Vanguard
Equipment,
Inc.

048-08OP-001A-01
2017-02

Operation and Maintenance Manual

VP 72H Pipelayer attachment Kit for D6T T4i LGP, D6T LGP, D6R LGP SIII, D6R LGP SII

S/N 048050010021– UP (Sideboom)

S/N 048051000021– UP (Sideboom)

S/N 048052000021– UP (Sideboom)

S/N 048053000021– UP (Sideboom)

S/N 048054000021– UP (Sideboom)

S/N 048055000021– UP (Sideboom)

S/N 048056000021– UP (Sideboom)

S/N 048057000021– UP (Sideboom)

TO BE USED WITH CATERPILLAR D6T T4i LGP, D6T LGP, D6R LGP SIII & D6R LGP SII TRACTOR OPERATION AND MAINTENANCE MANUALS

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Foreword

Literature Information

This manual should be stored in the operator's compartment in the literature holder or seat back literature storage area.

This manual contains safety information, operation instructions, transportation information, lubrication information and maintenance information.

The information contained in this manual is limited to the pipelayer attachment and specific modifications made to the tractor unit, refer to the CATERPILLAR Tractor Operation and Maintenance Manual for complete information regarding the tractor unit.

Some photographs or illustrations in this publication show details or attachments that can be different from your machine. Guards and covers might have been removed for illustrative purposes.

Continuing improvement and advancement of product design might have caused changes to your machine which are not included in this publication. The latest version of this publication is available for downloaded from the internet at vanguardequip.com. Read, study and keep this manual with the machine.

Whenever a question arises regarding your machine, or this publication, please consult Vanguard Equipment for the latest available information.

Machine Description

The sideboom equipment is attached to a Caterpillar D6T LGP tractor. The primary use of this machine is for petroleum-product pipeline-construction in the 20” to 30” (510 to 765 mm) pipeline range.

The operator should read, understand, and follow both the tractor and the pipelayer operating and maintenance instructions. The operator must comply with all pipelayer procedures, regulations, and safety precautions.

This equipment is to be operated by qualified personnel only.

The daily service/inspection procedure should be performed before start-up.

Operate all pipelayer controls with no load, until familiar with machine operation.

Note: Refer to the Caterpillar operation manual for detailed information on the specific operation of the tractor unit.

Safety

The safety section lists basic safety precautions. In addition, this section identifies the text and locations of warning signs and labels used on the machine.

Read and understand the basic precautions listed in the safety section before operating or performing lubrication, maintenance and repair on this machine.

NOTICE

Other safety precautions related to the operation of the tractor also apply.
Refer to CATERPILLAR Tractor Operation and Maintenance manual, Safety Section.

Operation

The operation section is a reference for the new operator and a refresher for the experienced operator. This section includes a discussion of gauges, switches, machine controls, attachment controls, transportation and towing information.

Photographs and illustrations guide the operator through correct procedures of checking, starting, operating and stopping the machine.

Operating techniques outlined in this publication are basic. Skill and techniques develop as the operator gains knowledge of the machine and its capabilities.

Maintenance

The maintenance section is a guide to equipment care. The Maintenance Interval Schedule (MIS) lists the items to be maintained at a specific service interval. Items without specific intervals are listed under the "When Required" service interval. The Maintenance Interval Schedule lists the page number for the step-by-step instructions required to accomplish the scheduled maintenance. Use the Maintenance Interval Schedule as an index or "one safe source" for all maintenance procedures.

Maintenance Intervals

Use the service hour meter to determine servicing intervals. Calendar intervals shown (daily, weekly, monthly, etc.) can be used instead of service hour meter intervals if they provide more convenient servicing schedules and approximate the indicated service hour meter reading Recommended service should always be performed at the interval that occurs first. Under extremely severe, dusty or wet operating conditions, more frequent lubrication than is specified in the maintenance intervals chart might be necessary. Perform service on items at multiples of the original requirement. For example, at every 500 service hours or 3 months, also service those items listed under every 250 service hours or monthly and every 10 service hours or daily.

Machine Capacity

Additional attachments or modifications may exceed machine design capacity which can adversely affect performance characteristics. Included would be stability and system certifications such as brakes, steering, and rollover protective structures (ROPS). Contact your Caterpillar dealer for further information.

Safety Section

Certain conditions and precautions are peculiar to pipelaying operations. The following represents the minimum considerations for safe operations.

NOTICE

Other safety precautions related to the operation of the tractor also apply.
Refer to CATERPILLAR Tractor Operation and Maintenance manual, Safety Section.

Safety Messages – VP 72H Pipelayer

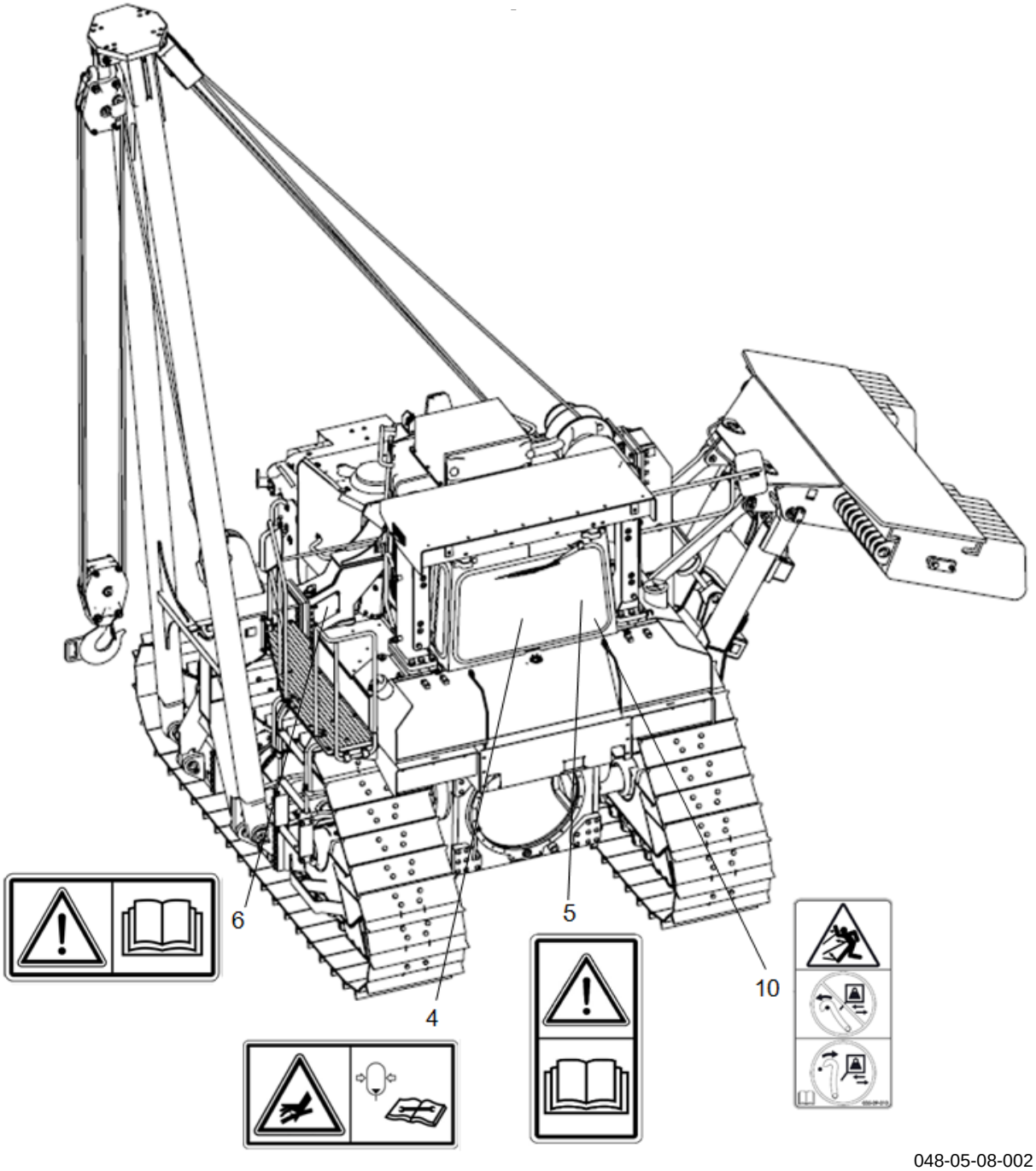

Figure 1: Safety Messages VP 72H Pipelayer

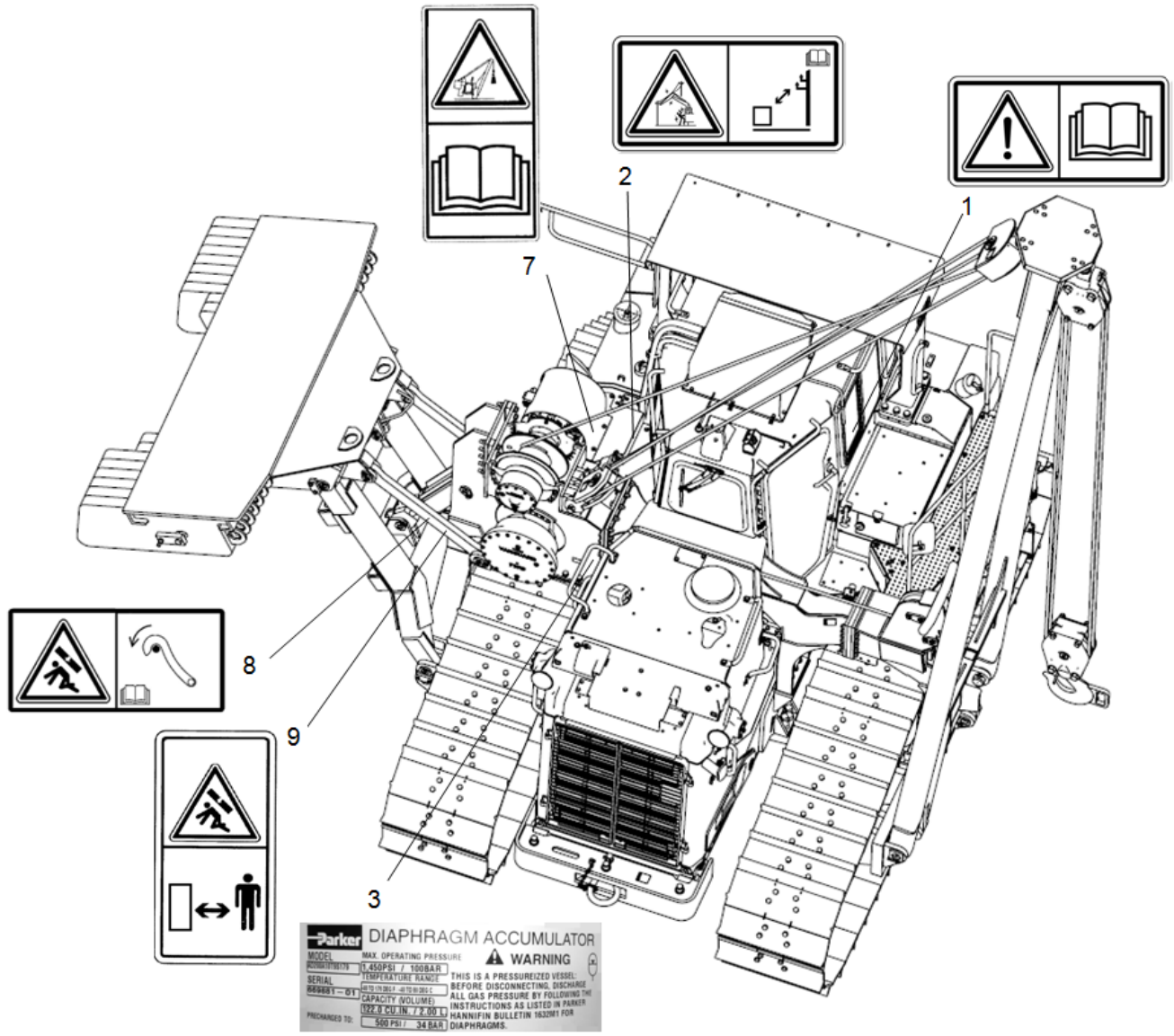

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Figure 2: Safety Messages VP 72H Pipelayer

There are several specific safety messages on this machine. The exact location of the hazards and the description of the hazards are reviewed in this section. Please become familiarized with all safety messages.

Make sure that all of the safety messages are legible. Clean the safety messages or replace the safety messages if you cannot read the words. Replace the illustrations if the illustrations are not visible. When you clean the safety messages, use a cloth, water, and soap. Do not use solvent, gasoline, or other harsh chemicals to clean the safety messages. Solvents, gasoline, or harsh chemicals could loosen the adhesive that secures the safety messages. Loose adhesive will allow the safety message to fall. Do not use pressure washers to clean the warning signs.

Replace any safety message that is damaged or missing. If a safety message is attached to a part of the machine that is replaced, install a safety message on the replacement part.

Do Not Operate (1)

⚠ WARNING

Do not operate or work on this machine unless you have read and understand the instructions and warnings in the Operation and Maintenance Manuals. Failure to follow the instructions or heed the warnings could result in injury or death. Contact your dealer for replacement manuals. Proper care is your responsibility.

Safety message (1) is located outside of the left hand operator console arm rest.

Figure 3: Do not operate (1)

Electrical Power Lines (2)

⚠ DANGER

Electrocution Hazard! Keep the machine and attachments a safe distance from electrical power. Stay clear 3 M (10 ft) plus twice the line insulator length. Read and understand the instructions and warnings in the Operation and Maintenance Manual. Failure to follow the instructions and warnings will cause serious injury or death.

Safety message (2) is located on the right side of the console, on the guarding to the front of the pipelayer controls.

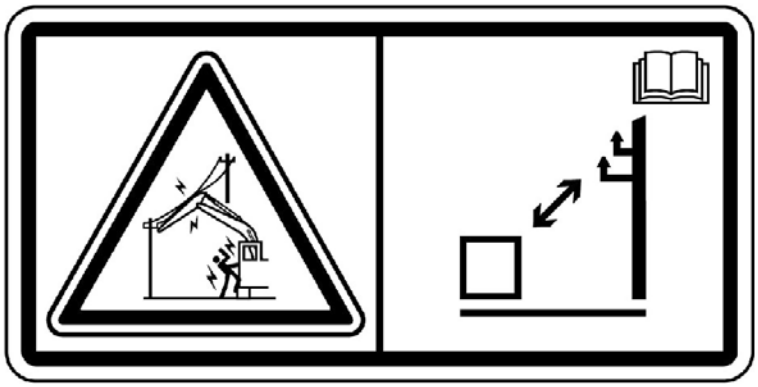


Figure 4: Electrical power lines (2)

Hydraulic Accumulator (3, 4)

WARNING

High Pressure Cylinder: Rapid discharging from disconnecting or disassembly or failure to follow the instructions and warnings could cause an explosion, resulting in possible injury or death. Do not expose to fire. Do not weld. Do not drill. Do not remove any hydraulic system lines, taps or parts until pressure has been relieved. Relieve pressure before discharging. See Operation and Maintenance Manual "Accumulator" for charging and discharging. See your Dealer for tools and detailed information. Precharge only with dry nitrogen gas.

Safety message (3) is located on the hydraulic accumulator. The hydraulic accumulator is located inside the winch base below the crossmember.

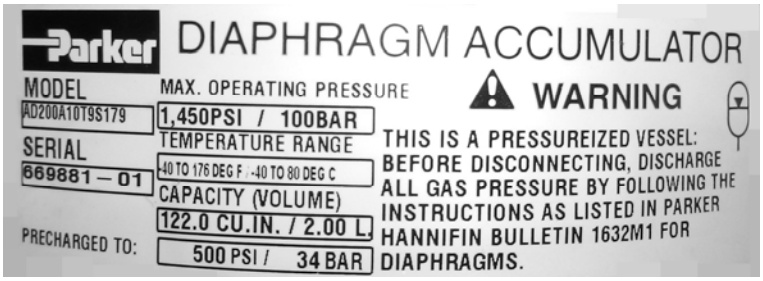


Figure 5: Hydraulic accumulator (3)

Safety message (4) is located on the lower right side of the console, below the pipelayer controls.

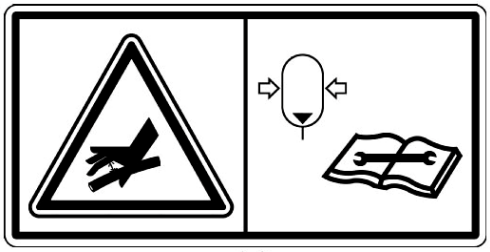


Figure 6: System equipped with an accumulator (4)

Free Fall Active - Do Not Operate (5)

WARNING

Dropping load hazard! The free fall control remains live for several hours after the engine has been stopped. Operation of the free fall control could cause a sudden uncontrolled drop of any supported load. Do not operate the free fall control when personnel are near a suspended load, even with the engine stopped. See Operation and Maintenance Manual "Pipelayer Operation" for complete description of control operation.

Safety message (5) is located on the right side, on the pipelayer control box.

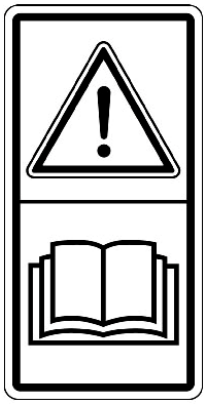


Figure 7: Free fall active warning (5)

Boom Stop Operation and Adjustment - Do Not Operate (6)

WARNING

The Boom Stop system stops the boom winch from hauling-in when the boom is vertical, preventing overloading of key machine components. Defeating the boom stop switch could result in serious equipment damage, personnel injury, or even death. The boom stop function must be checked and verified daily, Do not Operate until it has been checked and properly adjusted. See the Operation and Maintenance Manual " Boom Stop Switch".

Safety message (6) is located on the left side of the machine on the rear side of the crossmember support on the boom stop switch access panel.

Figure 8: Boom Stop Switch (6)

Tipover Hazard (7)

WARNING

The machine may tip and personal injury may occur if the maximum load capacities are exceeded. Load capacities assume that the machine is stationary on a level concrete surface with the counterweight extended. Lift capacities will decrease on slopes or soft ground. See Operation and Maintenance Manual "Lifting Capacities".

Safety message (7) is located to the right of the console, on the upper winch guarding.

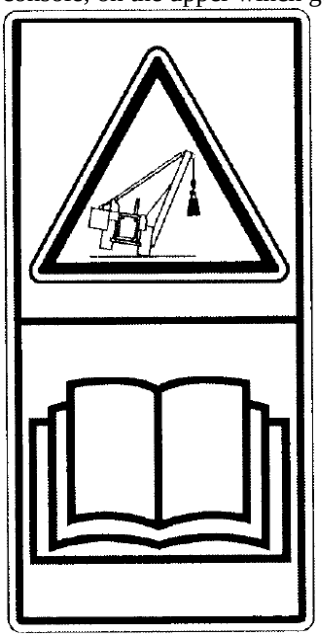


Figure 9: Tipover Warning (7)

Counterweight Crushing Hazard (8)

WARNING

Crushing Hazard! When the counterweight is in the fully extended position for servicing the machine, secure the extended counterweight with the counterweight lock lever. Use the counterweight lock lever to avoid possible personnel injury or death from crushing.

Use the lock to secure the counterweight when the machine is serviced. Refer to Operation and Maintenance Manual, "Counterweight Lock Lever" for details.

Safety message (8) is located on the front and rear sides of the Counterweight arm.

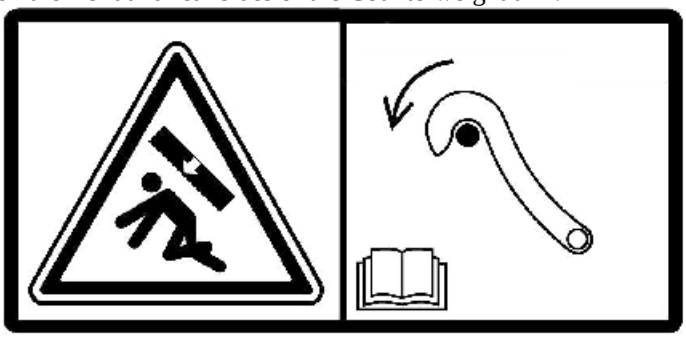


Figure 10: Counterweight crushing hazard, use lock lever (8)

Counterweight Crushing Hazard (9)

WARNING

Crushing Hazard! Be sure no one is under or near the counterweight before lowering the counterweight. When the counterweight is in the fully extended position for servicing the machine, secure the extended counterweight with the counterweight lock lever. Use the counterweight lock lever to avoid possible personnel injury or death from crushing. Keep all personnel away from the counterweight when lowering the counterweight to avoid possible personnel injury or death.

Safety message (9) is located on the front and rear sides of the upper counterweight frame, and on the front and rear counterweight swing links.

Figure 11: Counterweight crushing hazard and pinch point (9)

Counterweight Lock Lever Thrown or Flying Objects – Full Body Exposure (10)

WARNING

Thrown or flying objects - full body exposure! Do not operate counterweight while the counterweight lock lever is engaged. Retracting the counterweight while the lock lever is engaged could cause serious equipment damage, personnel injury, or even death. Ensure the counterweight lock lever is fully disengaged before retracting the counterweight.

Safety message (10) located on the right side, near the counterweight control.

Figure 12: Thrown or flying objects - counterweight lock lever instruction (10)

Before Operation

Clear all personnel from the machine and from the area.

Remove all obstacles from the path of the machine. Beware of hazards such as wires, ditches, etc.

Make sure that the machine horn, the backup alarm (if equipped) and all other warning devices are working properly.

Reference: Refer to Operation and Maintenance Manual, "Daily Inspection" in this manual and in the Tractor's manual.

Fasten the seat belt securely.

Visibility Information

Before starting the machine, the operator shall perform a walk-around inspection in order to ensure that there are no hazards around the machine.

While the machine is in operation, the operator should constantly survey the area around the machine. The operator needs to identify potential hazards as a hazard becomes visible around the machine.

Your machine may be equipped with mirrors or other visual aids. An example of a visual aid is Closed Circuit Television (CCTV). The operator should ensure that the visual aids are in proper working condition and that the visual aids are clean. Adjust the visual aids for the best visibility of all areas around the machine.

It may not be possible to provide direct visibility on large machines to all areas around the machine. Appropriate job site organization is required in order to minimize hazards that are caused by restricted visibility. Job site organization is a collection of rules and procedures that coordinates machines and people that work together in the same area.

Examples of job site organization include the following:

- Safety instructions
- Controlled patterns of machine movement
- Controlled patterns of vehicle movement
- Restricted areas
- Operator training
- Warning symbols or warning signs on machines or on vehicles
- A system of communication
- Communication between workers and operators prior to approaching the machine

Operation

Machine Operating Temperature Range

The standard pipelayer component configuration is intended for use within an ambient temperature range of -40 °C (-40 °F) to 50 °C (122 °F). Special configurations for different ambient temperatures may be available. Consult your dealer for additional information. Refer to the specific tractor Operation and Maintenance manual for standard tractor capabilities.

Machine Operation

Only operate the machine while you are in a seat. The seat belt must be fastened while you operate the machine. Only operate the controls while the engine is running.

Before you move the machine, make sure that no one will be endangered.

Check for proper operation of all controls and protective devices while you operate the machine slowly in an open area. Do not allow riders on the machine unless the machine has the following equipment:

- additional seat
- additional seat belt

Report any needed repairs that were noted during operation.

Do not go close to the edge of a cliff, an excavation, or an overhang.

If the machine begins to sideslip, turn the machine downhill.

Be careful to avoid any condition which could cause the machine to tip. The machine can tip when you work on hills, banks and slopes. Also, the machine can tip when you cross ditches, ridges or other obstacles.

Whenever it is possible, operate the machine up the slopes and down the slopes. Avoid operating the machine across the slope, when possible.

Keep the machine under control. Do not overload the machine beyond capacity.

Be sure that the towing eyes and towing devices are adequate.

Towing eyes and towing devices should only be used to recover the machine.

Connect trailing equipment to a drawbar or to a hitch only.

When you maneuver the machine to connect equipment, be sure that there are no personnel between the machine and the trailing equipment. Block the hitch of the trailing equipment in order to align the equipment with the drawbar.

Never straddle a wire cable or allow other personnel to straddle a wire cable.

Know the maximum dimensions of your machine.

Lifting Capacities

Maintain control of the machine. Do not overload the machine beyond the machine capacity. Ensure that the correct load chart is referenced. Loads must be within the capabilities of the machine. Lifting capacity decreases as the load is moved further from the machine.

Use lifting slings that are approved and use lifting slings that are load tested. Also, all wire ropes or chains must be properly maintained. The wire ropes and chains must meet local regulations. You must know the load carrying capacity of these devices and you must know the correct use of these devices.

Wire rope limitations, soil conditions, and slope of terrain reduce actual capacity. All lifts must be made with the load line vertical, and the boom centerline directed toward the load.

To prevent cable from slipping off the drum, a minimum of five full-wraps of cable must remain on the winch drum at maximum working extension of the hook or boom.

Limitations on Lifting Loads That Exceed the Working Range

Do not load the boom beyond the maximum load capacity. See Operation and Maintenance Manual, "Lifting Capacities" for the load capacity of the boom.

When the load capacity is exceeded, refer to "American National Standards ANSI/ASME B30.14".

Also, follow the procedures that are listed below:

- Inspect the wire cable for defects prior to the lift operation
- Inspect the wire cable for defects after the lift operation
- Do not exceed the load capacity of the boom
- The load must be handled safely in order to minimize tipping effects
- The lift operation and the inspections must be made under controlled conditions by a competent, authorized person

Electrical Power Lines

⚠ WARNING

Serious injury or death by electrocution can result if the machine or attachments are not kept the proper distance from electrical power lines.

Use the following chart, and refer to ANSI/ASME B30.14-3.4.2 in order to determine the safe distance from high voltage wires during these conditions:

- machine operation
- machine transportation

When Operating Near High Voltage Power Lines	
Normal Voltage (Phase to Phase)	**Minimum Clearance Required**
0 Volts to 50 kVolts	3.05 Meters (10 Feet)
Over 50 kVolts to 200 kVolts	4.60 Meters (15 Feet)
Over 200 kVolts to 350 kVolts	6.10 Meters (20 Feet)
Over 350 kVolts to 500 kVolts	7.62 Meters (25 Feet)
Over 500 kVolts to 750 kVolts	10.67 Meters (35 Feet)
Over 750 kVolts to 1000 kVolts	13.72 Meters (45 Feet)
While in Transit Near High Voltage Power Lines	
Normal Voltage (Phase to Phase)	**Minimum Clearance Required**
0 Volts to 0.75 kVolts	1.22 Meters (4 Feet)
Over 0.75 kVolts to 50 kVolts	1.83 Meters (6 Feet)
Over 50 kVolts to 345 kVolts	3.05 Meters (10 Feet)
Over 345 kVolts to 750 kVolts	6.10 Meters (20 Feet)
Over 750 kVolts to 1000 kVolts	7.62 Meters (25 Feet)

Table 1: Power lines, minimum clearance

Parking

Park on a level surface. If you must park on a grade, use blocks to prevent the machine from rolling.

Apply the service brake in order to stop the machine. Move the transmission control lever to NEUTRAL position and move the engine speed switch to the LOW IDLE position. Engage the parking brake.

Lower any load to the ground and fully retract the counterweight.

Refer to the tractor's operation and maintenance manual for the specific procedures regarding engine shut down and/or other implement attachments.

Slope Operation

Machines that are operating safely in various applications depend on these criteria: the machine model, configuration, machine maintenance, operating speed of the machine, conditions of the terrain, fluid levels. The most important criteria are the skill and judgment of the operator.

A well trained operator that follows the instructions in the Operation and Maintenance Manual has the greatest impact on stability. Operator training provides a person with the following abilities: observation of working and environmental conditions, feel for the machine, identification of potential hazards, and operating the machine safely by making appropriate decisions.

When you work on side hills and when you work on slopes, consider the following important points:

Speed of travel - At higher speeds, forces of inertia tend to make the machine less stable.

Roughness of terrain or surface - The machine may be less stable with uneven terrain.

Direction of travel - Avoid operating the machine across the slope. When possible, operate the machine up the slopes and operate the machine down the slopes. Place the heaviest end of the machine uphill when you are working on an incline.

Mounted equipment - Balance of the machine may be impeded by the following components: equipment that is mounted on the machine, machine configuration, weights, and counterweights.

Nature of surface - Ground that has been newly filled with earth may collapse from the weight of the machine.

Surface material - Rocks and moisture of the surface material may drastically affect the machine's traction and machine's stability. Rocky surfaces may promote side slipping of the machine.

Slippage due to excessive loads - This may cause downhill tracks or downhill tires to dig into the ground, which will increase the angle of the machine.

Width of tracks - Narrower tracks further increase the digging into the ground which causes the machine to be less stable.

Implements attached to the drawbar - This may decrease the weight on the uphill tracks. The decreased weight will cause the machine to be less stable.

Height of the working load of the machine - When the working loads are in higher positions, the stability of the machine is reduced.

Operated equipment - Be aware of performance features of the equipment in operation and the effects on machine stability.

Operating techniques - Keep all attachments or pulled loads low to the ground for optimum stability.

Machine systems have limitations on slopes - Slopes can affect the proper function and operation of the various machine systems. These machine systems are needed for machine control on slopes.

Note: Safe operation on steep slopes may require special machine maintenance. Excellent skill of the operator and proper equipment for specific applications are also required. Consult the Operation and Maintenance Manual sections for the proper fluid level requirements and intended machine use.

Note: Refer to the tractor’s operation and maintenance manual for further specific requirements for safe operation on steep slopes.

Equipment Lowering with Engine Stopped

Before lowering any equipment with the engine stopped, clear the area around the equipment of all personnel. The procedure will cause immediate, rapid lowering of the load. Wear appropriate personal protective equipment and follow the established procedure in the Operation and Maintenance Manual, "Equipment Lowering with Engine Stopped" in the Operation Section of the manual.

Sound Level Information

Hearing protection may be needed when the machine is operated with an open operator station and an open cab for extended periods or in a noisy environment. Hearing protection may be needed when the machine is operated with a cab that is not properly maintained, or when the doors and windows are open for extended periods or in a noisy environment.

Guards

There are different types of guards that are used to protect the operator.

A daily inspection of the guards is required in order to check for structures that are bent, cracked or loose. Never operate a machine with a damaged structure.

The operator becomes exposed to a hazardous situation if the machine is used improperly or if poor operating techniques are used. This situation can occur even though a machine is equipped with an appropriate protective guard. Follow the established operating procedures that are recommended for your machine.

Product Information Section

General Information

Components

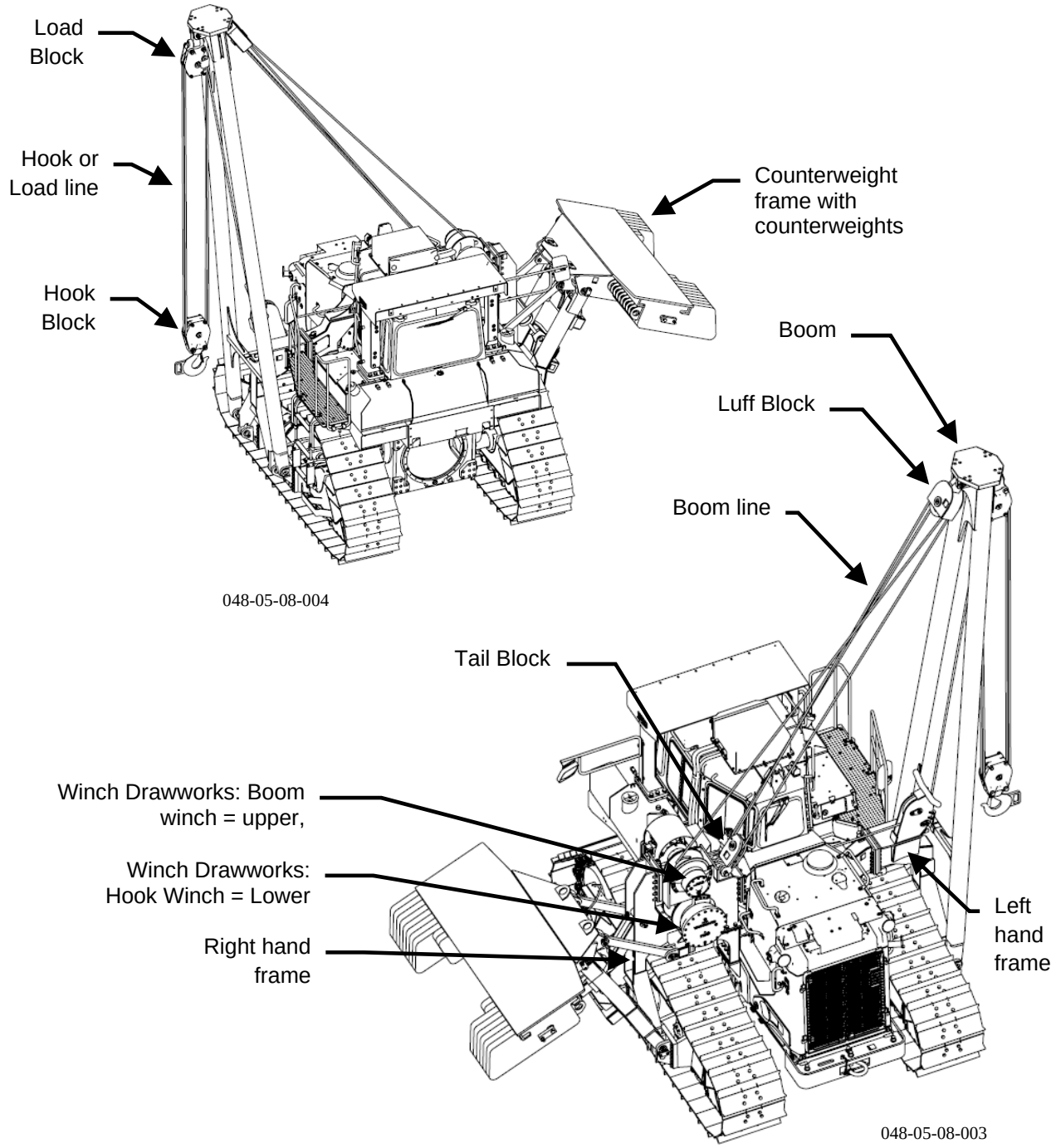
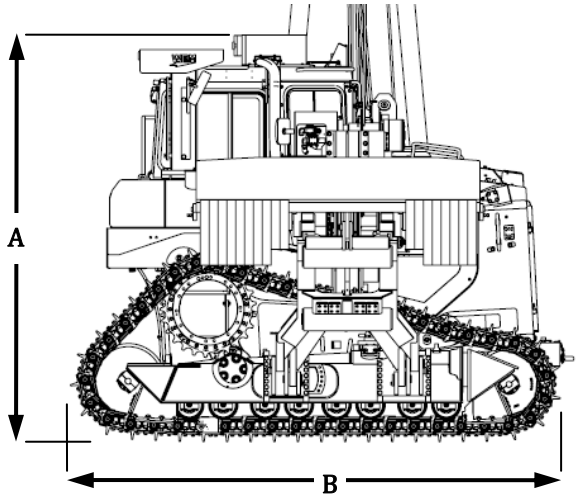


Figure 13: Component identification

Specifications



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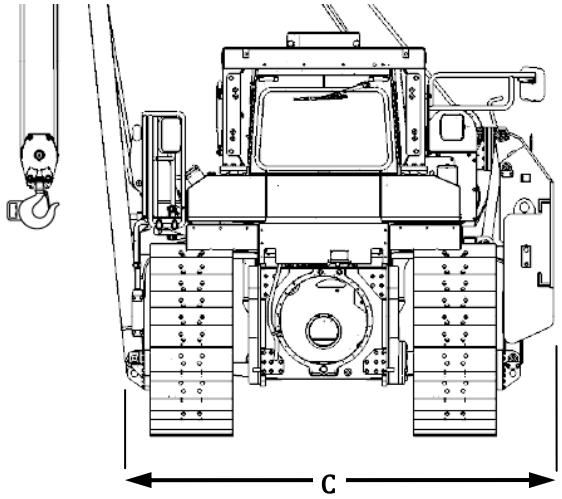

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Figure 14: Standard shipping specifications, height and width

VP 72H Pipelayer	
Approximate operating weight of the standard machine[1]	29770 kg (65,632 lb)
Approximate shipping weight of the standard machine[2]	28 360 kg (62,524 lb)
Weight of the 6.1 m (20 ft) boom	982 kg (2165 lb) [24 ft boom add 274 kg (604 lb)]
Weight of boom sheave blocks and terminator and load blocks	383 kg (845 lb)
Height of the machine without the boom (A)	3492 mm (11 feet 5-1/2 inch)
Length of the machine (B)	4498 mm (14 feet 9 inches)
Width of the machine without the boom (C)	3725 mm (12-feet 2 11/16-inch)
Height of the machine with the 20 ft boom	6884 mm (22 feet 7 inch) [24 ft boom add 1223 mm (48-1/8 inch)]
Ground clearance of the machine	434 mm (1-foot 5-inch)

Table 2: Specifications

Intended Use

This machine is a Pipelayer that is described in ISO 6165:2001. The machine is intended to perform the following functions: lift, handle, and lay down pipe with a side mounted boom.

Restrictions to Application and Configuration

Maximum approved operating weight is 36740 kg (81000 lb).

The maximum lift capacity is 40820 kg (90,000 lb).

The maximum fore and aft slope is 45 degrees or a 100 percent grade for the proper lubrication of the pipelayer components.

[1] Operating Weight: Includes lubricants, coolant, 100% fuel, hydraulic controls and fluids, backup alarm, seat belt, 660 mm (28 in) single grouser shoes, drawbar, counterweight, 20ft boom and pulley blocks and cable, and operator.

[2] Shipping Weight: Includes lubricants, coolant, 10% fuel, hydraulic controls and fluids, backup alarm, seat belt, 660 mm (28 in) single grouser shoes, drawbar, counterweight, and pulley blocks and cable.

Refer to the tractor operation and maintenance manual for additional restrictions.

Lifting Capacities

⚠ WARNING

The machine may tip and personal injury may occur if the maximum load capacities are exceeded. Load capacities assume that the machine is stationary on a level concrete surface with the counterweight extended. Lift capacities will decrease on slopes or soft ground.

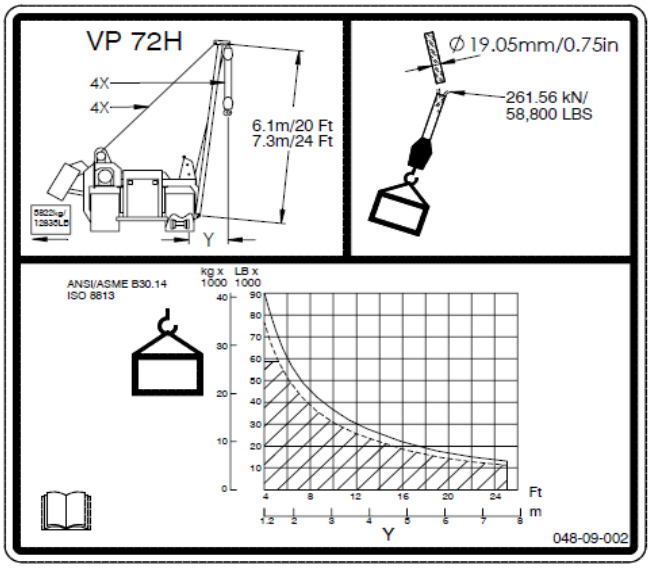

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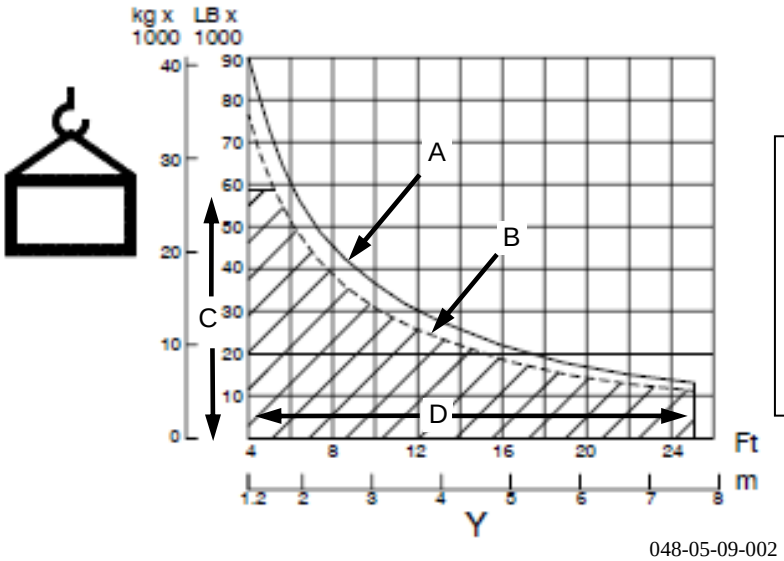
Figure 15: Lifting Capacities



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The following are as per ANSI/ASME B30.14, ISO 8813: 1992:
(A) Lift capacity at tipping point
(B) Rated Lift capacity
(Y) W12 Load overhang
(C) Rated tipping load lift capacity
(D) Working range

Figure 16: Lift capacity chart

NOTE: Do not exceed the lifting capacity that is shown in the chart in illustration above.

The lift capacity chart is located on the right hand winch-guarding to the front of the controls. The lift capacities are based on a stationary machine with the following specifications:

VP 72H Pipelayer	
Wire rope diameter	**19.05 mm (0.75 inch)**
Minimum breaking strength of the wire rope	**261.56 kN (58,800 lb)**
4 part load line	
4 part boom line	
Mass of the extended counterweight	**5822 kg (12 835 lb)**
Standard boom length	**6.1 m (20 ft)**
Total operating weight of the machine[3]	**29770 kg (65,632 lb)**

Table 3: Stationary specifications

If the lift capacity chart indicates that the lift operation is within the capability of the machine, attempt to perform the operation but proceed with care. Remember that the load may weigh more than the estimate for the load. The lift capacity chart is for estimating the lift operation only. Installation of additional equipment or other options may reduce the tipping characteristics of the machine below those indicated in the chart.

Operation Section

Before Operation

Mounting and Dismounting

Figure 17: Mounting and dismounting machine

Use steps and handholds whenever you mount the machine Use steps and handholds whenever you dismount the machine. Before you mount the machine, clean the step and the handholds. Inspect the step and handholds. Make all necessary repairs.

Face the machine whenever you mount the machine and whenever you dismount the machine. Maintain a three-point contact with the step and with handholds.

Note: Three-point contact can be two feet and one hand. Three-point contact can also be one foot and two hands.

Do not mount a moving machine. Do not dismount a moving machine. Never jump off the machine. Do not try to mount the machine when you carry tools or supplies. Do not try to dismount the machine when you are carrying tools or supplies. Use a hand line to pull equipment onto the platform. Do not use any controls as handholds when you enter the operator compartment or when you exit the operator compartment.

[3] Operating Weight: Includes lubricants, coolant, 100% fuel, hydraulic controls and fluids, backup alarm, seat belt, 660 mm (28 in) single grouser shoes, drawbar, counterweight, 20ft boom and pulley blocks & cable, and operator.

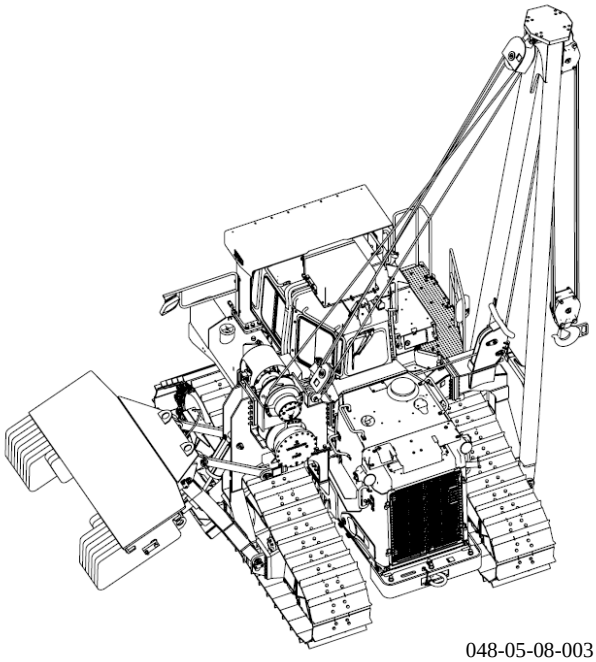

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Figure 18: Daily inspection walk around

For maximum service life of the machine, perform a daily walk-around inspection.

Note: Watch closely for leaks. If leaking is observed, find the source of the leak and correct the leak. If leaking is suspected or leaking is observed, check the fluid levels more frequently.

Inspect the machine for the following items:

- Inspect the hydraulic system for leaks. Repair any hydraulic system leaks. Inspect the hoses, the seals, and the flanges.
- Inspect the winch final drive for leaks. Repair any final drive leaks.
- Inspect covers and the guards for damage, for loose bolts, and for missing bolts.
- Inspect the condition of the steps and of the handholds. Inspect the steps and the handholds for cleanliness. If necessary, repair the steps or clean the steps.
- Inspect the operator compartment for cleanliness. Remove any trash buildup and any dirt buildup.
- Inspect mirrors and make sure they are in good condition and replace if broken.

Note: Refer to the tractor operation manual for detailed information on the specific daily inspection of the tractor unit.

NOTICE

Accumulated grease and oil on a machine is a fire hazard.

Remove debris with steam cleaning or high pressure water, at the specified interval in the Maintenance Interval Schedule or each time any significant quantity of oil is spilled on the machine.

Daily Checks

After you inspect the machine, perform the daily maintenance that is listed in the maintenance interval schedule. Perform the daily maintenance before you mount the machine in order to operate the machine.

Refer to Operation and Maintenance Manual, "Maintenance Interval Schedule" for the correct procedures for the following checks:

- "Boom Pivot Pins - Lubricate"
- "Cooling System Coolant Level - Check"
- "Counterweight Cylinder Bearings - Lubricate"
- "Counterweight Hinge Pins - Lubricate"
- "Fairlead Sheave - Lubricate"
- "Hook and Wire Cable Inspect"
- "Hydraulic System Oil Level - Check"
- "Sheave Block Bearings - Lubricate"
- "Boom Stop Switch - Check operation"

Note: Refer to the tractor operation manual for detailed information on the specific daily checks of the tractor unit.

Tractor Operation

Refer to the tractor operation and maintenance manual for the specific procedures regarding complete Tractor Operation.

Hydraulic Oil Temperature

Refer to the tractor operation and maintenance manual "Gauges" for the specific procedures regarding hydraulic oil temperature indication and operating temperature.

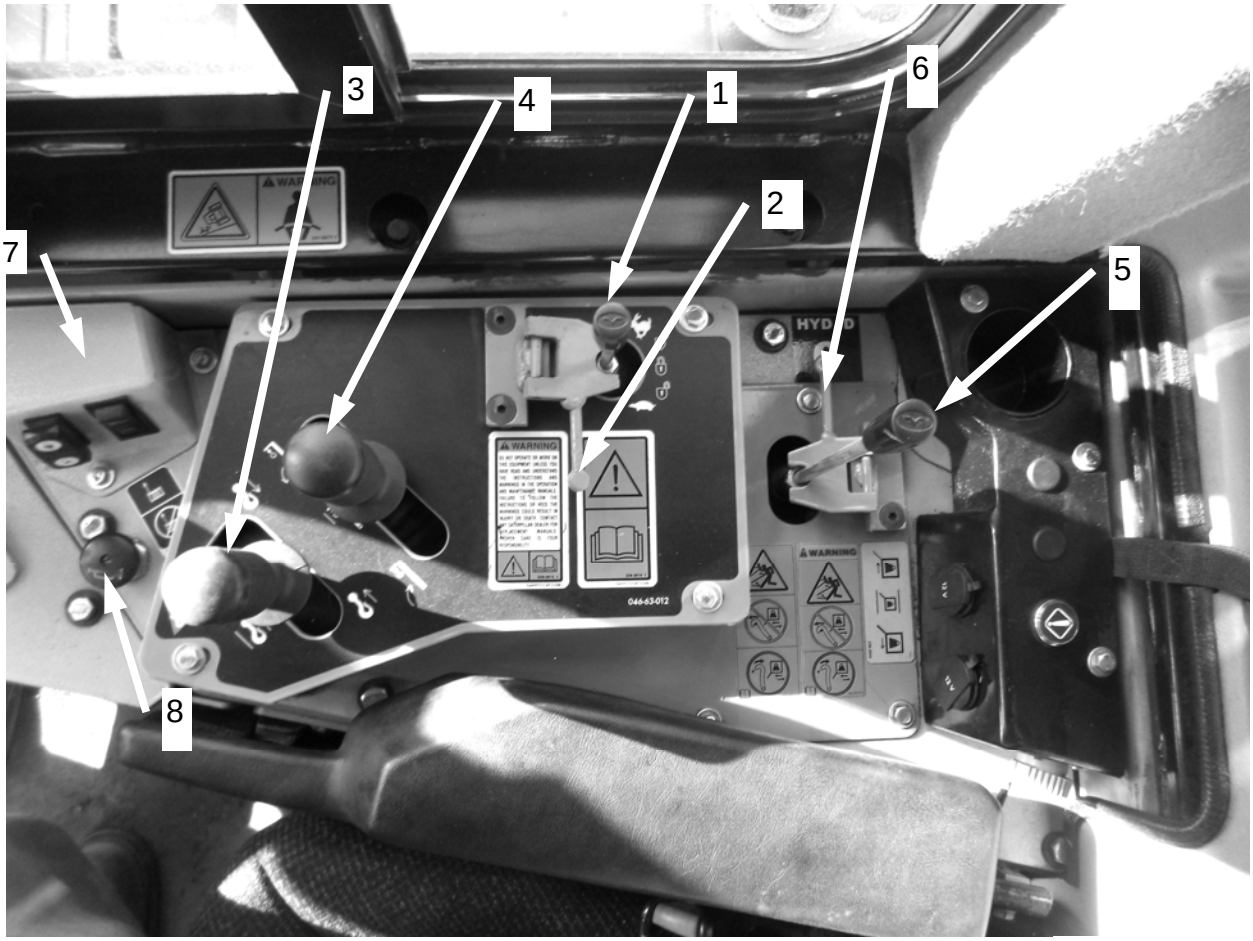


Figure 19: Controls for pipelayer

Speed/Lockout Control Lever (1)

The speed/lockout control lever has three positions that controls the speed range of the hook winch and prevents accidental actuation of the pipelayer-controls while not in use.

HIGH SPEED MODE—WINCH CONTROLS UNLOCKED: Push the speed/lockout control lever forward for the hook winch at high speed range, the maximum hook winch pull is reduced; the boom winch speed is unaffected.

LOCKED MODE—WINCH AND CONTROLS LOCKED: To prevent accidental actuation of the hook and boom winch controls while not in use, move the speed/lockout control lever to the centre position and flip the speed/lockout control lock to engage the lever (2) and lock it in position. In this mode, the hook and boom winch controls do not function. **Always** place the speed/lockout control lever in the LOCKED MODE **and** engage the speed/lockout control lock whenever the machine is left unattended, or when inadvertent control operation could result in a dangerous situation arising.

LOW SPEED MODE—WINCH CONTROLS UNLOCKED: Pull the speed/lockout control lever back for the hook winch low speed range, maximum hook winch pull is available; the boom winch speed unaffected.

Speed/Lockout Control Lock (2)

Use the speed/lockout control lock lever (2) to lock the speed/lockout control lever (1) in the LOCKED MODE position.

Move the boom control lever to HOLD position. Move the hook control lever to HOLD position. Move the speed/lockout control lever to the centre position. Flip the speed/lockout control lever over the control lever in order to lock the lever in the LOCKED MODE position. This locks the boom controls and the hook controls in HOLD in order to prevent accidental boom movement or hook movement.

Flip speed/lockout control lock away from the speed/lockout control lever in order to allow actuation of the speed/lockout control lever. Move the speed/lockout control lever to the desired speed range in order to operate the winches.

Always move the speed/lockout control lever to the **"LOCKED"** position before shutting off the engine or immediately after the engine quits running to prevent unintentional load release or--after the engine is restarted-- unintentional drawworks operation.

Hook Control (3)

 **HOLD**: The lever self centres to this position whenever it is released. In this position, the load winch brake will set, and the hook will stop and remain at the position it is in.

⚠ WARNING

Component failure! Re-engaging the free fall while the load is dropping causes shock loads which could cause component structural failure, resulting in possible personnel injury or death.

 **(Emergency Lower) Free Fall-** Move the hook control lever to this position to lower the load fast in an emergency. The load winch's free fall brake will release, and the hook will move down under the weight of the load Upon activating the free fall function the load will drop and must be allowed to fall to its end travel without re-engagement. The lever will return to the **"HOLD"** position when released, the load winch's free fall brake will set.

NOTICE

The Free Fall is used for a full release of a suspended load up to the maximum lift capacity of the hook winch. Upon activating the free fall function the load will drop and must be allowed to fall to its end travel without re-engagement.

NOTE: Free Fall is only available in pipelayer HIGH or LOW SPEED mode—Winch Controls Unlocked.

 **LOWER**: Move the lever to this position to lower the hook with controlled winch power. The further the lever is pushed away from HOLD, the faster the hook will lower. The closer the lever is toward HOLD, the slower the hook will lower. When the lever is released, it will return to the HOLD position, the winch brake will set, and the hook will stop and remain at the position it is in. Hook winch line speed varies with engine throttle setting. Hook control is smoothest at engine speeds faster than idle.

 **RAISE**: Move the lever to this position to raise the hook. The further the lever is pulled away from **"HOLD"**, the faster the hook will raise. The closer the lever is toward **"HOLD"**, the slower the hook will raise. When the lever is released, it will return to the **"HOLD"** position and the hook will stop and remain at the position it is in. Hook winch line speed varies with engine throttle setting. Hook control is smoothest at engine speeds faster than idle.

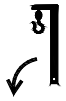
NOTE: The hydraulic pilot system and some machine controls, namely the hook Free Fall, are **"LIVE"** for as long as the accumulator holds a charge, even if the engine is not running. This pressure charge will take approximately four hours or more to bleed off. Refer to the operation and maintenance manual "Free Fall Active" for dropping load hazard warning. Refer to the operation and maintenance manual "Accumulator - Relieving Charge" to bleed off the residual pressure if required and when safe to do so.

Accumulator - Relieving Charge

To relieve the accumulator charge, with no load on the hook and the engine stopped, move the *hook control* lever from **"HOLD"** to **"RAISE"** 10 times.

Boom Control (4)

A)  **HOLD:** The lever self centres to this position whenever it is released. In this position, the boom winch brake will set, and the boom will stop and remain at the position it is in.

B)  **LOWER:** Move the lever to this position to lower the boom. The further the lever is pushed away from HOLD, the faster the boom will lower. The closer the lever is toward HOLD, the slower the boom will lower. When the lever is released, it will return to the HOLD position, and the boom will stop and remain at the position it is in. Boom winch line speed varies with engine throttle setting. Boom control is smoothest at engine speeds faster than idle.

C)  **RAISE:** Move the lever to this position to raise the boom. The further the lever is pulled away from HOLD, the faster the boom will raise. The closer the lever is toward HOLD, the slower the boom will raise. When the lever is released, it will return to the HOLD position, and the boom will stop and remain at the position it is in. Boom winch line speed varies with engine throttle setting. Boom control is smoothest at engine speeds faster than idle.

Boom Stop Switch

The Boom Stop switch is a safety device that is intended to automatically stop the boom winch from hauling-in when the boom is vertical, preventing overloading of key machine components. Refer to the Operation and Maintenance manual, Boom Stop Switch Adjustment, for correct operation and adjustment. Check its function daily.

Counterweight Control (5)

NOTICE

In order to prevent machine damage, check to make sure the counterweight lock lever is not locked in the extended position before you operate this control lever. Refer to Operation and Maintenance manual, "Safety Section".

Hold - When the operator releases the counterweight control from any position, the control will return to the HOLD and the counterweight will remain in position.

Out - Move the counterweight control to this position in order to move the counterweight outward. When the counterweight control is released, the returns to the HOLD position and the counterweight will remain in position.

Refer to the Operation and Maintenance Manual, "Counterweight Lock Lever" for the procedure to mechanically lock the counterweight in the fully extended position when you service the machine.

In - Move the counterweight control lever to this position in order to move the counterweight inward. When you release the counterweight control lever the lever returns to the HOLD position and the counterweight will remain in position.

Counterweight Control-Lockout Lever (6)

Use the counterweight control-lockout lever (6) to lock the counterweight control (5) in the HOLD position in order to avoid accidental actuation of the counterweight. Move the counterweight control (5) to the HOLD position. Flip the counterweight control-lockout lever (6) forward in order to lock the counterweight control (5) in the HOLD position.

Flip the lock lever (6) to the rear position in order to allow actuation of the counterweight control.

Throttle control switch & Operator Heater switch (7)

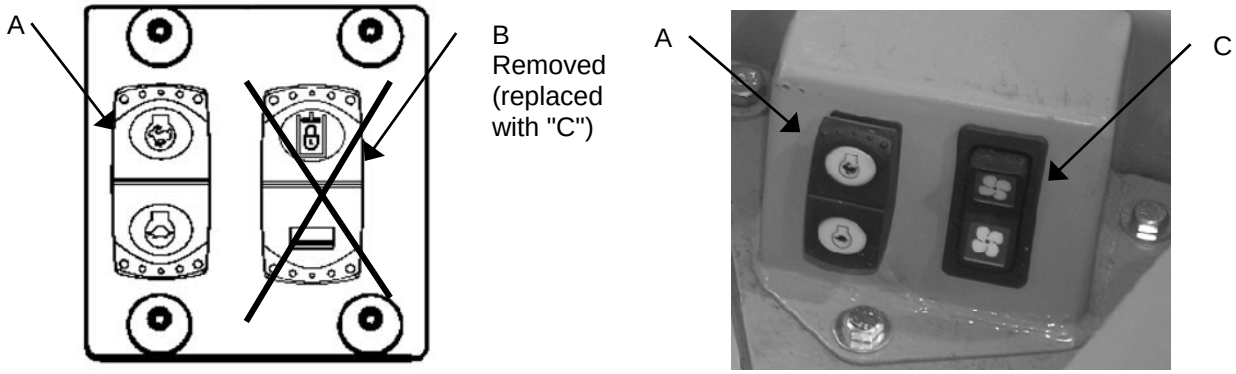


Figure 20: Control Switches

A. Throttle Control Switch, Refer to tractor's operation and maintenance manual for correct operation
B. Hydraulic lockout switch—Removed [use Speed/Lockout Control Lock (2) and Counterweight Control-Lockout Lever (6)]
C. Operator Heater switch, if equipped. Use the switch to vary the flow of heated air to the operator station: High-flow, Low-flow, or Off in the middle position.

Horn location moved (8)

NOTE: New location of this tractor's control, refer to the tractors operation and maintenance manual for correct operation.

Counterweight Lock Lever

⚠ WARNING

Crushing Hazard! When the counterweight is in the fully extended position for servicing the machine, secure the extended counterweight with the counterweight lock lever. Use the counterweight lock lever to avoid possible personnel injury or death from crushing.

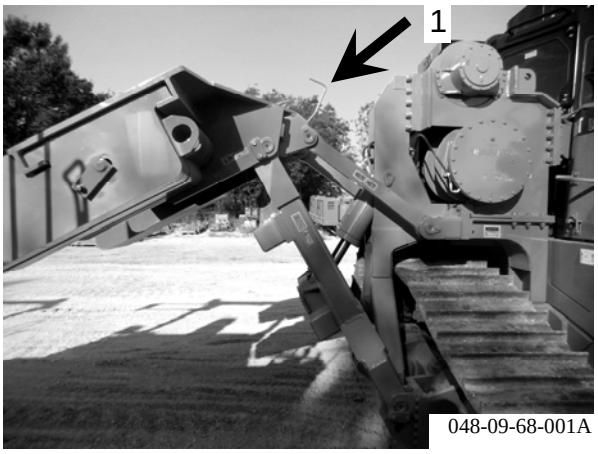


Figure 21: Counterweight Lock Lever (1) locked in the extended position, front view (1)

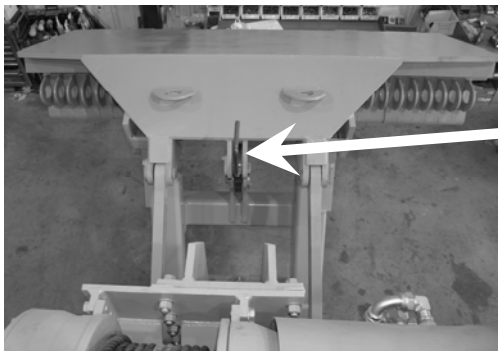


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Figure 22: Counterweight Lock Lever (1), locked in the extended position, side view (1)

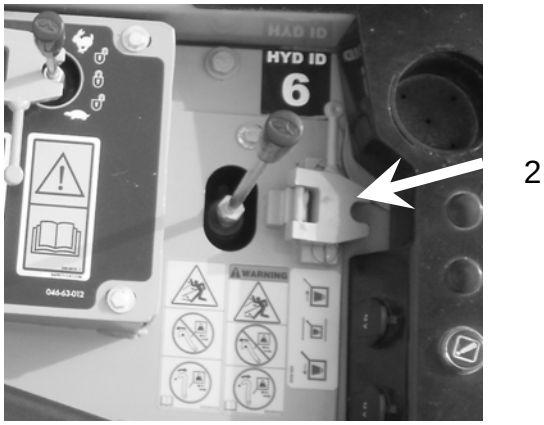

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Figure 23: Counterweight control-**lockout** (2), open position

NOTICE

When you engage the locking device for the counterweight or when you disengage the locking device for the counterweight use the Counterweight Control-Lockout lever for the counterweight controls. Lock the counterweight controls in HOLD in order to avoid the inadvertent movement of the counterweight. Refer to the topic "Counterweight Control-Lockout Lever " in the Operation and Maintenance Manual, "Operator Controls".

Lock the counterweight control-lockout (2) in the operator station when you service the machine.

Lock the counterweight when you service the machine.

Locked - Extend counterweight cylinders to maximum length Engage the lock lever (1).
Slowly retract the counterweight slightly until there is pressure on the lock lever (1). Do not continue to retract the counterweight against the lock lever once the lock lever is engaged. Refer to Operation and Maintenance manual, Safety Section "Counterweight Lock Lever Thrown or Flying Objects – Full Body Exposure".

Unlocked - Unlock the counterweight control-lockout (2) in the operator station. Extend counterweight cylinders to maximum length. Disengage the lock lever (1). Retract the counterweight.

The locking mechanism will hold the counterweight in position in the event of a hydraulic failure.

Equipment Lowering with Engine Stopped

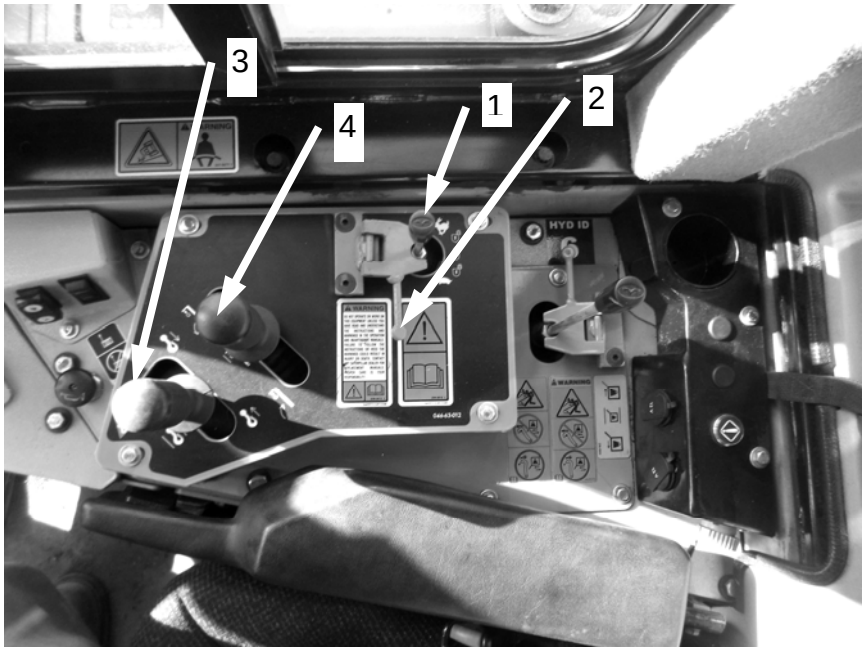

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Figure 24: Controls for Equipment lowering with engine stopped

NOTICE

Before lowering any equipment with the engine stopped, clear the area around the equipment of all personnel. The procedure will cause immediate, rapid lowering of the load. Refer to Operation and Maintenance Manual, "Hook Control" for complete control function description.

If the machine does not have engine power, in order to lower the equipment follow these steps:

- Unlock the Speed/Lockout Control Lock (2) and move the Speed/Lockout Control Lever (1) to LOW SPEED MODE—WINCH CONTROLS UNLOCKED or to HIGH SPEED MODE—WINCH CONTROLS UNLOCKED
- Move the hook control (3) to  **(Emergency Lower) Free Fall**.
- The accumulator will provide pilot pressure that will allow the hook to be immediately lowered fast under the weight of the load.
- Do not release the hook control to re-engage the Free Fall until the load is completely lowered.

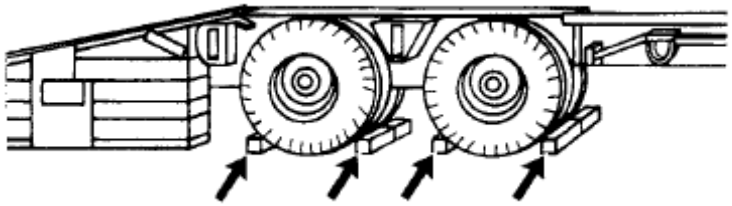
Shipping the Machine

Investigate the travel route for overpass clearances. Make sure that there is adequate clearance for the machine that is being transported.

Remove ice, snow, or other slippery material from the loading dock and from the truck bed before loading. Removing ice, snow, or other slippery material will prevent slippage while you load the machine. Removing ice, snow, or other slippery material will prevent the machine from slipping in transit.

NOTICE

Obey all state and local laws governing the weight, width, and length of a load. Observe all regulations governing wide loads.



1. Place blocks under the trailer wheels or under the rail car wheels before loading, as shown.
2. Move the transmission control lever to the NEUTRAL position.
3. Engage the parking brake switch.
4. Stop the engine.
5. Turn the start switch key to the OFF position. Remove the key and lock the parking brake switch.
6. Turn the battery disconnect switch to the OFF position. Remove the key.
7. Attach any vandalism protection and lock the access covers.
8. Install the tie-downs at several locations and chock the tracks in the front and in the rear.
9. Cover the opening for the engine exhaust in order to prevent rotation of the turbocharger that is caused by the force of the wind.

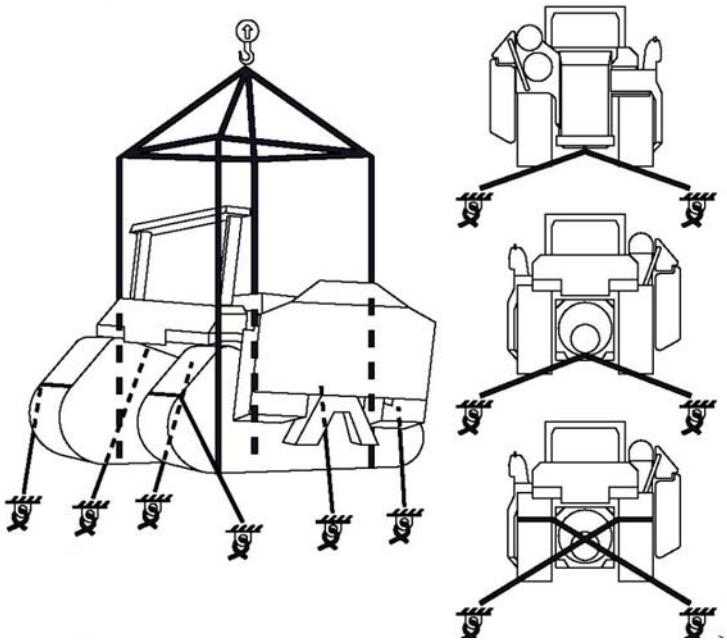
NOTICE

Rotation of the turbocharger without engine operation can result in damage to the turbocharger. Cover the exhaust opening or secure the rain cap in order to prevent the turbocharger from wind milling in transit. Refer to the tractor operation and maintenance manual for additional requirements and information.

Lifting and Tying Down the Machine

⚠ WARNING

Improper lifting and improper tie-downs can allow the load to shift or fail and cause injury or damage. Use only properly rated cables and slings with lift and tie down points provided.
Follow the instructions in Operation and Maintenance Manual, "Lifting and Tying Down the Machine" for the proper technique for securing the machine. Refer to Operation and Maintenance Manual, "Specifications" for specific pipelayer weight information.



An image of a standard equipped pipelayer is shown for example only.

NOTICE

Improper lifting or tie-downs can allow load to shift and can cause injury and damage.

Refer to the tractor's *Operation and Maintenance Manual* for correct lifting and tying down procedures, including precautions and for locations of tie-downs.

Removal of the Boom

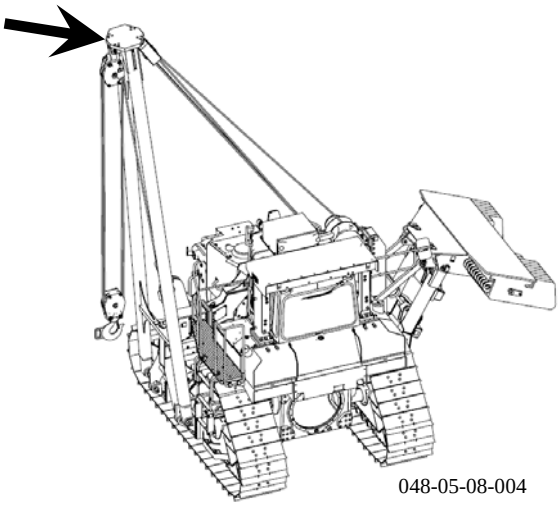


Figure 25: Removal of the boom

1. Lower the boom enough to remove the load blocks and the sheave block.

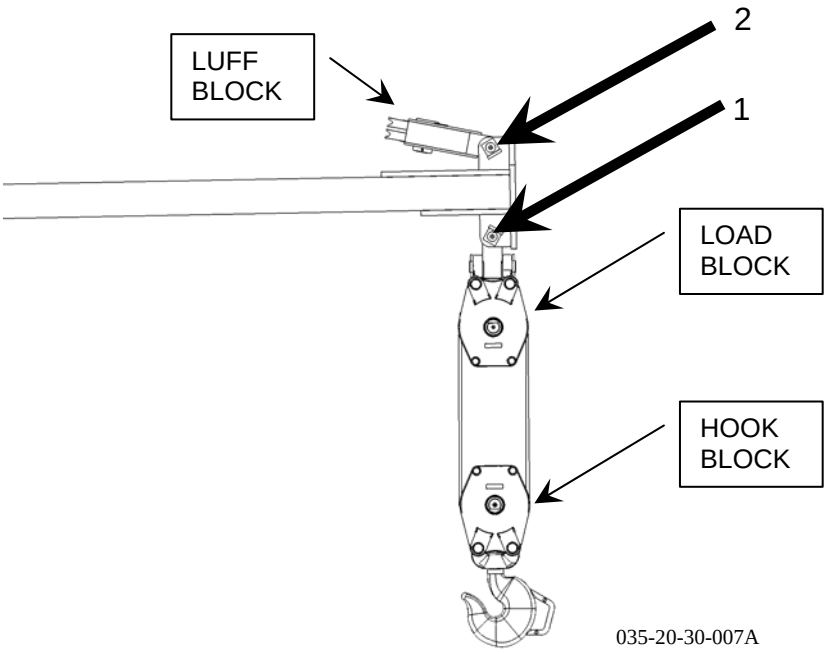
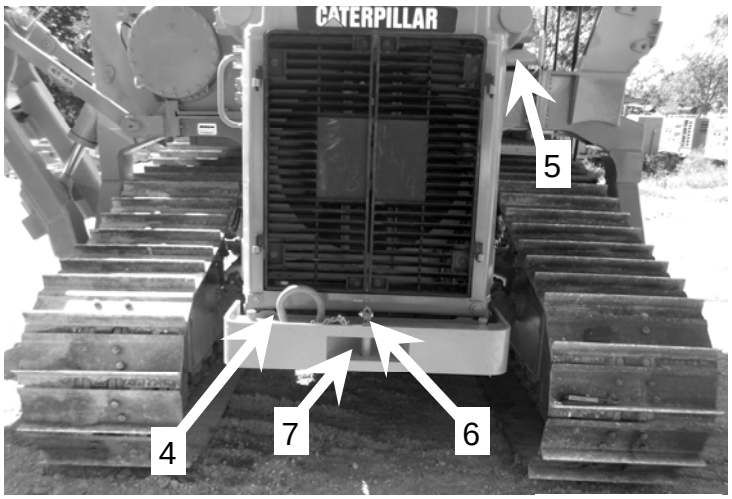


Figure 26: Removal of boom, steps 1, 2

2. Remove cotter pin, the retainer, and pin (1). Lower the load block and the hook block to the ground.

The approximate weight of the load block is 88 kg (194 lb). The approximate weight of the hook block is 100 kg (220 lb). The combined weight of the load block and the hook block is approximately 188 kg (414 lb).

3. Replace the pin (1) in the boom. Fasten the load block and the hook block to the machine for shipping as illustrated below. Draw in the excess hook load line.



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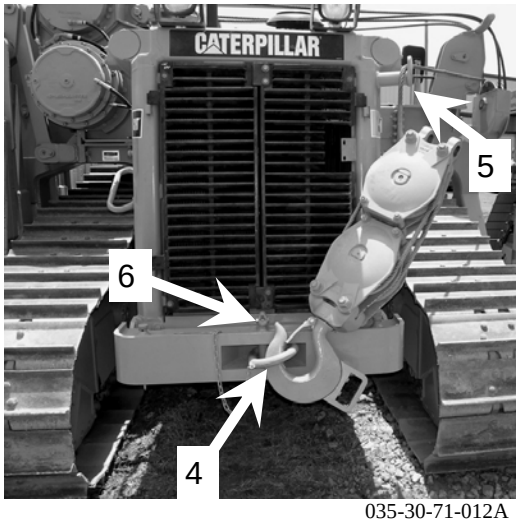

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Figure 27: Fastening of Load Blocks for Transport

4. Remove pin (6) and insert stowing-link (4) into bumper pocket (7) and reinstall pin (6).
5. Place hook load line over guide (5).
6. Slowly draw in the excess hook load line, when the load block and hook block are suspended by the load line, swing in the load block and hook block and lock into stowing- link (4) and tighten up the load line, being careful not to kink or damage load cable.
7. To remove load block and hook block from stowing-link, reverse the above steps, and ensure the stowing-link is placed firmly back into the slot in bumper.
8. Lower the boom to the horizontal position onto wood blocks that are sufficient to support the boom.
9. Remove the cotter pin, the retainer, and pin (2). The approximate weight of the luff block is 76 kg (168 lb).
10. Replace the pin and the retainer (2) in the boom.
11. Move the luff block clear of the boom and area; it will be secured after the boom has been removed.

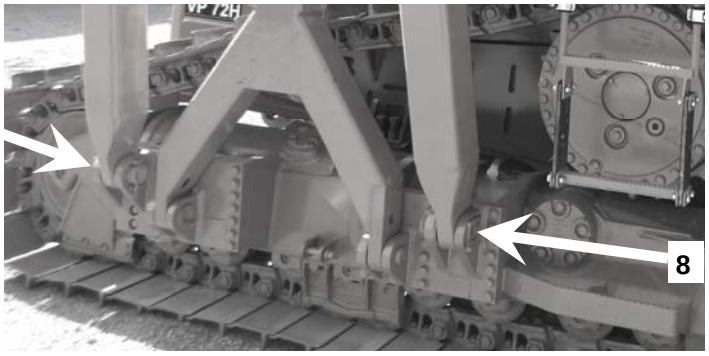

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Figure 28: Location of pins for removal of boom

12. Fasten an appropriate lifting device to the boom. The approximate weight of the boom is 936 kg (2064 lb).
13. Remove the cotter pins, the retainers, and the pins (8) from both sides of the support.

14. Remove the boom from the machine. Replace the pins in the support.

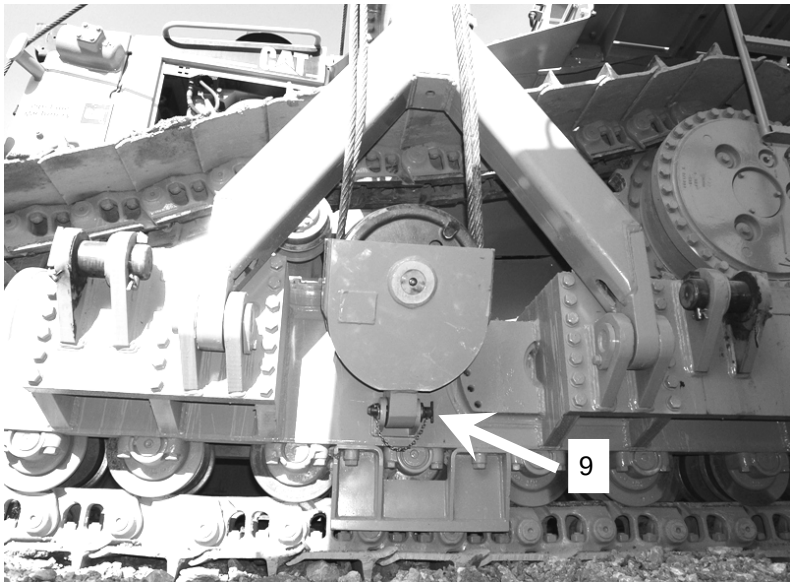

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Figure 29: Location of Luff Block stowing point and stowing pin (9)

15. Draw in the line for the boom and fasten the luff block to the machine at the luff block stowing point on the track frame for shipping using stowing-pin (9).

16. Draw in the excess line for the boom, ensuring not to over tighten the cables to avoid causing kinks.

Maintenance and Lubrication Section

Lubricant Viscosities

General

- Follow tractor manufacture's maintenance and lubrication instructions for tractor service as required.
- Follow tractor and/or winch manufacture's lubrication instructions for the pipelayer hydraulic system.

Selecting the Viscosity

The proper oil viscosity grade is determined by the minimum outside temperature. This is the temperature when the machine is started and when the machine is operated. In order to determine the proper oil viscosity grade, refer to the "Min" column in the table. This information reflects the coldest ambient temperature condition for starting a cold machine and for operating a cold machine. Refer to the "Max" column in the table in order to select the oil viscosity grade for operating the machine at the highest temperature that is anticipated. Use the highest oil viscosity that is allowed for the ambient temperature when you start the machine.

Machines that are operated continuously should use oils that have the higher oil viscosity in the final drives and in the differentials. The oils that have the higher oil viscosity will maintain the highest possible oil film thickness. Consult your dealer if additional information is needed.

Lubricant Viscosities for Ambient Temperatures

Lubricant Viscosities for Ambient Temperatures						
Compartment or System	**Oil Type and Classification**	**Oil Viscosities**	**°C**		**°F**	
			Min	**Max**	**Min**	**Max**
Hydraulic System	**Refer to Tractor Operation and Maintenance Manual**					
Winch Gearboxes and Drums	**Mobil Delvac Synthetic Gear Oil**	75W-90	-40	50	-40	122
	CAT Arctic GO	75W-90	-40	40	-40	104
Winch Brakes	**Cat HYDO Advanced 10**	SAE 10W	-20	40	-4	104
	Cat HYDO Advanced 30	SAE 30	0	50	32	122
	Cat BIO HYDO Advanced	"ISO 46" Multi-Grade	-30	45	-22	113
	Cat DEO-ULS Cold Weather	SAE 0W-40	-40	40	-40	104
	Cat TDTO Cold Weather	SAE 0W-20	-40	40	-40	104
	Cat MTO	SAE10W-30	-20	40	-4	104
	Cat TDTO-TMS	Multi-Grade	-15	50	5	122

Table 4: Lubricant viscosities for ambient temperature

Lubricant Capacities (Refill)

NOTICE

Use only none EP-Oil in the winch brake housing. Do not use Gear Oil in the brake housing.

NOTICE

Do not use Cat GO (Gear Oil) or commercial gear oil in the machine compartments unless specifically recommended by Caterpillar. The gear oil can cause seals to fail. The seals can also leak. The gear oil may not be compatible with friction materials. The oil can reduce the efficiency of the transmission and the brake performance. Refer to the Tractor Operation and Maintenance Manual for complete details.

APPROXIMATE LUBRICANT REFILL CAPACITIES			
Compartment or System	**Liters**	**US gal**	**Imperial gallon**
Hydraulic Oil (Tank only - D6T T4i)	65.5	17.3	14.41
Hydraulic Oil (System)	82.33	21.75	18.11
Hook Winch Brake	0.237	0.0625 (0.25 Quart)	0.052
Hook Winch Drum	1.892	0.5 (2.0 Quart)	0.416
Hook Winch Gearbox	3.075	0.8125 (3.25 Quart)	0.676
Boom Winch Brake	0.237	0.0625 (0.25 Quart)	0.052
Boom Winch Drum	1.419	0.0375 (1.5 Quart)	0.312
Boom Winch Gearbox	2.365	0.625 (2.5 Quart)	0.520

Table 5: Lubricant refill capacities

S-O-S Information

S O S Services is a highly recommended process for Caterpillar customers to use in order to minimize owning and operating cost. Customers provide oil samples, coolant samples, and other machine information. The dealer uses the data in order to provide the customer with recommendations for management of the equipment. In addition, S O S Services can help determine the cause of an existing product problem. Refer to Caterpillar Special Publication, SEBU6250, “Caterpillar Machine Fluid Recommendations” for detailed information concerning S O S Services.

Refer to the Operation and Maintenance Manual, “Maintenance Interval Schedule” for a specific sampling location and a service hour maintenance interval.

Consult your dealer for complete information and assistance in establishing an S-O-S program for your equipment.

Maintenance Interval Schedule (MIS)

Ensure that all safety information, warnings, and instructions are read and understood before any operation or any maintenance procedures are performed. The user is responsible for the performance of maintenance, including all adjustments, the use of proper lubricants, fluids, filters, and the replacement of components due to normal wear and aging. Failure to adhere to proper maintenance intervals and procedures may result in diminished performance of the product and/or accelerated wear of components. Use mileage, fuel consumption, service hours, or calendar time, WHICH EVER OCCURS FIRST, in order to determine the maintenance intervals. Products that operate in severe operating conditions may require more frequent maintenance.

Service Intervals

Note: Before each consecutive interval is performed, all maintenance from the previous interval must be performed. Perform the following servicing at EVERY interval they occur; for example, the 10 hour and 50 hour service are also performed at the 200 hour interval, etc.

When Required

- Boom Line – Install
- Hook Load Line – Install

Every 10 Service Hours or Daily

- Controls for proper operation of boom and hook– Check
- Boom Stop operation – Check, adjust if required
- Boom Pivot Pins – Lubricate
- Counterweight Cylinder Bearings – Lubricate
- Counterweight Hinge Pins – Lubricate
- Fairlead Sheave – Lubricate
- Hook and Wire Cable (Boom and Hook lines) – Inspect
- Hydraulic System Oil Level – Check
- Hoses and fittings for leaks – Check
- Sheave Block Bearings – Lubricate
- Pipelayer structures and components for loose bolts, cracks, damage, etc. – Inspect
- Inspect the hook for any distortion, bends, twists, etc. Inspect the hook for any wear, cracks, nicks, or gouges. Refer to American National Standard Institute ANSI/ASME B30.14, or ISO 8813.
- Blocks, and yokes for wear or damage – Inspect
- Ensure that area between tractor tracks and pipelayer-tractor attachment structures are free from dirt, debris, ice, snow, etc. – Inspect

Every 50 Service Hours or Weekly

- Thoroughly check Boom Stop system operation and adjustment, lubricate boom stop switch roller and actuator.
- Lightly lubricate wire rope with recommended engine or hydraulic oil.

Every 500 Service Hours

- Hydraulic System Oil Sample - Obtain

Every 500 Service Hours or 3 Months

- Hydraulic System Oil Filter – Replace
- Hydraulic System Case Drain Filter - Replace

Every 6 months

- Hook and boom winch gearbox and drum oil - Check
- Hook and boom winch brake oil - Check

Every 1000 Service Hours or 1 Year

- Hook and boom winch gearbox and drum oil - Change
- Hook and boom winch brake oil - Change
- Visually inspect winches for missing paint and/or rust - remove rust and repaint as necessary

Every 2000 Service Hours or 1 Year

- Hydraulic System Oil - Change

Accumulator

⚠ WARNING

This system contains high pressure gas. Failure to follow the instructions and warnings could cause an explosion, resulting in possible injury or death. Do not expose to fire. Do not weld. Do not drill. Do not remove any hydraulic system lines, taps or parts until pressure has been relieved. Relieve pressure before discharging. See Operation and Maintenance Manual "Accumulator - Relieving Charge". See Operation and Maintenance Manual "Accumulator" for charging and discharging. See your Dealer for tools and detailed information.

Accumulator must be charged with dry nitrogen (N_2) gas by qualified personnel only. The accumulator must be at the same temperature as the surrounding air before being checked or charged. Charge the accumulator depending on the ambient air temperature according to the table below. Access the accumulator to charge from the rear of the tractor, above the tow-winch drive.

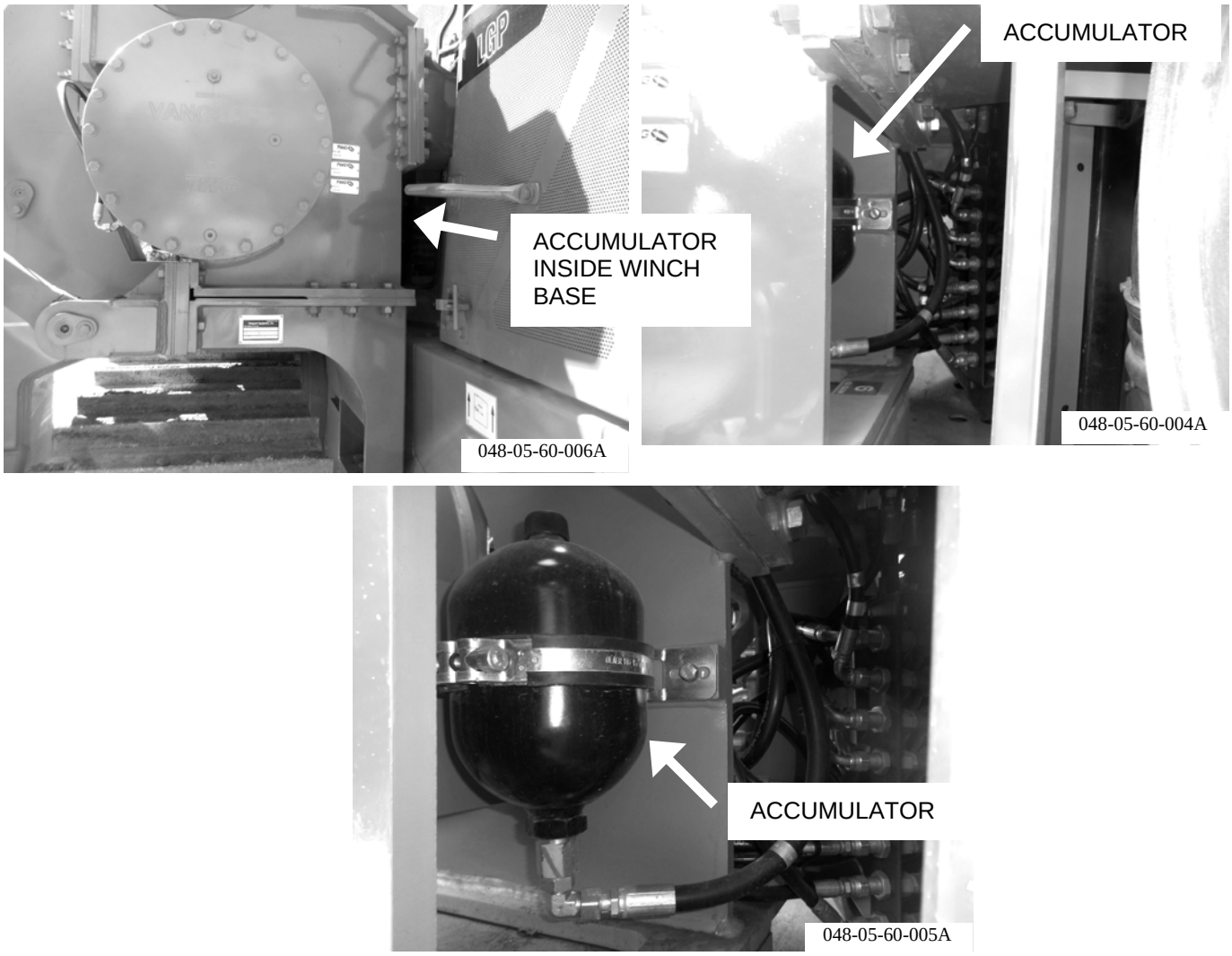


Figure 30: Accumulator located in winch base below crossmember

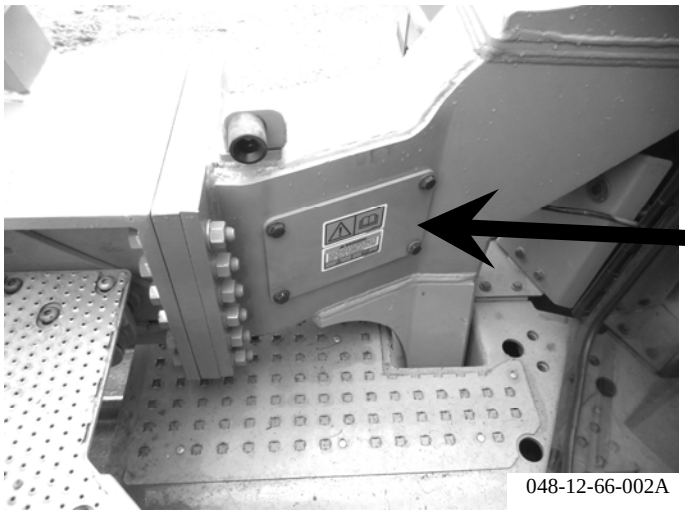
Ambient air temperature [°C (°F)]	Accumulator precharge pressure [kPa (psi)] ± 70 kPa (10 psi)
-7°C (20°F)	3100 kPa (450 psi)
-1°C (30°F)	3170 kPa(460 psi)
4°C (40°F)	3240 kPa (470 psi)
10°C (50°F)	3310 kPa (480 psi)
16°C (60°F)	3375 kPa (490 psi)
21°C (70°F)	3445 kPa (500 psi)
27°C (80°F)	3515 kPa (510 psi)
32°C (90°F)	3580 kPa (520 psi)
38°C (100°F)	3650 kPa (530 psi)
43°C (110°F)	3720 kPa (540 psi)
49°C (120°F)	3790 kPa (550 psi)

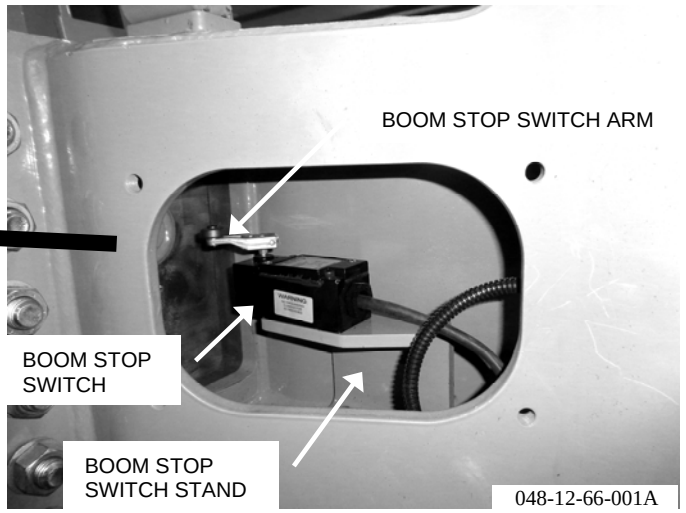
Table 6: Accumulator precharge pressure for ambient air temperature

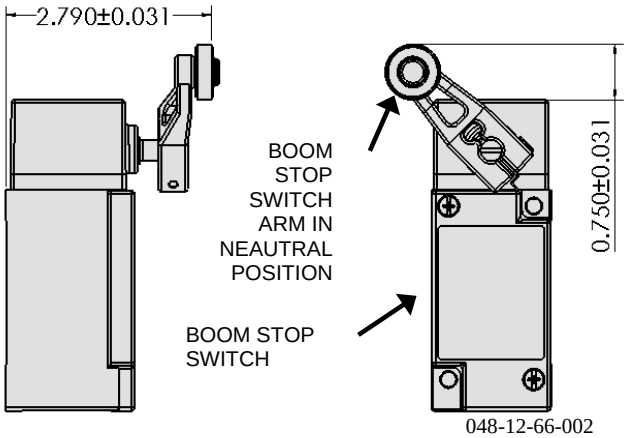
Boom Stop Switch Operation and Adjustment

⚠ WARNING

The Boom Stop system stops the boom winch from hauling-in when the boom is vertical, preventing overloading of key machine components. Incorrectly adjusting, or defeating the boom stop switch could result in serious equipment damage, personal injury, or even death. Its operation must be checked and verified daily.







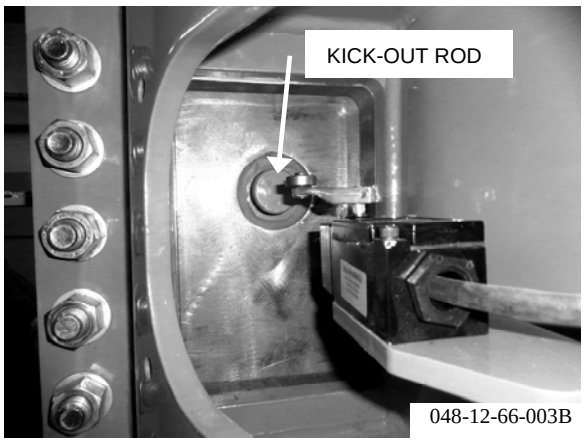


Figure 31: Boom stop switch location & adjustment.

- To check the operation, boom in slowly taking care not to over tension the boom lines when the boom goes vertical. When the boom is vertical, the boom winch should stop. No increase in tension should occur once the boom comes into contact with the left hand tower. If the boom winch does not stop and continues to increase the cable tension, STOP the operation at once and lower the boom to release the tension. Adjust the boom stop switch as set out below.
- Remove the boom stop switch access panel from the tower.
- Ensure boom stop switch arm is adjusted relative to boom stop switch as shown in Figure 31 when in neutral position.
- Ensure boom stop switch is fastened to the boom stop stand as shown in Figure 31.
- Adjust boom stop stand so that the boom stop switch arm is 74 mm (2.90 inches) from contacting the kick-out rod. (Note: when the boom is vertical it will push the kick-out rod in 85 mm (3.33 inches) and push the boom stop switch arm 11 mm (0.43 inches))
- Ensure the boom stop switch arm will stay in contact with the kick-out rod face for the entire distance it is pushed in (and will not roll off the face of the rod).
- Ensure all boom stop switch and stand fasteners are sufficiently torqued.
- Test the boom stop switch to see that it works properly. To do this, slowly raise the boom vertical so that it is **JUST** in contact with the tower; the boom kick-out rod is fully retracted into the tower. At this point the boom winch should be stopped and no increase in tension in the boom cable lines should occur once the boom comes in contact with the left hand tower. Do not over tighten the lines to the point that the boom or structures are overly stressed when testing boom stop switch operation.
- Lower the boom until the boom stop switch arm is free from the kick-out rod.
- Replace the boom stop switch access panel from the tower.
- Boom in slowly taking care not to over tension the boom lines when the boom goes vertical. When the boom is vertical, the kick-out rod will move the boom stop switch arm in 11 mm (0.43 in), and the boom winch should stop with the boom vertical. No increase in tension should occur once the boom comes into contact with the left hand tower, readjust the boom stop switch as required.

Boom Line – Install

WARNING

Do not operate or work on this equipment unless you have read and understand the instructions and warnings in the Operation and Maintenance Manual. Failure to follow the instructions or heed the warnings could result in injury or death. Contact your dealer or Vanguard Equipment or visit our website at vanguardequip.com for replacement manuals. Proper care is your responsibility.

WARNING

Personal injury or death can result from worn wire rope cable. Worn or frayed cable could break causing injury. Check the wire rope cable. If cable is worn or is frayed install new cable. Wear gloves when handling the wire rope cable. Proper care is your responsibility.

NOTICE

Make sure that the construction of the wire rope is 6x25 IWRC XIPS (Independent Wire Rope Core, eXtra Improved Plow Steel) USA MADE. Also, the established grade of the wire rope is the improved plow bolt (steel), 26670 kg (58 800 lb) minimum breaking strength.

SPECIFICATIONS (WIRE ROPE) Boom Line Cable		
Boom Length	**Diameter of Cable**	**Length of Cable**
6.1 m (20 ft)	19.05 mm (0.75 inch)	42.1 m (138 ft)
7.3 m (24 ft)	19.05 mm (0.75 inch)	46.6 m (153 ft)

Table 7: Boom line wire rope specifications

1. Lower the boom to the ground and support the boom.

Note: The loaded force in the winch drum must be neutralized before removing the wire rope from a loaded drum.

2. Remove the anchor for the wire rope from the drum for the boom. Remove the old wire rope.

3. Unroll the new wire rope from the spool.

Note: Weld the cable ends in order to prevent fraying.

NOTICE

Unroll all of the cable from the spool. Lay the wire rope on a flat surface. Never lift the wire rope off the spool in coils.

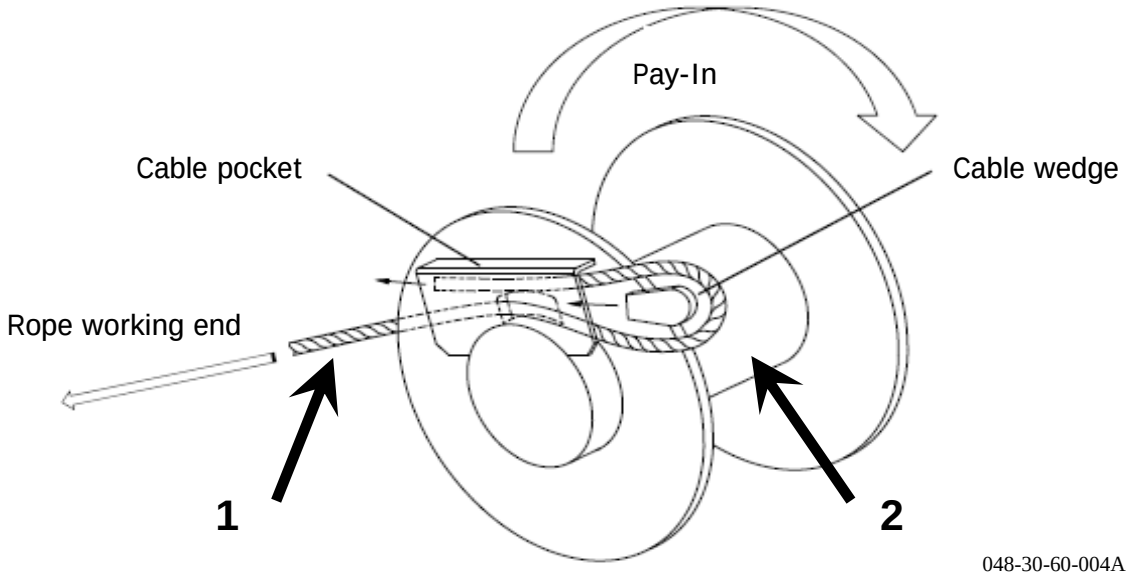


Figure 32: Installing boom line, cable anchor assembly

4. Insert the wire rope(1) through the drum flange opening and double back through the cable pocket opening. The rope end should not extend past the drum flange.
Note: always insert rope thru the drum flange from the pay-in direction

5. Insert cable wedge in the rope loop and into the cable pocket.

6. Pull on the working end of rope to seat the rope and wedge into the cable pocket. Rope and wedge needs to be firmly seated. Pull on the working end with 500-1000 lb force or pull by hand while having an assistant drive the rope and wedge in with a hammer.

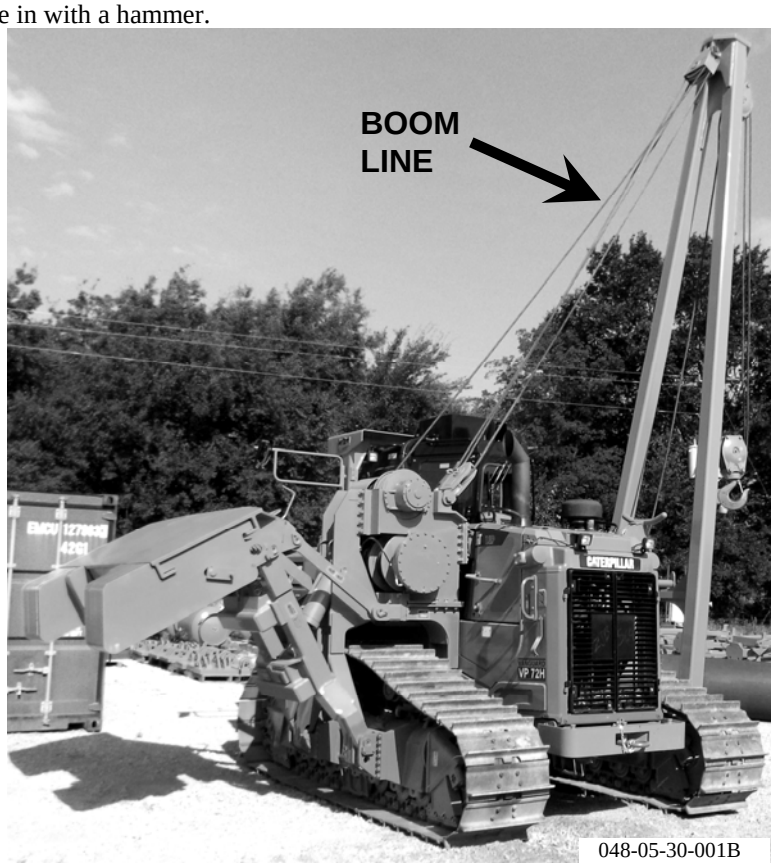


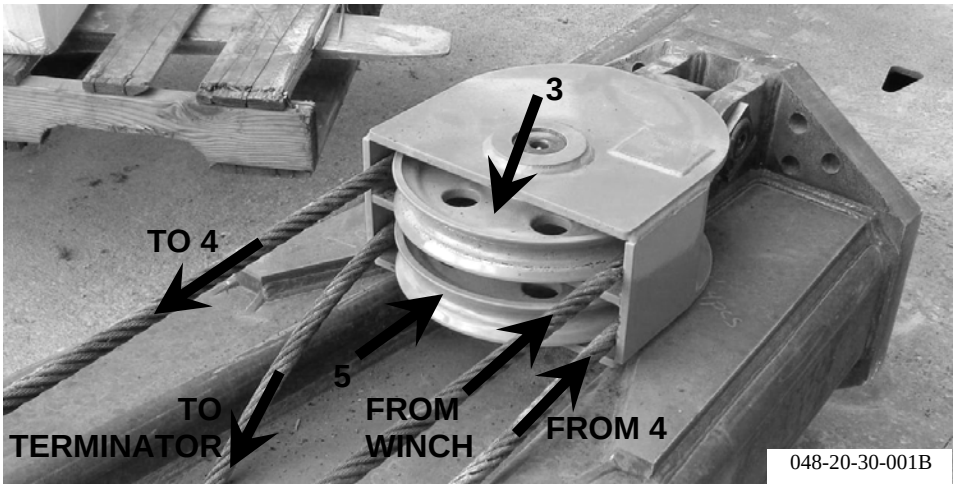
Figure 33: Installing boom line

7. Wind one half of the wire rope (1) on the drum (2.) Wind the wire rope evenly across the drum.

8. Install the wire rope from the winch to sheave (3) in the upper sheave block. Install the wire rope over sheave (3) from the front of the machine toward the rear of the machine.

9. Install the wire rope under sheave (4) in the lower sheave block from the rear of the machine to the front of the machine.

10. Install the wire rope over sheave (5) in the upper sheave block from the front of the machine toward the rear of the machine.



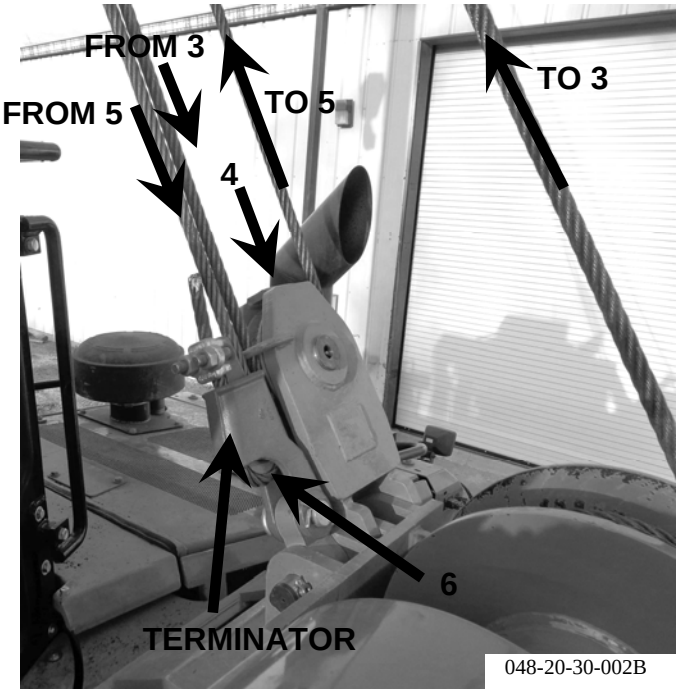
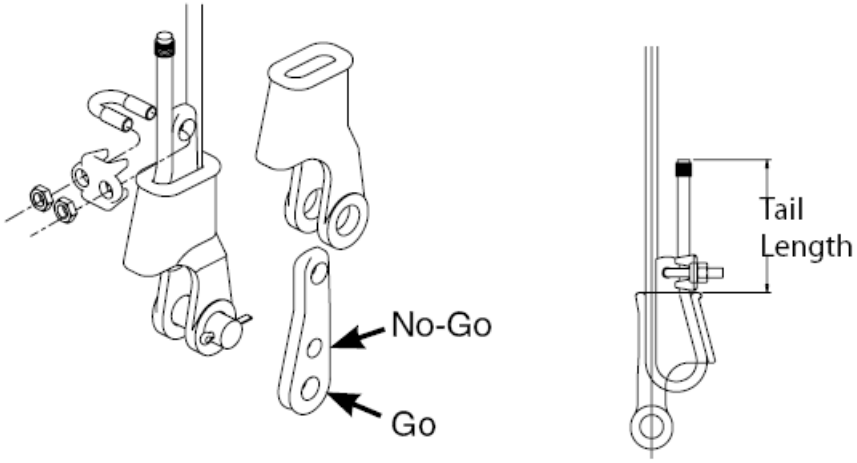


Figure 34: Rigging boom line

11. Ensure terminator is orientated as shown in Figure 34.

12. Secure the wire rope (1) to the line terminator on the winch, as per Terminator instructions outlined in **Appendix - Terminator Instructions**. Tail length must be 6 inches minimum.



NOTE: Do not clamp the loaded end of the wire rope and the tail end of the wire rope together. Refer to TERMINATOR instructions in the appendix of this manual. Tail length must be 6 inches minimum.

13. Apply the first load in order to seat wedge (11).

Boom Pivot Pins – Lubricate

The grease fittings for lubricating the boom pivot pins are located on the left side of the machine.

There is one grease fitting for each pin. The grease fittings are located on the end of the pin on the outside face of the boom.

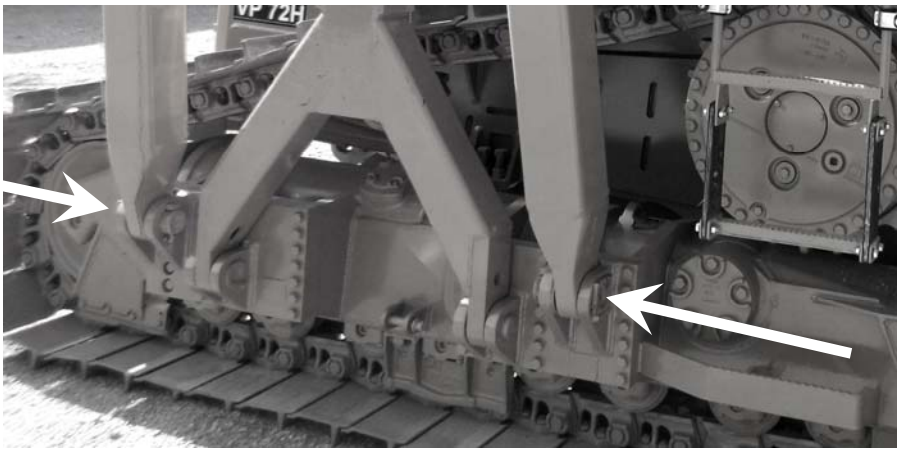


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Figure 35: Boom pivot pins, grease fittings

Lubricate the boom pivot pins through the two fittings.

Counterweight Cylinder Bearings – Lubricate

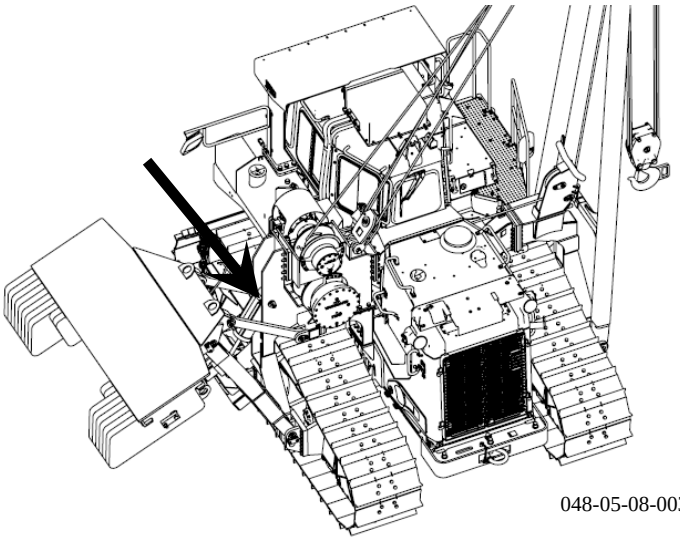

Figure 36: Counterweight cylinder bearings fittings location

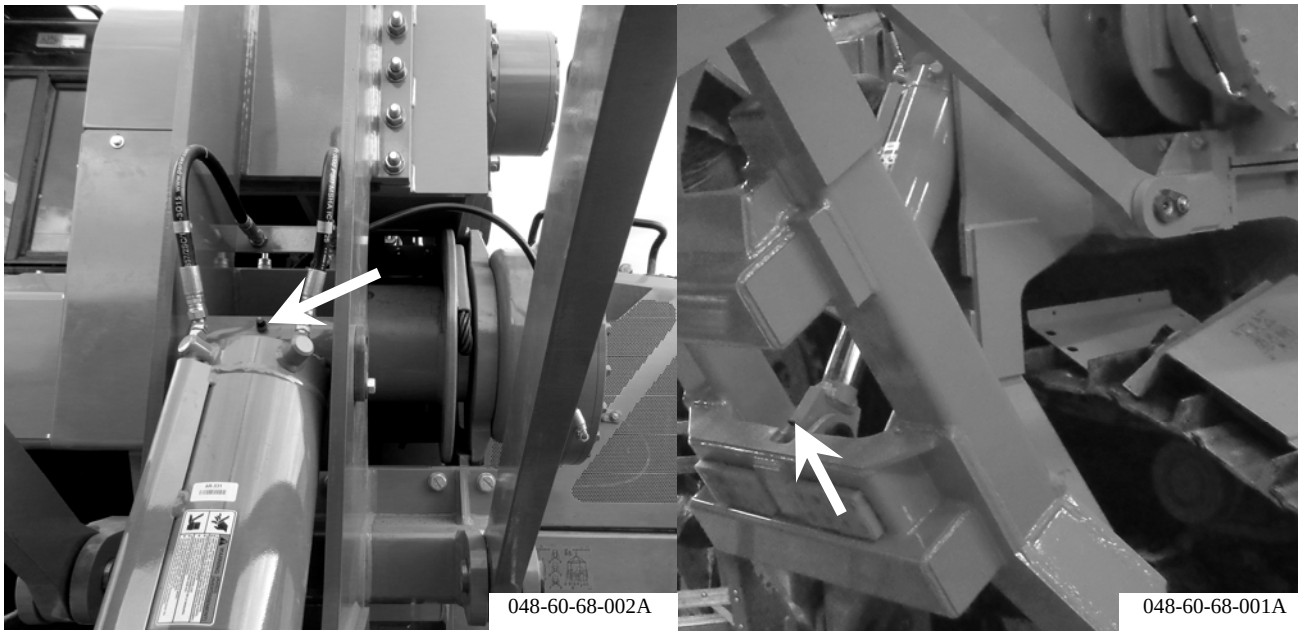

Figure 37: Counterweight cylinder bearings location

There are two grease fittings for the counterweight cylinder.

1. Extend the counterweight and lock the counterweight into position.

Refer to the Operation and Maintenance Manual, “Counterweight Lock Lever” for the proper procedure to lock the counterweight into position.

2. Lubricate the upper grease fitting that is located in the head end of the cylinder.

3. Lubricate the grease fitting that is located in the rod end of the cylinder.

4. Follow the procedure to unlock the counterweight and retract the counterweight.

5. Follow the procedure to unlock the counterweight and retract the counterweight.

Counterweight Hinge Pins - Lubricate

⚠ WARNING

Use a stable work platform placed in a secure location when lubricating the counterweight hinge pins. If a secure location is not available, use the appropriate safety equipment to prevent falling off of the machine. Failure to work from a secure location may result in injury or death from a slip or a fall.

Lubricate the six pins through the grease fittings. There are three grease fittings that face toward the front of the machine and there are three grease fittings that face toward the rear of the machine.

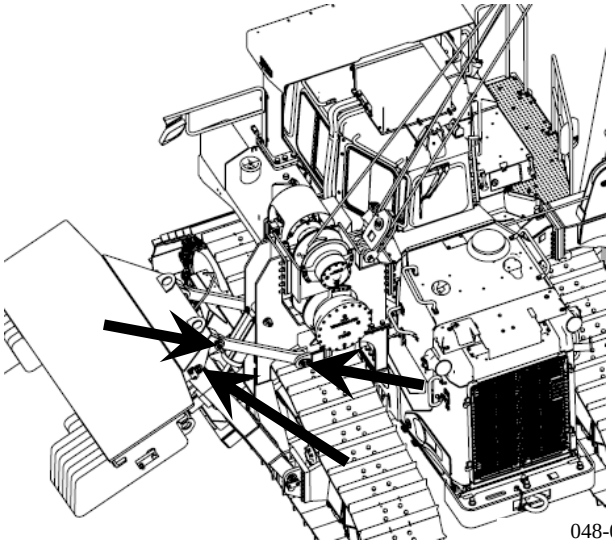

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Figure 38: Counterweight hinge pins located right side of machine

Note: If the counterweight is fully extended, install the counterweight lock lever in order to lubricate the counterweight hinge pins. Refer to Operation and Maintenance Manual, “Counterweight Lock Lever” for more details.

Lubricate the two lower pins through the grease fittings.

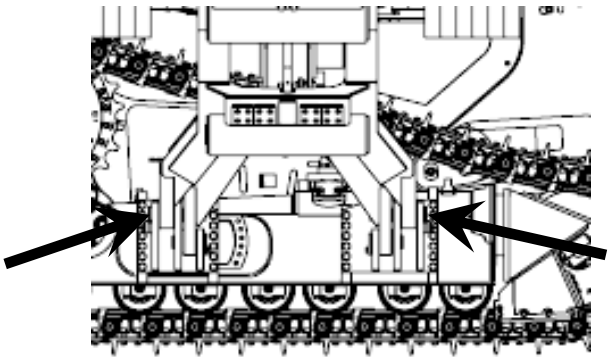

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Figure 39: Counterweight hinge pins lubrication points

Fairlead Sheave – Lubricate

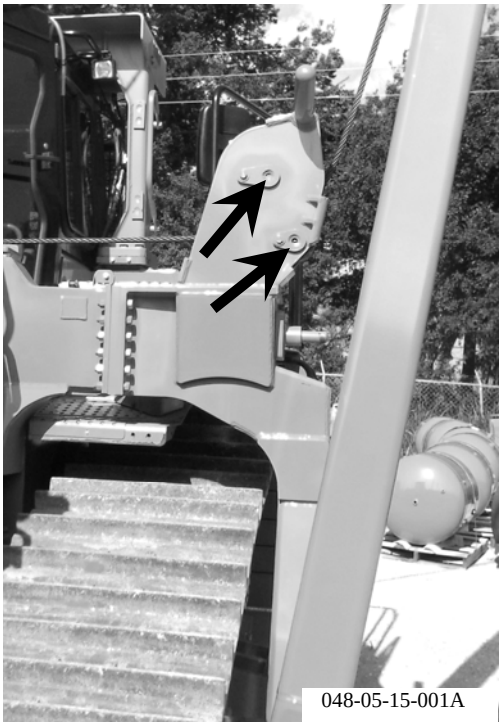


Figure 40: Fairlead sheave lubrication points

Lubricate one fitting in the lower sheave and lubricate one fitting in the upper pin.

Hook and Wire Cable – Inspect

Inspect the Hook

Inspect the hook frequently. The inspections should include observation of the hook during operation of the hook. A designated person determines if the conditions that are found during the inspections constitute a hazard. The designated person will determine if a more detailed inspection is required.

- Inspect the hook for any distortion such as bends in the hook or twists in the hook.
- Inspect the hook for any wear.
- Inspect the hook for cracks, nicks, or gouges.
- If a latch is provided, inspect the latch. Make sure that the latch engages properly. Inspect the latch for any damage. Make sure that the latch is not malfunctioning.
- Inspect the hook assembly and the means for securing the hook assembly.
- For additional information on the proper maintenance and on the proper inspection of hooks, refer to "American National Standard Institute ANSI/ASME B30.14".

Inspect Wire Cable - Boom and Hook lines

Make a visual inspection of all running cables that are in continuous use. Make the inspection of the running cables on a daily basis before the machine is placed in operation. Inspect all of the cables on a monthly basis.

All inspections shall be performed by a designated person. Keep a dated report of the condition of the cable on file in a location that is available to designated personnel. Perform a close inspection of the sections of the cable that are normally hidden during the visual inspection and the maintenance inspection. (This includes the sections of the cable that pass over the sheaves.) These points are the sections of the cable that are most likely to fail.

Note any deterioration that results in a notable loss of the original strength. (See the conditions that are described below.) Determine if further use of the cable will constitute a hazard.

Inspect the cable on a daily basis for the following conditions:

- Inspect the cable for a reduction in the diameter of the cable below the nominal diameter. A loss of support in the cored wire of the cable may be caused by internal corrosion, external corrosion, or wear of the outside wires.
- Inspect the cable for broken outside wires. Check for the degree of distribution of the broken outside wires. Check for the concentration of outside broken wires.
- Inspect the cable for worn outside wires.
- Inspect the cable for corroded wires and for broken wires at the connection on the wire cable end.
- Inspect the cable end for connections that are corroded, cracked, bent, worn, or improperly installed.
- Inspect the cable for sections that are crushed or kinked and for any loose wire strands.

Excessive wear or broken wires may occur in sections of the cable that are in contact with saddles, equalizer sheaves, or other sheaves. Excessive wear or broken wires can also occur when cable travel is limited. Take care to inspect the ropes at these locations.

When a machine is shutdown for a month or more, inspect all of the cables thoroughly. When a side boom machine has been in storage for a month or more inspect all of the cables thoroughly. The inspection should be completed before the machine is returned to operation.

The inspection should be for all types of deterioration. The inspection should be performed by a designated person or by an authorized person. The authorized person's approval is required for further use of the cable.

A dated report on the condition of the cable should be kept on file.

Take care in the inspection of cable that is resistant to rotation.

Any new poured socket or swaged socket assembly that is used as a standing cable (guy) shall be proof tested. Test the cable to the lift capacity of the side boom machine or to the manufacturer's recommendation.

Never give the cable a rating that is greater than 50 percent of the wire rope's nominal strength or of the structural strand's nominal strength.

Note: For additional information on the proper maintenance and on inspection of the cable, refer to "American National Standards Institute ANSI/ASME B30.14" or ISO 8813.

Hook Load Line – Install

WARNING

Do not operate or work on this equipment unless you have read and understand the instructions and warnings in the Operation and maintenance Manual. Failure to follow the instructions or heed the warnings could result in injury or death. Proper care is your responsibility.

WARNING

Personal injury or death can result from worn wire rope cable. Worn or frayed cable could break causing injury. Check the wire rope cable. If cable is worn or is frayed install new cable. Wear gloves when handling the wire rope cable.

NOTICE

Make sure that the construction of the wire rope is 6x25 IWRC XIPS (Independent Wire Rope Core, eXtra Improved Plow Steel) USA MADE. Also, the established grade of the wire rope is the improved plow bolt (steel), 26670 kg (58 800 lb) minimum breaking strength.

SPECIFICATIONS (WIRE ROPE) Hook Load Line Cable		
Boom Length	**Diameter**	**Length**
6.1 m (20 ft)	19.05 mm (0.75 inch)	50.3 m (165 ft)
7.3 m (24 ft)	19.05 mm (0.75 inch)	56.4 m (185 ft)

Table 8: Hook load line wire rope specifications

1. Lower the boom to the horizontal position.
2. Remove the anchor for the wire rope from the drum for the hook. Remove the old wire rope.
3. Unroll the new wire rope from the spool.

Note: Weld the cable ends in order to prevent fraying.

NOTICE

Unroll all of the cable from the spool. Lay the wire rope on a flat surface. Never lift the wire rope off the spool in coils.

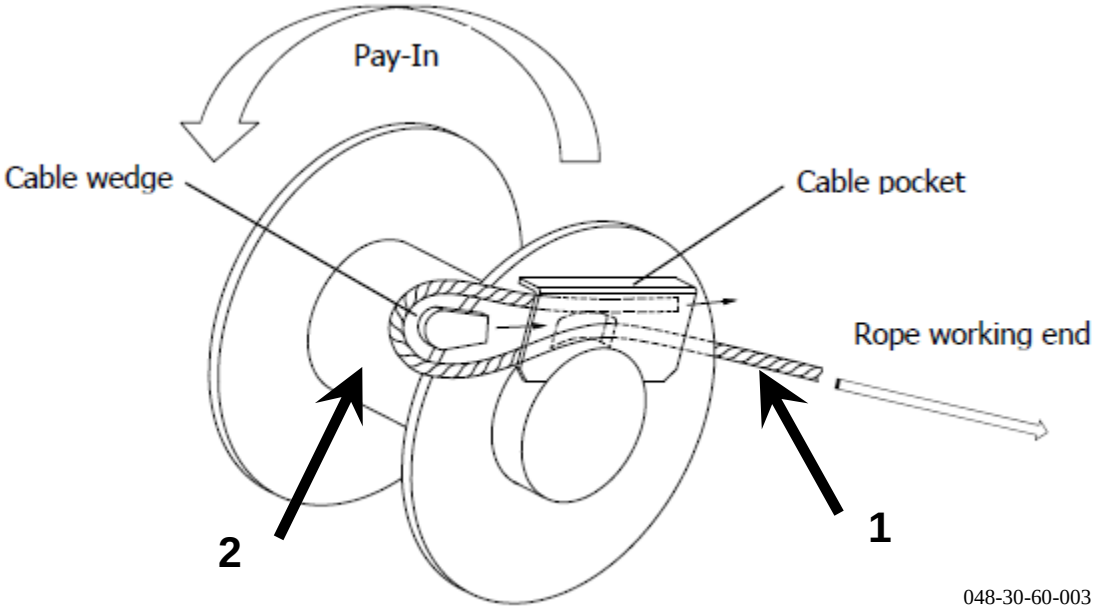


Figure 41: Installing hook load line, cable anchor assembly

1. Insert the wire rope (1) through the drum flange opening and double back through the cable pocket opening. (rope end should not extend past the drum flange)
2. Insert cable wedge in the rope loop and into the cable pocket.
3. Pull on the working end of rope to seat the rope and wedge into the cable pocket. Rope and wedge needs to be firmly seated. Pull on the working end with 500-1000 lb force or pull by hand while having an assistant drive the rope and wedge in with a hammer.

4. Wind one half of the cable evenly across the load drum (2).

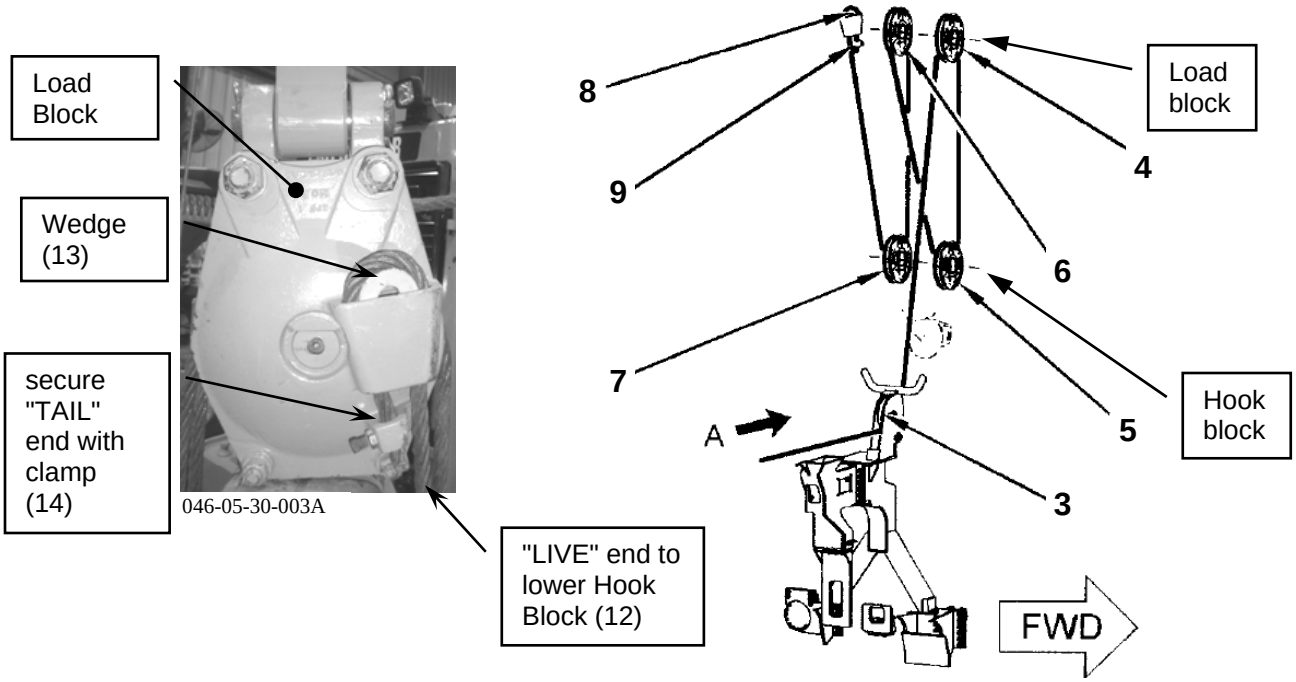


Figure 42: Installing hook load line

(A) Wire rope from the winch.

5. Install the hook load line from the winch drum onto the sheave blocks in the following manner:

a. Install the cable for the hook winch from the winch drum to fairlead sheave (3).

Note: The cable for the hook winch should go over upper sheave (4) which is toward the front of the machine. Anchor the cable for the hook winch toward the rear of the machine.

b. Install the cable over upper sheave (4).

c. Install the cable under lower sheave (5).

d. Install the cable over upper sheave (6).

e. Install the cable under lower sheave (7).

f. Insert the cable into the pocket and around wedge (8). Allow an additional length of cable to form a tail end (six inch minimum). Use a mallet to tap the wedge and the wire rope into the pocket.

g. Insert the tail end of the wire rope through clamp (9). Add a short piece of wire rope through clamp (9) in order to secure the clamp, as needed. Tighten the nuts on the clamp.

h. Pull the cable until the line is tight in order to seat wedge (8). Lift the lower block above the ground.

i. Raise the boom.

Hook Winch & Boom Winch: Gearbox & Drum Oil - Change

WARNING

Do not use EP type gear lubes in the brake section of this winch. EP lubes may prevent the brake-clutch from locking up, which, in turn causes the load to fall, resulting in property damage, personal injury, or death.

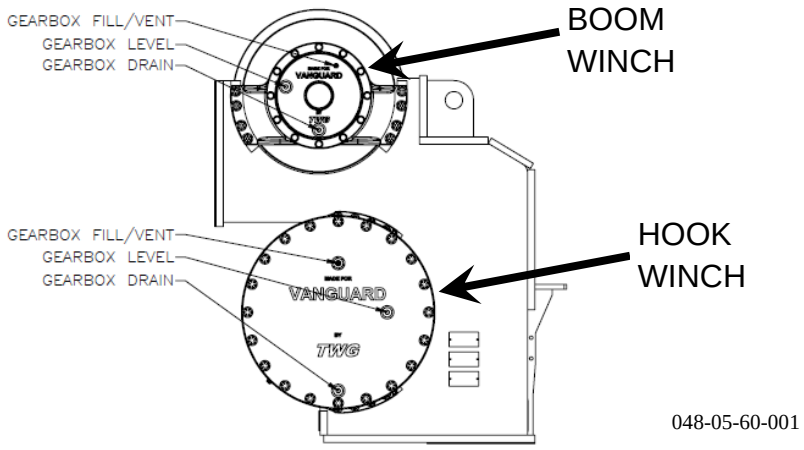


Figure 44: Hook Winch & Boom Winch Gearbox Oil Change Ports

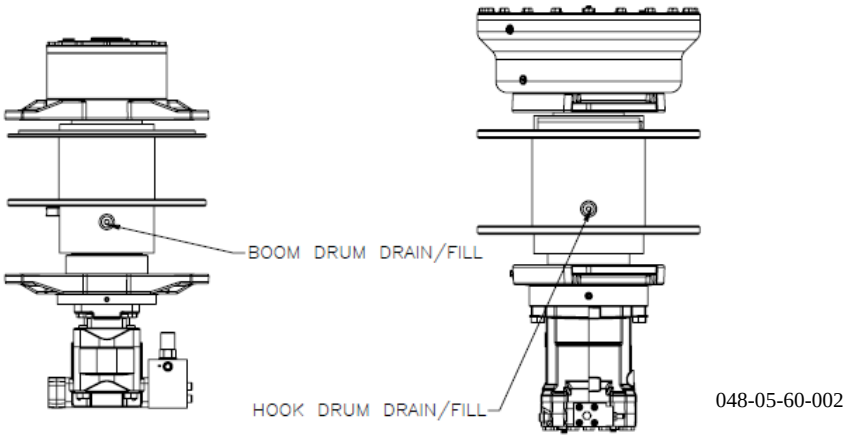


Figure 44: Hook Drum & Boom Drum Oil Drain/Fill Ports

GEARBOX and DRUM oil change:

Gearbox oil is drained by first operating the winches until the oil has been warmed.

FOR BOTH BOOM AND HOOK WINCH

- Drain the fluid from the GEARBOX section. Remove the "GEARBOX DRAIN" plug shown in Figure 46
- Drain the oil into a suitable container.
- After the fluid has drained, replace the plug "GEARBOX DRAIN" plug.
- Examine the oil for significant signs of metallic particles and/or burning. Significant signs of particles/burning could indicate that additional winch servicing is required.
- Dispose of the used oil in a proper manner.

FOR BOTH BOOM AND HOOK WINCH

- Drain the fluid from the DRUM section. Rotate the drum so that the fill/drain plug "BOOM/HOOK DRUM DRAIN/FILL" is at the bottom. Remove the plug.
- Drain the oil into a suitable container.

- After the fluid is drained, Rotate the drum so that the "BOOM/HOOK DRUM DRAIN/FILL" is now at the top.
- Examine the oil for significant signs of metallic particles and/or burning. Significant signs of particles/burning could indicate that additional winch servicing is required.
- Dispose of the used oil in a proper manner.

FOR BOTH BOOM AND HOOK WINCH

- Remove the "GEARBOX FILL/VENT" plug and the "GEARBOX LEVEL" plug.
- Add the correct quantity and type of gearbox/drum oil through the "GEARBOX FILL", see the Lubricant Viscosities and Lubricant Capacities sections in this manual for recommended oil type and grade for your application. The fluid should be even with the "GEARBOX LEVEL".
- Reinstall the "GEARBOX FILL/VENT" plug.
- Add the correct quantity and type of gearbox/drum oil, through the "BOOM/HOOK DRUM DRAIN/FILL", see the Lubricant Viscosities and Lubricant Capacities sections in this manual for recommended oil type and grade for your application.
- The fluid should be even with the "GEARBOX LEVEL".
- Reinstall the "BOOM/HOOK DRUM DRAIN/FILL" plug.

GEARBOX/DRUM oil level:

- The "GEARBOX LEVEL" plug on the freefall housing serves to monitor the oil level for both the gearbox and drum cavities. The cavities are drained and filled separately due to the rate at which fluid traverses the sections, however they are not separate and can be monitored from the same "GEARBOX LEVEL" port.
- The oil level should be even with the "GEARBOX LEVEL" port.
- If the oil level drops frequently or oil leakage is detected during an inspection, maintenance should be performed to correct any problems.
- Reinstall the "GEARBOX LEVEL" plug.

Hook Winch & Boom Winch: Brake Oil - Change

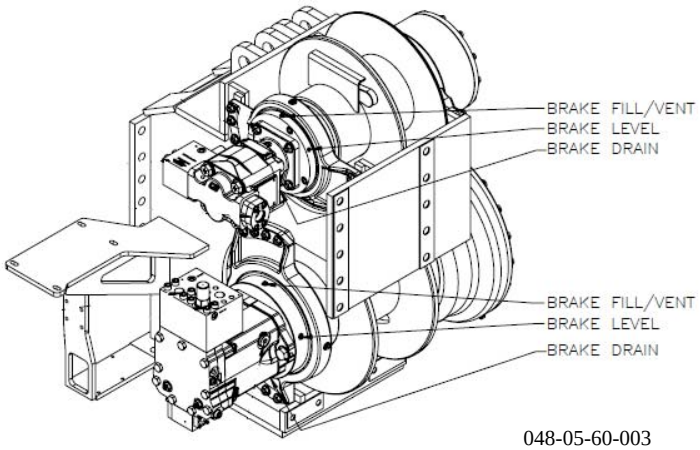


Figure 45: Hook Winch & Boom Winch Brake Oil Change Ports

BRAKE oil change:

Brake oil is drained by first operating the winches until the oil has been warmed.

FOR BOTH BOOM AND HOOK WINCH

- Drain the brake section by removing the drain plug "BRAKE DRAIN" under the motor along with the vent "BRAKE FILL/VENT" plug above the motor.
- Drain the oil into a suitable container.
- Reinstall the drain plug "BRAKE DRAIN".
- Inspect the oil for signs of metallic particles and/or burning. Significant signs of particles/burning could indicate that additional winch servicing is required.
- Remove the "BRAKE LEVEL" plug.

- Add the correct quantity of non-EP oil, see the Lubricant Capacities section in this manual for recommended oil type and grade for your application.
- The oil level should be even with the "BRAKE LEVEL" port.
- Reinstall the "BRAKE FILL/VENT" plug.

BRAKE oil level:

FOR BOTH BOOM AND HOOK WINCH

- Monitor the brake oil level at the "BRAKE LEVEL" port. The oil level should be even with the "BRAKE LEVEL" port.
- If the oil level drops frequently or oil leakage is detected during an inspection, maintenance should be performed to correct any problems.
- Reinstall the "BRAKE LEVEL" plug.

Hydraulic System Oil - Change

Refer to the specific tractor Operation and Maintenance Manual "Hydraulic System Oil - Change" for complete requirements and procedures.

⚠ WARNING

At operating temperature, the hydraulic tank is hot and under pressure. Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin. Remove the filler cap only when the engine is stopped, and the filler cap is cool enough to touch with your bare hand. Remove the filler cap slowly in order to relieve pressure.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling and component containing fluids.

Dispose of all fluids according to local regulations and mandates.

Operate the machine in order to warm the oil.

Park the machine on level ground. Engage the parking brake and stop the engine.

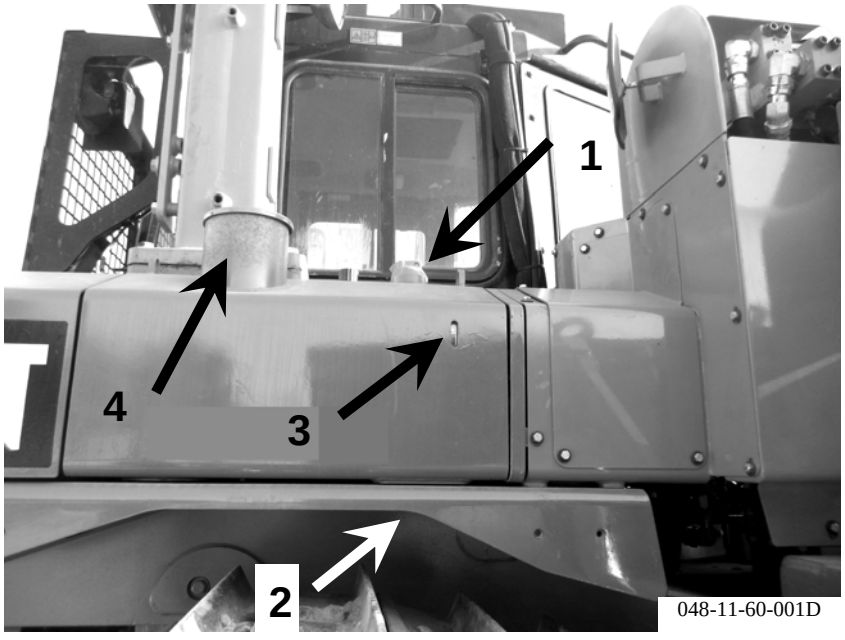


Figure 46: Hydraulic tank filler cap (D6T T4i shown)

Remove the hydraulic tank filler cap (1) slowly in order to relieve any pressure.

1. Wash the filler strainer and the filler cap in a clean nonflammable solvent.

2. Refer to the specific tractor Operation and Maintenance Manual (D6T T4i shown) for instructions on removing the oil drain plug (2) and draining the hydraulic tank.

3. Allow the oil to drain into a suitable container.

4. Clean drain plug (2) and install drain plug (2). Refer to the specific tractor Operation and Maintenance Manual for instructions.

5. See the Operation and Maintenance Manual, Maintenance and Lubrication section, “Hydraulic System Oil Filter – Replace”. Change the hydraulic system filter (2).

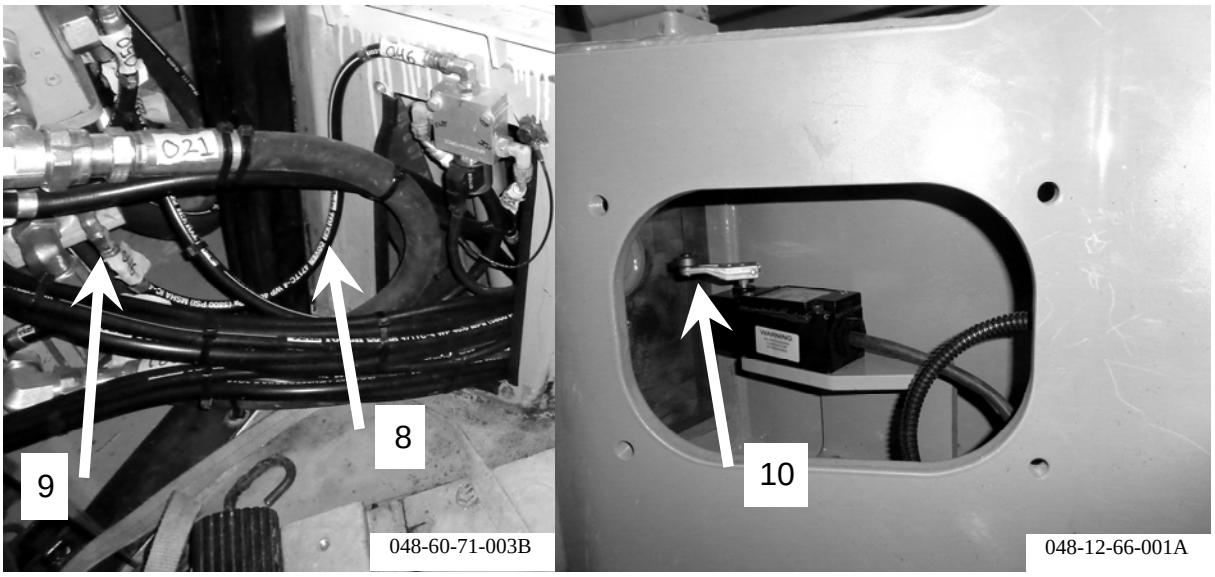
6. See the Operation and Maintenance Manual, Maintenance and Lubrication section, “Hydraulic System Oil Filter – Replace”. Change the hydraulic system case drain filter pipelayer (4).

7. Install the filler strainer.

8. See the Operation and Maintenance Manual, “Capacities (Refill) in order to determine the amount of hydraulic oil that is needed to fill the hydraulic oil tank. Fill the hydraulic oil tank.

9. Inspect the filler cap gasket. Install a new gasket if damage or wear is evident. Install the filler cap.

10. Start the engine. Run the engine for a few minutes. Check for leaks. Flush the boom stop drain line (8) at the return manifold connection (9) into a suitable container. Manually actuate the boom stop switch (10) while slowly raising the boom winch, the winch should not turn. Flush the boom stop drain line until the old oil in the lines is fully flushed out with new oil. Tighten the boom stop drain line connection (9).



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11. Check boom stop operation as per Operation and Maintenance Manual "Boom Stop Switch Operation and Adjustment"

12. Maintain the oil level to the “FULL” mark in sight gauge (3). Add oil, if necessary. Stop the engine.

Hydraulic System Oil Filter - Replace

WARNING

At operating temperature, the hydraulic tank is hot and under pressure. Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin. Remove the filler cap only when the engine is stopped, and the filler cap is cool enough to touch with your bare hand. Remove the filler cap slowly in order to relieve pressure.

1. Slowly remove the hydraulic tank filler cap (3) in order to relieve the system pressure.

2. Remove access panel.

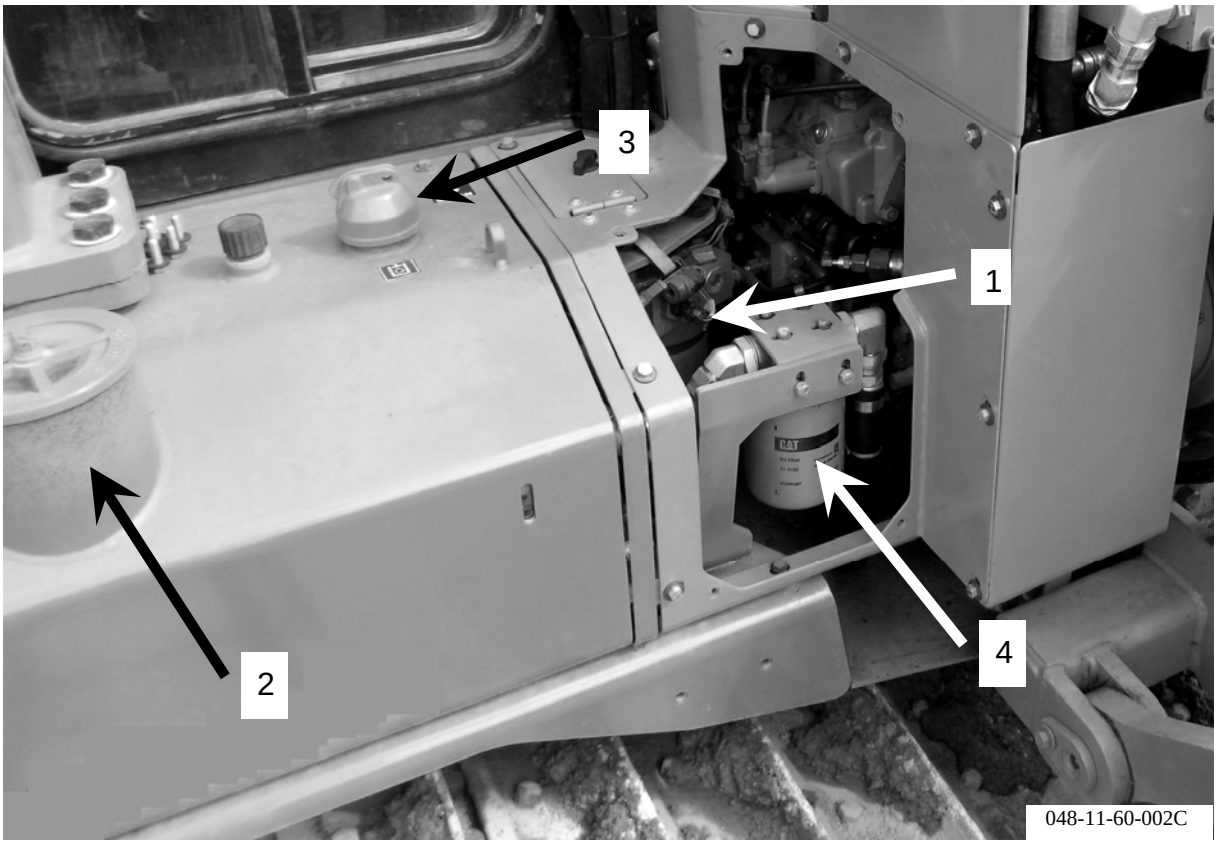


Figure 47: Filter locations

(1) Transmission oil filter
(2) Hydraulic system filter
(3) Hydraulic Tank filler cap
(4) Case drain filter pipelayer

3. Refer to appropriate tractor Operation and Maintenance Manual for tractor filter replacement (D6T T4i shown).

4. Remove Case drain filter pipelayer(4). Discard the used filter.

5. Inspect the seal on the filter housing for filter (4). If the seal is damaged or worn, install a new seal. Install a new filter element into the filter housing for (4).

Hydraulic System Oil Level – Check

⚠ WARNING

At operating temperature, the hydraulic tank is hot and under pressure. Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin. Remove the filler cap only when the engine is stopped, and the filler cap is cool enough to touch with your bare hand. Remove the filler cap slowly in order to relieve pressure.

The hydraulic tank is on the right rear corner of the machine.

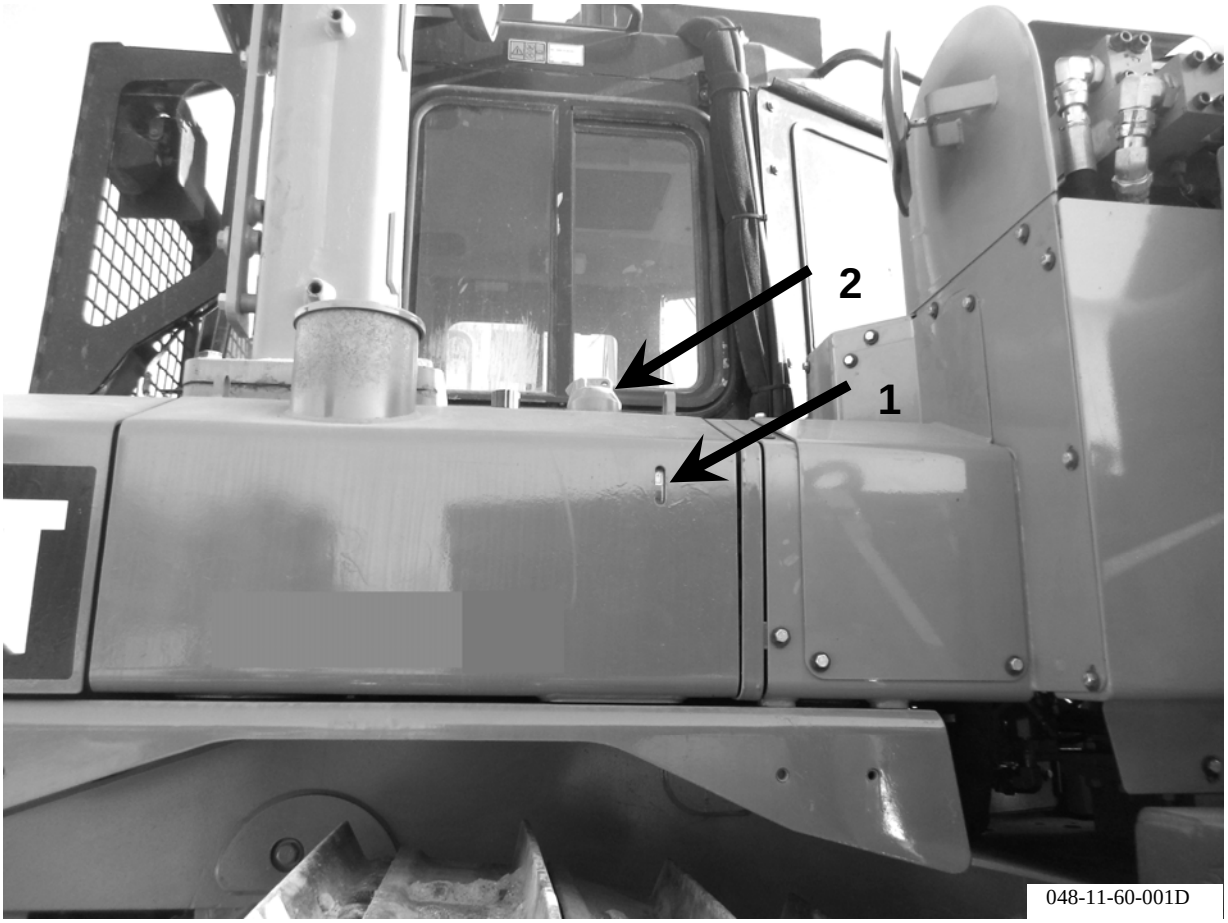


Figure 48: Hydraulic Tank

1. The counterweight should be fully retracted when you check the oil level.
2. Maintain the oil level to the “FULL” mark in sight gauge (1).
3. If the hydraulic system requires additional hydraulic oil, remove filler cap (2) and add oil. Clean filler cap (2) and install filler cap (2).

Hydraulic System Oil Sampling

Refer to the tractor's operation and maintenance manual for the specific procedures regarding Hydraulic System Sampling.

Oil Filter Inspection

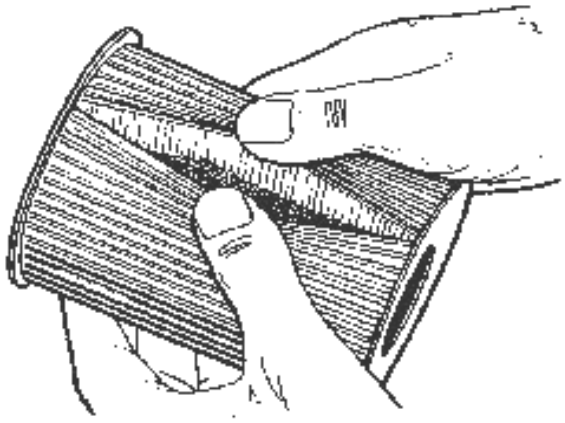


Figure 49: Oil filter.

Use a Filter Cutter - CAT# 4C-5084, or similar to cut the filter element open. Spread apart the pleats and inspect the element for metal and other debris. An excessive amount of debris in the filter element can indicate a possible failure.

If metals are found in the filter element, a magnet can be used to differentiate between ferrous metals and nonferrous metals. Ferrous metals would indicate wear on steel parts and on cast iron parts. Non ferrous metals would indicate wear of the brass or aluminum part of the hydraulics such as main bearings, pump sleeves, etc.

Small amounts of debris may be found in the filter element. This could be caused by friction and normal wear. Consult your Caterpillar dealer in order to arrange for further analysis if an excessive amount of debris is found.

Using an oil filter element that is not recommended by Caterpillar could result in severe damage. This could result in larger particles in unfiltered oil. These particles could enter the system and cause damage.

Sheave Block Bearing – Lubricate

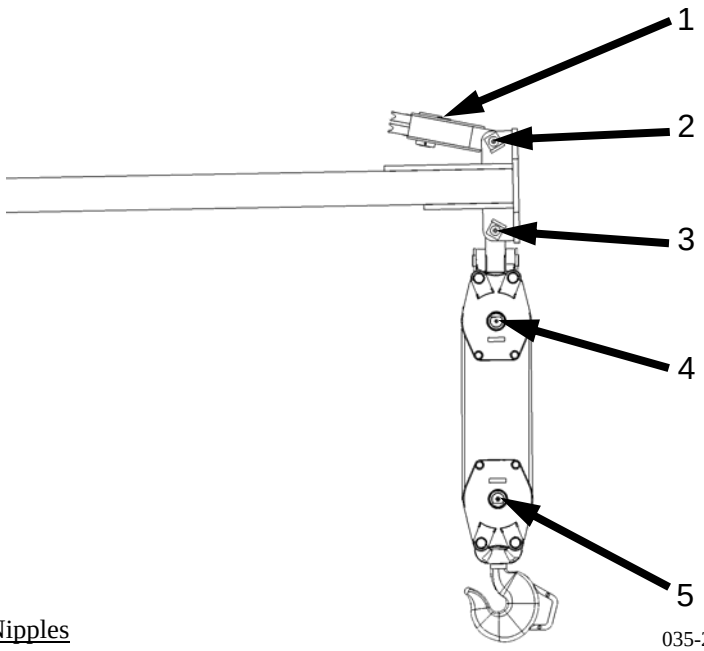


Figure 50:Rigging Grease Nipples

1. Lubricate (1) in the luff block.

Figure 51:Rigging Grease Nipples - Tail Block

2. Lubricate fitting in the pins for boom luff block (2 & 3) and load sheave block.
3. Lubricate pin (4) in load sheave block and the pin (5) in the hook sheave block.
4. Lubricate pin (6) on tail block.

Tractor Maintenance

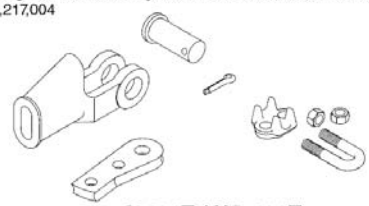
Refer to the tractor's operation and maintenance manual for the specific procedures regarding complete Tractor Maintenance.

Appendix

Terminator Instructions

TERMINATOR™ WARNINGS AND APPLICATION INSTRUCTIONS

Extended Wedge Socket Assembly U.S. Patent No. 5,553,360 and Canada Patent No. 2,217,004



S-421T / US-422T "TERMINATOR"™

NOTE: The design of the basket for the S-421T 1-1/4" TERMINATOR™ Wedge Socket does not allow proper fit to the old style Crosby S-421W wedge (see Fig. 1). **Do not assemble or use.**

The design of the basket for each US-422T TERMINATOR™ Wedge Socket does not allow proper fit to the old style UWO-422 wedge (See Fig. 1). **Do not assemble or use.**

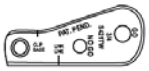
All S-421T and US-422T TERMINATOR™ baskets are marked with a capital "T" or TERMINATOR™.

Non TERMINATOR™ Wedge

S-421W
UWO-422

Figure 1

TERMINATOR™



S-421TW
UWO-422T

QUIC-CHECK® "Go" and "No-Go" features cast into wedge. The proper size wire rope is determined when the following criteria are met:

QUIC-CHECK®

1. The wire rope shall pass thru the "Go" hole in the wedge.
2. The wire rope shall NOT pass thru the "No-Go" hole in the wedge.

Important Safety Information – Read and Follow Inspection/Maintenance Safety

- Always inspect socket, wedge and pin before using.
- Do not use part showing cracks.
- Do not use modified or substitute parts.
- Repair minor nicks or gouges to socket or pin by lightly grinding until surfaces are smooth. Do not reduce original dimension more than 10%. Do not repair by welding.
- Inspect permanent assemblies annually, or more often in severe operating conditions.
- Do not mix and match wedges or pins between models or sizes.
- Always select the proper wedge and socket for the wire rope size.

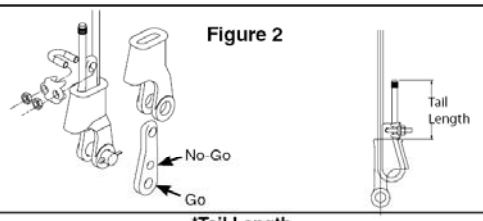
Assembly Safety

- Use only with standard 6 to 8 strand wire rope of designated size. For intermediate size rope, use next larger size socket. For example: When using 9/16" diameter wire rope use a 5/8" size Wedge Socket Assembly. Welding of the tail on standard wire rope is not recommended. Seizing of the tail is preferred following the recommended practices of the wire rope manufacturer. The tail length of the dead end should be a minimum of 6 rope diameters but not less than 6" (See Figure 2).
- **To use with Rotation Resistant wire rope** (special wire rope constructions with 8 or more outer strands) ensure that the dead end is welded, brazed or seized before inserting the wire rope into the wedge socket to prevent core slippage or loss of rope lay. Seizing of the tail is preferred following the recommended practices of the wire rope manufacturer. The tail length of the dead end should be a minimum of 20 rope diameters but not less than 6" (See Figure 2).
- Properly match socket, wedge and clip (See Table 1) to wire rope size.
- Align live end of rope, with center line of pin.(See Figure 2)
- Secure dead end section of rope. (See Figure 2)
- Tighten nuts on clip to recommended torque. (See Table 1)
- Do not attach dead end to live end or install wedge backwards (See Fig. 3).
- Use a hammer to seat Wedge and Rope as deep into socket as possible before applying first load.

⚠ WARNING

- **Loads may slip or fall if the Wedge Socket is not properly installed.**
- **Load misapplied in direct contact with the wedge can dislodge the wedge and cause loss of load.**
- **A falling load can seriously injure or kill.**
- **Read and understand these instructions before installing the Wedge Socket.**
- **Do not side load the Wedge Socket.**
- **Apply first load to fully seat the Wedge and Wire Rope in the socket. This load should be of equal or greater weight than loads expected in use.**
- **Do not interchange wedges between S-421T and US422T or between sizes.**
- **Do not assemble an old style 1-1/4" (30-32mm)S-421W wedge into an S-421T 1-1/4" (30-32mm) TERMINATOR™ basket.**
- **Do not assemble an old style UWO-422 wedge into a US-422T TERMINATOR™ basket.**

Figure 2



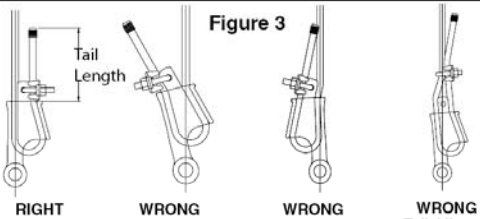
*Tail Length	
Standard 6 to 8 Strand Wire Rope	**Rotation Resistant Wire Rope**
A minimum of 6 rope diameters, but not less than 6"	A minimum of 20 rope diameters, but not less than 6"

TABLE 1

Rope Size (in.)	3/8	1/2	5/8	3/4	7/8	1	1-1/8	1-1/4
Clip Size (in.)	3/8	1/2	5/8	3/4	7/8	1	1-1/8	1-1/4
* Torque Ft./lbs.	45	65	95	130	225	225	225	360

* The tightening torque values shown are based upon the threads being clean, dry, and free of lubrication.

Figure 3



Operating Safety

- Apply first load to fully seat the Wedge and Wire Rope in the socket. This load should be of equal or greater weight than loads expected in use.
- Efficiency rating of the Wedge Socket termination is based upon the catalog breaking strength of Wire Rope. The efficiency of a properly assembled Wedge Socket is 80%.
- During use, do not strike the dead end section or wedge with any other elements of the rigging (Called two blocking).
- Do not allow a direct load to contact the wedge.

Winch Drum Wire Rope Termination Instructions

WIRE ROPE TERMINATION

1. Insert the wire rope through the drum flange opening and double back through the cable pocket opening. The rope end should not extend past the drum flange.
   Note: Always insert rope thru the drum flange from the pay-in direction
2. Insert cable wedge in the rope loop and into the cable pocket.
3. Pull on the working end of rope to seat the rope and wedge into the cable pocket. Rope and wedge needs to be firmly seated. Pull on the working end with 500-1000 lb force or pull by hand while having an assistant drive the rope and wedge in with a hammer.