hoses; and these must be relieved of pressure prior to service and maintenance. When working on the logic box, lockout is complete after the battery has been locked out.

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.**

LOCKOUT/TAGOUT - MACHINE ENERGY SOURCES

When servicing or performing maintenance on:	Energy Source to be locked out	Potential Hazard	System lockout required	Locked out when
Logic Box	Electrical	Electrical short	1) Ignition 2) Battery	1) Ignition switch turned to the "OFF" position and cover locked 2) Battery Disconnect Switch turned to the "OFF" position and cover locked
Clamp Arms, Jaw Arms, Chute and Doors	1) Electrical 2) Hydraulic 3) Gravity	1)Electrical Short 2)Built up pressure 3)Crushing injury	1a) Ignition 1b) Battery 2) Tagout 3) Tagout	1a) Ignition switch turned to the "OFF" position and cover locked 1b) Battery Disconnect Switch turned to the "OFF" position and cover locked 2) Workheads lockup is in place and Cylinder pressure is bled. 3) Workheads is locked up
Hydraulic Tank	1)Electrical 2)Hydraulic 3)Air	1)Shock 2)Built up pressure 3)Built up pressure	1a) Ignition 1b) Battery 2) Tagout 3) Tagout	1a) Ignition switch turned to the "OFF" position and cover locked 1b) Battery Disconnect Switch turned to the "OFF" position and cover locked 2) Tank pressure has been relieved using pressure relief valve on tank.
Brakes	1) Hydraulic 2) Mechanical	1)Built up pressure 2)Projectile injury	1)Tagout 2)Tagout	1) Brake lockups are in place and Cylinder pressure has been bled. 2) Brake lockups are in place
Engine	1) Electrical	1) Electrical short	1a) Ignition 1b) Battery	1a) Ignition switch turned to the "OFF" position and cover locked 1b) Battery Disconnect Switch turned to the "OFF" position and cover locked
Propulsion System	1) Hydraulic 2) Mechanical	1)Built up pressure 2)Crushing injury	1)Tagout 2)Tagout	1) Ignition switch turned to the "OFF" position and cover locked 2) Battery Disconnect Switch turned to the "OFF" position and cover locked
Battery	1) Electrical 2) Chemical	1) Electrical short 2) Chemical burns or inhalation	1a) Ignition 1b) Battery 2) Battery	1a) Ignition switch turned to the "OFF" position and cover locked 1b) Battery Disconnect Switch turned to the "OFF" position and cover locked; and cables removed 2) See Above
Boom/Winch	1) Hydraulic 2) Gravity	1)Built up pressure 2)Crushing injury	1)Tagout 2)Tagout	1) Winch valve pressure has been bled. 2) Boom has been locked in place and cable hooked in retaining washer
Anchor Dump Bin	1) Hydraulic 2) Gravity	1)Built up pressure 2)Crushing injury	1)Tagout 2)Tagout	1) Dump Bin Valve pressure has been bled. 2) Bin has been locked in place.

When servicing or performing maintenance on:	Energy Source to be locked out	Potential Hazard	System lockout required	Locked out when
Wiring Harnesses	1) Electrical	1) Electrical short	1a) Ignition 1b) Battery	1a) Ignition switch turned to the "OFF" position and cover locked 1b) Battery Disconnect Switch turned to the "OFF" position and cover locked
Junction and Control Boxes	1) Electrical	1) Electrical short	1a) Ignition 1b) Battery	1a) Ignition switch turned to the "OFF" position and cover locked 1b) Battery Disconnect Switch turned to the "OFF" position and cover locked
Proximity Switches	1) Electrical	1) Electrical short	1a) Ignition 1b) Battery	1a) Ignition switch turned to the "OFF" position and cover locked 1b) Battery Disconnect Switch turned to the "OFF" position and cover locked

HAZARD DECALS ON THIS MACHINE

Hazard decals and plaques that have been placed on this machine are to be kept clean and legible. Replace any decals or plaques that have become illegible or are missing.

When repairing or replacing components that had hazard decals on them, it is your responsibility to replace the decals. These can be ordered from the Parts Sales Department.

Hazard Decals on this Machine are:

PART NO.	DESCRIPTION	LOCATION
5642 0001	General Machine Cautions	Inside Logic Box Cover
5642 0002	Caution! Watch Your Step	Frame, by Step
5642 0003	Danger! Do Not Climb Under Machine...	Frame
5642 0004	Danger! Pinch Points	On Workheads near chutes
5642 0005	Warning! Hand Hazard	On Workheads
5642 0006	Danger! Before Servicing...	Logic Box Sides
5642 4501	Caution! Before Welding...	Logic Box Face Battery Box
5642 0010	Lockout Area	Logic Box Face
5642 0011	Lockout Area	Battery Box
5642 0012	Lockup Points	All areas requiring Lockups for travel.

GENERAL

This manual contains information for the **Anchor Applicator Model E** machine manufactured by NORDCO INC., Milwaukee, Wisconsin. 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 8 sections which have been separated by index tabs. The first, **Operation**, includes all information necessary to operate the machine. The second, **Maintenance**, includes lubrication, maintenance, and adjustments instructions. The third, **Troubleshooting**, includes basic troubleshooting for all components on the machine, as well as functional hydraulics, electrical schematics, logic sequence charts, and cabling locations. The fourth, **Mechanical**, has individual parts breakdown drawings and lists for each assembly. The fifth, **Hydraulic**, includes all piping and functional drawings for a standard machine; for optional equipment that requires additional drawings, see tab “Customer Options”. The sixth, **Electrical**, includes all electrical schematics, logic schematics, logic boxes, control boxes, cables and cabling layout drawings for the machine. The seventh, **Component Data**, includes parts breakdowns and service instructions for components installed on the machine that are not of NORDCO’s manufacture. The eighth, **Customer Options**, includes parts breakdowns, lists, and drawings for all equipment on the machine that is optional.

OPTIONAL EQUIPMENT

The specifications that follow 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 filter status indicator box. Optional equipment are those items that are not considered a vital operating part to the machine, but the customer wants them installed. Sheets and instructions 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

Gross Weight

With Boom Only	12,500 lbs (5675 kg)*
With Boom, Hydraulic Dump Bin and Canopy	14,800 lbs (6720 kg)*

Length

With Bumpers	14 feet 4 inches (436 cm)
Without Bumpers	13 feet 8 inches (417 cm)

Width

With Sliding Canopy Extended	10 feet 5 inches (318 cm)
With Sliding Canopy Closed	8 feet 3 inches (252 cm)

Height

With Boom Only	8 feet 10 inches (267 cm)
With Boom and Hydraulic Dump Bin (Extended)	9 feet 5 inches (285 cm)

Travel Speed	25 mph maximum (40 km/h)
Rated Draw Bar Pull	700 lbs. (318 kg)
Turntable	Hydraulically Operated
Wheel Base	6 feet 4 inches (193 cm)
Towing Speed	20 mph maximum (32 km/h)
Work Rate	600 ties boxed per hour

CAPACITIES

Fuel Tank	39.7 gallons (150 liters)
Hydraulic Oil Tank	100 gallons (379 liters)
Oil Cooler	100 gpm (378 L/mn)
Anchor Hopper Storage	1500 Anchors
Anchor Storage on Deck (without Dump Bin)	1000 Anchors
Anchor Dump Bin Storage	2000 Anchors

ENGINE

Make/Model	Deutz BF4L1011
Type	Turbo-charged 4-cylinder, 4-stroke
Idle Speed	1100 rpm
Continuous BHP	101 @ 2250 rpm - full load

Make/Model	John Deere, 4045D
Type	4-Cylinder, Inline
Idle Speed	1150 rpm
Continuous BHP	73 @ 2050 rpm - full load
Weight	1650 pounds (750 kg)

HYDRAULIC SYSTEM

Pressure Settings:

Relief Valve - Main Pump	2,900 psi (200 bar)
Compensator - Main Pump	2, 500 psi (172 bar)

Main Pump Make	Vickers PVH Series
Control Valves	Vickers Manifolded

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

*** Approximate Dry Weight. Actual weight may vary according to options and amount of anchors stored on your machine. Actual Dry Weight of your machine is as stenciled.**

ELECTRICAL SYSTEM

Battery . . . . . 12 Vdc, 1150 Cold Cranking Amps
Ground . . . . . Negative

DRIVE SYSTEM

Drive Type . . . . . Two wheel with one axle
Propulsion Motor Type . . . . . Hydraulic

WHEELS

Type . . . . . Cast Steel
Size . . . . . 16 inch (406 mm) diameter
Brake Type . . . . . Four wheel shoe type, spring actuated, hydraulic release - standard

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

INSTRUCTIONS FOR ORDERING REPAIR PARTS

The parts sheets identify all parts of your machine in three ways: 1) by part number; 2) by part name; and 3) by appearance as shown on the exploded view drawing.

The exploded view drawings have item numbers which are then cross-referenced to the list following the drawing. (Example, Item 17 on the drawing will be Item 17 on the list.)

You can order parts two ways, as individual parts or as one item of many in an assembly. Due to possible design changes some assemblies may have changed. Before you order, contact the Parts Sales Department to verify the items on the assembly. If you have any questions, the personnel in the Parts Sales Department will be happy to assist you in your ordering.

For your convenience, we now accept MasterCharge and Visa as a method of payment.

When ordering parts, always include the following information:

1. The Machine Make and Model.
2. The serial number of the machine.
3. The exact quantities of assemblies or parts desired. Please identify these parts by part number and name.
4. Specify the method of shipment desired.

To reduce delays, please avoid references to other matters in letters forwarded primarily for ordering repair parts. Forward all repair orders to:

NORDCO PARTS SALES DEPARTMENT
P.O. BOX 1562
MILWAUKEE, WI 53201

Call in your orders to:

NORDCO PARTS SALES DEPARTMENT
Telephone: (414) 769-4607
Telephone: (414) 769-4608
Telephone: (800) 647-1724
Fax: (414) 769-2140

A blank order form is located at the back of this manual (last sheet). For faster service, it is important that you provide NORDCO with the information requested on the form.

When ordering replacement parts manuals, it is important that you provide NORDCO with detailed information regarding your machine. If kits have been added in the field, this will allow NORDCO to make a manual that completely represents your machine.

GOODS RETURNED FROM CUSTOMER (GRFC)

When returning goods, you are to call the above number and explain the reasons for returning the goods. They will issue a GRFC number that you are to use for all future correspondence on the return including the package with the item being returned. This will speed up the exchange or credit process. GRFC's are also issued by the Service Manager.

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

BEFORE OPERATION

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

OPERATOR STATIONS

Two operator stations are used on this machine: the **WORK Station** and the **TRAVEL Station**. Removal of the seat and post from one station to the other is required.

WORK STATION

All the controls for running this machine are located at the **WORK Station**, with the exception of a "remote" operator control box that duplicates the Emergency Stop and Horn pushbuttons. This "remote" box is located at the **TRAVEL Station**.

There are three (3) footswitches located in the **WORK Station**. These control propulsion (forward and reverse) and the Automatic Sequence Start footswitch used during actual machine operation. (Braking is automatic upon release of the propulsion footswitch.)

TRAVEL STATION

A "remote" operator control box houses the duplicate Emergency Stop and Horn pushbuttons. This control box is located next to the **TRAVEL Station** seat position.

There are two (2) footswitches located in the **TRAVEL Station**. These control propulsion (forward and reverse) of the machine while the operator is in the travel position. (Braking is automatic upon release of the propulsion footswitch.)

Always use your seat belt when sitting in the operator's seats. Always use the handrail and step provided to climb on to and off of the machine.

WORKHEAD

The workhead consists of jaw arm, clamp arm, chutes (and doors), and anchor holders. There are several types of holders available, each requiring the use of different types of doors. Refer to the Machine Setup Section of this manual for more information regarding the installation of doors and holders.

During operation of the machine, the jaw arm assembly picks up the

anchors, swings down under the rail, boxes the tie and applies the anchor in place in one smooth operation. At the same time, the Clamp Arm assembly swings down on the outside of the rail to hold it in place as the anchors are applied and boxed.

HYDRAULIC SYSTEM

The hydraulic system is comprised of a **Main Manifold** and a few remotely located valves. The main manifold controls the gripper cylinders, the door cylinders, the boxing cylinder, the toggle cylinders, the clamp arm cylinder, the brakes and the propulsion.

Main system pressure is 2500 psi and is set at port “P3" on the main manifold. Refer to the functional hydraulic schematics located behind the tab marked **Hydraulics** for specific information on the manifold and valves.

PROPULSION/DRIVE SYSTEM

The machine is single axle drive, single chain, two drive sprocket system with a single hydraulic motor located next to the Travel Operator Platform.

BOOM/WINCH

The boom/winch system is in place to allow the operator to easily lift kegs of anchors into the Anchor Bin or the optional Dump Bin. The winch is capable of lifting loads up to 300 lbs. It is not designed or intended to be used for towing. The boom and winch should be locked up for travel or when not being used. See lockup requirements in the **Lockup** section of this manual.

LOGIC BOX CONTROL PANEL

The logic box control panel houses nearly all of the operator selectable items on the machine. The logic box drawing on the next page is representative of a standard machine. Refer to the Part Sheet Table of Contents for the drawing number of the logic box on your machine. Pull out that drawing and compare its symbols with those shown in Table OP-1. Become familiar with their functions!

OPERATOR CONTROLS
LOGIC BOX CONTROL PANEL

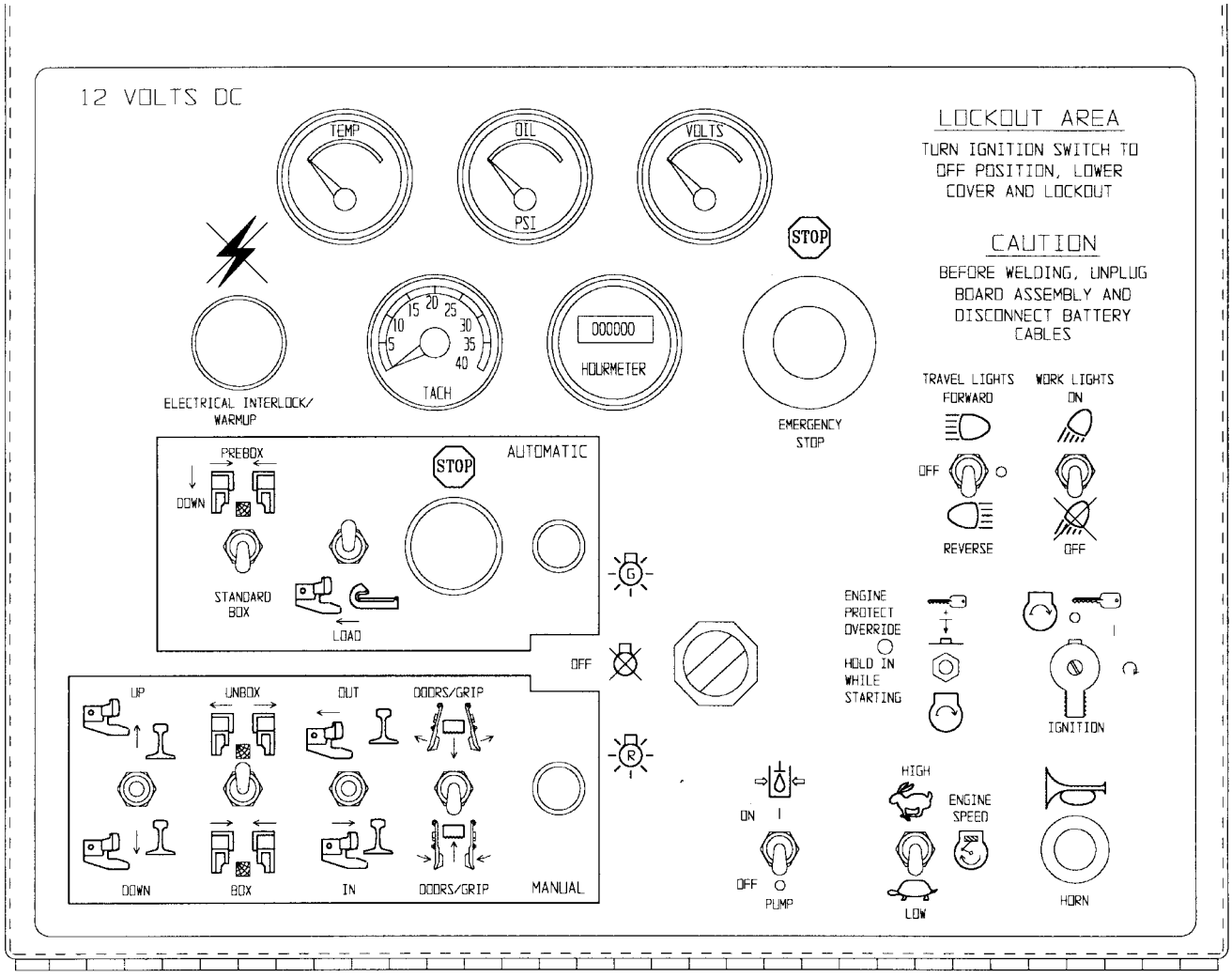
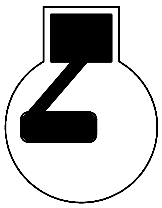
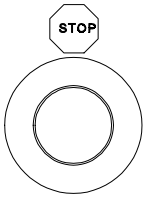
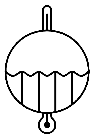
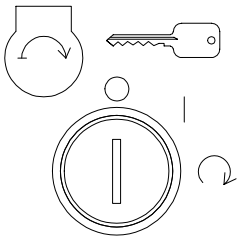
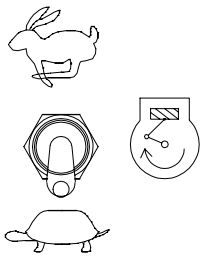
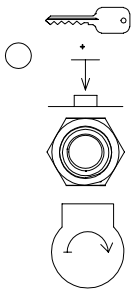
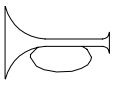
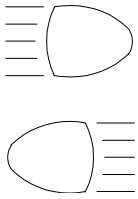
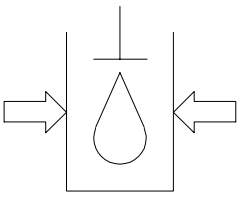
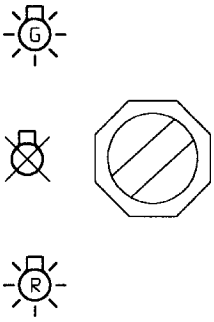
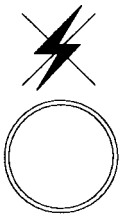


TABLE OP-1
LOGIC BOX CONTROL PANEL

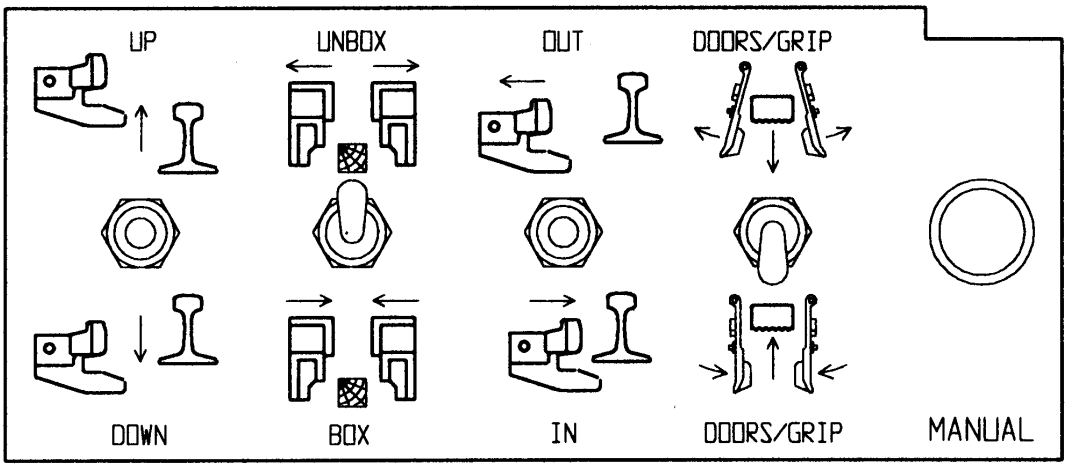
Control or Instrument	International Symbol	Function
TACH/HOUR METER		Indicates engine speed in hundreds of rpm. Block numbers on gauge indicate engine hours.
EMERGENCY STOP		Press button to shut down engine. Pull out button to reset. See "EMERGENCY STOPPING" at the end of this OPERATION section.
Engine TEMPERATURE Gauge		Indicates temperature of engine or cooling system. Normal reading is 160° to 185° F (71° - 85° C) for water cooled engines.
Voltmeter		Indicates voltage of battery. Normal reading is 13-15 volts.
Engine Oil Pressure Gauge		Indicates oil pressure. Does not indicate oil level. Measurement in psi graduations. Normal reading is 40-60 psi (3-4 bar).

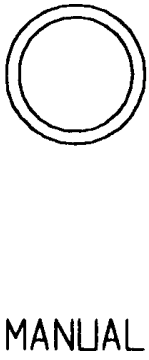
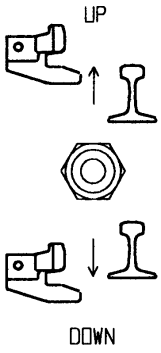
Control or Instrument	International Symbol	Function
IGNITION SWITCH		Switches power to all circuits. Activates starter (when held fully clockwise). **USED FOR NORMAL ENGINE SHUTDOWN.**
ENGINE SPEED		The LOW speed (turtle) setting is for starting. Set switch to HIGH (rabbit) to operate machine. Return to LOW before shutting down engine. NOTE: Engine will not start if switch is in HIGH position when starting.
ENGINE Push to Start		Press and hold until engine starts and oil pressure reaches 30 psi (2 bar). Engine will not start if button is not held in.
HORN		Press button to sound horn.
WORKING LIGHTS		Turn working lights ON or OFF

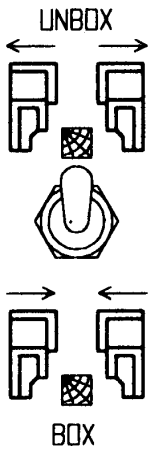
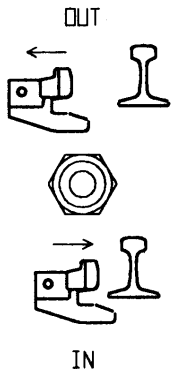
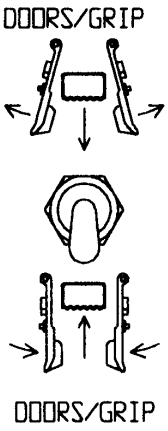
Control or Instrument	International Symbol	Function
TRAVEL LIGHTS		Turns travel lights ON or OFF. Three position switch, center position is OFF. Select light for direction of travel, DOWN for reverse travel, UP for forward travel. NOTE: On some machines this switch has been replaced with a 2-position ON/OFF switch that turns ALL travel lights and beacon/strobe on or off.
Pump ON/OFF Switch		Turns on hydraulic pump. Engine will not start if this switch is in the "on" position when ignition switch is turned. This is done to reduce engine load during starting. After engine has started, turn on pump.
Mode Selector Switch		Used to select the desired operational mode (**Auto** or **Manual**), or to turn power OFF from the Manual Mode. For **AUTO** mode, the switch must be momentarily rotated to the right position. When properly rotated, the green pilot light on the Auto Control Panel will illuminate. To stop the auto mode, you must depress the **Auto Stop** push button on the Auto Control Panel. For **MANUAL** mode, the switch must be moved to the left position and kept there. When properly rotated, the red pilot light on the Manual Control Panel will illuminate. To stop the manual mode, you must move the **Mode Selector Switch** to the center position.
Park Switch (Electrical Interlock/Warmup)		When pushed in, disables all electrical input to the workheads. Also locks brakes. Should be used during machine warmup or inspection.

MANUAL CONTROLS

(Used only when machine is in **Manual** Mode)

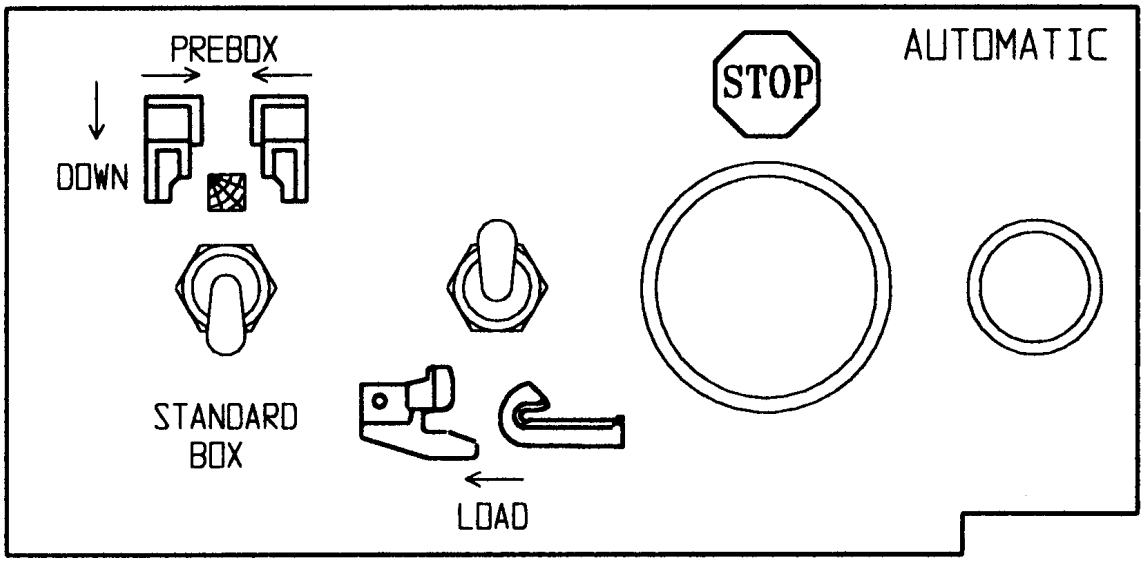


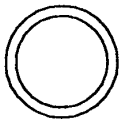
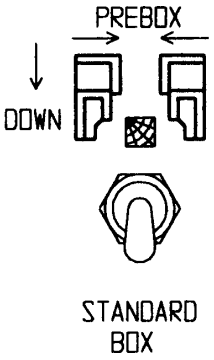
Control or Instrument	International Symbol	Function
MANUAL PILOT LIGHT (Red)		Illuminated when the **Mode Selector Switch** is in the **MANUAL** position.
UP/DOWN (Clamp Arm)		Used to control the up and down movement of the clamp arm during machine setup. **UP** position raises the clamp arm, **DOWN** position lowers the clamp arm. Releasing the switch will stop clamp arm movement. Note: This switch can also be used when an operating fault has interrupted the automatic mode in mid-cycle, but the machine has to be placed in the **Manual** mode to be operational.

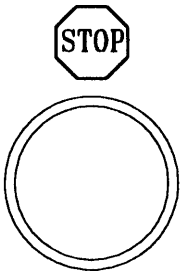
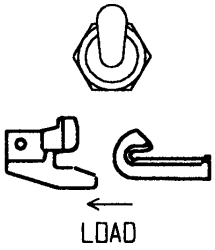
Control or Instrument	International Symbol	Function
BOX/UNBOX (Jaws)		Used to control the tie Box-Unbox function of the movable jaw assembly during machine setup. **BOX** will move the jaws together, **UNBOX** separates the jaws. Note: This switch can also be used when an operating fault has interrupted the automatic mode in mid-cycle, but the machine has to be placed in the **Manual** mode to be operational.
OUT/IN (Jaw Arm)		Used to control the in and out movement of the jaw arms during machine setup (when anchor and tooling types are being changed). **OUT** moves the jaw arm assembly away from the anchor chute, **IN** moves the jaw arm into position for gripping the anchors. Note: This switch can also be used when an operating fault has interrupted the automatic mode in mid-cycle, but the machine has to be placed in the **Manual** mode to be operational.
DOORS/GRIP		Controls the Door Open and Grip solenoid valves. The chute doors will open and grippers will close when the switch is pushed upward and held. Releasing the switch will close the chute doors and open the grippers.

AUTOMATIC CONTROLS

(Used only when machine is in **AUTOMATIC** Mode)



Control or Instrument	International Symbol	Function
AUTO PILOT LIGHT (Green)	AUTOMATIC 	Illuminated when the **Mode Selector Switch** is set to the AUTO position.
PREBOX/STD. BOX (Jaws)		When set to **PREBOX**, this allows the jaws to "box" as soon as the jaw arm starts to move in. This prevents ballast from getting between the anchor and the tie, holding the anchor away from the tie. When set to **STANDARD BOX** the jaws will box when the anchor extends approximately one inch under the base of the rail.

Control or Instrument	International Symbol	Function
AUTO STOP		Aborts the **AUTO** mode sequence in mid-cycle. It is not intended to be used as a method of stopping the machine. (Use the **EMERGENCY STOP** button for shutting the machine down in an emergency.) After this switch has been pressed, the **Mode Selector Switch** must be placed in the **MANUAL** position and the appropriate manual switches used to complete the cycle or return the system to a ready position.
LOAD (Anchors)		Used to load anchors into the Anchor Holders at the beginning of a job or to reload anchors that were kicked out because of an operating fault. Holding the switch down while depressing the footswitch will initiate a cycle in which the Jaw Arm assembly will move in and pick up the anchors and then return to a “ready” position.

REMOTE OPERATOR CONTROL BOX

The Remote Operator Control Box shown below is all-inclusive and is for symbol reference purposes only. This configuration may not reflect the box that is on your machine.

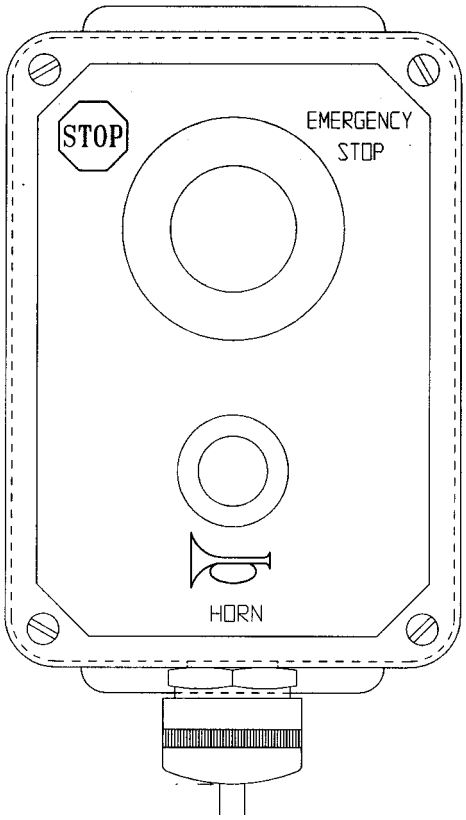
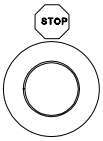
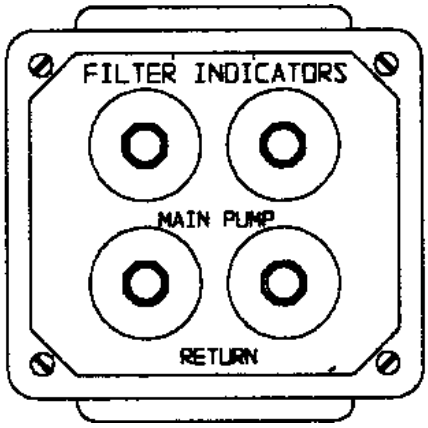
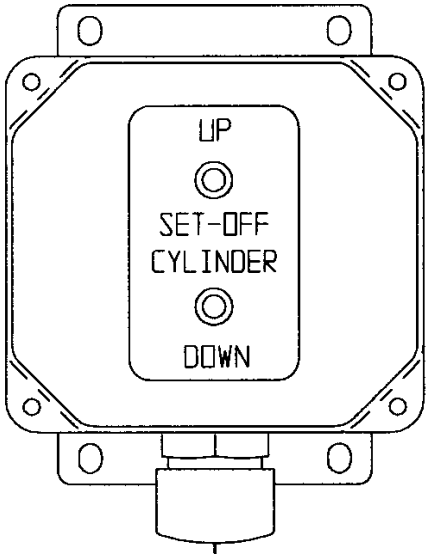


TABLE OP-2
REMOTE OPERATOR CONTROL BOX

Control or Instrument	Function
	Press button to sound horn.
	Press button to shut engine down. Pull out button to reset. See "EMERGENCY STOPPING" at the end of this OPERATION section.

STATUS INDICATOR BOXES





Control or Instrument	FILTER INDICATOR
GREEN LIGHT	Located next to the Travel Station. Gives filter status of the main and return filters. Green light indicates no service necessary,
RED LIGHT	Located next to the Travel Station. Gives filter status of the main and return filters. Red light indicates service is required. Red lights may be on if oil is under normal operating temperatures.

Control or Instrument	SETOFF CYLINDER
GREEN LIGHT	Located next to the Travel Station. Green light indicates that the turntable cylinder is in the raised (up) position.
RED LIGHT	Located next to the Travel Station. Red light indicates that the turntable cylinder is in the extended (down) position and that the turntable has been lowered. **Do not attempt travel if this light is illuminated!**

WORK STATION CONTROLS
FOOTSWITCHES

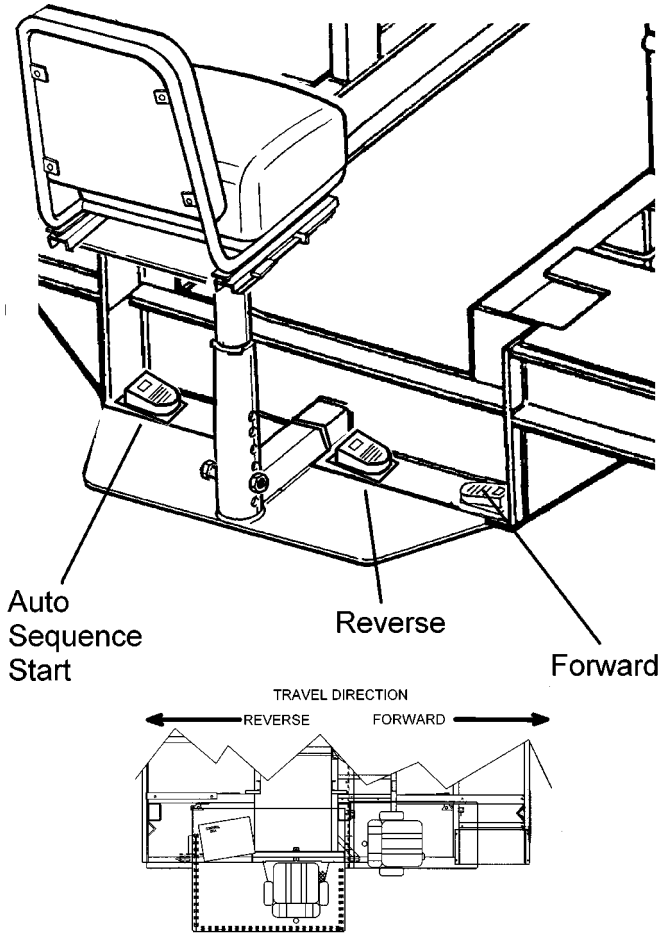


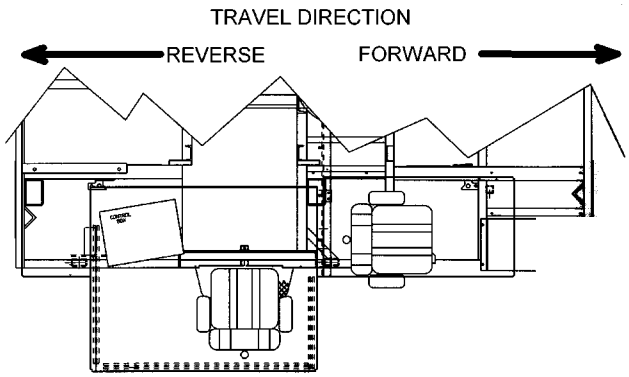
TABLE OP-3

WORK STATION CONTROLS
FOOTSWITCHES

Control or Instrument	Function
Reverse Propel Footswitch	Press this Footswitch to release brake and propel the machine in reverse.
Forward Propel Footswitch	Press this Footswitch to release brake and propel the machine forward.
Automatic Sequence Start Footswitch	When the control is in the **AUTOMATIC** mode, the automatic sequence can only be initiated by momentarily depressing the start footswitch located to the left of the operator in the **WORK Station**. Once the automatic sequence is started, it will go to completion unless the control system aborts the cycle due to an error or if the operator aborts the cycle by depressing the **Auto Stop** pushbutton.

NOTE: Braking on this machine is automatic upon release of footswitch.

TRAVEL STATION CONTROLS
FOOTSWITCHES



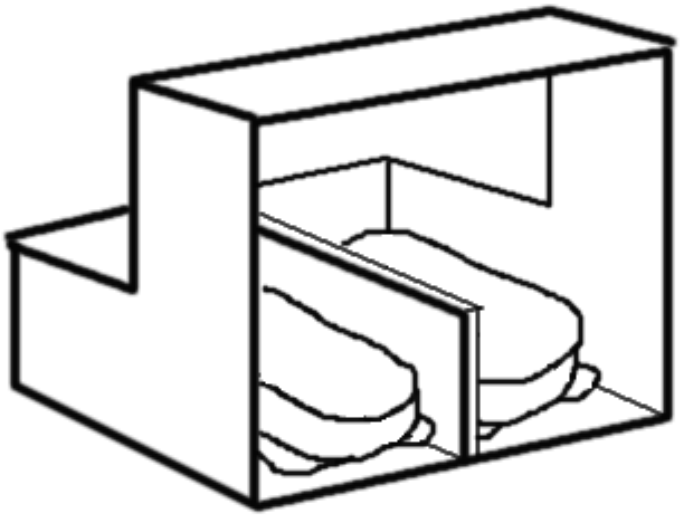


TABLE OP-4

TRAVEL STATION CONTROLS
FOOTSWITCHES

Control or Instrument	Function
Reverse Propel Footswitch	Press this Footswitch to release brake and propel the machine in reverse.
Forward Propel Footswitch	Press this Footswitch to release brake and propel the machine forward.

HYDRAULIC TANK CONTROLS

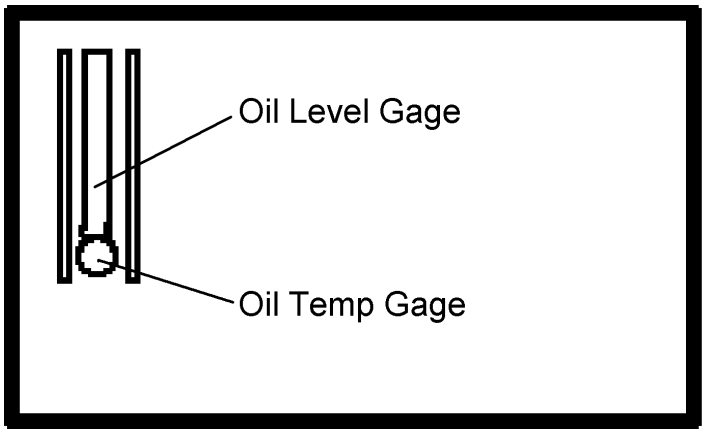


TABLE OP-5
HYDRAULIC TANK CONTROLS

Control or Instrument	Function
Hydraulic Oil Tank Sight Level	Located on hydraulic oil tank, it indicates the level of hydraulic oil in the tank.
Hydraulic Oil Temperature Gauge	Located on the bottom of the hydraulic oil sight level. Indicates temperature of the hydraulic oil. Normal operating temperature is 80° to 150° F (49° to 66° C).

REMOTE CONTROLS AND INDICATORS

TABLE OP-6
REMOTE CONTROLS AND INDICATORS

Item	Control or Instrument	Function
1	Emergency Pump (Optional) Top Off Pump (Optional)	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 pumping hand lever or by switch on electric pump. The top off pump can be either an electric or manual pump that is used for filling the hydraulic tank. Release tank pressure before filling tank.
2	Turntable Valve Hand Lever	The lever controls the upward/downward motion of the Turntable Cylinder and the machine. Moving the valve hand lever up extends the cylinder and raises the machine. Moving the lever down retracts the cylinder and lowers the machine. Moving the lever to the center position stops cylinder movement. The valve hand lever must be down and locked whenever the cylinder is not being used.
3	Battery Disconnect Switch	Located inside of battery box. Two position switch marked with "ON/OFF" plaque. This must be OFF and locked during service.
4	Winch Motor Control Valve	The valve is mounted near the winch motor. Pulling on one side of chain either raises or lowers the winch cable.
5	Hydraulic Dump Bin Lift Hand Lever	Mounted on the post between the work station and travel station (under the Status Indicator Boxes). Move to left to lift the bin and to the right to lower the bid. **Do not attempt travel with the bin in the raised position!**

PREPARING THE MACHINE FOR WORK

As with any machine, pre-operational checks and preventative maintenance should be performed before using the machine. We suggest that you follow the guidelines listed below before actually operating the machine.

1. Position the machine on level track so fluid levels can be accurately checked and filled if necessary.

2. See TOWING section if machine is to be towed to worksite.

3. Know and understand the use of all machine controls and instruments as described in Tables OP-1 through OP-6.

4. Perform the pre-operational inspection of the entire machine as specified in Table OP-7, on the next page. Find defects and correct them before serious damage or failure results.

5. If necessary, follow any applicable instructions under MAINTENANCE FOR EXTREME CONDITIONS.

6. Perform applicable preventative-maintenance procedures in MAINTENANCE AND SERVICE section.

7. Be ready to operate the machine with an alert and safety-conscious attitude.

8. Understand the use of the machine's Lock-Ups. See LOCK-UPS section.

9. Make sure the unit is setup for rail and tie size being worked on. Adjustments, if required, are described in the MACHINE SETUP.

10. Wear proper safety clothing.

Before you begin the pre-operational checklist you should become familiar with the controls that you will be checking. Tables OP-1 through OP-6 explain each control you will be using, and each control’s function. Knowing these controls and their functions may will help you in troubleshooting the machine at a later time.

PRE-OPERATIONAL CHECKLIST

NORDCO recommends that the following checks be performed WITHOUT electrical power, due to a possible battery drain.

TABLE OP-7 PRE-OPERATIONAL CHECKLIST
MAIN CONTROL PANEL STATUS
☐ Logic Box Cover Unlocked and Hooked in Up Position. ☐ Gages checked for broken glass. ☐ Emergency Stop pushbutton is pulled out. ☐ Control Panel Switches set as follows: ☐ Pump ON/OFF switch is OFF ☐ Ignition switch is in OFF ☐ Engine Speed switch is set to LOW ☐ Work Lights are OFF ☐ Electrical Interlock/Warmup Switch is pushed in for warm-up.
REMOTE OPERATOR CONTROL BOX
☐ Check position of switches/pushbuttons: ☐ Emergency Stop pushbutton is pulled out.
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
☐ Inspect for Leaks. Pay particular attention to hydraulic and fuel lines. ☐ Inspect all controls, wiring and switches for secure mounting ☐ Operator controller covers removed and stored ☐ Battery Disconnect Switch OFF (Switch located inside battery box on most models
MACHINE LOCK-UPS AND GUARDS
☐ Make certain Mechanical Lock-Up devices are in place (for traveling) ☐ Propulsion Chain guard(s) in place

Engine Operation

WARNING!

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

CAUTION!

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

NOTE: Avoid unnecessary idling.

1. Ensure the suction strainer valve (See Figure) on the hydraulic oil tank is open and the Battery Disconnect Switch is on.

2. Make certain EMERGENCY STOP pushbuttons on both the main control panel and remote operator control boxes have been pulled out. Set engine speed switch to LOW and the pump switch to OFF. Engine will not start if the engine speed switch is set to HIGH.

   NOTE: See Emergency Stopping Procedures at the end of the OPERATION section.

3. Hold the Magnetic Override switch (MO) (labeled ENGINE/PUSH TO START) in and turn the ignition switch to the right until the engine starts. Release the ignition switch (will spring back to centered position) and continue holding the MO switch until oil pressure reaches 30 psi (2 bar or 207 kPa). Allow 5-7 minutes of warmup if first start of the day.

   NOTE: Engine will not start if engine speed switch is in HIGH position, emergency stop pushbuttons are pushed in, if the MO is not held in, or if the pump switch is ON.

4. If the engine fails to start within 30 seconds, release the Push to Start pushbutton and allow the starting motor to cool a few minutes before trying again.

5. Perform the startup check on the next page.

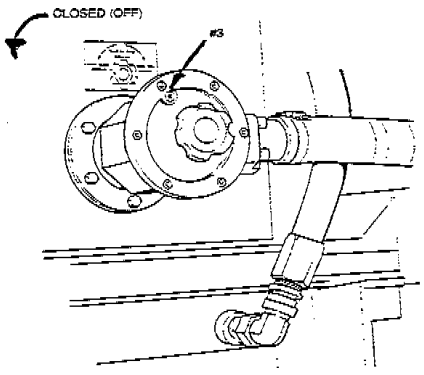


TABLE OP-8. STARTUP CHECKS	
GAUGE READINGS CHECKED:	
☐ Tachometer/Hourmeter:	2250 rpm (No load, high speed)
☐ Voltmeter:	13 to 15 Volts
☐ Engine Temperature:	160 to 185° F (71 to 85° C)
☐ Engine Oil Pressure:	40 to 60 psi, 3 to 4 bar, 276 to 414 kPa
LIGHT/HORN STATUS	
☐ LIGHTS FUNCTION:	
☐ Travel Lights	☐ Work Lights ☐ Brake or Marker Lights
☐ HORNS/ALARMS FUNCTION:	
☐ Travel Alarm	☐ Horn Button (Main Control Panel) ☐ Horn Button (Remote Operator Box)
OPERATOR CONTROLS FUNCTION	
☐ Foot switches	☐ Hand controllers
LOCK-UP DEVICES ENGAGED (See Lock-ups - Next Page)	
☐ Turntable/Setoff:	Lockup pin in place and setoff valve handle locked in DOWN position.
☐ Clamp Arm:	Locked
☐ Guide Wheels:	Locked
☐ Winch Boom:	Locked in place
☐ Winch Cable:	Secured to mast

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.

There are areas designated on the machine as lock-up points. Lock-up points are those areas required to be locked up prior to working travel through crossings, switches or other rail obstructions or during high speed travel (non-working travel). These have been painted red and have a decal located next to or on the area requiring locking up.

Use the following procedure to install or remove lock-ups. A detailed checklist follows this lock-up section.

Clamp Arm Lock

Located on the frame floor between the workhead and the **TRAVEL** Station footswitches. This is used to secure the Clamp Arm in the UP position for traveling. Use the following procedure to lock the clamp arms:

1. Put **Mode Selector Switch** in the **MANUAL** position. (Red pilot light will illuminate, indicating machine is in the manual mode.)

2. Raise the Clamp Arm by holding the **Clamp Arm Up/Down Switch** in the **UP** position.

3. Insert lock pin.

NOTE: Removal of the lockup may require use of step #2 to relieve the weight of the assembly off of the lockup pin.

Guide Wheel Lockpin

Used to lock the rail guide wheel in the UP position. There are two (2) guide wheel assemblies on this machine. The first is located on the flooring between the **TRAVEL Station** and the Dump Bin. The second is located next to the hydraulic tank on the operator side of the machine. To install the lockpin:

1. Raise the guide wheel assembly (by hand) until a hole appears.

2. Insert pin into hole.

Setoff Cylinder Lockup

To make certain that the setoff cylinder cannot be lowered without your knowledge, lock up the setoff valve in the down position (only way it can be locked). Some machines have been equipped with **Status Indicator Boxes** that show the status of the setoff cylinder, whether up (green light) or down (red light).

Boom and Winch Lock-ups

The boom assembly has a boom interlock handle that enables the operators to unlock the boom to move the assembly over the track. When the interlock handle is pulled out and roll pin on end of handle is released behind the bar beneath the bracket, the boom has free swing movement over the track. When locking up boom, swing boom so that it is parallel with the deck end of the machine, pull out handle to relieve pin pressure on bar, move pin to side of bar and release handle. Verify that boom has been locked in position before resuming operations.

Dump Bin

The hydraulic dump bin allows this machine to carry additional anchors. It was not designed to be in the raised position during working operations, except to dump more anchors into the primary bin. When this is occurring, the dump bin should be locked in the up position to prevent the bin from drifting down.

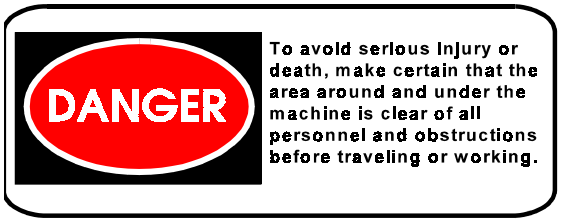
Lock pin should be used if access under the bin is required.

TABLE OP-9. LOCK-UPS

Lock-up	LOCATION	TOTAL	WHEN USED
Clamp Arm	On main deck to the right or left of the Clamp Arm.	2	During working travel through crossings, at switches, frogs, and other rail obstructions, and during high speed (non-working) travel. Note: Clamp Arm must be fully raised for lock pin to be inserted.
Guide Wheel	On main deck left of main logic box and right of operator's working station.	2	During working travel through crossings, at switches, frogs, and other rail obstructions, and during high speed (non-working) travel.
Boom & Winch	Post: Pulling red handle out and turning frees pin from lock bar on boom. Winch: Secure cable to boom.	1	At all times when boom and winch are not being used.
Turntable/Setoff	By main engine pump. Setoff Valve in DOWN position and locked.	1	At all times when not being used.
Dump Bin	Next to bin pivot on one or both sides.	1	At all times when in the raised position.
Canopy	Above operator's work station.	1	When travelling or transporting machine.
Swing Seat (opt)	Under swingseat in travel position.	1	When travelling or transporting machine.
Work Position Seat Bracket	Stored under hydraulic tank at tow hitch plate.	1	When travelling or transporting machine.

TRAVEL

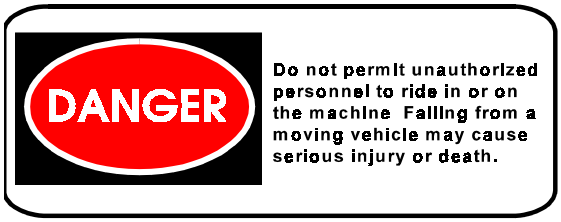
It is important that you read about and understand all operating controls, Cautions, Warnings, and Dangers before traveling.



ENGINE SPEEDS

Engine speed is controlled by the switch on the Main Control Panel located on the Logic Box. Engine speed settings are slow and fast. When idling, the switch should be set to **SLOW**, for traveling or work operations, you should have the engine speed switch in the **FAST** position.

PROPELLING AND BRAKING



This machine has been fitted with two (2) footswitches that control the propulsion of the machine (Forward and Reverse).

Propelling at Travel Speeds

1. See the Lock-ups sections and make sure lock-ups are installed.

2. Press the appropriate foot switch to propel the machine.

Propelling at Work Speeds

1. For work operations, all lockups should be unlocked - with the exception of the setoff cylinder lockup. Refer to Lock-ups section.

2. Press the appropriate foot switch to propel the machine.

Braking

Braking on this machine is automatic once the propulsion footswitch has been released.

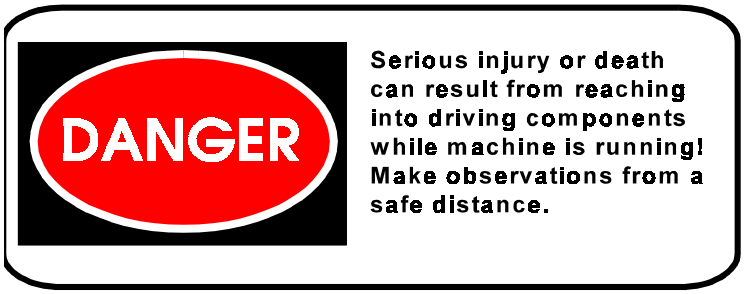
TRAVELING ON A INCLINE

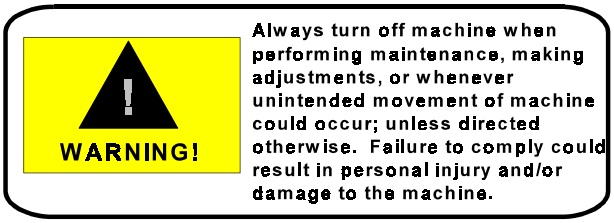
Before traveling down an incline, test the brakes to make sure that they are fully functional.

Machine Setup

Instructions in this section are provided for changing the type of anchors to be used and for making adjustments to the machine to compensate for different rail sizes. Some of these procedures will be required as part of the scheduled routine maintenance and are referenced on the maintenance chart located in the **Maintenance and Service** section of this manual.

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





NOTE: All adjustments in this section require the machine to be in the MANUAL mode of operation.

CHANGING ANCHOR TYPE

Each time a different type of anchor is to be used, compatible anchor holders and chute doors must also be installed and adjusted. (Chute door adjustments are given later in this section.) Refer to the table on the next page for specific components for each type of anchor.

To change anchor types:

1. Start engine and put **Mode Selector Switch** in the **MANUAL** position.

2. Use **Clamp Arm Up/Down Switch** to raise clamp arm and install clamp arm lock pin.

3. Use **Jaw Arm In/Out Switch** to move jaw arm out.

4. Turn ignition key switch to **OFF** and remove keys.

5. Remove spring post nuts and spring from each door.

6. Remove hinge pins and doors.

7. Disconnect hydraulic line from holder at quick disconnect (located at frame about two feet from holders on hydraulic line on each side of anchor bin).

8. Remove hairpin cotters, holder pins, and anchor holders.

9. Select type of anchor components to be used for the job (i.e., Fair, Channeloc, Woodings, Unit, etc.). The table on the next page calls out the component part numbers for each type of anchor and **must be followed** to determine the right and left hand parts. The part number for each component is cast into each part.

   Note: The hinge pin, tool holder pin, the door spring and the spring post nuts are standard parts and can be used with all anchor conversions.

10. Install each anchor holder into position on the sliding jaws. Align holes and secure with holder pin and hairpin cotter.

11. Connect hydraulic lines to anchor holders at quick disconnects.

12. Install appropriate doors, as specifed in the table on the next page, and secure with hinge pins.

13. Install the end loops of each spring over the spring posts at each doors and secure with post nuts.

14. Each time tooling is changed for a different type of anchor, chute adjustments **must be made** to accommodate the new anchors. Proceed to **CHUTE ADJUSTMENTS** before attempting to operate the machine.

COMPONENT SELECTION CHART

		ANCHOR HOLDER		DOORS				CHUTE
ANCHOR	RAIL SIZE	LEFT	RIGHT	LEFT OUTER	LEFT INNER	RIGHT INNER	RIGHT OUTER	LINER
Fair	5-1/2 to 6"	4391 0005	4391 0006	2724 4359	2724 4358	2724 4356	2724 4357	4847 0012
5" Fair	5"	4391 0016	4391 0017	2724 4359	2724 4358	2724 4356	2724 4357	4847 0012
Fair V	5-1/2 to 6"	4391 0031	4391 0030	2724 4362	2724 4360	2724 4361	2724 4363	N/A
Super Fair	6"	4391 0028	4391 0029	2724 4359	2724 4358	2724 4356	2724 4357	4847 0012
Channeloc	5-1/2 to 6"	4391 0023	4391 0022	2724 7303	2724 7305	2724 7304	2724 7302	N/A
Channeloc II	5-1/2 to 6"	4391 0023	4391 0022	2724 7303	2724 7305	2724 7304	2724 7302	N/A
Woodings	5-1/2 to 6"	4391 0011	4391 0012	2724 3355	2724 3357	2724 3356	2724 3354	N/A
5" Woodings	5"	4391 0020	4391 0021	2724 3355	2724 3363	2724 3362	2724 3354	N/A
Unit	5-1/2 to 6"	4391 0001	4391 0002	2724 3355	2724 3359	2724 3358	2724 3354	N/A
5" Unit	5"	4391 0001	4391 0002	2724 3355	2724 3361	2724 3360	2724 3354	N/A
Unit 4	5-1/2 to 6"	4391 0025	4391 0024	2724 4362	2724 4360	2724 4361	2724 4363	N/A
Unit 5	5-1/2 to 6"	4391 0034	4391 0033	2724 3355	2724 4364	2724 4365	2724 3354	N/A
Traktite	5-1/2 to 6"	4391 0026	4391 0027	2724 7306	2724 7305	2724 7304	2724 7307	N/A

N/A = Not Applicable

CHUTE ADJUSTMENTS

After installation of different doors, anchor holders or chute liners, the chutes must be adjusted for proper anchor pickup. Figure 41 shows all of the possible adjustments that can be made to the chutes. Detailed instructions on how to make the adjustments follow on the next pages. All chute adjustments should be made after anchor conversion.

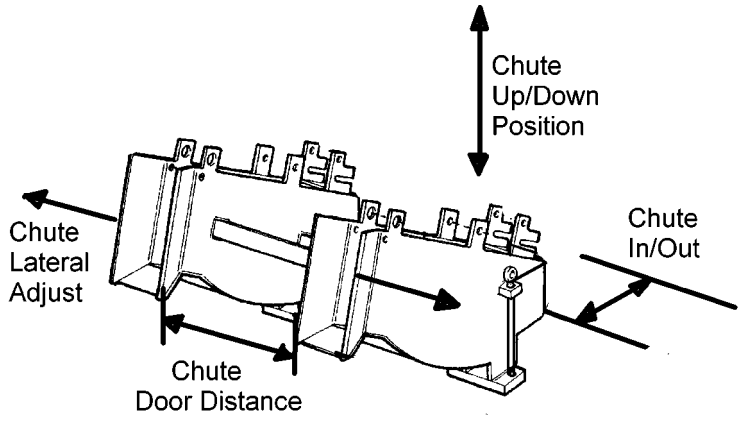


Figure 41

The following table should be used to determine the proper adjustment to be made when certain problems are encountered during setup.

PROBLEM	ADJUST
Anchors will not seat fully in doors.	Chute Door Width.
Anchors will not seat fully in holders.	Chute In/Out and Chute Door Distance.
Anchors slightly cocked.	Door width.
Chutes not centered w/holders	Chute lateral (left/right) position
Anchors not entering chutes at correct angle.	Chute arm angle (Up/Down).
Grippers do not pick up and hold anchors properly.	Chute In/Out height.

Chute Door Distance

The anchors must pass through the chutes and seat properly in the holders. If the chutes are positioned (relative to each other in the set) with too narrow or too wide an opening, the anchor holders will not enter the doors correctly. This will have an effect on the way the anchor enters the chute doors. To adjust door distance:

1. Loosen locknut on turnbuckle between chutes.

2. Using an anchor to determine correct width, adjust turnbuckle to position chute as required to obtain a smooth fit.

3. Tighten locknut on turnbuckle.

Chute Door Width

The anchors must pass through the holders and seat properly in the chute doors. If the chute doors are positioned with too narrow an opening, the doors may be pinching the anchors and they will not seat fully. If the door opening is too wide, the anchor will be slightly cocked and proper alignment with the anchor holder will be difficult. To adjust door width:

1. Loosen locknut on door setscrew (see Figure 42).

2. Using an anchor to determine correct door width, turn setscrew in or out as required to obtain a smooth fit.

3. Tighten locknut on setscrew.

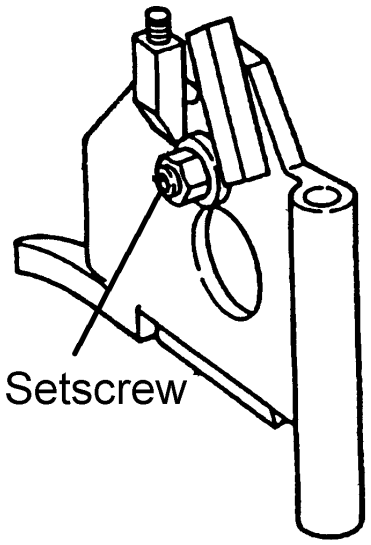


Figure 42

Chute Lateral Alignment

The chutes must be positioned so that the center of each anchor holder will be approximately aligned with the center of each chute. Figure 43A shows the related position of each anchor type in its matching holder. To make lateral chute adjustments:

1. Start engine and put **Mode Selector Switch** in the **MANUAL** position.

2. Use the **Jaw Arm In/Out Switch** to move the jaw arm into position to check the alignment.

3. If jaw arm must be moved to left, loosen locknut on left side of chute mounting (See Figure 43B). If jaw arm must be moved to right, loosen locknut on right side of chute mounting.

4. Move mounting as necessary until jaw arm is centered.

5. Tighten locknut on opposite side of chute mounting first, to keep jaw arm centered, then tighten the locknut loosened in Step #3.

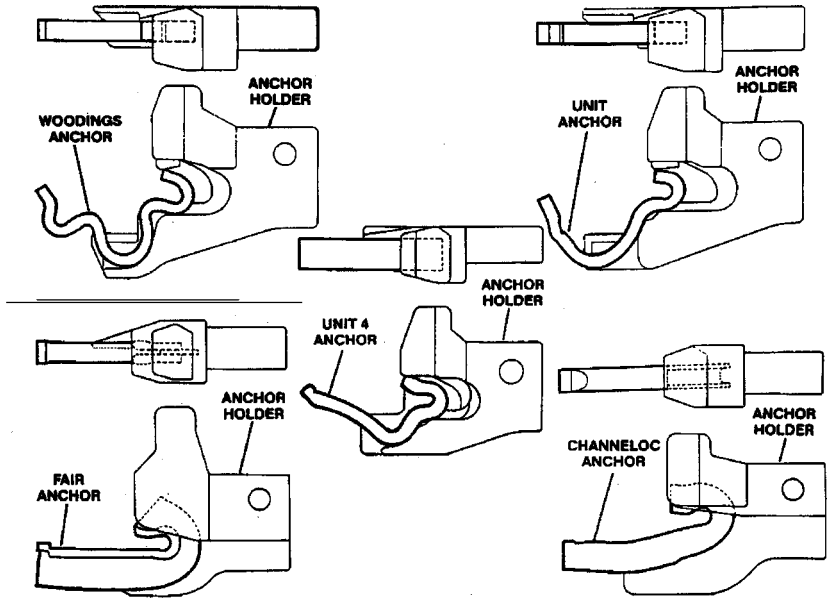
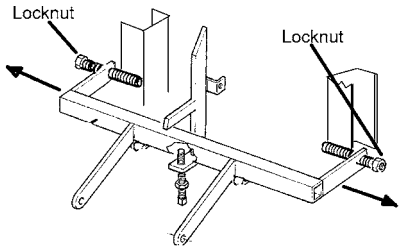


Figure 43A



Chute Mounting

Figure 43B

Chute Arm Angle (Up/Down Position)

The clutches must also be positioned so that the anchors enter the grippers at the correct angle. See Figure 44 and adjust chute angle, if necessary, as follows:

1. Load a pair of anchors in the chutes.
2. Turn on engine.
3. Place **Mode Selector Switch** in the **MANUAL** position.
4. Using the **Jaw Arm In/Out Switch**, move the jaw arm in to the pick up position.
5. Check position of anchors as compared to Figure 43A. Loosen locknut and adjust turnbuckle, on both sides, as necessary to position chute at correct angle for anchor pickup.
6. Tighten locknut to secure angle adjustment.

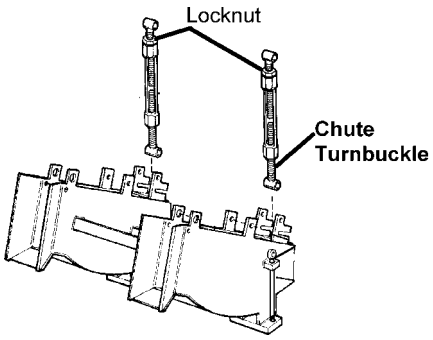


Figure 44

Chute In/Out Height

The chutes in/out position must be such that the anchors are not too far in or out for the grippers to pick up and securely hold each anchor. Check and adjust chute in/out position, if necessary, as follows:

1. Start engine.

2. Put **Mode Selector Switch** in the **MANUAL** position.

3. Use **Jaw Arm In/Out Switch** to move jaw arm in. With the jaw arm fully in, there should be a 1/16" to 1/8" gap between the chute mounting and height adjustment screw. See Figure 45.

4. Hold **Doors/Grip Switch** in the **OPEN** position to pick up anchors.

5. Use the **Jaw Arm In/Out Switch** to move jaw arm part way out.

6. Check the position of the anchor in tool as compared to the diagram in Figure 43A.

7. If adjustment is necessary, loosen locknut and turn adjusting screw up or down as required to bring chutes into alignment.

8. Repeat Steps 1 through 8 until adjustment is correct and then tighten locknut.

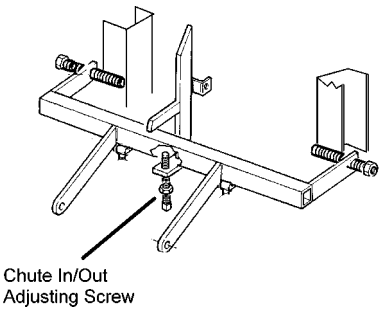


Figure 45

ADJUSTING FOR DIFFERENT SIZE RAIL OR TIES

There are several alterations or adjustments which may be necessary to compensate for a change in rail or tie size. As each adjustment will affect succeeding adjustments, it is imperative that they be performed in the order shown below:

1. Clamp Arm Pivot Pins
2. Clamp Arm Stops
3. Toggle Linkage
4. Chute In/Out Position
5. Chute Arm Angle
6. Down Opto Switch

Clamp Arm Pivot Pins

The pivot point of the clamp arm is adjustable and may have to be adjusted any time there is a change in rail size. Adjustment should also be checked on a regularly scheduled maintenance basis. There are two conditions for which an adjustment must be made: **Not enough clearance or Too much clearance.**

Not Enough Clearance

If the clamp arm block or stop does not clear the rail head and there is **not enough clearance** as shown in figure 47A, adjust the clamp arm pivot pin as follows:

1. Loosen four locknuts (one on each end of both housings). See Figure 47B.
2. Back out both inboard setscrews the approximate distance that the arm is not clearing the rail. Turn both setscrews the same amount of turns. Count the amount of turns the set screws are backed out.
3. Turn in the outboard setscrews the same amount of turns that the inboard setscrews were backed out in Step #2.
4. With the **Mode Selector Switch** in the **MANUAL** position, use **Clamp Arm Up/Down Switch** to lower clamp arm and check clearance. Repeat Steps #2 through #4 until clearance is correct.
5. Tighten four locknuts.

Too Much Clearance

If the clamp arm swings out too far, there is **too much clearance** as shown in Figure 47A, adjust the clamp arm pivot pin as follows:

1. Loosen four locknuts (one on each end of both housings). See Figure 47B.
2. Back out both outboard setscrews the approximate distance that the arm is out too far. Turn both setscrews the same amount of turns. Count the amount of turns the set screws are backed out.
3. Turn in the inboard setscrews the same amount of turns that the outboard setscrews were backed out in Step #2.
4. With the **Mode Selector Switch** in the **MANUAL** position, use **Clamp Arm Up/Down Switch** to lower clamp arm and check clearance. Repeat Steps #2 through #4 until clearance is correct.
5. Tighten four locknuts.

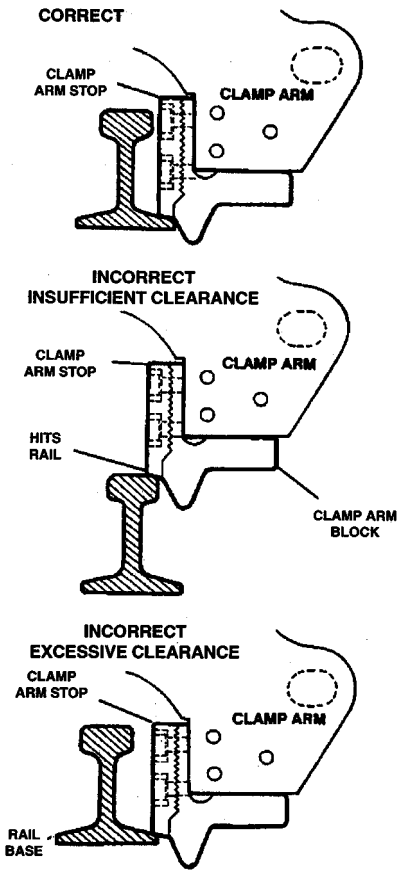


Figure 47A

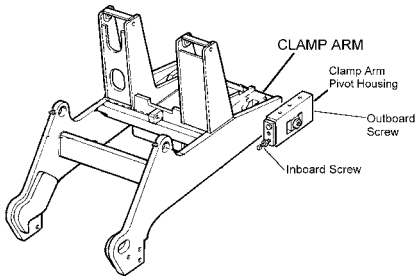


Figure 47B

Clamp Arm Stops (Anchor Height Adjustment)

As the jaw arm advances toward the rail, the anchor must be at a certain height, in relation to the rail, in order to be applied successfully. The Up/Down adjustment of the clamp arm stop determines the vertical position of the anchors. If a different type anchor is to be used or if trouble is experienced in applying anchors, the clamp arm stop needs adjustment. Depending on the type of anchors being used, adjust the clamp arm stop arm as follows:

Fair and Channeloc Anchors

1. With the **Mode Selector Switch** in the **MANUAL** mode, use manual controls to pick up an anchor

2. Lower clamp arm to rail base.

3. Move jaw arm in and stop when throats of anchors are just entering rail base as shown in Figure 47.

DANGER

Do not allow arms, legs or loose clothing to get in the way of the machine's moving parts when making adjustments or operating this machine. Failure to comply may cause serious injury or death.

4. With Grip and Door Open Switch held to ON, check position of anchors in relation to rail base. The edge of rail base must be at approximate center of anchor throat as shown under "CORRECT ADJUSTMENT" on Figure 48.

If the anchors are coming in too high and the clearance between the bottom of the rail base and the anchor is insufficient, the clamp arm stops must be raised. Conversely, if the anchors are coming in too low and the clearance between the top of the rail base and the anchor is insufficient, the clamp arm stops must be lowered.

5. Install Clamp Arm Lockups.

6. If adjustment is necessary, move the Jaw Arm OUT and the Clamp Arm UP until the Clamp Arm Stop adjustment screws are accessible.

CAUTION!

Both clamp arm stops must be adjusted so that they bear against the top of the rail evenly when the clamp arm is down. If improperly adjusted, the twisting force exerted on the clamp arm could cause serious damage to the clamp arm assembly.

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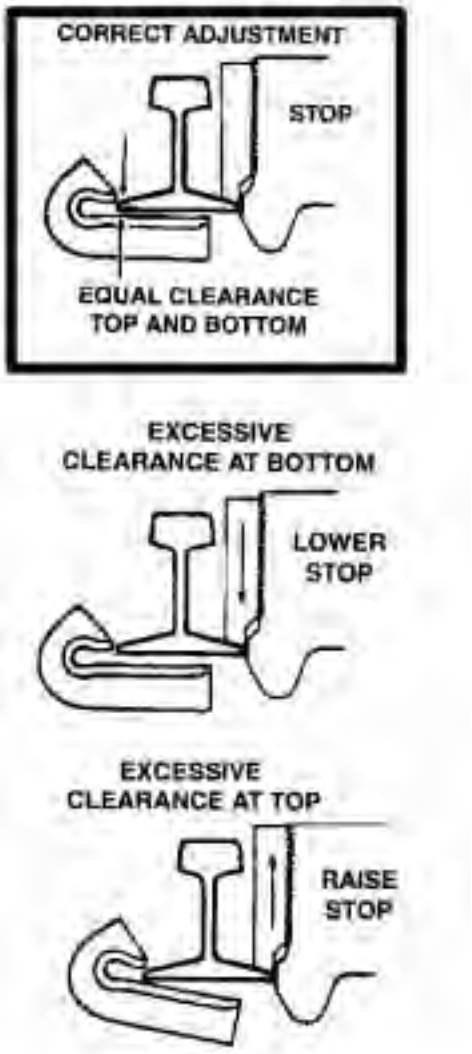


Figure 48

the screws and raise the stops to lower the anchor holders or lower the stops to raise the anchor holders. Tighten the capscrews and then recheck the clearance. Repeat steps 4 through 7, as necessary, to obtain CORRECT ADJUSTMENT.

Woodings And Unit Anchors

1. If anchors are in the anchor holders, knock both out using a long handled hook.

2. With the Mode Selector Switch in MANUAL, move the Clamp Arm down to rail base.

3. Move the Jaw Arm in so that the recess in the anchor holder straddles the rail base as shown in Illustration.

4. Check the position of the anchor holder in relation to the rail base. There must be a 3/4 inch clearance between the underside of the rail base and the anchor holder as shown under "CORRECT ADJUSTMENT" in Figure 49.

If the anchor holder is coming in too high and the clearance between the bottom of the rail base and the anchor holder is insufficient, the Clamp Arm Stops must be raised. Conversely, if the anchor holder is coming in too low and the clearance between the top of the anchor holder and the underside of the rail base is excessive, the clamp arm stop must be lowered.

CAUTION!

Both clamp arm stops must be adjusted so that they bear against the top of the rail evenly when the clamp arm is down. If improperly adjusted, the twisting force exerted on the clamp arm could cause serious damage to the clamp arm assembly.

5. Install Clamp Arm Lockups.

6. Move the Jaw Arm OUT and the Clamp Arm UP until the Clamp-Arm Stop adjustment screws are accessible.

7. Loosen the screws and raise the stops to lower the anchor holders or lower the stops to raise the anchor holders. Tighten the capscrews and then recheck the clearance. Repeat steps 4 through 7 as necessary to obtain CORRECT ADJUSTMENT.

NOTE

The TOGGLE LINKAGE adjustment below must preceed ANCHOR CHUTE UP-DOWN STOP adjustment.

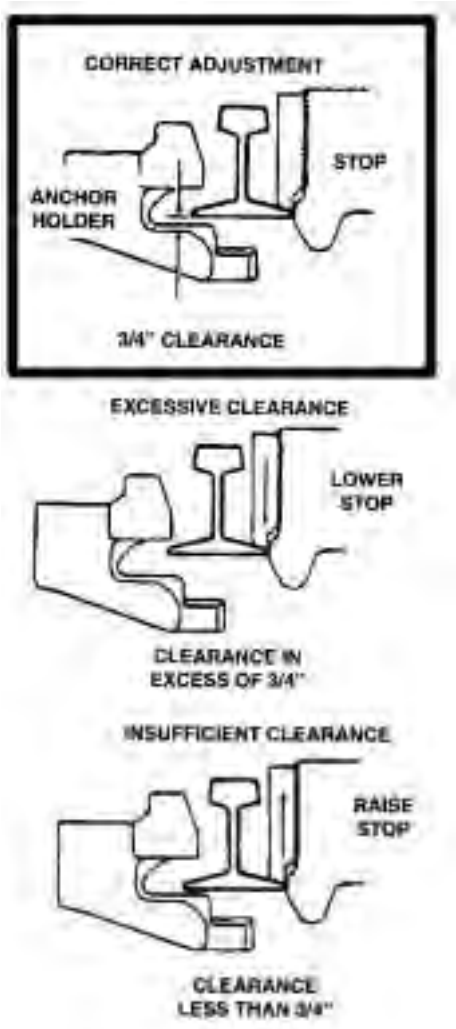
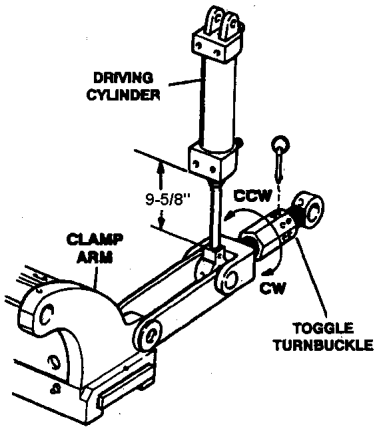


Figure 49

Toggle Linkage

The Toggle Linkage must be adjusted anytime different rail widths are encountered. Adjustment of the Toggle Linkage is based on the fact that the Driving Cylinders must be at the end of their stroke when anchors are fully applied. Refer to Figure 50 and adjust toggle linkage as follows:



1. Apply a set of anchors using the MANUAL mode (see MANUAL OPERATION). But release the Jaw Arm IN-OUT switch as soon as anchors are fully applied or the piston rods are fully extended.

2. Measure the rod stroke ON BOTH CYLINDERS 2855 2407.

   a. If the piston rod extends 9 – 5/8" (from bottom of gland to top of rod end) and the anchor is fully applied without being over driven, the linkage is adjusted correctly.

   b. If the piston rod is less than 9 – 5/8", the toggle linkage must be shortened. This will lengthen the piston rod stroke.

   c. If the piston rod is fully extended but the anchor is short of application, the toggle linkage must be lengthened.

   d. If the piston rod is fully extended but the anchor is overdriven, (loose or broken), the toggle linkage must be shortened.

CAUTION!

Make adjustment is correct on both arms to prevent twisting damage to the jaw arm assembly.

3. Remove Lock Pin and adjust toggle linkage, if necessary, as follows:

   a. Turn Toggle Turnbuckle CW to lengthen toggle linkage; or

   b. Turn toggle Turnbuckle CCW to shorten toggle linkage.

NOTE

One “flat” rotation of turnbuckle will adjust length approximately 0.028 inch.

4. Install Lock Pin to secure adjustment.

5. Apply a set of anchors and recheck length of piston stroke to make sure it is 9 – 5/8 inch when anchors are fully applied.

After the toggle linkage has been adjusted you must re-adjust the Chute In/Out Position. Refer to **Chute Adjustments** earlier in this manual for instructions on how to adjust the Chute In/Out Position.

Chute Arm Angle

After adjusting the chute Up/Down Stop described above, it may be necessary to also adjust the chute arm angle. Use the **MANUAL** mode to pick up a set of anchors. If the anchors are not staying in the holders, adjust the angle as described under **Chute Adjustments** earlier in this section.

OPTO SWITCH ADJUSTMENTS

NOTE: Some machines have been equipped with prox switches that replace the Up/Down and Out/Box Opto Switches described below. Refer tp PROX SWITCH ADJUSTMENTS following these instructions for detailed setup instructions for the prox switches.

The limit switches are responsible for sending input signals to the logic system for automatic operation. The limit switch assemblies are composed of two parts: the opto switch and the actuator (vane). To perform properly, the opto switches and the vanes must be positioned correctly.

NOTE: Adjustments to the Opto Switches require the use of 2 people, one to adjust the switch and the other to watch the lights on the logic board.

Down Opto Switch

When encountering rail of a different height, the Down Opto Switch, which signals the logic system when the clamp arm has reached its maximum down position, may have to be adjusted.

1. With the engine running, place the machine in **MANUAL** mode using the **Mode Selector Switch**. Use **Clamp Arm** switch to move clamp arms to extreme down position.

2. Shutdown the engine and place the **Mode Selector Switch** in the **AUTOMATIC** position. Turn ignition switch one turn to right, so that power to the machine is available - without starting the engine.

3. Remove cover from Opto Box (See Figure 52A).

4. Remove hairpin cotter from Down Adjusting Screw.

5. Turn Adjusting Screw to move switch down until “DOWN” light at logic board (See Figure 52B) just goes out.

6. Turn Adjusting Screw to move switch up to the point at which “DOWN” light on logic board is lit at full intensity. Continue to move switch up an additional 1/8-inch.

7. Install hairpin cotter and opto box cover.

8. Turn ignition switch to full left position to shut off power. Put **Mode Selector Switch** in the **MANUAL** position.

9. Turn ignition switch to the full right position to start engine. Using the **Clamp Arm Up** Switch, move the clamp arm up about 12 inches.

10. Turn ignition switch to the full left position to turn off power and engine. Put **Mode Selector Switch** in the **AUTOMATIC** position. Check logic board to make sure “DOWN” input light is **NOT** lit.

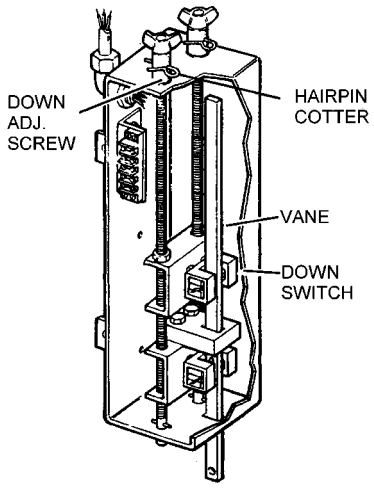


Figure 52A

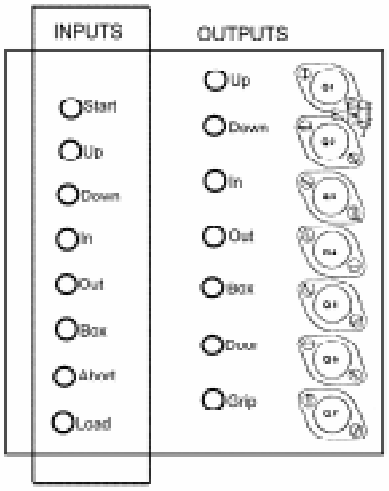


Figure 52B

UP Opto Switch

The UP Opto Switch signals the logic system when the clamp arm has reached its maximum up position and may have to be adjusted. To adjust the UP opto switch:

1. With the engine running, place the machine in **MANUAL** mode using the **Mode Selector Switch**. Use **Clamp Arm** switch to move clamp arms to extreme UP position.

2. Shutdown the engine and place the **Mode Selector Switch** in the **AUTOMATIC** position. Turn ignition switch one turn to right, so that power to the machine is available - without starting the engine.

3. Remove cover from Opto Box (See Figure 53A).

4. Remove hairpin cotter from UP Adjusting Screw.

5. Check logic board to see if "UP" input light is lit (see Figure 53B). If lit, proceed to step 6. If not lit, turn adjusting screw as necessary to move switch toward slot in vane until UP input light is lit. (The switch should be at the bottom of the vane slot.)

6. Turn Adjusting Screw to move switch down until the "UP" light goes out.

7. Counting the turns of the adjusting screw, move switch up to the point at which "UP" light comes on and continue up until light just goes out again.

8. Move switch back down vane half the amount of turns taken in step #7 (this will place switch mid-way in vane slot and input signal should be lit at full intensity).

9. Install hairpin cotter and opto box cover.

10. Turn ignition switch to full left position to shut off power. Put **Mode Selector Switch** in the **MANUAL** position.

11. Turn ignition switch to the full right position to start engine. Using the **Clamp Arm Up** Switch, move the clamp arm down about 12 inches.

12. Turn ignition switch to the full left position to turn off power and engine. Put **Mode Selector Switch** in the **AUTOMATIC** position. Check logic board to make sure "UP" input light is **NOT** lit.

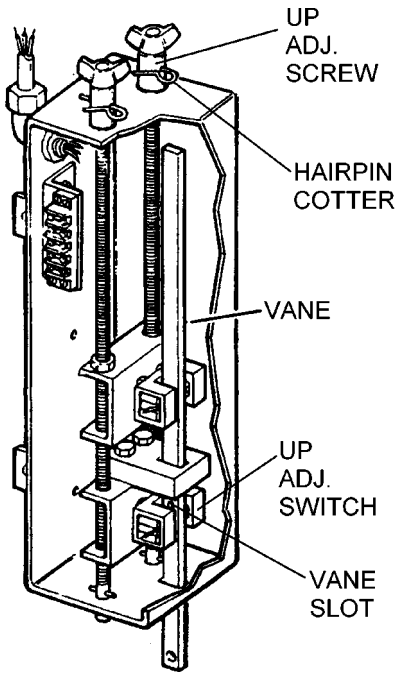


Figure 53A

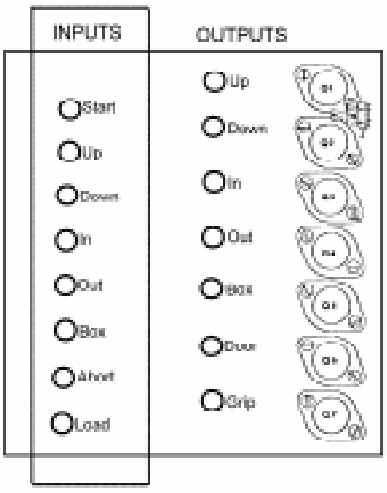


Figure 53B

BOX Opto Switch

1. With the engine running, place the machine in **MANUAL** mode using the **Mode Selector Switch**. Hold the **Grip and Door Open** switch in the UP (on) position.

NOTE: It is necessary to maintain the Grip and Door Open Switch in the ON position throughout this adjustment or the anchors will fall out of the tools. If there are not anchors in the tools, it will be necessary to pick up anchors using **Manual** control before continuing on with this procedure.

2. With the machine in **MANUAL Mode**, lower Clamp Arm and move the Jaw Arm in until the anchor extends 1/2-inch under the rail base as shown in Figure 54A.

3. Shutdown engine and put the machine in **AUTOMATIC** mode of operation.

4. Remove cover from Opto Box (See Figure 54B).

5. Remove hairpin cotter from Down Adjusting Screw.

6. Check logic board to see if “BOX” input light is lit (see Figure 54C). If lit, proceed to step 7. If not lit, turn adjusting screw as necessary to move switch toward slot in vane until BOX input light is lit. (The switch should be just at the top of the vane.)

7. Turn Adjusting Screw to move switch down until the “BOX” light goes out.

8. Turn Adjusting Screw to move switch up to the point at which the “BOX” light on logic board is lit at full intensity. Continue to move switch up an additional 1/8-inch.

9. Install hairpin cotter and opto box cover.

10. Turn ignition switch to the full left position to turn off power and engine. Put **Mode Selector Switch** in the **AUTOMATIC** position. Check logic board to make sure “BOX” input light is **NOT** lit.

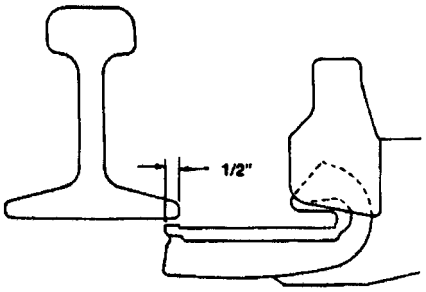


Figure 54A

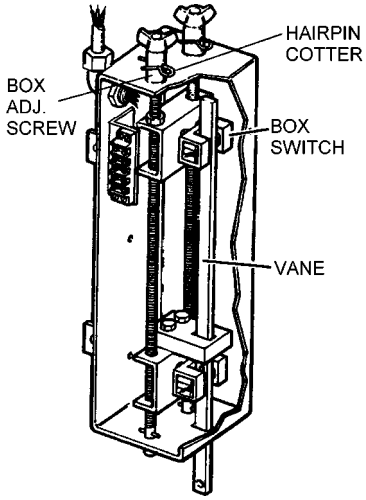


Figure 54B

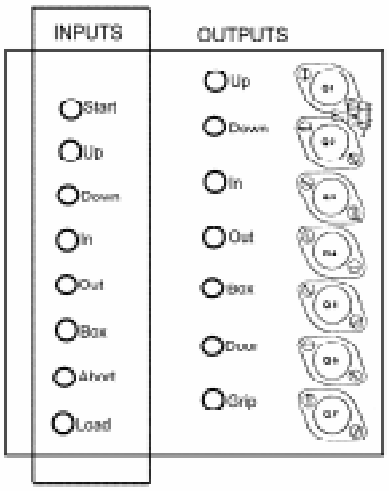


Figure 54C

OUT Opto Switch

The OUT Opto Switch signals the logic system when the jaw arm is in the "OUT" position. This switch may have to be adjusted:

1. With the engine running, use manual control to move **Jaw Arm** to extreme out position.

2. Shutdown the engine and place the **Mode Selector Switch** in the **AUTOMATIC** position. Turn ignition switch one turn to right, so that power to the machine is available - without starting the engine.

3. Remove cover from Opto Box (See Figure 55A).

4. Remove hairpin cotter from Down Adjusting Screw.

5. Check logic board to see if "OUT" input light is lit (see Figure 55B). If lit, proceed to step 6. If not lit, turn adjusting screw as necessary to move switch toward slot in vane until OUT input light is lit. (The switch should be at the bottom of the vane slot.)

6. Turn Adjusting Screw to move switch down until the "OUT" light goes out.

7. Counting the turns of the adjusting screw, move switch up to the point at which "OUT" light comes on and continue up until light just goes out again.

8. Move switch back down vane half the amount of turns taken in step #7 (this will place switch mid-way in vane slot and input signal should be lit at full intensity).

9. Install hairpin cotter and opto box cover.

10. Turn ignition switch to full left position to shut off power. Put **Mode Selector Switch** in the **MANUAL** position.

11. Turn ignition switch to the full right position to start engine. Using the **Jaw Arm IN** Switch, move the jaw arm in about 6 inches.

12. Turn ignition switch to the full left position to turn off power and engine. Put **Mode Selector Switch** in the **AUTOMATIC** position. Check logic board to make sure "OUT" input light is **NOT** lit.

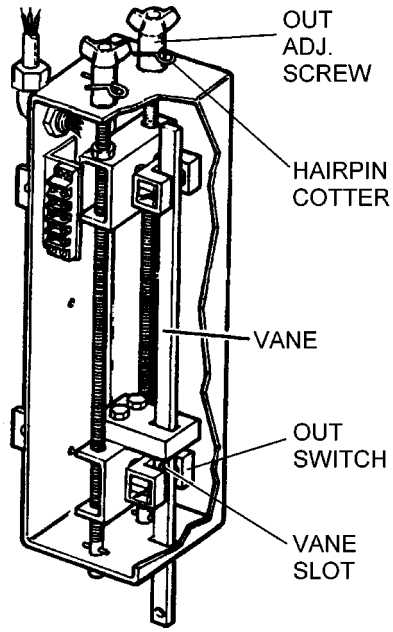


Figure 55A

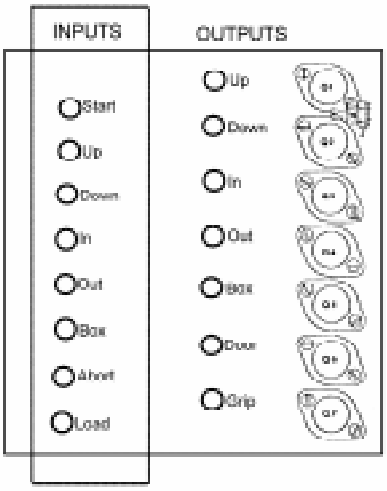


Figure 55B

PROX SWITCH ADJUSTMENTS

NOTE: Some machines have been equipped with prox switches that replace the Up/Down and Out/Box Opto Switches described earlier.

The prox switches are responsible for sending input signals to the logic system for automatic operation. The prox switch assemblies are composed of two parts: the prox switch and the target bar. To perform properly, the switches and the target bars must be positioned correctly. There are two sets of prox switches, one is located on the clamp arm cylinder - the other on the toggle turnbuckle. See Figure 56A.

NOTE: Adjustments to these switches require the use of 2 people, one to adjust the switch and the other to watch the lights on the logic boards.

Down Prox Switch

When encountering rail of a different height, the Down Opto Switch, which signals the logic system when the clamp arm has reached its maximum down position, may have to be adjusted. This switch is located on the Clamp Arm Cylinder.

1. With the engine running, place the machine in **MANUAL** mode using the **Mode Selector Switch**. Use **Clamp Arm** switch to move clamp arms to extreme down position.

2. Shutdown the engine then turn ignition on and place the **Mode Selector Switch** in the **AUTOMATIC** position. (Turn ignition switch one turn to right, so that power to the machine is available - without starting the engine.)

3. Loosen adjusting nut (see Figure 56B) and move switch down until actuator (target) bar is located in front of switch sensing head. The (yellow) signal light on the switch will be illuminated. (The green power light must always be illuminated. This comes on when the ignition power is on.)

4. Move the switch up until the signal light on the switch goes out. (The down light on the logic board will be illuminated.) Continue to move the switch up an additional 1/8", then tighten in place.

5. Turn ignition switch to full left position to shut off power. Put **Mode Selector Switch** in the **MANUAL** position.

6. Turn ignition switch to the full right position to start engine. Using the **Clamp Arm Up** Switch, move the clamp arm up about 12 inches.

7. Turn ignition switch to the full left position to turn off power and engine. Put **Mode Selector Switch** in the **AUTOMATIC** position. Check logic board to make sure “DOWN” input light is **NOT** lit.

Up Prox Switch

This switch is not adjustable.

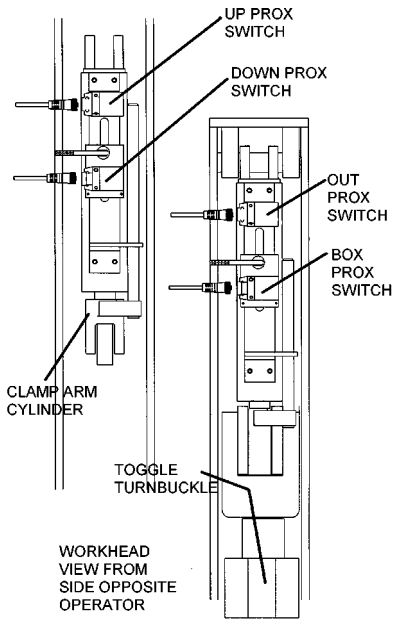


Figure 56A

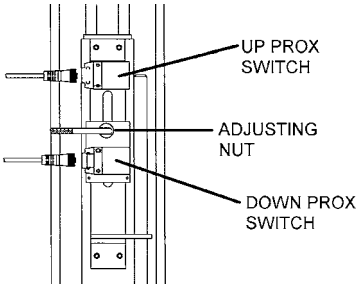


Figure 56B

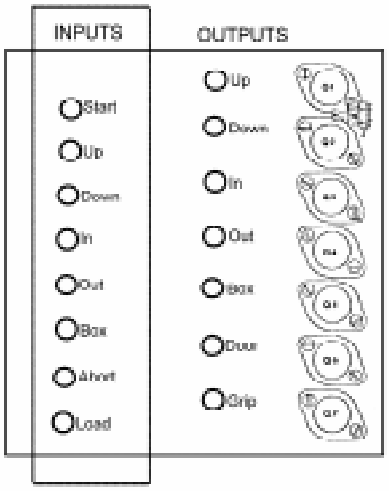


Figure 56C

BOX Prox Switch

This switch is located on the toggle turnbuckle. See Figure 57A.

1. With the engine running, place the machine in **MANUAL** mode using the **Mode Selector Switch**. Hold the **Grip and Door Open** switch in the UP (on) position.

NOTE: It is necessary to maintain the Grip and Door Open Switch in the ON position throughout this adjustment or the anchors will fall out of the tools. If there are not anchors in the tools, it will be necessary to pick up anchors using **Manual** control before continuing on with this procedure.

2. With the machine in **MANUAL Mode**, lower Clamp Arm and move the Jaw Arm in until the anchor extends 1/2-inch under the rail base as shown in Figure 57B.

3. Shutdown the engine then turn ignition on and place the **Mode Selector Switch** in the **AUTOMATIC** position. (Turn ignition switch one turn to right, so that power to the machine is available - without starting the engine.)

4. Loosen adjusting nut (see Figure 57D) and move switch down until actuator (target) bar is located in front of switch sensing head. The (yellow) signal light on the switch will be illuminated. (The green power light must always be illuminated. This comes on when the ignition power is on.)

5. Move the switch up until the signal light on the switch goes out. (The box light on the logic board will be illuminated.) Tighten the switch in this location.

6. Turn ignition switch to the full left position to turn off power and engine. Put **Mode Selector Switch** in the **AUTOMATIC** position. Check logic board to make sure “BOX” input light is **NOT** lit.

Out Prox Switch

This switch is not adjustable.

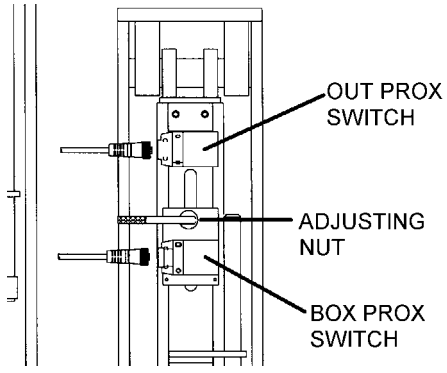


Figure 57D

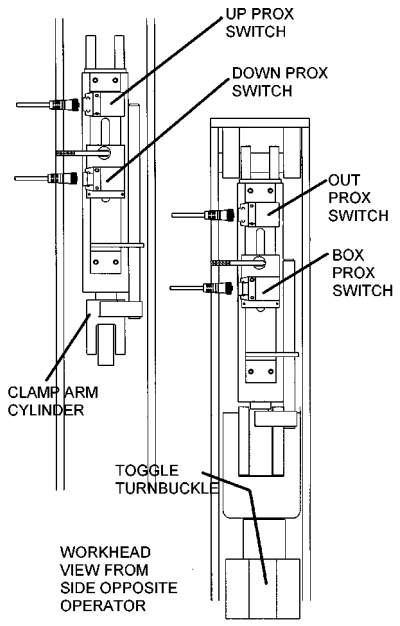


Figure 57A

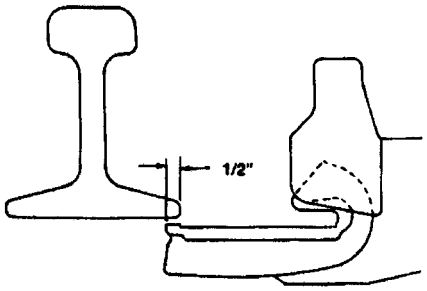


Figure 57B

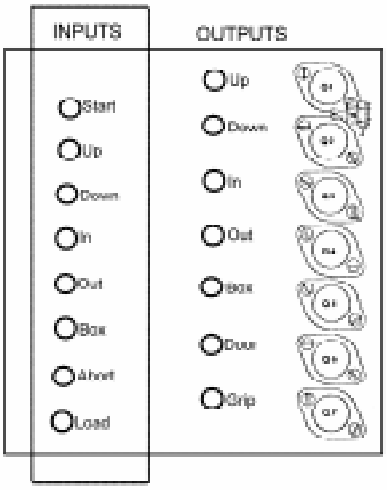


Figure 57C

SETUP FOR 14-INCH TIES

Sliding Jaw Opening Width

If the machine is to work on track that has fourteen inch ties, there are two stops on the Jaw Arm which must be removed (see Figure 58). This will allow the tool holders to open to their maximum width of fifteen inches. Each stop is held in place by two capscrews. Re-install these stops immediately after completing work on wider ties. See the following note.

NOTE:

Do not operate the machine on track with nine inch ties without the stops installed. The additional clearance between the anchor and tie, without the stops installed, will accumulate ballast during the boxing operation and the tie will not be properly boxed.

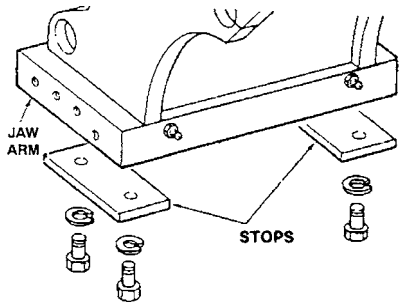


Figure 58

Setting Up Curtains (Optional Equipment)

Some machines have been equipped with optional curtains that attach to the canopy assemblies. These curtains require some initial setup to be totally functional.

Curtains are to be hooked on curtain hooks with the manufacturer's labels on the inside. Each curtain has been identified with a number that is located in the upper inside corner of the curtain. See Figure 59 for installation location for each of the curtains. The curtain numbers will be referred to in the setup instructions.

1. Hang all curtains as shown in Figure 59. Spread them out to get some wrinkles out and to allow you to determine ends of the curtains.

2. Attach the end of curtain #1 to angle on floor next to control box. (See Figure 59.)

3. Attach other end of curtain #1 to curtain #2 using the velcro strips.

4. Attach other end of curtain #2 to curtain #3.

5. Attach other end of curtain #3 to inward side of post #2.

6. Attach the end of curtain #4 to the outward side of post #2. Pull over and attach other end to fuel tank.

7. Attach end of curtain #5 to post #3. Pull over and attach other end of curtain #5 to velcro on curtain #4.

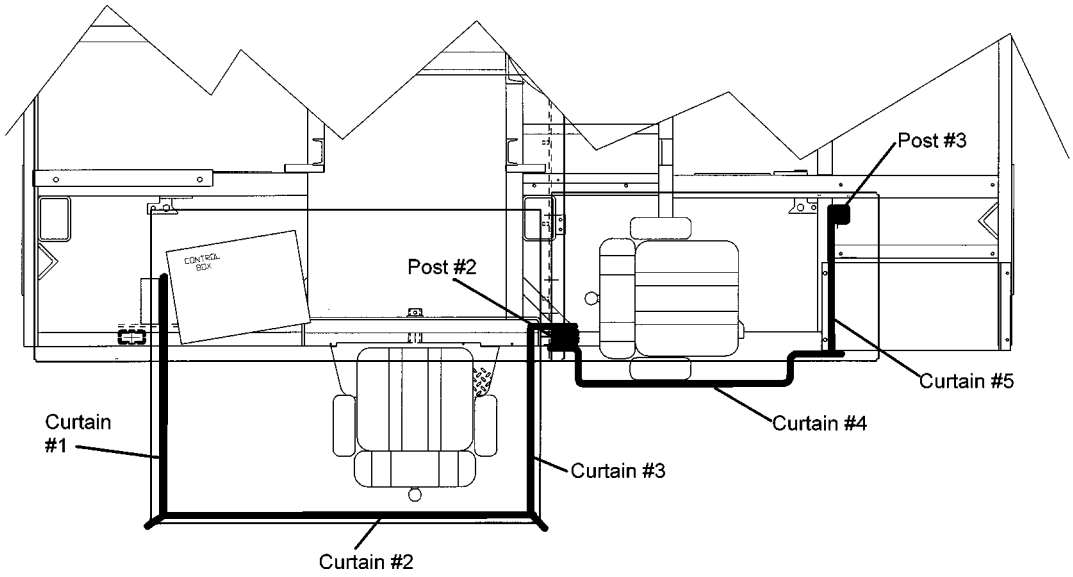


Figure 59

Stowing Curtains

The curtain assembly was designed so that they roll up (and secure by buckles at the top of each curtain) for temporary storage while still enabling the operator to use the sliding canopy. However, the sliding canopy **CANNOT BE** closed if the curtains are in the rolled position or if they have not been separated as detailed below. If you want to close the sliding canopy, follow the instructions below and refer to the drawing on page 59.

These curtains have been designed to stow away in as little space as possible. It is imperative that you follow the instructions below, or damage to the curtains may occur.

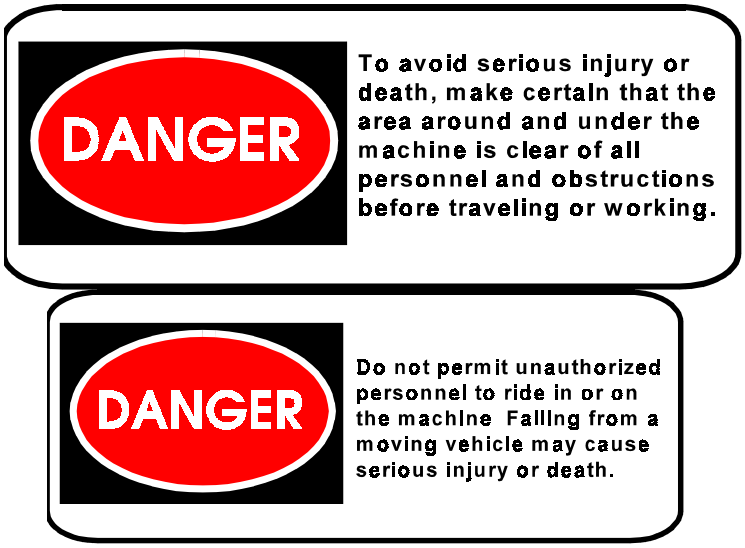
1. Separate all the curtains.

2. Curtains #1-3 are longer than normal and require special attention when stowing. Fold the bottom portion of each curtain inward until they reach the velcro along the bottom of each window. Attach to the velcro.

3. Slide the canopy closed and secure curtains to the following posts:

Curtains 1 and 2:	Post #1
Curtains 3 and 4:	Post #2
Curtain 5:	Post #3

MACHINE OPERATION



Before operating this machine you should be aware of the difference between the two types of **Automatic Cycle Shutdowns** and the **Emergency Shutdown** of the machine.

AUTOMATIC CYCLE MANUAL SHUTDOWN

The automatic sequence can be stopped at any time by depressing the **Auto Stop** button located inside the **Automatic** portion on the operator's control panel. This is considered a "Manual" Shutdown of the Automatic Cycle. Refer to **Restart After Manual Shutdown** for instructions on restarting the machine.

AUTOMATIC CYCLE AUTO SHUTDOWN

If the anchors, sliding jaws, or any other part of the jaw arm assembly should hit the tie, the rail, a large stone or any other object which offers abnormal opposition, prior to the application of the anchor, a pressure switch signals the logic system that an operating fault exists. The operating sequence is immediately interrupted and the machine automatically returns to the ready position. Refer to **Restart After Automatic Shutdown** for instructions on restarting the machine.

EMERGENCY SHUTDOWN

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, push the EMERGENCY STOP pushbutton located in the upper center of the Logic Box control panel or on either Remote Operator Control Box. Never use the emergency shutdown system except in an emergency. **DO NOT USE THIS METHOD AS A SHORTCUT TO TURNING OFF THE ENGINE!!**

AUTOMATIC OPERATION

While the machine can be operated in either the automatic or manual mode, automatic is the normal mode of operation. Manual operation is normally only used during emergency situations or while making adjustments to the machine. To operate the machine in the AUTOMATIC mode, proceed as follows:

1. Turn Mode Selector Switch to AUTOMATIC and release switch (Green pilot light will come on, indicating that machine is locked into auto mode).

CAUTION!

Use care not to activate LOAD SWITCH while anchors are in grippers. If grippers come to pick up position and still have anchors in place, severe damage to holders and/or chute can result.

2. Put one anchor in each chute positioned as shown in Figure 61. (An anchor MUST be loaded in each of the two chutes unless the machine is set up for applying single anchors as described in the MACHINE SETUP section.

3. Pull and hold Load Switch down. Then momentarily depress Automatic Sequence Start Foot Switch and after Jaw Arm starts forward release Load Switch. (The machine will continue through anchor pick-up and return to the ready position).

NOTE

Steps 1-3 above are required only on start up of each job to load the first set of anchors. Once anchors are loaded, continued automatic operation is performed as described in steps 4-6 below.

4. Depress Propulsion Foot Pedal in direction required to move machine to tie to be boxed and anchored. Position machine so tie is in approximate center of anchor chutes.

5. Start automatic sequence by momentarily depressing Automatic Sequence Start Foot Switch. As the machine goes through boxing and anchoring application sequences, LOAD ANOTHER SET OF ANCHORS INTO CHUTES. (After machine completes anchor applicaton it will pick up the next set of anchors and return to the ready position).

6. Repeat Steps 4 and 5 to continue automatic anchor application.

Remember! Automatic Cycle can be aborted by pressing the **Auto Stop** pushbutton. (Refer to **Restart After Manual Shutdown** later in this section.)

In the event of an emergency the machine can be shut down at any point by simply depressing the **Emergency Stop** pushbutton.

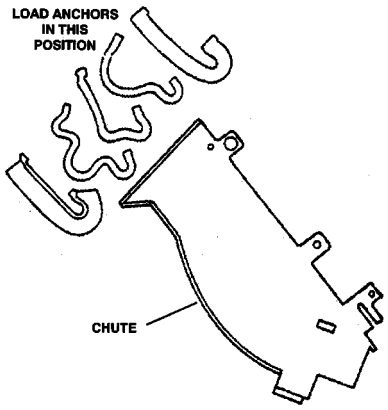


Figure 61

RESTART AFTER AUTOMATIC SHUTDOWN

When an automatic stop has been carried out, return the machine to service as follows:

1. Correct the operating fault. If the machine was not centered properly over the tie, spot the machine so that there will be no interference with the jaw arm assembly and the tie. If a stone or object in the ballast is causing the operating fault, remove the object.

2. Check to be certain both anchors are in the holders. If both anchors are in the holders, restart the automatic cycle by depressing the Start Sequence Foot Switch momentarily. If one of both anchors are missing, proceed to step 3.

3. If one anchor is still in a holder, depress STOP pushbutton (to de-energize the system) and remove anchor using a long handle hook. Only when both anchors are empty restart machine as described under AUTOMATIC OPERATION.

RESTART AFTER MANUAL SHUTDOWN

The automatic sequence can be stopped at any time by depressing the **Auto Stop** button located inside the **Automatic** portion on the operator's control panel. When a manual stop has been executed, the machine is returned to service as follows:

1. If the machine was stopped due to a hazardous condition or obstruction, the hazard must be remedied or the obstruction removed before operation is continued. If one or both of the anchors has dropped out, refer to the instructions under AUTOMATIC OPERATION for the proper procedure on anchor pickup and continued operation.

2. With both anchors in place either

   a. Return the control system to the AUTOMATIC mode. As soon as the Mode Selector is switched to automatic the gripper cylinders are activated and the anchors will be held during the machine's return to the ready position. Restart the automatic cycle by momentarily depressing the foot switch; or

   b. Complete the aborted cycle manually as described under MANUAL OPERATION below.

In the event of an emergency, use the red EMERGENCY STOP pushbutton on the control panel. This will shut down the machine.

MANUAL OPERATION

The machine is normally operated in the automatic mode, however, all of the hydraulic sequences of the machine can be operated by using the manual switches. Manual operation is used mainly to complete an aborted automatic operation or while making adjustments to the machine as described under the MACHINE SETUP. To operate the machine through a complete cycle proceed as follows:

NOTE

If the machine is to be operated manually, after an automatic sequence, it will first be necessary to break the (locked in) automatic circuit by depressing the STOP pushbutton OR switching the Mode Selector Switch to MANUAL.

The steps below describe a compete manual anchor application procedure from start to finish. To complete an aborted automatic cycle, it may not be necessary to go through all the steps. However, it is recommended you read the entire list of instructions before using the Manual Mode. Then, after putting the machine in the Manual Mode, start at the step following the procedure where the automatic cycle was aborted.

1. Put **Mode Selector Switch** in **MANUAL** position (Red pilot light will come on indicating machine is in manual mode).

2. Move Jaw Arm out by holding **Jaw Arm In-Out Switch** forward in **OUT** position and release switch when arm has reached the full out position.

3. Raise the clamp arm by holding **Clamp Arm Up-Down Switch** forward in the UP position.

CAUTION!

Under no circumstances apply a single anchor unless the machine has been properly prepared for this type of operation. Applying a single anchor without making the proper adjustments will damage the unload gripper cylinder rod.

4. Put one anchor in each chute as shown in Illustration 10.

5. Bring jaw arm into pickup position by holding Jaw Arm In-Out Switch down in the IN position. Release switch when arm has reached full in position.

6. Pick up anchors by holding Door Open and Grip Switch up in the on position. This switch must be held in the on position until the anchors are to be applied as described in Step 9 below. Releasing this switch too soon will drop the anchors before they can be applied.

7. Move Jaw Arm back by holding Jaw Arm In-Out Switch down in the OUT position. Release switch when arm is fully out.

8. Lower Clamp Arm by holding Clamp Arm Up-Down Switch in the DOWN position. Release switch when arm is fully down.

9. Bring Jaw Arm in to apply anchors by holding Jaw Arm In-Out Switch down in the IN position - as the anchors just begin to enter under rail hold Box-Unbox Switch up in the BOX position and release the Door Open and Grip Switch.

10. Release Box-Unbox Switch after anchors have been applied.

11. Return Jaw Arm to OUT position by holding Jaw Arm In-Out Switch in OUT position until arm is fully out.

12. Return clamp arm to raised position by holding Clamp Arm Switch up in the UP position. This returns machine to a “Ready” position.

Winch Operation

Your machine is equipped with a hydraulic winch for loading materials onto the deck of the machine.

In order for the winch to be fully operational, it must have the interlock pin set so that the boom can swing fully from left to right without the lock resetting in another hole. This is accomplished by pulling the interlock handle on the boom mast out until the spring compresses enough to allow the spring pin to move behind the bar located beneath the bracket. Releasing handle allows free movement of boom.

To move the winch assembly, pull down on the t-handle until pin releases from hole. Move to new location, release handle.

To raise a load:	Pull chain handle to left or right*
To stop a load:	Release chain handle
To lower the load:	Pull chain handle to the left or right*

*Depends on the position of the boom and where you are standing.

Under no circumstances is the winch to be used for towing or for lifting loads in excess of 300 pounds.

After winch work is complete, secure cable to boom. Refer to LOCKUP section for instructions on locking up the boom and winch assembly.

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 optional Hand Pump. See below.

EMERGENCY PUMP OPERATION

BRAKES

1. Connect hose (supplied with machine) to hand/electric emergency pump disconnect.

2. To release brakes, connect other end of hose to brake disconnect located at the bottom of the hydraulic tank below the main manifold. Turn brake shut-off valve (located next to disconnect) to off position in order to isolate the brake system.

3. Operate emergency pump to pump off brakes.

SET-OFF CYLINDER

1. Connect hose (supplied with machine) to hand/electric emergency pump disconnect.

2. To raise set-off cylinder, connect other end of hose to disconnect located at the set-off cylinder control valve. (Make certain set-off valve handle is in the DOWN position.)

3. Operate emergency pump to raise set-off cylinder.

OTHER FUNCTIONS

1. Connect hose (supplied with machine) to hand/electric emergency pump disconnect.

2. To operate other functions, connect hose to main manifold at any “P” port disconnect.

3. Operate emergency pump and manually override control valve for desired function. (Refer to Hydraulic Schematic for more information regarding ports and valves.)

AFTER OPERATION

General

1. Install lock-ups. See LOCK-UPS section.

4. Press the Electrical Interlock Button on the Main Control Panel.

3. Set engine speed to low position and turn pump off. Let engine idle for 5 minutes.

4. Shut off engine by returning ignition switch to the full counterclockwise position.

5. Return all switches to their "Pre-Operational" state using the Pre-Operational Checklist as a guide.

CAUTION!

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

6. Lower logic box cover and secure with padlocks.

7. Turn off battery disconnect switch. Lock battery box.

Parking or Locating Machine

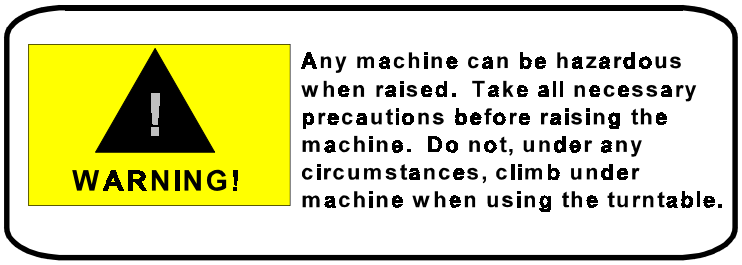
1. Park or locate machine on level track area, if possible; and where it will not be exposed to excessive dust.

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 on the rear deck of the machine.

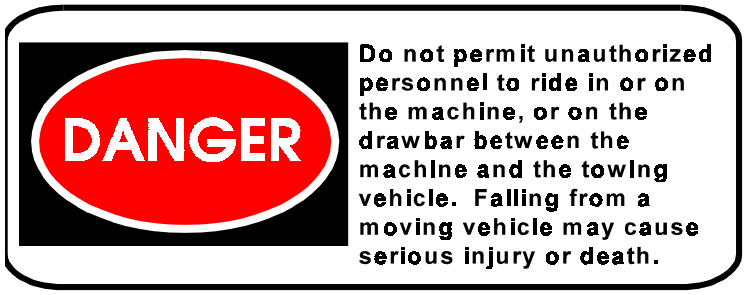
To lift and rotate the machine, proceed with the following steps:



1. Center turntable base across two solid and level ties.
2. Unlock set-off valve handle. Slowly lift handle to lower turntable until it comes into contact with ties.
3. Hold valve hand lever until the machine is fully raised off the track. Center the hand lever to lock in place.
4. Use manpower to rotate the machine. The wheels should be directly above the track after rotating the machine.
5. Slowly move the Set-Off Valve hand lever downward. The Turntable Cylinder will retract and the machine will lower onto the track.
6. Lock up set-off valve.

Towing

Maximum towing speed is 20 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.

The following steps must be taken before towing your machine:

1. Install Lock-Ups. See LOCK-UPS section.

2. Make certain turntable has been raised.

3. Remove drive chain(s) if machine is to be towed a long distance.

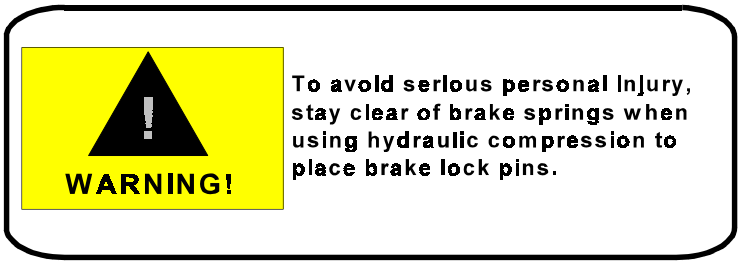
4. Inspect the towing vehicle coupler for damage or loose parts.

5. Back towing vehicle to the machine and engage the couplers. Keep hands and fingers clear of the coupling device and all other pinch points.

6. Ensure that the coupling device is fully engaged, closed, and locked.

7. Install Brake Lock Pins. See Brake Assembly in Maintenance and Service for instructions on installing brake lock pins.

8. Ensure that the coupling device and rear frame members on the towing vehicles will not interfere with or restrict motion of any part of the machine when maneuvering.



9 .

When towing is complete, engage brake by removing the Brake Lock Pins.

GENERAL

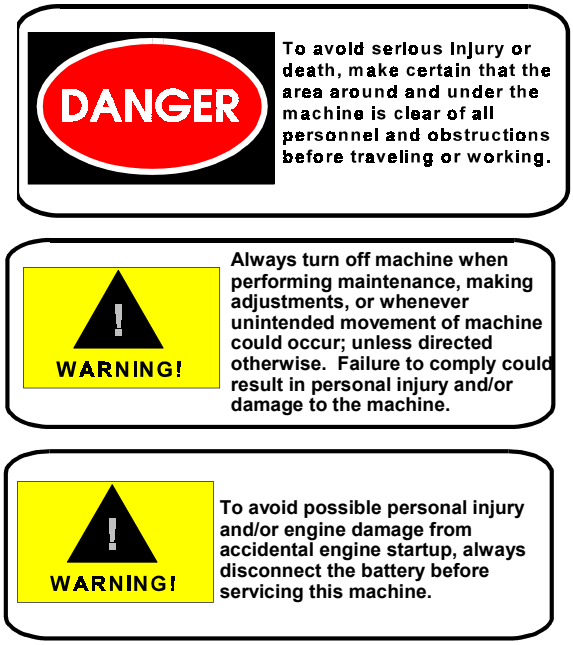
Sound service and maintenance practices will ensure that the machine continues to meet your demanding requirements. At each scheduled maintenance interval, perform all previous maintenance operations in addition to the ones specified.

NOTE: Recommended service intervals are for normal operating conditions. Service more often if engine is operated under adverse conditions (See Maintenance for Extreme Conditions later in this section). Neglecting maintenance can result in failures or permanent damage to equipment.

SAFETY DURING MAINTENANCE

Alert others in the area that service or maintenance is being performed on this machine. Become familiar with, and use, **lockout/tagout** procedures when performing maintenance on this machine. See **LOCKOUT/TAGOUT REQUIREMENTS** in the **Safety Section** of this manual.

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.



NORDCO'S SERVICE NETWORK

Need assistance? It's only a phone call away! As the owner of a NORDCO product, you have a complete network of service technicians and Representatives that are prepared to meet your parts and service needs. If you experience problems, contact your original sales representative first, he is the one listed on the front page of this manual. If you cannot reach him, we suggest that you contact the representative closest to your work area BEFORE calling NORDCO's Service Manager. See map on the next page for the alternate representative closest to your work area.

REQUESTING ASSISTANCE

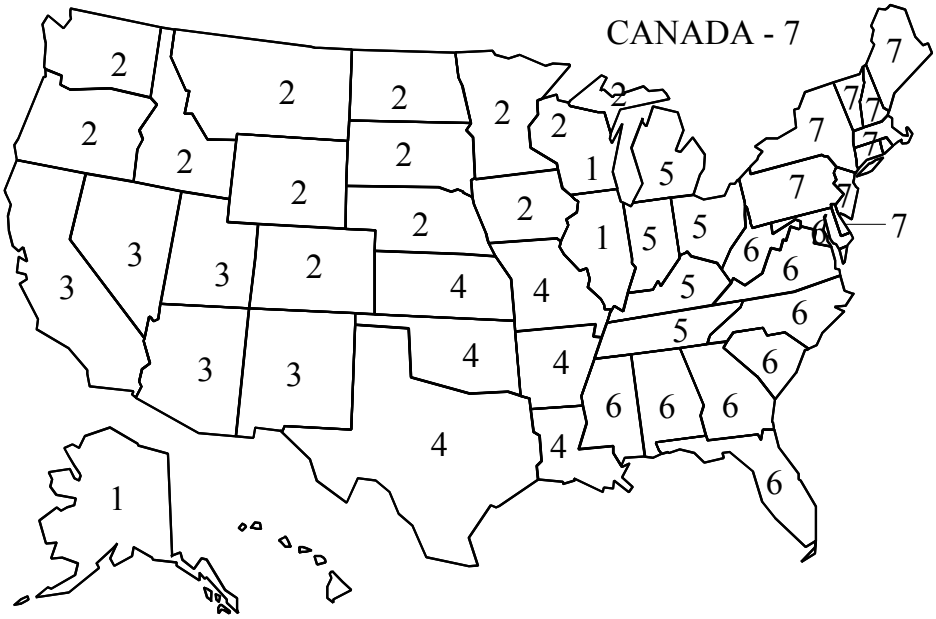
If you have any questions regarding maintenance and service on this machine, please call your local Nordco Representative or:

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

The process will be faster if you have the following information in hand **before calling**:

1. The Machine Name: Anchor Applicator
2. The Type of Machine: Model E, and:
3. The Serial Number: The Serial Number plaque is located on the frame to the right of the Operator.

NORDCO'S SERVICE NETWORK



No.	Representative	Phone Number
1.	Nordco Service Manager	1-800-445-9258 or (414) 769-4603
2.	Russell Railway Supply	(612) 835-5125
3.	Simkins Company, Inc.	(310) 316-5270
4.	James H. Lynde	(913) 648-7379
5.	Stanley H. Smith Inc.	(606) 885-3353
6.	Dwayne Lambing	(404) 424-0401
7.	Eastern Railway Supplies	(716) 675-2040

MAINTENANCE INSTRUCTIONS

Maintenance instructions (adjustments, lubrication, inspections, etc.) are given in this manual **by assembly**. The breakdown for each set of instructions is as follows:

Lubrication:	Tells you what parts of the assembly require lubrication and at what service intervals.
Inspection/Maint:	Tells you what parts of the assembly require maintenance or inspection and at what service intervals to keep the machine performing at optimum levels.
Adjustments:	Tells you what parts of the assembly may require adjustments that are not considered ”daily” adjustments to keep the machine running.

SERVICE POINTS

Service points on this machine (adjustments, inspections, lubrication, etc.) are indicated on the following illustration. The items listed on the chart are preceded by a “D1, W1, M1, Q1 and A1" designation. These points are shown on the illustration and refer to the 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.

LUBRICATION AND MAINTENANCE

INTERVAL		SPEC
Daily (8 Hours)		
D1.	Check Engine Oil Level	Spec A
D2.	Check Engine Coolant	See Engine Manual
D3.	Fill Fuel Tank (End of Day)	
D4.	Drain Water Separator on Engine	
D5.	Check Hydraulic Oil Level/quality	Spec B
D6.	Check Hydraulic Oil Filter Indicators	
D7.	Check Air Cleaner Indicator	
D8.	Inspect Hoses And Fittings For Leaks	
D9.	Inspect Electrical Connections/harnesses For Tightness	
Weekly (40 Hours)		
W1.	Check Battery Condition	
W2.	Oil Propulsion Chain	Spec A
W3.	Oil Propulsion Chain Adjusting Nut	Spec A
W4.	Grease Wheel Bearings (4)	Spec C
W5.	Grease Toggle Turnbuckle Rod Eye (2)	Spec C
W6.	Oil Toggle Turnbuckle Threads (2)	Spec A
W7.	Grease Clamp Arm Cylinder Rod Eye (2)	Spec C
W8.	Grease Toggle Link Pin Bushing (2)	Spec C
W9.	Grease Jaw Arm Sliding Jaw (2)	Spec C
W10.	Grease Jaw Arm Pivot Shaft (2)	Spec C
W11.	Grease Clamp Arm Pivot Pins (2)	Spec C
W12.	Oil Chute Up/Down Turnbuckle Threads (2)	Spec A
W13.	Oil Chute Door Hinge Pin (4)	Spec A
W14.	Oil Chute Door Width Turnbuckle Threads (1)	Spec A
W15.	Oil Chute Mounting Lateral Adjustment Screws (2)	Spec A
W16.	Oil Chute In/Out Adjusting Screw	Spec A
Monthly (150 Hours)		
M1.	Check Fan And Alternator Belts	
M2.	Change Engine Oil And Filters	
M3.	Oil Boom Release Chain	Spec A
M4.	Check Brake Shoes For Wear	
M5.	Run Pressure Checks on Main Pump/propulsion	
M6.	Clean Oil Cooler	
M7.	Inspect Air Cleaner Element	
M8.	Grease Winch Leg/boom	Spec C
M9.	Oil Winch Housing Rollers	Spec A
Quarterly (500 Hours)		
Q1.	Drain Fuel Tank And Replace Fuel Filters	
Q2.	Check Cooling System Hoses	
Q3.	Test Hydraulic Oil Cleanliness	

SERVICE SPECIFICATIONS FOR ITEMS ON NEXT PAGE

SPEC		
A.	ENGINE OIL:	
	ABOVE 32° F:	TEXACO URSA SUPER PLUS (SAE40)
	UNDER 32° F:	TEXACO URSA SUPER PLUS (SAE15W-40)
B.	HYDRAULIC OIL:	TEXACO RANDO OIL HD-46 (ISO #46)
C.	GREASES:	LUBRIPLATE 3000 (NGLI #2)

(FOR OTHER RECOMMENDED BRANDS SEE **RECOMMENDED LUBRICANTS**)

SPEC C 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

SPEC B 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

SPEC A 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

HYDRAULIC - GENERAL

GENERAL

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

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

1. Clean away the dirt in and around equipment before taking apart lines and removing parts.
2. Cap off all disconnected lines and open ports.
3. Protect the overhaul area from grinding dust, machining chips, and wind driven dirt.
4. Work only on metal or hard finished bench tops, easy to keep clean.
5. Handle parts carefully to avoid nicks and burrs.
6. Use lint-free cloths to wipe parts.
7. Use smooth burr-less tools, especially when working with O-rings.
8. Lubricate all sliding parts during assembly.
9. Cover sharp grooves and threads with thimble or shim stock when installing O-rings and other seals.
10. Discard all used O-rings to avoid re-use.
11. Make certain that seals are of the right size and material.
12. Use only recommended replacement parts.
13. Examine all prematurely worn or malfunctioned parts for clues as to the cause of the failure.
14. Test the overhauled device before reinstalling it, if possible.
15. Major component failure - have oil checked for contamination (see paragraph below) or purge system, clean tank and components, and refill with clean oil.

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 while adding it to your system. Make it another practice to change filters on a regular basis **before** they become clogged.

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

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

DISPOSING OF WASTE OIL

Dispose of used hydraulic and lubricating oil and filters in an environmentally responsible manner, according to recommendations of the Environmental Protection Agency (EPA), your local and/or State laws, and the recommendations of your employer. Store waste oil only in properly designated containers and dispose of only in authorized fills. Do not pour waste onto the ground, down a sewerage drain, or into any water source.

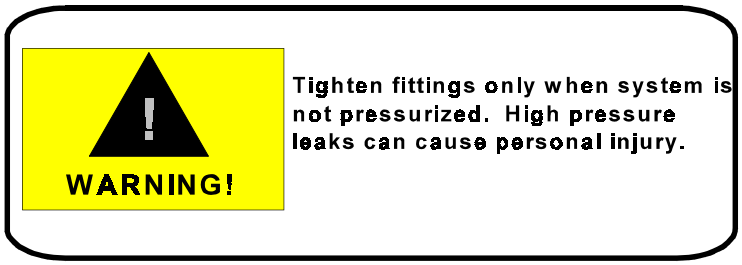
INSPECT HOSES AND FITTINGS FOR LEAKS (D8)

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

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

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

- Stop engine
- Always wear appropriate safety gear.
- Make certain locks and brakes have been applied.
- Make certain hydraulic system has been depressurized.



- Remove hoses, fittings or components slowly to release any trapped pressure.
- Do not sustain full system flow through system relief valve for more than 10 seconds. Full system flow at high pressure through relief valve will create extremely high temperatures.

ELECTRICAL - GENERAL

ELECTRICAL CONNECTIONS

The electrical system on this machine is extremely sensitive and should not be subjected to unusually high currents of any kind. Before welding on machine, to prevent damage to the electrical components:

1. Unplug circuit cards inside logic box.

2. Remove battery cables from battery.

Inspect connections on this machine on a daily basis, making certain all are correct and tight.

OPERATORS STATION

LUBRICATION

The only item at the operator's station requiring lubrication is the "forward/backward" seat slide adjustment. Oiling (with engine oil) on a periodic basis will prevent rust buildup and will allow the seat to slide easier. There is no set time interval for this lubrication and it does not appear in the lubrication and maintenance chart located on the machine.

INSPECTION/MAINTENANCE (D9)

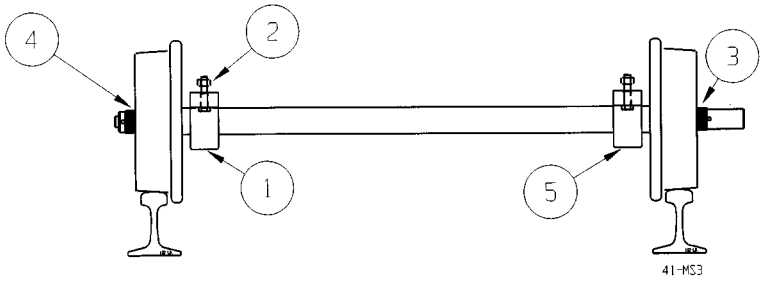
Daily inspection of the harnesses connected to the remote operator control box, footswitches, and logic box are required. Harnesses that may not have proper connection could cause problems in starting and stopping the machine.

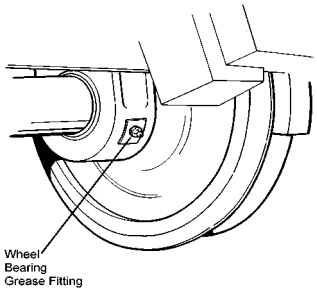
In addition to harness connections, the footswitch should be inspected on a regular basis to guard against wear, deterioration, etc. If you notice excessive wear or breakdown, replace the switch.

ADJUSTMENTS

No adjustments are necessary for this assembly.

AXLES





LUBRICATION (W4)

Wheel bearings should be lubricated on a weekly basis (40 hours). Remote wheel bearing grease fittings are located on the outside of the frame (close to the position of the axles).

Weather conditions affect the time intervals of greasing. In general, a small amount of grease should be ok. Overgreasing may cause seal failure.

INSPECTION/MAINTENANCE

Periodic inspection of the axle bearings and spacers for wear and breakdown are required to keep this machine functioning properly. Inspect hardware for proper fit and secure all loose nuts and bolts. (Items 2-4 on Figure.)

Grease hardens with age. When this occurs, the bearing should be taken apart, cleaned, and relubricated following the manufacturer's instructions on the **component data** sheet.

ADJUSTMENTS

No adjustments are necessary for this assembly.

HYDRAULIC BRAKES

INSPECTION/MAINTENANCE (M4)

Monthly inspection of the brake shoe is required. Check brake shoes at each wheel every month (250 hours). Replace brake shoes when the pad is less than 1/4 (.64 cm) thick. To replace brake shoes:

1. Override the brake valve cylinder on the main manifold until the cylinder collapses.
2. Once the cylinder has been collapsed, close the brake shut-off valve located under the main manifold. This will trap oil in the cylinder and keep the cylinder collapsed.
3. Insert the Brake lockup pins.
4. Turn off machine, following **Lockup/Tagout** procedures.
5. Remove the lower cotter pin and pin holding brake shoe bracket to brake lever. (See Item #1 in Figure).
6. Lift up the brake bracket to gain access to the brake shoe.
7. Remove brake shoe mounting hardware and replace brake shoe. Make certain you have reinstalled the mounting hardware!
8. Lower the brake bracket and reinstall the pin and cotter pin.

Repeat Steps 5 through 8 for all brake shoes that need replacing. After that is done, continue on with the following steps:

9. Remove the brake lockup pins.
10. Return machine to service following the **Lockout/Tagout** procedures. Turn on machine.
11. Open shut-off valve.

ADJUSTMENTS

When towing, it is recommended that the brake spring be locked up to prevent unintentional setting of the brake systems. Follow Steps 1-3 above to install brake lock pins.

DRIVE/PROPULSION

LUBRICATION (W2/W3)

Propulsion chain should be lubricated on a weekly basis (40 hours) with engine oil. This will extend chain life and prevent breakage of the chain.

The propulsion chain adjusting nut should be greased on a weekly basis (40 hours) to prevent rust buildup.

INSPECTION/MAINTENANCE

Periodic inspection of the sprockets for wear and breakdown are required to keep this machine functioning properly. Inspect hardware for proper fit and secure all loose nuts and bolts.

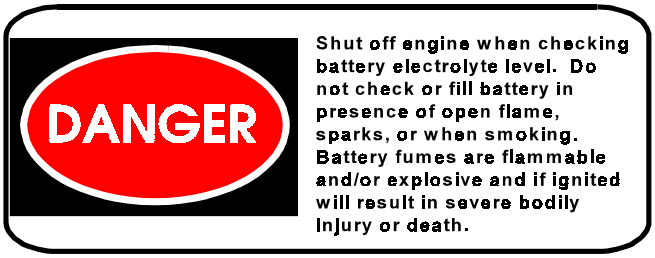
The drive chain should be inspected weekly (40 hours). When inspecting the drive chain, the chain should be nearly taut, with 1/4" (.635 Cm) play when depressed at the center. If not, adjustment is necessary see below. If the chain is too tight, the eccentricity of the sprockets may cause the chain to stretch and/or break. If the chain is too loose, the starting and stopping of the machine will shock load the chain, resulting in short chain life or failure. A worn or stretched chain will also cause short sprocket life as the load will not be carried by all of the teeth on the sprocket - resulting in excessive load on a few teeth.

ADJUSTMENTS

To adjust the drive chain:

1. Remove propulsion chain guard.
2. Unscrew the adjusting screw locknut, but do not remove it from the screw.
3. Turn adjusting screw clockwise (CW) to tighten the chain or counter-clockwise (CCW) to loosen the chain.
4. Once the desired tightness has been reached, tighten the adjusting screw locknut.
5. Reinstall the chain guard.

BATTERY



LUBRICATION

No lubrication is required on this assembly, however after cleaning the terminals and clamps it is suggested that you coat them with grease or other suitable product to reduce corrosion.

INSPECTION/MAINTENANCE (W1)

The battery requires periodic servicing. **Check the electrolyte level on a weekly (40 hour) basis.** Add distilled water if necessary, but **do not overfill**. Overfilling can cause poor battery performance and/or early failure.

Make certain that the Battery Disconnect Switch is in the OFF position. Inspect the terminals and cable clamps regularly. Clean battery terminals and cable clamps when corrosion is visible. Have excessively corroded or damaged parts replaced. To get best performance out of the battery, make certain that the terminal side of the battery (terminals and cable clamps) is kept clean. When battery replacement becomes necessary it is recommended that replacement battery meet or exceed original battery specifications; amps, cranking power, etc.

If the machine is to be out of service for more than 30 days, batteries should be removed and stored in a cool, dry place.

ENGINE AND PUMP

LUBRICATION

ENGINE OIL (D1)

Check the oil level daily with the engine stopped. If necessary, add sufficient oil to raise the level to the proper mark on the dipstick. All diesel engines are designed to use some oil, so periodic addition of oil is normal.

If the oil level is constantly above normal and excess lube oil has not been added to the crankcase, contact the engine maker's authorized service outlet listed in the Engine Manual. Fuel or coolant dilution of lube oil can result in serious engine damage.

ENGINE COOLANT (JOHN DEERE ONLY) (D2)

Check the coolant level daily. Add coolant as necessary, but do not overfill. Make a daily visual check for cooling system leaks. Look for an accumulation of coolant when the engine is running and when it is stopped.

INSPECTION/MAINTENANCE

Check electrical connections and harnesses to the engine on a daily basis.

ENGINE WATER SEPARATOR (D4)

If the engine is equipped with a fuel/water separator, drain off any water that has accumulated. Water in fuel can seriously affect engine performance and may cause water damage.

AIR CLEANER AND INDICATOR (D7, M7)

The air cleaner element should be inspected **every 150 hours**, or more often if the engine is operated under sever dust conditions. Some air cleaners are equipped with a restriction indicator which aids in determining the service interval. **Check the restriction indicator daily for** determining service interval. Do not allow air inlet restriction to exceed 20 inches of water (5.0 kPa) under any operating conditions. Inspect the entire air system for leaks daily. Look for torn air inlet piping or boots and loose or damaged clamps. Have worn or damaged parts repaired or replaced, as required. Retighten any loose connections.

FAN AND ALTERNATOR BELTS (M1)

Check the belts and tighten the fan drive, battery-charging alternator and other accessory drive belts. Belts should be neither too tight nor too loose. Belts that are too tight impose excess loads on the crankshaft, fan, and/or alternator bearings, shortening both belt and bearing life. Excessively overtightened belts can result in crankshaft breakage. A loose belt will slip and may cause damage to accessory components.

Replace all belts in a set when one is worn. Single belts of similar size should not be used as a substitute for a matched belt set. Premature belt wear can result because of belt length variation.

ENGINE OIL AND FILTER (M2)

At **250 hours (or monthly)** it is recommended that you change the oil and filter. Drain oil while engine is still warm. Examine the oil for contamination and/or metal particles. Remove engine oil filter and install new oil filter. Fill engine crankcase with new, clean oil to proper level. Follow the instructions in the engine manufacturer's manual for type of oil filter and for additional frequency of oil changes.

PRESSURE CHECKS ON MAIN PUMP/PROPULSION

Pressure checks should be performed **every 250 hours or monthly** after the engine and hydraulics have thoroughly warmed up (oil temperature has reached 100°F minimum). Before performing these checks, **read and understand all OPERATION instructions, warnings and cautions.**

The pressure check instructions can be found in the **PERIODIC ADJUSTMENTS - HYDRAULIC** section of this manual following this section. These testing procedures require at least two workers in order to be performed correctly.

DRAIN ENGINE COOLANT AND CHANGE COOLANT FILTER (IF SO EQUIPPED)

All coolant must be drained **annually** and the cooling system cleaned thoroughly. See the Engine Manual for proper types of coolant and coolant filters required.

CHANGE AIR CLEANER ELEMENTS

It is good practice to change elements after **1000 hours or annually**, whichever occurs first, to lengthen the life of the air cleaner.

DRIVE BELTS

Drive belts should be replaced **annually**. Replace all belts in a set when one is worn. Single belts of similar size should not be used as a substitute for a matched belt set. Premature belt wear can result because of belt length variation.

ADJUSTMENTS

ENGINE MOUNTS AND HARDWARE

The engine mounts, the exhaust manifold retaining nuts, exhaust flange clamps and other connections should be checked for tightness.

All other adjustments to the engine/pump should be made as recommended by the manufacturer in the Engine Manual included at the back of this manual.

HYDRAULIC TANK

LUBRICATION

HYDRAULIC OIL (D5)

NOTE: Depressurize tank before filling. To depressurize, push relief valve handle on tank pressure system. Gage should indicate 0 psi.

Inspect the oil level on a daily basis (or **every 10 hours** of operation) by reading the sight gauge located on the side of the reservoir. At full level, the oil should be to the top of the sight gauge. The hydraulic system uses SAE-20 (ISO 46) oil. Before filling the system with hydraulic oil, be sure that the fluid is as specified and that it is clean. Do not use cloth strainers or fluid that has been stored in contaminated containers.

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

NOTE: Always add hydraulic oil to reservoir through a filter. NEVER OVERFILL RESERVOIR. Never use hydraulic brake fluid in lieu of hydraulic oil.

INSPECTION/MAINTENANCE

GENERAL (D8)

Check all hoses and fittings for leaks on a daily basis.

HYDRAULIC FILTERS (D6)

To keep the hydraulic system clean and free from moisture, there is a return line filter and a strainer in the hydraulic system. The return line filter has an indicator needle which, when in the up position, indicates filter should be changed. The suction strainer has no indicating device and must be visually inspected.

Some units are equipped with an additional Main Pump (Pressure) Filter and a filter indicator box that gives the operator a visual status of the condition of the filters. The green light indicates no service required and the red light means service is required.

RETURN LINE FILTER

Located on top of the reservoir, remove and inspect the filter after the **first 40 hours** of operation **and every month** thereafter. Replace element when the indicator needle is in the up position or on those machines with filter indicator boxes, when the light is red.

SUCTION LINE STRAINER

Located on the side of the reservoir, remove and inspect the filter after the **first 40 hours** of operation and **every month** thereafter. Clean as required.

To access filter:

1. Turn off engine.
2. Make certain suction valve is closed (off).
3. Using Allen wrench, loosen socket head capscrew lock (item #3 in figure) by turning counter clockwise. Do not remove screw!
4. Remove six capscrews and lift off front cover.

Reverse process to reattach cover.

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

Some machines are equipped with a lockout device as a replacement for the handle on the suction strainer. This lockout prevents the valve from being opened or closed without the operator's knowledge. To open or close the suction strainer equipped with this device:

1. Remove padlock and pull out plug attached to cable.
2. Using Allen wrench, turn screw inside of plug housing clockwise to open (counterclockwise to close).
3. Replace the plug, put padlock back on and secure.

Reverse this process as necessary.

OIL CLEANLINESS (Q3)

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

1. Filter each change of oil to prevent introduction

of contaminants into the system.

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

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

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

FLUSH AND FILL HYDRAULIC TANK

Flush and fill every **1000 hours or annually**, whichever occurs first. It is good practice to replace all hydraulic oil filters when you are flushing and refilling the hydraulic oil reservoir.

ADJUSTMENTS

None required for this assembly.

OIL COOLER

LUBRICATION

No lubrication is required for this assembly.

INSPECTION/MAINTENANCE

(EXTERIOR ONLY) (M6)

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

CHECK COOLING SYSTEM HOSES (Q3)

All cooling system hoses should be inspected for cover damage and/or indications of twisted, worn, crimped, brittle, cracked, or leaking lines. Hoses with their outer cover worn through or damaged metal reinforcement should be considered unfit for further service and replaced.

ADJUSTMENTS

No adjustments are required for this assembly.

FUEL TANK

LUBRICATION (D3)

Refill the tank at the end of each day's operation to prevent condensation from contaminating the fuel.

Inspect the fuel level on a daily basis (or every 10 hours of operation) by reading the sight gauge on the side of the reservoir. Use Diesel fuel only.

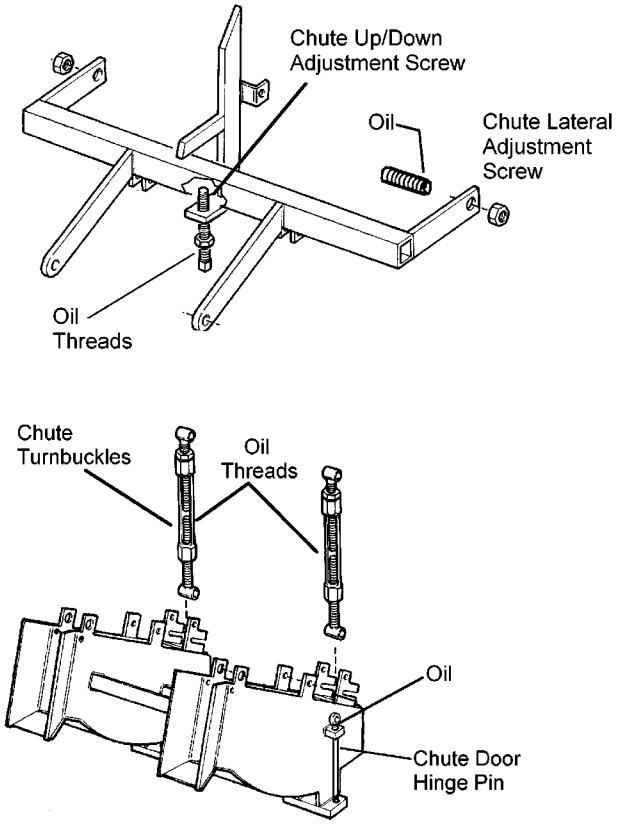
INSPECTION/MAINTENANCE (Q1)

Every **750 hours** tighten all fuel tank mountings and brackets. At the same time, check the seal in the fuel tank cap, the breather hole in the cap, and the condition of the crossover fuel line. Repair or replace the parts as necessary.

ADJUSTMENTS

No adjustments are required on this assembly.

CHUTES



LUBRICATION

Weekly lubrication (oil) of the Adjustment Screws and turnbuckles is required to prevent rust buildup on the threads. Weekly lubrication is also required on the chute door hinge pin to allow easier removal of the pin when switching doors on the chutes. See Figure above.

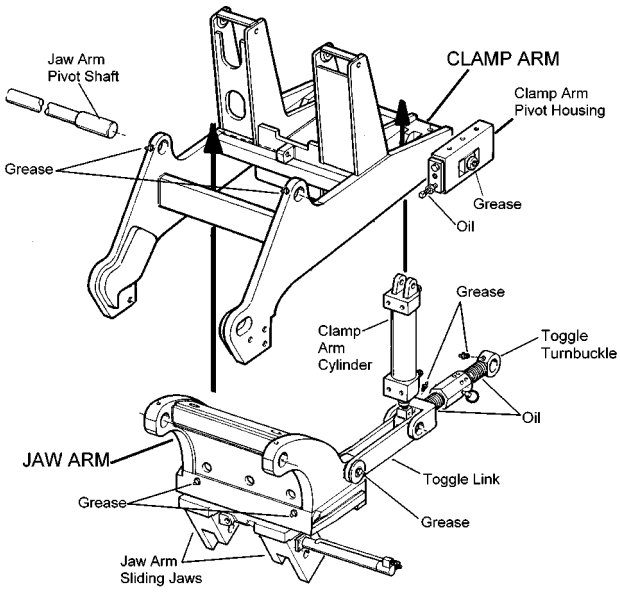
INSPECTION/MAINTENANCE

Inspect threads on all adjusting screws and turnbuckles on a monthly basis to make certain that threads are not stripped or screws bent. Stripped or bent screws will limit the adjusting of the assembly and should be repaired or replaced as required.

ADJUSTMENTS

Adjustments for this assembly can be found under **MACHINE SETUP**, **Chute Adjustments** in the Operation section of this manual.

JAW & CLAMP ARMS



LUBRICATION (W8, W9)

All grease fittings should be lubricated on a weekly basis. See Figure above for lubrication locations.

The adjusting screws for the Clamp Arm Pivot pins (4 screws total) and the toggle turnbuckle screws should be oiled weekly.

INSPECTION/MAINTENANCE

Inspect threads on all adjusting screws and turnbuckles on a monthly basis to make certain that threads are not stripped or screws bent. Stripped or bent screws will limit the adjusting of the assembly and should be repaired or replaced as required.

ADJUSTMENTS

Adjustments for this assembly can be found under **MACHINE SETUP**, **Changing Anchor Types** in the Operation section of this manual.

BOOM AND WINCH

LUBRICATION (M3, M8, M9)

Apply engine oil to boom release chain/ lockpin and the winch housing rollers. Grease boom using grease fittings located on the boom mast/canopy leg. This should be done on a weekly basis.

INSPECTION/MAINTENANCE

Inspect cable for burrs or other defects that may cause early failure of the cable. If any defects such as frays or burrs are apparent, replace cable immediately.

ADJUSTMENTS

No maintenance adjustments are required on this assembly.

MAINTENANCE FOR EXTREME CONDITIONS

Cold Weather

General Problems

Extreme cold generally causes fluids to thicken or gel, presents a risk of freezing and weakening the battery, can crack electrical insulation, can cause difficult starting, and causes rubber and plastic parts to become hard, brittle and easily damaged.

Lubricants

Use the correct grade of lubricants wherever they are used on the machine. Drain and refill if the lubricant is not correct for cold weather operation. See Lubrication under SERVICE AND MAINTENANCE. Cold weather also can cause moisture to accumulate in lubricants. If water is found in any lubricant, drain and refill.

Fuel System

Precautions can be taken to keep moisture out of the fuel system.

1. Keep fuel tank as full as possible to avoid condensation.

2. Remove ice and snow from the area of the filler opening before refilling. Whenever moisture does accumulate in the fuel system, drain water from tank and filters.

If fuel is seriously contaminated with moisture, drain, flush, and refill fuel tank.

Battery

Keep battery fully charged. Cranking power of battery is reduced in extreme cold.

Engine Operation

Run engine at LOW SPEED only long enough to circulate the oil through the engine, then increase speed to warm up the engine. Extended idling during extremely cold temperatures can cause incomplete combustion and heavy deposit formations on the valves.

Machine Storage

1. Park machine in a sheltered place if possible.

2. Wet mud or snow should be cleaned from wheels, axles and hubs before it freezes.

3. When the machine is shut down in extremely cold weather, remove the battery and store it in a moderately warm place. Reinstall battery just prior to starting.

Hot Weather

General

Precautions must be taken to avoid overheating. Check temperature gauge frequently for indications of overheating. When overheated, allow engine to idle until temperature is reduced.

Cooling System

Deutz engines: Check condition of cooling fins frequently. Keep fins and air duct clean and free of dirt that would reduce efficiency. Replace cracked, frayed, or excessively worn belts.

Lubrication

Lubricate the machine with correct grade of lubricants according to lubrication instructions. Change filter elements at shorter intervals than specified in the Maintenance procedures.

Air Cleaners

Check restriction indicator frequently. Service air cleaner at intervals specified in the engine manual.

Rainy or Humid Conditions

Fuel Tank

Keep fuel tank as full as possible and service filters more often than normal.

Lubrication

Keep all moving parts well lubricated.

Paint

If paint is chipped or scratched, the affected area should be refinished immediately to prevent rapid formation of rust. Remove all loose paint with paint remover, sandpaper, or sandblasting equipment. Apply two coats of primer and, when dry, apply finishing coat of paint.

Dusty or Sandy Areas

General

Sand and dust are abrasives which can cause wear on many parts of the machine. Airborne sand and dust can clog the air cleaners, cooler and radiator. Try to store machine in sheltered area when not in use.

Air Cleaners

Check the air cleaner indicator frequently and reduce the service intervals for the air cleaner. Clean the air cleaner as often as necessary to prevent it from becoming clogged.

Lubrication

Lubricate the machine more often then specified in the Lubrication

Chart. Clean all fittings and openings thoroughly before lubrication to keep out sand and dust. Take similar precautions with lubricant containers.

Salt Water Areas

In salt water areas, keep the machine as clean as possible. Salt water vapor in the air causes corrosion of exposed parts. After operation, wash with fresh water if available. Keep all lubrication points wiped clean and well lubricated.

RECOMMENDED SPARE PARTS FOR ONE YEAR OF OPERATION

QTY	PART NO.	DESCRIPTION	NOTE
CYLINDERS			
2	9609 0304	**Seal Kit**, Brake Cylinder (2855 1804)	
4	9668 0202	**Seal Kit**, Toggle & Clamp Arm Cylinder (2855 2407)	
2	9668 0201	**Seal Kit**, Jaw Boxing Cylinder (2855 0012)	
1	9668 0200	**Seal Kit**, Set-Off Cylinder (2855 3911)	
1		**Seal Kit**, Dump Bin Cylinder (2855 3734)(Option)	
4	9635 0523	**Cylinder,** Door	
12		**O-Ring,** Door Open Cylinder (9635 0523)	
BRAKES			
4	7090 0072	**Brake Shoe**	
FILTERS			
2	3894 289	**Filter Element,** Return (7 Micron)	
2	3894 289	**Filter Element,** Pressure (7 Micron)(Optional)	
2	3894 255	**Filter Element,** Suction Strainer	
JAW ARM & CLAMP ARM			
4	2249 2650	**Cam**, Chute Door	
8	3393 723	**Pin,** Spring	
2	9633 0497	**Opto Switch**	
1	8290 0012	**Turnbuckle,** Toggle	
1	6605 8846	**Rod End,** Turnbuckle	
1	6606 8865	**Turnbuckle**,	
1	5264 4500	**Pin,** Lock	
DOORS (Applies to All Anchor Tools)			
8	3662 174	**Spring,** Door Extension	
4	7299 2555	**Roller,** Cam Bushing	
4	2207 9294	**Bushing,** Cam Roller	
ELECTRICAL			
1	5194 631	**Switch,** High Pressure	
1	5194 630	**Switch,** Low Pressure	
1	5150 184	**Lamp**	

QTY	PART NO.	DESCRIPTION	NOTE
1	7889 3500	**Footswitch**	
1	9668 0218	Board and Plug Assembly	
HYDRAULIC			
1	5023 0073	**Motor,** Propulsion	
1	1699 098	**Valve**, Gripper/Door Box and Brakes	
1	5942 7925	**Pump**, Main	

See next pages for **Recommended Spare Parts for Anchor Tools**

RECOMMENDED SPARE PARTS FOR FAIR ANCHOR TOOLS			
QTY	PART NO.	DESCRIPTION	NOTE
FAIR ANCHOR TOOLS			
4	1878 0154	**Block,** Gripper	
1	4391 0006	**Holder,** RH Anchor	
1	4391 0005	**Holder,** LH Anchor	
4	3605 901	**Spring,** Gripper Return	
8	3570 2075	**O-Ring,** Gripper Piston	
6	5841 3795	**Gripper**	
SUPER FAIR ANCHOR TOOLS			
4	1878 0153	**Block,** Gripper	
1	4391 0029	**Holder,** RH Anchor	
1	4391 0028	**Holder,** LH Anchor	
4	3605 901	**Spring,** Gripper Return	
8	3570 2075	**O-Ring,** Gripper Piston	
6	5841 3795	**Gripper**	
5" FAIR ANCHOR TOOLS			
4	1878 0154	**Block,** Gripper	
1	4391 0017	**Holder,** RH Anchor	
1	4391 0016	**Holder,** LH Anchor	
4	3605 901	**Spring,** Gripper Return	
8	3570 2075	**O-Ring,** Gripper Piston	
6	5841 3795	**Gripper**	
FAIR V ANCHOR TOOLS			
4	1878 0305	**Block,** Gripper	
1	4391 0030	**Holder,** RH Anchor	
1	4391 0031	**Holder,** LH Anchor	
4	3605 901	**Spring,** Gripper Return	
8	3570 2075	**O-Ring,** Gripper Piston	
6	5841 3795	**Gripper**	

RECOMMENDED SPARE PARTS FOR UNIT ANCHOR TOOLS			
QTY	PART NO.	DESCRIPTION	NOTE
UNIT ANCHOR TOOLS			
4	1878 0155	**Block,** Gripper	
1	4391 0002	**Holder,** RH Anchor	
1	4391 0001	**Holder,** LH Anchor	
4	3605 901	**Spring,** Gripper Return	
8	3570 2078	**O-Ring,** Gripper Piston	
6	5841 3795	**Gripper**	
UNIT 4 ANCHOR TOOLS			
4	1878 0301	**Block,** Gripper	
1	4391 0024	**Holder,** RH Anchor	
1	4391 0025	**Holder,** LH Anchor	
4	3605 901	**Spring,** Gripper Return	
8	3570 2078	**O-Ring,** Gripper Piston	
6	5841 3795	**Gripper**	
UNIT 5 ANCHOR TOOLS			
4	1878 0301	**Block,** Gripper	
1	4391 0033	**Holder,** RH Anchor	
1	4391 0034	**Holder,** LH Anchor	
4	3605 901	**Spring,** Gripper Return	
8	3570 2078	**O-Ring,** Gripper Piston	
6	5841 3795	**Gripper**	
5" UNIT ANCHOR TOOLS			
4	1878 0155	**Block,** Gripper	
1	4391 0002	**Holder,** RH Anchor	
1	4391 0001	**Holder,** LH Anchor	
4	3605 901	**Spring,** Gripper Return	
8	3570 2078	**O-Ring,** Gripper Piston	
6	5841 3795	**Gripper**	

RECOMMENDED SPARE PARTS FOR CHANNELOC ANCHOR TOOLS			
QTY	PART NO.	DESCRIPTION	NOTE
CHANNELOC ANCHOR TOOLS			
4	1878 0208	**Block,** Gripper	
1	4391 0022	**Holder,** RH Anchor	
1	4391 0023	**Holder,** LH Anchor	
4	3607 470	**Spring,** Gripper Return	
8	3570 2923	**O-Ring,** Gripper Piston	
6	5841 5750	**Gripper**	
CHANNELOC II ANCHOR TOOLS			
4	1878 0208	**Block,** Gripper	
1	4391 0022	**Holder,** RH Anchor	
1	4391 0023	**Holder,** LH Anchor	
4	3607 470	**Spring,** Gripper Return	
8	3570 2923	**O-Ring,** Gripper Piston	
6	5841 5751	**Gripper**	

RECOMMENDED SPARE PARTS FOR WOODINGS ANCHOR TOOLS			
QTY	PART NO.	DESCRIPTION	NOTE
WOODINGS ANCHOR TOOLS			
4	1878 0155	**Block,** Gripper	
1	4391 0012	**Holder,** RH Anchor	
1	4391 0011	**Holder,** LH Anchor	
4	3605 901	**Spring,** Gripper Return	
8	3570 2078	**O-Ring,** Gripper Piston	
6	5841 3795	**Gripper**	
5" WOODINGS ANCHOR TOOLS			
4	1878 0245	**Block,** Gripper	
1	4391 0021	**Holder,** RH Anchor	
1	4391 0020	**Holder,** LH Anchor	
4	3605 906	**Spring,** Gripper Return	
8	3570 2078	**O-Ring,** Gripper Piston	
6	5841 5900	**Gripper**	

RECOMMENDED SPARE PARTS FOR TRAKTITE ANCHOR TOOLS			
QTY	PART NO.	DESCRIPTION	NOTE
TRAKTITE ANCHOR TOOLS			
4	1878 0298	**Block,** Gripper	
1	4391 0027	**Holder,** RH Anchor	
1	4391 0026	**Holder,** LH Anchor	
4	3607 470	**Spring,** Gripper Return	
8	3570 2923	**O-Ring,** Gripper Piston	
6	5841 5751	**Gripper**	

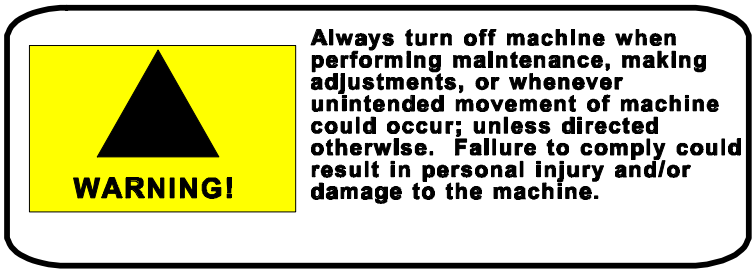
NOTES

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. This 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 general portion of the troubleshooting guide has been broken down into four sections, engine, hydraulics, electrical, and mechanical; 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 experience and, in a step-by-step method, check the causes listed until the correct remedy is found and the problem solved.



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.

CAUTION!

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

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

CAUTION!

Never shut off battery disconnect switch with 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.

For engine problems not listed in the troubleshooting charts, please refer to the Engine Manual.

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.

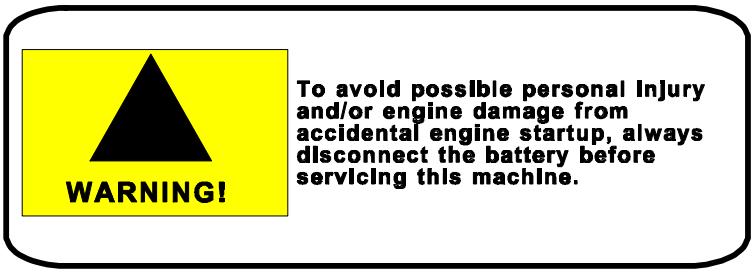
3. Inspect all connections, especially battery connection points. Cleaning harness connectors or ground connections can often correct what appears to be a malfunction.

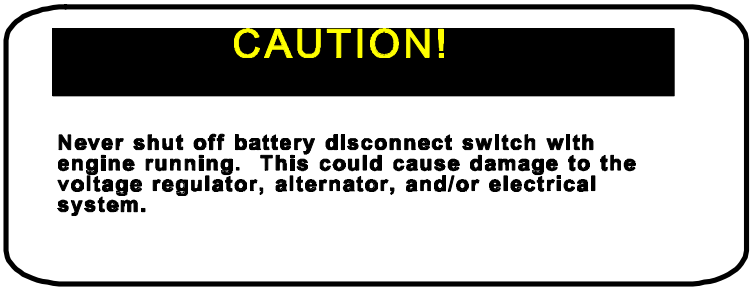
4. Check the battery electrolyte level. Continued loss of electrolyte fluid indicates overcharing or cracked battery case.

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.





ELECTRICAL SYSTEM
TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	SOLUTION
Battery uses too much water	Cracked battery case. High Ambient Temperature. Shorted Cell. Battery being Overcharged.	Replace battery. Refill with water. Check specific gravity. Alternator problem. Check, repair or replace alternator.
Cracked Battery Case	Frozen battery	Keep battery fully charged in cold weather. Replace battery.
Low Battery Output	Low water level. Dirty or wet battery top causing discharge. Corroded or loose battery cables. Broken Battery post. Wrong size replacement battery.	Add distilled water. Clean and wipe dry battery top. Clean and tighten battery cables. Wiggle battery post by hand. If post wiggles or turns, replace battery. Replace battery with type specified under "Machine Specifications".
Starting Motor will not turn.	Defective ignition switch Bad helper solenoid Battery disconnect switch turned off. Corroded battery terminals.	Repair or replace. Replace Turn switch to "ON" position. Inspect and clean if necessary.
Hourmeter does not work.	Hourmeter Wiring harness shorted Corroded or failed hourmeter groundwire. Key switch and /or Battery Disconnect switch.	Replace Hourmeter. Replace wiring harness. Replace groundwire. Make certain they are on.
Voltmeter does not work.	Voltmeter Wiring harness Regulator	Replace meter. Repair or replace. Repair or replace.
Engine Oil Pressure Gauge does not work.	Pressure Gauge Wiring harness.	Replace gauge. Repair or replace.
Engine Oil Pressure	High Oil Viscosity	Drain and add correct oil as

PROBLEM	POSSIBLE CAUSE	SOLUTION
Gauge always reads "HIGH"		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
Engine Oil Pressure Gauge always reads "LOW"	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.
Horn does not sound	Wiring Harness	Check harness, repair or replace.
	Connection at horn loose.	Tighten connection.
	Horn circuit breaker blown.	Reset circuit breaker, see page 98.
	Horn broken.	Check horn, repair or replace.
	Horn Switch.	Check switch, repair or replace.
Backup Alarm does not sound.	Wiring harness	Check harness, repair or replace.
	Connection at alarm loose.	Tighten connection.
	Backup Alarm	Check alarm, repair or replace.
	Backup Alarm switch not turned on	Turn on.
	Backup alarm switch faulty.	Check switch, repair or replace.
Travel Lights do not work.	Wiring harness	Check harness, repair or replace.
	Connection at light loose.	Tighten connection.
	Light circuit breaker blown.	Reset circuit breaker, see page 98
	Light switch defective.	Repair or replace switch.
	Bulb or socket in light defective.	Replace bulb or socket.

PROBLEM	POSSIBLE CAUSE	SOLUTION
Work Lights do not work.	Wiring harness	Check harness, repair or replace.
	Connection at light loose.	Tighten connection.
	Light circuit breaker blown.	Reset circuit breaker. See page 98
	Light switch defective.	Repair or replace switch.
	Bulb or socket in light defective.	Replace bulb or socket.
Cooling Fan not working	Loose connection at back of fan	Tighten.
	Loose connection on relay.	Tighten.
Brake Lights do not work	Wiring harness.	Check harness, repair or replace.
	Connection at light loose.	Tighten connection.
	Light Circuit breaker blown.	Reset circuit breaker. See page 98
	Bulb or socket in light defective.	Replace bulb or socket.
	Switch on main logic board in wrong position.	See Periodic Adjustments - Electrical for Main Board Settings.

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:

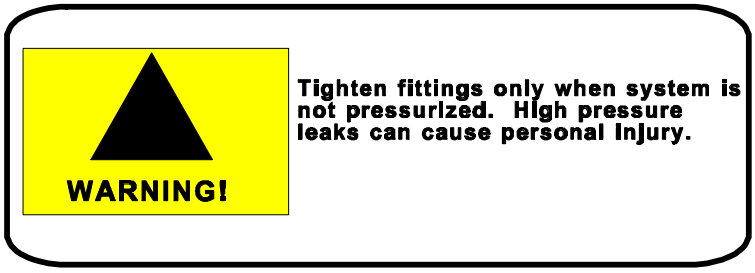
1. Check hydraulic oil level.

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 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.



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 tbe 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 tab entitled Electrical in Part 2 - PARTS INFORMATION.

HYDRAULIC SYSTEM
TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSE	SOLUTION
Hydraulic pump does not develop pressure	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.)	Increase pressure setting on relief valve. (See Pressure checks)
	Main pump compensator setting is too low.	Adjust compensator setting. (See Pressure Checks)
	Pump is defective.	Refer to pump manual or replace pump.
	Destroke valve stuck.	Repair or replace.
	Pump switch turned off.	Turn on.
	Tank not pressurized.	Check small air compressor. Check for air leak out of tank.
Hydraulic pump excessively noisy	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.
Machine will not propel	Main pump not developing pressure.	See above.
	Propulsion relief setting too low.	Increase relief setting. (See Pressure checks)
	Nippers not retracted or nipper work up switch not actuated.	Check nipper up switch, repair or replace.
Hydraulic Oil Overheats	Oil viscosity too high (oil too thick)	Drain and add correct oil as specified under "RECOMMENDED

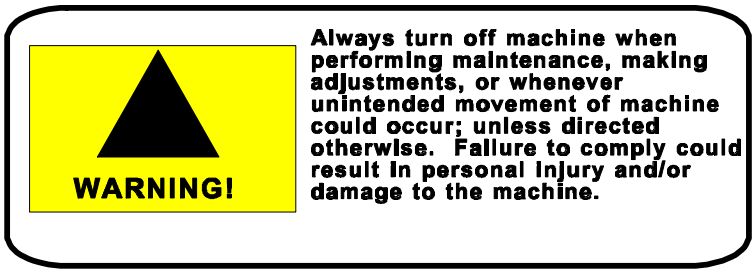
PROBLEM	POSSIBLE CAUSE	SOLUTION
		LUBRICANTS".
	System relief valve set too low.	Increase pressure setting on relief valve (see Pressure Checks)
	Oil lines damaged causing excessive internal restriction	Inspect and repair.
	Travel relief set too low	Check and reset
	Turntable valve in wrong position	Valve handle should be pushed down.
Hydraulic Oil Foams	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	Fill
	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.
Hydraulic Oil Filter Restriction Indicator Light stays on all the time (optional equipment)	Restricted hydraulic oil filter.	Replace filter.
	Hydraulic oil filter restriction switch	Replace switch.

See HYDRAULIC SYSTEM in the Maintenance and Service section for more information.

MECHANICAL TROUBLESHOOTING

INSPECTION

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



MECHANICAL SYSTEM
TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSE	SOLUTION
Machine will not propel.	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 chain.	Repair or replace motor or chain.
Brakes will not release	Relief valve setting too low.	Adjust relief setting.
	Brake valve not shifting.	Check valve spool for free motion and that solenoid is being energized.
	Brake cylinder bypassing oil.	Inspect and repack cylinder.
Brakes will not apply.	Brake valve not shifting.	Check valve spool for free motion and that solenoid is being energized.
	Broken brake spring.	Inspect spring and replace if necessary.
	Brake shoes worn.	Inspect shoes and replace it necessary.
Door Cylinder will not operate	Mode Selector Switch in **OFF** position.	Put Mode Selector Switch in **AUTO** or **MANUAL** position.
	Circuit breaker tripped.	Determine cause of electrical overload and correct. Reset circuit breaker.
	Logic circuit board fuse blown.	Determine cause of electrical overload and correct. Replace fuse.
	Defective logic board.	Troubleshoot logic board using Sequence Chart. Replace board if necessary.
	No hydraulic pressure.	See **Hydraulic System** troubleshooting, Hydraulic Pump does not develop pressure
	Control valve dirty or defective.	Clean or replace control valve.
Boxing Cylinder will not operate	Mode Selector Switch in **OFF** position.	Put Mode Selector Switch in **AUTO** or **MANUAL** position.
	Circuit breaker tripped.	Determine cause of electrical overload and correct. Reset

PROBLEM	POSSIBLE CAUSE	SOLUTION
		circuit breaker.
	Logic circuit board fuse blown.	Determine cause of electrical overload and correct. Replace fuse.
	Defective logic board.	Troubleshoot logic board using Sequence Chart. Replace board if necessary.
	No hydraulic pressure.	See **Hydraulic System** troubleshooting, Hydraulic Pump does not develop pressure
	Control valve dirty or defective.	Clean or replace control valve.
	Box Opto Switch not in adjustment.	Adjust switch.
	Box Opto Switch defective.	Replace switch.
Grippers do not grip and hold anchors	Mode Selector Switch in **OFF** position.	Put Mode Selector Switch in **AUTO** or **MANUAL** position.
	Circuit breaker tripped.	Determine cause of electrical overload and correct. Reset circuit breaker.
	Logic circuit board fuse blown.	Determine cause of electrical overload and correct. Replace fuse.
	Defective logic board.	Troubleshoot logic board using Sequence Chart. Replace board if necessary.
	No hydraulic pressure.	See **Hydraulic System** troubleshooting, Hydraulic Pump does not develop pressure
	Control valve dirty or defective.	Clean or replace control valve.
	Pressure reducing valve not in adjustment.	Adjust valve.
	Pressure reducing valve defective.	Replace valve.
	Quick disconnect not connected.	Connect hydraulic hose at disconnect.
Set off cylinder does not operate.	Loss of hydraulic pressure.	See **Hydraulic System** troubleshooting, Hydraulic Pump does not develop pressure
Clamp Arm Up/Down cylinder does not operate or operates too	Mode Selector Switch in **OFF** position.	Put Mode Selector Switch in **AUTO** or **MANUAL** position.

PROBLEM	POSSIBLE CAUSE	SOLUTION
slow.	Circuit breaker tripped.	Determine cause of electrical overload and correct. Reset circuit breaker.
	Logic circuit board fuse blown.	Determine cause of electrical overload and correct. Replace fuse.
	Defective logic board.	Troubleshoot logic board using Sequence Chart. Replace board if necessary.
	No hydraulic pressure.	See **Hydraulic System** troubleshooting, Hydraulic Pump does not develop pressure
	Control valve dirty or defective.	Clean or replace control valve.
	Up/Down Opto Switch not in adjustment.	Adjust switch.
	Out Opto Switch dirty.	Remove debris or grease from opto switch.
Anchors not being fed straight	Bent anchors	Replace with new anchors.
	Holder not adjusted properly.	
Jaw Arm In/Out Cylinder does not operate or operates too slow.	Mode Selector Switch in **OFF** position.	Put Mode Selector Switch in **AUTO** or **MANUAL** position.
	Circuit breaker tripped.	Determine cause of electrical overload and correct. Reset circuit breaker.
	Logic circuit board fuse blown.	Determine cause of electrical overload and correct. Replace fuse.
	Defective logic board.	Troubleshoot logic board using Sequence Chart. Replace board if necessary.
	No hydraulic pressure.	See **Hydraulic System** troubleshooting, Hydraulic Pump does not develop pressure
	Control valve dirty or defective.	Clean or replace control valve.

PROBLEM	POSSIBLE CAUSE	SOLUTION
	Jaw Arm hits obstruction and activates Abort Pressure Switch. Abort pressure switch out of adjustment or defective.	Shutdown engine, remove obstruction and use **MANUAL** mode to complete cycle. Adjust or replace abort pressure switch.
Jaw Arm is down, but will not come in to apply anchors	Abort pressure switch set too low. Down opto switch covered with grease or debris	Adjust switch. Clean opto switch.
Jaw arm does not return to OUT position after applying anchors Winch does not operate	IN pressure switch set too high. No hydraulic Pressure.	Adjust switch. See **Hydraulic System** troubleshooting, Hydraulic Pump does not develop pressure

See **Chute Adjustments** in the **OPERATION** portion of this manual for addition problems and solutions not listed on this chart.

Table 9. Sequence Chart

		INPUTS								FLIP FLOPS		OUTPUTS						
		START	UP	DOWN	IN	OUT	BOX	ABORT	LOAD	FF 2 (Y2)	FF 1 (Y1)	UP	DOWN	IN	OUT	BOX	DOOR (OPEN)	GRIP
LOAD	AUTOMATIC ON		●			●												●
	START LOAD CYCLE– JAW ARM STARTING IN	●	●			●			●	●	●			●				
	JAW ARM MOVING IN		●				●			●	●			●				
	JAW ARM IN–GRIPPING ANCHOR–DOORS OPEN		●		●		●	●			●				●		●	●
	JAW ARM MOVING OUT		●				●				●				●		●	●
	JAW ARM OUT–READY TO START APPLY CYCLE		●			●												●
APPLY ANCHORS & RELOAD	START APPLY CYCLE–CLAMP ARM STARTING DOWN	●	●			●				●			●					●
	CLAMP ARM MOVING DOWN					●				●			●					●
	CLAMP ARM DOWN – JAW ARM STARTING IN			●		●				●				●		●		●
	JAW ARM MOVING IN			●						●				●		●		●
	BOXING ANCHORS–UNGRIPPING			●			●			●				●		●		
	JAW ARM IN–ANCHORS ON JAW ARM STARTING OUT			●	●		●	●		●	●				●	●		
	JAW ARM MOVING OUT			●			●			●	●				●	●		
	JAW ARM MOVING OUT–UNBOXING			●						●	●				●			
	JAW ARM OUT–CLAMP ARM STARTING UP			●		●				●	●	●						
	CLAMP ARM MOVING UP					●				●	●	●						
	CLAMP ARM UP– JAW ARM STARTING IN		●			●				●	●			●				
	JAW ARM MOVING IN		●				●			●	●							
	JAW ARM IN–GRIPPING ANCHORS– DOORS OPEN–JAW ARM START. OUT		●		●		●	●			●				●		●	●
	JAW ARM MOVING OUT		●				●				●				●		●	●
	JAW ARM OUT – END OF CYCLE		●			●												●
ABORTED CYCLE	START APPLY CYCLE – CLAMP ARM STARTING DOWN	●	●			●				●			●					●
	CLAMP ARM MOVING DOWN					●				●			●					●
	CLAMP ARM DOWN– JAW ARM STARTING IN			●		●				●				●				●
	JAW ARM MOVING IN			●						●				●				●
	ANCHOR HITS OBSRUCTION – ABORTS CYCLE – JAW ARM STARTING OUT			●				●							●			●
	JAW ARM MOVING OUT			●											●			●
	JAW ARM OUT–CLAMP ARM STARTING UP			●		●						●						●
	CLAMP ARM MOVING UP					●						●						●
	CLAMP ARM UP– READY TO RESTART CYCLE		●			●												●

● INDICATES CORRESPONDING LIGHT ON CIRCUIT BOARD IS LIT