HSTX - Hydraulic Switch Tamper

Read & Understand all precautions in Section 1 of this manual before operating or servicing this machine.

NOTICE

Precautions must be taken to correctly isolate on board electronic systems while welding on this machine.
Failure to do so will result in system damage. See the Maintenance Section in this manual for the procedures.

Operation Manual

Including Routine Maintenance

Starting Machine S/N: **220100**
Reorder Manual P/N: **49452200**
Revision: **D**
October 2017

REVISIONS

Release	Date	Change Description
1	JUNE 2015	Initial release of manual
A	FEB 2016	Reformat of manual
B	JUL 2016	Updated Lubrication Instructions
C	JAN 2017	Reformat, update all topics
D	OCT 2017	Propel Gearbox Lubrication, chain tensioning

ABOUT THIS MANUAL

This Operation manual is part of the Machine Manual and contains operation and routine maintenance information for the:

HSTX - Hydraulic Switch Tamper

manufactured by Nordco Inc. Oak Creek, Wisconsin. This Operation manual covers safety instructions and information, product technical information, as well as basic operating and maintenance procedures. Additionally a Glossary of terms and acronyms is provided at the end of this manual.

Information regarding operation and maintenance of specific OEM parts not manufactured by Nordco can be found at the back of the Machine manual, behind the tab marked "**Component Data**".

This Machine manual includes the Parts Book, which is broken down into sections separated by index tabs:

"Mechanical Tab" has individual parts breakdown drawings and lists for each assembly.

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

"Electrical Tab" includes electrical schematics, distribution and control boxes, and cabling drawings for the machine; as well as troubleshooting instructions.

"Cylinders Tab" includes part breakdowns and service instructions for cylinders installed on the machine.

"Engine Tab" includes the engine Operation manual and a quick lookup sheet for Fault Codes. Also refer to "ROUTINE MAINTENANCE" on page 7-1 in the Operation manual.

"Component Data Tab" includes Original Equipment Manufacture (OEM) parts information.

The Machine Manual is provided for use by qualified personnel who will supervise, operate or service this machine. It is imperative that all operators become familiar with all safety instructions, controls and instruments before operating this machine. Follow all instructions carefully as detailed in "SAFETY INSTRUCTIONS & INFORMATION" on page 1-1 of the Operation manual.

For any other information, please contact:

Nordco Service Manager
(414) 766-2342 (Wisconsin)
1-800-445-9258 (USA and Canada)

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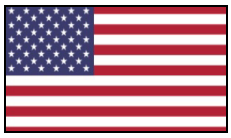
- Measurements in this manual are given in both metric (m, cm) and customary U.S. unit (ft, in) equivalents, where applicable.
- Throughout the Operation manual, operator controls are identified with bold caps and in brackets such as [**ENGINE SPEED**] and their position to be set at are identified in bold caps and italics, such as ***LOW*** or ***HIGH***.
- Personnel responsible for the operation and maintenance of this equipment should thoroughly study the manual before starting operation or maintenance procedures.
- This manual is a permanent component of the 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 Manuals), at a nominal cost, through the Nordco Part Sales Department.



Additional service information, parts, and application information is also available through the following Nordco product support resources:

Nordco Sales: **Oak Creek, Wisconsin** (414) 766-2180
sales@Nordco.com

Nordco Parts: **Oak Creek, Wisconsin** 1-800-647-1724
parts@Nordco.com

Nordco Service: 1-800-445-9258
service@Nordco.com

As a continued service commitment to improve information to our customers please submit any comments or suggestions about this manual using the comment form at the back of this manual or via our website:

http://www.Nordco.com/Parts/Parts-Manual-Feedback.htm

Please direct comments and inquiries to:

Technical Documentation Department
Nordco Inc.
245 W. Forest Hill Avenue
Oak Creek, WI 53154
(414) 766-2367

CALIFORNIA PROPOSITION 65 WARNING

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer; birth defects, and other reproductive harm.

HAZARDOUS MATERIAL DATA

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

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

Facilities Manager
Nordco Inc.
245 W. Forest Hill Avenue
Oak Creek, WI 53154

(414) 369-5632

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Section 1

SAFETY INSTRUCTIONS & INFORMATION

GENERAL

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

⚠ WARNING

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

- Nordco is NOT responsible for any modifications made without authorization or written approval. Replace all Nordco and Original Equipment Manufacturer (OEM) parts with genuine Nordco or OEM parts. Use of non-Nordco/OEM parts COULD compromise the safety of this machine.
- Federal Railroad Administration (FRA) regulations require that a copy of the Operation Manual be kept on the machine at all times. Additional copies of the Operation Manual can only be ordered from Nordco Parts Sales at 1-800-647-1724.
- Additional copies of this Operation Manual can be ordered from Nordco Parts Sales. Please contact 800-647-1724.

SAFETY ALERT SYMBOLS

Shown here are safety alert symbols used throughout this manual. These symbols require attention!

SAFETY IS IMPORTANT AND MAY BE AT RISK!

⚠ DANGER

This symbol is used to indicate a definite hazardous situation which, if not avoided, COULD result in death or serious injury.

⚠ WARNING

This symbol indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.

⚠ CAUTION

This symbol indicates a potentially hazardous situation which, if not avoided, MAY result in minor or moderate injury and/or property damage. It may also be used to alert against unsafe practices.

NOTICE

This symbol indicates special attention should be given to these specific instructions.

IMPORTANT

This symbol indicates the points that follow are instructions for safely operating the machine or specific components of the machine, and should not be ignored.

NOTE

This symbol indicates points of attention, as reference information, to be remembered.

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** allow anyone to operate this machine without these same instructions. Failure to understand the contents of this manual could result in serious personal injury or death.

⚠ DANGER

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

IMPORTANT

Throughout this manual references are made to right and left sides of the machine which are relative from within the operators control cab while looking toward the engine. Also reference to the front of the machine refers to the engine end of the machine.

GENERAL SAFETY TIPS

Only trained and authorized personnel should be allowed to operate this machine. All personnel at the work site (gang) are to be aware of the safety concerns and their individual responsibilities **PRIOR to working with or near this machine.**

⚠ CAUTION

- **Handle fuel safely. It is highly flammable and prolonged breathing of fumes may cause bodily harm.**
- **Prepare for emergencies. Keep a first aid kit and fire extinguisher handy.**
- **Wear good-fitting pants and shirt, no baggy or loose clothing.**
- **Wear a hard hat and safety goggles or glasses to protect your head and eyes from flying debris.**
- **Wear leather gloves to protect your hands from vibration or flying metal particles.**
- **Wear safety-toed work boots.**

OPERATIONAL SAFETY

SAFETY PRIOR TO OPERATION

ALL personnel at the work site (gang) are to be aware of the safety concerns and of their individual responsibilities **prior to operating this machine**:

⚠ CAUTION

- **If unsure of any operation, review the operating instructions. Know the positions and functions of ALL controls before attempting to operate this machine.**
- **Use the "PRE START CHECKLIST" on page 6-2 to check the machine for obvious faults. Repair or replace parts as necessary PRIOR to operating the machine.**
- **Before climbing onto the machine, make sure 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. Guards are to be removed ONLY when service or maintenance is being performed on that area of the machine. Make certain the guards have been re-installed PRIOR to operating the machine.**
- **Check and service the fire extinguisher (if so provided) at regular intervals. Make certain all personnel are trained in its use.**

NOTE

An unused fire extinguisher still requires a recharge at the interval stated on its last inspection notice.

- **Keep the stairs, cab entry platform, and cab interior 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 Lockup controls on this machine that are used for both work and travel. Lockup points are those areas required to be locked up prior to working, propelling through crossings, switches or other rail obstructions, or during high speed travel. See "WORKHEAD LOCKUPS" on page 3-1, for instructions on use.**
- **Lockup points are to be kept clear and free of debris, excess grease, etc. See "WORKHEAD LOCKUPS" on page 3-1, for instructions on use.**
- **Inspect the safety decals and replace when they become unreadable or are damaged. See "SAFETY DECALS ON THE MACHINE" on page 1-8.**
- **Before starting the engine check ALL fluid levels: engine coolant, hydraulic oil, and diesel fuel levels. Check for any leaks, damaged or loose components, and/or damaged or worn belts.**
- **Sound the horn several times before propelling the machine to alert anyone around the machine that it will soon be moving.**
- **DO NOT make any welding repairs to the machine until all power is shut off to the system by turning the [BATTERY DISCONNECT] switch to the *OFF* position, or disconnect the battery cables.**
- **Keep ALL equipment and assemblies clean.**

SAFETY WHILE STARTING THE MACHINE

ALWAYS use the Command position when running or using the machine. NEVER run the engine or the machine unless someone is at the **EMERGENCY STOP** button on the Left Arm Console.

⚠ CAUTION

To prevent injury to personnel or damage to the machine, it is highly recommended to:

- **ONLY start and operate the machine from the operator's seat.**
- **Use the "PRE START CHECKLIST" on page 6-2 to check the machine controls and gauges to make sure all systems operate correctly.**

ENGINE OPERATION

⚠ WARNING

HARMFUL IF INHALED! Exhaust emissions caused by the use of the engine on this machine may cause cancer, birth defects, or other reproductive harm if inhaled. Avoid inhaling exhaust fumes.

SAFETY WHILE OPERATING & TRAVELING

⚠ CAUTION

- **NEVER allow more riders than seats and seat belts allow. This machine was designed to be operated by one person.**
- **DO NOT stand and operate this machine. The machine is to be operated while seated at the Operator's seat ONLY.**
- **In emergencies and potentially dangerous situations press the EMERGENCY STOP pushbutton, located on the Left Arm Console.**

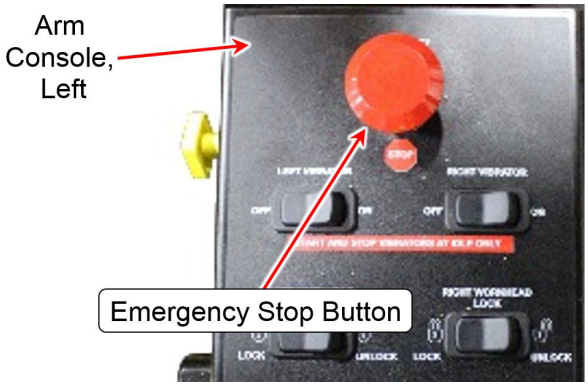


Figure 1-1: Emergency Stop Button

- **If personnel or bystanders are near the machine during operation, sound the horn to give a warning signal. If they fail to respond to this warning, stop operation immediately.**
- **Slow down the work cycle and use slower travel speeds in congested or populated areas.**
- **Halt work if visibility is poor. Strong rains, fog, and extremely dusty conditions can affect visibility in the work area. Wait for the weather to improve before continuing work.**

NON-OPERATIONAL SAFETY

SAFETY WHILE PARKED

When leaving a machine engine running, make certain that the yellow **SYSTEM PARK** brake button and the brake lever are applied.

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

SAFETY DURING MAINTENANCE

NOTICE

The following guidelines are suggested when performing maintenance:

- **Alert others in the area whenever service or maintenance is performed on this machine.**
- **Become familiar with, and use, your company's Lockout/Tagout procedures when performing maintenance on this machine.**
- **Refer to Section 2, "LOCK-OUT/TAGOUT", for a chart on energy sources located on this machine.**
- **DO NOT start the engine if repairs or work are being performed. should ALWAYS have at least two people working together if the engine must run during service repairs. One person needs to remain in the command position (seated at the controls), ready to stop the machine and shut off the engine if the need arises.**
- **Collect oil and fuel as needed and dispose of them properly. Be careful, there is a danger of scalding when working with engine oils.**

NOTICE

- **Use only Nordco supplied repair parts for this machine. Use of non-OEM designed parts could comprise the integrity of this machine.**
- **Precautions must be taken when welding on this machine. Prior to welding shut off power to the machine by setting the [BATTERY DICSONNECT] switch to the *OFF* position AND disconnecting the battery cables.**
- **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 the machine.**

MACHINE SAFETY ALERTS

DANGER

- **Improper use of this machine for ANY type of operation, other than for what is intended, 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 operating, propelling, or working.**

- **Serious injury or death can result from reaching into working components while the machine is running. Make ALL observations from a distance and SHUT OFF the machine while making adjustments.**
- **Shut off the engine when checking battery electrolyte level. DO NOT check or fill the battery in the presence of an 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 the tow bar between the machine and the towing vehicle. Falling from a moving vehicle will cause serious injury or death.**

⚠ WARNING

- **Failure to engage ALL lockup devices before propelling can result in injury to personnel and/or extensive damage to the machine.**
- **Remove hoses and fittings only when the system is not pressurized. High pressure hydraulic leaks can pierce skin and cause personal injury.**
- **ALWAYS turn off the machine when performing maintenance, making adjustments, or whenever unintended movement of the 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.**

⚠ CAUTION

- **NEVER start the hydraulic vibrators when the engine is at full throttle. ALWAYS start at engine idle or damage to the vibrator motors will occur.**
- **NEVER run the vibrators with loose tools as this will cause extreme damage to the hole inside the tool holder portion of the vibrator.**

POTENTIAL FOR MACHINE DAMAGE

NOTICE

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

NEVER shut off the [BATTERY DISCONNECT] switch (BDS) while the engine is running. This could cause damage to the voltage regulator, alternator, and/or electrical system.

IMPORTANT

This machine has an Electronic Control Unit (ECU). Failure to correctly isolate it during welding on this equipment will result in damage not covered under warranty. Unplug the ECU to isolate it.

See the decals on the engine for more engine specific notices that may cause damage to the engine.

SAFETY PROCEDURES

⚠ CAUTION

- **If not already done, determine which components require maintenance. Place ALL machine mechanical systems and/or workheads in the full up and locked positions.**
- **When mechanically locking up equipment is not feasible for maintenance, lower the component to the ground prior to working on the equipment.**
- **Chock the wheels to prevent accidental rolling of the machine on a grade.**
- **Turn the [IGNITION] switch to the *OFF* position.**
- **Place a TAGOUT notice in close proximity to the [IGNITION] switch.**
- **Turn the [BATTERY DISCONNECT] switch (BDS) to the *OFF* position. This turns off the power to the control circuits on the machine. See Figure 1-2.**

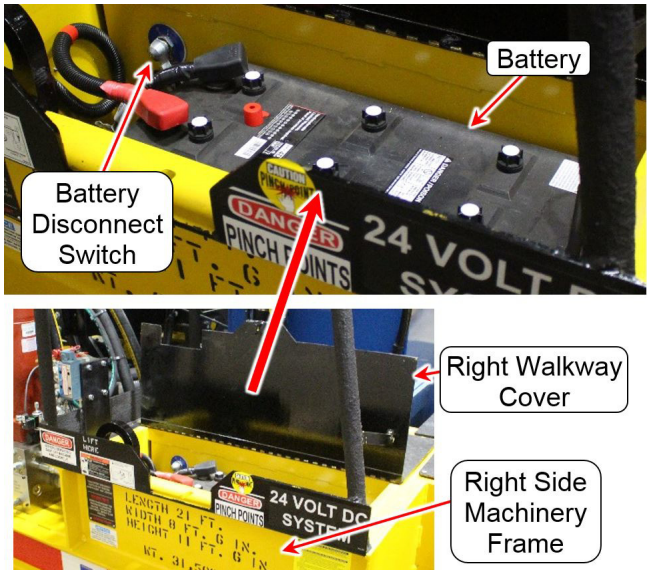


Figure 1-2: Battery Box, Right Side of Machine

For more information on the battery box and [**BATTERY DISCONNECT**] switch locations, refer to Figure on page 5-5“BATTERY BOXES” on page 5-5

- **After turning the [BATTERY DISCONNECT] switch to OFF, place a TAGOUT notice and a LOCKOUT lock on the battery box.**
- **Bleed off the hydraulic pressure.**
- **Follow all of your company’s Lockout/Tagout procedures before proceeding.**

NOTE

When working on the machine components, be aware that moving components during repairs (such as moving a hydraulic cylinder) may create static energy.

SAFETY FEATURES

EMERGENCY SHUTDOWN

The **EMERGENCY STOP** button is located on the Left Arm Console in the cab. See Figure 1-3. Press this button to shut down the machine in emergencies and potentially dangerous situations. This control shuts off the engine and electrical power.

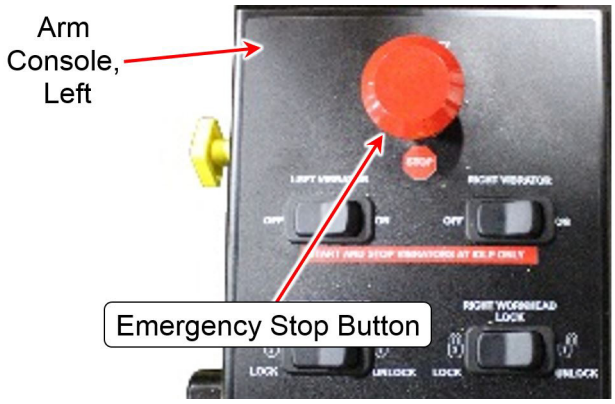


Figure 1-3: Emergency Stop Pushbutton

NOTICE

The Emergency Stop button is to be used only in emergency conditions and it NOT to be used as standard practice to shut down the machine.

NOTE

To operate the Emergency Stop button simply PUSH it IN. To activate electrical power PULL the Emergency Stop button OUT.

ELECTRICAL INTERLOCK

The yellow [**ELECTRICAL INTERLOCK**] button disables the hand controller electronic functions and locks the brakes. For machines with the optional Joystick Disable kit, the joystick hydraulics are also disabled when this button is pushed in. See Figure 1-4.

Figure 1-4: Electrical Interlock Pushbutton

LOCKUPS

This machine incorporates LOCKUPS on the workheads. The Lockups prevent motion in the workheads whenever the machine is not working and the workheads are in their LOCKED position. The lockups should be kept free of debris and excess grease.

The lockup controls are located on the Left Arm Console. See “WORKHEAD LOCKUPS” on page 6-4.

PARKING BRAKE

The Parking Brakes are set once the machine is at a stop, and it is intended to remain stopped. See Figure 1-5.

⚠ CAUTION

MOVEMENT HAZARD! The machine may move and cause personal injury. ALWAYS start and end operations with the yellow SYSTEM PARK button on the Left Arm Console.

The [**SYSTEM PARK**] button is located on the left side of the Left ARM CONSOLE.

To RELEASE the brake:

PUSH the [**SYSTEM PARK**] button ***IN***.

To APPLY the brake:

PULL the [**SYSTEM PARK**] button ***OUT***.

For further information, refer to “PARKING BRAKE” on page 6-10.

Figure 1-5: Parking Brake Control

STEPS, PLATFORMS & HANDRAILS

This machine is fitted with steps and platforms on components such as the fuel tank and the frame assembly. Hand or grab rails have also been added in some areas. These features provide safer access to components when servicing or making repairs.

1: SAFETY INSTRUCTIONS & INFORMATION

SAFETY DECALS ON THE MACHINE

Safety decals and plaques 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 as well. These can be ordered from the Parts Sales Department.

See Table 1-1 and Table 1-2 for the Decals on this Machine:

PART NUMBER	DESCRIPTION	LOCATION
56420001	General Machine Cautions	Inside the Main Control Cabinet Cover, Cab
56420002	Caution! Watch Your Step	Frame, by Steps
56420003	Danger! Do not crawl under...	Frame
56420004	Danger! Pinch Points	Railings / Workhead
56420005	Warning! Hand Hazard	On top of Workhead
56420006	Danger! Before Servicing...	Overhead Console / Frame by [**BATTERY DISCONNECT**] switch
56405355	Lockout Point / Welding Note	Frame by Battery Box Cover with [**BATTERY DISCONNECT**] switch

Table 1-1: Safety Decals on the Machine

GENERAL DECALS

Decal	Part Number	Description
	56405308	Axle Bearing Lube Point
	56420030	Grease Point
	56420033	Grease Point Arrow
	56420012	Lockup Point

1: SAFETY INSTRUCTIONS & INFORMATION

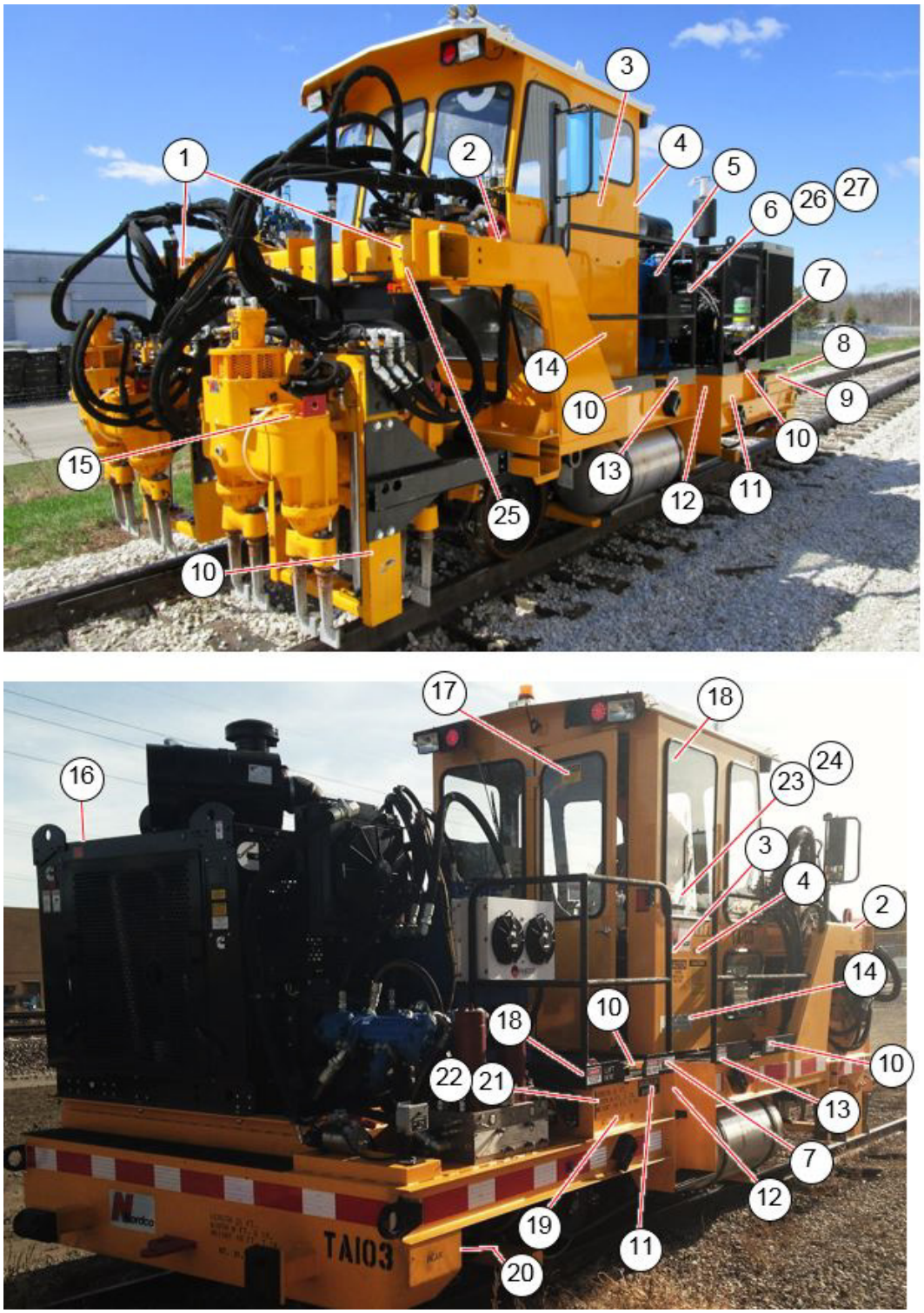
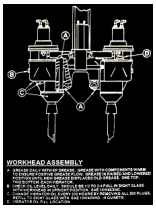
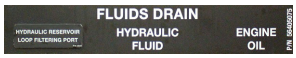


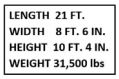
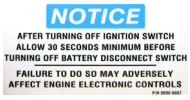
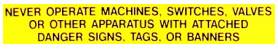
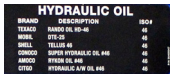
Figure 1-6: Safety Decals Locations

1: SAFETY INSTRUCTIONS & INFORMATION

Table 1-2: DECAL LIST

No.	Decal	Part Number	Description
1		56420005	Hand Hazard
2		56402217	Workhead Assembly Lube Instructions
3		29300186	Hearing Protection Required
4		56420001	CAUTION! General Cautions
5		56406341	Hydraulic Oil
6		56400110	Minimum Hydraulic Oil Level
7		56405131	Battery Jump Start
8		56357102	Machine ID and Serial Number
9		56405075	Fluids Drain
		56405049	Filtering Loop
10		56420004	DANGER! Pinch Points
11		690156	24 Volt DC System
12		56420002	CAUTION! Watch Your Step

1: SAFETY INSTRUCTIONS & INFORMATION

No.	Decal	Part Number	Description
13		56420003	DANGER! Do Not Climb Under
14		56406340	Diesel Fuel Only, Capacity
15		NA	Correct Rotation (8 total, one on each vibrator)
16		56420007	WARNING! Exhaust Emission
17		29300031	CAUTION! Door Must Be Latched
18		56420006	Before Servicing Shut Off
19		NA	Overall Size - Stenciled
20		56405239	Air Tanks Drain
21		56405355	Lockout Area
22		29300027	NOTICE: After turning off ignition
23		NA	Never Operate without Attached Signs, etc. Located inside Cab.
24		NA	Shut Down the Engine when Not in Use. Located inside Cab.
25		NA	Pinch Point
26		29300085	Check Hydraulic Oil Daily
27		56405047	Hydraulic Oil Specifications

Section 2

LOCKOUT/TAGOUT

LOCKOUT/TAGOUT OVERVIEW

⚠ WARNING

MOVING HAZARD! When working on machine components, be aware that moving components during repairs may create energy (that is, moving a hydraulic cylinder). Take proper precautions. Follow your company's Lockout/Tagout policies.

SCALD HAZARD! Personal injury can result from hot oil and hydraulic oil pressure. Allow the oil to cool down and release hydraulic pressure before working on hydraulic components.

PRESSURE HAZARD! The inner and outer traverse have pilot operated check valves in the extend and retract circuit. There will be pressurized hydraulic oil trapped between the pilot operated check valve and the hydraulic cylinder after the engine or hydraulic pump are turned off.

⚠ CAUTION

HIGH PRESSURE HAZARD! High pressure may exist in the hoses. Bleed off both hoses to that circuit.

Nordco has provided the means to **Lockout/Tagout** this machine.

IMPORTANT

Nordco cannot be held responsible for injury caused by failure to comply with your company's Lockout/Tagout Procedures. ONLY qualified and trained personnel are to impose or install Logout/Tagout devices on this machine.

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 and make the machine safe to begin repairs.

It is your company's responsibility to use appropriate **Lockout/Tagout Procedures** based on the included list and train their personnel in proper and safe use, and also to periodically inspect your work area to verify that you are complying with the procedures.

IMPORTANT

Lockout/Tagout Procedures must be followed at all times!

1. It is your company's responsibility to develop and enforce Lockout/Tagout procedures based on the following procedure, to train the operator on their proper and safe use, and to periodically inspect your work area to verify that the operator is complying with the procedures.
2. The following procedures lead the operator or mechanic through the steps required to:
   a. Shut the machine down.
   b. Install Lockout/Tagout devices.
   c. Prepare the machine for performing mechanical maintenance work.
3. These procedures are intended to release potentially dangerous stored energy forms and make the machine safe to begin repairs.
4. Stored or residual energy (as in capacitors, elevated machine components, hydraulic circuits, and pneumatic circuits, etc.) must be dissipated or restrained by methods such as grounding, repositioning, blocking, bleeding down, etc.
5. ONLY trained authorized personnel should be allowed to operate, make adjustments, and repair this machine. If unfamiliar with any of the machine's operation, the operator/mechanic needs to seek the assistance of a trained operator, supervisor, or mechanic.

6. ALL personnel at the job site need to be aware of safety concerns and their individual responsibilities before any operation of this machine. This should include a job briefing with any additional persons involved, including those on adjacent equipment.
7. If unsure of any of the tasks listed in this document, please consult the supervisor and always refer to the Operation and Maintenance Manual for this equipment.
8. DO NOT start the engine if repairs or work are being performed alone. The operator 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 the engine if the need arises.
9. Check that the machine has an Operation Manual, lockout tag, and clasp. Check that the operator and each mechanic has an assigned individual lock to secure a lock out clasp to the battery box.

LOCKOUT/TAGOUT PROCEDURE CHECKLIST

System Under Service:	Energy Source to be Locked Out:	Mandatory Procedure:
All Systems		For all of the following procedures: 1) Perform a job briefing. 2) On the Control Cabinet control panel set the [**ENGINE SPEED]** switch to the ***LOW*** position.
Electrical System (Main Control Cabinet, Battery, Wiring Harnesses, Junction and Control Boxes, Proximity Switches)	Electrical	1) Apply the parking brakes. PULL the yellow [**SYSTEM PARK**] switch located on the left side of the Left Arm Console ***OUT***. 2) On the Overhead Console turn the [**IGNITION**] switch to the ***OFF*** position. 3) Turn the [**BATTERY DISCONNECT**] switch to the ***OFF*** position. 4) Close, lock out, and tag the battery box. **NOTE** *This cuts off the electrical power supply to the machine.*
Engine	Electrical	1) Apply the parking brakes. PULL the yellow [**SYSTEM PARK**] switch located on the left side of the Left Arm Console ***OUT***. 2) On the Control Cabinet control panel turn the [**IGNITION**] switch to the ***OFF*** position. 3) Turn the [**BATTERY DISCONNECT**] switch to the ***OFF*** position. 4) Close, lock out, and tag the battery box. **NOTE** *This cuts off the electrical power supply to the machine and prevents accidental startup of the engine while servicing.*

2: LOCKOUT/TAGOUT

System Under Service:	Energy Source to be Locked Out:	Mandatory Procedure:
Brakes	Pneumatic	1) Park the machine on a level section of track. 2) Install chock blocks at the machine's wheels. 3) Apply the parking brakes. PULL the yellow [**SYSTEM PARK**] switch located on the left side of the Left Arm Console ***OUT***. 4) Set the [**ENGINE SPEED**] switch to ***LOW*** to decrease the engine speed to the desired level. 5) Push the yellow [**ELECTRICAL INTERLOCK**] switch ***IN***. 6) On the Control Cabinet control panel set the [**IGNITION**] switch to the ***OFF*** position. 7) Turn the [**BATTERY DISCONNECT**] switch to the ***OFF*** position. 8) Close, lock out, and tag the battery box. 9) Open the air drain valve to drain off stored air pressure.
All Hydraulic Systems	Hydraulic Pressure	**WARNING** **After Lockout/Tagout and BEFORE any repair or maintenance begins:** 1) Manually shift the directional control valves of the hydraulic circuit under service. 2) Open the hose fittings 1/8 to 1/4 turn Counterclockwise (CCW) at the cylinder or motor of the hydraulic circuit under service. This allows the pressurized oil to bleed off. Service or perform maintenance on the hydraulic circuit after the steady flow is gone. **NOTE** *This allows pressurized hydraulic oil between a directional control valve and the cylinder/motor to bleed off that might still be in that circuit.*

2: LOCKOUT/TAGOUT

System Under Service:	Energy Source to be Locked Out:	Mandatory Procedure:
Propulsion System	Hydraulic	1) Apply the parking brakes. PULL the yellow [**SYSTEM PARK**] switch located on the left side of the Left Arm Console ***OUT***. 2) On the Control Cabinet control panel set the [**IGNITION**] switch to the ***OFF*** position. 3) Turn the [**BATTERY DISCONNECT**] switch to the ***OFF*** position. 4) Close, lock out, and tag the battery box. **NOTE** *This cuts off the hydraulic pressure/flow to the filters and the directional control valves of the machine.*
Workheads Turntable	Hydraulic Gravity	1) On the Main Control Cabinet set the [**MODE**] switch to the ***TRAVEL*** position. This raises the workheads to allow insertion of the lockup devices. 2. Set the [**LEFT WORKHEAD LOCK**] switch in the ***LOCK*** position. Make sure that the lockups have engaged. 3) Set the [**RIGHT WORKHEAD LOCK**] switch in the ***LOCK*** position. Make sure that the lockups have engaged. 4. Apply the parking brakes. PULL the yellow [**SYSTEM PARK**] switch located on the left side of the Left Arm Console ***OUT***. 5) On the Control Cabinet control panel set the [**IGNITION**] switch to the ***OFF*** position. 6) Turn the [**BATTERY DISCONNECT**] switch to the ***OFF*** position. 7) Close, lock out, and tag the battery box. **NOTE** *This cuts off hydraulic pressure or flow to the workhead and directional control valves that prevents the "drifting" down of the workheads.*

LOCKOUT/TAGOUT REMOVAL PROCEDURE

The following procedures lead the operator/mechanic through the steps required to remove the Lockout/Tagout and return the machine to operation and after mechanical/maintenance is finished.

1. Check the machine and the area around the machine for tools, replaced parts, and items used during the mechanical or maintenance work that may need to be removed.
2. Visually check and inspect the machine's components before machine start up and operation.
3. Check the work area to make sure that all employees have been removed from the area or know their individual responsibilities before operating this machine.
4. Remove the assigned individual padlock(s) and the interlocking scissors hasp (Lockout/Tagout).
5. Follow all STARTUP procedures before starting/running the machine (See "PRE START CHECKLIST" on page 6-2).
6. Check the machine operation and inspect for leaks.
7. Notify all affected employees that the servicing or maintenance is completed and the machine or equipment is ready for use.

Section 3

LOCKUP POINTS

OVERVIEW

⚠ CAUTION

PERSONAL INJURY HAZARD! Failure to engage all lockup devices before propelling at travel speed can result in injury to personnel and/or cause machine damage. Make sure ALL devices are locked in place before traveling.

⚠ CAUTION

PERSONAL INJURY HAZARD! Failure to remove all lockup devices before working operations can result in injury to personnel and/or damage to the machine. Make sure ALL workheads and moving parts are unlocked before working with the machine.

This machine is equipped with Lockup Points required for machine travel, on both the left and right side of the machine. The lockup points are painted RED. Decals are located next to or near each lockup area. See Figure 3-1.

The lockup points are required to be LOCKED during these activities:

- During maintenance and service of this machine, unless lockup of the assembly prevents access to the area being serviced.
- In WORK mode prior to traveling through crossings, switches or other rail obstructions
- During high speed and non-working travel mode.

NOTE

All lockups must be unlocked prior to performing any working operations.

To engage the lockups, refer to the instructions in "OPERATING THE LOCKUPS" on page 6-4.

IMPORTANT

- **When the lockups have been set, visually make sure that the lockups have engaged.**
- **Lockup areas must be kept clear of debris, excess grease, etc.**
- **Always stay clear of the lockup areas as they may be activated by the operator at any time.**

Figure 3-1: Lockup Areas on the Machine

3: LOCKUP POINTS

WORKHEAD LOCKUPS

The workhead lockups secure the workheads to the frame. See Figure 3-2. These locks are controlled pneumatically with a switch on Left Arm Console.

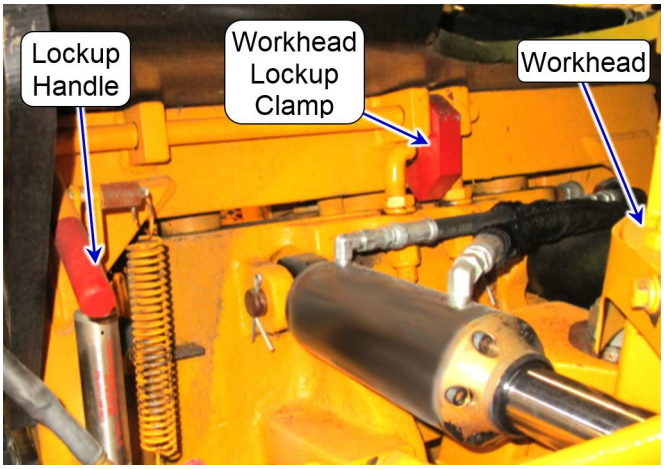


Figure 3-2: Workhead Lockups

TRAVERSE LOCKUPS

The traverse lockups secure the workhead assemblies to the frame so they do not slide out to the sides. See Figure 3-2. These locks are controlled manually with a pin. See Figure .

Figure 3-3: Traverse Lockups

TURNTABLE LOCKUP

The turntable lockup secures the turntable to the frame. See Figure 3-2. These locks are controlled hydraulically at the turntable manifold.

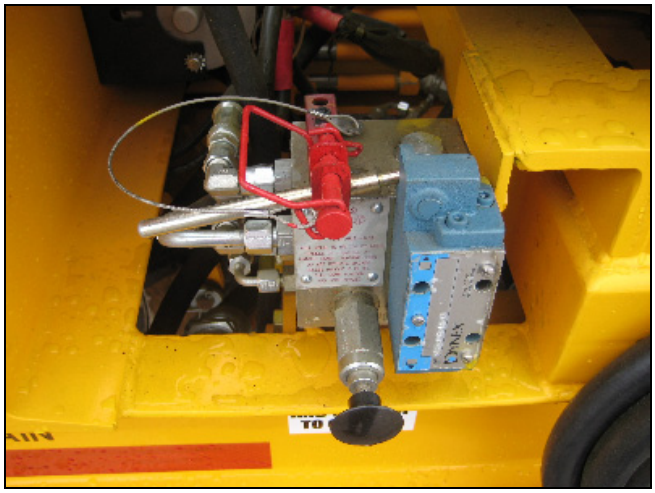


Figure 3-4: Turntable Lockup

Section 4

MACHINE SPECIFICATIONS

ABOUT THIS MACHINE

This machine is used to tamp ballast both inside and outside the rails as well as through switches.

It is a squeeze-type tamper with traversing workheads, performance speeds, simplicity in operation and maintenance, as well a high degree of dependability. The smaller footprint allows the machine to work in much tighter areas than other tampers.

The machine is a workhorse designed for speed, accuracy, and dependability. The tamper enables the operator to tamp the entire switch area and follow production machines very quickly and accurately.

The 16 tool machine includes four workheads normally configured to work simultaneously. However each side can be operated independently if the conditions require it. It also is capable of a manual or automatic tamping cycle.

This machine utilizes electric over hydraulic controls, ergonomic operator station, four wheel drive and air-operated clasp-type brakes with a failsafe feature on all four wheels.

It includes the following major working components:

- **Drive unit for propulsion**
- **Tamper workheads to tamp the ballast**

4: MACHINE SPECIFICATIONS

SPECIFICATIONS - HSTX TAMPER

(Continued on next page)

Category	Specification	Value
GENERAL	Gross Weight	31,500 lbs. (14,288 kg) **
	Length	21 feet (6.4 meters)
	Width: Workheads Retracted--------- One Workhead Extended--------- Both Workheads Extended---------	 8 feet 6 inches (2.6 meters) 11 feet (3.4 meters) 13 feet 6 inches (4.1 meters)
	Working Clearance	13 Feet 6 inches (4.1 Meters)
	Height	10 feet 7 inches (3.2 meters)
	Travel Speed on Rail	Top speed of 30 mph (56 km/h)
	Rated Draw Bar Pull (on rail)	15,000 lbs. (6803 kg)
	Turntable	Hydraulically Operated - Rail to Rail
	Towing Speed	35 mph (56 km/h) maximum
CAPACITIES	Fuel Tank (Painted Green) Dual Connected Tanks	Two 50 Gallon (189 liter) Tanks 100 Gallons (378.5 liters)
	Weight of One Full Tank Combined Weight of Both Tanks	300 Lbs (136.1 kg) 600 Lbs (272.2 kg)
	Hydraulic Oil Tank (Painted Blue)	185 Gallons (700 liters)
	Weight of Full Tank	1332 Lbs (604.2 kg)
	Oil Cooler	30 gpm (114 L/mn)
	Motor Gear Box	1.375 Quarts Gear Oil
AXLE DRIVE SYSTEM	Drive Type	Dual Axle Chain Drive
	Propulsion Motor Type	Hydraulic Motor Driven 2 Speed variable displacement motor
AXLE/WHEELS	Axle Size	3.44 inch (8.7 cm)
	Wheel Size	24 inch (60 cm) diameter
	Wheel Type	Forged Steel
BRAKES	Type	Pneumatically Applied (Air)
	Style	Four Wheel Cobra-Style
	Indexing ------	4 Wheel Hydro-Dynamic
	Traveling ------	Four Wheel Clasp Type with Fail Safe
	Emergency & Parking ------	Fail Safe Spring Take-Over
HYDRAULIC SYSTEM	Main Pump Manufacturer	Rexroth
	Volume	25.7 GPM
	Compensator - Main Pump Pressure	2,700 psi (186.2 bar)

4: MACHINE SPECIFICATIONS

Category	Specification	Value
	Relief Cartridge (Valve Banks)	1600 psi (110.3 bar)
	Main Pump Make/Model	Rexroth Model A10VO, Series 31, Size 45
	Type	Piston Pump
	Vibrator Pump Manufacturer	Hybel
	Volume	18.6 GPM
PNEUMATIC SYSTEM	Engine Mounted Compressor: Unloading Valve --------- Relief Valve---------	14 cfm @ 120 psi 90 psi/110 psi 150 psi
	Tanks	2 @ 6.5 gallons each
	Air Dryer	CR Brakemaster Turbo 2000, with Heater
ELECTRICAL SYSTEM	Battery	24 VDC - Dual 12 VDC Batteries 1150 Cold Cranking Amps
	Ground	Negative
	Alternator	70 Ampere
	Main Disconnect	Positive Disconnect
ENGINE JOHN DEERE	Make/Model	**6068 HF485 Tier 3**
	Type	Turbocharged, 6-Cylinder
	Dry Weight (with Pump Drive)	1495 Lbs (678 kg)
	Continuous BHP	175 HP @ 2200 rpm
	Oil Capacity	34.3 Quarts (32.5 Liters)
	Coolant Capacity	13 Quarts (11.9 Liters)
	Maximum Oil Temp	280°F (138°C)
	Recommended Minimum Operating Temp.	160°F (71°C)
ENGINE CUMMINS	Make/Model	**QSB6.7, Tier 3**
	Type	Turbocharged, 6-Cylinder
	Dry Weight (with Pump Drive)	1450 Lbs (658 kg)
	Continuous BHP	190 HP @ 2350 rpm
	Oil Capacity (total system)	16 Quarts (15 liters)
	Coolant Capacity	5 Gallons (19 liters)
	Maximum Oil Temp	280°F (138°C)
	Recommended Minimum Operating Temp.	160°F (71°C)

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

**Approximate weight. Actual weight may vary according to the options on the machine. The actual weight of the machine is as stenciled on the frame.

OVERALL MACHINE DIMENSIONS

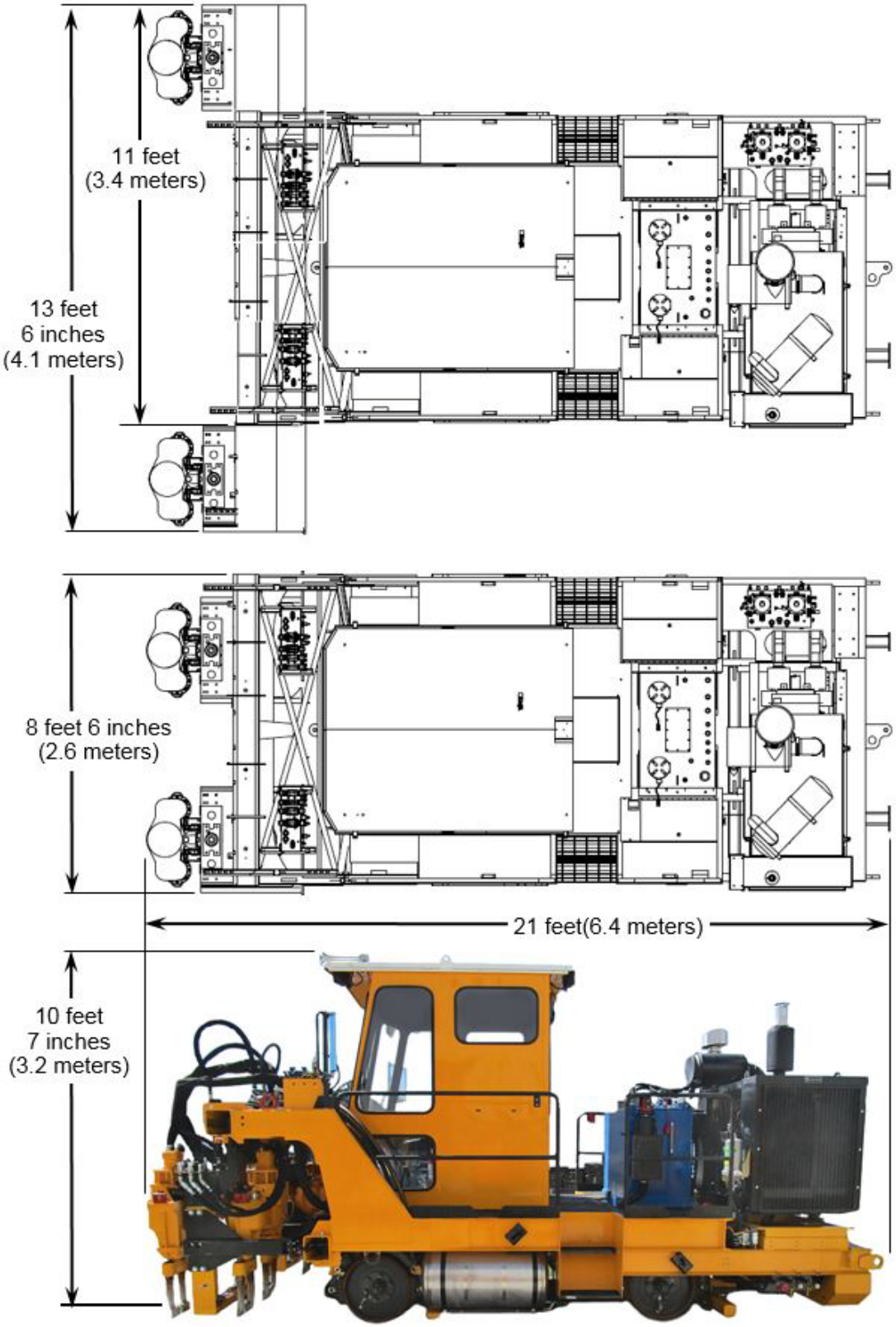


Figure 4-1: Overall Dimensions

MACHINE ORIENTATION

Throughout this manual references made to RIGHT and LEFT are relative from within the operators control cab while looking toward the tamper workheads. Also reference to the FRONT of the machine refers to end of the machine with the tamper workhead. The BACK of the machine refers to the end of the machine with the engine. See Figure 4-2.

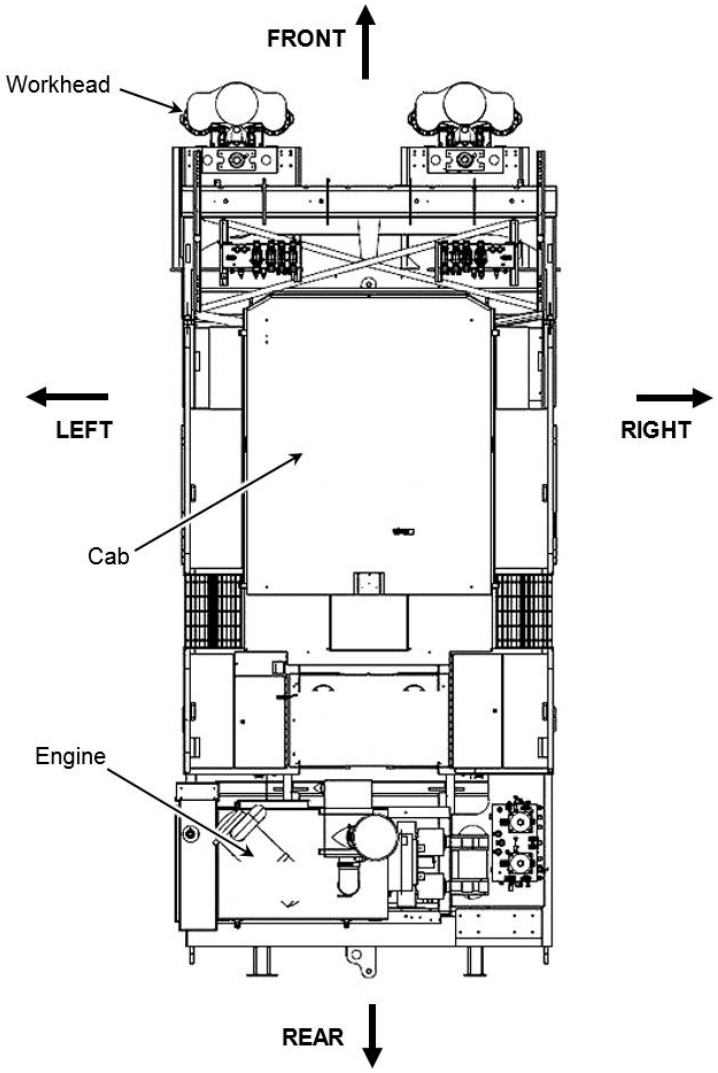
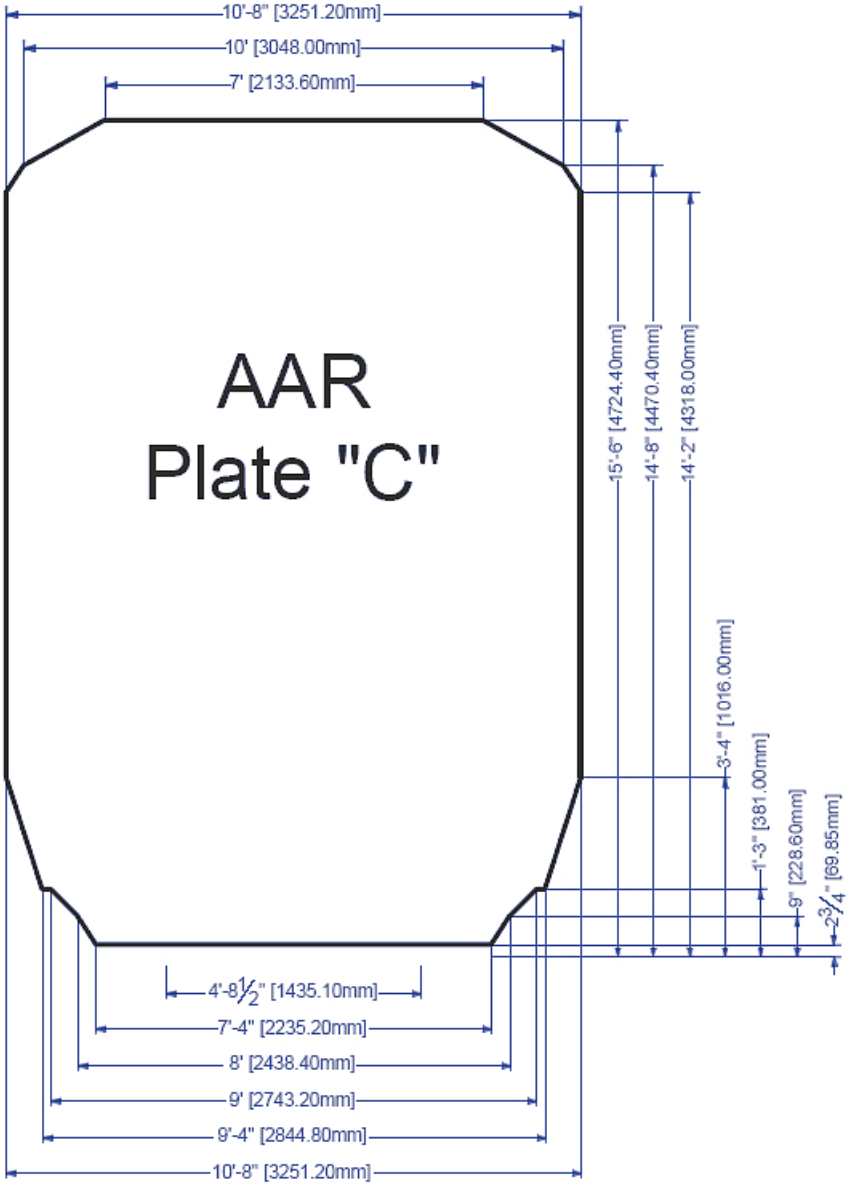


Figure 4-2: Machine Orientation View

4: MACHINE SPECIFICATIONS

RAILWAY LINE CLEARANCE

This machine meets Association of American Railroads (AAR) Plate C Clearance.



Section 5

OPERATOR SYSTEM & CONTROLS FAMILIARIZATION

An overview of critical assemblies and operator controls are outlined in this section. Operators must become familiar with all components of this machine before using the machine.

DANGER

DO NOT allow anyone to operate this machine without proper on-board training. Failure to understand the contents of this manual could result in serious personal injury or death.

WARNING

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

Federal Railroad Administration (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 the controls properly.

Under no circumstances are there to be more riders on this machine than seat belts available. Always use the seat belt when sitting in the operator seat.

5: OPERATOR SYSTEM & CONTROLS FAMILIARIZATION

MACHINE COMPONENTS

Critical machine components are identified in the following figure.

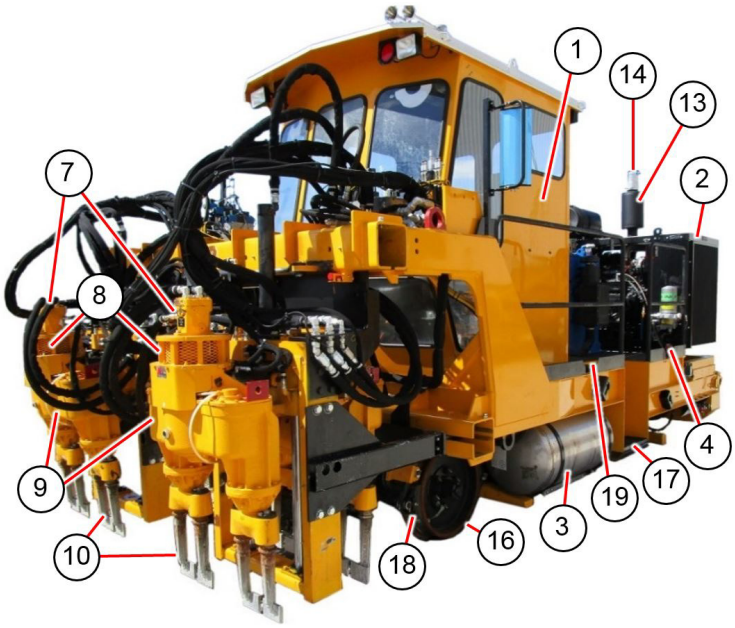


Figure 5-1: Left Side View

1 Operators Cab
2 Engine
3 Fuel Tank
4 Battery Box (Below Walkway, Each Side)
5 Battery Disconnect Switch (In Box)
6 Pressure Filters
7 Workhead Motor
8 Workhead Fan
9 Vibrator Workheads
10 Tamping Tines
11 Hydraulic Tank
12 Air Cleaner
13 Muffler
14 Exhaust
15 Oil Cooler
16 Drive Wheels & Axles
17 Access Steps
18 Brakes
19 Fuel Filler
20 Cab Door
21 Main Pumps 1 & 2
22 Vibrator Pumps 1 & 2

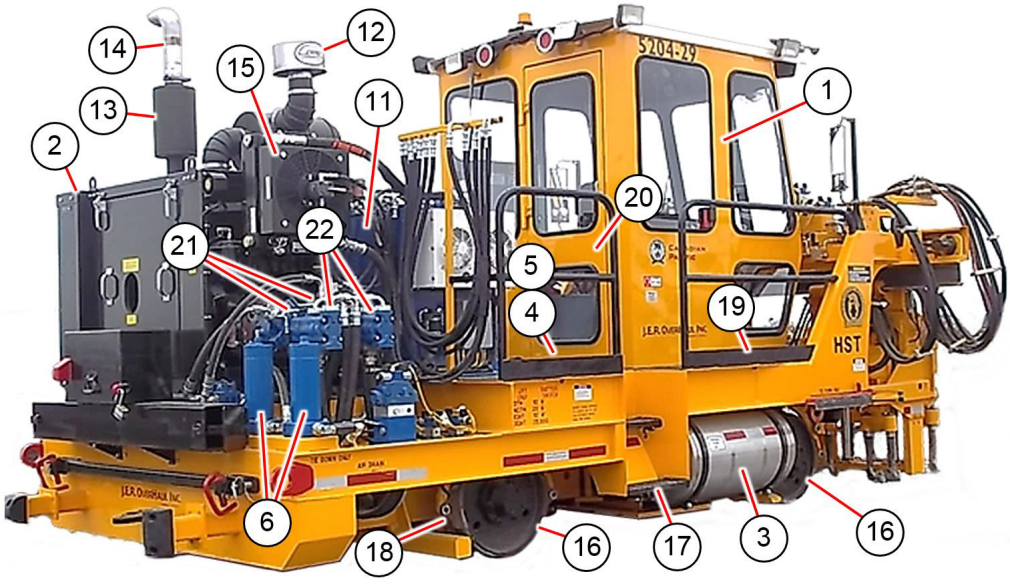


Figure 5-2: Right Side View

VIBRATOR WORKHEAD ASSEMBLY

NOTICE

Start and stop the vibrators with the ENGINE SPEED switch at *IDLE* only. Failure to do so may damage the vibrator motors.

Be sure to allow the hydraulic fluid to warm up before starting the vibrators.

There are four (4) workheads on this machine. Each workhead consists of a vibrator unit with four (4) tools attached. There are a total of 16 tools on this machine. See Figure 5-3. Each side of the machine has a front and rear workhead that operates in sync with each other. The operator can select whether to run just the left or right sets or both at the same time.

The vibrators vibrate the tools at approximately 3200 vibrations per minute (VPM) with a maximum movement range of 3/8 inch (9.5 mm). As the tool vibrates it lowers into the ballast to a depth preselected by a lower proximity switch setting. See “WORKHEAD PROXIMITY SWITCHES” on page 6-12 for more information. When the maximum depth has been reached, the front and rear workhead tools close and compact the ballast under the tie.

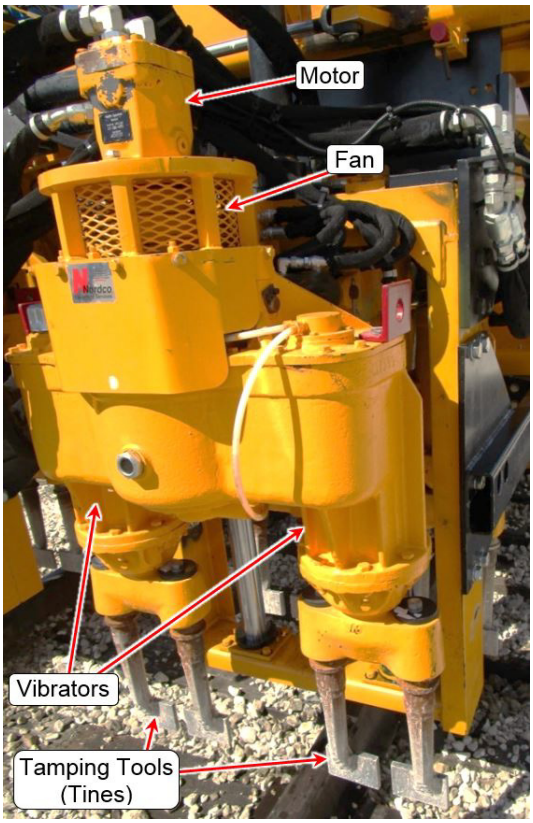


Figure 5-3: Vibrators Workhead

ENGINE

This machine is equipped with an automatic shutdown system when low engine oil pressure and high engine coolant temperatures have been reached. Before the machine reaches its shutdown levels, it activates an audio and visual alarm.

This machine may also be equipped with a Shutdown Override System (Optional), which allows the operator to override and shutdown in the event of an emergency. This gives the operator time to move the machine to a different location before shutting down the machine and attempting to troubleshoot the engine problems.

IMPORTANT

If available, use the Shutdown Override System (Optional) only in the event of an emergency!

MANIFOLDS

The hydraulic system on this machine uses four (4) hydraulic manifolds and one pneumatic manifold. More detailed information regarding the hydraulic system and manifolds can be found in the HYDRAULIC section included with this manual, and for the pneumatic system and manifold can be found in the PNEUMATICS section included with this manual. This includes a layout of the machine and the locations of all hydraulic components. See Figure 5-4, Figure 5-5, and Figure 5-6.

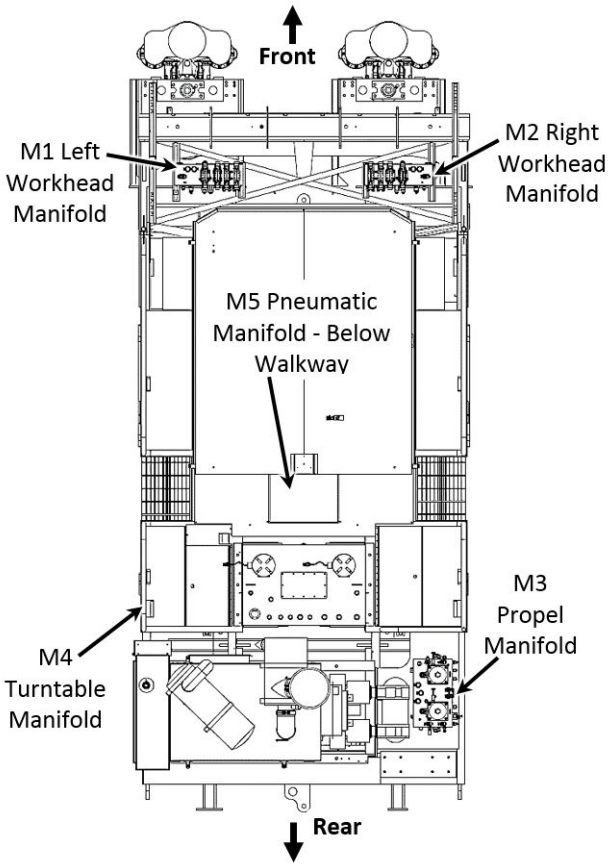


Figure 5-4: Manifold Locations

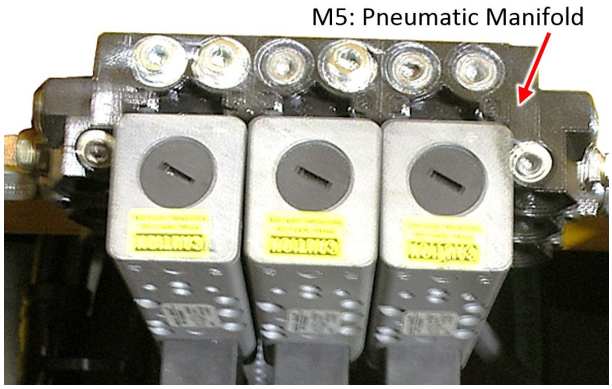


Figure 5-5: Pneumatic Manifold

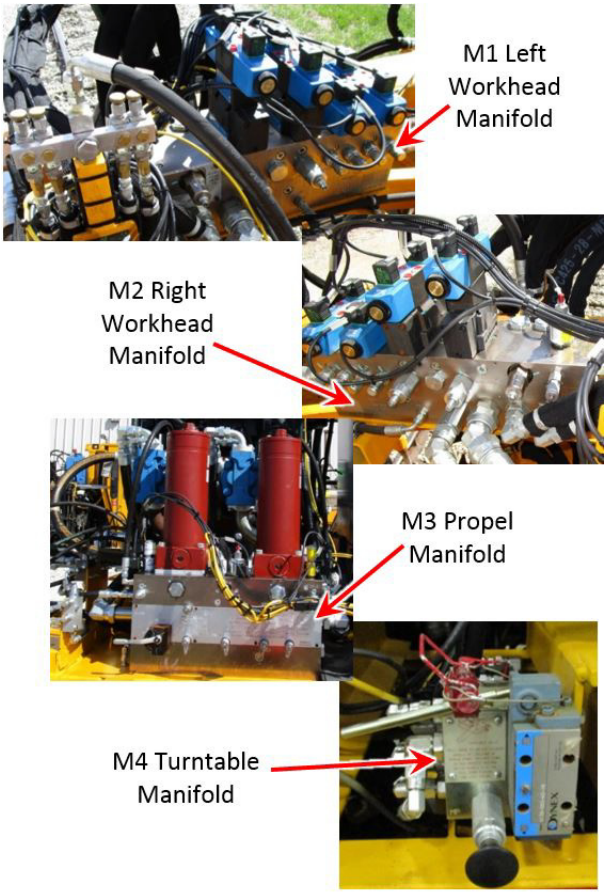


Figure 5-6: Hydraulic Manifolds

PROPULSION DRIVE SYSTEM

This machine is propelled at both axles with a chain drive. There are two hydraulic motors; one located directly next to (behind) the engine and the other is located below the right side of the cab. See Figure 5-7.

Figure 5-7: Drive Axles & Wheels

BATTERY BOXES

There are two (2) battery boxes on this machine, one on each side of the machine behind the cab, under each outer walkway. Each box houses a battery used to power the electrical system. The [**BATTERY DISCONNECT**] Switch (BDS) is located inside the RIGHT side battery box. See Figures 5-8 and 5-9.

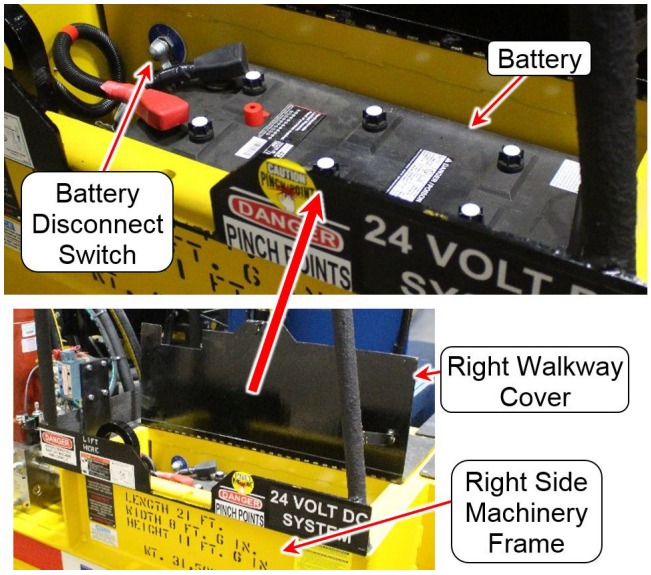


Figure 5-8: Right Battery Box

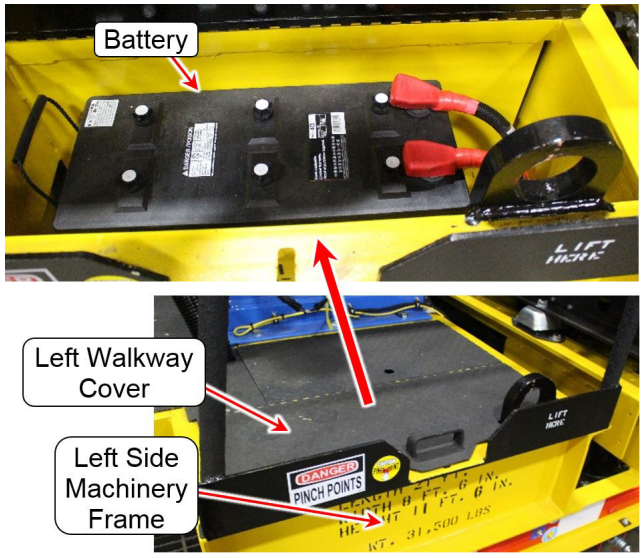


Figure 5-9: Left Battery Box

The walkway plates are hinged on their inboard side. To access the batteries and/or the [**BATTERY DISCONNECT**] switch, lift the walkway plate from the outside and open toward the machine.

Each battery box can be securely locked.

ELECTRICAL SYSTEM

The hydraulic functions of the machine are controlled by the electrical system. The relays, proximity switches, micro switches, and timing modules that make up the electrical system are shown on the schematics and wiring diagrams included in the ELECTRICAL section included with this manual.

REMOTE CONTROLS & INDICATORS

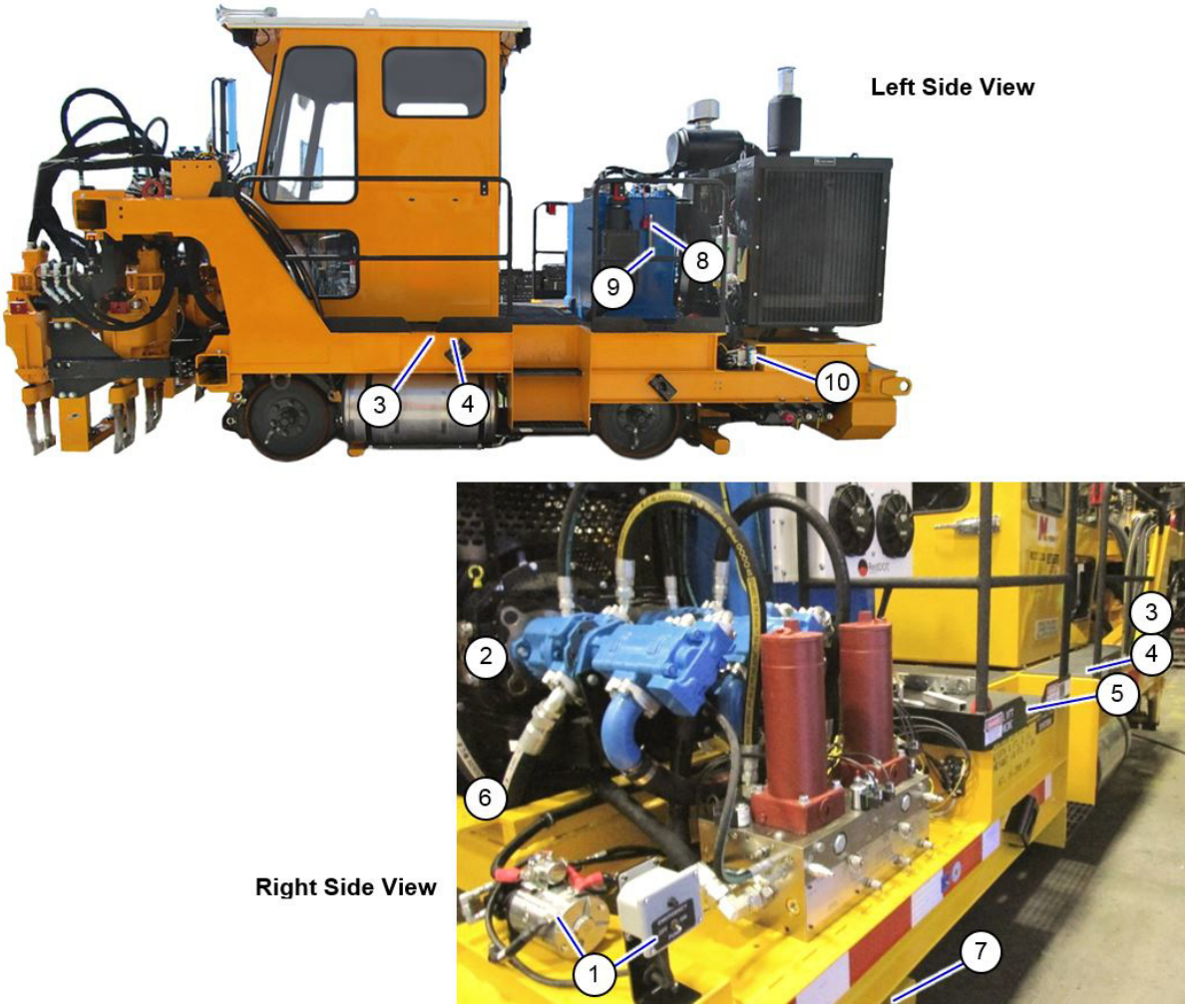


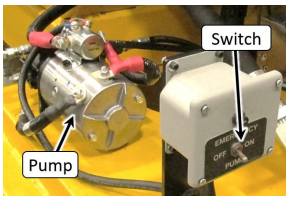
Figure 5-10: Remote Controls & Indicators

NOTE

Refer to the following page for a description of the items in the figure above.

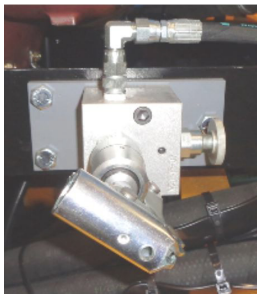
5: OPERATOR SYSTEM & CONTROLS FAMILIARIZATION

Remote Controls & Indicators Descriptions:



(1) EMERGENCY PUMP, ELECTRICAL

Located on the frame behind the propel manifold. The control switch is located on a post next to the emergency pump. When there is loss of hydraulic pressure, this pump is used to supply pressure to the system in order to lock up the workheads for travel.



(2) EMERGENCY HAND PUMP

Located below the left pump (P2) at the right-rear of the machine. When there is loss of hydraulic pressure, this pump is used to supply pressure to lock up the workheads for travel.

(3) PROPEL ENGAGE/DISENGAGE SWITCH

Located on each side of the machine below the walkways, engage or disengage a propel motor to enable machine towing. Both switches must be in either the ***ENGAGE*** or ***DISENGAGE*** position.

(4) FUEL FILLER

Fill the machine with fuel through the opening in the walkways.

(5) BATTERY DISCONNECT SWITCH (BDS)

Located inside the battery box on the right side of the machine, below the walkway. This switch must be in the ***OFF*** position and the cover locked during maintenance.

(6) AIR DRYER

Located below the engine, this removes moisture from the air system.

(7) AIR DRAIN

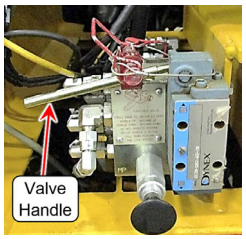
Air System Drain, Air Tanks Water Drain and Purge Tank Drain, located below the propel manifold on the right side of the frame. Pull the cord to release.

(8) HYDRAULIC SIGHT GAUGE

Located on the left side of the hydraulic oil tank, it indicates the level of hydraulic oil in the tank.

(9) HYDRAULIC TEMPERATURE GAUGE

Located on the left side of the hydraulic oil tank, it indicates the temperature of the hydraulic oil in the system.



(10) TURNTABLE CONTROL VALVE

An UP/DOWN directional control valve used to lift the machine off the rails.

NOTE

When the turntable is raised, it MUST be locked up at all times.

5: OPERATOR SYSTEM & CONTROLS FAMILIARIZATION

OPERATOR CONTROLS

DANGER

CRUSHING POTENTIAL! Death will occur if personnel are run over by the machine. To avoid serious injury or death, make certain that the area around and under the machine is clear of ALL personnel and obstructions before start the engine, traveling or working.

CAUTION

INJURY POTENTIAL! Failure to engage ALL lockup devices before propelling at travel speed can result in injury to personnel and/or damage to the machine. Make sure ALL devices are locked up before propelling at travel speed.

Become thoroughly familiar with the function and operation of all controls, as described in this section, before attempting to operate the machine. Also carefully read all instructions in this manual before attempting to operate this machine.

The circled items in the figure are listed below and are described on the following pages, with their numbers in parenthesis.Some controls are optional.

1 Overhead Console
2 Left Arm Console
3 Right Arm Console
4 Main Control Cabinet
5 Propulsion Foot Pedal
6 Brake Lever
7 Parking Brake
8 Emergency Stop Button
9 Electrical Interlock Button
10 Heater / AC / Ventilation System
11 Fans
12 Backup Camera Display
13 Propel Decelerate Valve
14 Operator's Seat

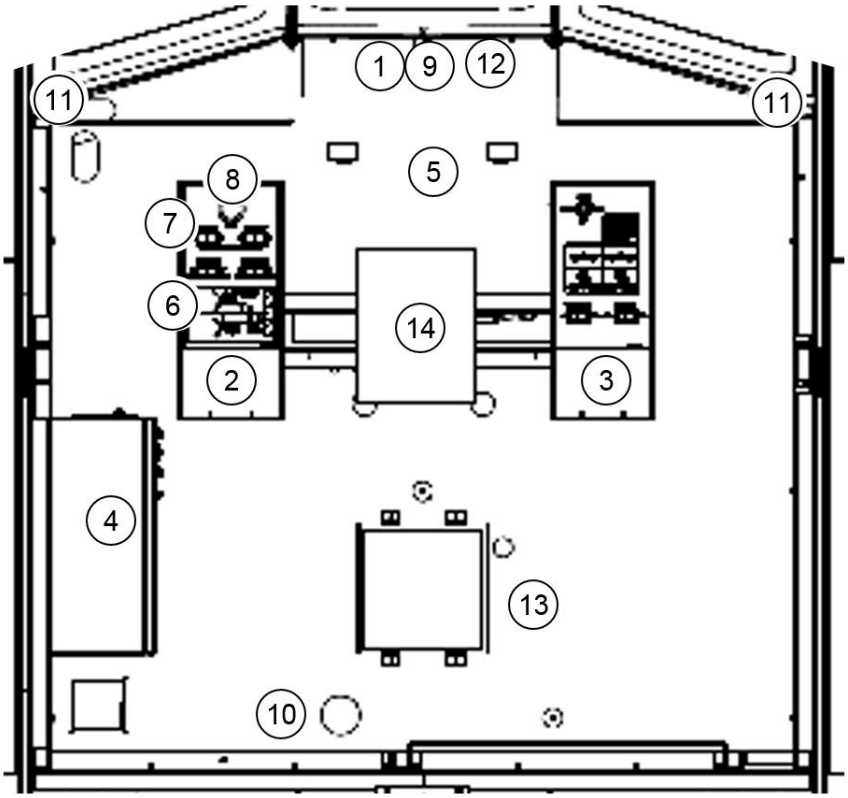


Figure 5-11: Operator Controls

5: OPERATOR SYSTEM & CONTROLS FAMILIARIZATION

OVERHEAD CONSOLE

(Item #1)

The Overhead Console is located in front of the operator, above the front window near the ceiling. This panel contains the gauge that monitors engine and machine performance, switches for lights and wipers, and the ignition and throttle switch for the engine.

At the bottom center of this console is the Engine Diagnostics Display which monitors and displays engine parameters. See Figure 5-12.

NOTE

Some items are optional. Items may vary in location due to options installed.

Figure 5-12: Overhead Console

Description of Controls:

(1) PERIMETER LIGHTS (Optional) - A 2-position switch used to turn the lights on the side of the machine ON or OFF.

(2) FRT CNTR & REAR WIPERS - A 2-position switch used to turn the FRONT CENTER and REAR wipers ON or OFF.

(3) FRT OUTER WIPERS - A 2-position switch used to turn the FRONT OUTER wipers ON or OFF.

(4) HYDRAULIC OIL TEMPERATURE - Gauge that indicates temperature of the oil in the hydraulic reservoir.

(5) SPEEDOMETER - Gauge that indicates the travel speed of the machine in both kilometers and miles per hour.

(6) AUDIBLE ALARM - An alarm that sounds on low oil pressure and high coolant temperature.

(7) AIR PRESSURE - Gauge that displays air system pressure.

(8) LOW PRESSURE WARNING - LED that indicates when there is a low air pressure situation.

(9) FRONT LIGHTS - A 2-position switch used to turn ON the TRAVEL LIGHTS. The front travel lights and rear marker lights are energized.

(10) REAR LIGHTS - A 2-position switch used to turn ON the REAR LIGHTS. The rear travel lights and front marker lights are energized.

(11) WORK LIGHTS - A 2-position switch used to turn on the work lights.

(12) ELECTRICAL INTERLOCK - A yellow pushbutton that shuts off the Travel Power and all work power. The lights, horns, radio functions, etc. still function

(13) ENGINE DIAGNOSTICS DISPLAY - Engine Diagnostic Display. For further information refer to the Electrical Preface included with this manual.

(14) ENGINE SPEED - A 2-position switch used to set the engine speed to Low (Tortoise) or High (Hare) speeds.

(15) IGNITION - A key switch used to turn the electrical power ON or OFF, and also to START the engine.

LEFT ARM CONSOLE

(Item #2)

The Left Arm Console controls the workheads and vibrators. This includes turning the vibrators ***ON*** or ***OFF***, ***LOCK*** or ***UNLOCK*** the workheads, and set the production and squeeze heights. The [**EMERGENCY STOP**] and [**SYSTEM PARK**] pushbuttons are on this console. See Figure 5-13.

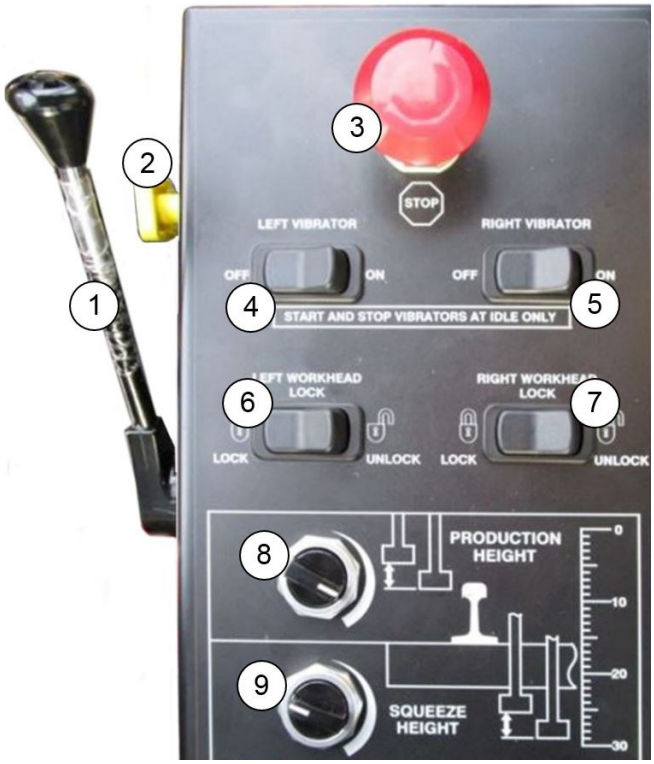


Figure 5-13: Arm Console Controls - Left

Description of Controls:

SIDE CONTROLS

(1) SERVICE BRAKE - Lever to set and release the brakes.

(2) SYSTEM PARK - A push-pull button used to set the brakes.

FRONT CONTROLS

(3) EMERGENCY STOP - A pushbutton use to disable all machine operation and the engine, for emergency situations only.

(4) LEFT VIBRATOR - A 2-position switch that turns the left vibrators ON or OFF.

(5) RIGHT VIBRATOR - A 2-position switch that turns the right vibrators ON or OFF.

(6) LEFT WORKHEAD LOCK - A 2-position switch used to LOCK (engage) and UNLOCK (disengage) the vertical lock on the left workhead.

(7) RIGHT WORKHEAD LOCK - A 2-position switch used to LOCK (engage) and UNLOCK (disengage) the vertical lock on the right workhead.

WORKHEAD HEIGHT CONTROLS (Optional)

(Not used with the proximity switch height control)

(8) PRODUCTION HEIGHT - Rotary dial that adjusts the height the workhead raises to at the end of a tamping cycle.

(9) SQUEEZE HEIGHT - Rotary dial that adjusts the height where the insertion action stops and tools begin to squeeze.

RIGHT ARM CONSOLE

(Item #3)

The Right Arm Console controls placement of the workheads and tamping tools, including placement of the traverse beam and machine movement forward or back. A joystick controls the positioning of the machine and the workhead cycle. See Figure 5-14.

Figure 5-14: Arm Console Controls-Right

Description of Controls:

(1) LEFT TRAVERSE EXTEND RETRACT - A 2-position switch that controls the left to right movement of the left vibrator workhead.

- EXTEND the traverse past the tie.
- RETRACT the traverse to the machine.

(2) RIGHT TRAVERSE EXTEND RETRACT - A 2-position switch that controls the left to right movement of the right vibrator workhead.

- EXTEND the traverse past the tie.
- RETRACT the traverse to the machine.

(3) LEFT TRAVERSE MODE - A 3-position switch used to precisely center the left workhead for installing locks.

- BOTH: Enables full range of motion and fastest adjustment.
- INNER/OUTER: Provides for reduced speed or precise control, to align the workhead for locking.

(4) RIGHT TRAVERSE MODE - A 3-position switch used to precisely center the right workhead for installing locks.

- BOTH: Enables full range of motion and fastest adjustment.
- INNER/OUTER: Provides for reduced speed or precise control, to align the workhead for locking.

(5) WORKHEAD SELECT - A 3-position switch used to select the LEFT, RIGHT or BOTH workheads.

(6) INDEX SELECT - A 2-position switch use to select AUTO or MANUAL mode.

- MANUAL: The joystick cycles the workheads, the foot pedal is disabled.
- AUTO: Enables the foot pedal or the joystick for cycling the workheads.

(7) Joystick - A 4-way Work Control Joystick. Refer to Figure 5-15.

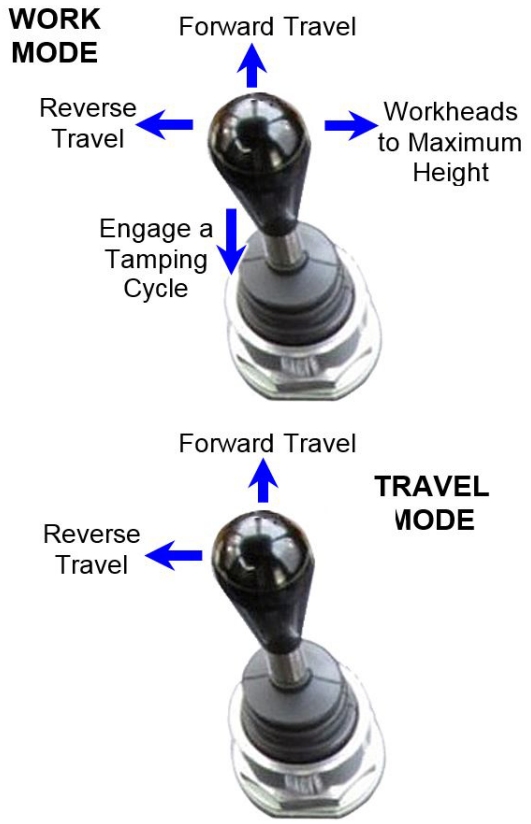


Figure 5-15: Joystick Motions

MAIN CONTROL CABINET

(Item #4)

This panel is located on the left cab wall, behind the operator.

The panel contains switches for the setup of the machine for travel or work. It also contains LEDs that monitor hydraulic filter status. See Figure 5-16.

Refer to the following pages for the Right, Upper and Lower controls.

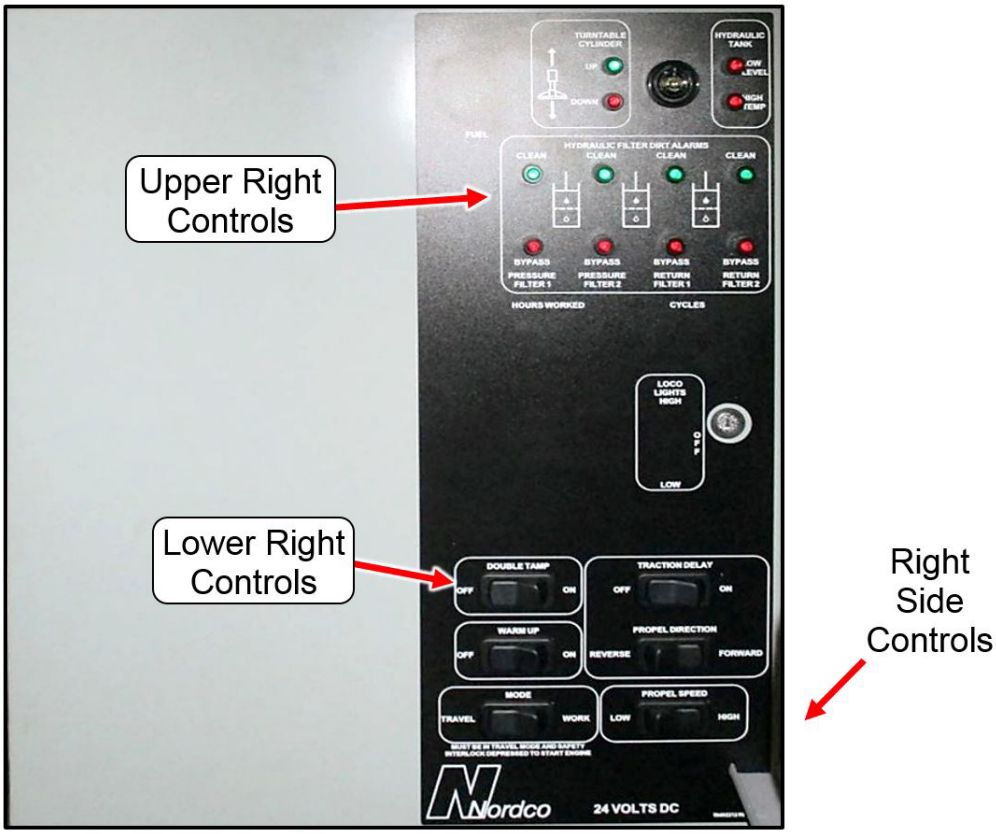


Figure 5-16: Main Control Cabinet

Main Control Cabinet - Right Side

This panel is located on the right cab wall, behind the operator.

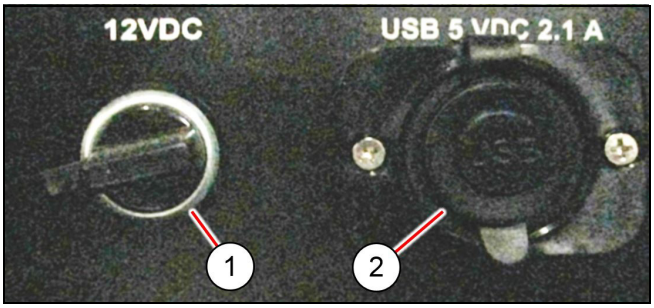


Figure 5-17: Right Side Controls

Description of Controls:

(1) 12 VDC Power - Provides source of 12V power to customer supplied equipment.

(2) USB Outlet: 5 VDC 2.1 A - Provides source of 5V power to charge mobile devices.

5: OPERATOR SYSTEM & CONTROLS FAMILIARIZATION

Main Control Cabinet - Upper

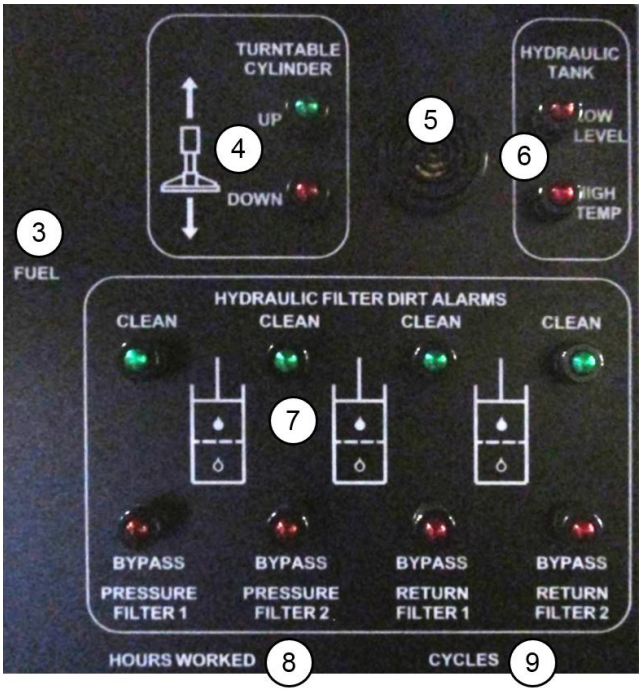


Figure 5-18: Upper Panel Controls

Description of Controls:

(3) FUEL Gauge (Optional) - In-cab diesel fuel tank gauge.

(4) TURNABLE CYLINDER - LEDs which monitor the position of the turntable cylinder to ensure it has not drifted or been unintentionally lowered.

- GREEN: indicates the turntable is raised.
- RED: Indicates the turntable is extended. The audible buzzer will sound.

(5) Alarm - Audible buzzer that sounds when:

- The turntable is extended.
- The hydraulic oil is low (LOW LEVEL).
- The hydraulic temperature is high (HIGH TEMP).
- A hydraulic filter is dirty or clogged.

(6) HYDRAULIC TANK (Optional) - With LEDs, the same audible buzzer that is used for the turntable. The audible buzzer will sound when either of the alarm states occur:

- LOW LEVEL: low hydraulic oil
- HIGH TEMP: high hydraulic temperature.

NOTE

An LED indicates which error is occurring. These are separate from the alarm states issued on the Engine Diagnostics Display.

(7) HYDRAULIC FILTER DIRT ALARMS - LEDs that indicate the status of the filters.

- GREEN: Indicate all filters are in optimum condition.
- RED: An alarm just above the bank of LEDs indicate a filter is dirty or clogged.

(8) HOURS WORKED (Optional) - Indicates the time the machine is powered on and the MODE switch is set to WORK.

(9) CYCLES (Optional) - Cycle Counter that indicates the number of times the tools are inserted into the ballast.

NOTE

When in DOUBLE TAMP mode the Cycle Counter counts two insertions for each cycle.

Main Control Cabinet - Lower

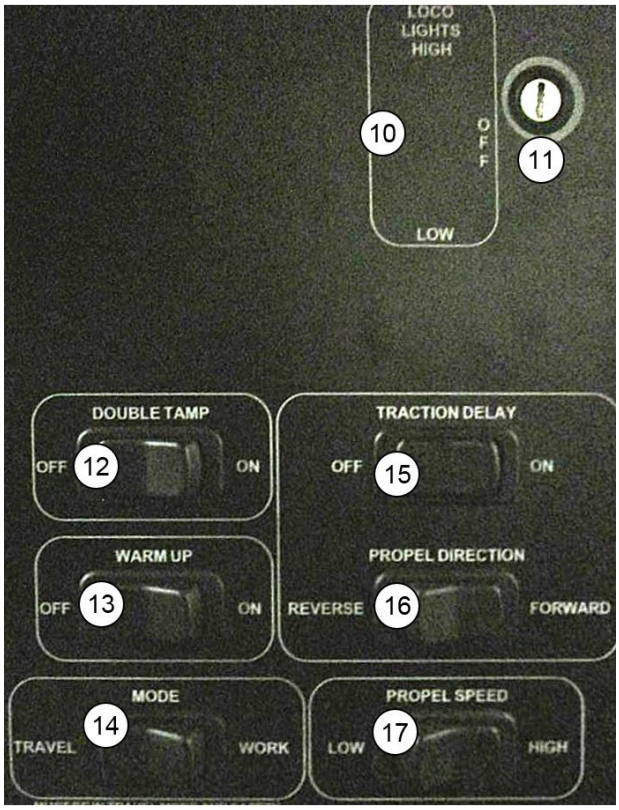


Figure 5-19: Lower Panel Controls

Description of Controls:

(10) LOCO LIGHTS (Optional) - A 3-position switch that controls the large locomotive style bulbs to HIGH beam, LOW beam or center OFF.

(11) DOOR LOCK - Use to lock the internal components and prevent random modifications.

(12) DOUBLE TAMP - 2 position switch which controls the automatic tamping cycles:

- OFF: A single tamp will be performed.
- ON: After the first tamp, the workhead raises a timed amount and then tamps again. This timer is adjustable at the PLC inside the Main Control Cabinet in the cab.

(13) WARM UP - 2 position switch.

- OFF: Normal machine operations.
- ON: Disables workhead and propel functions. Brings the pumps up to a low pressure setting to circulate some oil. Select ON when using the turntable.

(14) MODE - 2 position switch.

- WORK: Enables workhead operations, both tamping cycles and traversing. The foot pedal can be used for workhead auto cycles if the INDEX SELECT switch is set to AUTO.
- TRAVEL: Disables the workhead functions, both tamping cycles and traversing. The foot pedal is used for propelling the machine. Direction controlled by the PROPEL DIRECTION switch.

(15) TRACTION DELAY - A 2-position switch.

When the INDEX SELECT switch is set to AUTO, the forward propel valve engages after the final tamp, triggered by the squeeze pressure switch.

- OFF: No delay from when the squeeze pressure switch input occurs to when the forward propel valve is engaged.
- ON: A timed delay after the squeeze pressure switch input occurs before the forward propel valve is engaged.

This timer is adjustable at the PLC in the Main Control Cabinet. Refer to the PLC Timer Adjustments in the Electrical Preface included with this manual. Use this mode to allow more time for the workhead to raise and clear the ties before propelling forward, especially useful when operating downhill.

(16) PROPEL DIRECTION - 2 position switch that controls when the back alarms will sound and, in TRAVEL mode, controls which direction of travel will be engaged when the foot pedal is pressed.

(17) PROPEL SPEED - 2 position switch.

- LOW: Dual axle drive (4 wheel drive) for high torque.
- HIGH: Dual axle drive (4 wheel drive) for high top speed.

5: OPERATOR SYSTEM & CONTROLS FAMILIARIZATION

Main Control Cabinet - Inside

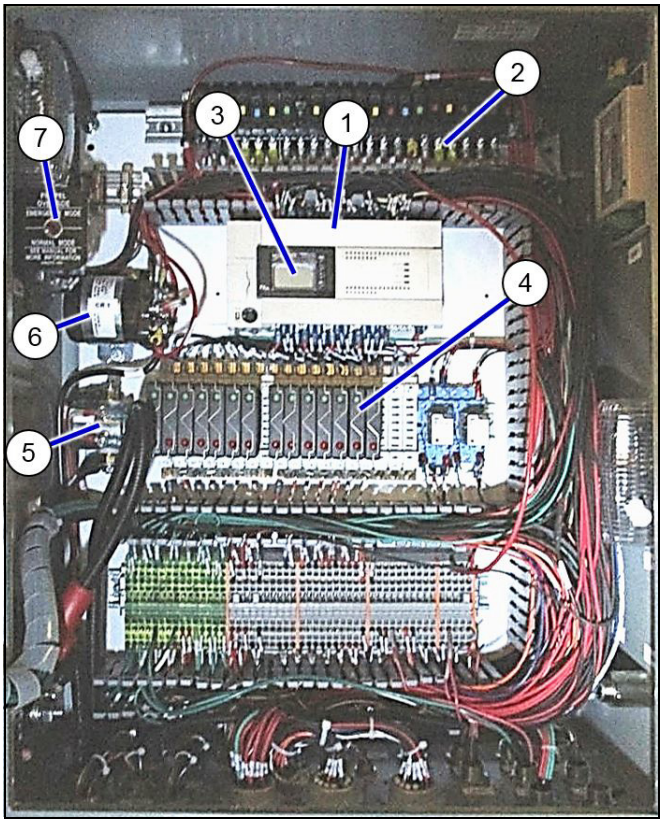


Figure 5-20: Inside the Main Control Cabinet

Figure 5-21: Propel Override Switch Inside Cabinet

Description of Controls:

(1) Programmable Logic Controller (PLC) - Used for automation of typically industrial electromechanical processes.

(2) Circuit Breakers - Provide over-current protection.

(3) PLC Display - Used for diagnostics and to adjust timer settings. See the ELECTRICAL section included with this manual for more details.

(4) Remote Power Controllers (RPCs) - Modules that provide control to specific tasks on the machine.

(5) Safety Electrical Interlock Relay - Controls all system power dependent upon the attitude of the Electrical Interlock Control.

(6) Main Power Relay - Main system power control relay.

(7) PROPEL OVERRIDE - 2 position switch accessible for maintenance or emergency operation. Normal position is down (NORMAL MODE) for PLC Mode. See Figure 5-21.

PROPULSION FOOT PEDAL

(Item #5)

One (1) Propulsion Foot Pedal is used to move the machine. To set the direction of propulsion set the **[PROPEL DIRECTION]** switch on the Main Control Cabinet to either ***FORWARD*** or ***REVERSE***. See Figure 5-22. For further information refer to “TRAVEL USING THE PEDAL” on page 6-7.

Figure 5-22: Propulsion Foot Pedal

BRAKE LEVER

(Item #6)

The BRAKE LEVER is used to stop the machine when it is in motion. It is located on the Left Arm Console. PULL this lever to stop the machine. See Figure 5-23. For further information refer to “STOPPING THE MACHINE” on page 6-10.

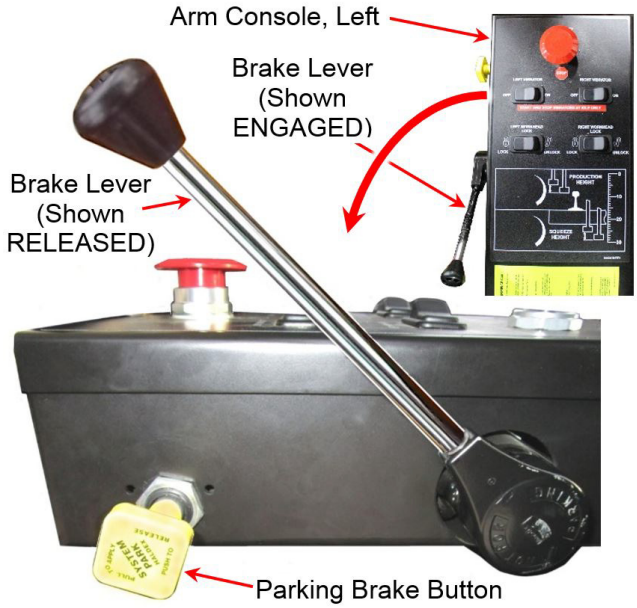


Figure 5-23: Brake Controls in the Cab

PARKING BRAKE

(Item #7)

The PARKING BRAKE is a yellow pushbutton located on the outside of the LEFT Arm Console in the cab. See Figure 5-23.

Push the button in to APPLY the Parking Brake AFTER the machine has stopped. For further information refer to “PARKING BRAKE” on page 6-10.

EMERGENCY STOP BUTTON

(Item #8)

The Emergency Stop button is located on the Left Arm Console. Use this button only in an emergency. For further information refer to “EMERGENCY SHUTDOWN” on page 1-6.

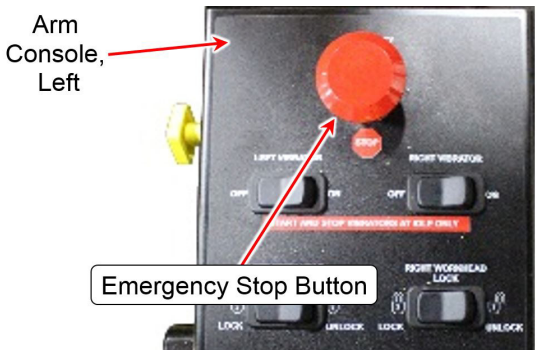


Figure 5-24: Emergency Stop Button in the Cab

ELECTRICAL INTERLOCK BUTTON

(Item #9)

The Electrical Interlock button is located on the Overhead Console in the cab. For further information refer to “ELECTRICAL INTERLOCK BUTTON” on page 5-17.

Figure 5-25: Electrical Interlock Button on the Overhead Console

HEATING/VENTILATION/AC

(Item #10)

The Heating/Ventilation/Air Conditioner unit (HVAC) is located on the left side of the cab, behind the operator and offers heat, cool air, and ventilation. See Figure 5-26.

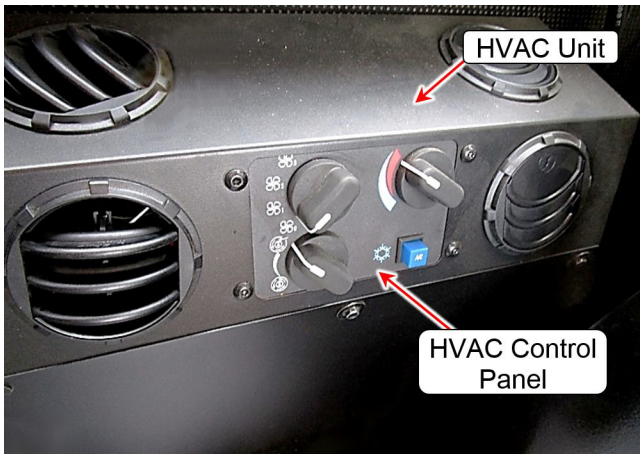


Figure 5-26: HVAC Controls Behind the Operator

FANS

(Item #11)

Fans to clear fog and moisture from the windows are located at the front corners of the cab. These fans have their own switches to turn them on or off. See Figure 5-27.

Figure 5-27: Ceiling Fan in the Cab

BACKUP CAMERA DISPLAY

(Item #12)

The Backup Camera Display is mounted on the middle wiper motor housing. This displays what the backup camera views so that the operator can know what is behind the machine.

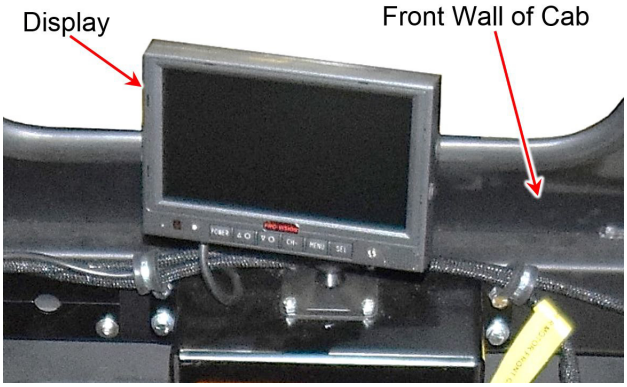


Figure 5-28: Backup Camera Display

PROPEL DECELERATE VALVE

(Item #13)

The Propel Decelerate Valve is mounted on the turntable cover located behind the operator seat.

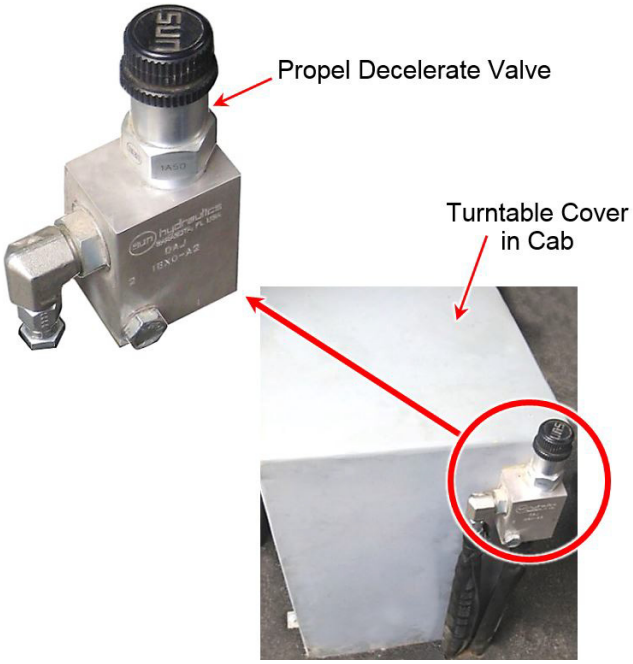


Figure 5-29: Propel Decelerate Valve

The Propel Decelerate Valve is an adjustable pressure relief valve that allows the operator the ability to control the rate of deceleration in work mode.

- **Harder / Faster Deceleration**: Turn the Propel Decelerate Valve Clockwise (CW).
- **Smoother / Slower Deceleration**: Turn the Propel Decelerate Valve Counterclockwise (CCW).

Section 6

MACHINE OPERATION

OVERVIEW

DANGER

- **CRUSH HAZARD! Death can result from reaching into driving components while the machine is running!**
- **Make observations from a distance. Shut off the machine and observe the safety measures in Section 1, "SAFETY INSTRUCTIONS & INFORMATION", before reaching into components.**

CAUTION

- **MOVING HAZARD! Sudden stops can cause personal injury. ALWAYS use the seat belt when seated.**
- **SLIP HAZARD! Wet or icy conditions can cause slips and/or falls around the machine. ALWAYS use the handrails and steps provided to climb onto and off the machine.**

WARNING

- **PINCH HAZARD! Moving parts could result in personal injury and/or damage to the machine. ALWAYS turn off the machine when performing maintenance, making adjustments, or whenever unintended movement of machine could occur, unless directed otherwise.**
- **Before exiting the cab for any reason, always press in the large yellow [ELECTRICAL INTERLOCK] button in order to shutdown electrical circuits and prevent unintended operation of any machine assembly.**

NOTICE

Before operating and/or adjusting this machine, it is imperative that the operator read and completely understand **Section 1, "SAFETY INSTRUCTIONS & INFORMATION"**, and that the operator becomes completely familiar with all aspects of this machine's operation.

The operator must become familiar with the system adjustments required, as well as subsystem component and fluid checks needed before operating this machine.

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

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

PREPARING THE MACHINE FOR WORK

Pre-operational checks and preventative maintenance should be performed before using the machine. It is highly recommended that the operator follow the guidelines listed below before actually operating the machine.

6: MACHINE OPERATION

1. Position the machine on a level track so the fluid levels can be accurately checked and filled as necessary:
   a. Check the engine oil and coolant levels.
      Fill as necessary. DO NOT fill the engine oil above the mark on the dipstick.
   b. Check the Diesel fuel level.
      There are 2 tanks on this machine, one located on either side of the machine. Each tank holds 50 gallons (189 liters) depending on the options installed. The tanks are interconnected. Fill as required.
   c. Check the hydraulic oil level.
      Make sure that the tank is over 3/4 full, but not filled to the top.
   d. Check the oil level in each vibrator housing.
      Use the sight glass on each vibrator. Oil should be to the top of the sight glass.

NOTE

The vibrators MUST be in a vertical position in order to accurately read the level of oil. Fill as required.

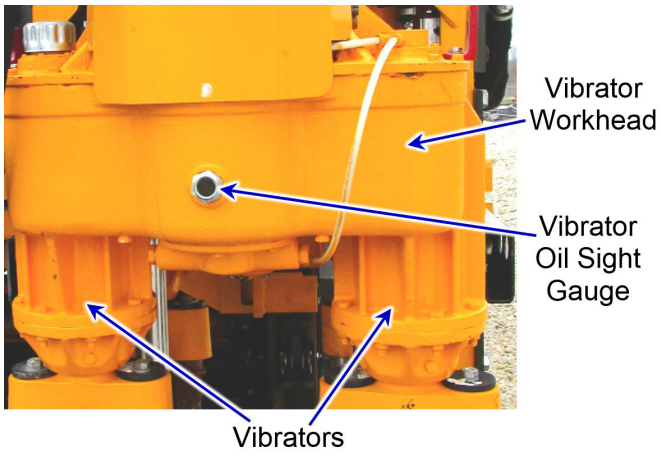


Figure 6-1: Oil Sight Gauge in a Vibrator

2. See “RAILWAY TOWING” on page 6-17 if the machine is to be towed to the work site.
3. Completely understand the use of all machine controls and instruments described in “OPERATOR CONTROLS” on page 5-8.
4. Make sure to check for hydraulic or other fluid leaks PRIOR to operating this machine.
5. Perform preventive maintenance procedures as required, daily/weekly/monthly, etc. See **Section 7, “ROUTINE MAINTENANCE”**.
6. Understand the use of the Lock-Ups on the machine. See **Section 3, “LOCKUP POINTS”**.
7. Make sure that the machine is set up for the rail size being worked on. Adjustments, if required, are described in this section.
8. Wear proper safety clothing. and personal protective equipment (PPE).
9. Always follow all safety instructions at **Section 1, “SAFETY INSTRUCTIONS & INFORMATION”**.

PRE START CHECKLIST

NOTE

Perform the following checks WITHOUT electrical power, due to a possible battery drain and/or unintentional system operation.

Ensure the following:

1. The RED [**EMERGENCY STOP**] pushbutton is pulled ***OUT***.
2. The YELLOW [**SAFETY INTERLOCK**] switch is pushed ***IN***.
3. The [**PROPEL DIRECTION**] switch is set to the desired travel direction.
4. The [**PUMP**] switch is ***OFF***.
5. The [**IGNITION**] switch is ***OFF***.
6. The [**WORK LIGHTS**] switch is ***OFF***.
7. The [**BATTERY DISCONNECT**] switch is ***OFF***.
8. The Hydraulic Tank is full.
9. The Fuel Tank is full.
10. The Oil Reservoir is full.
11. The Lockup devices are in place (for traveling).

Also:

12. Inspect for leaks anywhere on the machine, especially near hydraulic and fuel lines.
13. Inspect all controls, wiring and switches for secure mounting.
14. Check that the windows are clean and not damaged. Clean and repair as necessary.
15. Check the seat belt and mountings for damage. Replace damaged seat belts or anchors before
16. attempting to travel and/or operate this machine.
17. Clean all mirrors as required.

6: MACHINE OPERATION

STARTING THE MACHINE

WARNING

INHALATION HAZARD! Exhaust emissions caused by the use of this machine may cause cancer, birth defects or other reproductive harm If inhaled. Stay a safe distance from any exhaust exiting the engine.

NOTICE

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

NOTE

Avoid unnecessary idling.

1. Make sure the suction strainer valves on the hydraulic oil tank are open. Suction strainers are located at the back of the hydraulic tank, near the bottom, between the tank and the engine.
2. Open the right battery box cover (part of the right hand walkway behind the cab).
3. Turn the [**BATTERY DISCONNECT**] switch to the ***ON*** position. This is the full clockwise (CW) position if the ***ON*** position is not identified.
4. Make sure that the [**MODE**] switch on the Main Control Cabinet is in the ***TRAVEL*** position.
5. Pull the Yellow [**ELECTRICAL INTERLOCK**] button on the Overhead Console OUT to the ***ON*** position.
6. Pull the Red **EMERGENCY STOP** button OUT to the ON position.
7. Turn the [**IGNITION**] switch to the ***ON*** position. Power comes on but the engine is not started.
8. Wait for the Engine Diagnostics Display to come on.

   When the display comes on, a *WAIT TO START PREHEAT* message appears on the screen. See Figure 6-2.

Figure 6-2: Preheat Notice

   Once this message disappears it is safe to start the engine.
9. Turn the [**IGNITION**] switch on the Overhead Console one more position clockwise (CW) and hold until the engine starts. Once the engine starts release the [**IGNITION**] switch. The switch springs back to the centered position.

IMPORTANT

Never activate the starter for longer than 10 seconds. Also, if the engine fails to start after three tries consult the engine manual or a local John Deere or Cummins engine representative.

10. Allow the engine to idle until it warms up. Allow 5-7 minutes of warm-up if this is the first engine start of the day.

NOTICE

Running the hydraulics at temperatures below 32°F (0°C) may cause extensive damage to the machine.

11. Set the [**ENGINE SPEED**] switch on the Overhead Console to ***HIGH***.

The machine should now be ready to travel or do work.

NOTICE

There are some adjustments which may have to be made due to varying conditions such as rail height and base width. Adjustments must be made to compensate for these conditions before operations can begin. Refer to "TAMPING ADJUSTMENTS" on page 6-11.

OPERATING THE LOCKUPS

WORKHEAD LOCKUPS

This machine is equipped with pneumatically operated lockups for the vibrator workheads. These lockups are engaged (LOCKED) or disengaged (UNLOCKED) using pushbuttons on the operator's Left Arm Console. See Figure 6-3.

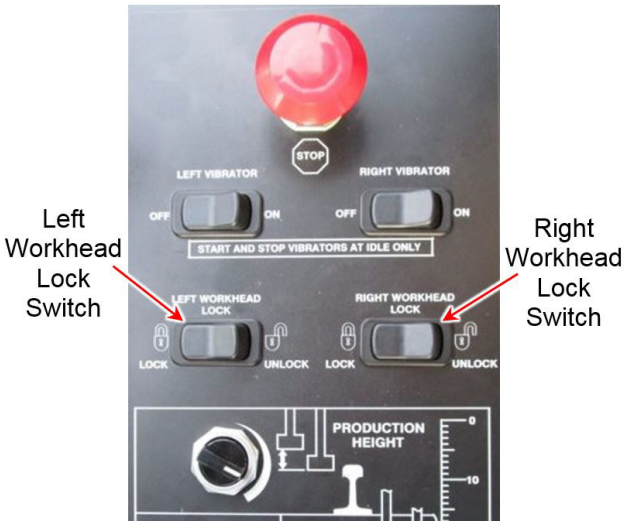


Figure 6-3: Vibrator Workhead Lockup Controls

To UNLOCK the Vibrator Workheads:

1. Ensure that the machine is at a complete stop and has been started and warmed up.
2. Pull OUT the yellow [**ELECTRICAL INTERLOCK**] button on the Overhead Console to its ***ON*** position if not already if not already.
3. Set the [**ENGINE SPEED**] switch on the Overhead Console to the ***HIGH*** position if not already.
4. Set the [**MODE**] switch on the Main Control Cabinet to ***WORK*** if not already.
5. Set the [**LEFT WORKHEAD LOCK**] switch to the ***UNLOCK*** position.
6. Set the [**RIGHT WORKHEAD LOCK**] switch to the ***UNLOCK*** position.
7. Visually verify that the workheads are UNLOCKED before proceeding.

To LOCK the Vibrator Workheads:

1. On the Left Arm Console, set the [**LEFT VIBRATOR**] switch to the ***ON*** position.
2. Set the [**RIGHT VIBRATOR**] switch to the ***ON*** position.
3. Set the [**LEFT WORKHEAD LOCK**] switch to the ***UNLOCK*** position.
4. Set the [**RIGHT WORKHEAD LOCK**] switch to the ***UNLOCK*** position.
5. On the Right Arm Console PULL the [**JOYSTICK**] BACK to the ***CYCLE*** position then let it return to its neutral position. This will drop the Vibrator Workheads into the ballast.
6. On the Right Arm Console move the [**JOYSTICK**] to the right to the ***UPFEED*** position then let it return to its neutral position. This will retract the Vibrator Workheads to their UP position and stop.
7. Move the [**JOYSTICK**] once again to the right to the UPFEED position then allow it to return to its neutral position, to assure the Vibrator Workheads are all the way up.

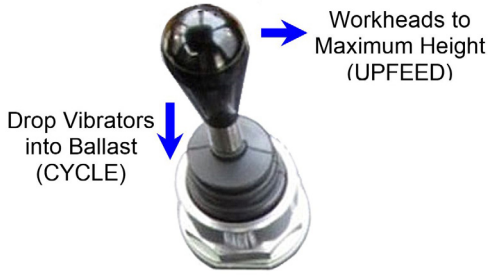


Figure 6-4: Joystick Motions for Workhead Lockups

8. Set the [**LEFT WORKHEAD LOCK**] switch to the ***LOCK*** position.
9. Set the [**RIGHT WORKHEAD LOCK**] switch to the ***LOCK*** position.
10. Visually make sure the locks are engaged. See Figure 6-5.

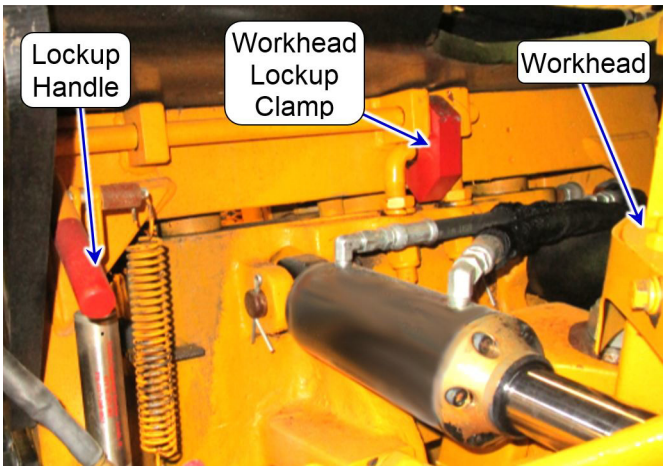


Figure 6-5: Workhead Lockup Engaged

TRAVERSE LOCKUPS

This machine is equipped with traverses, which permit the workheads to tamp the area outside of each rail. There are manual traverse lockups for each workhead. Use the following procedures to LOCK and UNLOCK the traverses. See Figure 6-6 for the Traverse controls.

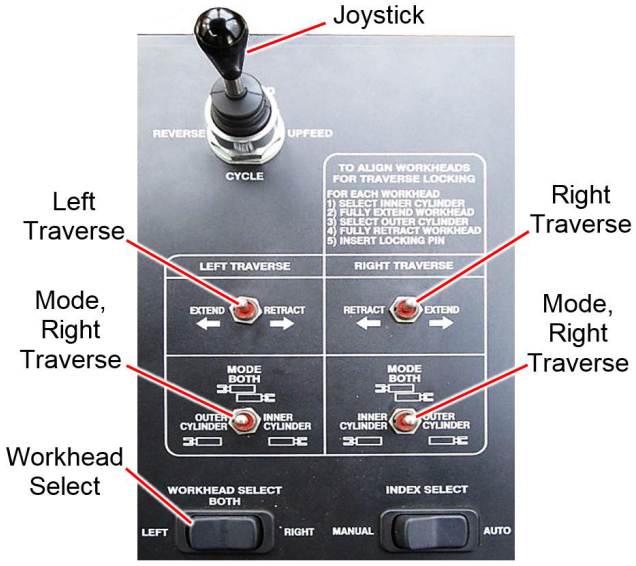


Figure 6-6: Traverse Controls

To ENGAGE the Traverse Lockups:

1. Ensure that the machine is at a complete stop and has been started and warmed up.
2. Pull OUT the yellow [**ELECTRICAL INTERLOCK**] button on the Overhead Console to its ***ON*** position if not already if not already.
3. Set the [**ENGINE SPEED**] switch on the Overhead Console to the ***HIGH*** position if not already.
4. Set the [**MODE**] switch on the Main Control Cabinet to ***WORK*** if not already.
5. On the Right Arm Console, set the [**WORKHEAD SELECT**] switch to ***LEFT***.
6. Set the [**MODE**] switch for the Left Traverse to ***INNER CYLINDER***.
7. Set the [**LEFT TRAVERSE**] switch to ***EXTEND*** to fully extend the workhead.
8. Set the [**MODE**] switch for the Left Traverse to ***OUTER*** CYLINDER.
9. Set the [**LEFT TRAVERSE**] switch to ***RETRACT*** to fully extend the workhead.
10. Exit the cab and insert the locking pin toward the rear of the machine. See Figure 6-7.
11. Enter the cab and repeat steps 1-6 for the RIGHT Traverse.

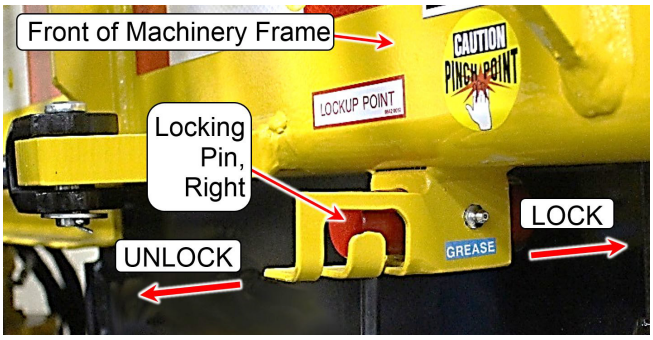


Figure 6-7: Traverse Locking Pin, Right

To DISENGAGE the Traverse Lockups:

1. Ensure that the machine is at a complete stop and there is no activity.
2. Exit the cab and pull each Traverse Locking Pin out toward the front of the machine.

TURNTABLE LOCKUP

DANGER

DO NOT climb under machine when it is raised on the turntable! The turntable is to be used as a method of transferring the machine on and off the rails. It is NOT intended to be used for the maintenance of items under the machine. Failure to comply could result in personal injury or death.

The turntable is to be retracted and LOCKED at any time the turntable is NOT being actively used. This includes all railway travel, all working operations, all maintenance operations and when the machine is idle.

IMPORTANT

With no exception, all lockups are to be in place during track travel.

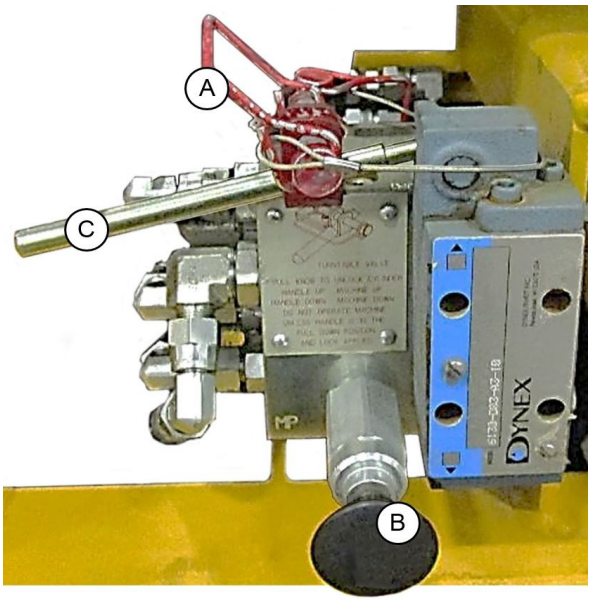


Figure 6-8: Turntable Valve Assembly

To UNLOCK the Turntable in order to raise and rotate the machine:

1. Ensure that the machine is at a complete stop, has been started and warmed up.
2. Locate the Turntable Valve assembly at the left-rear of the machine. See Figure 6-8.
3. Remove the Red Locking Pin (item **A**) at the top of the Turntable Valve Handle.
4. Pull the Black Knob (item **B**) to unlock the Turntable.
5. The Turntable is UNLOCKED and ready to be lowered.

NOTE

To lower the Turntable and rotate the machine or to raise the Turntable, refer to "ROTATING THE MACHINE" on page 6-16.

To LOCK the Turntable after the machine has been rotated:

1. Ensure that the machine is at a complete stop, has been started and warmed up.
2. Visually ensure that the Turntable is at it fully retracted position. If not:
   a. Locate the Turntable Valve assembly.
   b. LOWER the Turntable Valve Handle (item **C**) to attempt to lower the machine and raise the Turntable, until the Turntable is fully retracted.
3. Once the Turntable is retracted, Push the Black Knob (item **B**) IN to lock the Turntable.
4. Insert the Red Locking Pin (item **A**) at the top of the Turntable Valve Handle.

MACHINE RAILWAY TRAVEL

TRAVEL USING THE PEDAL

To move the machine forward or reverse on the rails using the Propulsion Pedal:

1. Ensure that the machine is at a complete stop.
2. Ensure that all lockups are ENGAGED:
   a. Workhead Locks
   b. Traverse Locks
   c. Turntable
3. Ensure that the [**ELECTRICAL INTERLOCK**] switch on the Overhead Console is pulled OUT to the ***ON*** position.
4. Push in the yellow [**SYSTEM PARK**] switch on the LEFT Arm Console. This will release the parking brakes.
5. Set the [**MODE**] switch on the Main Control Cabinet to the ***TRAVEL*** position.
6. Set the [**ENGINE SPEED**] switch on the Overhead Console to ***HIGH***.
7. Set the [**PROPEL DIRECTION**] switch on the Main Control Cabinet to the desired direction of travel, ***FORWARD*** or ***REVERSE***.
8. Press the Propulsion Foot Pedal to move the machine. The machine will continue to move as long as the pedal is pressed.
9. To stop the machine that is in motion PULL the [**BRAKE LEVER**] on the LEFT Arm Console until the machine stops.

TRAVEL USING THE JOYSTICK

To move the machine forward or reverse on the rails using the Joystick:

1. Ensure that the machine is at a complete stop.
2. Ensure that all lockups are ENGAGED:
   a. Workhead Locks
   b. Traverse Locks
   c. Turntable (Center Jack)
3. Ensure that the [**ELECTRICAL INTERLOCK**] switch on the Overhead Console is pulled OUT to the ***ON*** position.
4. Push in the yellow [**SYSTEM PARK**] switch on the left side of the Left Arm Console. This will release the parking brakes.
5. Set the [**MODE**] switch on the Main Control Cabinet to the ***TRAVEL*** position.
6. Set the [**ENGINE SPEED**] switch on the Overhead Console to ***HIGH***.
7. On the RIGHT Arm Console:
8. To move the machine FORWARD push the [**JOYSTICK**] FORWARD.
9. To move the machine in REVERSE pull the [**JOYSTICK**] to the LEFT.

Figure 6-9: Joystick Motions for Machine Travel

10. The machine continues to move as long as the [**JOYSTICK**] is held in the selected direction.
11. To stop the machine that is in motion PULL the [**BRAKE LEVER**] on the LEFT Arm Console until the machine stops.

TAMPING OPERATION

There are some adjustments which may have to be made to the machine due to varying conditions such as rail height and base width. Adjustments must be made to compensate for these conditions before operations can begin. Refer to “TAMPING ADJUSTMENTS” on page 6-11.

STARTING THE VIBRATORS

1. When ready to start the tamping operation, proceed with the following to start the vibrators:
2. Ensure that all items in the pre-start checklist have been followed, and that the machine has been started and warmed up. See “PRE START CHECKLIST” on page 6-2 and “STARTING THE MACHINE” on page 6-3.
3. If the outside ambient temperature is below 70°F (21°C):
   a. Set the [**MODE**] switch on the Main Control Cabinet to the ***WORK*** position.
   b. Set the [**WARMUP**] switch on the Main Control Cabinet to the ***ON*** position.
   c. Monitor the **[HYDRAULIC OIL TEMPERATURE]** gauge on the Overhead Console. Once the temperature reaches 70°F (21°C) continue with the following steps.
4. Make sure all lockups have been removed and stored (as required).
5. Ensure that all lockups are removed (DISENGAGED) as needed:
   a. Workhead Locks
   b. Traverse Locks
   c. Turntable (Center Jack)
6. Set the [**ENGINE SPEED**] switch on the Overhead Console to ***LOW*** in order to decrease the engine speed to idle.
7. On the LEFT Arm Console, set the [**LEFT VIBRATOR**] and the [**RIGHT VIBRATOR**] switches to the ***ON*** position.

NOTICE

If the vibrators do not achieve full speed in less than two seconds, set [LEFT VIBRATOR] and [RIGHT VIBRATOR] switches to the *OFF* position. Resolve the issue before continuing.

8. Set the [**MODE**] switch on the Main Control Cabinet to the ***WORK*** position.

TRAVEL IN WORK MODE

To travel from one tie to the next, using the Propulsion Pedal:

1. Ensure that the [**ELECTRICAL INTERLOCK**] switch on the Overhead Console is pulled OUT to the ***ON*** position.
2. Set the [**MODE**] switch on the Main Control Cabinet to the ***WORK*** position.
3. Set the [**PROPEL DIRECTION**] switch on the Main Control Cabinet to either ***FORWARD*** or ***REVERSE***.
4. Set the [**INDEX SELECT**] switch on the RIGHT Arm Console to either ***AUTO*** or ***MANUAL***.
5. To move the machine, do either of the following:
   a. If the **[INDEX SELECT]** switch is set to ***AUTO***, press the Propulsion Pedal to cycle the workhead. The machine automatically moves on to the next tie.
   b. If the [**INDEX SELECT**] switch is set to ***MANUAL***, pull the [**JOYSTICK**] BACKWARD to the ***CYCLE*** position to cycle the workhead. This does not move the machine. Push the [**JOYSTICK**] FORWARD to move ***FORWARD*** or pull it LEFT to move in ***REVERSE*** to travel to the next tie.

Figure 6-10: Joystick Motions for Machine Travel

6. To stop the machine that is in motion PULL the [**BRAKE LEVER**] on the LEFT Arm Console until the machine stops.

To travel from one tie to the next, using the Joystick:

1. Ensure that the [**ELECTRICAL INTERLOCK**] switch on the Overhead Console is pulled OUT to the ***ON*** position.
2. Set the [**MODE**] switch on the Main Control Cabinet to the ***WORK*** position.
3. Set the [**INDEX SELECT**] switch on the RIGHT Arm Console to either ***AUTO*** or ***MANUAL***.
4. To move the machine, do either of the following:

   If the **[INDEX SELECT**] switch is set to ***AUTO***, pull the [**JOYSTICK**] BACKWARD to the ***CYCLE*** position to cycle the workhead. The machine automatically moves to the next tie.

   If the [**INDEX SELECT**] switch is set to ***MANUAL***, pull the [**JOYSTICK**] BACKWARD to the ***CYCLE*** position to cycle the workhead. The machine does not automatically move. Push the [**JOYSTICK**] FORWARD to move the machine ***FORWARD*** or to the LEFT to move the machine in ***REVERSE*** to the next tie.

Figure 6-11: Joystick Motions for Machine Travel

5. To stop the machine that is in motion PULL the [**BRAKE LEVER**] on the LEFT Arm Console until the machine stops. See “STOPPING THE MACHINE” on page 6-10.

MANUAL TAMPING OPERATION

1. Ensure that the machine has been started and is warmed up. Refer to “STARTING THE MACHINE” on page 6-3.
2. Locate the machine on the first tie to be tamped.
3. Ensure that the vibrators are running. Refer to “STARTING THE VIBRATORS” on page 6-8.
4. On the RIGHT Arm Console, set the [**INDEX SELECT**] switch to the ***MANUAL*** position.
5. On the RIGHT Arm Console pull the [**JOYSTICK**] BACKWARD to the ***CYCLE*** position and hold. This will:
   a. Move the workhead down to a depth preset by the DOWN proximity switch or the [**SQUEEZE HEIGHT**] switch (Optional) on the LEFT Arm Console.
   b. CLOSE the tools at the speed set by the Right and Left Speed Control Valves and at the pressure set at the Close Pressure Control Switch.
   c. OPEN the tools and bring the workhead back up to a height preset by the UP proximity switch or by the [**PRODUCTION HEIGHT**] switch (Optional) on the LEFT Arm Console.
   d. The operation then stops and waits for input.
6. Push the [**JOYSTICK**] FORWARD to move the machine ***FORWARD*** or to the LEFT to move the machine in ***REVERSE*** to the next tie.
7. Repeat the process using steps 5 and 6 as desired.

AUTOMATIC TAMPING OPERATION

1. Ensure that the machine has been started and is warmed up. Refer to “STARTING THE MACHINE” on page 6-3.
2. Locate the machine on the first tie to be tamped.
3. Ensure that the vibrators are running. Refer to “STARTING THE VIBRATORS” on page 6-8.
4. On the RIGHT Arm Console, set the [**INDEX SELECT**] switch to the ***AUTO*** position.
5. Begin the automatic cycle with either of the following:
   a. Pull the [**JOYSTICK**] on the RIGHT Arm Console BACKWARD to the ***CYCLE*** position and HOLD it in position.

   - or -

   b. Press the Propulsion Pedal and HOLD in position.

Figure 6-12: Joystick Motion for the Tamping Cycle

The automatic cycle proceeds as follows:

- — Moves the workhead down to a depth preset by the DOWN proximity switch or [**SQUEEZE HEIGHT**] switch (Optional) on the LEFT Arm Console.
- — CLOSE the tools at the speed set by the Right and Left Speed Control Valves and at the pressure set at the Close Pressure Control Switch.
- — OPEN the tools and bring the workhead back up to a height preset at the UP proximity switch or by the [**PRODUCTION HEIGHT**] switch (Optional) on the LEFT Arm Console.
- — The machine automatically moves forward.

6. At the next tie, RELEASE the [**JOYSTICK**] and repeat Step 5.

MANUAL DOUBLE TAMPING

If double tamping is required:

1. Ensure the machine is running, the vibrators are running and the machine is at a tie to be tamped.
2. Set the **[DOUBLE TAMP**] switch on the Main Control Cabinet to the ***ON*** position.
3. Proceed with tamping one tie using the automatic or manual process.
4. Return the [**JOYSTICK**] to the center position.
5. Pull the [**JOYSTICK**] BACKWARD again to the CYCLE position to repeat the operation on the same tie.

STOPPING THE MACHINE

There are two (2) brake controls on the LEFT Arm Console. The **Brake Lever** is the service brake, the **System Park** button is the parking brake.

Use the **BRAKE LEVER** on the LEFT Arm Console to stop the machine that is in motion.

PULL the lever BACKWARD to ***ENGAGE*** the brakes.

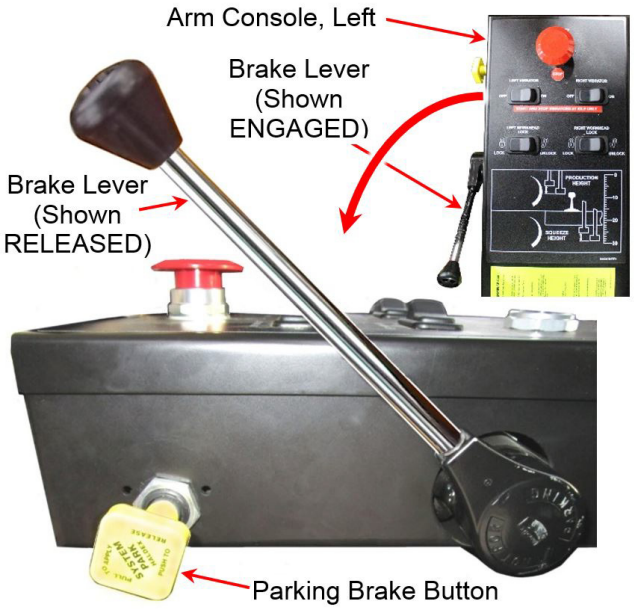


Figure 6-13: Brake Controls

PARKING BRAKE

Set the Parking Brake only after the machine is at a complete stop, and it is intended that it remain stopped. The parking brake is activated by the yellow [**SYSTEM PARK**] button located on the side of the Left Arm Console.

To RELEASE the brake:

PUSH the [**SYSTEM PARK**] button ***IN***.

To APPLY the brake:

PULL the [**SYSTEM PARK**] button ***OUT***.

⚠ CAUTION

MOVEMENT HAZARD! The machine may move and cause personal injury. ALWAYS start and end operations with the yellow SYSTEM PARK button on the Left Arm Console.

IMPORTANT

Always apply the parking brake:

- **When the machine is stopped.**
- **Before leaving the cab.**
- **When stopping for extended periods.**

NOTES

- *The Parking Brake will not release if the system air pressure is less than 60 PSI.*
- *When released, the Parking Brake automatically applies if system air pressure is below 60 PSI.*

TAMPING ADJUSTMENTS

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

⚠ DANGER

MOVING PART HAZARD! Serious injury or death can result from reaching into moving components while the machine is running. Make observations from a safe distance.

⚠ WARNING

MOVING PART HAZARD! SHUT DOWN the machine when performing maintenance, making adjustments, or whenever unintended movement of the machine could occur, unless directed otherwise. Failure to comply could result in personal injury and/or damage to the machine.

NOTICE

NEVER start the hydraulic vibrators when the engine is at full throttle. ALWAYS start the vibrators at engine idle or damage to the vibrator motors will occur.

Read and understand all operating procedures, warnings, and cautions before making adjustments to this machine.

WORKHEAD PROXIMITY SWITCHES

NOTE

If the machine has the optional cab operated workhead height controls, it will not have proximity switches. See "LEFT ARM CONSOLE" on page 5-10 for the switch location if present.

When the Lower Proximity Switch is triggered by the workhead moving down, it stops the down movement of the workhead and the tools begin to close under the tie. If not properly adjusted, the tools will be closing on the sides of the tie and not the ballast under the tie - or the ballast under the tie will not be fully compacted.

The Upper Proximity Switch determines the UP position of the workhead during any cycle (***MANUAL*** or ***AUTO***). Normally, the workheads should be adjusted to allow the tamping tools to clear the top of the ties so that the rear tamping tools do not strike a tie when the machine is moved to the next tie.

When working with very hard "cemented" ballast it is advisable to set these switches higher to permit each tamping tool to hit the ballast with more velocity and allow better penetration of the ballast.

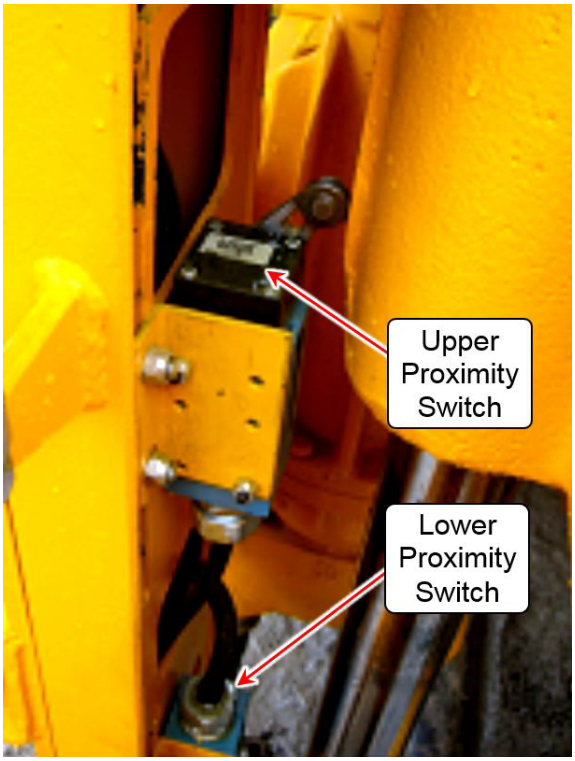


Figure 6-14: Proximity Switches

NOTE

The proximity switches must be adjusted for the size of rail being worked on and must be re-adjusted for every change in rail sizes or tie sizes.

WORKHEAD DOWN POSITION

To adjust the workhead DOWN position:

1. Loosen the two bolts that hold the Lower Proximity Switch mounting bracket to the frame.
2. Slide the bracket up or down as required.
   - UP DECREASES the depth
   - DOWN INCREASES the depth.
3. Re-tighten the bolts.

The proper setting is attained when the top blade of each tamping tool is 1/4 to 1/2 inch (6.4 to 12.7 mm) below the bottom of the tie being tamped. Refer to Figure 6-15.

To verify the dimension remove the ballast between a tie on each side and adjust the depth. Should the rail or tie sizes change, another depth adjustment is required.

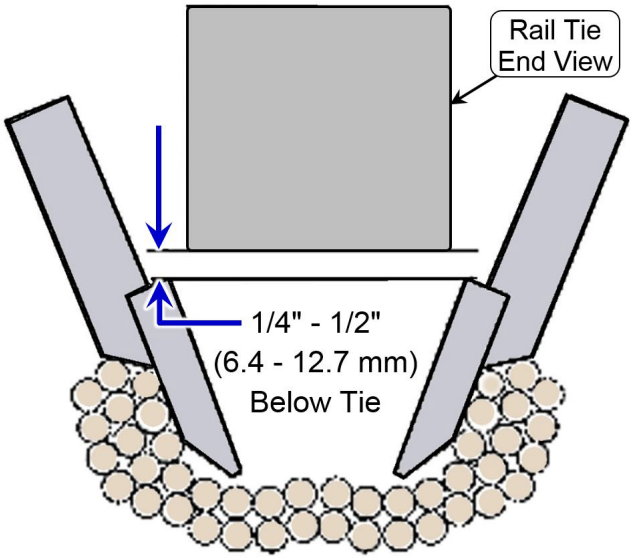


Figure 6-15: Adjust Tamper Depth

WORKHEAD UP POSITION

To adjust the workhead UP position:

1. Loosen the two bolts that hold the Upper Proximity Switch mounting bracket to the frame.
2. Slide the bracket up or down as required.
   - UP INCREASES the clearance
   - DOWN DECREASES the clearance.
3. Re-tighten the bolts.

WORKHEAD OPENING

The workheads are fitted with resilient bumpers which control the maximum opening of the tools. The bumpers are especially useful with close tie spacing and help to prevent the tools from hitting the ties ahead of or behind the tie being tamped.

The bumpers are located behind the vibrator housing fastened to the workhead carriers. Each includes a large hex head screw and a lock nut. The screws should be kept locked at all times. Turn the bumper screws counterclockwise (CCW) to decrease the distance between the opposing tools. See Figure 6-16.

Also adjust the bumpers to suit the spacing and slewed conditions of the ties.

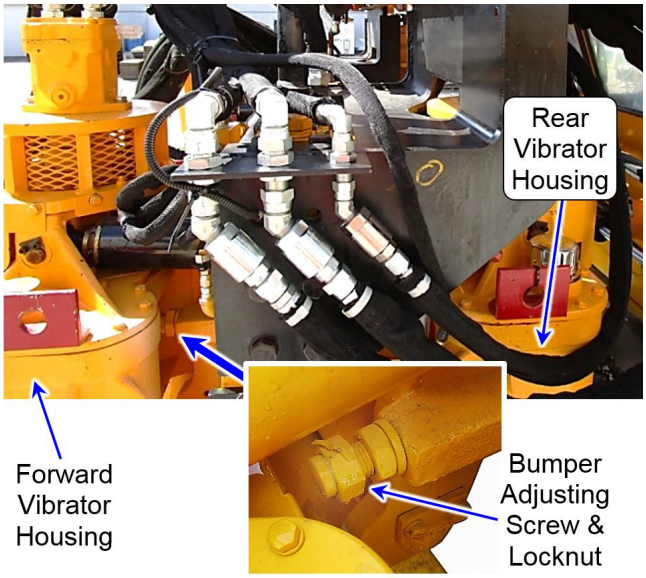


Figure 6-16: Workhead Bumper Adjustment

TRACTION DELAY

Traction Delay introduces a time delay from the time the workheads are in up-feed until the time travel starts. Traction Delay is for automatic operation only.

To initiate Traction Delay in AUTO mode:

1. On the RIGHT Arm Console, set the [**INDEX SELECT**] switch to the ***AUTO*** position.
2. Set the [**TRACTION DELAY**] switch on the Main Control Cabinet to ***ON***.

NOTES

- *This option is provided so that the operator can adjust the indexing from tie to tie when working down a steep grade.*
- *Traction delay should not be used during normal operations as it increases the time it takes to tamp one tie and thus reduce overall production.*
- *Adjustments to timing are made on the on the PLC display in the Main Control Cabinet.*

WORKHEAD CLOSE PRESSURE CONTROL

The Close Pressure Control is located in the front corner of the left hand walkway. This controls the ballast compaction between the opposing tamping tools. When the preset pressure is reached, the tamping tools automatically cycle “UP” and “OUT”. See Figure 6-17 and Figure 6-18.

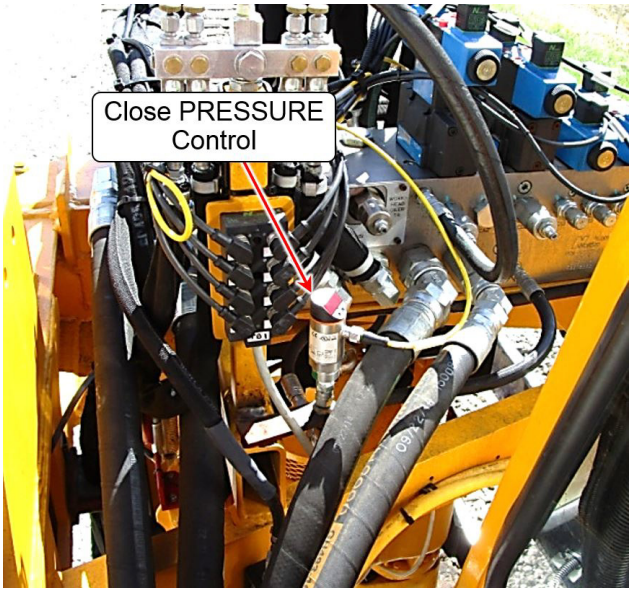


Figure 6-17: Close Pressure Control

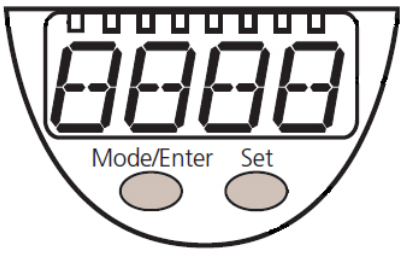


Figure 6-18: Control Display

Set the CLOSE PRESSURE between 850-1450 psi.

To reset the minimum and maximum pressure:

1. Press and hold the [**SET**] button for more than five seconds. The display will enter programming mode.
2. Press the [**MODE**/**ENTER**] button repeatedly to move between settings. Stop when parameter SP1 is displayed
3. With SP1 displayed, press the [**SET**] button and hold it until the desired PSI is displayed.
4. Press the [**MODE**/**ENTER**] button once to confirm the change.

NOTE

*The display returns to **RUN** mode after 15 seconds.*

Pressures within the 850-1450 psi range give better results than higher pressure, provided the Close Speed Control is properly set. See “WORKHEAD CLOSE SPEED CONTROL” on page 6-14.

Refer to “Squeeze Cylinder Pressure Sensor” in the Hydraulic section included with this manual for more information on the needed Pressure Settings.

WORKHEAD CLOSE SPEED CONTROL

Flow Control Valves control the rate of speed at which the tamping tools close in when they have reached their set depth. The flow controls are located on the workhead manifolds in front of the cab on each side of the machine. See Figure 6-19.

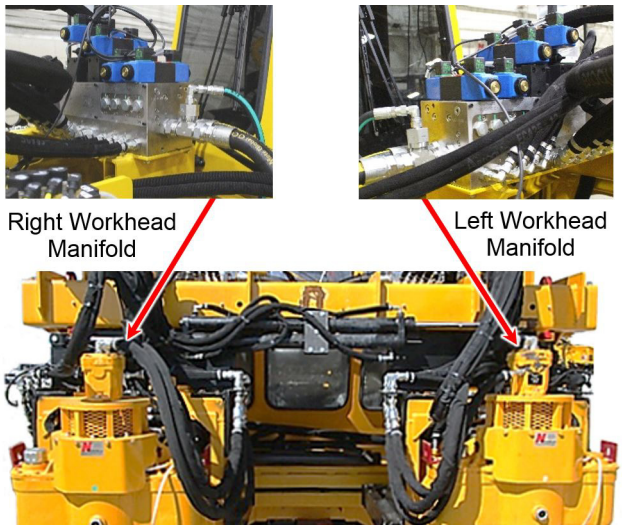


Figure 6-19: Workhead Manifold Locations

NOTES

- *The Left Speed control is on the Left Manifold and the Right Speed control is on the Right Manifold. See Figure 6-20 & Figure 6-21.*
- *Under all conditions, whether operated individually or simultaneously, both workheads should squeeze at the same speed, Therefore both controls should be opened the same amount. Check this setting daily.*
- *Refer to the Hydraulic Section included with this manual for more information.*

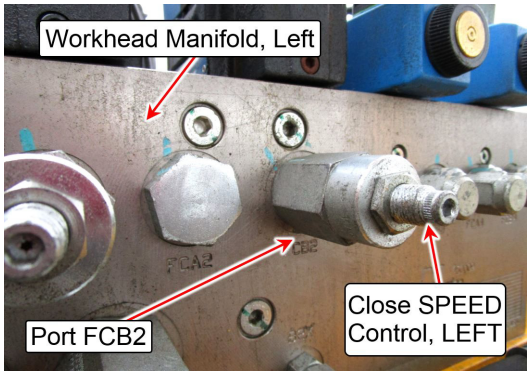


Figure 6-20: Left Speed Control

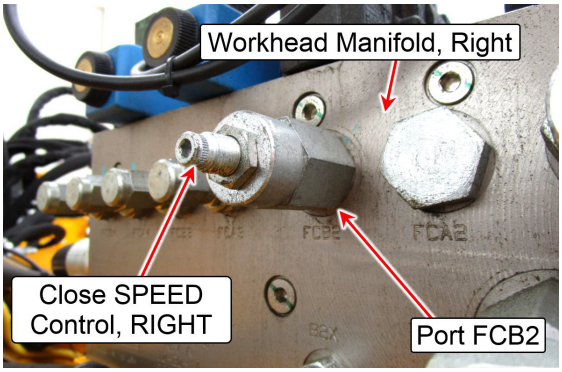


Figure 6-21: Right Speed Control

TAMPING TOOLS

Tamping tools are made in three different patterns:

- Straight
- Left hand
- Right hand

The terms straight, left or right refer to the position of tamping tool face in respect to the tool shank. To check, stand the tool up on end just as it fits into the vibrator. Rotate the tool until the key way in the upper end of the shank is on the back side. Look down at the back side of the tool face or blade.

- If the tool shank appears to be in the middle of the blade, the tool is a “straight”.

- If the blade is offset to the left, then it is a left hand.
- If the blade is offset to the right, then it is a right hand.

Tampers DO NOT use straight tools. The set of tools includes eight (8) left tools and eight (8) right tools. In all cases, the tool next to the rail is offset away from the rail. Refer to Figure 6-22 and Figure 6-23.

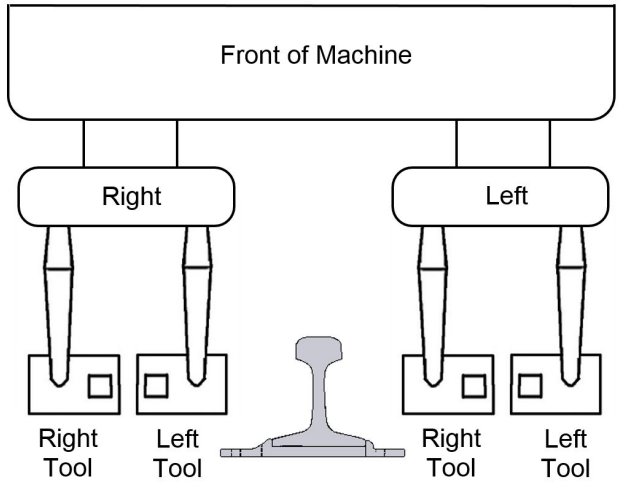


Figure 6-22: Tool Configuration

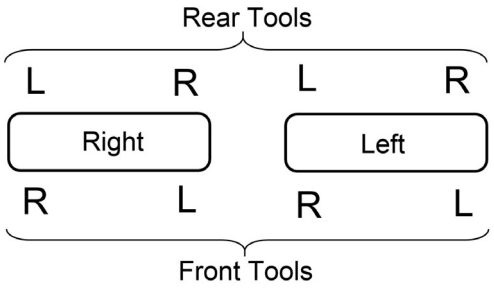


Figure 6-23: Tool Configuration

TAMPING TOOL REPLACEMENT

To replace one tamping tool:

1. Ensure that the machine is at a complete stop.
2. Shut down the machine.
3. For the tool requiring replacement:
4. Loosen the tamping tool bolt, then remove the bolt, spring washer and round washer.
5. Remove the tamping tool from the vibrator.
6. Remove the key from the vibrator or tool.
7. Remove all the grease from the hole in the vibrator.
8. Install the key in the key way of the replacement tamping tool.
9. Slide the tamping tool into the hole of the vibrator, making sure the key on the tool lines up with the key way in the tool holder.
10. Install the round washer, spring washer, and bolt into the top of the tamping tool.
11. Tighten the tamping tool bolt while hitting the tamping tool with a hammer until the bolt is tight.

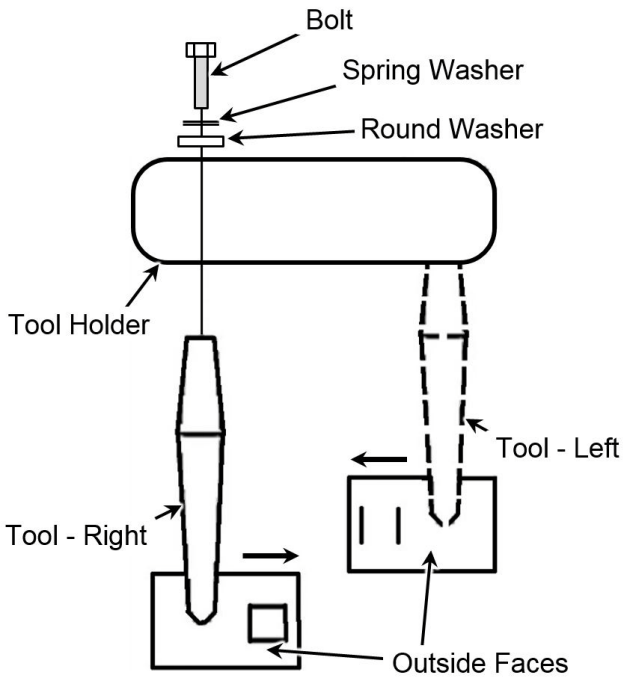


Figure 6-24: Tamping Tool Installation

MACHINE SHUTDOWN

1. Locate the machine on a level track if at all possible.
2. Lock the workheads.
3. Push the [**SYSTEM PARK**] button IN to apply the Parking Brake.
4. Set the [**ENGINE SPEED**] switch to LOW and allow the engine to idle:
   - — Allow regular engines to idle for one minute.
   - — Allow turbocharged engines to idle for five minutes.
5. Install the manual lockups.
6. Turn the [**IGNITION]** key counterclockwise (CCW) to the ***OFF*** position.
7. Turn the **[BATTERY DISCONNECT**] switch to the ***OFF*** position.

PARKING OR LOCATING THE MACHINE

1. Park or locate machine on level track area, if possible, and where it will not be exposed to excessive dust and/or adverse conditions.
2. If the machine was towed, disconnect the towing vehicle and set the brakes. Move the towing vehicle well clear of the parked machine.
3. Ensure that the machine is shut down, the brakes are set and all lockups are engaged.

ROTATING THE MACHINE

This 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 lift the machine.

⚠ DANGER

DO NOT climb under machine when it is raised on the turntable! The turntable is to be used as a method of transferring the machine on and off the rails. It is NOT intended to be used for the maintenance of items under the machine. Failure to comply could result in personal injury or death.

Once the machine is lifted with the turntable clear of the roadway, personnel are used to rotate the machine in line with the new direction of travel. At that point the turntable is used once again to lower the machine to the roadway.

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

1. Position the machine in a suitable location for lifting and turning. Set the brakes.
2. Set the [**MODE**] switch on the Main Control Cabinet to ***WORK***.
3. Set the [**WARMUP**] switch on the Main Control Cabinet to the ***ON*** position.
4. Monitor the Turntable Cylinder position using the LED indicator on the Main Control Cabinet.

The Turntable Valve is located at the rear of the battery box on the right side of the machine. See Figure 6-25.

The Turntable Valve Handle is used to raise and lower the machine. The directions relative to handle position are as follows:

UP - RAISE the machine. (Lower the turntable.)
DOWN - LOWER the machine. (Retract the turntable.)

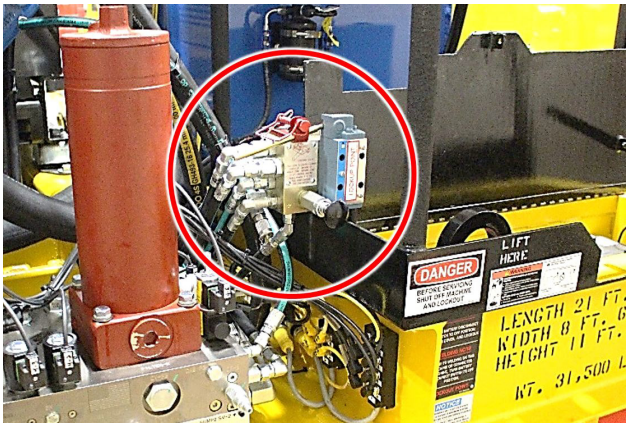


Figure 6-25: Location of the Turntable Valve

Lower the turntable as follows. Refer to Figure 6-26.

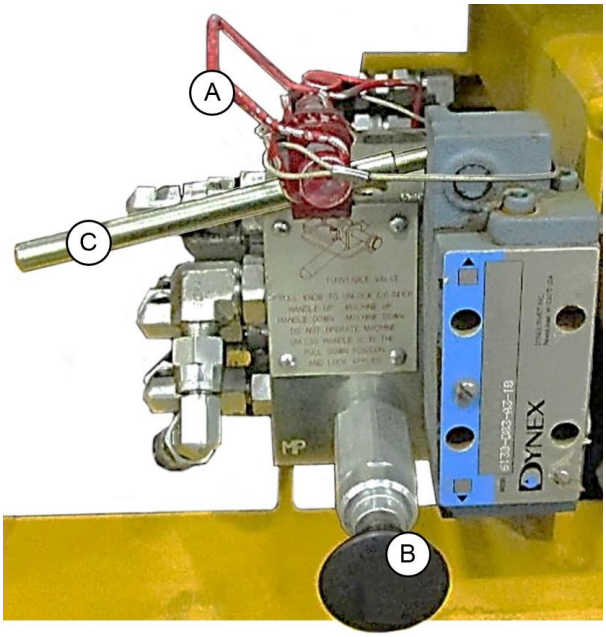


Figure 6-26: Turntable Valve

5. Unlock the Turntable Valve Handle (item **C**) by releasing Valve Locking Pin (item **A**).
6. Pull OUT the Back Knob (item **B**).
7. Slowly lift Turntable Valve Handle (item **C**) UP to lower the turntable. Lower the turntable just until it is close to the roadway then return the handle to it's center position to stop the turntable.

8. Turn the Rail-to-Rail turntable as needed to straddle the rails or better line it up.
9. Lift Turntable Valve Handle (item **C**) UP again and hold until the turntable comes into contact with the roadway and stop.
10. Once satisfied with the machine positioning, move the Turntable Valve Handle (item **C**) UP and hold until the machine is fully raised off the roadway.
11. Move the Turntable Valve Handle (item **C**) to its CENTER position.
12. Use personnel to rotate the machine. The wheels should be directly above the track after rotating the machine. When lowering onto tracks, wheel flanges must be properly aligned with the rails.

IMPORTANT

Push the machine, do not pull the machine to rotate. Pulling the machine could put the machine on top of a fallen worker.

13. Once the machine is rotated to its new direction, slowly move the Turntable Valve Handle (item **C**) downward. The Turntable Cylinder will retract and the machine will lower onto the roadway.
14. Ensure that:
    a. The turntable has retracted fully.
    b. The Black Knob (item **B**) is pushed IN.
    c. The Turntable Valve Handle (item **C**) is in it's CENTER position.
    d. The Valve Locking Pin (item **A**) is engaged.
15. Release the brakes.

The machine can now be moved to it new destination.

RAILWAY TOWING

The maximum towing speed is 35 mph. Reduce the maximum speed accordingly as dictated by weather or track conditions.

Machine weight may approach the weight of the towing vehicle. Therefore, increase stopping distance accordingly.

NOTICE

The propel motors must be disengaged before towing. Whenever the machine is to be towed, set the Propel Motor [DISENGAGE/ENGAGE] switches to *DISENGAGE*. Both switches must be set to *DISENGAGE*.

Two (2) switches are on the machine to disengage and engage the propel motors. These switches are located in the cavity next to the fuel fillers on each side of the machine. See Figure 6-27.

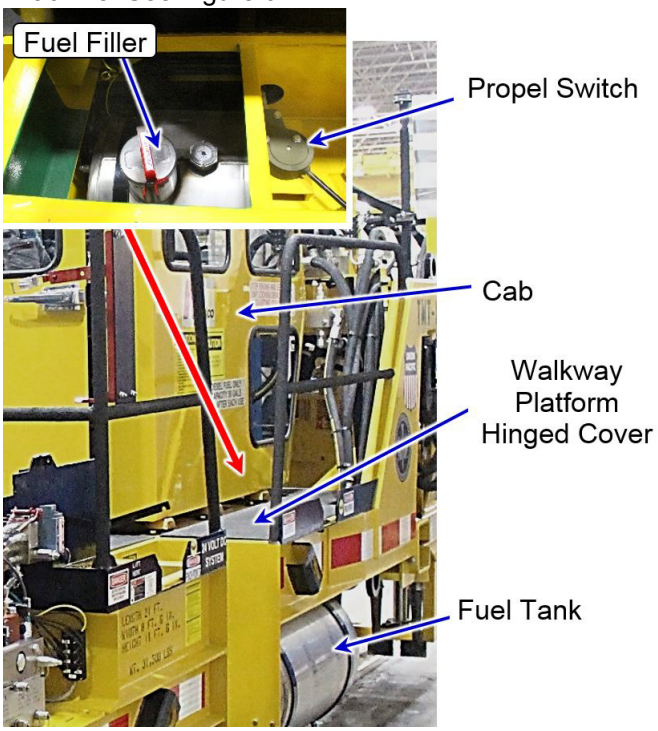


Figure 6-27: Propel Switch Location, Right

- The RIGHT switch engages/disengages the REAR propel motor.
- The LEFT switch engages/disengages the FRONT propel motor.

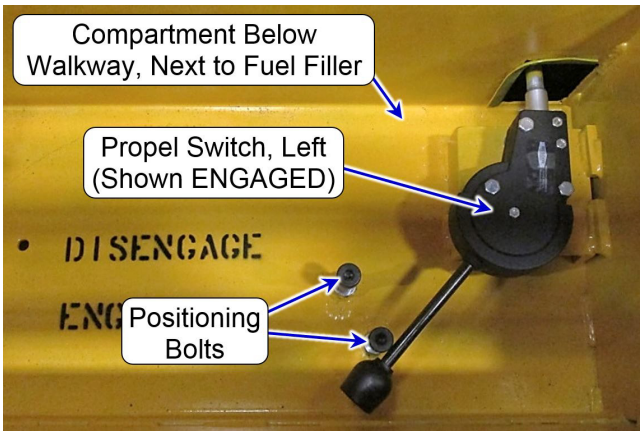


Figure 6-28: Propel DISENGAGE/ENGAGE Switch, Left Side of Machine

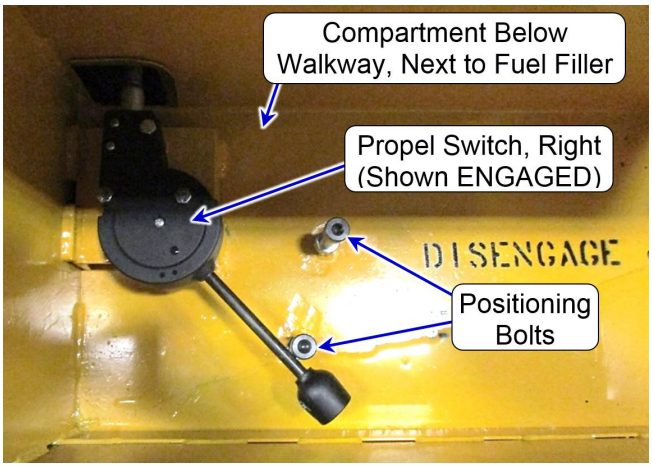


Figure 6-29: Propel DISENGAGE/ENGAGE Switch, Right Side of Machine

NOTE

One propel switch is located in each walkway compartment, along with two (2) bolts. Each bolt keeps the switch in one position or the other. When repositioning each switch, BOTH bolts must be removed in order to move the switch, then BOTH bolts must be reinstalled.

To DISENGAGE the Propel Motors:

1. Ensure that the machine is at a complete stop.
2. Chock the wheels.
3. Verify that both [**PROPEL DISENGAGE/ENGAGE**] switches are in the ***ENGAGE*** position from the machine having been working.
4. In the Left walkway compartment, remove the two (2) bolts.
5. Move the Left [**PROPEL DISENGAGE/ENGAGE**] switch handle to the ***DISENGAGE*** position.
6. Reinstall BOTH bolts and tighten.
7. In the Right walkway compartment, repeat the previous steps for the Right [**PROPEL DISENGAGE/ENGAGE**] switch.

Both switches MUST be in the ***DISENGAGE*** position before continuing to tow the machine.

For towing the machine, proceed with towing steps. Refer to “RAILWAY TOWING” on page 6-17.

To ENGAGE the Propel Motors:

1. Ensure that the machine is at a complete stop and is running.
2. Chock the wheels.
3. Verify that both [**PROPEL DISENGAGE/ENGAGE**] switches are in the ***DISENGAGE*** position from the machine having been towed.
4. In the Left walkway compartment, remove the two (2) bolts.
5. Move the Left [**PROPEL DISENGAGE/ENGAGE**] switch handle to the ***ENGAGE*** position.
6. Reinstall BOTH bolts and tighten.
7. In the Right walkway compartment, repeat the previous steps for the Right [**PROPEL DISENGAGE/ENGAGE**] switch.

Both switches MUST be in the ***ENGAGE*** position before continuing use the machine for anything other than towing.

The machine should now be ready to travel or work.

EMERGENCY PROCEDURES

EMERGENCY SHUTDOWN

NOTICE

DO NOT use this method as a shortcut to turning off the engine! ONLY use the emergency shutdown when the engine does not respond to the normal stop engine procedure or in the event of an emergency where time is critical.

To shut down the engine and stop all machine functions in an emergency, push the **EMERGENCY STOP** pushbutton located on the left arm control.

HYDRAULIC EMERGENCIES

1. If a hydraulic hose fails:
   a. Shut down the machine immediately.
   b. Determine the cause of the failure.
   c. Correct the condition.
2. If the indications on gauges are not within the normal range:
   a. Shut down the engine.
   b. Repair before further operation.
3. Emergency cylinder actuation requires the electric emergency pump. Refer to the HYDRAULICS section included with this manual.

MANUAL PROPEL MODE

In the event of a PLC controller or output failure, the PLC can be bypassed in order to allow movement of the machine.

To bypass the controller and propel the machine, do the following:

1. Rule out all other potential causes to the issue. Contact Nordco Service for help diagnosing a fault to determine if the controller issue is the cause of the fault.
2. Ensure that the machine is otherwise in good repair, is at a complete stop, and is running and warmed up.
3. In the Main Control Cabinet, switch circuit breaker [**CB10**] to ***OFF***. This prevents any undesired outputs from the PLC in the event that it is partially functional.
4. On the Main Control Cabinet, set the [**MODE**] switch to ***TRAVEL***.
5. INSIDE the Main Control Cabinet, set the [**PROPEL OVERRIDE**] switch to the ***EMERGENCY MODE*** position (UP). Refer to “MAIN Control Cabinet” on page 5-12.
6. On the Overhead Console, PULL the yellow [**ELECTRICAL INTERLOCK**] switch out to the ***ON*** position. (This will energize the hydraulic pumps and bring them up to high pressure.)
7. On the Overhead Console, set the [**ENGINE SPEED**] switch to the ***HIGH*** position.
8. On the Main Control Cabinet, set the [**PROPEL DIRECTION**] switch to the desired direction - **REVERSE** or **FOWARD**.
9. Press the Propulsion Pedal to move the machine.

⚠ CAUTION

DO NOT let the machine sit idle for extended periods of time in EMERGENCY MODE and with the ELECTRICAL INTERLOCK switch pulled out. The pumps will stay on high, generating excessive heat due to lack of circulation through the system, which can result in pump damage.

Section 7

ROUTINE MAINTENANCE

OVERVIEW

Please read and comply with all of the safety precautions in this manual BEFORE operating or servicing this machine. See **Section 1, "SAFETY INSTRUCTIONS & INFORMATION"**.

Recommended service intervals are for normal operating conditions. Service more often if the engine is operated under adverse conditions, such as areas with extreme heat, extreme cold, excessive dust, excessive humidity, and near salt water.

REQUESTING ASSISTANCE

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

Nordco Service Manager

(414) 766-2342

1-800-445-9258 (USA & Canada)

The process will be faster with the following information in hand before calling:

Model Name:	Hydraulic Switch Tamper (HSTX)
Serial Number:	**S N 2 2 _ _ _ _**

⚠ CAUTION

Neglecting maintenance can result in failures or permanent damage to the equipment.

SAFETY DURING MAINTENANCE

Alert others in the area that service or maintenance is being performed on this machine. Become familiar with, and follow your company's **Lockout/Tagout** procedures when performing maintenance on this machine. See **Section 2, "LOCKOUT/TAGOUT"**.

Do not start the engine if repairs or work is being performed alone. The operator 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 required.

⚠ WARNING

When performing maintenance on this machine:

- **ALWAYS make sure that the engine has been turned off and the [BATTERY DISCONNECT] switch has been turned to the *OFF* position and the box locked out before performing maintenance on this machine.**
- **NEVER clean, adjust, repair, or lubricate the machine while it is running unless:**
  - **a. It is specifically required to do so.**
  - **b. All necessary precautions have been taken.**
- **When performing maintenance on the brakes, exercise caution and cage the brakes if possible. Follow the brake manufacturer's instructions on the outside of the canister before attempting to disassemble the brake housing. The springs in the brake chamber are under tremendous compression.**
- **Use caution when draining hot fluids from the machine. Splashing hot fluid can cause serious burns.**
- **NEVER open the engine radiator cap while the engine coolant is hot.**
- **NEVER attempt to work under the machine while it is raised on the turntable unless special support blocks provided by Nordco are utilized.**

GENERAL ENGINE MAINTENANCE

ENGINE PRECAUTIONS

NOTICE

WHEN WELDING:

This machine is equipped with an engine that has an electronic control unit/module (ECU/ECM). Failure to correctly isolate it during welding on this machine WILL result in damage not covered under warranty.

Take the following steps to avoid damage to the ECU or ECM:

1. **Remove ground connection between the engine and the machine frame.**
2. **Remove the connectors from the ECU/ECM of the engine and the engine harness from the control box or panel.**
3. **Turn the [BATTERY DISCONNECT] switch to the *OFF* position.**
4. **Connect the welder ground close to the weld point so the ECU/ECM, and other electronic components, are not in the ground path.**

WHEN INSTALLING COMPONENTS ON THE ENGINE:

DO NOT apply a thrust load or end force to either end of the crankshaft during engine installation or during operation.

DO NOT force or use bolts to pull up the transmission or other drives to the engine.

Be sure the clutch shaft or drive shafts DO NOT restrict proper engine crankshaft end play.

Failure to follow these instructions may result in SEVERE engine damage.

CUMMINS ENGINES ONLY

After turning off the [**IGNITION]** switch, allow 30 seconds minimum before turning off the [**BATTERY DISCONNECT**] switch (BDS). Failure to do so may adversely affect machine electronic controls.

MACHINE FUELS, LUBRICANTS & COOLANTS

Diesel Fuel (Ultra Low Sulfur)

In all cases, the fuel shall meet the following properties:

Cetane number of 43 minimum. Cetane number greater than 47 is preferred, especially for temperatures below –20°C (–4°F) or elevations above 1500 m (5000 ft). Cold Filter Plugging Point (CFPP) should be at least 5°C (9°F) below the expected lowest temperature or Cloud Point below the expected lowest ambient temperature.

Fuel lubricity should pass a maximum scar diameter of 0.45 mm as measured by ASTM D6079 or ISO 121561.

Sulfur Content for Interim Tier 3 and EU Stage IIIB Engines:

- Diesel fuel quality and fuel sulfur content must comply with all existing emissions regulations for the area in which the engine operates.
- Use ONLY Ultra Low Sulfur Diesel (ULSD) fuel with a maximum of 0.0015% (15 mg/kg) sulfur content.

Use of fuel other than ULSD, that does not meet the specifications set forth in this Operator's Manual, will reduce the efficiency and durability of the engine, will harm and permanently damage the engine's advanced emissions control systems, reduce fuel economy and possibly prevent the engine from running at all.

Emission related warranties are likely to be rendered void by the use of a fuel that does not meet the specifications set forth in this Operator's Manual.

Engine Oil (Low Ash)

Oils meeting API CJ4, ACEA E9, or ACEA E6 or use of other specification oils in Interim Tier 3 and Stage IIIB engines can result in premature failure.

Coolant (No Nitrates)

IMPORTANT

- **DO NOT use cooling system sealing additives or antifreeze that contains sealing additives.**
- **DO NOT mix ethylene glycol and propylene glycol base coolants.**
- **DO NOT use coolants that contain nitrites.**

Water Quality

Water quality is important to the performance of the cooling system. Distilled, deionized, or de-mineralized water is recommended for mixing with ethylene glycol and propylene glycol base engine coolant concentrate.

LUBRICATION & MAINTENANCE

1. ALWAYS make sure that all lubricating oils, fluids, and filters are clean and maintained as outlined in this section. It is important that lubrication is performed at the time intervals stated to help prevent machine damage.
2. ALWAYS make sure that the engine radiator and oil cooler are kept clean and free of debris. Also make sure that the cooling fins are in good shape and not bent over.
3. ALWAYS make sure that the pump suction lines and ball valves are open and not blocked, closed, or collapsed.
4. Before starting the machine, inspect it for obvious defects and correct any problems discovered.
5. Inspect the brake shoes for ice, and remove if present, before operation of the machine. If ice is allowed to build up on brake shoes, braking efficiency is greatly reduced.
6. Replace the glass in the cab if nicks or damages occur to the outside.

Use a dry lubricant such as powder graphite, dry silicone, or equivalent on the traverse arm assemblies.

Lube points on this machine are indicated as shown in Figure 7-3 through Figure 7-5.

Figure 7-1: Grease Points & Labels

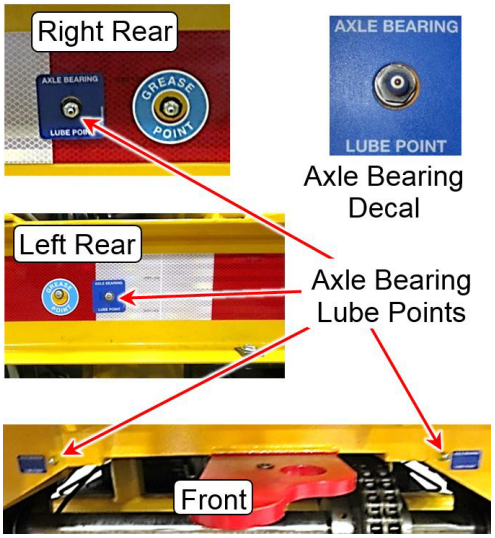


Figure 7-2: Axle Grease Points

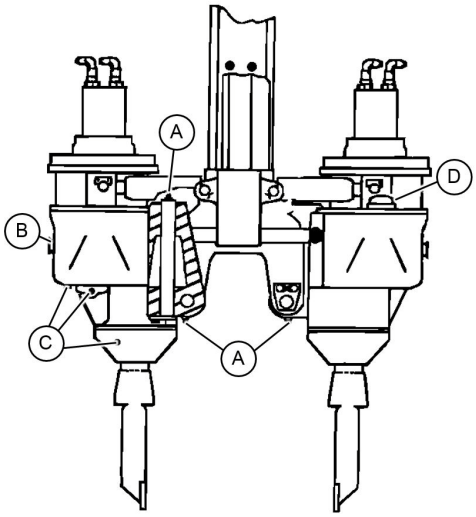


Figure 7-3: Workhead Grease Points

LUBRICATION SCHEDULE

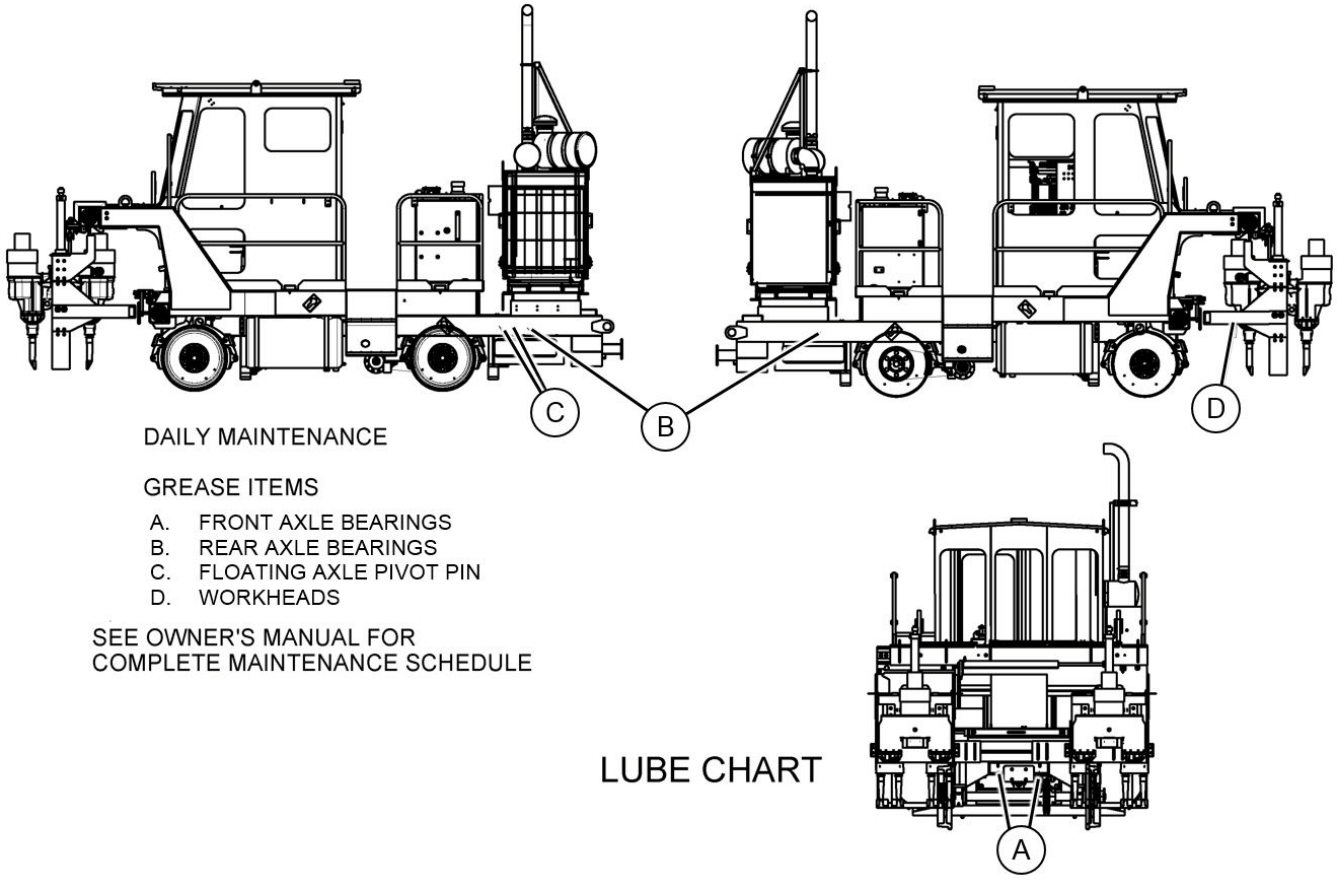


Figure 7-4: Lubrication Schedule

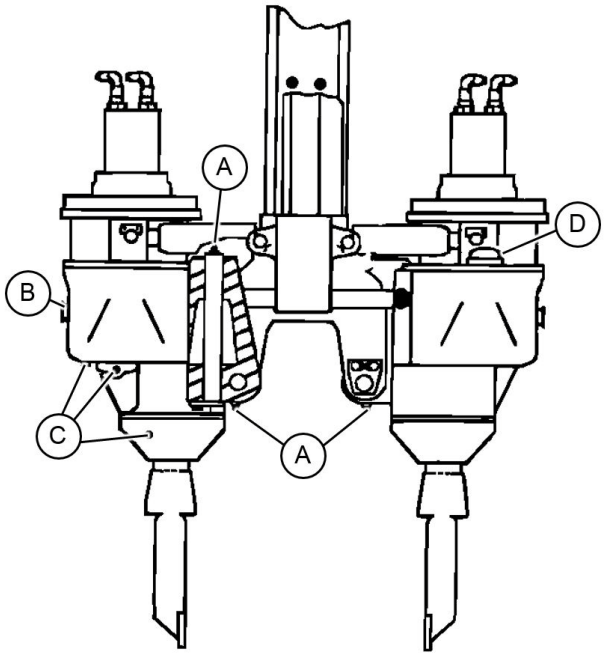


Figure 7-5: Lubrication Schedule, Workheads

Workhead Assembly:

A. Grease daily with EP grease. Grease with components warm to ensure positive grease flow. Grease in raised and lowered position until new grease displaces old grease. One top, two bottom and each vibrator.

B. Check oil level daily. Should be 1/2 to 3/4 full in sight glass with workhead in upright position. Use SAE 10W40XHD oil.

C. Change vibrator oil every 200 hours by removing all six plugs. Refill to sight glass with SAE 10W40XHD oil (6 quarts.)

D. Vibrator oil fill location.

7: ROUTINE MAINTENANCE

MAJOR COMPONENT MAINTENANCE SPECIFICATIONS

John Deere Engine	
Break-In Period:	50 Hours
Oil Change Schedule:	First 50 Hours, every 6 months thereafter
Lubricant Type:	API C4
Oil Capacity:	34.3 Quarts (32.5 L)
Lubricant Grade:	15W-40
Coolant Capacity:	13 Quarts (11.9 L)

Cummins Engine	
Break-In Period:	50 Hours
Oil Change Schedule:	First 50 Hours, every 6 months thereafter
Lubricant Type:	API C4
Oil Capacity:	16 Quarts (15 L)
Lubricant Grade:	15W-40
Coolant Capacity:	5 Gallons (19 L)

Funk Pump Drive	
Break-In Period:	50 Hours
Oil Change Schedule:	First 500 Hours, every six months thereafter
Lubricant Type:	Gear Oil
Capacity:	2 Quarts
Lubricant Grade, Weather Dependent	
Below -10°F (-23°C)	75W
-10°F - 100°F (-23°C - 37.8°C)	80W-90
Above 100°F (Above 37.8°C)	85W-140

Durst Pump Drive	
Break-In Period:	50 Hours
Oil Change Schedule:	First 500 Hours or 3 months of service (whichever comes first) Every 1000 Hours or 6 months thereafter
Lubricant Type:	Gear Oil
Capacity:	2 Quarts
Lubricant Grade, Weather Dependent	
Below -10°F (-23°C)	SHC 630
-10°F - 100°F (-23°C - 37.8°C)	80W-90 or EP90
Above 100°F (Above 37.8°C)	SHC 630

Propel Motor / Gearbox		
Lubricant Type:	Gear Lube	
Oil Capacity:	1.375 Quarts	
Lubricant Viscosity Grade, Weather Dependent		
	ISO	**SAE**
Below 50°F:	100	80W-90
32°F to 86°F:	150	90
68°F TO 104°F:	220	90
86°F TO 122°F:	320	90
Oil Change Schedule: First 100 gearbox operating hours and every 2500 operating hours thereafter. At least once a year.		

7: ROUTINE MAINTENANCE

MAINTENANCE SCHEDULES

Machine adjustments, inspections and lubrication are shown in charts on the following pages. Each numbered item listed in the charts is preceded by a letter **D**, **W**, **M**, **Q**, **X**, or **Y** which refers to the service interval for each task:

- D = Daily
- W = Weekly
- M = Monthly
- Q = Quarterly
- X = Every Six Months
- Y = Yearly

The recommended maintenance periods used in this manual are:

Daily -or- 10 hours
Weekly -or- 40 hours
Monthly -or- 150 hours
Quarterly -or- 500 hours
Semi-annual (6 months) -or- 1200 hours
Yearly -or- 2000 hours

Detailed instructions follow each chart where further instructions are needed.

DAILY SCHEDULE

DAILY (OR 10 HOURS, WHICHEVER COMES FIRST)			
Key: = Refer to Mfr's Manual in Component Data; = More Detailed Instructions Follow			
LOC	**ITEM**	**SYM**	**TASK**
ENGINE	D1		Check Engine Oil Level, Add SAE 15W-40 as needed.
	D2		Check Engine Coolant Level and add antifreeze (Ethyl-based), as required.
	D3		Check Fuel Filter & Fuel Water Separator.
	D4		Inspect V-Belt for proper tension and condition.
	D5		Check Visual Air Filters Indicators. Replace elements as needed.
	D6		Inspect Engine Exhaust and Intake System for leaks and rain cap for fit.
	D7		Check Air Pressure with Engine Running – Should maintain 120 PSI.
	D8		*- Reserved for Future Use -*
HYDRAULICS	D9		Check Hydraulic Oil Level. Maintain at least 3/4 Full. Add ISO 46 Oil as necessary.
	D10		Inspect Hoses and Fittings for Leaks.
	D11		Check Hydraulic Oil Return Filter Indicator when running. Replace elements if needed.
	D12		Check Hydraulic Oil Pressure Filter Indicator when running. Replace elements if needed.
	D13		*- Reserved for Future Use -*
			(Table Continued on Next Page)

7: ROUTINE MAINTENANCE

DAILY (OR 10 HOURS, WHICHEVER COMES FIRST)			
Key: = Refer to Mfr's Manual in Component Data; = More Detailed Instructions Follow			
LOC	**ITEM**	**SYM**	**TASK**
MISCELLANEOUS	D14		Inspect Electrical Connections/Harnesses for Tightness.
	D15		Drain Air Tanks, checking for excessive water or oil.
	D16		Fill Fuel Tank - End of day – Maintain at Least 1/4 Tank.
	D17		Clean Windows.
	D18		Inspect wheels, wheel nuts, brake shoes, and check gap between brake shoes and wheels.
	D19		Check all brake chamber for caging bolts.
	D20		Check machine for cracks or other structural damage.
	D21		Check that all lights (brake, marker, work, travel, strobes) are functioning.
	D22		Clean debris/trash from machine.
	D23		*- Reserved for Future Use -*
	D24		*- Reserved for Future Use -*
	D27		*- Reserved for Future Use -*
WORKHEADS	D31		Check oil level in vibrators. Should be in sight glass. Fill with SAE 15W40 as needed.
	D32		Grease workhead pivot pins, 2 on horizontal pin and 1 on top of vertical pin.
	D33		Check that the Guide Rods Drip Style Oilers are working.
	D34		*- Reserved for Future Use -*
	D35		*- Reserved for Future Use -*

7: ROUTINE MAINTENANCE

DETAILED DAILY INSTRUCTIONS:

D1. CHECK ENGINE OIL LEVEL: JOHN DEERE ENGINES

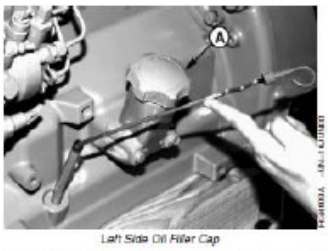
Check the oil level daily with the engine stopped. If necessary, add sufficient oil to raise the level to the proper mark on the dipstick. All diesel engines are designed to use some oil, so periodic addition of oil is normal.

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

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.

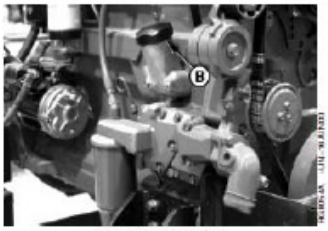
DO NOT add makeup oil until the oil level is BELOW the ADD mark on dipstick.

John Deere ENGINE BREAK-IN OIL (TY22041) should be used to make up any oil consumed during the break-in period.

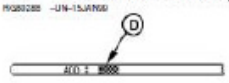


Left Side Oil Filler Cap

Rocker Arm Cover Filler Cap



Right Side Oil Filler Cap



Crosshatch on Dipstick

D1. CHECK ENGINE OIL LEVEL: CUMMINS ENGINES

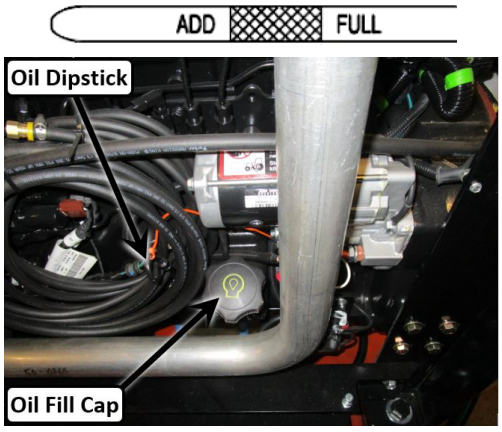
Check the oil level daily with the engine stopped. If necessary, add sufficient oil to raise the level to the proper mark on the dipstick. All diesel engines are designed to use some oil, so periodic addition of oil is normal.

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

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.

DO NOT add makeup oil until the oil level is BELOW the ADD mark on dipstick.

Cummins recommends that no special “break-in” oils be used in new or rebuilt engines. Cummins recommends using the same lubricating oil used in normal engine operations.



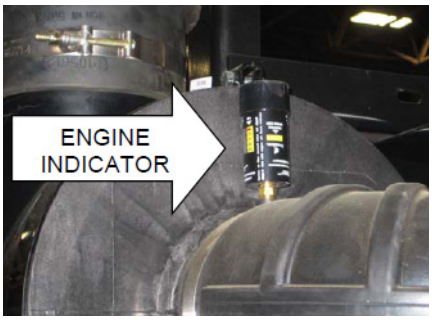
D3. DRAIN ENGINE WATER SEPARATOR/FUEL WATER TRAP

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

D5. CHECK AIR CLEANER INDICATORS

Do not allow air inlet restriction to exceed 20 inches of water (5.0 kPa) under any operating conditions. Inspect the entire air system for leaks daily. Look for torn air inlet piping or boots and loose or damaged clamps. Have worn or damaged parts repaired or replaced as required.

Retighten any loose connections.



D9. CHECK HYDRAULIC OIL LEVEL & QUALITY – SIGHT INSPECTION ONLY

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, check the oil quality. If oil becomes dark or milky colored, it should be changed immediately.

If equipped with the optional top-off pump, ALWAYS use the hydraulic tank top-off pump assembly.

NOTES

- *ALWAYS add hydraulic oil to the reservoir through a filter.*
- *NEVER overfill the reservoir.*
- *NEVER use hydraulic brake fluid in lieu of hydraulic oil.*

D10. INSPECT HOSES & 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 the shut-off valve on suction strainers are OPEN. Opening the valve can often correct what appears to be a malfunction.
3. Inspect all vital hose connections, especially at the 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 damaged should be considered unfit for further service.

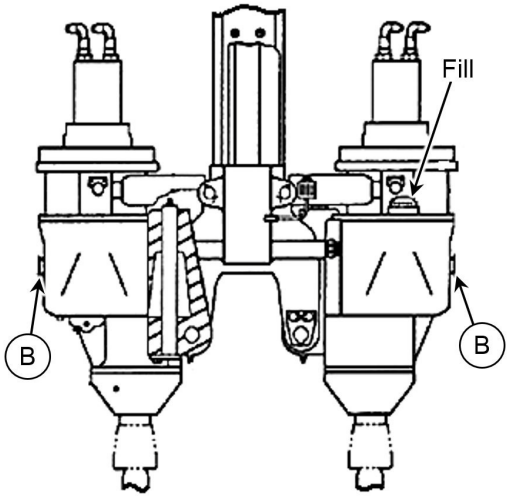
D14. INSPECT ELECTRICAL CONNECTIONS/HARNESSES FOR TIGHTNESS

Daily inspection of the harnesses connected to the controllers, operator control boxes (both left and right control boxes), footswitches, and Main Control Cabinet 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 excessive wear or breakdown is noticed, replace the switch.

D31. CHECK OIL LEVEL IN VIBRATORS

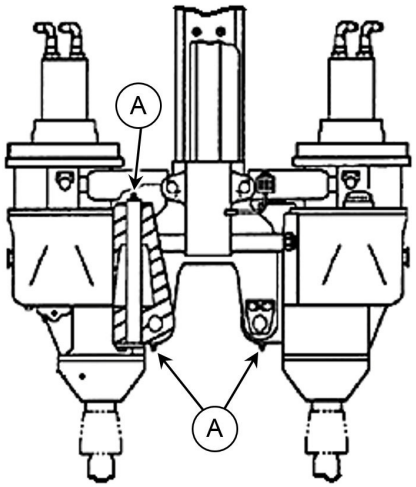
Check oil level daily. Should be 1/2 to 3/4 full in sight glass (refer to “B” in the figure) with workhead in upright position.

Fill with SAE 10W40 XHD.



D32. GREASE WORKHEAD PIVOT PINS

- Grease workhead pivot pins (refer to “A” in the figure) daily with EP grease.
- Grease with components warm (end of day) to ensure positive grease flow.
- Grease in raised and lowered positions until new grease displaces old grease.
- There are one(1) top and two(2) bottom grease fittings per vibrator, four vibrators total per machine.



7: ROUTINE MAINTENANCE

WEEKLY SCHEDULE

WEEKLY (OR 40 HOURS, WHICHEVER COMES FIRST)			
Key:  = Refer to Mfr's Manual in Component Data;  = More Detailed Instructions Follow			
LOC	**ITEM**	**SYM**	**TASK**
MISCELLANEOUS	W1		Perform all Daily Lubrication and Maintenance Procedures
	W2		Check Battery electrolyte level adding distill water as needed and inspect/clean contact points and cables
	W3		Adjust and oil Propulsion Chains, Adjusting screw and yoke threads (Front & Rear)
	W4		Check Oil Level in Pump Drive
	W5		*- Reserved for Future Use -*
	W6		Clean Engine Air Filter Dust Collector
	W7		Visually Inspect Hydraulic Tank Air Breather for COLOR change
	W8		Inspect Engine Fan for Condition
	W9		Check tamping tool tightness and wear
	W10		Check brake shoes and adjust as needed
	W11		Grease Brake Lever Pivot
	W12		Grease Axle Bearings
	W13		Check Fire Extinguisher Charge
	W14		After First 40 Hours of Machine Use. Remove & Inspect BOTH Suction Strainer Elements (Yearly Thereafter)
	W15		*- Reserved for Future Use -*
	W16		*- Reserved for Future Use -*

DETAILED WEEKLY INSTRUCTIONS:

W2. CHECK BATTERY CONDITION, CLEAN TERMINALS

DANGER

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

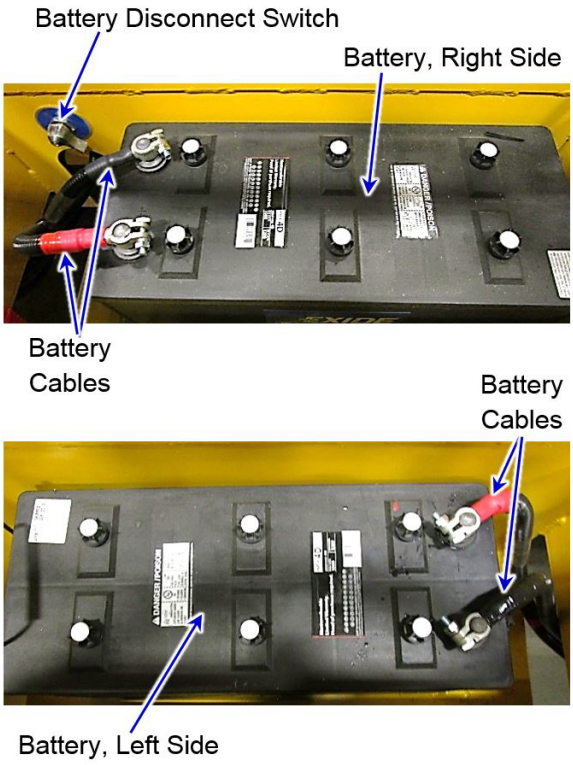
The battery requires periodic servicing. Check the electrolyte level on a weekly basis. Add distilled water if necessary, but do not overfill. Overfilling can cause poor battery performance and/or early failure.

Make sure that the **[BATTERY DISCONNECT]** switch is in the ***OFF*** position.

Inspect the terminals and cable clamps regularly. Clean the battery terminals and cable clamps when corrosion is visible. Have excessively corroded or damaged parts replaced. To get best performance out of the battery, make sure that the terminal side of the battery (terminals and cable clamps) is kept clean. It is suggested to coat them with grease or other suitable product to reduce corrosion.

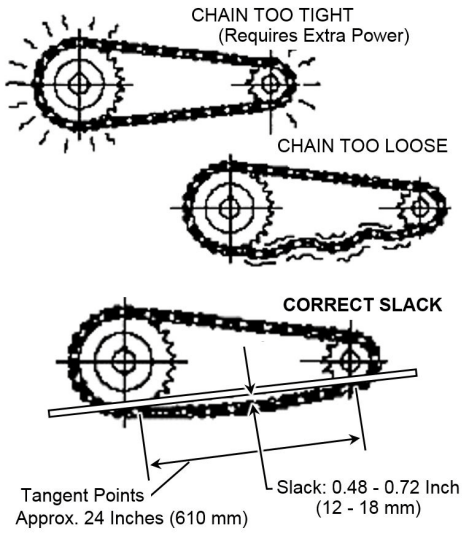
When battery replacement becomes necessary it is recommended that the replacement battery meet or exceed the original battery specifications. Refer to “SPECIFICATIONS - HSTX TAMPER” on page 4-2.

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



W3. ADJUST & OIL PROPULSION CHAINS

Inspect the propel drive chain with the full machine weight resting on the wheels and axles.



IMPORTANT

The chain is not to be tensioned while the machine is on jack stands or suspended in the air.

The chain should have a slack near the center between the tangent points where the chain meets the sprockets. The proper slack is between 2% and 3% of the distance between the 2 tangent points. For vertical installations, the slack should be approx. 2%.

For a tangent distance of approx. 24 inches (610 mm) the correct slack should be:

0.48 to 0.72 inch (12-18 mm).

For longer or shorter chains adjust the slack accordingly.

NOTES

- *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 is not carried by all of the teeth on the sprocket. This results in an excessive load on a few teeth.*

To adjust the drive chain:

1. Remove the propulsion chain guard.
2. Unscrew the adjusting screw locknut, but **DO NOT** remove it from the screw.
3. Turn the adjusting screw Clockwise (CW) to tighten the chain, or Counterclockwise (CCW) to loosen the chain.
4. Once the desired tightness has been reached, tighten the adjusting screw locknut.
5. Drizzle engine oil along the chain and sprockets, top and bottom.
6. Oil the propulsion chain adjusting nuts.
7. Reinstall the chain guard.

W4. CHECK THE OIL IN THE PUMP DRIVE

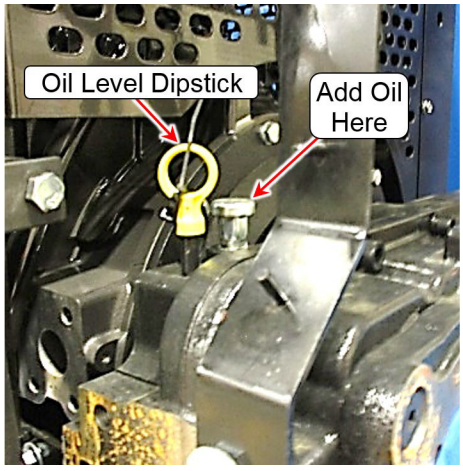
The type of service and the operating conditions determine the service interval. However, it is recommended that the oil level be checked weekly, at the same time checking for oil leaks.

Because the lubricant system is the heart of the unit, it is especially important that the oil be kept clean.

1. Stop the engine before checking or adding oil.
2. Clean around the oil fill before checking or adding oil.
3. It is recommended that the lubricating oil (SAE 80W90) be changed after the first 500 hours of service. (See the 6 Month Schedule (X-3) for procedure.)

IMPORTANT

DO NOT overfill. This will result in overheating and possible malfunction of the unit.



W12. GREASE AXLE BEARINGS

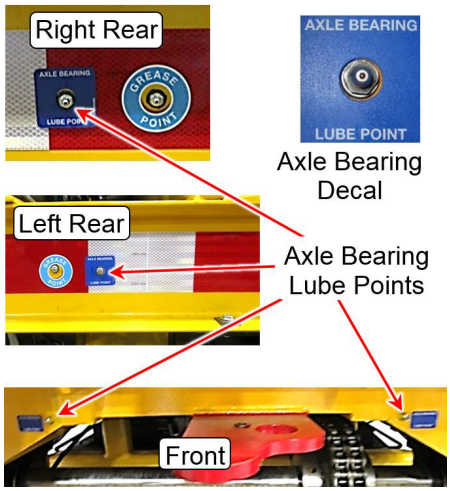
Periodic inspection of the axle bearings and spacers for wear and breakdown are required to keep this machine functioning properly. Inspect hardware for proper fit and secure all loose nuts and bolts. Check spacers for wear.

The wheel bearing grease fittings are located:

- One fitting on both sides of the frame (A) at the rear axle.
- Two fittings on the front of the unit (B), behind the workheads.

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

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



NOTE

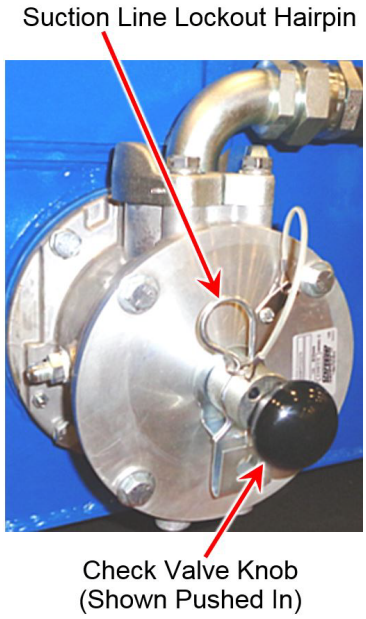
If supplied, check the automatic greasing for proper charge.

W14. CHECK BOTH SUCTION STRAINER ELEMENTS

There are two (2) Suction Strainers on this machine, located on the back of the hydraulic reservoir, near the bottom, between the tank and the engine. Remove and inspect the filter after the **first 40 hours** of operation and **every year** thereafter. Clean as required. To access each filter proceed as follows:

1. Shut down the machine.
2. Push the Check Valve Knob inward and remove the Quick Pin.
3. With the quick pin removed, the knob assembly extends outward and allows the check valve to engage. **Ensure that the Check Valve Knob is extended out.**

   When the check valve is engaged, the inspection and cleaning of the magnetic suction separator or servicing hydraulic components can be done without draining oil from the hydraulic reservoir.
4. Remove the four (4) capscrews that attach the cover.
5. Lift off the cover.
6. Inspect the magnetic separator. Clean or replace as needed.
7. Insert the replacement or cleaned separator.
8. Attach the suction strainer cover and install the four (4) capscrews, then tighten the capscrews.
9. Push the Check Valve Knob in to disengage the check valve, then insert the Quick Pin.
10. Restart the machine and check for proper operation and leaks.



NOTE

If the suction line filter is to be removed, the hydraulic tank must be sealed to prevent external contamination.

7: ROUTINE MAINTENANCE

MONTHLY SCHEDULE

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		Change engine oil and oil filter
	M3		Change engine fuel filter and fuel/water separator element
	M4		Change engine coolant filter
	M5		Inspect engine cooling system (leaks, connections, and hoses)
	M6		Check air compressor coolant lines
	M7		Ensure engine mounts, fuel tank mounts and hydraulic tank mounts are secure
	M8		Check engine serpentine belt
	M9		Check Fan, Alternator, and Generator Belts
	M10		Check hydraulic hoses on machine for wear and leaks. Repair as needed
	M11		Check hydraulic cylinders for leaks and/or damage
	M12		Check hydraulic valves for leaks and/or damage
	M13		Inspect Hydraulic Tank Top Off for Damage/Cleanliness
	M14		Check both implement pump pressures. Adjust to 2700 PSI
	M15		Check Propel Cross Over Relief Valves 2800 PSI
	M16		Change oil in vibrators. Refill with SAE 15W40 (8 Quarts each)
	M17		If Water in Air tanks, Check Air Dryer desiccant. Replace if needed
	M18		Check Cab Pressurizer Air Filter. Replace if needed
	M19		Lube left/right Traverse Tubes/Wear Pads with Powder Graphic, Dry Silicone, or Equivalent
	M20		Clean AC/Heater Vents / Filter
	M21		Inspect the Left and Right workhead wear pads for any damage or excessive wear. Replace as needed
	M22		Test Emergency Pump Operation 2000 PSI
			(Table Continued on Next Page)

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	M23		Check Brake Shoes For Wear and/or Replace Shoes
	M24		Check Brake Chambers – Diaphragm - Spring
	M25		*- Reserved for Future Use -*
	M26		Inspect Windshield Wipers. Replace if needed
	M27		Clean Oil Cooler
	M28		Check Propel Gearbox Oil Levels
	M29		*- Reserved for Future Use -*
	M30.		*- Reserved for Future Use -*

DETAILED MONTHLY INSTRUCTIONS:

M9. CHECK FAN, ALTERNATOR & GENERATOR BELTS

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.

M14 & M15. RUN PRESSURE CHECKS ON MAIN PUMP & PROPULSION

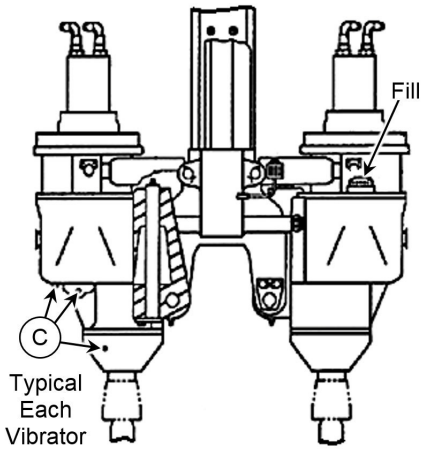
Pressure checks should be performed every 250 hours or monthly after the engine and hydraulics have thoroughly warmed up (oil temperature has reached 100°F (37.8°C minimum). Before performing these checks, read and understand all operating instructions, warnings, and cautions.

M16. CHANGE OIL IN VIBRATORS

The oil in the vibrators should be changed every 200 hours.

When changing the oil, check the magnetic drain plugs (refer to “C” in the figure) for any sign of metal particles.

Fill with SAE 10W40 Motor Oil.



M17 CHECK DESICCANT AIR DRYER

If during the daily draining of air tanks water is being drained off, the desiccant cartridge for the air dryer needs to be inspected and/or replaced.

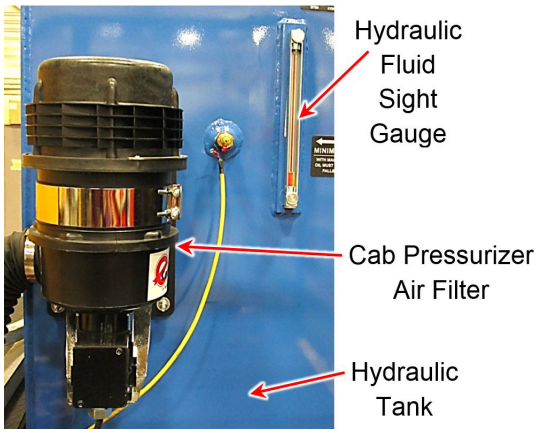
Refer to “Y7. Replace Desiccant Cartridge” on page 7-29 for replacement procedures.

M18. CAB PRESSURIZER AIR FILTER

1. Loosen the screws which hold the lid in place. The screws remain attached to the lid after they are loosened.
2. When the lid is removed, examine the rubber gasket that seals the lid to the filter housing. If the gasket is damaged or missing, replace it.
3. If filter needs to be replaced, do not try cleaning it. Replace it.

NOTE

Filter: EU P1/MERV8, Part # FEFF003

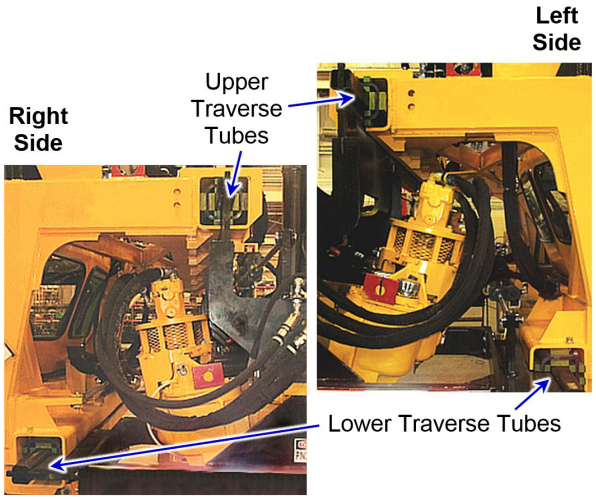


M19. LUBE LEFT/RIGHT TRAVERSE TUBES/WEAR PADS

Lubricate the traverse arms with a dry lubricant, such as powder graphite, dry silicone, or equivalent.

To lubricate the traverse arms:

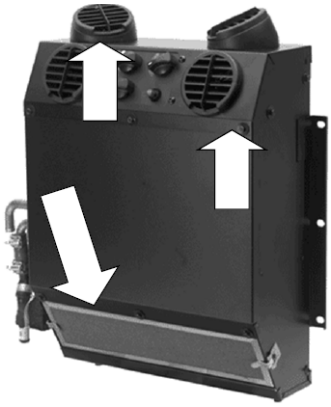
1. Extend the traverse arms out as far as they will extend.
2. Apply the lubricant to the arms.
3. Retract the traverse arms.



M20. CHECK & CLEAN A/C VENTS, FILTER SCREENS

Blow out the vents on a monthly basis.

Clean the screen filter on a monthly basis, more often if used continuously.



M23. CHECK BRAKE SHOES FOR WEAR AND/OR REPLACE SHOES

IMPORTANT

Replace the brake shoes when the pad is less than 3/8 inch (0.952 cm) thick.

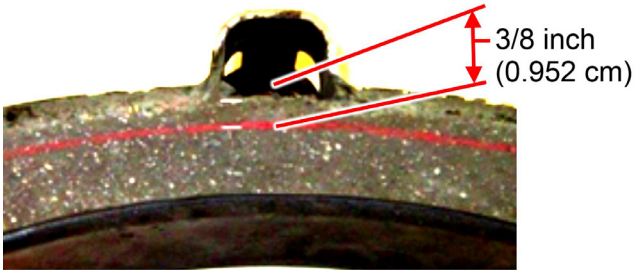


Figure 7-6: Minimum Brake Pad Thickness

Once it has been determined that the brake shoes are worn and require replacement, the following topics describe how to replace the brake shoes using two (2) slightly different methods:

- When compressed air is not available. See “REPLACING THE BRAKE SHOES WITH NO AIR ASSIST” on page 7-19.
- When on-board compressed air is available for releasing the brakes. See “REPLACING THE BRAKE SHOES WITH AIR ASSIST” on page 7-21.

Choose one or the other method.

NOTES

- *For both methods, numbers in parenthesis refer to item numbers in the associated figures.*
- *There are two (2) brake shoes on each wheel, one forward and one at the rear. When replacing the brake shoes, it is recommended to replace the shoes in pairs.*
- *There is one Brake Canister per wheel. When replacing all brake shoes on the machine, all 4 brake canisters must be released.*

REPLACING THE BRAKE SHOES WITH NO AIR ASSIST

1. Ensure that the machine is at a complete stop.
2. Set the [**IGNITION**] switch to the ***OFF*** position.
3. Turn the [**BATTERY DISCONNECT**] switch to the ***OFF*** position. Lock out and Tag out the [**BATTERY DISCONNECT**] switch using the proper procedures. See “LOCKOUT/TAGOUT” on page 2-1
4. Chock all of the wheels.
5. Bleed the air from the system by pulling the AIR DRAIN cable at the back of the machine. Drain the air reservoirs.
6. Remove the Brake Canister Release Bolt from the side of the brake canister. Screw the bolt into the bottom of the canister to secure the spring (the bolt is inserted to provide a positive mechanical release in addition to the air).

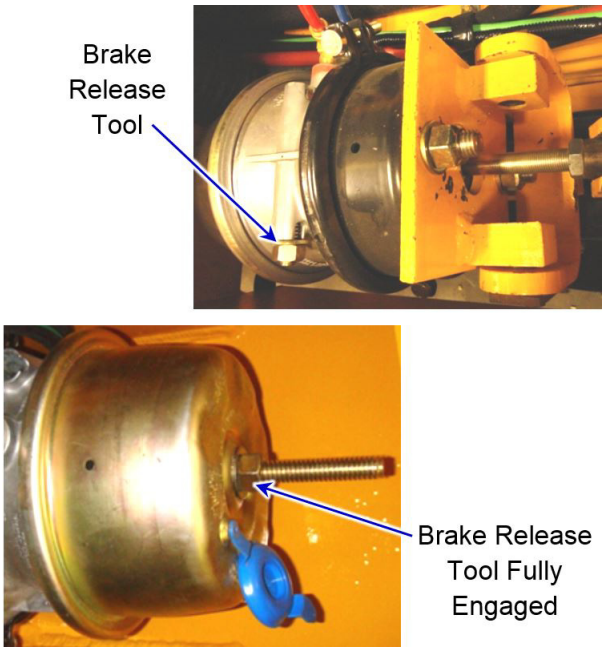


Figure 7-7: Brake Release Tool

7. Remove the Brake Canister Release Bolt for all brake shoes that need replacing.

Replacing the brake shoe:

7: ROUTINE MAINTENANCE

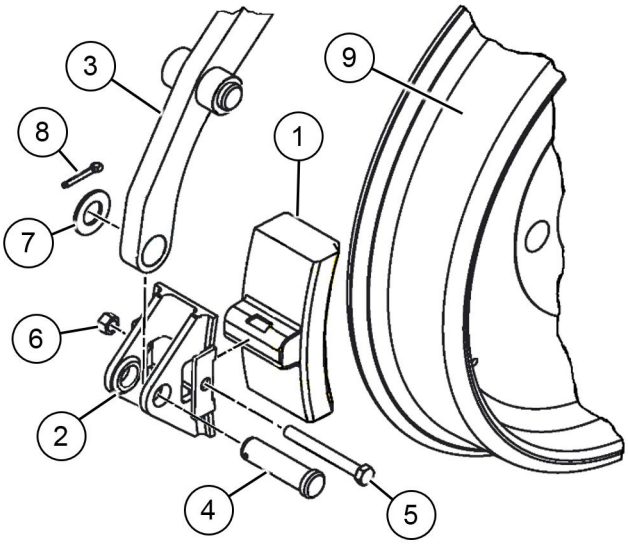


Figure 7-8: Brake Shoe Installation

(1) Brake Shoe
(2) Brake Shoe Bracket
(3) Brake Arm Lever
(4) Brake Shoe Bracket Pin
(5) Brake Shoe Mounting Bolt
(6) Nut
(7) Flat Washer
(8) Cotter Pin
(9) Wheel

a. Remove the Cotter Pin (8) from the Brake Shoe Bracket Pin (4).
b. Remove the Brake Shoe Bracket Pin (4) and Flat Washer (7) from the Brake Arm Lever (3) and the Brake Shoe Bracket (2).
c. Remove the Brake Shoe and Bracket assembly (1 & 2) from the wheel (9).
d. Remove the Brake Shoe Mounting Bolt (5) and Nut (6). Separate the Brake Shoe (1) and the Bracket (2).
e. Place the new Brake Shoe (1) in the Brake Shoe Bracket (2).
f. Reinstall the Mounting Bolt (5) and Nut (6). Tighten to the proper specification.
g. Install the new Brake Shoe and Bracket assembly underneath the brake lever (3) and reinstall the Brake Shoe Bracket Pin (4) through the Brake Arm Lever (3) and the Brake Shoe Bracket (2).
h. Install a new Cotter Pin (8) (discard the original one) on the Brake Shoe Bracket Pin.

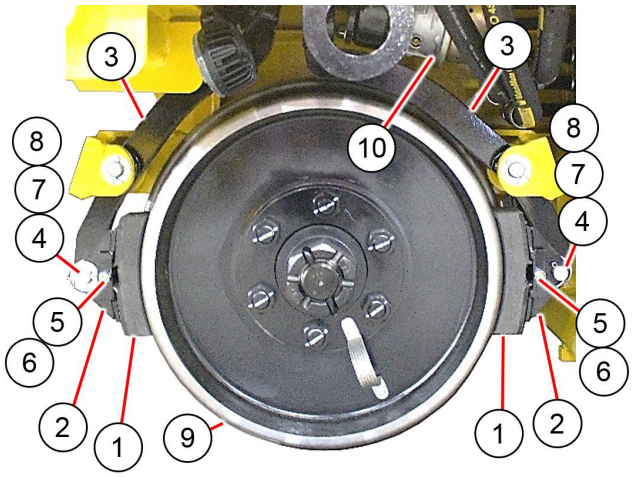


Figure 7-9: Brake Shoe Installation Assembled

(1) Brake Shoe
(2) Brake Shoe Bracket

(3) Brake Arm Lever

(4) Brake Shoe Bracket Pin

(5) Brake Shoe Mounting Bolt

(6) Nut

(7) Flat Washer

(8) Cotter Pin

(9) Wheel

(10) Brake Canister

8. Remove the Brake Canister Release Bolt from the bottom of the canister and store on the side of the brake canister.
9. Adjust the brake position bolt until there is a 3/16 inch (0.952 cm) clearance between the brake pad and the wheel with the brake pedal off. Also refer to the Pneumatic section included with this manual.
10. Repeat the above steps for each additional brake that needs new shoes.
11. When all brakes are repaired, remove the lock and tag from the [**BATTERY DISCONNECT**] switch using the proper procedures.
12. Remove the wheel chocks.

The machine should now be ready for normal operation.

REPLACING THE BRAKE SHOES WITH AIR ASSIST

Refer to the notes in the previous topic.

1. Ensure that the machine is at a complete stop.
2. Chock all of the wheels.
3. Turn the [**BATTERY DISCONNECT**] switch to the ***ON*** position.
4. Select the [**MODE**] switch to the ***TRAVEL*** position.
5. Turn the [**IGNITION**] switch to the ***ON*** position.
6. PULL the [**ELECTRICAL INTERLOCK**] switch ***OUT*** to enable the electrical system.
7. Turn the [**IGNITION**] switch again to start the engine. Once started, allow the air system to charge completely (60-80 psi).
8. PUSH the yellow [**SYSTEM PARK**] switch on the left side of the Left Arm Console ***IN*** to release the parking brake.
9. Remove the brake canister release bolt from the side of the brake canister. Screw the bolt into the bottom of the canister to secure the spring (the bolt is inserted to provide a positive mechanical release in addition to the air).

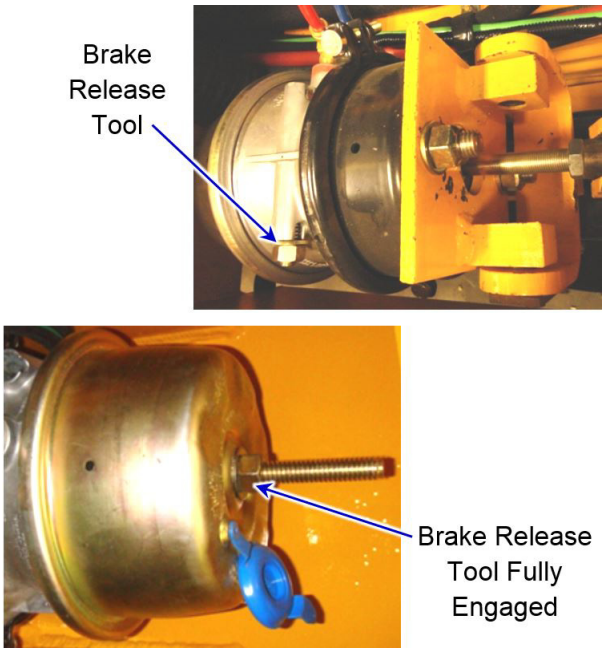


Figure 7-10: Brake Release Tool

10. Remove the brake canister release bolt for all brake shoes that need replacing.
11. Turn the [**IGNITION**] switch to the ***OFF*** position to shut down the engine.
12. This resets the [**SYSTEM PARK**] switch, but the canisters remain released since the release bolt has been inserted in the bottom of the canister.
13. Turn the [**BATTERY DISCONNECT**] switch to the ***OFF*** position. Lock out and Tag out the [**BATTERY DISCONNECT**] switch using the proper procedures. See “LOCKOUT/TAGOUT” on page 2-1.

Replacing the brake shoe:

7: ROUTINE MAINTENANCE

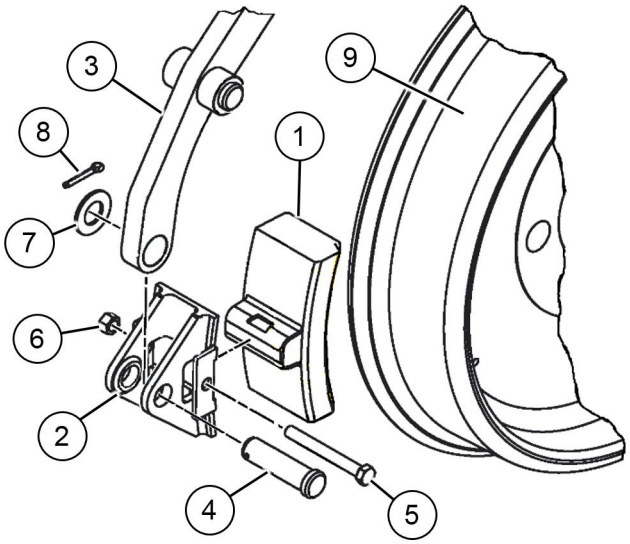


Figure 7-11: Brake Shoe Installation

(1) Brake Shoe
(2) Brake Shoe Bracket
(3) Brake Arm Lever
(4) Brake Shoe Bracket Pin
(5) Brake Shoe Mounting Bolt
(6) Nut
(7) Flat Washer
(8) Cotter Pin
(9) Wheel

a. Remove the Cotter Pin (8) from the Brake Shoe Bracket Pin (4).
b. Remove the Brake Shoe Bracket Pin (4) and Flat Washer (7) from the Brake Arm Lever (3) and the Brake Shoe Bracket (2).
c. Remove the Brake Shoe and Bracket assembly (1 & 2) from the wheel (9).
d. Remove the Brake Shoe Mounting Bolt (5) and Nut (6). Separate the Brake Shoe (1) and the Bracket (2).
e. Place the new Brake Shoe (1) in the Brake Shoe Bracket (2).
f. Reinstall the Mounting Bolt (5) and Nut (6). Tighten to the proper specification.
g. Install the new Brake Shoe and Bracket assembly underneath the brake lever (3) and reinstall the Brake Shoe Bracket Pin (4) through the Brake Arm Lever (3) and the Brake Shoe Bracket (2).
h. Install a new Cotter Pin (8) (discard the original one) on the Brake Shoe Bracket Pin.

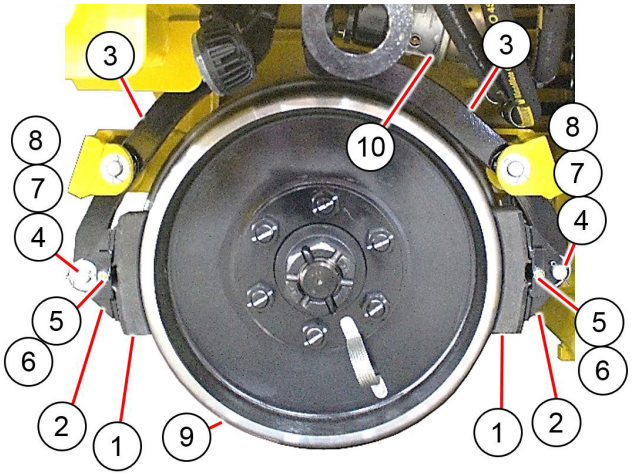


Figure 7-12: Brake Shoe Installation Assembled

(1) Brake Shoe
(2) Brake Shoe Bracket
(3) Brake Arm Lever
(4) Brake Shoe Bracket Pin
(5) Brake Shoe Mounting Bolt
(6) Nut
(7) Flat Washer
(8) Cotter Pin
(9) Wheel
(10) Brake Canister

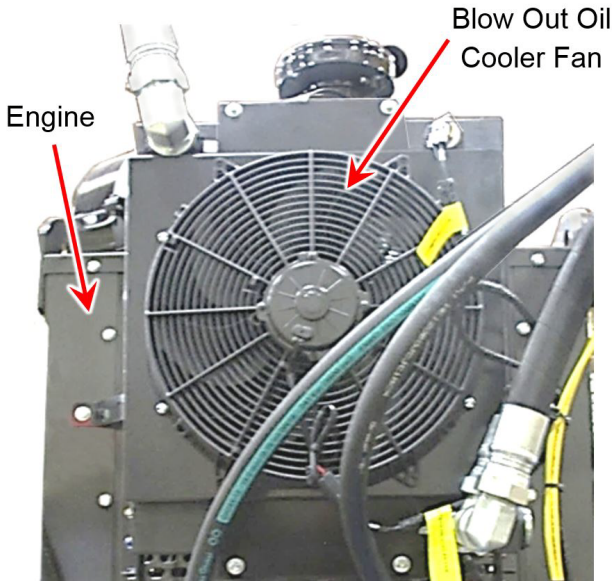
14. Adjust the brake position bolt until there is a 3/16 inch (0.952 cm) clearance between the brake pad and the wheel with the brake pedal off. Also refer to the Pneumatic section included with this manual.
15. Repeat the above steps for each additional brake that needs new shoes.
16. When all brakes are repaired, remove the lock and tag from the [**BATTERY DISCONNECT**] switch using the proper procedures.
17. Turn the [**BATTERY DISCONNECT**] switch to the ***ON*** position.
18. Turn the [**IGNITION**] switch to the ***ON*** position.
19. Turn the [**IGNITION**] switch again to start the engine. Once started, allow the air system to charge completely (60-80 psi).
20. PUSH the yellow [**SYSTEM PARK**] switch on the left side of the Left Arm Console ***IN*** to release the parking brake.
21. Remove the brake canister release bolt from the bottom of the canister for each brake that has been repaired.
22. PULL out the yellow [**SYSTEM PARK**] switch on the left side of the Left Arm Console to set the parking brake.
23. Remove all of the wheel chocks.

The machine should now be ready for normal operation.

M27. CLEAN THE OIL COOLER

Brush the debris from the outside of the oil cooler with a soft brush.

Inspect the fins for damage or obstructions every 200 hours of operation. Blow out any debris from the cooler fins with low pressure compressed air as required.



M28. CHECK PROPEL MOTOR/GEARBOX OIL LEVEL

The required maintenance for the Propel Motor/Gearbox is to check the lube level in the gearbox and replace the lubricant if and when needed.

IMPORTANT

When replacing the Propel Motor / Gearbox, the replacement component is delivered with NO gear lube. Before placing the gearbox into service it must be filled with the proper type and quantity of gear lube.

- Check the lubricant level in the Propel Gearbox per the “MONTHLY SCHEDULE” on page 7-15.
- Change the lubricant in the Propel Gearbox per the schedule in “MAJOR COMPONENT MAINTENANCE SPECIFICATIONS” on page 7-5.
- For the proper lubrication to use, see “MAJOR COMPONENT MAINTENANCE SPECIFICATIONS” on page 7-5.

For draining or filling the gearbox, refer to the locations shown in Figure 7-13 and use one of the Drain/Fill plugs at the gearbox end (output) of the assembly.

To avoid deposits, replace the lubricant when the gearbox is hot.

CAUTION

The surface of the gearbox and the lubricant may be very hot. Wear protective apparel (gloves, goggles, etc.) when changing the lubricant. See additional cautions in “SAFETY DURING MAINTENANCE” on page 1-4.

When necessary to add fluid to the gearbox, use the same gear lube that is already in the gearbox. When disposing of used lubricant, protect the environment and obey all local laws and dispose of properly.

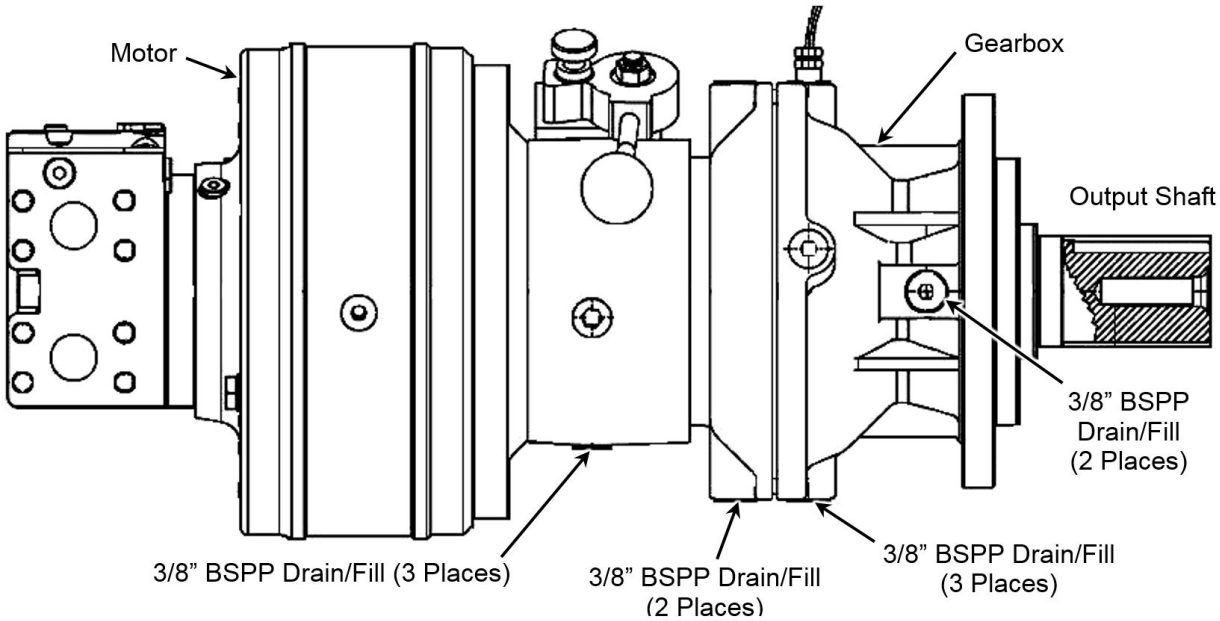


Figure 7-13: Propel Gearbox Drain & Fill Locations

7: ROUTINE MAINTENANCE

QUARTERLY SCHEDULE

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		Replace fuel filters.
	Q3		Test hydraulic oil cleanliness, replace filters as necessary.
	Q4		Replace hydraulic and fuel tank breathers and filler screens.
	Q5		Check all wiring for wear and/or damage.
	Q6		Check switches and contacts for tightness.
	Q7		Check terminal strips for tightness.
	Q8		Check wheels lugs for tightness.
	Q9		Measure wheel diameters for uniform wear within set.
	Q10		*- Reserved for Future Use -*
	Q11		*- Reserved for Future Use -*

DETAILED QUARTERLY INSTRUCTIONS:

Q3. 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 the fluid whenever contamination occurs because even small amounts of water can affect system performance as well as induce corrosion and oil breakdown.

Q4. REPLACE HYDRAULIC & FUEL TANK BREATHERS, FILLER SCREENS

Proper fluid condition is essential for long and productive life of hydraulic components and fuel systems.

1. Change the hydraulic tank air dryer cartridge.
2. Change both hydraulic tank return filters.

Inspect both fuel tank and hydraulic tank filler screens for contamination or damage. Replace as needed.

7: ROUTINE MAINTENANCE

6 MONTH (SEMI-ANNUAL) SCHEDULE

6 Month (OR 1200 HOURS, WHICHEVER COMES FIRST)			
Key: = Refer to Mfr's Manual in Component Data; = More Detailed Instructions Follow			
LOC	**ITEM**	**SYM**	**TASK**
MISCELLANEOUS	X1		Perform all Daily, Weekly, Monthly, and Quarterly Lubrication and Maintenance Procedures
	X2		Check all bolts and nuts on machine for missing hardware and tightness
	X3		Change oil in pump drive. Refill with SAE 80W90
	X4		Drain and Refill Propulsion Motor Gearbox. For reference Figure 7-13 on page 7-24
	X5		*- Reserved for Future Use -*
	X6		Change Hydraulic Tank Top-Off Filter (Optional)
	X7		*- Reserved for Future Use -*
	X8		*- Reserved for Future Use -*

DETAILED 6-MONTH INSTRUCTIONS:

X3. PUMP DRIVE OIL CHANGE

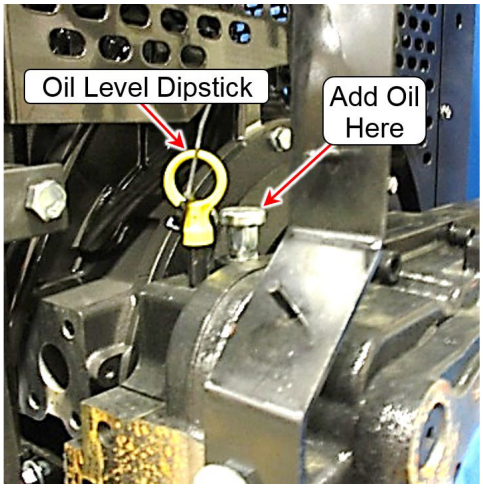
The type of service and the operating conditions will determine the service interval. However it is recommended that the oil level be checked weekly, at the same time checking for oil leaks.

Because the lubricant system is the heart of the unit, it is especially important that the oil be kept clean.

IMPORTANT

It is recommended that the lubricating oil be changed after the first 500 hours of service. Thereafter, and under normal operating conditions, it is recommended that the oil be changed after every six months of operation. The oil in the unit should be changed whenever the oil level shows discoloration or strong odor.

1. Stop the engine before checking or adding oil.
2. Clean around the oil fill before checking or adding oil.
3. Drain the oil while the unit is still warm. The magnetic drain plug is located at the bottom tip of the pump drive.
4. Examine for contamination or metal particles.
5. Clean all magnetic drain plugs before replacing.
6. Replace the drain plugs.



NOTICE

DO NOT overfill. This will result in overheating and possible malfunction of the unit.

7. Add new oil to the appropriate level.

X6. CHANGE HYDRAULIC TANK TOP OFF FILTER

(Optional)

Proper fluid condition is essential for long and productive life of hydraulic components and systems.

The Hydraulic Tank Top Off Filter is located behind the left rear wheel assembly on the vibrator relief manifold.

1. Turn off the engine.
2. Clean the area around the filter.
3. Change the hydraulic tank top off filter every six months to prevent the introduction of contaminants into the system.

7: ROUTINE MAINTENANCE

YEARLY SCHEDULE

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		Drain and clean hydraulic tank. Replace oil with ISO46 and clean magnetic strainers
	Y3		Check hydraulic tank oil level sight glass and temperature gauge for damage
	Y4		Drain and clean fuel tank, Change fuel filters
	Y5		Test/Check fuel tank gauge sender
	Y6		Test A/C performance and charge with refrigerant, if required
	Y7		Replace air dryer desiccant cartridge, if equipped
	Y8		Inspect BOTH Suction Strainer Elements
	Y9		Service Fire Extinguisher
	Y10		Inspect Engine Motor Mounts
	Y11		*- Reserved for Future Use -*
	Y12		Clean the Oil Cooler
	Y13		*- Reserved for Future Use -*
	Y14		*- Reserved for Future Use -*

DETAILED YEARLY INSTRUCTIONS:

Y7. REPLACE DESICCANT CARTRIDGE

(Every Year, unless water builds up in tanks, then as required.)

Desiccant Cartridge Replacement:

1. Drain the air system.
2. Use a strap wrench to turn the desiccant cartridge counterclockwise (CCW) and remove it.
3. Discard the cartridge.
4. Remove and discard the O-ring from the adapter plate stud.

NOTE

If there is excessive oil in the check valve port, the compressor may require servicing.

5. Clean the top surface of the adapter plate and threaded stud.
6. Use supplied grease to apply a light coating on the O-ring.
7. Install the O-ring on the adapter stud.
8. Apply a generous coat of grease on the new desiccant cartridge gasket surface.
9. Turn clockwise (CW) to thread the new cartridge onto the adapter stud. When the gasket contacts the adapter plate, the tighten cartridge 1/2 turn.

IMPORTANT

DO NOT over-tighten.

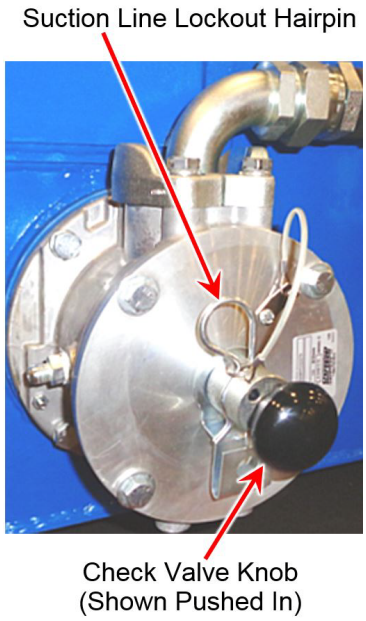
This is the most common service item for the Turbo 2000. For other items, like unloader valve, bleed valve, etc., refer to Component Data Section, Tab “Other” for Turbo 2000 Service Manual.

Y8. CHECK BOTH SUCTION STRAINER ELEMENTS

There are two (2) Suction Strainers on this machine, located on the back of the hydraulic reservoir, near the bottom, between the tank and the engine. Remove and inspect the filter after the **first 40 hours** of operation and **every year** thereafter. Clean as required. To access each filter proceed as follows:

1. Shut down the machine.
2. Push the Check Valve Knob inward and remove the Quick Pin.
3. With the quick pin removed, the knob assembly extends outward and allows the check valve to engage. **Ensure that the Check Valve Knob is extended out.**

   When the check valve is engaged, the inspection and cleaning of the magnetic suction separator or servicing hydraulic components can be done without draining oil from the hydraulic reservoir.
4. Remove the four (4) capscrews that attach the cover.
5. Lift off the cover.
6. Inspect the magnetic separator. Clean or replace as needed.
7. Insert the replacement or cleaned separator.
8. Attach the suction strainer cover and install the four (4) capscrews, then tighten the capscrews.
9. Push the Check Valve Knob in to disengage the check valve, then insert the Quick Pin.
10. Restart the machine and check for proper operation and leaks.



NOTE

If the suction line filter is to be removed, the hydraulic tank must be sealed to prevent external contamination.

JOHN DEERE TIER 3 ENGINE MAINTENANCE

FUELS, LUBRICANTS & COOLANTS

Diesel Fuel (Ultra Low Sulfur)

In all cases, the fuel shall meet the following properties:

Cetane number of 43 minimum. Cetane number greater than 47 is preferred, especially for temperatures below –20°C (–4°F) or elevations above 1500 m (5000 ft). **Cold Filter Plugging Point** (CFPP) should be at least 5°C (9°F) below the expected lowest temperature or **Cloud Point** below the expected lowest ambient temperature.

Fuel lubricity should pass a maximum scar diameter of 0.45 mm as measured by ASTM D6079 or ISO 121561.

Sulfur Content for Interim Tier 3 and EU Stage IIIB Engines:

- Diesel fuel quality and fuel sulfur content must comply with all existing emissions regulations for the area in which the engine operates.
- Use ONLY ultra low sulfur diesel (ULSD) fuel with a maximum of 0.0015% (15 mg/kg) sulfur content.

Use of fuel other than ULSD, that does not meet the specifications set forth in this Operator's Manual, will reduce the efficiency and durability of the engine, will harm and permanently damage the engine's advanced emissions control systems, reduce fuel economy and possibly prevent the engine from running at all.

Emission related warranties are likely to be rendered void by the use of a fuel that does not meet the specifications set forth in this Operator's Manual.

Engine Oil (Low Ash)

Oils meeting API CJ4, ACEA E9, or ACEA E6 or use of other specification oils in Interim Tier 3 and Stage IIIB engines can result in premature failure.

Coolant (No Nitrates)

IMPORTANT

- **DO NOT use cooling system sealing additives or antifreeze that contains sealing additives.**
- **DO NOT mix ethylene glycol and propylene glycol base coolants.**
- **DO NOT use coolants that contain nitrites.**

It is possible that John Deere COOLGARD II, COOLGARD, and COOLGARD PG coolants are unavailable in the geographical area where service is performed. If these coolants are unavailable, use a coolant concentrate or pre-diluted coolant intended for use with heavy duty diesel engines and with a minimum of the following chemical and physical properties:

- Formulated with a quality nitrite free additive package.
- Provides cylinder liner cavitation protection according to either the John Deere Cavitation Test Method or a fleet study run at or above 60% load capacity.
- Protects the cooling system metals (cast iron, aluminum alloys, and copper alloys such as brass) from corrosion.
- The additive package must be a part of one of the following coolant mixtures:
  a. Ethylene glycol or propylene glycol base pre-diluted (40% to 60%) heavy duty coolant
  b. Ethylene glycol or propylene glycol base heavy duty coolant concentrate in a 40% to 60% mixture of concentrate with quality water.

Water Quality

Water quality is important to the performance of the cooling system. Distilled, deionized, or demineralized water is recommended for mixing with ethylene glycol and propylene glycol base engine coolant concentrate.

ENGINE FAULT CODES

Refer to Figure 7-14 and Figure 7-15 for John Deere engine fault colds.

SPN	FMI	Description of Fault
28	3	Throttle Voltage High
	4	Throttle Voltage Low
29	3	Throttle Voltage High
	4	Throttle Voltage Low
	14	Throttle Voltage Out of Range
84	31	Vehicle Speed Mismatch
91	3	Throttle Voltage High
	4	Throttle Voltage Low
	7	Throttle Calibration Invalid
	10	Throttle Voltage Low
	13	Throttle Calibration Invalid
	14	Throttle Voltage Out of Range
97	0	Water in Fuel Input Voltage High
	3	Water in Fuel Signal Voltage High
	4	Water in Fuel Signal Voltage Low
	16	Water in Fuel Detected
	31	Water in Fuel Detected, Condition Exists
100	1	Engine Oil Pressure Extremely Low
	3	Engine Oil Pressure Input Voltage High
	4	Engine Oil Pressure Input Voltage Low
	16	Engine Oil Pressure, Reading Incorrect
	18	Engine Oil Pressure Moderately Low
105	3	Manifold Air Temperature Input Voltage High
	4	Manifold Air Temperature Input Voltage Low
	16	Manifold Air Temperature Moderately High
107	0	Air Filter Restricted
110	0	Engine Coolant Temperature Extremely High
	3	Engine Coolant Temperature Input Voltage High
	4	Engine Coolant Temperature Input Voltage Low
	15	Engine Coolant Temperature High Least Severe
	16	Engine Coolant Temperature Moderately High
111	0	Loss of Coolant Temperature Extremely High
	3	Loss of Coolant Temperature Input Voltage High
	4	Loss of Coolant Temperature Input Voltage Low
158	17	ECU Power Down Error
	17	ECU Power Down Error

Figure 7-14: Engine Fault Codes Page 1

171	3	Ambient Air Temperature, Voltage Out of Range, High
	3	Ambient Air Temperature, Voltage Out of Range, Low
174	3	Fuel Temperature Input Voltage High
	4	Fuel Temperature Input Voltage Low
	16	Fuel Temperature High Moderately Severe
189	0	Engine Speed Derate
190	0	Engine Overspeed Extreme
	1	Engine Speed, Below Normal, Most Severe
	16	Engine Overspeed Moderate
620	3	Sensor Supply Voltage High
	4	Sensor Supply Voltage Low
627	4	ECU Unswitched Power Missing
629	13	ECU Error
636	2	Engine Position Sensor Noise Detected
	8	Engine Position Sensor Signal Missing
	10	Engine Position Sensor Pattern Error Detected
637	1	Timing (Crank) Sensor, Signal Pattern Error
	2	Crank Position Input Noise
	10	Crank Position Input Pattern Error
639	13	CAN Bus Error
729	3	Inlet Air Heater Signal High
	5	Inlet Air Heater Signal Low
970	31	Auxiliary Engine Shutdown Switch Active
971	31	External Engine Derate Switch Active
1076	0	Pump Control Valve Closure Too Long
	1	Pump Control Valve Closure Too Short
	3	Pump Solenoid Current High
	5	Pump Solenoid Circuit Open
	6	Pump Solenoid Circuit Severely Shorted
	7	Pump Control Valve Closure Not Detected
	10	Pump Solenoid Circuit Moderately Shorted
	13	Pump Current Decay Time Invalid
1079	3	Sensor Supply Voltage High
	4	Sensor Supply Voltage Low
1109	31	Engine Shutdown Warning
1110	31	Engine Shutdown
1568	4	Torque Curve Selection Input Voltage Low
1569	31	Fuel Derate
2000	6	Internal ECU Failure
	13	Security Violation

Figure 7-15: Engine Fault Codes Page 2

The Engine Diagnostics Display on the instrument panel may also display text for communication faults, such as “CAN Bus FAILURE”. Contact your servicing dealer.

EXHAUST FILTER (REGEN) CLEANING

NOTE

This information has been taken from Pages 21-5 through 21-7 of the John Deere Tier 3 Engine Manual. Read this entire section before operating this machine.

DANGER

FIRE HAZARD! The area above and surrounding the engine during an exhaust filter cleaning should be free of any flammable objects, as temperatures can reach as high as 1022°F (550°C). Exhaust Filter Cleaning should be HALTED if these issues are encountered.

The exhaust filter will require maintenance periodically. Some of the maintenance will be transparent to the operator. During continuous heavy loads and other conditions, the engine may create enough heat to naturally remove accumulated soot in the exhaust filter. When the exhaust filter does have accumulated higher levels of soot, the display panel may require, depending on predefined user settings, an exhaust filter cleaning. During this cleaning, the machine must be located or moved to a suitable location with adequate ventilation.

WARNING

INHALATION AND BURN HAZARD! Servicing machine or attachments during exhaust filter cleaning can result in serious personal injury. Avoid exposure and skin contact with hot gases and components.

During automatic or manual exhaust filter cleaning procedures the engine will run at an elevated idle, with hot temperatures for an extended period of time. Exhaust gases and exhaust filter components reach temperatures hot enough to burn skin and melt or ignite common materials.

NOTICE

Gauge instructions given on the following pages are based on the use of a JD Programmed Murphy Gauge.

Passive Regeneration/Natural Cleaning

Periodically, the exhaust filter will experience higher heat levels simply through the engine operating at higher loads. During these times, the higher exhaust heat will naturally clean a small amount of soot build up in the exhaust filter. Conversely, unnecessary idling can cause additional exhaust filter soot to accumulate. For the best possible engine operation which requires the least amount of operator interaction, the engine should be worked at higher load conditions whenever possible and idling should be kept to a minimum.

Automatic (AUTO) Exhaust Filter Cleaning

NOTE

Operator display icons and procedures can vary in other applications. The information contained in this section specifically applies to only OEM engines. If using a John Deere engine, please see the engine operator manual for all exhaust filter cleaning and handling information and procedures.

Operating the engine in AUTO Mode allows the ECU to perform intelligent exhaust filter cleaning as required. The Exhaust Filter Cleaning Indicator will illuminate when the system is actively performing an exhaust filter cleaning.

During this process, the doser will inject small amounts of fuel into the exhaust stream to assist in cleaning the exhaust filter. When the exhaust filter cleaning process has completed its cycle, the cleaning indicator will automatically turn off.

CAUTION

BURN HAZARD! Servicing the machine or attachments during exhaust filter cleaning can result in serious personal injury. During auto or manual/parked (stationary) exhaust filter cleaning operations, the engine will run at elevated idle and hot temperatures for approximately 30 minutes. Exhaust gases and exhaust filter components reach temperatures hot enough to burn skin, and ignite or melt common materials. Avoid exposure and skin contact with hot exhaust gases and components.

⚠ CAUTION

MOVEMENT HAZARD! If the machine is not in a safe location for elevated exhaust temperatures, move the machine to a safe location and check for adequate fuel level before beginning the exhaust filter cleaning process. Any power take-off (PTO) driven devices (if equipped) should be powered off or disconnected.

If the machine is not able to be moved into a safe location, the operator should temporarily disable auto exhaust filter cleaning (see Disable Exhaust Filter Cleaning later in this section). If the machine is located in a safe location, the auto mode should always be engaged.

To engage the auto exhaust filter cleaning mode:

1. Press the [**MENU**] button on the Engine Diagnostics Display.
2. Press the [**ARROW**] buttons to scroll up or down to select ***EXHAUST FILTER***.
3. Press the [**ENTER**] button.
4. Press the [**ARROW**] buttons to scroll up or down and select ***AUTO EXH FLT CLEAN*** to enable auto exhaust filter cleaning.
5. Press the [**ENTER**] button.

Manual/Parked Exhaust Filter Cleaning

NOTE

Operator display icons and procedures can vary in other applications. The information contained in this section specifically applies to only OEM engines. If using a John Deere engine, please see the engine operator manual for all exhaust filter cleaning and handling information and procedures.

NOTICE

Manual/Parked Regen will only run when the [**ELECTRICAL INTERLOCK**] on this machine is pressed ***IN***. Make sure the cleaning indicator icon is shown on the Engine Diagnostics Display. See Figure 7-16.

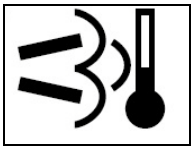


Figure 7-16: Cleaning Indicator

The Manual/Parked Exhaust Filter Cleaning is an automated process initiated at the request of the operator.

This process allows the system to clean the exhaust filter when the operator previously needed to engage the disable exhaust filter cleaning because of specific conditions. During this process the engine speed will be controlled by the ECU and the machine must remain parked to complete the procedure. The time required for the Manual/Parked Exhaust Filter Cleaning process is dependent upon the level of exhaust filter restriction, ambient temperatures, and current exhaust gas temperature. Complete cleaning times will vary on several criteria including fuel type, oil type, duty cycle, and the number of previously aborted exhaust filter cleaning requests. Average time for a standard cleaning can range from 20-50 minutes or longer.

⚠ CAUTION

BURN HAZARD! Servicing the machine or attachments during exhaust filter cleaning can result in serious personal injury. During auto or Manual/Parked exhaust filter cleaning operations, the engine will run at elevated idle and hot temperatures for approximately 30 minutes. Exhaust gases and exhaust filter components reach temperatures hot enough to burn skin, ignite, or melt common materials. Avoid exposure and skin contact with hot exhaust gases and components.

MOVEMENT HAZARD! Always park the machine in a safe location and check for adequate fuel level before beginning the exhaust filter cleaning process. Any PTO driven devices (if equipped) should be powered off or disconnected.

To request a Manual/Parked exhaust filter cleaning:

1. Reduce the engine speed to a slow idle.
2. Press the [**MENU**] button.
3. Press the [**ARROW**] buttons to scroll up or down to select ***EXHAUST FILTER***.
4. Press the [**ENTER**] button.
5. Press the [**ARROW**] buttons to scroll up or down and select: ***REQUEST EXH FLT CLEAN*** to request a manual / parked exhaust filter cleaning.
6. Press the [**ENTER**] button.

7. Follow the directions on the display and make sure all conditions are met.
8. Press the [**ENTER**] button to ***CONFIRM*** all conditions are met.

NOTE

The engine speed will be controlled by the ECU during filter cleaning. Speed may be in excess of 1800 rpm.

The Exhaust filter indicator remains off when Filter Cleaning is complete. If not returning the machine to service immediately after the procedure, allow the engine and the exhaust filter time to return to normal operating temperature before stopping the engine. At any time during the parked procedure, the process can be canceled

Avoid disabling the cleaning procedure unless absolutely necessary. Repeated disabling or ignoring prompts to perform a Manual/Parked cleaning procedure will cause additional engine power limitations and can eventually lead to dealer required service. Utilize Exhaust Filter Cleaning AUTO mode to avoid additional service.

Disable Exhaust Filter Cleaning

NOTICE

Disabling the cleaning process and forgetting to enable it later is the primary cause of all Tier 3 engine derates. Do not use this setting unless under critical fire hazard situations.

NOTES

- *Operator display icons and procedures can vary in other applications. The information contained in this section specifically applies to only OEM engines. If using a John Deere engine, please see the engine operator manual for all exhaust filter cleaning and handling information, and procedures.*
- *Disabling the exhaust filter cleaning request is not recommended. Disable the automatic exhaust filter cleaning only when necessary. Whenever possible cleaning should be allowed and the Engine Diagnostics Display should be left in the auto mode. When left in the auto mode, soot buildup in the exhaust filter system will be at a minimum.*
- *When AUTO or PARKED cleaning is enabled, the exhaust temperature may be high under no load or light load conditions, or at certain times during the exhaust filter cleaning cycle. Disable the exhaust filter cleaning in conditions where it may be unsafe for elevated exhaust temperatures.*

To disable the auto exhaust filter cleaning mode:

1. Press the **menu** button on the Engine Diagnostics Display.
2. Press the [**ARROW**] buttons to scroll up or down to select ***EXHAUST FILTER***.
3. Press the [**ENTER**] button.
4. Press the [**ARROW**] buttons to scroll up or down and select ***DISABLE EXH FLT CLEAN*** to disable the auto exhaust filter cleaning.
5. Press the **enter** button.

Exhaust Filter Service Required

The exhaust filter cleaning procedures listed earlier in this section clean the soot from the exhaust filter. The exhaust filter also traps ash deposits over time which are not removed during an exhaust filter cleaning. When the exhaust filter has run several thousand hours, these ash deposits can restrict the engines performance due to increased back pressure. To correct this situation, replace the exhaust filter or have the exhaust filter cleaned with specialized equipment. Please see “Manual/Parked Exhaust Filter Cleaning” on page 7-35.

Section 8

GLOSSARY

GLOSSARY OF TERMS

Term	Definition
AAR	Association of American Railroads, an industry trade group representing primarily the major freight railroads of North America. Amtrak and some regional commuter railroads are also members.
Bar	Metric unit of pressure.
BDS	Battery Disconnect Switch, located next to the battery compartment.
CCW	Counter Clock Wise - rotation of a valve and/or control.
CW	Clock Wise - rotation of a valve and/or control.
CANbus	Controller Area Network - the operating system used within the machine electronics.
CFM	Measure of flow in Cubic Feet per Minute.
ECU/ECM	Electronic Control Unit/Electronic Control Module. The “computer like” system that controls all regulator operation.
FRA	Federal Road Administration, which regulates all railroad travel and operations.
Front	The frame area ahead of the operator while seated in the operators cab command position and looking toward the TAMPER WORKHEADS.
LED	Light Emitting Diode, indicators used throughout the system.
Left	The side of the machine to the LEFT of the operator, while seated in the operators cab command position and looking toward the front of the machine.
LOTO	Lock-out/Tag-out, a practice to “lock out” energy sources that can cause injury or death.
LS	Limit Switch
LVDT	Linear Variable Displacement Transducer - Position Sensor.
MCC	Main Control Cabinet, the cabinet located on the inside rear of the cab that houses numerous electrical connections, along with relays, fuses, and CANbus system module connections.
MCK	Machine Control Keypad
OEM	Original Equipment Manufacturer, the manufacturer of an item not made by Nordco.
OSP	Operator Station Panel
OSHA	Occupational Safety and Health Administration, a US federal agency that oversees employee health and safety in the workplace.
PLC	Programmable Logic Controller
PSI	Pressure levels shown in Pounds per Square Inch
PS	Pressure Switch
Rear	The frame area behind the operator, while seated in the operators cab command position and looking toward the machine ENGINE.
Right	The side of the machine to the RIGHT of the operator, while seated in the operators cab command position and looking toward the front of the machine.

8: GLOSSARY

Term	Definition
RPC	Remote Power Controller - Located in the Main Control Cabinet, control power to workhead devices, etc.
RPM	Engine speed measured in Revolutions Per Minute.
SDS	Safety Data Sheets, documents that detail any chemicals used, including fluids. These sheets give the make-up of the chemical, its hazards, and safety instructions.
SOL	Solenoid
TRANS	Transducer
WH	Workhead