



Anchor Applicator Model F



Operation and Maintenance Manual

Applies to S/N 680313 & Above
Reorder Part: 49456801
Last Revision: Rev. B
MAY 2016

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

Release/Revisions

Release/Rev	Date	Change Description
Rev. B	5/12/2016	Updated Illustration on page 56 of manual. Changes to hydraulic, electrical and mechanical sheets. Removed Opto Box References.

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

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.



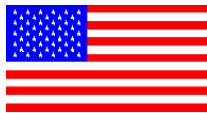
This manual should be considered a permanent part of your machine and should remain with the machine at all times.

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_sales@nordco.com

NORDCO Service:

1-800-445-9258
techsupport@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) 766-2249

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NOTES

SAFETY

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

GENERAL

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

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

FRA regulations require that a copy of this Operation Manual be kept on the machine at all times. Additional copies of the Operation Manual only can be ordered from Nordco Parts Sales at 1-800-647-1724.

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. Failure to understand the contents of this manual could result in serious personal injury or death.

SAFETY ALERT SYMBOLS!

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



DANGER is used to indicate a definite hazardous situation which, if not avoided, **WILL** result in severe bodily harm or even death.



WARNING indicates a potentially hazardous situation which, if not avoided, **COULD** result in severe bodily harm or even death.



CAUTION indicates a potentially hazardous situation which, if not avoided, **MAY** result in minor or moderate injury.



CAUTION without the safety “!” means that failure to follow the alert may result in machine damage.



SAFETY means that the following points are instructions for safely operating the machine or the specific component of the machine.

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.**

SAFETY

1. Handle fuel safely. It is highly flammable and prolonged breathing of fumes may cause bodily harm.
2. Prepare for emergencies. Keep a first aid kit and fire extinguisher handy.
3. Wear adequate protective gear:
 - a. Safety Glasses
 - b. Good-fitting pants and shirt
 - c. Safety-toed work boots
 - d. Leather gloves
 - e. Hard hat

SAFETY PRIOR TO WORKING

All personnel at the worksite (gang) should be aware of the safety concerns and their individual responsibilities **prior to working this machine:**

SAFETY

- Review the operating instructions if you are unsure of anything.
- Use the “pre-operational checklist” to check the machine for obvious faults. Repair or replace as necessary PRIOR to operating the machine.
- Before climbing onto the machine, make certain the area around and under the machine is clear of obstructions and personnel.
- Use care when climbing onto the machine. Always use the steps and handrails provided. (If an area does not have tread grips, walkways, or other methods to access the area, then DO NOT attempt to access that area.)

- Make seat and control adjustments PRIOR to starting the machine. ALWAYS wear a seatbelt.
- Know the weather forecast and plan your work speeds accordingly.
- There are guards on this machine. These are to be removed ONLY when service or maintenance is being performed on that area of the machine. Make certain they have been re-installed PRIOR to starting the machine.
- Check and service the fire extinguisher 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.
- Keep the stairs and platform free and clear of ice, tools and personal items. Use the accessories provided on the machine (tool box, cup holder, coat hook, etc.) to properly store your gear.
- Never climb onto the machine while it is in motion.
- 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.
- Inspect safety decals and replace when they become unreadable or are damaged. (See “Safety Decals” at the end of this Safety section).

SAFETY WHILE STARTING THE MACHINE

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

SAFETY

1. Only start and operate the machine from the operator's seat.
2. Use the "STARTUP Checklist" to check the machine controls and gauges to make certain all systems are operating correctly.

SAFETY WHILE OPERATING/TRAVELING**SAFETY**

1. Never allow more riders than seats and seatbelts allow. This machine was designed to be operated by one person.
2. The machine is to be operated from the Operator's seat only. Do NOT stand and operate this machine.
3. Press the EMERGENCY STOP pushbutton on the center control console in emergencies and potentially dangerous situations.
4. If personnel or bystanders are near the machine during operation, give a warning signal using the air horn. If they fail to respond to this warning, stop operation immediately.
5. Slow down the work cycle and use slower travel speeds in congested or populated areas.
6. Halt work if visibility is poor. Strong rains, fog, and extremely dusty conditions can affect visibility in your work area. Wait for the weather to improve before continuing work.

SAFETY WHILE PARKED

When leaving a machine engine running, make certain that the parking brake is applied and the electrical interlock button has been activated.

NEVER stop and park this machine on an incline unless the machine wheels have been chocked.

SAFETY DURING MAINTENANCE

The following guidelines are suggested when performing maintenance:

SAFETY

1. Always chock the wheels
2. Alert others in the area that service or maintenance is being performed on this machine.
3. 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.
4. 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.
5. Collect oils and fuels and dispose of them properly. There is a danger of scalding when working with engine oils.
6. Use only Nordco supplied repair parts for this machine. Use of non-OEM designed parts could compromise the integrity of this machine.
7. There are welding cautions on this machine. Pay attention to them **PRIOR** to welding.
8. Kits supplied by Nordco have welding instructions included. Welding of any components NOT of Nordco's manufacture or failure to follow these instructions may affect the stability of this machine.

MACHINE SAFETY ALERTS



DANGER ALERTS

Improper use of this machine for any type of operation can cause serious injury or death.
To avoid serious injury or death, make certain that the area around and under the machine is clear of all personnel and obstructions BEFORE travelling or working.
Serious injury or death can result from reaching into working components while machine is running. Make all observations from a distance and SHUT OFF machine while making adjustments.
Shut off engine when checking battery electrolyte level. Do not check or fill battery in presence of open flame, sparks, or when smoking. Battery fumes are flammable and/or explosive and if ignited will result in severe bodily injury or death.
Do not ride on tow bar between the machine and the towing vehicle. Falling from a moving vehicle may cause serious injury or death.

machine could occur; unless directed otherwise. Failure to comply could result in personal injury and/or damage to the machine.
Exhaust emissions caused by the use of the engine on this machine may cause cancer, birth defects, or other reproductive harm if inhaled.
Disconnect the battery before servicing this machine. Failure to do so could result in personal injury from accidental engine startup.
When machine is to be turned using the turntable, raise machine only high enough for the wheels to clear the rail.

MACHINE SAFETY ALERTS

CAUTION ALERTS

When dry cycling the workhead, the machine MUST be mounted on the jackstands or damage to the workhead will occur.
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MACHINE SAFETY ALERTS



WARNING ALERTS

Failure to engage all lockup devices before propelling at travel speed can result in injury to personnel and/or extensive damage to the machine.
Remove hoses/fittings only when system is not pressurized. High pressure leaks can cause personal injury.
Always turn off machine when performing maintenance, making adjustments, or whenever unintended movement of

LOCKOUT AND/OR TAGOUT REQUIREMENTS

The following list suggests lockout procedures to use on all components of the machine that require lockout due to the storage of various forms of energy. It is your company's responsibility to **Lockout/Tagout Procedures** based on this list, 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 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 PROCEDURES

The following procedures are designed to lead the operator through the steps required to shut the machine down and prepare it for performing mechanical maintenance work. These procedures are intended to release potentially dangerous stored energy forms and make the machine safe to begin repairs.

**SAFETY PROCEDURES
LOCKOUT/TAGOUT**

1. Apply parking brakes by pushing in **parking brake button** located on the center (front) control console.
2. Chock wheels to prevent accidental rolling of machine on grade.
3. If you have not already done so, determine which components are to have maintenance. Place all machine mechanical systems or workheads in the full up and locked positions.
4. When mechanical locking up of equipment is not feasible for maintenance lower the component to the ground prior to working on the equipment.
5. Turn the **ignition switch** to the **OFF** position. This turns off the power to the control circuits on the machine. Place a **TAGOUT card** in close proximity to the ignition switch.
6. Turn the **battery disconnect switch (BDS)** to the **OFF** position. Place a lockout/tagout device on the switch.
7. Bleed off hydraulic pressure.
8. Follow all of your company's lockout/tagout rules before proceeding.
Note: When working on machine components, be aware that moving components during repairs may create energy (ie., moving a hydraulic cylinder). Proper precautions should be taken.

SAFETY DECALS ON THIS MACHINE

Safety 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 safety decals on them, it is your responsibility to replace the safety decals. These can be ordered from the Parts Sales Department.

Safety Decals on this Machine are:

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>LOCATION</u>
5642 0001	General Machine Cautions	Inside Cab
5642 0002	Caution! Watch Your Step	Each stairway
5642 0004	Danger! Pinch Points	On workhead
5642 0005	Warning! Hand Hazard	On workhead
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 operation and maintenance information for the Anchor Applicator Model “F” manufactured by NORDCO INC., Oak Creek, Wisconsin. Information regarding the operation and maintenance of this machine can be found behind the appropriate tabs. Information regarding operation and maintenance of OEM parts not of NORDCO manufacture can be found at the back of this manual, behind the tab marked **Component Data**.

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

ABOUT THIS MANUAL

This manual has been broken down into sections which have been separated by index tabs. Behind each index tab is a blue colored section for troubleshooting the applicable section.

Mechanical has individual parts breakdown drawings and lists for each assembly

Hydraulic includes adjustment instructions and troubleshooting for the hydraulic system; and all piping and functional drawings for a standard machine and optional equipment

Electrical, includes all electrical schematics, logic box, control box, and cable drawings for the machine; and troubleshooting instructions

Component Data includes parts breakdowns and service instructions for components installed on the machine that are not of NORDCO’s manufacture

SPECIFICATIONS

GENERAL

Gross Weight

With Boom Only.....	14,500 lbs (6577 kg)
With Boom, Large Hydraulic Dump Bin and Canopy.....	17,750 lbs (8051 kg)

Length

With Bumpers.....	15 feet 10 inches (4.8 m)
Without Bumpers.....	14 feet 8 inches (4.5 m)

Width

With Sliding Canopy Extended.....	10 feet 8 inches (3.25 m)
With Sliding Canopy Closed.....	8 feet 5 inches (2.57 m)

Height

With Boom Only.....	10 feet (3.1 m)
With Boom and Hydraulic Dump Bin (Extended).....	11 feet 5 inches (3.48 m)

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.....	40 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.....	John Deere, 4045TF
Type.....	4-Cylinder, Inline
Idle Speed.....	1150 rpm
Continuous BHP.....	80 @ 2400 rpm - full load
Weight.....	1650 pounds (750 kg)

Make/Model.....	Cummins B4.5-P80
Type.....	4-Cylinder, Inline
Idle Speed.....	1150 rpm
Continuous BHP.....	80 @ 2200 rpm - full load
Weight.....	1650 pounds (750 kg)

ⓘtems or capacities may vary according to options on your machine. Weights are 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.

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 PVM Series
Control Valves Vickers Manifoldd

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.

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BEFORE OPERATION

GENERAL

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

FRA regulations require that a copy of this Operation Manual be kept on the machine at all times. Additional copies of the Operation Manual only can be ordered from Nordco Parts Sales at 1-800-647-1724.

Carefully read all safety messages in this manual and on the decals located throughout the machine. Learn how to operate the machine and how to use controls properly.



Do not let anyone operate this machine without instruction. Failure to understand the contents of this manual could result in serious personal injury or death.

ABOUT THIS MACHINE

It is always good practice to become familiar with the components of the machine you are using.

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.

PROPULSION/DRIVE SYSTEM

The machine is dual axle outboard driven, comprised of a single chain, two drive sprockets and a hydraulic motor.

BOOM/WINCH (OPTIONAL)

The boom/winch system is in place to allow the operator to easily lift bags of anchors into the Anchor Bin. The winch is capable of lifting loads up to 300 lbs. 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.

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.

GUIDE ROLLERS

This guide roller functions as a workhead stabilizer and is controlled by a hydraulic cylinder (up and down movement of guide roller) and a second hydraulic cylinder controls the left/right movement of the carriage assembly.

BOOM/WINCH

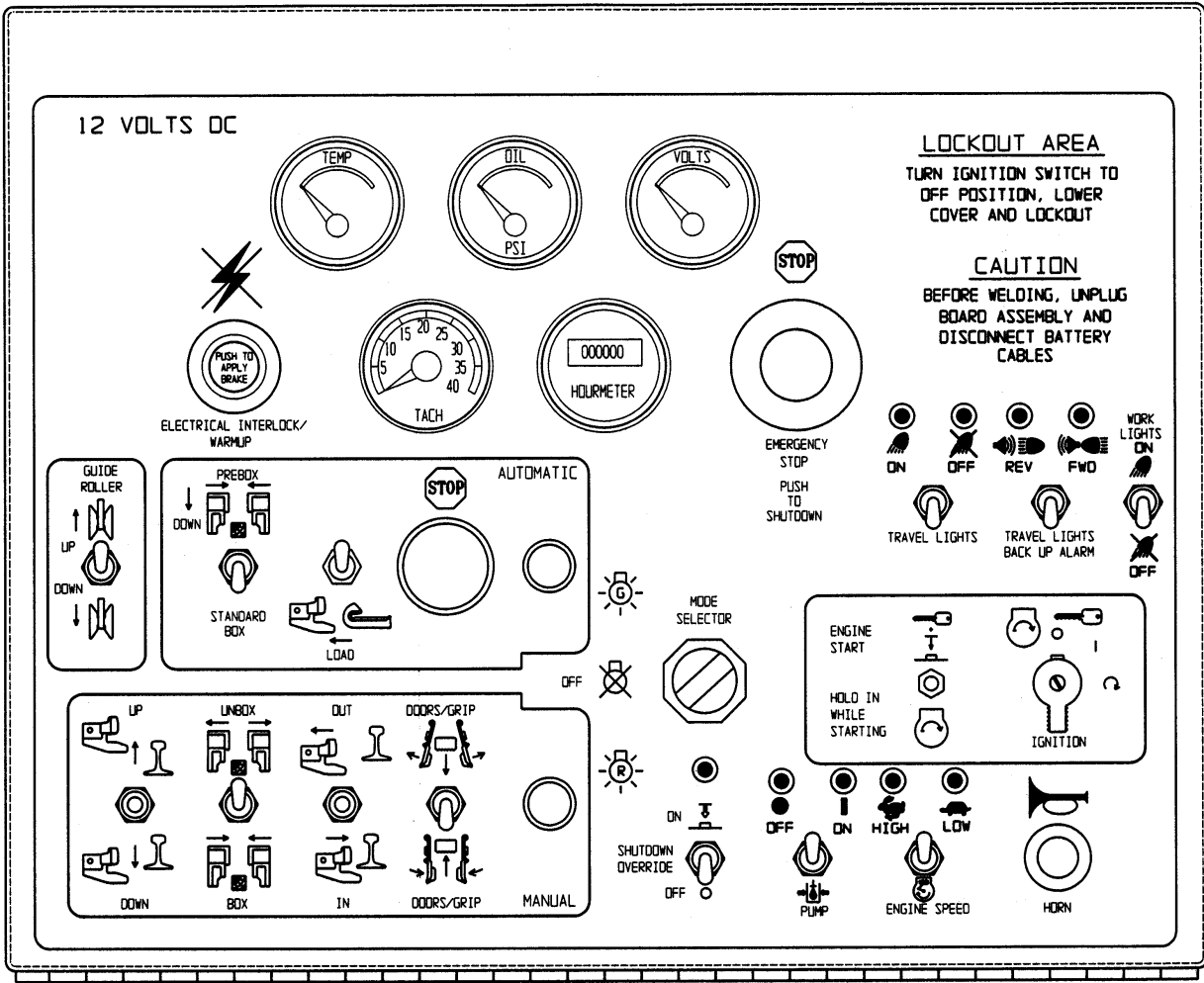
The boom/winch system is in place to allow the operator to easily lift kegs of anchors into the Anchor Bin or the optional Dump Bin. The winch is capable of lifting loads up to 300 lbs. It is not designed or intended to be used for towing. The boom and winch should be locked up for travel or when not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

LOGIC BOX CONTROL PANEL

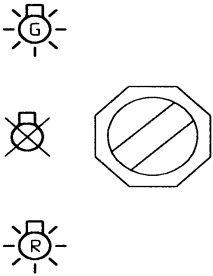
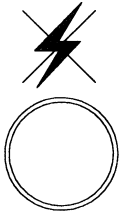
The logic box control panel houses nearly all of the operator selectable items on the machine. The logic box drawing on the next page is representative of a standard machine. Refer to the Part Sheet Table of Contents for the drawing number of the logic box on your machine. Pull out that drawing and compare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

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MAIN CONTROL PANEL

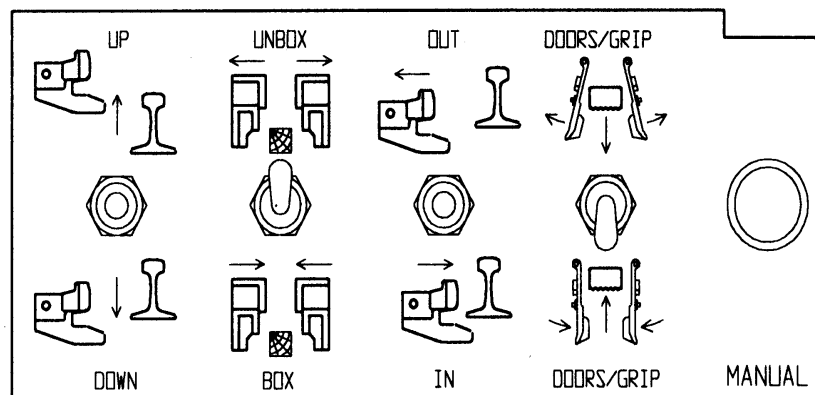


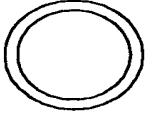
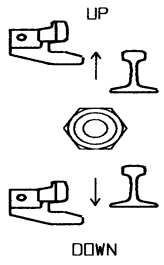
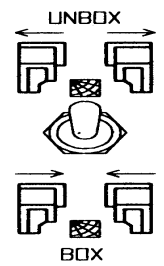
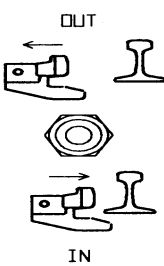
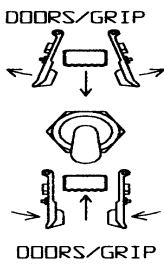
Control or Instrument	Control Type	Function
TACH/HOUR METER	Gauge	Indicates engine speed in hundreds of rpm. Block numbers on gauge indicate engine hours.
EMERGENCY STOP	Button	Press button to shut down engine. Pull out button to reset. See "EMERGENCY STOPPING" at the end of this OPERATION section.
Engine 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).
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
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 Aon@ position when ignition switch is turned. This is done to reduce engine load during starting. After engine has started, turn on pump.

Control or Instrument	Control Type	Function
Mode Selector Switch		<p>Used to select the desired operational mode (Auto or Manual), or to turn power OFF from the Manual Mode.</p> <p>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.</p> <p>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.</p>
Park Switch (Electrical Interlock/Warmup)		<p>When pushed in, disables all electrical input to the workheads. Also locks brakes.</p> <p>Should be used during machine warmup or inspection.</p>

MANUAL CONTROLS

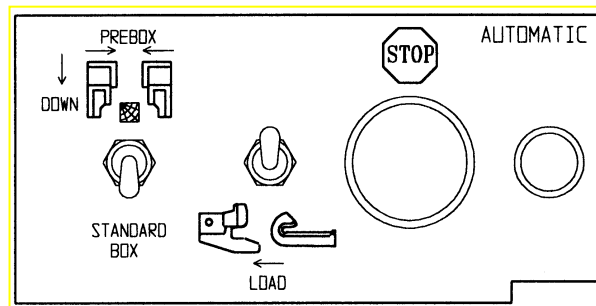
(Used only when machine is in **Manual Mode**)

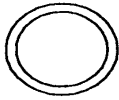
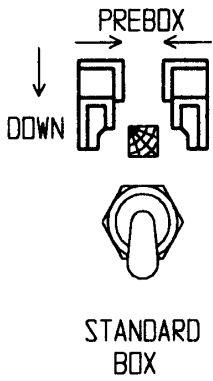
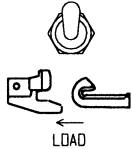


Control or Instrument	International Symbol	Function
<p>MANUAL PILOT LIGHT (Red)</p>	 <p>MANUAL</p>	<p>Illuminated when the Mode Selector Switch is in the MANUAL position.</p>
<p>UP/DOWN (Clamp Arm)</p>		<p>Used to control the up and down movement of the clamp arm during machine setup. UP position raises 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.</p>
<p>BOX/UNBOX (Jaws)</p>		<p>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.</p>
<p>OUT/IN (Jaw Arm)</p>		<p>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.</p>
<p>DOORS/GRIP</p>		<p>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.</p>

AUTOMATIC CONTROLS

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

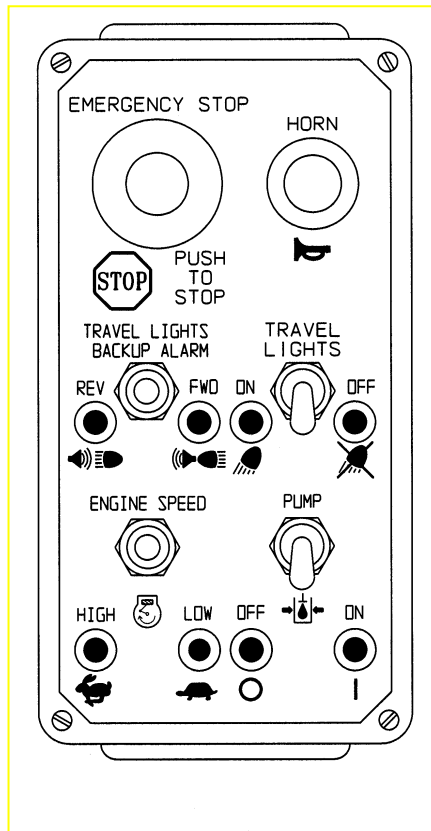


Control or Instrument	International Symbol	Function
AUTO PILOT LIGHT (Green)	AUTOMATIC 	Illuminated when the Mode Selector Switch is set to the AUTO position.
PREBOX/STD. BOX (Jaws)	 STANDARD BOX	When set to PREBOX , this allows the jaws to Abox@ as soon as the jaw arm starts to move in. This prevents 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.
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)	 LOAD	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 Aready@ position.

REMOTE OPERATOR CONTROL BOX

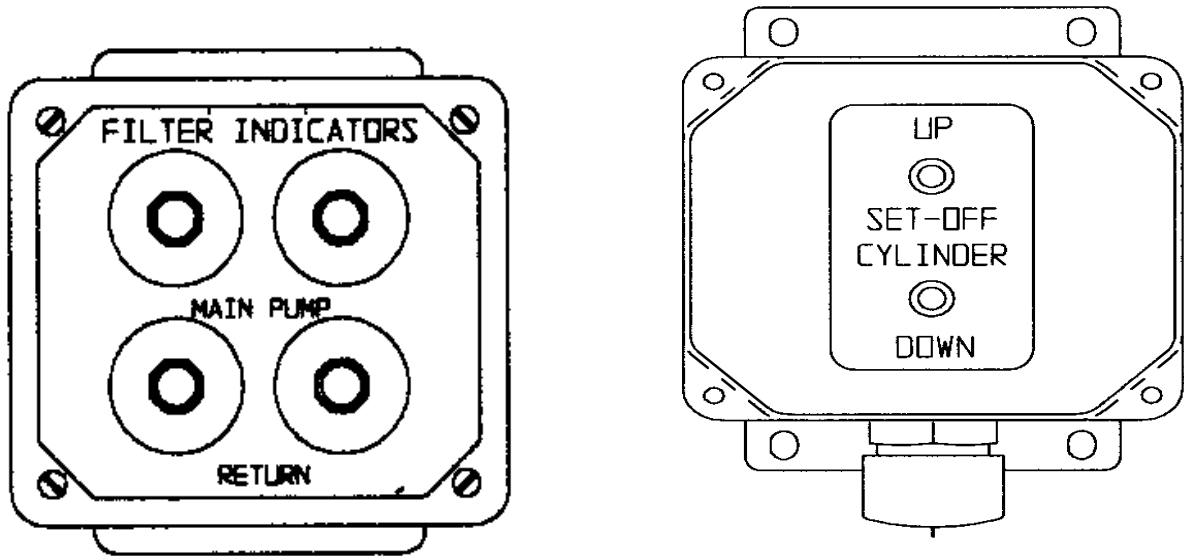
The Remote Operator Control Box shown below is all-inclusive and is for symbol reference purposes only. This configuration may not reflect the box that is on your machine.

TABLE OP-2
REMOTE OPERATOR CONTROL BOX



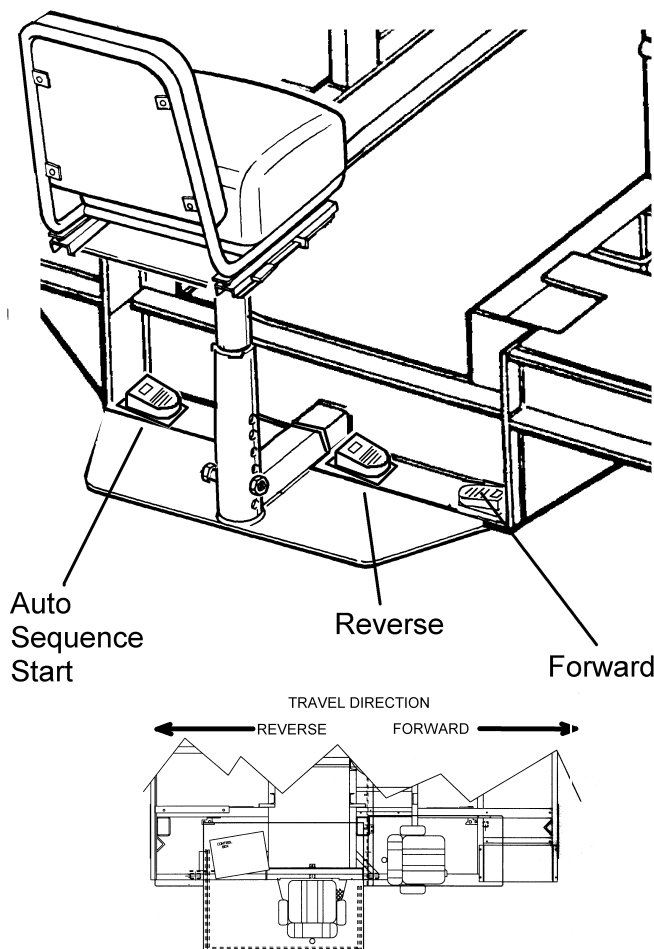
Control or Instrument	Control Type	Function
EMERGENCY STOP	Button	Press button to shut down engine. Pull out button to reset. See "EMERGENCY STOPPING" at the end of this OPERATION section.
ENGINE SPEED		The LOW speed (turtle) setting is for starting. Set switch to HIGH (rabbit) to operate machine. Return to LOW before shutting down engine. NOTE: Engine will not start if switch is in HIGH position when starting.
HORN		Press button to sound horn.
TRAVEL LIGHTS		Turns travel lights ON or OFF.
TRAVEL LIGHTS/ BACKUP ALARM		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 Aon@ position when ignition switch is turned. This is done to reduce engine load during starting. After engine has started, turn on pump.

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!



**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

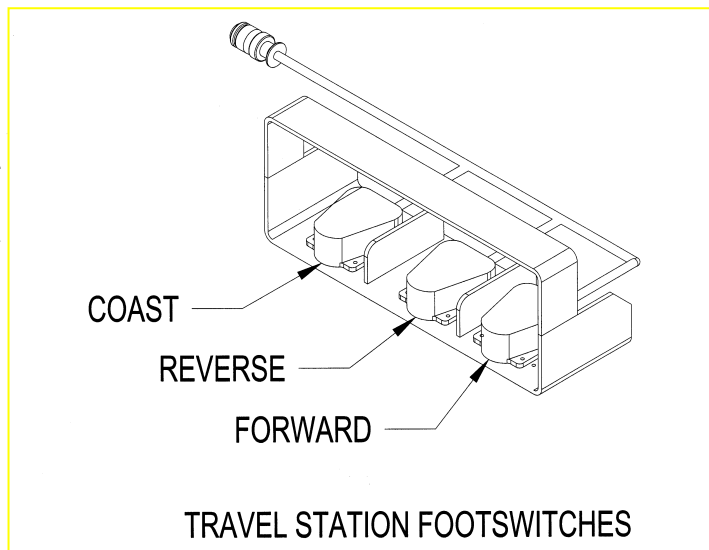
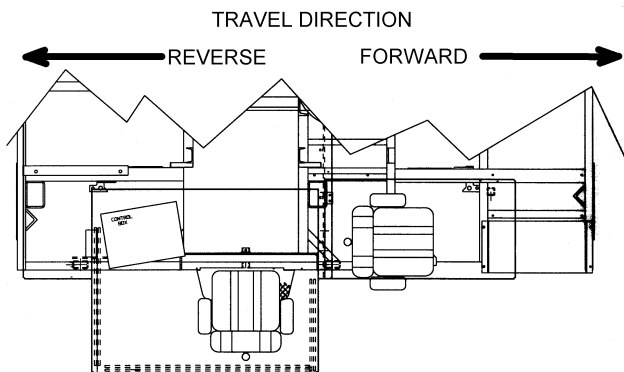


TABLE OP-4
TRAVEL STATION CONTROLS
FOOTSWITCHES

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.
Coast Footswitch	Allows the machine to coast without application of brakes. This footswitch must be pressed BEFORE you release either propel footswitch, or brakes will apply.

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

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!
6	Hydraulic Oil Tank Sight Level	Located on hydraulic oil tank, it indicates the level of hydraulic oil in the tank.
7	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).

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. Perform the pre-operational inspection of the entire machine as shown to the right. Find defects and correct them before serious damage or failure results.
4. If necessary, follow any applicable instructions under MAINTENANCE FOR EXTREME CONDITIONS.
5. Perform applicable preventative-maintenance procedures in MAINTENANCE AND SERVICE section.
6. Be ready to operate the machine with an alert and safety-conscious attitude.
7. Understand the use of the machine's Lock-Ups. See LOCK-UPS section.
8. Make sure the unit is setup for rail and tie size being worked on. Adjustments, if required, are described in the MACHINE SETUP.
9. Wear proper safety clothing.

Before you begin the pre-operational checklist you should become familiar with the controls that you will be checking. Knowing these controls and their functions may will help you in troubleshooting the machine at a later time.

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

PREOPERATIONAL CHECKLIST	
Main Control Panel Status:	
<input checked="" type="checkbox"/>	Gages Checked for broken glass
<input checked="" type="checkbox"/>	Switches/buttons set as follows:
<input checked="" type="checkbox"/>	Emergency Stop button PULLED OUT.
<input checked="" type="checkbox"/>	Pump On/Off Switch is OFF.
<input checked="" type="checkbox"/>	Ignition Switch is in the OFF position.
<input checked="" type="checkbox"/>	Engine Speed Switch is set to LOW.
<input checked="" type="checkbox"/>	Work and Travel Lights are OFF
<input checked="" type="checkbox"/>	Electrical Interlock button is PUSHED IN.
Travel Box Status:	
<input checked="" type="checkbox"/>	Emergency Stop button PULLED OUT.
Machine Fluid/Lubrication Check:	
<input checked="" type="checkbox"/>	Check Engine Oil Level
<input checked="" type="checkbox"/>	Check Engine Coolant Level
<input checked="" type="checkbox"/>	Check Hydraulic Tank Fluid Level
<input checked="" type="checkbox"/>	Check Diesel Fuel Tank Level
<input checked="" type="checkbox"/>	All grease fittings lubed
Machine Inspection:	
<input checked="" type="checkbox"/>	Inspect for leaks
<input checked="" type="checkbox"/>	Inspect all controls and cables/harnesses
Machine Lockups/Guards in Place:	
<input checked="" type="checkbox"/>	Make certain lockup devices are in place for traveling and are clear of any debris
Safety Decals	
<input checked="" type="checkbox"/>	Take a walk around the machine to make Certain decals are in place and readable.

Engine Operation

CAUTION

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

WARNING

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

NOTE: Avoid unnecessary idling.

1. Ensure the suction strainer valve 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 workhead control box have been pulled out. Set engine speed switch to LOW and pump switch to OFF.

NOTE: Engine will not start if the engine speed switch is set to HIGH.

1. 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.

If the machine is equipped with glow plugs, push and hold the momentary push button for 15 seconds prior to cranking the engine.

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 pump switch is ON.

2. If the engine fails to start within 30 seconds, allow the starting motor to cool a few minutes before trying again.
5. Perform the following startup check:

STARTUP CHECKS
Gauge Readings Checked:
<input checked="" type="checkbox"/> Tachometer: 2250 rpm (No load, high speed)
<input checked="" type="checkbox"/> Voltmeter: 25 to 27 volts
<input checked="" type="checkbox"/> Engine Temp: 160 to 185° F (71-85° C)
<input checked="" type="checkbox"/> Engine Oil Pressure: 40-60 psi John Deere Engine: approx. 40 psi Cummins Engine: approx. 75 psi
Light/Horn Status:
<input checked="" type="checkbox"/> Travel Lights Function (both directions)
<input checked="" type="checkbox"/> Backup Alarm Functions (both directions)
<input checked="" type="checkbox"/> Work Lights Function
<input checked="" type="checkbox"/> Brake/Marker Lights Function (both directions)
<input checked="" type="checkbox"/> Horn button functions
Operator Controls Function
<input checked="" type="checkbox"/> Coast Footswitch function
<input checked="" type="checkbox"/> Propulsion footswitches function
Lockup Devices
<input checked="" type="checkbox"/> Lockup devices are engaged for travel
<input checked="" type="checkbox"/> Turntable (valve handle locked)
<input checked="" type="checkbox"/> Guide roller lockup cylinders activated
<input checked="" type="checkbox"/> Sliding Canopy Retracted and Locked
<input checked="" type="checkbox"/> Winch boom locked in place (if equipped)
<input checked="" type="checkbox"/> Winch cable secured to mast (if equipped)

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.

These are required to be in the locked up position prior to working travel through crossings, switches or other rail obstructions or during high speed travel (non-working travel). See next page for details on when lockups are to be used.

Use the following procedures to install or remove lock-ups.

Clamp Arm Lock

Located on the frame floor to the left and right of the Clamp Arms. This lock 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 LED will illuminate, indicating machine is in manual mode.)
2. Raise the Clamp Arm by holding the Clamp Arm UP/DOWN Switch in the UP position.
3. Insert lockpin.

Note: Removal of the lockup may require use of Step #2 to take 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. Manually raise the guide wheel assembly until a hole appears.
2. Insert pin into hole.

Set-Off Cylinder Lockup

To make certain that the turntable cannot be lowered without your knowledge, lock up the turntable control valve lever in the down position (only way it can be locked).

Some machines are equipped with Status Indicator Boxes that will show the status of the setoff cylinder, whether up (green light) or down (red light).

Dump Bin Lockups

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. The dump bin should be in the locked UP position to 1) prevent the bin from drifting down when adding anchors, and 2) during maintenance when access to the hydraulic cylinder is needed.


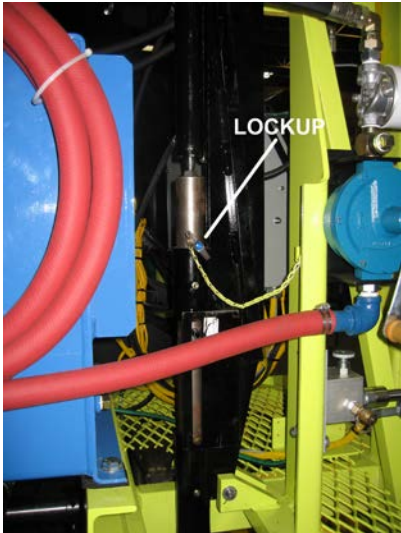
Boom and Winch Lock-ups

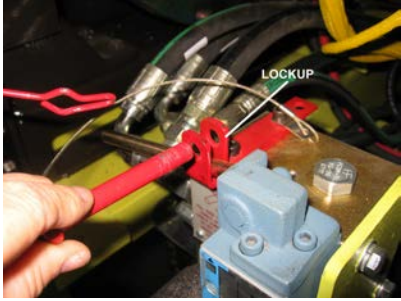

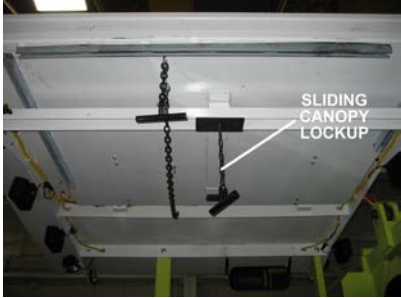
The optional boom assembly has a boom interlock handle that enables the operators to unlock the boom to move the assembly over the track. When the interlock handle is pulled down and rotated until the roll pin is in its seated, locked position, the boom has free swing movement. When locking up the boom, pull the interlock handle down and rotate it until the roll pin is free from its seated position. Release the handle. Swing the boom so that it is parallel with the track and the spring loaded pin engages the lock-up hole.

Sliding Canopy

The sliding canopy interlock handle enables the operators to unlock the sliding canopy from the main canopy and pull it out and over the operator from. When the interlock handle is pulled down and rotated until the roll pin is in its seated, locked position, the boom has free swing movement. When locking up the boom, pull the interlock handle down and rotate it until the roll pin is free from its seated position. Release the handle. Swing the boom so that it is parallel with the track and the spring loaded pin engages the lock-up hole.

TABLE OP-9. LOCK-UPS

Lock-up	LOCATION	TOTAL	WHEN USED
Clamp Arm	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 floor between Travel Station and Dump Bin and next to the hydraulic tank on the operator side of the machine. 	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.

Lock-up	LOCATION	TOTAL	WHEN USED
Turntable/Setoff	Setoff Valve in DOWN position and locked. 	1	At all times when not being used.
Dump Bin	Below dump bin near travel station. 	1	At all times when in the raised position.
Sliding Canopy	Underside of Sliding Canopy 	1	Sliding Canopy must be retracted and locked into stored position during high speed (non-working) travel and at all times when not being used.

TRAVEL

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

DANGER

Do not permit unauthorized personnel to ride on the decks outside the cab. Falling from a moving Vehicle will cause serious injury or death.

Make certain that the area around and under the machine is clear of all personnel and obstructions before traveling or working. Failure to do so will cause serious injury or death.

ENGINE SPEEDS

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

PROPELLING AND BRAKING

Before traveling (either in work or travel modes) determine the method of braking and set the controls to either “deadman” (brakes automatically apply upon release of propulsion pedal) or “service” (brakes are applied only when brake pedal is applied).

Propelling for Non-Working Travel

1. Put the machine in the TRAVEL position.
2. Make certain that all lockups are engaged.
3. Put the Propel Speed switch in the HIGH (2X) position.
4. Press the appropriate foot switch to propel the machine.

Propelling for Working Travel

1. Put the machine in the WORK position.
2. All lockups should be unlocked – with the exception of the turntable lockup.
3. Put the Propel Speed switch in the LOW (4X) position.
4. Press the appropriate footswitch to propel the machine.

Propelling on Steep Grades (Work or Travel)

CAUTION

Switching from 2X to 4X while traveling at speeds in excess of 10 mph will result in dynamic braking, which may cause bodily injury.

1. Put the machine in the TRAVEL position.
2. Put the Propel Speed switch in the LOW (4X) position.
3. Make certain that brakes function properly.
4. Press the appropriate foot switch to propel the machine.

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.



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



Always turn off machine when performing maintenance, making adjustments, or whenever unintended movement of machine could occur; unless directed otherwise. Failure to comply could result in severe personal injury and/or damage to the machine.

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 specified 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.

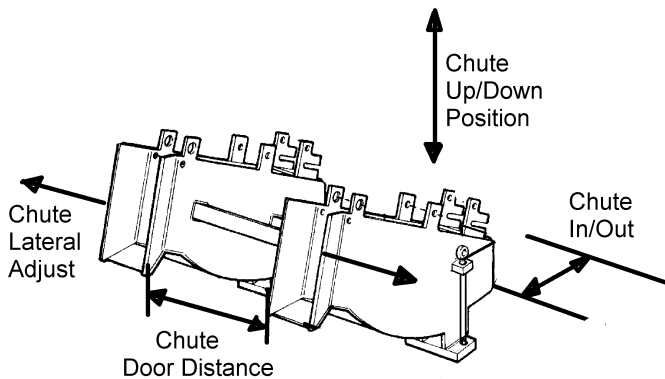
COMPONENT SELECTION CHART

ANCHOR	RAIL SIZE	ANCHOR HOLDER		DOORS				CHUTE
		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.



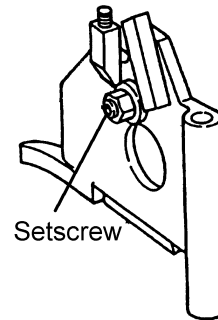
The following table should be used to determine the proper adjustment to be made when certain problems are encountered during setup.

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

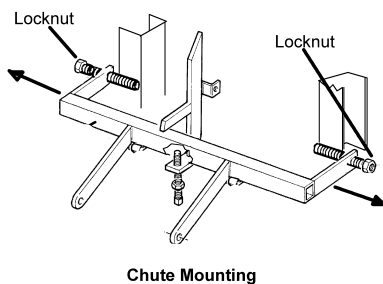
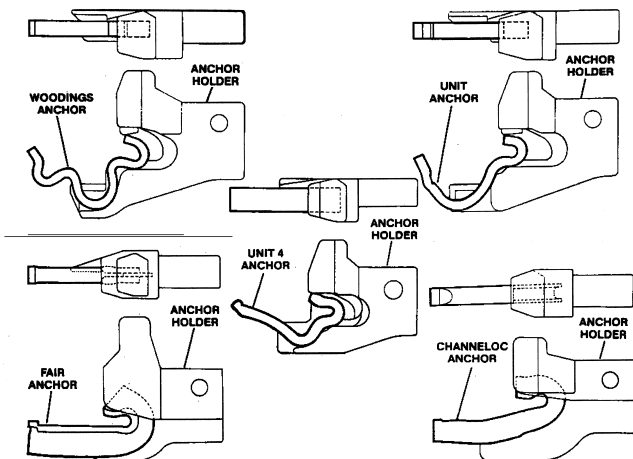
The anchors must pass through the holders and seat properly in the chute doors. If the chute doors are positioned with too narrow an opening, the doors may be pinching the anchors and they will not seat fully. If the door opening is too wide, the anchor will be slightly cocked and proper alignment with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

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:

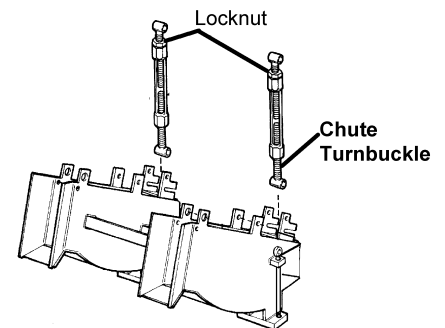
1. Start engine and put **Mode Selector Switch** in the **MANUAL** position.
2. Use the **Jaw Arm In/Out Switch** to move the jaw arm into position to check the alignment.
3. If jaw arm must be moved to left, loosen locknut on left side of chute mounting (See Figure 43B). If jaw arm must be moved to 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.



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



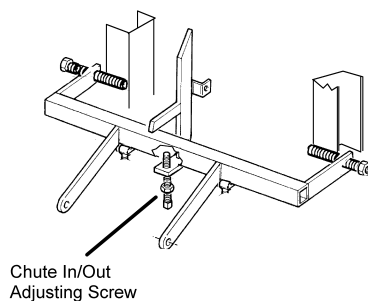
MANUAL position.

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.

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.

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

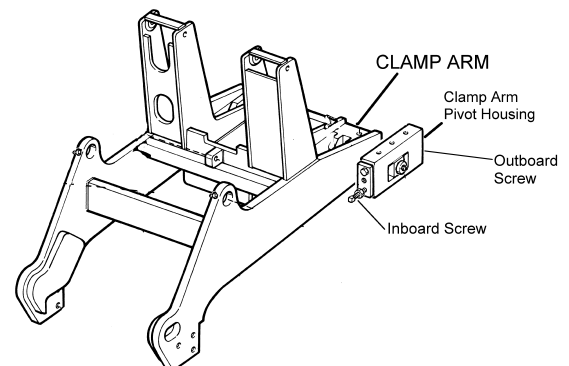
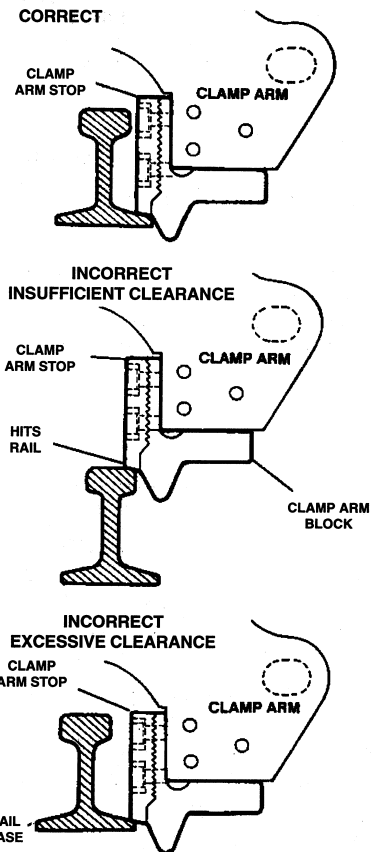
The pivot point of the clamp arm is adjustable and may have to be adjusted any time there is a change in rail size. Adjustment should also be checked on a regularly scheduled maintenance basis. There are two conditions for which an adjustment must be made: **Not enough clearance** or **Too much clearance**.

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.

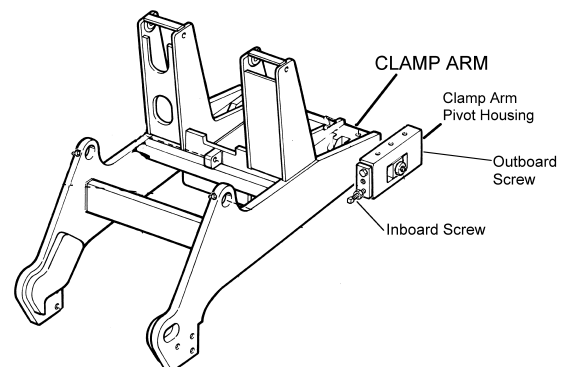
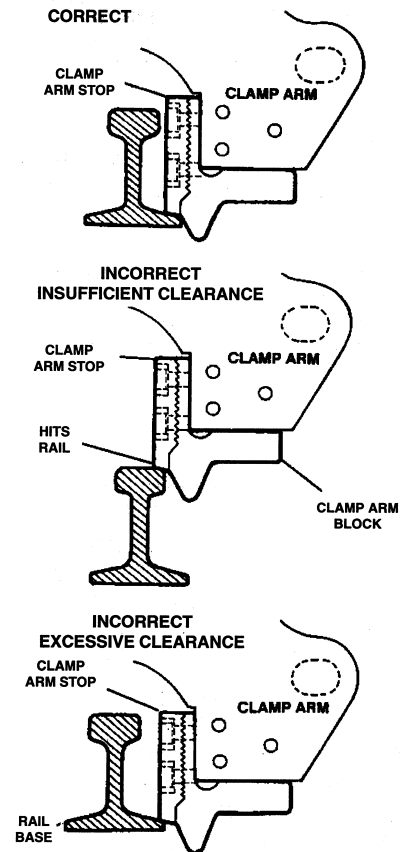


5. Tighten four locknuts.

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.



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.



Do not allow arms, legs, or loose clothing get in the way of the machine's moving parts when making adjustments or operating this machine. Failure to comply will 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 **ACORRECT ADJUSTMENT@** on Figure 48.

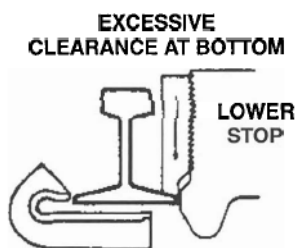
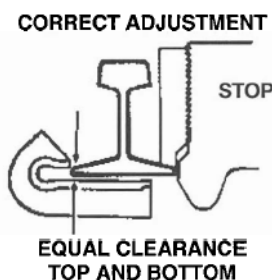
If the anchors are coming in too high and the clearance between the bottom of the rail base and the anchor is insufficient, the clamp arm stops must be raised. Conversely, if the anchors are coming in too low and the clearance between the top of the rail base and the anchor is insufficient, the clamp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

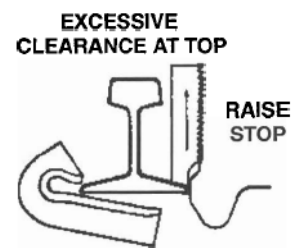


Both clamp arm stops must be adjusted so that they bear against the top of the rail evenly when the clamp arm is down. If improperly adjusted, the twisting force exerted on the clamp arm could cause serious damage to the clamp arm assembly.

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**.



FAIR AND CHANNELOC ANCHORS



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 **ACORRECT 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.

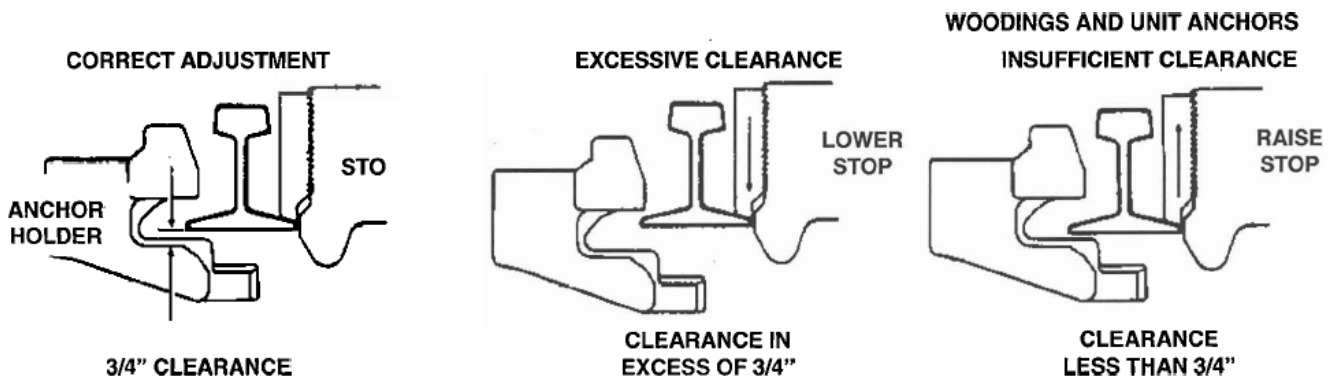
CAUTION

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 precede ANCHOR CHUTE UP-DOWN STOP adjustment.



Toggle Linkage

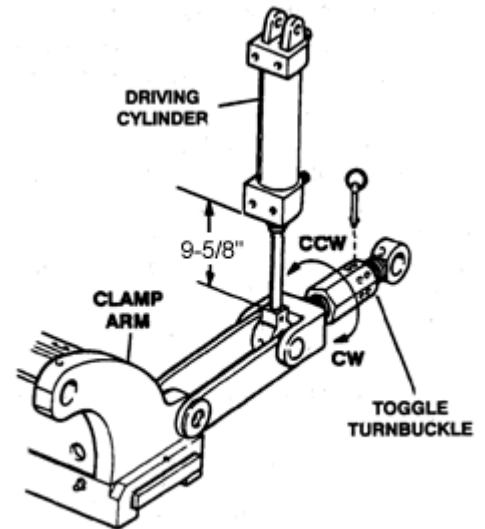
The Toggle Linkage must be adjusted anytime different rail widths are encountered. Adjustment of the Toggle Linkage is based on the fact that the Driving Cylinders must be at the end of their stroke when anchors are fully applied. Refer to Figure 50 and adjust toggle linkage as follows:

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**.
 - a. If the piston rod extends 9-5/8" 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 certain 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 Aflat@ 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.

Anchor Chute Up-down Stop

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.

PROX SWITCH ADJUSTMENTS

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

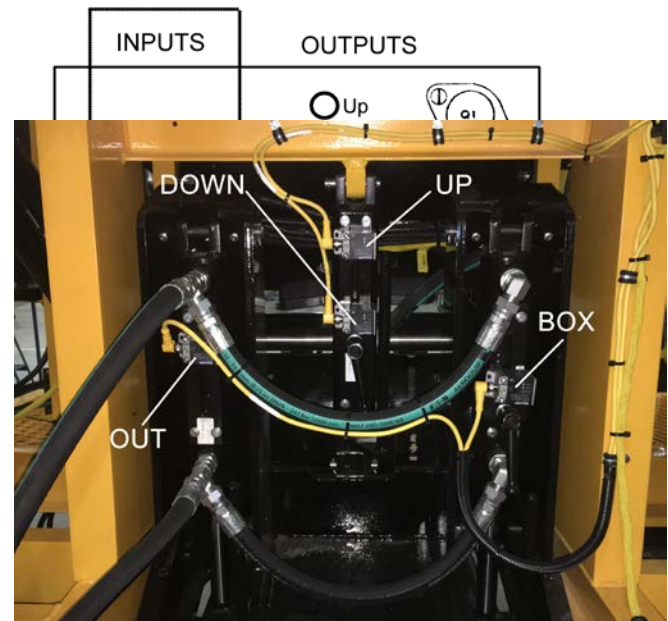
When encountering rail of a different height, the Down Opto Switch, which signals the logic system when the clamp arm has reached its maximum down position, may have to be adjusted. This switch is located on the Clamp Arm Cylinder.

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 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 ADOWN@ input light is **NOT** lit.

Up Prox Switch

This switch is not adjustable.



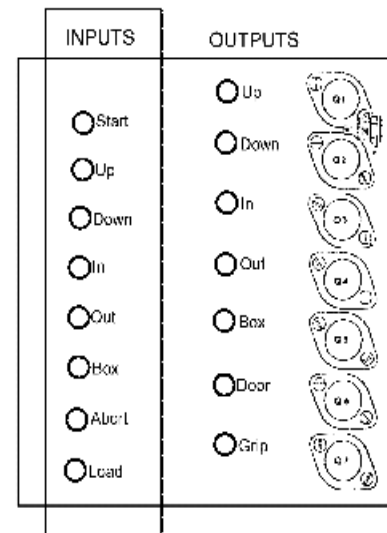
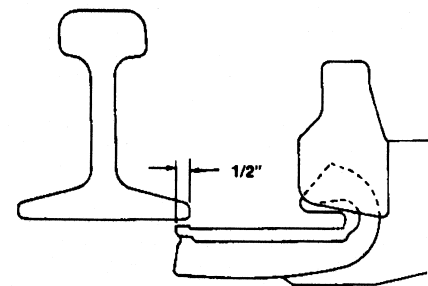
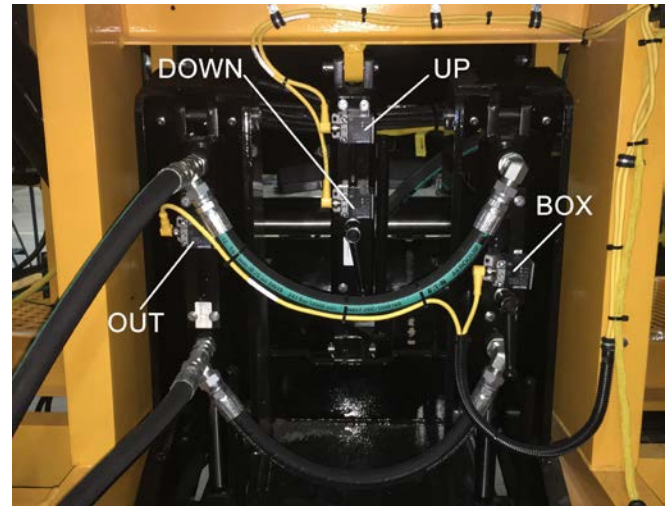
BOX Prox Switch

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 ABOX@ input light is **NOT** lit.



Out Prox Switch

This switch is not adjustable.

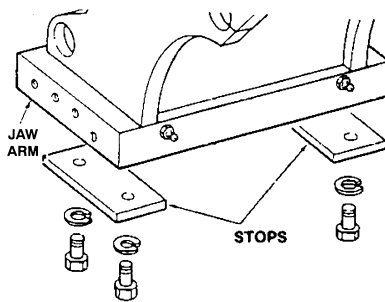
SETUP FOR 14-INCH TIES

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.



SLIDE OUT CANOPY

The work station canopy is designed to slide out during working operations and remain closed during high speed travel.

When the canopy is needed, pull down on the lockup handle to release pin.

While holding down the lockup handle chain, pull on the t-handle chain and slide out the canopy. Release the lockup pin handle. Pull out Canopy until lock snaps into place.

NOTE: This canopy is to be stored in the travel (closed) position at all times during high speed travel.

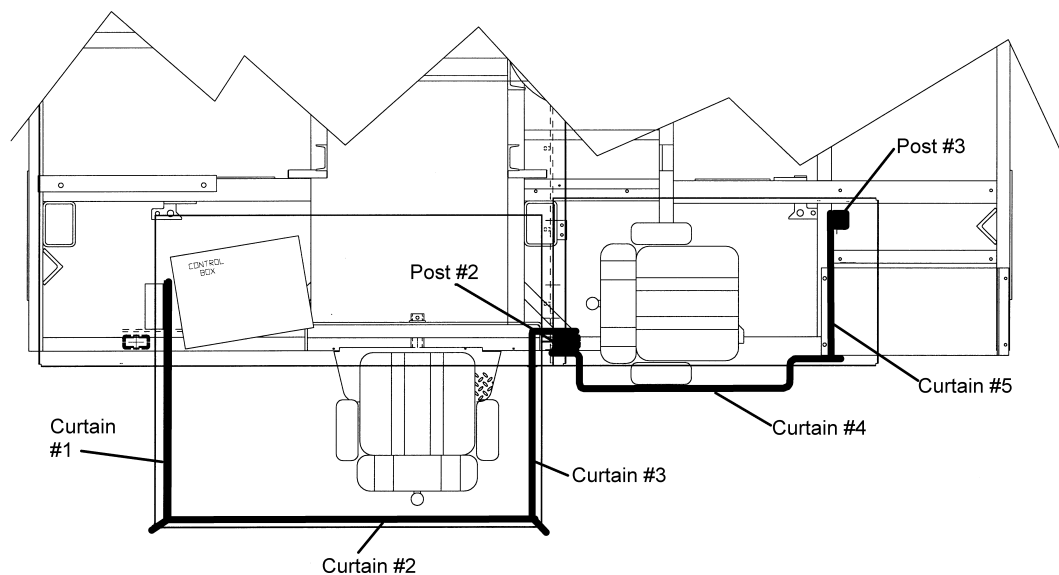
Setting Up Curtains (Optional Equipment)

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. Note: Curtain #5 is not used on machines with operator station windows and wipers.



MACHINE OPERATION



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



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



Do not permit unauthorized personnel to ride in or on the machine. Falling from a moving vehicle may cause serious injury or death.

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

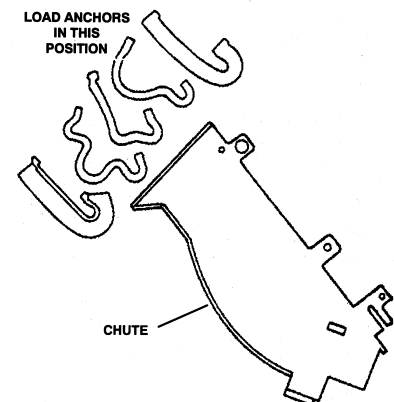
Steps 1-3 above are required only on start up of each job to load the first set of anchors. Once anchors are loaded, continued automatic operation is performed as described in steps 4-6 below.

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 application 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.



RESTART AFTER AUTOMATIC SHUTDOWN

MANUAL OPERATION below.

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.

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

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

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 complete 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 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

Refer to the Preface of the Hydraulic Section.

AFTER OPERATION

General

1. Install lock-ups. See LOCK-UPS section.
2. 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.
6. Lower logic box cover and secure with padlocks.



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

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.



When machine is to be turned using the turntable, raise machine only high enough for the wheels to clear the rail.

Any machine can be hazardous when raised. Take all necessary precautions before raising the machine. Do NOT, under any circumstances, climb under this machine when using the turntable

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.



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

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.



To avoid serious personal injury, stay clear of brake springs when using hydraulic compression to place brake lock pins.

7. Install Brake Lock Pins, using instructions on next page.
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.

BRAKE LOCK-OFF FOR SHOE REPLACEMENT OR TOWING

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

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



Removing the Lock-Pin

1. Make certain machine wheels have been properly chocked.
2. Remove the lock-pin from the brake lever. If the cylinder has experienced a seal leak and the pin is now hard to remove:
 - a. Verify that the brake lock valve is still in the CLOSED position.
 - b. With the emergency pump hose connections in place, operate the emergency pump until the brake cylinder has collapsed.
 - c. Remove lock-pin.
3. Remove lock or cable tie from brake lock valve and turn the handle to the OPEN position.
4. Remove Lockout/Tagout from Control Box (or cab door if equipped).
5. Start engine and pump.
6. Apply brakes to test function.

Installing the Lock-Pin

1. Turn off machine. Apply Lockout/Tagout to control panel (or to Cab door if equipped with Cab). **DO NOT TURN OFF BATTERY DISCONNECT SWITCH!**
2. Chock wheels to prevent ALL movement of machine.
3. Make certain that the brake lock valve on or near the manifold is in the CLOSED position.
4. Attach one end of pump hose (located in toolbox) to quick disconnect on the pump and the other end to the quick disconnect located next to the Brake Lock Valve.
5. Using the emergency pump (electric or manual) circulate hydraulic pressure until the brake cylinder has collapsed and the brakes have released.
6. Install the lockpins in each brake lever (total of 4) as shown in the illustration.
7. It is recommended that a lock or cable tie be placed on the brake lock valve to prevent accidental opening of the valve due to vibration during towing.
8. Remove and replace the brake shoes, or prepare for towing.
9. Do NOT remove Lockout/Tagout items until service or towing is complete and lock-pins have been removed.

-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. 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.



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



Always perform LOTO procedures when performing maintenance, making adjustments, or whenever unintended movement of machine could occur; unless directed otherwise. Failure to comply will result in severe personal injury and/or damage to the machine.

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 that are prepared to meet your parts and service needs. If you experience problems, contact NORDCO's Service Manager.

REQUESTING ASSISTANCE

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

Nordco Service Manager
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
2. The Type or Model of Machine
3. The Serial Number

SERVICE POINTS

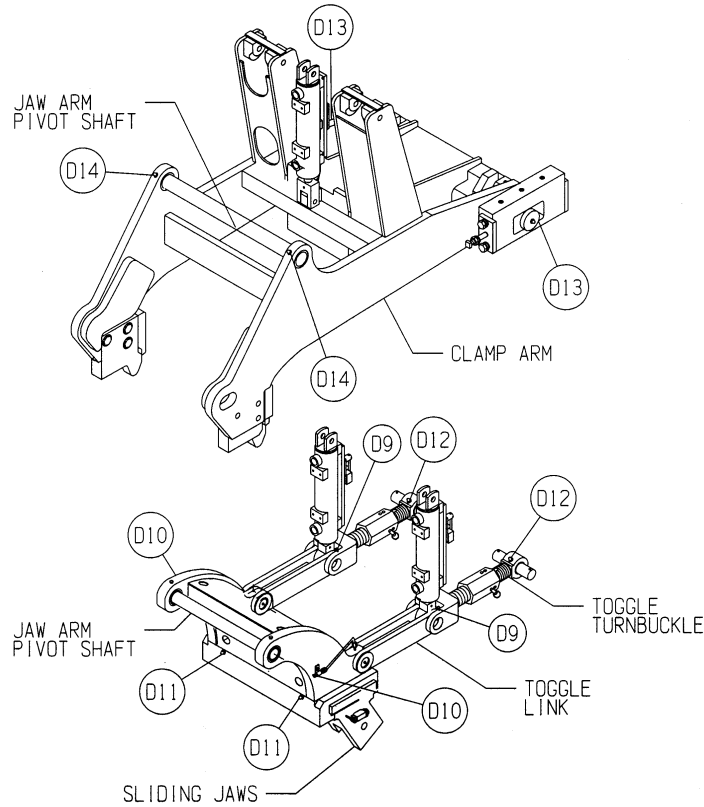
Service points on this machine (adjustments, inspections, lubrication, etc.) are listed on the follow







RECOMMENDED LUBRICANTS

RECOMMENDED GREASES (NGLI #2)	
BRAND	DESCRIPTION/TYPE
Lubriplate	3000
Texaco	MolyTex EP2
Mobil	MobilGrease Special
Conoco	Super Sta M
Amoco	Rykon Premium Moly 2
Chevron	Moly Grease EP2

RECOMMENDED HYDRAULIC OILS (ISO #46)	
BRAND	DESCRIPTION/TYPE
Texaco	Rando Oil HD-46
Mobil	DTE-15M
Conoco	Super Hydraulic Oil #46
Amoco	Rykon Oil #46
Citgo	Hydraulic A/W Oil #46

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



DAILY (OR 8 HOURS, WHICHEVER COMES FIRST)			
Key: =			
 = Refer to Mfr's Manual in Component Data  = More Detailed Instructions Follow			
LOC	ITEM	SYM	TASK
ENG	D1.	 	Follow Engine Mfr's recommendations for daily maintenance
	D2.		Check Engine Oil Level, fill as required.
	D3.		Check Engine Air Cleaner Indicator (Optional)
HYDRAULIC	D4.		Check Case Drain Filter Indicator (Optional)(Requires machine running and working)
	D5.		Check Hydraulic Oil Level and Quality (Sight inspection at Gauge). Fill as req'd.
	D6.		Check Hydraulic Oil Filter Indicators at Logic Box (requires machine running and working)
	D7.		Inspect Hoses and Fittings for Leaks
	D8.		Check Top Off Filter Indicator Gauge (Optional) while in Use
WORKHEADS	D9.		Grease Clamp Arm Cylinder Rod Eye (2 total)
	D10.		Grease Toggle Link Pin Bushing (2 total)
	D11.		Grease Jaw Arm Sliding Jaw (2 total)
	D12.		Grease Toggle Turnbuckle Rod Eye (2 Total)
	D13.		Grease Clamp Arm Pivot Pins (2 Total)
	D14.		Grease Jaw Arm Pivot Shaft (2 Total)
MISC.	D26.		Fill Fuel Tank – End of Day
	D27.		Inspect electrical connections/harnesses for tightness

*Optional Assemblies

Detailed Daily Instructions

D2. Check Engine Oil Level	
<p>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.</p> <p>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.</p> <p>Never operate the engine with the oil level below the "L" (low) mark or above the "H" (high) mark on the oil dipstick. Wait at least 15 minutes after shutting off the engine to check the oil. This allows time for the oil to drain to the oil pan.</p> <p>Check Engine Manufacturer's Manual for Engine Oil Capacity.</p>	






D5. Check Hydraulic Oil Level and Quality – Sight Inspection Only	
<p>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.</p> <p>NOTE: Always add hydraulic oil to reservoir through a filter.</p> <p>NEVER OVERFILL RESERVOIR. Never use hydraulic brake fluid in lieu of hydraulic oil.</p>	

D7. Inspect Hoses and Fittings for Leaks

1. Look for loose or disconnected hoses. An oil spot below the machine is a good indication of a loose hose or hydraulic component.
2. Make certain shut-off valve on suction strainer is OPEN. Opening valve can often correct what appears to be a malfunction.
3. Inspect all vital hose connections, especially at main pump and the main pump hose connection at the manifold.
4. 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.

D27. Inspect Electrical Connections/Harnesses for Tightness

Daily inspection of the harnesses connected to the controllers, 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.

WEEKLY (OR 40 HOURS, WHICHEVER COMES FIRST)			
Key: =			
 = Refer to Mfr's Manual in Component Data  = More Detailed Instructions Follow			
LOC	ITEM	SYM	TASK
MISC.	W1.		Perform all Daily Lubrication and Maintenance Procedures
	W2.		Check Battery Condition.
	W3.		Oil Propulsion Chains
	W4.		Oil Propulsion Chain Adjusting Nuts
	W5.		Grease Axle Bearings
	W6.		Check Suction Strainer Element ^a
WORKHEADS	W10.		Oil Toggle Turnbuckle Threads (2 Turnbuckles)
	W11.		Oil Chute Up/Down Turnbuckle Threads (2 Turnbuckles)
	W12.		Oil Chute Door Hinge Pin (4 Total)
	W13.		Oil Chute Door Width Turnbuckle Threads
	W14.		Oil Chute Mounting Lateral Adjustment Screws
	W15.		Oil Chute In/Out Adjusting Screw

a. Check Suction Strainer Element first 40 hours of operation and yearly after initial inspection.

Detailed Weekly Instructions

W3. Oil Propulsion Chains

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. 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.

W6. Grease Axle Bearings

Periodic inspection of the axle bearings 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 wheel bearing grease fittings are located on the underside of the pillow blocks. Remote wheel bearing grease fittings for the wheels are located on the outside of the frame close to each axle.

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

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.







If supplied, check automatic greasing assemblies for proper charge.

W7. Check Suction Strainer Element

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

1. Turn off engine, Make certain suction valve is closed (off)(ccw).
2. Remove padlock (1) and pull out plug attached to cable.
3. Using Allen wrench, turn screw (2) inside of plug housing clockwise to open (counterclockwise to close).
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.

MONTHLY (OR 150 HOURS, WHICHEVER COMES FIRST)			
Key: =			
 = Refer to Mfr's Manual in Component Data  = More Detailed Instructions Follow			
LOC	ITEM	SYM	TASK
MISCELLANEOUS	M1.		Perform all Daily and Weekly Lubrication and Maintenance Procedures
	M2.		Check Fan, Alternator and Generator Belts
	M3.		Change Engine Oil and Filters
	M4.		Check Brake Shoes for Wear
	M5.		Run Pressure Checks on Main Pump and Propulsion
	M6.		Check Oil Cooler, clean as necessary
	M7.		Grease Winch Boom

Detailed Monthly Instructions

M2. Check Fan, Alternator and Generator Belts	
<p>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.</p>	

M4. Check Brake Shoes for Wear

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 behind the left 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.

M5. Run Pressure Checks on Main Pump and 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 [37.8°C] minimum). Before performing these checks, **read and understand all OPERATION instructions, warnings and cautions.**

QUARTERLY (OR 500 HOURS, WHICHEVER COMES FIRST)

Key: =



= Refer to Mfr's Manual in Component Data



= More Detailed Instructions Follow

LOC	ITEM	SYM	TASK
MISCELLANEOUS	Q1.		Perform all Daily, Weekly and Monthly Lubrication and Maintenance Procedures
	Q2.		Drain Fuel Tank. Replace Fuel Filters.
	Q3.		Check Cooling System Hoses
	Q4.		Test Hydraulic Oil Cleanliness, replace filters as necessary
	Q5.		Replace Hydraulic Tank Breathers

Detailed Quarterly Instructions**Q4. Test Hydraulic Oil Cleanliness**

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

1. Filter each change of oil to prevent introduction of contaminants into the system.
2. Maintain the proper oil level and regularly service filters, breathers, and reservoirs.
3. Take precautions to prevent moisture contamination.

Change fluid whenever contamination occurs because even small amounts of water can affect system performance as well as induce corrosion and oil breakdown.

YEARLY (OR 2000 HOURS, WHICHEVER COMES FIRST)

Key: =



= Refer to Mfr's Manual in Component Data



= More Detailed Instructions Follow

LOC	ITEM	SYM	TASK
MISCELLANEOUS	Y1.		Perform all Daily, Weekly, Monthly and Quarterly Lubrication and Maintenance Procedures
	Y2.		Steam Clean Engine Radiator and Oil Cooler
	Y3.		Inspect Wheels for Excessive Wear
	Y4.		Inspect Suction Strainer Element.
	Y5.		Drain and Replace Hydraulic Oil in Tank. Replace all Filter Elements.

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 than 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.

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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 experienced and, in a step-by-step method, check the causes listed until the correct remedy is found and the problem solved.



Always turn off machine and perform LOTO procedures when performing maintenance, making adjustments, or whenever unintended movement of machine could occur; unless directed otherwise. Failure to comply will result in severe personal injury and/or damage to the machine.

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.

WARNING

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

CAUTION

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

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

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 overcharging or cracked battery case.
5. Inspect for overheated parts after the unit has been stopped for a while. They will often smell like burned insulation. Put your hand on the alternator. Heat in these parts, when the machine has not been operated for some time, is a sure clue to charging circuit problems.

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

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.

PROBLEM	POSSIBLE CAUSE	SOLUTION
Engine Oil Pressure Gauge always reads "HIGH"	High Oil Viscosity Wiring harness Engine Oil Pressure Gauge defective. Defective pressure sensor	Drain and add correct oil as specified under "RECOMMENDED LUBRICANTS" Check wiring harness. Repair or replace Repair or replace. Replace sensor
Engine Oil Pressure Gauge always reads "LOW"	Low oil level. Low oil viscosity. Wiring harness Gauge defective. Defective pressure sensor.	Stop engine, check level. If low fill to desired level. Drain and add correct oil as specified under "RECOMMENDED LUBRICANTS" Repair or replace. Replace gauge. Replace sensor.
Horn does not sound	Wiring Harness Connection at horn loose. Horn circuit breaker blown. Horn broken. Horn Switch.	Check harness, repair or replace. Tighten connection. Reset circuit breaker, see page 98. Check horn, repair or replace. Check switch, repair or replace.
Backup Alarm does not sound.	Wiring harness Connection at alarm loose. Backup Alarm Backup Alarm switch not turned on Backup alarm switch faulty.	Check harness, repair or replace. Tighten connection. Check alarm, repair or replace. Turn on. Check switch, repair or replace.
Travel Lights do not work.	Wiring harness Connection at light loose. Light circuit breaker blown. Light switch defective.	Check harness, repair or replace. Tighten connection. Reset circuit breaker, see page 98 Repair or replace switch.

TROUBLESHOOTING

Anchor Applicator Model F

PROBLEM	POSSIBLE CAUSE	SOLUTION
	Bulb or socket in light defective.	Replace bulb or socket.
Work Lights do not work.	Wiring harness Connection at light loose. Light circuit breaker blown. Light switch defective. Bulb or socket in light defective.	Check harness, repair or replace. Tighten connection. Reset circuit breaker. See page 98 Repair or replace switch. Replace bulb or socket.
Cooling Fan not working	Loose connection at back of fan Loose connection on relay.	Tighten. Tighten.
Brake Lights do not work	Wiring harness. Connection at light loose. Light Circuit breaker blown. Bulb or socket in light defective. Switch on main logic board in wrong position.	Check harness, repair or replace. Tighten connection. Reset circuit breaker. See page 98 Replace bulb or socket. 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 be determined before it can be corrected. A scratch in a fitting seat or a cut in a seal lip that is big enough to leak excessively can still be too small to find with the naked eye. The use of a magnifying glass would assist you.

HOSE LIFE

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

High oil temperatures (over 200 degrees Fahrenheit, 93 degrees celcius) quickly harden or stiffen a rubber hose. When pressure pulses flex a hardened hose, it fails by cracking. Every increase of 25E F (14EC) cuts hose life in half. Use a replacement hose rated for actual fluid temperatures. Keep a log of hose use so replacement can be made before failure occurs.

If a hose is installed with a twist in it, high operating pressures tend to force it straight. This can loosen the fitting or even burst the hose at the point of the strain.

HYDRAULIC SYSTEM

TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSE	SOLUTION
Hydraulic pump does not develop pressure	<p>No hydraulic oil in tank (NOTE: if pump is run without oil in tank, pump damage will occur.)</p> <p>Shut-off valve closed. (NOTE: if pump is run with valve closed, pump damage will occur.)</p> <p>Main relief valve bypassing. (NOTE: oil blowing past any relief valve can cause oil to overheat.)</p> <p>Main pump compensator setting is too low.</p> <p>Pump is defective.</p> <p>Destroke valve stuck.</p> <p>Pump switch turned off.</p> <p>Tank not pressurized.</p>	<p>Check oil level. Refill tank.</p> <p>Open valve completely.</p> <p>Increase pressure setting on relief valve. (See Pressure checks)</p> <p>Adjust compensator setting. (See Pressure Checks)</p> <p>Refer to pump manual or replace pump.</p> <p>Repair or replace.</p> <p>Turn on.</p> <p>Check small air compressor. Check for air leak out of tank.</p>
Hydraulic pump excessively noisy	<p>Cold oil.</p> <p>Low oil level.</p> <p>Oil viscosity too high (oil too thick)</p> <p>System relief valve set too low.</p> <p>Intake hose to pump restricted.</p> <p>Defective pump.</p>	<p>Allow unit to warm up.</p> <p>Check and add oil.</p> <p>Drain and add correct oil as specified under "RECOMMENDED LUBRICANTS".</p> <p>Increase pressure setting on relief valve (see Pressure Checks)</p> <p>Inspect and repair.</p> <p>See pump manual, repair or replace pump.</p>
Machine will not propel	<p>Main pump not developing pressure.</p> <p>Propulsion relief setting too low.</p> <p>Nippers not retracted or nipper work up switch not actuated.</p>	<p>See above.</p> <p>Increase relief setting. (See Pressure checks)</p> <p>Check nipper up switch, repair or replace.</p>
Hydraulic Oil Overheats	<p>Oil viscosity too high (oil too thick)</p>	<p>Drain and add correct oil as specified under "RECOMMENDED</p>

PROBLEM	POSSIBLE CAUSE	SOLUTION
	<p>System relief valve set too low.</p> <p>Oil lines damaged causing excessive internal restriction</p> <p>Travel relief set too low</p> <p>Turntable valve in wrong position</p>	<p>LUBRICANTS".</p> <p>Increase pressure setting on relief valve (see Pressure Checks)</p> <p>Inspect and repair.</p> <p>Check and reset</p> <p>Valve handle should be pushed down.</p>
Hydraulic Oil Foams	<p>Water in oil</p> <p>Using wrong oil</p> <p>Low hydraulic level</p> <p>Damaged hydraulic oil lines</p> <p>Air leak in suction line to hydraulic pump or pump shaft seal leaking</p>	<p>Inspect oil for water. Drain and add correct oil as specified under "RECOMMENDED LUBRICANTS".</p> <p>Drain and add correct oil as specified under "RECOMMENDED LUBRICANTS".</p> <p>Fill</p> <p>Inspect, repair or replace.</p> <p>Inspect, repair or replace.</p>
Hydraulic Oil Filter Restriction Indicator Light stays on all the time (optional equipment)	<p>Restricted hydraulic oil filter.</p> <p>Hydraulic oil filter restriction switch</p>	<p>Replace filter.</p> <p>Replace switch.</p>

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

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

TROUBLESHOOTING

Anchor Applicator Model F

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

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

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

