

HX30

Kubota® D1105

Operator's Manual



Overview

Chapter Contents

Serial Number Location 2

Intended Use 3

Equipment Modification 3

Machine Components 4

Regulatory Notices 5

- United States 5
- Canada 5
- RF Exposure Statement 5


Operator Orientation 6

Operating Area 6

About This Manual 7

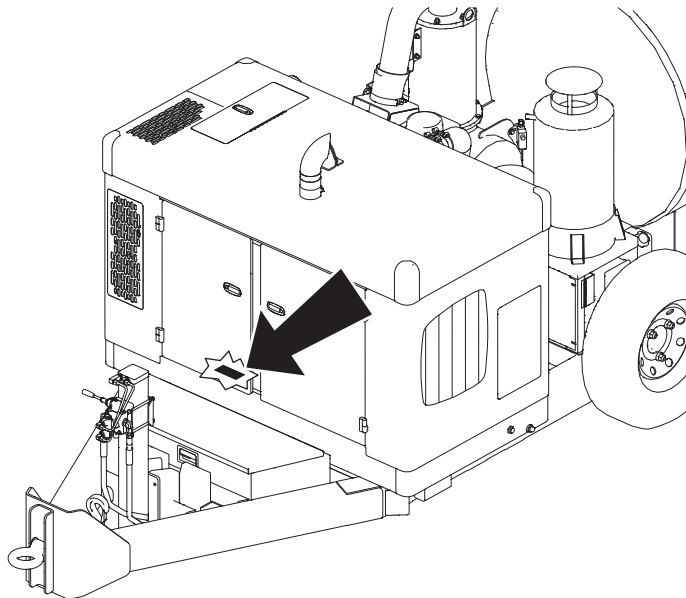
- Bulleted Lists 7
- Numbered Lists 7

California Proposition 65

 **WARNING** Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm. www.P65warnings.ca.gov.

Serial Number Location

Record serial numbers and date of purchase in spaces provided. Serial number is located as shown.



j70om005w.eps

| Item | |
|-----------------------|--|
| Date of manufacture | |
| Date of purchase | |
| Machine serial number | |

Intended Use

The HX30 is a self-contained vacuum excavation machine capable of vacuuming a wide variety of non-hazardous, non-flammable liquid and solid debris. It is designed to perform efficient soft excavation, including exposing utilities for visual verification and potholing. The optional reverse flow system allows for spoils transfer to another tank.

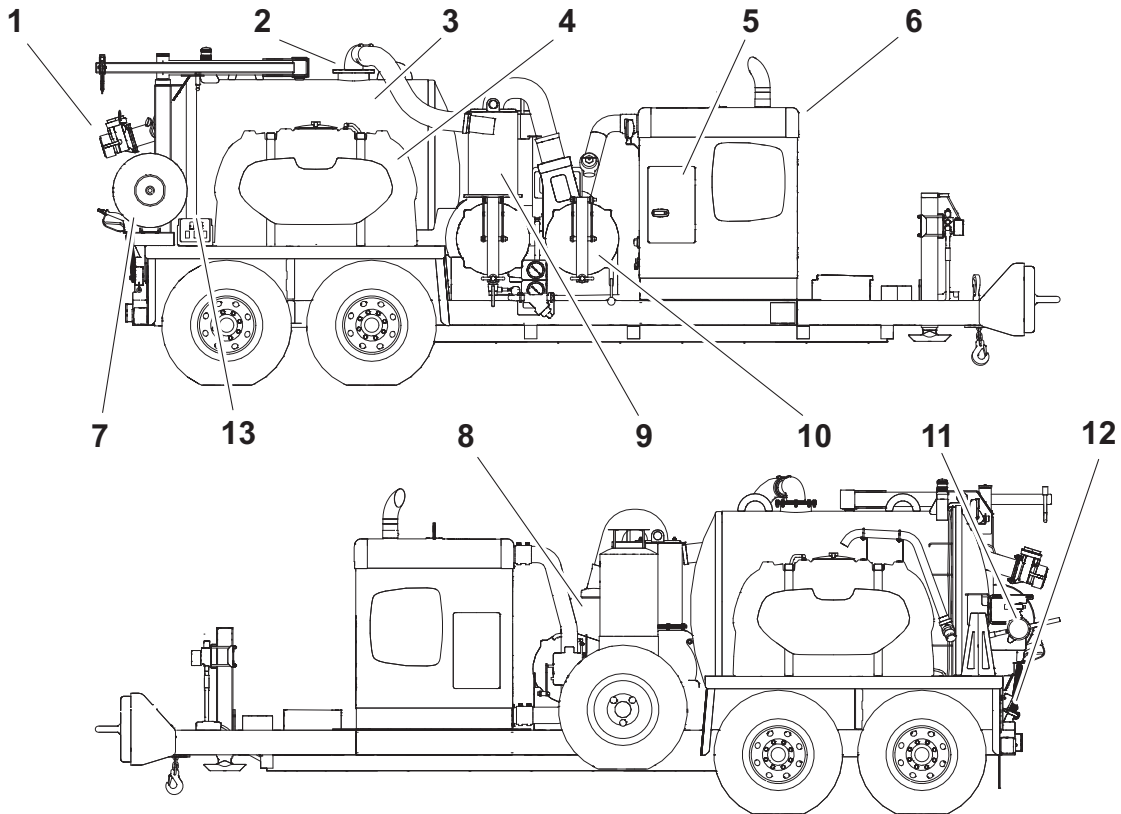
This machine is intended for operation only according to the instructions in this manual. Operate machine in ambient temperatures from 10° to 115°F (-12° to 46°C). Contact your Ditch Witch® dealer for provisions required for operating in extreme temperatures. Use in any other way is considered contrary to the intended use.

This machine should be operated, serviced, and repaired only by professionals familiar with its particular characteristics and acquainted with the relevant safety procedures.

Equipment Modification

This equipment was designed and built in accordance with applicable standards and regulations. Modification of equipment could mean that it will no longer meet regulations and may not function properly or in accordance with the operating instructions. Modification of equipment should only be made by competent personnel possessing knowledge of applicable standards, regulations, equipment design functionality/requirements and any required specialized training.

Machine Components



j70om001w.eps

- | | |
|--------------------------|------------------------|
| 1. Inlet valve | 8. Antifreeze tank |
| 2. Primary shutoff valve | 9. Cyclone filter |
| 3. Debris tank | 10. Vacuum filter |
| 4. Water tank | 11. Potholing tools |
| 5. Operator station | 12. Drain/Outlet valve |
| 6. Power pack | 13. Wash wand |
| 7. Hose reel | |

Regulatory Notices

United States

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Changes or modifications not expressly approved by **The Charles Machine Works, Inc.** could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Contains **FCC ID:** LW9-ERGOF-2G4 & LW9-MFS-RX-2G4.

Canada

CAN ICES-2/NMB-2

This device complies with Industry Canada *license-exempt* RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Contains **IC:** 2119B-ERGOF & 2119B-MFSRX.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Contient **IC:** 2119B-ERGOF & 2119B-MFSRX.

RF Exposure Statement

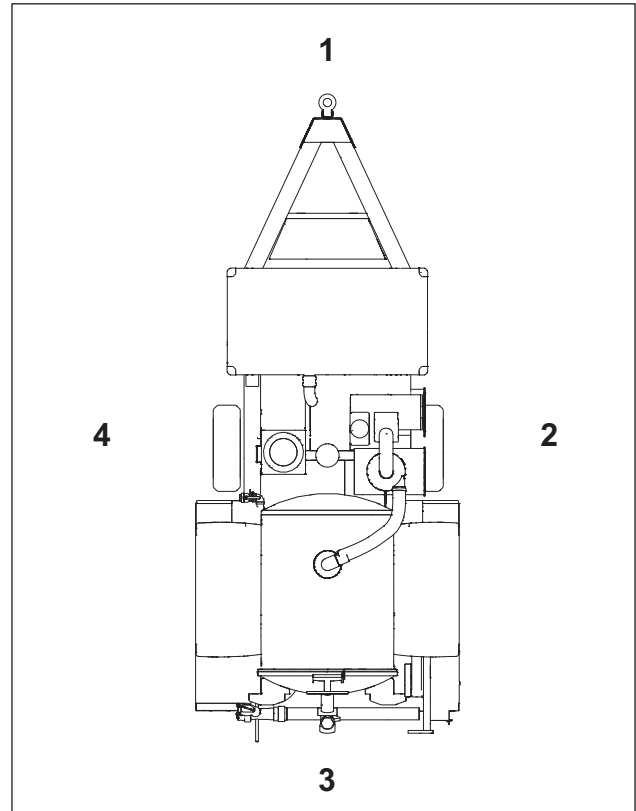
In order to comply with RF exposure requirements during normal operation, this device must be held in front of the body horizontally. The antenna must be vertical in line with the body with at least 4" (100mm) separation distance from the body.

This device complies with Health Canada's Safety Code Section 6.

Operator Orientation

IMPORTANT: Top view of machine is shown.

1. Front
2. Right side
3. Rear
4. Left side



j70om006w.eps

Operating Area

Operate within easy access of controls and/or remote control.

About This Manual

This manual contains information for the proper use of this machine. Cross references such as “See page 50” will direct you to detailed procedures.

Bulleted Lists

Bulleted lists provide helpful or important information or contain procedures that do not have to be performed in a specific order.

Numbered Lists

Numbered lists contain illustration callouts or list steps that must be performed in order.

Foreword

This manual is an important part of your equipment. It provides safety information and operation instructions to help maintain your Ditch Witch® equipment.

Read this manual before using your equipment. Keep it with the equipment at all times for future reference. If you sell your equipment, be sure to give this manual to the new owner.

If you need a replacement copy, contact your Ditch Witch dealer. If you need assistance in locating a dealer, visit our website at www.ditchwitch.com or write to the following address:

The Charles Machine Works, Inc.
ATTN: Marketing Department
PO Box 66
Perry, OK 73077-0066
USA

The descriptions and specifications in this manual are subject to change without notice. The Charles Machine Works, Inc. reserves the right to improve equipment. Some product improvements may have taken place after this manual was published. For the latest information on Ditch Witch equipment, see your Ditch Witch dealer.

Thank you for buying and using Ditch Witch equipment.

Reporting Safety Defects

If you believe that your vehicle has a defect which could cause a crash or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying the Product Safety Coordinator at The Charles Machine Works, Inc.

If NHTSA receives similar complaints, it may open an investigation, and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in any individual problems between you, your Ditch Witch dealer, or The Charles Machine Works, Inc.

To contact NHTSA you may either call the Auto Safety Hotline toll-free at 1-888-327-4236 (TTY: 1-800-424-9153), go to <http://www.safercar.gov>, or write to:

Administrator
NHTSA
1200 New Jersey Avenue S.E.
Washington, DC 20590

You can also obtain other information about motor vehicle safety from <http://www.safercar.gov>.

**HX30
Operator's Manual**

Kubota® D1105

Issue number 4.1/OM-03/2020

Part number 053-3102

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and Ditch Witch are registered trademarks of The Charles Machine Works, Inc.

This product and its use may be covered by one or more patents at <http://patents.charlesmachine.works>.

Contents

| | |
|---|------------|
| Overview | 1 |
| Machine serial number, information about the type of work this machine is designed to perform, basic machine components, and how to use this manual | |
| Foreword | 9 |
| Part number, revision level, and publication date of this manual, and factory contact information | |
| Safety | 13 |
| Machine safety alerts and emergency procedures | |
| Prepare | 27 |
| Procedures for preparing jobsite, preparing operator, and preparing equipment | |
| Controls | 37 |
| Machine controls, gauges, and indicators and how to use them | |
| Transport | 59 |
| Procedures for lifting, hauling, and towing | |
| Vacuum and Pothole | 67 |
| Procedures for removing debris and potholing utility locations | |
| Complete the Job | 89 |
| Procedures for restoring the jobsite and rinsing and storing equipment | |
| Service | 93 |
| Service intervals and instructions for this machine including lubrication, replacement of wear items, and basic maintenance | |
| Specifications | 129 |
| Machine specifications including weights, measurements, power ratings, and fluid capacities | |

Support **147**


The warranty policy for this machine and procedures for obtaining warranty consideration and training

Appendix **149**

Additional information about Ditch Witch® equipment

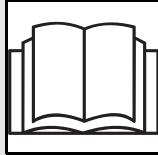
Safety Awareness

Chapter Contents

| | |
|---|--|
|  | For additional precautions, see "Prepare" chapter. |
|---|--|

- Guidelines 14**
- Emergency Procedures 15**
 - Electric Strike Description 15
 - If an Electric Line is Damaged 16
 - If a Gas Line is Damaged 16
 - If a Fiber Optic Cable is Damaged 16
 - If Machine Catches on Fire 16
- Safety Alert Classification 15**
- Machine Safety Alerts 16**

Guidelines

**⚠ WARNING**

Misuse of machine can cause death or serious injury. Read and understand operator's manual and all other safety instructions before use. Know how to use all controls.

Follow these guidelines before operating any jobsite equipment:

- Complete proper training.
- Read and understand operator's manual before using equipment.
- Wear personal protective equipment. See "Prepare Operator" in "Prepare" chapter.
- Mark proposed path with white paint and have underground utilities located before working. In the US or Canada, call 811 (US) or 888-258-0808 (US and Canada). Also contact any local utilities that do not participate in the One-Call service. In countries that do not have a One-Call service, contact all local utility companies to have underground utilities located.
- Classify jobsite based on its hazards and use correct tools and machinery, safety equipment, and work methods for jobsite.
- Mark jobsite clearly and keep spectators away.
- Review jobsite hazards, safety and emergency procedures, and individual responsibilities with all personnel before work begins. Safety videos are available from your Ditch Witch® dealer or at www.ditchwitch.com/safe. Safety Data Sheets (SDS) are available at www.ditchwitch.com/support.
- Fully inspect equipment before operating. Repair or replace any worn or damaged parts. Replace missing or damaged safety shields and safety alert signs. Contact your Ditch Witch dealer for assistance.
- Follow instructions on all safety alert signs on machine.
- Use equipment carefully per the instructions in this manual. Stop operation and investigate anything that does not look or feel right.
- Do not operate machine where flammable gas may be present.
- Only operate equipment in well ventilated areas.
- Always tie down equipment and properly stow accessories, even if traveling short distances.
- Contact your Ditch Witch dealer if you have any questions about operation, maintenance, or equipment use.
- Complete the equipment checklist located at www.ditchwitch.com/safe.

Emergency Procedures



⚠ WARNING

Underground utilities. Contact can cause death or serious injury. Locate and verify underground utilities before digging or drilling.

Before operating any equipment, review emergency procedures and check that all safety precautions have been taken.

EMERGENCY SHUTDOWN: Shut off machine or press remote engine stop button (if equipped).

Electric Strike Description

When working near electric cables, remember the following:

- Electricity follows all paths to ground, not just path of least resistance.
- Pipes, hoses, and cables will conduct electricity back to all equipment.
- Low voltage current can injure or kill. Many work-related electrocutions result from contact with less than 440 volts.

Most electric strikes are not noticeable, but indications of a strike include:

- power outage
- smoke
- explosion
- popping noises
- arcing electricity

If any of these occur, assume an electric strike has occurred.

If an Electric Line is Damaged

If you suspect an electric line has been damaged, **DO NOT MOVE** and **DO NOT TOUCH ANY EQUIPMENT**. Take the following actions. The order and degree of action will depend on the situation.

- If you are **operating machine**, immediately **RELEASE CONTROLS**.
- If you must leave the area, take small steps with feet close together to reduce the hazard of being shocked from one foot to another.
- Warn people nearby that an electric strike has occurred. Instruct them to leave the area.
- Have someone contact electric company to shut off power.
- If you leave the area, do not return to jobsite or allow anyone into area until given permission by utility company.

If a Gas Line is Damaged

If you suspect a gas line has been damaged, take the following actions. The order and degree of action will depend on the situation.

- Immediately shut off engine(s), if this can be done safely and quickly.
- Remove any ignition source(s), if this can be done safely and quickly.
- Warn others that a gas line has been cut and that they should leave the area.
- After warning others to leave the area, leave jobsite as quickly as possible.
- Immediately call your local emergency phone number and utility company.
- If jobsite is along street, stop traffic from driving near jobsite.
- Do not return to jobsite until given permission by emergency personnel and utility company.

If a Fiber Optic Cable is Damaged

Do not look into cut ends of fiber optic or unidentified cable. Vision damage can occur. Contact utility company.

If Machine Catches on Fire

Perform emergency shutdown procedure and then take the following actions. The order and degree of action will depend on the situation.

- Immediately move battery disconnect switch (if equipped and accessible) to disconnect position.
- If fire is small and fire extinguisher is available, attempt to extinguish fire.
- If fire cannot be extinguished, leave area as quickly as possible and contact emergency personnel.

Safety Alert Classifications

These classifications and the icons defined on the following pages work together to alert you to situations which could be harmful to you, jobsite bystanders, or your equipment. When you see these words and icons in the book or on the machine, carefully read and follow all instructions. **YOUR SAFETY IS AT STAKE.**



When you see this safety alert sign, carefully read and follow all instructions. **YOUR SAFETY IS AT STAKE.** Read this entire section before using your equipment.

Watch for the three safety alert levels: **DANGER**, **WARNING**, and **CAUTION**. Learn what each level means.



DANGER indicates a hazardous situation that, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.



WARNING indicates a hazardous situation that, if not avoided, could result in death or serious injury.



CAUTION indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

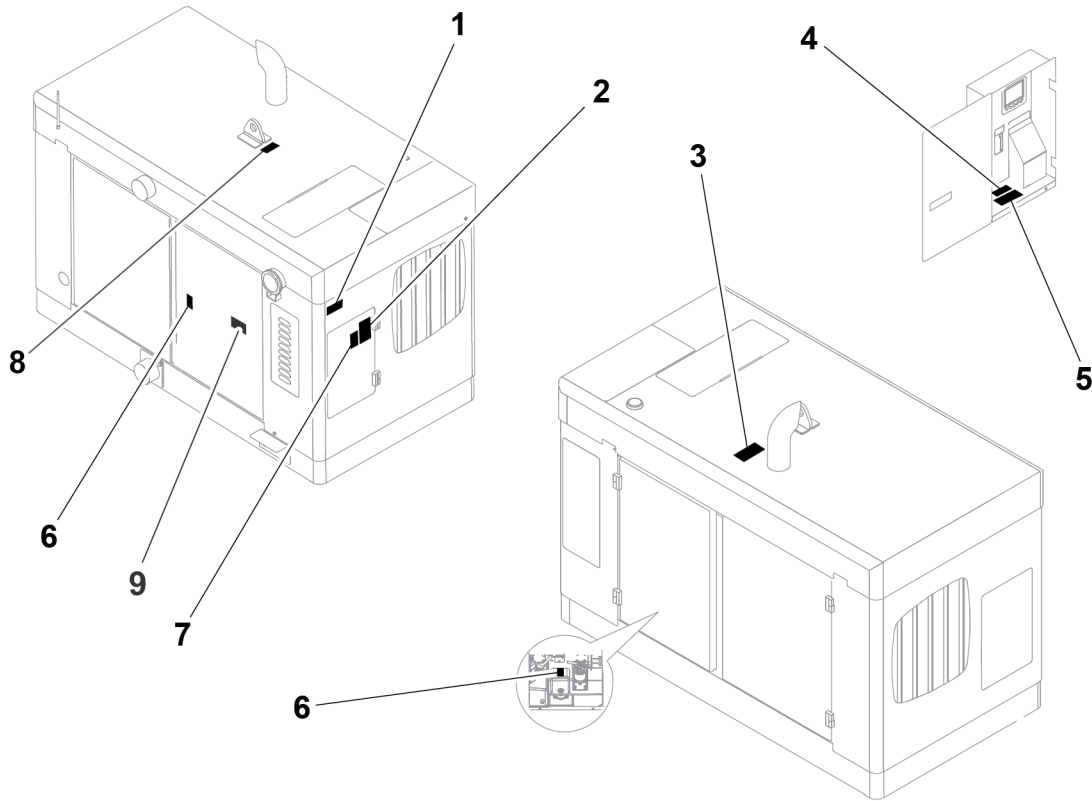
Watch for two other words: **NOTICE** and **IMPORTANT**.

NOTICE indicates information considered important, but not hazard-related (e.g., messages relating to property damage).

IMPORTANT can help you do a better job or make your job easier in some way.

Machine Safety Alerts

Power Unit



Decal_HX30_Powerpack.png



⚠ WARNING High pressure. Impact can cause death or serious injury. Exercise and clean relief valve before each use.



⚠ CAUTION Thrown objects. Impact can cause injury. Wear hard hat and safety glasses.



⚠ CAUTION Hot parts. Contact can cause burns. Only touch when cool or wear gloves.

4



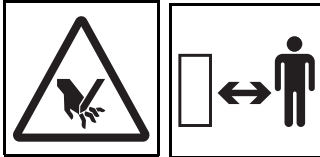
⚠ WARNING Underground utilities. Contact can cause death or serious injury. Locate and verify underground utilities before digging or drilling.

5



⚠ WARNING Misuse of machine can cause death or serious injury. Read and understand operator's manual and all other safety instructions before use. Know how to use all controls.

6



⚠ WARNING Moving parts. Contact can cause serious injury. Stay away.

7



⚠ CAUTION High noise levels. Exposure can cause hearing loss. Wear hearing protection.

8



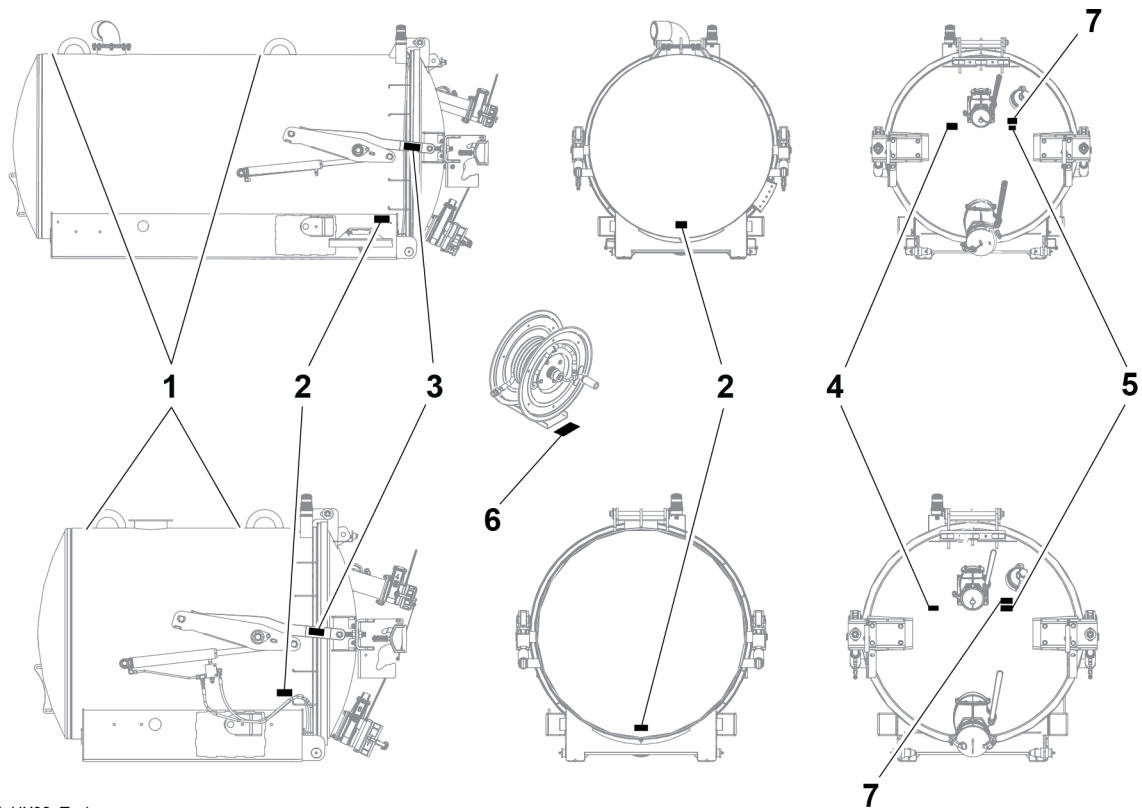
Lift point. See Transport chapter for more information.

9



⚠ WARNING Pre-heater. Fire or explosion can cause death or serious injury. Never use starter fluid.

Tanks



Decal_HX30_Tanks.png

1



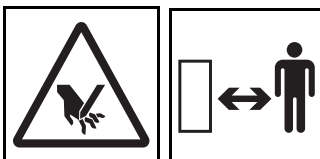
Lift point. See Transport chapter for more information.

2



! WARNING Raised component. Crushing can cause death or serious injury. Stay away or secure raised component with locking device. Use correct equipment and procedures.

3



! WARNING Moving parts. Contact can cause serious injury. Stay away.

4



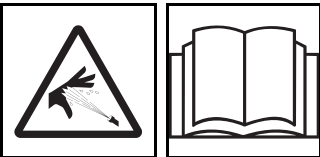
⚠ WARNING Static charge. Fire or explosion can cause death or serious injury. Never vacuum flammable or combustible substances.

5



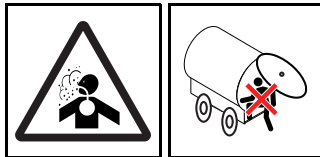
⚠ WARNING Contents under pressure. Impact can cause death or serious injury. Refer to operator's manual for correct use.

6



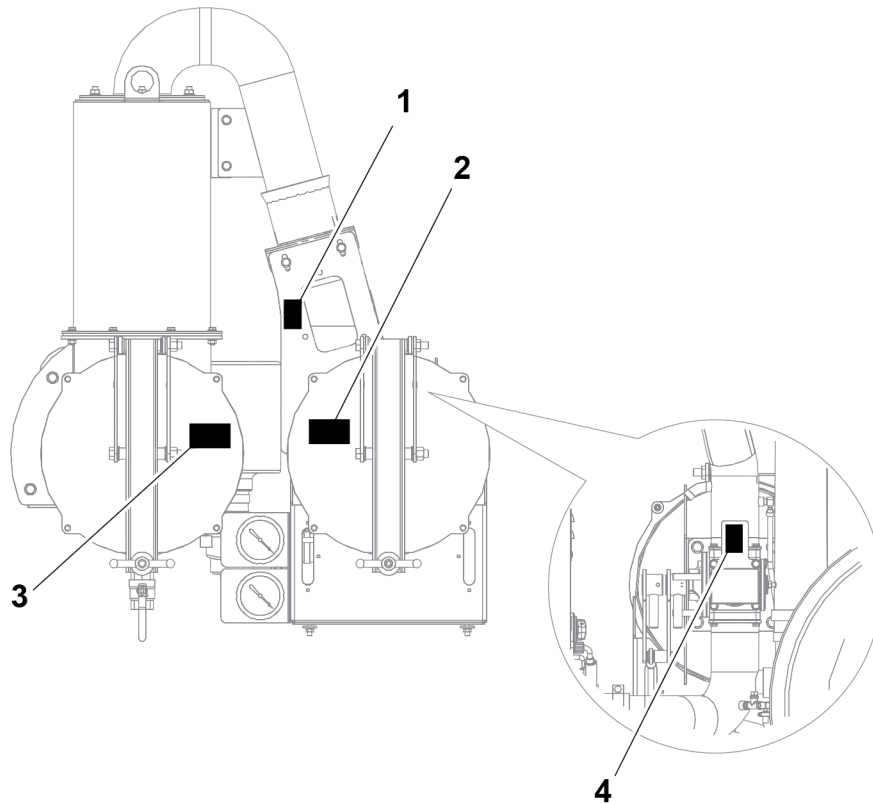
⚠ WARNING Pressurized fluid or air. Contact can cause death or serious injury. Refer to operator's manual for correct use.

7



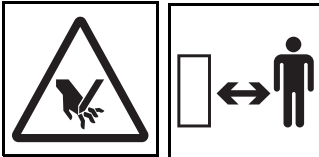
⚠ DANGER Confined space. Suffocation will cause death. Stay away or follow procedures for entering.

Filters and Cyclones



Decal_HX30_Cyclone.png

1



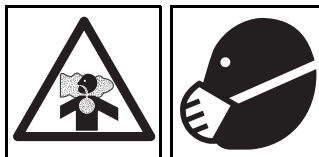
! WARNING Moving parts. Contact can cause serious injury. Stay away.

2



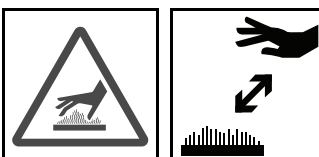
! WARNING Contents under pressure. Impact can cause death or serious injury. Refer to operator's manual for correct use.

3



! CAUTION Silica dust. Exposure can cause lung disease. Use breathing protection.

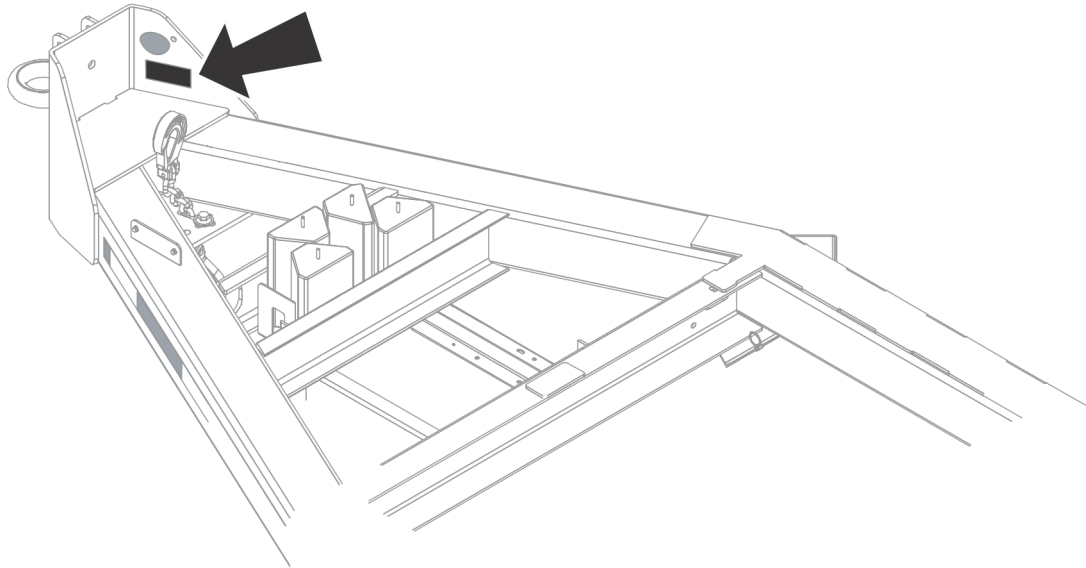
4



! CAUTION Hot parts. Contact can cause burns. Only touch when cool or wear gloves.

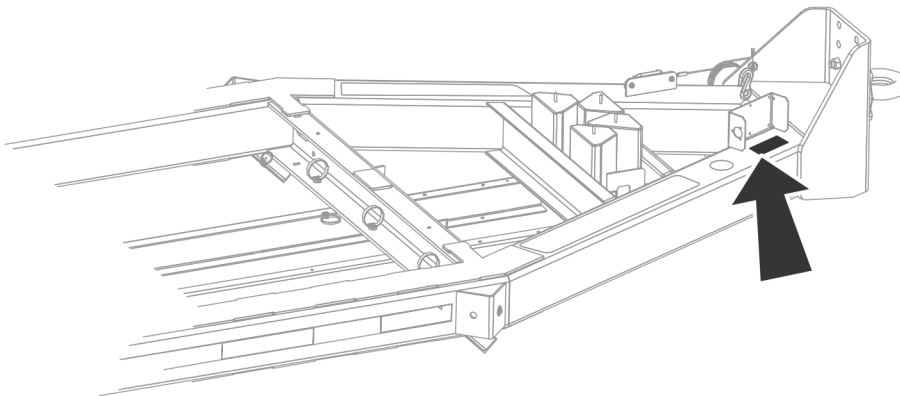
Trailer

VT9/VT9H/VT12/VT14/VT17

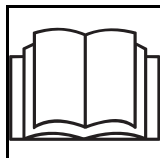


Decal_VT12_VT14.png

VT20/VT24



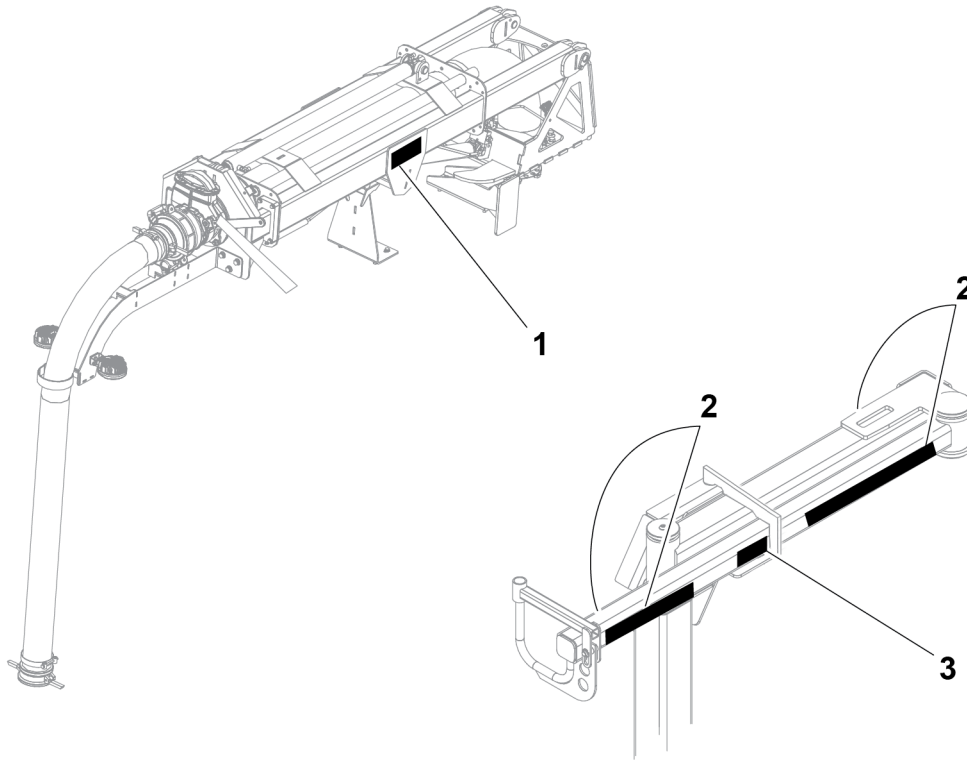
Decal_VT20.png



⚠ WARNING

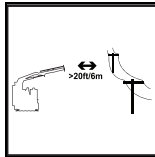
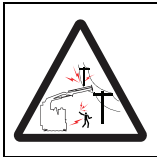
Misuse of machine can cause death or serious injury. Read and understand operator's manual and all other safety instructions before use. Know how to use all controls.

Boom



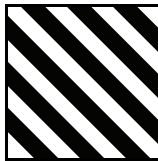
Decal_HXVacBooms.png

1



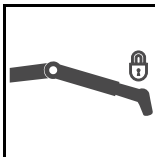
⚠ DANGER Overhead electrical lines. Exposure will cause death or serious injury. Keep raised components away from electrical lines. Use a spotter.

2



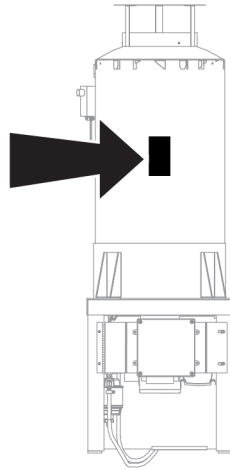
DANGER stripe decal. See Parts Manual for replacement part numbers.

3

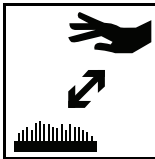


⚠ WARNING Swinging overhead boom. Impact can cause death or serious injury. Lock boom before transporting or tilting tank. Use correct boom procedures.

Water Heater



Decal_Vac_Heater.png



⚠ CAUTION Hot parts. Contact can cause burns. Only touch when cool or wear gloves.



Prepare

Chapter Contents



See "Safety Awareness" for additional precautions.

Prepare Jobsite 28

- Review Job Plan 28
- Select Start and End Points 28
- Identify Hazards 30
- Locate Utilities 30
- Classify Jobsite 30
- Arrange for Traffic Control 32
- Prepare Excavation Point 32

Prepare Operator 33

Prepare Equipment 34

- Check Supplies 34
- Check Equipment 34
- Assemble Accessories 35

Prepare Jobsite



⚠ WARNING

Underground utilities. Contact can cause death or serious injury. Locate and verify underground utilities before digging or drilling.

To help avoid injury:

- Use appropriate equipment and procedures for exposing utility lines.
- Classify jobsite and follow precautions based on classification.
- Follow local regulations for digging near utilities.

A successful job begins before working. The first step in planning is reviewing information already available about the job and jobsite.

Review Job Plan

Review blueprints or other plans. Check for information about existing or planned structures, elevations, or proposed work that may be taking place at the same time.

Select Start and End Points

Select one end to use as a starting point. Consider the following when selecting a starting point:

Slope

Equipment should be parked on a level site. Consider how slope will affect setup and operation. Assess the risks on each slope to determine if factors affecting risks create an unsafe condition for working.

Space

Check that starting and ending points allow enough space for working.

Comfort

Consider shade, wind, fumes, and other site features.

Identify Hazards

Inspect jobsite before transporting equipment. Check for the following:

- overall grade or slope
- changes in elevation such as hills or open trenches
- obstacles such as buildings, railroad crossings, or streams
- signs of utilities
 - “buried utility” notices
 - gas or water meters
 - drop boxes
 - manhole covers
 - utility facilities without overhead lines
 - junction boxes
 - light poles
 - sunken ground
- traffic
- access
- soil type and condition
- water supply

Locate Utilities

Notify One-Call Services

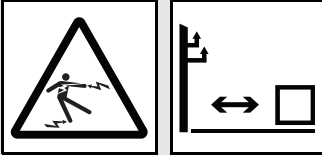
Mark proposed path with white paint and have underground utilities located before working.

- In the US or Canada, call 811 (US) or 888-258-0808 (US and Canada). Also contact any local utilities that do not participate in the One-Call service.
- In countries that do not have a One-Call service, contact all local utility companies to have underground utilities located.

Verify Underground Utilities

Have an experienced locating equipment operator sweep area within 20' (6m) to each side of proposed excavation to verify previously marked line and cable locations. Mark locations of all buried utilities and obstructions.

Locate Overhead Lines



⚠ DANGER Overhead electrical lines. Contact will cause death or serious injury. Know location of lines. Stay away.

Note location and height of all overhead lines in jobsite and ensure that equipment maintains proper distance from live lines.

Classify Jobsite


Select a Classification

Jobsites are classified according to underground hazards present, not by line being installed. Jobsite may have more than one classification.

| If working . . . | then classify jobsite as . . . |
|---|--------------------------------|
| within 10' (3m) of a buried electric line | electric |
| within 10' (3m) of a natural gas line | natural gas |
| in concrete, sand, or granite which is capable of producing crystalline silica dust | crystalline silica dust |
| within 10' (3m) of any other hazard | other |

Classify jobsite as electric if jobsite is in question or if the possibility of unmarked electric utilities exists.

Apply Precautions



⚠ WARNING Underground utilities. Contact can cause death or serious injury. Locate and verify underground utilities before digging or drilling.

Once classified, precautions appropriate for jobsite must be taken. Follow US Department of Labor regulations on excavating and trenching (Part 1926, Subpart P) and other similar regulations.

Electric Jobsite Precautions

Use one or both of these methods:

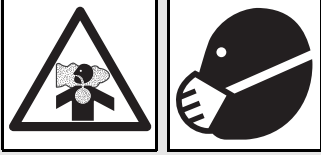
- Use appropriate equipment and procedures for exposing utility lines.
- Have service shut down while work is in progress. Have electric company test lines before returning them to service.

Natural Gas Jobsite Precautions

Position equipment upwind from gas lines and use one or both of these methods:

- Use appropriate equipment and procedures for exposing utility lines.
- Have service shut down while work is in progress. Have gas company test lines before returning them to service.

Crystalline Dust Jobsite Precautions



⚠ CAUTION Silica dust. Exposure can cause lung disease or cancer. Use breathing protection.

Crystalline silica dust is a naturally occurring substance found in soil, sand, concrete, granite, and quartz.

To reduce exposure when cutting, drilling, or working these materials:

- Use water spray or other means to control dust.
- Refer to US Occupational Safety and Health Administration (OSHA) guidelines or other applicable regulating guidelines for appropriate breathing protection or dust control methods.

Other Jobsite Precautions

You may need to use different methods to safely avoid other underground hazards. Talk with those knowledgeable about hazards present at each site to determine which precautions should be taken or if job should be attempted.

Clear objects such as landscaping fabric, cable, and wire from the work area. These objects may be underground or partially buried.

Arrange for Traffic Control

Vehicle and pedestrian traffic must be a safe distance from equipment. Evaluate jobsite and allow an appropriate buffer zone around equipment. If working near a road or other traffic area, contact local authorities about safety procedures and regulations.

Prepare Excavation Point

Clear the area to be excavated. Remove rocks or branches too large for vacuum hose.

Select a solid area to stand on while excavating.

Prepare Operator



WARNING Jobsite hazards. Exposure can cause death or serious injury. Use correct equipment and work methods. Use and maintain appropriate safety equipment.

To help avoid injury:

- Wear personal protective equipment including hard hat, safety eye wear, foot protection, hearing protection, and gloves (except when near rotating equipment).
- Remove jewelry.
- Wear close-fitting, high visibility clothing.
- Have other personal protective equipment, such as insulated boots and gloves, breathing protection, and face shield, etc. available for use depending on jobsite hazards or requirements.

Follow these guidelines before operating any jobsite equipment:

- Complete proper training and read operator's manual before using equipment.
- Plan for emergency services. Have the telephone numbers for local emergency and medical facilities on hand. Check that you will have access to a telephone.
- Review jobsite hazards, safety and emergency procedures, and individual responsibilities with all personnel before work begins. Safety videos are available from your Ditch Witch® dealer or at www.ditchwitch.com/safe. Safety Data Sheets (SDS) are available at www.ditchwitch.com/support.
- Use equipment carefully. Stop operation and investigate anything that does not look or feel right.

Any time jobsite is classified as electric, operator must wear boots and gloves meeting the following standards:

- Boots must have high tops and meet the electric hazard protection requirements of ASTM F2413 or ASTM F1117 when tested at 18,000 volts. Tuck legs of pants completely inside boots.
- Gloves must have 17,000 AC maximum use voltage, according to ASTM specification D120.
- If working around higher voltage, use gloves and boots with appropriately higher ratings.

Prepare Equipment

Check Supplies

- fuel
- keys
- marking flags or paint
- notepad and pencil
- spare fuses
- lubricants
- extra batteries for accessories and equipment

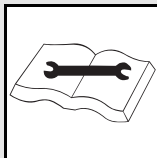
Check Equipment

Fluid Levels

- fuel
- engine oil
- diesel exhaust fluid (DEF), if needed
- hydraulic fluid
- engine coolant

Condition and Function

- all controls



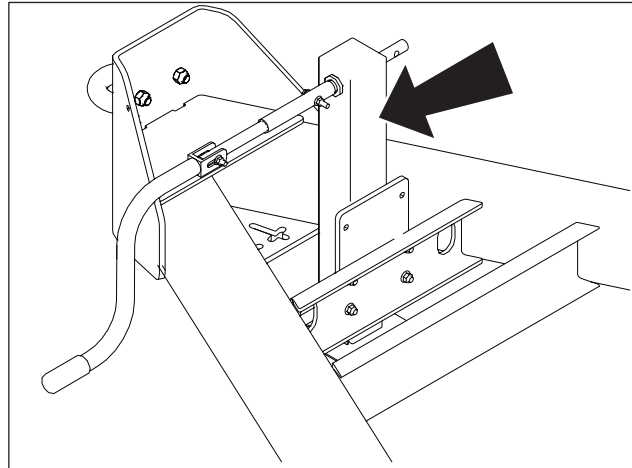
⚠ WARNING Improper control function. Use can cause death or serious injury. If control does not work as described in instructions, stop machine and have it serviced.

- battery
- hoses and valves
- pumps and motors
- tires or tracks
- signs, guards, and shields
- couplers and fittings
- water tank(s)
- filters (air, oil, hydraulic)
- belts

Assemble Accessories

Fire Extinguisher

Mount a fire extinguisher near the power unit but away from possible points of ignition where shown. The fire extinguisher should always be classified for both oil and electric fires. It should meet legal and regulatory requirements.



j70om080w.eps

Lighting Kit

If additional lighting is needed, plug lighting kit into provided outlet. Contact your local Ditch Witch® dealer for further information.

Controls

Chapter Contents

Power Pack 38

- Battery Disconnect 38
- Controls 39
- Display 41

Rear Console 43

Reverse Flow 45

Tank, 500-gal 46

Tank, 800-gal 48

Tool Controls 50

Trailer Jack 50

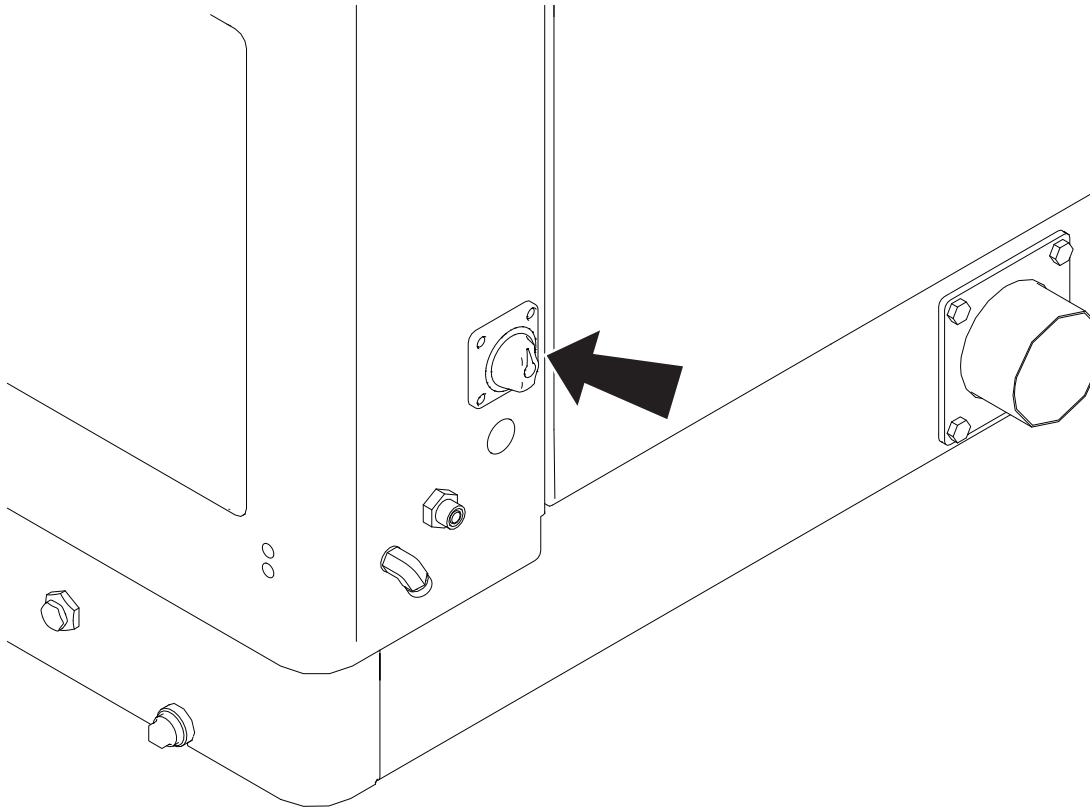
Water Heater 52

- Controls 52
- Heater Flame Indicator 53

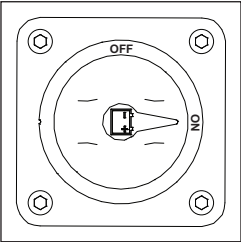
Wireless Remote Control 54

Power Pack

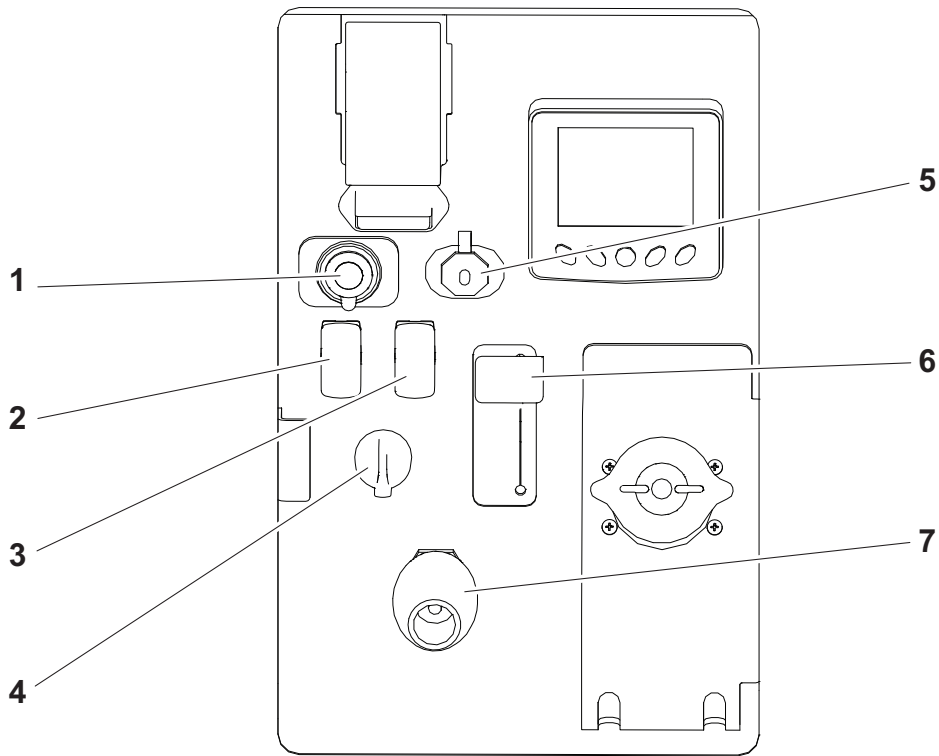
Battery Disconnect



j70om009w.eps

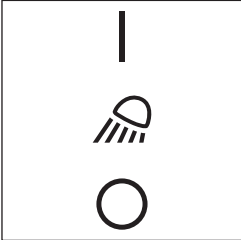
| Item | Description | IMPORTANT |
|--|---|--|
| <p>Battery disconnect switch</p>  <p>c00ic272w.eps</p> | <p>To connect, move right.</p> <p>To disconnect, move left.</p> | <p>NOTICE:</p> <ul style="list-style-type: none"> • Do not disconnect with engine running. • To avoid equipment damage, wait two minutes after turning engine off before disconnecting battery. |


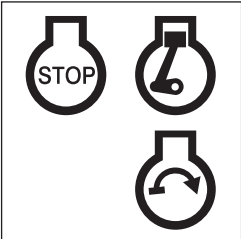
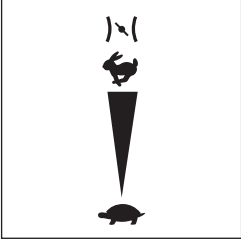
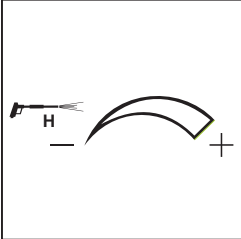
Controls



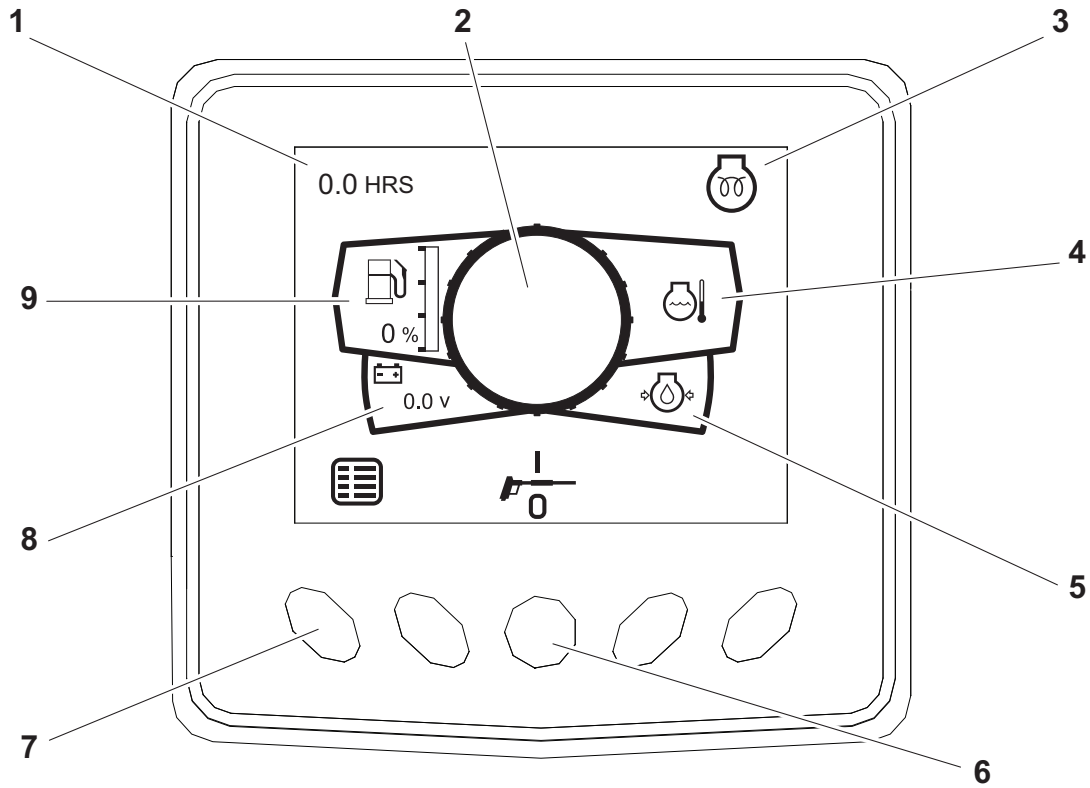
j70om007w.eps

- 1. USB port
- 2. Work light switch
- 3. Cold start switch
- 4. Ignition switch
- 5. Auxiliary outlet
- 6. Throttle
- 7. Water pressure control

| Item | Description | IMPORTANT |
|---|--|---------------------------------|
| <p>1. USB port</p> | <p>Provides power for mobile devices.</p> | <p>Dual USB 12VDC 2.1A</p> |
| <p>2. Work light switch</p>  <p>c00ic274w.eps</p> | <p>To turn on, press top. To turn off, press bottom.</p> | <p>All lights will turn on.</p> |

| Item | Description | IMPORTANT |
|--|---|--|
| <p>3. Cold start switch</p>  <p>c00ic275w.eps</p> | <p>To turn on, press and hold.</p> | <p>See "Wireless Remote Control" on page 75.</p> |
| <p>4. Ignition switch</p>  <p>c00ic065h.eps</p> | <p>To activate accessories, turn right.</p> <p>To start engine, turn right and hold.</p> <p>To shut off machine, turn left.</p> | <p>NOTICE:</p> <ul style="list-style-type: none"> Do not start unit unless flow direction control is in vacuum mode. When engine is on, blower operates and vacuum is present at tank inlet valve. <p>See "Wireless Remote Control" on page 75.</p> |
| <p>5. Auxiliary outlet</p> | <p>Provides power for other equipment.</p> | <p>DC12V, 10A</p> |
| <p>6. Throttle control</p>  <p>c00ic116h.eps</p> | <p>To increase engine speed, move up.</p> <p>To reduce engine speed, move down.</p> | <p>Run engine at full throttle during operation.</p> |
| <p>7. Water pressure control</p>  <p>c00ic060t.eps</p> | <p>To increase, move right.</p> <p>To decrease, move left.</p> | |









Display



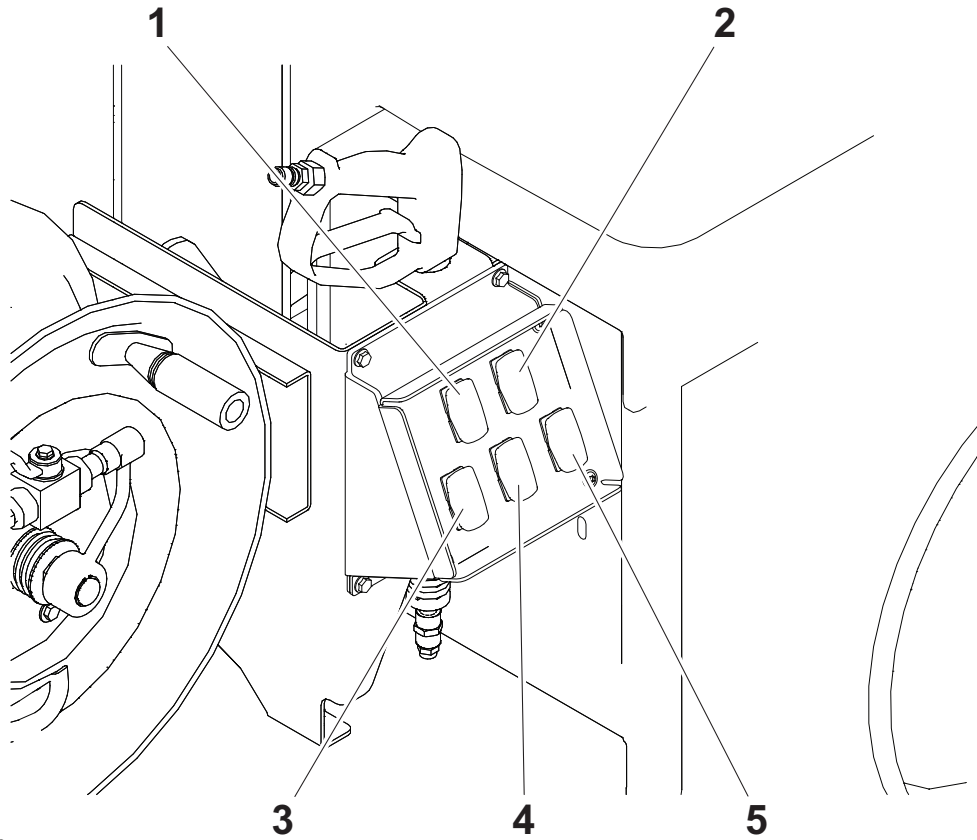
j67om064w.eps

- | | |
|---|---------------------------|
| 1. Hourmeter | 6. Water pump key |
| 2. Water pump indicator | 7. User settings menu key |
| 3. Cold start wait indicator | 8. Voltmeter |
| 4. Engine coolant temperature indicator | 9. Fuel gauge |
| 5. Engine oil pressure indicator | |

| Item | Description | IMPORTANT |
|--------------|---------------------------------|--------------------------------------|
| 1. Hourmeter | Displays engine operating time. | Use these times to schedule service. |

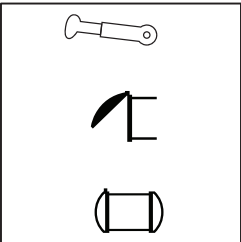
| Item | Description | IMPORTANT |
|--|---|---|
| <p>2. Water pump indicator</p> | <p> When water pump is off, center ring displays wash wand icon.</p> <p>PSI When water pump is on, center ring displays water pressure.</p> | |
| <p>3. Cold start wait indicator</p> | <p> Lights when cold start switch is engaged.</p> | |
| <p>4. Engine coolant temperature indicator</p> | <p> Flashes engine coolant temperature is high.</p> | |
| <p>5. Engine oil pressure indicator</p> | <p> Flashes when engine oil pressure is low.</p> | |
| <p>6. Water pump key</p> | <p> To turn on, press.</p> <p>To turn off, press again.</p> | |
| <p>7. User settings menu key</p> | <p> To access menu used to customize user settings, press.</p> | <p>Brightness, contrast, language, and units of measurement can be adjusted in this screen.</p> |
| <p>8. Voltmeter</p> | <p> Displays machine voltage.</p> | |
| <p>9. Fuel gauge</p> | <p> Displays fuel level.</p> | <p>Icon flashes when fuel level reaches 10%.</p> <p>See "Approved Fuel" on page 99</p> |

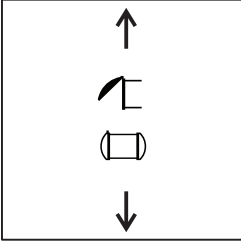
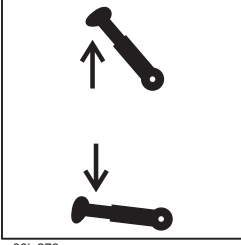
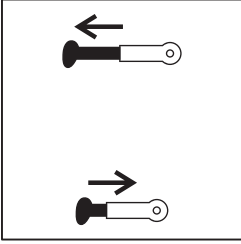
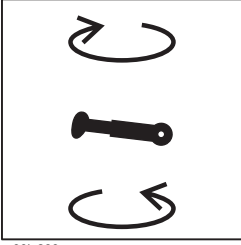
Rear Console



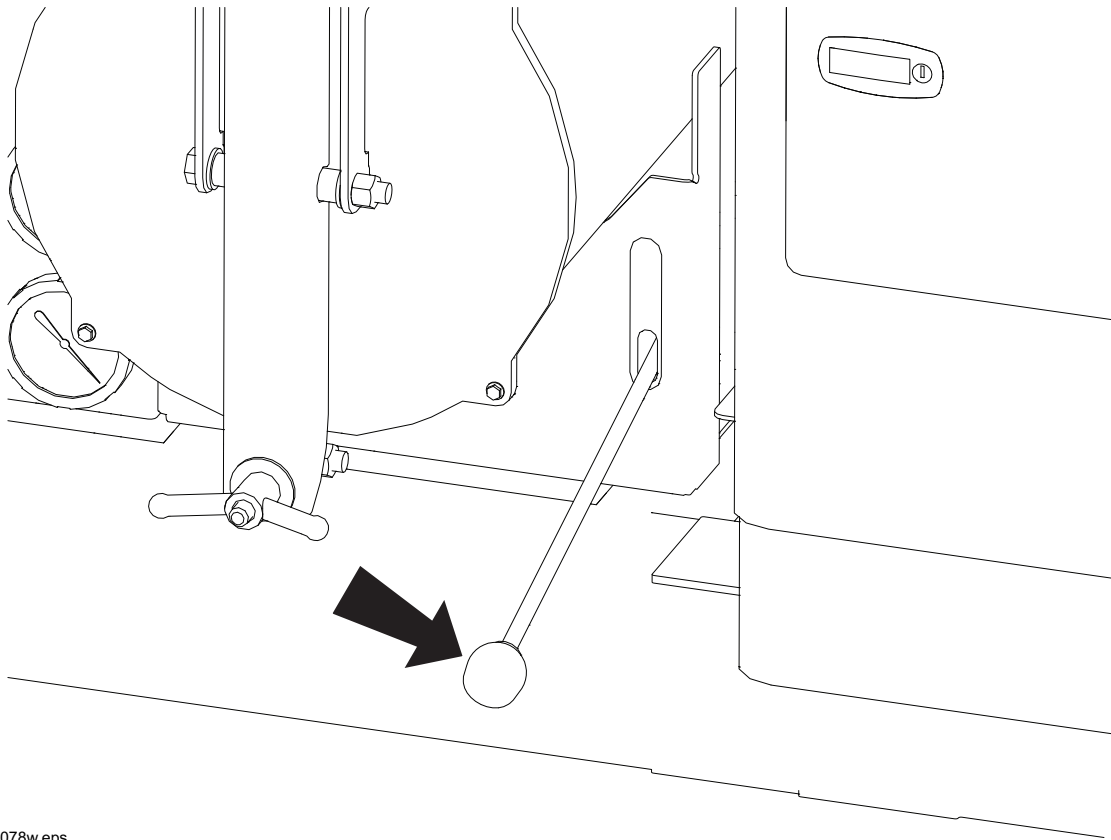
j70om012w.eps

- 1. Function selection switch
 - 2. Hydraulic lift switch
 - 3. Boom tilt switch*
 - 4. Boom extension switch*
 - 5. Boom rotation switch*
- * If equipped

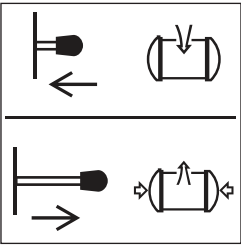
| Item | Description | IMPORTANT |
|---|--|-----------|
| <p>1. Function selection switch</p>  <p>c00ic277w.eps</p> | <p>To enable boom functions, press top.</p> <p>To enable door functions, move to middle.</p> <p>To enable debris tank functions, press bottom.</p> | |

| Item | Description | IMPORTANT |
|--|--|--|
| <p>2. Hydraulic lift switch</p>  <p><small>c00ic276w.eps</small></p> | <p>To raise debris tank/door, press and hold top.</p> <p>To lower debris tank/door, press and hold bottom.</p> | <p>For door function, enable door functions at function selection switch.</p> <p>When closing door, ensure door closes fully. See "Open/Close Tank Door" on page 86.</p> <p>For debris tank function, enable debris tank functions at function selection switch.</p> |
| <p>3. Boom tilt switch</p>  <p><small>c00ic278w.eps</small></p> | <p>To raise boom, press and hold top.</p> <p>To lower, press and hold bottom.</p> | <p>For boom function, enable boom functions at function selection switch.</p> |
| <p>4. Boom extension switch</p>  <p><small>c00ic279w.eps</small></p> | <p>To extend boom, press and hold top.</p> <p>To retract, press and hold bottom.</p> | <p>For boom function, enable boom functions at function selection switch.</p> |
| <p>5. Boom rotation switch</p>  <p><small>c00ic280w.eps</small></p> | <p>To rotate boom right, press top.</p> <p>To rotate boom left, press bottom.</p> | <p>For boom function, enable boom functions at function selection switch.</p> |

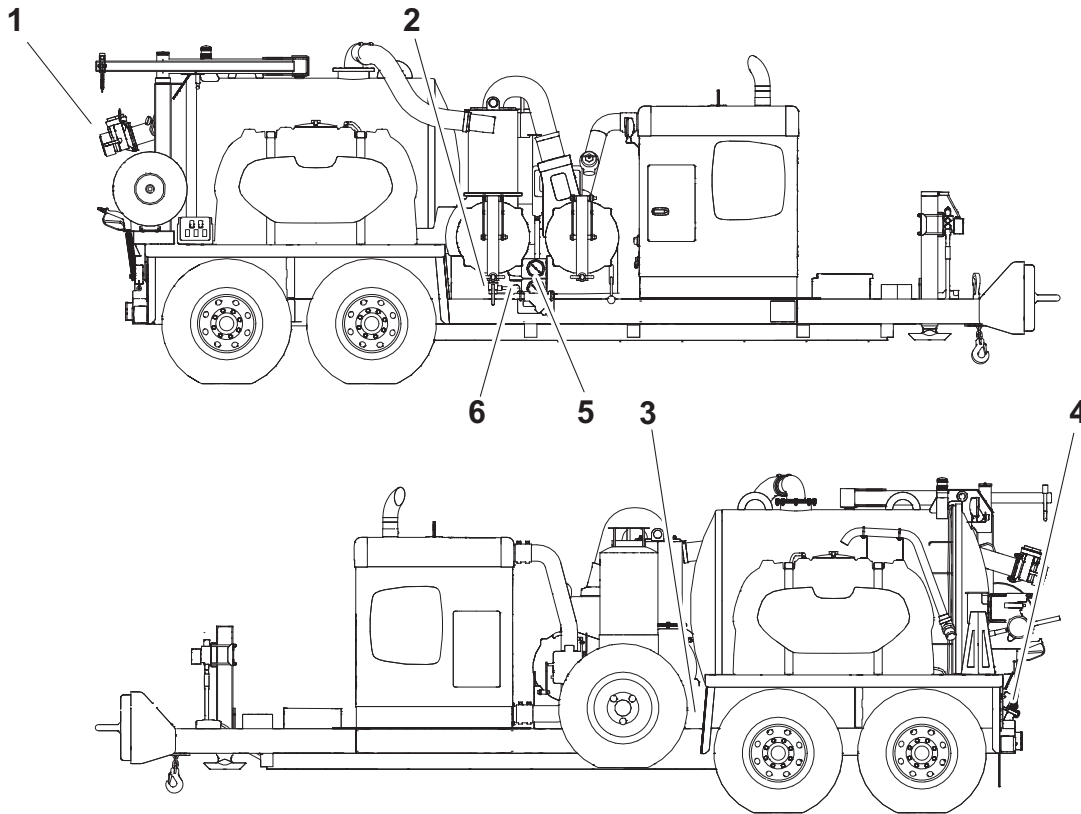
Reverse Flow



j70om078w.eps

| Item | Description | IMPORTANT |
|---|--|---|
| <p>Flow direction control</p>  <p>c00ic292w.eps</p> | <p>To select suction, push in fully.</p> <p>To select reverse flow, lift and pull out fully.</p> | <p>Use optional reverse flow to unload debris tank contents to another tank.</p> <p>Operate reverse flow function only when outlet valve is open.</p> |

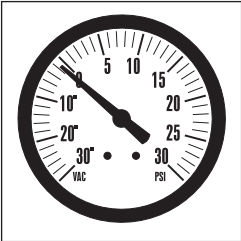
Tank, 500-gal



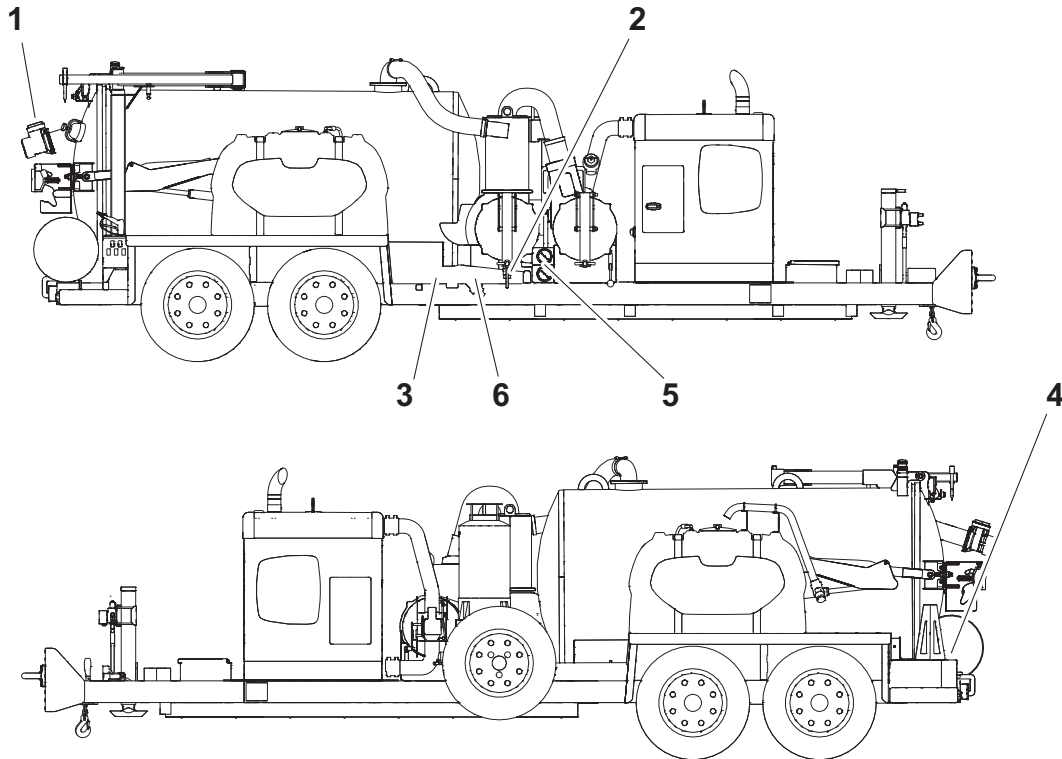
j70om010w.eps

- | | |
|----------------------------|-------------------------------|
| 1. Inlet valve | 4. Outlet valve |
| 2. Water tank supply valve | 5. Vacuum/Reverse flow gauges |
| 3. Water tank drain | 6. Antifreeze tank valve |

| Item | Description | IMPORTANT |
|---|--|--|
| <p>1. Inlet valve</p> <div style="border: 1px solid black; padding: 10px; text-align: center;"> <p>CLOSE</p> <p>↑</p> <p>○</p> <p>↓</p> <p>OPEN</p> </div> <p><small>c00ic127h.eps</small></p> | <p>To start suction, move down.</p> <p>To stop suction, move up.</p> | <p>NOTICE:</p> <ul style="list-style-type: none"> Do not run engine with tank inlet valve closed. If hose or tool gets stuck on the ground or material being vacuumed, use tank inlet valve to break suction. |

| Item | Description | IMPORTANT |
|--|--|--|
| <p>2. Water tank supply valve</p> | <p>To send water from tank to wash wand, move left.</p> <p>To stop water flow, move right.</p> | <p>NOTICE: Ensure water tank supply valve or antifreeze tank valve is open when pump is on.</p> |
| <p>3. Water tank drain</p> | <p>To open, move left.</p> <p>To close, move right.</p> | |
| <p>4. Outlet valve</p> <div style="border: 1px solid black; padding: 10px; text-align: center;"> <p>CLOSE</p> <p>↑</p> <p>○</p> <p>↓</p> <p>OPEN</p> </div> <p><small>c00ic127h.eps</small></p> | <p>To open and drain tank, move down.</p> <p>To close, move up.</p> | |
| <p>5. Vacuum/Reverse flow gauges</p> <div style="border: 1px solid black; padding: 10px; text-align: center;">  </div> <p><small>c00ic131h.eps</small></p> | <p>Bottom gauge displays vacuum reading.</p> <p>Top gauge displays reverse flow pressure, if equipped.</p> | <p>Vacuum relief valve opens when vacuum reaches 15inHG (381mm).</p> |
| <p>6. Antifreeze tank valve</p> | <p>To open, move left.</p> <p>To close, move right.</p> | <p>NOTICE: Ensure water tank supply valve or antifreeze tank valve is open when pump is on.</p> |

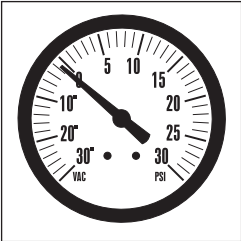
Tank, 800-gal



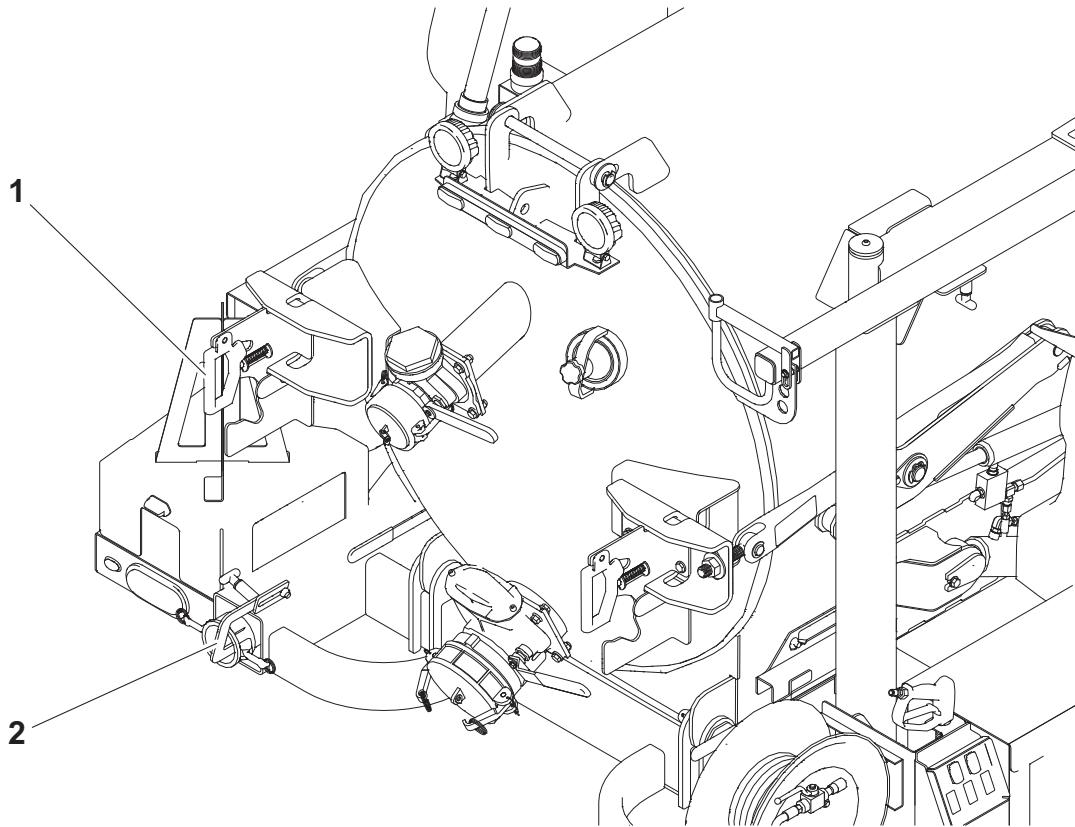
j70om011w.eps

- | | |
|----------------------------|-------------------------------|
| 1. Inlet valve | 4. Outlet valve |
| 2. Water tank supply valve | 5. Vacuum/Reverse flow gauges |
| 3. Water tank drain | 6. Antifreeze tank valve |

| Item | Description | IMPORTANT |
|---|--|--|
| <p>1. Inlet valve</p> <div style="border: 1px solid black; padding: 10px; text-align: center;"> <p>CLOSE</p> <p>↑</p> <p>○</p> <p>↓</p> <p>OPEN</p> </div> <p><small>c00ic127h.eps</small></p> | <p>To start suction, move down.</p> <p>To stop, move up.</p> | <p>NOTICE:</p> <ul style="list-style-type: none"> Do not run engine with tank inlet valve closed. If hose or tool gets stuck on the ground or material being vacuumed, use tank inlet valve to break suction. |

| Item | Description | IMPORTANT |
|--|--|--|
| <p>2. Water tank supply valve</p> | <p>To send water from tank to wash wand, move left.</p> <p>To stop water flow, move right.</p> | <p>NOTICE: Ensure water tank supply valve or antifreeze tank valve is open when pump is on.</p> |
| <p>3. Water tank drain</p> | <p>To open, move left.</p> <p>To close, move right.</p> | |
| <p>4. Outlet valve</p> <div style="border: 1px solid black; padding: 10px; text-align: center;"> <p>CLOSE</p> <p>↑</p> <p>○</p> <p>↓</p> <p>OPEN</p> </div> <p style="font-size: small; margin-top: 5px;">c00ic127h.eps</p> | <p>To open and drain tank, move down.</p> <p>To close, move up.</p> | |
| <p>5. Vacuum/Reverse flow gauges</p> <div style="border: 1px solid black; padding: 10px; text-align: center;">  </div> <p style="font-size: small; margin-top: 5px;">c00ic131h.eps</p> | <p>Bottom gauge displays vacuum reading.</p> <p>Top gauge displays reverse flow pressure, if equipped.</p> | <p>Vacuum relief valve opens when vacuum reaches 15inHG (381mm).</p> |
| <p>6. Antifreeze tank valve</p> | <p>To open, move left.</p> <p>To close, move right.</p> | <p>NOTICE: Ensure water tank supply valve or antifreeze tank valve is open when pump is on.</p> |

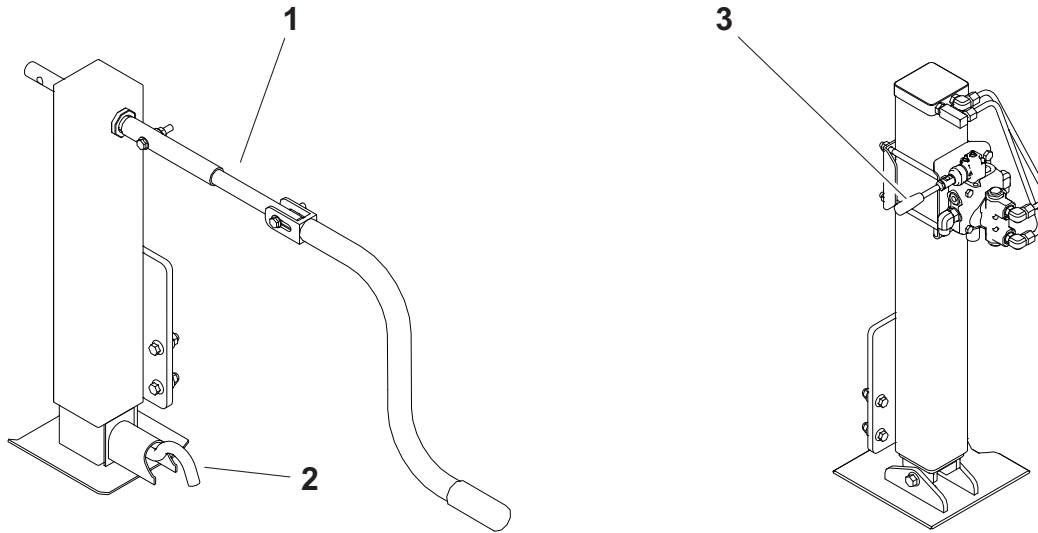
Tool Controls



j70m083w.eps

| Item | Description | IMPORTANT |
|------------------------|---|--|
| 1. Tool rack handle | Pull handle and turn 90° to access tool. | Handle can accept lock or other security device. |
| 2. Hose storage handle | Pull handle to release restraining arm and access hose. | |

Trailer Jack



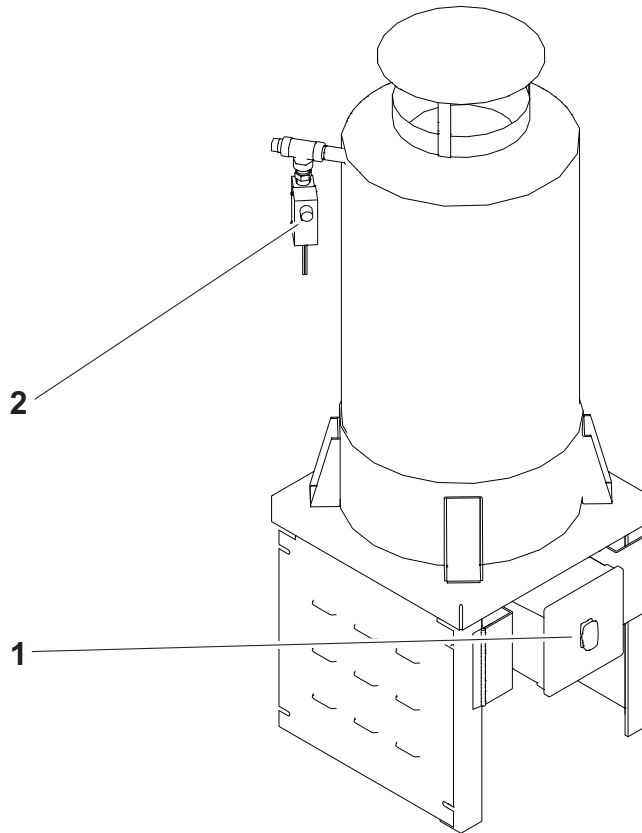
j70om074w.eps

| Item | Description | IMPORTANT |
|---|--|--|
| <p>1. Manual trailer jack handle</p> | <p>To raise front of trailer, turn handle clockwise.</p> <p>To lower front of trailer, turn handle counterclockwise.</p> | <p>Fold handle down when not in use.</p> |
| <p>2. Jack base latch</p> | <p>To raise and lower jack base, pull.</p> | <p>Trailer jack automatically raises when latch is pulled.</p> |
| <p>3. Hydraulic trailer jack control</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> </div> | <p>To raise front of trailer, move up.</p> <p>To lower front of trailer, move down.</p> | |

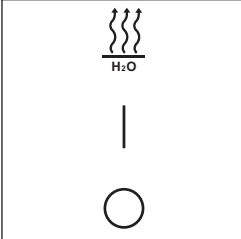
c00ic701h.eps

Water Heater

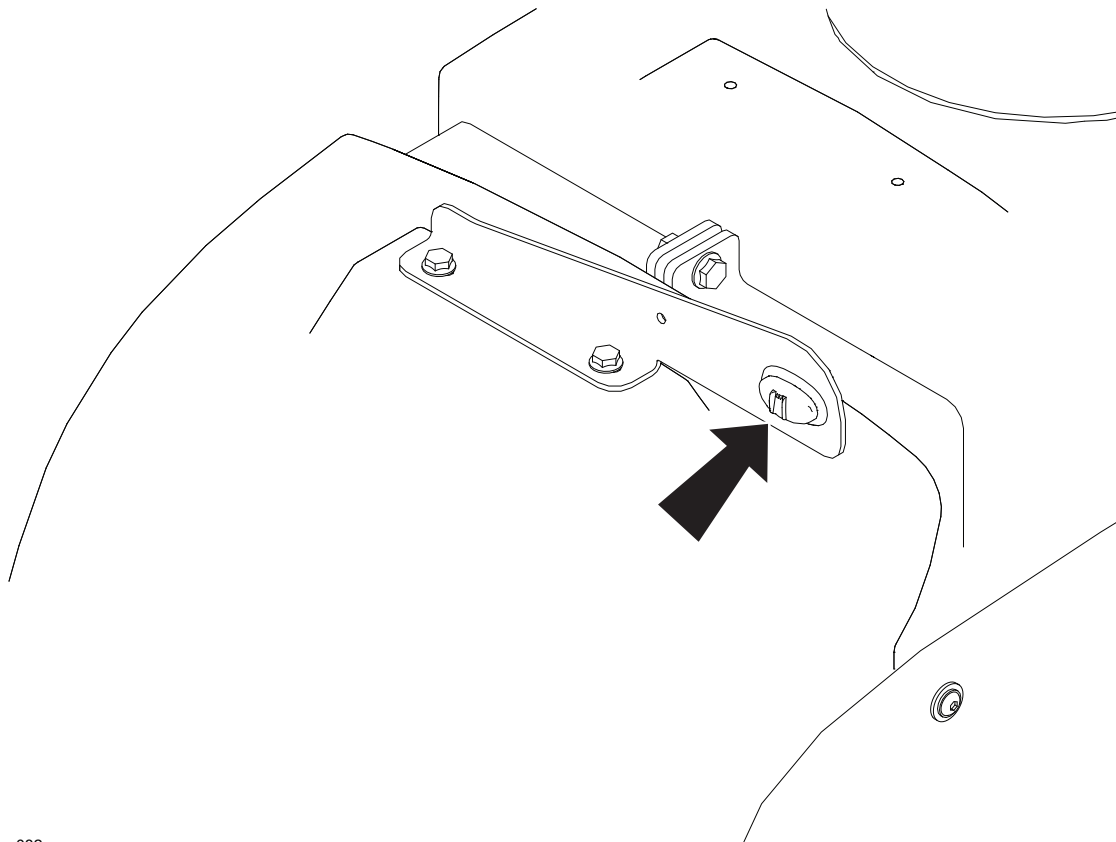
Controls



j70om014w.eps

| Item | Description | IMPORTANT |
|--|---|---|
| <p>1. Power switch</p>  <p>c00ic293w.eps</p> | <p>To turn on, press top.</p> <p>To turn off, press bottom.</p> | <p>NOTICE:</p> <ul style="list-style-type: none"> • Turn off when not in use. • Heater will shut off any time water flow stops or power pack is off. |
| <p>2. Thermostat</p> | <p>To raise or lower temperature, turn dial.</p> | <p>NOTICE: Do not adjust temperature above 130°F (54°C).</p> |

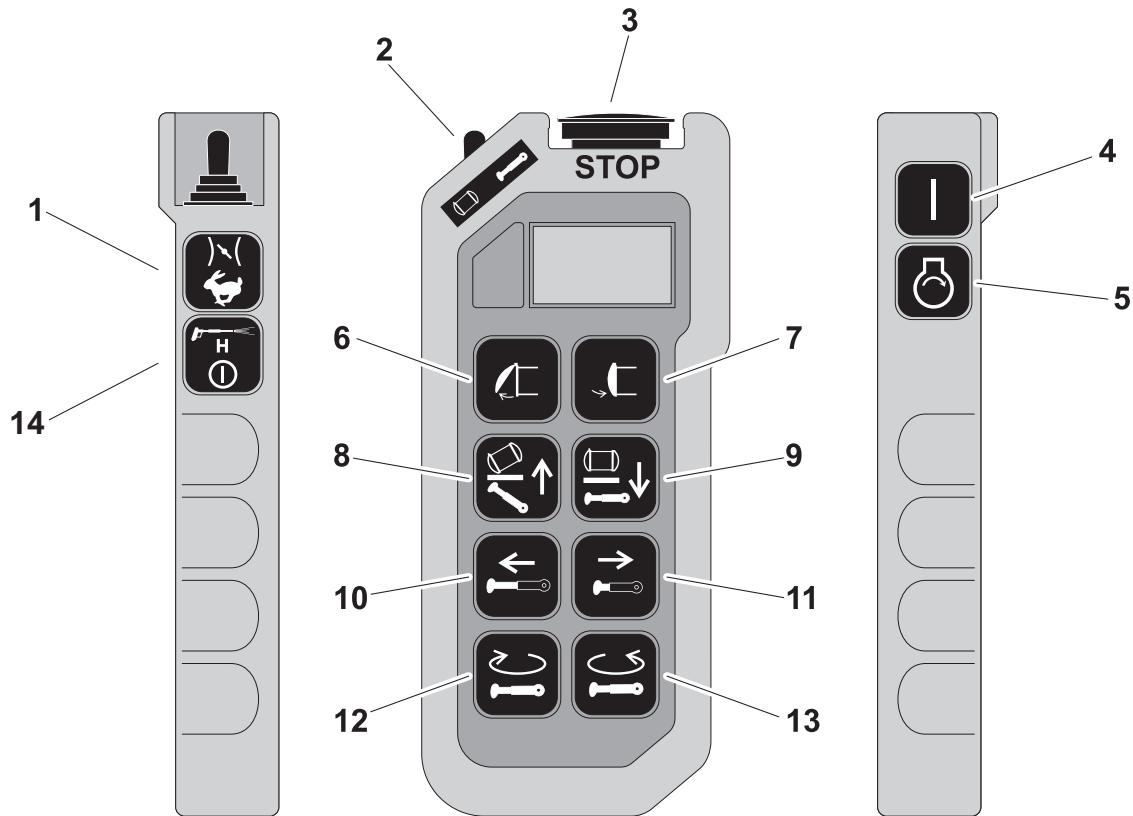
Heater Flame Indicator



j70om082w.eps

| Item | Description | IMPORTANT |
|--------------------------------------|--|---|
| <p>Heater flame indicator</p> | <p>Flashes when heater flame is out.</p> | <p>Indicator should be visible in towing vehicle's left side rearview mirror.</p> <p>If indicator is flashing, turn off water heater power switch and check heater fuel tank.</p> <ul style="list-style-type: none"> • If tank has fuel, turn heater power switch on to restart flame. • If flame does not restart, contact your Ditch Witch® dealer. |

Wireless Remote Control



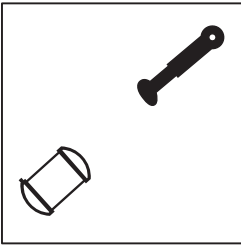
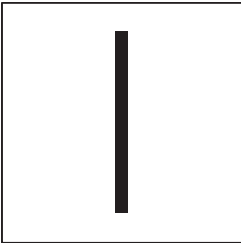
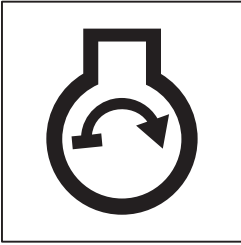
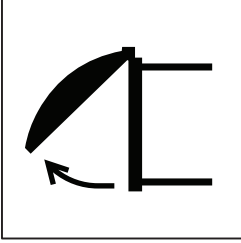
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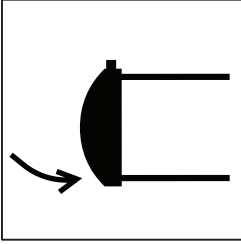
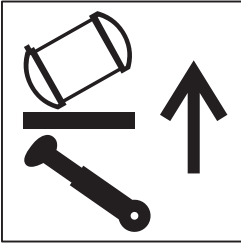
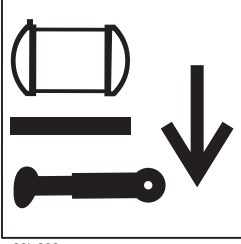
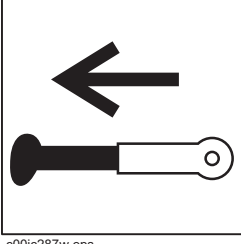
IMPORTANT: Wireless remote control should be paired to receiver at factory. See “Wireless Remote Control” on page 75.

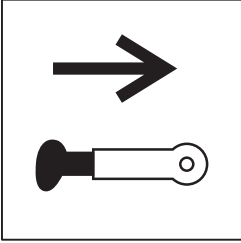
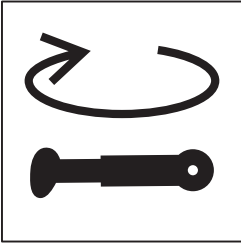
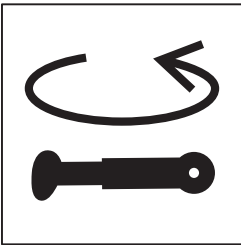
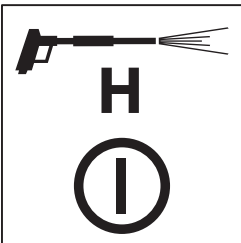
- 1. Throttle key
- 2. Function selection switch
- 3. Engine stop button
- 4. Power key
- 5. Remote start key
- 6. Door open key
- 7. Door close key
- 8. Tank/Boom* up key
- 9. Tank/Boom* down key
- 10. Boom extend key*
- 11. Boom retract key*
- 12. Boom rotate right key*
- 13. Boom rotate left key*
- 14. Water pump key

* If equipped.

| Item | Description | IMPORTANT |
|-----------------|-------------|-------------------------------------|
| 1. Throttle key | Not used. | Use throttle control on power pack. |

| Item | Description | IMPORTANT |
|--|--|--|
| <p>2. Function selection switch</p>  <p><small>c00ic282w.eps</small></p> | <p>To enable boom functions, move right.</p> <p>To enable debris tank and door functions, move left.</p> | |
| <p>3. Engine stop button</p> | <p>To stop engine, press.</p> | <p>Pressing button also turns off wireless remote control.</p> <p>To restart engine, turn ignition switch off and back on.</p> <p>To restart wireless remote control, press power key.</p> |
| <p>4. Power key</p>  <p><small>c00ic284w.eps</small></p> | <p>To turn on wireless remote control, press.</p> | <p>Wireless remote control turns off after 20 minutes of inactivity.</p> |
| <p>5. Remote start key</p>  <p><small>c00ic056t.eps</small></p> | <p>To start machine, press and hold until engine starts.</p> | <p>For remote start to function, accessories must be activated, and wireless remote control must be on.</p> <p>NOTICE: If cold start procedures are needed, do not start engine with wireless remote control.</p> |
| <p>6. Door open key</p>  <p><small>c00ic368w.eps</small></p> | <p>To open debris tank door, press and hold.</p> | |

| Item | Description | IMPORTANT |
|--|--|---|
| <p>7. Door close key</p>  <p><small>c00ic369w.eps</small></p> | <p>To close debris tank door, press and hold.</p> | |
| <p>8. Tank/Boom up key</p>  <p><small>c00ic285w.eps</small></p> | <p>To raise debris tank or boom, press and hold.</p> | <p>Select tank or boom functions using function switch.</p> <p>NOTICE:</p> <ul style="list-style-type: none"> Do not use boom to raise or lower objects. Do not operate tank while trailer is unhitched. |
| <p>9. Tank/Boom down key</p>  <p><small>c00ic286w.eps</small></p> | <p>To lower debris tank or boom, press and hold.</p> | <p>Select tank or boom functions using function switch.</p> <p>NOTICE:</p> <ul style="list-style-type: none"> Do not use boom to raise or lower objects. Do not operate tank while trailer is unhitched. |
| <p>10. Boom extend key</p>  <p><small>c00ic287w.eps</small></p> | <p>To extend power boom, press and hold.</p> | |

| Item | Description | IMPORTANT |
|---|---|--|
| <p>11. Boom retract key</p>  <p><small>c00ic288w.eps</small></p> | <p>To retract power boom, press and hold.</p> | |
| <p>12. Boom rotate right key</p>  <p><small>c00ic289w.eps</small></p> | <p>To rotate power boom right, press and hold.</p> | |
| <p>13. Boom rotate left key</p>  <p><small>c00ic290w.eps</small></p> | <p>To rotate power boom left, press and hold.</p> | |
| <p>14. Water pump key</p>  <p><small>c00ic291w.eps</small></p> | <p>To start water pump, press. To stop, press again.</p> | <p>Check and adjust pressure at power pack controls.</p> |

Transport

Chapter Contents



For additional precautions, see "Safety Awareness" and "Prepare" chapters.

IMPORTANT: For more information on how to operate controls, see "Controls" chapter.


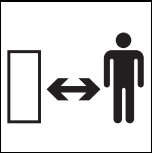
Lift 60

- Points 60
- Procedure 60

Haul 61

- Inspect Trailer 61
- Operate Jack 62
- Hitch Trailer 63
- Unhitch Trailer 64
- Adjust Trailer Lunette 64
- Haul in Cold Weather 65

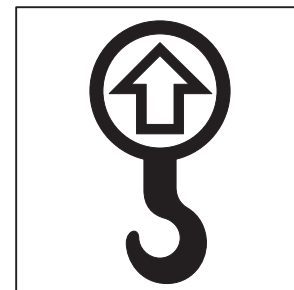
Lift

⚠ WARNING Lifted load. Crushing weight can cause death or serious injury. Stay away from lifted load and its range of movement.

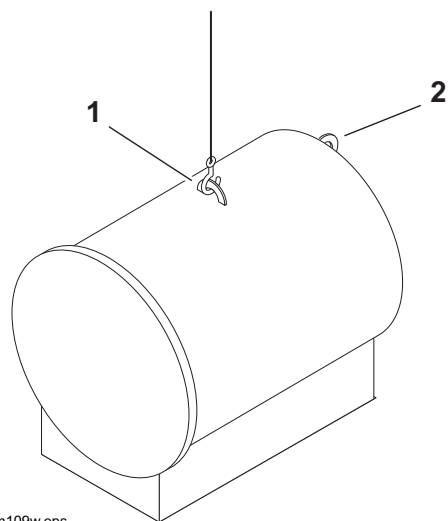
Points

Lifting points are identified by lifting decals. Lifting at other points is unsafe and can damage machine.

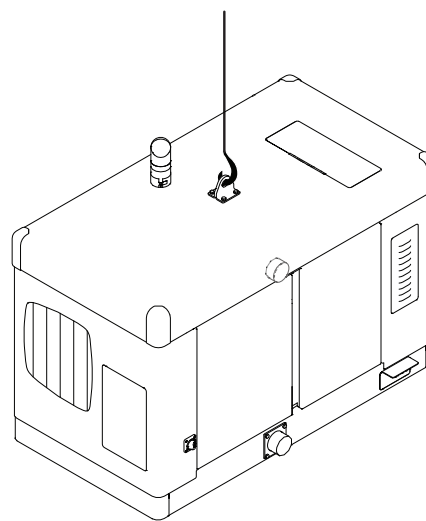


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Procedure



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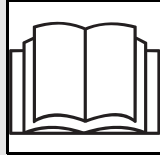
Use equipment capable of supporting machine's size and weight. See "Specifications" on page 129 or measure and weigh equipment before lifting.

For debris tank, use top lift point (1) to lift tank. Use end lift point (2) to drain tank if machine is disabled.

NOTICE:

- Ensure power pack or tank is detached from trailer before lifting.
- Relieve pressure in tank before lifting.
- Only lift empty water or debris tanks.
- Do not lift tank using boom, if equipped.

Haul



⚠ WARNING

Misuse of machine can cause death or serious injury. Read and understand operator's manual and all other safety instructions before use. Know how to use all controls.

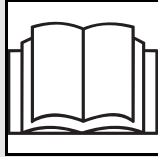
To help avoid injury:

- Only haul if tank is fully lowered and horizontal.
- Only haul if optional vacuum boom is secured. See "Stow Boom" on page 92.

Inspect Trailer

- Check hitch for wear and cracks.
- Check battery for 12V charge.
- Inspect lights for cleanliness and correct operation.
- Inspect reflectors and replace if needed.
- Check tire pressure.
- Check lug nut torque.
- Ensure trailer brakes are adjusted to come on with tow vehicle brakes.
- Check trailer for cracks.

Operate Jack

**⚠ WARNING**

Misuse of machine can cause death or serious injury. Read and understand operator's manual and all other safety instructions before use. Know how to use all controls.

To help avoid injury:

- Do not use manual crank to force jack operation. See your Ditch Witch® dealer if jack binds.
- Use manual crank only when hydraulic power is unavailable.
- Operate the hydraulic motor only when engine is set to medium or low throttle.
- Do not overextend jack. Use telescoping leg to gain additional height.

1. Support trailer tongue.
2. Raise or lower jack base.

IMPORTANT: Ensure trailer jack latch engages.

3. Remove tongue support.

Hitch Trailer

1. Back tow vehicle to trailer.
2. Put manual transmission into first or reverse gear or automatic transmission into park.
3. Shut off machine.
4. Block wheels.
5. Connect trailer lunette to tow vehicle hitch and lock in place with lock pin.

IMPORTANT: Trailer must be level. If needed, adjust lunette bolts to move lunette and level trailer. See "Adjust Trailer Lunette" on page 64.

6. Connect safety chains to tow vehicle, crossing chains under lunette.

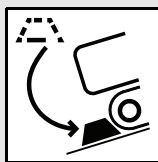
NOTICE: Do not connect chains to pintle hook or hitch ball.

7. Connect breakaway switch cable to tow vehicle.

NOTICE: Do not connect cable to pintle hook or hitch ball.

8. Plug trailer electrical connector into tow vehicle connector.
9. Raise jack base.
10. Remove and stow wheel blocks.

Unhitch Trailer



⚠ WARNING Runaway machine. Impact can cause death or serious injury. Chock or block machine when parking on slopes.

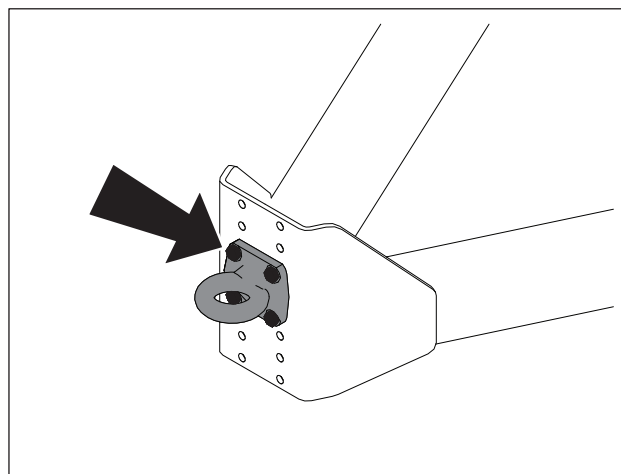
1. Stop tow vehicle and trailer on level ground.
2. Put manual transmission into first or reverse gear or automatic transmission into park.
3. Shut off machine.
4. Block trailer wheels.
5. Unhitch trailer.

Adjust Trailer Lunette

To ensure level trailer, adjust lunette.

1. Lower jack base.
2. Remove lunette bolts (shown).
3. Move lunette to new position.

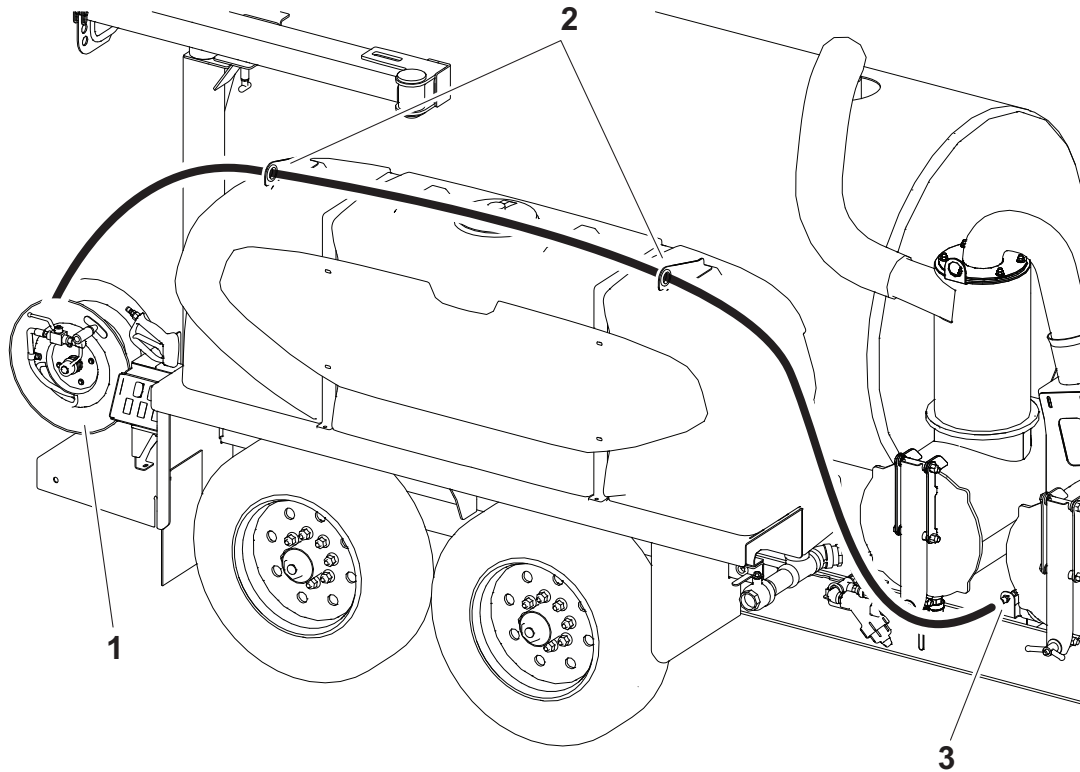
IMPORTANT: On VT20 or VT24 trailer, remove paint from lunette destination location. Retouch paint after installation.



TrailerHitchAdjust_VT20.eps

4. Reattach lunette, ensuring bolts are properly tightened. See "Specifications" on page 129.

Haul in Cold Weather



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To transport in cold weather, connect and run optional water heater.

1. Extend hose from hose reel (1).
2. Route hose through retainers (2).
3. Connect hose to QDC adapter (3).
4. Start engine and set to low throttle.
5. Turn on water pump and set to 3000psi (206bar).
6. Turn on water heater and adjust temperature according to conditions.

Vacuum and Pothole

Chapter Contents



For additional precautions, see "Safety Awareness" and "Prepare" chapters.

IMPORTANT: For more information on how to operate controls, see "Controls" chapter.

| | |
|---|-----------|
| Set Up | 68 |
| • Connect Hoses | 68 |
| • Monitor Working Trailer Weight | 68 |
| • Wireless Remote Control | 68 |
| Start | 75 |
| Position Vacuum Boom | 77 |
| • Precautions near Electrical Power Lines | 77 |
| • Procedure | 78 |
| • Jib Boom | 78 |
| • Power Boom | 79 |
| Remove Debris | 80 |
| Pothole | 81 |
| Drain Tank | 83 |
| Unload to Another Tank | 85 |
| Open/Close Tank Door | 86 |
| Shut Down | 87 |

Set Up

Connect Hoses

1. Remove vacuum hoses from storage.
2. Connect hoses. Secure all locking clamps.
3. Ensure debris tank outlet valve is closed.

Monitor Working Trailer Weight

Working trailer weight can be determined by using weight gauge or determining tank fill level.

Weight Gauge

Use weight gauge (3) to see approximate weight of trailer and working load.

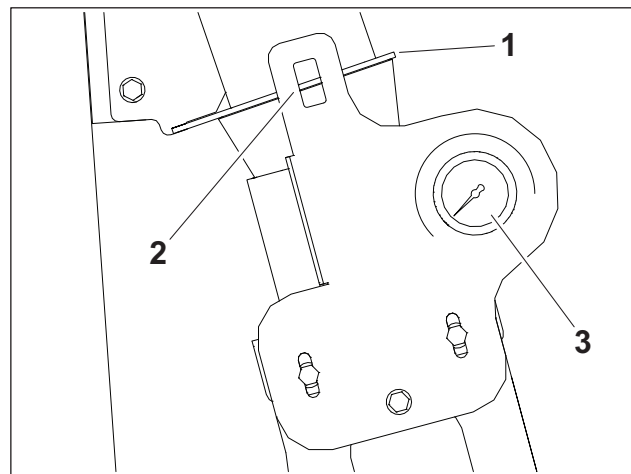
To use gauge after calibration:

1. Lower tank into position.

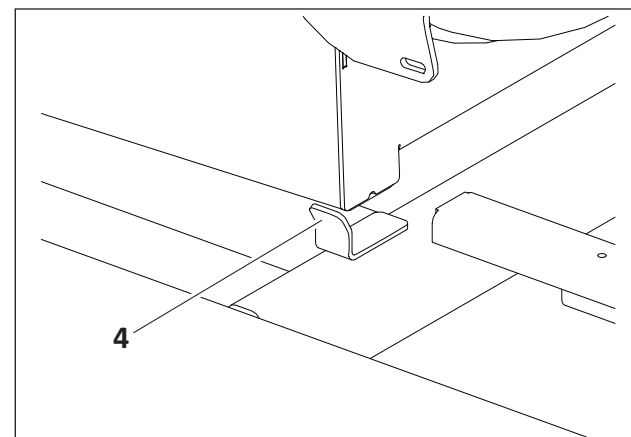
NOTICE: Tank must be lowered into position for weight reading to be accurate. If tank is not lowered into position, tank tilt cylinders will not be bearing full weight of tank.

- **VT9/VT9H:** Lower until bottom of tank is near upper edge of lowering guide (4), as shown.
- **All other trailers:** Lower until back lip of make/break seal tube (1) is visible inside gauge window (2).

2. Read value on gauge.



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Tank Fill Level

NOTICE: Exceeding the maximum fill level will overload the trailer. Never exceed trailer capacity.

IMPORTANT: For all materials, vacuum tank should be no more than half full when lifting the tank.

Use the reference charts below to help determine how full of various materials the vacuum tank can be without overloading trailer.

To use these charts, first select the appropriate table based on trailer and vacuum tank size. Next find the material being excavated. If material being excavated is not listed, find a material with similar density. Finally, determine the maximum fill level based on the amount of water in water tank.

500 Gallon Debris Tank on VT9/VT9H Trailer

Values shown are for machine with no options. Values will vary for other configurations.

| Material | Maximum Debris Tank Fill Level | |
|--|--------------------------------|------------------|
| | Water Tank Full (200gal/757L) | Water Tank Empty |
| Wood chips, dry | 100% | 100% |
| Snow, dry | 100% | 100% |
| Water | 75% | 91% |
| Lightweight mud, 8-10lb/gal (1-1.2kg/L) | 69% | 84% |
| Earth, dry loose | 64% | 78% |
| Caliche | 60% | 72% |
| Earth, loam | 60% | 72% |
| Mid-weight mud, 10-12lb/gal (1.2-1.44kg/L) | 56% | 68% |
| Limestone, crushed | 48% | 59% |
| Asphalt | 46% | 56% |
| Sand, dry | 46% | 56% |
| Earth, wet excavated | 46% | 56% |
| Heavy-weight mud, 12-15lb/gal (1.44-1.8kg/L) | 46% | 56% |
| Gravel, dry | 45% | 55% |
| Shale, riprap | 44% | 54% |
| Sand, wet | 36% | 43% |

Set Up

500 Gallon Debris Tank on VT12 Trailer

Values shown are for machine with optional jib boom, reverse flow, spare tire and carrier, and trailer tongue toolbox. Values will vary for other configurations.

| Material | Maximum Debris Tank Fill Level | |
|--|--------------------------------|------------------|
| | Water Tank Full (200gal/757L) | Water Tank Empty |
| Wood chips, dry | 100% | 100% |
| Snow, dry | 100% | 100% |
| Water | 74% | 100% |
| Lightweight mud, 8-10lb/gal (1-1.2kg/L) | 69% | 100% |
| Earth, dry loose | 64% | 99% |
| Caliche | 59% | 91% |
| Earth, loam | 59% | 91% |
| Mid-weight mud, 10-12lb/gal (1.2-1.44kg/L) | 56% | 86% |
| Limestone, crushed | 48% | 74% |
| Asphalt | 46% | 71% |
| Sand, dry | 46% | 71% |
| Earth, wet excavated | 46% | 71% |
| Heavy-weight mud, 12-15lb/gal (1.44-1.8kg/L) | 46% | 70% |
| Gravel, dry | 45% | 69% |
| Shale, riprap | 44% | 68% |
| Sand, wet | 36% | 55% |

500 Gallon Debris Tank on VT14 Trailer

Values shown are for machine with optional jib boom, reverse flow, spare tire and carrier, and trailer tongue toolbox. Values will vary for other configurations.

| Material | Maximum Debris Tank Fill Level | |
|--|--------------------------------|------------------|
| | Water Tank Full (200gal/757L) | Water Tank Empty |
| Wood chips, dry | 100% | 100% |
| Snow, dry | 100% | 100% |
| Water | 100% | 100% |
| Lightweight mud, 8-10lb/gal (1-1.2kg/L) | 100% | 100% |
| Earth, dry loose | 100% | 100% |
| Caliche | 98% | 100% |
| Earth, loam | 98% | 100% |
| Mid-weight mud, 10-12lb/gal (1.2-1.44kg/L) | 93% | 100% |
| Limestone, crushed | 80% | 93% |
| Asphalt | 76% | 89% |
| Sand, dry | 76% | 89% |
| Earth, wet excavated | 76% | 89% |
| Heavy-weight mud, 12-15lb/gal (1.44-1.8kg/L) | 75% | 88% |
| Gravel, dry | 74% | 87% |
| Shale, riprap | 73% | 85% |
| Sand, wet | 59% | 69% |

Set Up

500 Gallon Debris Tank on VT17 Trailer

Values shown are for machine with optional hydraulic jack, power boom, spare tire and carrier, and trailer tongue tool box. Values will vary for other configurations.

| Material | Maximum Debris Tank Fill Level | |
|--|--------------------------------|------------------|
| | Water Tank Full (200gal/757L) | Water Tank Empty |
| Wood chips, dry | 100% | 100% |
| Snow, dry | 100% | 100% |
| Water | 100% | 100% |
| Lightweight mud, 8-10lb/gal (1-1.2kg/L) | 100% | 100% |
| Earth, dry loose | 100% | 100% |
| Caliche | 100% | 100% |
| Earth, loam | 100% | 100% |
| Mid-weight mud, 10-12lb/gal (1.2-1.44kg/L) | 100% | 100% |
| Limestone, crushed | 97% | 100% |
| Asphalt | 92% | 100% |
| Sand, dry | 92% | 100% |
| Earth, wet excavated | 92% | 100% |
| Heavy-weight mud, 12-15lb/gal (1.44-1.8kg/L) | 91% | 100% |
| Gravel, dry | 89% | 100% |
| Shale, riprap | 88% | 100% |
| Sand, wet | 71% | 90% |

800 Gallon Debris Tank on VT20 Trailer

Values shown are for machine with optional jib boom, reverse flow, spare tire and carrier, trailer tongue toolbox, and water heater. Values will vary for other configurations.

| Material | Maximum Debris Tank Fill Level | |
|--|--------------------------------|------------------|
| | Water Tank Full (200gal/757L) | Water Tank Empty |
| Wood chips, dry | 100% | 100% |
| Snow, dry | 100% | 100% |
| Water | 100% | 100% |
| Lightweight mud, 8-10lb/gal (1-1.2kg/L) | 100% | 100% |
| Earth, dry loose | 100% | 100% |
| Caliche | 100% | 100% |
| Earth, loam | 100% | 100% |
| Mid-weight mud, 10-12lb/gal (1.2-1.44kg/L) | 100% | 100% |
| Limestone, crushed | 88% | 100% |
| Asphalt | 84% | 100% |
| Sand, dry | 84% | 100% |
| Earth, wet excavated | 84% | 100% |
| Heavy-weight mud, 12-15lb/gal (1.44-1.8kg/L) | 83% | 99% |
| Gravel, dry | 82% | 97% |
| Shale, riprap | 80% | 95% |
| Sand, wet | 65% | 77% |

Set Up

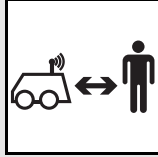
800 Gallon Debris Tank on VT24 Trailer

Values shown are for machine with optional power boom and reverse flow. Values will vary for other configurations.

| Material | Maximum Debris Tank Fill Level | |
|--|--------------------------------|------------------|
| | Water Tank Full (200gal/757L) | Water Tank Empty |
| Wood chips, dry | 100% | 100% |
| Snow, dry | 100% | 100% |
| Water | 100% | 100% |
| Lightweight mud, 8-10lb/gal (1-1.2kg/L) | 100% | 100% |
| Earth, dry loose | 100% | 100% |
| Caliche | 100% | 100% |
| Earth, loam | 100% | 100% |
| Mid-weight mud, 10-12lb/gal (1.2-1.44kg/L) | 100% | 100% |
| Limestone, crushed | 100% | 100% |
| Asphalt | 100% | 100% |
| Sand, dry | 100% | 100% |
| Earth, wet excavated | 100% | 100% |
| Heavy-weight mud, 12-15lb/gal (1.44-1.8kg/L) | 100% | 100% |
| Gravel, dry | 98% | 100% |
| Shale, riprap | 96% | 100% |
| Sand, wet | 78% | 100% |

Wireless Remote Control

Check batteries. Replace if needed. See "Battery, Wireless Remote Control" on page 106.



CAUTION Remote-controlled equipment. Impact can cause death or serious injury. Stay away.

To help avoid injury:

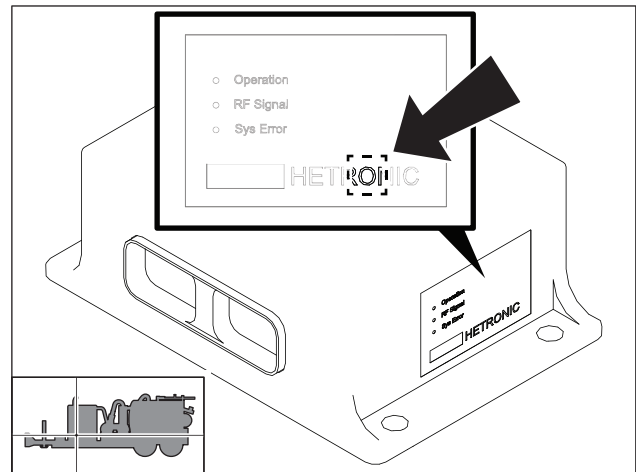
- Keep machine in sight at all times when using wireless remote control.
- Keep a safe distance away from machine when operating wireless remote control.
- Remove strap from around neck when using wireless remote control near moving parts.

EMERGENCY STOP: Press engine stop on wireless remote control.

NOTICE: Place wireless remote control in storage box after use. Take care not to store with neck strap on top of switches.

Wireless remote control should be paired to receiver at factory. If paired connection is lost, re-pair control to receiver.

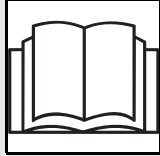
1. Activate accessories using ignition switch.
2. Locate wireless receiver box inside power pack.
3. Press and hold "O" (shown) in the word "HETRONIC" to engage pairing button.
4. While holding down pairing button, turn on remote control.
5. Release pairing button.
6. Turn off remote control.
7. Shut off machine.
8. Activate accessories using ignition switch.
9. Turn remote control on and test for function.



j70om081w.eps

Start

EMERGENCY SHUTDOWN: Turn ignition switch off.



⚠ WARNING Misuse of machine can cause death or serious injury. Read and understand operator's manual and all other safety instructions before use. Know how to use all controls.

To help avoid injury:

- Allow hydraulic fluid time to warm before operating in cold weather. Cold hydraulic fluid can lengthen ground drive stopping time.
- For starting in extreme temperatures, contact your Ditch Witch® dealer.



⚠ WARNING Pre-heater. Fire or explosion can cause death or serious injury. Never use starter fluid.

NOTICE: If engine turns but does not start within 10 seconds, allow starter to cool. Wait at least 30 seconds and try again.

1. Open tank inlet valve.
2. Ensure machine is in vacuum mode.
3. Ensure all controls are in neutral.
4. Insert key and activate accessories using ignition switch.
5. **If starting machine in normal conditions**, start engine and run at medium throttle under light load for at least one minute before applying heavier load.

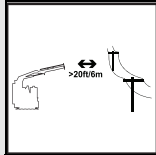
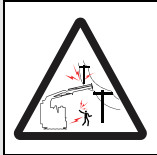
If starting machine in cold weather:

- 5.1 Press and hold cold start switch for 8-10 seconds. Cold start wait indicator will light.
- 5.2 When cold start wait indicator turns off, start engine.
- 5.3 Warm engine and hydraulic fluid by gradually increasing engine speed for up to 30 minutes.
- 5.4 After warmup, carefully operate all hydraulic controls at low throttle until controls operate as described in controls chapter.

Position Vacuum Boom

The vacuum boom is optional equipment. Contact your Ditch Witch® dealer to add this option. Always secure boom when not in use.

Precautions near Electrical Power Lines



⚠ WARNING Overhead electric lines. Exposure will cause death or serious injury. Keep boom away from electric lines. Use a spotter.

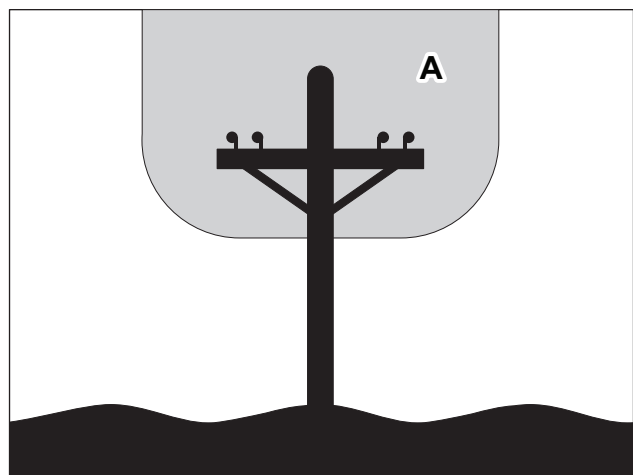
To help avoid injury:

- Follow US Occupational Safety and Health Administration (OSHA) or other applicable regulating guidelines for working around power lines.
- Observe minimum clearance requirements.

| Normal Voltage (Phase to Phase) | Minimum Operating Clearance Required | Normal Voltage (Phase to Phase) | Minimum Transporting Clearance Required |
|---------------------------------|--------------------------------------|---------------------------------|---|
| up to 50kV | 10' (3m) | up to 0.75kV | 4' (1.2m) |
| 51-200kV | 15' (4.6m) | 0.76-200kV | 6' (1.8m) |
| 201-350kV | 20' (6m) | 201-345kV | 10' (3.8m) |
| 351-500kV | 25' (7.6m) | 346-750kV | 16' (4.9m) |
| 501-750kV | 35' (10.7m) | 751-1000kV | 20' (6.1m) |
| 751-1000kV | 45' (13.7m) | unknown | 20' (6.1m) |

Never enter the danger zone (A), unless one of the following conditions is met:

- An appointed person has confirmed that electrical distribution and transmission lines have been de-energized and visibly grounded at the point of work.
- Insulating barriers (not a part of the boom) have been erected to prevent physical contact with electrical lines.



t59om114w.eps

Procedure



⚠ WARNING Raised component. Crushing can cause death or serious injury. Stay away or secure raised component with locking device. Use correct equipment and procedures.

To help avoid injury:

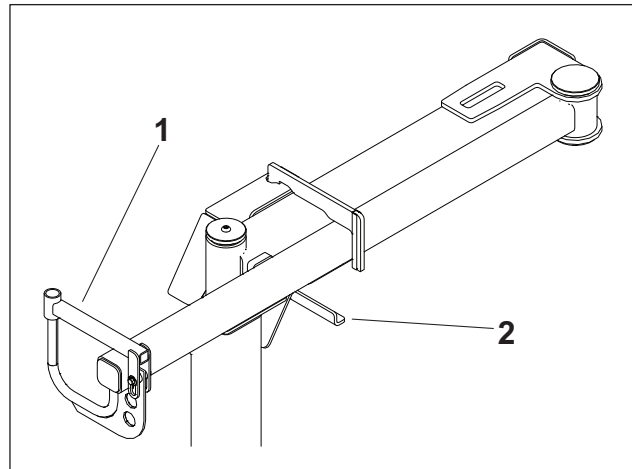
- Secure boom before lifting tank.
- Never move boom when tank is tilted up.
- Always check boom path before moving boom.
- If machine is parked on a slope, control boom so it does not swing freely when released.
- Never use boom to lift or move objects.

NOTICE: Do not use boom to break vacuum.

Jib Boom

1. Remove vacuum hoses from storage.
2. Run hoses along boom, securing with tube latch (1).
3. Lift pin (2) to release boom arms.

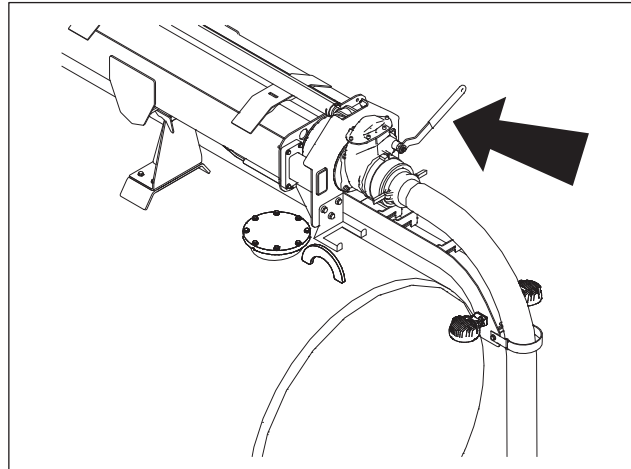
NOTICE: Ensure pin is fully engaged when stowing jib boom.



j70om065w.eps

Power Boom

1. Remove vacuum hoses from storage.
2. Use lever (shown) to ensure inlet valve on boom is closed.
3. Attach hoses at tank inlet valve.
4. Operate boom from rear console or wireless remote control.
5. Open tank inlet valve to start vacuum flow.

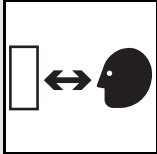


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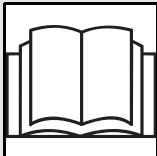
Remove Debris

EMERGENCY SHUTDOWN:

- Close tank inlet valve to shut off suction.
- Turn ignition switch off or press engine stop button on wireless control module.



⚠ DANGER Suction. Suffocation will cause death. Keep hose end away from face.



⚠ WARNING Misuse of machine can cause death or serious injury. Read and understand operator's manual and all other safety instructions before use. Know how to use all controls.

To help avoid injury:

- Never excavate hazardous or other toxic materials. Machine is designed to excavate only soil cuttings, drilling fluids, and other non-toxic waste.
- Never lift an object using vacuum hose.



⚠ WARNING Static charge. Fire or explosion can cause death or serious injury. Never vacuum flammable or combustible substances.

To help avoid injury:

- Use proper equipment to monitor inlet air to ensure it is outside of flammability limits.
- Use proper grounding equipment.
- See "Set Up" on page 68.

NOTICE: Close tank inlet valve or shut off machine to break suction when hose or tool gets stuck on the ground or to what is being vacuumed.

1. Position vacuum hose in area to be excavated.
2. Start engine.
3. Open tank inlet valve if necessary to begin excavation.


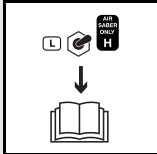
4. Use sight glass to monitor debris level in tank. Vacuum will shut off automatically when tank is full but engine will remain running.

NOTICE: Exceeding maximum fill level will overload trailer. See “Monitor Working Trailer Weight” on page 68.


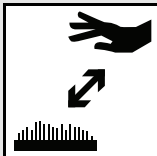
Pothole

EMERGENCY SHUTDOWN:

- Close tank inlet valve to shut off suction
- Turn ignition switch off or press engine stop button on wireless control module.

WARNING High pressure. Impact can cause death or serious injury. Refer to air tool manual to ensure proper pressures are used.

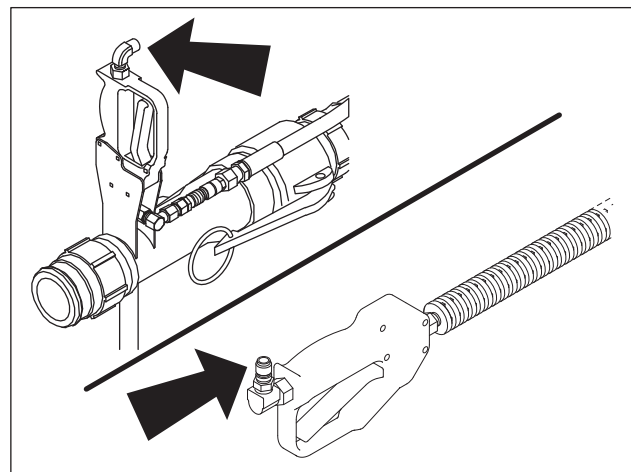
CAUTION Hot parts. Contact can cause burns. Only touch when cool or wear gloves.

Set Up

1. Remove 2-in-1 potholing tool or digging lance from storage.

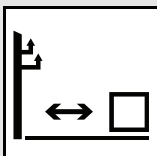
IMPORTANT: Do not use wash wand for digging tasks.

2. Connect water pressure hose to 2-in-1 potholing tool or digging lance where shown.



J70om089w.eps

Operate



⚠ DANGER Overhead electrical lines. Contact will cause death or serious injury. Know location of lines. Stay away.

To help avoid injury: Never direct water at overhead lines.



⚠ WARNING Pressurized fluid or air. contact can cause death or serious injury. Refer to operator's manual for correct use.

To help avoid injury:

- Never use high pressure when using wash wand.
- When exposing utilities, only use rotating nozzle.
- Never point or aim nozzle at yourself or anyone else.
- Keep nozzle low to the ground but never allow tip to touch ground or utility.
- Keep tool moving over area to be potholed. Never point nozzle at utility continuously.
- Test water pressure on a sample of utility line material to be exposed. Adjust pressure until no damage occurs to the material. High pressure water can cut utility lines.

1. Open water tank supply valve.
2. Open tank inlet valve.
3. Start engine.
4. Turn on water pump.
5. Position tool over area to be excavated

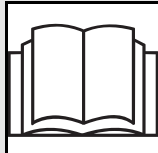
| 2-in-1 Tool | Digging Lance |
|---|---|
| 5.1 Squeeze water pressure lever to start water pressure. 5.2 Work pressurized water in side-to-side or circular motion to loosen and excavate soil until hole is at desired diameter and depth. | 5.1 Use digging lance to loosen soil. 5.2 Work lance in side-to-side or circular motion to excavate soil. 5.3 Use digging lance and vacuum alternately until hole is at desired diameter and depth. |

6. Adjust water pressure as needed to match soil conditions and/or material of utility being exposed.
7. Ensure water sprays from nozzle. If it does not, nozzle may be clogged and pump will not function properly. Clean or replace nozzle as necessary.

- When freshwater tank is empty, stop operation and turn water pump off.

NOTICE: Never operate with freshwater tank empty.

Drain Tank

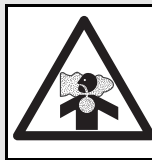


⚠ WARNING

Misuse of machine can cause death or serious injury. Read and understand operator's manual and all other safety instructions before use. Know how to use all controls.

To help avoid injury:

- Never unhitch from tow vehicle before or during dumping. A freestanding machine can become unstable when tilting tank.
- Only unlatch door with tank fully lowered.



⚠ CAUTION

Silica dust. Exposure can cause lung disease. Use breathing protection.

To help avoid injury:

- Use water spray or other means to control dust.
- Follow US Occupational Safety and Health Administration (OSHA) or other applicable regulating guidelines for appropriate breathing protection or dust control methods.

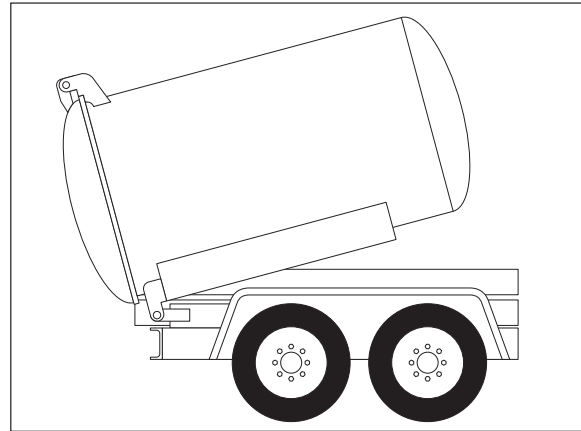
- Ensure machine is hitched to vehicle. See "Hitch Trailer" on page 63.
- Haul to approved dumping area.

NOTICE: Never drive with tank door raised.

- Open tank outlet valve.
- Open tank inlet valve.
- Allow tank to drain in the horizontal position until tank is approximately half drained.
- Start engine and run at low throttle.
- Stow jib or power boom, if equipped. See "Stow Boom" on page 92.


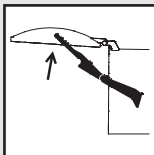
Drain Tank

8. Tilt tank up to flush solids from tank.
9. Lower tank to full horizontal position.
10. Close tank outlet valve.
11. Close tank inlet valve.



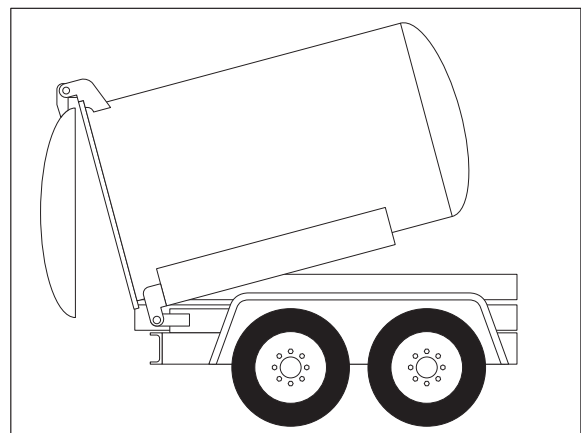
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12. If further draining is needed, open tank door.


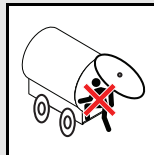
⚠ WARNING

Raised component. Crushing can cause death or serious injury. Ensure door has opened fully and locked into place before working beneath open door.



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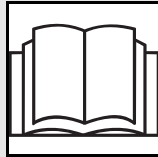
13. Tilt tank up. Allow tank to drain completely.
14. Connect water pressure hose to wash wand.
15. Turn water pump switch on. Adjust water pressure.
16. Use wash wand to thoroughly rinse inside of tank and around door seal.

⚠ DANGER Confined space. Suffocation will cause death. Stay away or follow procedures for entering.

17. Return tank to full horizontal position.
18. Close tank door.

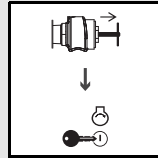
Unload to Another Tank



⚠ WARNING Contents under pressure. Impact can cause death or serious injury. Refer to operator's manual for correct use.

To help avoid injury:

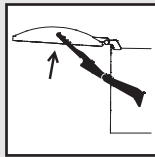
- Restrain hose prior to pressurization.
- Only open valves and tank door when tank is not pressurized.
- Never use pressure to clear clogs in vacuum hose.



⚠ WARNING High pressure. Impact can cause death or serious injury. Exercise and clean relief valve before each use.

1. Close debris tank outlet valve.
2. Connect transfer hose to debris tank outlet valve.
3. Ensure inlet valve on offboard tank is closed and tank is vented.
4. Connect other end of transfer hose to offboard tank inlet valve.
5. Close debris tank inlet valve and open debris tank outlet valve. Material may flow into transfer hose.
6. Open offboard tank inlet valve.
7. Select reverse flow.
8. Start engine. Material will flow into offboard tank.
9. When transfer is complete, close debris tank outlet valve.
10. Close offboard tank inlet valve
11. Disconnect hose only from offboard tank inlet valve.
12. Select vacuum.
13. Open debris tank outlet valve. Material will empty from transfer hose.
14. Close debris tank outlet valve.
15. Disconnect transfer hose from debris tank.

Open/Close Tank Door

**⚠ WARNING**

Raised component. Crushing can cause death or serious injury. Ensure door has opened fully and locked into place before working beneath open door.

Open

NOTICE: Only drive with tank in full horizontal position and door lowered.

IMPORTANT: Relieve pressure in tank before opening door.

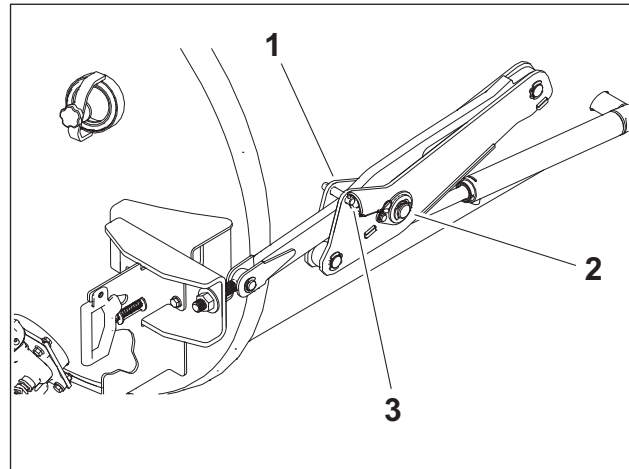
1. If optional reverse flow is installed, select vacuum function.
2. Start engine.
3. Lower tank to full horizontal position.
4. Open tank inlet valve.
5. Remove locking pins from door arms.
6. Enable door function.
7. Open door fully. See page 96 for more information.

Close

1. Ensure seal mating surfaces are clean and free of debris.
2. Close door until linkages on both sides of tank are fully collapsed.

IMPORTANT:

- Door is closed when arms are fully below round pin hole (1) and in contact with brass roller (2).
- Hold switch (or key) for two seconds after door appears closed to fully seat seals.
- Once door is fully closed, insert retaining pin (3).
- On trailers with 500 gallon (1893L) debris tanks, pin hole sits behind water tanks. Tilt tank slightly to expose pin hole.



Shut Down

1. When job is complete, move machine to level ground.
2. Return all controls to neutral.
3. Run engine at low throttle with no load for at least five minutes to cool.
4. Shut off machine.
5. If leaving machine unattended, remove key.
6. For maintenance or long-term storage, disconnect battery using battery disconnect switch.

NOTICE: Wait two minutes after shutting off machine before disconnecting battery.

Complete the Job

Chapter Contents



For additional precautions, see "Safety Awareness" and "Prepare" chapters.

| | |
|---------------------------------|-----------|
| Antifreeze Machine | 90 |
| • Add Antifreeze | 90 |
| • Reclaim Antifreeze | 90 |
| Rinse Equipment | 91 |
| Disconnect | 92 |
| Stow Tools | 92 |
| Stow Boom | 92 |
| • Jib Boom | 92 |
| • Power Boom | 92 |

Antifreeze Machine

IMPORTANT: Antifreeze can be removed from antifreeze tank and disposed of properly or it can be reused until it is too diluted to protect against freezing.

This machine can be left overnight in freezing conditions by filling fluid lines with a polypropylene-based, RV antifreeze with optional antifreeze system before shutdown.

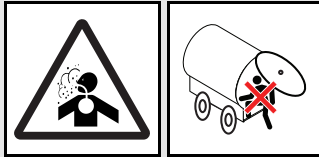
Add Antifreeze

1. Fill antifreeze tank.
2. Close water tank supply valve.
3. Open antifreeze tank valve.
4. Connect water pressure hose to wash wand.
5. Start engine.
6. Turn on water pump.
7. Squeeze wash wand handle and run until antifreeze comes out of nozzle.
8. Turn off water pump.
9. Close antifreeze tank supply valve.
10. Shut off machine.
11. Drain water tank completely.

Reclaim Antifreeze

1. Turn water pressure down.
2. Turn on water pump.
3. Put end of wash wand in antifreeze tank.
4. Squeeze wash wand handle and run until water comes out of nozzle.
5. Turn off water pump.

Rinse Equipment



⚠ DANGER Confined space. Suffocation will cause death. Stay away or follow procedures for entering.

To help avoid injury: Enter tank only if necessary. Follow US Department of Labor guidelines for entering confined spaces.



⚠ WARNING Pressurized fluid or air. Contact can cause death or serious injury. Refer to operator's manual for correct use.

To help avoid injury:

- Never use high flow when using wash wand.
- Never point or aim wand at yourself or anyone else. Keep nozzle low to the ground.

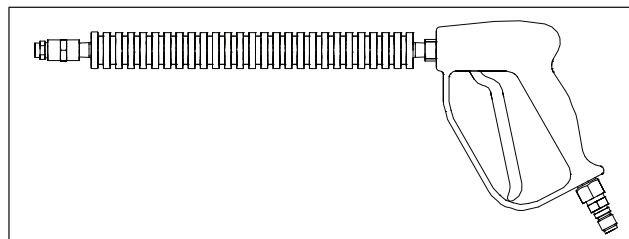


⚠ WARNING Raised component. Crushing can cause death or serious injury. Ensure door has opened fully and locked into place before working beneath open door.

NOTICE:

- Do not spray water onto operator console or electrical center in engine compartment. Water can damage electrical components. Wipe down instead.
- Do not spray water directly onto trailer axle hub caps. Water can enter hubs and cause premature wear or failure.

Use wash wand (shown) to spray water onto equipment to remove dirt and mud. Thoroughly rinse inside of tank and around door seal mating surfaces.



washWand.eps

Disconnect

Disconnect and store all hoses.

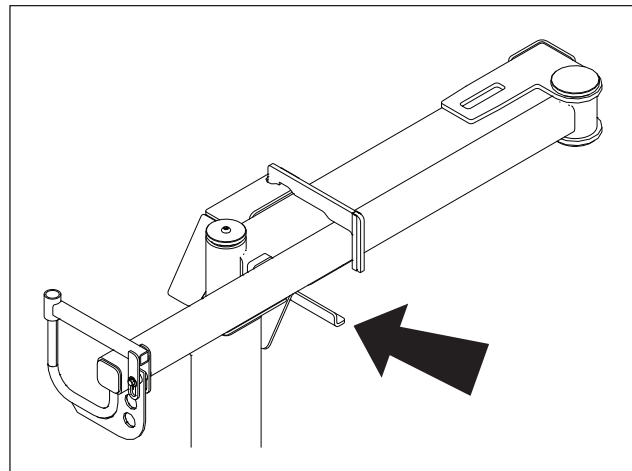
Stow Tools

Ensure hoses and tools are properly stowed.

Stow Boom

Jib Boom

1. Ensure hoses are removed and in frame rail.
2. Ensure retaining pin (shown) is engaged.



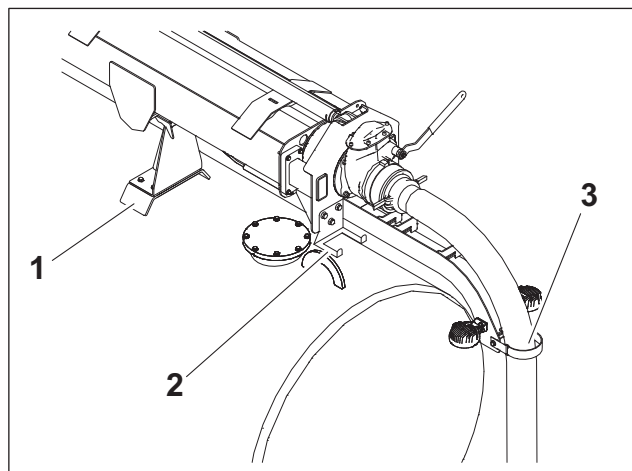
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Power Boom

1. Settle boom in place on cradle (1).

NOTICE: On 500 gallon tanks, extend boom for stowing and transport. Leaving boom retracted will cause hose to interfere with power pack.

2. Stow hose end on retaining plate (2).
3. Secure hose with retaining strap (3).



j73om020w.eps

Service

Chapter Contents



For additional precautions, see "Safety Awareness" and "Prepare" chapters.

Service Precautions 94

- Washing Precaution 94
- Welding Precaution 95
- Working under Raised Debris Tank 95
- Working under Raised Tank Door 96
- Removing/Replacing Power Pack Doors 96

Recommended Lubricants 97

- Engine Oil Temperature Chart 98
- Approved Coolant 98
- Approved Fuel 99

Vac Service Interval Chart 100

Vac Procedures 102

Trailer Service Interval Chart 124

Trailer Procedures 124

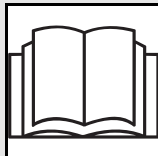
Service Precautions



⚠ WARNING Jobsite hazards. Exposure can cause death or serious injury. Use correct equipment and work methods. Use and maintain appropriate safety equipment.

To help avoid injury:

- Wear personal protective equipment including hard hat, safety eye wear, foot protection, hearing protection, and gloves (except when near rotating equipment).
- Remove jewelry.
- Wear close-fitting, high visibility clothing.
- Have other personal protective equipment, such as insulated boots and gloves, breathing protection, and face shield, etc. available for use depending on jobsite hazards or requirements.



⚠ WARNING Misuse of machine can cause death or serious injury. Read and understand operator's manual and all other safety instructions before use. Know how to use all controls.

To help avoid injury:

- Unless otherwise instructed, all service should be performed with the engine off and cool.
- Lower unsecured, raised components before servicing equipment.
- Unless otherwise instructed, all service should be performed with machine parked on level surface.
- Refer to US Occupational Safety and Health Administration (OSHA) guidelines for appropriate lockout-tagout procedures.

Washing Precaution

NOTICE: Water can damage electronics. When cleaning equipment, do not spray electrical components with water.

Welding Precaution

NOTICE: Welding can damage electronics.

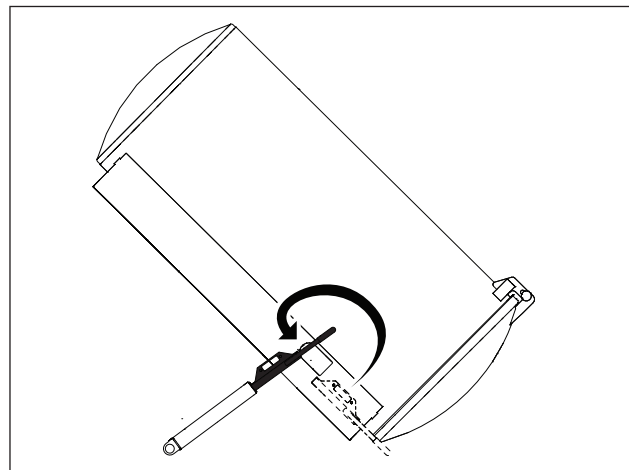
- Welding currents can damage electronic components. Always disconnect the ECU ground connection from the frame, harness connections to the ECU, and other electronic components prior to welding on machine or attachments.
- Connect welder ground close to welding point and make sure no electronic components are in the ground path.
- Disconnect battery at battery disconnect switch before welding to prevent damage to battery.
- Never turn off battery disconnect switch with engine running, or alternator and other electronic equipment devices may be damaged.

Working under Raised Debris Tank



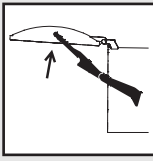
⚠ WARNING Raised component. Crushing can cause death or serious injury. Stay away or secure raised component with locking device. Use correct equipment and procedures.

1. Stow and secure boom, if equipped.
2. Raise vacuum tank.
3. Remove cylinder lockout tool (shown) and place over extended cylinder rod.
4. Lower vacuum tank until load is supported by cylinder lockout tool.



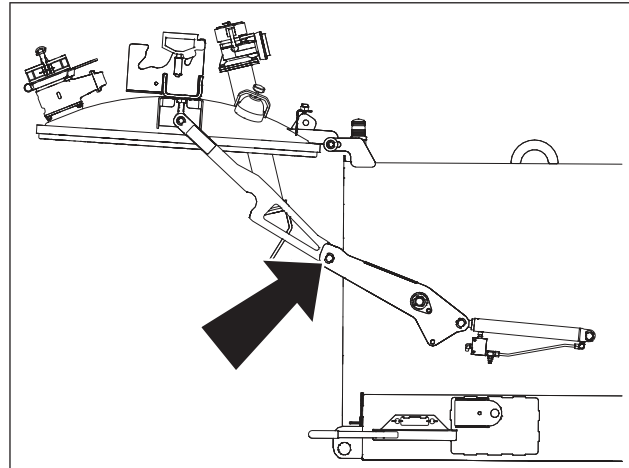
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Working under Raised Tank Door



⚠ WARNING Raised component. Crushing can cause death or serious injury. Ensure door has opened fully and locked into place before working beneath open door.

Open door fully. Door linkage is fully open when both arms stop moving and are in contact with pivoting joint (shown).



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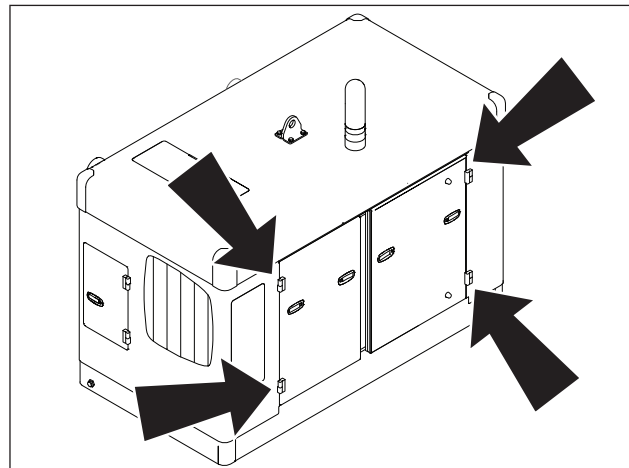
Removing/Replacing Power Pack Doors

Remove

1. Unlatch and swing door open.
2. Lift door up and off. Hinges (shown) will separate.









Replace

1. Fit hinges together to line up doors.
2. Close and latch doors.



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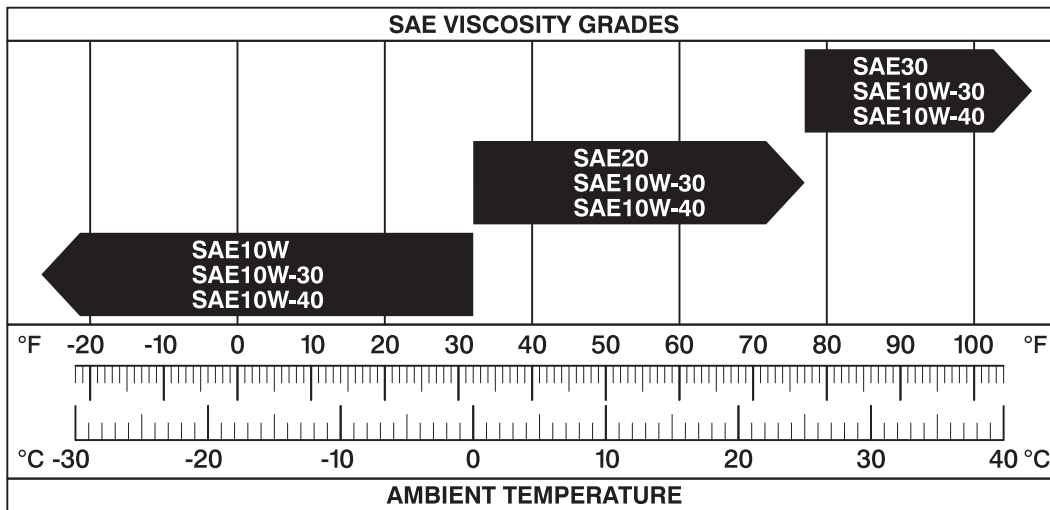
Recommended Lubricants

| Item | Description |
|---|---|
|  DEAC | Low silicate, fully formulated diesel engine antifreeze/coolant meeting ASTM D6210 See "Approved Coolant" on page 98. |
|  DEO | HRC: Diesel engine oil meeting or exceeding API service classification CH-4 (CH-4, CI-4, or CJ-4) or ACEA E7 (E6, E7, or E9). <ul style="list-style-type: none"> • API American Petroleum Institute, ACEA European Automobile Manufacturer's Association • See "Engine Oil Temperature Chart" on page 98. LRC: Diesel engine oil compatible with the sulfur content of the fuel used. <ul style="list-style-type: none"> • If fuel sulfur content exceeds 500ppm (500mg/kg), DEO base number (TBN) should exceed 10. • If fuel sulfur content exceeds 5000ppm (5000mg/kg), service interval is reduced to every 50 hours. • See "Engine Oil Temperature Chart" on page 98. |
| DOT | DOT 3 or 4 brake fluid. |
|  HTG | High temperature, NLGI #2 premium grade, petroleum-based grease |
|  MPG | Multipurpose grease, polyurea based NLGI GC-LB Grade1.5 or lithium based NLGI GC-LB Grade 2 |
|  MPS | Multipurpose aerosol spray lubricant, silicone based |
|  NDO | 30W non-detergent oil |
|  SGL | Synthetic gear oil (ISO 100), Ditch Witch® p/n 256-044. See blower manual for more information. |
|  THF | Tractor hydraulic fluid, Phillips 66® PowerTran, Mobilfluid® 423, Chevron® Tractor Hydraulic Fluid, Texaco® TDH Oil, or equivalent |

Proper lubrication and maintenance protects Ditch Witch® equipment from damage and failure. Service intervals listed are for minimum requirements. In extreme conditions, service machine more frequently. Use only genuine Ditch Witch parts, filters, approved lubricants, TJC, and approved coolants to maintain warranty. Fill to capacities listed in "Specifications" on page 129.

For more information on engine lubrication and maintenance, see your engine manual.

Engine Oil Temperature Chart



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Temperature range anticipated before next oil change

Approved Coolant

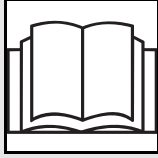
NOTICE:

- Use only pre-diluted coolant or concentrated coolant mixed with distilled water. Do not use tap water.
- Using water or high-silica automotive-type coolant will lead to engine damage or premature engine failure.
- Mixing heavy-duty diesel engine coolant and automotive-type coolants will lead to coolant breakdown and engine damage.

This machine was filled with Fleetguard® ES Compleat™ coolant (blue in color) before shipment from factory. This coolant is available, pre-diluted, from your Ditch Witch® dealer as part number 255-1055. Add or replace only with coolant meeting ASTM D6210.

Approved Fuel

HRC (Highly Regulated Countries)

**⚠ WARNING**

Ultra Low Sulfur Diesel (ULSD) poses a greater static ignition hazard than earlier diesel formulations with higher sulfur content. Avoid death or serious injury from fire or explosion; consult with your fuel or fuel system supplier to ensure the delivery system is in compliance with fueling standards for proper grounding and bonding practices.

This engine is designed to run on diesel fuel. Use only high quality fuel meeting ASTM D975 No. 2D, EN590, or equivalent. At temperatures below 32°F (0°C) winter fuel blends are acceptable. See the engine operation manual for more information.

NOTICE: Use only Ultra Low Sulfur Diesel (less than 15ppm sulfur content in the US and Canada or 10mg/kg in EU and Japan) in this machine. Operating with higher sulfur content will damage the engine and aftertreatment device.

Biodiesel blends up to 5% (B5) are approved for use in this machine. The fuel must meet the specifications for diesel fuel shown above. In certain markets, higher blends may be used if certain steps are taken. Extra attention is needed when using biodiesel, especially when operating in cold weather or storing fuel. Contact your Ditch Witch® dealer or the engine manufacturer for more information.

LRC (Less Regulated Countries)







This engine is designed to run on diesel fuel. Use only high quality fuel meeting ASTM D975 No. 2D, EN590, or equivalent. At temperatures below 32°F (0°C) winter fuel blends are acceptable. See the engine operation manual for more information.

NOTICE: Worldwide, fuel sulfur regulations vary widely. Fuel used should always comply with local regulations. Prior to shipping, LRC machines were filled with API CJ-4 DEO. If using fuel with sulfur content above 15ppm (15mg/kg), change oil initially at 250 hours.

Biodiesel blends up to 5% (B5) are approved for use in this machine. The fuel must meet the specifications for diesel fuel shown above. In certain markets, higher blends may be used if certain steps are taken. Extra attention is needed when using biodiesel, especially when operating in cold weather or storing fuel. Contact your Ditch Witch® dealer or the engine manufacturer for more information.

Vac Service Interval Chart

IMPORTANT: Chart indicates first instance of repeated service procedures. See detailed information below.

| | | | | | |
|---|--------------------------|---|-----------------|--|---------------|
|  | Adjust, service, or test |  | Change, initial |  | Lube, initial |
|  | Check |  | Change |  | Lube |

| Service | Startup | 10 Hours | 25 Hours | 50 Hours | 100 Hours | 150 Hours | 1000 Hours | 2000 Hours | As Needed |
|----------------------------------|---------|----------|----------|----------|-----------|-----------|------------|------------|-----------|
| Air intake system | | ▲ | | | | | | | |
| Battery | | ▲ | | | | | | | ▽ |
| Battery, wireless remote control | | | | | | | | | ■ |
| Belt, blower | | ▲ | | | | ▲ | | | ■ |
| Belt, fan | | | | ▲ | | | | | ■ |
| Belt, water pump | | ▲ | | | | | | | ■ |
| Blower | | | | | | | | | ● |
| Blower bearings | | | | ● | | | | | |
| Boom, extension shaft | | | | ● | | | | | |
| Boom, mounting bolts | | | | | ▲ | | | | |
| Boom, pivot | | | ● | | | | | | |
| Boom, structure | | | | | ▲ | | | | |
| Coolant | | ▲ | | | | | | ■ | |
| Cyclonic separator canister | ▽ | ▽ | | | | | | | |
| Debris tank deflector | | ▲ | | | | | | | |
| Debris tank door rollers | | | | | ▲ | | | | |
| Debris tank door seals/fittings | | ▲ | | | | | | | |

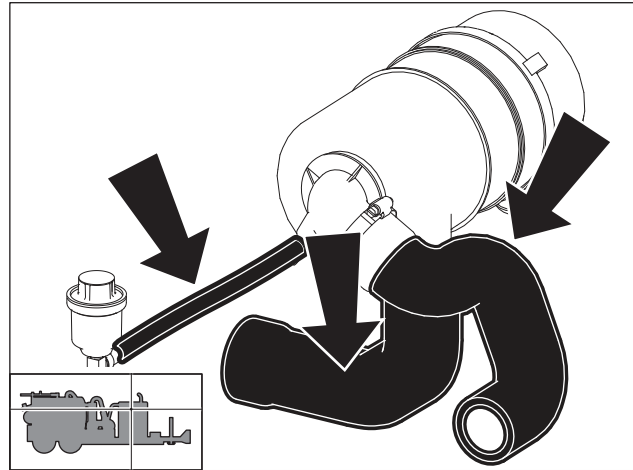
Vac Procedures

Air Intake System

Check air intake system (shown) for dirt and debris every 10 hours.

If clamp is loose, apply oil to threads and retighten.

If hose is cracked or worn, replace.



j70om001w20.eps

Battery



⚠ CAUTION Corrosive fluid. Contact can cause death or serious injury. Avoid contact. Wear appropriate gloves. See Safety Data Sheet (SDS) for more information.

To help avoid injury:

- Never attempt to charge a battery that is leaking, bulging, heavily corroded, frozen, or otherwise damaged.
- Refer to Safety Data Sheet (SDS) for additional information regarding battery.



⚠ CAUTION Explosive hydrogen gas. Fire or explosion can cause death or serious injury. Keep heat flames, sparks, and other sources of ignition away.

To help avoid injury:

- Use a single 12V maximum source for charging. Never connect to rapid chargers or dual batteries.
- Never lean over battery when making connections.
- Never allow vehicles to touch when charging.
- Never short-circuit battery terminals for any reason or strike battery posts or cable terminals.
- Refer to Safety Data Sheet (SDS) for additional information regarding battery.

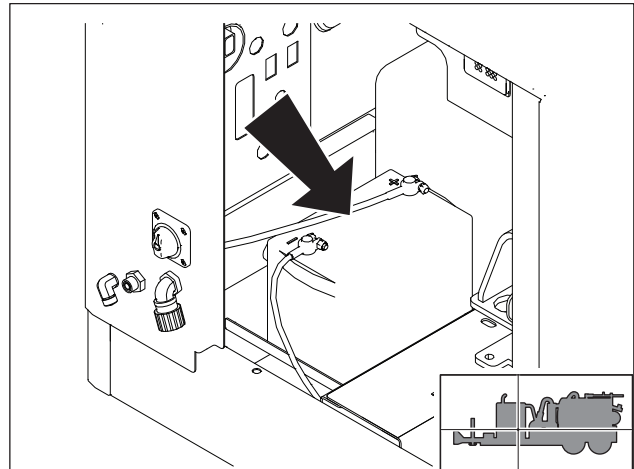
NOTICE:

- Electronic components can be easily damaged by electrical surges. Jump starting can damage electronics and electrical systems, and is not recommended. Try to charge the battery instead. Use quality large diameter jumper cables capable of carrying high currents (400 amps or more). Low quality cables may not allow enough current flow to charge a dead/discharged battery.
- Read all steps thoroughly and review illustration before performing procedure.

Check every 10 hours. Charge as needed.

Check

1. Disconnect battery at battery disconnect switch, if equipped.
2. Ensure no ignition sources are near battery.
3. Loosen and remove battery cable clamps carefully, negative (-) cable first.
4. Clean cable clamps and terminals to remove dull glaze.
5. Check for signs of internal corrosion in cables.
6. Connect battery cable clamps, positive (+) cable first.
7. Tighten any loose connections.
8. Ensure that battery tiedowns are secure.
9. Turn battery disconnect, if equipped, on.



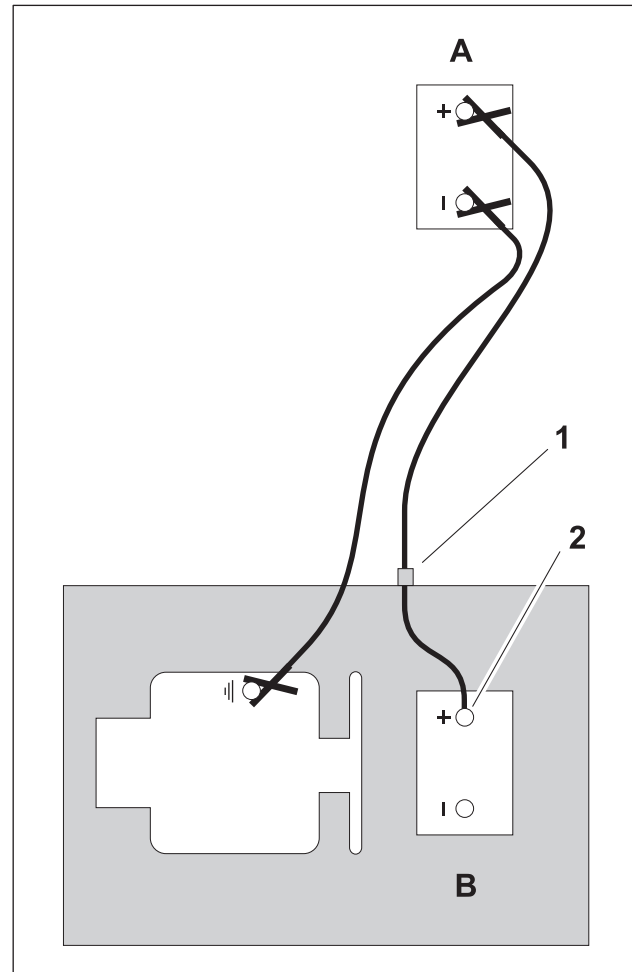
j70om044w.eps

Charge

1. Park service vehicle close to disabled machine but do not allow vehicles to touch.
2. Set parking brake in both, if equipped.
3. Turn both off.
4. Disconnect machine controller.
5. Inspect battery in disabled machine (B) for signs of cracking, bulging, leaking, or other damage.
6. Connect red positive (+) jumper cable clamp to positive (+) post of battery (2) in disabled machine.

IMPORTANT: Some machines may have a positive jumper cable terminal (1) located externally. If so equipped, connect red positive (+) jumper cable clamp to terminal.

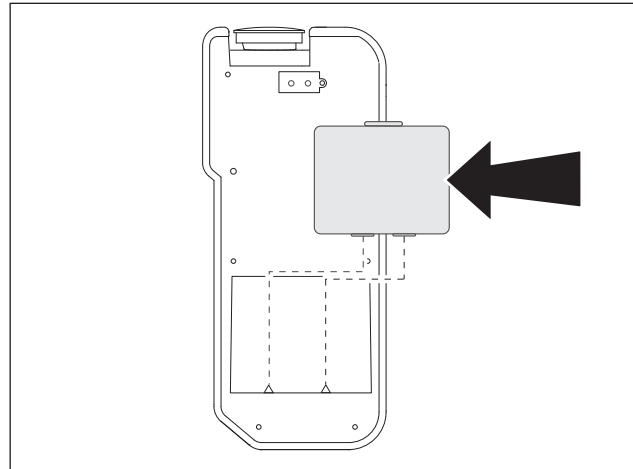
7. Connect the other red positive (+) jumper cable clamp to positive (+) post of battery (A) in service vehicle.
8. Connect black negative (-) cable clamp to negative (-) post of battery (A) in service vehicle.
9. Connect the other black negative (-) cable clamp to engine or frame ground on disabled machine, at least 12" (305 mm) from failed battery, as shown.
10. Operate service vehicle engine at 1500-2000 rpm for a few minutes to build an electrical charge in failed battery.
11. Stop engine in service vehicle.
12. Remove jumper cables from service vehicle, black negative (-) clamp first. Do not allow clamps to touch.
13. Remove black negative (-) cable clamp from disabled engine or frame ground.
14. Remove red positive (+) cable clamp from disabled machine.
15. Reconnect machine controller.
16. Start disabled machine.



Battery, Wireless Remote Control

Change batteries as needed.

1. Remove back cover.
2. Remove battery adapter (shown).
3. Remove old batteries from battery adapter.
4. Insert 3 AA batteries into slots battery adapter as indicated on case.
5. Slide battery adapter into battery compartment.
6. Replace back cover.



VacWirelessControlBattery.eps

Belt, Blower

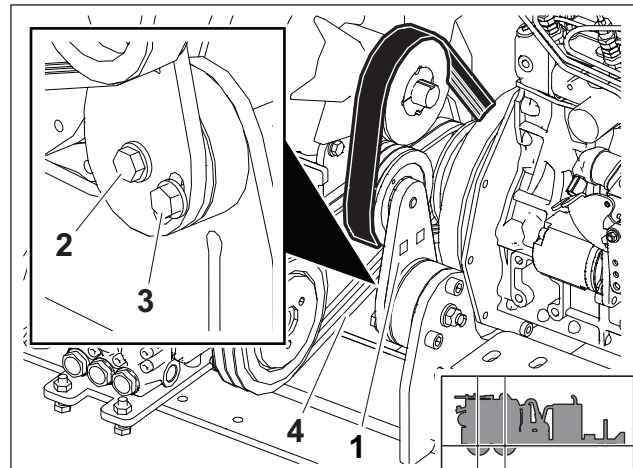
Check at 10 hours and every 150 hours thereafter.
Change as needed.

Check

Check belt (shown) for excessive slack, damage, or wear.

To adjust:

1. Apply 30ft•lb (41N•m) of torque to tensioner arm (1).
2. Tighten slot bolt (3) to 80ft•lb (108N•m).
3. Tighten cross bolt (2) to 80ft•lb (108N•m).



j70om104w.eps

Change

IMPORTANT: Water pump belt (4) must be removed before changing blower belt.

1. Loosen slot bolt.
2. Loosen cross bolt.
3. Replace belt.
4. Reassemble.
5. Adjust tension.

Belt, Fan

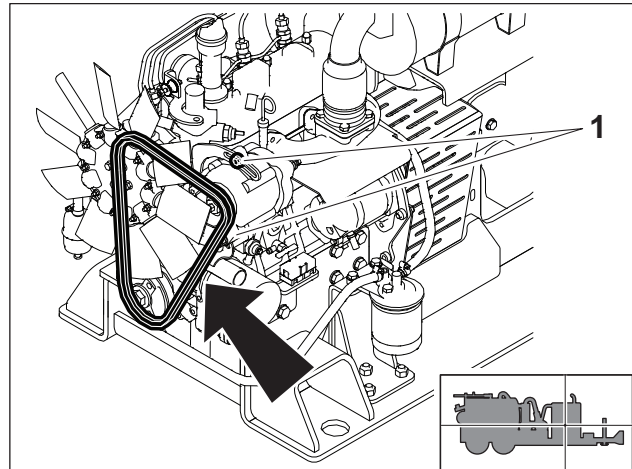
Check every 50 hours. Change as needed.

Check

Check for excessive slack, damage, or wear. Belt is properly tensioned when it moves about 1/4-3/8" (7-9mm) when pushed at the long span (shown).

Change

1. Loosen two alternator bolts (1).
2. Replace belt.
3. Adjust position as needed.
4. Tighten bolts.
5. Check tension.



j70om042w.eps

Belt, Water Pump

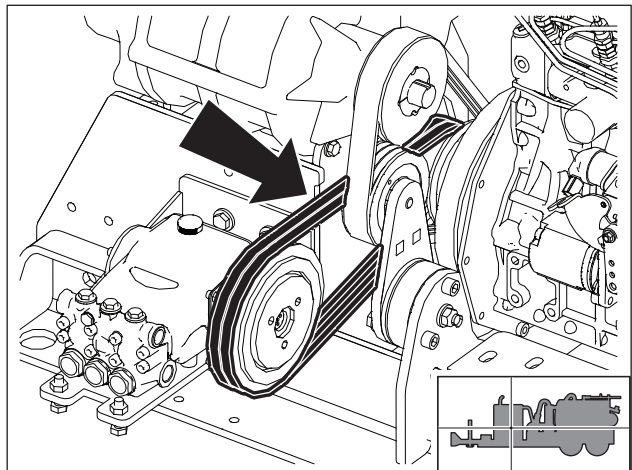
Check every 10 hours. Change as needed.

Check

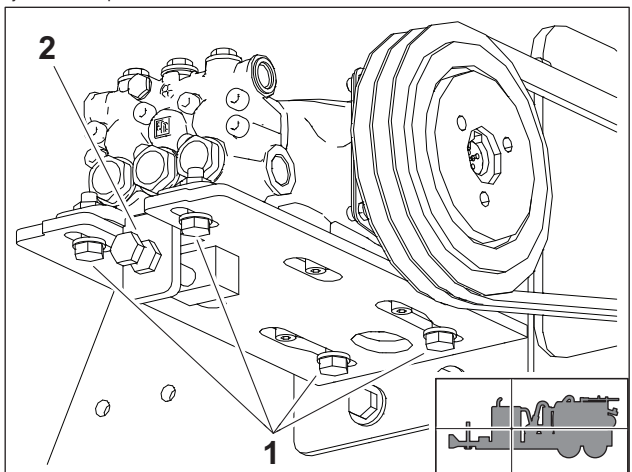
Check for excessive slack, damage, or wear. Belt is properly tensioned when it moves about 1/8-1/4" (3-6mm) when pushed where shown.

Change

1. Loosen four bolts (1) on underside of pump mount.
2. Loosen jam nut on tension screw (2) and adjust screw to relieve tension on belt.
3. Replace belt.
4. Adjust tension screw to properly tension belt.
5. Tighten jam nut on tension screw.
6. Tighten bolts to secure pump on mount.



j70om107w.eps

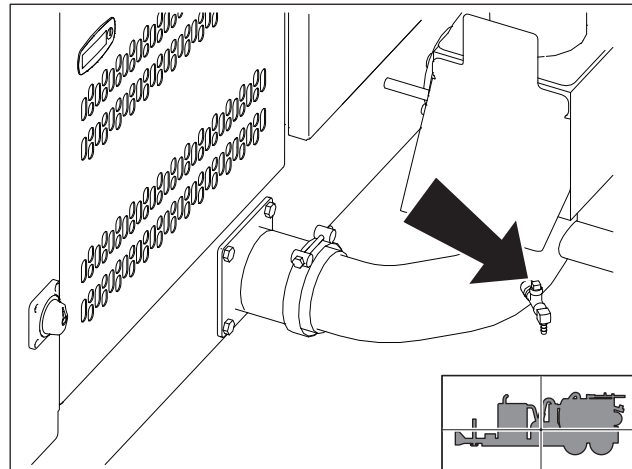


j70om108w.eps

Blower

Lube as needed to help prevent rust and seizing during long-term storage.

1. Remove plug (shown).
2. Start engine.
3. Spray light oil (WD-40® or equivalent) into port.
4. Run engine for 1-2 minutes.
5. Shut off machine.
6. Install plug.

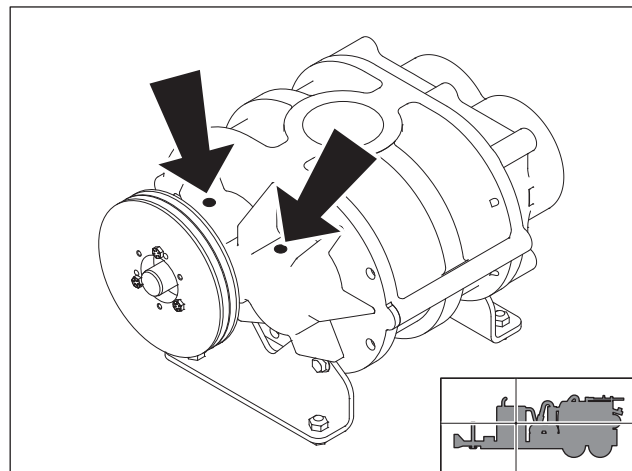


j70om071w.eps

Blower Bearings

NOTICE: Do not inject grease too quickly. Drive shaft seal damage could occur.

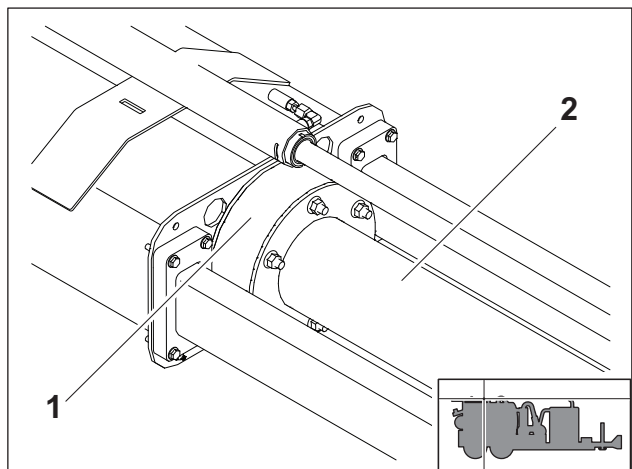
Wipe two zerks (shown) clean and lube with HTG every 50 hours. Inject grease into zerk until clean grease comes out of relief fittings.



j70om046w.eps

Boom, Extension Shaft

Lube with MPS every 50 hours. Extend boom shaft (2) fully from housing (1) to lube.



j73om017w.eps

Boom, Mounting Bolts

Check top (shown) and bottom bolts every 100 hours. Adjust as needed.

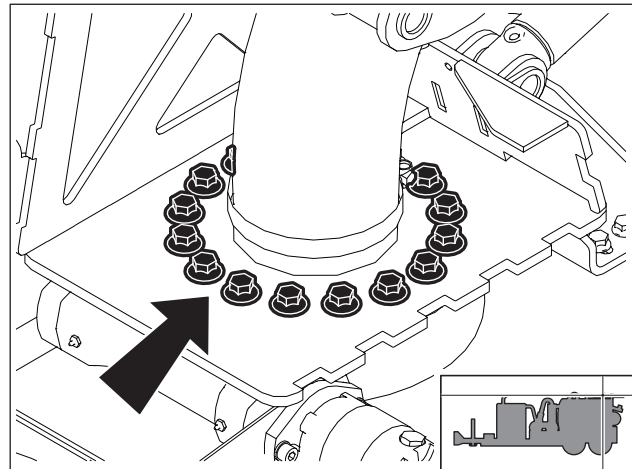
NOTICE: Bottom bolts are accessed from inside tank.

1. Ensure both sets of bolts are tightened to 160ft•lb (217N•m).

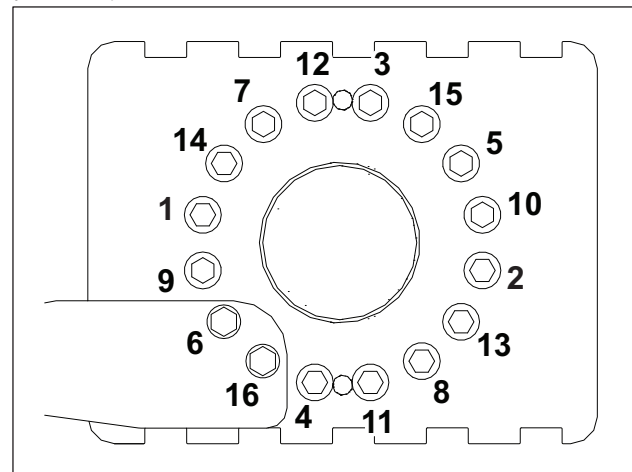
NOTICE:

- Tighten bolts in star pattern (1-16).
- Tighten one set of bolts (top or bottom) entirely before starting the other set.
- Use Loctite® 242 on threads.

2. If any bolt is excessively loose, change bolt and washer.



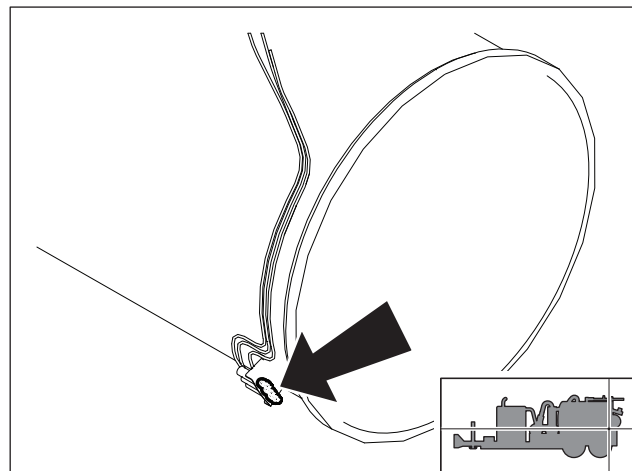
j70om088w.eps



j70om101w.eps

Boom, Pivot

Lube three zerks (shown) with MPG every 25 hours.



j70om048w.eps

Boom, Structure

If equipped, check boom structure for damage every 100 hours. Change or repair if needed.

Coolant

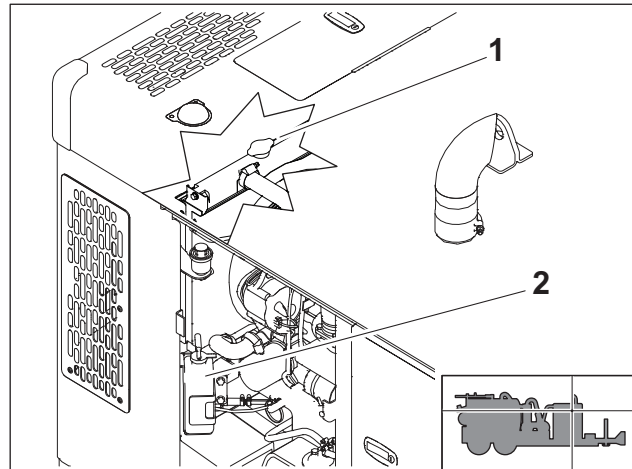
Check every 10 hours. Change every 2000 hours.

Check

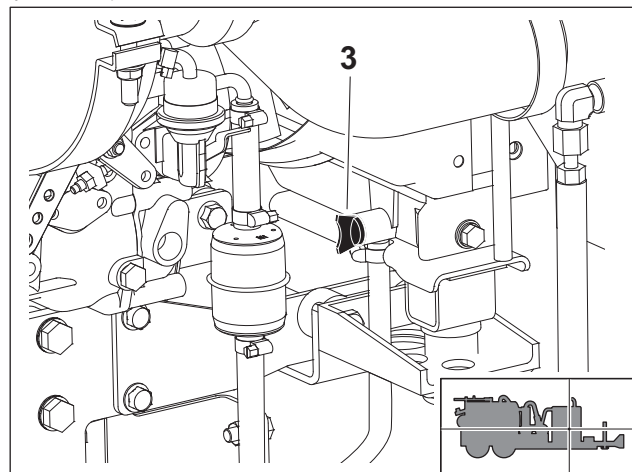
1. Check level at overflow bottle (2).
2. Add DEAC at fill (1) as needed to keep level between LOW and FULL marks on overflow bottle.

Change

1. Uncoil drain hose.
2. Open valve (3) to drain.
3. Close valve.
4. Coil and secure hose.
5. Add DEAC at fill to keep level between LOW and FULL marks on overflow bottle.



j70om073w.eps

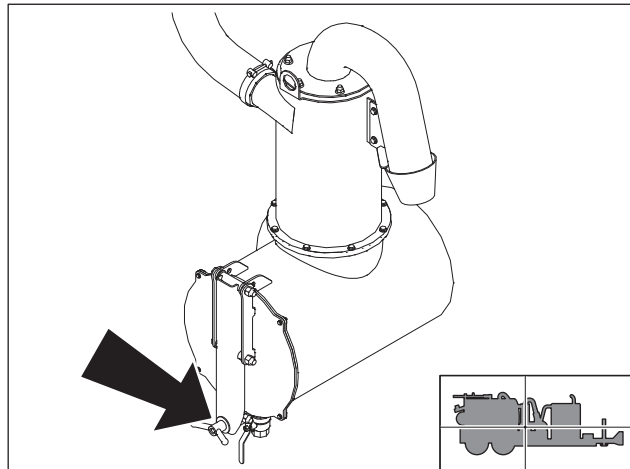


j70om053w.eps

Cyclonic Separator Canister

IMPORTANT: Relieve pressure in debris tank before emptying canister.

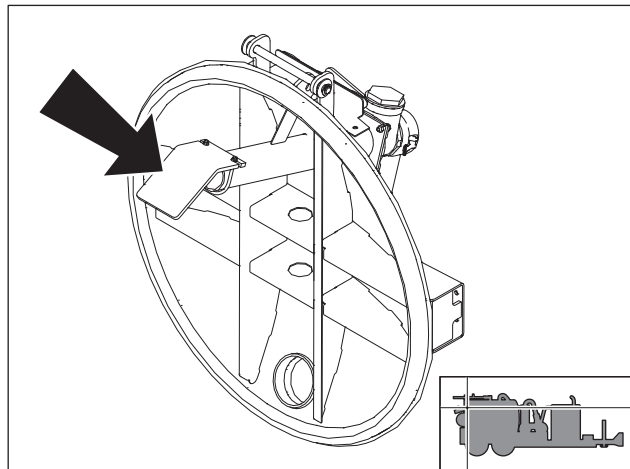
Remove wing nut (shown) to drain before startup and every 10 hours.



j70om034w.eps

Debris Tank Deflector

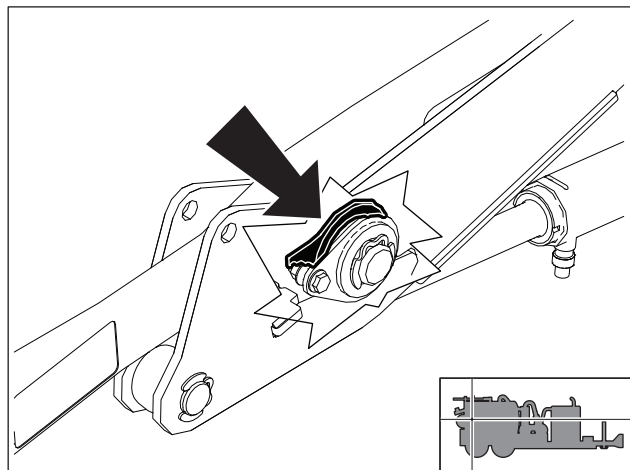
Check deflector (shown) every 10 hours for buildup, wear, or damage. Clean or change as needed.



j70om037w.eps

Debris Tank Door Rollers

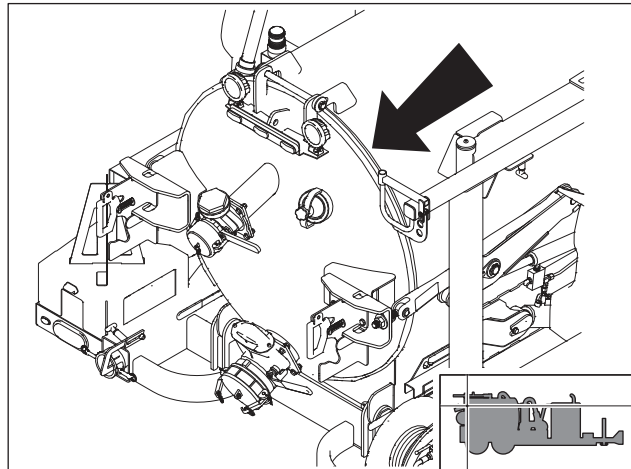
Check rollers (shown) every 100 hours for excessive wear or flat spots. Change as needed.



j70om079w.eps

Debris Tank Door Seals/ Fittings

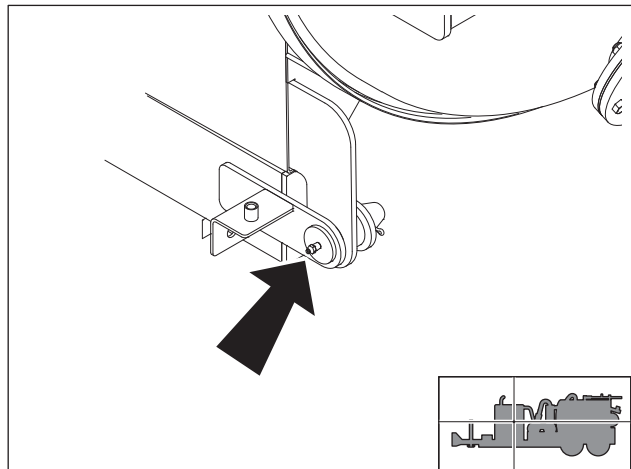
Check seal (shown) and fittings every 10 hours for wear, damage, or leaks. Change as needed.



j70om036w.eps

Debris Tank Pivot Pins

Lube two pins (shown) with MPG every 50 hours.

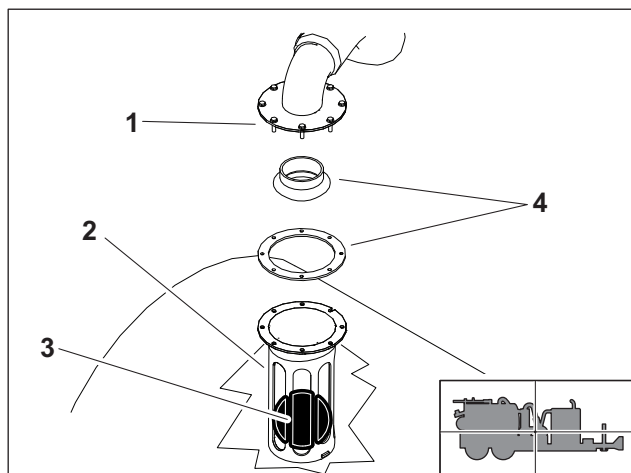


j70om047w.eps

Debris Tank Primary Shutoff Valve

Clean as needed.

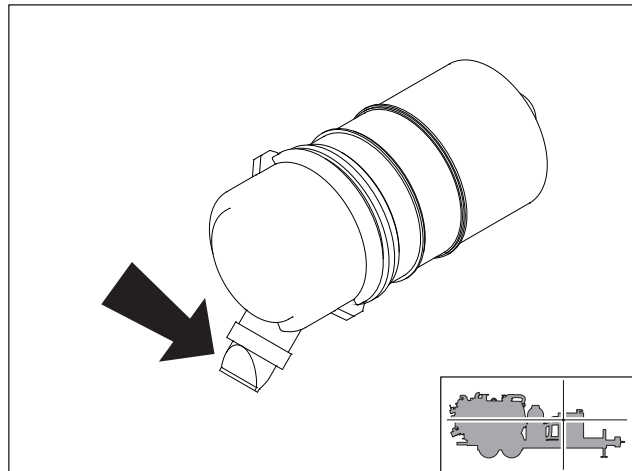
1. Loosen eight bolts (1) to remove elbow weldment.
2. Remove ball (3).
3. Clean ball, housing (2), and seals (4) with high-pressure water.
4. Inspect seals. Change as needed.
5. Reassemble.



j70om058w.eps

Dust Ejector Valve

Check valve (shown) before startup and every 10 hours. Ensure valve is not inverted, damaged, plugged, or cracked.



j330m089h.eps

Filter, Blower Relief Air

NOTICE: Operating system above 15inHG may result in blower damage.

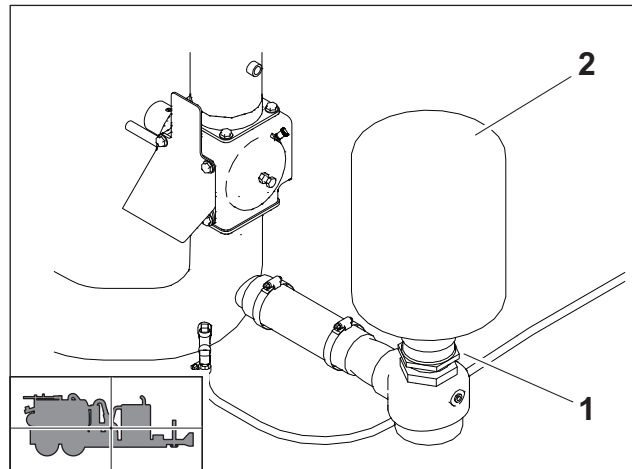
Check whenever vacuum gauge goes over 15inHG. Change as needed.

Check

Check filter (2) for dirt or debris.

Change

1. Remove clamp (1).
2. Replace filter.
3. Install clamp.



j700m072w.eps

Filter, Engine Air

NOTICE:

- Only open air filter canister when air restriction is indicated.
- Change the elements. Do not attempt to clean them.
- Compressed air or water may damage filter element.
- Tapping to loosen dirt may damage element.

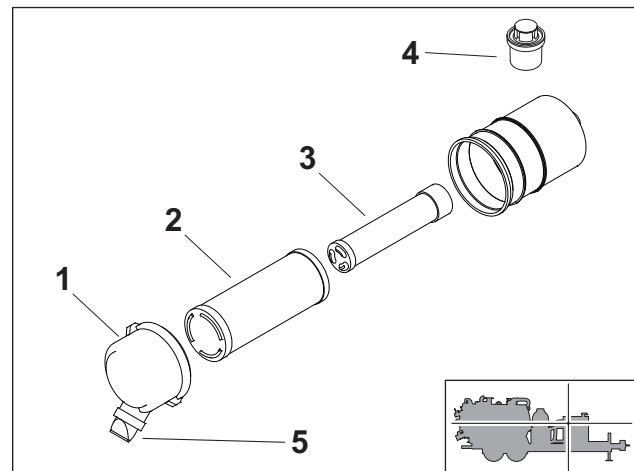
Check every 10 hours. Change as needed.

Check

Check air filter restriction indicator (4). Change filter when red band on indicator is visible.

Change

1. Remove cover (1).
2. Remove primary element (2) and secondary element (3).
3. Wipe inside of housing and wash cover.
4. Insert new secondary element and ensure it is seated correctly.
5. Insert new primary element.
6. Install cover with dust ejector (5) facing down.
7. Reset air filter restriction indicator.



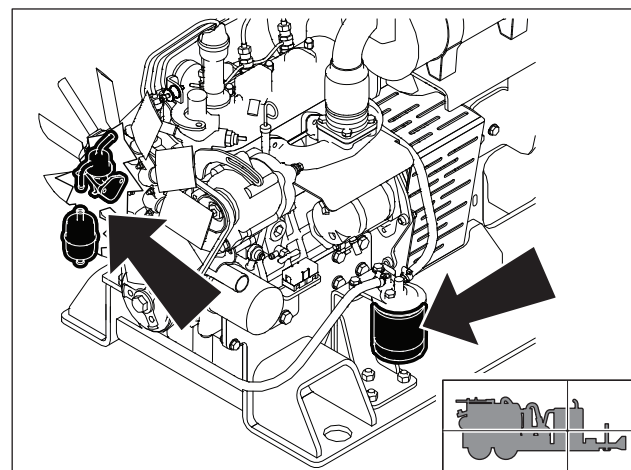
j330m074h.eps

Filter, Fuel

IMPORTANT: Do not pre-fill filters with diesel. Use hand pumps to prime.

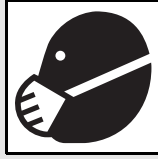
Change filters (shown) at 50 hours and every 100 hours thereafter.

1. Remove filters.
2. Thinly apply fuel over filter gaskets.
3. Install new filters.
4. Bleed air from injection pump. See engine manual for more information.



j700m041w.eps

Filter, Vacuum Air



CAUTION Silica dust. Exposure can cause lung disease. Use breathing protection.

To help avoid injury:

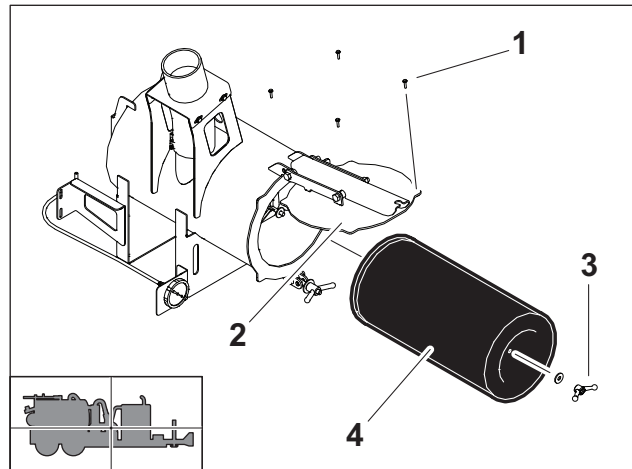
- Use water spray or other means to control dust.
- Follow US Occupational Safety and Health Administration (OSHA) or other applicable regulating guidelines for appropriate breathing protection or dust control methods.

Check every 10 hours. Clean as needed.

1. Remove bolts (1) to open cover (2).
2. Remove wing nut (3) to remove filter element (4).
3. Wipe inside of housing and wash cover.
4. Clean element with low pressure water, as needed.

NOTICE: Do not use high pressure water or air to clean filter.

5. Allow element to dry completely.
6. Reassemble.

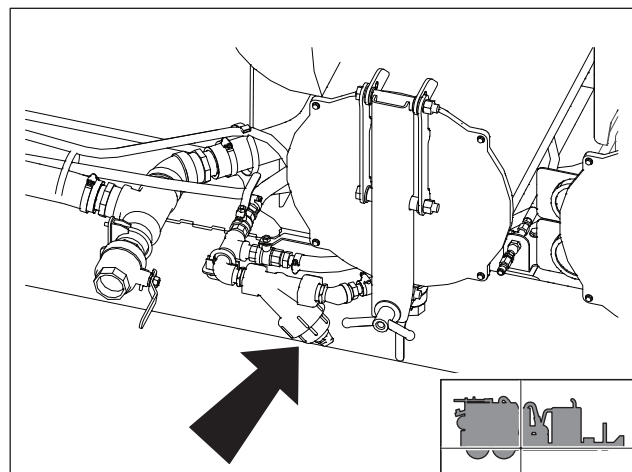


j70om032w.eps

Filter, Water Pump

Check every 10 hours. Change as needed.

1. Open filter housing (shown).
2. Remove element.
3. Wipe inside of housing.
4. Inspect element for damage or wear. Change as needed.
5. Reassemble.



j70om068w.eps

Fluid, Hydraulic

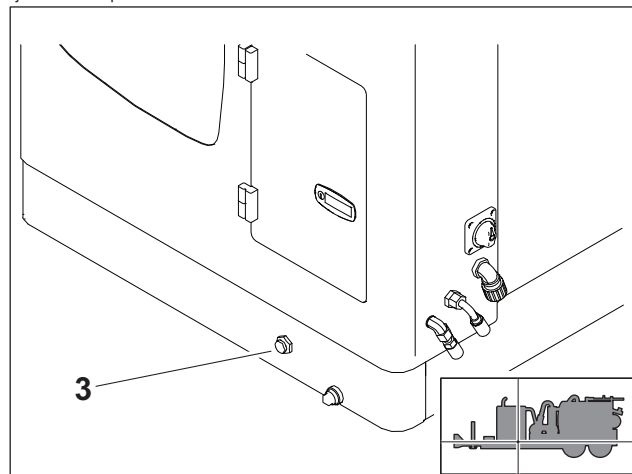
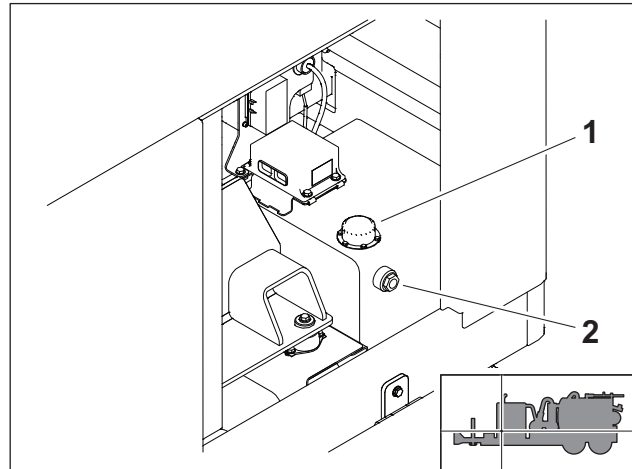
Check every 10 hours. Change at 100 hours and every 1000 hours thereafter.

Check

1. Check level at sight glass (2).
2. Add THF at fill (1) as needed to keep level at halfway point on sight glass.

Change

1. Remove plug (3) to drain.
2. Install plug.
3. Add THF at fill to keep level at halfway point on sight glass.



Hoses, Hydraulic

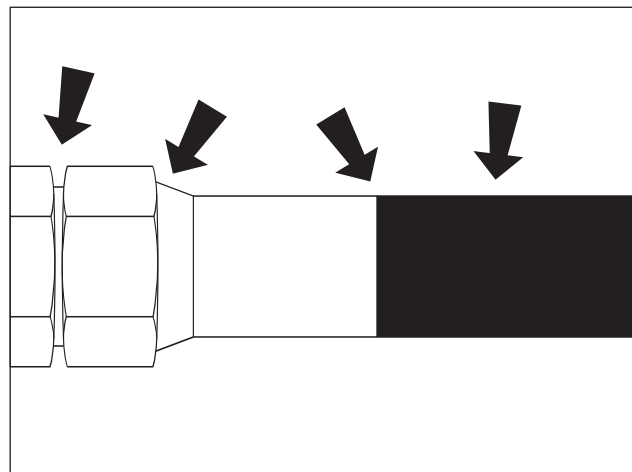


⚠ WARNING Pressurized fluid or air. Injection can cause death or serious injury. Refer to operator's manual for correct use.

To help avoid injury:

- Use a piece of cardboard or wood, rather than hands, to check for leaks.
- Before disconnecting a hydraulic line, turn engine off and operate all controls to relieve pressure.
- Lower, block, or support any raised component with a hoist.
- Cover connection with heavy cloth and loosen connector nut slightly to relieve residual pressure. Catch all fluid in a container.
- Before using system, check that all connections are tight and all lines are undamaged.
- If you are injured, seek immediate medical attention from a doctor familiar with this type of injury.

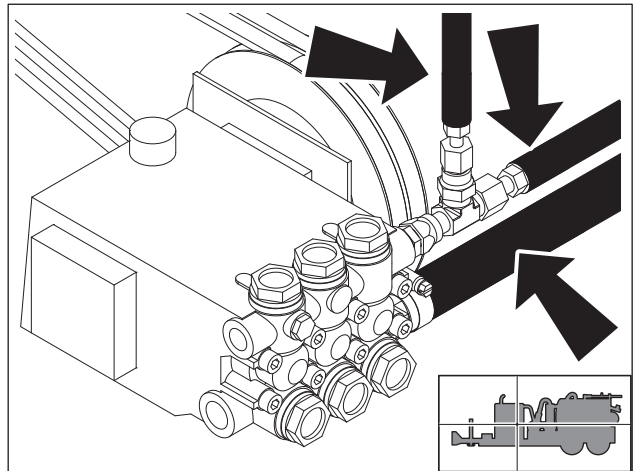
Check for leaks where shown before startup and every 10 hours.



CheckHoses.eps

Hoses, Water

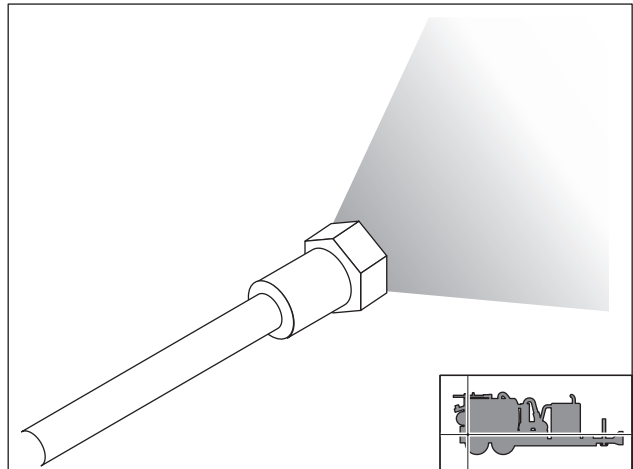
Check hoses (shown) for damage or wear every 50 hours. Change as needed.



j70om045w.eps

Lance Spray Nozzle

Check every 10 hours. Ensure water sprays in a rotary pattern. Clean or change as needed.



j70om033w.eps

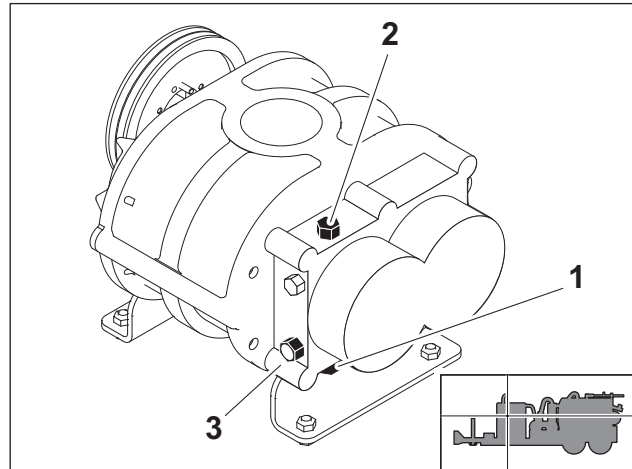
Oil, Blower

IMPORTANT: Change oil more often if working in dusty conditions.

Check every 10 hours. Change at 100 hours and every 1000 hours thereafter.

Check

1. Check level at sight glass (3).
2. Add SGL at fill (2) as needed to keep level at halfway point on sight glass.



j70om049w.eps

Change

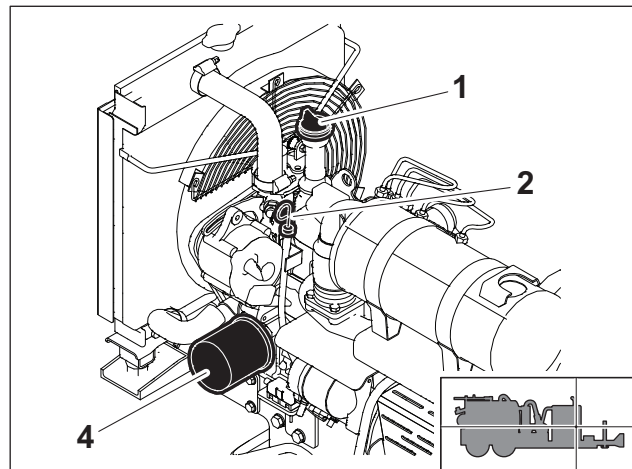
1. While oil is warm, remove plug (1) to drain.
2. Install plug.
3. Add SGL at fill as needed to keep level at halfway point on sight glass.

Oil, Engine

Check every 10 hours. Change at 50 hours and every 150 hours thereafter.

Check

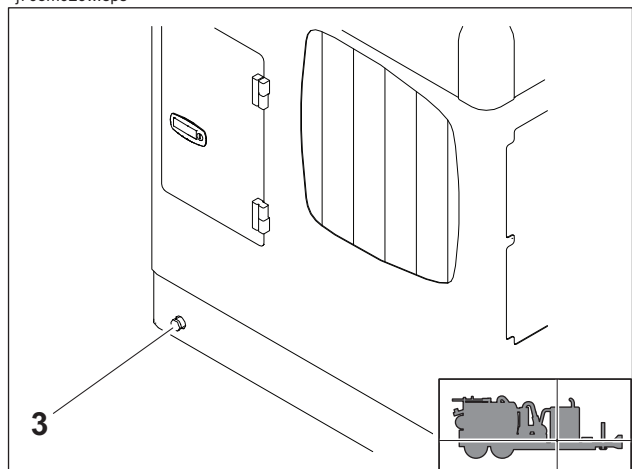
1. While oil is warm, check level at dipstick (2).
2. Add DEO at fill (1) as needed to keep level at highest line on dipstick.



j70om026w.eps

Change

1. Remove plug (3) to drain.
2. Install plug.
3. Remove filter (4) and replace with new filter.
4. Add DEO at fill to keep level at highest line on dipstick.



Oil, Water Pump

IMPORTANT: Change oil more often if working in dusty conditions.

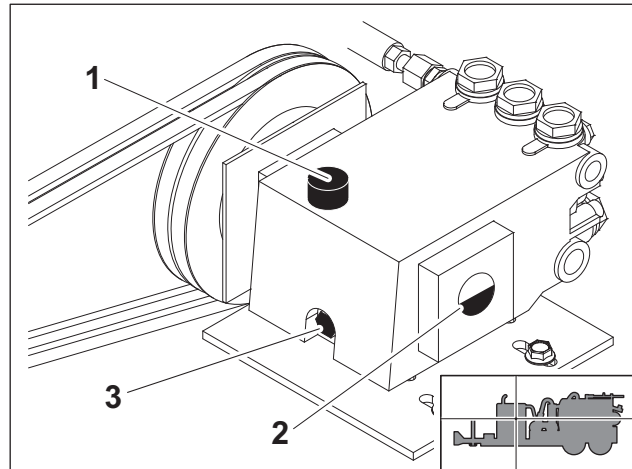
Check every 10 hours. Change at 25 hours and every 100 hours thereafter.

Check

1. Check level at sight glass (2).
2. Add NDO at fill (1) as needed to keep level at halfway point on sight glass.

Change

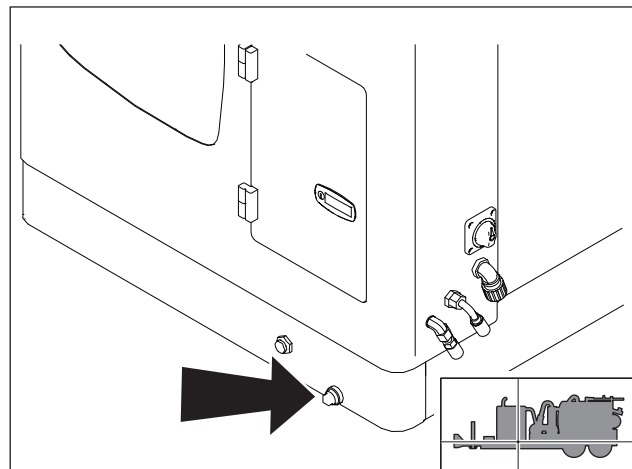
1. While oil is warm, remove plug (3) to drain.
2. Install plug.
3. Add NDO at fill to keep oil level at halfway point on sight glass.



j70om038w.eps

Power Pack Base

Drain fluids from base where shown as needed.



j70om087w.eps

Radiator

NOTICE: Radiator may need to be cleaned more often in dusty or grassy conditions.

Check every 50 hours. Clean as needed.

Check

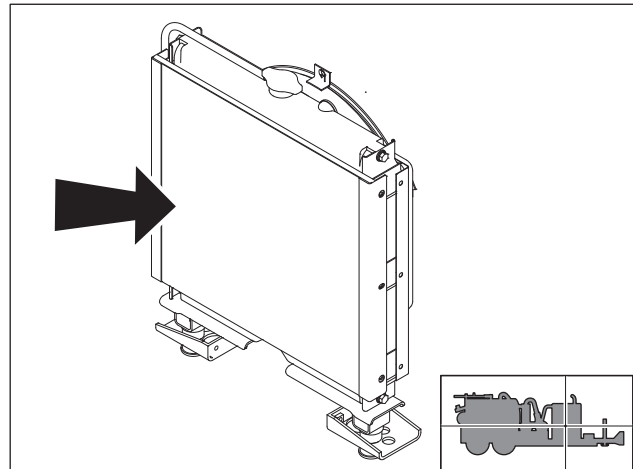
Check radiator (shown) for dirt, grass, and other debris. Check radiator hoses for wear. Check hose clamps for proper tightness.

Clean

1. Clean fins with compressed air or spray wash.

NOTICE: Cleaning with high pressure air or water can damage fins.

2. Open rear hood and spray through radiator toward engine.
3. If grease and oil are present on radiator, spray with solvent and allow to soak overnight.



j70om043w.eps

Reverse Flow 4-Way Valve

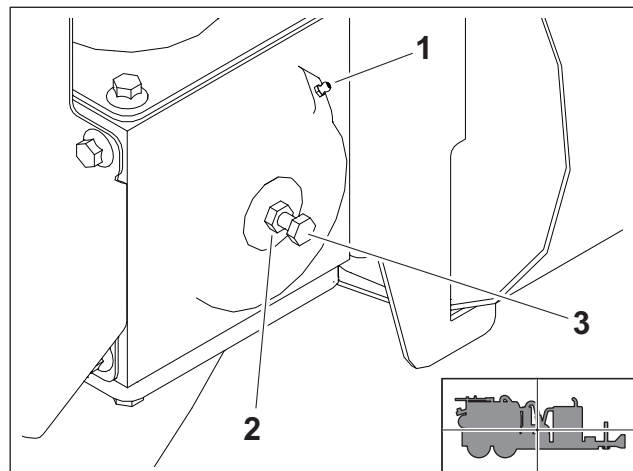
Lube or adjust as needed.

Lube

If reverse flow becomes difficult or impossible to engage, lube zerks (1) on each side of valve with two pumps of MPG at each zerk.

Adjust

If reverse flow is difficult or impossible to engage after lube, adjust valve.



j70om069w.eps

1. Loosen nut (2).
2. Adjust bolt (3) until desired operation is achieved.

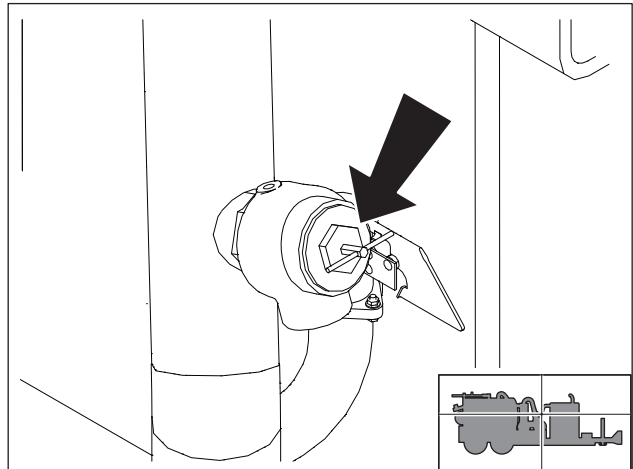
IMPORTANT: Tightening bolt loosens valve.

3. Hold bolt and tighten nut to prevent further adjustment.

Reverse Flow Relief Valve

Exercise valve before startup.

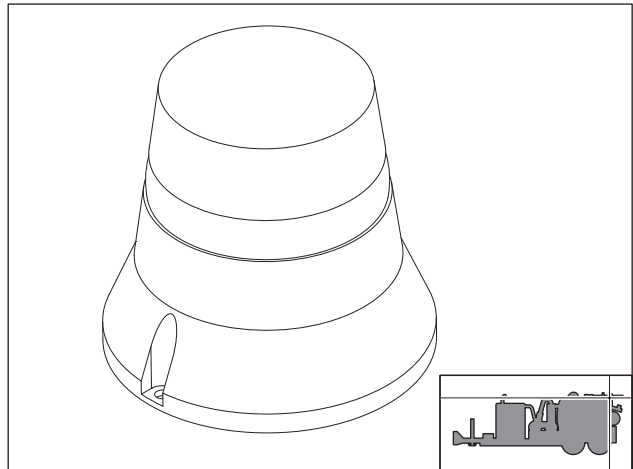
1. Pull handle (shown), rotate back and forth, and release.
2. Ensure vents on valve are free of mud and other restrictions.



j70om018w.eps

Strobe Light

Check every 10 hours. Strobe light should flash. Change as needed.



j70om035w.eps

Weight Gauge

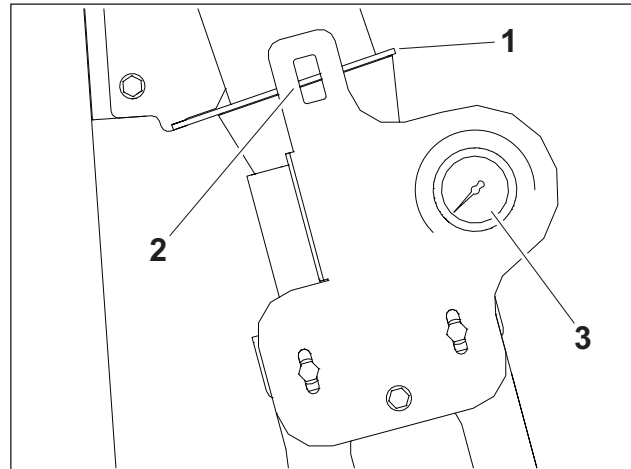
Check before startup. Adjust as needed.

Check

Check set screws on gauge face (3) for tightness.

Adjust

Adjust gauge any time gauge face is loose, new options are installed on machine, or base trailer load otherwise changes.

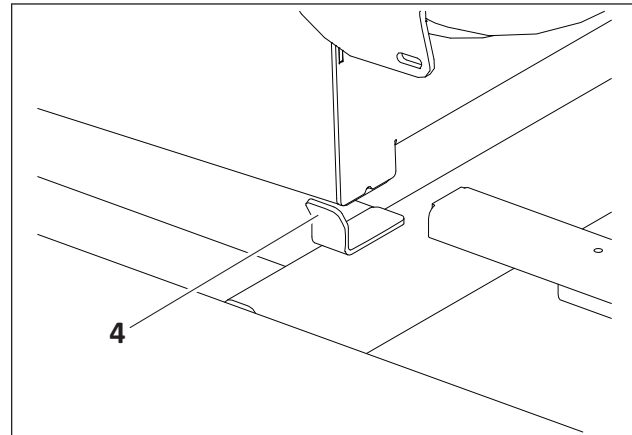


j70om090w.eps

1. Empty water and debris tanks.
2. Weigh trailer.
3. Note empty trailer weight.
4. Raise tank until back lip of make/break seal tube (1) is above gauge plate,
5. Lower tank into position.

NOTICE: Tank must be lowered into position for weight reading to be accurate. If tank is not lowered into position, tank tilt cylinders will not be bearing full weight of tank.

- **VT9/VT9H:** Lower until bottom of tank is near upper edge of lowering guide (4), as shown.
- **All other trailers:** Lower until back lip of make/break seal tube is visible inside gauge window (2).



j70in004w19.eps







6. Loosen set screws on gauge face, and rotate gauge until arrow points at empty trailer weight. For example, if empty trailer weighs 10,000 pounds, rotate gauge until arrow indicates "10".
7. With gauge arrow properly oriented, tighten gauge set screws to fix gauge in place.









IMPORTANT: Apply blue Loctite® 24221 to set screws.

8. Fully lower tank.

Trailer Service Interval Chart

IMPORTANT: Chart indicates first instance of repeated service procedures. See detailed information below.

| | | | | | |
|---|--------------------------|---|-----------------|---|---------------|
|  | Adjust, service, or test |  | Change, initial |  | Lube, initial |
|  | Check |  | Change |  | Lube |

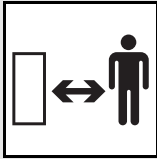
| Service | Startup | 100 Hours | 200 Miles (320km) | 3000 Miles (5000km) | 12000 Miles (20 000km) |
|---------------------------|---|---|--|--|---|
| Bearings | | | | |  |
| Brakes, electric | | |  |  | |
| Brakes, shoes and linings | | | | |  |
| Hitch bolts |  | | | | |
| Lights and reflectors |  | | | | |
| Tires |  | | | | |
| Mounting hardware | |  | | | |

Trailer Procedures

Bearings

Lube and adjust bearings every 12,000 miles (20 000km). See Dexter® trailer manual for more information. Visit www.dexteraxle.com.

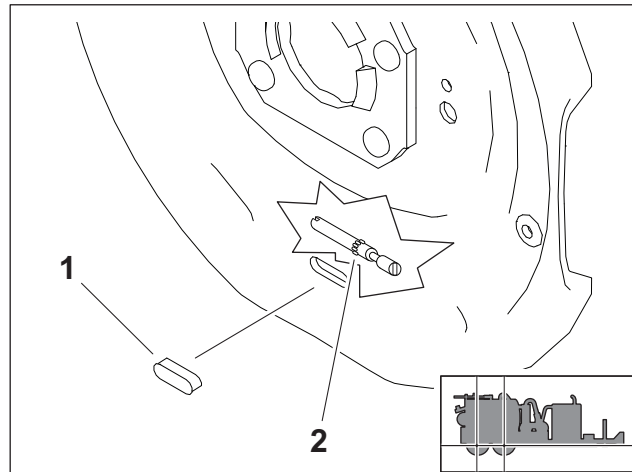
Brakes, Electric



⚠ WARNING Raised component. Crushing can cause death or serious injury. Stay away. Use correct equipment and procedures.

Adjust at 200 miles (320km), and every 3000 miles (5000km) thereafter.

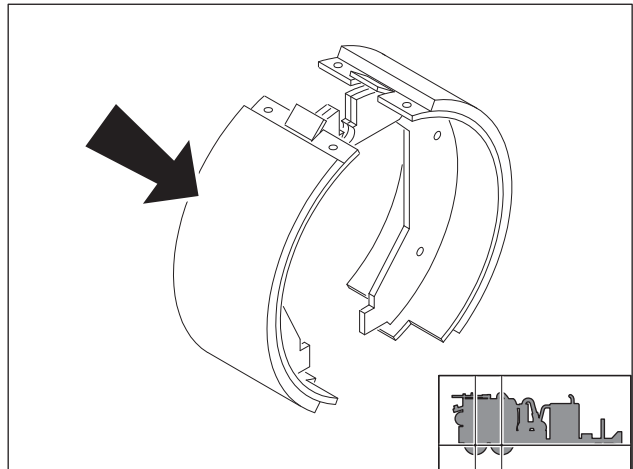
1. Place jack stands under frame rails and remove wheels.
2. Remove cover (1) from adjusting slot on bottom of backing plate.
3. Rotate adjuster starwheel (2) with screwdriver or brake spoon to expand brake shoes. Adjust until drum is very difficult to turn by hand.
4. Rotate starwheel the other direction until drum turns with slight drag.
5. Replace adjusting slot cover and replace wheel.
6. Repeat procedure for all remaining brakes.
7. Remove jack stands and lower wheels to ground.



j70om106w.eps

Brakes, Shoes and Linings

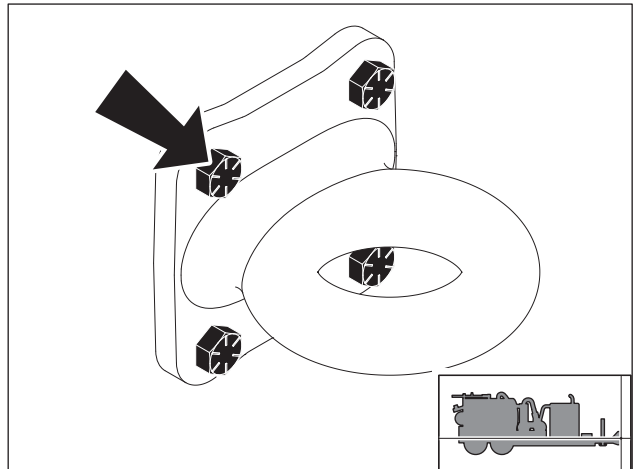
Check every 12 months or 12,000 miles (20 000km) for wear. When lining is worn to 1/16" (2mm) or less, change. Change shoe (shown) and lining if contaminated by oil.



j70om062w.eps

Hitch Bolts

Check before startup. Torque varies by trailer model. See "Specifications" on page 129.



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Lights and Reflectors

Check all lights and reflectors for correct operation and cleanliness before startup.

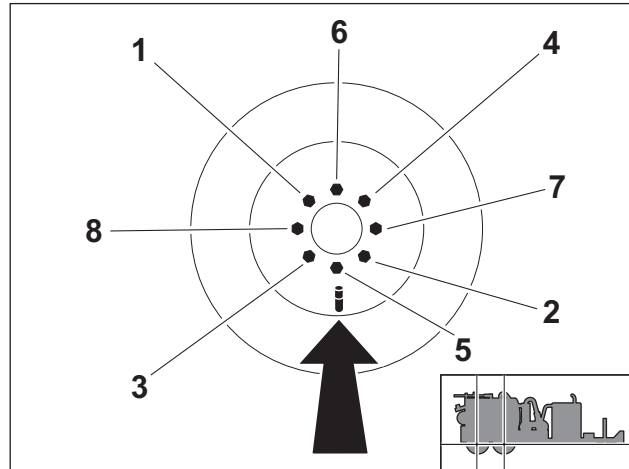
Tire

Check tire pressure and lug nut torque before startup.

Check Pressure

Check pressure at valve stem (shown). Adjust as needed.

| Trailer | Tire Pressure |
|----------|-----------------|
| VT9/VT9H | 80psi (551kPa) |
| VT12 | 80psi (551kPa) |
| VT14 | 80psi (551kPa) |
| VT17 | 110psi (758kPa) |
| VT20 | 125psi (861kPa) |
| VT24 | 125psi (861kPa) |



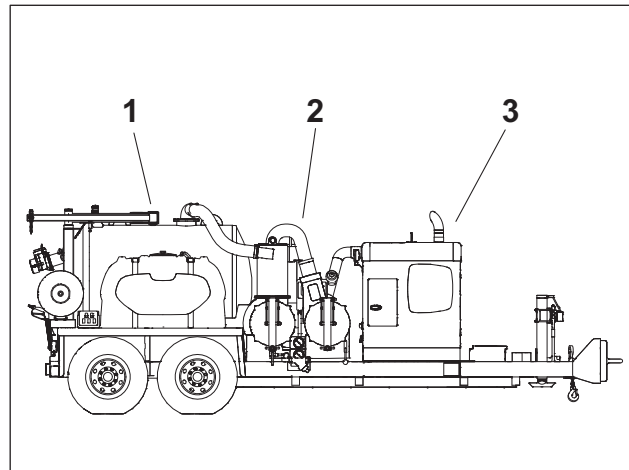
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Check Lug Nut Torque

Check torque on lug nuts (1-8) in sequence shown. See “Specifications” on page 129 for correct torque values by trailer model.

Mounting Hardware

Check mounting hardware on trailer mounted components every 100 hours. Check debris tank (1), vacuum system (2), power pack (3), and any optional equipment or systems installed on trailer. Tighten or change hardware as needed.



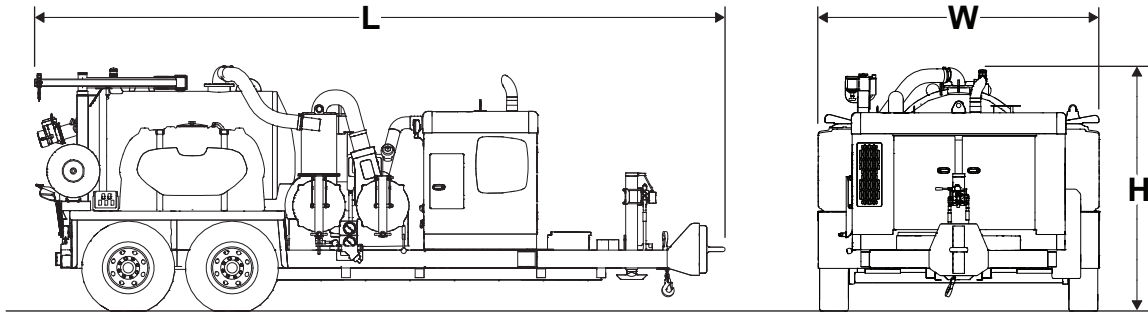
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Specifications

Chapter Contents

| | |
|---------------------------------|-----|
| HX30-500 | 130 |
| HX30-800 | 139 |
| Declaration of Conformity | 145 |

HX30-500



j70om003w.eps

| Dimensions | | US | Metric |
|------------|--|---------|--------|
| H | Height, VT9/VT9H trailer | 84.4in | 2.14m |
| | Height, VT12/VT14 trailer | 84.2in | 2.14m |
| | Height, VT17 trailer | 84.8in | 2.15m |
| L | Length, VT9 trailer | 218in | 5.54m |
| | Length, VT9H trailer | 223in | 5.66m |
| | Length, VT12/VT14/VT17 trailer | 232.1in | 5.9m |
| W | Width, VT9/VT9H/VT12/VT14/VT17 trailer | 96in | 2.44m |

| Debris Tank | | US | Metric |
|------------------|--|--------|--------|
| Capacity | | 500gal | 1893L |
| Diameter | | 48in | 1219mm |
| Drain valve size | | 6in | 152mm |
| Dump angle | | 45° | 45° |
| Inlet valve size | | 4in | 102mm |

| Operation | | US | Metric |
|------------------------------|-------------------|-----------|---------------|
| Weight, power pack only | | 1700lb | 771kg |
| Weight, debris tank only | | 2000lb | 907kg |
| Weight, machine (dry weight) | | | |
| | VT9 trailer | 6240lb | 2830kg |
| | VT9H trailer | 6290lb | 2853kg |
| | VT12/VT14 trailer | 6853lb | 3108kg |
| | VT17 trailer | 7698lb | 3492kg |

Weight, debris tank full of water*

| | | | |
|--|-------------------|----------|--------|
| | VT9 trailer | 10,410lb | 4722kg |
| | VT9H trailer | 10,460lb | 4745kg |
| | VT12/VT14 trailer | 10,985lb | 4983kg |
| | VT17 trailer | 11,925lb | 5409kg |

Weight, all tanks filled with water*

| | | | |
|--|-------------------|----------|--------|
| | VT9 trailer | 11,075lb | 5024kg |
| | VT9H trailer | 11,125lb | 5046kg |
| | VT12/VT14 trailer | 12,495lb | 5668kg |
| | VT17 trailer | 13,593lb | 6166kg |

*Options included in weight calculation: no options

| Vacuum System | | US | Metric |
|--|-------------------|--------------------|-------------------------|
| Tuthill 4007 positive displacement rotary lobe | | | |
| | Drive type | Belt | |
| | Displacement | 512cfm | 14.5m ³ /min |
| | Max vacuum | 15inHg | 381mmHg |
| | Flow @ 15inHg | 350cfm | 9.9m ³ /min |
| | Filter type | Polyester washable | |
| | Filter area | 73ft ² | 6.8m ² |
| | Suction hose size | 3in | 76mm |

| Water System | | US | Metric |
|--|-----------------------------|------------------------------|---------------|
| General Pump EP1813S17 triplex plunger | | | |
| | Max pressure | 3000psig | 207bar |
| | Max flow | 4.2gpm | 15.9L/min |
| | Hose reel capacity, locking | 50ft | 15.2m |
| | Antifreeze | 50/50 water/antifreeze mix | |
| | Clutch type | Electric with auto de-clutch | |

| Engine | | US | Metric |
|--|---------------------|-----------------------|---------------|
| Kubota® D1105 (EPA Tier 4) | | | |
| | Fuel | Diesel | |
| | Cooling medium | Liquid | |
| | Injection | Indirect | |
| | Aspiration | Natural | |
| | Number of cylinders | 3 | |
| | Displacement | 638.53in ³ | 1.1L |
| | Bore | 3.07in | 78mm |
| | Stroke | 3.09in | 78.5mm |
| Engine manufacturer's gross power rating (per SAE J1995) | | 24.8hp | 18kW |
| Estimated net power rating (per SAE 1349) | | 23.8hp | 18kW |

Max tilt angles, continuous use

| | | | |
|--------------------|--------------|---------|---------|
| | Longitudinal | 20° | 20° |
| | Latitudinal | 20° | 20° |
| | Lateral | 20° | 20° |
| Rated engine speed | | 3000rpm | 3000rpm |

| Hydraulic System | | US | Metric |
|-------------------------|------------|-----------|---------------|
| Casappa PLP10 gear pump | | | |
| | Pressure | 2500psig | 172bar |
| | Drive type | Gear | |
| | Flow rate | 3.6gpm | 14L/min |

| Fluid Capacities | US | Metric |
|-------------------------|-----------|---------------|
| Cooling system | 1.25gal | 4.7L |
| Engine oil with filter | 5.2qt | 4.9L |
| Fuel tank | 25gal | 94.6L |
| Hydraulic reservoir | 6.3gal | 23.8L |
| Hydraulic system | 7.75gal | 29.3L |
| Vacuum pump | 11oz | .33L |
| Water pump oil | .47qt | .4L |
| Water tank | 200gal | 757L |

| Battery | US | Metric |
|--|-----------|---------------|
| SAE reserve capacity 110 minutes, cold crank (0°F/-18°C) 800A, 12V electrical system | | |

Noise Level

This machine can generate sound levels exceeding 80dBA. Always wear appropriate hearing protection when operating machine. Find sound power and pressure information at www.ditchwitch.com, or contact customersupport@ditchwitch.com.

Specifications are called out according to SAE recommended practices. Specifications are general and subject to change without notice. If exact measurements are required, equipment should be weighed and measured. Due to selected options, delivered equipment may not match that shown.

| VT9 Trailer | | US | Metric |
|-------------|--|--------------|------------|
| Dimension | | | |
| | Adjustable coupler height, 7 positions | 16.9-28.9in | 424-729mm |
| | Clearance, at jack foot pad | 12.7in | 323mm |
| | Width, outside fenders | 96in | 2.4m |
| General | | | |
| | Number of axles | 2 | 2 |
| | Coupler, square mount drawbar | 3in | 76.2mm |
| | Type of brakes | Electric | |
| | Lug nut torque | 100-120ft•lb | 136-162N•m |
| | Hitch bolt torque | 160ft•lb | 217N•m |
| | Electrical system | 12V | |
| Tire | | | |
| | T/W (ST235/80R16) | | |
| Load rating | | | |
| | Tongue weight, empty** | 1225lb | 556kg |
| | Tongue weight, full, approximate** | 1195lb | 542kg |
| | Max tongue load | 2600lb | 1179kg |
| | GVWR (gross vehicle weight rating)* | 9999lb | 4535kg |
| | GAWR (gross axle weight rating, each)* | 6000lb | 2722kg |

* Load ratings for speeds up to 65mph (104 km/h).

**Weights are with no options installed.

| VT9H Trailer | | US | Metric |
|--------------|--|--------------|------------|
| Dimension | | | |
| | Adjustable coupler height, 7 positions | 19.8-28.8in | 503-732mm |
| | Clearance, at jack foot pad | 12.7in | 323mm |
| | Width, outside fenders | 96in | 2.4m |
| General | | | |
| | Number of axles | 2 | 2 |
| | Coupler, square mount drawbar | 3in | 76.2mm |
| | Type of brakes | Hydraulic | |
| | Lug nut torque | 100-120ft•lb | 136-162N•m |
| | Hitch bolt torque | 160ft•lb | 217N•m |
| | Electrical system | 12V | |
| Tire | | | |
| | T/W (ST235/80R16) | | |
| Load rating | | | |
| | Tongue weight, empty** | 1125lb | 510kg |
| | Tongue weight, full, approximate** | 1095lb | 497kg |
| | Max tongue load | 2000lb | 907kg |
| | GVWR (gross vehicle weight rating)* | 9999lb | 4535kg |
| | GAWR (gross axle weight rating, each)* | 6000lb | 2722kg |

* Load ratings for speeds up to 65mph (104 km/h).

**Weights are with no options installed.

| VT12 Trailer | | US | Metric |
|--------------|--|--------------|------------|
| Dimension | | | |
| | Adjustable coupler height, 7 positions | 16.7-28.7in | 424-729mm |
| | Clearance, at jack foot pad | 12.5in | 318mm |
| | Width, outside fenders | 96in | 2.4m |
| General | | | |
| | Number of axles | 2 | 2 |
| | Coupler, square mount drawbar | 3in | 76.2mm |
| | Type of brakes | Electric | |
| | Lug nut torque | 100-120ft•lb | 136-162N•m |
| | Hitch bolt torque | 160ft•lb | 217N•m |
| | Electrical system | 12V | |
| Tire | | | |
| | T/W (ST235/80R16) | | |
| Load rating | | | |
| | Tongue weight, empty** | 1515lb | 687kg |
| | Tongue weight, full, approximate** | 1600lb | 726kg |
| | Max tongue load | 2600lb | 1179kg |
| | GVWR (gross vehicle weight rating)* | 12,000lb | 5443kg |
| | GAWR (gross axle weight rating, each)* | 7000lb | 3175kg |

* Load ratings for speeds up to 65mph (104 km/h).

**Weights are with hydraulic jack, toolbox, reverse flow, and jib boom.

| VT14 Trailer | | US | Metric |
|---------------------|--|--------------|---------------|
| Dimension | | | |
| | Adjustable coupler height, 7 positions | 16.7-28.7in | 424-729mm |
| | Clearance, at jack foot pad | 12.5in | 318mm |
| | Width, outside fenders | 96in | 2.4m |
| General | | | |
| | Number of axles | 2 | 2 |
| | Coupler, square mount drawbar | 3in | 76.2mm |
| | Type of brakes | Electric | |
| | Lug nut torque | 100-120ft•lb | 136-162N•m |
| | Hitch bolt torque | 160ft•lb | 217N•m |
| | Electrical system | 12V | |
| Tire | | | |
| | T/W (ST235/80R16) | | |
| Load rating | | | |
| | Tongue weight, empty** | 1515lb | 687kg |
| | Tongue weight, full, approximate** | 1600lb | 726kg |
| | Max tongue load | 2600lb | 1179kg |
| | GVWR (gross vehicle weight rating)* | 14000lb | 6350kg |
| | GAWR (gross axle weight rating, each)* | 7000lb | 3175kg |

* Load ratings for speeds up to 65mph (104 km/h).

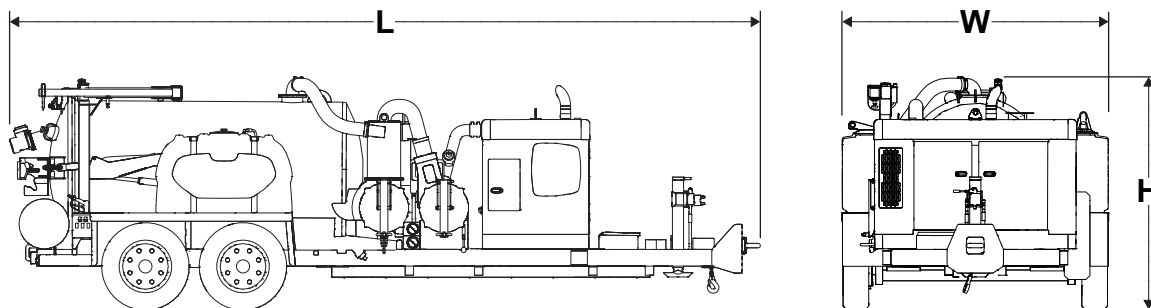
**Weights are with hydraulic jack, toolbox, reverse flow, and jib boom.

| VT17 Trailer | | US | Metric |
|---------------------|--|--------------|---------------|
| Dimension | | | |
| | Adjustable coupler height, 7 positions | 167-28.7in | 424-729mm |
| | Clearance, at jack foot pad | 12.5in | 318mm |
| | Width, outside fenders | 96in | 2.4m |
| General | | | |
| | Number of axles | 2 | 2 |
| | Coupler, square mount drawbar | 3in | 76.2mm |
| | Type of brakes | Electric | |
| | Lug nut torque | 140-170ft•lb | 190-230N•m |
| | Hitch bolt torque | 320ft•lb | 433N•m |
| | Electrical system | 12V | |
| Tire | | | |
| | T/W (ST235/85R16) | | |
| Load rating | | | |
| | Tongue weight, empty** | 2050lb | 930kg |
| | Tongue weight, full, approximate** | 2315lb | 1050kg |
| | Max tongue load | 3000lb | 1361kg |
| | GVWR (gross vehicle weight rating)* | 17000lb | 7711kg |
| | GAWR (gross axle weight rating, each)* | 8000lb | 3629kg |

* Load ratings for speeds up to 65mph (104 km/h).

**Weights are with hydraulic jack, toolbox, heater, power boom, spare tire and carrier.

HX30-800



j70om004w.eps

| Dimensions | | US | Metric |
|------------|--------------------------------|---------|--------|
| H | Height, VT20 trailer | 85in | 2.16m |
| | Height, VT24 trailer | 85.5in | 2.17m |
| | Height, VT24 trailer with boom | 110.2in | 2.8m |
| L | Length, VT20/VT24 trailer | 269.4in | 6.84m |
| W | Width, VT20/VT24 trailer | 96in | 2.44m |

| Debris Tank | | US | Metric |
|------------------|--|--------|--------|
| Capacity | | 800gal | 3028L |
| Diameter | | 48in | 1219mm |
| Drain valve size | | 6in | 152mm |
| Dump angle | | 45° | 45° |
| Inlet valve size | | 4in | 102mm |

| Operation | | US | Metric |
|--------------------------------------|--------------|-----------|---------------|
| Weight, power pack only | | 1700lb | 771kg |
| Weight, debris tank only | | 2500lb | 1134kg |
| Weight, machine (dry weight) | | | |
| | VT20 trailer | 8538lb | 3873kg |
| | VT24 trailer | 9008lb | 4086kg |
| Weight, debris tank full of water* | | | |
| | VT20 trailer | 15,065lb | 6833kg |
| | VT24 trailer | 15,930lb | 7226kg |
| Weight, all tanks filled with water* | | | |
| | VT20 trailer | 16,660lb | 7557kg |
| | VT24 trailer | 18,985lb | 8611kg |

*Options included in weight calculation: no options

| Vacuum System | | US | Metric |
|--|-------------------|--------------------|-------------------------|
| Tuthill 4007 positive displacement rotary lobe | | | |
| | Drive type | Belt | |
| | Displacement | 512cfm | 14.5m ³ /min |
| | Max vacuum | 15inHg | 381mmHg |
| | Flow @ 15inHg | 350cfm | 9.9m ³ /min |
| | Filter type | Polyester washable | |
| | Filter area | 73ft ² | 6.8m ² |
| | Suction hose size | 3in | 76mm |

| Water System | | US | Metric |
|--|-----------------------------|------------------------------|---------------|
| General Pump EP1813S17 triplex plunger | | | |
| | Max pressure | 3000psig | 207bar |
| | Max flow | 4.2gpm | 15.9L/min |
| | Hose reel capacity, locking | 50ft | 15.2m |
| | Antifreeze | 50/50 water/antifreeze mix | |
| | Clutch type | Electric with auto de-clutch | |
| Engine | | US | Metric |
| Kubota D1105 (EPA Tier 4) | | | |
| | Fuel | Diesel | |
| | Cooling medium | Liquid | |
| | Injection | Indirect | |
| | Aspiration | Natural | |
| | Number of cylinders | 3 | |
| | Displacement | 638.53in ³ | 1.1L |
| | Bore | 3.07in | 78mm |
| | Stroke | 3.09in | 78.5mm |
| Engine manufacturer's gross power rating (per SAE J1995) | | 24.8hp | 18kW |
| Estimated net power rating (per SAE 1349) | | 23.8hp | 18kW |
| Max tilt angles, continuous use | | | |
| | Longitudinal | 20° | 20° |
| | Latitudinal | 20° | 20° |
| | Lateral | 20° | 20° |
| Rated engine speed | | 3000rpm | 3000rpm |

| Hydraulic System | | US | Metric |
|-------------------------|--|-----------|---------------|
| Casappa PLP10 gear pump | | | |
| Pressure | | 2500psig | 172bar |
| Drive type | | Gear | |
| Flow rate | | 3.6gpm | 14L/min |

| Fluid Capacities | | US | Metric |
|--------------------------|--|-----------|---------------|
| Cooling system | | 1.25gal | 4.7L |
| Engine oil with filter | | 5.2qt | 4.9L |
| Fuel tank | | 25gal | 94.6L |
| Hydraulic reservoir | | 6.3gal | 23.8L |
| Hydraulic system | | 7.75gal | 29.3L |
| Vacuum pump | | 11oz | .33L |
| Water pump oil | | .47qt | .4L |
| Water tank, VT20 trailer | | 200gal | 757L |
| Water tank, VT24 trailer | | 370gal | 1400L |

| Battery | US | Metric |
|--|-----------|---------------|
| SAE reserve capacity 110 minutes, cold crank (0°F/-18°C) 800A, 12V electrical system | | |

Noise Level

This machine can generate sound levels exceeding 80dBA. Always wear appropriate hearing protection when operating machine. Find sound power and pressure information at www.ditchwitch.com, or contact customersupport@ditchwitch.com.

Specifications are called out according to SAE recommended practices. Specifications are general and subject to change without notice. If exact measurements are required, equipment should be weighed and measured. Due to selected options, delivered equipment may not match that shown.

| VT20 Trailer | | US | Metric |
|--------------|--|--------------|------------|
| Dimension | | | |
| | Adjustable coupler height, 6 positions | 18.3-29.55in | 465-750mm |
| | Clearance, at jack foot pad | 13.9in | 353mm |
| | Width, outside fenders | 96in | 2.4m |
| General | | | |
| | Number of axles | 2 | 2 |
| | Coupler, square mount drawbar | 3in | 76.2mm |
| | Type of brakes | Electric | |
| | Lug nut torque | 275-325ft•lb | 373-441N•m |
| | Hitch bolt torque | 320ft•lb | 433N•m |
| | Electrical system | 12V | |
| Tire | | | |
| | 235/75R-17.5, H16TL | | |
| Load rating | | | |
| | Tongue weight, empty** | 2025lb | 919kg |
| | Tongue weight, full, approximate** | 2290lb | 1039kg |
| | Max tongue load | 3000lb | 1361kg |
| | GVWR (gross vehicle weight rating)* | 20,000lb | 9072kg |
| | GAWR (gross axle weight rating, each)* | 10,000lb | 4536kg |

* Load ratings for speeds up to 65mph (104 km/h).

**Weights are with hydraulic jack, toolbox, reverse flow, jib boom, heater, spare tire and carrier.

| VT24 Trailer | | US | Metric |
|--------------|--|--------------|------------|
| Dimension | | | |
| | Adjustable coupler height, 6 positions | 18.3-29.55in | 465-750mm |
| | Clearance, at jack foot pad | 13.9in | 353mm |
| | Width outside fenders | 96in | 2.4m |
| General | | | |
| | Number of axles | 2 | 2 |
| | Coupler, square mount drawbar | 3in | 76.2mm |
| | Type of brakes | Electric | |
| | Lug nut torque | 275-325ft•lb | 373-441N•m |
| | Hitch bolt torque | 320ft•lb | 433N•m |
| | Electrical system | 12V | |
| Tire | | | |
| | 235/75R-17.5, H16TL | | |
| Load rating | | | |
| | Tongue weight, empty** | 1675lb | 760kg |
| | Tongue weight, full, approximate** | 1895lb | 860kg |
| | Max tongue load | 3600lb | 1633kg |
| | GVWR (gross vehicle weight rating)* | 24,000lb | 10 886kg |
| | GAWR (gross axle weight rating, each)* | 12,000lb | 5443kg |

* Load ratings for speeds up to 65mph (104 km/h).

**Weights are with hydraulic jack, reverse flow.

Declaration of Conformity

Countries in the European Union should have received a Declaration of Conformity (DOC) with this machine similar to the example below.

The Charles Machine Works, Inc.
PO Box 661959 West Fir Avenue
Perry, Oklahoma, USA 73077-0066
Phone: 580 572 3784
FAX: 580 572 3525

Declares that the product:

| | |
|-----------------------|----------------------------|
| Model: | Ditch Witch® XXXX |
| Type: | (Machine Type) |
| Engine Power: | xxx kW |
| Serial Number: | CMWXXXXXXXXXXXXXXXX |

Conforms to the requirements of:

2006/42/EC Machinery Directive
2004/108/EC Electromagnetic Compatibility Directive
2000/14/EC Noise Emission Directive
Measured sound power level (Annex V): **XXXdBA**
Guaranteed sound power level (Annex V): **XXXdBA**

The Technical Construction File is maintained at the manufacturer's location.

The manufacturer's European representative is:

Ditch Witch Barcelona
International Underground Systems, S.L.
C/EL PLA, 130 *Poligon Industrial El Pla
08980 Sant Feliu De Llobregat *Spain
Phone: +34 93 632 7344
FAX: +34 93 632 7343

Support

Registration

If your equipment was purchased through a Ditch Witch® dealer, it is already registered. If you purchased from any other source, please email productsupportwarrantyadmin@ditchwitch.com or fill out the registration card located in the back of the parts manual. Registration enables you to receive updates on this equipment as well as information on new products of interest.

Procedure

Notify your dealer immediately of any malfunction or failure of Ditch Witch® equipment.

Always give model, serial number, and approximate date of your equipment purchase. This information should be recorded and placed on file by the owner at the time of purchase.

Return damaged parts to dealer for inspection and warranty consideration if in warranty time frame.

Order genuine Ditch Witch replacement or repair parts from your authorized Ditch Witch dealer. Use of another manufacturer's parts may void warranty consideration.

Resources

Publications

Contact your Ditch Witch dealer for publications and videos covering safety, operation, service, and repair of your equipment.

Ditch Witch® Training

For information about on-site individualized training, contact your Ditch Witch dealer.

Warranty

Ditch Witch® Equipment and Replacement Parts Limited Warranty Policy

Subject to the limitation and exclusions herein, free replacement parts will be provided at any authorized Ditch Witch dealership for any Ditch Witch equipment or parts manufactured by the Ditch Witch factory that fail due to a defect in material or workmanship within one (1) year of first commercial use. Free labor will be provided at any authorized Ditch Witch dealership for installation of parts under this warranty during the first year following "initial commercial" use of the serial-numbered Ditch Witch equipment on which it is installed. The customer is responsible for transporting their equipment to an authorized Ditch Witch dealership for all warranty work.

Exclusions from Product Warranty

- All incidental or consequential damages.
- All defects, damages, or injuries caused by misuse (including, but not limited to, rollover), abuse, improper installation, alteration, neglect, or uses other than those for which products were intended.
- All defects, damages, or injuries caused by improper training, operation, or servicing of products in a manner inconsistent with manufacturer's recommendations.
- All engines and engine accessories (these are covered by original manufacturer's warranty).
- Tires, belts, and other parts which may be subject to another manufacturer's warranty (such warranty will be available to purchaser).
- ALL IMPLIED WARRANTIES NOT EXPRESSLY STATED HEREIN, INCLUDING ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE AND MERCHANTABILITY.

IF THE PRODUCTS ARE PURCHASED FOR COMMERCIAL PURPOSES, AS DEFINED BY THE UNIFORM COMMERCIAL CODE, THEN THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE FACE HEREOF AND THERE ARE NO IMPLIED WARRANTIES OF ANY KIND WHICH EXTEND TO A COMMERCIAL BUYER. ALL OTHER PROVISIONS OF THIS LIMITED WARRANTY APPLY INCLUDING THE DUTIES IMPOSED.

Ditch Witch products have been tested to deliver acceptable performance in most conditions. This does not imply they will deliver acceptable performance in all conditions. Therefore, to assure suitability, products should be operated under anticipated working conditions prior to purchase.

Defects will be determined by an inspection within thirty (30) days of the date of failure of the product or part by Ditch Witch Product Support (DWPS) or its authorized dealer. DWPS will provide the location of its inspection facilities or its nearest authorized dealer upon inquiry. DWPS reserves the right to supply remanufactured replacement parts under this warranty as it deems appropriate.

Extended warranties are available upon request from your local Ditch Witch dealer or the Ditch Witch factory.

Some states do not allow exclusion or limitation of incidental or consequential damages, so above limitation of exclusion may not apply. Further, some states do not allow exclusion of or limitation of how long an implied warranty lasts, so the above limitation may not apply. This limited warranty gives product owner specific legal rights and the product owner may also have other rights which vary from state to state.

For information regarding this limited warranty, contact the DWPS department, P.O. Box 66, Perry, OK 73077-0066, or contact your local dealer.

Appendix

Chapter Contents

Tire Safety Information

TIRE SAFETY INFORMATION

1.1. STEPS FOR DETERMINING CORRECT LOAD LIMIT – TRAILER

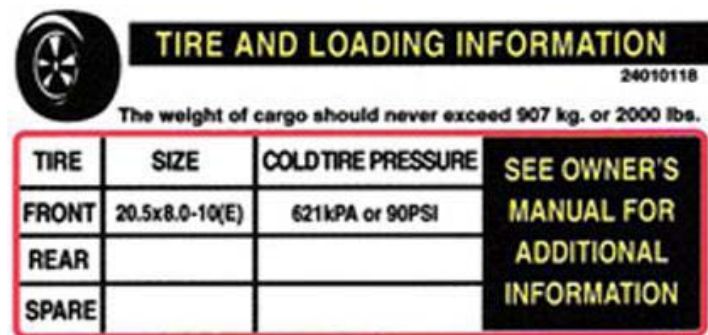
Determining the load limits of a trailer includes more than understanding the load limits of the tires alone. On all trailers there is a Federal certification/VIN label that is located on the forward half of the left (road) side of the unit. This certification/VIN label will indicate the trailer's Gross Vehicle Weight Rating (GVWR). This is the most the fully loaded trailer can weigh. It will also provide the Gross Axle Weight Rating (GAWR). This is the most a particular axle can weigh. If there are multiple axles, the GAWR of each axle will be provided.

If your trailer has a GVWR of 10,000 pounds or less, there is a vehicle placard located in the same location as the certification label described above. This placard provides tire and loading information. In addition, this placard will show a statement regarding maximum cargo capacity. Cargo can be added to the trailer, up to the maximum weight specified on the placard. The combined weight of the cargo is provided as a single number. In any case, remember: the total weight of a fully loaded trailer can not exceed the stated GVWR.

When loading your cargo, be sure it is distributed evenly to prevent overloading front to back and side to side. Heavy items should be placed low and as close to the axle positions as reasonable. Too many items on one side may overload a tire. The best way to know the actual weight of the trailer is to weigh it at a public scale. Talk to your dealer to discuss the weighing methods needed to capture the various weights related to the trailer. This would include the weight empty or unloaded, weights per axle, wheel, hitch or king-pin, and total weight.

Excessive loads and/or underinflation cause tire overloading and, as a result, abnormal tire flexing occurs. This situation can generate an excessive amount of heat within the tire. Excessive heat may lead to tire failure. It is the air pressure that enables a tire to support the load, so proper inflation is critical. The proper air pressure may be found on the certification/VIN label and/or on the Tire Placard. This value should never exceed the maximum cold inflation pressure stamped on the tire.

1.1.1. TRAILERS 10,000 POUNDS GVWR OR LESS



Tire and Loading Information Placard – Figure 1-1

1. Locate the statement, "The weight of cargo should never exceed XXX kg or XXX lbs.," on your trailer's placard. See figure 1-1.
2. This figure equals the available amount of cargo load capacity.
3. Determine the combined weight of cargo being loaded on the trailer. That weight may not safely exceed the available cargo load capacity.

The Tire Information Placard is attached adjacent to or near the trailer's VIN (Certification) label at the left front of the trailer.

1.1.2. TRAILERS OVER 10,000 POUNDS GVWR (NOTE: These trailers are not required to have a tire information placard on the trailer.)

1. Determine the empty weight of your trailer by weighing the trailer using a public scale or other means. This step does not have to be repeated.
2. Locate the GVWR (Gross Vehicle Weight Rating) of the trailer on your trailer's VIN (Certification) label.
3. Subtract the empty weight of your trailer from the GVWR stated on the VIN label. That weight is the maximum available cargo capacity of the trailer and must not be exceeded.

1.2. STEPS FOR DETERMINING CORRECT LOAD LIMIT – TOW VEHICLE

1. Locate the statement, "The combined weight of occupants and cargo should never exceed XXX lbs.," on your vehicle's placard.
2. Determine the combined weight of the driver and passengers who will be riding in your vehicle.
3. Subtract the combined weight of the driver and passengers from XXX kilograms or XXX pounds.
4. The resulting figure equals the available amount of cargo capacity. For example, if the "XXX" amount equals 1400 lbs. and there will be five 150 lb. passengers in your vehicle, the amount of available cargo and luggage capacity is 650 lbs. ($1400 - 750 (5 \times 150) = 650$ lbs.).
5. Determine the combined weight of cargo being loaded on the vehicle. That weight must not exceed the available cargo capacity calculated in Step # 4.
6. If your vehicle will be towing a trailer, load from your trailer will be transferred to your vehicle. Consult the tow vehicle's manual to determine how this weight transfer reduces the available cargo and luggage capacity of your vehicle.

1.3. GLOSSARY OF TIRE TERMINOLOGY

Bead - the part of the tire that is made of steel wires, wrapped or reinforced by ply cords and that is shaped to fit the rim.

Bead separation - the breakdown of the bond between components in the bead.

Bias ply tire - a pneumatic tire in which the ply cords that extend to the beads are laid at alternate angles substantially less than 90 degrees to the centerline of the tread.

Carcass - the tire structure, except tread and sidewall rubber which, when inflated, bears the load.

Chunking - the breaking away of pieces of the tread or sidewall.

Cold inflation pressure - the pressure in the tire before you drive.

Cord - the strands forming the plies in the tire.

Cord separation - the parting of cords from adjacent rubber compounds.

Cracking - any parting within the tread, sidewall, or inner liner of the tire extending to cord material.

Curb weight - the weight of a vehicle with standard equipment.

Groove - the space between two adjacent tread ribs.

Gross Axle Weight Rating (GAWR) - the maximum weight that any axle can support, as published on the Certification / VIN label on the front left side of the trailer. Actual weight determined by weighing each axle on a public scale, with the trailer attached to the towing vehicle.

Gross Vehicle Weight Rating (GVWR) - the maximum weight of the fully loaded trailer, as published on the Certification / VIN label. Actual weight determined by weighing trailer on a public scale, without being attached to the towing vehicle.

Tongue Weight - the downward force exerted on the hitch ball or lunette by the trailer coupler.

Innerliner - the layer(s) forming the inside surface of a tubeless tire that contains the inflating medium within the tire.

Innerliner separation - the parting of the innerliner from cord material in the carcass.

Light truck (LT) tire - a tire designated by its manufacturer as primarily intended for use on lightweight trucks or multipurpose passenger vehicles.

Load rating - the maximum load that a tire is rated to carry for a given inflation pressure.

Maximum load rating - the load rating for a tire at the maximum permissible inflation pressure for that tire.

Maximum permissible inflation pressure - the maximum cold inflation pressure to which a tire may be inflated.

Maximum loaded vehicle weight - the sum of curb weight, accessory weight, vehicle capacity weight, and production options weight.

Outer diameter - the overall diameter of an inflated new tire.

Overall width - the linear distance between the exteriors of the sidewalls of an inflated tire, including elevations due to labeling, decorations, or protective bands or ribs.

Ply - a layer of rubber-coated parallel cords.

Ply separation - a parting of rubber compound between adjacent plies.

Pneumatic tire - a mechanical device made of rubber, chemicals, fabric and steel or other materials, that, when mounted on an automotive wheel, provides the traction and contains the gas or fluid that sustains the load.

Radial ply tire - a pneumatic tire in which the ply cords that extend to the beads are laid at substantially 90 degrees to the centerline of the tread.

Recommended inflation pressure - the inflation pressure provided by the vehicle manufacturer on the Tire Information label and on the Certification / VIN tag.

Rim - a metal support for a tire or a tire and tube assembly upon which the tire beads are seated.

Rim diameter - the nominal diameter of the bead seat.

Rim size designation - the rim diameter and width.

Rim type designation - the industry of manufacturer's designation for a rim by style or code.

Rim width - the nominal distance between rim flanges.

Sidewall - that portion of a tire between the tread and bead.

Sidewall separation - the parting of the rubber compound from the cord material in the sidewall.

Special Trailer (ST) tire - the "ST" is an indication the tire is for trailer use only.

Tread - that portion of a tire that comes into contact with the road.

Tread rib - a tread section running circumferentially around a tire.

Tread separation - pulling away of the tread from the tire carcass.

Treadwear indicators (TWI) - the projections within the principal grooves designed to give a visual indication of the degrees of wear of the tread.

Vehicle maximum load on the tire - the load on an individual tire that is determined by distributing to each axle its share of the maximum loaded vehicle weight and dividing by two.

Vehicle normal load on the tire - the load on an individual tire that is determined by distributing to each axle its share of the curb weight and dividing by 2.

1.4. TIRE SAFETY - EVERYTHING RIDES ON IT

The National Traffic Safety Administration (NHTSA) has published a brochure (DOT HS 809 361) that discusses all aspects of Tire Safety, as required by CFR 575.6. This brochure is reproduced in part below. It can be obtained and downloaded from NHTSA, free of charge, from the following web site: http://www.nhtsa.dot.gov/cars/rules/TireSafety/ridesonit/tires_index.html

Studies of tire safety show that maintaining proper tire pressure, observing tire and trailer load limits (not carrying more weight in your trailer than your tires or trailer can safely handle), avoiding road hazards, and inspecting tires for cuts, slashes, and other irregularities are the most important things you can do to avoid tire failure, such as tread separation or blowout and flat tires. These actions, along with other care and maintenance activities, can also:

- ◇ Improve vehicle handling
- ◇ Help protect you and others from avoidable breakdowns and accidents
- ◇ Improve fuel economy
- ◇ Increase the life of your tires.

This booklet presents a comprehensive overview of tire safety, including information on the following topics:

- ◇ Basic tire maintenance
- ◇ Uniform Tire Quality Grading System
- ◇ Fundamental characteristics of tires
- ◇ Tire safety tips.

Use this information to make tire safety a regular part of your trailer maintenance routine. Recognize that the time you spend is minimal compared with the inconvenience and safety consequences of a flat tire or other tire failure.

1.5. SAFETY FIRST—BASIC TIRE MAINTENANCE

Properly maintained tires improve the steering, stopping, traction, and load-carrying capability of your trailer. Underinflated tires and overloaded vehicles are a major cause of tire failure. Therefore, as mentioned above, to avoid flat tires and other types of tire failure, you should maintain proper tire pressure, observe tire and trailer load limits, avoid road hazards, and regularly inspect your tires.

1.5.1. FINDING YOUR TRAILER'S RECOMMENDED TIRE PRESSURE AND LOAD LIMITS

Tire information placards and vehicle certification labels contain information on tires and load limits. These labels indicate the vehicle manufacturer's information including:

- ◇ Recommended tire size
- ◇ Recommended tire inflation pressure
- ◇ Vehicle capacity weight
- ◇ Front and rear gross axle weight ratings

Both placards and certification labels are permanently attached to the trailer near the left front.

1.5.2. UNDERSTANDING TIRE PRESSURE AND LOAD LIMITS

Tire inflation pressure is the level of air in the tire that provides it with load-carrying capacity and affects the overall performance of the trailer. The tire inflation pressure is a number that indicates the amount of air pressure—measured in pounds per square inch (psi) or kilopascals (kpa)—a tire requires to be properly inflated.

This number based on the trailer's design load limit, that is, the greatest amount of weight a trailer can safely carry and the tire size. The proper tire pressure for your trailer is referred to as the "recommended cold inflation pressure." (As you will read below, it is difficult to obtain the recommended tire pressure if your tires are not cold.)

Because tires are designed to be used on more than one type of vehicle, tire manufacturers list the "maximum permissible inflation pressure" on the tire sidewall. This number is the greatest amount of air pressure that should ever be put in the tire under normal driving conditions.

1.5.3. CHECKING TIRE PRESSURE

It is important to check your trailer's tire pressure at least once a month for the following reasons:

- ◇ Most tires may naturally lose air over time.
- ◇ Tires can lose air suddenly if you drive over a pothole or other object or if you strike the curb when parking.
- ◇ With radial tires, it is usually not possible to determine underinflation by visual inspection.

For convenience, purchase a tire pressure gauge to keep with your trailer. Gauges can be purchased at tire dealerships, auto supply stores, and other retail outlets.

The recommended tire inflation pressure that manufacturers provide reflects the proper psi when a tire is cold. The term cold does not relate to the outside temperature. Rather, a cold tire is one that has not been driven on for at least three hours. When you drive, your tires get warmer, causing the air pressure within them to increase. Therefore, to get an accurate tire pressure reading, you must measure tire pressure when the tires are cold or compensate for the extra pressure in warm tires.

1.5.4. STEPS FOR MAINTAINING PROPER TIRE PRESSURE

Step 1: Locate the recommended tire pressure on the trailer's tire information placard, certification label, or in the owner's manual.

Step 2: Record the tire pressure of all tires.

Step 3: If the tire pressure is too high in any of the tires, slowly release air by gently pressing on the tire valve stem with the edge of your tire gauge until you get to the correct pressure.

Step 4: If the tire pressure is too low, note the difference between the measured tire pressure and the correct tire pressure. These "missing" pounds of pressure are what you will need to add.

Step 5: Add the missing pounds of air pressure to each tire that is underinflated.

Step 6: Check all the tires to make sure they have the same air pressure (except in cases in which the front and rear tires are supposed to have different amounts of pressure).

If you have been towing your trailer and think that a tire is underinflated, fill it to the recommended cold inflation pressure indicated on your trailer's tire information placard or certification label.

While your tire may still be slightly underinflated due to the extra pounds of pressure in the warm tire, it is safer to drive with air pressure that is slightly lower than the recommended cold inflation pressure than to drive with a significantly underinflated tire. Since this is a temporary fix, don't forget to recheck and adjust the tire's pressure when you can obtain a cold reading.

1.5.5. TIRE SIZE

To maintain tire safety, purchase new tires that are the same size as the trailer's original tires or another size recommended by the manufacturer. Look at the tire information placard, the owner's manual, or the sidewall of the tire you are replacing to find this information. If you have any doubt about the correct size to choose, consult with your dealer.

1.5.6. TIRE TREAD

The tire tread provides the gripping action and traction that prevent your trailer from slipping or sliding, especially when the road is wet or icy. In general, tires are not safe and should be replaced when the tread is worn down to 1/16 of an inch. Tires have built-in treadwear indicators that let you know when it is time to replace your tires. These indicators are raised sections spaced intermittently in the bottom of the tread grooves. When they appear "even" with the outside of the tread, it is time to replace your tires. Another method for checking tread depth is to place a penny in the tread with Lincoln's head upside down and facing you. If you can see the top of Lincoln's head, you are ready for new tires.

1.5.7. TIRE BALANCE AND WHEEL ALIGNMENT

To avoid vibration or shaking of the trailer when a tire rotates, the tire must be properly balanced. This balance is achieved by positioning weights on the wheel to counterbalance heavy spots on the wheel-and-tire assembly. A wheel alignment adjusts the angles of the wheels so that they are positioned correctly relative to the trailer's frame. This adjustment maximizes the life of your tires. These adjustments require special equipment and should be performed by a qualified technician.

1.5.8. TIRE REPAIR

The proper repair of a punctured tire requires a plug for the hole and a patch for the area inside the tire that surrounds the puncture hole. Punctures through the tread can be repaired if they are not too large, but punctures to the sidewall should not be repaired. Tires must be removed from the rim to be properly inspected before being plugged and patched.

1.5.9. TIRE FUNDAMENTALS

Federal law requires tire manufacturers to place standardized information on the sidewall of all tires. This information identifies and describes the fundamental characteristics of the tire and also provides a tire identification number for safety standard certification and in case of a recall.

1.5.9.1. UTQGS Information

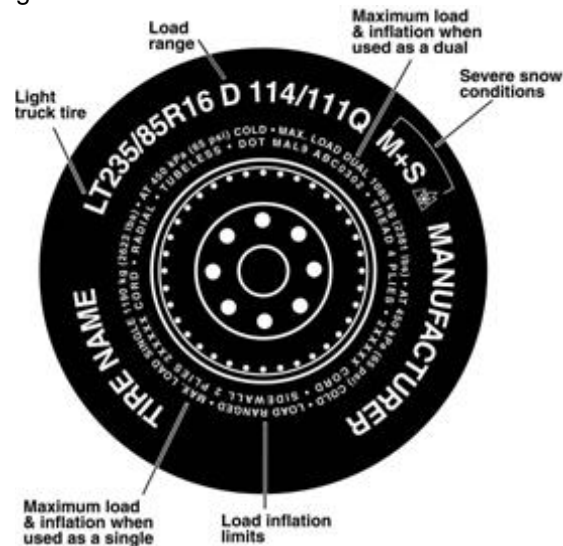
Treadwear Number - indicates the tire's wear rate. The higher the treadwear number is, the longer it should take for the tread to wear down. For example, a tire graded 400 should last twice as long as a tire graded 200.

Traction Letter - indicates a tire's ability to stop on wet pavement. A higher graded tire should allow you to stop your car on wet roads in a shorter distance than a tire with a lower grade. Traction is graded from highest to lowest as "AA", "A", "B", and "C".

Temperature Letter - indicates a tire's resistance to heat. The temperature grade is for a tire that is inflated properly and not overloaded. Excessive speed, underinflation or excessive loading, either separately or in combination, can cause heat build-up and possible tire failure. From highest to lowest, a tire's resistance to heat is graded as "A", "B", or "C".

1.5.9.2. Information on Light Truck Tires

Please refer to the diagram below.



Tires for light trucks have other markings besides those found on the sidewalls of passenger tires.

LT - indicates the tire is for light trucks or trailers.

ST - indicates the tire is for trailer use only.

Max. Load Dual kg (lbs) at kPa (psi) Cold - indicates the maximum load and tire pressure when the tire is used as a dual, that is, when four tires are put on each axle.

Max. Load Single kg (lbs) at kPa (psi) Cold - indicates the maximum load and tire pressure when the tire is used as a single.

Load Range - identifies the tire's load-carrying capabilities and its inflation limits.

1.6. TIRE SAFETY TIPS

Preventing Tire Damage

- ◇ Slow down if you have to go over a pothole or other object in the road.
- ◇ Do not run over curbs or other foreign objects in the roadway, and try not to strike the curb when parking.

Tire Safety Checklist

- ◇ Check tire pressure regularly (at least once a month), including the spare (if equipped).
- ◇ Inspect tires for uneven wear patterns on the tread, cracks, foreign objects, or other signs of wear or trauma.
- ◇ Remove bits of glass and foreign objects wedged in the tread.
- ◇ Make sure your tire valves have valve caps.
- ◇ Check tire pressure before going on a long trip.
- ◇ Do not overload your trailer. Check the Tire Information and Loading Placard or Owner's Manual for the maximum recommended load for the trailer.